The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

June 2006
TNC Pacific Island Countries
Report No 1/06

Solomon Islands Marine Assessment

Technical report of survey conducted May 13-June 17, 2004

Edited by:
Alison Green, Paul Lokani,
William Atu, Peter Ramohia,
Peter Thomas & Jeanine Almany

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

SOLOMON ISLANDS GOVERNMENT

June 2006
TNC Pacific Island Countries
Report No 1/06

Solomon Islands Marine Assessment

Technical report of survey conducted May 13-June 17, 2004

Edited by:
Alison Green, Paul Lokani,
William Atu, Peter Ramohia,
Peter Thomas & Jeanine Almany

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Contact Details:
Alison Green : The Nature Conservancy, 51 Edmondstone Street, South Brisbane, QLD 4101 Australia
e-Mail : agreen@tnc.org

William Atu : The Nature Conservancy, PO BOX 759, Honiara, Solomon Islands
e-Mail : tncdpm@solomon.com.sb

Suggested Citation:
Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: © Louise Goggin, CRC Reef Research Centre

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Supported by:

AUSTRALIAN INSTITUTE OF MARINE SCIENCE

David and Lucile Packard Foundation

M.V. FeBrina PAPUA NEW GUINEA

WWF for a living planet

Queensland Government Department of Primary Industries and Fisheries

John D and Catherine T MacArthur Foundation

CONSERVATION INTERNATIONAL

WILDLIFE CONSERVATION SOCIETY

APEX ENVIRONMENTAL

Marisla Foundation

Triggerfish Images

SeagrassWatch

CRC Reef Research Centre

Foreword

The Solomon Islands is a young country striving to overcome the destabilising social and economic impacts of the recent civil unrest and provide a future of hope for our people based on sound, sustainable economic development and the protection of our distinct and unique natural heritage, cultural traditions and social values. We are a country where over 85 % of our people still live in rural communities. The recent troubles showed us just how heavily we rely on clean rivers and streams to provide us with life giving water, on the land for our gardens, on healthy forests for many resources, and the sea, coral reefs and mangroves for our daily sustenance. It is also true that for many of our communities these same natural resources are our only source of cash income to pay for the necessities of life such as school fees, fuel and trade goods.

Because we are still so heavily reliant on our environment it is vital that we work together to sustainably and wisely manage our biological and natural resources. This is not a new concept to us. Solomon Islanders have been successfully practising conservation since our forebears first arrived in our beautiful islands many generations ago. Indeed, many of our cultural traditions and Christian beliefs have their very origin in the conservation of our environment as do our traditional systems of resource use rights. However, in recent times population growth and the influence of the cash economy has made an impact on our society resulting in dramatically increased pressures on all our natural resources.

The establishment of conservation areas is an important way of helping to safeguard our natural resources so that they can continue to meet our material and cultural needs and help us and our children flourish as a society. In this regard the Solomon Islands Marine Assessment will be invaluable to helping us plan the future sustainable use of our marine resources. This first national marine survey is a scientific milestone in our history and provides us with vital information on the state of our marine environment and a baseline against which we can measure change over time. More importantly, it will help many coastal communities to establish community based conservation areas to protect important fish breeding grounds and reefs.

The survey was remarkable in that it was also a fully co-operative project between the Solomon Islands Government which provided logistical support and scientific and technical expertise, local communities which freely gave their permission for the survey team to visit their reefs and international conservation groups which provided scientific expertise, planning and funding.

On behalf of the people of the Solomon Islands I would like to thank all those involved in bringing this important project to a successful conclusion. In many ways this report is the beginning of the hard work not the end and I would urge that we all commit to working in continued partnership to sustain the future of the Solomon Islands.

Sir Allan Kemakeza
Office of the Prime Minister

Acknowledgements

The survey was a cooperative project between The Nature Conservancy, Solomon Islands National and Provincial Government Departments and non-government conservation agencies including World Wide Fund for Nature (WWF), Conservation International (CI), Wildlife Conservation Society (WCS), Australian research organisations (Australian Institute of Marine Science (AIMS), CRC Reef Research Centre, Queensland Dept Primary Industries & Fisheries (QDPI&F), APEX Environmental Pty Ltd) and Triggerfish Images.

The success of this survey hinged on the support and interest of the tribal chiefs, church leaders, local NGOs, elders, men, women and children of the villages and communities that we have visited from May 13- June 17. We thank them all and would like to say, ***Barava Tagio Tumas***. Your kind assistance in helping us to carry out this survey on your reefs has been instrumental to its success. It is hoped that the results of the marine assessment will be used to help ensure the sustainability of the marine resources of the Solomon Islands, while also raising global awareness on the uniqueness and importance of Solomon Islands reefs, some of the last great reef ecosystems on earth.

This survey was supported by the David and Lucile Packard Foundation, Marisla Foundation, the John D. and Catherine T. MacArthur Foundation and the MV FeBrina of Walindi Plantation Dive Cruises.

Contents

Executive Summary

The Solomon Islands Marine Assessment represents the first broad scale survey of marine resources in the Solomon Islands. The survey was conducted over a five-week period from May 13 to June 17 2004, covering a distance of almost 2000-nm and encompassing seven of the nine provinces. The survey team comprised an international team of scientists and managers, including some of the world's experts of coral reefs and associated habitats. The survey provided an assessment of the biodiversity and status of coral reefs, seagrass beds, oceanic cetaceans, reef food fish, commercial invertebrates and associated habitats, and recommendations for their conservation and management.

The marine assessment demonstrated that the Solomon Islands is an area of high conservation value where marine diversity is exceptionally high, marine habitats are in good condition, and current threats are low. The diversity of marine life, condition of marine habitats, and the attractiveness of rainforest-dominated islands combine to create coastal settings seldom seen in today's over-populated and over-exploited world. However, there is some concern regarding increasing threats to marine habitats, particularly from fishing and poor land use practices.

The Solomon Islands has one of the highest diversities of corals anywhere in the world. A total of 494 species were recorded on this survey: 485 known species and nine that were unknown to the coral experts, which may be new species. This extraordinarily high diversity of coral species is the second highest in the world, second only to the Raja Ampat Islands of eastern Indonesia. Of the described species, 122 species have their known ranges extended by this study.

The survey also confirmed that the Solomon Islands possess one of the richest concentrations of reef fishes in the world. A total of 1019 fish species were recorded, of which 786 were observed during the survey and the rest were found from museum collections. A formula for predicting the total reef fish fauna indicates that at least 1,159 species can be expected to occur in the Solomon Islands. Forty-seven new distributional records were obtained, including at least one new species of cardinalfish. The number of species visually surveyed at each site ranged from 100 to 279, with an average of 184.7. Two hundred or more species per site is considered the benchmark for an excellent fish count, and this figure was achieved at 37 percent of the sites in the Solomon Islands. One site (Njari Island, Gizo) was the fourth highest fish count ever recorded for a single dive, surpassed only by three sites in the Raja Ampat Islands.

Seagrass biodiversity is also high. Ten species of seagrass were identified, which represents 80% of the known seagrass species in the Indo-Pacific Region. The most extensive seagrass meadows were found in Malaita Province, where there were some very large meadows, including one that was more than 1000 hectares in size. Seagrass meadows were associated with a high biodiversity of fauna including dugong, fish, sea cucumbers, seastars, algae and coral. These highly productive seagrass meadows are often located on the fringe of coastal communities and support important fisheries and provide extensive nursery areas for juvenile fish.

A relatively low species diversity and abundance of cetaceans (whales and dolphins) was recorded throughout most of the Solomon Islands with spinner and spotted dolphins locally abundant in some areas. Ten species of cetaceans where sighted, including spinner, pantropical spotted, Risso's, common bottlenose, Indo-Pacific bottlenose and rough-toothed dolphins, a Bryde's or Sei whale, orca and beaked whales. Sperm whales were also identified acoustically.

The Indispensable Strait region and some other narrow, deep passages in the Solomon Seas were tentatively identified as important migratory corridors.

This survey has shown that the Solomon Islands are clearly part of the global centre of marine diversity, known as the Coral Triangle, which also includes parts of the Philippines, Indonesia, Malaysia (Sabah), East Timor and Papua New Guinea

Figure 1. The Coral Triangle

The primary reason for this extraordinary biodiversity is the wide range of marine habitats. Virtually every situation is represented from highly protected, silt-laden embayments around larger islands to clear-water oceanic atolls situated well offshore. In some areas, the coastlines are exceptionally convoluted with many fjord-like embayments, narrow straits and island clusters, all set in very wide ranges of bathymetry and current regimes. In other areas, the coastlines are dominated by reefs exposed to high-energy wave action (including barrier reefs of many types). Other coastlines have very extensive mangrove forests, seagrass meadows and other soft substrate habitats. There are also vertical walls exposed to currents and dominated by sea fans, sponges and crinoids, and islands with enclosed lagoons with steeply sloping sides and clear deep water. When combined, this array of habitats creates a range of environments seldom seen in other regions of comparable size.

Unfortunately it was not possible to include the remote outer islands and reefs in the Solomon Islands (Ontong Java atoll, Rennel Island, Indispensable reefs and Santa Cruz Islands) in this survey. These areas are geologically, oceanographically and climatologically different from the rest of the Solomon Islands, and are therefore expected to support different coral reef communities. The full extent of the biodiversity of the Solomon Islands will not be understood until similar surveys have been completed in these areas.

A significant component of the survey was an assessment of key fisheries resources, which are vitally important to the livelihood of the Solomon Island people. Healthy populations of reef fishes were observed in more remote areas (particularly Choiseul, Isabel and Western Provinces), although there was some evidence of overfishing in provinces close to major population centres in Guadalcanal and Malaita. There was also evidence of overfishing of large, vulnerable reef fishes and commercially important invertebrates (particularly trochus, sea cucumbers and giant clams) throughout most of the Solomon Islands. In contrast, these species were still abundant in the Arnavon Community Marine Conservation Area (ACMCA) where commercial fishing and collecting is banned and only subsistence collecting of some reef fish species is allowed. These results show that after more than 10 years of protection, the ACMCA has been successful in achieving its goal of protecting important fisheries species.

Finally, reflecting their concern and that of the community representatives who participated in the survey, the survey team has offered a range of recommendations for the conservation and sustainable use of these globally, nationally and locally important marine habitats and resources. These include specific recommendations for the establishment of networks of locally managed marine areas, the management of important reef fisheries, the protection of key habitats (coral reefs, seagrasses and mangroves), and the conservation of oceanic cetaceans and associated habitats.

Conservation & Management Recommendations

Reflecting their concern and that of the community representatives who participated in the survey, the survey team has offered a range of recommendations for the conservation and sustainable use of the globally, nationally and locally important marine habitats and resources in the Solomon Islands. These include specific recommendations for the establishment of networks of locally managed marine areas, the management of critically important reef fisheries, the protection of key habitats (coral reefs, seagrasses and mangroves), and the conservation of oceanic cetaceans and associated habitats.

Marine Conservation Areas

Locally managed marine conservation areas can play a critical role in protecting biological diversity and marine resources. The key to protecting the biological diversity of the Solomon Islands is to establish a network of marine conservation areas (MCAs) that includes representative examples of the main habitat types (coral reefs, seagrasses and mangroves), with special attention to degree of exposure from wind and waves, substrate type, and depth. While it is seldom possible to capture all these characteristics in a single area, there is plenty of scope to create an effective network that represents the full range of marine biodiversity in the Solomon Islands. While climate change has not had major impacts on the Solomon Islands to date, it is also important that MCA networks are designed to be resilient in the face of change.

The Arnavon Islands Community Marine Conservation Area (ACMCA) is an important community managed marine conservation area and an example of what can be achieved in marine conservation in the Solomon Islands. Although originally established to protect an important sea turtle-nesting area, the ACMCA also harbours impressive coral reef and fish communities and due to its high biodiversity status and the excellent condition of the reefs, the Arnavon Islands is a high priority to remain as a MCA in the Solomon Islands.

Marine Conservation Areas like the Arnavon Islands play an important role in maintaining and enhancing marine resources on which the people of the Solomon Islands depend. The ACMCA provides an excellent example of how local communities can work together to protect their marine resources. Since local communities have traditional user rights in all the reef and coastal sea areas, community managed MCAs are a key strategy for marine resource management in the Solomon Islands. While these MCAs are often small in size, they can be successful in protecting marine resources if they are strategically incorporated as part of a larger scale network of MCAs. A number of these small MCAs have already been established by communities in Marau Sound, Ngella, Marovo Lagoon, Tetepare, Roviana Lagoon and Gizo (Figure 1). Similar areas should be established for marine resource management in the Shortland Islands, Russell Islands, Three Sisters Islands, Leli Island, Lau Lagoon, Suafa Bay, Langalanga Lagoon, Are'Are Lagoon and small Malaita, Northern Isabel and Northern Choiseul. Although these areas would be managed by the communities themselves, government and partner NGO support would be essential. Both the national and provincial governments through relevant department(s) with community and clan support, should take appropriate steps to legalise these locally managed marine areas as provided for under provisions of the Fisheries Act 1998. Under this Act, the responsibility for coastal and inshore fisheries is vested in the provinces. This also includes the power to prepare ordinances for the establishment and protection of marine reserves.

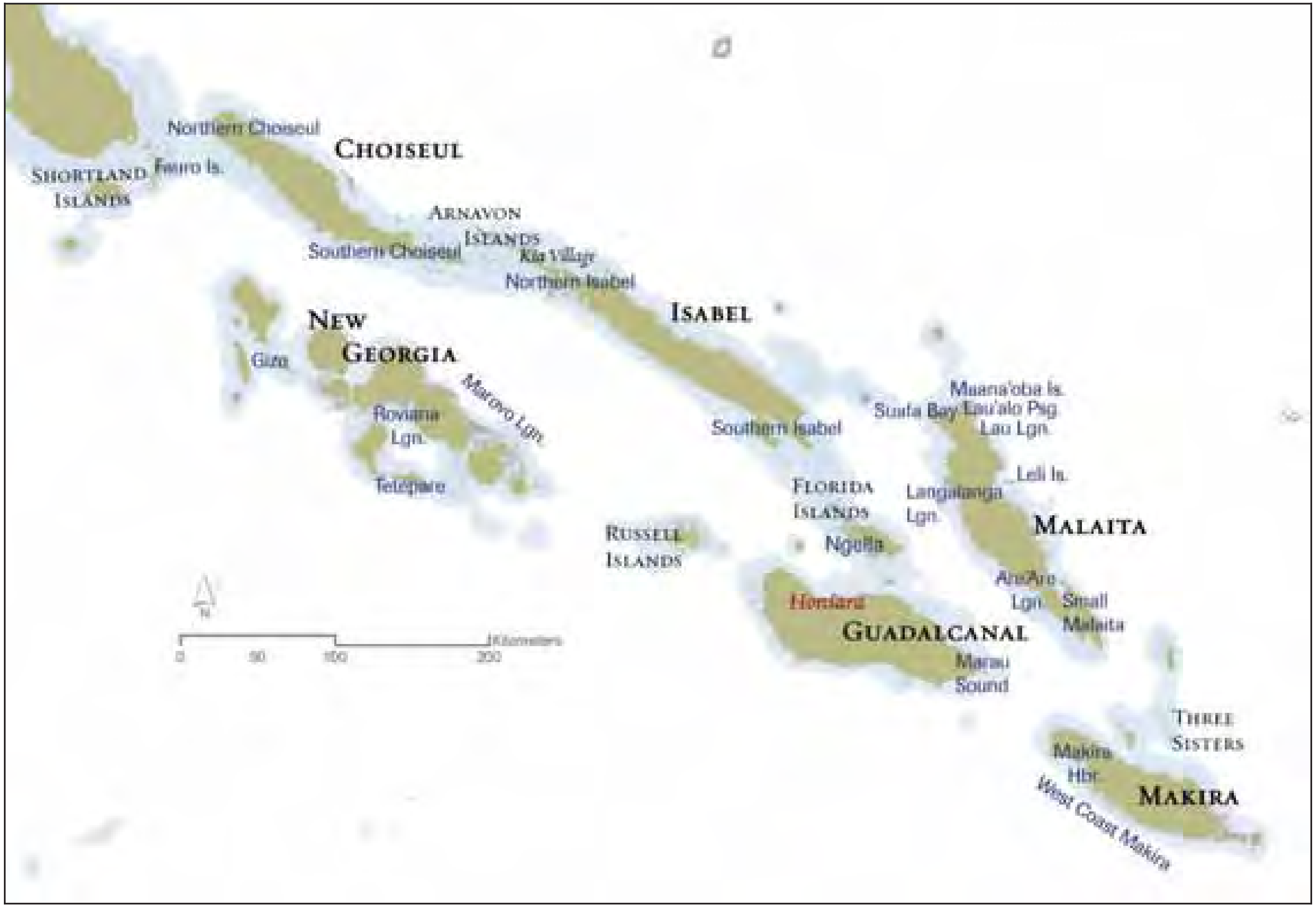


Figure 1. Priority sites for Marine Conservation Areas identified during the Solomon Islands Marine Assessment.

Other areas that the survey team believe would make good choices for MCAs to protect biodiversity would include (Figure 1) (by Province):

Choiseul Province

- The fjord-like coastline on the south coast of Choiseul Island is an area of great interest from an ecological and biodiversity perspective.

Isabel Province

- The general area around Kia Village (north-western Isabel) provides an excellent variety of well-flushed sheltered reef habitats and extensive mangrove environment. It is perhaps the best example of this sort of habitat in the entire Solomons. The mangrove-reef habitat is vital for many commercial species, such as snappers and Napoleon Wrasse. Therefore its inclusion in any protected area network is essential.
- The fjord-like coastline on southern Isabel is also an area of great interest.

Western Province

- Njari Island (near Gizo) is a world-class diving site and a prime location for a MCA. This is an area of very high diversity, strong currents and good flushing, steep outer reef dropoff, and a sheltered reef near shore interspersed with areas of clean-sand. The island is uninhabited. Coral reef fish diversity is extremely high – the highest recorded in the Solomon Islands and one of the highest recorded in the world.
- The Shortland Islands is also an area of great interest, where biodiversity is high, and reefs are in good condition. One good candidate would be Haliuna Bay and vicinity (Fauro Island). This area supports a very diverse fish community despite its sheltered position. There is a good cross section of habitat within the bay including mangroves, seagrass beds, shallow reef flat, rich coral areas, and an abrupt slope to relatively deep water. The bay is uninhabited and the surrounding mountainous slopes provide a spectacular setting. There would also be scope at this location to encompass the more exposed marine habitats, including the outer reef environment, that lie just outside the bay.

Central Province

- The Russell Islands provide the best opportunity for a MCA in Central Province, since biodiversity is relatively high, there is a range of habitat types, and the reefs are in good condition.

Guadalcanal Province

- Marau Sound is an extensive, picturesque lagoonal system at the southern tip of Guadalcanal with great conservation potential. There is an excellent variety of reef habitats from sheltered bays to exposed outer reefs. Of special interest are the numerous, variable-sized islands scattered across the sound. The human population is relatively sparse and the local community has experience with conservation and management projects, since it is the site of a giant clam grow-out experiment.

Malaita Province

- Lau'alo Passage and Maana'oba Island (northeast Malaita) with its extensive shallow reef areas and reticulate channels, seagrass meadows and artificial reef island villages, is an area of great ecological and cultural value, and potential conservation interest. The artificial reef island villages in this area reflect a unique culture in Malaita, and the inhabitants' livelihood is strongly linked with the reef and its resources. The passage to the harbour was not surveyed, but it is likely to support unique coral community types. This was also an area of extremely large seagrass beds, perhaps the largest in the Solomon Islands. This area may prove to be one of the most special areas in the Solomon Islands.
- Leli Island (north-eastern coast of Malaita) has a unique "half-atoll" structure featuring a well-sheltered lagoon with mangroves and fringing reef, and a very interesting complex of outer reefs offering all degrees of exposure. Water clarity on outer reef dives is excellent. The island does not appear to support a permanent human population, only sporadic fishing camps.

Makira Province

- The west coast of Makira was one of the most scenic areas visited during the survey, and the Makira Harbour area in particular appears to have excellent potential as a MCA. There is an extensive network of highly sheltered bays as well as ample outer reef habitat.
- The Three Sisters Islands also have excellent potential, providing a prime example of an offshore island system with minimal terrestrial influence and a very sparse human population. Some of the best underwater conditions were encountered off Malaupaina Island, including excellent visibility and high biodiversity. Malaupaina also has an extensive shallow lagoon that is almost entirely land-locked.

Two key areas of the Solomon Islands were not surveyed during this survey: Rennell Island and Ontong Java Atoll. These areas possess special environmental features and need to be assessed in the future. It would appear that both areas would feature prominently within a national network of MCAs.

Fisheries Management

The results of this survey indicate that overfishing of marine resources may already be occurring in some provinces. While overfishing is a concern for coral reef fish resources in some provinces, the situation is even more serious for some species of commercially important invertebrates. Given the rapidly rising population in the Solomon Islands, this problem is likely to become more serious and widespread in the future.

Because of the importance of these resources to the livelihood of the Solomon Island people, it is very important that they are managed to ensure their long term sustainability. As the country's population increases, the reliance on reef fish resources is also expected to increase. In light of this scenario, the government is strongly urged to undertake appropriate measures to safeguard its coral reef resources.

Coral Reef Fishes

We recommend that the National Government consider the following management actions to ensure the long term sustainability of coral reef fishes:

- Ban the use of highly efficient and destructive fishing methods, particularly gillnets and night spear fishing;
- Undertake a nationwide education and awareness program to help fishermen understand the importance of conservation and management of fisheries resources, and the important habitats these resources depend on for their well being;
- Implement an education and awareness program on blast fishing targeted towards ensuring that young people understand the effect of these methods on marine resources and their habitats, and that this activity is prohibited and penalties apply for breaching the law;
- Recruit more enforcement officers to work closely with other law enforcement agencies and rural fishing communities to monitor and enforce fisheries laws and regulations;
- Facilitate and support the establishment of Marine Conservation Areas in conjunction with local communities, to protect key fisheries species (food and aquarium fishes);
- Protect large and vulnerable fish species (humphead parrotfish, humphead wrasse and large groupers) through the protection of fish spawning aggregation sites, and the implementation of the National Management and Development Plan for the Live Reef Food Fish Fishery;
- Develop Management and Development Plans for other food fishes and the Aquarium Industry;
- Speed-up the appointment and establishment of the Fishery Advisory Council as provided for under the Fisheries Act 1998, to ensure proper Fisheries Management and Development Plans are implemented;
- Develop alternative offshore fisheries such as deep water snapper fishing, raft fishing for tuna and squid fishing to ease fishing pressure on the inshore resources; and
- Establish long term monitoring of key fisheries resources, and their use in subsistence and artisanal fisheries in the Solomon Islands

Commercially Important Macroinvertebrates

We recommend that the National Government consider the following management actions to ensure the long term sustainability of commercially important invertebrates:

- The Fisheries Regulation banning the use of SCUBA and Hookar gear for harvesting of valuable invertebrate resources like sea cucumber should be vigorously enforced.
- Awareness programs on all Fisheries Regulations should be targeted at rural communities, schools and the public at large. Funding should be sought for radio awareness programs. A meeting should be held with each Provincial Police Commander to discuss with them aspects relating to the enforcement of Fisheries Regulations.
- The Department of Fisheries and Marine Resources should consider alternative management options for the sea cucumber and *Trochus* fisheries in the Solomon Islands. A number of options are suggested:
    1) Limiting the number of export permits;
    2) Setting annual export quotas for these resources; and
    3) Setting size limits for sea cucumbers species (wet and dry size limits)

- The Department of Fisheries and Marine Resources should impose a total protection of the species greensnail (*Turbo marmoratus*) through a Fisheries Regulation. A reseeding program should be initiated to rebuild this almost extinct population.
- The Department of Fisheries and Marine Resources should consider utilising existing structures like Fisheries Centres and Extension arrangements already in place to improve collection of harvest data (species and location) and awareness for fisheries in rural areas.
- The collection of live coral for lime production may pose a serious threat to reefs in some locations, and should be investigated and managed.

Addressing Land Based Threats

One of the major threats to inshore marine habitats in the Solomon Islands, particularly seagrasses and coral reefs, is poor land use practices associated with large scale logging and agricultural practices. This is a serious issue that will need to be addressed through appropriate environmental guidelines to fully protect marine biodiversity and key resources in the Solomon Islands.

Protection of Seagrasses & Mangrove Habitats

Seagrasses and mangroves provide vitally important habitat for many marine species, including many species of fish and invertebrates that are important in local fisheries. Recommendations for the conservation and management of seagrasses and mangroves in the Solomon Islands include:

- Promoting seagrass and mangrove conservation as they have had a low priority in conservation programs in the region. Seagrass and mangrove conservation values need to be enhanced by development of education resource materials, to be used in schools and community groups;
- Establishing more MCAs to ensure that examples of seagrass and mangrove ecosystems remain in the Solomon Islands for use by future generations;
- Enforcing legislation for the protection of mangrove forests;
- Establishing a monitoring program of seagrass and mangrove ecosystem health, linked to existing region/global monitoring programs (e.g., Seagrass-Watch, www.seagrasswatch.org) for monitoring climate change/sea level rise impact;
- Preparing detailed maps of seagrass beds for locations which are highly threatened by poor water quality (e.g., Marovo Lagoon);
- Conducting detailed surveys and studies on dugong/turtle-seagrass distribution based on the known seagrass habitats identified in this survey; and
- Conducting studies on the importance, ecology, and population dynamics of subsistence fisheries (e.g., rabbit fish) which seagrass/mangrove ecosystems support.

Conservation of Oceanic Cetaceans & Associated Habitats

This study represents the first broad scale assessment of oceanic cetaceans and associated habitats throughout the main island chain of the Solomon Islands. However, further studies are still required to provide a strong basis for their conservation and management including:

- Identifying important cetacean habitats for protective management, including preferred breeding, feeding and resting areas, as well as migratory routes and corridors;
- Investigating the sustainability of traditional dolphin drives;
- Investigating interactions between cetaceans and pelagic fisheries, marine tourism and other commercial uses (eg captive-dolphin export trade);
- Further evaluating the effect of the increased pressure of the Gavutu Captive Dolphin Facility on local fish stocks due to the captive dolphin food requirements;
- Further studies to address the knowledge gap on the diversity, abundance and distribution of whales and dolphins in Solomon Islands' territorial waters, including additional cetacean surveys and focused research on priority areas and species (particularly commercially exploited species and those targeted by traditional fisheries); and
- Accessing other available information through short term, cost-effective projects such as canvassing and consolidating local knowledge, establishing a local cetacean sighting and stranding network, and recording new sightings and human-interactions (fisheries, tourisms).

Oceanic cetaceans are wide ranging and it is not possible to support them throughout their entire range. However, they do have preferred habitats for breeding, feeding, resting, and migrating, which should be identified and protected. While further studies are required to identify and confirm these areas in the Solomon Islands, best available information suggests that the following should be regarded as a preliminary shortlist for protection:

- North Guadalcanal to the Florida Islands (waters and inter-island passages);
- New Georgia Group, especially the wider Gizo – Kolombangara – Simbo Isl. Area;
- Malaita, especially the waters around Fanalei and Bita 'Ama (southeast and northwest Malaita respectively);
- Shortland Islands (Fauro and Shortland Island Groups);
- Russell Islands;
- Southern oceanic waters off New Georgia;
- All deep, yet relatively narrow passages separating the main islands of the Solomon Islands from the South Pacific Ocean or the Solomon Sea: Indispensable Strait to Bita 'Ama, Manning Strait including the Arnavon Islands, Iron Bottom Sound, Gizo Strait and Vella Gulf, Blanche Channel, and Bougainville Strait; and
- Temotu Province.

Other recommendations for the conservation and management of ocean cetaceans and associated habitats include:

- The national government should seriously consider becoming a member of Convention of International Trade of Endangered Species (CITES)[1], in order to strengthen the management and conservation of the relatively high level of endemic and endangered species (both terrestrial and marine) in the Solomon Islands.
- Preferred cetacean habitats such as migratory corridors should be protected through site based management such as their inclusion in MCAs and managing key threats particularly gill and/or drift netting, blast fishing and noise pollution.

---

[1] CITES is an internationally recognized mechanism to sustainably manage wildlife trade in endangered species, including cetaceans.

- Protecting dolphin resting areas by working with local communities in collaboration with provincial and national government agencies, and exploring opportunities for dolphin watch tourism in these areas.
- Building local capacity to improve local expertise in cetacean monitoring and research by government and NGO personnel, and interested resort dive staff and community groups.
- Policy development for marine mammal conservation and management, for both national and provincial governments
- Broadening environmental awareness of cetaceans and related issues.

June 2006
TNC Pacific Island Countries
Report No 1/06

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

Overview

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

First Author Contact Details:
Peter Thomas : pthomas@tnc.org
Alison Green : agreen@tnc.org
William Atu : tncdpm@solomon.com.sb
Louise Goggin: Louise.Goggin@csiro.au

Suggested Citations:
Thomas, P., P. Lokani and W. Atu. 2006. Conservation Context. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Green, A., W. Atu and P. Ramohia. 2006. Solomon Islands Marine Assessment. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Atu, W. 2006. Partner and Community Liaison. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Goggin, L. and J. Almany. 2006. Communications. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

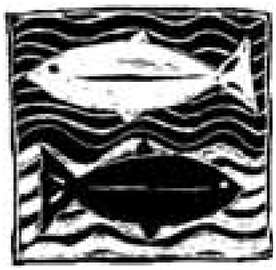
Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: ©Emre Turak

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org



CONSERVATION CONTEXT

PETER THOMAS, PAUL LOKANI AND WILLIAM ATU
The Nature Conservancy

ABOUT THE SOLOMON ISLANDS

Dotting the South Pacific in a double chain of 922 islands, the Solomon Islands covers more than two million square kilometres of ocean, making it one of the largest archipelagos in the world (Figure 1). In keeping with the nature of island environments, which have evolved in isolation from continental land masses, the Solomon Islands has many rare and endemic species. Although the country has long been known for its diverse and valuable marine resources, the Solomon Islands Marine Assessment confirmed that it supports one of the world's highest levels of marine diversity.

Figure 1. Location of the Solomon Islands

The Solomon Islands has a population of about 538,000 people, with an annual growth rate of 2.8 percent—one of the world's highest. Eighty-five percent of its people live in rural village communities, most of which are dependant on the sea for their livelihoods. Like other emerging Pacific Island nations with fast growing populations, the Solomon Islands is rapidly depleting its natural resources to obtain food and generate income for basic necessities. In some areas of the country, valuable marine resources such as beche-de-mer, trochus, and giant clams have been so heavily exploited that they have almost completely disappeared. Commercially valuable coral reef fish species are also beginning to show signs of overfishing in several provinces.

Because the people of the Solomon Islands own more than 95% of the land and have traditional user rights in all the reef and coastal sea areas, any conservation work must take into account the needs of local communities. The Nature Conservancy and other conservation organisations have collaborated with community and government partners in the Solomon Islands for more than a decade to protect some of the planet's richest marine ecosystems. In

1995, the Conservancy helped establish one of the first community-managed marine conservation areas in the South Pacific at the Arnavon Islands, a small island group between the main islands of Choiseul and Isabel (Figure 2). The Conservancy and other conservation organisations are now committed to expanding marine conservation strategies to all areas of the Solomon Islands archipelago, with a long-term goal of helping local communities, provincial and national governments, and other partners establish networks of marine protected areas to achieve lasting conservation in the Solomon Islands.

SURVEY BACKGROUND AND PARTNERSHIPS

Despite the extraordinary natural environment of the Solomon Islands, there is little scientific information regarding its biodiversity, an issue that has limited the effective conservation and management of local resources. At an experts' planning meeting for the Bismarck-Solomon Seas Ecoregion in 2003 led by World Wide Fund for Nature, participants agreed that the Solomon Islands was an area of extreme data deficiency and that a marine assessment of the area should be of highest priority. To help address this issue The Nature Conservancy collaborated with community, government, and non-government partners to organize the first comprehensive scientific survey of the Solomon Islands' marine environment. Conducted from May 13 to June 17 2004, and led by the Conservancy's Dr. Alison Green, the Solomon Islands Marine Assessment focused on the islands of the seven main provinces in the Solomon Island chain—Isabel, Choiseul, Western, Central, Guadalcanal, Malaita and Makira (San Cristobal) (Figure 2). The goal of the survey was to gather critical data on the biodiversity and status of marine ecosystems in the Solomon Islands.

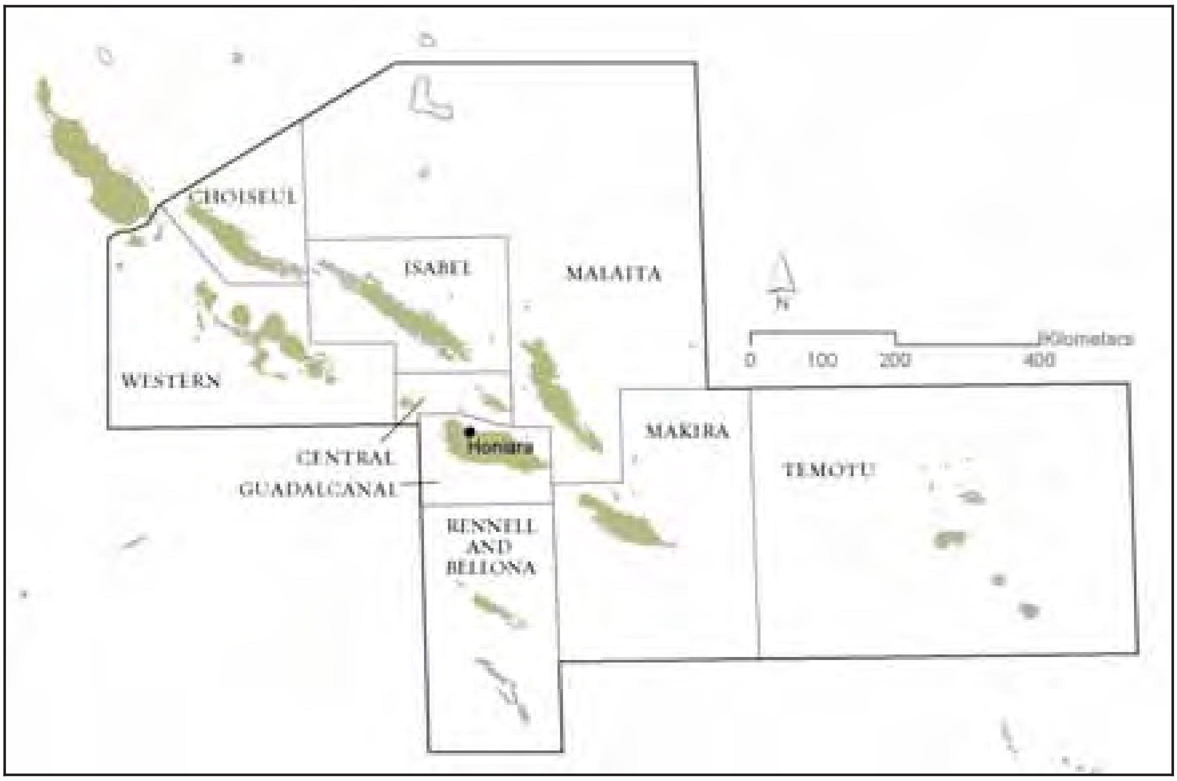


Figure 2. Solomon Island Provinces

To ensure support from local and provincial governments and the many village communities, the survey team also conducted a series of community liaison activities before, during, and after the survey (see *Partner and Community Liaison* this report).

A critical factor in the success of the survey was the decision by Solomon Island NGOs and Government agency representatives to establish the Solomon Islands Marine Assessment Coordinating Committee (SIMACC). SIMACC was comprised of:

- ***Government Partners:*** Department of Forestry, Environment and Conservation; Department of Fisheries and Marine Resources; Department of National Reform and Planning; and the Visitors Bureau.

- ***Local NGOs:*** Environmental Concern Action Network of Solomon Islands; and Foundations of South Pacific International.

- ***International NGOs:*** Worldwide Fund for Nature; International Waters Program; and The Nature Conservancy.

At their first official meeting, members of SIMACC unanimously agreed that the survey was of critical importance for future marine conservation and sustainable resource management. Expectations were discussed and the role that each member would take to ensure its success was agreed on. Subsequently, the SIMACC and its members were responsible for the successful co-ordination of the in-country logistics for the survey.

The committee also endorsed The Nature Conservancy to lead the survey as the organization in the strongest position to co-ordinate logistic, scientific, and financial support for the expedition. Other partners included Conservation International, the Wildlife Conservation Society, the Australian Institute of Marine Science, CRC Reef Research Centre, Queensland Department of Primary Industries and Fisheries, APEX Environmental, and Triggerfish Images. Funding support was provided by the David and Lucile Packard Foundation, Marisla Foundation, the John D. and Catherine T. MacArthur Foundation, and The Nature Conservancy.

Capacity Building

All partners agreed that the marine survey represented a unique opportunity to help build the skills and scientific knowledge of local marine scientists and managers in the Solomon Islands. Eight out of 17 positions on the survey team were assigned to Solomon Islanders, who were nominated for the survey based on recommendations from the SIMACC. Subsequently, these participants were engaged in all aspects of the survey, from planning and logistics to field surveys and report writing. They worked alongside recognized scientific experts with decades of experience conducting marine surveys in an atmosphere that encouraged learning and long-term mentoring relationships. This hands-on, one on one skill-building strengthened the ability of local scientists to conduct surveys and undertake follow up monitoring independently in the future. In turn, The Solomon Island participants contributed their extensive knowledge and understanding of the local environment, which they shared with the scientific experts.

Conservation for the Future

The survey showed that the mega-diversity area of the Indo-Pacific region known as the Coral Triangle extends to and embraces the Solomon Islands (Figure 3). This knowledge will enable marine scientists to create a blueprint for conservation in the Solomon Islands that takes into account the Coral Triangle and its associated marine ecosystems. Based on information gathered during the assessment, the survey partners are now working on establishing a network of marine protected areas in the Solomon Islands that links to other high-biodiversity sites in the Coral Triangle.

Perhaps most importantly, the marine survey showed that the Solomon Islands has one of the highest levels of marine biodiversity in the world. This realisation provides a new opportunity for the Solomon Islands in terms of its importance on a global scale and its ability to attract support for conservation.

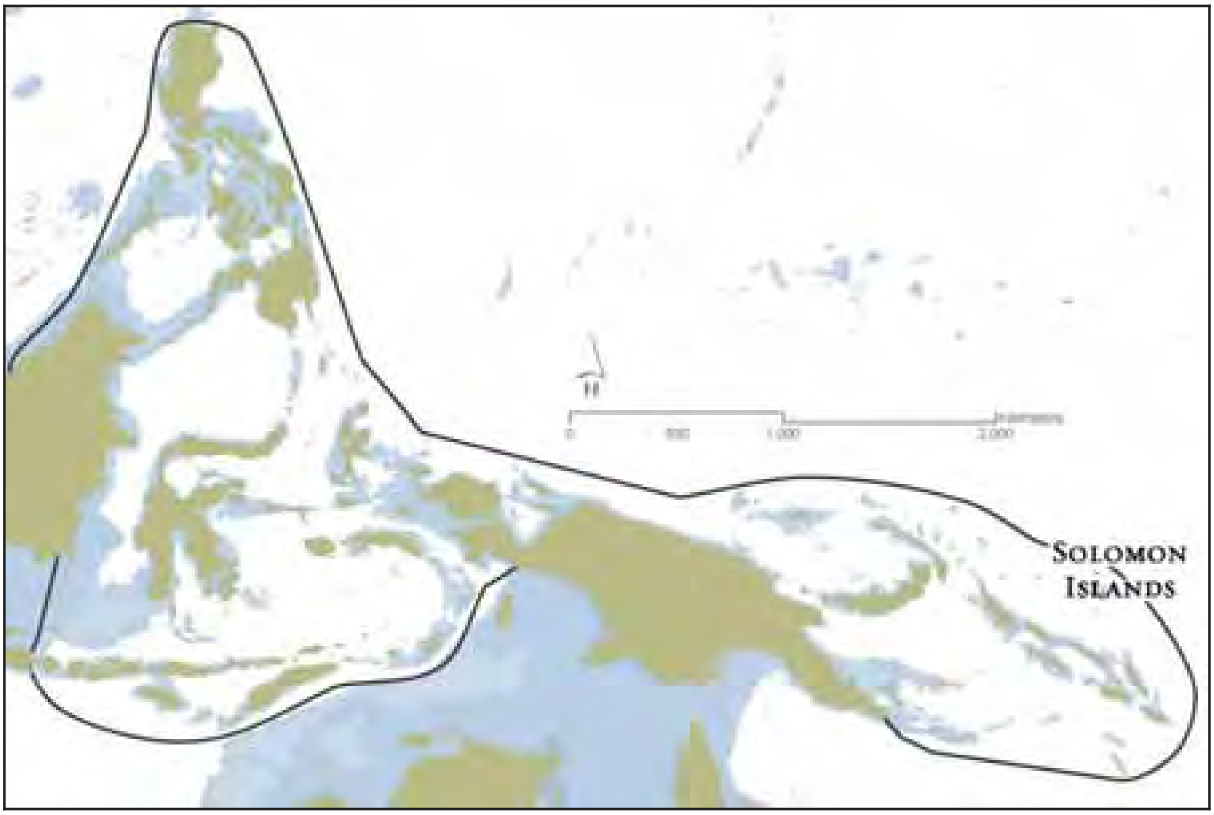


Figure 3. The Coral Triangle (Green and Mous 2006)

Building on their success with the in country co-ordination of the survey, SIMACC members have decided to evolve their organisation into the Conservation Council for the Solomon Islands (CCOSI). This group meets regularly to discuss issues of national importance and work together to influence conservation at a broader scale. Importantly, in terms of the future of conservation in the Solomon Islands, the CCOSI is now is acting as a catalyst to reinvigorate the process to develop a National Biodiversity Strategic Action Plan (NBSAP) for the Solomon Islands. The NBSAP is critical for developing conservation policy and action at the national level and for linking the Solomon Islands to the International Convention on Biological Diversity and associated international funding opportunities. The new organisation will also provide co-ordination, continuity and support as the survey partners begin applying its results to on-the-ground conservation work in the Solomon Islands.

The Solomon Islands Marine Assessment also provided a scientific basis for the National Government to reassess the status of beche de mer stocks in the Solomon Islands, leading to a moratorium on this fishery (particularly the commercial export of all beche de mer products) introduced in December 2005. While this moratorium is in place, the National Government is in the process of developing a Management and Development Plan for this fishery. The Solomon Islands Marine Assessment has also helped provide a scientific basis for the National Government to review the status of other key fisheries species, including food and aquarium fishes. These results will be used as the basis for reassessing management arrangements for these fisheries, particularly the use of highly efficient and destructive fishing methods.

These outcomes demonstrate that the Solomon Islands Marine Assessment has provided a strong basis for the future of marine conservation in the Solomon Islands.

References

Green A.L. & Mous P.J. 2006. Delineating the Coral Triangle, its ecoregions and functional seascapes. Report based on an expert workshop, held at the TNC Coral Triangle Center (April - May 2003), Bali, Indonesia, and on expert consultations held in June – August 2005. Version 3.1 (February 2006). Report from The Nature Conservancy, Coral Triangle Center (Bali, Indonesia) and the Global Marine Initiative, Indo-Pacific Resource Centre (Brisbane Australia). 340 pp.

SOLOMON ISLANDS MARINE ASSESSMENT

ALISON GREEN[1], WILLIAM ATU[1] AND PETER RAMOHIA[2]
The Nature Conservancy[1] & Solomon Islands Dept of Fisheries and Marine Resources[2]

OBJECTIVE

The primary objective of the Solomon Islands Marine Assessment was to conduct a broad-scale assessment of the biodiversity and status of marine ecosystems of the Solomon Islands.

SURVEY AREA AND TIMING

While a comprehensive survey of the Solomon Islands (Figure 1) was desirable, it was not feasible given logistic constraints (available time and resources), so the survey focused on the core island group stretching from Choiseul and the Shortland Islands in the northwest to Makira (San Cristobal) in the southeast (Figure 2). The survey track was 1860 nautical miles long, encompassing seven of the nine provinces: Isabel, Choiseul, Western, Central, Guadalcanal, Malaita and Makira.

The Marine Assessment was conducted over a five-week period from May 13 to June 17, 2004. This time period was selected because favorable weather conditions were expected at that time of the year, and the research vessel (see *Research Platform* below) was available at that time. The timing also allowed adequate time to make logistic arrangements, develop effective partnerships, and conduct community liaison prior to the survey (see *Partner and Community Liaison* this report).

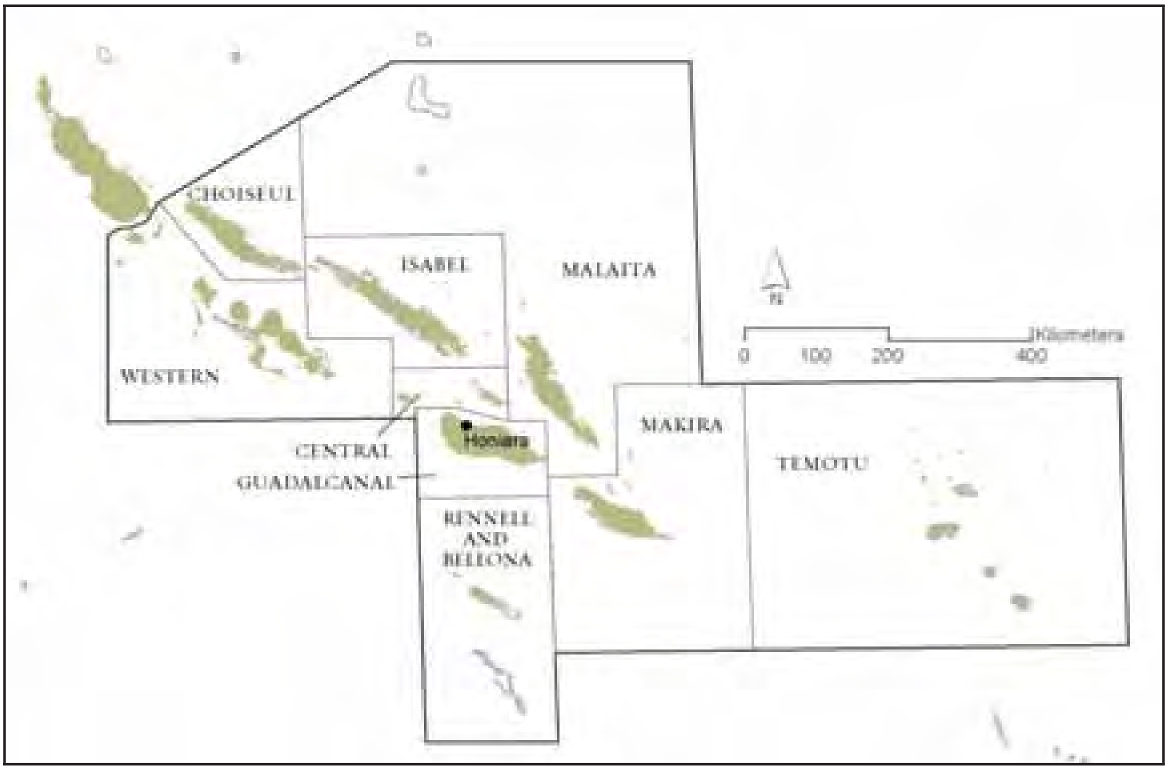


Figure 1. Solomon Island Provinces.

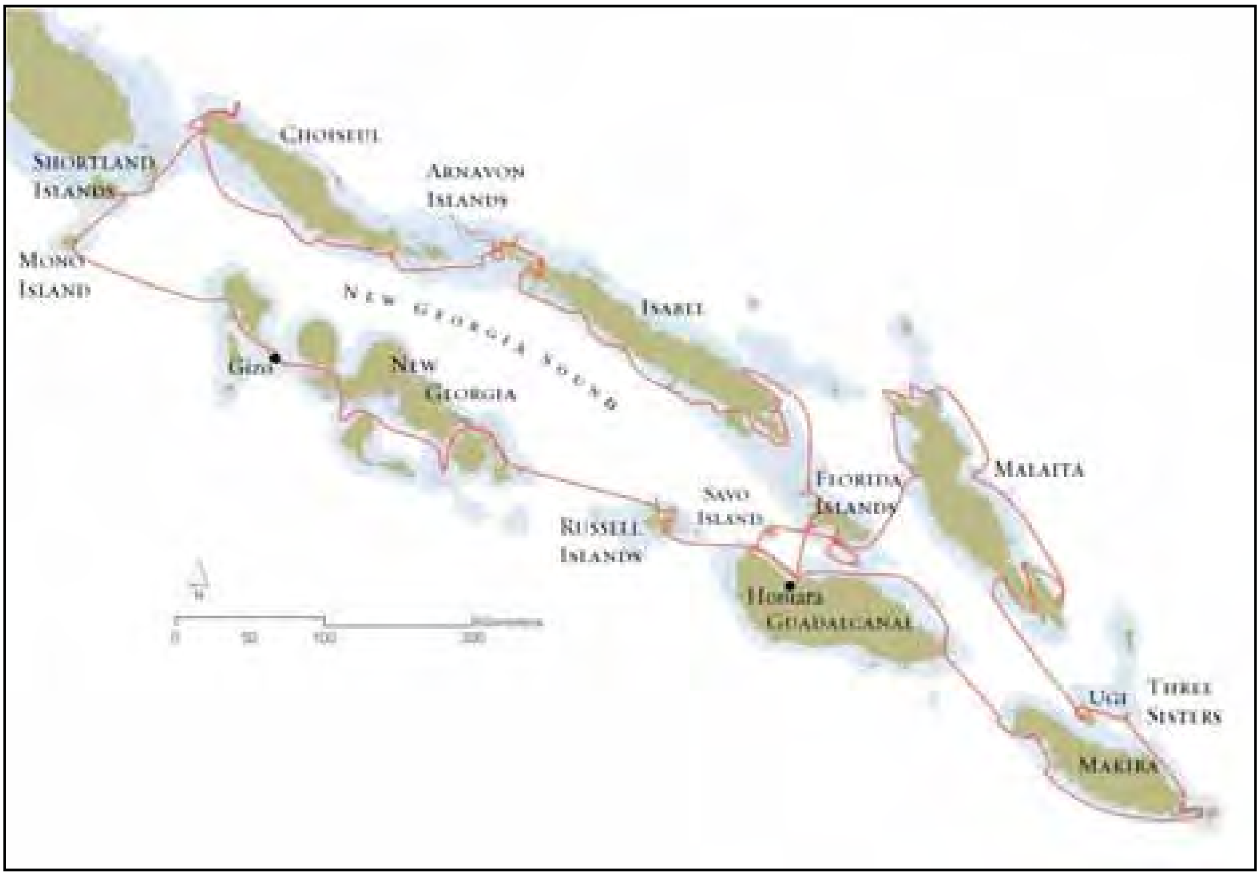


Figure 2. Survey route (red line) of the Solomon Islands Marine Assessment.

The survey was divided into two sectors due to the requirements of provisioning in Honiara and Gizo:

- **Northwest Sector:** The first three weeks focused on the northwest sector of the main island chain. The survey departed Honiara on May 13, and traveled north to the Florida Islands, Isabel, Arnavon Islands, Choiseul, Shortland Islands, Mono Island, New Georgia, Russell Islands and returned to Honiara on June 3.
- **Southeast Sector:** The last two weeks of the survey focused on the southeast sector of the main island chain. The survey departed Honiara on June 5 and traveled southeast along Guadalcanal to Makira, the Three Sisters and Ugi Island, before heading north to Malaita, west to the Florida Islands and Savo Island, and back to Guadalcanal, returning to Honiara on June 17.

Survey Components and Research Team

The primary focus of the survey was a scientific assessment of marine ecosystems, with an emphasis on high priority shallow water ecosystems: coral reefs and seagrass beds (with some information collected on mangrove forests). A cetacean survey was also conducted, due to the high level of interest in cetacean conservation and management in the Solomon Islands.

The Marine Assessment was conducted by a multi-disciplinary team focusing on the following components:

- Coral Reef Biodiversity and Reef Health (Corals and Reef Fishes);
- Coral Reef Resources (Benthic Communities, Key Invertebrates and Reef Fishes);

- Seagrass Beds and Mangrove Forests;
- Cetaceans and Deep Water Habitats;
- Community Liaison; and
- Communications.

The core survey team comprised seventeen people: nine were international scientists and eight were local scientists, managers and community representatives. The composition of the survey team was endorsed by the Solomon Islands Marine Assessment Coordinating Committee (SIMACC: see *Partner and Community Liaison* this report).

The following is a brief biography of the survey team, their relevant experience and roles:

Scientific Team Leader

Dr. Alison Green, The Nature Conservancy: Dr Green is the Marine Science Coordinator (Asia Pacific) for the Conservancy's Global Marine Initiative. She is a coral reef ecologist with expertise in coral reef assessment and monitoring, who has led numerous coral reef surveys in the Pacific Islands over the last 10 years. Her role was to work with the survey team and vessel crew to design and implement the survey, based on advice from the SIMACC.

Coral Reef Biodiversity and Reef Health

The primary objectives of this team were to assess: 1) the biological diversity of corals and reef fishes – two key components of the coral reef communities; and 2) the current health of the coral reef communities. The team comprised:

- **Dr. Gerry Allen, Conservation International:** Dr. Allen is recognised as one of the world's leading experts in coral reef fish taxonomy and has refined the methodology for rapidly assessing fish biodiversity on coral reefs in the Indo-Pacific Region. With more than 30 years experience, Dr. Allen has participated in many rapid ecological assessments for the Conservancy and other partners throughout the Region, including Indonesia and Papua New Guinea. Dr. Allen compiled detailed species lists for reef fishes at each site and a complete species inventory for the Solomon Islands.

- **Mr. Emre Turak, Marine Consultant:** Mr. Turak is a coral ecologist who has extensive experience conducting rapid ecological assessments in the Indo-Pacific region. Mr. Turak conducted an ecological assessment of the coral reef communities at each site. In particular, he assessed coral community types, their current status and health, and the extent of impacts on these reefs from disturbances, such as coral bleaching, crown of thorns starfish outbreaks, destructive fishing practices, and terrestrial runoff. He also compiled a detailed species list of corals for each site.

- **Dr. Charlie Veron, Australian Institute of Marine Science:** Dr. Veron is a world expert on coral taxonomy and biogeography. Together with Mr Turak, he compiled a complete species inventory for the survey. His role was to look beyond the detailed species lists compiled at each site to search for new and rare species. When new species were found, more detailed information was collected so they could be described. Dr. Veron participated in the first three weeks of the survey (the northwest sector) only.

Coral Reef Resources (Benthic Communities, Key Invertebrates and Reef Fishes)

A team of five scientists, managers and community representatives conducted a quantitative baseline assessment of the status of marine resources in the survey area. They assessed the size and structure of populations of key fisheries species (reef fish and invertebrates), and the cover and composition of benthic communities, including hard and soft corals. Key fisheries species were identified by discussions with Department of Fisheries and Marine Resources representatives and local fishermen. This survey established the basis for the long term monitoring of the coral reef resources of the Solomon Islands.

The survey team comprised:

- **Mr. Peter Ramohia, Department of Fisheries and Marine Resources (DFMR)**. Mr Ramohia completed a Bachelor of Science from the University of the South Pacific in 1990. Until recently, he was head of the Research and Resources Management Division of the DFMR in the Solomon Islands, and was acting Deputy Director of the Research and Resource Management Unit during the survey. Over the last 14 years, his work as a biological research officer in DFMR has included stock assessments of commercially important marine invertebrates and important reef fishes; and monitoring fish spawning aggregation sites, turtle nesting beaches, coral reefs and the tuna fishery. He conducted the assessment of populations of commercially important invertebrates during this survey. Mr Ramohia has recently left DFMR to join The Nature Conservancy as Marine Scientist for the Solomon Islands Project.

- **Mr. Alec Hughes, World Wildlife Fund (WWF)**. Mr Hughes has a Bachelor of Science in Marine Biology from James Cook University in Australia. At the time of the survey he was working for WWF as a Marine Officer in the Solomon Islands (based in Gizo), monitoring coral reefs and grouper spawning aggregations in the Western Solomons. Mr Hughes conducted the assessment of the benthic communities during the survey. He has recently left his position with WWF to undertake postgraduate studies at James Cook University in Australia.

- **Mr. Michael Ginigele, Marine Consultant**. Mr Ginigele is a master fishermen and a renowned natural historian. He is a qualified Dive Master who continues to divide his time between tourism, fisheries and conservation. He has worked with marine scientists and local and international NGOs on fisheries related research and monitoring in the Solomon Islands since 1999. He is a team leader of the Roviana Spawning Aggregation Monitoring Team, and is heavily involved in monitoring and conservation of reef fish spawning aggregation sites in the Western Solomons Islands, and wider Melanesia Region. Mr Ginigele conducted the assessment of the large food fish species in the survey.

- **Mr. Tingo Leve, World Wildlife Fund**. Mr Leve is a qualified dive master with 10 years experience diving around the Western Solomon Islands. He is currently a Field Officer with the WWF in the Solomon Islands, focusing on coral reef monitoring and grouper spawning aggregation programs. Mr Leve participated in the assessment of food fishes, benthic communities and commercially important invertebrates in the survey.

- **Dr Alison Green, The Nature Conservancy** (see *Scientific Team Leader* above). Dr Green conducted a survey of all reef fishes amenable to visual census techniques, with a focus on small to medium sized food and aquarium fishes.

Seagrass Beds and Mangrove Forests

The seagrass team comprised three people:

- **Dr. Len McKenzie and Dr. Stuart Campbell, Queensland Department of Primary Industries & Wildlife Conservation Society:** Drs. McKenzie and Campbell are seagrass ecologists and Principle Investigators with the Seagrass Watch Program, which is active throughout the Pacific Islands. They conducted a baseline survey of the extent (area and biomass), biodiversity, threats, and condition of seagrass beds. Where possible, they also made similar observations for mangroves forests. Dr McKenzie participated in the first three weeks of the survey (northwest sector), and Dr Campbell participated in last two weeks (southeast sector).

- **Mr. Ferral Lasi**, **The Nature Conservancy**: Mr. Lasi has a Masters Degree in Marine Biology from University of the South Pacific. He has previously worked with ICLARM, and was working for The Nature Conservancy (based in Honiara) at the time of the survey. He has recently left the Conservancy to join the Marine Resources Division with the Secretariat of the Pacific Community. Mr. Lasi assisted Drs McKenzie and Campbell in the seagrass survey.

Cetaceans and Deep Water Habitats

- **Dr. Benjamin Kahn, APEX Environmental:** Dr. Kahn is a cetacean expert who has worked towards establishing collaborative cetacean conservation and management programs in eastern Indonesia and Papua New Guinea. Programs include biodiversity, fisheries interactions, policy, outreach and marine tourism components; with a focus on Indo-Pacific marine corridors and other critical habitats for large cetaceans and other large migratory marine life. Dr Kahn conducted the cetacean survey during the survey, including visual and acoustic surveys, and canvassing community knowledge.

Community Liaison

The core community liaison team comprised three people:

- **Mr. Willie Atu, The Nature Conservancy:** Mr. Atu is the Project Manager for the Conservancy’s Project in the Solomon Islands. He holds a Diploma of Education from Pacific Adventist University in PNG, and a Bachelor of Environmental Science from the University of the South Pacific. Mr Atu led the Community Liaison Team, conducting community liaison before, during and after the survey. During the survey, he conducted community liaison during the northwest sector of the survey.

- **Mr. Rudi Susurua, The Nature Conservancy**: Mr Susurua is the Enterprise Coordinator for the Conservancy’s’ Project in the Solomon Islands, and has worked as a Fishery Trainer for the European Union’s Rural Fisheries Project in the Solomon Islands. He holds a Diploma in Tropical Fisheries from the University of the South Pacific. Together with John Pita, he conducted community liaison during the southeast sector of the survey.

- **Mr. John Pita, Department of Environment:** Mr Pita holds a certificate in Ecotourism from the Australian Conservation Training Institute, and a Certificate in Protected Area Management from the University of South Pacific. At the time of the survey, he was a Wild Life Officer with the Department of Environment in the Solomon Islands, seconded to SPREP as Solomon Islands Representative for the

South Pacific Biodiversity Program (SPBCP). Mr Pita has led turtle and dugong monitoring programs in the Solomon Islands, and was appointed as the Conservation Area Support Officer (CASO) for the Arnavon Community Marine Conservation Area. Mr Pita has recently joined WWF Gizo as Bismarck Solomon Seas Ecoregion Country Coordinator for the Solomon Islands. Together with Rudi Susurua, he conducted community liaison during the southeast sector of the survey.

In addition to the core team, representatives from local communities and government joined the survey for a few days each to assist with community liaison in their areas. Their participation greatly facilitated the community liaison team in obtaining permission to work in those areas. They included:

- Chief Leslie Miki, Kia House of Chiefs and representative of Kia community to Arnavon Community Marine Conservation Area Management Committee;
- Hon Ivan Rotupeoko, Hon Minister for Natural Resources, Isabel Provincial Government;
- Mr. Bruno Manele, Darwin Project Coordinator, World Wildlife Fund;
- Mr. Nelson Tanito, Senior Fisheries Officer, Choiseul Province;
- Mr. Stephen Mauni, Senior Fisheries Officer, Malaita Province; and
- Mr. Andrew Doritelia, Fisheries Assistant, Malaita Province.

Communications

The communications team comprised two people – a science writer and an underwater photographer. Since only one berth was allocated to this team, the science writer participated in the northwest sector of the survey, and the underwater photographer participated in the southeast sector. The team overlapped for a few days on southwest portion of the northwest sector (from Gizo to Honiara) to allow time to coordinate their activities more closely. They were:

- **Dr. Louise Goggin, Cooperative Research Centre for the Great Barrier Reef World Heritage Area:** Dr. Goggin is a science writer and marine biologist. She has written communication strategies, industry reports, scripts for corporate videos, promotional brochures, annual reports, press releases, radio scripts, and newsletters, as well as stories for newspapers, magazines, and the worldwide web. At the time of the survey, Dr. Goggin was leading the Communication and Extension Program at the Cooperative Research Centre for the Great Barrier Reef where she managed all media contact, as well as the production of printed and online products. She is currently an editor at CSIRO in Canberra, Australia.

- **Dr. David Wachenfeld, Triggerfish Images:** Dr. Wachenfeld is an underwater photographer and marine biologist who provided high quality underwater images for the survey. He has a doctorate in marine biology and is currently the Director of the Science, Technology and Information Group at the Great Barrier Reef Marine Park Authority.

Some of the scientists, particularly Emre Turak, Benjamin Kahn and Gerry Allen, also provided high quality images for the communications team, and Jeanine Almany of The Nature Conservancy coordinated the publication of communication products for the survey (see *Communications* this report).

RESEARCH PLATFORM

The MV *FeBrina* provided the research platform for the survey. *FeBrina* is a 72ft liveaboard dive vessel based at Walindi Plantation Resort in Kimbe Bay, Papua New Guinea. *FeBrina* provided an ideal research platform, since it is equipped to provide support for diving in remote locations. The vessel provided accommodation, an experienced crew, full diving facilities, and a work platform for the research team. In addition to the tender (small boat) provided by the research vessel, the Arnavon Community Marine Conservation Area and the Department of Fisheries and Marine Resources provided three additional tenders and motors. The use of a liveaboard dive vessel, an experienced crew, and four tenders were major factors in the success of the Marine Assessment, since they allowed the scientists to maximise their survey time.

SITE SELECTION

Study sites were distributed to provide maximum geographic coverage of the main islands, and exposures around the islands, within the study area. Sites were selected on a daily basis taking survey objectives and logistic constraints into consideration. Sites were selected to include representative examples of marine habitats of interest, special and unique areas, and areas of particular interest to partner organisations (particularly marine reserves).

In general, five to seven days were spent on each of the large islands or groups (Isabel, Choiseul, New Georgia, Guadalcanal, Makira and Malaita), while one or two days were spent on each of the smaller islands or groups (Arnavons, Shortlands, Russells, Floridas, Three Sisters, Ugi, and Savo Islands). Both exposed and sheltered sites were surveyed on each island or island group.

Each day, the scientific survey teams, the community liaison team, and the vessel crew assembled to select two general areas to survey the following day, and to identify potential study sites within those areas (based on best available information from navigation charts, satellite images, and local knowledge). When the research team arrived in the study area the next day, they would confirm their site selection based on a visual assessment of potential sites. The community liaison team would then visit the local communities and obtain permission to survey those sites. Once permission had been obtained, the survey would proceed.

SURVEY PROTOCOL

Three survey teams were deployed in separate tenders in each survey area: the Coral Reef Biodiversity and Reef Health team; the Coral Reef Resources team, and the Seagrass and Mangrove team.

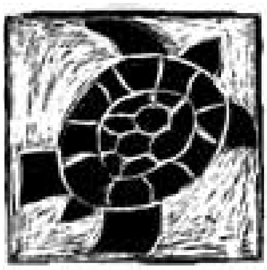
In general, the two coral reef teams each surveyed two sites (exposed and sheltered) in each study area. Two or three sites were surveyed each day, leading to a total of more than 60 sites surveyed each. This was the maximum possible given logistic constraints of diving, since each site required a long dive (1.5-2 hours) of depths up to 50-60m. It was also often necessary to steam for several hours between survey areas, which limited the number of sites that could be surveyed each day. This time was used to process data and samples, and to allow divers to have the required surface intervals.

In contrast, the Seagrass and Mangrove team covered many sites over a much wider area within each study area. This team employed a rapid assessment technique, which allowed them to survey a total of 1426 sites throughout the Solomon Islands.

The cetacean survey was conducted while the research vessel was underway (using visual and acoustic methods), and while on-site when tenders were available. Visual surveys were conducted over 36 days of the survey (a distance of 1228nm) and acoustic surveys were conducted at 49 sites.

The communications team worked with each of the survey teams to summarise their key findings and produce high quality communications products for partners (SIMACC members) and key stakeholders (particularly local communities) through news media (newspaper and radio), magazine articles, websites, and PowerPoint presentations.

Further details of survey methodology can be found in the technical reports by each survey team in this report.



Partner & Community Liaison

William Atu
The Nature Conservancy

In the early stages of the planning process for the Solomon Islands Marine Assessment, it was realised that the success of the scientific components of the survey would be contingent, in large part, upon the backing of the survey by the Solomon Island (SI) Government, survey partners, and the local SI rural communities and villages. To address these social and political elements of the Assessment, a Community Liaison Team was assembled, led by William Atu of The Nature Conservancy (TNC) and assisted by Rudi Susurua of TNC and John Pita of the Solomon Islands Department of Environment.

Solomon Islands: Leadership and Customary Ownership of Resources

The Solomon Islands has been an independent nation since 1978, and is a member of the British Commonwealth of nations. There are three distinct tiers of leadership in the Solomon Islands: national and provincial governments and local village leaders. The national government consists of a parliamentary configuration, in which members are elected from 50 electorates. Provincial governments, of which there are nine, elect ward representatives to manage their affairs at the Provincial level, and at the local level, village chiefs and church leaders play an important leadership role. The Community Liaison Team worked to gain the understanding and support of all levels of SI leadership, as each level had a critical role to play in the progress and overall success of the Marine Assessment.

One particularly important tier for the Community Liaison Team to address was that of the local leadership. As nearly 85% of the land and associated marine areas in the Solomon Islands are customarily owned by local villages, tribal groupings and communities, the Community Liaison Team had to seek permission from customary owners to access their customary fishing grounds.

Partnerships and Community Outreach

Solomon Islands Marine Assessment Co-ordinating Committee (SIMACC)

The first initiative by The Nature Conservancy (TNC) and the Arnavon Marine Conservation Area (AMCA) to conduct a biodiversity-focused marine assessment in the Solomon Islands was in 1999 as part of the AMCA Expansion Program. The idea for this assessment was to focus on the islands of Choiseul and Isabel, which were the two main islands surrounding the already existing AMCA, and thus a possible target for the extension of TNC and AMCA's conservation efforts in the area. Unfortunately, while AMCA and TNC planned to conduct this survey in 1999, they were forced to delay these plans because of political unrest in the country.

Several years later in 2003, new interest and a revitalised plan to conduct a marine assessment of the SI surfaced at an expert planning meeting for the Bismarck-Solomon Seas Ecoregion (BSSE) held in Madang, Papua New Guinea. Participants agreed that the Solomon Islands was an area of extreme data deficiency and that a marine assessment of the area should be a high priority. After this meeting, the SI participants (government and non-government officials) returned home with a strong commitment to conduct an assessment that would begin to fill some of the gaps in the biological information for the SI marine environment.

In 2004, TNC facilitated the formation of the Solomon Islands Marine Assessment Coordinating Committee (SIMACC) to co-ordinate the Marine Assessment. SIMACC was comprised primarily of local and international NGOs and various sectors of the SI government. Members included: Department of Forestry, Environment and Conservation; Fisheries Department (of the Ministry of Natural Resources); Solomon Islands Visitors Bureau (SIVB); Department of National Reform and Planning; Environment Concern Action Network of Solomon Islands(ECANSI); Foundations of South Pacific International (FSPI); International Waters Program (IWP); The Nature Conservancy (TNC); and the World Wide Fund for Nature (WWF). The SIMACC was chaired by Peter Ramohia of the Solomon Islands Department of Fisheries and Marine Resources.

In their first official meeting, SIMACC members unanimously agreed that a marine assessment of the SI was of critical importance. They then discussed the expectations for the survey and the role that each of the various NGOs and governmental departments that formed the SIMACC would take to ensure the success of the survey and its benefits to their work programs and to the country as a whole. The committee agreed that The Nature Conservancy would lead the survey, since they were in the strongest position to provide logistic, scientific and financial support for the expedition.

Community Outreach and Awareness

Once the SIMACC had determined the geographic scope of the assessment (see *Solomon Islands Marine Assessment* this report), the next step was to determine how to go about raising adequate awareness at the community and provincial levels. This was critical because, as previously mentioned, tribal villages maintain customary tenure over their reefs, thereby governing who is allowed to visit them and who isn't. As such, the Conservancy was faced with the difficult task of raising awareness around seven of the nine provinces in the SI, educating people about why the survey was going to be conducted, what it would entail, where and when it would happen, and most importantly, why this should matter at all to the local communities. The strategy used to address this challenge involved three main concepts: using established relationships within SIMACC and grassroots NGOs to promote and raise awareness within the affected provinces and communities; forging new relationships with provincial leaders, chiefs and church leaders by visiting the region and giving presentations; and using media and environmental awareness programs to educate even the most remote of communities about the nature of the survey, and to inform them when the survey vessel was expected to be in their area.

Using Established Relationships to Promote the Marine Assessment

An example of an opportunity to raise awareness for the Marine Assessment using pre-existing relationships arose during a Conservancy-run reef fish spawning aggregation workshop held in Gizo, Western Province, in March 2004. This workshop was attended by the Gizo Dive Shop, WWF, the Department of Fisheries and Conservation, Uepi Dive Resort, International Waters Program and the Roviana Resource Management Program. A session was scheduled in the workshop to discuss the community liaison strategies with the participants. All of the participants of this meeting agreed to not only provide support for the upcoming survey, but to raise grassroots and provincial awareness on what the survey was about and its relevance to the livelihoods of Solomon Islanders.

Soon after the spawning aggregation workshop, a National Fisheries meeting was conducted in Honiara, which was attended by all the Fishery Officers from all the Provinces in the country. The Fisheries Department invited the Conservancy to give a presentation about the survey at this meeting, which provided an excellent opportunity to encourage the Fisheries Department to actively sponsor the assessment. The Fisheries Department was a critical ally for the assessment, not only because they have management jurisdiction over marine resources in the Solomon Islands and an obvious interest in the information that the survey would provide, but because they have networks and influence that spread to even the most remote villages in the Solomon Islands. Therefore the Fisheries Department had the position and respect needed to successfully communicate the importance of the survey for the Solomon Islands, which would translate into much support and cooperation within the Provinces visited by the expedition.

The National Fisheries meeting proved very successful. The Marine Assessment was given full support from all the Provincial Fisheries officers and was given two letters of support issued by the Department of Fisheries and the Department of Environment and Conservation. In addition to wholeheartedly backing the survey, the provincial officers went one step further and helped identify significant sites within their provinces that they considered important to include in the survey.

Forging New Relationships

The next step taken to raise awareness for the survey was to visit the Provincial Centres of the Central Islands, Isabel, Guadalcanal and Malaita Provinces. The Provincial Premiers, Church Leaders and elders of each province were briefed about the Marine Assessment and its importance to the local rural communities, the nation, and the world at large. The Provincial Premiers of these Provinces endorsed the Marine Assessment and pledged the support of their respective Provinces and its communities to this important national undertaking.

With the National and Provincial governments now fully in support of the expedition, the Community Liaison Team then focussed its efforts on the local villages that directly controlled all access to the reefs. To access these tribal resource owners, collaboration with existing grassroots organisations in each province was required. Some of the indigenous grassroots organizations that were consulted included the Lauru Land Conference of Tribal Community in Choiseul, the Isabel Council of Chiefs in Isabel Province, the FAMOA Council of Chiefs in the Shortlands, and the Gela Council of Chiefs in the Central Island Province. All of the grassroots organisations that were approached gave their full approval for the assessment to be carried out in their respective areas. Churches also served as a useful medium for raising awareness at the community level, as Solomon Island is a Christian country and religion has been very integral part of the lives of the people in rural communities.

Media

The final tactic that the Community Liaison Team used to promote the survey to the villages involved the use of radio and print media as well as environmental awareness presentations in schools. These strategies were implemented before and during the survey, and were successful in convincing the local villages about the importance of this marine assessment to their daily livelihood and that of their future generations.

Radio was the most important means of communicating with remote villages, as radio frequencies could be received in even the most remote villages. The Community Liaison Team used the Solomon Islands Broadcasting Cooperation to send out survey related messages to church leaders, village chiefs, political leaders and community elders prior to and during the assessment. These radio awareness messages outlined what the Marine Assessment was, and the expected dates of arrival at various villages and islands.

In addition to public radio, two-way radios were also used to communicate the whereabouts of the survey vessel with the communities. Upon arrival at the villages, the Community Liaison Team would call in to arrange a meeting with the chief and church leaders and to tell them who was aboard the vessel, and what activities were being conducted as part of the survey. This type of communication was well received among all the communities visited.

In addition to radio, the Community Liaison Team helped facilitate press releases to promote the progress and the findings of the assessment (see *Communications*, this report). These releases raised interest among local newspapers, including the local daily the *Solomon Star*, as well as with the national broadcaster.. In several instances, media releases created opportunities for live interviews with several of the scientific experts from the survey to talk about the importance and uniqueness of Solomon Islands' coral reefs, and the need to preserve them for the benefits of future generations of Solomon Islanders.

The last tactic that was used to help with the education and awareness of the Marine Assessment within the villages involved the survey team members leading environmental awareness presentations for several of the schools and communities. While unfortunately time was a limiting factor during the survey and only a limited number of these sorts of presentations took place, it did proved to be an extremely valuable tool for sharing the content and the importance of the survey with the people of the Solomon Islands.

Lessons Learned and Implications for Management

Working with people is a complex task. Unlike the biological components of the Marine Assessment where rigid scientific methods could be applied throughout the survey, the Community Liaison component involved many more variables and operated more along the norms and cultural systems that were different in each location. Different challenges were faced every day of the survey, and for each of these challenges there was a different set of solutions. Below is a collection of some of the most critical 'lessons learned' with regards to the process of liaising with the people, villages, community groups and governments in the Solomon Islands.

Work within existing infrastructure

- Seek the support of the government and churches in what you are doing.. The people in the rural communities have respect for the government and churches who have operated and lived with them and understand them. Communities also respect conservation NGO's who have genuine interest and sincere commitment in what they were doing in their community.
- Respect the beliefs of local churches, customs and cultures as these elements are the foundation of local communities.
- Work with local communities, organisations and groups in the villages so they really understand what you are intending to do, as misunderstandings can make things really difficult for you.
- It is very important to contact the community residents who are also living in the urban centres about your planned undertaking.
- Always consult the chief of the village upon arrival in a community as there may be restricted or cultural *tamboo* sites.

Use meaningful and relevant approaches when interacting with communities
To gain acceptance from local people, use meaningful and relevant approaches. For example, instead of promoting the Marine Assessment as a means of understanding the biodiversity of the Solomon Islands (a term that locals are not familiar with), promote it as a survey which will improve local knowledge about the status of their marine resources, and how to sustainably manage these resources for future generations.

Focus on relationship building rather than one-off visits to the communities
- Community liaison is about building partner relationships and this process takes up a lot of time. It takes time to build confidence and trust with the community before they can confidently confide in you. It will be really difficult to build it again once it has been messed up.
- The people in rural communities are simple and hospitable. They will accept you and be willing to share with you what they have as long as you are honest and sincere.
- You must always go back to the villages and communities and inform them about the findings of their resources.
- Admit what you can and cannot do.
- Do not make any promise that you cannot keep.

ROLE OF COMMUNITY LIAISON IN RESOURCE MANAGEMENT

In my work as the leader of the Community Liaison Team for the SI Marine Assessment, my approach was to bring the idea across to the communities that our population is increasing, and as such it exerts a lot of pressure on the resources. For many more years to come the majority of our people in rural communities will depend on natural resources for their survival. Therefore, it is important that we should apply proper management to ensure the long term sustainability of these resources.

Many of the people have already realised that their resources are being depleted at a fast rate, and they do not know what to do. My aim was to show them what is possible using the Arnavon Marine Conservation Area as an example of how they can conserve their marine resources. Inviting community groups to the Arnavons to see for themselves the successful conservation of marine resources by local communities has had positive impacts on the lives of the visitors and conservation. Last year a group of chiefs and elders visited the Arnavons and they were really surprised at what they saw. Since that trip many have started restricting access to some portion of their reefs for conservation.

Many (or most) of the resource owners do not have a good understanding of their marine resources, or the relationships within and among ecosystems. As you start to explain this to them their eyes lit up as they nod their heads. I believe if local communities' knew more about the interrelationship and the interdependence of their ecosystems, they would be more cautious about how they use their marine resources.

In one of the communities that I gave an awareness talk to during the Marine Assessment, most of the participants were women. After I had given the talk they really thanked me and said that this was their first time to hear such a talk with so much useful information. In this particular area of the Solomon Islands they have a matrilineal system, and the women have the last say about how to use their resources. Women have the most worry of feeding their families every day, and such information will help them protect their livelihood and support their future generations.

THANK YOU'S

To the tribal chiefs, elders, men, women and children of the villages and communities that we have visited from May 13th – June 17th 2004, I would like to say, *Barava Tagio Tumas*. Your kind assistance in helping us in your villages and communities and to carry out this survey on your reefs has been instrumental to its success. It is my sincere hope that the results of the Marine Assessment will be used to help ensure the sustainability of the marine resources of our country, while also raising global awareness on the uniqueness and importance of Solomon Islands inshore reef systems

COMMUNICATIONS

Louise Goggin[1] and Jeanine Almany[2]
Cooperative Research Centre for the Great Barrier Reef World Heritage Area (CRC Reef)[1] and The Nature Conservancy[2]

Effective communication was vital to the success of the Solomon Islands Marine Assessment. A well-developed communication strategy enabled the survey team to engage a variety of local, national and international audiences with specific tools designed to capture support and to promote interest in the Marine Assessment.

Successful and effective communication depended on identifying the objectives of communication efforts, and the key messages. It was also crucial to determine the target audiences who needed to be kept informed of the survey, and then design the most effective ways to communicate with them (Appendix 1). As with any process, it was important to evaluate the effectiveness of the communication efforts and to identify the lessons learned.

OBJECTIVES

The objectives of the communication plan for the Solomon Islands marine survey were to:

- inform key audiences of the impending survey, its progress and key findings;
- seek access to survey sites from customary owners;
- raise the profile of the Solomon Islands for conservation;
- generate interest in the scientific community to work in the Solomon Islands;
- raise the profile of Solomon Islands as a tourist destination, and
- raise awareness of the assessment among partners (in Solomon Islands and elsewhere) and interested members of the public.

KEY MESSAGES

An important part of the communication planning was identifying the key messages about the survey. The messages which were considered key were:

- Marine resources of the Solomon Islands cannot be managed properly for future generations unless we better understand the status of key marine species.
- The survey will help to improve knowledge of the status of key marine resources in the Solomon Islands, particularly those of importance for the subsistence, artisanal and commercial fisheries.
- The results will be important to local rural communities, to the Solomon Islands nation and to the world.
- The survey will determine if the Solomon Islands is within the ‘Coral Triangle’: an area which has the highest marine biodiversity in the world
- A survey will determine the effectiveness of existing marine conservation areas in the Solomon Islands.
- The survey is a cooperative project between The Nature Conservancy, Solomon Islands Government, local and international non-government conservation agencies including WWF, Conservation International, Wildlife Conservation Society, Australian research organisations (Australian Institute of Marine Science, CRC Reef

Research Centre, Queensland Dept Primary Industries & Fisheries, APEX Environmental Pty Ltd) and Triggerfish Images. It is supported by the David and Lucile Packard Foundation, Marisla Foundation, the John D. and Catherine T. MacArthur Foundation and the MV FeBrina of Walindi Plantation Dive Cruises.

Target Audiences

This survey would not have been possible if key audiences were not kept advised of plans for the survey, informed of progress of the survey once it began, and notified of the results of the survey as soon as possible after it was completed. The target audiences for the communication plan were:

- local communities in the Solomon Islands;
- Solomon Islands Marine Assessment Coordinating Council (SIMACC);
- Solomon Islands Government;
- The Nature Conservancy, WWF and other NGOs involved in the survey;
- donors;
- international general public; and
- scientific community.

Communication Tools

While the key messages about the survey were the same, communication methods had to be tailored for different audiences to be most effective. Some of the key communication tools used before, during and after the Solomon Islands marine survey were:

- face-to-face communication including meetings and briefings with individuals, villagers, committees and interest groups;
- posters and flyers;
- two-way and public radio;
- media including local and international newspapers, television, magazines, radio and online news services;
- The Nature Conservancy magazine and website;
- CRC Reef newsletter;
- a slide show (in Microsoft PowerPoint) of the best images;
- video footage;
- web diaries and web photo gallery;
- summary of key findings;
- scientific journal articles, and
- technical report.

Communicating with Target Audiences

Local Communities, Partners and the Solomon Islands Government

The support of local communities and the Solomon Islands Government was critical to the success of the survey: the survey would not have been possible without their support (see *Partner & Community Liaison*, this report). Communications for these audiences were facilitated primarily through the partner and community liaison strategy, with support from the tools generated by the communications team.

The *Partner & Community Liaison* chapter provides a detailed description of how local communities, partners through SIMACC and the Solomon Islands Government were engaged in the Marine Assessment. The survey team worked before, during and after the Marine Assessment to secure the support of these very important audiences, ensuring that they were kept up-to-date with the latest news, location and progress of the survey.

The SIMACC and Solomon Islands Government were briefed as frequently as possible throughout the survey, and at its conclusion. Both received the technical report that outlines the full details of results.

Three media releases (18 May, 31 May, 3 June) were distributed to local media during the survey which stimulated several stories in the local Solomon Islands newspaper, the Solomon Star. An example of a media release is attached (Appendix 2) which may be used as a template for future surveys.

At the end of the survey, but prior to the release of the technical report, two critical communication tools were produced: a slide show (in Microsoft PowerPoint) of the surveys' best images and; a two-sided A4 sheet outlining the Key Findings from the survey (Appendix 3). These tools were effective in disseminating survey results to key partners in a fast and efficient manner so they could be used immediately for conservation in the Solomon Islands while the full technical report was compiled.

The best images from the survey participants (including a professional photographer, Dr David Wachenfeld) were compiled into a slide show. About 100 of the best images were used to highlight the major scientific areas of the survey; corals, fishes, cetaceans, seagrasses and commercial species.

Pictures speak in all languages and are a powerful tool to communicate with any audience. The slide show was intended to be used as a prompt for any presenter who could tell the story of the survey's highlights in their own words and language. The slide show was easily distributed to Conservancy staff on CD and was then loaded onto laptop computers for viewing in remote villages. Therefore, it was very useful for the Community Liaison team when they visited communities after the survey.

Eight hours of video footage taken by a member of the survey team, Dr Benjamin Kahn, was edited into an 8-minute compilation. While the video was not taken for broad release and was initially intended for Dr Kahn's personal use, we decided to take the opportunity to create another communication tool. The final 8-minute video illustrated the key species as well as how the scientists did their work. The video was particularly useful when providing feedback to communities after the survey.

Donors

The support of public and private donors was critical to the success of this survey and will be critical to the long term success of conservation in the Solomon Islands.

We used the Key Findings and existing mechanisms including The Nature Conservancy website (nature.org) and The Nature Conservancy magazine to share the results of the survey with donors. A web diary, written over the course of the survey, was posted on nature.org. An example of this type of communication product is provided in Appendix 4. A photo gallery was also posted on the website.

Stories were published in The Nature Conservancy magazine to promote the importance of the region scientifically and to emphasize the urgency for funding. Together, the web and the magazine were designed to help gain support for marine conservation in the Solomon Islands.

The slide show, mentioned above, was also a powerful tool to share with donors and the international community. It has assisted The Nature Conservancy in raising the profile of work in the region.

General Public

The media were used to raise awareness of the survey both locally and internationally. Local media coverage in the Solomon Islands is mentioned above.

In Australia, media releases were written before (5 May) and after (22 June) the survey to raise awareness of the work. In addition, stories appeared in the magazines, *Ecos* (also online http://www.publish.csiro.au/ecos/index.cfm?sid=10&issue_id=4745) and *Australasian Science* about the results of the survey as well as on television, in newspapers and online.

Television coverage for a story hinges on footage. The quality the footage will determine the reach of the story. Unfortunately, the 8-minute video compilation was not yet finished when the press release about the survey was distributed in Australia (22 June). Therefore, television coverage of the results of the survey was limited. It is intended that the footage will be used to attract television media coverage when a press release is written about the distribution of the technical report.

The survey results were also reported in the CRC Reef newsletter which is printed and posted to 1,200 people and organisations in Australia and overseas. It is also available online at http://www.reef.crc.org.au/publications/newsletter/june04_coraltriangle.htm

The Conservancy's website (nature.org) is also a valuable tool for communicating with a broad audience. As mentioned above, it houses background information about the survey, web diaries and photo gallery.

A total of two radio broadcasts, nine newspaper articles, two newsletter articles, five online stories, four magazine articles and one television story reported the results of the survey.

Scientific Community

Communicating survey outcomes to the scientific community helped to raise awareness of marine life of the region. It was also intended to attract attention and interest in further work in the region.

The Key Findings document, mentioned above, was prepared soon after the survey was completed so it could be distributed at the 10th International Coral Reef Symposium (ICRS) which was held from 28 June until 2 July 2004 in Okinawa, Japan. The ICRS is the key conference for coral reef researchers and attracts several thousand delegates from around the globe.

Scientific team participants gave a presentation at the conference to about 30 delegates using the slideshow mentioned above to highlight the scientific results.

In addition, an article was written for *Biodiversity* which is an online scientific journal (Goggin L. 2004. Solomon Islands: a marine life survey. Biodiversity. 5(4):8-12). It is likely that the scientists involved in the survey will also write scientific articles in the near future.

Lastly, the Solomon Islands Marine Assessment technical report, which includes full scientific details of all species found during the survey, will be a valuable resource for the scientific community. It will be available in PDF format on Conserve Online (conserveonline.org).

Lessons Learned

Communication tools that were found particularly useful were brief and very visual.

The slide show and Key Findings were effective for both local and international audiences, and the fact that they were available immediately after the survey meant that the results were disseminated quickly and well received.

The communication tools for donors were also well received, and there has been steady interest from donors to support marine conservation in the Solomon Islands since the survey.

In addition, the survey and the associated communication tools have attracted the interest of international tourists. For example, a US-based ecotourism company is now taking small groups to visit the Conservancy's project site and several villages in the Arnavons Community Marine Conservation Area.

Some other lessons learned were:

- Target the communications for different audiences. Face-to-face contact is vital for some audiences, while a technical report or media article can be used to reach a different audience.
- Use existing networks and mechanisms – newsletters, magazines, websites, community groups or posters.
- Use every opportunity for communicating.
- Professional video footage is vital to attract television coverage.
- Photographs speak louder than words, in any language, to any audience. They are particularly useful to attract media coverage of a story. Take lots of photographs to capture the landscape, the work and the people.

Thanks

Louise Goggin thanks The Nature Conservancy and CRC Reef for the opportunity to participate in the marine survey. I was very proud to be part of such a significant voyage of discovery that has greatly expanded understanding and raised awareness of this incredibly diverse reef ecosystem.

Appendix 1. Summary of communications planning for Solomon Islands marine assessment

Target audiences	Timing	Objectives	Key Messages	Strategies	Desired Outcomes
Local communities	Before survey	Inform communities of the impending survey	Why, when and how the survey is being conducted	Local radio and newspaper; Meetings with Provincial Govt etc (see *Partner & Community Liaison* report)	Communities well informed of impending survey and know to expect team
Local communities	During survey	Inform communities adjacent to survey sites where scientists will visit and what they will be doing	Why and how we are conducting the survey; results reported after survey completed	Consultation during survey (see *Partner & Community Liaison* report)	Communities well informed about survey and happy for survey team to visit sites adjacent to their villages
Local communities	After survey	Inform communities of results of survey	Key findings of survey and relevance to local communities	Local radio, newspapers and posters (see *Partner & Community Liaison* report)	Communities well informed about survey results, particularly on issues that are of interest to them
SIMACC (SI Govt, NGOs etc) & donors	Before survey	Welcome survey team; reinforce SIMACC survey objectives	What SIMACC require from survey	SIMACC meetings (and 3 Ministers), reception for participants on arrival in Honiara	Clear understanding by participants of needs of SIMACC: local radio and newspaper coverage of meeting/start of survey
SIMACC (SI Govt, NGOs etc), donors, members and local communities	During survey	Keep SIMACC, donors and local communities informed of progress of survey and key findings	How things are going, what is found	Web diary, 1-2 page summary of key findings provided every 1-2 weeks when in Port (Gizo, Honiara)	Target audiences well informed of progress and key findings; key findings reported by local media (for local communities)

Target audiences	**Timing**	**Objectives**	**Key Messages**	**Strategies**	**Desired Outcomes**
SIMACC (SI Govt, NGOs etc), donors and local communities	By end of survey	SIMACC & donors informed of survey results ASAP after survey	Summary of key findings of survey: marine biodiversity; status of key fisheries species; particularly imp areas for conservation etc	1-2 page glossy summary with photos	SIMACC and donors happy that survey has achieved its stated goals (before technical report is available); picked up by local media (for info of local communities)
SIMACC, donors and scientists	After survey	Report technical details of survey results	Key findings of survey supported by technical details	Technical report	Technical details summarised in a single report: executive summary for non-technical audiences
General public (international), scientific community	After survey	Raise profile of SI for conservation; Generate interest by scientific community to work in SI; Good profile for TNC and partners; Raise money for marine conservation in SI	SI is an area of high biodiversity, healthy marine ecosystems, and a good investment for conservation. TNC and partners have already started working there with SI govt; need support to protect this area	Articles in magazines eg *Australasian Science*, *Ecos*, content on TNC website	Improved profile of SI for conservation; Increased funding for marine conservation in SI

Target audiences	Timing	Objectives	Key Messages	Strategies	Desired Outcomes
TNC members & potential SI donors	After survey	Raise profile of Solomon Islands for conservation	Key findings of the survey	The Nature Conservancy magazine	Increased interest for marine conservation in the Solomon Islands
International tourists	After survey	Raise profile of SI as a tourist destination	Why SI is a good destination for tourists	Team to provide key info and images for use by Tourism Bureau in promotional materials	Increased tourism profile for Solomon Islands
Solomon Islands Cabinet	After survey	Inform Cabinet of the results of the survey	Reporting results, maintaining interest	Key Findings	Continued participation by Cabinet in research and conservation in the SI
Solomon Islands Cabinet	After survey	Inform Cabinet of the results of the survey	Reporting results, maintaining interest	Technical report	Continued participation by Cabinet in SI research and conservation
SIMACC (SI Govt, NGOs etc) & donors & Public	Before, during and after Survey	Raise profile of the assessment among partners (SI and NGOs) and interested members of the public	SI Govt and NGOs running first broad-scale marine resource assessment in SI: project proposal, 1-2 updates during survey, 2 page summary at end, technical report	Content for TNC's website under Asia Pacific/ Solomon Islands with link to NGO partners	A greater awareness of the Marine Assessment

Appendix 2. Example of a Media Release

MEDIA RELEASE

(Solomon Islands Release)

31 May 2004

CONSERVATION AREA PROTECTS DWINDLING MARINE RESOURCES

The conservation area in the Arnavon Islands is protecting marine resources that are disappearing from many reefs in the Solomon Islands. This discovery has been made by a 15-member team of local and international scientists led by The Nature Conservancy who are surveying the marine resources of the Solomon Islands.

“On many reefs in the Florida, Isabel, Choiseul and the Shortland Islands that we surveyed so far, we have found very few beche-de-mer even though some of these areas should be very good habitat for them,” said Mr Peter Ramohia from the Department of Fisheries and Marine Resources. “We have also found few trochus shells, giant clams or large commercially important fish.”

“Before this survey, we didn’t know the status of many of the stocks that are harvested commercially. From the survey, we have learned that many of these marine resources are depleted,” he said.

“The reefs in the Arnavon Islands were different to other parts of the Solomons,” said Mr Ramohia. “In the Arnavon Islands, where all commercial fishing is banned, we saw many large fish, giant clams and beche-de-mer. It shows that conservation areas really do work to protect commercially important species and can help them to recover from overfishing.”

“Large-scale commercial operations using hookah and SCUBA gear can strip all the beche-de-mer. We know that in some places when beche-de-mer are stripped from a reef, it can take 20 or 30 years for the populations to return, if at all,” said Mr Ramohia.

The use of hookah and SCUBA gear to collect beche-de-mer is prohibited under national law. Communities should not allow this gear to be used to collect beche-de-mer.

“Beche-de-mer are an important part of the reef ecosystem, and we need to make sure that they are not all removed from a reef so that their populations can recover. It is also important that some beche-de-mer remain on a reef so that there are enough for local communities to collect and supplement their incomes.”

“It is important to establish more conservation areas in the Solomon Islands to protect our marine resources,” said Mr Ramohia.

The survey team departed Honiara on May 13 and have visited Florida Island, Shortland Islands, and Isabel and Choiseul Provinces. The team is now surveying the New Georgia Group and will then travel back to Guadalcanal before heading east to Malaita and Makira.

The survey is a cooperative project by the Solomon Islands Government, non-government conservation agencies (particularly The Nature Conservancy, World Wide Fund for Nature, Conservation International, Wildlife Conservation Society) and Australian scientific institutions including the Australian Institute of Marine Science, CRC Reef Research Centre, Queensland Department of Primary Industries and Fisheries and APEX Environmental Pty Ltd.

For more information contact:
Mr Paul Lokani, Director, Melanesia Program, The Nature Conservancy, Port Moresby PNG on 675 323 0699 or 686 0459.
Mr Peter Ramohia, on FeBrina by satellite phone on 0061145125676.

Appendix 3. Solomon Islands Marine Assessment, Key Findings

An international team of scientists and managers conducted a large-scale marine assessment of the Solomon Islands in May/June 2004. Led by Dr Alison Green of the Nature Conservancy, this was the first survey of the marine resources of the main archipelago, covering a distance of almost 2,000nm and seven provinces. In 35 days of survey, the team found very high biodiversity of both corals and fish indicating that the Solomon Islands are part of the Coral Triangle which has the highest marine biodiversity in the world. Unfortunately, the team found low numbers of commercially exploited species in most areas, indicating that overfishing is widespread.

CORALS AND REEF CONDITION

Dr Charlie Veron (AIMS) and Emre Turak found that the Solomon Islands has one of the highest diversities of corals anywhere in the world. They recorded 494 species of corals and several new species. This extraordinarily high diversity of coral species is second in the world only to Raja Ampat in Indonesia. The reefs that the team visited were generally in good health. However, many sites had above natural numbers of crown-of-thorns starfish (COTS), with significant coral mortality at a few sites where there were high numbers of COTS. Patches of mortality that appear to match the 2000 coral bleaching event were found, particularly in the eastern Solomon Islands. Damage to corals from blast fishing was only seen at a few sites.

REEF FISH

The survey confirms that the Solomon Islands has one of the richest concentrations of reef fishes in the world and is an integral part of the Coral Triangle. Dr Gerry Allen (CI) recorded 1019 fish species of which 786 (77%) were observed during the survey and the rest were found from museum collections. Gerry found approximately 47 new distribution records for the Solomon Islands, as well as a cardinalfish (Apogonidae) which is a new species. Gerry found from100 to 279 fish species per site, with an average of 185 per site. A total of 200 species per site is considered the benchmark for an excellent fish count. This figure was exceeded at 37% of Solomon Islands sites. The best site for fish diversity was Njari Island, off Gizo with a total of 279 fish species. Gerry has only found more species than this at three other sites in the world.

COMMERCIALLY IMPORTANT MARINE SPECIES

Peter Ramohia (Department of Fisheries), Alec Hughes, Tingo Leve (WWF), Michael Ginigele (Tiola Marine Protected Area Project, Roviana Lagoon) and Alison Green (TNC) surveyed the status of stocks of commercially important species. On many reefs, the team found few sea cucumbers, *Trochus* shell, crayfish, tridacnid clams or large commercial fish species. The most valuable species such as maori wrasse, bumphead parrotfish, *Trochus*, larger species of tridacnid clams and some sea cucumbers (*Holothuria nobilis*, *Holothuria fuscogilva*, *Thelanota ananas*) were often absent. During the survey, the team did not see a single green snail *Turbo marmoratus* which used to support a large export industry, indicating that this species may be locally extinct and requires immediate protection.

In contrast, in the Arnavon Marine Conservation Area where commercial fishing and collecting is banned and only subsistence collecting of some reef fish species is allowed, there were many sea cucumbers, *Trochus*, tridacnid clams, crayfish, as well as large commercial fish species particularly the bumphead parrot fish. Also, after more than 10 years of protection, pearl oyster, especially black lip *Pinctada margaritifera*, were abundant. This shows that the conservation area has achieved its goal of protecting important fisheries species.

WHALES AND DOLPHINS

© Triggerfish Images 2004

Benjamin Kahn (APEX Environmental Pty Ltd) found a relatively low cetacean species diversity and abundance throughout most of the Solomon Islands with dolphins locally abundant in a few areas. Benjamin sighted 10 species of cetaceans including spinner, spotted, Risso's, bottlenose, Indo-Pacific bottlenose and rough-toothed dolphins, and a Bryde's or Sei whale, orca and beaked whales. Sperm whales were also identified acoustically. The Indispensable Strait region and some other narrow, deep passages in the Solomon Seas are probably migratory corridors. Benjamin spoke to villagers about the traditional dolphin drive which is still practiced in some areas. The drive has a strong cultural heritage with minimal modernisation in the fishery.

SEAGRASS

Len McKenzie (QDPI&F), Ferral Lasi (TNC) and Stuart Campbell (WCS) found 10 species of seagrass, 80% of the known seagrass species in the Indo-Pacific region. They found some very large meadows, including one that was more than 1000 hectares in size and some deep meadows, down to 37m. Throughout the survey, the seagrass meadows were associated with a high biodiversity of fauna including dugong, fish, sea cucumbers, seastars, algae and coral. The highly productive seagrass meadows are often on the fringe of coastal communities and support important artisanal fisheries and provide extensive nursery areas for juvenile fish.

© Triggerfish Images 2004

COMMUNITY LIAISON

Communication with local communities and national and provincial governments was critical to the success of the survey and was conducted by Willie Atu, Ferral Lasi, Rudi Susurua (TNC) and John Pita (Dept Environment & Conservation), with assistance from national and provincial government officials, WWF and local NGOs. Because of the excellent liaison work conducted before and during the survey, the team had fantastic support as it travelled through the Solomon Islands. This survey has provided an important basis for working with partners and local communities to protect these important resources in the long term.

SUPPORT

The survey was a cooperative project between The Nature Conservancy (TNC), Solomon Islands Government, local and international non-government conservation agencies including World Wide Fund for Nature (WWF), Conservation International (CI), Wildlife Conservation Society (WCS), Australian research organisations (Australian Institute of Marine Science (AIMS), CRC Reef Research Centre, Queensland Dept Primary Industries & Fisheries (QDPI&F), APEX Environmental Pty Ltd) and Triggerfish Images. It was supported by the David and Lucile Packard Foundation, Homeland Foundation, the John D. and Catherine T. MacArthur Foundation and the MV FeBrina of Walindi Plantation Dive Cruises.

© Triggerfish Images 2004

For more information contact: Dr Alison Green, The Nature Conservancy. Email: agreen@tnc.org

APPENDIX 4. Example of Solomon Islands Postcard from the field

They have also found more than 100 corals in the Solomon Islands that are thousands of kilometres beyond where they were known to live. According to Charlie, these amazing discoveries mean that many of his maps showing the distribution of corals are in tatters.

So far, Charlie and Emre have found 474 species of corals in the Solomon Islands as well as nine species which could be new to science. This is the second highest diversity of corals in the world, second only to the Raja Ampat Islands in eastern Indonesia. This incredible biodiversity places the Solomon Islands into the ‘Coral Triangle’ – a region with more coral species than anywhere else in the world. The Coral Triangle was thought to extend from Indonesia only to Papua New Guinea. The survey has shown that the Solomon Islands also belong within the Coral Triangle. But the news is not only exciting for corals.

So far, Gerry Allen has found more than 900 species of reef fish during the survey, which means that the Solomon Islands is one of the ‘big five’ for reef fish species, ranking with Indonesia, Philippines, Papua New Guinea and Australia.

Gerry has also found some sites in the Solomon Islands that have extremely high biodiversity. During a single dive at Njari near Gizo, Gerry found 278 species of reef fish! In 35 years of diving and with more than 7,000 hours underwater, he has only found higher biodiversity at a few sites in Raja Ampat in Indonesia where the most he has ever found was 284 species of fish on a single dive; only six species less than he recorded in the Solomon Islands.

This incredible biodiversity is exciting news for the Solomon Islands. But also brings an enormous challenge. With rising populations in the Solomon Islands, the challenge will be to ensure that this bountiful marine life is protected for future generations.

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

June 2006
TNC Pacific Island Countries
Report No 1/06

Chapter 1

Coral Diversity

Solomon Islands Marine Assessment

Charlie Veron
& Emre Turak

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
'Charlie' Veron: Australian Institute of Marine Science, Townsville 4810, Australia
e-Mail: j.veron@aims.gov.au
Emre Turak: Rue Francois Villon, 95000, Cergy, France
e-Mail: emreturak@wanadoo.fr

Suggested Citation:
Veron, J.E.N. and E. Turak. 2006. Coral Diversity. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds). 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Cover Photo: © Emre Turak

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Contents

EXECUTIVE SUMMARY

A total of 485 described species belonging to 76 genera were recorded during the Solomon Islands survey. An additional 9 species were collected that are unknown to the authors and are possibly new species. This is the second highest species diversity in the world, second only to the region of the Raja Ampat Islands of eastern Indonesia. Significantly, of the described species, 122 species have their known ranges extended by this study. This unexpectedly high diversity is due to the wide range of habitats encountered during the survey.

METHODS

This study concentrated on building a cumulative total of species for the entire island group and was undertaken simultaneously with a study of site comparisons (*Coral Communities and Reef Health*, this report).

Observations were recorded by scuba diving at 66 sites to a maximum depth of ~50m. All records were initially based on visual identification made underwater. Where skeletal detail was required for species determination voucher specimens were collected.

Specimens of taxonomic interest were sent to the Australian Institute of Marine Science. The bulk of the collection was sent to the Department of Fisheries of the Solomon Islands. Where there was a taxonomic or identification issue, collections were made as necessary to address the issue.

Sites are as listed elsewhere in this report. (*Coral Communities and Reef Health*, this report).

The taxonomic basic for this study was Veron (2000) and the references cited therein. Geographic information providing the basis for reporting range extensions are the species distribution maps of Veron and Stafford-Smith (2001).

RESULTS

A total of 485 described species belonging to 76 genera were found during the survey (Table 1). This table does not include additional 9 unidentified species belonging to genera *Acropora*, *Anacropora, Goniopora*, *Leptoseris*, *Merulina, Porites*, *Seriatopora* and *Turbinaria* which brings the total species complement to 494. Table 1 also lists the described species from the Raja Ampat Islands of Indonesia and Milne Bay of Papua New Guinea.

Field reference numbers of specimens prepared for further study or reference are given in Table 2. Extensive collections were made of some species where there was a taxonomic or identification problem that warranted detailed study. Excess specimens were discarded because of space and handling limitations and many species were not collected if *in situ* identification was deemed adequate.

Of the 485 described species, 122 species (indicated in Table 1) and 4 genera (all of which are monospecific) have distribution range extended by this study, although all but one (*Pectinia africanus*) has been previously recorded in the western Pacific. This high number of range extensions is mostly because little previous work has been done at the Solomons.

Only one otherwise common group of corals, Genus *Alveopora*, was rarely encountered.

Many species had variation in growth form or skeletal detail not previously recorded and some well-studied species (notably *Merulina ampliata* and *Stylocoeniella guentheri*) have variations so different from previous records that they were initially thought to be different species.

Discussion

There have been no in-depth surveys of Solomon Island corals before the present work, which is why there were so many range extensions in the present results. The Solomon Islands can now be recognised as being an integral part of the centre of coral biodiversity. The high diversity is due to the wide range of habitats encountered during the survey. However, very high diversities were recorded in only a small (<5) number of sites. Thus the total species diversity recorded was site dependent, as is normal for all such studies.

Records from the Raja Ampat Islands of Indonesia (Veron, 2002, Turak and Souhoka, 2003) and Milne Bay, Papua New Guinea (Veron 1998, Fenner and Turak 2003) are directly comparable to this study as they are based on a similar amount of field observation and have the same taxonomic basis. The total species complement of the Raja Ampat Islands (535 species) remains the highest recorded for any region in the world. That of Milne Bay (436 species) was previously thought to indicate an eastern limit of the Indo-Pacific center of diversity, the so-called ‘Coral Triangle’ (Green and Mous, 2003). That limit now includes the Solomon Islands.

The level of endemism of Solomon Islands corals is difficult to estimate but is low. The Unidentified species might all be endemic, but this highly unlikely and cannot be verified at this time. All described species are known from other countries.

As shown by Table 1, there is a high level of uniformity among the species complements of Solomon Islands, Milne Bay and Raja Ampat Islands. This is also seen in other areas within the region, notably Kimbe Bay, Papua New Guinea (392 species; Turak and Aitsi, 2003 and Brodie and Turak, 2004). The reason for this is that surface circulation (which primarily controls the dispersal of larvae), intermixes taxa within the center of diversity as a whole. The reason why both the Solomon Islands and the Raja Ampat Islands has such a high diversity is the wide range of habitats found in these regions.

Conservation Merit

The Solomon Islands are clearly part of the global center of coral diversity. It is not the geographic position of the Solomons that is responsible for this, nor anything to do with the corals themselves; it is the islands’ habitat diversity.

Some parts of Solomons coastlines are exceptionally convoluted, with many fjord-like embayments, narrow straits and island clusters, all set in very wide ranges of bathometry and current regimes. Some coastlines are dominated by reefs exposed to high-energy wave action, and there are barrier reefs of many types. Other coastlines have very extensive mangrove forests, sea-grass meadows and other soft substrate habitats (as described elsewhere in this publication). There are also vertical walls exposed to currents and dominated by sea fans, sponges and crinoids. When combined, this array of habitats creates a range of environments seldom seen in other regions of comparable size. In particular, the islands excel in enclosed lagoons with steeply sloping sides and clear deep water. These commonly have coral communities that are not dominated by *Acropora* and (presumably as a result) have an extraordinary array of other taxa.

By World Heritage criteria the Solomon Islands rates high. The overall condition of most reefs is good, presumably an outcome of low population density and low levels of explosive fishing. Reef condition, the diversity of marine life, and the attractiveness of rainforest-dominated islands, combine to create old-world settings that are seldom seem in today's over-populated and over-exploited world.

REFERENCES

Brodie, J. and E. Turak. 2004. Land use practices in the Stettin Bay catchment area and their relation to the status of the coral reefs in the Bay. Report to TNC and NBPOL.

Fenner, D. and E. Turak. 2003. List of coral species recorded at Milne Bay Province, Papua New Guinea during 2000 RAP survey. In: Allen, Gerald R., Jeff P. Kinch, and Sheila A. McKenna, (eds). A Rapid Marine Biodiversity Assessment of Milne Bay Province, Papua New Guinea – Survey II (2000). Conservation International Rapid Assessment Program

Green, A. and P.J. Mous. 2003. Delineating the Coral Triangle, its ecoregions and functional seascapes. Report on an expert workshop, held at the Southeast Asia Center for Marine Protected Areas, Bali, Indonesia. The Nature Conservancy, Southeast Asia Center for Marine Protected Areas.

Turak, E. and J. Aitsi. 2003. Assessment of coral biodiversity and status of coral reefs of East Kimbe Bay, New Britain, Papua New Guinea, 2002. The Nature Conservancy Report.

Turak, E. and J. Souhoka. 2003. Coral diversity and status of coral reefs in the Raja Ampat Islands. In: Donnelly R, Duncan N and Mous PJ (eds). Report on a rapid ecological assessment of the Raja Ampat Islands, Papua, Eastern Indonesia. The Nature Conservancy.

Veron, J.E.N. 1998. Corals of the Milne Bay Region of Papua New Guinea. In: Werner, TA and Allen GR (eds). A rapid biodiversity assessment of the coral reefs of Milne Bay Province, Papua New Guinea. Conservation International.

Veron, J.E.N. 2000. Corals of the World Vols.1-3. Townsville. Australian Institute of Marine Science.

Veron, J.E.N. 2002. Reef corals of the Raja Ampat Islands, Irian Papua Province, Indonesia. RAP Bulletin of biological assessment. 22

Veron, J.E.N. and M.G. Stafford-Smith. 2002. Coral ID. Australian Institute of Marine Science (CD-ROM).

Tables

Table 1. Coral species list.

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
	Record	Distribution		
Family Astrocoeniidae Koby, 1890	●	P	●	●
Genus Stylocoeniella Yabe and Sugiyama, 1935	●	P	●	●
Stylocoeniella armata (Ehrenberg, 1834)	●	P	●	●
Stylocoeniella cocosensis Veron, 1990				●
Stylocoeniella guentheri Bassett-Smith, 1890	●	P	●	●
Genus Palauastrea Yabe and Sugiyama, 1941	●	N	●	●
Palauastrea ramosa Yabe and Sugiyama, 1941	●	N	●	●
Genus Madracis Milne Edwards and Haime, 1849	●	N	●	●
Madracis kirbyi Veron and Pichon, 1976	●	N	●	●
Family Pocilloporidae Gray, 1842	●	P	●	●
Genus Pocillopora Lamarck, 1816	●	P	●	●
Pocillopora ankeli Scheer and Pillai, 1974			●	●
Pocillopora damicornis (Linnaeus, 1758)	●	P	●	●
Pocillopora danae Verrill, 1864	●	P	●	●
Pocillopora elegans Dana, 1846	●	N		●
Pocillopora eydouxi Milne Edwards and Haime, 1860	●	P	●	●
Pocillopora kelleheri Veron, 2000	●	P		●
Pocillopora meandrina Dana, 1846	●	P	●	●
Pocillopora verrucosa (Ellis and Solander, 1786)	●	P	●	●
Pocillopora woodjonesi Vaughan, 1918	●	P	●	●
Genus Seriatopora Lamarck, 1816	●	P	●	●
Seriatopora aculeata Quelch, 1886	●	P	●	●
Seriatopora caliendrum Ehrenberg, 1834	●	P	●	●
Seriatopora dendritica Veron, 2000	●	N	●	●
Seriatopora guttatus Veron, 2000	●	P	●	●
Seriatopora hystrix Dana, 1846	●	P	●	●
Seriatopora stellata Quelch, 1886	●	P	●	●
Genus Stylophora Schweigger, 1819	●	P	●	●
Stylophora pistillata Esper, 1797	●	P	●	●
Stylophora subseriata (Ehrenberg, 1834)	●	P	●	●
Family Acroporidae Verrill, 1902	●	P	●	●
Genus Montipora Blainville, 1830	●	P	●	●
Montipora aequituberculata Bernard, 1897	●	P	●	●
Montipora altasepta Nemenzo, 1967	●	P		●
Montipora angulata (Lamarck, 1816)	●	N	●	●
Montipora australiensis Bernard, 1897	●	P		●
Montipora cactus Bernard, 1897	●	N	●	●
Montipora calcarea Bernard, 1897	●	N		●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Montipora caliculata (Dana, 1846)	●	P	●	●
Montipora capitata Dana, 1846	●	P	●	●
Montipora capricornis Veron, 1985	●	P	●	●
Montipora cebuensis Nemenzo, 1976	●	P	●	●
Montipora cocosensis Vaughan, 1918	●	N		●
Montipora confusa Nemenzo, 1967	●	N	●	●
Montipora corbetensis Veron and Wallace, 1984	●	P	●	●
Montipora crassituberculata Bernard, 1897	●	P	●	●
Montipora danae (Milne Edwards and Haime, 1851)	●	P	●	●
Montipora deliculata Veron, 2000	●	N	●	●
Montipora digitata (Dana, 1846)	●	P	●	●
Montipora efflorescens Bernard, 1897	●	P	●	●
Montipora effusa Dana, 1846	●	P		
Montipora florida Nemenzo, 1967			●	●
Montipora floweri Wells, 1954	●	P	●	●
Montipora foliosa (Pallas, 1766)	●	P	●	●
Montipora foveolata (Dana, 1846)	●	P	●	●
Montipora friabilis Bernard, 1897	●	N		●
Montipora gaimardi Bernard 1897				●
Montipora grisea Bernard, 1897	●	P	●	●
Montipora hirsuta Nemenzo, 1967	●	N		●
Montipora hispida (Dana, 1846)	●	P	●	●
Montipora hodgsoni Veron, 2000	●	N	●	●
Montipora hoffmeisteri Wells, 1954	●	P	●	●
Montipora incrassata (Dana, 1846)	●	P	●	●
Montipora informis Bernard, 1897	●	P	●	●
Montipora mactanensis Nemenzo, 1979	●	N	●	●
Montipora malampaya Nemenzo, 1967	●	N		●
Montipora meandrina (Ehrenberg, 1834)				●
Montipora millepora Crossland, 1952	●	P	●	●
Montipora mollis Bernard, 1897	●	P	●	●
Montipora monasteriata (Forskäl, 1775)	●	P	●	●
Montipora niugini Veron, 2000	●	N	●	
Montipora nodosa (Dana, 1846)	●	P	●	●
Montipora orientalis Nemenzo, 1967	●	N		●
Montipora plawanensis Veron, 2000	●	N	●	●
Montipora peltiformis Bernard, 1897	●	P	●	●
Montipora porites Veron, 2000	●	N		●
Montipora samarensis Nemenzo, 1967		P		●
Montipora spongodes Bernard, 1897	●	P	●	●
Montipora spumosa (Lamarck, 1816)	●	P	●	●
Montipora stellata Bernard, 1897	●	N	●	●
Montipora taiwanensis Veron, 2000				●
Montipora tuberculosa (Lamarck, 1816)	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Montipora turgescens Bernard, 1897	●	P	●	●
Montipora turtlensis Veron and Wallace, 1984	●	P	●	●
Montipora undata Bernard, 1897	●	P	●	●
Montipora venosa (Ehrenberg, 1834)	●	P	●	●
Montipora verrucosa (Lamarck, 1816)	●	P	●	●
Montipora verruculosa Veron, 2000	●	N	●	●
Montipora vietnamensis Veron, 2000	●	N	●	●
Genus Anacropora Ridley, 1884	●	P	●	●
Anacropora forbesi Ridley, 1884	●	P	●	●
Anacropora matthai Pillai, 1973	●	N	●	●
Anacropora pillai Veron, 2000	●	N		
Anacropora puertogalerae Nemenzo, 1964	●	P	●	●
Anacropora reticulata Veron and Wallace, 1984	●	P	●	●
Anacropora spinosa Rehberg, 1892	●	N		●
Genus Acropora Oken, 1815	●	P	●	●
Acropora abrolhosensisVeron, 1985	●	P	●	●
Acropora abrotanoides (Lamarck, 1816)	●	P	●	●
Acropora aculeus (Dana, 1846)	●	P	●	●
Acropora acuminata (Verrill, 1864)	●	P	●	●
Acropora akajimensis Veron, 1990	●	N		●
Acropora anthocercis (Brook, 1893)	●	P	●	●
Acropora aspera (Dana, 1846)	●	P	●	●
Acropora austera (Dana, 1846)	●	P	●	●
Acropora awi Wallace and Wolstenholme, 1998	●	N		●
Acropora batunai Wallace, 1997	●	N	●	●
Acropora bifurcata Nemenzo, 1971	●	N		●
Acropora brueggemanni (Brook, 1893)	●	P	●	●
Acropora carduus (Dana, 1846)	●	P	●	●
Acropora caroliniana Nemenzo, 1976	●	P	●	●
Acropora cerealis (Dana, 1846)	●	P	●	●
Acropora chesterfieldensis Veron and Wallace, 1984	●	P		●
Acropora clathrata (Brook, 1891)	●	P	●	●
Acropora convexa (Dana, 1846)	●	N		●
Acropora cophodactyla (Brook, 1892)	●			●
Acropora copiosa Nemenzo, 1967	●	P		●
Acropora crateriformis (Gardiner, 1898)	●	P	●	●
Acropora cuneata (Dana, 1846)	●	P	●	●
Acropora cylindrica Veron and Fenner, 2000	●	N	●	●
Acropora cytherea (Dana, 1846)	●	P	●	●
Acropora dendrum (Bassett-Smith, 1890)	●	P	●	●
Acropora derewanensis Wallace (1997)			●	●
Acropora desalwii Wallace, 1994	●	N		●
Acropora digitifera (Dana, 1846)	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Acropora divaricata (Dana, 1846)	●	P	●	●
Acropora donei Veron and Wallace, 1984	●	P		●
Acropora echinata (Dana, 1846)	●	P	●	●
Acropora efflorexcens (Dana, 1846)	●	P		
Acropora elegans Milne Edwards and Haime, 1860			●	●
Acropora elseyi (Brook, 1892)	●	P	●	●
Acropora exquisita Nemenzo, 1971	●	P	●	●
Acropora florida (Dana, 1846)	●	P	●	●
Acropora formosa (Dana, 1846)	●	P	●	●
Acropora glauca (Brook, 1893)				●
Acropora gemmifera (Brook, 1892)	●	P	●	●
Acropora globiceps (Dana, 1846)	●	P		●
Acropora gomezi Veron, 2000	●	N		
Acropora grandis (Brook, 1892)	●	P	●	●
Acropora granulosa (Milne Edwards and Haime, 1860)	●	P	●	●
Acropora hoeksemai Wallace, 1997	●	N		●
Acropora horrida (Dana, 1846)	●	P	●	●
Acropora humilis (Dana, 1846)	●	P	●	●
Acropora hyacinthus (Dana, 1846)	●	P	●	●
Acropora indonesia Wallace, 1997	●	N		●
Acropora inermis (Brook, 1891)	●	P		●
Acropora insignis Nemenzo, 1967	●	P	●	●
Acropora irregularis (Brook, 1892)	●	N		●
Acropora jacquelineae Wallace, 1994	●	N	●	●
Acropora kimbeensis Wallace, 1999	●	P		●
Acropora kirstyae Veron and Wallace, 1984	●	P	●	●
Acropora latistella (Brook, 1891)	●	P	●	●
Acropora listeri (Brook, 1893)	●	P	●	●
Acropora loisetteae Wallace, 1994				●
Acropora lokani Wallace, 1994	●	N	●	●
Acropora longicyathus (Milne Edwards and Haime, 1860)	●	P	●	●
Acropora loripes (Brook, 1892)	●	P	●	●
Acropora lovelli Veron and Wallace, 1984	●	P		
Acropora lutkeni Crossland, 1952	●	P	●	●
Acropora macrostoma (Brook, 1891)				●
Acropora meridiana Nemenzo, 1971	●	N		●
Acropora microclados (Ehrenberg, 1834)	●	P	●	●
Acropora microphthalma (Verrill, 1859)	●	P	●	●
Acropora millepora (Ehrenberg, 1834)	●	P	●	●
Acropora mirabilis (Quelch, 1886)		P		●
Acropora monticulosa (Brüggemann, 1879)	●	P	●	●
Acropora multiacuta Nemenzo, 1967	●	N	●	
Acropora nana (Studer, 1878)	●	P	●	●
Acropora nasuta (Dana, 1846)	●	P	●	●

		Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
		Acropora navini Veron, 2000	●	N		
		Acropora nobilis (Dana, 1846)	●	P	●	●
		Acropora ocellata (Klunzinger, 1879)				●
		Acropora orbicularis Brook, 1892	●	N		●
		Acropora palifera (Lamarck, 1816)	●	P	●	●
		Acropora palmerae Wells, 1954	●	P		●
		Acropora paniculata Verrill, 1902	●	P	●	●
		Acropora papillarae Latypov, 1992				●
		Acropora parahemprichii Veron, 2000				●
		Acropora parilis (Quelch, 1886)	●	P	●	●
		Acropora pectinatus Veron, 2000				●
		Acropora pichoni Wallace, 1999	●	P	●	●
		Acropora pinguis Wells, 1950	●	N		●
		Acropora plana Nemenzo, 1967	●	N		●
		Acropora plumosa Wallace and Wolstenholme, 1998	●	N	●	●
		Acropora polystoma (Brook, 1891)	●	P	●	●
		Acropora prostrata (Dana, 1846)	●	P		●
		Acropora proximalis Veron, 2000				●
		Acropora pulchra (Brook, 1891)	●	P	●	●
		Acropora rambleri (Bassett-Smith, 1890)	●	P	●	●
		Acropora robusta (Dana, 1846)	●	P	●	●
		Acropora retusa (Dana, 1846)	●	N		
		Acropora rosaria (Dana, 1846)	●	P	●	●
		Acropora russelli Wallace, 1994				●
		Acropora samoensis (Brook, 1891)	●	P	●	●
		Acropora sarmentosa (Brook, 1892)	●	P	●	●
		Acropora scherzeriana (Brüggemann, 1877)				●
		Acropora secale (Studer, 1878)	●	P	●	●
		Acropora sekiseinsis Veron, 1990			●	
		Acropora selago (Studer, 1878)	●	P	●	●
		Acropora seriata Ehrenberg, 1834			●	●
		Acropora simplex Wallace and Wolstenholme, 1998				●
		Acropora solitaryensis Veron and Wallace, 1984	●	P		●
		Acropora speciosa (Quelch, 1886)	●	P	●	●
		Acropora spicifera (Dana, 1846)	●	P	●	●
		Acropora striata (Verrill, 1866)			●	●
		Acropora subglabra (Brook, 1891)	●	P	●	●
		Acropora subulata (Dana, 1846)	●	P	●	●
		Acropora tenella (Brook, 1892)		P	●	●
		Acropora tenuis (Dana, 1846)	●	P	●	●
		Acropora tortuosa (Dana, 1846)		P		●
		Acropora turaki Wallace, 1994	●	N		●
		Acropora valenciennesi (Milne Edwards and Haime, 1860)	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Acropora valida (Dana, 1846)	●	P	●	●
Acropora variabilis (Klunzinger, 1879)				●
Acropora vaughani Wells, 1954	●	P	●	●
Acropora vermiculata Nemenzo, 1967				●
Acropora verweyi Veron and Wallace, 1984	●	P	●	●
Acropora walindii Wallace, 1999		P		●
Acropora wallaceae Veron, 1990	●	P	●	
Acropora willisae Veron and Wallace, 1984	●		●	●
Acropora yongei Veron and Wallace, 1984	●	P	●	●
Genus Astreopora Blainville, 1830	●	P	●	●
Astreopora cuculata Lamberts, 1980		P	●	●
Astreopora expansa Brüggemann, 1877	●	P	●	●
Astreopora gracilis Bernard, 1896	●	P	●	●
Astreopora incrustans Bernard, 1896	●	N	●	●
Astreopora listeri Bernard, 1896	●	P	●	●
Astreopora macrostoma Veron and Wallace, 1984			●	
Astreopora myriophthalma (Lamarck, 1816)	●	P	●	●
Astreopora ocellata Bernard, 1896	●	P	●	●
Astreopora randalli Lamberts, 1980	●	P	●	●
Astreopora scabra Lamberts, 1982				●
Astreopora suggesta Wells, 1954	●	P	●	●
Family Euphilliidae Veron, 2000	●	P	●	●
Genus Euphyllia	●	P	●	●
Euphyllia ancora Veron and Pichon, 1979	●	N	●	●
Euphyllia cristata Chevalier, 1971	●	P	●	●
Euphyllia divisa Veron and Pichon, 1980	●	N	●	●
Euphyllia glabrescens (Chamisso and Eysenhardt, 1821)	●	P	●	●
Euphyllia paraancora Veron, 1990	●	P	●	●
Euphyllia paradivisa Veron, 1990				●
Euphyllia yaeyamensis (Shirai, 1980)	●	P	●	●
Genus Catalaphyllia Wells, 1971			●	●
Catalaphyllia jardinei (Saville-Kent, 1893)			●	●
Genus Nemenzophyllia Hodgson and Ross, 1981				●
Nemenzophyllia turbida Hodgson and Ross, 1981				●
Genus Plerogyra Milne Edwards and Haime, 1848	●	P	●	●
Plerogyra discus Veron and Fenner, 2000				●
Plerogyra simplex Rehberg, 1892	●	P	●	●
Plerogyra sinuosa (Dana, 1846)	●	P	●	●
Genus Physogyra Quelch, 1884			●	●
Physogyra lichtensteini (Milne Edwards and Haime, 1851)	●	P	●	●
Family Oculinidae Gray, 1847	●	P	●	●
Genus Galaxea Oken, 1815	●	P	●	●
Galaxea acrhelia Veron, 2000	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Galaxea astreata (Lamarck, 1816)	●	P	●	●
Galaxea cryptoramosa Fenner and Veron, 2000				●
Galaxea fascicularis (Linnaeus, 1767)	●	P	●	●
Galaxea horrescens (Dana, 1846)	●	P	●	●
Galaxea longisepta Fenner & Veron, 2000	●	N	●	●
Galaxea paucisepta Claereboudt, 1990	●	N	●	●
Family Siderasteridae Vaughan and Wells, 1943	●	P	●	●
Genus Pseudosiderastrea Yabe and Sugiyama, 1935	●	P	●	●
Pseudosiderastrea tayami Yabe and Sugiyama, 1935	●	P	●	●
Genus Psammocora Dana, 1846	●	P	●	●
Psammocora contigua (Esper, 1797)	●	P	●	●
Psammocora digitata Milne Edwards and Haime, 1851	●	P	●	●
Psammocora explanulata Horst, 1922	●	P	●	●
Psammocora haimeana Milne Edwards and Haime, 1851	●	P	●	●
Psammocora nierstraszi Horst, 1921	●	P	●	●
Psammocora obtusangula (Lamarck, 1816)	●	P	●	●
Psammocora profundacella Gardiner, 1898	●	P	●	●
Psammocora stellata Verrill, 1864				●
Psammocora superficialis Gardiner, 1898	●	P	●	●
Genus Coscinaraea Milne Edwards and Haime, 1848	●	P	●	●
Coscinaraea columna (Dana, 1846)	●	P	●	●
Coscinaraea crassa Veron and Pichon, 1980		P	●	●
Coscinaraea exesa (Dana, 1846)	●	P	●	●
Coscinaraea monile (Foskål, 1775)			●	●
Coscinaraea wellsi Veron and Pichon, 1980	●	P	●	●
Family Agariciidae Gray, 1847	●	P	●	●
Genus Pavona Lamarck, 1801	●	P	●	●
Pavona bipartita Nemenzo, 1980	●	P	●	●
Pavona cactus (Forskål, 1775)	●	P	●	●
Pavona clavus (Dana, 1846)	●	P	●	●
Pavona danae Milne Edwards and Haime, 1860				●
Pavona decussata (Dana, 1846)	●	P	●	●
Pavona duerdeni Vaughan, 1907	●	P	●	●
Pavona explanulata (Lamarck, 1816)	●	P	●	●
Pavona frondifera (Lamarck, 1816)	●	N	●	●
Pavona maldivensis (Gardiner, 1905)	●	P	●	●
Pavona minuta Wells, 1954	●	P	●	●
Pavona varians Verrill, 1864	●	P	●	●
Pavona venosa (Ehrenberg, 1834)	●	P	●	●
Genus Leptoseris Milne Edwards and Haime, 1849	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Leptoseris amitoriensis Veron, 1990				●
Leptoseris explanata Yabe and Sugiyama, 1941	●	P	●	●
Leptoseris foliosa Dineson, 1980	●	N	●	●
Leptoseris gardineri Horst, 1921	●	P	●	●
Leptoseris hawaiiensis Vaughan, 1907	●	P	●	●
Leptoseris incrustans (Quelch, 1886)	●	P	●	●
Leptoseris mycetoseroides Wells, 1954	●	P	●	●
Leptoseris papyracea (Dana, 1846)	●	P	●	●
Leptoseris scabra Vaughan, 1907	●	P	●	●
Leptoseris solida (Quelch, 1886)	●	N		●
Leptoseris striata (Fenner & Veron 2000)	●	N	●	●
Leptoseris tubulifera Vaughan, 1907	●	N	●	●
Leptoseris yabei (Pillai and Scheer, 1976)	●	P	●	●
Genus Gardineroseris Scheer and Pillai, 1974	●	P	●	●
Gardineroseris planulata Dana, 1846	●	P	●	●
Genus Coeloseris Vaughan, 1918	●	P	●	●
Coeloseris mayeri Vaughan, 1918	●	P	●	●
Genus Pachyseris Milne Edwards and Haime, 1849	●	P	●	●
Pachyseris foliosa Veron, 1990	●		●	●
Pachyseris gemmae Nemenzo, 1955	●	P	●	●
Pachyseris involuta (Studer, 1877)			●	●
Pachyseris rugosa (Lamarck, 1801)	●	P	●	●
Pachyseris speciosa (Dana, 1846)	●	P	●	●
Family Fungiidae Dana, 1846	●	P	●	●
Genus Cycloseris Milne Edwards and Haime, 1849	●	P	●	●
Cycloseris colini Veron, 2000	●	N	●	●
Cycloseris costulata (Ortmann, 1889)	●	N	●	●
Cycloseris curvata (Hoeksema, 1989)		N	●	●
Cycloseris cyclolites Lamarck, 1801	●	P	●	●
Cycloseris erosa (Döderlein, 1901)	●	N	●	●
Cycloseris hexagonalis (Milne Edwards and Haime, 1848)	●	P		●
Cycloseris patelliformis (Boschma, 1923)	●	P	●	●
Cycloseris sinensis (Milne Edwards and Haime, 1851)	●	P	●	●
Cycloseris somervillei (Gardiner, 1909)	●	P	●	●
Cycloseris tenuis (Dana, 1846)	●	P	●	●
Cycloseris vaughani (Boschma, 1923)	●	P	●	●
Genus Diaseris	●	P	●	●
Diaseris distorta	●	P		
Diaseris fragilis Alcock, 1893	●	P		●
Genus Cantharellus Hoeksema and Best, 1984	●	N		●
Cantharellus jebbi Hoeksema, 1993	●	N	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Cantharellus nuomeae Hoeksema & Best, 1984			●	●
Genus Helliofungia Wells, 1966	●	P	●	●
Heliofungia actiniformis Quoy and Gaimard, 1833	●	P	●	●
Genus Fungia Lamarck, 1801	●	P	●	●
Fungia concinna Verrill, 1864	●	P	●	●
Fungia corona Döderlein, 1901		P		●
Fungia danai Milne Edwards and Haime, 1851	●	P	●	●
Fungia fralinae Nemenzo, 1955	●	N	●	●
Fungia fungites (Linneaus, 1758)	●	P	●	●
Fungia granulosa Klunzinger, 1879	●	P	●	●
Fungia horrida Dana, 1846	●	P	●	●
Fungia klunzingeri Döderlein, 1901	●	P	●	●
Fungia moluccensis Horst, 1919	●	N	●	●
Fungia paumotensis Stutchbury, 1833	●	P	●	●
Fungia repanda Dana, 1846	●	P	●	●
Fungia scabra Döderlein, 1901	●	P	●	●
Fungia scruposa Klunzinger, 1879	●	P	●	●
Fungia scutaria Lamarck, 1801	●	P	●	●
Fungia spinifer Claereboudt and Hoeksema, 1987	●	N	●	●
Genus Ctenactis Verrill, 1864	●	P	●	●
Ctenactis albitentaculata Hoeksema, 1989	●	P	●	●
Ctenactis crassa (Dana, 1846)	●	P	●	●
Ctenactis echinata (Pallas, 1766)	●	P	●	●
Genus Herpolitha Eschscholtz, 1825	●	P	●	●
Herpolitha limax (Houttuyn, 1772)	●	P	●	●
Herpolitha weberi Horst, 1921	●	P	●	●
Genus Polyphyllia Quoy and Gaimard, 1833	●	P	●	●
Polyphyllia novaehiberniae (Lesson, 1831)	●	P	●	●
Polyphyllia talpina (Lamarck, 1801)	●	P	●	●
Genus Sandalolitha Quelch, 1884	●	P	●	●
Sandalolitha dentata (Quelch, 1886)	●	P	●	●
Sandalolitha robusta Quelch, 1886	●	P	●	●
Genus Halomitra Dana, 1846	●	P	●	●
Halomitra clavator Hoeksema, 1989	●	N	●	●
Halomitra meierar Veron and Maragos, 2000				●
Halomitra pileus (Linnaeus, 1758)	●	P	●	●
Genus Zoopilus Dana, 1864	●	P	●	●
Zoopilus echinatus Dana, 1846	●	P	●	●
Genus Lithophyllum Rehberg, 1892	●	P	●	●
Lithophyllon lobata Horst, 1921	●	N		
Lithophyllon mokai Hoeksema, 1989	●	P	●	●
Lithophyllon undulatum Rehberg, 1892				●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Genus Podabacia Milne Edwards and Haime, 1849	●	P	●	●
Podabacia crustacea (Pallas, 1766)	●	P	●	●
Podabacia motuporensis Veron, 1990	●	P	●	●
Family Pectinidae Vaughan and Wells, 1943	●	P	●	●
Genus Echinophyllia Klunzinger, 1879	●	P	●	●
Echinophyllia aspera (Ellis and Solander, 1788)	●	P	●	●
Echinophyllia costata Fenner and Veron, 2000	●	N		●
Echinophyllia echinata (Saville-Kent, 1871)	●	P	●	●
Echinophyllia echinoporoides Veron and Pichon, 1979	●	N	●	●
Echinophyllia orpheensis Veron and Pichon, 1980	●	P	●	●
Echinophyllia patula (Hodgson and Ross, 1982)	●	N	●	●
Echinophyllia pectinata Veron 2000	●	N		●
Genus Echinomorpha Veron, 2000	●	N		●
Echinomorpha nishihirea (Veron, 1990)	●	N		●
Genus Oxypora Saville-Kent, 1871	●	P	●	●
Oxypora crassispinosa Nemenzo, 1979	●	N	●	●
Oxypora glabra Nemenzo, 1959	●	P	●	●
Oxypora lacera Verrill, 1864	●	P	●	●
Genus Mycedium Oken, 1815	●	P	●	●
Mycedium elephatotus (Pallas, 1766)	●	P	●	●
Mycedium mancaoi Nemenzo, 1979	●	P	●	●
Mycedium robokaki Moll and Best, 1984	●	N	●	●
Genus Pectinia Oken, 1815	●	P	●	●
Pectinia africanus Veron, 2000	●	N		
Pectinia alcicornis (Saville-Kent, 1871)	●	P	●	●
Pectinia ayleni (Wells, 1935)	●	N	●	●
Pectinia elongata Rehberg, 1892	●	P	●	●
Pectinia lactuca (Pallas, 1766)	●	P	●	●
Pectinia maxima (Moll and Borel Best, 1984)	●	N		●
Pectinia paeonia (Dana, 1846)	●	P	●	●
Pectinia pygmaeus Veron, 2000	●	N		●
Pectinia teres Nemenzo and montecillo, 1981	●	N	●	●
Family Merulinidae Verrill, 1866	●	P	●	●
Genus Hydnophora Fischer de Waldheim, 1807	●	P	●	●
Hydnophora bonsai Veron, 1990				●
Hydnophora exesa (Pallas, 1766)	●	P	●	●
Hydnophora grandis Gardiner, 1904	●	P	●	●
Hydnophora microconos (Lamarck, 1816)	●	P	●	●
Hydnophora pilosa Veron, 1985	●	P	●	●
Hydnophora rigida (Dana, 1846)	●	P	●	●
Genus Paraclavarina Veron, 1985	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Paraclavarina triangularis (Veron and Pichon, 1980)	●	P	●	
Genus Merulina Ehrenberg, 1834	●	P	●	●
Merulina ampliata (Ellis and Solander, 1786)	●	P	●	●
Merulina scabricula Dana, 1846	●	P	●	●
Genus Scapophyllia Milne Edwards and Haime, 1848	●	P	●	●
Scapophyllia cylindrica Milne Edwards and Haime, 1848	●	P	●	●
Family Dendrophylliidae Gray, 1847	●	P	●	●
Genus Turbinaria Oken, 1815	●	P	●	●
Turbinaria frondens (Dana, 1846)	●	P	●	●
Turbinaria irregularis, Bernard, 1896	●	N	●	●
Turbinaria mesenterina (Lamarck, 1816)	●	P	●	●
Turbinaria patula (Dana, 1846)	●	P		●
Turbinaria peltata (Esper, 1794)	●	P	●	●
Turbinaria reniformis Bernard, 1896	●	P	●	●
Turbinaria stellulata (Lamarck, 1816)	●	P	●	●
Family Mussidae Ortmann, 1890	●	P	●	●
Genus Blastomussa Well, 1961	●	P		●
Blastomussa merleti, Wells, 1961	●	P		
Blastomussa wellsi Wijsman-Best, 1973	●	P		●
Genus Micromussa Veron, 2000	●	P	●	●
Micromussa amakusensis (Veron, 1990)	●	P	●	●
Micromussa diminuta Veron, 2000	●	N		
Micromussa minuta (Moll and Borel-Best, 1984)	●	N	●	●
Genus Acanthastrea Milne Edwards and Haime, 1848	●	P	●	●
Acanthastrea bowerbanki Milne Edwards and Haime, 1851	●	P		●
Acanthastrea brevis Milne Edwards and Haime, 1849	●	N	●	●
Acanthastrea echinata (Dana, 1846)	●	P	●	●
Acanthastrea faviaformis Veron, 2000	●	N	●	●
Acanthastrea hemprichii (Ehrenberg, 1834)	●	N	●	●
Acanthastrea hillae Wells, 1955			●	●
Acanthastrea ishigakiensis Veron, 1990	●	P		●
Acanthastrea lordhowensis Veron and Pichon, 1982	●	N		●
Acanthastrea regularis Veron, 2000	●	N		●
Acanthastrea rotundoflora Chevalier, 1975	●	P	●	●
Acanthastrea subechinata Veron, 2000	●	N	●	●
Genus Lobophyllia Blainville, 1830	●	P	●	●
Lobophyllia corymbosa (Forskål, 1775)	●	P	●	●
Lobophyllia dentatus Veron, 2000	●	P	●	●
Lobophyllia diminuta Veron, 1985	●	P	●	●
Lobophyllia flabelliformis Veron, 2000	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Lobophyllia hataii Yabe and Sugiyama, 1936	●	P	●	●
Lobophyllia hemprichii (Ehrenberg, 1834)	●	P	●	●
Lobophyllia pachysepta Chevalier, 1975	●	P	●	●
Lobophyllia robusta Yabe and Sugiyama, 1936	●	N	●	●
Lobophyllia serratus Veron, 2000	●	N	●	●
Genus Symphyllia Milne Edwards and Haime, 1848	●	P	●	●
Symphyllia agaricia Milne Edwards and Haime, 1849	●	P	●	●
Symphyllia hassi Pillai and Scheer, 1976	●	N	●	●
Symphyllia radians Milne Edwards and Haime, 1849	●	P	●	●
Symphyllia recta (Dana, 1846)	●	P	●	●
Symphyllia valenciennesii Milne Edwards and Haime, 1849	●	P	●	●
Genus Scolymia Haime, 1852	●	P	●	●
Scolymia australis (Milne Edwards and Haime, 1849)	●	P	●	●
Scolymia vitiensis Brüggemann, 1878	●	P	●	●
Genus Australomussa Veron, 1985	●	P	●	●
Australomussa rowleyensis Veron, 1985	●	P	●	●
Genus Cynarina Brüggemann, 1877	●	P	●	●
Cynarina lacrymalis (Milne Edwards and Haime, 1848)	●	P	●	●
Family Faviidae Gregory, 1900	●	P	●	●
Genus Caulastrea Dana, 1846	●	P	●	●
Caulastrea curvata Wijsman-Best, 1972	●	P	●	
Caulastrea echinulata (Milne Edwards and Haime, 1849)	●	N	●	
Caulastrea furcata Dana, 1846	●	P	●	●
Caulastrea tumida Matthai, 1928		P		●
Genus Favia Oken, 1815	●	P	●	●
Favia danae Verrill, 1872	●	P	●	●
Favia favus (Forskål, 1775)	●	P	●	●
Favia helianthoides Wells, 1954	●	P	●	●
Favia laxa (Klunzinger, 1879)	●	P	●	●
Favia lizardensis Veron and Pichon, 1977	●	P	●	●
Favia maritima (Nemenzo, 1971)	●	P	●	●
Favia marshae Veron, 2000	●	N		●
Favia matthai Vaughan, 1918	●	P	●	●
Favia maxima Veron, Pichon & Wijsman-Best, 1972	●	N	●	●
Favia pallida (Dana, 1846)	●	P	●	●
Favia rosaria Veron, 2000	●	P	●	●
Favia rotumana (Gardiner, 1899)	●	P	●	●
Favia rotundata Veron, Pichon & Wijsman-Best, 1972	●	P	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Favia speciosa Dana, 1846	●	P	●	●
Favia stelligera (Dana, 1846)	●	P	●	●
Favia truncatus Veron, 2000	●	N	●	●
Favia veroni Moll and Borel-Best, 1984	●	P	●	●
Genus Barabattoia Yabe and Sugiyama, 1941	●	P	●	●
Barabattoia amicorum (Milne Edwards and Haime, 1850)	●	P		●
Barabattoia laddi (Wells, 1954)				●
Genus Favites Link, 1807	●	P	●	●
Favites abdita (Ellis and Solander, 1786)	●	P	●	●
Favites acuticolis (Ortmann, 1889)	●	N		●
Favites bestae Veron, 2000	●	P		●
Favites chinensis (Verrill, 1866)	●	P	●	●
Favites complanata (Ehrenberg, 1834)	●	P	●	●
Favites flexuosa (Dana, 1846)	●	P	●	●
Favites halicora (Ehrenberg, 1834)	●	P	●	●
Favites micropentagona Veron, 2000	●	N		●
Favites paraflexuosa Veron, 2000	●	N	●	●
Favites pentagona (Esper, 1794)	●	P	●	●
Favites russelli (Wells, 1954)	●	P	●	●
Favites spinosa (Klunzinger, 1879)				●
Favites stylifera (Yabe and Sugiyama, 1937)	●	N		●
Favites vasta (Klunzinger, 1879)	●	N	●	●
Genus Goniastrea Milne Edwards and Haime, 1848	●	P	●	●
Goniastrea aspera Verrill, 1905	●	P	●	●
Goniastrea australensis (Milne Edwards and Haime, 1857)	●	P	●	●
Goniastrea edwardsi Chevalier, 1971	●	P	●	●
Goniastrea favulus (Dana, 1846)	●	P	●	●
Goniastrea minuta Veron, 2000				●
Goniastrea palauensis (Yabe and Sugiyama, 1936)	●	P	●	
Goniastrea pectinata (Ehrenberg, 1834)	●	P	●	●
Goniastrea ramosa Veron, 2000	●	N		●
Goniastrea retiformis (Lamarck, 1816)	●	P	●	●
Genus Platygyra Ehrenberg, 1834	●	P	●	●
Platygyra acuta Veron, 2000	●	N	●	●
Platygyra contorta Veron, 1990	●	P	●	●
Platygyra daedalea (Ellis and Solander, 1786)	●	P	●	●
Platygyra lamellina (Ehrenberg, 1834)	●	P	●	●
Platygyra pini Chevalier, 1975	●	P	●	●
Platygyra ryukyuensis Yabe and Sugiyama, 1936	●	P	●	●
Platygyra sinensis (Milne Edwards and Haime, 1849)	●	P	●	●
Platygyra verweyi Wijsman-Best, 1976	●	N	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Platygyra yaeyemaensis Eguchi and Shirai, 1977	●	N	●	●
Genus Australogyra Veron, Pichon and Wijsman-Best, 1977	●	P	●	
Australogyra zelli Veron and Pichon, 1977	●	P	●	
Genus Oulophyllia Milne Edwards and Haime, 1848	●	P	●	●
Oulophyllia bennettae (Veron, Pichon, 1977)	●	P	●	●
Oulophyllia crispa (Lamarck, 1816)	●	P	●	●
Oulophyllia levis Nemenzo, 1959	●	N	●	●
Genus Leptoria Milne Edwards and Haime, 1848	●	P	●	●
Leptoria irregularis Veron, 1990			●	●
Leptoria phrygia (Ellis and Solander, 1786)	●	P	●	●
Genus Montastrea Blainville, 1830	●	P	●	●
Montastrea annuligera (Milne Edwards and Haime, 1849)	●	P	●	●
Montastrea colemani Veron, 2000	●	P		●
Montastrea curta (Dana, 1846)	●	P	●	●
Montastrea magnistellata Chevalier, 1971	●	P	●	●
Montastrea multipunctata Hodgson, 1985		P	●	
Montastrea salebrosa (Nemenzo, 1959)	●	P	●	●
Montastrea valenciennesi (Milne Edwards and Haime, 1848)	●	P	●	●
Genus Plesiastrea Milne Edwards and Haime, 1848	●	P	●	●
Plesiastrea versipora (Lamarck, 1816)	●	P	●	●
Genus Oulastrea Milne Edwards and Haime, 1848			●	●
Oulastrea crispata (Lamarck, 1816)			●	●
Genus Diploastrea Matthai, 1914	●	P	●	●
Diploastrea heliopora (Lamarck, 1816)	●	P	●	●
Genus Leptastrea Milne Edwards and Haime, 1848	●	P	●	●
Leptastrea aequalis Veron, 2000				●
Leptastrea bewickensis Veron and Pichon, 1977			●	
Leptastrea bottae (Milne Edwards and Haime, 1849)	●	N		●
Leptastrea inaequalis Klunzinger, 1879	●	P	●	
Leptastrea pruinosa Crossland, 1952	●	P	●	●
Leptastrea purpurea (Dana, 1846)	●	P	●	●
Leptastrea transversa Klunzinger, 1879	●	P	●	●
Genus Cyphastrea Milne Edwards and Haime, 1848	●	P	●	●
Cyphastrea agassizi (Vaughan, 1907)	●	N	●	●
Cyphastrea chalcidium (Forskål, 1775)	●	P	●	●
Cyphastrea decadia Moll and Best, 1984	●	P	●	●
Cyphastrea japonica Yabe and Sugiyama, 1932	●	N	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Cyphastrea microphthalma (Lamarck, 1816)	●	P	●	●
Cyphastrea ocellina (Dana, 1864)	●	P	●	●
Cyphastrea serailia (Forskål, 1775)	●	P	●	●
Genus Echinopora Lamarck, 1816	●	P	●	●
Echinopora gemmacea Lamarck, 1816	●	P	●	●
Echinopora hirsutissima Milne Edwards and Haime, 1849	●	P	●	●
Echinopora horrida Dana, 1846	●	P	●	●
Echinopora lamellosa (Esper, 1795)	●	P	●	●
Echinopora mammiformis (Nemenzo, 1959)	●	P	●	●
Echinopora pacificus Veron, 1990	●	P	●	●
Echinopora taylorae (Veron, 2000)	●	N		●
Genus Moseleya Quelch, 1884				●
Moseleya latistellata Quelch, 1884				●
Family Trachyphyllidae Verrill, 1901	●	P		
Genus Trachyphyllia Milne Edwards and Haime, 1848	●	N		
Trachyphyllia geoffroyi (Audouin, 1826)	●	N	●	●
Family Poritidae Gray, 1842	●	P	●	●
Genus Porites Link, 1807	●	P	●	●
Porites aranetai Nemenzo, 1955				●
Porites annae Crossland, 1952	●	P	●	●
Porites attenuata Nemenzo 1955	●	P	●	●
Porites australiensis Vaughan, 1918	●	P	●	●
Porites cumulatus Nemenzo, 1955	●	N	●	●
Porites cylindrica Dana, 1846	●	P	●	●
Porites deformis Nemenzo, 1955	●	P	●	●
Porites densa Vaughan, 1918	●	N	●	●
Porites eridani Umbgrove, 1940	●	N		
Porites evermanni Vaughan, 1907	●	N	●	●
Porites flavus Veron, 2000	●	N	●	●
Porites heronensis Veron, 1985			●	●
Porites horizontalata Hoffmeister, 1925			●	●
Porites latistellata Quelch, 1886	●	P	●	●
Porites lichen Dana, 1846	●	P	●	●
Porites lobata Dana, 1846	●	P	●	●
Porites lutea Milne Edwards and Haime, 1851	●	P	●	●
Porites mayeri Vaughan, 1918			●	●
Porites monticulosa Dana, 1846	●	P	●	●
Porites murrayensis Vaughan, 1918	●	P	●	●
Porites napopora Veron, 2000				●
Porites negrosensis Veron, 1990			●	●
Porites nigrescens Dana, 1846	●	N	●	●
Porites profundus Rehberg, 1892				●
Porites rugosa Fenner & Veron, 2000	●	N	●	●

Zooxanthellate Scleractinia	Solomon Islands		Milne Bay, Papua New Guinea[1]	Raja Ampat Islands, Indonesia[2]
Porites rus (Forskål, 1775)	●	P	●	●
Porites sillimaniana Nemenzo, 1976	●	P		●
Porites solida (Forskål, 1775)	●	P	●	●
Porites stephensoni Crossland, 1952	●	P	●	●
Porites tuberculosa Veron, 2000	●	N		●
Porites vaughani Crossland, 1952	●	P	●	●
Genus Goniopora Blainville, 1830	●	P	●	●
Goniopora albiconus Veron, 2000				●
Goniopora burgosi Nemenzo, 1955	●	N		●
Goniopora columna Dana, 1846	●	P	●	●
Goniopora djiboutiensis Vaughan, 1907	●	P	●	●
Goniopora eclipsensis Veron and Pichon, 1982	●	N		●
Goniopora fruticosa Saville-Kent, 1893	●	N	●	●
Goniopora lobata Milne Edwards and Haime, 1860	●	P	●	●
Goniopora minor Crossland, 1952	●	P	●	●
Goniopora palmensis Veron and Pichon, 1982	●	N	●	●
Goniopora pandoraensis Veron and Pichon, 1982	●	P	●	●
Goniopora pendulus Veron, 1985				●
Goniopora polyformis Zou, 1980				●
Goniopora somaliensis Vaughan, 1907	●	P	●	●
Goniopora stokesi Milne Edwards and Haime, 1851	●	P	●	●
Goniopora stutchburyi Wells, 1955	●	P	●	●
Goniopora tenella (Quelch, 1886)				●
Goniopora tenuidens (Quelch, 1886)	●	P	●	●
Genus Alveopora Blainville, 1830	●	P	●	●
Alveopora catalai Wells, 1968	●	N	●	●
Alveopora daedalea (Forskål, 1775)				●
Alveopora excelsa Verrill, 1863				●
Alveopora fenestrata (Lamarck, 1816)	●	P	●	●
Alveopora gigas Veron, 1985				●
Alveopora marionensis Veron and Pichon, 1982			●	●
Alveopora minuta Veron, 2000	●			●
Alveopora spongiosa Dana, 1846	●	P	●	●
Alveopora tizardi Bassett-Smith, 1890	●	P	●	●
Alveopora verrilliana Dana, 1872			●	
TOTAL SPECIES	485	N = 122	436	535

P = Previously recorded (within the distribution range of Veron, 2000)

N = New record for the Solomon Islands (not within the distribution range of Veron, 2000)

[1] From the combined records of Veron (2000) and Turak and Souhoka (2003)

[2] From the combined records of Veron (1998) and Fenner and Turak (2003)

Table 2. Coral specimens collected for further study or reference, and their associated field reference number.

SPECIES	FIELD REFERENCE NUMBER
Acanthastrea brevis	617, 618
Acanthastrea echinata	140, 120, 304, 340, 341, 347, 619
Acanthastrea faviaformis	875
Acanthastrea ishigakiensis	769, 871
Acropora abrolhosensis	757
Acropora akajimensis	206, 363, 627
Acropora awi	758
Acropora batunai	213, 214, 215, 216, 217
Acropora bifurcata	571
Acropora bruggemanni	757, 758, 759, 851
Acropora caroliniana	207, 373, 374, 565, 629
Acropora cerealis	362, 376, 382, 395, 568, 761
Acropora chesterfieldensis	756, 765
Acropora clathrata	369
Acropora convexa	576
Acropora cophodactyla	629
Acropora cylindrica	383, 428, 444, 450
Acropora digitifera	859
Acropora donei	763
Acropora echinata	572, 868
Acropora elseyi	380, 566, 877
Acropora gemmifera	570, 575
Acropora globiceps	358
Acropora grandis	200
Acropora granulosa	203
Acropora hoeksemai	627

SPECIES	FIELD REFERENCE NUMBER
Acropora horrida	204, 332, 360, 754
Acropora indonesia	628
Acropora inermis	573
Acropora irregularis	852
Acropora jacquelineae	353
Acropora kimbeensis	372
Acropora latistella	205
Acropora lokani	371, 384
Acropora lovelli	760
Acropora microclados	365, 750, 837
Acropora microphthalma	355, 864
Acropora millepora	386
Acropora monticulosa	405
Acropora multiacuta	744, 745, 746
Acropora nana	403
Acropora nasuta	96, 397, 398, 759, 835
Acropora navini	890
Acropora orbicularis	853
Acropora palifera	218
Acropora paniculata	574
Acropora parilis	762
Acropora pichoni	415
Acropora plana	756
Acropora plumosa	569, 393
Acropora polystoma	375, 387, 388, 389, 390, 391
Acropora pulchra	377

SPECIES	FIELD REFERENCE NUMBER
Acropora rambleri	368, 381, 755
Acropora retusa	836
Acropora robusta	370, 858
Acropora rosaria	385
Acropora samoensis	219
Acropora sarmentosa	202, 354
Acropora secale	392
Acropora selago	747, 748, 749
Acropora solitaryensis	357, 394
Acropora sp.	761, 762
Acropora speciosa	356, 379
Acropora subglabra	359, 364, 366, 367, 378, 754
Acropora subulata	201, 753, 755
Acropora tenuis	751, 752
Acropora valenciennesi	399
Acropora valida	795
Acropora vaughani	361, 628, 767
Acropora wallaceae	872
Alveopora catalai	244, 452, 878, 879
Alveopora spongiosa	633, 634
Alveopora tizardi	643
Anacropora forbesi	211, 461, 462, 463
Anacropora pillai	212
Anacropora puertogalerae	209, 460, 790
Anacropora reticulata	208, 464
Anacropora sp.	210, 453, 454, 455, 456, 457, 458, 816
Anacropora spinosa	577, 459,

SPECIES	FIELD REFERENCE NUMBER
Astreopora gracilis	775, 777
Astreopora incrustans	672, 770, 771
Astreopora myriophthalma	772, 774, 776, 789
Astreopora randalli	773
Australogyra zelli	470, 471, 411
Australomussa rowleyensis	424
Blastomussa merleti	607, 608, 865
Blastomussa wellsi	418, 613, 614
Cantharellus jebbi	539
Caulastrea curvata	438, 467, 472, 723
Caulastrea furcata	724
Coeloseris mayeri	547
Coscinaraea columna	552
Coscinaraea wellsi	844, 845, 848
Ctenactis albitentaculata	131
Cycloseris colini	247, 509, 510, 511, 783
Cycloseris costulata	254
Cycloseris cyclolites	127
Cycloseris erosa	132, 141, 784, 785
Cycloseris hexagonalis	787
Cycloseris patelliformis	786
Cycloseris somervillei	501, 512, 513
Cycloseris tenuis	133
Cynarina lacrymalis	123, 249, 250, 507, 508, 422
Cyphastrea 8 septa	312
Cyphastrea agassizi	564
Cyphastrea chalcidium	611
Cyphastrea decadia	468, 469, 417, 445

SPECIES	FIELD REFERENCE NUMBER
Cyphastrea microphthalma	309, 310, 311, 555
Cyphastrea serailia	554, 735
Diaseris fragilis	130, 442
Echinophyllia aspera	315, 321, 322, 829, 830, 831, 832
Echinophyllia echinoporoides	667, 843
Echinophyllia orpheensis	251
Echinophyllia patula	820
Echinopora gemmacea	301, 302, 343
Echinopora horrida	414
Echinopora lamellosa	248, 466
Echinopora taylorae	308, 314, 345, 610, 670, 731
Euphyllia ancora	665
Euphyllia paraancora	106
Euphyllia yaeyamaensis	105, 522
Favia danae	876
Favia helianthoides	732
Favia laxa	797
Favia matthaii	324, 325, 326, 327, 733, 768
Favia maxima	741
Favia rotumana	563 346
Favia rotundata	313
Favia stelligera	412, 416, 426, 440, 739
Favia truncatus	320, 323
Favites complanata	348
Favites flexuosa	740
Favites pentagona	305, 306, 307, 558, 559, 560
Favites russelli	561, 780
Fungia concinna	516

SPECIES	FIELD REFERENCE NUMBER
Fungia fralinae	856, 857
Fungia fungites	515
Fungia granulosa	253
Fungia horrida	140
Fungia klunzingeri	139,
Fungia moluccensis	128, 134, 138, 788, 794
Fungia paumotensis	126
Fungia scutaria	137
Galaxea astreata	711
Galaxea fascicularis	434, 722
Galaxea horrescens	433, 441, 709, 710
Galaxea longisepta	408
Galaxea paucisepta	342, 421, 436, 716
Gardineroseris planulata	677
Goniastrea aspera	743, 781
Goniastrea pectinata	553
Goniastrea retiformis	336, 730
Goniopora burgosi	647, 648, 649, 650
Goniopora columna	651, 821
Goniopora djiboutiensis	653
Goniopora eclipsensis	817
Goniopora fruticosa	793
Goniopora lobata	654, 655, 660
Goniopora minor	635, 636, 637, 639, 656
Goniopora palmensis	644
Goniopora pandoraensis	645, 646
Goniopora somaliensis	518, 822
Goniopora sp.	658, 659

SPECIES	FIELD REFERENCE NUMBER
Goniopora stokesi	652
Goniopora stutchburyi	638, 641, 642
Halomitra clavator	101, 102, 103, 822
Herpolitha weberi	136
Hydnophora pilosa	409
Hydnophora rigida	329, 330, 540, 541
Leptastrea inaequalis	734
Leptastrea pruinosa	317, 809
Leptastrea purpurea	318, 319, 333, 557
Leptastrea transversa	671
Leptoseris explanata	523, 532, 536, 537, 538, 404
Leptoseris foliosa	109, 526, 534, 612
Leptoseris gardineri	519, 532
Leptoseris hawaiiensis	823, 824, 825, 849
Leptoseris mycetoseroides	406
Leptoseris papyracea	107, 108
Leptoseris scabra	529, 801, 826
Leptoseris solida	524, 525, 530, 531
Leptoseris sp.	803, 804, 805, 806, 812
Leptoseris tubulifera	527, 528
Leptoseris yabei	413, 420
Lithophyllon lobata	668, 676, 815, 847
Lithophyllon mokai	539, 808
Lobophyllia dentatus	402
Lobophyllia diminuta	432, 792
Lobophyllia flabelliformis	860
Lobophyllia hataii	427
Lobophyllia pachysepta	401

SPECIES	FIELD REFERENCE NUMBER
Merulina ampliata	548, 727
Merulina sp.	430, 542, 543, 665, 666, 713, 714, 715, 796, 811, 854
Micromussa diminuta	615
Micromussa minuta	122,
Montastrea annuligera	556, 735
Montastrea colemani	303, 349, 350, 736
Montastrea curta	465, 328, 351, 742
Montastrea magnistellata	467
Montastrea salebrosa	624
Montastrea valenciennesi	738
Montipora aequituberculata	264, 271, 272
Montipora altasepta	220, 221
Montipora calcarea	704
Montipora caliculata	235, 686, 687, 698,
Montipora capricornis	245
Montipora cocosensis	259, 260
Montipora confusa	673
Montipora danae	267, 429
Montipora digitata	224, 225, 226, 227
Montipora efflorescens	238, 239, 240, 707
Montipora foliosa	690, 691, 693
Montipora foveolata	234, 274, 684, 685
Montipora grisea	236, 237, 261, 262, 706
Montipora hirsuta	695
Montipora hispida	232, 233
Montipora hodgsoni	692
Montipora incrassata	255, 270, 702

SPECIES	FIELD REFERENCE NUMBER
Montipora informis	257, 259
Montipora mactanensis	518, 689
Montipora malampaya	222, 223, 246
Montipora mollis	275, 276
Montipora monasteriata	241, 708
Montipora niugini	520
Montipora orientalis	265, 266
Montipora palawanensis	703
Montipora peltiformis	258 869
Montipora spongodes	277, 278
Montipora spumosa	699, 700, 701, 705
Montipora stellata	228, 229, 694
Montipora tuberculosa	263, 620
Montipora turgescens	256
Montipora undata	242, 243
Montipora verruculosa	268, 269
Montipora vietnamensis	230, 231
Mycedium elephantotus	546
Mycedium robokaki	545
Oulophyllia crispa	725
Oulophyllia levis	726
Oxypora crasispinosa	835, 836, 837, 840, 841, 842
Oxypora glabra	827
Oxypora lacera	833, 834
Pachyseris foliosa	419
Pachyseris speciosa	451
Palauastrea ramosa	113, 335, 682, 683
Pavona bipartita	674, 675, 810, 828

SPECIES	FIELD REFERENCE NUMBER
Pavona cactus	339, 449
Pavona clavus	814, 846, 866
Pavona explanulata	678
Pavona frondifera	535
Pavona maldivensis	117, 337
Pavona varians	800,
Pavona venosa	112
Pectinia africanus	517
Pectinia alcicornis	431
Pectinia ayleni	104, 345, 838, 839
Pectinia elongata	439
Pectinia maxima	344
Pectinia pygmaeus	111, 813
Platygyra pini	764
Platygyra yaeyamaensis	316, 560, 729
Plerogyra simplex	423
Pocillopora damicornis	521
Pocillopora elegans	874
Pocillopora kelleheri	867
Podabacia motuporensis	407
Polyphyllia novaehiberniae	135, 435
Porites attenuata	153
Porites australiensis	177
Porites cylindrica	152, 158
Porites deformis	179
Porites densa	630, 873, 880
Porites flavus	160, 161
Porites horizontalata	168

SPECIES	FIELD REFERENCE NUMBER
Porites latistellata	144, 145, 146, 147, 154, 162
Porites lichen	163, 164, 165, 168, 870
Porites monticulosa	173, 174, 175, 176, 855
Porites murrayensis	178, 180
Porites nigrescens	150, 151
Porites rugosa	148, 149, 157
Porites rus	116, 155, 156
Porites solida	169
Porites sp. 1	182, 183, 184, 185, 186
Porites sp. 2	792, 793, 794
Porites stephensoni	631
Porites tuberculosa	159, 181
Porites vaughani	166, 167, 170, 171, 172
Psammocora contigua	114, 544
Psammocora digitata	334
Psammocora explanulata	669
Psammocora nierstraszi	625
Psammocora profundacella	115, 551, 621, 682, 862
Psammocora superficialis	141, 622, 623, 819, 861

SPECIES	FIELD REFERENCE NUMBER
Pseudosiderastrea tayami	609
Sandalolitha dentata	331, 443
Scapophyllia cylindrica	440
Scolymia vitiensis	502, 503, 504, 505, 506
Seriatopora dendritica	712
Seriatopora hystrix	252, 446, 447, 448
Seriatopora sp.	125, 795, 796
Seriatopora stellata	791
Stylocoeniella armata	100
Stylocoeniella guentheri	110, 142, 143, 338, 437, 550, 600, 601, 603, 604, 605, 606, 680, 681, 818
Stylophora subseriata	549
Symphyllia valenciennesi	410
Trachyphyllia geoffroyi	679
Turbinaria irregularis	720, 721, 766
Turbinaria mesenterina	718
Turbinaria reniformis	717

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

SOLOMON ISLANDS GOVERNMENT

June 2006
TNC Pacific Island Countries
Report No 1/06

CHAPTER 2

Coral Communities & Reef Health

Solomon Islands Marine Assessment

Emre Turak

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
Emre Turak: 1 Rue François Villon, 95000, Cergy, France
e-Mail: emreturak@wanadoo.fr

Suggested Citation:
Turak, E. 2006. Coral Communities and Reef Health. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: © Emre Turak

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Contents

Executive Summary

Coral diversity and reef status was assessed by SCUBA surveys at 113 sites at 59 locations around all the major islands of the main island chain of the Solomons. Very high hard coral species richness with 485 species belonging to 76 genera in 14 families was recorded.

Seven coral community types were recognized. Of these, coral communities found in very sheltered inlets in the fjord like coastlines were of particular interest. These communities were unique, had high species richness, usually high living coral cover and were generally in good health.

Overall, reefs and coral communities of the Solomons were in good condition. With the exception of some localized areas, impacts and reef degradation were low to moderate at most sites.

Crown of thorns starfish damage was the most widespread and significant at some locations. Damage from the 2000 coral bleaching event was noted at some locations. Sediment associated impact was rarely noted. However such areas were usually avoided for the purpose of this survey. There was evidence of over harvesting of commercially targeted reef species, such as giant clams, *Trochus* and sea cucumbers.

Lau'alo Passage (northeast Malaita) with its extensive shallow reef areas and reticulate channels, seagrass meadows and artificial reef island villages, is an area of great ecological and cultural value, and potential conservation interest.

Introduction

An extensive survey of the coral reefs of the nine main island and island groups of the Solomon Islands was conducted during a 5 week cruise in May – June 2004. The main chain of the Solomon Islands, form a natural continuation of Bougainville Island in PNG, also forming the north and eastern borders of the Solomon Sea. They are islands of volcanic origin with in some areas current volcanic and tectonic activity. With the exception of two main atolls, Ontong Java atoll and the Indispensable Reefs (which were not visited during the surveys), Solomon Island reefs are predominantly fringing and barrier type. A few small platform and pinnacle reefs are scattered throughout the archipelago.

The principal aims of this survey were to map the coral and reef biodiversity and to assess the current status of the reefs of the Solomon Islands. Work was done closely with coral taxonomic surveys and this report is complimented by taxonomy report (*Coral Diversity*, this report).

Very little previous knowledge of corals from the Solomons exists. The only published coral species count by the 1965 Royal Expedition lists 87 species (Spalding et al., 2001). This curent survey is the most comprehensive coral survey conducted to date in the Solomon Islands.

METHODS

Rapid Ecological Assessment (REA) surveys were conducted using SCUBA at 59 fringing reef locations (Figure 1, Appendix 1) in May – June 2004. Locations, each of approx. 1 ha in total area, were selected to provide the broadest range of reef habitat types, developed in relation to different environmental conditions (e.g. exposure, slope angle, depth). At most locations, deep and shallow sites (designated as site #.1 and #.2 respectively) were surveyed concurrently, representing the deeper reef slope (> 10m depth) and the shallow slope, reef crest and flat (< 10m depth). Deep sites were surveyed first, in accordance with safe diving practice, with the observers swimming initially to the maximum survey depth (usually 40-45 m), then working steadily into shallower waters. In total, 113 sites at the 59 locations were surveyed (Figure 1). The method was similar to that employed during biodiversity assessments in other parts of the Indo-West Pacific, Indonesia and Australia (see e.g. DeVantier et al. 1998, 2000, DeVantier 2002, 2003, Turak 2002, Turak, 2003, Turak and Fenner 2002, Turak and DeVantier, 2003, Turak and Shouhoko 2003, Turak and Aitsi 2003, Turak et al. 2003). It thus provides the opportunity for future comparisons of species diversity, composition and community structure of these different areas in terms of their coral communities.

At each site, the survey swim covered an area of approx. 5,000m^2 (ca. 50m x 100 m), such that each survey location represented approx. one ha in total. Although 'semi-quantitative', this method has proven far superior to more traditional quantitative methods (transects, quadrats) in terms of biodiversity assessment, allowing for the active searching for new species records at each site, rather than being restricted to a defined quadrat area or transect line (DeVantier et al. 1998, 2000). For example, the present method has regularly returned a two- to three-fold increase in coral species records in comparison with line transects conducted concurrently at the same sites (e.g. Red Sea, Great Barrier Reef).

Two types of information were recorded on water-proof data-sheets during the ca. one and a half hour SCUBA survey swims at each location:

1. an inventory of species, genera and families of sessile benthic taxa (Appendices 2 and 3); and
2. an assessment of the percent cover of the substrate by the major benthic groups and status of various environmental parameters (Appendix 1, after Done 1982, DeVantier et al. 1998, 2000).

TAXONOMIC INVENTORIES

A detailed inventory of sessile benthic taxa was compiled during each swim. Taxa were identified in situ to the following levels:

- stony (hard) corals were identified to species level wherever possible (based on Veron and Pichon 1976, 1980, 1982, Veron, Pichon and Wijsman-Best 1977, Veron and Wallace 1984, Veron 1986, 1993, 1995, 2000, Hoeksema 1989, Wallace and Wolstenholme 1998, Wallace 1999, Veron and Stafford-Smith 2002), otherwise genus and growth form (e.g. *Porites* sp. of massive growth-form).
- soft corals, zoanthids, corallimorpharians, anemones and some macro-algae were identified to genus, family or broader taxonomic group (Allen and Steene 1995, Colin and Arneson 1995, Goslinger et al. 1996, Fabricius and Alderslade 2000);
- other sessile macro-benthos, such as sponges, ascidians and most algae were usually identified to phylum plus growth-form (Allen and Steene 1995, Colin and Arneson 1995, Goslinger et al. 1996).

At the end of each survey swim, the inventory was reviewed, and each taxon was categorized in terms of its relative abundance in the community (Table 1). The categories reflect relative numbers of individuals in each taxon, rather than its contribution to benthic cover (DeVantier et al. 1998).

For each coral taxon present, a visual estimate of the total amount of injury (dead surface area) present on colonies at each site was made, in increments of 0.1, where 0 = no injury and 1 = all colonies dead. The approximate proportion of colonies of each taxon in each of three size classes was also estimated. The size classes were 1 - 10 cm diameter, 11 - 50 cm diameter and > 50 cm diameter (Table 1).

Table 1. Categories of relative abundance, injury and sizes (maximum diameter) of each benthic taxon in the biological inventories.

Rank	Relative abundance	Injury	Size frequency distribution
0	absent	0 - 1 in increments of 0.1	proportion of corals in each of 3 size classes: 1) 1 - 10 cm 2) 11 - 50 cm 3) > 50 cm
1	rare		
2	uncommon		
3	common		
4	abundant		
5	dominant		

<u>Taxonomic Certainty</u>

Despite recent advances in field identification and stabilizing of coral taxonomy (e.g. Hoeksema 1989, Veron 1986, Wallace 1999, Veron 2000, Veron and Stafford-Smith 2002), substantial taxonomic uncertainty and disagreement among different workers remains. This is particularly so in the families Acroporidae and Fungiidae, with different workers each providing different taxonomic classifications and synonymies for various corals (see e.g. Hoeksema 1989, Wallace 1999, Veron 2000). In the present study, extensive use of digital underwater photography and collection of specimens of taxonomically difficult reef-building coral species were made to confirm field identifications.

Small samples, usually < 10 cm on longest axis, were removed from living coral colonies in situ, leaving the majority of the sampled colony intact. Living tissue was removed from the specimens by bleaching with household bleach. The dried specimens were examined and identified, as far as possible to species level. Most of these specimens were identified on board the *FeBrina*, our survey vessel, using all the above reference materials, resulting in a comprehensive list of reef-building coral taxa for the area. Most specimens were left with the TNC office in Honiara as a basis for a reference collection for the local researchers. Some specimens required additional detailed study, and were shipped to the Museum of Tropical Queensland, Australia.

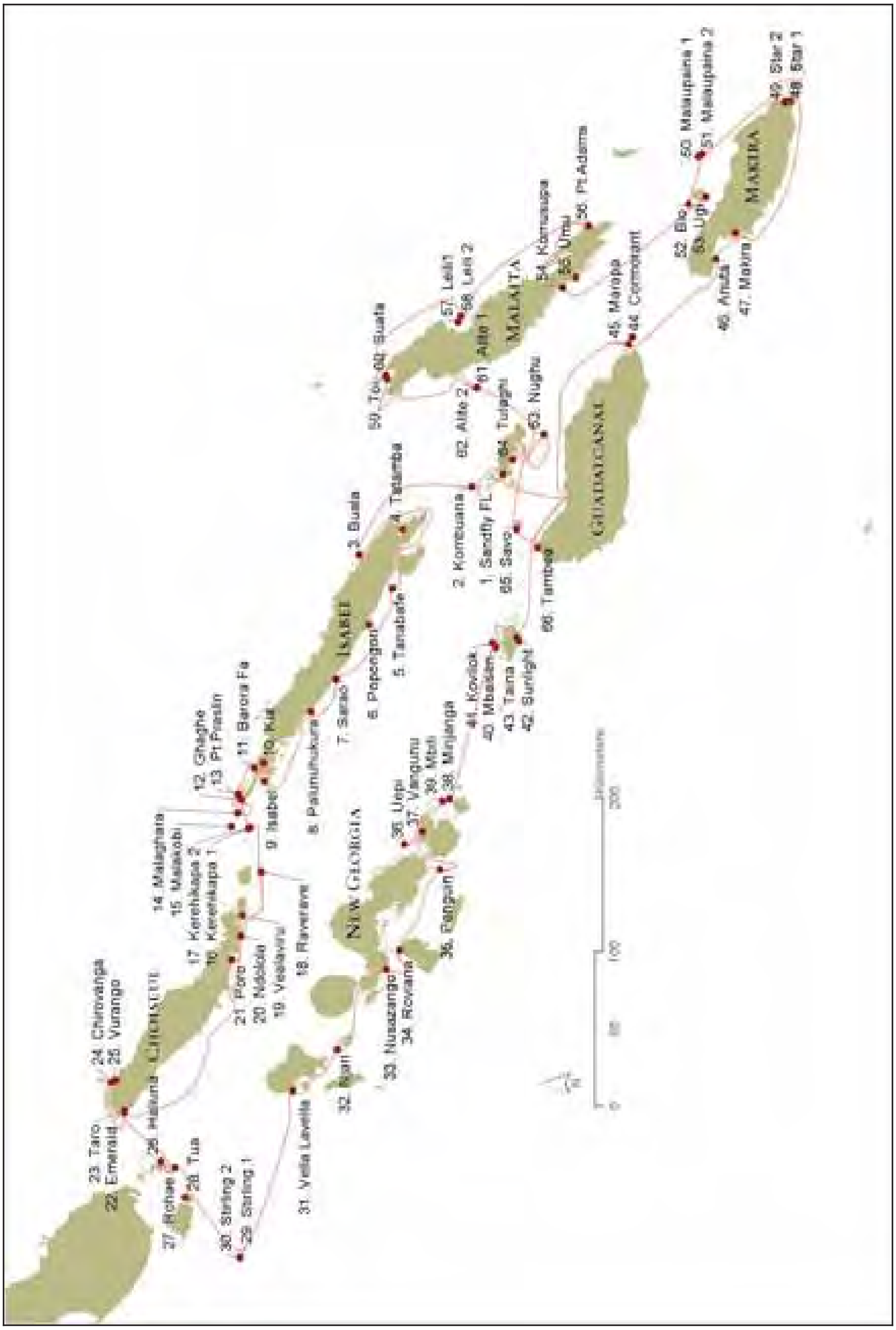


Figure 1. Full study area showing all numbered locations. At all locations two sites were surveyed, each corresponding to deep (10m to maximum depth) and shallow. (minimum depth to 8m).

BENTHIC COVER AND REEF DEVELOPMENT

At completion of each swim, six ecological and six substratum attributes were assigned to 1 of 6 standard categories (Table 2), based on an assessment integrated over the length of the swim (after Done 1982, DeVantier et al. 1998, 2000).

Table 2. Categories of benthic attributes and % cover categories

Attribute		
ecological	**physical**	**% cover**
Hard coral	Hard substrate	not present
Dead standing coral	Continuous pavement	1 - 10 %
Soft coral	Large blocks (diam. > 1 m)	11 - 30 %
Coralline algae	Small blocks (diam. < 1 m)	31 - 50 %
Turf algae	Rubble	51 - 75 %
Macro-algae	Sand	76 - 100 %

The sites were classified into one of four categories based on the amount of biogenic reef development (after Hopley 1982, DeVantier et al. 1998):

1. Coral communities developed directly on non-biogenic rock, sand or rubble;
2. Incipient reefs, with some calcium carbonate accretion but no reef flat;
3. Reefs with moderate flats (< 50m wide); and
4. Reefs with extensive flats (> 50m wide).

The sites were also classified arbitrarily on the degree of exposure to wave energy, where:
1. sheltered;
2. semi-sheltered;
3. semi-exposed; and
4. exposed.

The depths of the sites (maximum and minimum in m), average angle of reef slope to the horizontal (estimated visually to the nearest 10 degrees), and underwater visibility (to the nearest m) were also recorded. The presence of any unique or outstanding biological features, such as particularly large corals or unusual community composition, and evidence of impacts, were also recorded, such as:
- sedimentation;
- blast fishing;
- poison fishing;
- anchoring;
- bleaching impact;
- crown-of-thorns seastars predation;
- *Drupella* snails predation; and
- coral diseases.

Digital underwater photos were taken of sampled corals for which field identifications were uncertain, and of the representative coral community types. All data were input to EXCEL spreadsheets for storage and preliminary analysis.

COMMUNITY TYPES

Site groups defined by community type were generated by hierarchical cluster analysis using abundance ranks of all corals in the inventories. The analysis used Squared Euclidean Distance as the clustering algorithm and Ward's Method as the fusion strategy to generate site groups of similar community composition and abundance. Analyses were conducted on the raw (untransformed) data. The clustering results were plotted as a dendrogram to illustrate the relationships among sites in terms of levels of similarity among the different community groups.

Coral Injury

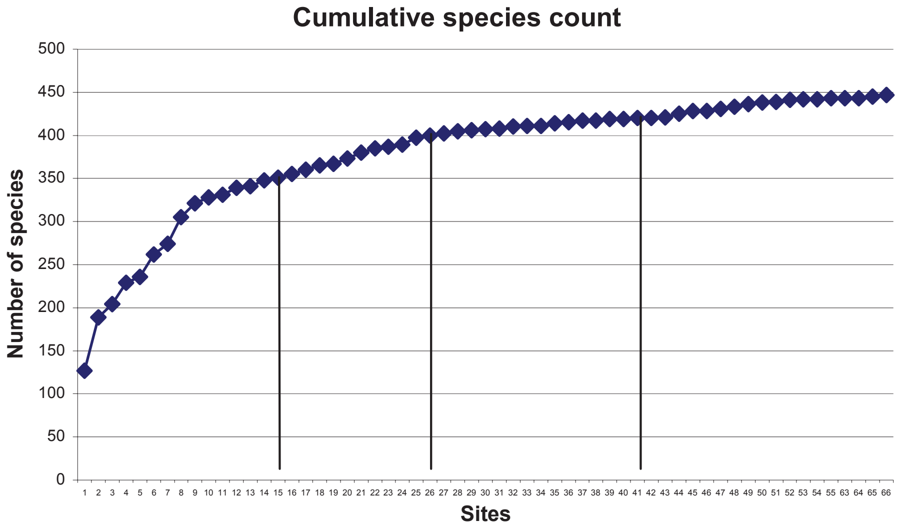
Each coral species in the sites was assigned a score for its level of injury, from 0 – 1 in increments of 0.1 (from 0 for no injury to any colony of that species at that site to 1 where all colonies of the species were dead, see *Methods* above). Sites were compared for the amounts of injury to their coral communities, for the proportion of the total number of species present in each site that were injured, and the average injury to those coral species in each site.

Results

Biodiversity and Biogeography

Hard Corals

Hard coral diversity was exceptionally high (*Coral Diversity*, this report). The two obvious explanations were, the size of area covered (virtually most of the Solomons) and the high diversity of reef habitats found and surveyed. On the other hand it was expected that species number should diminish as we moved east away from the coral-triangle. But this proved not to be the case, at least as far as the Solomon Islands were concerned. Most species had Solomons wide distribution, indicating good connectivity between the islands. Over 90% of the total coral species were recorded in the North and West section only in the first half of the sites (Figure 2). Surveys in the south and east added less than 10% to the total hard coral species compliment.



Most coral genera were well represented, with exception of *Alveopora*, where only 4 out of 11 known species were recorded and of those recorded only a few colonies were seen. In addition a number of monospecific genera were not found during this survey. These are relatively rare genera and were: *Catalaphyllia, Nemenzophyllia, Heterocyathus, Heteropsammia, Oulastrea, Moseleya, Stylaraea* and *Duncanopsammia.* Of these the first 5 have been known to occur in the Solomons. The next two, *Moseleya* and *Stylaraea* are found in the area. The closest area that last *Duncanopsammia* is known from is Southeast PNG. All these genera have very specific habitat requirements and unless such specific habitats are not surveyed they will likely to be missed. Therefore it is quite possible for the last three genera to be found in the Solomons.

To date, the Solomons survey has yielded the second highest coral species count (485 species) from one study anywhere in the world. The highest count (487 with a cumulative total of 535) is from the Raja Ampat Islands (Turak and Shouhoko, 2003) in Papua province, Indonesia and is found in what has been traditionally described as the Coral Triangle. Average site diversity was relatively high. However relative site richness was low, which is usually the case in areas of extreme high species richness. Only 12% of all sites had 1/3rd or more of the total species count for the Solomons. On the other hand, overall mean hard coral cover (32%) was typical for the region (Table 3).

Table 3. A comparison of coral diversity in the Solomons and other Indo-West Pacific reef areas. . **SOL –** Solomon Islands; **MB** - Milne Bay, Papua New Guinea; **EKB** - East Kimbe Bay, Bismarck Sea; **GBR** - N Great Barrier Reef, Australia; **RA** - Rajah Ampat area, Papua; **BI** - Banda Isl., Banda Sea, Maluku; **W** - Wakatobi area, S. Sulawesi; **BNP** - Bunaken National Park; **ST** - Sangihe-Talaud Isl.; **DER** – Derewan, East Kalimantan. GBR - Turak, 2001 unpublished data. * Is an estimate based on a combination of values for two depths per site, ** Incorporates data of two observers. Total number of species data is field records only, except for Milne Bay which incorporates incomplete lab and museum based identification.

	This study	Turak and Fenner, 2002	Turak & Aitsi, 2003	Turak, 2001	Turak & Souhoka, 2003	Turak et al. 2002	Turak, 2003	Turak & DeVantier 2003**	Turak, 2002	Turak, 2004
	SOL	MB	EKB	GBR	RA	BI	W	BNP	ST	DER
Total number of species	485	393	351	318	487	301	387	380	445	444
Average no. of species per site	135	147	124	100*	131	106	124	155	100	164
% of sites with over 1/3 rd species	12	82	74		18	61	41	85	8	78
Number of locations surveyed	59	28	27	26	51	18	27	20	52	36
Area covered (x1000 km^2)	120	15	1.1	0.8	30	0.4	10	0.9	23	20
Average % hard coral cover	32	33.3	30	34.8	33	40.3	32	41	21.3	36

Soft Corals and Other Benthic Biota

Overall soft coral diversity was high. Around half (46) of the known 90 genera of alcyonacea were recorded. However with the exception of a few reef flat areas, abundance and occurrence was low. In the shallows *Sarcophyton* and *Sinularia* were the most common, whereas on the deeper slopes gorgonian fan corals were more common. The other octocoral with a hard skeleton, the organ pipe coral *Tubipora musica* was one of the more common non-scleractinian hard corals (Table 4).

Of the azooxanthellate scleractinia, *Tubastrea* was uncommonly rare and the non-scleractinian firecoral *Millepora* was found at only 2/3rd of the sites and was never very abundant. The blue coral *Heliopora* was rarely encountered.

Sponges were present at all sites and often in considerable abundance. Mostly rope, tube, encrusting and foliose forms were present. However the large barrel sponge *Xestospongia*, was less common than other parts visited in PNG and Indonesia.

Giant clams of the family Tridacnidae were relatively rare, especially the largest *Tridacna gigas* was seen only at 5 sites. The most common clams were *T. maxima* and *T. squamosa*. The crown of thorns starfish was seen at 12 sites though many more sites showed evidence of their presence. Holothurians were rarely seen, averaging 1-2 animals per site. On none of the sites was macro-algae abundant and seagrasses were rarely seen.

Table 4. Non-scleractinian and azooxanthellate scleractinian hard corals, and soft corals recorded in 113 sites on reefs in the Solomon Islands. Y: present but number of sites not confirmed.

Hard Corals		**Sites**	**Soft Corals (cont.)**	**Sites**	**Others (cont.)**		**Sites**
Dendrophylliidae			Xeniidae		Zoanthidae		
Tubastrea	*micrantha*	10	*Anthelia*	1	*Palythoa*		58
Tubastrea	*coccinae*	8	*Cespitularia*	5	*Protopalythoa*		19
Tubastrea	*folkneri*	3	*Heteroxenia*	3	*Zoanthus*		1
			Sensibia	3	Coralimorpharian		23
Milleporidae			*Sympodium*	2	Anemon		29
Millepora	*dichotoma*	34	*Xenia*	20	Plumulariidae		
Millepora	*exesa*	61	Briareidae		*Aglophenia*		1
Millepora	*intricata*	20	*Briareum*	30			
Millepora	*platyphylla*	1	Anthothelidae		Sponge (other)		63
Millepora	*tenella*	16	*Alertigorgia*	3	*Cliona*		24
			Iciligorgia		*Carterospongia*		36
Stylastridae			*Solenocaulon*	Y	*Siphonochalina*		1
Distichopora		17	Supergorgiidae		*Xestospongia*		25
			Annella	Y	encrusting		26
Helioporidae			*Supergorgia*	Y	foliose		25
Heliopora	*coerolea*	13	Melithaeidae				
			Melithaea	21	Ascidian		
Tubiporidae			Acanthogorgiidae		*Lissoclinum*		10
Tubipora	*musica*	43	*Acanthogorgia*	Y	*Diademnum*		28
			Muricella	Y	*Polycarpa*		55
Soft Corals			Plexauridae		Tridacnidae		
Alcyonacea			*Astrogorgia*	Y	*Tridacna*	*crocea*	22
Clavulariidae			*Echinogorgia*		*Tridacna*	*gigas*	5
Clavularia		46	*Euplexaura*	Y	*Tridacna*	*squamosa*	25
Alcyoniidae			*Menella*	2	*Tridacna*	*maxima*	33
Cladiella		2	*Paracis*	Y	*Tridacna*	*derasa*	6
Dampia		7	*Paraplexaura*		*Hipopus*	*hipopus*	6
Klyxum		9	*Villogorgia*	Y	*Trochus*		4
Lobophytum		44	Gorgoniidae		*Linckia*		28
Sarcophyton		92	*Rumphella*	27	*Diadema*		4
Sinularia		89	Ellisellidae		*Culcita*		31
Sinularia	*brascica*	17	*Elisella*	15	*Acanthaster*	*planci*	12
Sinularia	*lamellata*	6	*Junceella*	13	Foraminifera		17
Sinularia	tree	10	Isididae		*Sargassum*		1
Nephtheidae			*Isis*	6	*Padina*		7
Capnella		20	Other gorgonians	26	*Halimeda*		76
Dendronephthya		33	Pennatulacea		*Caulerpa*	*serrulata*	10
Lemnalia		17	Virgulariidae		*Caulerpa*	*racemosa*	27
Litophyton		2	*Virgularia*	Y	*Chlorodesmis*		10
Nephthea		34			*Dictyota*		12
Paralemnalia		56	**Others**		*Turbinaria*	*ornata*	7
Scleronephthya		24	Antipathidae		*Halymenia*	*floressi*	9
Stereonepthya		1	*Antipathes*	14	CRA		85
Nidaliidae			*Cirrhipathes*	12	*Peyssonnelia*		33
Chironephthya		3			*Halophila*	*ovalis*	3
Nephthyigorgia		2			*Halophila*	*dicipens*	1
Siphonogorgia		3			*Enhalus*		4

CORAL COMMUNITIES

A cluster analysis of the hard coral species abundance data identified seven community types in 3 – 4 subgroups of the main groups (Figure 3). The two main groups were shallow (two community types) and mixed depth communities. Within the mixed depth group, two subgroups were identified, with one having two deep community types and the other of mixed depth community types. Another, fifth community type of mixed depth was also noted.

Within each subgrouping the two community types had in general similar characteristics (Figure 4), making sometimes difficult to distinguish between them clearly. Probably the main reason clustering was not so tight (either along depth, geographic or habitat gradient), is because survey sites were extremely spread out over a large area and sufficient numbers of sites were not surveyed in the main distinct habitats types. However despite this some depth and geography related patterns are apparent (Figure 5).

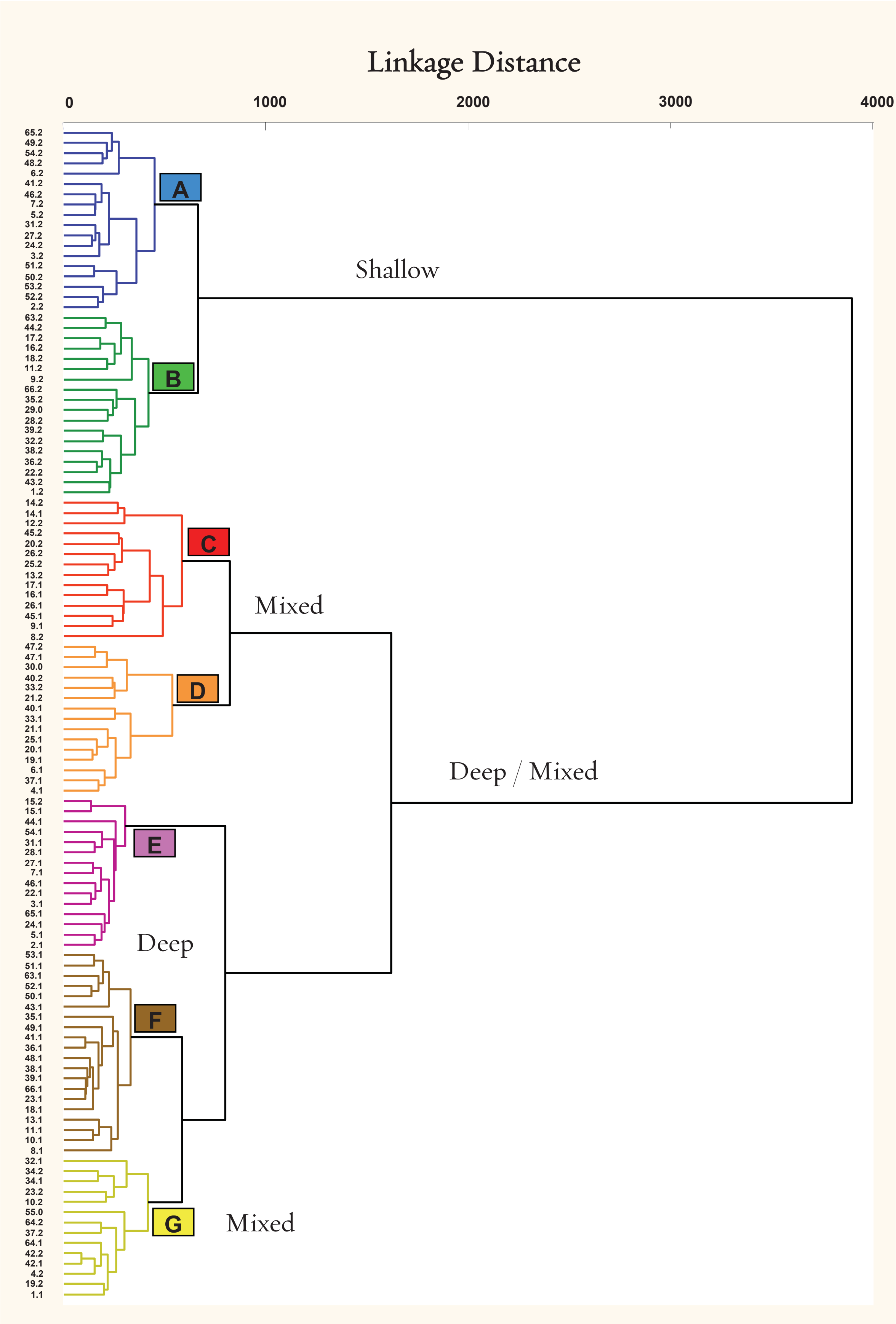


Figure 3. Hierarchical cluster analysis of 113 sites in 59 locations showing the 2 main groups of shallow and deep / mixed, and two shallow, three deep and 2 mixed community types.

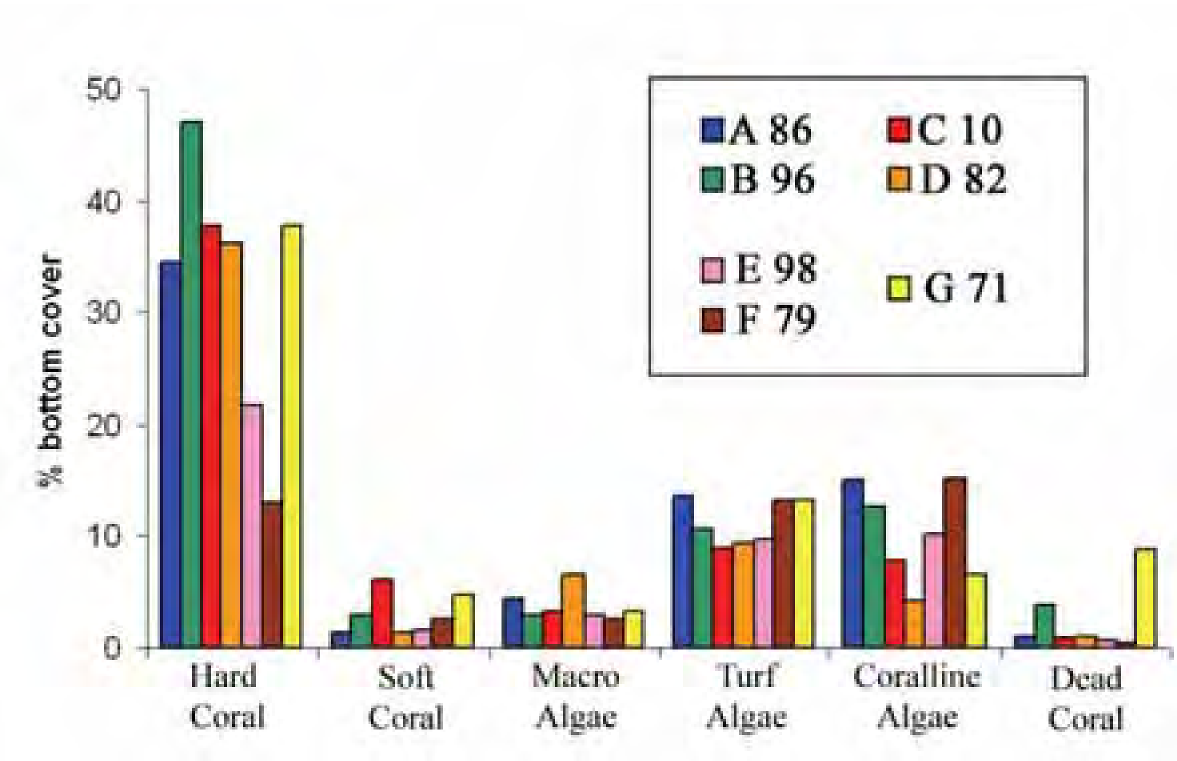


Figure 4. Summary of bottom cover estimates of major biotic groups found in seven community types. Numbers next to community types in legend are average hard coral species counts. Colour coding corresponds to Figures 3 and 4, and Tables 5 and 6.

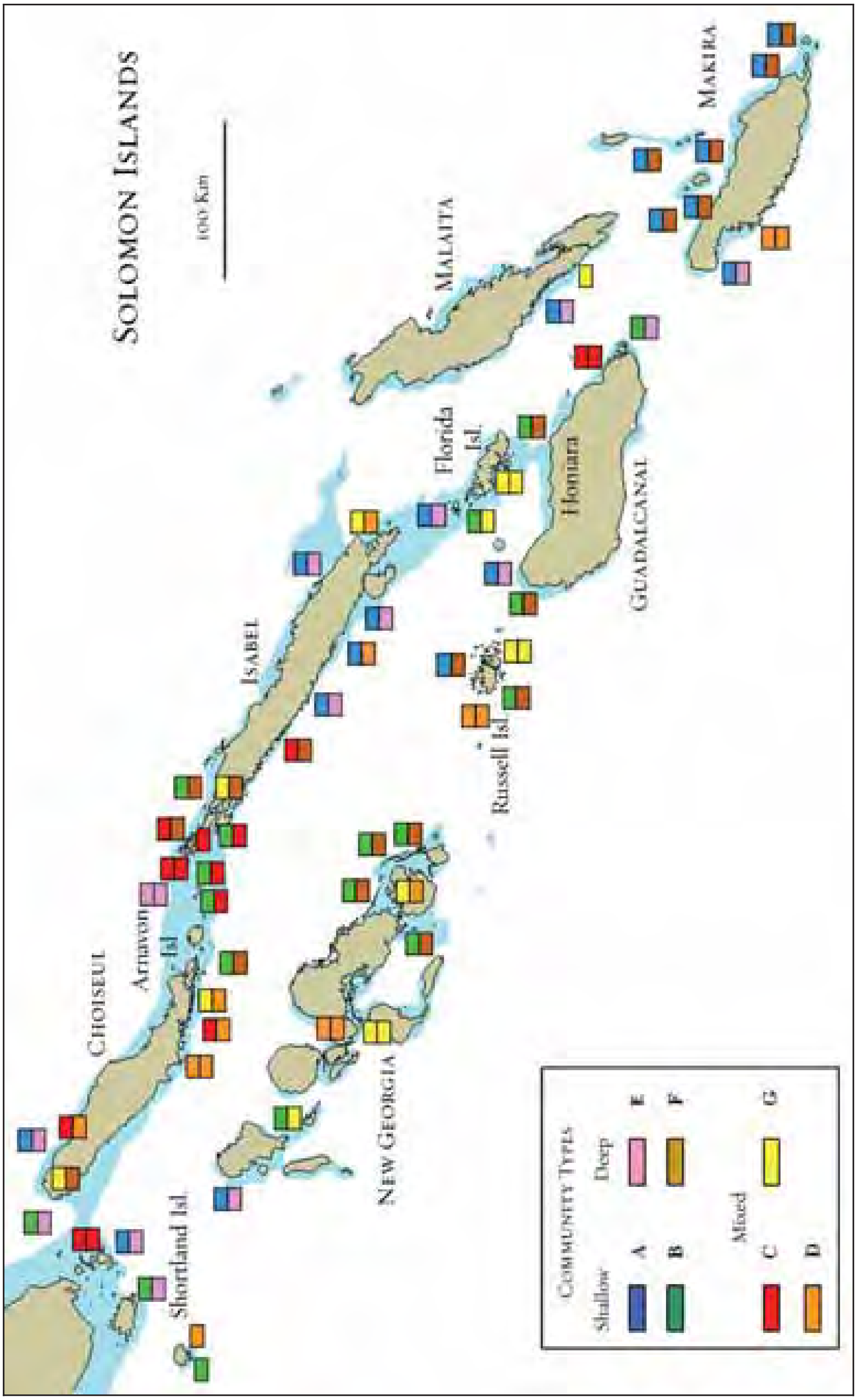


Figure 5. Map of Solomon Islands survey sites and community types. For colour coding of community types refer to Figure 4, and Tables 5 and 6.

Type A – *Acropora,* Pocilloporid, Massive Favids and *Millepora* Exposed Shallow Water Community.

This community was found on shallow reef flats exposed to strong wave action. Slope was minimum and consolidated substrate was the highest (Table 5). There was highest hard substrate (94%) and turf algae (14%) cover and exposure rating. On the other hand, soft coral cover (1%) and unconsolidated substrate cover was the lowest (6%). *Acropora,* pocilloporids, favids and *Millepora* were the most common hard corals, and *Sinularia* was the most common soft coral (Appendix 4, I and II, Table 6). Encrusting coralline red algae were common and cover was among the highest of all community types. This shallow water community was usually associated with deep community types E and F (Figure 5). With type E it was usually found between Guadalcanal and south half of Isabel, and far western Solomons. With type F, was usually found at the far Southeast of Solomons, in the east and north of Makira on reefs exposed to open Pacific Ocean waters and swells.

Table 5. Site habitat and physical characteristics of seven community types identified in the cluster analysis in Figure 3.

	Shallow		Deep / mixed				
			Mixed		Deep		Mixed
Community type	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Number of sites	18	18	14	15	15	20	14
Site							
Max. depth (m)	8	9	17	19	33	36	18
Min. depth (m)	2	1	5	7	9	10	4
Slope (degrees)	11	12	13	31	24	44	21
Hard Substratum (%)	94	88	79	79	82	64	81
Benthos							
Hard coral (%)	34	47	38	36	22	13	38
Soft Coral (%)	1	3	6	1	2	3	5
Macro-algae (%)	4	3	3	7	3	3	3
Turf-algae (%)	14	11	9	9	10	13	13
Coralline algae (%)	15	13	8	4	10	15	7
Dead coral (%)	1	4	1	1	1	1	9
Substratum							
Continuous pavement (%)	84	74	52	48	66	40	64
Large blocks (%)	6	8	16	22	7	14	9
Small blocks (%)	3	6	10	9	9	11	9
Rubble (%)	3	8	6	6	10	21	10
Sand (%)	3	3	15	15	7	16	9
Visibility (m)	17	17	28.9	5	22	19	12
Water temperature	3.3	2.7	2	1.3	2.1	1.5	1.9
Reef development (1-4)	3.7	3.7	3	3.2	3.9	3.5	3.4
Average no. of species	86	96	108	82	98	79	71

<u>Type B – Table *Acropora,* Massive Favid, *Millepora* and Alcyonacea Shallow Water Communities.</u>

This community type was typical of shallow reef flats with an exposure rating somewhat less than type A, minimal slope and highest hard coral (and dead coral) cover (Table 5). Coral species richness was high and unconsolidated substrate cover low. Table and digitate *Acropora,* massive favids and pocilloporids were the most common corals (Appendix 4, III). Also *Millepora*, alcyonacean soft corals, macro-algae *Halimeda* and crustose red algae were common (Table 6). Some sites with this type showed damage to table corals in the shallows from crown of thorns starfish (COTS) infestations (Appendix 4, IV). This community was usually associated with deep community type F (Figure 5), but also to some extent with mixed community C and deep community E. This community associated with type F was mostly found around Morova Lagoon and around north Guadalcanal. Associated with type C, it was found only around Arnavon and Northwest Isabel (Figure 5).

<u>Type C – Mixed Merulinid, Fungid, and Sponge and Alcynoacean Communities with Very High Species Richness.</u>

This community type found sheltered and semi sheltered reefs in waters of moderate clarity. Hard coral species richness was the highest, as well as soft coral cover (Table 5). Mixed species assemblages with merulinids and fungids were typical, with sponge and alcyonacean (Appendix 4, V) being also common (Table 6). When in deep this community was usually associated with type B, and when in shallow water, it was usually associated with the same, or F and D. It was mainly found around the northwest of Isabel and the Arnavon Islands (Figure 5).

<u>Type D – Mixed *Astreopora, Lobophyllia, Alcyonacea* and Sponge Sheltered Water Communities.</u>

This community was mostly found on the deeper reef slopes of highly protected bays and inlets with low underwater visibility. Reefs with this community type had lowest reef development value and highest macro-algae cover (Table 5). Hard coral assemblages were mixed (Appendix 4, VI) with *Astropora* and *Lobophyllia* being the most common genera. Alcyonacean soft corals and sponges were also common (Table 6). This community type in deep water was usually associated with the same, or type G and D in shallow water (Figure 5). It was mostly found in the western half of the Solomon Islands where higher number of very protected sites existed.

<u>Type E – Massive favid, pocilloporid, *Acropora* and alcyonacea clear deep water communities.</u>

This community was found on deep reef slopes with highest reef development and best underwater visibility (Table 5). Hard coral species richness was relatively high, though hard coral cover was low. Massive favids, pocilloporids and *Acropora* were the most common corals (Appendix 4, VII and VIII). Alcyonacean corals as well as sponges and *Millepora* were also common (Table 6). This deep community was predominantly associated with shallow community type A (Figure 5), but also to some extend with type B. It was mostly found around the southern half of Isabel, though some sites at the far west and east also had this community type.

<u>Type F – Agaricid, Massive Favid, Plating Pectinid and Gorgonian Communities on Steep Deep Reef Slopes.</u>

This community type was found on the steepest and deepest slopes mostly in open and clear water. Hard substrate as well as hard coral cover was the lowest and unconsolidated substrate cover was the highest (Table 5). Hard coral species diversity was also low. Agaricids (Appendix 4, X), massive favids and plating pectinids, particularly *Oxypora* (Appendix 4, IX) were the most common corals. In addition gorgonian fans, alcyonaceas and sponges were common (Table 6). This community was usually associated with shallow community types B and A, but also a few times with types C and G. Community F was wide spread throughout the Solomon Islands, but to a lesser extent in the west. In association with type A, it was found mostly around Makira and in association with B, it was found mostly around the central area, particularly Morova (Figure 5).

Table 6. Species attributes of the seven coral community types in the Solomon Islands, May-June 2004. The top ten hard coral species and top ten other benthic taxa recorded are listed. **sites:** number of sites where taxa was found, **abn:** accumulated abundance for all sites. Species showing relatively high fidelity to particular communities are **bolded.** CRA: Coralline Red Algae

A (18 sites)	sites	abn
Pocillopora verrucosa	18	40
Acropora digitifera	18	37
Hydnophora microconos	18	36
Leptoria phrygia	18	35
Acropora humilis	18	34
Platygyra verweyi	18	28
Acropora palifera	17	37
Pocillopora eydouxi	17	34
Galaxea fasicularis	17	34
Acropora robusta	17	33
CRA	16	47
Millepora exesa	14	28
Sinularia	14	22
Palythoa	13	22
Tridacna maxima	13	13
Sarcophyton	12	21
Halimeda	11	24
Lobophytum	11	18
Polycarpa	8	14
Distichopora	7	11

B (18 sites)	sites	abn
Acropora hyacinthus	18	38
Acropora millepora	18	36
Acropora gemmifera	18	34
Goniasatrea edwardsi	18	34
Porites massive	17	39
Stylophora pistillata	17	35
Pocillopora verrucosa	17	33
Fungia fungites	17	32
Hydnophora microconos	17	32
Platygyra ryukyuensis	17	31
Halimeda	14	34
Sinularia	14	28
Millepora exesa	14	27
CRA	13	37
Sarcophyton	13	26
Millepora dichotoma	12	20
Tridacna maxima	12	17
Nephthea	11	23
Palythoa	10	17
Diademnum	9	17

C (14 sites)	sites	abn
Goniasatrea pectinata	14	28
Hydnophora rigida	14	24
Ctenactis crassa	14	22
Porites massive	13	27
Merulina ampliata	13	25
Pocillopora damicornis	13	23
Lobophyllia hemprichii	13	21
Echinopora mammiformis	13	21
Fungia paumotensis	13	20
Herpolitha limax	13	20
Halimeda	13	27
Sponge	11	24
Sarcophyton	10	20
Sinularia	9	19
Lobophytum	9	16
Caulerpa racemosa	8	17
Millepora exesa	8	15
Carterospongia	7	16
CRA	7	16
Clavularia	7	14

D (15 sites)	sites	abn
Pachyseris speciosa	15	28
***Porites* massive**	14	34
Astreopora myriophthalma	14	28
Scolymia vitiensis	13	28
Pectinia alcicornis	13	25
Leptastrea transversa	13	25
Merulina ampliata	13	23
Lobophyllia hemprichii	13	22
Cyphastrea serailia	13	21
Physogyra lichtensteini	13	19
Sarcophyton	11	17
Sinularia	10	17
CRA	9	20
Sponge	9	18
Halimeda	9	16
Culcita	9	11
Peyssonnelia	7	18
Sinularia brascica	6	13
Xestospongia	6	7
Caulerpa racemosa	5	10

Table 6 (cont.). . Species attributes of the seven coral community types in the Solomon Islands, May-June 2004. The top ten hard coral species and top ten other benthic taxa recorded are listed. **sites:** number of sites where taxa was found, **abn:** accumulated abundance for all sites. Species showing relatively high fidelity to particular communities are **bolded.** CRA: Coralline Red Algae

E (15 sites)	**sites**	**abn**	**F** (20 sites)	**sites**	**abn**
Stylophora pistillata	15	30	***Pavona varians***	20	34
Pocillopora verrucosa	15	28	*Goniasatrea pectinata*	19	35
Platygyra daedelea	15	28	***Pachyseris speciosa***	19	31
Favia matthai	15	27	*Favites russelli*	19	25
Fungia paumotensis	15	22	*Porites* massive	18	34
Porites vaughani	14	28	*Merulina ampliata*	18	26
Goniasatrea pectinata	14	25	*Porites vaughani*	17	32
Acropora palifera	14	24	*Cyphastrea microphthalma*	17	28
Montastrea curta	14	24	*Oxypora lacera*	17	24
Acropora divaricata	14	23	*Physogyra lichtensteini*	17	20
Sarcophyton	15	27	***Sarcophyton***	19	31
Sinularia	14	26	CRA	18	47
Millepora exesa	13	25	**Sponge**	16	32
Paralemnalia	13	24	***Sinularia***	16	26
CRA	12	34	*Paralemnalia*	15	28
Halimeda	12	26	**Gorgonian**	13	28
Dendronephthya	12	18	*Peyssonnelia*	13	26
Polycarpa	10	19	*Clavularia*	13	25
Palythoa	10	15	*Tubipora musica*	12	21
Clavularia	9	18	*Halimeda*	10	22

G (14 sites)	**sites**	**abn**
Porites cylindrica	12	27
Diploastrea heliopora	12	17
Porites massive	11	29
Porites rus	11	20
Porites vaughani	11	20
Pavona varians	11	18
Herpolitha limax	11	14
Acropora millepora	10	19
Acropora formosa	10	18
Favia favus	10	16
Sarcophyton	12	22
Sinularia	11	21
Sponge	11	21
CRA	10	22
Palythoa	10	14
Polycarpa	9	15
Linckia	8	14
Paralemnalia	8	12
Sponge foliose	7	15
Millepora dichotoma	7	14

Type G – *Porites*, Massive Favid, Fungid, Agaricid, Alcyonacea and Sponge Communites of Mixed Depth and Low Species Richness.

Type G was a loosely defined community with a mixture of characteristics and coral assemblages, and was found in both shallow and deeper waters. Although generally found on reefs in very protected locations with low underwater visibility, a number of sites with this community type was found in relatively clearer waters. The common characteristic of sites with this community type is that they had the most significant amount of coral damage, mostly due to crown of thorns infestations. Overall hard coral species richness was the lowest and dead coral cover (Appendix 4, XI) the highest (Table 5). Most common corals were *Porites* (mostly massive and encrusting forms, but also some branching), massive favids, fungids and agaricids (Appendix 4, XII). In addition alcyonacean soft corals, sponges and *Millepora* were common (Table 6). This community was found usually in association with deep communities of the same type or types D and F (Figure 5).

REEF CONDITION

Overall reef health in the Solomons was good. Most reefs visited were not impacted by human activities, which are usually of concern in other areas of the region. The main cause of reef damage was from crown of thorns starfish (COTS) infestations. The coral eating snail *Drupella*, which when in full outbreak can cause serious damage to reefs, was seen at most locations. However numbers were always very low and damage very limited. In addition some evidence of damage following bleaching events in 2000-2001 was observed, as well as some minor current bleaching damage. Clear evidence of blast fishing damage was only seen at one site (Site 19.2). However at several other locations there was evidence of possible old damage from destructive fishing practices (SE Choisel, NE Guadalcanal, and Florida Islands, particularly at Nughu Island).

During surveys we generally avoided sampling reefs and areas that were potentially known to be impacted by sedimentation, in particular due to land based activities such as logging and clear felling for oil-palm plantation development. However at some locations terrigenous sediment on reefs was seen and some impact was observed. This was strongest in Morova lagoon especially at the near coast site (site 37).

Evidence of coral disease was occasionally seen though without widespread effect. However at one site (site 36), which is one of the popular tourist dive sites, significant mortality was seen with some diseased corals. Anecdotal information from locals indicated that a gradual spread of mortality was noted in the area over the last two years, which could possibly be the result of a coral pathogen.

With the few exceptions of COTS damage most mortality was old and therefore it was not possible to identify detailed taxonomic level impact. The few sites that showed moderate to high levels of damage were mostly COTS affected and involved limited number of taxa (Figure 6).

Coral Bleaching

Some damage from the Pacific bleaching events in 2000-2001, was reported for the Solomon Islands (Spalding et al., 2001, Wilkinson, 2002). It has been reported that damage was patchy, mostly on the western islands and that in some areas Acropora corals were particularly affected. The 2000-2001 bleaching event is known to have caused wide spread in some areas (Fiji) extensive damage to coral reefs in the south and west Pacific (Wilkinson, 2000 and 2002). However it appears that reefs closer to the equator, such as in PNG and the Solomons, were spared the worst. Although information from the Solomons about the bleaching event is limited, this survey confirmed that damage from the 2000-2001 bleaching was overall limited and patchy and less extensive in comparison to places like Fiji. It is possible that Malaita, in particular the east coast and northern tip suffered the most from the bleaching.

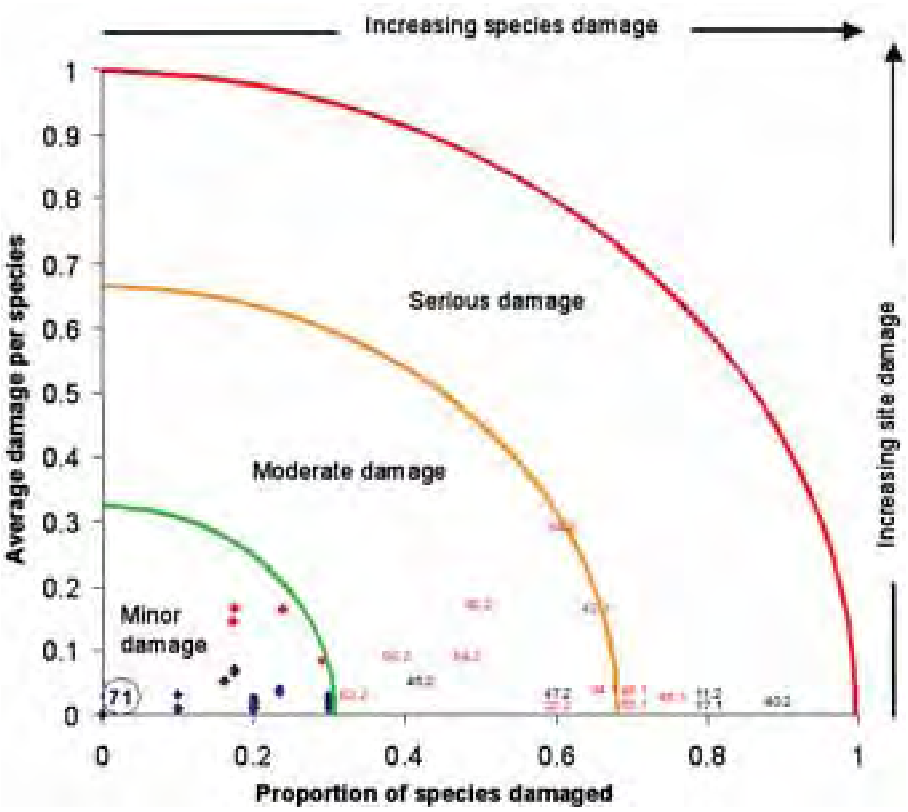


Figure 6. Scatterplot of the average injury per species versus proportion of injured species in each of 113 sites, Solomon Islands, May – June 2004. 71 sites (in circle, 62 % of total) recorded no damage. Sites with moderate or serious damage are numbered. Red lozenges and numbers are sites with COTS damage. Blue lozenges are non-specified other damage.

Crown of Thorns Starfish

There was evidence of above natural densities of COTS at most survey sites. On 1/3rd of the sites at least several COTS and related coral mortality was seen. At eight sites (sites: 23.2, 32.2, 34.1, 34.2, 53.2, 55, 63.2 and 66.2) over 40 COTS were counted during one dive and damage to corals was severe. Highest numbers of COTS and associated damage was seen at sites on reefs where other stresses were present. Such as near human habitation, pollution (rubbish), high sediment levels, dive sites. Although at this stage there is not a severe widespread outbreak killing wide tracks of reef, the potential is there for this to happen. Current low levels are nevertheless causing significant mortality and stress to reefs, reducing their fattiness. One particular site (Site 66, Appendix 4, IV) on Mary Shoal in NW Guadalcanal, which would have been one of the most beautiful reef flat sites, was severely damaged by an active COTS outbreak. This site with one hundred percent cover of mainly diverse *Acropora* corals will most likely be totally dead in the coming months / year.

ARTIFICIAL REEF ISLANDS (SULUFOU) IN LAU'ALO PASSAGE

Human settlements on artificial islands built on shallow reef flat are relatively common on Malaita Island, particularly in Lau'ola Passage at the north. The main foundation material for these islands is reef rock, which is collected as dead or live coral blocks / colonies. Most collection is done on patch reefs where islands are built. There were many islands of various stages of building. While some were in the first stages of building, others appeared to be many decades and perhaps a 100 or more years old (Figure 7). They were very large and covered in vegetation, with some very large trees. These villages will often start with one hut built by one family and over the years as the family grows, can expand to large islands with many dozens of houses and other usual village construction and amenities, such as a church, cemetery, etc.

Figure 7. Taoliabu Village / Island, one of the many artificial reef islands called “Sulufou”, in Lau’ola Passage, north Malaita.

With the current level of information it was difficult to estimate the impact of the collection of reef material, particularly live coral colonies, might have on the health of reef communities and the integrity of reef structure. The Lau’ola Passage is an area of extensive and very shallow reef flats, well protected from potentially destructive oceanic swells. In general, reefs in this area appear to be healthy and flourishing, and most reef tops have possibly attained their maximum height relative to sea level. Therefore, as long as removal of reef material does not exceed accretion rate, the impact on reef health may be at the worst limited, if not somewhat positive (by stimulating new growth through the lowering of reef flat level). However, anecdotal information suggests that in the last 10-20 years there has been a significant increase in the rate of new reef island building and the expansion of the older ones, which may lead to problems in the future.

In other areas of Malaita, coral rock (collected both living and dead) is used extensively as building material, especially around the sea side of coastal constructions as foundation and protection walls. Such constructions were seen in at many coastal settlements around Malaita, particularly those found in lagoons and not on exposed coastland, like Langalanga lagoon and Auki town on the west side of Malaita.

Discussion

Reefs of the Solomon Islands were diverse with rich and relatively healthy communities. The most unusual reef communities were found in the many fjord like coastal formations typical of the southern coasts of Isabel and Choiseul Islands. Overall coral diversity was very high, which makes the Solomon Islands comparable to countries in the 'Coral Triangle'. The high species number for hard corals is partly due to the fact that the coral list was compiled by two workers working on the taxonomy jointly. This would have added about 10% additional species to the overall list. However the major reasons for this high diversity was primarily high habitat diversity and the large area of sampling. Most corals found in the central Indo-Pacific were also recorded in the Solomons. This includes around 120 species with range extensions from the central Indo-Pacific and PNG (*Coral Diversity*, this report).

Coral communities found in very sheltered inlets were of particular interest. These communities had high species richness with diverse assemblages, large stands and /or high abundance of some unusual or rare species (such as *Acropora multiacuta* at Site 14). However, despite the presence of some extensive monospecific stands, very large (old age) coral colonies were not very common. This may be an indication of the high turnover of the reef ecosystem in the Solomons. However adequate numbers of small coral recruits were seen at all sites, including those that were damaged. This would indicate good replenishment (good connectivity) and good recovery capacity, therefore good health.

Some of the targeted reef fisheries species were low in abundance or virtually absent. The main ones were; the giant clams, in particular the largest *Tridacna, gigas* (only 5 individuals were seen during the whole survey), *Trochus*, sea cucumbers, and the 'Green Snail' (*Fisheries Resources: Commercially Important Macroinvertebrates,* this report).

Conservation

There are a number of current and potential future threats to reef ecosystems in the Solomons. Most types of impacts seen on Solomon reefs, are the types that have and are causing serious damage to reefs elsewhere in the world, including in the central Indo-Pacific countries, such as Philippines, Indonesia, Malaysia, Thailand and to some extent PNG. However the reason reefs are in relatively better condition here is that the level of impact is much less as a result of lower population densities and relatively simpler life styles. But Solomons have one of the highest population growth rates (Spalding et al., 2001) in the region. So, pressure on reef resources will increase rapidly.

Destructive fishing methods, over harvesting of major target reef species, collection of live coral for lime production, clear felling for oil-palm plantations will all begin to have a serious negative impact on the reef ecosystems of the Solomons in the future. A rough estimate four years ago gives a potential total of live *Acropora* collection for lime production (needed for betel nut chewing) at around 10 thousand tons per year (Spalding et al., 2001). With the current population growth rates this figure will be expected to grow significantly, perhaps making this practice one of the largest threats to reefs of the Solomon Islands. The same concern applies to the usage of reef rock for construction material. Currently we do not have sufficient information to make estimates of possible loads and significance to the reef habitat and structure. It is important to carry out research in this area to measure the significance of the potential impact and what future projections may be.

From an ecological and biodiversity perspective, the fjord like coastline on the south coast of Isabel and Choiseul, and the islands of the Shortlands group are of great interest and worth high consideration for conservation. In addition, the Russell Islands were of interest to a second degree.

An area of particular interest is the northeast tip of Malaita Island. More precisely, Lau'alo Passage and Maana'oba Island, Northeast Malaita. I was not able to dive in this area, but visited the passage and island, particularly the artificial reef island villages. These structures reflect a unique culture in Malaita, and the habitants livelihood is strongly linked with the reef and its resources. I suspect the passage to the harbour supports unique coral community types. This was also an area of extremely large seagrass beds, perhaps the largest in the Solomons (*Seagrasses,* this report). I recommend that in the future comprehensive studies be carried out on the reefs and their 'occupants' of Lau'alo Passage and Maana'oba Island, as this area may prove to be one of the special spots in the Solomons.

We did not visit the far off islands and atolls of the Solomons: Ontong Java atoll, Rennel Island, Indispensable reefs and Santa Cruz Islands. These areas are geologically, oceanographically and climatologically different from the rest of the Solomons, and are therefore expected to support different coral communities. The biodiversity of the Solomon Islands will not be complete without surveys of these areas.

References

Allen, G.R., and R. Steene. 1994. *Indo-Pacific Coral Reef Field Guide*. Tropical Reef Research 378pp.

Brodie, J and E. Turak. 2004. Land use practices in the Stettin Bay catchment area and their relation to the status of the coral reefs in the Bay. Australian Canter for Tropical Freshwater Research Report No. 04/01.

Colin, P.and C. Arneson. 1995. *Tropical Pacific Invertebrates.* Coral Reef Press, California, USA, 296pp.

DeVantier, L.M., G. De'Ath, T.J. Done, and E. Turak. 1998. *Ecological Assessment of a complex natural system: A case study from the Great Barrier Reef.* Ecological Applications **8**: 480-496.

DeVantier, L.M., Turak, E., Al-Shaikh, K.A. and G. De'Ath. 2000. Coral communities of the central-northern Saudi Arabian Red Sea. *Fauna of Arabia* **18**: 23-66.

Done, T. J. 1982. Patterns in the distribution of coral communities across the central Great Barrier Reef. Coral Reefs **1**: 95-107.

Fabricius, K. and P. Alderslade. 2000. Soft Corals and Sea Fans A comprehensive guide to the tropical shallow-water genera of the Central-West Pacific, the Indian Ocean and the Red Sea. Australian Institute of Marine Science, Townsville, Australia, 264pp.

Goslinger, T.M., Behrens, D.W. and G.C. Williams. 1996. *Coral Reef Animals of the Indo-Pacific.* Sea Challengers publ., Monteray, California, 314pp.

Hoeksema, B.W. 1989. Taxonomy, phylogeny and biogeography of mushroom corals (Scleractinia: Fungiidae). Zoologische Verhandelingen **254**, 295pp.

Hopley, D. 1982. The Geomorphology of the Great Barrier Reef: Quaternary Development of Coral Reefs. John Wiley-InterScience, New York, 453p.

Spalding, M.D., Ravilious, C. & Green, E.P. 2001. *World Atlas of Coral Reefs.* Prepared at the UNEP World Conservation Monitoring Centre. University of California Press, Berkeley, USA.

Turak, E. and Fenner, D. 2002. *Hard Corals of Milne Bay Province, Papua New Guinea.* In, RAP working papers, Conservation International, Washington, DC.

Turak, E. 2002. *Assessment of coral biodiversity and coral reef health of the Snagihe-Talaud Islands, North Sulawesi, Indonesia, 2002*. Final Report to The Nature Conservancy.

Turak, E. 2003. Coral Reef Surveys During TNC SEACMPA RAP of Wakatobi National Park, Southeast Sulawesi, Indonesia, May 2003. Final Report to The Nature Conservancy.

Turak, E. and Aitsi, J. 2003. *Assessment of coral biodiversity and status of coral reefs of East Kimbe Bay, New Britain, Papua New Guinea, 2002*. Final Report to The Nature Conservancy.

Turak, E. and L.M. DeVantier. 2003. *Corals and coral communities of Bunaken National Park and nearby reefs, North Sulawesi*, Indonesia: Rapid ecological assessment of biodiversity and status. Final Report to the International Ocean Institute Regional centre for Australia and western Pacific.

Turak, E. and J. Shouhoka. 2003. *Coral diversity and status of the coral reefs in the Raja Ampat islands, Papua province, Indonesia, November 2002.* Final Report to The Nature Conservancy.

Turak, E., Wakeford, M. and Done, T.J. 2003. *Banda Islands rapid ecological assessment, May 2002: Assessment of coral biodiversity and coral reef health*. In, Mous PJ (ed), Report on a rapid ecological assessment of the Banda Islands, Maluku, Eastern Indonesia, held April 28 – May *5 2002,* TNC and UNESCO publication, 150pp.

Turak, E. and L.M DeVantier. 2003. *Capacity Building in coral biodiversity surveys and coral identification.* Final Report to the International Ocean Institute (Australia).

Veron, J.E.N. 1986. *Corals of Australia and the Indo-Pacific*. Sydney and London: Angus and Robertson, Australia, 644pp.

Veron, J.E.N. 2000. *Corals of the World*. 3 Vols. Australian Institute of Marine Science.

Veron, J.E.N. and M. Pichon. 1976. Scleractinia of Eastern Australia. Part I. Families Thamnasteriidae, Astrocoeniidae, Pocilloporidae. Australian Institute of Marine Science Monograph Series 1, 86pp.

Veron, J.E.N. and M. Pichon. 1980. Scleractinia of Eastern Australia. Part III. Families Agaraciidae, Siderastreidae, Fungiidae, Oculinidae, Merulinidae, Mussidae, Pectiniidae, Caryophylliidae, Dendrophylliidae. Australian Institute of Marine Science Monograph Series IV, 471pp.

Veron, J.E.N. and M. Pichon. 1982. *Scleractinia of Eastern Australia. Part IV. Family Poritidae*. Australian Institute of Marine Science Monograph Series V, 210pp.

Veron, J.E.N. and C.C. Wallace. 1984. *Scleractinia of Eastern Australia. Part V Family Acroporidae.* Australian Institute of Marine Science Monograph Series VI, 483pp.

Veron, J.E.N., Pichon, M., and M. Wijsman-Best. 1977. *Scleractinia of Eastern Australia. Part II. Families Faviidae, Trachyphyllidae.* Australian Institute of Marine Science Monograph Series III, 233.

Veron, J.E.N. and Stafford-Smith, M 2002. *Coral ID An electronic key to the zooxanthellate scleractinian corals of the World* Australian Institute of Marine Science.

Wallace, C.C. 1999. *Staghorn Corals of the World.* CSIRO publ., Australia, 421pp.

Wallace, C.C. 1999. Staghorn Corals of the World An electronic key to the genus Acropora. Museum of Tropical Queensland.

Wilkinson, C. 2000. *Status of Coral Reefs of the World: 2000*. Australian Institute of Marine Science. Australia. 364 pp.

Wilkinson, C. 2002. *Status of Coral Reefs of the World: 2002*. Australian Institute of Marine Science. Australia. 378 pp.

Appendix 1. Details of sites surveyed in the Solomon Islands, May-June 2004. GPS locations using WGS 84 datum. Site #.1 - deep. Site #.2- shallow.

Location	Site Name	Site Number	Maximum	Minimum	Slope	Hard substrate	Hard coral	Soft coral	Macro algae	Turf algae	Coralline algae	Dead coral	Continuous pavement	Large blocks	Small blocks	Rubble	Sand	Exposure	Reef develop.	Aspect	Visibility	Water temp.	Distance (m)	Latitude	Longitude	**TOTAL SPECIES**
Florida Islands	Sandfly FL	**1.1**	30	10	30	70	20	2	5	10	10	5	40	20	10	15	15	2	4	N	10	30	100	9°2.138	160°6.323	**77**
Florida Islands	Sandfly FL	**1.2**	8	1	10	90	40	2	10	10	20	20	70	10	10	5	5	2	4	N	10	30	150	9°2.138	160°6.323	**92**
Florida Islands	Kombuana	**2.1**	30	10	20	90	20	1	1	5	10	2	80	0	10	10	0	2	4	N	25	30	100	8°50.58	160°2.027	**102**
Florida Islands	Kombuana	**2.2**	8	2	5	95	30	2	1	10	10	2	95	0	0	0	5	3	4	N	20	30	150	8°50.58	160°2.027	**64**
Isabel	Buala	**3.1**	30	10	20	60	20	1	3	10	5	1	30	10	20	20	20	3	4	N	8	29	100	8°8.732	159°38.085	**96**
Isabel	Buala	**3.2**	10	3	5	95	70	2	5	10	10	5	95	0	0	5	0	4	4	N	8	29	150	8°8.732	159°38.085	**55**
Isabel	Tatamba	**4.1**	27	10	40	90	10	1	40	10	10	2	70	20	0	5	5	1	4	S	3	29	50	8°25	159°47	**60**
Isabel	Tatamba	**4.2**	8	1	10	100	70	1	20	5	5	2	100	0	0	0	0	2	4	S	5	29	50	8°25	159°47	**48**
Isabel	Tanabafe	**5.1**	38	10	30	70	20	1	1	5	10	0	30	20	20	30	0	2	4	S	18	29	100	8°21.101	159°26.461	**94**
Isabel	Tanabafe	**5.2**	8	3	5	100	30	1	1	10	10	0	100	0	0	0	0	4	4	S	15	29	100	8°21.101	159°26.461	**75**
Isabel	Popongori	**6.1**	26	10	40	80	30	2	1	5	5	2	40	25	5	15	5	1	4	SW	3	29	50	8°12.306	159°13.835	**82**
Isabel	Popongori	**6.2**	8	1	5	100	70	1	3	10	5	1	100	0	0	0	0	3	4	SW	4	29	100	8°12.306	159°13.835	**114**
Isabel	Sarao	**7.1**	43	10	30	90	20	1	0	5	10	0	80	5	5	10	0	2	4	S	15	29	100	8°0.37	158°54.758	**83**
Isabel	Sarao	**7.2**	8	2	5	100	20	1	0	10	10	0	100	0	0	0	0	4	4	S	15	29	150	8°0.37	158°54.758	**76**
Isabel	Palunuhukura	**8.1**	26	10	40	80	30	2	1	10	5	1	30	40	10	0	20	1	4	SW	8	29	50	7°50.789	158°43.319	**71**
Isabel	Palunuhukura	**8.2**	10	2	20	90	50	1	2	10	10	2	30	50	10	10	0	2	4	SW	5	29	150	7°50.789	158°43.319	**141**
Isabel	Isabel	**9.1**	19	10	10	70	30	5	2	10	10	0	30	20	20	5	25	2	4	SW	4	29	100	7°33.762	158°19.048	**112**
Isabel	Isabel	**9.2**	8	1	5	90	60	5	2	10	10	0	80	5	5	10	0	2	4	SW	6	29	100	7°33.762	158°19.048	**101**
Isabel	Kia	**10.1**	17	10	30	60	20	2	2	10	10	2	30	20	10	20	20	1	3	E	6	29	100	7°33.401	158°25.546	**80**
Isabel	Kia	**10.2**	8	1	5	70	30	2	3	5	5	2	60	5	5	20	10	2	3	E	7	29	100	7°33.401	158°25.546	**72**
Isabel	Barora Fa	**11.1**	17	10	30	80	10	5	2	10	10	0	50	30	10	5	15	2	3	N	4	29	100	7°29.931	158°23.756	**89**
Isabel	Barora Fa	**11.2**	8	2	5	90	30	5	5	10	10	2	80	0	10	10	0	3	3	N	6	29	100	7°29.931	158°23.756	**98**
Isabel	Ghaghe	**12.2**	11	1	20	70	20	5	10	10	5	0	30	20	20	5	25	1	3	S	5	29	150	7°25.078	158°12.658	**129**
Isabel	Pt Praslin	**13.1**	37	10	30	95	10	1	1	5	15	0	30	50	15	0	5	1	3	SW	8	29	100	7°23.734	158°14.458	**73**
Isabel	Pt Praslin	**13.2**	8	1	5	100	20	20	2	5	5	0	100	0	0	0	0	2	3	SW	7	29	100	7°23.734	158°14.458	**97**
Isabel	Malaghara	**14.1**	17	8	5	30	30	1	2	5	5	0	20	0	10	10	60	1	2	NW	8	29	200	7°23.627	158°7.915	**70**
Isabel	Malaghara	**14.2**	8	2	5	80	60	1	2	5	5	0	70	5	5	10	10	2	2	NW	7	29	200	7°23.627	158°7.915	**94**
Isabel	Malakobi	**15.1**	23	10	30	100	20	1	2	10	10	0	90	5	5	0	0	2	4	W	25	29	100	7°21.289	158°3.266	**86**

Location	Site Name	Site Number	Maximum	Minimum	Slope	Hard substrate	Hard coral	Soft coral	Macro algae	Turf algae	Coralline algae	Dead coral	Continuous pavement	Large blocks	Small blocks	Rubble	Sand	Exposure	Reef develop.	Aspect	Visibility	Water temp.	Distance (m)	Latitude	Longitude	**TOTAL SPECIES**
Isabel	Malakobi	**15.2**	8	2	5	100	20	1	1	10	10	0	100	0	0	0	0	3	4	W	25	29	100	7°21.289	158°3.266	**93**
Arnavon Islands	Kerehikapa 1	**16.1**	26	10	20	80	30	1	5	10	10	1	50	20	10	5	15	1	4	SW	25	29	100	7°27.656	158°2.594	**95**
Arnavon Islands	Kerehikapa 2	**16.2**	8	1	10	90	40	1	5	10	10	1	80	5	5	10	0	2	4	SW	25	29	100	7°27.656	158°2.594	**78**
Arnavon Islands	Kerehikapa 2	**17.1**	29	10	20	60	20	40	10	10	10	0	30	25	5	5	35	2	4	W	25	29	100	7°28.48	158°2.874	**101**
Arnavon Islands	Kerehikapa 3	**17.2**	8	1	10	80	60	1	10	10	10	2	60	10	10	20	0	3	4	W	25	29	100	7°28.48	158°2.874	**85**
Choiseul	Raverave	**18.1**	22	10	30	70	20	5	2	10	10	0	40	20	10	0	30	2	4	N	12	29	100	7°32.432	157°47.386	**71**
Choiseul	Raverave	**18.2**	8	1	5	90	60	10	5	10	10	0	50	30	10	5	5	3	4	N	12	29	100	7°32.432	157°47.386	**87**
Choiseul	Vealaviru	**19.1**	20	10	70	90	20	1	2	10	5	3	50	35	5	5	5	1	3	W	1	29	100	7°25.548	157°32.295	**74**
Choiseul	Vealaviru	**19.2**	8	2	5	90	50	1	1	10	5	5	70	15	5	10	0	2	3	W	5	29	100	7°25.548	157°32.295	**89**
Choiseul	Ndolola	**20.1**	26	10	60	80	10	2	1	10	5	1	40	35	5	5	15	1	3	E	5	29	100	7°24.862	157°25.041	**83**
Choiseul	Ndolola	**20.2**	8	1	5	95	50	5	5	10	10	2	60	20	15	5	0	2	3	E	8	29	100	7°24.862	157°25.041	**108**
Choiseul	Poro	**21.1**	23	10	40	80	20	5	8	10	5	0	40	35	5	10	10	1	3	N	5	29	100	7°21.388	157°16.713	**99**
Choiseul	Poro	**21.2**	8	1	10	90	60	3	3	10	5	1	70	15	5	10	0	2	3	N	5	29	100	7°21.388	157°16.713	**86**
Choiseul	Emerald	**22.1**	32	10	20	90	10	1	2	10	10	0	70	10	10	10	0	2	4	N	30	29	100	6°41.556	156°23.454	**73**
Choiseul	Emerald	**22.2**	8	1	5	100	80	2	3	5	5	1	100	0	0	0	0	3	4	N	25	29	100	6°41.556	156°23.454	**91**
Choiseul	Taro	**23.1**	30	10	70	80	10	2	1	10	10	3	70	5	5	20	0	1	4	E	15	29	100	6°41.684	156°24.052	**63**
Choiseul	Taro	**23.2**	8	1	5	80	60	2	5	10	10	5	70	5	5	10	10	2	4	E	15	29	100	6°41.684	156°24.052	**74**
Choiseul	Chirovanga	**24.1**	42	10	30	90	20	1	2	10	20	0	90	0	0	10	0	2	4	N	25	29	100	6°36.924	156°33.985	**98**
Choiseul	Chirovanga	**24.2**	8	2	5	100	10	1	1	30	20	0	100	0	0	0	0	4	4	N	20	29	100	6°36.924	156°33.985	**58**
Choiseul	Vurango	**25.1**	19	10	40	80	30	1	0	10	5	1	40	30	10	0	20	1	4	S	2	29	100	6°38.298	156°34.617	**67**
Choiseul	Vurango	**25.2**	8	1	5	95	60	1	0	10	5	2	80	10	5	0	5	2	4	S	5	29	100	6°38.298	156°34.617	**100**
Shortland Islands	Haliuna	**26.1**	32	10	30	70	20	2	1	10	10	0	40	20	10	20	10	1	3	SW	5	29	100	6°55.266	156°6.263	**132**
Shortland Islands	Haliuna	**26.2**	8	1	5	95	70	2	1	10	5	0	80	10	5	5	0	2	3	SW	8	29	100	6°55.266	156°6.263	**116**
Shortland Islands	Rohae	**27.1**		10	30	70	20	1	0	10	10	0	70	0	0	30	0	2	4	E	35	29	100	7°0.568	156°4.118	**87**
Shortland Islands	Rohae	**27.2**	8	2	2	100	20	1	1	20	20	0	100	0	0	0	0	4	4	E	12	29	100	7°0.568	156°4.118	**88**
Shortland Islands	Tua	**28.1**	21	10	10	60	30	3	2	10	10	2	55	0	5	0	40	2	4	N	20	29	100	7°4.27	155°53.764	**102**
Shortland Islands	Tua	**28.2**	8	1	5	100	50	2	1	10	10	0	100	0	0	0	0	3	4	N	15	29	100	7°4.27	155°53.764	**102**

Location	Site Name	Site Number	Maximum	Minimum	Slope	Hard substrate	Hard coral	Soft coral	Macro algae	Turf algae	Coralline algae	Dead coral	Continuous pavement	Large blocks	Small blocks	Rubble	Sand	Exposure	Reef develop.	Aspect	Visibility	Water temp.	Distance (m)	Latitude	Longitude	**TOTAL SPECIES**
Shortland Islands	Stirling 1	**29**	26	1	40	90	20	2	1	10	10	0	70	15	5	10	0	2	4	N	30	29	100	7°24.474	155°32.625	**118**
Shortland Islands	Stirling 2	**30**	16	1	30	60	30	1	3	10	0	2	0	40	20	10	30	1	2	N	2	29	100	7°24.68	155°32.843	**67**
New Georgia	Vella Lavella	**31.1**	43	10	30	90	20	1	0	20	20	0	80	5	5	10	0	2	4	W	30	29	100	7°44.307	156°30.849	**112**
New Georgia	Vella Lavella	**31.2**	8	1	10	100	30	2	1	20	10	0	100	0	0	0	0	3	4	W	20	29	100	7°44.307	156°30.849	**74**
New Georgia	Njari	**32.1**	35	10	60	90	30	10	1	10	10	3	80	5	5	5	5	2	4	N	25	29	100	8°0.816	156°45.418	**118**
New Georgia	Njari	**32.2**	8	1	5	95	80	2	1	5	5	5	95	0	0	0	0	3	4	N	15	29	100	8°0.816	156°45.418	**97**
New Georgia	Nusazango	**33.1**	17	8	40	80	40	1	0	10	2	1	50	20	10	0	20	1	3	SW	3	29	100	8°18.893	157°13.365	**99**
New Georgia	Nusazango	**33.2**	8	1	5	90	70	0	0	10	0	2	70	15	5	5	5	2	3	SW	5	29	100	8°18.893	157°13.365	**86**
New Georgia	Roviana	**34.1**	35	10	20	80	30	30	0	10	5	5	60	10	10	15	5	2	3	NE	8	29	100	8°23.701	157°19.949	**73**
New Georgia	Roviana	**34.2**	8	1	5	95	5	1	0	60	10	70	95	0	0	5	0	3	3	NE	10	29	100	8°23.701	157°19.949	**44**
New Georgia	Penguin	**35.1**	45	10	90	100	10	1	0	10	20	0	100	0	0	0	0	2	3	W	30	29	100	8°38.711	157°48.207	**94**
New Georgia	Penguin	**35.2**	8	1	5	95	70	1	1	5	20	0	90	0	5	0	5	3	3	W	25	29	100	8°38.711	157°48.207	**101**
New Georgia	Uepi	**36.1**	43	10	80	100	5	10	1	20	20	2	100	0	0	0	0	2	3	N	20	29	100	8°25.557	157°57.128	**79**
New Georgia	Uepi	**36.2**	8	1	20	95	30	1	1	20	20	5	80	10	5	5	0	3	3	N	15	29	100	8°25.557	157°57.128	**72**
New Georgia	Vangunu	**37.1**	21	10	50	70	40	0	0	10	5	0	50	10	10	10	20	1	4	E	3	29	100	8°32.249	158°1.501	**85**
New Georgia	Vangunu	**37.2**	8	1	5	80	60	1	0	10	5	0	60	10	10	10	10	2	4	E	5	29	100	8°32.249	158°1.501	**82**
New Georgia	Minjanga	**38.1**	43	10	30	40	5	0	0	10	20	0	20	10	10	10	60	1	3	W	25	28	100	8°42.26	158°12.871	**66**
New Georgia	Minjanga	**38.2**	8	1	5	90	50	1	0	5	10	0	80	5	5	10	0	2	3	W	20	29	100	8°42.26	158°12.871	**98**
New Georgia	Mbili	**39.1**	30	10	90	80	5	2	0	20	20	0	65	5	10	10	10	1	3	NW	30	29	100	8°39.695	158°12.233	**56**
New Georgia	Mbili	**39.2**	8	1	60	80	40	2	0	10	20	3	70	5	5	15	5	2	3	NW	20	29	100	8°39.695	158°12.233	**108**
Russell Islands	Mbaisen	**40.1**	40	10	40	90	30	1	30	10	10	0	70	15	5	5	5	1	4	S	12	29	100	8°59.588	159°5.805	**102**

Location	Site Name	Site Number	Maximum	Minimum	Slope	Hard substrate	Hard coral	Soft coral	Macro algae	Turf algae	Coralline algae	Dead coral	Continuous pavement	Large blocks	Small blocks	Rubble	Sand	Exposure	Reef develop.	Aspect	Visibility	Water temp.	Distance (m)	Latitude	Longitude	**TOTAL SPECIES**
Russell Islands	Mbaisen	**40.2**	8	1	5	70	70	0	5	5	5	2	40	10	20	5	25	2	4	S	15	29	100	8°59.588	159°5.805	**78**
Russell Islands	Kovilok	**41.1**	40	10	90	100	5	5	0	20	30	0	100	0	0	0	0	2	2	NW	25	29	100	8°58.251	159°7.453	**74**
Russell Islands	Kovilok	**41.2**	8	1	70	100	10	2	0	10	40	0	100	0	0	0	0	3	2	NW	20	29	100	8°58.251	159°7.453	**83**
Russell Islands	Sunlight	**42.1**	41	10	30	70	5	2	0	20	10	5	40	10	20	30	0	1	3	N	30	28	100	9°7.248	159°9.409	**59**
Russell Islands	Sunlight	**42.2**	8	1	40	80	20	5	0	10	5	10	30	20	30	10	10	2	3	N	15	29	100	9°7.248	159°9.409	**38**
Russell Islands	Taina	**43.1**	44	10	30	60	20	1	0	10	20	0	20	20	20	35	5	2	4	N	30	29	100	9°8.003	159°8.188	**88**
Russell Islands	Taina	**43.2**	8	1	10	70	40	2	0	10	10	0	20	30	20	10	20	3	4	N	20	29	100	9°8.003	159°8.188	**86**
Guadalcanal	Cormorant	**44.1**	44	10	30	90	30	3	10	10	10	1	40	10	40	10	0	2	4	S	15	28	100	9°50.262	160°54.229	**134**
Guadalcanal	Cormorant	**44.2**	8	2	5	95	5	1	3	30	20	5	80	10	5	0	5	3	4	S	12	28	100	9°50.262	160°54.229	**112**
Guadalcanal	Marapa	**45.1**	40	10	30	90	30	1	3	10	10	0	70	10	10	5	5	1	4	W	8	28	100	9°48.883	160°51.806	**115**
Guadalcanal	Marapa	**45.2**	8	1	5	80	40	1	2	10	10	5	40	20	20	5	15	2	4	W	8	29	100	9°48.883	160°51.806	**108**
Makira	Anuta	**46.1**	37	10	30	60	5	1	20	10	5	2	40	10	10	5	35	2	4	W	10	29	100	10°21.109	161°21.499	**85**
Makira	Anuta	**46.2**	8	1	5	90	10	1	30	20	10	3	50	30	10	5	5	3	4	W	10	29	100	10°21.109	161°21.499	**74**
Makira	Makira	**47.1**	21	10	20	50	10	1	5	10	0	0	10	20	20	5	45	1	2	W	6	29	100	10°28.497	161°30.605	**75**
Makira	Makira	**47.2**	8	1	5	70	40	1	5	10	0	0	40	20	10	5	25	2	2	W	6	29	100	10°28.497	161°30.605	**47**
Makira	Star 1	**48.1**	40	10	30	40	10	1	20	20	0	0	10	10	20	5	55	2	4	E	12	28	100	10°46.976	162°16.325	**67**
Makira	Star 1	**48.2**	8	1.5	3	95	30	1	20	20	5	0	90	0	5	0	5	3	4	E	10	28	100	10°46.976	162°16.325	**104**
Makira	Star 2	**49.1**	30	10	30	30	10	1	2	20	0	0	0	10	20	5	65	1	3	E	10	28	100	10°48.905	162°16.619	**86**
Makira	Star 2	**49.2**	8	0.5	5	80	60	2	5	10	5	0	40	15	5	15	5	3	3	E	6	28	100	10°48.905	162°16.619	**102**
Makira	Malaupaina 1	**50.1**	46	10	30	60	30	1	2	20	30	0	50	0	10	40	0	2	4	S	35	28	100	10°14.846	161°57.282	**81**
Makira	Malaupaina 1	**50.2**	8	3	5	90	60	2	2	5	30	0	70	10	10	10	0	3	4	S	35	28	100	10°14.846	161°57.282	**93**
Makira	Malaupaina 2	**51.1**	42	10	30	60	10	1	3	20	20	0	20	20	20	40	0	2	4	N	20	29	100	10°16.295	161°58.227	**93**
Makira	Malaupaina 2	**51.2**	8	1	5	95	30	1	3	10	20	0	80	10	5	5	0	3	4	N	20	28	100	10°16.295	161°58.227	**119**
Makira	Bio	**52.1**	50	10	40	50	20	1	3	10	20	0	20	20	10	50	0	1	4	W	35	28	100	10°11.198	161°40.615	**108**
Makira	Bio	**52.2**	8	1	5	95	60	1	2	5	20	0	90	0	5	0	5	3	4	W	30	28	100	10°11.198	161°40.615	**89**
Makira	Ugi	**53.1**	43	10	20	30	10	5	0	10	5	2	0	10	20	70	0	1	4	NW	20	28	100	10°17.389	161°43.178	**85**
Makira	Ugi	**53.2**	8	1	5	90	30	2	0	5	20	5	70	15	5	5	5	3	4	NW	20	28	100	10°17.389	161°43.178	**90**
Malaita	Komusupa	**54.1**	44	10	30	90	40	5	1	10	10	1	80	5	5	5	5	2	4	NW	20	29	100	9°24.37	161°11.378	**109**

Location	Site Name	Site Number	Maximum	Minimum	Slope	Hard substrate	Hard coral	Soft coral	Macro algae	Turf algae	Coralline algae	Dead coral	Continuous pavement	Large blocks	Small blocks	Rubble	Sand	Exposure	Reef develop.	Aspect	Visibility	Water temp.	Distance (m)	Latitude	Longitude	**TOTAL SPECIES**
Malaita	Komusupa	**54.2**	8	1	40	95	20	1	1	20	20	3	90	0	5	0	5	3	4	NW	15	29	100	9°24.37	161°11.378	**105**
Malaita	Umu	**55**	17	0.5	20	40	20	2	1	10	2	5	10	10	20	5	55	1	2	NW	6	29	100	9°29.224	161°15.13	**84**
Florida Islands	Nughu	**63.1**	36	10	30	60	20	5	10	10	10	2	40	10	10	35	5	2	4	W	20	28	100	9°17.309	160°20.231	**104**
Florida Islands	Nughu	**63.2**	8	1	5	85	20	10	5	10	10	5	75	5	5	10	5	3	4	W	12	28	100	9°17.309	160°20.231	**105**
Florida Islands	Tulaghi	**64.1**	26	10	50	95	50	5	10	10	5	2	85	5	5	0	5	1	4	SW	12	29	100	9°5.864	160°11.534	**64**
Florida Islands	Tulaghi	**64.2**	8	0.5	10	100	80	2	2	5	5	5	90	5	5	0	0	2	4	SW	8	29	100	9°5.864	160°11.534	**74**
Guadalcanal	Savo	**65.1**	28	10	10	85	30	2	1	10	5	1	50	30	5	5	10	2	2	W	25	28	100	9°7.074	159°47.123	**119**
Guadalcanal	Savo	**65.2**	8	0.5	5	80	30	2	2	20	5	1	50	25	5	5	15	3	2	E	20	28	100	9°7.074	159°47.123	**83**
Guadalcanal	Tambea	**66.1**	36	10	30	5	2	1	2	10	30	0	0	0	5	75	20	1	4	SE	20	28	100	9°15.09	159°40.596	**49**
Guadalcanal	Tambea	**66.2**	8	2	2	60	70	5	0	10	20	20	50	5	5	30	10	3	4	SE	20	28	200	9°15.09	159°40.596	**88**

Appendix 2. Detailed species records and abundance data for all survey sites. *(Raw data, available in electronic format only)*

Appendix 3. List of zooxenthelate scleractinian coral species recorded during Solomon REA in May-June, 2004

Family Astrocoeniidae Koby, 1890
Genus *Stylocoeniella* Yabe and Sugiyama, 1935
Stylocoeniella armata (Ehrenberg, 1834)
Stylocoeniella guentheri Bassett-Smith, 1890
Genus *Palauastrea* Yabe and Sugiyama, 1941
Palauastrea ramosa Yabe and Sugiyama, 1941
Genus *Madracis* Milne Edwards and Haime, 1849
Madracis kirbyi Veron and Pichon, 1976

Family Pocilloporidae Gray, 1842
Genus *Pocillopora* Lamarck, 1816
Pocillopora ankeli Scheer and Pillai, 1974
Pocillopora damicornis (Linnaeus, 1758)
Pocillopora danae Verrill, 1864
Pocillopora elegans Dana, 1846
Pocillopora eydouxi Milne Edwards and Haime, 1860
Pocillopora kelleheri Veron, 2000
Pocillopora meandrina Dana, 1846
Pocillopora verrucosa (Ellis and Solander, 1786)
Pocillopora woodjonesi Vaughan, 1918

Genus *Seriatopora* Lamarck, 1816
Seriatopora aculeata Quelch, 1886
Seriatopora caliendrum Ehrenberg, 1834
Seriatopora dendritica Veron, 2000
Seriatopora hystrix Dana, 1846
Seriatopora stellata Quelch, 1886
Genus *Stylophora* Schweigger, 1819
Stylophora pistillata Esper, 1797
Stylophora subseriata (Ehrenberg, 1834)

Family Acroporidae Verrill, 1902
Genus *Montipora* Blainville, 1830
Montipora aequituberculata Bernard, 1897
Montipora altasepta Nemenzo, 1967
Montipora calcarea Bernard, 1897
Montipora caliculata (Dana, 1846)
Montipora capitata Dana, 1846
Montipora capricornis Veron, 1985
Montipora cebuensis Nemenzo, 1976
Montipora confusa Nemenzo, 1967
Montipora corbetensis Veron and Wallace, 1984
Montipora crassituberculata Bernard, 1897
Montipora danae (Milne Edwards and Haime, 1851)
Montipora deliculata Veron, 2000
Montipora digitata (Dana, 1846)
Montipora efflorescens Bernard, 1897
Montipora floweri Wells, 1954
Montipora foliosa (Pallas, 1766)
Montipora foveolata (Dana, 1846)
Montipora friabilis Bernard, 1897
Montipora grisea Bernard, 1897
Montipora hirsuta Nemenzo, 1967
Montipora hispida (Dana, 1846)
Montipora hodgsoni Veron, 2000
Montipora hoffmeisteri Wells, 1954
Montipora incrassata (Dana, 1846)
Montipora informis Bernard, 1897
Montipora mactanensis Nemenzo, 1979
Montipora malampaya Nemenzo, 1967
Montipora millepora Crossland, 1952
Montipora mollis Bernard, 1897
Montipora monasteriata (Forskäl, 1775)
Montipora niugini Veron, 2000
Montipora nodosa (Dana, 1846)
Montipora plawanensis Veron, 2000
Montipora peltiformis Bernard, 1897
Montipora samarensis Nemenzo, 1967
Montipora spongodes Bernard, 1897
Montipora spumosa (Lamarck, 1816)
Montipora stellata Bernard, 1897
Montipora tuberculosa (Lamarck, 1816)
Montipora turgescens Bernard, 1897
Montipora turtlensis Veron and Wallace, 1984

Montipora undata Bernard, 1897
Montipora verriculosa Veron, 2000
Montipora verrucosa (Lamarck, 1816)

Montipora vietnamensis Veron, 2000

Genus *Anacropora* Ridley, 1884
Anacropora forbesi Ridley, 1884
Anacropora matthai Pillai, 1973
Anacropora pillai Veron, 2000
Anacropora puertogalerae Nemenzo, 1964

Anacropora reticulata Veron and Wallace, 1984
Anacropora spinosa Rehberg, 1892
Genus *Acropora* Oken, 1815
*Acropora abrolhosensis*Veron, 1985

Acropora abrotanoides (Lamarck, 1816)

Acropora aculeus (Dana, 1846)
Acropora acuminata (Verrill, 1864)

Acropora anthocercis (Brook, 1893)

Acropora aspera (Dana, 1846)
Acropora austera (Dana, 1846)
Acropora awi Wallace and Wolstenholme, 1998
Acropora batunai Wallace, 1997
Acropora bifurcata Nemenzo, 1971
Acropora brueggemanni (Brook, 1893)

Acropora carduus (Dana, 1846)
Acropora caroliniana Nemenzo, 1976

Acropora cerealis (Dana, 1846)
Acropora chesterfieldensis Veron and Wallace, 1984
Acropora clathrata (Brook, 1891)
Acropora convexa (Dana, 1846)
Acropora cophodactyla (Brook, 1892)

Acropora crateriformis (Gardiner, 1898)

Acropora cuneata (Dana, 1846)
Acropora cylindrica Veron and Fenner, 2000
Acropora cytherea (Dana, 1846)
Acropora dendrum (Bassett-Smith, 1890)

Acropora digitifera (Dana, 1846)
Acropora divaricata (Dana, 1846)
Acropora donei Veron and Wallace, 1984

Acropora echinata (Dana, 1846)
Acropora efflorescens (Dana, 1846)
Acropora elseyi (Brook, 1892)
Acropora exquisita Nemenzo, 1971
Acropora florida (Dana, 1846)
Acropora formosa (Dana, 1846)
Acropora gemmifera (Brook, 1892)
Acropora globiceps (Dana, 1846)
Acropora grandis (Brook, 1892)
Acropora granulosa (Milne Edwards and Haime, 1860)
Acropora hoeksemai Wallace, 1997
Acropora horrida (Dana, 1846)
Acropora humilis (Dana, 1846)
Acropora hyacinthus (Dana, 1846)
Acropora indonesia Wallace, 1997
Acropora inermis (Brook, 1891)
Acropora insignis Nemenzo, 1967
Acropora irregularis (Brook, 1892)

Acropora jacquelineae Wallacew, 1994

Acropora kimbeensis Wallace, 1999

Acropora latistella (Brook, 1891)
Acropora listeri (Brook, 1893)
Acropora lokani Wallace, 1994
Acropora longicyathus (Milne Edwards and Haime, 1860)
Acropora loripes (Brook, 1892)
Acropora lutkeni Crossland, 1952
Acropora microclados (Ehrenberg, 1834)

Acropora meridiana Nemenzo, 1971

Acropora microphthalma (Verrill, 1859)

Acropora millepora (Ehrenberg, 1834)

Acropora monticulosa (Brüggemann, 1879)

Acropora multiacuta Nemenzo, 1967

Acropora nana (Studer, 1878)
Acropora nasuta (Dana, 1846)
Acropora nobilis (Dana, 1846)
Acropora palifera (Lamarck, 1816)
Acropora palmerae Wells, 1954
Acropora paniculata Verrill, 1902
Acropora pinguis Wells, 1950
Acropora pichoni Wallace, 1999
Acropora plana Nemenzo, 1967
Acropora plumosa Wallace and Wolstenholme, 1998
Acropora polystoma (Brook, 1891)
Acropora prostrata (Dana, 1846)
Acropora pulchra (Brook, 1891)
Acropora rambleri (Bassett-Smith, 1890)

Acropora robusta (Dana, 1846)
Acropora rosaria (Dana, 1846)
Acropora samoensis (Brook, 1891)

Acropora sarmentosa (Brook, 1892)

Acropora secale (Studer, 1878)
Acropora selago (Studer, 1878)
Acropora solitaryensis Veron and Wallace, 1984
Acropora spathulata (Brook, 1891)

Acropora speciosa (Quelch, 1886)
Acropora spicifera (Dana, 1846)
Acropora subglabra (Brook, 1891)
Acropora subulata (Dana, 1846)
Acropora tenuis (Dana, 1846)
Acropora teres (Verrill, 1866)
Acropora turaki Wallace, 1994
Acropora valenciennesi (Milne Edwards and Haime, 1860)
Acropora valida (Dana, 1846)
*Acropora vaughani*Wells, 1954
Acropora verweyi Veron and Wallace, 1984
Acropora willisae Veron and Wallace, 1984
Acropora yongei Veron and Wallace, 1984

Genus *Astreopora* Blainville, 1830
Astreopora cuculata Lamberts, 1980

Astreopora expansa Brüggemann, 1877

Astreopora gracilis Bernard, 1896
Astreopora incrustans Bernard, 1896

Astreopora listeri Bernard, 1896
Astreopora myriophthalma (Lamarck, 1816)
Astreopora randalli Lamberts, 1980

Astreopora suggesta Wells, 1954
Family Euphilliidae Veron, 2000
Genus *Euphyllia*
Euphyllia ancora Veron and Pichon, 1979

Euphyllia cristata Chevalier, 1971
Euphyllia divisa Veron and Pichon, 1980

Euphyllia glabrescens (Chamisso and Eysenhardt, 1821)
Euphyllia paraancora Veron, 1990
Euphyllia yaeyamensis (Shirai, 1980)

Genus *Plerogyra* Milne Edwards and Haime, 1848
Plerogyra simplex Rehberg, 1892
Plerogyra sinuosa (Dana, 1846)
Genus *Physogyra* Quelch, 1884
*Physogyra lichtensteini (*Milne Edwards and Haime, 1851)
Family Oculinidae Gray, 1847
Genus *Galaxea* Oken, 1815
Galaxea acrhelia Veron, 2000
Galaxea astreata (Lamarck, 1816)
Galaxea fascicularis (Linnaeus, 1767)

Galaxea horrescens (Dana, 1846)
Galaxea longisepta Fenner & Veron, 2000

Galaxea paucisepta Claereboudt, 1990

Family Siderasteridae Vaughan and Wells, 1943
Genus *Pseudosiderastrea* Yabe and Sugiyama, 1935
Pseudosiderastrea tayami Yabe and Sugiyama, 1935
Genus *Psammocora* Dana, 1846
Psammocora contigua (Esper, 1797)

Psammocora digitata Milne Edwards and Haime, 1851
Psammocora explanulata Horst, 1922

Psammocora haimeana Milne Edwards and Haime, 1851
Psammocora nierstraszi Horst, 1921

Psammocora obtusangula (Lamarck, 1816)

Psammocora profundacella Gardiner, 1898

Psammocora superficialis Gardiner, 1898

Genus *Coscinaraea* Milne Edwards and Haime, 1848
Coscinaraea columna (Dana, 1846)
Coscinaraea crassa Veron and Pichon, 1980
Coscinaraea exesa (Dana, 1846)
Coscinaraea wellsi Veron and Pichon, 1980
Family Agariciidae Gray, 1847
Genus *Pavona* Lamarck, 1801
Pavona bipartita Nemenzo, 1980
Pavona cactus (Forskål, 1775)
Pavona clavus (Dana, 1846)
Pavona decussata (Dana, 1846)
Pavona duerdeni Vaughan, 1907
Pavona explanulata (Lamarck, 1816)

Pavona frondifera (Lamarck, 1816)
Pavona maldivensis (Gardiner, 1905)

Pavona minuta Wells, 1954
Pavona varians Verrill, 1864
Pavona venosa (Ehrenberg, 1834)
Genus *Leptoseris* Milne Edwards and Haime, 1849
Leptoseris explanata Yabe and Sugiyama, 1941

Leptoseris foliosa Dineson, 1980
Leptoseris gardineri Horst, 1921
Leptoseris hawaiiensis Vaughan, 1907

Leptoseris incrustans (Quelch, 1886)

Leptoseris mycetoseroides Wells, 1954

Leptoseris papyracea (Dana, 1846)
Leptoseris scabra Vaughan, 1907
Leptoseris solida (Quelch, 1886)
Leptoseris striata (Fenner & Veron 2000)

Leptoseris tubulifera Vaughan, 1907

Leptoseris yabei (Pillai and Scheer, 1976)

Genus *Gardineroseris* Scheer and Pillai, 1974
Gardineroseris planulata Dana, 1846

Genus *Coeloseris* Vaughan, 1918
Coeloseris mayeri Vaughan, 1918
Genus *Pachyseris* Milne Edwards and Haime, 1849
Pachyseris foliosa Veron, 1990
Pachyseris gemmae Nemenzo, 1955

Pachyseris rugosa (Lamarck, 1801)
Pachyseris speciosa (Dana, 1846)

Family Fungiidae Dana, 1846
Genus *Cycloseris* Milne Edwards and Haime, 1849
Cycloseris colini Veron, 2000
Cycloseris cyclolites Lamarck, 1801
Cycloseris erosa (Döderlein, 1901)
Cycloseris sinensis Milne Edwards and Haime, 1851)
Cycloseris somervillei (Gardiner, 1909)

Cycloseris tenuis (Dana, 1846)
Genus *Diaseris*
Diaseris distorta(Michelin, 1843)
Diaseris fragilis Alcock, 1893
Genus *Cantharellus* Hoeksema and Best, 1984
Cantharellus jebbi Hoeksema, 1993
Genus *Helliofungia* Wells, 1966
Heliofungia actiniformis Quoy and Gaimard, 1833
Genus *Fungia* Lamarck, 1801
Fungia concinna Verrill, 1864
Fungia danai Milne Edwards and Haime, 1851
Fungia fralinae Nemenzo, 1955
Fungia fungites (Linneaus, 1758*)*
Fungia granulosa Klunzinger, 1879

*Fungia gravis*Nemenzo, 1955
Fungia horrida Dana, 1846
Fungia klunzingeri Döderlein, 1901
Fungia moluccensis Horst, 1919
Fungia paumotensis Stutchbury, 1833

Fungia repanda Dana, 1846
Fungia scruposa Klunzinger, 1879
Fungia scutaria Lamarck, 1801
Fungia spinifer Claereboudt and Hoeksema, 1987
Genus *Ctenactis* Verrill, 1864
Ctenactis albitentaculata Hoeksema, 1989

Ctenactis crassa (Dana, 1846)
Ctenactis echinata (Pallas, 1766)
Genus *Herpolitha* Eschscholtz, 1825
Herpolitha limax (Houttuyn, 1772)
Herpolitha weberi Horst, 1921
Genus *Polyphyllia* Quoy and Gaimard, 1833
Polyphyllia novaehiberniae (Lesson, 1831)

Polyphyllia talpina (Lamarck, 1801)

Genus *Sandalolitha* Quelch, 1884
Sandalolitha dentata (Quelch, 1886)

Sandalolitha robusta Quelch, 1886
Genus *Halomitra* Dana, 1846
Halomitra clavator Hoeksema, 1989

Halomitra pileus (Linnaeus, 1758)
Genus *Zoopilus* Dana, 1864
Zoopilus echinatus Dana, 1846
Genus *Lithophyllum* Rehberg, 1892
Lithophyllon lobata Horst, 1921
Lithophyllon mokai Hoeksema, 1989

Genus *Podabacia* Milne Edwards and Haime, 1849
Podabacia crustacea (Pallas, 1766)
Podabacia motuporensis Veron, 1990

Family Pectinidae Vaughan and Wells, 1943
Genus *Echinophyllia* Klunzinger, 1879
Echinophyllia aspera (Ellis and Solander, 1788)
Echinophyllia echinata (Saville-Kent, 1871)
Echinophyllia echinoporoides Veron and Pichon, 1979
Echinophyllia orpheensis Veron and Pichon, 1980
Genus *Echinomorpha* Veron, 2000
Echinomorpha nishihirea (Veron, 1990)

Genus *Oxypora* Saville-Kent, 1871
Oxypora crassispinosa Nemenzo, 1979

Oxypora glabra Nemenzo, 1959
Oxypora lacera Verrill, 1864
Genus *Mycedium* Oken, 1815

Mycedium elephatotus (Pallas, 1766)

Mycedium robokaki Moll and Best, 1984

Mycedium mancaoi Nemenzo, 1979

Genus *Pectinia* Oken, 1815
Pectinia africanus Veron, 2000
Pectinia alcicornis (Saville-Kent, 1871)

Pectinia ayleni (Wells, 1935)
Pectinia elongata Rehberg, 1892
Pectinia lactuca (Pallas, 1766)
Pectinia paeonia (Dana, 1846)
Pectinia pygmaeus Veron, 2000
Pectinia teres Nemenzo and montecillo, 1981
Pectinia maxima (Moll and Borel Best, 1984)
Family Merulinidae Verrill, 1866
Genus *Hydnophora* Fischer de Waldheim, 1807
Hydnophora exesa (Pallas, 1766)
Hydnophora grandis Gardiner, 1904

Hydnophora microconos (Lamarck, 1816)

Hydnophora pilosa Veron, 1985
Hydnophora rigida (Dana, 1846)
Genus *Paraclavarina* Veron, 1985
Paraclavarina triangularis (Veron & Pichon, 1980)
Genus *Merulina* Ehrenberg, 1834
Merulina ampliata (Ellis and Solander, 1786)
Merulina scabricula Dana, 1846
Genus *Scapophyllia* Milne Edwards and Haime, 1848
Scapophyllia cylindrica Milne Edwards and Haime, 1848
Family Dendrophylliidae Gray, 1847
Genus *Turbinaria* Oken, 1815
Turbinaria frondens (Dana, 1846)
Turbinaria irregularis, Bernard, 1896

Turbinaria mesenterina (Lamarck, 1816)

Turbinaria patula (Dana, 1846)
Turbinaria peltata (Esper, 1794)
Turbinaria reniformis Bernard, 1896

Turbinaria stellulata (Lamarck, 1816)

Turbinaria sp.
Family Mussidae Ortmann, 1890
Genus *Blastomussa* Wells, 1961
Blastomussa wellsi Wijsmann-Best, 1973

Genus *Micromussa* Veron, 2000
Micromussa amakusensis (Veron, 1990)

Micromussa minuta (Moll and Borel-Best, 1984)
Genus *Acanthastrea* Milne Edwards and Haime, 1848
*Acanthastrea bowerbanki*Milne Edwards and Haime, 1851
Acanthastrea brevis Milne Edwards and Haime, 1849
Acanthastrea echinata (Dana, 1846*)*

Acanthastrea faviaformis Veron, 2000

Acanthastrea hemprichii (Ehrenberg, 1834)

Acanthastrea ishigakiensis Veron, 1990

Acanthastrea lordhowensis Veron & Pichon, 1982
Acanthastrea rotundoflora Chevalier, 1975

Acanthastrea subechinata Veron, 2000

Acanthastrea sp. 1
Genus *Lobophyllia* Blainville, 1830
Lobophyllia corymbosa (Forskål, 1775)

Lobophyllia dentatus Veron, 2000
Lobophyllia diminuta Veron, 1985
Lobophyllia flabelliformis Veron, 2000

Lobophyllia hataii Yabe and Sugiyama, 1936
Lobophyllia hemprichii (Ehrenberg, 1834)

Lobophyllia pachysepta Chevalier, 1975

Lobophyllia robusta Yabe and Sugiyama, 1936
Lobophyllia serratus Veron, 2000
Genus *Symphyllia* Milne Edwards and Haime, 1848
Symphyllia agaricia Milne Edwards and Haime, 1849
Symphyllia hassi Pillai and Scheer, 1976

Symphyllia radians Milne Edwards and Haime, 1849
Symphyllia recta (Dana, 1846)
Symphyllia valenciennesii Milne Edwards and Haime, 1849
Genus *Scolymia* Haime, 1852
Scolymia vitiensis Brüggemann, 1878

Genus *Australomussa* Veron, 1985
Australomussa rowleyensis Veron, 1985

Genus *Cynarina* Brüggemann, 1877

Cynarina lacrymalis (Milne Edwards and Haime, 1848)

Family Faviidae Gregory, 1900

Genus *Caulastrea* Dana, 1846

Caulastrea curvata Wijsmann-Best, 1972

Caulastrea echinulata (Milne Edwards and Haime, 1849)

Caulastrea furcata Dana, 1846

Caulastrea tumida Matthai, 1928

Genus *Favia* Oken, 1815

Favia danae Verrill, 1872

Favia favus (Forskål, 1775)

Favia helianthoides Wells, 1954

Favia laxa (Klunzinger, 1879)

Favia lizardensis Veron and Pichon, 1977

Favia maritima (Nemenzo, 1971)

Favia marshae Veron, 2000

Favia matthai Vaughan, 1918

Favia maxima Veron, Pichon & Wijsman-Best, 1972

Favia pallida (Dana, 1846)

Favia rosaria Veron, 2000

Favia rotumana (Gardiner, 1899)

Favia rotundata Veron, Pichon & Wijsman-Best, 1972

Favia speciosa Dana, 1846

Favia stelligera (Dana, 1846)

Favia truncatus Veron, 2000

Favia veroni Moll and Borel-Best, 1984

Favia vietnamensis Veron, 2000

Genus *Barabattoia* Yabe and Sugiyama, 1941

Barabattoia amicorum (Milne Edwards and Haime, 1850)

Barabattoia laddi (Wells, 1954)

Genus *Favites* Link, 1807

Favites acuticulis (Ortmann, 1889)

Favites abdita (Ellis and Solander, 1786)

Favites bestae Veron, 2000

Favites chinensis (Verrill, 1866)

Favites complanata (Ehrenberg, 1834)

Favites flexuosa (Dana, 1846)

Favites halicora (Ehrenberg, 1834)

Favites micropentagona Veron, 2000

Favites pentagona (Esper, 1794)

Favites russelli (Wells, 1954)

Favites stylifera (Yabe and Sugiyama, 1937)

Favites vasta (Klunzinger, 1879)

Genus *Goniastrea* Milne Edwards and Haime, 1848

Goniastrea aspera Verrill, 1905

Goniastrea australensis (Milne Edwards and Haime, 1857)

Goniastrea edwardsi Chevalier, 1971

Goniastrea favulus (Dana, 1846)

Goniastrea palauensis Yabe and Sugiyama, 1936

Goniastrea pectinata (Ehrenberg, 1834)

Goniastrea ramosa Veron, 2000

Goniastrea retiformis (Lamarck, 1816)

Genus *Platygyra* Ehrenberg, 1834

Platygyra acuta Veron, 2000

Platygyra contorta Veron, 1990

Platygyra daedalea (Ellis and Solander, 1786)

Platygyra lamellina (Ehrenberg, 1834)

Platygyra pini Chevalier, 1975

Platygyra ryukyuensis Yabe and Sugiyama, 1936

Platygyra sinensis (Milne Edwards and Haime, 1849)

Platygyra verweyi Wijsman-Best, 1976

Platygyra yaeyemaensis Eguchi and Shirai, 1977

Genus *Australogyra* Veron & Pichon, 1982

Australogyra zelli (Veron & Pichon, 1977)

Genus *Oulophyllia* Milne Edwards and Haime, 1848

Oulophyllia bennettae (Veron & Pichon, 1977)

Oulophyllia crispa (Lamarck, 1816)

Oulophyllia levis Nemenzo, 1959

Genus *Leptoria* Milne Edwards and Haime, 1848

Leptoria irregularis Veron, 1990

Leptoria phrygia (Ellis and Solander, 1786)

Genus *Montastrea* Blainville, 1830

Montastrea annuligera (Milne Edwards and Haime, 1849)

Montastrea colemani Veron, 2000

Montastrea curta (Dana, 1846)

Montastrea magnistellata Chevalier, 1971

Montastrea multipunctata Hodgson, 1985

Montastrea salebrosa (Nemenzo, 1959)

Montastrea valenciennesi (Milne Edwards and Haime, 1848)

Genus *Plesiastrea* Milne Edwards and Haime, 1848

Plesiastrea versipora (Lamarck, 1816)

Genus *Oulastrea* Milne Edwards and Haime, 1848

Oulastrea crispata (Lamarck, 1816)

Genus *Diploastrea* Matthai, 1914
Diploastrea heliopora (Lamarck, 1816)

Genus *Leptastrea* Milne Edwards and Haime, 1848
Leptastrea inaequalis Klunzinger, 1879

Leptastrea pruinosa Crossland, 1952

Leptastrea purpurea (Dana, 1846)
Leptastrea transversa Klunzinger, 1879

Genus *Cyphastrea* Milne Edwards and Haime, 1848
Cyphastrea agassizi (Vaughan, 1907)

Cyphastrea chalcidium (Forskål, 1775)

Cyphastrea decadia Moll and Best, 1984

Cyphastrea microphthalma (Lamarck, 1816)
Cyphastrea ocellina (Dana, 1864)
Cyphastrea serailia (Forskål, 1775)
Genus *Echinopora* Lamarck, 1816
Echinopora gemmacea Lamarck, 1816

Echinopora horrida Dana, 1846
Echinopora lamellosa (Esper, 1795)

Echinopora mammiformis (Nemenzo, 1959)
Echinopora pacificus Veron, 1990
Echinopora taylorae (Veron, 2000)
Family Trachyphyllidae Verrill, 1901
Genus *Trachyphyllia* Milne Edwards and Haime, 1848
Trachyphyllia geoffroyi (Audouin, 1826)

Family Poritidae Gray, 1842
Genus *Porites* Link, 1807
Porites annae Crossland, 1952
Porites attenuata Nemenzo 1955
*Porites australiensis*Vaughan, 1918
Porites cylindrica Dana, 1846
Porites deformis Nemenzo, 1955
Porites evermanni Vaughan, 1907
Porites flavus Veron, 2000
Porites horizontalata Hoffmeister, 1925

Porites latistellata Quelch, 1886
Porites lichen Dana, 1846
Porites lobata Dana, 1846
Porites lutea Milne Edwards & Haime, 1851
Porites monticulosa Dana, 1846
Porites negrosensis Veron, 1990
Porites nigrescens Dana, 1846
Porites profundus Rehberg, 1892
Porites rugosa Fenner & Veron, 2000

Porites rus (Forskål, 1775)
Porites solida (Forskål, 1775)
Porites tuberculosa Veron, 2000
Porites vaughani Crossland, 1952
Porites massive
Genus *Goniopora* Blainville, 1830
Goniopora albiconus Veron, 2000
Goniopora burgosi Nemenzo, 1955

Goniopora columna Dana, 1846
Goniopora djiboutiensis Vaughan, 1907

Goniopora eclipsensis Veron and Pichon, 1982
Goniopora fruticosa Saville-Kent, 1893

Goniopora lobata Milne Edwards and Haime, 1860
Goniopora minor Crossland, 1952
Goniopora palmensis Veron and Pichon, 1982
Goniopora pandoraensis Veron and Pichon, 1982
Goniopora somaliensis Vaughan, 1907

Goniopora stokesi Milne Edwards and Haime, 1851
Goniopora stutchburyi Wells, 1955
Goniopora tenuidens (Quelch, 1886)

Genus *Alveopora* Blainville, 1830
Alveopora catalai Wells, 1968
Alveopora fenestrata (Lamarck, 1816)

Alveopora spongiosa Dana, 1846
Alveopora tizardi Bassett-Smith, 1890

Appendix 4. Representitive images of the seven coral community types identified in the Solomon Islands.

I. Type A shallow community on reef flat site at Pwaunani Point , Uki Ni Masi Island, Makira

II. Type A shallow community on reef flat site at Malaupaina Island, Makira.

III. Type B shallow community on reef flat site at Matavaghi, Isabel.

IV. Type B shallow community showing extensive crown of thorns damage, on reef flat site at Mary Shoal, Guadalcanal.

V. Type C community showing large *Sinularia* stands on reef flat site at Papu Passage, Gehbira Island, Isabel.

VI. Community type D of mixed coral assemblages on reef at Nusazonga Island, New Georgia.

VII. Deep Community type E on lower slopes of Kombuana Island, Florida Group.

VIII. Deep Community type E on lower slopes on reef site at Vella Lavella, New Georgia.

IX. Deep Community type E on lower slopes of reef site at Papu Passage, Gehbira Island, Isabel.

X. Deep Community type F on lower slopes of Pio Island reef, Makira.

XI. Community type G showing high coral mortality on shallow reef flat at Linggatu Cove, Russell Island

XII. Community type G on shallow reef flat at Linggatu Cove, Russell Island.

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

June 2006
TNC Pacific Island Countries
Report No 1/06

Chapter 3

Coral Reef Fish Diversity

Solomon Islands Marine Assessment

Gerald R. Allen
Western Australia Museum

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
Gerald R. Allen: 1 Dreyer Road Roleystone, WA 6111 Australia;
e-Mail: tropical_reef@bigpond.com

Suggested Citation:
Allen, G.R. 2006. Coral Reef Fish Diversity. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: © Gerald Allen

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Contents

Executive Summary

- A list of fishes was compiled for 65 sites throughout the main Solomon Islands archipelago. The survey involved about 94 hours of scuba diving to a maximum depth of 60 m.

- The Solomon Islands possesses a diverse coral reef fish fauna, consisting of at least 82 families, 348 genera, and 1019 species, of which 786 (77 %) were observed or collected during the survey.

- Forty-seven new distributional records were obtained, including at least one new species of cardinalfish (Apogonidae).

- A formula for predicting the total reef fish fauna based on the number of species in six key indicator families indicates that at least 1,159 species can be expected to occur at the Solomon Islands.

- Gobies (Gobiidae), damselfishes (Pomacentridae), and wrasses (Labridae) are the dominant groups at the Solomon Islands in both number of species (120, 100, and 84 respectively) and number of individuals.

- Species numbers at visually sampled sites during the 2004 survey ranged from 100 to 279, with an average of 184.7.

- Njari Island, Gizo (site 32) was the leading site for fish diversity. The 279 species count is the fourth highest ever recorded for a single dive, surpassed only by three sites in the Raja Ampat Islands.

- Outer reef habitats contained the highest fish diversity with an average of 197.8 species per site. Sheltered near-shore sites exhibited the least diversity (151.3 species), and moderately exposed locations had an average of 189.9 species per site.

- 200 or more species per site is considered the benchmark for an excellent fish count. This figure was achieved at 37 percent of Solomon Islands sites.

- Although fish diversity was generally high, there were signs of overfishing indicated by a general paucity of large-sized reef fishes. Abundance of Napoleon Wrasse, another indicator of fishing pressure, was moderate – better than most places in the Coral Triangle, but less than Milne Bay Province in Papua New Guinea.

- Conservation recommendations based on fish community structure and aesthetic qualities of the physical environment include possible establishment of MPAs at the Shortland Islands, Gizo (New Georgia), Marau Sound (Guadalcanal), western Makira, Three Sisters Islands, Leli Island (Malaita), and north-western Isabel

Introduction

The primary goal of the fish survey was to provide a comprehensive inventory of species inhabiting the Solomon Islands, primarily species living on or near coral reefs down to the limit of safe sport diving or approximately 50-60 m depth. It therefore excludes deepwater fishes, offshore pelagic species such as flyingfishes, tunas, and billfishes, and most estuarine forms.

History of Solomon Islands Ichthyology

There has been considerable fish collecting activity in the Solomon Islands dating back to the visit of H.M.S. Curacao in 1865. A small collection of fishes were collected on this expedition by J. Brenchley and was mainly reported by Günther (1873), who was the fish curator at the British Museum. Herre (1931) published the first checklist of Solomons fishes. It included extensive collections from the Shortland Islands made by Alvin Seale in 1903, as well as 189 species that Herre obtained mainly at Isabel during a 4-day visit in 1929. Herre also collected at Ugi, Tulaghi, Malaita, Kolombangara, New Georgia, and the Shortlands. He prophetically proclaimed "I have no doubt that at any one of them 700 or 800 species could be collected during a single season".

The Crane Pacific Expedition of 1928-1929 from the Field Museum in Chicago collected nearly 200 fish species at the Solomon Islands that were reported by Herre (1936). In addition, the Templeton Crocker Expedition to Polynesia and Melanesia in 1933, made collections (reported by Seale, 1935) at Rennell, Bellona, Santa Ana Island, Malaita, Tulaghi, Gavutu Island, Guadalcanal, Sikaiana Island, Ugi, and Makira. Finally, Fowler (1928 and 1934) provided a few additional records of Solomons fishes during this period.

World War II provided an opportunity for further fish collecting activities by two enterprising American servicemen, W.M. Chapman and H. Cheyne, who collected numerous specimens between May-July 1944 at Gizo, Munda, New Georgia, and the Florida Islands. The collections included a variety of reef fishes, including many large species such as sharks and rays. Their material is deposited at the United States National Museum in Washington D.C. This institution houses a significant collection of Solomons fishes composed of approximately 2,200 lots. The collection is also the repository of a major collection made by Jeffrey Williams of USNM at the Santa Cruz Islands in 1998.

The author previously collected fishes in the Solomon Islands at Guadalcanal, Savo, Florida Islands, and Malaita in 1973 with John Randall, sponsored by a grant from the National Geographic Society. Most of the fishes from this trip were deposited at the Bishop Museum in Honolulu, but a small number of specimens were also lodged at the Australian Museum, Sydney.

The list of Solomons fishes that accompanies this report (see Appendix 3) is the most comprehensive inventory to date and includes at least 47 new records for the region. It is the first summary of Solomons fishes to appear since 1958, the year that Munro's "Fishes of the New Guinea Region [including Solomons]" was published.

Methods

The fish portion of the REA involved approximately 94 hours of scuba diving by G. Allen to a maximum depth of 60 m. A list of fishes was compiled for 65 sites (see Appendices 1 and 2). The basic method consisted of underwater observations made during a single, 60-100 minute dive at each site. The name of each observed species was recorded in pencil on a plastic sheet attached to a clipboard. The technique usually involved rapid descent to 20-60 m, then a slow, meandering ascent back to the shallows. The majority of time was spent in the 2-12 m depth zone, which consistently harbours the largest number of species. Each dive included a representative sample of all major bottom types and habitat situations, for example rocky intertidal, reef flat, steep drop-offs, caves (utilizing a flashlight when necessary), rubble and sand patches.

Only the names of fishes for which identification was absolutely certain were recorded. However, very few, less than one percent of those observed, could not be identified to species. This high level of recognition is based on more than 30 years of diving experience in the Indo-Pacific and an intimate knowledge of the reef fishes of this vast region as a result of extensive laboratory and field studies.

The visual survey was supplemented with occasional small collections procured with the use of anaesthetic quinaldine-sulphate and the ichthyocide rotenone. In addition, specimens of the small free-swimming blenny, *Meiacanthus crinitus*, were collected with a rubber-propelled, multi-prong spear. The purpose of the quinaldine and rotenone collections was to flush out small, crevice-dwelling fishes (for example tiny gobies) that are difficult to record with visual techniques. Rotenone was also used on one occasion to collect a new species of cardinalfish.

A number of valuable records were provided by other survey participants Ben Kahn and Emre Turak, who photographed (using a digital camera or video) rare or unusual species during the inventory dives. In many cases species not seen by the author at a particular site were noted after inspecting the photographs.

Results

The total reef fish fauna of the Solomon Islands reported herein consists of 1,019 species belonging 82 families and 348 genera (see Appendix 3). A total of 786 species were actually recorded during the present marine assessment. The additional 233 species were either reported in the literature or represent museum records. For example, just prior to the survey the author had an opportunity to visit the United States National Museum in Washington D.C. where numerous Solomons fishes are lodged. Allen et al. (2003), Allen (1993), Randall et al. (1990), and Myers (1989) illustrated the majority of species currently known from the region.

General faunal composition

The fish fauna of the Solomon Islands consists mainly of species associated with coral reefs. The most abundant families in terms of number of species are gobies (Gobiidae), damselfishes (Pomacentridae), wrasses (Labridae), cardinalfishes (Apogonidae), blennies (Blenniidae), groupers (Serranidae), butterflyfishes (Chaetodontidae), surgeonfishes (Acanthuridae), snappers (Lutjanidae), and parrotfishes (Scaridae). These 10 families collectively account for 609 species or about 60 percent of the total reef fauna (Figure 1).

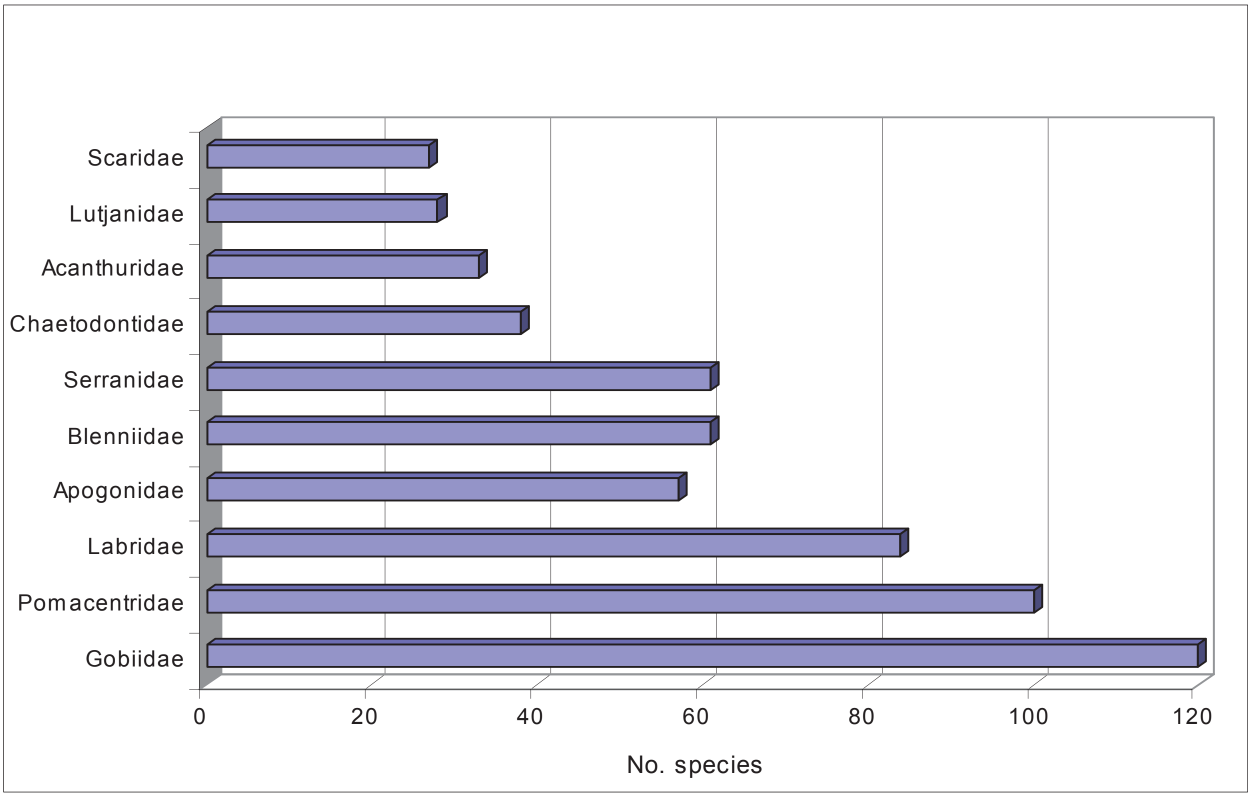


Figure 1. Ten largest families of Solomon Islands fishes.

The relative abundance of Solomons fish families is similar to other reef areas in the Indo-Pacific, although the ranking of individual families is variable as shown in Table 1. Although the Gobiidae was the leading family, it was not adequately collected, due to the small size and cryptic habits of many species. Similarly, the moray eel family Muraenidae is consistently among the most speciose groups at other localities, and is no doubt abundant. However, they are best sampled with rotenone due to their cryptic habits.

Table 1. Family ranking in terms of number of species for various localities in the Indo- Pacific region (SOL = Solomon Islands; RA = Raja Ampat Islands, Indonesia; MB = Milne Bay Province, PNG; TB = Togean-Banggai Islands, Indonesia; CAL = Calamianes Islands, Philippines; MAD = Madagascar; PI = Phoenix Islands). Data for Raja Ampat Islands is from Allen (2002), for Milne Bay is from Allen (2003), for Togean-Banggai Islands from Allen (2001a), for Calamianes Islands from Allen (2001b), for Madagascar from Allen (unpublished) and for Phoenix Islands from Allen (unpublished).

Family	SOL	RA	MB	TB	CAL	MAD	PI
Gobiidae	**1st**	1st	1st	1st	3rd	1st	3rd
Pomacentridae	**2nd**	2nd	3rd	3rd	1st	3rd	4th
Labridae	**3rd**	3rd	2nd	2nd	2nd	2nd	1st
Apogonidae	**4th**	4th	4th	4th	4th	5th	10th
Blenniidae	**5th**	8th	6th	6th	8th	6th	8th
Serranidae	**6th**	5th	5th	5th	5th	4th	2nd
Chaetodontidae	**7th**	6th	6th	7th	6th	10th	7th
Acanthuridae	**8th**	7th	8th	8th	7th	8th	5th
Lutjanidae	**9th**	10th	9th	9th	9th	14th	15th
Scaridae	**10th**	9th	10th	10th	10th	10th	11th

FISH COMMUNITY STRUCTURE

The composition of local reef fish communities in the Solomons and elsewhere in the vast Indo-Pacific region is dependent on habitat variability. The relatively rich reef fish fauna of the Solomon Islands directly reflects a high level of habitat diversity. Nearly every conceivable habitat situation is present from highly sheltered embayments with a large influx of freshwater to oceanic atolls and outer barrier reefs. The number of species found at each site is indicated in Table 2. Totals ranged from 100 to 279, with an average of 184.7 per site**.**

Table 2. Number of fish species observed at each site during TNC survey of the Solomon Islands. (note: site 30 is omitted as fishes were not surveyed).

Site	Species	Site	Species	Site	Species
1	196	**23**	160	**46**	164
2	174	**24**	198	**47**	113
3	147	**25**	149	**48**	196
4	102	**26**	198	**49**	144
5	153	**27**	198	**50**	189
6	148	**28**	229	**51**	243
7	157	**29**	210	**52**	255
8	219	**31**	189	**53**	201
9	177	**32**	279	**54**	241
10	160	**33**	153	**55**	144
11	220	**34**	232	**56**	210
12	140	**35**	166	**57**	197
13	177	**36**	234	**58**	181
14	144	**37**	100	**59**	203
15	176	**38**	233	**60**	191
16	203	**39**	228	**61**	206
17	172	**40**	155	**62**	125
18	218	**41**	152	**63**	200
19	116	**42**	177	**64**	140
20	157	**43**	202	**65**	203
21	223	**44**	235	**66**	176
22	240	**45**	190		

The survey sites can be broadly categorized according to degree of shelter from wind and waves (Appendix 1). The most highly sheltered reefs are typically close to shore and generally situated within embayments. They are often subject to heavy silt deposition and consequent reduced visibility, although tidal flushing sometimes results in periods of much improved water clarity. The most sheltered sites typically have a much-depleted fish fauna, particularly those that are associated with heavy siltation. Nevertheless, there are a number of species associated with this environment that are not found elsewhere and the community "mix" is also very unique.

At the opposite extreme are exposed outer reefs with periodic strong currents and relatively clear water. Most outer reefs in the Solomons drop away quickly to deep water although we dived at a few locations (e.g. site 65) where the slope was relatively gradual. There is considerable habitat variability among outer reef sites, ranging from relatively sheltered leeward sites near shore to highly exposed offshore reefs. Outer reefs generally support the most species and the diversity is greatly enhanced if there is good substrate variability and periodic strong currents. The highest diversity is found when these conditions are found in close proximity to sheltered shorelines, for example the Njari Island site (32).

Between the two extremes of reef exposure there is a variety of moderately exposed habitat situations. These are often reefs that lie close to shore, but experience strong tidal flushing and therefore support a fish community that is partially composed of species that are more typical of outer reefs. There are also a number of species that are most abundant at these semi-sheltered sites, even though they may be found in other environment (e.g. the damselfishes *Pomacentrus nigromanus* and *Neoglyphidodon nigroris*.)

For the purpose of analysis, the 65 sites that were surveyed for fishes were placed in three general categories depending on their general degree of exposure and their associated fish communities (Appendix 2 and Table 3): sheltered inshore reefs, moderately exposed reefs, and outer reefs. This categorization is obviously an over-simplification of complex environmental variables, but is nevertheless useful for analytical purposes.

Table 3. Comparison of fish diversity for major habitat types.

Major habitat	No. sites	Avg. spp. per site
Outer reef	27	197.8
Moderately sheltered	20	189.9
Strongly sheltered inshore	18	151.3

RICHEST SITES FOR FISHES

The total species at a particular site is ultimately dependent on the availability of food, shelter and the diversity of substrata. Well-developed reefs with relatively high coral diversity and significant live coral cover were usually the richest areas for fishes, particularly if the reefs were exposed to periodic strong currents. These areas provide an abundance of shelter for fishes of all sizes and the currents are vital for supporting numerous planktivores, the smallest of which provide food for larger predators.

Although silty bays (often relatively rich for corals), mangroves, seagrass beds, and pure sand-rubble areas were consistently the poorest areas for fish diversity, sites that incorporate mixed substrates (in addition to live coral) usually support the most fish species. Sites that encompass both exposed outer reefs as well as sheltered back reefs or shoreline reefs are also correlated with higher than average fish diversity (e.g. site 32).

The 12 most speciose sites for fishes are indicated in Table 4. The average total for all sites (184.7) was relatively high, especially considering that many of the sites involved relatively impoverished near-shore habitats. The total of 279 species at site 32 (Njari Island, Gizo) was the fourth highest total recorded by the author for a single dive anywhere in the Indo-Pacific. It is surpassed only by three sites in the Raja Ampat Islands that had between 281-284 species.

Table 4. Twelve richest fish sites for fish diversity.

Site No.	Location	Total Spp.
32	Njari, Gizo	279
52	Bio, Makira	255
51	Malaupaina 2, Three Sisters Islands	243
54	Komusupa, Malaita	240
22	Emerald, Choiseul	240
44	Cormorant, Guadalcanal	235
36	Uepi Pt., Marovo Lagoon, New Georgia	234

Site No.	Location	Total Spp.
38	Minjanga, New Georgia Group	233
34	Roviana, New Georgia Group	232
28	Tua, Shortland Islands	229
39	Mbili, New Georgia Group	227
21	Poro Island, Choiseul	223

Table 5 presents a comparison of the reef fish fauna of major geographical areas that were surveyed. The highest average number of species (216) was recorded at the Three Sisters with the lowest value (163) from Isabel. However, these figures are based on relatively few sites and are therefore not particularly useful as a guide to overall richness. Virtually any of the 11 geographic areas would be capable of generating high average species counts if sites were chosen with only this goal in mind. In conclusion, there does not appear to be any significant correlation between species richness and geographic location.

Table 5. Average number of fish species per site recorded for geographic areas in the Solomon Islands.

Rank	General Area	No. sites	Site nos.	Avg. species/site
1.	Three Sisters Islands	2	50-51	216.0
2.	Shortland Islands/Mono	4	26-29	208.8
3.	New Georgia Group	9	31-39	201.3
4.	Guadalcanal/Savo	2	44-45, 65-66	201.0
5.	Malaita	9	54-62	188.5
6.	Arnavon Islands	2	16-17	187.5
7.	Makira	6	46-49, 52-53,	178.8
8.	Florida Islands/Sealark Channel	4	1-2, 63-64	177.3
9.	Russell Islands	4	40-43	171.5
10.	Choiseul	8	18-25	164.9
11.	Isabel	13	3-15	163.0

Coral Fish Diversity Index (CFDI)

Allen (1998) devised a convenient method for assessing and comparing overall reef fish diversity. The technique essentially involves an inventory of six key families: Chaetodontidae, Pomacanthidae, Pomacentridae, Labridae, Scaridae, and Acanthuridae. The number of species in these families is totaled to obtain the Coral Fish Diversity Index (CFDI) for a single dive site, relatively restricted geographic areas or countries and large regions (e.g. Solomon Islands).

CFDI values can be used to make a reasonably accurate estimate of the total coral reef fish fauna of a particular locality by means of regression formulas. The latter were obtained after analysis of 35 Indo-Pacific locations for which reliable, comprehensive species lists exist. The data were first divided into two groups: those from relatively restricted localities (surrounding seas encompassing less than 2,000 km^2) and those from much larger areas (surrounding seas encompassing more than 50,000 km^2). Simple regression analysis revealed a highly significant difference ($P = 0.0001$) between these two groups. Therefore, the data were separated and subjected to additional analysis. The Macintosh program Statview was used to perform simple linear regression analyses on each data set in order to determine a predictor formula, using CFDI as the predictor variable (x) for estimating the independent variable (y) or total coral reef fish fauna. The resultant formulae were obtained: 1. total fauna of areas with surrounding seas encompassing more than 50,000 km^2 = 4.234(CFDI) -

114.446 (d.f = 15; R^2 = 0.964; P = 0.0001); 2. total fauna of areas with surrounding seas encompassing less than 2,000 km^2 = 3.39 (CFDI) - 20.595 (d.f = 18; R^2 = 0.96; P = 0.0001).

The CFDI regression formula is particularly useful for large regions such as the Philippines, where reliable totals are lacking. Moreover, the CFDI predictor value can be used to gauge the thoroughness of a particular short-term survey that is either currently in progress or already completed. For example, the CFDI obtained for the Solomon Islands is 301, and the appropriate regression formula (3.39 x 345 - 20.595) predicts an approximate total of 1,159 species, indicating that at least 140 more species can be expected.

Indonesia is the world's leading country for reef fish diversity, based on CFDI values. A recent study by Allen and Adrim (2003), which lists a total of 2,056 species from Indonesia strongly supports this ranking. Table 6 presents CFDI values, number of shallow reef fishes recorded to date, and the estimated number of species based on CFDI data for selected countries or regions in the Indo-Pacific. In most cases the predicted number of species is similar or less than that actually recorded, and is thus indicative of the level of knowledge. For example, when the actual number is substantially less than the estimated total (e.g. Sabah) it indicates incomplete sampling. However, the opposite trend is evident for Indonesia, with the actual number being slightly greater than what is predicted by the CFDI. The total number of species for the Philippines is yet to be determined and is therefore excluded.

Table 6. Coral fish diversity index (CFDI) for regions or countries with figures for total reef and shore fish fauna (if known), and estimated fauna from CFDI regression formula.

Locality	CFDI	No. reef fishes	Estim. Reef fishes
Indonesia	**507**	2056	2032
Australia (tropical)	**401**	1627	1584
Philippines	**387**	?	1525
Papua New Guinea	**362**	1494	1419
S. Japanese Archipelago	**348**	1315	1359
Great Barrier Reef, Australia	**343**	1325	1338
Taiwan	**319**	1172	1237
Micronesia	**315**	1170	1220
Solomon Islands	**301**	**1019**	**1159**
New Caledonia	**300**	1097	1156
Sabah, Malaysia	**274**	840	1046
Northwest Shelf, Western Australia	**273**	932	1042
Mariana Islands	**222**	848	826
Marshall Islands	**221**	795	822
Ogasawara Islands, Japan	**212**	745	784
French Polynesia	**205**	730	754
Maldive Islands	**219**	894	813
Seychelles	**188**	765	682
Society Islands	**160**	560	563
Tuamotu Islands	**144**	389	496
Hawaiian Islands	**121**	435	398
Marquesas Islands	**90**	331	267

ZOOGEOGRAPHIC AFFINITIES OF THE SOLOMONS FISH FAUNA

The Solomon Islands belong to the overall Indo-west Pacific faunal community. Its reef fishes are very similar to those inhabiting other areas within this vast region, stretching eastward from East Africa and the Red Sea to the islands of Micronesia and Polynesia. Although most families, and many genera and species are consistently present across the region, the species composition varies greatly according to locality.

The Solomons Islands are part of the Indo-Australian region, the richest faunal province on the globe in terms of biodiversity. The nucleus of this region, or Coral Triangle, is mainly composed of Indonesia, Philippines, Papua New Guinea and the Solomon Islands. Species richness generally declines with increased distance from the Triangle, although the rate of attenuation is generally less in a westerly direction. The damselfish family Pomacentridae is typical in this regard. For example, Indonesia has the world's highest total with 138 species, with the following totals recorded for other areas (Allen, 1991): Papua New Guinea (109), Solomon Islands (100), northern Australia (95), W. Thailand (60), Fiji Islands (60), Maldives (43), Red Sea (34), Society Islands (30), and Hawaiian Islands (15).

Considering the broad dispersal capabilities via the pelagic larval stage of most reef fishes it is not surprising that only two species appear to be endemic to the Solomons, a garden eel (*Heteroconger cobra*) and the undescribed cardinalfish (*Apogon* sp.) collected during the present REA. The garden eel was first collected by the author and colleagues in 1973 from a Japanese shipwreck near Honiara. A visit to this same site by Ben Kahn and David Wachenfeld at the end of the present REA failed to find this species.

NEW SPECIES AND NOTABLE RANGE EXTENSIONS

A total of 47 new distributional records for the Solomon Islands were recorded during the survey (Table 7). Most of these represent range extensions of widespread species and therefore it is not surprising to find them in the Solomons. However several notable exceptions are discussed in the following paragraphs.

1. ***Apogon* new species –** I noticed this species at the beginning of the dive at site 48 situated at Star Harbour at the south-eastern end of Makira. It was among a large, mixed aggregation of cardinalfishes that were hovering above a clump of boulders on a semi-sheltered outer reef slope at a depth of 25 m. I realized immediately it was something special and therefore employed rotenone to collect about 10 specimens. Close examination in my laboratory back in Perth revealed that it is an undescribed species closely related to *Apogon lineomaculatus* Allen & Randall, which is endemic to the Lesser Sunda Islands of Indonesia. The Indonesian fish is characterized by a prominent black mid-lateral stripe and fainter vertical bars on the lower half of the body. The new species has a very similar shape, but lacks both of these distinct colour features.
2. ***Dunckerocampus naia*** – This is a small, delicate pipefish I recently described (with Rudie Kuiter). In fact, the manuscript is still in press and hopefully there is still time to add the Solomons specimen. It is apparently widespread, but only two other specimens are known, one from Fiji and another from north-eastern Kalimantan. The Solomons specimen was caught by hand in 30 m in a small crevice on a vertical slope at site 36 (Uepi Point, New Georgia Group).
3. ***Meiacanthus crinitus* –** This fang-blenny was previously thought to be endemic to the Raja Ampat Islands and therefore the Solomons record represents a considerable range extension. It is a distinct fish characterised by a trio of alternating black and white stripes. Males have a very lunate caudal fin with curious filamentous extensions of the central caudal rays. I collected 4 specimens from site 14 (Isabel), but it was also seen at sites on New Georgia, Guadalcanal, and Makira.

4. ***Chaetodon burgessi*** **–** This distinctive butterflyfish is known only from a few locations and therefore the Solomon Islands sightings are significant. It was previously recorded from Palau (type locality), New Britain, Flores, Sulawesi, Sipadan Island (Sabah), Philippines, and Pohnpei. Three individuals were seen during the REA, one at site 39 (Minjanga I., New Georgia Group) and a pair at site 41 (Kovilok I., Russell Islands). The typical habitat consists of nearly vertical outer reef slopes at depths below 30-40 m.
5. ***Pterois mombasae*** **–** The Solomons sighting of this species on the last dive of the survey (site 66, north-western Guadalcanal) represents the first record in the Pacific. A single individual was photographed in 12 m depth. The species ranges widely in the Indian Ocean and is also known from southern Indonesia as far east as Flores.

Table 7. New distribution records for the Solomon Islands.

Family	Species	General location
Holocentridae	*Myripristis botche*	Isabel I.
Holocentridae	*Myrpristis hexagona*	widespread
Holocentridae	*Sargocentron rubrum*	Tulaghi Harbour
Syngnathidae	*Dunckerocampus naia*	Uepi Pt, New Georgia
Scorpaenidae	*Pterois mombasae*	NW Guadalcanal
Serranidae	*Cephalopholis polleni*	Russell Is.
Serranidae	*Epinephelus coioides*	Choiseul
Serranidae	*Pseudanthias hutomoi*	Shortland Is.
Pseudochromidae	*Pseudoplesiops knighti*	Bio I. & Alite Reef
Plesiopidae	*Steeneichthys plesiopsus*	Roviana Lagoon, New Georgia
Opistognathidae	*Opistognathus* sp.	Isabel & Shortland Is.
Apogonidae	*Apogon* n. sp.	Star Harbour, Makira
Apogonidae	*Apogon chrysotaenia*	Emerald Entrance, Choiseul
Apogonidae	*Apogon gilberti*	New Georgia
Apogonidae	*Apogon hoeveni*	Isabel, Choiseul, and New Georgia
Apogonidae	*Apogon rhodopterus*	Arnavon Is. & New Georgia
Apogonidae	*Cheilodipterus alleni*	widespread
Lutjanidae	*Lutjanus mizenkoi*	Shortland Is.
Lutjanidae	*Lutjanus timorensis*	Star Harbour, Makira
Lutjanidae	*Paracaesio sordidus*	Bio I.
Chaetodontidae	*Chaetodon burgessi*	New Georgia & Russell Is.
Pomacentridae	*Pomacentrus albimaculus*	widespread
Pomacentridae	*Pomachromis richardsoni*	Choiseul
Labridae	*Bodianus bimaculatus*	widespread
Labridae	*Cirrhilabrus condei*	widespread
Labridae	*Halichoeres minutus*	Isabel & New Georgia
Labridae	*Pseudocheilinops ataenia*	widespread
Blenniidae	*Ecsenius bicolor*	widespread
Blenniidae	*Laiphognathus multimaculatus*	Tulaghi Harbour
Blenniidae	*Meiacanthus crinitus*	widespread
Gobiidae	*Bryaninops amplus*	widespread
Gobiidae	*Bryaninops loki*	widespread
Gobiidae	*Bryaninops natans*	Shortland Is. & New Georgia
Gobiidae	*Bryaninops yongei*	widespread

Family	Species	General location
Gobiidae	*Eviota distigma*	Alite Reef
Gobiidae	*Eviota cometa*	Roviana Lagoon, New Georgia
Gobiidae	*Eviota sparsa*	Star Harbour, Makira
Gobiidae	*Gobiodon acicularis*	Russell Is.
Gobiidae	*Oplopomops diacanthus*	New Georgia
Gobiidae	*Pleurosicya boldinghi*	Isabel
Gobiidae	*Pleurosicya elongata*	widespread
Gobiidae	*Pleurosicya micheli*	Roviana Lagoon New Georgia
Gobiidae	*Sueviota lachneri*	Alite Reef
Ptereleotridae	*Ailiops novaeguineae*	widespread
Siganidae	*Siganus punctatissimus*	widespread
Acanthuridae	*Acanthurus fowleri*	widespread
Acanthuridae	*Naso minor*	widespread

OBSERVATIONS OF COMMERCIAL SPECIES

Separate data regarding commercially valuable species were gathered by the reef survey team and are reported (see *Fisheries Resources: Food and Aquarium Fishes*, this report), but the following general comments pertain to the 65 sites where fish species inventories were conducted. Large fishes were generally scarce, especially coral trout, large gropers, and sharks. The only large serranid that was seen regularly was *Plectropomus oligocanthus*. Occasional small groups of large sweetlips (*Plectorhinchus*) were encountered and an aggregation of about 40 *P. vittatus* was encountered at site 65. Based on this evidence and brief visits to a few local fish markets, there appears to be signs of over-fishing, especially for the larger species.

Underwater observations of Napoleon Wrasse, a conspicuous indicator of fishing pressure, show that it is probably moderately exploited, certainly not as heavily as in Indonesia or the Philippines, but more than at Milne Bay Province in PNG (Table 8). The species appears to reach the zenith of its abundance in the Central Pacific in uninhabited areas such as the Phoenix Islands. During the fish inventory dives at the Solomons I encountered 56 individuals, with an estimated average total length of 64 cm. Most were solitary fish or occasionally loose pairs were sighted. The exception was site 14 (near Malaghara I., NE tip of Isabel) where 10 juveniles (25-35 cm) were observed. The latter sighting provides evidence for the importance of sheltered inshore reefs with mangrove shorelines as nursery areas for this species.

Table 8. Frequency of Napoleon Wrasse (*Cheilinus undulatus*) for various locations in the Indo-Pacific.

Location	No. sites where seen	% of total sites	No. seen
Solomon Islands REA 2004	**31**	**47.69**	**56**
Phoenix Islands 2002	47	83.92	412
Milne Bay, PNG – 2000	28	49.12	90
Milne Bay, PNG – 1997	28	52.83	85
Raja Ampat Islands – 2002	9	18.0	14
Raja Ampat Islands – 2001	7	15.55	7
Togean/Banggai Islands – 1998	6	12.76	8
Weh Island, Sumatra – 1999	0	0.00	0
Calamianes Is., Philippines – 1998	3	7.89	5

Conservation Recommendations

The main reason for the wealth of marine diversity in the Solomon Islands is the excellent variety of marine habitats. Virtually every situation is represented from highly protected, silt-laden embayments around the larger islands to clear-water oceanic atolls situated well offshore. The real key to protecting the reef resources of the Solomons is to establish a network of MPA's that capture a representative cross-section of the main habitat types, with special attention to degree of exposure from wind and waves, substrate type, and depth. While it is seldom possible to capture all the main variables within a single MPA, there is plenty of scope in the Solomons to create an effective network. I was particularly impressed with the potential of the following sites, but there are plenty of alternatives that are not mentioned. Two key areas that were not surveyed during the present survey, Rennell Island and Ontong Java Atoll, possess special environmental features, and need to be assessed in future. It would appear that both areas would feature prominently within a national network of MPAs.

Potential MPA sites based on fish community structure and physical attributes

1. **Arnavon Islands –** The Arnavon Group is currently a marine conservation area. Although it was established to protect an important turtle-nesting area, it also harbours an impressive fish community. Of added interest is the brackish lagoon near the research station, which apparently has a more or less permanent population of milkfish (*Chanos chanos*) and several other species. It would be advisable to conduct a comprehensive fish survey at the Arnavons as no doubt the resulting list would be impressive and further justify the ongoing conservation activities.

2. **Haliuna Bay and vicinity** – This location situated on Fauro Island in the Shortlands, supported a very diverse fish community despite its very sheltered position. Obviously the bay is well flushed. There is a good cross section of habitat within the bay including mangrove shore, seagrass beds, shallow reef flat, rich coral areas, and an abrupt slope to relatively deep water. The bay is uninhabited and the surrounding mountainous slopes provide a spectacular setting. There would also be scope at this location to encompass the more exposed marine habitats, including the outer reef environment, that lie just outside the bay.

3. **Njari Island, Gizo** – This is truly a world-class diving site and a prime location for an MPA. I recorded the world's fourth highest total number of reef fishes for a single dive at this location (Table 9). It has all the ingredients for a prime site including strong current flushing, steep outer reef dropoff, and a sheltered reef near shore interspersed with areas of clean-sand. The island is uninhabited and would be an excellent site for a field station. There appears to be considerable scope for marine conservation in the general vicinity, with many excellent reefs in the area as well as a few small islands that are similar to Njari.

4. **Marau Sound** – I was highly impressed with the conservation potential of this extensive, picturesque lagoonal system at the southern tip of Guadalcanal. We only spent one day here and I had a strong feeling that several days would be required to adequately assess its conservation potential. There is an excellent variety of reef habitats from sheltered bays to exposed outer reefs. Of special interest are the numerous, variable-sized islands scattered across the sound. The human population is relatively sparse and the local community is used to being involved in conservation projects as the Sound is the site of a *Tridacna* grow-out experiment.

5. **Makira Harbour** – The west coast of Makira was one of the most scenic areas visited during the survey, and the Makira Harbour area in particular appears to have excellent potential as a marine conservation site. There is an extensive network of highly sheltered bays as well as ample outer reef habitat. Any MPA that is established in this area would need to include

adjacent forestland in order to fully protect the marine environment. This is especially important as it appears that Makira is being targeted by logging operations.

6. **Three Sisters Islands** – Some of the best underwater conditions were encountered off Malaupaina Island, including excellent visibility and a wealth of outer reef fishes. More survey work is needed but the Three Sisters appears to have excellent MPA potential, providing a prime example of an offshore island system with minimal terrestrial influence. The islands are very sparsely populated and Malaupaina has an extensive shallow lagoon that is almost entirely land-locked.

7. **Leli Island** – Lying off the north-eastern coast of Malaita, Leli Island, has a unique "half-atoll" structure featuring a well-sheltered lagoon with mangroves and fringing reef, and a very interesting complex of outer reefs offering all degrees of exposure. Water clarity on outer reef dives was excellent. The island does not appear to support a permanent human population, only sporadic fishing camps.

8. **North-western Isabel** – The general area around Kia Village provides an excellent variety of well-flushed sheltered reef habitats and extensive mangrove environment. It was perhaps the best example of this sort of habitat in the entire Solomons. The mangrove-reef habitat, although relatively poor for fish diversity is nevertheless an important one, and vital for many commercial species, for example snappers and Napoleon Wrasse. Therefore its inclusion in any MPA network is essential

Table 9. G. Allen's 12 all-time best dive sites for fish diversity.

Rank	Location	No. spp.
1	Wambong Bay, Kofiau, Raja Ampat Is.	284
2	Kri Island, Raja Ampat Is.	283
3	SE of Miosba I., Fam Is., Raja Ampat Is.	281
4	**Njari Island, Gizo I., Solomon Is.**	**279**
5	Watjoke Island, off SE Misool, Raja Ampat Is.	275
6	Boirama Island, MBP, PNG	270
7	Irai Island, Conflict Group, MBP, PNG	268
8	Dondola Island, Togean Is., Indonesia	266
9	Keruo Island, Fam Is., Raja Ampat Is.	263
10	Pos II Reef, Menjangan I., Bali, Indonesia	262
11	Kalig Island, off SE Misool, Raja Ampat Is.	261
12	Equator Islands, Raja Ampat Is.	258

References

Allen, G. R. 1991. Damselfishes of the world. Aquarium Systems, Mentor, Ohio.

Allen, G. R. 1993. Reef fishes of New Guinea. Christensen Research Institute, Madang, Papua New Guinea Publ. No.8.

Allen, G. R. 1998. Reef and shore fishes of Milne Bay Province, Papua New Guinea. In: Werner, T. B. and G. R. Allen (eds.). A rapid biodiversity assessment of the coral reefs of Milne Bay Province, Papua New Guinea. RAP Working Papers 11, Washington, D.C.: Conservation International. Pp. 39-49, 67-107.

Allen, G. R. 2001a. Chapter 4. Reef of the Togean and Banggai Islands, Sulawesi, Indonesia. In: Allen, G.R., and S. McKenna (eds.). A Marine Rapid Assessment of the Togean and Banggai Islands, Sulawesi, Indonesia. RAP Bulletin of Biological Assessment 20, Conservation International, Washington, DC.

Allen, G. R. 2001b. Reef and Shore Fishes of the Calamianes Islands, Palawan Province, Philippines. In: Werner, T.B., G.R. Allen , and S. McKenna (eds.). A Rapid Marine Biodiversity Assessment of the Calamianes Islands, Palawan Province, Philippines. Bulletin of the Rapid Assessment Program 17, Conservation International, Washington, DC.

Allen, G. R. 2001c. Two new species of cardinalfishes (Apogonidae) from the Raja Ampat Islands, Indonesia. Aqua, J. Ichthy. Aquat. Biol. 4 (4): 143-149.

Allen, G. R. 2001d. Description of two new gobies (*Eviota*, Gobiidae) from Indonesian seas. Aqua, J. Ichthy. Aquat. Biol. 4 (4): 125-130.

Allen, G. R. 2002. Chapter 3. Reef fishes of the Raja Ampat Islands, Papua Province, Indonesia. In: McKenna, S., G. R. Allen, and S. Suryadi (eds.). A Marine Rapid Assessment of the Raja Ampat Islands, Papua Province, Indonesia. RAP Bulletin of Biological Assessment 22, Conservation International, Washington, DC.

Allen, G. R. 2003. Reef Fishes of Milne Bay Province, Papua New Guinea. In: Allen, G.R., J.P. Kinch, S.A. McKenna, and P. Seeto (eds.) A Rapid Marine Biodiversity Assessment of Milne Bay Province, Papua New Guinea – Survey II (2000). RAP Bulletin of Biological Assessment 29, Conservation International, Washington, DC.

Allen, G. R. and M. Adrim. 2003. Coral reef fishes of Indonesia. Zool. Stud. 42(1): 1-72.

Eschmeyer, W. N. (ed.). 1998. Catalog of Fishes. Vols. 1-3. California Academy of Sciences, San Francisco.

Fowler, H.W. 1928. The fishes of Oceania. Mem. Bishop Mus. 10: 1-540.

Fowler, H.W. 1934. The fishes of Oceania. Supplement II. Mem. Bishop Mus. 11(6): 385-466.

Günther, A. 1873. Reptiles and fishes of the South Sea Islands. In: Brenchley, J. L. Jottings during the cruise of H. M. S. Curaçao among the South Sea Islands in 1865. Cruise Curaçao: 1-487, Pls. 1-59.

Herre, A.W. 1931. A check list of fishes from the Solomon Islands. J. Pan-Pacific Res. Instit., 6(4):4-9.

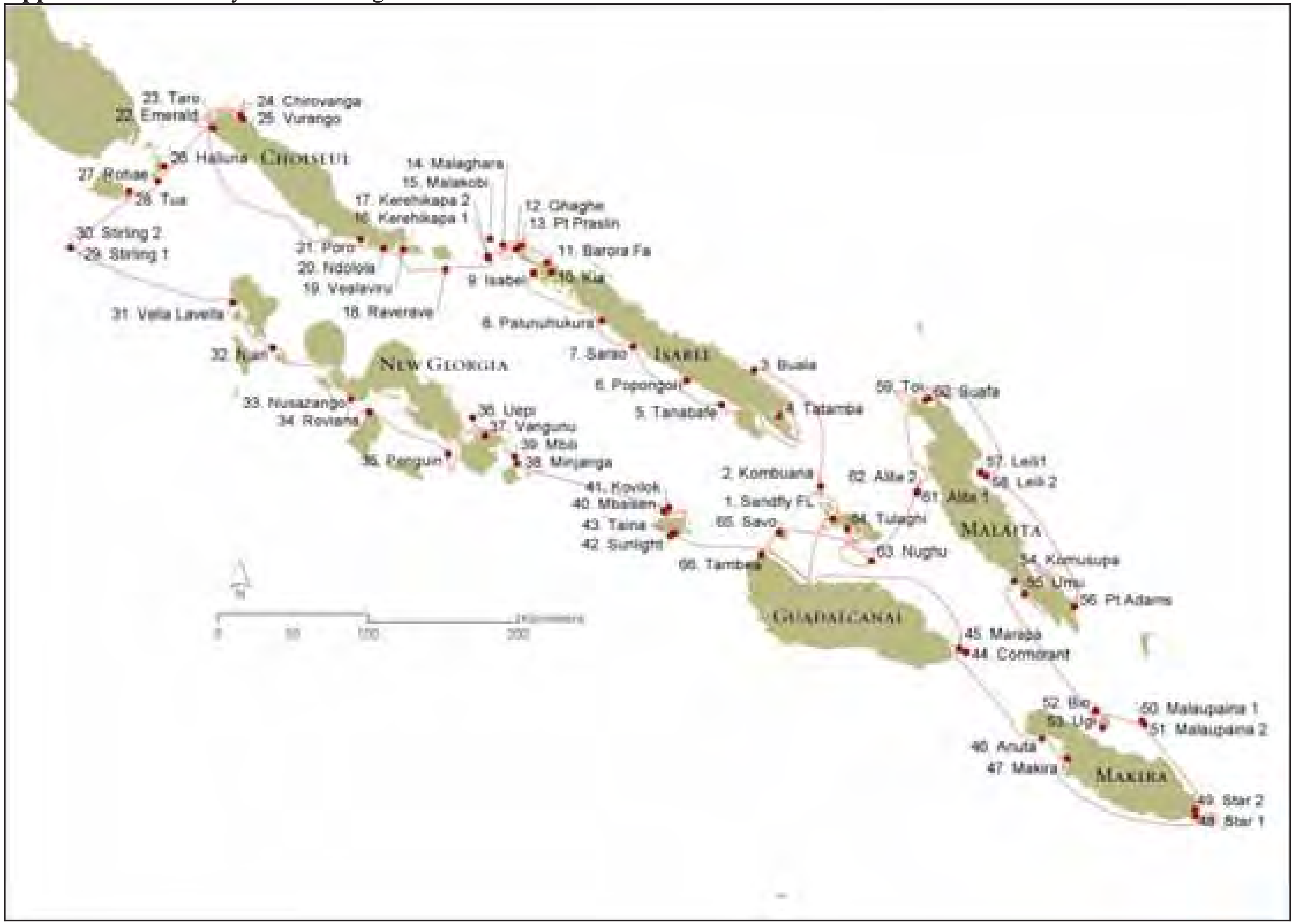
Herre, A.W. 1936. Fishes of the Crane Pacific Expedition. Zool. Ser. Field Mus. Nat. Hist. 21, publication 353: 1-472, 50 figs.

Myers, R. F. 1989. Micronesian reef fishes. Coral Graphics, Guam.

Randall, J. E., G. R. Allen, and R. C. Steene. 1990. Fishes of the Great Barrier Reef and Coral Sea. Crawford House Press, Bathurst (Australia).

Seale, A. 1935. The Templeton Crocker Expedition to western Polynesia and Melanesian islands, 1933. Proc. Cal. Acad. Sci. Fourth Series, 21(27): 337-378.

Appendix 1. Full study area showing all numbered locations.



Appendix 2. Summary of Sites (colour highlights refer to three main habitat types: yellow = sheltered reefs; turquoise = exposed outer reef; pink = moderately exposed)

Site No.	Date	ISLAND	SITE NAME	Time (mins)	Depth range	General habitat	Total Spp.
1	13/05/2004	Florida Islands	Sandfly FL	110	0-33	Sheltered inshore reef	196
2	13/05/2004	Florida Islands	Kombuana	70	1-30	Outer reef	174
3	14/05/2004	Isabel	Buala	65	5-33	Outer reef	147
4	14/05/2004	Isabel	Tatamba	100	0-30	Sheltered bay	102
5	15/05/2004	Isabel	Tanabafe	65	1.5-39	Outer reef	153
6	15/05/2004	Isabel	Popongori	75	1.5-26	Sheltered fringing	148
7	16/05/2004	Isabel	Sarao	70	2.5-43	Outer reef	157
8	16/05/2004	Isabel	Palunuhukura	165	1-26	Sheltered bay	219
9	17/05/2004	Isabel	Isabel	80	1-30	Sheltered passage	177
10	17/05/2004	Isabel	Kia	60	0-25	Channel with strong current	160
11	17/05/2004	Isabel	Barora Fa	85	1-34	Sheltered fringing	220
12	18/05/2004	Isabel	Ghaghe	95	1-15	Sheltered passage	140
13	18/05/2004	Isabel	Pt Praslin	90 (31.25	0-32	Sheltered fringing	177
14	19/05/2004	Isabel	Malaghara	150	0-15	Sheltered inlet	144
15	19/05/2004	Isabel	Malakobi	75	2-24	Semi-exposed passage	176
16	20/05/2004	Arnavon Islands	Kerehikapa 1	90	1-31	Lagoon entrance	203
17	20/05/2004	Arnavon Islands	Kerehikapa 2	90	1-30	Outside, but lagoonal habitat	172
18	21/05/2004	Choiseul	Raverave	90	0-31	Outer island fringing	218
19	21/05/2004	Choiseul	Vealaviru	90	1-18	Sheltered inshore	116
20	22/05/2004	Choiseul	Ndolola	80	10-24	Sheltered bay	157
21	22/05/2004	Choiseul	Poro	90	0-40	Semi-exposed fringing reef	223
22	23/05/2004	Choiseul	Emerald	120	1-34	Outer pass	240
23	23/05/2004	Choiseul	Taro	105	3-28	Inner pass	160
24	24/05/2004	Choiseul	Chirovanga	75	2-45	Exposed outer reef	198
25	24/05/2004	Choiseul	Vurango	90	0-20	Sheltered lagoon	149
26	25/05/2004	Shortland Islands	Haliuna	80	0-40	Sheltered bay	198
27	25/05/2004	Shortland Islands	Rohae	65	2-50	Exposed outer reef	198
28	26/05/2004	Shortland Islands	Tua	90	1-18	Small island fringing reef with sand and bommies	229
29	26/05/2004	Shortland Islands	Stirling 1	90	0-42	Outer reef	210
31	27/05/2004	New Georgia	Vella Lavella	80	2-42	Outer reef	189
32	27/05/2004	New Georgia	Njari	120	1-45	Outer reef	279
33	29/05/2004	New Georgia	Nusazango	90	0-20	Sheltered bay	153
34	29/05/2004	New Georgia	Roviana	80	1-50	Passage and dropoff	232
35	30/05/2004	New Georgia	Penguin	90	0-19	Sheltered fringing reef	166
36	31/05/2004	New Georgia	Uepi	90	0-52	Sheltered outer reef	234
37	31/05/2004	New Georgia	Vangunu	90	3-20	Sheltered lagoon reef	100
38	1/06/2004	New Georgia	Minjanga	90	0-50	Sheltered passage	233
39	1/06/2004	Russell Islands	Mbili	80	0-65	Sheltered outer reef drop-off	228

Site No.	Date	ISLAND	SITE NAME	Time (mins)	Depth range	General habitat	Total Spp.
40	2/06/2004	Russell Islands	Mbaisen	100	2-40	Sheltered pass	155
41	2/06/2004	Russell Islands	Kovilok	65	0-50	Sheer outer wall	152
42	3/06/2004	Russell Islands	Sunlight	75	0-42	Sheltered pass	177
43	3/06/2004	Guadalcanal	Taina	70	3-42	Island fringing reef	202
44	5/06/2004	Guadalcanal	Cormorant	90	2-44	Outer reef passage	235
45	5/06/2004	Makira	Marapa	120	1-40	Sheltered bay	190
46	6/06/2004	Makira	Anuta	80	1-36	Outer reef w/Halimeda	164
47	6/06/2004	Makira	Makira	100	1-15	Sheltered fringing reef	113
48	7/06/2004	Makira	Star 1	80	1-36	Semi-sheltered outer reef	196
49	7/06/2004	Three Sisters Islands	Star 2	70	1-30	Sheltered passage	144
50	8/06/2004	Three Sisters Islands	Malaupaina 1	85	1-45	Outer platform	189
51	8/06/2004	Makira	Malaupaina 2	165	1-42	Leeward outer reef	243
52	9/06/2004	Makira	Bio	90	1-35	Leeward outer reef	255
53	9/06/2004	Malaita	Ugi	80	1-40	Leeward outer reef	201
54	10/06/2004	Malaita	Komusupa	100	1-52	Outer to inner Passage	241
55	10/06/2004	Malaita	Umu	90	0-15	Lagoon fringing reef around mangrove islet	144
56	11/06/2004	Malaita	Pt Adams	80	1-32	Inner passage grading to lagoonal	210
57	12/06/2004	Malaita	Leili1	90	2-36	Well-sheltered outer reef slope	197
58	12/06/2004	Malaita	Leili 2	70	3-40	Outer reef	181
59	13/06/2004	Malaita	Toi	85	3-29	Outer passage	203
60	13/06/2004	Indispensible Strait	Suafa	85	2-50	Fringing reef in large bay	191
61	14/06/2004	Indispensible Strait	Alite 1	75	4-50	Steep outer slope	206
62	14/06/2004	Nughu Island	Alite 2	80	6-25	Lagoonal sand patches	126
63	15/06/2004	Florida Islands	Nughu	85	2-40	Outer reef slope	200
64	15/06/2004	Savo Island	Tulaghi	90	0-25	Sheltered fringing reef & mangrove shore	140
65	16/06/2004	Guadalcanal	Savo	85	1-35	Outer reef gradual sloping	203
66	16/06/2004	Guadalcanal	Tambea	90	2-36	Outer reef, rubble slope	176

Note: Site 30 is missing from the table above. This was done to allow for consistency in site names and locations between this report and the Coral Communities and Reef Health report.

Note: Latitude and longitude data is not included, but can be found in the chapter provided by Emre Turak. The following table includes this information for the six sites that were omitted from Turak's coverage when he was forced out of the water for a few days due to an ear problem.

Site no.	Latitude	Longitude	Site no.	Longitude	Latitude
57	8° 45.5'S	160° 59.5'E	60	8° 18.8' S	160° 40.7'E
58	8° 46.7'S	161° 01.5'E	61	8° 52.746'S	160° 36.615'E
59	8° 19.332'S	160° 39.577'E	62	8° 52.4'S	160° 36.6'E

Appendix 3. List of the Reef Fishes of the Solomon Islands

Compiled by Gerald R. Allen

This list includes all species of shallow (to 60 m depth) coral reef fishes known from the Solomon Islands at 20 June 2004. The list is based on the following sources:
1) Results of the 2004 TNC REA; 2) examination of specimens at the United States National Museum, Smithsonian Institution (Washington D.C., USA); 3) and various literature records, most of which appear in relatively recent generic and family revisions. The family classification used here is mainly based on Eschmeyer's Catalog of Fishes (1998).

Terms relating to relative abundance are as follows: *Abundant* **-** Common at most sites in a variety of habitats with up to several hundred individuals being routinely observed on each dive. *Common* **-** seen at the majority of sites in numbers that are relatively high in relation to other members of a particular family, especially if a large family is involved. *Moderately common* **-** not necessarily seen on most dives, but may be relatively common when the correct habitat conditions are encountered. *Occasional* **-** infrequently sighted and usually in small numbers, but may be relatively common in a very limited habitat. *Rare* **-** less than 10, often only one or two individuals seen on all dives

Note: Site 30 was not surveyed for fishes.

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
ORECTOLOBIDAE			
Nebrius ferrugineus (Lesson, 1830)	28	Rare, one seen by B. Kahn.	1-70
HEMISCYLLIDAE			
Chiloscyllium indicum (Gmelin, 1789)		Günther, 1873	
CARCHARHINIDAE			
Carcharhinus albimarginatus (Rüppell, 1837)	35	Rare, one seen by B. Kahn.	14-40
C. amblyrhynchos (Bleeker, 1856)	5, 7, 27, 28, 31, 32, 35, 36, 38, 52, 53, 54, 57, 59, 63, 65	Occasional, infrequently sighted during survey, three seen at site 27.	0-100
C. melanopterus (Quoy and Gaimard, 1824)	7, 17, 20, 22, 27, 57, 59	Occasional. Four adults seen at site 59.	0-10
Galeocerdo cuvier (Péron and Lesueur, 1822)		Compagno, 1984	0-150
Negaprion acutidens (Rüppell, 1835)	28	Rare, one seen by B. Kahn.	
Triaenodon obesus (Rüppell, 1835)	11, 22, 24, 27, 32, 34, 36, 38, 43, 44, 45, 52, 59, 61, 65	Occasional, usually seen on outer slopes.	
DASYATIDIDAE			
Dasyatis kuhlii (Müller and Henle, 1841)	23, 28	Rare.	2-50
Himantura granulata (Macleay, 1883)	24	Rare, one seen in 20 m on outer reef.	1-85
Taeniura lymma (Forsskål, 1775)	28, 45, 47, 52, 56	Rare, only five individuals observed.	2-30
T. meyeni (Müller and Henle, 1841)	15	Rare, a single individual observed.	1-200
MYLIOBATIDAE			
Aetobatus maculatus (Gray, 1832)	7, 35	Rare, only two seen.	1-25
A. narinari (Euphrasen, 1790)	7, 18, 22, 23, 34, 35, 48, 61	Occasional, usually on outer slopes. Three seen at site 22.	0-40
MOBULIDAE			
Manta birostris (Walbaum, 1792)		None seen during survey, but no doubt occurs in Solomons.	0-100
Mobula tarapacana (Philippi, 1892)	28	Several seen by B. Kahn.	0-40
MORINGUIDAE			
Moringua sp.		USNM collection.	1-10
CHLOPSIDAE			
Kaupichthys brachychirus Schultz, 1953		USNM collection.	5-25
MURAENIDAE			
Anarchias allardicei Jordan and Starks, 1906		USNM collection.	1-30
Echidna nebulosa (Thünberg, 1789)		USNM collection.	1-10
E. polyzona (Richardson, 1845)		USNM collection.	1-15
Gymnothorax buroensis (Bleeker, 1857)		USNM collection.	1-25
G. chilospilus Bleeker, 1865		Seale, 1935	
G. fimbriatus (Bennett, 1831)		USNM collection.	0-30
G. flavimarginatus (Rüppell, 1828)	50	Rare, only 1 seen.	1-150
G. javanicus (Bleeker, 1865)	13, 32, 35, 54, 59	Rare, only five seen during survey. Photographed.	0.5-50
G. margaritophorus Bleeker, 1865	50	One collected with rotenone.	1-40
G. melatremus Schultz, 1953	52, 61	Two collected with rotenone.	5-30

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
G. pictus (Ahl, 1789)		USNM collection.	0-3
G. polyuranodon (Bleeker, 1853)		USNM collection.	0-2
G. richardsoni (Bleeker, 1852)		USNM collection.	0-5
G. robinsi Böhlke, 1997		USNM collection.	0-30
G. undulatus (Lacepède, 1803)		Günther, 1873	
G. zonipectus Seale, 1906		USNM collection.	8-45
Pseudechidna brummeri (Bleeker, 1859)		USNM collection.	1-10
Rhinomuraena quaesita Garman, 1888	66	Rare, only 1 seen. Photographed.	1-50
OPHICHTHIDAE			
Brachysomophis henshawi Jordan and Snyder, 1904		McCosker and Randall, 2001	1-15
Leiuranus semicinctus (Lay and Bennett, 1839)		Seale, 1935	
Muraenichthys gymnopterus (Bleeker, 1853)		Seale, 1935	
M. macropterus Bleeker, 1857	61	One collected with rotenone.	
Myrichthys colubrinus (Boddaert,1781)		USNM collection.	0-8
M. maculosus (Cuvier, 1816)		USNM collection.	0-30
Schultzidia retropinnis (Fowler, 1934)		USNM collection.	1-20
CONGRIDAE			
Ariosoma scheelei (Strömman, 1896)		USNM collection.	0-5
Gorgasia barnesi Robison and Lancraft, 1984 fine spotting		Castle and Randall, 1995	depth
G. maculata Klausewitz and Eibesfeldt, 1959	18, 24, 34, 44, 54, 59	Occasional, but locally common.	20-50
Heteroconger cobra Bohlke and Randall, 1981		Castle and Randall, 1995Type loc. is 7 mi. W. of Honiara in 30-36 m near wreck of Jap. transport.	30-40
H. haasi (Klausewitz and Eibl-Eibesfeldt, 1959)	18, 28, 34, 43, 56, 59, 62, 65	Occasional, but locally abundant. Photographed.	3-45
CLUPEIDAE			
Spratelloides delicatulus (Bennett, 1832)	1, 16, 17, 22, 38	Occasional, hundreds seen schooling near surface at several sites.	0-1
CHANIDAE			
Chanos chanos (Forsskal, 1775)	15, 28	Rare, a few large adults sighted.	1-20
PLOTOSIDAE			
Plotosus lineatus (Thünberg, 1787)	15, 28, 49, 55, 56	Occasional, several schools of juveniles containing up to about 100 fishes observed. Photographed.	1-20
SYNODONTIDAE			
Saurida gracilis (Quoy and Gaimard, 1824)	11, 45, 64	Rarely sighted, but difficult to detect.	1-30
Synodus dermatogenys Fowler, 1912	1, 6, 9, 12, 13, 16, 21, 23, 25, 28, 31, 32, 35, 37, 43-45, 54, 59, 65, 66	Moderately common, solitary individuals usually seen resting on dead coral or rubble. Photographed.	1-25
S. jaculum Russell and Cressy, 1979	24, 28, 32, 36, 48, 51	Occasional on rubble bottoms.	10-50
S. variegatus (Lacepède, 1803)	1, 6, 8, 26, 39, 42, 44, 46, 48, 56, 58	Occasional, solitary individuals or pairs usually seen resting on live coral. Photoraphed.	5-50
Trachinocephalus myops (Forster, 1801)		Seale, 1906	
OPHIDIIDAE			
Brotula multibarbata (Temminck and Schlegel, 1846)		USNM collection.	5-150
CARAPIDAE			
Encheiliophis homei (Richardson, 1844)		USNM collection.	2-30
BYTHITIDAE			
Brosmophyciops pautzkei Schultz, 1960		USNM collection.	5-55
Ogilbia sp.			0-5
ANTENNARIIDAE			
Antennarius analis (Schultz, 1957)		Pietsch and Grobecker, 1987	
A. biocellatus Cuvier, (1817)		Pietsch and Grobecker, 1987	
A. coccineus (Lesson, 1830)		Pietsch and Grobecker, 1987	
A. comersonii (Latreille, 1804)		Pietsch and Grobecker, 1987	1-40
A. dorehensis Bleeker, 1859		Pietsch and Grobecker, 1987	
A. nummifer Cuvier, (1817)		USNM collection.	
A. pictus (Shaw and Nodder, 1794)		USNM collection.	1-15
A. striatus (Shaw, 1794) *Antennatus tuberosus* Cuvier, (1817)		Pietsch and Grobecker, 1987 Pietsch and Grobecker, 1987	10-200
GOBIESOCIDAE			
Diademichthys lineatus (Sauvage, 1883)	45, 55, 64	Generally rare, but moderately common at site 64 where *Diadema* abundant.	3-20
MUGILIDAE			
Crenimugil crenilabis (Forsskål, 1775)	21, 41	Rare, two small schools seen.	0-4
Liza vaigiensis (Quoy and Gaimard, 1825)	32, 40	Rare, two schools seen. No doubt abundant in seagrass/estuarine habitat.	0-3
Valamugil seheli (Forsskål, 1775)		Fowler, 1928	

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
ATHERINIDAE			
Atherinomorus endrachtensis (Quoy and Gaimard, 1825)		USNM collection.	0-2
A. duodecimalis (Valenciennes, 1835)		USNM collection.	0-2
A. lacunosus (Forster, 1801)	1, 10, 21, 29, 32, 38,34	Occasional. Several large schools seen.	0-2
Hypoatherina barnesi Schultz, 1953		USNM collection.	0-2
H. ovalua (Herre, 1935)		USNM collection.	0-2
H. temminckii (Bleeker, 1853)		USNM collection.	0-2
Iso sp.		USNM collection.	0-2
Stenatherina panatela (Jordan and Richardson, 1908)	22, 39	Locally abundant at 2 sites. Collected and photographed.	0-4
BELONIDAE			
Tylosurus crocodilus (Peron and Lesueur, 1821)	1, 9, 16, 18, 24, 32, 34, 36, 39, 42, 52, 54, 56, 57	Moderately common on surfaces at several sites.	0-4
HEMIRAMPHIDAE			
Hemirhamphus far (Forsskål, 1775)		Photographed in seagrass beds by Len McKenzie.	0-2
Hyporhamphus affinis (Günther, 1866)	21, 36	Two schools seen at surface.	0-2
H. dussumieri (Valenciennes, 1846)		Herre, 1931	
Zenarchopterus dispar (Valenciennes, 1847)	10, 13, 21, 39	Common along edge of mangroves along shore at several sites. Photographed.	
Z. dunckeri Mohr, 1926		USNM collection.	
HOLOCENTRIDAE			
Myripristis adusta Bleeker, 1853	8, 23, 24, 28, 31, 36, 45, 54	Occasional, sheltering in caves and under ledges	3-30
M. amaena (Castelnau, 1873)	7, 17, 21	Rarely seen, but cryptic during day.	
M. berndti Jordan and Evermann, 1902	2, 3, 5, 13, 18, 23, 24, 29, 31, 32, 36, 38, 39, 44, 48, 51-54, 58, 59, 63, 66	Moderately common, sheltering in caves and under ledges. Most abundant at site 65.	8-55
M. botche Cuvier, 1829	11	Rare, several seen in 30 m depth.	Randall
M. hexagona (Lacepède, 1802)	6, 8, 13, 26, 55, 64	Occasional, usually in coastal areas affected by silt.	10-40
M. kuntee Valenciennes, 1831	1-3, 5, 7-11, 13, 15-17, 22-24, 25, 27-32, 34-36, 38, 39, 42-46, 48, 49, 51-63, 65, 66	Common, sheltering in caves and under ledges, but frequently exposes itself for brief periods. Photographed.	5-30
M. murdjan (Forsskål, 1775)	13, 16, 21, 29, 31, 44, 48, 59, 63	Occasional, sheltering in caves and under ledges.	3-40
M. pralinia Cuvier, 1829	8, 11, 16, 21, 29, 31, 36, 38, 39	Occasional, but shleters deep in crevices during the day.	3-40
M. trachyacron Bleeker, 1863		Randall and Greenfield, 1996	Randall
M. violacea Bleeker, 1851	1, 4, 6, 8-18, 20-39, 40, 42, 43, 45, 47-49, 52-57, 59, 60, 63	Common, most abundant squirrelfish seen in Solomons. Often seen at entrance of crevices.	3-30
M. vittata Valenciennes, 1831	21, 32, 34, 36, 38, 39, 41, 51, 52, 56, 57, 60	Moderately common, sheltering in caves and ledges on drop-offs. Photographed.	12-80
Neoniphon argenteus (Valenciennes, 1831)	1, 3, 4, 8,10, 11, 25, 33, 35, 37, 38, 40, 42, 45-47, 56, 57	Common among braching *Acropora* corals.	3-30
N. opercularis (Valenciennes, 1831)	4, 18, 33, 34, 38, 39, 44, 47, 63	Occasional. Photographed.	3-20
N. sammara (Forsskål, 1775)	7-9, 11-13, 16-18, 21-26, 28, 31, 32, 34, 35, 38, 39, 40, 42-49, 51, 53-57, 59, 60	Moderately common, usually among branches of staghorn *Acropora* coral. Especially abundant at sites 42 and 55. Photographed.	2-50
Sargocentron caudimaculatum (Rüppell, 1835)	1, 2, 3, 5, 6, 7, 11, 13, 18, 21-24, 27-32, 34, 36, 38, 39, 41-46, 48-54, 57-63, 65, 66	Common, always seen close to cover.	6-45
S. cornutum (Bleeker, 1853)	66		6-50
S. diadema (Lacepède, 1802)	1, 11, 24, 40, 45, 46, 48, 60, 62, 66	Occasional, but common at site 62. Photographed.	2-30
S. ittodai (Jordan and Fowler, 1903)		Randall, 1998	6-70
S. melanospilos (Bleeker, 1858)	66	Rare, only 2 seen. Photographed.	10-25
S. microstomus (Günther, 1859)	51, 56, 59	Rarely sighted, but nocturnal.	1-180
S. praslin (Lacepède, 1802)		Randall, 1998	2-15
S. punctatissimum (Cuvier, 1829)		Randall, 1998	0-30
S. rubrum (Forsskål, 1775)	64	Rare, only 2 seen.	
S. spiniferum (Forsskål, 1775)	9, 11, 12, 16-18, 21, 22, 24, 32, 33, 35, 36, 38, 39, 45-47, 49-54, 61, 65	Moderately common, in caves and under ledges. Photographed.	5-122
S. tiere (Cuvier, 1829)	32	Rarely seen, but nocturnal.	10-180
S. tieroides (Bleeker, 1853)	16, 29, 52, 66	Rarely seen, but nocturnal.	10-40
S. violaceus (Bleeker, 1853)	10, 25, 33, 38, 44, 45, 47, 60	Rarely seen, but cryptic during day.	3-30
PEGASIDAE			
Eurypegasus draconis (Linnaeus, 1766)		Palsson and Pietsch, 1989.	2-20
AULOSTOMIDAE			
Aulostomus chinensis (Linnaeus, 1766)	2, 3, 5, 13, 16, 18, 22, 26, 31, 32, 33, 36, 39, 41, 42, 45, 51-54, 56, 57, 60, 62, 63, 65, 66	Moderately common, but always in low numbers. Photographed.	2-122
FISTULARIIDAE			

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Fistularia commersoni Rüppell, 1835	10, 19, 28, 32, 34, 44, 52	Rarely seen.	2-128
CENTRISCIDAE			
Aeoliscus strigatus (Günther, 1860)	9	Rare, one school observed.	1-30
Centriscus scutatus (Linnaeus, 1758)	55	Rare, one school observed. Photographed.	1-30
SOLENOSTOMIDAE			
Solenostomus paradoxus (Pallas, 1770)		Orr and Fritzsche, 1993	5-25
SYNGNATHIDAE			
Bhanotia fasciolata (Dumeril, 1870)		Dawson, 1985	
Choeroichthys brachysoma (Bleeker, 1855)		Dawson, 1985	
C. sculptus (Günther, 1870)		Dawson, 1985	0-30
Corythoichthy amplexus Dawson and Randall, 1975		Dawson, 1985	8-25
C. haematopterus (Bleeker, 1851)	37, 42	Rare, only 2 seen.	1-20
C. intestinalis (Ramsay, 1881)	1, 25, 28	Rare, only 3 seen. Photographed.	1-25
C. ocellatus Herald, 1953		Dawson, 1985	1-15
Doryrhamphus excisus Kaup, 1856		Dawson, 1985	2-50
D. janssi (Herald and Randall, 1972)		Dawson, 1985	5-35
Dunckerocampus dactyliophorus (Bleeker, 1853)	64	Rare, only one seen. Photographed.	1-56
D. naia Allen and Kuiter, 2004	36	Rare, but cryptic in holes and under ledges. Only two seen.	20-40
Festucalex erythraeus (Gilbert, 1905)		Dawson, 1985	2-20
Halicampus. dunckeri (Chabanaud, 1929)		Dawson, 1985	2-20
H. macrorhynchus Bamber, 1915		Dawson, 1985	3-30
Hippocampus bargibanti Whitley, 1970		One seen by reef survey team. Probably not uncommon, but difficult to detect.	10-40
Micrognathus andersoni (Bleeker, 1858)		Dawson, 1985	2-15
M. brevirostris (Rüppell, 1838)		Dawson, 1985	2-15
Phoxocampus belcheri (Kaup, 1856)		Dawson, 1985	2-20
Phoxocampus diacanthus (Schultz, 1943)		Dawson, 1985	2-20
Siokunichthys breviceps Smith, 1963		Dawson, 1985	10-20
Syngnathoides biaculeatus (Bloch, 1785)		Dawson, 1985	0-10
SCORPAENIDAE			
Dendrochirus biocellatus (Fowler, 1935)	38	One specimen seen by B. Kahn in cave.	1-40
Pterois antennata (Bloch, 1787)	55, 66	Rare, only two seen at one site. Photographed.	1-50
P. mombasae Smith, 1957	66	Rare, only one seen. Photographed.	
P. volitans (Linnaeus, 1758)	14, 18, 24, 43, 66	Rare, except about 6 seen at sight 14. Photographed.	2-50
Scorpaenodes. guamensis (Quoy and Gaimard, 1824)		USNM collection.	0-10
S. hirsutus (Smith, 1957)	52	One collected with rotenone.	5-40
S. parvipinnis (Garrett, 1863)		USNM collection.	2-50
S. varipinnis Smith, 1957		USNM collection.	1-50
Scorpaenopsis diabolus (Cuvier, 1829)		Randall and Eschmeyer, 2001	1-70
S. papuensis (Cuvier, 1829)	45, 48, 64, 65	Rare, only 3 seen, but difficult to detect.	1-40
S. possi Randall and Eschmeyer, 2001		Randall and Eschmeyer, 2001	1-40
S. vittapinna Randall and Eschmeyer, 2001		Randall and Eschmeyer, 2001	3-40
Sebastapistes cyanostigma (Bleeker, 1856)	2, 5	Probably not uncommon, but only two seen among coral branches.	2-15
S. strongia (Cuvier, 1829)		USNM collection.	1-15
Taenianotus triacanthus (Lacepède, 1802)		Fowler, 1934	
SYNANCEIIDAE			
Inimicus didactylus (Pallas, 1769)		Fowler, 1934	
Synanceia alua Eschmeyer and Rama-Rao, 1973		USNM collection.	1-25
S. verrucosa Bloch and Schneider, 1801		Günther, 1873	
TETRAROGIDAE			
Ablabys taenianotus (Cuvier, 1829)		Seale, 1906	
PLATYCEPHALIDAE			
Cymbacephalus beauforti Knapp, 1973	39, 55	Rare, only 2 seen, but difficult to detect.	2-12
Eurycephalus otaitensis (Cuvier, 1829)	48	One collected with rotenone.	1-80
Thysanophrys arenicola (Schultz, 1966)		USNM collection.	1-15
T. celebica (Bleeker, 1854)		USNM collection.	1-20
T. chiltoni Schultz, 1966		USNM collection.	1-80
SERRANIDAE			
Aethaloperca rogaa (Forsskål, 1775)	1, 13, 18, 28, 29, 32, 43, 59	Occasional.	1-55

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Anyperodon leucogrammicus (Valenciennes, 1828)	3, 5, 8, 15, 16, 18, 20, 22-24, 32, 34, 36, 39, 42-45, 50-54, 57, 58, 61, 63, 65, 66	Moderately common, although always in low numbers. Photographed.	5-50
Aporops bilinearis Schultz, 1943		USNM collection.	1-30
Belonoperca chabanaudi Fowler and Bean, 1930	38, 39, 52	Rare, a few seen in caves on drop offs.	4-45
Cephalopholis argus Bloch and Schneider, 1801	5, 6, 7, 13, 18, 21, 22, 24, 27, 34, 36, 39, 44, 46, 48, 51, 54, 65, 66	Occasional.	1-40
C. boenack (Bloch, 1790)	4, 6, 11, 16, 17, 26, 33, 37, 40	Occasional, in silty harbors and bays.	1-20
C. cyanostigma (Kuhl and Van Hasselt, 1828)	1, 3, 4, 6, 8, 9, 12-16, 18-23, 25, 26, 28, 29, 32, 34-36, 38-41, 43-45, 52-55, 58, 60-64	Moderately common in more sheltered areas. Photographed.	2-35
C. leopardus (Lacepède, 1802)	2, 5, 7, 8, 15, 17, 18, 20-24, 26-28, 32, 34-36, 38, 39, 42-45, 50-55, 57-62, 65, 66	Common. Photographed.	3-25
C. microprion (Bleeker, 1852)	1, 4, 8, 9, 11, 12, 14, 16, 17, 19, 20, 25, 26, 37, 40, 43, 45, 47, 64	Occasional on relatively silty reefs.	2-20
C. miniata (Forsskål, 1775)	1, 18, 26, 32, 36, 39, 51	Occasional, usually in areas of clear water.	3-150
C. polleni (Bleeker, 1868)	41	Rare, one seen in 40 m depth.	20-120
C. sexmaculata Rüppell, 1828	15, 18, 21, 26, 32, 34, 36, 38, 39, 41, 54, 56, 60, 61	Occasional, on ceilings of caves on steep drop-offs. Photographed.	6-140
C. sonnerati (Valenciennes, 1828)	44, 48	Rare, only 2 seen.	10-100
C. spiloparaea (Valenciennes, 1828)	5, 7, 8, 11, 16, 24, 26, 27, 28, 31, 32, 34, 36, 39, 44, 50-52, 58, 61, 65	Moderately common in deep water (below 20 m) of outer slopes.	16-108
C. urodeta (Schneider, 1801)	2, 5, 6, 7, 8, 15, 21, 22, 24, 27-32, 34, 36, 38, 39, 41-44, 46, 48-54, 57, 58, 60-63, 65, 66	Common in variety of habitats.	1-36
Cromileptes altivelis (Valenciennes, 1828)	1, 3, 36, 63	Rare only 7 seen.	2-40
Diploprion bifasciatum Cuvier, 1828	5, 33, 58, 63	Rarely seen.	2-25
Epinephelus. caeruleopunctatus (Bloch, 1790)	2, 7, 24, 31, 36, 38-40, 51, 52, 60, 63	Occasional.	5-25
E. coioides (Hamilton, 1822)	20, 23	Rare, only two seen. Kahn photo.	2-100
E. corallicola (Kuhl and Van Hasselt, 1828)	31, 44, 47, 54, 58, 60	Rare, only four individuals sighted. Photographed.	3-15
E. cyanopodus Richardson, 1846		Randall and Heemstra, 1991	
E. fasciatus (Forsskål, 1775)	2, 6, 10, 20, 35, 53	Rare, less than 10 seen.	4-160
E. fuscoguttatus (Forsskål, 1775)	8, 14, 29, 31, 32, 34, 41, 43, 58	Occasional.	3-60
E. hexagonatus (Bloch and Schneider, 1801)		Randall and Heemstra, 1991	3-10
E. macrospilos (Bleeker)		Randall and Heemstra, 1991	5-25
E. maculatus (Bloch, 1790)	1, 8, 18, 22, 44, 46, 48-50, 51, 53, 55	Occasional, around rocky outcrops on sandy slopes.	10-80
E. melanostigma Schultz, 1953	48, 51	Rare, only 2 seen.	
E. merra Bloch, 1793	1, 6, 8, 10, 11, 15-18, 20-22, 26, 28, 32, 33, 35, 42, 43, 45-49, 51-56, 64	Moderately common in shallow areas. Photographed.	1-15
E. ongus (Bloch, 1790)	8, 11, 28, 34, 40, 64	Rare, less than 10 seen.	5-25
E. polyphekadion (Bleeker, 1849)	7, 21, 54, 61	Rare, only 4 seen.	2-45
E. spilotoceps Schultz, 1953	21, 50	Rare, only 2 seen.	1-15
E. tauvina (Forsskål, 1775)		Randall and Heemstra, 1991	
E. undulosus (Quoy and Gaimard, 1824)		Randall and Heemstra, 1991	10-90
Grammistes sexlineatus (Thünberg, 1792)	22	Rare, only one seen.	0.5-30
Grammistops ocellatus Schultz, 1953	61	One collected with rotenone.	5-30
Gracila albimarginata (Fowler and Bean, 1930)	7, 8, 13, 18, 22, 27, 29-32, 34, 36, 39, 41, 43, 50-54, 58, 60, 61	Occasional on outer slopes.	6-120
Liopropoma mitratum Lubbock and Randall, 1978		Randall and Taylor, 1988	3-46
L. multilineatum Randall and Taylor, 1988		Randall and Taylor, 1988	
L. susumi (Jordan and Seale, 1906)		Randall and Taylor, 1988	2-34
Luzonichthys waitei (Fowler, 1931)	32, 36, 43	Rarely seen, but locally abundant at 3 sites. Photographed.	10-55
Plectranthias longimanus (Weber, 1913)		Randall, 1980	6-75
Plectropomus areolatus (Rüppell, 1830)	11, 13, 36, 54, 56	Rare, less than 10 seen.	2-30
P. laevis (Lacepède, 1802)	1, 28, 31, 34	Rare, only 5 seen.	4-90
P. leopardus (Lacepède, 1802)	1, 10, 11, 15, 16, 24, 57, 59	Occasional, mainly on outer slopes.	3-100
P. maculatus (Bloch, 1790)	8, 9, 14, 19, 20, 26, 33, 37, 40	Occasional, mainly on silty, sheltered reefs.	2-30
P. oligocanthus (Bleeker, 1854)	4, 13, 16, 31, 36, 38, 39, 41, 43, 45, 53, 54, 56, 59-61	Occasional on outer slopes and in passages. Large (1 m) fish at 13. Photographed.	4-40
Pseudanthias dispar (Herre, 1955)	28, 32, 34, 36, 43, 50, 51, 53, 60, 63, 65	Occasional and locally abundant at a few sites. Photographed.	4-40

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
P. huchtii (Bleeker, 1857)	1, 2, 22, 27-29, 32, 36, 39, 42, 43, 44, 51-54, 56, 60, 61, 63, 65, 66	Moderately common and locally abundant at a few sites. Very abundant at site 63. Photographed.	4-20
P. hutomoi (Allen and Burhanuddin, 1976)	26	Rare, aggregation of about 20 fish seen in 40 m.	30-60
P. hypselosoma Bleeker, 1878	28, 48	Rare, only a few seen at two sites.	10-40
P. lori Lubbock and Randall, 1976		USNM collection.	
P. luzonensis (Katayama and Masuda, 1983)	11	Rare, group of about 10 seen in 30 m.	12-60
P. pleurotaenia (Bleeker, 1857)	5, 7, 8, 18, 22, 24, 27, 29-32 34, 36, 39, 42-44, 50-54, 56-58, 61, 63, 65, 66	Moderately common, on outer slopes below about 20 m depth. Phtographed.	15-180
P. rubrizonatus (Randall, 1983)		Randall, 1983. Savo is type locality.	15-133
P. squamipinnis (Peters, 1855)	7, 32, 34, 36	Rare.	4-20
P. tuka (Herre and Montalban, 1927)	1, 7, 8, 13, 15, 18, 21, 23, 27, 29-32, 34, 36, 38, 39, 41-45, 50-54, 56-59, 61	Common in a variety of habitats, but usually in areas exposed to currents. Photographed.	8-25
P. smithvanizi (Randall and Lubbock, 1981*)*	29, 32, 34, 36, 39, 44, 51	Occasional aggregations seen, but abundant at site 51.	6-70
Pseudogramma polyacantha (Bleeker, 1856)	61	One collected with rotenone.	1-15
Suttonia lineata Gosline, 1960		USNM collection.	3-30
Variola albimarginata Baissac, 1953	2, 5, 6, 15, 22, 24, 27, 42-44, 50, 57, 58, 61, 63, 66	Occasional and always in low numbers.	12-90
V. louti (Forsskål, 1775)	3, 9-11, 15, 16, 23, 28, 31, 34, 36, 38, 39, 44-46, 51-53, 58	Occasional and always in low numbers.	4-150
PSEUDOCHROMIDAE			
Cypho purpurescens (De Vis, 1884)	3, 29, 31, 39, 46, 51-53, 59	Occasional at base of deep gullies and in caves. Photographed.	5-35
Pseudochromis bitaeniatus (Fowler, 1931)	11, 32, 36, 39, 54	Occasional, among crevices and ledges.	5-30
P. cyanotaenia Bleeker, 1857	44, USNM	Rare. Seen only once, but cryptic.	0-10
P. fuscus (Müller and Troschel, 1849)	1, 4, 8, 10, 12-16, 19, 20, 25, 26, 29, 33, 35, 37, 40, 45, 47, 49, 55, 57, 64	Occasional, around small coral and rock outcrops.	1-30
P. jamesi Schultz, 1943	USNM	USNM collection.	3-15
P. marshallensis (Schultz, 1953)	15, 16, 31, 32, 34, 36, 39, 43, 50, 51, 54, 56, 64, 65	Occasional under rocky overhangs. Photographed.	2-25
P. paccagnellae Axelrod, 1973	1, 6, 8, 10, 11, 13, 17, 18, 21-27, 29-32, 34, 36, 38, 39, 41, 42-44, 48-54, 56-58, 60, 61, 65, 66	Moderately common at base of steep slopes. Photographed.	6-70
P. sp. 1 (sim. to *perspicillatus*)	22	Two seen in 30 m. Possibly an undescribed species similar to *P. perspicillatus*.	5-25
P. tapeinosoma Bleeker, 1853	28	Rare. Seen only once, but cryptic.	2-60
Pseudoplesiops immaculatus Gill and Edwards, 2002		USNM collection.	
P. knighti Allen, 1987	52, 61	Two collected with rotenone.	5-35
P. typus Bleeker, 1858		USNM collection.	5-30
PLESIOPIDAE			
Belonepterygium fasciolatum (Ogilby, 1889)		USNM collection.	1-15
Plesiops cephalotaenia Inger, 1955		Mooi, 1995	0-10
P. coeruleolineatus Rüppell, 1835		Mooi, 1995	0-19
P. corallicola Bleeker, 1853		Mooi, 1995	0-3
P. verecundus Mooi, 1995		Mooi, 1995	0-10
Steeneichthys plesiopsus Allen and Randall, 1985	34	One collected with quinaldine sulphate.	3-40
CIRRHITIDAE			
Cirrhitichthys falco Randall, 1963	3, 5, 6, 8, 15, 22, 24, 27, 29, 36, 41, 42, 44, 46, 48, 52-54, 56, 57, 59, 62, 63, 65, 66	Moderately common. Photographed	4-45
C. oxycephalus (Bleeker, 1855)	5, 7, 21, 22, 27, 32, 34, 44, 36, 61, 65	Occasional. Abundant at 5.	2-40
Cyprinocirrhites polyactis (Bleeker, 1875)		Rare.	10-132
Oxycirrhitus typus Bleeker, 1857	22, 32, 36, 41	Rare, only 4 seen, usually among black coral on steep slopes.	10-100
Paracirrhites arcatus (Cuvier, 1829)	2, 3, 5, 7, 11, 13, 15, 18, 21, 22, 24, 27-32, 36, 38, 39, 41, 44, 46, 48-54, 57-61, 65, 66	Common, one of two most abundant hawkfish in Solomons, seen on regular basis, but in relatively low numbers. Photographed.	1-35
P. forsteri (Schneider, 1801)	2, 3, 5, 6-8, 11, 13, 15, 18, 21, 22, 24-28, 31, 32, 34, 36, 39, 42, 43, 44, 46, 48, 50-54, 56, 58, 59, 62, 63, 65, 66	Common, one of two most abundant hawkfish in Solomons, seen on regular basis, but in relatively low numbers. Photographed.	1-35

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
OPISTOGNATHIDAE			
Opistognathus sp. 1	6, 27	Rare, one collected with rotenone at site 6.	5-20
TERAPONTIDAE			
Terapon jarbua (Forsskål, 1775)	USNM	USNM collection.	0-5
PRIACANTHIDAE			
Heteropriacanthus cruentatus (Lacepède, 1801)	6	Rare, one juvenile collected with quinaldine.	1-30
Priacanthus hamrur (Forsskål, 1775)	1, 2, 18, 28, 46, 63	Rare, only 6 seen.	5-80
APOGONIDAE			
Apogon abogramma Fraser and Lachner, 1985	32, 36, 38, 60	Rare, a few individuals seen in caves below 30 m depth. Photographed.	20-40
A. angustatus (Smith and Radcliffe, 1911)	2, 24, 36, 66,	Rare, less than 10 seen.	5-30
A. apogonides (Bleeker, 1856)	48	Rare, aggregation of about 30 fish seen.	12-40
A. bandanensis Bleeker, 1854	8, 20, 42, 45, 55, 64	Occasional amongst branching *Porites* at sheltered sites. Photographed.	3-10
A. caudicinctus Randall and Smith, 1988		USNM collection.	1-30
A. chrysotaenia Bleeker, 1851	22	Rare.	1-14
A. compressus (Smith and Radcliffe, 1911)	1, 8, 9, 10, 12, 14, 16, 17, 20, 25, 26, 32, 33, 35, 37, 38, 42, 45, 55	Common, one of most abundant cardinalfishes seen during the day, usually among branching *Acropora* and *Porites* corals at sheltered sites. Photographed.	2-20
A. crassiceps Garman, 1903	61	One collected with rotenone.	1-30
A. cyanosoma Bleeker, 1853	1, 28, 55, 56, 62	Rare, only a few encountered. Photographed.	3-15
A. caudicinctus Randall and Smith, 1988		USNM collection.	
A. dispar Fraser and Randall, 1976		USNM collection.	12-50
A. doryssa (Jordan and Seale, 1906)		USNM collection.	
A. exostigma Jordan and Starks, 1906	6, 14, 16, 38, 39, 48, 55	Occasional in caves and crevices.	3-25
A. fraenatus Valenciennes, 1832	1, 6, 11, 14-17, 20, 21, 26, 28, 48, 54, 55, 56	Occasional, but locally common under ledges and in coral crevices. Photographed.	3-35
A. fragilis Smith, 1961	8, 9, 26, 33, 37, 40, 45, 47	Occasional, but locally abundant among braching corals. Common at site 37. Photographed.	1-15
A. gilberti (Jordan and Seale, 1905)	33, 37	Generally rare, except common at site 37. Photographed.	
A. hoeveni Bleeker, 1854	12, 25, 33, 37	Rare, mainly seen in sheltered areas on barren sandy bottoms around sea pens and soft corals. Photographed.	1-25
A. holotaenia Regan, 1905	46	Rare, about 10 scattered individuals seen at one site.	15-40
A. kallopterus Bleeker, 1856	5, 16, 32, 38, 40, 45, 55, 56, 64, 65	Occasional, but mainly nocturnal.	3-35
A. leptacanthus Bleeker, 1856	8, 12, 14, 26, 33, 45, 47	Occasional, but locally common among branching *Porites* coral.	1-12
A. melanoproctus Fraser and Randall, 1976		USNM collection.	15-40
A. nanus Allen, Kuiter, and Randall, 1994	8, 20, 25, 33, 37, 64	Rarely encountered, but locally abundant. Photographed.	5-20
A. new species	48	Rare, one aggregation of about 30 fish seen in 30 m. Several collected. Photographed.	
A. neotes Allen, Kuiter, and Randall, 1994	6, 8, 9, 11, 12, 17, 19, 20, 26, 32, 40, 45, 64	Occasional, but locally common, often adjacent to steep slopes around black coral. Photographed.	10-25
A. nigrofasciatus Schultz, 1953	3, 6-8, 13, 15, 29-32, 34, 36, 38, 39, 41, 43, 44, 51-57, 59-61, 63, 65, 66	Moderately common, one of most abundant cardinalfishes, but always in small numbers under ledges and among crevices.	2-35
A. novemfasciatus Cuvier, 1828	35	Rare, only one seen in shallows.	0.5-3
A. ocellicaudus Allen, Kuiter, and Randall, 1994	11, 17, 21	Generally rare, a few small aggregations seen at three sites.	11-55
A. quadrifasciatus Cuvier, 1828	25, 49, 55	Rare, but mainly occurs on barren sandy slopes away from reef habitat. Photographed.	5-40
A. rhodopterus Bleeker, 1852	16, 33	Rare, about 8 seen at two sites. Photographed.	10-40
A. sealei Fowler, 1918	9, 12	Rare, two small aggregations seen at 2 sites. Photographed.	2-12
A. selas Randall and Hayashi, 1990	4, 19, 64	Rare, three small aggregations seen. Photographed.	20-35
A. taeniophorus Regan, 1908	1, 18	Rare, but occurs in very shallow water and is nocturnal and therefore difficult to accurately survey.	0.5-2
A. thermalis Cuvier, 1829	33, 37	Rare, small aggregations seen at 2 sites. Photographed.	0-10
A. trimaculatus Cuvier, 1828	6, 40, 47, 64	Rare, but difficult to survey due to nocturnal habitats.	2-10
Apogonichthys perdix Bleeker, 1854		USNM collection.	
Archamia biguttata Lachner, 1951	31, 54	Two aggregations seen in caves. Photographed.	5-18
A. dispilus Lachner, 1951	44	Rare, about 30 seen among branching Acropora.	
A. fucata (Cantor, 1850)	1, 8, 9, 14, 16, 17, 21, 25, 26, 31, 33, 40, 43, 48, 54-56, 64	Moderately common, usually seen in caves. Photographed.	3-60
A. zosterophora (Bleeker, 1858)	8, 12, 14, 20, 25, 26, 33, 35, 37, 40, 45, 47	Moderately common, but locally abundant among branching *Porites* at several sheltered sites.	2-15
Cercamia eremia (Allen, 1987)		USNM collection.	5-40
Cheilodipterus alleni Gon, 1993	6-8, 26, 40, 64	Rare, less than 10 seen.	1-25

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
C. artus Smith, 1961	8, 11, 14-17, 19, 26, 28, 33, 38, 44, 45, 47, 56	Moderately common, usually among branching corals.	2-20
C. macrodon Lacepède, 1801	1, 3, 11, 15, 18, 19, 21, 25, 29, 31, 38, 39, 41, 44, 46, 48, 51-56, 58, 60, 61, 63, 64, 66	Moderately common, but always in low numbers (except juveniles).	4-30
C. parazonatus Gon, 1993	14, 19, 20, 25, 26, 33, 37, 45, 47, 64	Occasional on sheltered inshore reefs. Photographed.	1-35
C. quinquelineatus Cuvier, 1828	1, 4, 6-23, 25-33, 34-43, 45, 47-49, 51, 54-56, 62	Common, most abundant member of genus in Solomons.	1-40
C. zonatus Smith and Radcliffe, 1912		USNM collection, but record probably invalid as normal range is Philippines-Sabah.	1-30
Foa brachygramma (Jenkins, 1902)	6	Rare, but very cryptic and difficult to assess.	1-15
Fowleria vaiulae (Jordan and Seale, 1906)		USNM collection.	3-20
Gymnapogon urospilotus Lachner, 1953		USNM collection.	1-15
Neamia octospina Smith and Radcliffe, 1912		USNM collection.	2-20
Pseudamia amblyuroptera (Bleeker, 1856)		Randall, Lachner and Fraser, 1985	
P. gelatinosa Smith, 1955		Randall, Lachner and Fraser, 1985	1-40
P. zonata Randall, Lachner and Fraser, 1985		Randall, Lachner and Fraser, 1985	10-35
Pseudamiops gracilicauda (Lachner, 1953)		USNM collection.	1-15
Rhabdamia cypselurus Weber, 1909	26	One aggregation containing several hundred fish seen.	2-15
R. gracilis (Bleeker, 1856)	43, 56	Rarely observed, but in high numbers swarming around coral bommies.	5-20
Sphaeramia nematoptera (Bleeker, 1856)	4, 10, 12, 14, 33, 37, 40, 45, 47	Occasional, but locally common among branching *Porites* in sheltered locations. Photographed	1-8
S. orbicularis (Cuvier, 1828)	10, 39	Rarely seen, but no doubt abundant amongst mangrove roots. Photographed.	0-3
MALACANTHIDAE			
Hoplolatilus cuniculus Randall and Dooley, 1974	22, 27, 44, 58	Rare, but restricted to deep rubble slopes.	25-115
H. starcki Randall and Dooley, 1974	5, 7, 27, 29-32, 34, 36, 50-54, 58, 61, 65	Occasional on steep outer slopes. Photographed.	20-105
Malacanthus brevirostris Guichenot, 1848	22, 28, 38, 42, 43, 44, 48, 58, 59, 65	Occasional in sandy areas.	10-45
M. latovittatus (Lacepède, 1798)	22, 28, 31, 34, 44, 48, 50, 51, 58	Occasional.	5-30
ECHENEIDAE			
Echeneis naucrates Linnaeus, 1758	22, 28, 36, 46, 52, 59	A few individuals seen attached to sharks.	0-30
CARANGIDAE			
Alepes vari (Cuvier, 1833)	36, 59	Rare, except large aggregation at site 36.	2-50
Carangoides bajad (Forsskål, 1775)	1, 4, 8, 17, 18, 21, 26-28, 32-36, 39-42, 52, 54	Occasional, usually in low numbers.	5-30
C. ferdau (Forsskål, 1775)	20	Rare, only 1 seen.	2-40
C. fulvoguttatus (Forsskål, 1775)	38	Rare, only 1 seen.	5-100
C. oblongus (Cuvier, 1833)	47, 48	Rare, only 2 seen.	5-40
C. orthogrammus (Jordan and Gilbert, 1882)	14, 27, 51	Rare only 3 seen.	3-168
C. plagiotaenia Bleeker, 1857	5, 6, 9, 10, 15-17, 20, 21, 36, 56, 61, 63	Occasional, usually in low numbers.	5-200
Caranx ignobilis (Forsskål, 1775)	19, 59, 65	Rare, 3 large adults seen.	2-80
C. melampygus Cuvier, 1833	3, 6, 8, 9, 10, 13-36, 38-44, 46-54, 56-63	Moderately common, ususally seen solitary or in small schools. The most common reef carangid in Solomons.	1-190
C. papuensis Alleyne and Macleay, 1877	9, 10, 19, 20, 26, 27, 33, 47, 49, 55, 64	Occasional, solitary or in small groups.	1-50.
C. sexfasciatus Quoy and Gaimard, 1825	4, 51	Rarely seen, but usually in large schools.	3-96
Elegatis bipinnulatus (Quoy and Gaimard, 1825)	36, 52, 53, 60, 61, 63, 65	Six schools encountered on steep outer slopes or in passages.. Photographed	5-150
Gnathanodon speciosus (Forsskål, 1775)	4	Rare, only 1 seen.	1-30
Scomberoides lysan (Forsskål, 1775)	36, 43	Rare, only 2 seen.	1-100
Selar boops (Cuvier, 1833)	34	School seen by B. Kahn.	1-30
S. tol (Cuvier, 1832)		Herre, 1931	
S. crumenophthalmus (Bloch, 1793)	28, 64	Rare, 2 schools seen.	1-170
Trachinotus blochii (Lacepède, 1801)	28,	Rare, one adult seen.	3-40
LUTJANIDAE			
Aphareus furca (Lacepède, 1802)	1, 2, 8, 11, 13, 17, 22-24, 26-29, 32, 35, 36, 38, 39, 41, 43-45, 48, 50-54, 57-61	Moderately common. Seen on most outer reef dives.	6-70
Aprion virescens Valenciennes, 1830	3, 43, 51, 53, 57, 58	Rare, less than 10 seen.	3-40

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Lutjanus argentimaculatus (Forsskål, 1775)	33, 35, 36, 56, 59, 60	Generally rare, but about 30 large individuals seen at site 56.	1-100
L. biguttatus (Valenciennes, 1830)	3, 5, 9, 11, 18, 19, 24, 26, 32, 35, 38-40, 55, 59	Moderately common on sheltered reefs. Especially abundant at site 11. Photographed.	3-40
L.bohar (Forsskål, 1775)	2, 3, 5, 7, 8-11, 13-18, 21, 23, 25-32, 34, 36, 38, 39, 41-45, 48-55, 58-62, 65, 66	Common, one of the three most common snappers, but usually in relatively low numbers at each site.	4-180
L. boutton (Lacepède, 1802)	6, 9, 26, 38	Rarely seen and usually in low numbers.	5-25
L. carponotatus (Richardson, 1842)	4, 9, 19, 20, 25, 26, 33, 37, 40, 64	Occasional. Usually on sheltered coastal reefs.	2-35
L. ehrenburgi (Peters, 1869)		Allen and Talbot, 1985	1-20
L. fulviflamma (Forsskål, 1775)	24, 66	Rare, except several hunded seen at site 24.	1-35
L. fulvus (Schneider, 1801)	6, 9, 11, 13, 16-18, 20, 21, 24, 25, 28-33, 35, 36, 38-41, 43, 45, 47, 48, 51, 52, 54-60, 63, 64-66	Commom, but usually in small numbers.	2-40
L. gibbus (Forsskål, 1775)	6-9, 11-19, 21, 24, 28, 32-36, 38-41, 43-63, 65, 66	Common, one of three most common snappers. An extraordinarily large school containing hundreds of fish seen at site 58. Photographed.	6-40
L. kasmira (Forsskål, 1775)	28, 34, 40, 44, 46, 48, 65	Occasional, usually in low numbers, except abundant in 30 m at site 65.	3-265
L. lutjanus Bloch, 1790		Allen and Talbot, 1985	10-90
L. mizenkoi Allen and Talbot, 1985	26	Rare.	15-80
L. monostigma (Cuvier, 1828)	8, 9, 11, 13, 16-18, 22, 23, 24, 26, 28, 29, 32-36, 38-45, 47, 48, 50-54, 56-61, 63, 65, 66	Common, between 10- 20 seen on some dives.	5-60
L. quinquelineatus (Bloch, 1790)	9, 18, 38	Occasional, usually in small aggregations.	5-30
L. rivulatus (Cuvier, 1828)	6, 9,12, 13, 20, 23, 26, 29, 40, 42, 44, 47, 48, 50, 52, 56, 59, 60	Occasional. The largest snapper in the Solomons.	2-100
L. rufolineatus (Valenciennes, 1830)	65	Generally rare, but abundant in 30 m at site 65.	12-50
L. russelli (Bleeker, 1849)	13, 17, 33, 54, 56, 58	Rare, less than 10 seen. Photographed.	1-80
L. sebae (Cuvier, 1828)		Allen and Talbot, 1985	10-100
L. semicinctus Quoy and Gaimard, 1824	2, 3, 4, 7-55, 57-66	Common, one of the three most common snappers, but usually in relatively low numbers at each site.	10-40
L. timorensis (Quoy and Gaimard, 1824)	48	Rare, one photographed with video camera by B. Kahn.	6-130
L. vitta (Quoy and Gaimard, 1824)	8, 9, 11, 14, 20, 25, 33, 40, 64	Occasional on sandy bottoms at sheltered coastal sites. Photographed.	8-40
Macolor macularis Fowler, 1931	1, 2, 3, 5, 7-11, 13, 15-18, 21-24, 26-32, 34, 36, 38-54, 56-63, 65, 66	Common. Photographed.	3-50
M. niger (Forsskål, 1775)	6, 10, 12-17, 21-24, 26, 29, 32, 36, 44, 47, 50-53, 55, 57-59, 63, 65	Common.	3-90
Paracaesio sordidus Abe and Shinohara, 1962	52	One school photographed with video camera by B. Kahn.	5-100
Symphorichthys spilurus (Günther, 1874)	11, 12	Rare, only 2 seen. Photographed	5-60
Symphorus nematophorus (Bleeker, 1860)	8, 60	Rare, only 2 seen.	5-50
CAESIONIDAE			
Caesio caerulaurea Lacepède, 1802	1, 2, 3, 6, 8, 10-13, 16-18, 20-24, 26-36, 38, 39, 41, 43-46, 48-54, 56-61, 63-65	Abundant in variety of habitats.	1-30
C. cuning (Bloch, 1791)	1-4, 6-29, 33-40, 42, 43, 45-47, 49, 54, 55, 57-60, 64	Abundant in variety of habitats, particularly coastal reefs. Photographed.	1-30
C. lunaris Cuvier, 1830	5, 8, 11, 16-18, 20, 22, 24, 26-28, 32, 34, 36, 39, 41-44, 46, 48, 50-53, 59-61, 66	Common on outer slopes and in passages. Photographed.	1-35
C. teres Seale, 1906	1, 10, 34, 38, 39, 41, 43, 48, 49, 51-53, 56, 58, 62, 63, 65, 66	Occasional, but locally common. Photographed.	1-40
Dipterygonotus balteatus (Valenciennes, 1830)		Carpenter, 1987	
Gymnocaesio gymnoptera (Bleeker, 1856)		Carpenter, 1987	5-30
Pterocaesio digramma (Bleeker, 1865)	19, 55	Rarely seen, but locally common.	1-25
P. lativittata Carpenter, 1987	39, 61	One school of about 100 fish seen in 50 m depth.	10-70 m
P. marri Schultz, 1953	1, 2, 4, 11, 18, 22, 24, 26, 31, 32, 54, 56, 63	Occasional.	1-35
P. pisang (Bleeker, 1853)	1, 5, 8, 9, 13, 15, 18, 19, 21-32, 34, 36, 39, 41, 43, 44, 48, 49, 51, 53-59, 61, 62, 65	Common in variety of habitats.	1-35
P. tessellata Carpenter, 1987	11, 23, 31, 38, 39, 52, 56, 58, 63	Occasional, but locally abundant.	1-35
P. tile (Cuvier, 1830)	7, 9, 10, 18, 22, 23, 27, 28, 32, 34, 36, 38, 39, 41, 43, 44, 50-53, 56, 58, 59, 63, 65, 66	Common, especially on outer slopes. Photographed.	1-60
P. trilineata Carpenter, 1987	9, 11, 15-17, 18, 21, 23, 54, 56-58, 60, 61	Moderately common, but locally abundant. Photographed.	1-30

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
GERREIDAE			
Gerres oyena (Forsskål, 1775)	1	Rarely seen, but frequents sandy zone next to shore.	0-40
HAEMULIDAE			
Diagramma pictum (Thünberg, 1792)	18, 20, 28	Rare, a few seen in silty areas.	2-40
Plectorhinchus albovittatus (Rüppell, 1838)	16, 40, 50-52, 54, 61	Occasional. Formerly known as *P. obscurus*.	5-50
P. celebicus Bleeker, 1873	28, 32, 51, 57	Rare.	6-30
P. chaetodontoides (Lacepède, 1800)	8, 13, 14, 16-18, 20, 26, 27, 28, 33, 34, 36, 38-40, 54, 57, 59, 61	Moderately common, the most abundant sweetlinps in Solomons, but always seen in small numbers.	1-40
P. gibbosus (Lacepède, 1802)	32, 40, 50, 56, 59, 65	Rare, only 5 adults seen.	2-30
P. lessoni (Cuvier, 1830)	24, 54	Rare, only 2 seen. .	5-35
P. lineatus (Linnaeus, 1758)	3, 9, 14, 24, 28, 31, 32, 40, 52, 56, 58-60, 65	Occasional.	2-40
P. vittatus (Linnaeus, 1758)	2, 3, 16-18, 21, 24, 28, 34, 43, 44, 46, 48, 51, 52, 58, 63, 65	Occasional, but common (about 40 seen) in 30 m at site 65.	3-30
LETHRINIDAE			
Gnathodentex aurolineatus Lacepède, 1802	1, 3, 5, 16, 18, 24, 32, 38, 39, 41, 46, 54, 64-66	Occasional. Photographed.	1-30
Gymnocranius grandoculus (Valenciennes, 1830)	18, 56, 57	Rare, only 3 seen.	20-100
Lethrinus atkinsoni Seale, 1909	11, 16, 46, 55	Rare, only a few juveniles seen on sheltered reefs.	2-30
L. erythracanthus Valenciennes, 1830	1, 2, 15, 21, 24, 29, 32, 44, 45, 50, 51, 61-63	Occasional. Photographed.	15-120
L. erythropterus Valenciennes, 1830	3, 4, 8, 11-18, 20-24, 26, 29-34, 36, 38-40, 42, 43, 45, 48, 50, 51, 54, 59-63	Common.	2-30
L. harak (Forsskål, 1775)	1, 2, 8, 11, 12, 16, 18, 20, 21, 35, 49, 52, 57	Occasional in shallow waters with sand or rubble bottoms.	1-20
L. lentjan (Lacepède, 1802)	10, 18, 28, 60	Rare, except group of 10 in 30 m at site 18.	10-50
L. obsoletus (Forsskål, 1775)	11, 16-18, 46, 56, 60, 63	Occasional, and always in low numbers.	1-25
L. olivaceous Valenciennes, 1830	12, 15, 17, 23, 26, 31, 35, 40, 42, 65	Occasional, in low numbers.	4-185
L. semicinctus Valenciennes, 1830	63	Rare, several seen in 40 m on sand-rubble bottom.	10-40
L. variegatus Valenciennes, 1830	40	Rare, but seagrass is main habitat.	1-10
L. xanthocheilus Klunzinger, 1870	16, 18, 20, 22, 28, 44, 50, 52, 58	Occasional, mainly on outer reefs.	2-25
Monotaxis grandoculis (Forsskål, 1775)	1-66	Abundant. The most common lethrinid in Solomons.	1-100
NEMIPTERIDAE			
Pentapodus aureofasciatus Russell, 2001	1, 2, 5, 6, 8, 9, 15, 17, 18, 22, 23, 26, 27, 31, 44-46, 57, 62, 65, 66	Moderately common, mainly on sand-rubble slopes. Photographed.	3-25
P. trivittatus (Bloch, 1791)	1, 4, 8-14, 18, 20, 25, 26, 28, 33, 35, 37, 40, 42, 45-47, 49, 55-57, 60, 64	Mocerately common, usually on sheltered coastal reefs.	1-35
Scolopsis affinis Peters, 1876	1, 16, 17, 28, 33, 46, 65, 66	Occasional, but locally common in sandy areas. Photographed.	3-60
S. bilineatus (Bloch, 1793)	1, 2, 5, 6, 8-15, 17, 18, 20-24, 26-32, 34-36, 38, 39, 42-46, 48-51, 53-66	Common. Photographed.	2-20
S. ciliatus (Lacepède, 1802)	8, 9, 14, 16, 17, 18, 21, 25, 26, 33, 37, 46, 49, 55, 57, 60, 64	Moderately common at sites subjected to silting and also on clean sand bottoms. Photographed.	1-30
S. lineatus Quoy and Gaimard, 1824	1, 11, 16-18, 21, 38, 48, 57	Occasional on shallow reefs. Common at site 16.	0-10
S. margaritifer (Cuvier, 1830)	1, 3, 4, 6, 8-23, 25, 26, 29, 32, 33, 35, 37, 38, 40, 42, 43, 45-49, 54-57, 59, 60, 62, 64	Common, especially on sheltered coastal reefs	2-20
S. temporalis (Cuvier, 1830)	11, 14, 18, 55	Rare, but mainly occurs in sand areas away from reef.	5-30
S. trilineatus Kner, 1868	15, 16	Rare.	1-10
S. xenochrous (Günther, 1872)	2, 3, 15, 22, 24, 27, 31, 56-58, 65, 66	Occasional, usually on outer slope or in passages below 25 m on rubble bottoms. Photographed.	5-50
MULLIDAE			
Mulloidichthys flavolineatus (Lacepède, 1802)	1, 2, 6, 9, 11, 12, 14, 16-18, 20, 32, 43, 49, 56, 64	Occasional, but sometimes locally common. Photographed.	1-40
M. vanicolensis (Valenciennes, 1831)	1, 11, 38, 39, 46, 48, 49, 56, 57, 60, 65, 66	Occasional, but sometimes locally common. Photographed.	1-113
Parupeneus barberinus (Lacepède, 1801)	1-18, 20-66	Common, one of three most abundant goatfish in Solomons.	1-100
P. bifasciatus (Lacepède, 1801)	1-3, 5-13, 15-18, 21-32, 34-36, 38-54, 56-63, 65, 66	Common, one of three most abundant goatfish in Solomons. Photographed.	1-80
P. cyclostomus (Lacepède, 1802)	2, 3, 6, 8, 9, 11, 14, 16-18, 20-22, 26-32, 34, 38, 39, 42-44, 46, 48-52, 54, 56-61, 63, 65	Moderately common.	2-92
P. heptacanthus (Lacepède, 1801)	8, 14, 16, 18, 20	Rare, but usually occurs on open sandy bottoms away from reef edge.	1-60
P. indicus (Shaw, 1903)	6, 8, 55	Rare, only 3 seen, but probably common in seagrass meadows.	0-15

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
P. multifasciatus Bleeker, 1873	1-3, 5-36, 38-46, 48-66	Common, one of three most abundant goatfish in Solomons.	1-140
P. pleurostigma (Bennett, 1830)	1, 18, 21, 28, 32, 46, 62, 66	Occasional on clean sand bottoms.	5-46
Upeneus tragula Richardson, 1846	4, 14, 25, 40, 46, 56	Occasional, but mainly found on sand bottoms away from reefs.	1-40
PEMPHERIDAE			
Parapriacanthus ransonneti Steindachner, 1870	8, 54, 56	Rarely encountered, but forms dense aggregations.	5-30
Pempheris adusta Bleeker, 1877	3, 21, 29, 32	Rarely seen, but difficult to survey due to cryptic diurnal behaviour.	5-30
P. oualensis Cuvier, 1831	3, 21, 31, 54, 59	Probably common, but difficult to survey due to cryptic diurnal behaviour.	3-38
P. schwenkii Bleeker, 1855	21, 29	Rarely seen, but difficult to survey due to cryptic diurnal behaviour.	
P. vanicolensis Cuvier, 1831	3, 6, 11, 17, 21, 24, 26, 29, 31, 32, 38, 48, 49, 54, 56, 59, 65, 66	Common, but difficult to properly survey due cave habitat.	
KYPHOSIDAE			
Kyphosus bigibbus Lacepède, 1801	1, 32, 41, 51, 55	Rarely seen, but may be locally common.	1-30
K. cinerascens (Forsskål, 1775)	17, 21, 28, 31, 32, 34, 36, 38, 39, 41, 44, 51, 52, 54, 56, 58, 59, 61	Moderately common, but sometimes locally abundant.	1-24
K. vaigiensis (Quoy and Gaimard, 1825)	17, 18, 21, 36, 54, 59	Occasional, but sometimes locally common.	1-20
CHAETODONTIDAE			
Chaetodon auriga Forsskål, 1775	3, 12, 16, 23, 28, 29, 32, 35, 40, 42, 44, 45, 57, 59, 62	Occasional, ususally areas with weed and sand mixed with coral reef.	1-30
C. baronessa Cuvier, 1831	1-3, 5-36, 38-40, 42-58, 61-66	Common, seen on nearly every dive.	2-15
C. bennetti Cuvier, 1831	8, 10, 13, 14, 18, 19, 21-23, 27, 28, 32, 34-41, 50, 51, 57-59, 61, 65	Moderately common, frequently on outer slopes. Photographed.	5-30
C. burgessi Allen & Starck, 1973	39, 41	Rare, only 3 seen below 40 m depth on vertical outer slopes. Photographed.	20-100
C. citrinellus Cuvier, 1831	1, 2, 3, 5, 6, 11, 14-16, 21, 22, 24, 27-32, 34, 36, 44, 46, 48-50, 52, 53, 59-61, 63, 65, 66	Common, mainly on shallow reefs affected by surge.	1-12
C. ephippium Cuvier, 1831	3, 6-8, 10, 12-18, 21, 22, 24-32, 34-36, 38-43, 45-55, 58-61, 63, 66	Moderately common, never more than 2-3 pairs seen at a single site.	1-30
C. kleinii Bloch, 1790	1-3, 5-11, 13, 15, 18, 21-24, 27, 31, 32, 34, 36, 38, 39, 41-46, 50-66	Common, especially on outer slopes.	6-60
C. lineolatus Cuvier, 1831	14, 27, 33, 36, 40, 51, 55	Occasional, less common than the very similar *C. oxycephalus*. Photographed.	2-170
C. lunula Lacepède, 1803	5, 7, 16, 18, 36, 40, 43, 44, 48, 51, 52, 56, 61	Occasional.	1-40
C. lunulatus Quoy and Gaimard, 1824	1-66	Common, one of the most abundant butterflyfishes in Solomons; seen on almost every dive.	1-25
C. melannotus Schneider, 1801	7, 11, 18, 52, 63, 65	Rare, less than 10 seen.	2-15
C. mertensii Cuvier, 1831	46, 49	Rare, only 2 seen.	10-120
C. meyeri Schneider, 1801	2, 6, 7, 11, 13, 21, 22, 24, 25, 34, 35, 41, 43, 50, 52	Occasional.	5-25
C. ocellicaudus Cuvier, 1831	10, 13, 15, 23, 29, 32, 35, 36, 38, 54, 56, 57, 63	Moderately common on sheltered inshore reefs.	1-15
C. octofasciatus Bloch, 1787	4, 9-11, 17, 19, 20, 26, 33, 40, 47, 64	Occasional, except common at a few inshore influenced by silt. Photographed.	3-20
C. ornatissimus Cuvier, 1831	2, 5-7, 9-11, 13, 15-29, 32, 34-36, 38-61, 63-66	Common, several seen on most dives, especially in rich coral areas.	1-36
C. oxycephalus Bleeker, 1853	2, 10, 12, 13, 16-19, 22, 23, 26, 28, 29, 32, 33, 35, 52, 60, 61, 66	Occasional. *C. oxycephalus* x *C. auriga* hybrid (in company of pair of *C. auriga*) seen at site 32.	8-30
C. pelewensis Kner, 1868	5, 7, 10, 22, 29-32, 38, 39, 43, 48, 50-54, 56, 58, 61, 65, 66	Occasional on outer slopes and in passages. Photographed.	6-45
C. punctatofasciatus Cuvier, 1831	7, 36, 38, 50, 56	Rare. Many suspected hybrids with *C. pelewensis* observed..	6-45
C. rafflesi Bennett, 1830	1-62, 64-66	Common, one of the most abundant butterflyfishes in Solomons; at least 1-2 pairs seen on every dive.	1-15
C. reticulatus Cuvier, 1831	44, 50, 52	Rare, about 6 seen.	1-35
C. semeion Bleeker, 1855	2-19, 21, 22, 24, 27-29, 35, 36, 38-41, 44, 45, 48, 50-54, 57, 60, 61, 64, 65	Moderately common.	1-25
C. speculum Cuvier, 1831	7, 18, 29	Rare, only 3 seen.	1-30
C. trifascialis Quoy and Gaimard, 1824	2, 6, 7, 20, 23-25, 28, 29, 32, 34, 36, 38, 44, 48, 49, 53, 59	Occasional in areas of tabular *Acropora*.	2-30
C. ulietensis Cuvier, 1831	7, 10, 13, 14, 18-22, 28, 29, 32-36, 38, 39, 41-45, 47, 50-52, 54, 55, 59-61, 65	Moderately common. Photographed.	8-30

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
C. unimaculatus Bloch, 1787	5, 6, 11, 22, 28, 29, 34, 35, 38, 39, 44, 46, 48, 50, 51, 53, 65	Occasional, mainly on outer slopes.	1-60
C. vagabundus Linnaeus, 1758	1-66	Common, the most abundant butterflyfish in Solomons; several seen on every dive.	1-30
Chelmon rostratus (Linnaeus, 1758)	33, 37	Rare, only 2 pairs seen. Photographed.	1-15
Coradion chrysozonus Cuvier, 1831	1, 15, 17, 18, 21, 23, 29, 41, 42, 45, 54, 59, 63	Occasional, mainly on sheltered reefs.	5-60
Forcipiger flavissimus Jordan and McGregor, 1898	1, 2, 3, 7, 8, 11, 13, 15, 22-25, 27, 29-32, 34, 36, 38, 39, 41-46, 48-54, 56-61, 63, 65, 66	Common, especially on outer reef slopes.	2-114
F. longirostris (Broussonet, 1782)	5, 8, 11, 15, 16, 22, 25, 38, 41, 44, 51	Occasional, mainly on outer reef slopes. Photographed.	5-60
Hemitaurichthys polylepis (Bleeker, 1857)	32, 34, 39, 41, 44, 50-52, 54, 60, 61, 65	Occasional, but locally common on steep outer slopes.	3-60
Heniochus acuminatus (Linnaeus, 1758)	4, 19, 22, 28, 33, 36, 37, 39, 48, 55, 56, 65	Occasional. Photographed.	2-75
H. chrysostomus Cuvier, 1831	1- 8, 10, 11, 13, 14, 17-19, 21, 23-25, 27-36, 38, 39, 42-45, 47, 49-66	Common, one of most abundant butterflyfishes in Solomons.	5-40
H. diphreutes Jordan, 1903	51, 54	Rare, but large aggregation at site 51.	15-210
H. monoceros Cuvier, 1831	28, 29, 39, 45	Rare. Photographed.	2-25
H. singularius Smith and Radcliffe, 1911	1, 2, 3, 5, 7, 10, 12, 13, 19, 21, 23, 24, 27, 31, 36, 37, 45, 50-55, 58-61, 64-66	Moderately common.	12-45
H. varius (Cuvier, 1829)	1-66	Common, the most abundant butterflyfish in Solomons.	2-30
POMACANTHIDAE			
Apolemichthys trimaculatus (Lacepède, 1831)	2, 11, 18, 22, 27, 31, 39, 42-44, 53, 54, 58, 59, 63, 65, 66	Occasional on outer reefs. Most common at site 63.	10-50
A. griffisi (Carlson and Taylor, 1981)		Allen, Steene and Allen, 1998	10-40
Centropyge bicolor (Bloch, 1798)	1-3, 5-13, 15-18, 21-24, 27-32, 34, 38-40, 42-46, 48-66	Common.	3-35
C. bispinosus (Günther, 1860)	1, 2, 11, 13, 15, 22, 27, 29, 32, 34, 39, 42-44, 46, 48, 50-54, 58, 59	Common on seaward slopes, but rare inshore. Photographed.	10-45
C. flavicauda Fraser-Brunner, 1933	2, 22, 34, 43, 52, 53	Generally rare, but sometimes locally common on rubble bottoms. Photographed.	10-60
C. loricula (Günther, 1874)	51	Rare, only 2 seen. Photographed.	5-60
C. nox (Bleeker, 1853)	1, 6-11, 13-21, 23-26, 29-32, 34, 40, 41, 43, 45, 51-53, 55-57, 59, 60	Common, except in clear water of outer reefs. Photographed.	10-70
C. vroliki (Bleeker, 1853)	1-3, 5-13, 15-32, 34-46, 48-66	Common, one of the two most abundant angelfishes in Solomons.	3-25
Chaetodontoplus mesoleucus (Bloch, 1787) grey tailed form	1, 4, 6, 8-14, 16, 19, 20, 23, 25, 26, 33, 37, 40, 45, 47, 55, 64	Moderately common, but mainly restricted to sheltered inshore reefs. Photographed.	1-20
Genicanthus lamarck Lacepède, 1798	2, 22, 23, 27, 53, 58, 63	Occasional, mainly on steep slopes below 20 m.	15-40
G. melanospilos (Bleeker, 1857)	5, 7, 32, 34, 39, 44, 50, 51, 53, 61, 63, 65	Occasional, but locally common on outer reef slopes and in passages.	20-50
Paracentropyge multifasciatus (Smith and Radcliffe, 1911)	13, 21, 26, 32, 36, 50, 51, 56, 57, 60, 61	Occasional, but seldom noticed due to cave-dwelling habits. Photographed.	10-50
Pomacanthus annularis (Bloch, 1787)		Allen et al.	1-60
Pomacanthus imperator (Bloch, 1787)	6, 17, 22, 34, 41, 48, 50, 51, 53, 57, 59, 65, 66	Occasional and in low numbers.	3-70
P. navarchus Cuvier, 1831	1, 3, 7, 8, 10, 13-15, 22-24, 28, 31, 32, 34, 36, 38, 40-44, 47, 50-54, 56, 57, 60, 61	Moderately common, but always in low numbers. Photographed.	3-30
P. semicirculatus Cuvier, 1831	7, 17, 21, 28, 41, 56	Rare, only 6 seen.	5-40
P. sexstriatus Cuvier, 1831	4, 6, 7, 9, 10, 14, 16, 17, 20, 21, 23, 25, 33, 37, 39, 41, 54, 63, 64	Occasional.	3-50
P. xanthometopon (Bleeker, 1853)	2, 7, 18, 21, 22-24, 27, 32, 33, 34, 35, 36, 41, 43	Occasional, mainly on outer reef slopes.	5-30
Pygoplites diacanthus (Boddaert, 1772)	1-3, 5-32, 34-66	Common, the most abundant angelfish in Solomons. Photographed.	3-50
POMACENTRIDAE			
Abudefduf lorenzi Hensley and Allen, 1977	13, 21, 39, 55	Rarely seen, but locally common in shallow water next to shore. Photographed.	0-6
A. septemfasciatus (Cuvier, 1830)	1, 21, 29, 39, 41	Occasional, but surge zone environment not regularly surveyed.	1-3
A. sexfasciatus Lacepède, 1802	1, 32, 48, 56, 60, 64	Occasional, but sometimes locally common. Abundant at sites 60 and 64.	1-15
A. sordidus (Forsskäl, 1775)	41	Rare, but surge zone environment not regularly surveyed. Photographed.	1-3
A. vaigiensis (Quoy and Gaimard, 1825)	1, 13, 16-18, 21, 22, 25, 28, 29, 32, 34, 36, 38, 39, 41, 44, 46, 48-50, 52, 53, 56, 59, 61	Generally common.	1-12

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Acanthochromis polyacantha (Bleeker, 1855)	1-13, 15-24, 26-32, 34-36, 38-47, 50-54, 56-66	Abundant in wide range of habitats. Some populations with white tails. Photographed.	1-50
Amblyglyphidodon aureus (Cuvier, 1830)	6, 7, 10, 11, 13, 15, 21, 24, 26-32, 34, 36, 39, 41, 43, 44, 48, 50-54, 56, 59-61, 63, 65, 66	Common on outer slopes.	10-35
A. batunai Allen, 1995	1, 32	Rare.	
A. curacao (Bloch, 1787)	2, 3, 5-7, 11, 15, 18, 21-24, 27, 28, 31, 32, 34-36, 38-40, 42, 43, 45-47, 49, 54-57, 60, 62-64	Common.	1-15
A. leucogaster (Bleeker, 1847)	1-3, 5-13, 15, 17-19, 23, 24, 26-32, 34, 36, 38-45, 48-54, 56-63, 65	Common.	2-45
Amblypomacentrus breviceps (Schlegel and Müller, 1839-44)		Allen,1975	2-35
Amphiprion chrysopterus Cuvier, 1830	1, 3, 17, 22, 24, 27-29, 32, 38, 42-44, 50-53, 57-61, 63	Common. One of the two most abundant anemonefishes in Solomons. Photographed.	1-20
A. clarkii (Bennett, 1830)	1, 2, 5, 9, 10, 11, 13, 15-18, 20-23, 25, 27-29, 32, 34, 38, 39, 43, 44, 48, 50, 51, 54-61, 63, 65, 66	Common. One of the two most abundant anemonefishes in Solomons.	1-55
A. leucokranos Allen, 1973	7, 11, 28, 32, 43, 57, 60, 66	Rare, less than 10 seen. This "species" actually a hybrid between *A. chrysopterus* & *A. sandaracinos*. Photographed.	2-12
A. melanopus Bleeker, 1852	1, 9, 16-18, 21, 22, 26, 31, 32, 43, 51, 53, 57, 63	Occasional. Photographed.	1-10
A. percula (Lacepède, 1802)	2, 3, 7, 9, 20, 25, 26, 33, 39, 48, 51, 60, 63, 66	Occasional. Photographed.	1-15
A. perideraion Bleeker, 1855	1, 15, 38, 39, 46, 50, 53, 54, 56, 57, 60, 61, 63, 66	Occasional. Photographed.	3-20
A. polymnus (Linnaeus, 1758)		Photographed by D. Wachenfeld on sand bottom near site 53.	2-30
A. sandaracinos Allen, 1972	9, 11, 17, 21, 28, 43, 55, 57, 66	Occasional. Photographed.	3-20
Cheiloprion labiatus (Day, 1877)	10, 35, 49, 56, 62	Rarely observed, but relatively inconspicuous.	1-3
Chromis alpha Randall, 1988	2, 5, 7, 8, 10, 11, 13, 15, 22, 24, 27, 29-32, 34, 36, 38, 39, 41, 43, 44, 48, 50-54, 56-63, 65, 66	Common on steep slopes of outer reefs and passages.	18-95
C. amboinensis (Bleeker, 1873)	3, 5-11, 13, 15-23, 26-31, 34-36, 38, 39, 41, 43-45, 50-63, 65, 66	Abundant.	5-65
C. analis (Cuvier, 1830)	27, 32, 34, 36, 39, 41, 51, 53, 61, 65	Occasional on steep slopes, but locally abundant.	10-70
C. atripectoralis Welander and Schultz, 1951	1, 10-12, 13, 17, 22, 23, 32, 38, 39, 44, 48, 50-53, 63	Common on upper edge of outer slopes and in passages. Photographed.	2-15
C. atripes Fowler and Bean, 1928	1-3, 6-11, 13, 15, 18, 21-24, 27-32, 34, 36, 38, 39, 41-44, 49-63, 65, 66	Common, particularly on slopes.	10-35
C. caudalis Randall, 1988	51	Rare, a few seen in 20 m depth. Photographed.	20-50
C. delta Randall, 1988	5, 7, 8, 11, 13, 15-18, 21, 22, 24, 26-32, 34, 36, 38, 39, 42-44, 50-61, 63, 65, 66	Common, especially on steep slopes below about 15 m depth.	10-80
C. elerae Fowler and Bean, 1928	1, 6, 13, 17, 18, 21, 25, 26, 29, 32, 34, 36, 39, 41, 44, 54, 56, 60, 61	Moderately common, always in caves and crevices on steep slopes.	12-70
C. iomelas Jordan and Seale, 1906	50, 51, 61	Rare, only 4 seen. Photographed.	
C. lepidolepis Bleeker, 1877	1, 2, 3, 6, 8-13, 15, 17, 18, 22-24, 27-32, 34, 36, 38, 39, 41-45, 49-58, 61-63, 65, 66	Common.	2-20
C. lineata Fowler and Bean, 1928	2, 7, 11, 21, 24, 27, 29-32, 34, 36, 38, 39, 41, 42, 44, 50, 51, 58-60	Moderately common and locally abundant, usually in clear water with some wave action.	2-10
C. margaritifer Fowler, 1946	1-3, 5, 7, 13, 15, 18, 21, 22, 24, 25, 27-32, 34, 38, 39, 41-45, 48-54, 56-61, 63, 65	Common, mainly in clear water areas.	2-20
C. retrofasciata Weber, 1913	1, 2, 5-23, 25, 26, 28-32, 34-36, 38, 39, 42-46, 48-55, 57-63, 65, 66	Common at most sites. Photographed.	5-65
C. ternatensis (Bleeker, 1856)	1-40, 42-45, 47-54, 56-60, 62, 63, 65, 66	Abundant, often forming dense shoals on the edge of steep slopes. Photographed.	2-15
C. viridis (Cuvier, 1830)	1, 6, 8-13, 15-17, 20, 21, 25, 26, 28, 29, 32, 33, 35-38, 42, 43, 45, 49, 55, 56, 64	Common in shelterd areas of rich coral, generally in clear water.	1-12
C. weberi Fowler and Bean, 1928	2, 5, 8, 22, 23, 27, 28, 32, 34, 36, 38, 39, 42-44, 46, 50-54, 56-63, 65, 66	Common.	3-25

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
C. xanthochira (Bleeker, 1851)	2, 5, 15, 22, 23, 27, 29-32, 34, 39, 42-44, 50-54, 57-59, 61, 63, 65	Moderately common on outer slopes.	10-48
C. xanthura (Bleeker, 1854)	2, 3, 5-11, 13, 15, 21-24, 26-32, 34, 36, 38, 39, 41-44, 46, 48, 50-54, 56-63, 65, 66	Common, especially on steep slopes.	3-40
Chrysiptera biocellata (Quoy and Gaimard, 1824)	33, 52	Rare, but habitat (sheltered, shallow water next to shore) infrequently surveyed.	0-5
C. brownriggii (Bennett, 1828)	1, 2, 5-7, 21, 24, 27-31, 36, 39, 41, 46, 48, 49, 51, 52, 61, 63, 65, 66	Common on wave-swept reef tops.	
C. caruleolineata (Allen, 1973)		Allen, 1975	30-65
C. cyanea (Quoy and Gaimard, 1824)	1, 9-11, 13, 16-20, 25, 26, 28, 29, 32, 34-36, 38, 42, 52, 54, 57, 60	Moderately common on reef top near shore in sheltered areas.	0-10
C. cymatilis Allen, 1999	4, 8-10, 12, 14, 19, 20, 26, 33, 35, 37, 40, 45, 47, 55, 64	Common on sheltered inshore reefs to 17 m depth. Photographed.	
C. flavipinnis (Allen and Robertson, 1974)	22, 24, 44	Rare, only a few seen.	
C. glauca (Cuvier, 1830)		Allen, 1975	
C. oxycephala (Bleeker, 1877)	4, 8-10, 12, 14, 19, 20, 26, 33, 35, 37, 40, 45, 47, 55	Moderately common on sheltered inshore reefs. Photographed.	
C. rex (Snyder, 1909)	3, 5-7, 11, 18, 21, 24, 27, 31, 34, 41, 46, 48, 49, 51-54, 57-60, 65	Moderately common, except abundant on outer reef at site 24.	1-6
C. rollandi (Whitley, 1961)	1, 4, 6, 8-21, 23, 25, 26, 32, 33-35, 37, 38, 40, 42, 43, 45, 52-60, 63, 64, 66	Moderately common, particularly on reef slopes affected by silt.	2-35
C. talboti (Allen, 1975)	1-3, 5-7, 10, 11, 13, 15, 16, 18, 21-25, 27-32, 34, 36, 38, 39, 41-44, 46, 48-54, 56-66	Common, except in silty areas. Photographed.	6-35
C. unimaculata (Cuvier, 1830)	1, 11, 13, 18-21, 28, 35	Occasional, but locally common. Photographed.	0-2
Dascyllus aruanus (Linnaeus, 1758)	8, 12, 25, 26, 35, 38, 45, 47, 52, 55, 56, 62	Moderately common, forming aggregations around small coral heads in sheltered lagoonal habitat. Photographed.	1-12
D. melanurus Bleeker, 1854	4, 8-10, 12, 14, 16, 20, 26, 28, 32, 33, 34, 35, 38, 40, 45, 47, 52, 55-57, 64	Common, forming aggregations around small coral heads in sheltered lagoonal habitat.	1-25
D. reticulatus (Richardson, 1846)	1-3, 5-13, 15-18, 20-32, 34, 36, 38, 39, 42-44, 48-54, 56-63, 65, 66	Common. Photographed.	1-50
D. trimaculatus (Rüppell, 1928)	1-3, 5-7, 10, 11, 13, 15-18, 20-23, 26-32, 34, 36, 38, 39, 43-46, 48-66	Common in wide range of habitats. Photographed.	1-55
Dischistodus chrysopoecilus (Schlegel and Müller, 1839)	10, 12, 26, 33, 35	Generally rare, but locally common in sand-rubble areas near shallow seagrass beds.	1-5
D. melanotus (Bleeker, 1858)	1, 8-12, 16-20, 22, 23, 25, 26, 28, 32, 35, 38, 42, 43, 45, 47, 54, 56, 57, 60	Moderately common.	1-10
D. perspicillatus (Cuvier, 1830)	1, 4, 9, 10, 12, 14, 20, 33, 35, 37, 40, 45, 64	Occasional in shallow sandy parts of sheltered reefs.	1-10
D. prosopotaenia (Bleeker, 1852)	4, 9, 12, 14, 16, 20, 40, 45, 47, 49, 55, 64	Occasional. Photographed.	1-17
D. pseudochrysopoecilus Allen and Robertson, 1974	1, 15, 28, 56, 62	Generally rare, but common at 15 on reef top. Photographed.	1-5
Hemiglyphidodon plagiometopon (Bleeker, 1852)	4, 8-11, 14, 17, 19, 20, 25, 26, 33, 35, 40, 47, 49, 55, 64	Moderately common, generally on sheltered reefs affected by silt.	1-20
Lepidozygus tapeinosoma (Bleeker, 1856)	32, 43, 50, 51, 52	Generally rare, except abundant at oceanic, clear water sites (50-51). Photographed.	5-25
Neoglyphidodon melas (Cuvier, 1830)	1, 2, 6, 9-14, 17, 18, 20, 22, 23, 25-29, 35, 37, 43, 44, 47-51, 60, 63	Moderately common, but in low numbers at each site.	1-12
N. nigroris (Cuvier, 1830)	1, 3, 6, 9-14, 16-18, 20-23, 25-32, 34, 35, 38, 39, 42-49, 52, 54, 56, 57, 59, 60, 62, 66	Common.	2-23
N. thoracotaeniatus (Fowler and Bean, 1928)	16, 26, 38, 43, 50	Generally rare, but moderately common at few sites.	15-45
Neopomacentrus azysron (Bleeker, 1877)	6, 17, 18, 21, 29, 39, 46, 49, 54, 65	Occasional, but locally common at some sites. Photographed.	1-12
N. cyanomos (Bleeker, 1856)	1, 26	Rare.	5-18
N. filamentosus (Macleay, 1833)	4, 20, 25, 33, 37, 40, 55, 64	Occasional, but locally common. Abundant at site 37.	5-15
N. nemurus (Bleeker, 1857)	4, 8, 14, 20, 25, 33, 35, 37, 55, 64	Occasional, but locally common on sheltered inshore reefs. Photographed.	1-10
N. taeniurus (Bleeker, 1856)		Reported from Solomons by Allen, 1975, but mainly freshwater/estuarine.	
N. violascens (Bleeker, 1848)	49, 55	Generally rare, but moderately common at 2 turbid inshore sites. Photographed.	5-25

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Plectroglyphidodon dickii (Liénard, 1839)	2, 3, 7, 16-18, 21, 22, 24, 27-32, 34, 36, 39, 41, 43, 44, 46, 48-54, 56-59, 61, 63, 65	Moderately common.	1-12
P. lacrymatus (Quoy and Gaimard, 1824)	1-3, 5-11, 13, 15-24, 27-32, 34, 36, 38, 39, 41-46, 48-54, 56-66	Abundant at most sites.	2-12
P. leucozonus (Bleeker, 1859)	2, 6, 7, 21, 24, 27, 29, 31, 36, 39, 41, 61, 65	Occasional, in shallow, wave-swept zone of outer reefs.	0-2
Pomacentrus adelus Allen, 1991	1, 6, 8-23, 25, 26, 28, 29 32, 34, 35, 38, 39, 42, 43, 45, 46, 48, 49, 51, 54-57, 59, 60	Common.	0-5
P. albimaculus Allen, 1975	4, 9, 12, 14, 20, 33, 37, 55, 64	Occasional on highly sheltered, silty inshore reefs. Photographed.	10-29
P. amboinensis Bleeker, 1868	1-3, 5-32, 34-37, 38, 39, 42-49, 51-66	Abundant.	2-40
P. aurifrons Allen, 2004	4, 9, 10, 12, 14, 17, 19, 20, 33, 37, 40, 45, 47, 55, 64	Common on sheltered reefs.	
P. bankanensis Bleeker, 1853	1-3, 5-8, 11, 13, 15-18, 21-24, 26-32, 35, 36, 38, 39, 41, 43, 44, 46, 48-53, 56-63, 65, 66	Common.	0-12
P. brachialis Cuvier, 1830	1-3, 5, 7-11, 13, 15, 18, 19, 21-24, 27-32, 34, 36, 38, 39, 41-44, 46, 48, 49, 51-63, 65, 66	Abundant, especially in areas exposed to curents. Photographed.	6-40
P. burroughi Fowler, 1918	4, 8-14, 16, 17, 19, 20, 25, 26, 33, 35, 37, 38, 40, 42, 43, 45, 47, 55, 62, 64	Moderately common, usually on silty inshore reefs.	2-16
P. chrysurus Cuvier, 1830	1	Rare.	0-3
P. coelestis Jordan and Starks, 1901	1-3, 5, 7, 8, 10, 11, 15, 21, 22, 24, 29-32, 34, 36, 38, 39, 43, 44, 48, 50-54, 56, 58, 59, 61, 63, 65, 66	Common on exposed outer reefs. Photographed.	1-12
P. grammorhynchus Fowler, 1918	1, 9, 12, 14-17, 19, 25, 26, 38, 43, 45, 62	Occasional, but locally common among live and dead corals (often staghorn *Acropora*).	2-12
P. lepidogenys Fowler and Bean, 1928	2, 3, 5-7, 11, 15, 18, 21-24, 27, 28, 31, 32, 34-36, 38, 39, 42-44, 46, 48-54, 56-61, 63, 65, 66	Common.	1-12
P. moluccensis Bleeker, 1853	1, 2, 4, 6-32, 34-36, 38, 39, 42, 45, 48-57, 59-63, 65, 66	Abundant.	1-14
P. nagasakiensis Tanaka, 1917	1, 8, 10, 15-18, 22, 24, 28, 32, 42-44, 46, 48, 54, 56-58, 63, 65	Moderately common, around isolated rocky outcrops surrounded by sand.	5-30
P. nigromanus Weber, 1913	1, 4, 6, 8-21, 23, 25, 26, 38, 40, 42, 43, 45, 49, 52-57, 60, 62, 64, 66	Common, usually on slopes in a variety of habitats.	6-60
P. nigromarginatus Allen, 1973	1, 5, 7, 8, 10, 11, 13, 15, 16, 17, 21-23, 26, 27, 29-32, 34, 36, 38, 39, 41-44, 45, 50-54, 56, 58-61, 63, 65, 66	Common on steep slopes.	20-50
P. pavo (Bloch, 1878)	4, 12, 14, 17, 19, 20, 25, 26, 33, 35, 37, 40, 52, 55, 60	Moderately common, always around coral patches in sandy lagoons. Photographed.	1-16
P. philippinus Evermann and Seale, 1907	1, 3, 5-7, 11, 13, 17, 21-24, 29-32, 35, 36, 38, 39, 41, 44-46, 48, 53, 54, 56-61	Common, except on sheltered inshore reefs. Photographed	1-27
P. reidi Fowler and Bean, 1928	1-3, 5-8, 10, 11, 13, 15, 16, 18, 21, 23, 24, 26-32, 34, 36, 38, 39, 41-46, 48-54, 56-63, 65, 66	Common, usually on seaward slopes or in passages.	12-70
P. simsiang Bleeker, 1856	4, 8, 10, 12, 14, 19, 20, 25, 26, 33, 35, 37, 40, 45, 47, 55, 64	Moderately common, usually in shallow, silt-affected areas. Photographed.	0-10
P. tripunctatus Cuvier, 1830	55, 64	Rarely seen, but main habitat consists of very shallow water next to shore.	0-3
P. vaiuli Jordan and Seale, 1906	2, 5, 15, 29, 44, 48, 50-54, 56-59, 61-63, 65, 66	Moderately common on outer slopes. Photographed.	3-45
Pomachromis richardsoni (Snyder, 1909)	24	Rare, a solitary fish seen in 3 m.	
Premnas biaculeatus (Bloch, 1790)	12, 20, 25, 26, 33, 40, 45, 62, 64	Occasional. Photographed	1-6
Stegastes albifasciatus (Schlegel and Müller, 1839)	11, 15, 16, 18, 21, 28, 29, 32, 51, 52, 54, 57	Occasional, but sometimes locally common.	0-2
S. fasciolatus (Ogilby, 1889)	2, 3, 6, 7, 16, 18, 21, 22, 24, 27, 29, 31, 36, 39, 41, 46, 48, 52, 54, 61, 65	Moderately common in wave-swept zone of outer reefs.	0-5
S. lividus (Bloch and Schneider, 1801)	10, 19, 26, 33, 35, 45, 56	Occasional, but locally common.	1-5
S. nigricans (Lacepède, 1802)	1, 4, 9, 15, 16, 25, 26, 28, 32, 35, 38, 42, 45, 49, 52, 56, 62	Occasional, but locally common.	1-12
LABRIDAE			
Anampses caeruleopunctatus Rüppell, 1828	3, 5, 24, 46, 48	Rare, only 5 seen.	2-30
A. melanurus Bleeker, 1857	5, 57	Rare, only 2 seen.	12-40

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
A. meleagrides Valenciennes, 1840	3, 5, 22, 24, 27, 32, 36, 39, 41, 50, 51, 53, 54, 63, 65	Occasional, always in small numbers.	4-60
A. neoguinaicus Bleeker, 1878	7, 18, 27, 54	Rare, less than 10 seen	8-30
A. twistii Bleeker, 1856	22, 36, 39, 50, 51, 54, 56, 61	Rare, about 10 seen.	2-30
Bodianus anthioides (Bennett, 1831	31, 57	Rare, only 2 seen.	6-60
B.bimaculatus Allen, 1973	6, 11, 18, 34, 36, 39, 41, 44, 49, 51, 58	Occasional, usually below 30 m.	30-60
B. diana (Lacepède, 1802)	1, 15, 18, 21, 26, 27, 29, 32, 34, 36, 38, 39, 41-44, 51-54, 56-63, 65	Moderately common.	6-25
B. loxozonus (Snyder, 1908)	50	Rare, only 1 seen.	3-40
B. mesothorax (Bloch and Schneider, 1801)	1-3, 5-13, 15-32, 34-46, 48-54, 56-66	Common.	5-30
Cheilinus chlorurus (Bloch, 1791)	14, 15, 57	Rare, only 3 seen.	2-30
C. fasciatus (Bloch, 1791)	2-4, 7-13, 15-64, 66	Common, several adults seen on most dives.	4-40
C. oxycephalus (Bleeker, 1853)	1-3, 5-7, 9, 11, 15-17, 21, 22, 24, 27, 29, 32, 36, 38, 39, 42-44, 46, 48, 50-52, 54, 56, 57, 59, 62, 63, 65	Moderately common.	1-20
C. trilobatus Lacepède, 1801	1-3, 5-13, 15-18, 21-23, 27, 28, 32-36, 39, 44, 46, 48, 49, 51-57, 60, 62, 63, 65	Common, several adults seen on most dives.	1-20
C. undulatus Rüppell, 1835	8-10, 12, 14-18, 23, 24, 29, 32, 34-36, 39-43, 46, 52, 54, 58-61, 65, 66	Moderately common, but always in small numbers.	2-60
Cheilio inermis (Forsskål, 1775)	11, 16, 56	Rare, but mostly in weed habitats.	0-3
Choerodon anchorago (Bloch, 1791)	1, 4, 6, 8-14, 19, 20, 25, 26, 28, 33, 37, 40, 42, 45, 47-49, 55, 56, 60, 64	Moderately common, usually in slity areas.	1-25
C. jordani (Snyder, 1908)	1, 15-17, 24	Rare, only seen in NE Solomons.	10-20
Cirrhilabrus condei Allen and Randall, 1996	3, 22, 27, 43, 51, 52, 66	Occasional, usually below 20-30 m.	25-45
C. exquisitus Smith, 1957	2, 22, 27, 29, 38, 44, 50, 51, 53, 63, 66	Occasional.	6-32
C. punctatus Randall and Kuiter, 1989	1-3, 8-11, 15, 17, 18, 22-24, 26-28, 32, 34, 36, 38, 42-44, 46, 50-55, 57-63, 66	Abundant, one of most common labrids in Solomons. Photographed.	3-60
Coris aygula (Lacepède, 1801)		Günther, 1873	
C. batuensis (Bleeker, 1862)	1, 8-13, 15-18, 22, 23, 28, 43, 45, 46, 60, 62, 63, 65	Occasional over sand bottoms.	3-25
C. gaimardi (Quoy and Gaimard, 1824)	2, 5, 15, 18, 22-24, 27, 29, 32, 44, 46, 48, 50-54, 58, 59, 61, 63, 65, 66	Occasional.	1-50
Diproctacanthus xanthurus (Bleeker, 1856)	1, 4, 6, 8-23, 25, 26, 28, 32-36, 38, 40, 42, 45, 47, 49, 64, 66	Moderately common on protected inshore reefs.	2-15
Epibulus insidiator (Pallas, 1770)	1-45, 47-60, 63-66	Common.	1-40
Gomphosus varius Lacepède, 1801	1-3, 6-18, 20-24, 27-32, 34-36, 38, 39, 41-46, 48-54, 56-63, 65, 66	Common. Hybrid between *Gomphosus* x *T. lunare* seen at site 1. Photographed.	1-30
Halichoeres argus (Bloch and Schneider, 1801)	1, 6, 9-11, 13, 19, 25, 26, 33, 52, 54, 56, 57	Occasional, usually in silty protected areas with weeds.	0-3
H. binotopsis (Bleeker, 1849)		Rare, about five seen.	2-20
H. biocellatus Schultz, 1960	2, 3, 5, 7, 24, 36, 39, 42, 44, 46, 48, 50-52, 54, 58, 59, 61-63, 65, 66	Moderately common on outer reef slopes.	6-35
H.chloropterus (Bloch, 1791)	1, 4, 6, 8-14, 19, 20, 25, 26, 33, 35, 37, 38, 40, 45, 47, 54, 55, 64	Moderately common, ususally on protected inshore reefs with sand and weeds.	0-10
H.chrysus Randall, 1980	1, 2, 3, 5, 15, 18, 21, 22, 27, 28, 31, 32, 34, 36, 38, 42-44, 48-54, 56-63, 65, 66	Moderately common on clean sand bottoms.	7-60
H. hartzfeldi Bleeker, 1852	3, 27, 46	Rare.	10-30
H. hortulanus (Lacepède, 1802)	1-3, 5-11, 13, 15-25, 27-32, 34-36, 38, 39, 41-46, 48-54, 56-63, 65, 66	Common.	1-30
H. leucurus (Walbaum, 1792)	4, 6, 8-12, 14, 19, 20, 25, 26, 33, 37, 40, 42, 45, 47, 55, 64	Occasional, mainly on silty inshore reefs.	2-15
H. margaritaceus (Valenciennes, 1839)	1, 2, 3, 5, 10, 11, 15, 16, 18, 21, 22, 24, 27, 29, 32, 44, 46, 48-54, 59, 63, 66	Moderately common, usually at sites including shallow water next to shore.	0-3
H. marginatus (Rüppell, 1835)	2, 3, 5, 7, 11, 13, 16-18, 21, 22, 24, 27-29, 36, 38, 39, 42, 44, 46, 48, 49, 51-53, 56, 59-61, 63, 65, 66	Moderately common.	1-30

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
H. melanurus (Bleeker, 1853)	1, 6, 8-18, 20-23, 26, 28, 32, 34-36, 38-40, 42, 43, 45, 47, 49, 51, 53-57, 59, 60, 62, 65, 66	Common.	2-15
H. melasmapomus Randall, 1981	50, 51, 61	Rare, less than 10 seen.	
H. miniatus (Valenciennes, 1839)	13, 35	Rare, but sometimes locally common.	0-8
H. prosopeion (Bleeker, 1853)	1-3, 5-11, 13, 15-24, 26-32, 34-36, 38, 39, 41-44, 46, 48, 49, 51-54, 56-63, 65, 66	Common in variety of habitats.	5-40
H. richmondi Fowler and Bean, 1928	3, 8, 11, 21, 25, 26, 29, 34, 42, 54, 56	Occasional. Photographed.	
H. scapularis (Bennett, 1832)	1, 4, 8-10, 12-17, 20, 21, 25, 26, 28, 31-40, 42-45, 51-57, 62, 65	Moderately common, always in sandy areas.	0-15
H. trimaculatus (Quoy and Gaimard, 1834)	21, 51, 52, 56, 60, 62, 63, 65	Occasional, but relatively common at site 62. Found in sandy areas.	0-20
Hemigymnus fasciatus (Bloch, 1792)	1-3, 5-7, 9, 11, 13, 15-18, 22-24, 27, 29, 32, 34, 36, 38, 39, 41-46, 48, 50-55, 58, 59, 61-63, 65, 66	Common, but usually in lower numbers than *H. melapterus*.	1-20
H. melapterus (Bloch, 1791)	1, 2, 4, 5, 7-36, 38-44, 46-54, 56-60, 63-66	Common, but in relatively low numbers at each site.	2-30
Hologymnosus annulatus (Lacepède, 1801)	1, 2	Rare, only 2 seen.	5-30
H. doliatus (Lacepède, 1801)	1, 44, 46, 48, 52, 59, 65	Rare, less than 10 seen.	4-35
Iniistius aneitensis (Günther, 1862)		Günther, 1873	
Labrichthys unilineatus (Guichenot, 1847)	1, 2, 3, 6, 8-32, 34, 36, 38-40, 42-60, 62-65	Common, especially in rich coral areas.	1-20
Labroides bicolor Fowler and Bean, 1928	2, 3, 7, 11-13, 16-18, 22, 24, 27, 29-32, 34-36, 38, 39, 43-45, 48, 50-54, 57-60, 62, 63	Moderately common, generally in much smaller numbers than other *Labroides* species.	2-40
L. dimidiatus (Valenciennes, 1839)	1-66	Common	1-40
L. pectoralis Randall and Springer, 1975	3, 8, 11, 13, 14, 16-18, 22-32, 34-36, 38, 39, 41-45, 48, 50-54, 57-63, 65	Moderately common. Photographed.	2-28
Labropsis alleni Randall, 1981	7, 13, 24, 29, 31, 34, 38, 39, 42, 51, 61, 63	Occasional.	4-52
L. australis Randall, 1981	2, 3, 10, 15, 16, 27, 44, 46, 48, 51, 54, 58, 61, 63, 65, 66	Occasional.	2-55
L. xanthonota Randall, 1981	3, 22, 24, 27, 29-32, 36, 41, 44, 50-54, 57-59, 61, 63	Occasional. Photographed.	1-30
Leptojulis urostigma Randall, 1996	11, 48	Rare, but easliy overlooked due to sandy habitat.	15-80
Macropharyngodon meleagris (Valenciennes, 1839)	1, 2, 5, 11, 13, 16-18, 22, 24, 27, 31, 34, 36, 43, 44, 46, 48, 50-54, 57-59, 61-63, 65, 66	Moderately common, but always in small numbers at each site.	1-30
M. negrosensis Herre, 1932	1, 2, 5, 7, 15, 24, 32, 46, 52, 54, 56, 58, 59, 65, 66	Occasional.	8-30
Novaculichthys taeniourus (Lacepède, 1802)	1, 2, 16, 21, 22, 32, 43, 44, 46, 48, 50, 58, 61, 63, 66	Occasional.	1-14
Oxycheilinus bimaculatus (Valenciennes, 1840)	9, 17, 18, 22, 23, 26, 46, 56, 57, 66	Occasional, around rock and coral outcrops on sandy or rubble bottoms.	2-110
O. celebicus (Bleeker, 1853)	1, 4, 8-14, 17-21, 25, 26, 33, 37, 38, 40, 42, 43, 45, 47, 55, 62, 64, 66	Moderately common on sheltered inshore reefs. Photographed	3-30
O. diagrammus (Lacepède, 1802)	1, 2, 5, 7, 9, 11, 13-18, 21-24, 26-32, 34-36, 38, 39, 41-54, 56-59, 61-63, 65, 66	Moderately common.	3-120
O. orientalis (Günther, 1862)	64	Rare, but several seen in 20-25 m at site 64. Photographed.	
O. rhodochrous (Playfair and Günther, 1867)	8, 16, 27, 32, 34, 38, 59, 63, 65	Occasional.	15-70
O. unifasciatus (Streets, 1877)	50, 52	Rare, about 5 seen.	3-80
Parachelinus filamentosus Allen, 1974	5, 8-11, 15-17, 19, 22, 26-31, 33, 34, 37, 38, 40, 43, 44, 46, 51-55, 57, 58, 63, 66	Common, usually in rubble areas.	10-50
Pseudocheilinops ataenia Schultz, 1960	4, 8, 40, 64	Generally rare, but locally common on sheltered reefs.	5-25
Pseudocheilinus evanidus Jordan and Evermann, 1902	2, 3, 5, 7, 11, 18, 24, 27, 31, 32, 34, 36, 38, 39, 43, 44, 46, 48-54, 56-63, 65, 66	Moderately common, especially on outer reefs.	6-40
P. hexataenia (Bleeker, 1857)	2, 3, 7, 11, 15, 16, 18, 21, 22, 24-32, 36, 38, 39, 41, 44, 46, 48, 50-54, 56-61, 63, 65, 66	Moderately common, only a few seen on each dive, but has cryptic habits. Photographed.	2-35
Pseudocoris heteroptera (Bleeker, 1857)	44	Rare, only one male and five females seen.	10-30
P. yamashiroi (Schmidt, 1930)	5, 22, 27, 29, 32, 44, 54, 56, 58, 63, 66	Occasional.	10-30
Pseudodax moluccanus (Valenciennes, 1840)	2, 3, 5, 15, 21, 22, 24, 27, 29-32, 34, 36, 38, 39, 41-44, 48, 51-54, 56-59, 61, 63, 65, 66	Moderately common, especially on outer reef and in passages.	3-40
Pseudojuloides cerasinus (Snyder, 1904)	46	Rare, 2 males and 5 females seen.	15-50

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Pteragogus cryptus Randall, 1981	3, 11, 14, 15, 16	Rare, but has cryptic habits.	4-65
Stethojulis bandanensis (Bleeker, 1851)	2, 9, 11, 15-17, 28, 29, 32, 44, 48, 49, 50, 52, 54, 57, 59	Occasional.	0-30
S. interrupta (Bleeker, 1851)	65	Rare, group of 4 seen in 10 m.	4-25
S. strigiventer (Bennett, 1832)	1, 22, 23, 25, 28, 31, 32, 44, 46	Occasional.	0-6
S. trilineata (Bloch and Schneider, 1801)	1-3, 5-7, 9, 11, 16, 17, 19, 21-32, 34, 35, 36, 38-40, 42, 44-46, 48, 51-54, 56, 57, 59-61, 65, 66	Moderately common.	1-10
Thalassoma amblycephalum (Bleeker, 1856)	2, 3, 5, 7, 8, 11-13, 15, 18, 21, 22, 24, 27-32, 34, 36, 38, 39, 41, 44, 46, 48-54, 59-61, 63, 65, 66	Common.	1-15
T. hardwicke (Bennett, 1828)	1-3, 5-14, 15, 16, 18-32, 34-36, 38, 39, 41-46, 48-54, 56, 57, 59-61, 63, 65, 66	Common. Photographed.	0-15
T. jansenii (Bleeker, 1856)	2, 5, 7, 15, 21, 24, 27, 29, 31, 34, 36, 41, 44, 46, 48, 50, 52, 54, 61, 63, 65	Moderately common, usually in very shallow water exposed to surge.	0-15
T. lunare (Linnaeus, 1758)	1-7, 9, 11-13, 15-33, 35-38-66	Common, one of most abundant wrasses. *T. lunare* x *T. quinquevittatum* hybrid seen at site 24. Photographed.	1-30
T. purpureum (Forsskål, 1775)	21, 29, 41	Rare, only a few seen, but main habitat is surge zone.	2-20
T. quinquevittatum (Lay and Bennett, 1839)	2, 5, 21, 22, 24, 27, 29, 31, 36, 41, 44, 48, 50-53, 61, 65	Occasional, locally common at a few sites exposed to surge (e.g. site 24).	0-18
Wetmorella albofasciata Schultz and Marshall, 1954	32, 38, 61	Observed in caves at 2 sites and 1 collected with rotenone.	5-40
W. nigropinnata (Seale, 1901)	61	Collected with rotenone.	
SCARIDAE			
Bolbometopon muricatum (Valenciennes, 1840)	7, 12-14, 18, 20, 24, 28, 31, 33, 35, 36, 42, 47, 48, 54, 59	Occasional, always in low numbers.	1-30
Calotomus carolinus (Valenciennes, 1839)	2, 11, 32, 46	Rare, only a few seen.	4-30
Cetoscarus bicolor (Rüppell, 1828)	2, 5-16, 18-29, 32-36, 38, 41-45, 47-49, 51-54, 59-62, 65	Common, but usually in small numbers.	1-30
Chlorurus bleekeri (de Beaufort, 1940)	1, 3, 4, 6-16, 18-43, 45-57, 60-64	Common, one of most abundant parrotfishes in Solomons. Photographed.	2-30
C. japanensis (Bloch, 1789)	2, 3, 7, 9, 11, 16-18, 21, 22, 24, 27-29, 32, 34, 41, 44, 46, 48, 51, 57, 59, 61, 63, 65, 66	Moderately common.	3-20
C. microrhinos (Bleeker, 1854)	5, 9, 14, 16, 17, 21, 27, 28, 31-33, 35, 36, 38, 39, 41, 44, 48, 50-54, 57-62	Common. Photographed.	2-35
C. sordidus (Forsskål, 1775)	1-3, 5-7, 9-11, 13, 15, 16, 20-25, 27-32, 34-39, 41-66	Common, one of most abundant parrtofishes in Solomons.	1-25
Hipposcarus longiceps (Bleeker, 1862)	3, 6-10, 12, 15, 16, 18, 20-22, 24, 27-31, 34, 35, 38, 40, 42, 43, 47, 51, 52, 57, 59, 60	Common at sites adjacent to sandy bottoms.	5-40
Leptoscarus vaigiensis (Quoy and Gaimard, 1824)	11	Rarely seen, but mainly lives amongst seagrass & sargassum.	1-20
Scarus altipinnis (Steindachner, 1879)	22, 24, 25, 52, 59, 61	Rarely seen, but moderately common at some sites.	5-20
S. chameleon Choat and Randall, 1986)	2, 7, 11, 22, 43, 44, 46, 51, 56, 63	Occasional, always in small numbers.	3-15
S. dimidiatus Bleeker, 1859	1, 3, 4, 7-23, 25, 26-40, 42, 43, 45-62, 64-66	Common. Photographed.	1-15
S. flavipectoralis Schultz, 1958	1-4, 6-19, 21-26, 28-32, 34, 35, 38, 40, 42-45, 47-57, 59, 60, 62-66	Common, one of most abundant parrotfishes in Solomons. Photographed.	8-40
S. festivus Valenciennes, 1840		Rare, one adult male seen.	5-30
S. forsteni (Bleeker, 1861)	2, 5, 8, 15, 27, 29, 34, 38, 44, 50-54, 61, 62, 65, 66	Occasional, but locally common at a few sites.	3-30
S. frenatus Lacepède, 1802	3, 7, 18, 22, 28, 29, 50	Occasional.	3-25
S. ghobban Forsskål, 1775	15, 20, 22-24, 26, 35, 36, 41, 42, 44, 56, 58, 59	Occasional.	3-30
S. globiceps Valenciennes, 1840	5, 44	Rare, only a few seen.	2-15
S. niger Forsskål, 1775	1, 2, 5-7, 9, 11, 13, 15, 17, 18, 20-24, 27-36, 38, 39, 42-45, 47, 50-54, 56-61, 63, 65, 66	Common.	2-20
S. oviceps Valenciennes, 1839	2, 3, 7, 16-18, 21-24, 28-32, 34, 36, 38, 39, 41, 44, 45, 50-53, 56-59, 61, 63, 65, 66	Common.	1-12
Scarus prasiognathos	24, 29	Rare, only 2 males seen.	
S. psittacus Forsskål, 1775	5, 7, 13, 18, 22, 28, 31, 44, 46, 52, 57-59, 63	Occasional. Photographed.	4-25
S. quoyi Valenciennes, 1840	1, 6, 8-11, 16, 20, 21, 23, 25, 26, 33-35, 42, 45-49, 51, 52, 54-57, 60, 64	Common on sheltered reefs.	
S. rivulatus Valenciennes, 1840	17, 22, 32, 36, 47	Rare, less than 10 seen.	5-20

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
S. rubroviolaceus Bleeker, 1849	2, 3, 5, 7, 16, 21, 22, 24, 27-31, 36, 44, 46, 48, 50-54, 58, 61, 63, 65	Moderately common.	1-30
S. schlegeli (Bleeker, 1861)	29, 32, 38, 44, 46, 57, 59-61	. Occasional	1-45
S. spinus (Kner, 1868)	1, 2, 5, 7, 11, 16, 21, 22, 24, 27, 28, 31, 32, 34, 36, 38, 39, 43, 44, 50-54, 57, 59-61, 63	Moderately common. Photographed.	2-18
S. tricolor Bleeker, 1849	32, 34, 36, 39, 41, 54, 61, 63, 65	Occasional, always adjacent to steep slopes, usually below 20 m.	8-40
CREEDIIDAE			
Chalixodytes chamaelontoculis Smith, 1957		USNM collection.	
C. tauensis Schultz, 1943		USNM collection.	
PINGUIPEDIDAE			
Parapercis australis Randall, 2003	46	Rare, only a few seen. Photographed.	5-25
P. clathrata Ogilby, 1911	22, 24, 27-29, 34, 44, 46, 48, 50-53, 62, 63, 65, 66	Occasional, the most common grubfish in Solomons.	3-50
P. lineopunctata Randall, 2003	8, 18, 28	Occasional, but frequents open sand.	
P. millepunctata (Günther, 1860)	1-3, 5, 6, 11, 15, 21	Occasional, but apparently restricted to NE Solomons.	3-50
P. xanthozona (Bleeker, 1849)	8, 9, 20, 21, 22, 23, 25, 26, 42, 49, 55, 64	Occasional. Photographed.	5-25
PHOLIDICHTHYIDAE			
Pholidichthys leucotaenia Bleeker, 1856	7, 22, 27, 36, 39, 41-45, 48-54, 59, 63	Occasional, locally common but usually only juveniles seen.	1-40
TRIPTERYGIIDAE			0-10
Ceratobregma helenae Holleman, 1987		Fricke, 1994	0-10
Enneapterygius elegans (Peters, 1876)		Fricke, 1994	8-37
E. fasciatus (Weber, 1908)		Fricke, 1994	0-10
E. hemimelas (Kner and Steindachner, 1867)		Fricke, 1994	0-10
E. philippinus (Peters, 1868)		Fricke, 1994	0-10
E. rhabdotus Fricke, 1994		Fricke, 1994	0-10
E. tutuilae Jordan and Seale, 1906		Fricke, 1994	0-10
Helcogramma novaecaledoniae Fricke, 1994		Fricke, 1994	3-15
Helcogramma springeri Hansen, 1986		Fricke, 1994	0-10
Helcogramma sp. 7		Fricke, 1994	0-10
H. striata Hansen, 1986	2	Rare.	1-20
H. trigloides (Bleeker, 1858)		Fricke, 1994	0-10
Springerichthys kulbicki (Fricke and Randall, 1994)		Fricke, 1994	0-10
Ucla xenogrammus Holleman, 1993	8, 10, 29, 37	Rare. Photographed.	2-40
BLENNIIDAE			
Alticus sertatus (Garman, 1903)		USNM collection.	0-10
Andamia amphibus (Walbaum, 1792)		USNM collection.	0-10
Aspidontus dussumieri (Valenciennes, 1836)		USNM collection.	1-25
A. taeniatus Quoy and Gaimard, 1834	28	Rare, only 1 seen.	1-25
Atrosalarias fuscus (Rüppell, 1835)	4, 12, 20, 26, 33, 35, 45, 47, 59, 64	Occasional in rich coral areas, but easily escapes notice..	1-12
A. hosokawai Suzuki and Senou, 1999		USNM collection.	
Blenniella caudolineata (Günther, 1877)		USNM collection.	
B. chrysospilos (Bleeker, 1857)	2, 5, 24, 27, 31	Rare, but not readily observed due to shallow wave-swept habitat.	0-3
B. interrupta (Bleeker, 1857)		USNM collection.	0-3
B. paula (Bryan and Herre, 1903)	31	Rare, but not readily observed due to shallow wave-swept habitat.	0-3
Cirripectes castaneus Valenciennes, 1836	5, 7, 11	Rare, but easily escapes notice.	1-5
C. filamentosus (Alleyne and Macleay, 1877)	16, 34	Rare, but easily escapes notice.	1-20
C. polyzona (Bleeker, 1868)		Williams, 1988	0-3
C. stigmaticus Strasburg and Schultz, 1953	2, 5, 7, 18, 21, 24, 27, 28, 35, 38, 39, 48, 50-53, 60, 61, 63, 65	Occasional. Photographed.	0-5
Cirrisalarias bunares Springer, 1976		USNM collection.	
Crossosalarias macrospilus Smith-Vaniz and Springer, 1971	15, 43	Rare, only 2 seen.	1-25
Ecsenius axelrodi Springer, 1988	29	Rare, one photographed by B. Kahn.	10-40
E. bicolor (Day, 1888)	24, 28, 58, 61, 66	Rare, usually on outer reefs. Photographed.	3-20
E. lividinalis Chapman and Schultz, 1952	1, 64	Rare, only 3 seen. Photographed.	2-15

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
E. midas Starck, 1969	32	Rare, only 1 seen.	5-30
E. namiyei (Jordan and Evermann, 1903)	33, 42, 55	Rare, about 5 seen. Photographed.	5-30
E. pictus McKinney and Springer, 1976	11, 34, 35, 39, 43	Rare, only 5 seen. Photographed.	10-40
E. prooculis Chapman and Schultz, 1952 (sim E. taeniatus)	1, 4, 8-12, 19, 20, 25, 33, 35, 37, 40, 42, 43, 45, 47, 55, 64	Common on sheltered inshore reefs. Especially numerous at sites 40 & 64. Type locality is Munda I., Solomons. Photographed.	1-15
E. sellifer Springer, 1988		Springer, 1988	1-15
E. trilineatus Springer, 1972	1, 11, 32, 34, 38, 59, 60	Occasional. Photographed.	2-20
E. yaeyamensis (Aoyagi, 1954)	21, 22, 24, 25, 39, 54, 59, 60, 66	Occasional.	1-15
Enchelyurus kraussi (Klunzinger, 1881)		USNM collection.	1-10
Entomacrodus caudofasciatus (Regan, 1909)		USNM collection.	0-3
E. decussatus (Bleeker, 1858)		USNM collection.	0-3
E. epalzeochilus (Bleeker, 1859)		USNM collection.	0-3
E. niaufooensis (Fowler, 1932)		USNM collection.	0-3
E. sealei Bryan and Herre, 1903		USNM collection.	0-3
E.striatus (Quoy and Gaimard, 1836)		USNM collection.	0-2
E. thalassinus (Jordan and Seale, 1906)		USNM collection.	0-3
E. vermiculatus (Valenciennes, 1837)		USNM collection.	0-3
E. williamsi Springer and Fricke, 2000		USNM collection.	0-3
Exallias brevis (Kner, 1868)	32	Rare, only 1 seen.	1-20
Glyptoparus delicatulus Smith, 1959	35	Rare, several seen.	1-5
Istiblennius edentulus Bloch and Schneider, 1801	1	Rare, but lives mainly in inter-tidal zone.	0-2
I. lineatus (Valenciennes, 1836)	USNM	USNM collection.	0-2
Laiphognathus multimaculatus Smith, 1955	64	Rare, only 1 seen. Photographed.	5-15
Meiacanthus anema (Bleeker, 1852)		Reported from Solomons by Smith-Vaniz, 1976, but mainly freshwater/estuarine.	0-3
M. atrodorsalis (Günther, 1877)	1, 2, 5-16, 20, 21, 23, 25-36, 38-45, 48-54, 56-66	Common.	1-20
M. crinitus Smith-Vaniz, 1987	14, 37, 45, 47	Rarely seen, but moderately common at a few sheltered sites with significant silt. Photographed.	
M. grammistes (Valenciennes, 1836)	1, 9, 12, 14, 15, 17, 18, 20, 22, 29, 33, 37, 45, 47, 55, 56, 62, 64, 66	Moderately common. Photographed.	1-20
Nannosalarias nativittatus Regan, 1909)		USNM collection.	1-10
Petroscirtes mitratus (Rüppell, 1830)		USNM collection.	0-10
P. thepassi Bleeker, 1853 (marbled)		USNM collection.	0-10
P. xestus Jordan and Seale, 1906		USNM collection.	
Plagiotremus laudandus (Whitley, 1961)	6, 7, 22, 26, 33, 34, 36, 50	Occasional.	2-35
P. rhinorhynchus (Bleeker, 1852)	8, 14, 17-23, 25-29, 32-34-37, 40, 42, 43, 45, 51-53, 55-58, 61, 63-66	Common, but alway in low numbers. Photographed.	1-40
P. tapeinosoma (Bleeker, 1857)	21, 29, 32, 48, 55	Rare.	1-25
Praealticus bilineatus. (Peters, 1868)		USNM collection.	
Rhabdoblennius snowi (Fowler, 1928)		USNM collection.	
Salarias alboguttatus (Kner, 1867)	1, 35, 37, 45	Rarely seen, but moderately common near shore at a few sites. Photographed.	
S. ceramensis (Bleeker, 1852)	25, 35, 64	Rare, about 8 seen. Photographed.	
S. fasciatus (Bloch, 1786)	1	Rare, only 1 seen.	0-8
S. guttatus Valenciennes, 1836	25, 28, 35	Rare, only a few seen.	1-15
S. segmentatus Bath and Randall, 1991	4, 14, 26, 33, 35, 37, 40, 45, 47, 55, 64	Occasional on sheltered inshore reefs. Photographed.	2-30
S. sinuosus Snyder, 1908		USNM collection.	
Stanulus seychellensis Smith, 1959		USNM collection.	
Xiphasia matsubarai Okada and Suzuki, 1952		USNM collection.	
CALLIONYMIDAE			
Callionymus delicatulus Smith, 1963		USNM collection.	1-20
C. enneactis Bleeker, 1879	9, 14, 20, 26, 33, 37, 40, 42, 45, 54	Occasional on sand bottoms. Photographed.	0-20
Diplogrammus goramensis (Bleeker, 1858)		USNM collection.	5-35
Synchiropus laddi Schultz, 1960		USNM collection.	
S. morrisoni Schultz, 1960		USNM collection.	
S. splendidus (Herre, 1927)	37	Rare, a few seen at 1 site, but cryptic habits. Photographed.	1-18
ELEOTRIDAE			
Calumia godeffroyi	5, 34	Collected with rotenone.	
GOBIIDAE			
Amblyeleotris biguttata Randall, 2004	20, 25, 26	Rare, but sand habitat inadequately sampled. Guadalcanal is type locality. Photographed.	

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
A. diagonalis Polunin and Lubbock, 1979	11, 12	Rare, but sand habitat inadequately sampled. Photographed.	6-35
A. fontanesii (Bleeker, 1852)	14, 20, 25, 26, 55, 64	Occasional on soft silty bottoms. Photographed.	5-25
A. guttata (Fowler, 1938)	3, 8-10, 13, 16, 18, 20, 23, 26, 31, 32, 36, 38, 39, 44-46, 48-51, 53-56, 61, 63, 65	Moderately common, the most abundant shrimp goby in Solomons. Photographed.	10-35
A. gymnocephala (Bleeker, 1853)	40	Rare, but sand habitat inadequately sampled.	
A. periophthalma (Bleeker, 1853)	25, 44	Rare, but sand habitat inadequately sampled. Photographed.	8-15
A. randalli Hoese and Steene, 1978	8, 31, 39, 50, 53, 61	Rare, only 6 seen. Photographed.	
A. sp.	8, 12, 55	Rare, but sand habitat inadequately sampled. Photographed at 12.	10-20
A. steinitzi (Klausewitz, 1974)	4, 8, 11, 16-18, 20, 21, 28, 32, 40, 45, 46, 56, 57, 62	Occasional, locally common in some sandy areas.	6-30
A. wheeleri (Polunin and Lubbock, 1977)	6, 22, 23, 28, 32, 34, 46, 48, 50, 51, 53, 57, 65	Occasional.	5-20
Amblygobius buanensis (Herre, 1927)	64	Rare, but found in very shallow water next to mangrove shore. Photographed.	1-5
A. decussatus (Bleeker, 1855)	4, 8, 12, 14, 16, 17, 19, 20, 25, 26, 33, 35, 37, 38, 40, 45, 47, 55, 60, 64	Moderately common on silty inshore reefs.	
A. nocturnus (Herre, 1945)	8, 14, 25, 26, 33, 45, 64	Occasional on silty inshore reefs.	
A. phalaena (Valenciennes, 1837)	4, 8-10, 14, 35, 40, 45	Occasional.	1-20
A. rainfordi (Whitley, 1940)	4, 8-10, 13, 14, 16-18, 20, 21, 26, 31-35, 38-40, 42, 43, 45, 46, 60, 64	Occasional.	5-25
Ancistrogobius yanoi Shibukawa, Yoshino & Allen, in press	4, 8, 14, 19, 45, 49, 64	Rare, but sand habitat inadequately sampled. Photographed.	
Asterropteryx bipunctatus Allen and Munday, 1996	19, 60	Rare, but difficult to detect due to cryptic habits. Photographed.	15-40
A. ensifera (Bleeker, 1874)		USNM collection.	6-40
A. semipunctatus Rüppell, 1830	14, 35	Rarely seen, but prefers shallows next to shore.	1-10
A. striatus Allen and Munday, 1996	6, 34, 35, 38, 43, 45, 46, 52, 57, 66	Occasional, but locally abundant. Photographed.	5-20
Bathygobius cyclopterus (Valenciennes, 1837)		USNM collection.	0-2
Bathygobius fuscus (Rüppell, 1830)		USNM collection.	0-2
Bryaninops amplus Larson, 1985	3, 22, 28, 59	Only a few seen, but difficult to detect. No doubt common wherever seawhips are abundant.	10-40
B. loki Larson, 1985	2, 21, 32, 36, 41, 43, 63	Occasional, but no doubt common where sea fans and black coral are abundant.	6-45
B. natans Larson, 1986	26, 38	Rare, but relatively inconspicuous due to tiny size.	6-27
B. yongei (Davis and Cohen, 1968)	8, 9, 18, 21, 26, 46, 63	Occasional, but difficult to detect. No doubt common wherever seawhips are abundant.	
Cabillus tongarevae (Fowler, 1927)		USNM collection.	
Callogobius clitellus McKinney & Lachner, 1978		USNM collection.	
C. maculipennis (Fowler, 1918)		USNM collection.	
C. sclateri (Steindachner, 1879)		USNM collection.	3-25
Cryptocentrus cinctus (Herre, 1936)	4, 12, 37, 40, 45	Rare, but sand habitat not adequately surveyed. Photographed.	2-15
C. fasciatus (Playfair and Günther, 1867)	12, 18, 46	Rare, but sand habitat not adequately surveyed.	2-15
C. inexplicatus (Herre, 1934)	4, 14, 40, 64	Rare, but sand habitat not adequately surveyed. Photographed.	
C. leucostictus (Günther, 1872)	13, 18	Rare, but sand habitat not adequately surveyed. Photographed.	
C. strigilliceps (Jordan and Seale, 1906)	8, 12, 14, 20, 25, 31, 33, 35, 37, 38, 47, 54, 55, 57, 64, 65	Occasional, but sand/silt habitat not adequately surveyed. Photographed.	1-6
C. sp. 1 (Bluespot Shrimpgoby)	8, 12, 14, 25	Rare, but sand/silt habitat not adequately surveyed. Photographed.	
C. sp. 2 (Ventral-barred)	12, 20	Rare, but sand/silt habitat not adequately surveyed. Photographed.	
C. sp. 3 (Dorsal spot)	45	Rare, but sand/silt habitat not adequately surveyed. Photographed.	
Ctenogobiops feroculus Lubbock and Polunin, 1977	8, 32	Rare, only a few seen.	2-15
C. pomastictus Lubbock and Polunin, 1977	4, 8, 9, 10, 13, 14, 16-18, 20, 21, 23, 25, 26, 33, 35, 36, 38-40, 42, 45, 47, 49, 51, 55, 62	Occasional. Photographed.	2-20
Eviota albolineata Jewett and Lachner, 1983	1, 32, 35, 40, 42, 43, 60	Noticed on several occasions, but easily missed due to small size. Photographed.	1-10
E. bifasciata Lachner and Karnella, 1980	4, 8, 9, 16, 19, 20, 33, 34, 37, 38, 40, 42, 62, 64	Occasional, but locally abundant. Photographed.	5-25
E. cometae Jewett & Lachner, 1983	34	Three specimens collected with quinaldine.	

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
E. distigma Jordan & Seale, 1906	61	One specimen collected in 18 m with rotenone.	
E. fasciola Karanella and Lachner, 1981		USNM collection.	
E. guttata Lachner and Karanella, 1978	1, 9, 13, 24, 26, 27, 31, 32-34, 36, 38, 39, 41, 42, 45, 46, 49, 51, 59, 60	Occasional, but easily missed due to small size. Photographed.	3-15
E. lachdeberei Giltay, 1933	12, 33, 37, 40	Rarely encountered, but common at site 33.	
E. lacrimae Sunobe, 1988		USNM collection.	
E. melasma Lachner and Karanella, 1980		USNM collection.	2-15
E. nigriventris Giltay, 1933	8, 19, 20, 40	Rarely encountered, but locally common in highly sheltered areas. Photographed.	4-20
E. pellucida Larson, 1976	1, 4, 6, 8, 9, 11-13, 16, 19-21, 23, 25, 26, 32-35, 37-40, 42, 43, 45, 47, 54, 55, 60, 62, 64	Moderately common.	3-20
E. prasites Jordan and Seale, 1906	29, 32, 34, 38, 63	Noticed on several occasions, but easily missed due to small size.	3-15
E. punctulata Jewett and Lachner, 1983	8, 22, 33		1-10
E. queenslandica Whitley, 1932	35	Noticed on only 1 occasion, but easily missed due to small size. Photographed.	5-30
E. sebreei Jordan and Seale, 1906	29, 32	Noticed on only 2 occasions, but easily missed due to small size. Photographed.	3-20
E. sigillata Jewett and Lachner, 1983	33	Noticed on only 1 occasion, but easily missed due to small size. Two specimens collected.	3-20
E. sparsa Jewett & Lachner, 1983	48	One collected with rotenone in 30 m.	
Exyrias bellisimus (Smith, 1959)	8, 9, 12, 14, 16, 19, 20, 21, 25, 33	Occasional on silty reefs..	1-25
Fusigobius aureus (Randall, 2001)	33	Rare, only 1 seen. Photographed.	
Fusigobius duospilus Hoese and Reader, 1985	29	Rare, only 1 seen.	
F. inframaculatus Randall, 1994	31	Rare, only 5 seen. Photographed.	
F. neophytus (Günther, 1877)	4, 12, 20, 22, 23, 25, 26, 37, 40, 42, 45, 57, 60	Occasional. Photographed.	2-15
F. signipinnis Hoese and Obika, 1988	1, 2, 4, 8, 11, 12, 15-18, 20, 23, 26, 33, 37, 38-40, 45, 47, 48, 52-54, 62, 63	Occasional, but locally common. Photographed.	10-30
F. melacron Randall, 2001	6, 8, 34, 38, 54	Rare, but easily overlooked.	5-25
Gladiogobius ensifer Herre, 1933	33	Rare, only a few seen, but easily escapes notice. Photographed.	
Gnatholepis anjerensis (Bleeker, 1851)	13, 33, 37	Rarely observed, but frequents very shallow water next to shore. Photographed.	3-30
G. cauerensis (Bleeker, 1853)	31, 32, 36, 45, 54, 55, 57	Only a few seen, but easily escapes notice due to small size and cryptic habits. Photographed.	1-45
Gobiodon acicularis Harold and Winterbottom, 1995.	40	Several specimens collected from plate *Acropora*.	3-15
G. axillaris DeVis, 1884		USNM collection.	
G. okinawae Sawada, Arai and Abe, 1973	8, 19, 20, 45, 64	Relatively rare, but a secretive species that is easily overlooked.	2-12
G. quinquestrigatus (Valenciennes, 1837)	USNM	USNM collection.	2-12
G. spilophthalmus Fowler, 1944	33, 40	Rare, but a secretive species that is easily overlooked.	2-15
Istigobius decoratus (Herre, 1927)	31, 54, 56	Only a few seen, but probably moderately common on sand bottoms. Photographed.	1-18
I. nigroocellatus (Günther, 1873)	18, 21	Only a few seen, but probably moderately common on sand bottoms..	
I. ornatus (Rüppell, 1830)	13	Only a few seen, but probably moderately common on sand bottoms..	0-5
I. rigilius (Herre, 1953)	32, 45	Only a few seen, but probably moderately common on sand bottoms..	0-30
Lotila graciliosa Klausewitz, 1960	18, 29	Rare.	2-15
Macrodontogobius wilburi Herre, 1936	4, 8, 9, 12, 14, 19, 20, 23, 25, 26, 33, 37, 40, 45, 47, 55, 60, 64	Occasional in slilty areas. Common at site 12. Photographed	2-15
Mahidolia mystacina (Valenciennes, 1837)	8, 12, 14, 25, 33, 37, 45, 49, 64	Occasional. Photographed.	
Oplopomops diacanthus (Schultz, 1943)	35	Only noticed on one occasion, but very tiny and lives on barren sand. Two specimens collected. Photographed.	
Oplopomus oplopomus (Valenciennes, 1837)	12, 25, 64	Probably common, but seldom noticed in sandy areas. Photographed	2-25
Oxyurichthys sp. 1 Kuiter & Tonozuka, 2001	8	One specimen collected.	
Paragobiodon echinocephalus (Rüppell, 1830)		USNM collection.	1-12
Periophthalmus argentilineatus Valenciennes, 1837		USNM collection.	
P. kalolo Lesson, 1831		USNM collection.	

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Phyllogobius platycephalops (Smith, 1964)	9, 16, 26, 38, 56, 59	Only a few seen, but easily escapes notice due to small size and cryptic habits. Commensal with sponges *(Phyllospongia)*.	3-20
Pleurosicya boldinghi Weber, 1913	5	Only one seen in 35 m, but easily escapes notice due to small size and cryptic habits.	8-40
P. elongata Larson, 1990	4, 8, 33, 42, 66	Occasional, commensal with sponge (*Ianthella basta*). Photographed.	10-40
P. micheli Fourmanoir, 1971	34	USNM collection.	10-50
Priolepis cincta (Regan, 1908)		USNM collection.	1-70
P. fallacincta Winterbottom and Burridge, 1992		Winterbottom and Burridge, 1992	
P. inhaca (Smith, 1949)		USNM collection.	
P. nuchifasciatus (Günther, 1873)		USNM collection.	
P. semidoliatus (Valenciennes, 1837)		Winterbottom and Burridge, 1993	0-10
Sueviota lachneri Winterbottom and Hoese, 1988	61	One specimen collected with rotenone in 18 m.	
Signigobius biocellatus Hoese and Allen, 1977	8, 12, 26, 38, 42, 45, 54	Occasional on silty bottoms. Photographed.	2-30
Stonogobiops xanthorhinica Hoese and Randall,1982	58	One seen on outer slope in 35 m.	12-60
Trimma anaima Winterbottom, 2000	41	Only 1 noticed, but easly escapes notice due to small size. Photographed.	
T. benjamini Winterbottom, 1996	26, 50, 52, 60	Only a few noticed, but easly escapes notice due to small size	10-24
T. caesiura (Jordan and Seale, 1906)		USNM collection.	2-12
T. griffthsi Winterbottom, 1984	4, 6, 19, 40, 64	Occasional, but is easily overlooked due to small size and secretive habits.	20-40
T. macrophthalma (Tomiyama, 1936)	34	One specimen collected with rotenone.	5-30
T. naudei Smith, 1957	4, 8, 38, 39	Occasional, but is easily overlooked due to small size and secretive habits.	
T. okinawae (Aoyagi, 1949)		USNM collection.	5-30
T. rubromaculata Allen and Munday, 1995	32	Seen only once, but common in 40 m depth at site 32.	20-35
T. sp. 8 (red with yellow mid-lateral stripe, white on belly)	6, 40, 49, 64	Occasional. Two specimens collected with quinaldine sulphate.	25-40
T. striata (Herre, 1945)	33	Rare, but easily overlooked due to small size and secretive habits.	2-25
T. taylori Lobel, 1979	6, 60	Rare, but easily overlooked due to small size and secretive habits. Photographed.	15-50
T. tevegae Cohen and Davis, 1969	1, 6, 8, 10, 11, 13, 16, 19, 21, 26, 32, 34, 36, 38-41, 54, 56, 57, 60	Moderately common under ledges and in caverns on steep slopes. Photographed.	8-45
Trimmatom eviotops (Schultz, 1943)		USNM collection.	
T. nanus Winterbottom and Emery, 1981		USNM collection.	6-35
Valenciennea helsdingenii (Bleeker, 1858)		Hoese and Larson, 1994	1-30
V. muralis (Valenciennes, 1837)	4, 33, 37, 40, 47	Rarely seen, but probably moderately common in shallow sandy areas near shore.	1-15
V. parva Hoese & Larson, 1994		Hoese and Larson, 1994	
V. puellaris (Tomiyama, 1936)	8, 49, 65	Rare, only 2 seen, but found on open sand.	2-30
V. randalli Hoese and Larson, 1994	8, 46, 64	Rare, only 4 seen. Photographed.	8-30
V. sexguttata (Valenciennes, 1837)	4, 8, 32, 45	Rarely seen, but probably moderately common in shallow sandy areas near shore.	1-10
V. strigata (Broussonet, 1782)	2, 5, 8, 11, 21, 28, 29, 31, 33, 36, 44, 46, 48, 50, 51, 53, 58, 63, 65, 66	Occasional, in relatively low numbers at each site. Usually seen in pairs.	1-25
Vanderhorstia ambanoro (Fourmanoir, 1957)	14, 20	Rare, but sand habitat inadequately surveyed. Photographed.	4-20
V. sp.	12, 25	Rare. Photographed.	
Yongeichthys criniger (Valenciennes, 1837)		USNM collection.	
PTERELEOTRIDAE			
Aioliops novaeguineae Rennis and Hoese, 1987	8, 12, 14, 19, 20, 33, 37, 45	Occasional.	1-15
Nemateleotris decora Randall and Allen, 1973	2, 27, 29, 32, 34, 36, 38, 39, 44, 58, 61	Occasional on steep outer slopes. Photographed.	28-70
N. magnifica Fowler, 1938	22, 29, 32, 34, 36, 38, 39, 44, 50-53, 58, 61, 65	Occasional. Photographed.	6-61
Parioglossus lineatus Rennis and Hoese, 1985		USNM collection also.	
P. rainfordi McCulloch, 1921	8, 13, 40	Rarely encountered, but locally abundant along edge of mangroves. Photographed at site13.	
P. nudus Rennis and Hoese, 1985	10, 39	Rare, but easily overlooked due to small size. Seen to depths of 15-20 m. Photographed.	10-35

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Ptereleotris evides (Jordan and Hubbs, 1925)	5, 9, 14, 15, 18, 19, 21-24, 26-28, 43, 44, 46, 48, 50-54, 57-59, 61, 63, 65, 66	Moderately common.	2-15
P. heteroptera (Bleeker, 1855)	5, 22, 27, 38, 44, 58	Occasional, usually below 25 m depth.	6-50
P. microlepis Bleeker, 1856 *P. uroditaenia* Randall and Hoese, 1985	4, 5, 10, 33, 37, 40	Occasional, but locally common. Randall and Hoese, 1985.	1-22 10-30
P. zebra (Fowler, 1938)	2, 5, 27, 31, 48, 58, 63	Occasional.	2-10
XENISTHMIDAE			
Tyson belos Springer, 1983		USNM collection.	
Xenisthmus sp.		USNM collection.	5-20
EPHIPPIDAE			
Platax boersi Bleeker, 1852	24, 25, 28, 35, 38, 52, 56, 58	Occasional. Photographed.	1-20
P. orbicularis (Forsskål, 1775)	8, 51	Rare, only 2 adults seen.	1-30
P. pinnatus (Linnaeus, 1758)	6, 13, 14, 22, 28, 32, 33, 35, 39, 52, 54, 56, 59, 63, 65	Occasional. Photographed.	1-35
P. teira (Forsskål, 1775)	17, 18, 24, 32, 43, 49, 54, 58	Occasional.	0-2
SIGANIDAE			
Siganus argenteus (Quoy and Gaimard, 1824)	3, 8, 21, 22, 24, 26, 27, 32, 33, 35, 45, 48, 50-52, 54, 56	Occasional.	1-30
S. corallinus (Valenciennes, 1835)	7, 9, 11, 12, 14, 15, 17, 18, 21-24, 26-28, 32, 38, 39, 43, 47, 53, 54, 56, 58, 59, 61, 63, 64	Moderately common. Photographed.	4-25
S. doliatus Cuvier, 1830	4, 5, 9, 10, 14, 17, 20, 25, 28, 29, 33, 35, 37, 38, 40, 42, 44, 46-49, 54, 55, 58, 60	Moderately common, usually at sheltered sites.	1-15
S. fuscescens (Houttuyn, 1782)		Woodland, 1990	
S. lineatus (Linnaeus, 1835)	8, 9, 21, 26, 33, 35, 38, 42, 48, 56, 57, 60	Occasional, but sometimes in large schools.	1-25
S. puellus (Schlegel, 1852)	2, 3, 5, 8, 9, 11, 13-18, 21-24, 26-28, 31-34, 36, 38-45, 47-54, 56-58, 61, 62, 64, 65	Common.	2-30
S. punctatissimus Fowler and Bean, 1929	1, 2, 3, 8, 9, 14, 15, 22, 24, 27, 29, 32-36, 40, 47, 48, 51, 59, 60, 62, 64	Occasional, usually in pairs. Photographed.	3-30
S. punctatus (Forster, 1801)		Woodland, 1990	1-40
S. randalli Woodland, 1990		Woodland, 1990	1-15
S. spinus (Linnaeus, 1758)	11, 16	Occasional, but main habitat (seagrass) not surveyed.	1-12
S. vermiculatus (Valenciennes, 1835)	64	One school seen on edge of mangroves.	
S. vulpinus (Schlegel and Müller, 1844)	1-66	Common, usually in pairs.	1-30
ZANCLIDAE			
Zanclus cornutus Linnaeus, 1758	1-5, 7-36, 38-66	Common. Photographed.	1-180
ACANTHURIDAE			
Acanthurus bariene Lesson, 1830	5, 22, 44, 48	Rare, less than 10 seen.	15-50
A. blochi Valenciennes, 1835	2, 9, 12, 16, 19, 22, 24, 27, 28, 34, 36, 44, 51, 56, 57	Occasional, Large schools encountered at site 22.	3-20
A. dussumieri Valenciennes, 1835		Seale, 1935	
A. fowleri de Beaufort, 1951	32, 34, 38, 39, 63, 65	Rare, a few seen on steep outer slopes.	10-30
A. guttatus Forster, 1801	29, 36	Rare, but main habitat is rocky surge zone next to shore.	
A. lineatus (Linnaeus, 1758)	2, 3, 5-7, 9, 11, 13-19, 21, 22, 24, 25, 27-32, 34-36, 38, 39, 41, 43, 44, 46, 48-54, 56-61, 63, 65, 66	Common, usually on reef top shallow surge-affected areas.	1-15
A. maculiceps (Ahl, 1923)	11, 17, 21, 24, 28, 34, 44, 48, 51, 52	Occasional.	1-15
A. mata (Cuvier, 1829)	1, 3, 8, 18, 22, 23, 27, 28, 31, 36, 44, 52, 53, 61, 65, 66	Occasionally encountered, but locally abundant at site 28.	5-30
A. nigricans (Linnaeus, 1758)	2, 11, 22, 24, 29, 36, 44, 50-53, 58-60, 63	Occasional, but locally common at a few sites. Photographed.	3-65
A. nigricaudus Duncker and Mohr, 1929	2, 3, 8, 10, 16, 17, 22, 23, 26, 28-36, 38, 39, 42, 43, 46, 48, 54, 59-62, 65, 66	Moderately common.	3-30
A. nigrofuscus (Forsskål, 1775)	2, 3, 5, 7, 11, 13, 15, 21, 27, 29, 32, 36, 38, 39, 43, 44, 46, 48, 49, 51-54, 56, 58, 59, 65, 66	Moderately common.	2-20
A. nubilus (Fowler and Bean, 1929)	32, 34, 36, 38, 39, 41, 43, 54, 60, 61	Occasional on steep outer slopes.	10-30
A. olivaceus Bloch and Schneider, 1801	2, 5, 16, 22, 31, 44, 52, 61, 66	Occasional, but locally abundant at some sites.	5-45
A. pyroferus Kittlitz, 1834	1-3, 5-13, 16-18, 21-32, 36, 38-46, 48-54, 56-63, 65, 66	Common. Photographed.	4-60
A. thompsoni (Fowler, 1923)	2, 13, 23, 24, 27, 29-32, 34, 36, 38, 39, 41-44, 50-54, 57, 58, 61	Common on outer slopes, usually on steep dropoffs.	4-75
A. triostegus (Linnaeus, 1758)	1, 2, 5, 11, 16, 21, 24, 27-29, 41, 52	Occasional, usually in shallow wave-affected areas.	0-90
A. xanthopterus Valenciennes, 1835	8, 9, 14, 18-21, 23, 25, 26, 28, 32, 33, 45, 47, 52, 55	Occasional, usually on sandy slopes adjacent to reefs.	3-90

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Ctenochaetus binotatus Randall, 1955	1, 2, 5-17, 21-31, 35, 38, 40, 42-66	Common.	10-55
C. striatus (Quoy and Gaimard, 1824)	1-3, 5-66	Common, usually in depths less than 10 m.	2-30
C. cyanocheilus Randall & Clements, 2001	3, 12, 13, 22	Only a few noticed, but hard to differentiate from *C. striatus* at a distance.	3-25
C. tominiensis Randall, 1955	7, 9, 11, 13, 14, 16, 19, 20, 23-26, 29, 32, 34-36, 38-43, 45, 47, 49, 51, 54, 57, 60, 64	Moderately common, especially in sheltered locations that drop steeply to deep water. Photographed.	5-40
Naso brachycentron (Valenciennes, 1835)	15-17, 21, 22, 28, 29, 44, 51, 52	Occasional.	15-50
N. brevirostris (Valenciennes, 1835)	24, 28, 32, 34, 36, 44,	Occasional.	4-50
N. hexacanthus (Bleeker, 1855)	22, 32, 34, 39, 50-53, 59, 61, 65	Occasional, but locally common to abundant on outer reef slopes.	6-140
N. lituratus (Bloch and Schneider, 1801)	2, 3, 5-11, 13-18, 20-24, 26-32, 34, 36, 38-54, 56-66	Common.	5-90
N. lopezi Herre, 1927	31, 34, 38	Rare, a few seen on outer reef slopes. Photographed.	6-70
N. minor (Smith, 1966)	27, 32, 63	Generally rare, but 2 large schools (and solitary fish at site 63) encountered on outer reefs.	10-50
N. thynnoides (Valenciennes, 1835)	27, 44, 66	Generally rare, but 2 large schools encountered on outer reefs.	8-50
N. tonganus (Valenciennes, 1835)	2, 51	Rare.	3-20
N. unicornis (Forsskål, 1775)	9, 11, 15, 16, 21, 22, 24, 28, 56, 58, 59, 65	Occasional.	4-80
N. vlamingii Valenciennes, 1835	3, 8, 11, 13-15, 18, 22, 23, 27, 31, 32, 34, 36, 39-41, 43, 44, 50-53, 58, 60, 61, 64, 66	Moderately common, usually adjacent to steeper outer slopes.	4-50
Paracanthurus hepatus (Linnaeus, 1758)	5, 31, 34, 44, 46, 62, 63, 66	Occasional.	2-40
Zebrasoma scopas (Cuvier, 1829)	1, 3, 5-66	Abundant.	1-60
Z. veliferum (Bloch, 1797)	2, 4, 5, 8-15, 18, 19, 21, 24-40, 42-47, 49-57, 59, 60, 62, 64, 65	Common. Photographed.	4-30
SPHYRAENIDAE			
Sphyraena barracuda (Walbaum, 1792)	42, 54, 57	Rare, only 3 seen.	0-20
S. flavicauda Rüppell, 1838	25, 57	Two schools encountered. Photographed.	1-20
S. forsteri Cuvier, 1829	32	One school of about 100 fish seen. Photographed.	
S. jello Cuvier, 1829	34, 36	Two schools encountered.	1-20
S. qenie Klunzinger, 1870	32, 59	Two schools encountered.	5-40
SCOMBRIDAE			
Euthynnus affinis (Cantor, 1849)		Caught by local fisherman near site 65.	0-20
Gymnosarda unicolor (Rüppell, 1836)	15, 17, 27, 50, 52, 61, 63	Rare, about 8 fish seen on outer reef slopes.	5-100
Rastrelliger kanagurta (Cuvier, 1816)	8, 16, 18, 19, 28, 34, 35, 39, 42, 44, 48, 53, 54, 56, 57	Occasional, often in large schools. Photographed.	0-30
Scomberomorus commerson (Lacepède, 1800)	2, 22, 25, 34, 39, 52, 53	Rare, 7 seen on outer reef slopes.	0-30
BOTHIDAE			
Bothus mancus (Broussonet, 1782)	8	Only 1 seen, but very difficult to detect due to camouflage coloration.	5-30
B. pantherinus (Rüppell, 1830)		Fowler, 1928	
BALISTIDAE			
Balistapus undulatus (Park, 1797)	1-66	Abundant.	3-50
Balistoides conspicillum (Bloch and Schneider, 1801)	2, 3, 18, 22, 28, 34, 36, 41-44, 50, 52, 58, 61, 63, 65	Occasional. Photographed.	10-50
B. viridescens (Bloch and Schneider, 1801)	5, 10, 16, 21-24, 26-36, 38, 39, 41-44, 51-53, 55, 57-59, 61, 64, 65	Occasional.	5-45
Canthidermis maculatus (Bloch, 1786)	52, 53	Rare, but locally common at 2 sites. Also photographed around floating log by B. Kahn. Photographed.	1-30
Melichthys vidua (Solander, 1844)	2, 5, 7, 13, 18, 21, 22, 24, 27-32, 34, 36, 38, 39, 41, 43, 44, 50-54, 57-61, 63, 65, 66	Moderately common.	3-60
Odonus niger (Rüppell, 1836)	1, 8, 16, 18, 22, 24, 27, 28, 31, 32, 34, 36, 39, 42-44, 46, 49, 51-54, 56-58, 61, 63, 66	Moderately common, but locally abundant at some sites (e.g. site 66). Photographed.	3-40
Pseudobalistes flavimarginatus (Rüppell, 1828)	2, 5, 8, 26, 33-35, 40, 48, 52, 54, 59, 65	Occasional, in sheltered sand or rubble areas.	2-50
Rhinecanthus aculeatus (Linnaeus, 1758)	16, 40, 52	Rare, about 5 seen.	0-3
R. rectangulus (Bloch and Schneider, 1801)	2, 5, 21, 24, 52	Rare, less than 10 encountered.	1-3
R. verrucosus (Linnaeus, 1758)	1, 4, 6, 10, 11, 16, 18, 21, 22, 28, 32, 35, 40, 52, 55, 56, 60	Occasional, but locally common on shallow flats near shore.	0-3

SPECIES	SITE RECORDS	ABUNDANCE/BASIS OF RECORD IF NOT COLLECTED DURING REA	DEPTH (m)
Sufflamen bursa (Bloch and Schneider, 1801)	1-3, 5, 7, 8-13, 15, 18, 21-24, 26-32, 34, 36, 38, 39, 41-46, 48-54, 56-63, 65, 66	Common. Photographed.	3-90
S. chrysoptera (Bloch and Schneider, 1801)	1-3, 4, 5, 7, 10, 15, 18, 21-24, 27, 28, 31, 34, 38, 40, 42-44, 46, 48-53, 56-58, 60-63, 65, 66	Common. Photographed.	1-35
S. fraenatus (Latreille, 1804)	46	Rare, 1 seen in 25 m depth.	8-185
Xanthichthys auromarginatus (Bennett, 1832)	41, 58	Rare, but mainly occurs below 30 m on steep outer reef slopes. Photographed.	25-80
MONACANTHIDAE			
Aluterus scriptus (Osbeck, 1765)	21, 22, 28, 32, 41, 42, 52, 53, 63	Occasional.	2-80
Amanses scopas (Cuvier, 1829)	2, 3, 22, 27, 32, 38, 44, 48-52, 57, 63	Occasional.	3-20
Cantherines dumerilii (Hollard, 1854)	24, 52	Rare.	1-35
C. pardalis (Rüppell, 1866)	1, 2, 3, 27, 50, 52, 63	Occasional.	2-20
Oxymonacanthus longirostris (Bloch and Schneider, 1801)	3, 11, 29, 34, 48, 49	Occasional, in rich coral areas.	1-30
Pervagor janthinosoma (Bleeker, 1854)		Hutchins, 1986	2-18
P. melanocephalus (Bleeker, 1853)		Hutchins, 1986	15-40
P. nigrolineatus (Herre, 1927)	37, 45, 64	Rare, only 6 seen, but relatively cryptic. Photographed.	2-15
OSTRACIIDAE			
Lactoria cornuta (Linnaeus, 1758)		Seale, 1906	
Ostracion cubicus Linnaeus, 1758	2, 15, 22, 27, 28, 32, 41-43, 52	Occasional.	1-40
O. meleagris Shaw, 1796	11, 21, 22, 41, 43, 44, 49, 50, 51, 63, 66	Occasional. Photographed.	2-30
O. solorensis Bleeker, 1853	1, 27, 29, 44, 50, 52, 63	Occasional.	1-20
TETRAODONTIDAE			
Arothron hispidus (Linnaeus, 1758)		Seale, 1935	
A. mappa (Lesson, 1830)	4, 6, 29, 32, 43, 61	Rare, 6 individuals seen.	4-40
A. nigropunctatus (Bloch and Schneider, 1801)	4, 6, 11, 15, 16, 20, 22, 24, 26, 29, 32, 34, 36, 38, 39, 43, 45, 52, 56, 59, 60, 63, 64, 66	Occasional..	2-35
A. stellatus (Schneider, 1801)	52	Rare, 1 seen by B. Kahn.	3-58
Canthigaster bennetti (Bleeker, 1854)		Allen and Randall, 1977	1-10
C. compressa (Marion de Procé, 1822)		Allen and Randall, 1977	1-20
C. coronata (Vaillant and Sauvage, 1875)	22	Rare, only 1 seen.	15-40
C. epilampra (Jenkins, 1903)	5	Rare, only 1 seen.	3-20
C. janthinoptera (Bleeker, 1855)		Allen and Randall, 1977	9-60
C. ocellicincta Allen and Randall, 1977		Allen and Randall, 1977. Sandfly Passage, Florida Islands is type locality.	10-30
C. papua (Bleeker, 1848)	1, 4, 8, 10, 11, 12, 14, 16, 26, 29, 32, 34-40, 45, 54, 56, 61, 64	Occasional.	1-36
C. valentini (Bleeker, 1853)	1, 18, 22, 32, 54, 56, 66	Occasional.	3-55
DIODONTIDAE			
Chilomycterus reticulatus (Linnaeus, 1758)	52	Rare, 1 seen by B. Kahn.	
Diodon hystrix Linnaeus, 1758	22, 24, 61	Rare, only 3 seen.	1-30
D. liturosus Shaw, 1804		Leis, 1977	

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

June 2006
TNC Pacific Island Countries
Report No 1/06

Chapter 4

Benthic Communities

Solomon Islands Marine Assessment

Alec Hughes

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
Alec Hughes: P.O Box 59, Gizo, Western Province, Solomon Islands. Phone : +67 7 70899
eMail: mastaliu@solomon.com.sb

Suggested Citation:
Hughes, A. 2006. Benthic Communities. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: © David Wachenfeld, Triggerfish Images

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Contents

Executive Summary

Coral reefs are a key part of the ecological system that supports vitally important food supplies and resources for economic activities. Little scientific information has so far been available on the status of Solomon Islands coral reefs. Apart from a British Society funded expedition back in the 1960s, no systematic surveys of the reefs have been carried out. This component of the Marine Assessment of the Solomon Islands was aimed at collecting data on the substrate composition and condition of the coral reefs at 66 sites located within sheltered and exposed habitats around the country.

Hard coral cover across Solomon Islands ranged between 47% and 29%, decreasing from west to east. The highest hard coral cover was found in Western, Isabel and Choiseul Provinces respectively which roughly constitute the western half of the archipelago. Makira and Malaita had less living coral cover, with Malaita having the highest non-living cover of the regions surveyed. Macroalgae cover in general was lower than coral cover at all sites. Coral cover was highest in areas located in clear, well-flushed waters, which were typical of those in exposed sites as opposed to those in sheltered sites. As a result, regions which had more sites surveyed in exposed areas had higher coral cover.

Placing this data alongside information on human population size and density, and proximity to logging operations and urban centres suggests that live coral cover decreases with greater intensity of human impact and less effective flushing and supply of fresh nutrients from open-ocean sources. Though this is not surprising, and by itself does not offer any recommendations about remedial action, it provides a possible first step towards a science-based approach to conservation of coral reefs so as to support the food and economic needs of the growing population.

Introduction

The Solomon Islands archipelago comprises 6 major islands, 30 medium size islands and numerous smaller islands making a total of 922 islands. The 6 main islands (Guadalcanal, New Georgia, Malaita, Isabel, Choiseul and Makira) run in a double chain oriented south east of Bougainville, Papua New Guinea (Figure 1).

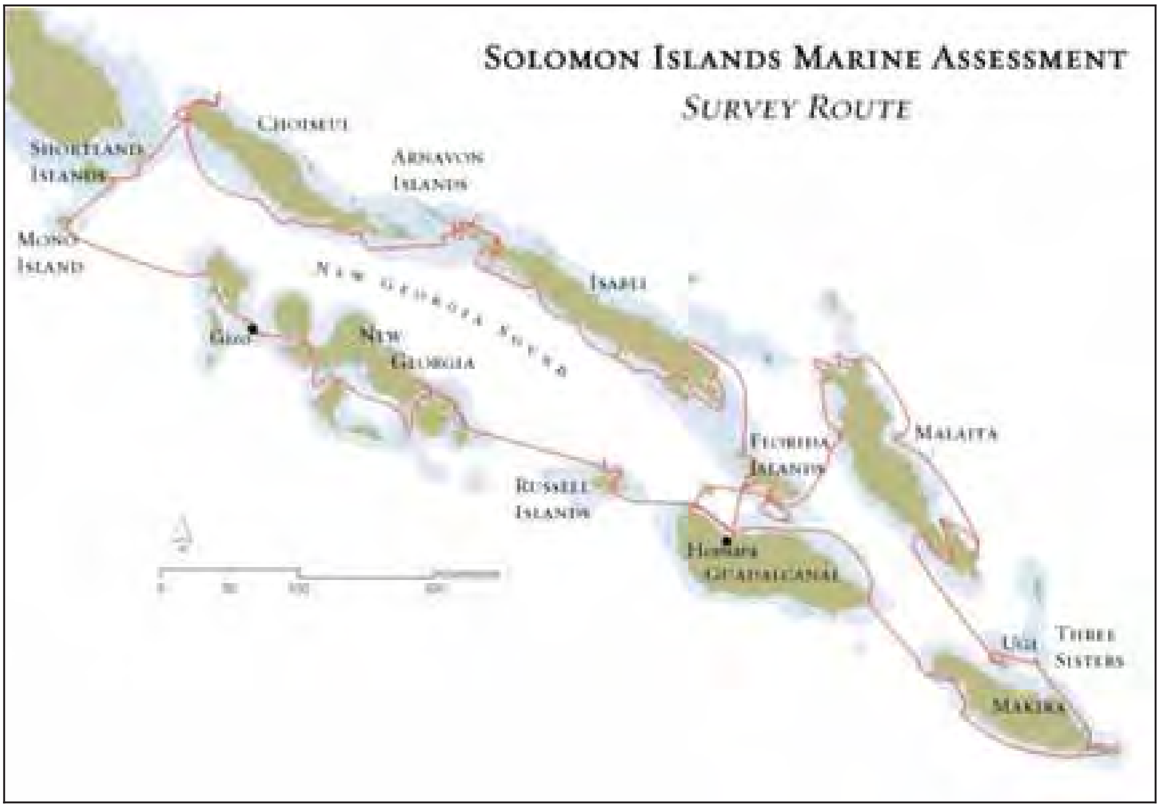


Figure 1. Map of the Solomon Islands Marine Assessment survey route

The Solomons are on the interface of the Indo-Australian and Pacific Plates which accounts for volcanic activity past and present. The islands are the result of past volcanic activities. Morton (1974) describes the living coral reefs of Solomon Islands as being generally associated with uplifted shores and attached either to volcanic coastlines or growing upon the seaward members of successively elevated coral limestone benches. Sulu and others (2000) highlight some of the larger regions of coral reefs found in the country. Such areas are found within:

- Shortland Islands
- Choiseul Island – inside barrier reefs along the northeastern shore
- Manning Strait – between Choiseul and Isabel Islands, and along the south western shore of Isabel Island
- New Georgia Island Group – Gizo Island through to Vonavona Lagoon
- Marovo Lagoon and Vangunu Island (also within the New Georgia Group)
- Lau and Langa Langa Lagoon on Malaita Island
- Marau Sound on the eastern end of Guadalcanal Island.

Coral reef systems however are not limited to these areas and are spread right throughout the archipelago. The Royal Society produced a report in 1974 on the only extensive survey ever done in the Solomon Islands in which they surveyed 36 reefs. As a result of this survey, Morton (1974) distinguished the reefs of the Solomon Islands as belonging to four distinct classes with reference primarily to their sheltered/exposure characteristics. Below are the following classes:

- Broad fringing reefs in sheltered embayments
- Sheltered reefs in land enclosed waters
- Narrow fringing reefs of north-facing or leeward coasts
- Reefs of exposed (south facing) weather coasts.

Since then no other surveys of this magnitude have been carried out. Solomon Islands as a nation has grown significantly over the last thirty years with an annual population growth rate of 2.8 percent (Otter, 2002). With the growing population has come steadily increasing pressure on its resource both on land and sea. It is of vital importance to the country that these resources are effectively managed and monitored to ensure that they can continue to support the population in years to come.

Coral reefs are an essential component of the ecological system that supports food fisheries and commercial fishing in the lagoons and nearshore and offshore waters of Solomon Islands.The aim of this report is provide an analysis of the substrate composition and present condition of coral reefs throughout the main part of the Solomon Islands archipelago, as an input towider studies on resource management..

Data presented here should be treated as a general overview of the substrate composition of Solomon Islands only. In order to assess local impacts, more detailed and site specific surveys will need to be done in the area of interest.

Methods

A total of 66 sites were surveyed during the Solomon Islands Marine Assessment over a 4 week period (Figure 2). These sites were distributed throughout the archipelago from west to east. For the purpose of data comparison the survey area was split into 6 regions (Figure 3). These regions were established according to the timing of the survey. For example Region 2 was the second lot of sites that were surveyed, Region 3 was the third and so forth. The only exception lies with Region 1 which had sites surveyed at the start, in the middle, and at the end of the assessment period.

Figure 2. Map of the Solomon Islands showing the survey sites.

Figure 3. Map of Solomon Islands showing the different regions surveyed.

Sites were generally of two habitat types, exposed or sheltered. Sheltered sites were identified as being within a protected system such as a lagoon or leeward side of an island/reef with relatively low wave energy. Such reefs tended to be behind barrier reefs or tucked inside a bay. Exposed sites were those with high wave energy and generally were on outer slopes of barrier reefs and fringing reefs on the windward side of islands/reefs. Efforts were made to survey both habitat types on each day, preferably with the exposed and sheltered habitats in close proximity to each other. This provided a general overview of both habitat types in each region. Where this was not possible, efforts were made to survey one habitat type, whichever of these the reef topography allowed.

Survey Techniques

Five 50m transects were laid at a depth profile of 8-10m for each site. Data was collected at three points at every 2m interval, for a total of 25 intervals on each transect. At each interval, two points were taken 1m on either side of the transect tape and the third directly below the tape. This resulted in a total of 75 points for each transect, and a total of 375 points for each site.

Corals and other substrate forms were recorded at the growth form level consistent with the categories used by the Australian Institute of Marine Science (AIMS) survey manual (English et al, 1997; Appendix 1). For ease of presentation these were further grouped into 4 super categories: Corals, Macroalgae, Non-living and Others (Appendix 1).

Data sheets were pre-printed on underwater paper and attached to plastic slates via bull dog clips and rubber bands. On average there were two 90 minute dives per day. At the end of each dive, data was entered into Microsoft Excel.

Data Analysis

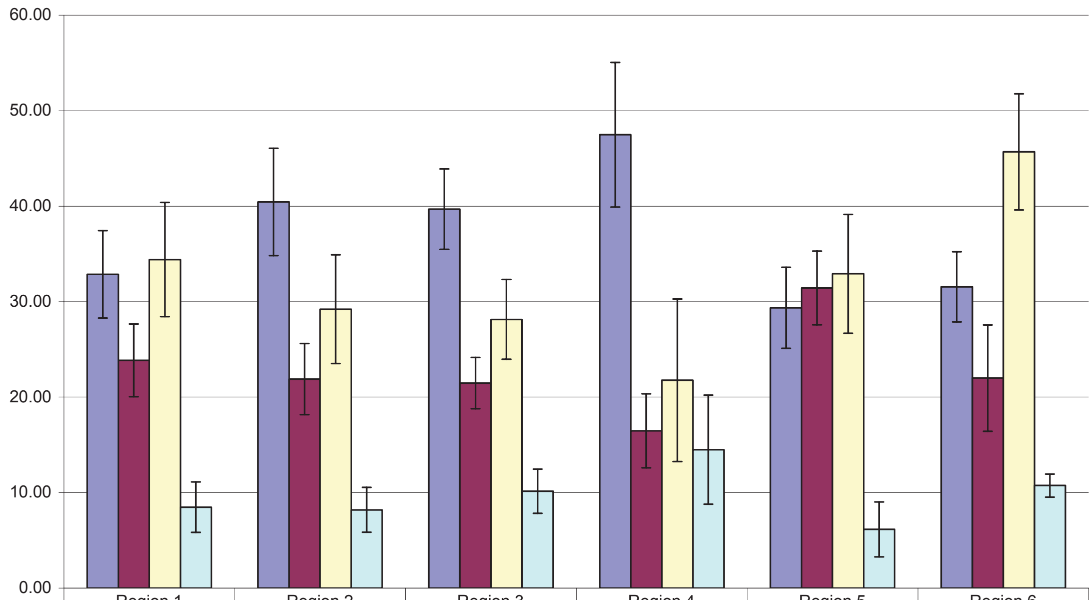
Data analysis was carried out using Microsoft Excel to investigate trends in substrate cover across the 66 sites. This was done in the following manner:

Major Lifeforms
Large scale: Summary of the 4 major categories between each of the 6 regions.
Small scale: Summary of the 4 major lifeforms within each region site by site

Coral Lifeforms
Large scale: A summary of coral lifeforms between each of the 6 regions
Small scale: Summary of coral lifeforms within each region site by site and finally a comparison of the different coral lifeforms which were dominant within each of the different habitant types.

Results

Summary of the Major Lifeforms Across Each of the 6 Regions



	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6
Coral	32.86	40.44	39.70	47.49	29.36	31.56
M-algae	23.86	21.90	21.47	16.47	31.44	22.00
N-living	34.42	29.21	28.14	21.77	32.92	45.69
Others	8.48	8.20	10.15	14.50	6.15	10.74

Figure 4. Overall trends of the four major lifeforms of the six regions.

Coral Cover

Overall coral cover was highest amongst the 6 regions in Region 4 followed by Regions 2 and 3 with similar cover, 40.44 % ± 5.61 and 39.70 % ± 4.21 (Figure 4). Region 5 had the lowest cover 29.36 % ± 4.21. Except for Region 1, all the other regions had higher coral cover in exposed locations (Figure 5).

Macroalgae Cover

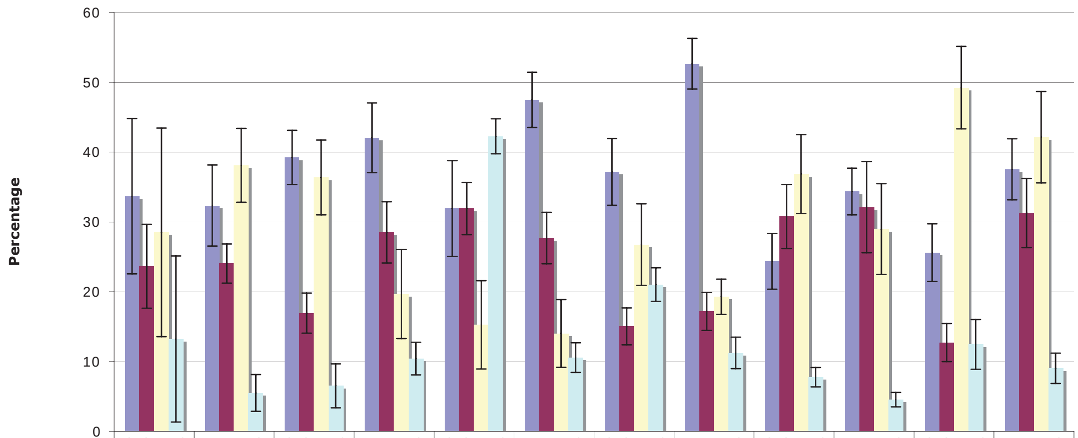
Macroalgae cover was highest in Region 5 with an average of 31.44 % ± 2.68 (Figure 4). Macroalgal cover remains relatively constant between the other regions except for Region 4 which has the lowest average 16.47% ± 3.87. Within most of the regions there was a higher coverage of this lifeform in exposed areas (Figure 5).

Non-living Cover

Region 6 has the highest non-living cover 45.69% ± 6.23. Relatively similar coverage was encountered in the other regions, whilst Region 4 had the lowest cover 21.77% ± 8.51 (Figure 4). Sheltered sites had more nonliving substrate than exposed sites (Figure 5).

Others

Highest others lifeform was recorded in Region 4 with a mean of 14.50 ± 5.72. Averages ranged between 8.48 – 10.15 % for the other regions except for Region 5 which had the lowest 6.15% ± 1.21 (Figure 4). Those in lifeforms in this category were encountered more frequently in sheltered habitats (Figure 5).



	Region 1		Region 2		Region 3		Region 4		Region 5		Region 6	
	Sheltered	Exposed	Sheltered	Exposed	Sheltered	Exposed	Sheltered	Exposed	Sheltered	Exposed	Sheltered	Exposed
Coral	33.69	32.34	39.23	42.05	31.92	47.48	37.18	52.65	24.36	34.36	25.59	37.54
M-algae	23.64	24.04	16.94	28.5	31.92	27.69	15.04	17.18	30.77	32.12	12.72	31.28
N-living	28.51	38.11	36.37	19.66	15.26	14.02	26.75	19.27	36.86	28.97	49.23	42.15
Others	13.23	5.51	6.53	10.43	42.26	10.56	21.03	11.24	7.76	4.55	12.46	9.03

Coral M-algae N-living Others

Figure 5. A mean representation of the substrate composition within the two habitat types of the 6 geographical regions visited during the survey.

REGION 1: FLORIDA ISLANDS, RUSSELL ISLANDS, SAVO ISLAND AND GUADALCANAL ISLAND

A total of 13 sites were surveyed throughout this region, which is located roughly in the centre of the main archipelago (Figure 3). Of these 13 sites, 5 were in sheltered habitats and the remaining 8 were in exposed habitats (Figure 6).

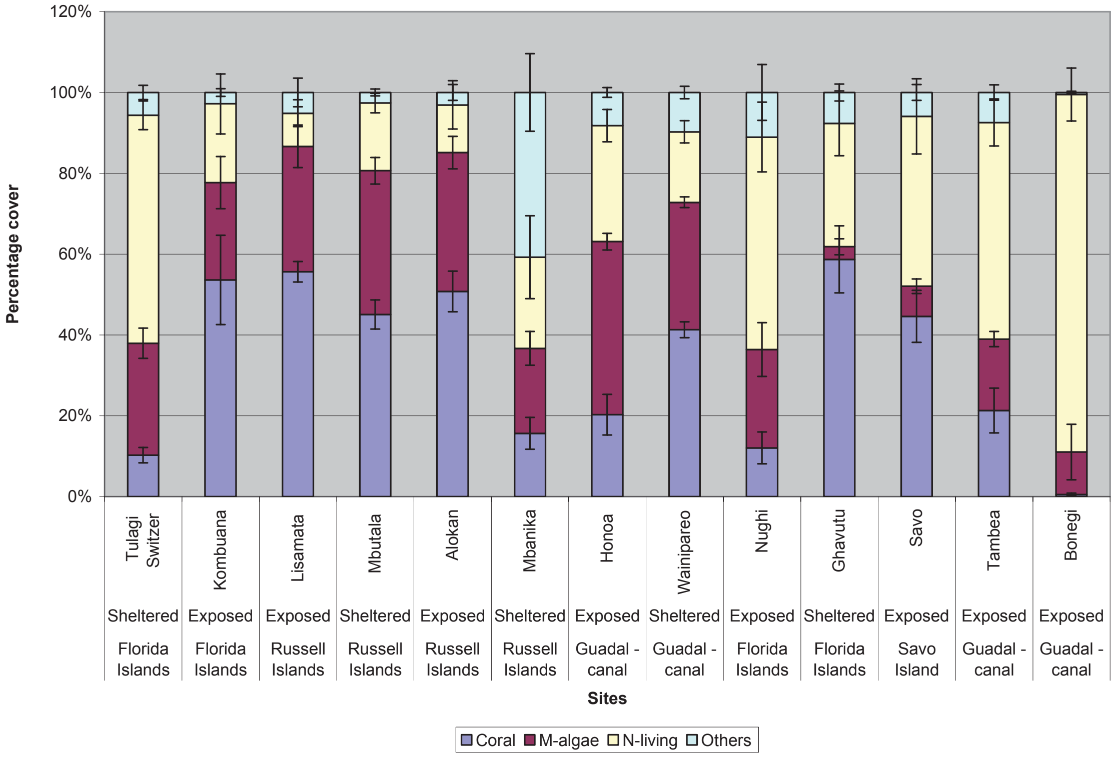


Figure 6. Substrate composition of sites in Region 1.

<u>Region 1: Coral</u>

Coral cover was variable for the sites surveyed with an average of 32.86% ± 4.57 cover for the 13 sites (Figure 4). Lowest coral cover was recorded in Tulaghi Switzer Island (10.26%) while Ghavutu recorded the highest cover (57.8%) (Figure 6). Coral cover was very similar between the exposed, 32.34% and sheltered 33.69% habitats (Figure 5).

Within exposed sites ACB and CM registered higher values, 7.38% ± 3.73 and 8.38% ± 2.61 respectively, than the rest of the lifeforms. Kombuana had the highest values of ACB, 29.23% ± 10.97, however this was not consistent. Lisamata had the highest values for CM, 22.56% ± 2.91 (Appendix 2, A)

In sheltered sites CB and CM had similar values of 10.56% ± 4.09 each which were the highest for sites in this habitat type. Out of the 5 sheltered sites Wainipareo (22.32% ± 2.31) and Mbutata (21.28% ± 1.98) had the highest values for CB. While the high reading for CM was due to the a high cover at Ghavutu (24.62% ± 2.76) followed by Mbutata (13.59% ± 1.97) (Appendix 2, B)

<u>Region 1: Macroalgae</u>

Throughout the 13 sites, macroalgae dominated 23.86% ± 3.8 of benthic cover (Figure 4). Highest cover was recorded at Honoa (42.82%) on Guadalcanal while moderately medium cover were recorded elsewhere in the region (20-40%) except for Ghavutu in the Florida Islands which had the lowest cover of the region (3.08%) (Figure 6). Exposed habitats had similar macroalgae cover (24.04%) to sheltered sites (23.64%) (Figure 5).

Region 1: Non-living

Non-living cover was variable amongst the sites and amounted to 34.42% ± 5.9 of the substrate (Figure 4). Bonegi, on Guadalcanal had the highest recording (88.46%) and Lisamata in the Russell Islands had the least (8.21%) (Figure 6). Exposed habitats recorded more non-living data (38.11%) than sheltered habitats (28.51%) (Figure 5).

Region 1: Others

Average reading for other lifeforms was 8.48% ± 2.65 (Figure 4). Highest cover was at Mbanika, Russell Islands (40.77%), while lowest cover was at Bonegi (0.51%), Guadalcanal. All other sites recorded similar coverage (2-12%) (Figure 6). Coverage was lower in exposed sites (5.51%) compared to sheltered sites (13.23%) (Figure 5).

Region 2: Isabel Island and Arnavon Islands

A total of 14 sites were surveyed within this region, 6 of which were exposed habitat and 8 sheltered habitat (Figure 7).

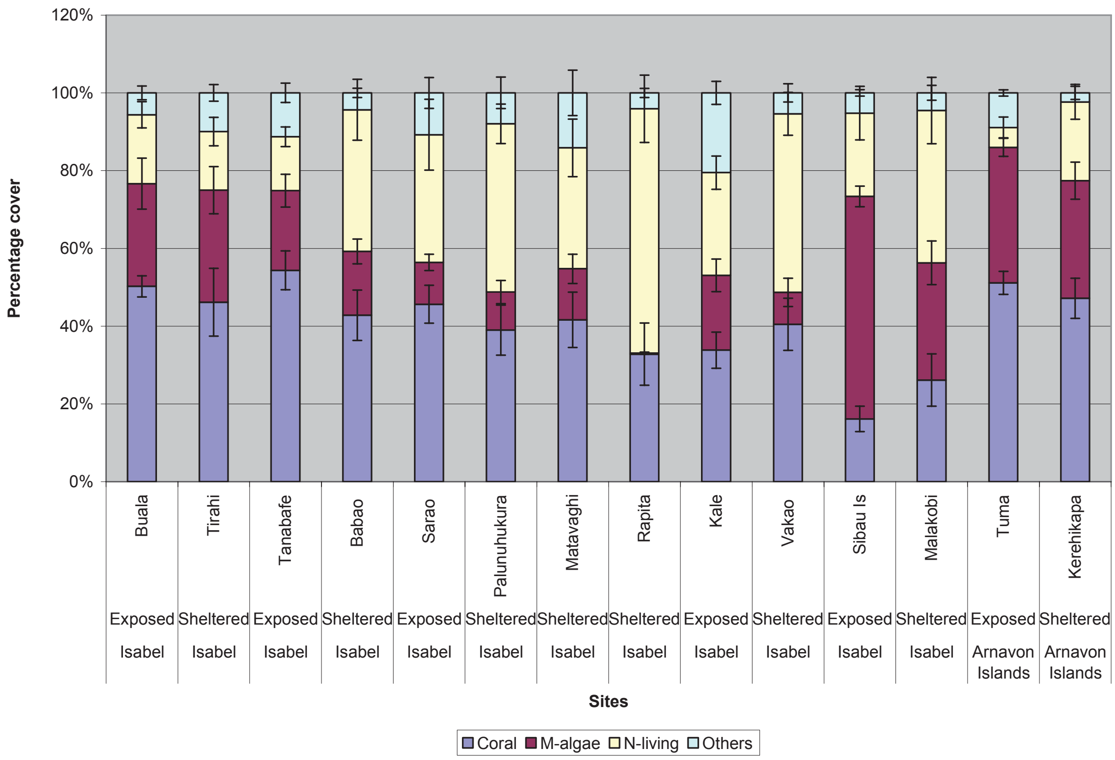


Figure 7. Substrate composition for Region 2.

Region 2: Coral

Coral cover was relatively constant for 9 sites and was approximately 40.44% ± 5.61 (Figure 4). Tanabafe had the highest reading (54.36%) followed closely by Tuma (51.4%), with the lowest reading taken at Sibau (16.67%) (Figure 7). Higher coral cover occurred on exposed sites (42.05%) compared to sheltered sites (39.23%) (Figure 5).

CM (7.89% ± 3.51), ACB (6.97% ± 5.06) and CE (5.73% ± 3.59) had higher values for this region however this was not representative of all sites in the region. There was a very high cover of ACB (32.05% ± 2.5) at Buala however the other five exposed sites had less than 5% cover. Tuma had the highest CE cover out of the exposed sites (22.05% ± 2.76). Tanabafe had consistent high CM cover (20.51% ± 0.26) followed by Kale (16.15% ± 4.95) (Appendix 2, C).

Sheltered sites in Region 2 had average consistent cover of CM (9.31% ± 0.33), CB (7.05% ± 0.29) and CF (7.03 ± 0.31). Tirahi had the highest CM cover (18.59% ± 4.97), Vakao second (17.68% ± 4.58) and Babao (14.36% ± 2.48). CB cover was highest at Kerehikapa (14.62% ± 5.93), Malakobi (12.05% ± 3.41) and Rapita (11.03% ± 4.74) (Appendix 2, D).

Region 2: Macroalgae

Algae cover was variable throughout the sites and accounted for 21.90% ± 3.72 of the substrate surveyed (Figure 4). Sibau recorded the highest abundance (58.97%) while Rapita had the lowest (0.26%) (Figure 7). There were a lot more macroalgae on exposed sites (28.50%) than sheltered sites (16.94%) (Figure 5).

Region 2: Non-living

Non-living cover represented 29.21% ± 5.69 of the total substrate cover surveyed in Region 2 (Figure 4). Rapita had the highest cover (62.8%), while Tuma had the lowest (5.13%) (Figure 7). Sheltered sites had higher non-living coverage (36.37%) compared to exposed sites (19.66%) (Figure 7).

Region 2: Others

Others accounted for 8.20% ± 2.35 of total substrate (Figure 4). Kale on Isabel had the highest cover (20.51%) while Kerehikapa in the Arnavon Islands had the lowest cover (2.31%). Most other sites had less than 10% cover (Figure 7). Higher readings were recorded on sheltered sites (10.43%) as opposed to exposed sites (6.53%) (Figure 5).

REGION 3: CHOISEUL ISLAND AND SHORTLAND ISLANDS

Twelve sites were surveyed within the Region with 8 of these on Choiseul and the remaining 4 within the Shortland Islands. Of the 12 sites, 6 were exposed habitats and the other six sheltered habitats (Figure 8).

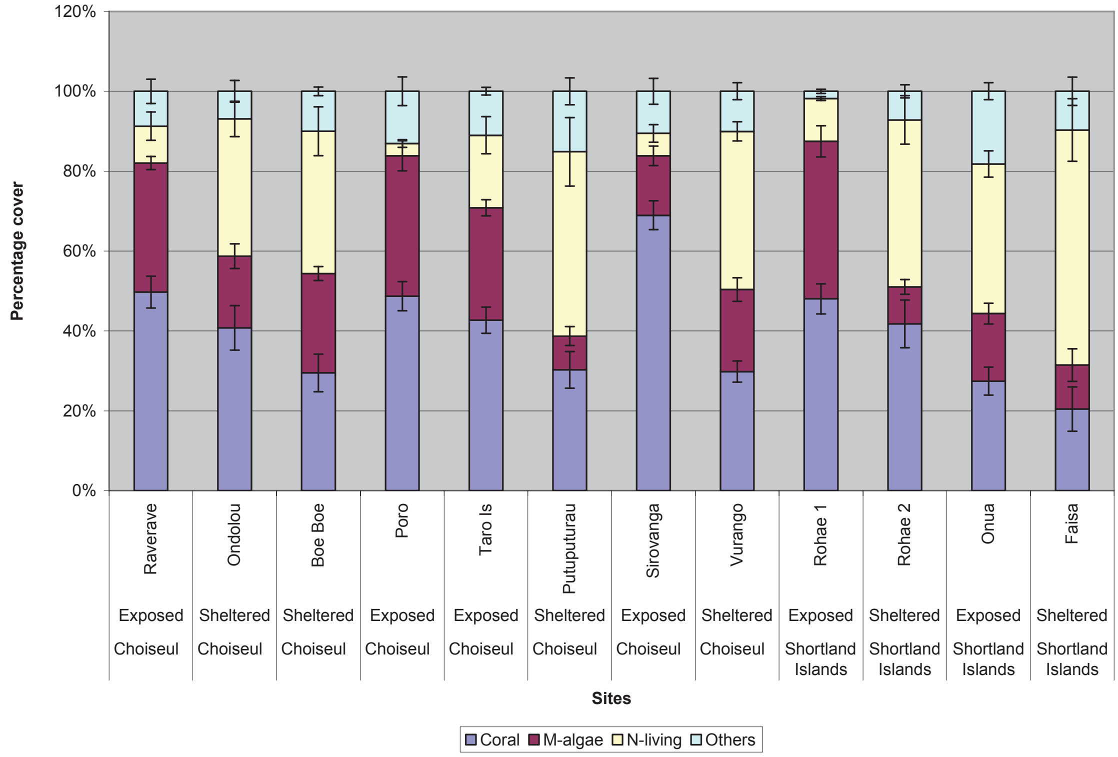


Figure 8. Substrate composition in Region 3.

Region 3: Coral

Coral cover was inconsistent and amounted to 39.7% ± 4.21 of the area surveyed (Figure 4). Of these Sirovanga had the highest cover (68.97%), and Faisi had the lowest (19.49%) (Figure 8). Exposed habitats exhibited higher abundance of coral cover (47.48%), while the coral cover in sheltered habitats was less (31.92%) (Figure 5).

Coral lifeforms with high cover throughout exposed areas of the region were ACE (8.68% ± 0.52), CE (8.57% ± 0.41), CS (7.31% ± 0.52) and CM (7.12% ± 0.32). ACE was highest in Sirovanga (26.92% ± 2.56). Poro (18.97% ± 2.67) had the most CE occurrence. Raverave (26.41% ± 3.36) had exceptionally high CS cover compared to the other five exposed sites (Appendix 2, E).

Average cover of coral types within the sheltered areas were dominated by CM (7.65% ± 0.35), CE (5.85% ± 0.40) and ACB (4.96% ± 0.43). There was a consistent CM cover at all sites but Rohae 2 (14.36% ± 2.45) had the highest cover. Boe Boe (14.62% ± 2.21) had good CE cover followed by Ondolou (11.28% ± 2.93) (Appendix 2, F).

Region 3: Macroalgae

Variable algal cover occurred throughout the 12 sites averaging at 21.47% ± 4.21(Figure 4). Highest cover occurred at the exposed Rohae 1 (38.72%) while lower cover occurred at the sheltered site at Taro Island (8.46%) (Figure 8). Exposed sites (27.69%) in general had higher algal occurrences than sheltered sites (15.26%) (Figure 5).

Region 3: Non-living

Non-living cover accounted for 28.14% ± 4.18 of the total substrate composition (Figure 4). Faisi had the most abundant non-living cover (56.14%) while Poro had the lowest cover

(3.08%) (Figure 8). Higher occurrences of non-living cover were noted in sheltered sites (42.26%) as compared to exposed sites (14.02%) (Figure 5).

Region 3: Others

This category made up a small percentage of the substrate and had a fairly even distribution throughout the sites averaging at 10.15% ± 2.32 (Figure 4). Onua accounted for the highest reading (18.21%) while Rohae 1 had the least (1.79%) (Figure 8). There were slightly more occurrences on the Sheltered sites (10.56%) than the sheltered sites (9.74%) (Figure 5).

REGION 4: VELLA LAVELLA ISLAND, GIZO ISLAND, NEW GEORGIA ISLAND AND MAROVO LAGOON

A total of 9 sites were surveyed within this region. Of the 9 sites, 3 were sheltered and 6 were exposed sites (Figure 9).

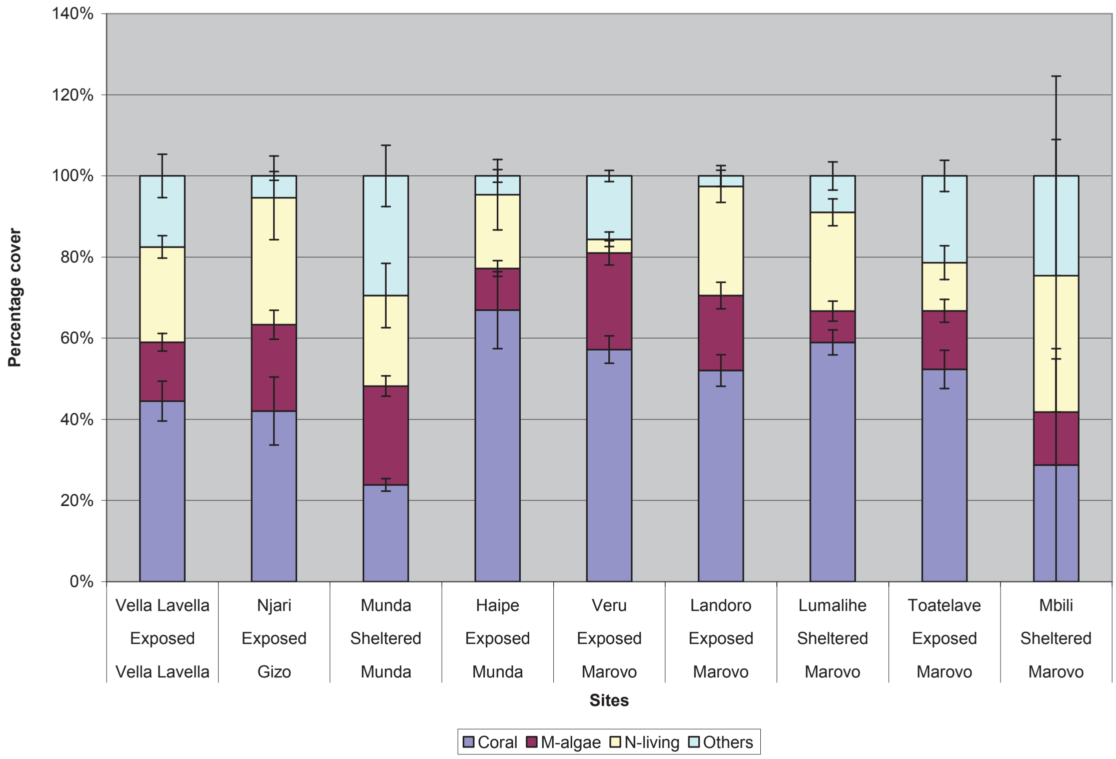


Figure 9. Substrate composition of Region 4.

Region 4: Coral

Coral cover accounted for 47.49% ± 7.58 of the survey area (Figure 4). Haipe which is a platform reef, had the highest cover (66.92%) with the lowest cover recorded on the sheltered site at Munda (23.85%) (Figure 9). Exposed sites had more cover (52.65%) compared to sheltered sites (37.18%) (Figure 5).

Within the exposed sites the most common coral type was the CM (19.72% ± 0.39). All other coral types had less than 10% cover. Toatelave (27.60% ± 4.36) had the highest occurrence followed by Landoro (25.64% ± 4.88). Though it wasn't significant for the region there was a high cover of ACT at Haipe (17.95% ± 2.26) (Appendix 2, G).

CM (19.19 ± 0.10) was the dominant lifeform within the sheltered regions. CTU (7.52 ± 0.51) was second, the rest of the coral types registered less than 2% cover each. All three sheltered sites had consistent CM cover. Lumalihe (24.62% ± 2.12) had the highest followed by Mbilli (19.74% ± 1.93) and Munda (13.21% ± 2.04). A high occurrence of CTU was found in Lumalihe (22.56% ± 4.01) (Appendix 2, H).

Region 4: Macroalgae

Macroalgae covered 16.47% ± 3.87 of area surveyed (Figure 4). Munda had the highest cover (24.36%) followed closely by Veru Pt (23.85%) and lowest cover was at Lumalihe passage (7.69%) (Figure 9). Exposed and sheltered sites had 17.18% and 15.04% cover respectively (Figure 5).

Region 4: Non-living

Non-living cover had a mean of 21.77% ± 8.51 and was variable among the sites (Figure 4). Mbili passage had the most cover (33.59%) while Veru had the lowest (3.33%) (Figure 9). The non-living cover for sheltered and exposed sites was also variable with sheltered sites recorded a mean cover of 26.75% and exposed sites with 19.27% respectively (Figure 5).

Region 4: Others

An average of 14.50% ± 5.72 cover was recorded. Of this the highest was recorded for Munda Bar (29.49%) and the lowest for Landoro (2.56%) (Figure 9). Sheltered sites had higher occurrences (21.03%) while exposed sites (11.24%) (Figure 5).

Region 5: Makira Island, Three Sister Islands and Uki Ni Masi Islands

This is the far most region surveyed. A total of 8 sites were surveyed, 4 in sheltered areas and 4 in exposed area (Figure 10).

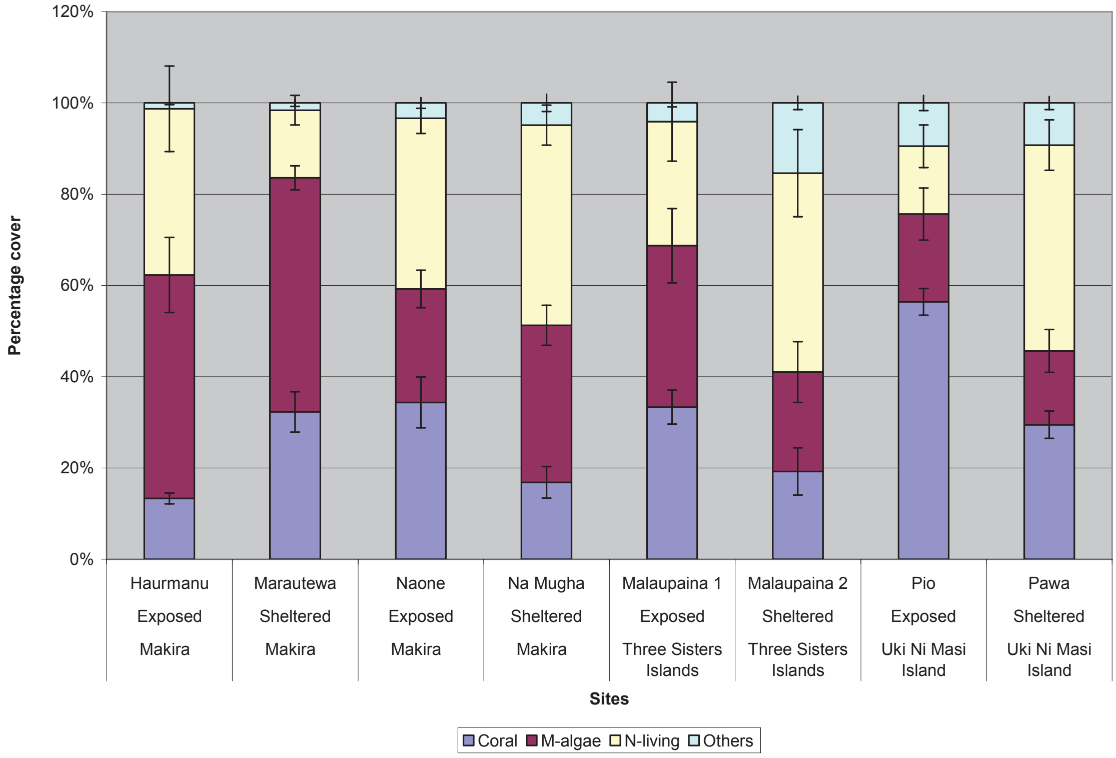


Figure 10. Substrate composition for Region 5

Region 5: Coral

Coral lifeforms made up 29.36% ± 3.67 of the surveyed sites (Figure 4). Pio had the highest cover (56.41%) and Haurimanu had the least (13.33%) (Figure 10). Exposed sites had higher cover (34.36%) than sheltered sites (24.36%) (Figure 5).

Of the four exposed sites in the region the most common were CM (7.82% ± 0.51), ACT (6.54% ± 0.53), ACS (5.64% ± 0.56) and ACB (5.51% ± 0.43). CM was most abundant in Pio (13.14% ± 0.47). Similar values were recorded for ACT in Pio (10.51% ± 0.38) and Naone (10.26% ± 0.47). For ACS, Pio (10.26% ± 0.51) again had the highest cover with Malaupaina 1 (9.49% ± 0.61) having the second highest which also had the highest ACB cover (8.97% ± 0.74) (Appendix 2, I).

Sheltered sites were dominated by CM (6.32% ± 0.61) which was highest in Marautewa (8.46% ± 0.59) . Though not significant for the region, Marautewa also had significantly more CB (8.46% ± 0.59) cover than the other sites (Appendix 2, J).

Region 5: Macroalgae

Macroalgae accounted for 31.44% ± 5.56 of area surveyed (Figure 4). Highest cover occurred on Marautewa Island (50.51%) while Ugi had the lowest cover (16.15%) (Figure 10). Exposed sites had more cover (32.12%) than sheltered sites (30.77%) (Figure 10).

Region 5: Non-living

There were more non-living benthic structures on the reefs around Makira province than other structures with an average of 32.92% ± 6.08 cover (Figure 4). Ugi had the highest cover (45.13%) of the surveyed sites while Marautewa Island had the lowest (14.62%) (Figure 10). Sheltered sites had more cover (36.86%) than exposed sites (28.97%) (Figure 5).

Region 5: Others

These benthic structures made up 6.15% ± 1.21 of the substrate area surveyed (Figure 4). Three Sisters group of islands had the highest percentage cover (15.38%) while Haurimanu had the least (1.28%) (Figure 10). Sheltered sites had more cover (7.76%) than exposed sites (4.55%) (Figure 5).

REGION 6: MALAITA ISLAND

The most populated region located in the north eastern corner of the country. A total of 10 sites were surveyed with 5 in sheltered areas and 5 in exposed areas (Figure 11).

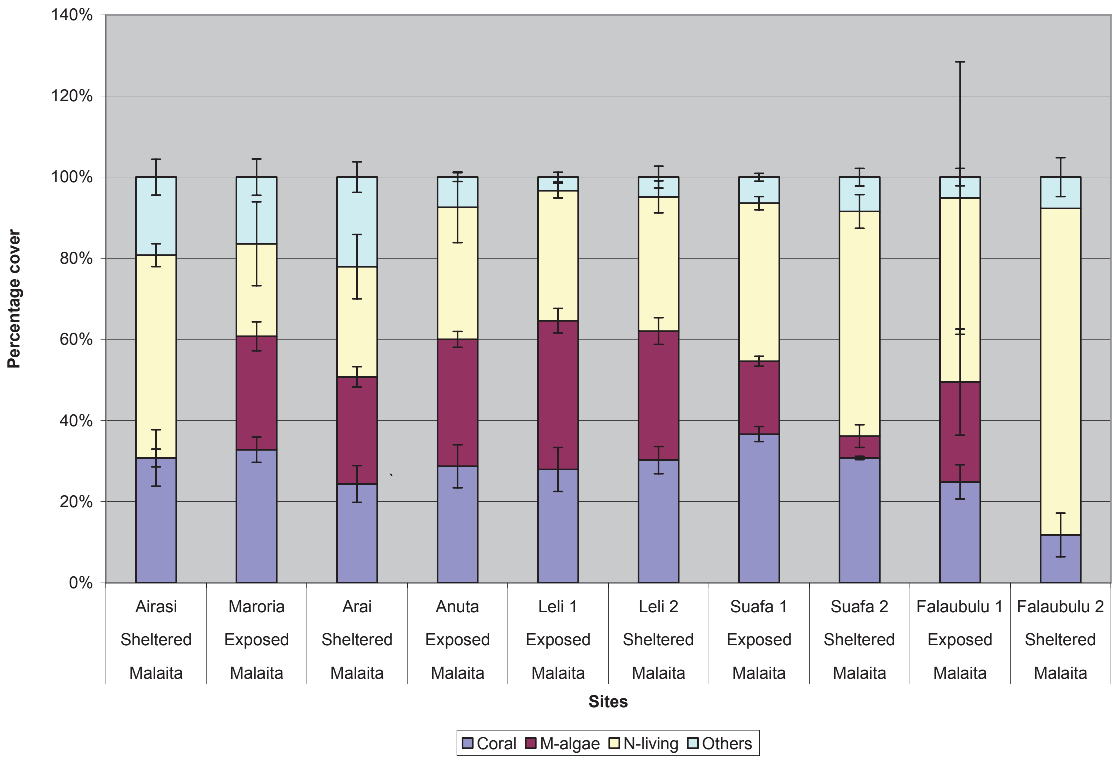


Figure 11. Substrate composition in Region 6.

Region 6: Coral

Malaita had some of the lowest coral covers recorded during the survey with a consistent cover of 31.56% ± 4.25 (Figure 4). Toi was an exception with very high coral cover (73.33%) whilst Falaubulu 2 had the lowest cover (11.79%) (Figure 11). Exposed sites had more cover (37.54%) compared to sheltered sites (25.59%) (Figure 5).

Throughout the exposed sites CM (9.08% ± 0.41) and CE (5.08% ± 0.34) were the dominant lifeforms. Anuta (14.10% ± 0.54) had highest CM cover followed by Falaubulu 1 (11.28% ± 0.36) and Suafa 1 (10.77% ± 0.48). Suafa 1 also had the highest CE (10.26% ± 0.34) and CS (8.97% ± 0.39) cover (Appendix 2, K).

CM (12% ± 0.46) was again the dominant form in the sheltered sites. The highest cover was at Arai (17.44 ± 0.49), Suafa 2 (14.87% ± 0.52) and Falaubulu (14.10% ± 0.23) (Appendix 2, L).

Region 6: Macroalgae

Macroalgae accounted for 22.00% ± 3.85 of sites surveyed (Figure 4). Highest cover occurred for Leli 1 (36.67%) while Suafa 2 had the lowest cover (5.38%). Two sites, Airasi and Falaubulu Island had no macroalgae recorded (Figure 11). Macroalgae were found to be abundant at exposed sites (31.28%) than in sheltered sites (12.72%) (Figure 5).

Region 6: Non-living

Non-living benthic structures accounted for 45.69% ± 6.23 of the total substrate cover surveyed for the reefs in this region (Figure 4). Falaubulu 2 had the most non-living surface area (80.51%) while Maroria had the least (22.82%) (Figure 11). Sheltered sites had more non-living cover (49.23%) than exposed sites (42.15%) (Figure 5).

Region 6: Others

These benthic structures accounted for 10.74% ± 2.87 of the substrate (Figure 4). Arai had the highest cover (22.05%) while Leli 1 the lowest (3.33%) (Figure 11). Sheltered sites had higher percentage cover (12.46%) than exposed site (9.03%) (Figure 5).

Discussion

General Country Trend for Coral Cover

The average coral cover for the Solomon Islands ranges between 29.4% and- 47.5% with a general trend of decreasing hard coral cover as the focus shifts from the western half to the eastern half of the archipelago. This decreasing coral cover is most likely linked to the change in topography of sites selected in the western and eastern ends of the country. The structure and composition of a coral reef in species and growth forms, results – as is well known – primarily from its place on a spectrum of relative exposure to waves and surge. As well as by exposure, reef structure and composition will be greatly influenced by the considerable effects of freshwater run-off and sediments from the land, greatest in volcanic islands with considerable watershed area and streams of significant size and smallest in low-pitched sand cays, often with fringing reefs of very great extent (Morton, 1974).

Habitat Trends

Sites located in exposed habitats had higher coral cover than those in sheltered sites, which may be attributed to the location of the sites. There is a higher tendency for reefs located in lagoons and near large land masses to be periodically affected by extreme weather events resulting in masses of freshwater and sediments flowing over and damaging coral reefs (Wilkinson, 1999). Those located in exposed areas tend to experience higher wave energy and stronger currents and are thus better at flushing out sediments and have clearer waters. This may help to explain why certain regions which had more sites surveyed in exposed sites (due to logistical regions) had higher coral cover. For example, caution must be exercised when viewing the trends for Region 4, as some trends may not be true representations of the habitats found within that region.

Overall the most dominant coral type found within sheltered and exposed habitats of all six regions was the coral massive (CM) represented by species within the Faviddae

Family(*Favites, Goniastrea* and *Cyphastrea*) and Family Mussidae (*Lobophyllia* and *Symphyllia*).

On their own, the various different lifeforms of the Family Acroporidae which stood out amongst the regions were the branching, encrusting, digitate and tabulate forms. *Acropora* species were visibly more abundant within exposed habitats than in sheltered habitats. When the different *Acropora* lifeforms cover were accumulated it showed a significant presence of the Family *Acropora* as a whole, especially within the exposed habitats.

In areas such as Region 6 the low presence of *Acropora* could possibly be due to the relatively high human activities taking place on the reefs such as the intense harvesting of *Acropora* branching species for the very popular betel nut trade, especially in such densely populated region such as Malaita.

SUBSTRATE COMPOSITION WITHIN THE ARCHIPELAGO

Central Solomons: Region 1 (Central and Guadalcanal Province)

In 1999 Central province had a population of 21, 577 with a population density of 35 people per km^2, while Guadalcanal had a population of 60, 275 with a population density of 11 people per km^2 (Solomon Islands Government, 2000).

Guadalcanal Island is much bigger than the islands of Central Province combined. Its coral reef area is made up of intermittent narrow fringing reefs. The mountainous ridges of Guadalcanal have rivers that drain out onto the northern and southern sides of the island. Marau Sound lagoon differs from the rest of the province as it is studded with dozens of small islands and sand cays surrounded by intact coral reefs with healthy coral cover. Central Province is made up of the Savo, Russell and Florida islands. Unlike the mountainous island of Guadalcanal these smaller islands, except for Savo , are surrounded by fringing reefs and have patch reef networks within their small lagoons.

Coral Cover

The overall low coral cover within Region 1 does not represent the level of cover found in each of the two provinces. The low, and at times, almost non existent coral cover on the northern coast of Guadalcanal is characteristic of reefs which are situated close to river systems. The presence of rivers along the coastline will tend to limit coral populations distribution especially "in times of extreme weather events resulting in freshwater and sediments flowing over and damaging the coral reefs (Wilkinson, 1999)". There exists a relatively large river known as Bonegi river, which is a popular weekend hangout for residents of the nearby national capital, Honiara. The freshwater influx from the river would be a contributing factor to the low coral cover in that area. Overfishing of marine resources in order to supply the increasing population of the capital, Honiara, has placed further pressure on the reef health along the Guadalcanal coastline. The exception here is that of Wainipareo, located in the sheltered but well flushed waters of Marau Lagoon, which had the highest cover in the province.

The use of dynamite to catch fish has been a problem within the Florida Islands (Sulu, unpublished, 2001). Dynamite fishing is preferred by fishermen who are skilled in locating schools of fish due to its high profitability , but it is an indiscriminate form of fishing which can kill non commercial species and corals (Alcala and Gomez, 1987). In areas such as the Tulaghi Switzer Island, dynamite fishing has destroyed the reef resulting in the low coral cover and a higher occurrence of non living substrate. Apart from this, the majority of exposed sites were located on fringing reefs on the outskirts of the province located away from any major anthropogenic influences in areas exposed to high water movement, clarity and thus higher coral cover than Guadalcanal province.

Macro Algae Cover

The absence or low presence of competition from corals and predation by herbivorous predators can result in increased algal biomass on coral reefs (Sammarco, 1982; Jompa and McCook, 2002). The high algal cover at Honoa, which is typical of the exposed coastline of Guadalcanal, could be a direct sign of overfishing in order to supply the high demand for reef fish in Honiara. In the sheltered areas of the Central Province the levels maybe due to the increase in suspended nutrients linked to freshwater runoff which affect coral photosynthesis and increase algal production. Several sites in Central Province had rates of algae cover that were as high or higher than coral cover indicating overfishing. One exception exists at Gavutu, where there is a very low algal cover while there is a high coral cover. It is possible that this site is hasn't been overfished and there is a strong coral recruitment to the area with healthy herbivorous population keeping the algal cover down. Apart from this, the levels of algae on the reefs in the region were in proportion to the level of coral cover.

Non Living Cover

The high non living cover is expected of an area exposed to dynamite fishing, such as the Tulagi Switzer island site. The remaining sheltered sites in the province had levels of non living cover relative to coral abundance. Exposed sites, especially on the Guadalcanal Island and Savo Island, were high in non living cover possibly due to the constant pounding from waves during heavy seas.

Western Solomons: Regions 2, 3 and 4 (Isabel, Choiseul and Western Provinces)

Coral reefs are found throughout most of the coastlines of the three provinces within the three regions. Isabel Province (Region 2) is the longest island in the country and has fringing reefs hugging it's coastline on both the northern and southern end. Population density in 1999 was about 5 person per square kilometre, similar to Choiseul Province in Region 3 (Solomon Islands Government, 2000). Due to the topography of the area, the north eastern end of Isabel and the south western end of Choiseul have a high level of coral reef area which continues along the northern end of Choiseul right up around the northern tip. In 1999 Western Province (Region 4) had a higher population density of 8 persons per square kilometre with 87% of the households consuming fish most of the time (Otter, 2002). Region 4 harbours the largest reef area of the 3 regions. Stretching from Vella Lavella to Marovo Lagoon it encompasses 3 lagoon systems surrounded by fringing reefs and barrier reefs. The lagoons are rich with islands and have patch reefs distributed throughout their system. The province contains two urban centres, Gizo and Noro, and is home to a number of logging operations.

Coral Cover

Choiseul and Isabel province share various similarities in topography, population density and in this case, coral cover. However when the sites in Shortland Islands (Region 3) are included the coral cover remains reduces slightly. The lower cover found in sheltered sites located closer to the mainland are most likely a result of experiencing a greater influence from land through freshwater influx causing sedimentation and nutrients to be resuspended (Wilkinson, 1999).

The sites within Region 4 were located mainly in exposed habitats, such as Haipe reef, contributing to the overall high coral cover observed throughout the region. Within Marovo lagoon a site within Mbili passage was the only one situated close to a logging operation. Coral cover here dropped with visible signs of high sedimentation and bleaching levels. By contrast Toatelave Island which is located at the entrance to Mbili passage had high coral cover due to the strong incoming and outgoing currents which rapidly disperse sedimentation into oceanic depths beyond possible resuspension through wave and current action. Lafranchi (1999) reported that logging operations can increase the level of sedimentation causing an increase in turbidity reducing the level of sunlight that reaches the coral resulting in coral dying.

Though in a sheltered area the site in Lumelihe Passage, Marovo lagoon, is located well away from any logging activity and experiences a high water movement through the passage from currents permitting a significantly higher coral cover presence with little sign of sedimentation. The low cover in Munda is due to the location of the site itself. Its close proximity to Munda community means that it is a popular spot for line fishing and spear fishing activities. This is also the same area where the tuna fishing boats from the nearby tuna cannery in Noro come to collect their baitfish at night.
.

Macro Algae Cover

Macro algal cover in general was lower than coral cover throughout region except in the sheltered site on Munda Bar. Heavy fishing pressure from the fishing communities around Munda district has affected the coral – algal distribution on the reef. Signs of overgrowth on certain coral colonies may indicate the lack of herbivores on the reefs which is perfectly possible considering the numerous small fishery outlets around Munda.

Haipe reef is a popular fishing spot for fishermen from Munda and Rendova however the expected trends of overfishing do not show and macro algae cover is quite low. This maybe due to high recruitment rates of herbivorous species and the very high coral cover which currently persists.

Non Living Cover

Apart from the high levels of non living substrate in Mbili Passage and at Munda due to logging and overfishing the rest of the region had reasonable levels. In Gizo several outbreaks of crown of thorns in the past have affected coral health its surrounding reefs. These outbreaks are still occurring around popular dive spots with increasing frequency, which has prompted concerns from within the local tourism industry (*pers comm.* Danny Kennedy).

<u>Eastern Solomons: Regions 5 and 6 (Malaita and Makira Province)</u>

<u>MALAITA</u>

Malaita has the largest population of any island in the country, which when coupled with its high population density, means that there will be a substantial impact on the surrounding marine ecosystems. In the past, dynamite fishing and artificial island construction has occurred within Langa Langa lagoon, Lau Lagoon and in the Fanalei/Walende region in South Malaita (Sulu et al. 2000). As the population continues to increase the demand for land and food supply will place further pressure upon the coral reefs.

Coral Cover

The population pressure in Malaita has inevitably had a big impact on the surrounding coral reefs, which shows up in the generally low coral cover at the sites. Low coral cover in the Falaubulu area in Langa Langa Lagoon is a result of the removal of corals for artificial island construction and of dynamite fishing practices. Toi island situated outside of Lau Lagoon with its' high coral cover is further away from human settlements, and probably has less anthropogenic interference unlike Suafa, which is in Lau Lagoon.

Macro Algae Cover

The similar levels, and sometimes higher levels, of macro algal cover to coral cover indicate an imbalance on the coral reefs around Malaita. This is quite possibly due to overfishing, destruction of coral habitats, sedimentation and nutrient eutrophication allowing for higher algae growth.

Non Living Cover

High non living cover in Falaubulu is linked to the lack of coral cover through destructive fishing practices and removal of coral for artificial island construction. Airasi is situated within Are Are Lagoon with high level of sedimentation and a substrate comprised of silt. The site is prone to heavy sedimentation during rainy periods with a sandy/silty bottom that is easily stirred up in strong currents. Due to turbidity levels coral cover is restricted and limited along the survey depth profile with high levels of non living/abiotic substrate between existing coral lifeforms.

MAKIRA

The mountainous ridges of the island drain out towards the northern coastline possibly prohibiting any major coral growth unlike the southern coastline which is made up of a discontinuous chain of fringing reefs.In 1999 Makira had a population of 31,006 with a population density of 10 per square kilometre.

Coral Cover

The generally higher coral cover in the exposed sites reflects better coral growing opportunities than those in sheltered sites except for Marautewa Island Higher Coral cover on the outer islands, such as Pio Island, in the northern end of Makira are probably a result of less freshwater run off and sedimentation associated with coastlines of high mountainous islands and lower levels of anthropogenic activities.

Macro Algae Cover

High algal presence in relation to coral possibly indicates the lack of herbivorous predators and or nutrient eutrophication or past natural events leading to coral die off and hence algal growth.

Non Living Cover

This appears to be closely linked areas of low coral cover and high macro algae cover. Pio Island with it's high coral, and Marautewa Island are the only sites with low non living cover due perhaps to a more ecologically stable environment and its location which is reasonably far from dense human populations.

References

Alcala, A.C. and E. D. Gomez. 1987. Dynamiting Coral Reefs for Fish: a Resource-destructive Method. *in* B. Salvat, (Ed.). Human Impacts on Coral Reefs: Facts and Recommendations. Antenne Museum E.P.H.E. Moorea, French Polynesia. 51-60,

Jompa, J and McCook, L.J. 2002. Effects of competition and herbivory on interactions between a hard coral and a brown alga. J. Exp. Mar. Bio. Ecol 3835, 1-15

Lafranchi, C (1999). Islands Adrift? Comparing Industrial and Small Scale Economic Options for Marovo Lagoon Region of the Solomon Islands. Greenpeace Pacific.

Morton, J.E., 1974. The coral reefs of the British Solomon Islands: A comparative study of their composition and ecology. Proc. 2nd Int. Coral Reef Symp, 2, 31-53.

Otter, M (2002). Solomon Islands Human Development Report 2002. Building a Nation. Volume 1, Main Report.

Personal Communication. Danny Kennedy. Dive Gizo. www.divegizo.com.
Sammarco, P.W. 1982. Echinoid grazing as a structuring force in coral communities: whole reef manipulations. J. Exp. Mar. Biol. Ecol. 45, 245-272

Sulu, R.; Hay, C.; Ramohia, P. and Lam. M. 2000. The Status of Solomon Islands' Coral Reefs. A Report prepared for the Global Coral Reef Monitoring Network, Townsville, Queensland, Australia

Sulu, R. 2001. Unpublished report. Report on visit to Ngella group for the idenitification and selection of GCRMN monitoring sites.

Solomon Islands Government. Report on the 1999 population and housing census. Basic table and census description.

Wilkinson, C.R. 1999. Global and local threats to coral reef functioning and existence: review and predictions. Mar. Freshwater. Res. 50, 867-878

Appendices

Appendix 1.

CODE	LIFEFORM	MAJOR CATEGORY
ACB	*Acropora* Branching	CORAL
ACE	*Acropora* Encrusting	CORAL
ACD	*Acropora* Digitate	CORAL
ACT	*Acropora* Tabular	CORAL
ACS	*Acropora* Submassive	CORAL
CB	Coral Branching	CORAL
CE	Coral Encrusting	CORAL
CF	Coral Foliose	CORAL
CM	Coral Massive	CORAL
CS	Coral Submassive	CORAL
CMR	Mushroom Coral	CORAL
CHL	Blue Coral	CORAL
CME	Fire Coral	CORAL
CTU	Organ Pipe Coral	CORAL
DCA	Dead Coral with Algae	MACROALGAE
AA	Algal Assemblage	MACROALGAE
CA	Coraline Algae	MACROALGAE
HA	*Halimeda* Algae	MACROALGAE
MA	Macroalgae	MACROALGAE
TA	Turf Algae	MACROALGAE
S	Sand	NON-LIVING
R	Rubble	NON-LIVING
SI	Silt	NON-LIVING
DC	Dead Coral	NON-LIVING
RCK	Rock	NON-LIVING
SC	Soft coral	OTHERS
SP	Sponge	OTHERS
ZO	Zoanthids	OTHERS
OT	Others	OTHERS

Appendix 2.

A)
REGION 1 EXPOSED

		Florida		Guadalcanal			Russell Islands		Savo Island
Mean		Kombuana	Nughi	Bonegi	Honoa	Tambea	Alokan	Lismata	Savo
	ACB	29.23	7.69	0.00	0.00	0.00	17.69	6.67	1.54
	ACD	4.10	0.00	0.00	2.44	0.00	4.10	3.33	0.77
	ACE	0.77	0.00	0.00	1.03	0.00	0.00	0.77	2.56
	ACS	7.69	0.51	0.00	0.77	0.00	8.85	3.85	0.00
	ACT	3.85	0.00	0.00	0.51	0.00	1.03	4.23	1.28
	CB	0.26	0.77	0.26	6.92	2.56	1.54	4.36	10.77
	CE	0.00	0.00	0.00	2.31	2.31	3.08	1.79	8.21
	CF	2.82	0.00	0.00	0.00	0.51	0.77	4.62	2.31
	CM	6.41	1.28	0.00	3.08	10.90	10.00	22.56	12.82
	CME	0.00	0.77	0.00	1.28	0.00	0.00	1.28	0.26
	CMR	0.00	1.03	0.00	0.26	0.00	0.77	0.26	1.28
	CS	0.00	0.00	0.26	0.77	0.51	0.51	0.77	2.82
	CTU	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00

		Florida		Guadalcanal			Russell Islands		Savo Island
Std Error		Kombuana	Nughi	Bonegi	Honoa	Tambea	Alokan	Lismata	Savo
	ACB	10.87	3.32	0.00	0.00	0.00	6.97	1.37	0.94
	ACD	2.12	0.00	0.00	0.64	0.00	1.03	1.32	0.77
	ACE	0.51	0.00	0.00	0.66	0.00	0.00	0.51	1.07
	ACS	4.61	0.51	0.00	0.33	0.00	4.47	1.46	0.00
	ACT	0.00	0.00	0.00	0.33	0.00	0.48	1.59	0.81
	CB	0.26	0.77	0.26	4.01	0.81	1.03	0.96	3.50
	CE	0.00	0.00	0.00	0.72	0.75	1.93	1.12	1.65
	CF	2.00	0.00	0.00	0.00	0.51	0.77	0.65	1.03
	CM	2.29	0.81	0.00	0.81	2.73	5.12	2.91	3.11
	CME	0.00	0.77	0.00	0.81	0.00	0.00	0.70	0.26
	CMR	0.00	1.03	0.00	0.29	0.00	0.51	0.26	0.57
	CS	0.00	0.00	0.26	0.55	0.31	0.51	0.51	1.31
	CTU	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00

REGION 1 EXPOSED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	7.85	10.56	3.73
	ACD	1.84	1.86	0.66
	ACE	0.64	0.89	0.31
	ACS	2.71	3.67	1.30
	ACT	1.36	1.72	0.61
	CB	3.43	3.75	1.33
	CE	2.21	2.71	0.96
	CF	1.38	1.70	0.60
	CM	8.38	7.39	2.61
	CME	0.45	0.58	0.20
	CMR	0.45	0.51	0.18
	CS	0.71	0.91	0.32
	CTU	0.03	0.09	0.03

B)
REGION 1 SHELTERED

Mean		Florida Islands		Guadalcanal	Russell Islands	
		Ghavutu	Tulaghi Switzer	Wainipareo	Mbanika	Mbutata
	ACB	0.77	3.59	4.10	0.26	0.77
	ACD	0.51	0.51	0.00	0.77	0.26
	ACE	0.00	0.00	0.26	0.26	0.00
	ACS	0.51	0.77	0.26	0.00	0.51
	ACT	1.03	1.54	1.79	0.00	0.51
	CB	8.46	0.00	22.82	0.26	21.28
	CE	4.62	0.00	2.05	0.77	2.05
	CF	4.87	1.79	2.05	0.26	0.51
	CM	24.62	1.54	3.85	9.23	13.59
	CME	0.00	0.26	0.00	2.56	0.00
	CMR	1.54	0.00	1.03	0.00	1.03
	CS	6.15	0.26	3.08	0.00	3.59

Std Error		Florida Islands		Guadalcanal	Russell Islands	
		Ghavutu	Tulaghi Switzer	Wainipareo	Mbanika	Mbutata
	ACB	0.77	1.79	2.48	0.26	0.51
	ACD	0.31	0.51	0.00	0.77	0.26
	ACE	0.00	0.00	0.26	0.26	0.00
	ACS	0.51	0.77	0.26	0.00	0.31
	ACT	0.63	0.48	0.65	0.00	0.51
	CB	2.28	0.00	2.31	0.26	1.93
	CE	0.65	0.00	0.65	0.77	1.26
	CF	1.96	0.77	0.65	0.26	0.51
	CM	2.76	0.75	1.40	4.43	1.97
	CME	0.00	0.26	0.00	1.22	0.00
	CMR	1.03	0.00	0.75	0.00	0.48
	CS	3.75	0.26	1.32	0.00	2.20

REGION 1 SHELTERED- OVERALL

		Mean	Std Dev	Std Error
	ACB	1.90	1.80	0.81
	ACD	0.41	0.29	0.13
	ACE	0.10	0.14	0.06
	ACS	0.41	0.29	0.13
	ACT	0.97	0.73	0.33
	CB	10.56	11.04	4.94
	CE	1.90	1.75	0.78
	CF	1.90	1.84	0.82
	CM	10.56	9.15	4.09
	CME	0.56	1.12	0.50
	CMR	0.72	0.69	0.31
	CS	2.62	2.55	1.14

C)

REGION 2 EXPOSED

Mean		Arnavon Islands	Isabel				
		Tuma	Buala	Kale	Sarao	Sibau	Tanabafe
	ACB	2.56	32.05	0.51	4.62	0.26	1.79
	ACD	0.00	2.82	4.10	5.64	0.00	10.51
	ACE	0.00	0.00	3.33	7.69	0.00	5.90
	ACS	0.00	9.49	1.28	4.10	0.00	6.15
	ACT	0.26	3.33	0.77	9.62	1.28	5.90
	CB	11.28	0.00	2.69	2.82	1.03	0.00
	CE	22.05	0.26	1.03	0.51	9.74	0.77
	CF	5.64	0.51	1.28	0.26	0.00	1.03
	CM	0.26	0.26	16.15	7.18	2.99	20.51
	CME	0.00	0.00	0.00	1.03	0.00	0.26
	CMR	2.56	1.28	1.28	2.31	0.00	1.03
	CS	6.92	0.26	0.51	0.51	3.33	0.51

Std Error		Arnavon Islands	Isabel				
		Tuma	Buala	Kale	Sarao	Sibau	Tanabafe
	ACB	1.67	2.50	0.51	3.10	0.26	0.77
	ACD	0.00	0.94	0.75	1.55	0.00	2.20
	ACE	0.00	0.00	0.65	3.01	0.00	2.21
	ACS	0.00	2.55	0.81	1.64	0.00	0.94
	ACT	0.26	1.50	0.51	2.41	0.00	1.44
	CB	1.64	0.00	0.31	0.85	0.63	0.00
	CE	2.76	0.26	0.63	0.51	2.61	0.77
	CF	2.21	0.51	0.81	0.26	0.00	0.63
	CM	0.26	0.26	4.94	0.51	0.88	1.34
	CME	0.00	0.00	0.00	1.03	0.00	0.26
	CMR	0.81	0.57	0.99	1.74	0.00	0.48
	CS	1.19	0.26	0.51	0.31	0.96	0.51

REGION 2 EXPOSED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	6.97	12.39	5.06
	ACD	3.85	3.96	1.62
	ACE	2.82	3.39	1.38
	ACS	3.50	3.81	1.56
	ACT	3.53	3.64	1.48
	CB	2.97	4.26	1.74
	CE	5.73	8.79	3.59
	CF	1.45	2.11	0.86
	CM	7.89	8.59	3.51
	CME	0.21	0.41	0.17
	CMR	1.41	0.93	0.38
	CS	2.01	2.67	1.09

D)
REGION 2 SHELTERED

Mean		Arnavon Islands	Isabel						
		Kerehikapa	Babao	Malakobi	Matavaghi	Palunuhukura	Rapita	Tirahi	Vakao
	ACB	1.92	9.74	6.15	5.64	1.03	1.79	0.96	1.79
	ACD	0.00	5.13	0.00	1.54	3.33	1.28	1.60	1.28
	ACE	0.00	1.28	0.00	5.38	2.82	2.05	1.28	0.51
	ACS	0.00	3.33	0.00	7.18	7.69	4.17	6.41	3.59
	ACT	0.00	2.31	0.00	2.18	6.15	0.77	0.32	0.00
	CB	14.62	0.51	12.05	1.28	4.74	11.03	8.33	3.85
	CE	5.90	0.26	4.87	0.26	0.51	0.51	0.64	0.51
	CF	20.77	2.82	0.00	5.77	7.05	5.13	6.73	7.95
	CM	1.03	14.36	1.54	8.72	5.90	6.67	18.59	17.69
	CME	0.00	0.26	0.00	0.00	0.26	0.00	0.00	0.51
	CMR	0.26	0.77	0.51	1.79	1.67	1.03	2.24	0.77
	CS	2.05	0.26	0.00	0.26	0.00	0.26	0.64	1.03

Std Error		Arnavon Islands	Isabel						
		Kerehikapa	Babao	Malakobi	Matavaghi	Palunuhukura	Rapita	Tirahi	Vakao
	ACB	0.81	4.56	5.54	1.55	0.48	1.26	0.55	1.50
	ACD	0.00	1.94	0.00	0.75	1.04	0.57	0.86	0.99
	ACE	0.00	0.57	0.00	3.57	1.31	0.51	0.47	0.51
	ACS	0.00	0.87	0.00	3.41	0.91	1.18	0.57	0.94
	ACT	0.00	0.48	0.00	0.38	4.92	0.77	0.29	0.00
	CB	5.93	0.51	3.41	0.57	0.94	4.74	1.78	1.15
	CE	1.93	0.26	1.74	0.26	0.31	0.51	0.57	0.51
	CF	9.28	1.24	0.00	1.78	3.65	3.07	1.27	2.08
	CM	0.48	2.48	0.63	1.24	1.93	1.83	4.97	4.58
	CME	0.00	0.26	0.00	0.00	0.26	0.00	0.00	0.51
	CMR	0.26	0.31	0.31	0.51	1.24	0.48	0.72	0.51
	CS	1.44	0.26	0.00	0.26	0.00	0.26	0.57	0.75

REGION 2 SHELTERED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	6.97	12.39	0.44
	ACD	3.85	3.96	0.25
	ACE	2.82	3.39	0.23
	ACS	3.50	3.81	0.24
	ACT	3.53	3.64	0.24
	CB	2.97	4.26	0.26
	CE	5.73	8.79	0.37
	CF	1.45	2.11	0.18
	CM	7.89	8.59	0.37
	CME	0.21	0.41	0.08
	CMR	1.41	0.93	0.12
	CS	2.01	2.67	0.2

E)
REGION 3 EXPOSED

Mean		Choiseul				Shortland Islands	
		Poro	Raverave	Sirovanga	Taro	Onua	Rohae1
	ACB	1.28	0.77	3.59	2.31	0.00	1.28
	ACD	2.31	4.62	4.36	3.85	3.33	8.97
	ACE	9.74	0.00	26.92	4.62	0.77	10.00
	ACS	2.82	0.00	13.85	6.41	2.31	6.15
	ACT	1.79	1.03	9.74	4.36	5.45	1.54
	CB	0.00	0.77	0.26	0.00	0.00	0.51
	CE	18.97	12.56	4.49	6.92	3.85	4.62
	CF	1.79	0.26	0.00	0.26	1.03	0.77
	CM	8.21	3.33	4.17	5.45	13.33	8.21
	CME	0.00	0.00	0.00	0.00	0.00	0.51
	CMR	0.26	0.00	0.26	0.77	0.00	0.26
	CS	1.54	26.41	2.82	8.72	0.00	4.36
	CTU	0.00	0.00	0.26	0.26	0.00	0.00

Std Error		Choiseul				Shortland Islands	
		Poro	Raverave	Sirovanga	Taro	Onua	Rohae1
	ACB	0.99	0.51	1.03	1.10	0.00	0.41
	ACD	0.75	0.96	0.87	0.70	1.04	1.46
	ACE	3.33	0.00	2.56	1.50	0.77	0.63
	ACS	1.37	0.00	2.91	2.15	1.74	2.24
	ACT	0.87	0.48	1.55	1.04	0.98	0.63
	CB	0.00	0.77	0.26	0.00	0.00	0.31
	CE	2.67	1.59	0.74	0.87	0.57	0.87
	CF	0.77	0.26	0.00	0.26	1.03	0.51
	CM	2.38	0.31	0.98	0.86	2.01	1.26
	CME	0.00	0.00	0.00	0.00	0.00	0.31
	CMR	0.26	0.00	0.26	0.51	0.00	0.26
	CS	0.26	3.36	0.48	1.03	0.00	0.51
	CTU	0.00	0.00	0.26	0.26	0.00	0.00

REGION 3 EXPOSED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	1.54	1.26	0.19
	ACD	4.57	2.31	0.25
	ACE	8.68	9.90	0.52
	ACS	5.26	4.86	0.37
	ACT	3.99	3.32	0.30
	CB	0.26	0.32	0.09
	CE	8.57	6.03	0.41
	CF	0.68	0.66	0.14
	CM	7.12	3.66	0.32
	CME	0.09	0.21	0.08
	CMR	0.26	0.28	0.09
	CS	7.31	9.82	0.52
	CTU	0.09	0.13	0.06

F)
REGION 3 SHELTERED

		Choiseul				Shortland Islands	
Mean		Boe Boe	Ondolou	Putuputurau	Vurango	Faisi	Rohae 2
	ACB	0.77	7.44	17.18	2.56	0.00	1.79
	ACD	0.00	1.54	0.00	0.00	1.54	1.28
	ACE	0.00	0.00	2.31	3.33	0.26	0.26
	ACS	0.00	0.00	0.26	0.26	0.51	1.79
	ACT	0.51	2.05	0.00	0.51	1.03	2.05
	CB	1.54	1.03	3.33	1.28	0.51	11.28
	CE	14.62	11.28	2.56	4.10	0.51	2.05
	CF	2.05	4.36	1.28	4.87	0.77	6.41
	CM	9.74	5.38	1.28	9.23	5.90	14.36
	CME	0.00	0.00	0.00	1.03	3.85	0.00
	CMR	0.00	0.00	0.26	0.26	1.03	1.03
	CS	0.26	7.69	1.54	1.28	0.00	1.28
	CTU	0.00	0.00	0.26	1.03	0.00	0.51

		Choiseul				Shortland Islands	
Std Error		Boe Boe	Ondolou	Putuputurau	Vurango	Faisi	Rohae 2
	ACB	0.77	3.23	4.54	1.67	0.00	0.31
	ACD	0.00	1.24	0.00	0.00	0.75	0.70
	ACE	0.00	0.00	1.24	1.04	0.26	0.26
	ACS	0.00	0.00	0.26	0.26	0.51	0.51
	ACT	0.31	0.51	0.00	0.51	1.03	0.87
	CB	0.48	0.48	1.55	0.81	0.51	1.59
	CE	2.21	2.93	1.15	0.48	0.51	0.77
	CF	0.87	1.65	0.99	1.83	0.77	2.26
	CM	2.31	1.24	0.57	1.48	2.01	2.45
	CME	0.00	0.00	0.00	0.63	2.92	0.00
	CMR	0.00	0.00	0.26	0.26	1.03	0.48
	CS	0.26	4.59	0.26	0.81	0.00	0.41
	CTU	0.00	0.00	0.26	0.48	0.00	0.51

REGION 3 SHELTERED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	4.96	6.53	0.43
	ACD	0.73	0.80	0.15
	ACE	1.03	1.43	0.20
	ACS	0.47	0.68	0.14
	ACT	1.03	0.86	0.15
	CB	3.16	4.09	0.34
	CE	5.85	5.71	0.40
	CF	3.29	2.25	0.25
	CM	7.65	4.49	0.35
	CME	0.81	1.54	0.21
	CMR	0.43	0.48	0.12
	CS	2.01	2.85	0.28
	CTU	0.30	0.41	0.11

G)
REGION 4 EXPOSED

Mean		New Georgia					
		Njari	Landoro	Toatelave	Veru	Haipe	Vella Lavella
	ACB	6.92	2.82	3.08	5.90	6.15	1.28
	ACD	1.54	0.77	2.05	7.44	8.72	4.36
	ACE	0.77	0.77	1.79	1.28	0.26	2.05
	ACS	3.59	1.79	2.82	2.05	4.62	0.51
	ACT	0.90	4.36	4.36	11.03	17.95	6.41
	CB	6.92	3.85	0.77	0.77	0.51	10.00
	CE	0.51	1.54	3.08	8.46	3.59	0.77
	CF	2.31	5.26	1.03	3.59	3.85	0.51
	CM	13.85	25.64	27.69	15.90	17.56	17.69
	CME	0.26	0.26	1.92	0.26	1.03	1.03
	CMR	3.59	1.28	0.00	0.00	0.00	0.77
	CS	0.51	1.03	2.31	0.00	0.26	0.26
	CTU	0.00	1.79	0.51	0.00	0.00	0.00

Std Error		New Georgia					
		Njari	Landoro	Toatelave	Veru	Haipe	Vella Lavella
	ACB	2.09	1.69	1.50	0.87	1.88	0.81
	ACD	0.94	0.31	0.96	1.88	1.92	0.65
	ACE	0.31	0.51	0.51	0.81	0.26	0.65
	ACS	1.48	0.51	1.59	0.87	2.49	0.51
	ACT	0.38	2.80	1.04	2.77	2.26	2.03
	CB	2.09	1.62	0.51	0.77	0.51	3.72
	CE	0.31	0.75	0.51	0.65	1.92	0.31
	CF	1.03	2.15	0.63	1.48	1.99	0.31
	CM	2.12	4.88	4.36	1.88	2.96	1.48
	CME	0.26	0.26	0.57	0.26	0.75	0.48
	CMR	1.24	0.70	0.00	0.00	0.00	0.31
	CS	0.31	0.26	1.18	0.00	0.26	0.26
	CTU	0.00	0.65	0.00	0.00	0.00	0.00

REGION 4 EXPOSED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	4.36	2.26	0.25
	ACD	4.15	3.30	0.30
	ACE	1.15	0.68	0.14
	ACS	2.56	1.44	0.20
	ACT	7.50	6.10	0.41
	CB	3.80	3.93	0.33
	CE	2.99	2.95	0.29
	CF	2.76	1.81	0.22
	CM	19.72	5.59	0.39
	CME	0.79	0.67	0.14
	CMR	0.94	1.40	0.20
	CS	0.73	0.85	0.15
	CTU	0.38	0.72	0.14

H) REGION 4 SHELTERED				
		New Georgia		
Mean		Lumalihe	Mbili	Munda
	ACB	0.00	0.77	0.00
	ACD	0.77	0.00	1.28
	ACE	0.77	0.26	0.77
	ACS	0.77	0.00	0.26
	ACT	0.00	0.77	2.82
	CB	2.56	0.77	0.77
	CE	0.77	1.41	0.26
	CF	1.79	0.26	0.00
	CM	24.62	19.74	13.21
	CME	0.26	3.33	0.00
	CMR	0.00	0.51	0.64
	CS	4.10	0.26	0.26
	CTU	22.56	0.00	0.00
		New Georgia		
Std Error		Lumalihe	Mbili	Munda
	ACB	0.00	0.77	0.00
	ACD	0.51	0.00	0.81
	ACE	0.51	0.26	0.77
	ACS	0.77	0.00	0.26
	ACT	0.00	0.77	2.82
	CB	0.81	0.77	0.77
	CE	0.51	0.87	0.26
	CF	1.12	0.26	0.00
	CM	2.12	1.93	2.04
	CME	0.26	1.32	0.00
	CMR	0.00	0.51	0.57
	CS	1.59	0.26	0.26
	CTU	4.01	0.00	0.00
REGION 4 SHELTERED- OVERALL				
		Mean	**Std Dev**	**Std Error**
	ACB	0.26	0.44	0.22
	ACD	0.68	0.41	0.21
	ACE	0.60	0.26	0.17
	ACS	0.34	0.39	0.21
	ACT	1.20	1.46	0.40
	CB	1.37	0.02	0.05
	CE	0.81	0.31	0.18
	CF	0.68	0.59	0.26
	CM	19.19	0.10	0.10
	CME	1.20	0.70	0.28
	CMR	0.38	0.32	0.19
	CS	1.54	0.77	0.29
	CTU	7.52	2.31	0.51

I)

REGION 5 EXPOSED

		Makira		Three Sisters Islands	Uki Ni Masi
Mean		Haurmanu	Naone	Malaupaina 1	Pio
	ACB	1.79	5.90	8.97	5.38
	ACD	1.28	0.77	1.79	5.00
	ACE	0.00	0.00	1.03	0.51
	ACS	0.00	2.82	9.49	10.26
	ACT	2.82	10.26	2.56	10.51
	CB	0.51	1.79	0.00	3.59
	CE	1.28	4.10	1.03	4.36
	CF	0.51	0.26	0.00	0.77
	CM	4.36	4.81	8.97	13.14
	CME	0.00	0.77	0.00	1.03
	CMR	0.00	0.26	0.26	0.77
	CS	0.77	2.31	1.03	1.54
	CTU	0.00	0.00	0.00	0.26

		Makira		Three Sisters Islands	Uki Ni Masi
Std Error		Haurmanu	Naone	Malaupaina 1	Pio
	ACB	0.24	0.48	0.74	0.37
	ACD	0.27	0.21	0.37	0.39
	ACE	0.00	0.00	0.30	0.21
	ACS	0.00	0.33	0.61	0.51
	ACT	0.36	0.47	0.27	0.38
	CB	0.21	0.29	0.00	0.41
	CE	0.19	0.33	0.26	0.43
	CF	0.17	0.15	0.00	0.26
	CM	0.33	0.40	0.48	0.47
	CME	0.00	0.17	0.00	0.30
	CMR	0.00	0.15	0.15	0.26
	CS	0.21	0.28	0.21	0.29
	CTU	0.00	0.00	0.00	0.15

REGION 5 EXPOSED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	5.51	2.94	0.43
	ACD	2.21	1.91	0.35
	ACE	0.38	0.49	0.18
	ACS	5.64	5.03	0.56
	ACT	6.54	4.44	0.53
	CB	1.47	1.60	0.32
	CE	2.69	1.78	0.33
	CF	0.38	0.33	0.14
	CM	7.82	4.11	0.51
	CME	0.45	0.53	0.18
	CMR	0.32	0.32	0.14
	CS	1.41	0.68	0.21
	CTU	0.06	0.13	0.09

J)
REGION 5 SHELTERED

Mean		Makira		Three Sisters Islands	Uki Ni Masi Island
		Marautewa	Na Mugha	Malaupaina 2	Pawa
	ACB	0.77	2.82	3.08	2.82
	ACD	0.00	2.05	1.03	2.31
	ACE	0.00	0.00	1.28	0.00
	ACS	0.00	1.79	1.54	2.31
	ACT	0.51	1.54	1.28	2.05
	CB	8.46	0.26	3.08	2.31
	CE	2.56	1.03	0.00	0.77
	CF	1.03	1.54	0.00	0.00
	CM	14.10	4.36	0.00	6.84
	CS	2.82	0.26	7.95	0.26

Std Error		Makira		Three Sisters Islands	Uki Ni Masi Island
		Marautewa	Na Mugha	Malaupaina 2	Pawa
	ACB	0.26	0.34	0.42	0.33
	ACD	0.00	0.34	0.30	0.37
	ACE	0.00	0.00	0.34	0.00
	ACS	0.00	0.40	0.37	0.45
	ACT	0.17	0.33	0.34	0.34
	CB	0.59	0.15	0.45	0.36
	CE	0.42	0.30	0.00	0.26
	CF	0.24	0.30	0.00	0.00
	CM	0.28	0.38	0.00	0.36
	CS	0.33	0.15	0.79	0.15

REGION 5 SHELTERED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	2.37	1.08	0.26
	ACD	1.35	1.05	0.26
	ACE	0.32	0.64	0.20
	ACS	1.41	0.99	0.25
	ACT	1.35	0.64	0.20
	CB	3.53	3.50	0.47
	CE	1.09	1.08	0.26
	CF	0.64	0.77	0.22
	CM	6.32	5.91	0.61
	CS	2.82	3.63	0.48

K) REGION 6 EXPOSED						
		Malaita				
Mean		Anuta	Falaubulu 1	Leli 1	Maroria	Suafa 1
	ACB	0.00	0.77	2.31	6.67	3.59
	ACD	4.10	1.03	2.31	5.13	4.36
	ACE	1.79	0.00	1.28	1.54	1.03
	ACS	0.00	3.85	5.13	0.00	2.56
	ACT	3.08	0.77	2.56	3.33	0.77
	CB	0.26	3.33	2.31	5.38	0.77
	CE	3.59	3.08	3.85	4.62	10.26
	CF	0.00	0.26	2.05	0.51	0.77
	CM	14.10	11.28	4.10	5.13	10.77
	CMR	0.51	0.00	0.00	0.51	0.00
	CS	1.28	0.51	1.28	0.00	8.97
		Malaita				
Std Error		Anuta	Falaubulu 1	Leli 1	Maroria	Suafa 1
	ACB	0.00	0.26	0.28	0.28	0.41
	ACD	0.36	0.30	0.36	0.36	0.31
	ACE	0.40	0.00	0.34	0.33	0.21
	ACS	0.00	0.25	0.54	0.00	0.38
	ACT	0.29	0.26	0.32	0.33	0.17
	CB	0.15	0.38	0.24	0.38	0.26
	CE	0.40	0.37	0.35	0.36	0.34
	CF	0.00	0.15	0.36	0.21	0.26
	CM	0.54	0.36	0.41	0.23	0.48
	CMR	0.17	0.00	0.00	0.21	0.00
	CS	0.27	0.17	0.30	0.00	0.39

REGION 6 EXPOSED- OVERALL				
		Mean	**Std Dev**	**Std Error**
	ACB	2.67	2.63	0.32
	ACD	3.38	1.68	0.26
	ACE	1.13	0.69	0.17
	ACS	2.31	2.29	0.30
	ACT	2.10	1.25	0.22
	CB	2.41	2.06	0.29
	CE	5.08	2.95	0.34
	CF	0.72	0.80	0.18
	CM	9.08	4.28	0.41
	CMR	0.21	0.28	0.11
	CS	2.41	3.71	0.39

L)
REGION 6 SHELTERED

Mean		Malaita				
		Airasi	Arai	Falaubulu 2	Leli 2	Suafa 2
	ACB	8.21	0.00	0.00	6.92	3.33
	ACD	0.77	0.51	0.00	0.51	0.00
	ACS	1.54	0.26	0.00	0.00	0.51
	ACT	4.10	0.26	0.00	0.26	0.00
	CB	0.51	1.54	3.33	9.23	3.59
	CE	3.08	1.54	0.00	0.77	5.38
	CF	1.03	0.26	0.00	2.05	0.00
	CM	9.23	17.44	14.10	4.36	14.87
	CME	0.51	0.00	0.00	2.05	0.00
	CMR	0.77	0.00	0.00	1.79	1.03
	CS	1.03	2.56	0.00	2.31	2.05

Std Error		Malaita				
		Airasi	Arai	Falaubulu 2	Leli 2	Suafa 2
	ACB	0.54	0.00	0.00	0.51	0.47
	ACD	0.26	0.21	0.00	0.21	0.00
	ACS	0.29	0.15	0.00	0.00	0.17
	ACT	0.38	0.15	0.00	0.15	0.00
	CB	0.21	0.29	0.47	0.54	0.31
	CE	0.34	0.30	0.00	0.26	0.46
	CF	0.24	0.15	0.00	0.34	0.00
	CM	0.48	0.49	0.23	0.28	0.52
	CME	0.21	0.00	0.00	0.37	0.00
	CMR	0.21	0.00	0.00	0.29	0.30
	CS	0.24	0.33	0.00	0.32	0.31

REGION 6 SHELTERED- OVERALL

		Mean	**Std Dev**	**Std Error**
	ACB	3.69	3.81	0.39
	ACD	0.36	0.34	0.12
	ACS	0.46	0.64	0.16
	ACT	0.92	1.78	0.27
	CB	3.64	3.37	0.37
	CE	2.15	2.13	0.29
	CF	0.67	0.88	0.19
	CM	12.00	5.20	0.46
	CME	0.51	0.89	0.19
	CMR	0.72	0.76	0.17
	CS	1.59	1.06	0.21

June 2006
TNC Pacific Island Countries
Report No 1/06

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

Chapter 5

Fisheries Resources: Coral Reef Fishes

Solomon Islands Marine Assessment

Alison Green, Peter Ramohia,
Michael Ginigele & Tingo Leve

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
Alison Green : The Nature Conservancy, 51 Edmondstone Street, South Brisbane, QLD 4101 Australia
e-Mail : agreen@tnc.org

Peter Ramohia : The Nature Conservancy, PO BOX 759, Honiara, Solomon Islands
e-Mail : peter_tnc@solomon.com.sb

Michael Ginigele : c/o Agnes Lodge, PO Box 9, Munda, Western Province, Solomon Islands.

Tingo Leve : World Wide Fund Solomon Islands Program, PO Box 97, Gizo, Western Province, Solomon Islands.

Suggested Citation:
Green, A., P. Ramohia, M. Ginigele and T. Leve, E. 2006. Fisheries Resources: Coral Reef Fishes. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: © Emre Turak

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Contents

List of Appendices

Summary

Reef fin-fish are the mainstay of subsistence and artisanal fisheries in the Solomon Islands, comprising a major component of the protein diet of Solomon Islanders. These resources are also becoming an important source of income for inhabitants of many coastal communities.

This survey represents the first broad scale, quantitative survey of coral reef fish communities and fisheries resources conducted in the Solomon Islands. The survey results will greatly increase our understanding of the status of these critically important marine resources, and help provide a scientific basis for their effective management.

Quantitative surveys were conducted at 66 sites throughout seven of the nine provinces in the Solomon Islands: Isabel, Choiseul, Western, Central, Guadalcanal, Malaita and Makira. Coral reef fish communities and key fisheries resources were assessed using underwater visual census methods along five replicate transects on reef slopes at depths of approximately 10m at each site. Study sites were distributed to provide maximum geographic coverage of the main islands, and exposures around the islands, within the study area. A restricted list of 37 families (383 species) was used, comprising only those amenable to underwater visual census techniques. Of these, 23 families (67 species or species groups) and 12 families (42 species or species groups) were considered food and aquarium fishes respectively. A total of 110,640 reef fishes were counted during the survey, and their size estimated for biomass estimates.

The status of coral reef fish communities was assessed based on their species richness, density and biomass, while the status of food fish populations was assessed based on their density and biomass. Aquarium fish populations were assessed based on their density only, since aquarium fishes are sold by the "piece" and not by weight

The status of coral reef fish communities and fisheries resources was highly variable among provinces, islands and sites. In general (see Table 1):

- Coral reef fish communities were in good condition throughout most of the Solomon Islands, with those in the Central (Russell Islands and Savo Island), Choiseul, Isabel (particularly the Arnavon Islands), Makira (particularly the offshore islands of Three Sisters and Ugi), and Western Provinces (both New Georgia and the Shortland Islands), tending to be in better condition (in terms of fish species richness, density and biomass) than those in Guadalcanal, Malaita and Central (Florida Islands) Provinces.
- Healthy populations of food fishes were encountered in some locations in Central (Russell Islands), Choiseul, Isabel (particularly the Arnavon Islands), Makira (Makira Island), and Western Provinces. In contrast, healthy populations of food fishes were not observed in Central (Florida Islands and Savo Islands), Guadalcanal, Makira (Three Sisters Islands and Ugi Island) and Malaita Provinces. Similar patterns were recorded for four of the five major food fish families (snappers, surgeonfishes, emperors and parrotfishes). This pattern was most pronounced for key fisheries species of parrotfishes (including the humphead parrotfish), which were not observed on Guadalcanal at all. The other major food fish family (groupers) was uncommon throughout the survey area, with the highest densities recorded in the Arnavon Community Marine Conservation Area.
- Large bony reef fishes (>30cm) were most abundant in Western, Makira, Isabel, Choiseul and Central Provinces, with few recorded in Guadalcanal or Malaita Provinces.
- Large and vulnerable reef fish species, particularly those targeted by the live reef food fish trade (LRFFT) eg humphead wrasse, were uncommon or rare throughout the survey area, with most recorded in the northwestern provinces (particularly Choiseul, Western and Isabel Provinces). Large groupers also targeted by the LRFFT (brown

marbled grouper, camouflage grouper, and square-tailed coral grouper) were rare throughout the survey area, as were barramundi cod, giant trevally, sharks and rays. Large and vulnerable emperor species were most abundant in Makira, Choiseul, and Isabel Provinces.

- Healthy populations of aquarium fishes were encountered in some locations, particularly in Central (Russell Islands and Savo Island), Choiseul, Isabel, Makira (particularly Three Sisters Islands and Ugi Island), and Western Provinces (New Georgia and Shortland Islands). In contrast, only low densities of aquarium fish species were encountered in Guadalcanal and Malaita Provinces, and some locations in Central (Florida Islands), Makira (Makira Island) and Isabel (Arnavon Islands) Provinces. The most abundant families were damselfishes, wrasses, surgeonfishes and fairy basslets, which accounted for most of the variation among provinces, islands and sites, while other target families (butterflyfishes, angelfishes and hawkfishes) were less abundant. Key target species such as anemonefishes, blue-girdled angelfish, and emperor angelfish, were uncommon or rare throughout the survey area. Two other key target species, the blue devil and blue tang, were not included in this survey, since they tend to occur in habitat types and depths not included in this study.

The reasons for the varying status of coral reef fish communities and key fisheries resources throughout the Solomon Islands cannot be determined with certainty, because of the lack of previous surveys and historical catch data for the study area. However, the variation at the site level (within provinces and islands), was most likely due to the variation in coral reef habitats among sites.

However, some of the variation among provinces was also likely to be due to the impact of human activities, particularly fishing, on reef fish populations, since the healthiest populations of food fishes were observed in areas with small human populations, while those in worse condition were located in or close to the most heavily populated provinces of Guadalcanal and Malaita, including areas where the coral reef habitat was in otherwise good condition.

Table 1. Provinces and major islands or island groups where healthy coral reef communities or populations of key fisheries species were encountered.

<table>
<tr><th>Province</th><th>Island or Island Group</th><th>Coral Reef Fish Comm.</th><th>Food Fish Pops.</th><th>Large Reef Fishes (>30cm)</th><th>Large, vulnerable reef fishes</th><th>Aquarium Fishes</th></tr>
<tr><td rowspan="3">Central</td><td>Russell Islands</td><td>Yes</td><td>Yes</td><td rowspan="3">Yes</td><td rowspan="3">No</td><td>Yes</td></tr>
<tr><td>Florida Islands</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td>Savo Island</td><td>Yes</td><td>No</td><td>Yes</td></tr>
<tr><td>Choiseul</td><td>Choiseul</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Guadalcanal</td><td>Guadalcanal</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td rowspan="2">Isabel</td><td>Isabel</td><td>Yes</td><td>Yes</td><td rowspan="2">Yes</td><td rowspan="2">Yes</td><td>Yes</td></tr>
<tr><td>Arnavon Islands</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td rowspan="3">Makira</td><td>Makira</td><td>Yes</td><td>Yes</td><td rowspan="3">Yes</td><td rowspan="3">No</td><td>No</td></tr>
<tr><td>Three Sisters Islands</td><td>Yes</td><td>No</td><td>Yes</td></tr>
<tr><td>Ugi Island</td><td>Yes</td><td>No</td><td>Yes</td></tr>
<tr><td>Malaita</td><td>Malaita</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td rowspan="2">Western*</td><td>New Georgia</td><td>Yes</td><td>Yes</td><td rowspan="2">Yes</td><td rowspan="2">Yes</td><td>Yes</td></tr>
<tr><td>Shortland Islands</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
</table>

*Sites were excluded where no surveys were conducted for small or medium sized fishes.

A high human population implies high fishing pressure on reef fish stocks and other marine resources. Two provinces, Guadalcanal and Malaita, host the two largest populated urban centers in the Solomon Islands - Honiara and Auki respectively. The demand for reef fish in these areas is high and expected to increase as these urban areas grow. Unlike other provinces such as the Western, Isabel or Choiseul, which have large extensive coral reef systems and therefore a large unit area of coral reef per number of people, both Malaita (excluding Ontong Java) and Guadalcanal have less extensive reef systems and therefore a small unit area of coral reef per number of people. With the current high population levels in these provinces, the level of fishing pressure on reef fish stocks and other marine resources in these and nearby provinces may already be too high. The use of highly efficient and destructive fishing methods, particularly blast fishing, gill netting, night spear fishing and targeting spawning aggregation sites, may be exacerbating the problem, particularly for large and vulnerable species.

In summary, the results of this survey indicate that overfishing of reef fish populations may already be occurring in some provinces, particularly in Guadalcanal, Malaita and Central (Florida Islands) Provinces. Given the rapidly rising population in the Solomon Islands, this problem is likely to become more serious and widespread in future.

Because of the importance of coral reef fish resources to the livelihood of the Solomon Island people, it is very important that these resources are managed to ensure their long term sustainability. As the country's population increases, the reliance on reef fish resources is also expected to increase. In light of this inevitable scenario, the government is strongly urged to undertake appropriate measures to safeguard its coral reef fisheries resources. This study has helped provide a scientific basis for the National Government to reassess the status of these resources, and the management arrangements for these fisheries.

We recommend that the National Government consider the following management actions to ensure the long term sustainability of these critically important resources:

- Ban the use of highly efficient and destructive fishing methods, particularly gillnets and night spear fishing;
- Undertake a nationwide education and awareness program to help fishermen understand the importance of conservation and management of fisheries resources, and the important habitats these resources depend on for their well being;

- Implement an education and awareness program on blast fishing targeted towards ensuring that young people understand the effect of these methods on marine resources and their habitats, and that this activity is prohibited and penalties apply for breaching the law;
- Recruit more enforcement officers to work closely with other law enforcement agencies and rural fishing communities to monitor and enforce fisheries laws and regulations;
- Facilitate and support the establishment of Marine Protected Areas to protect key fisheries species (food and aquarium fishes);
- Protect large and vulnerable fish species (humphead parrotfish, humphead wrasse and large groupers) through the protection of fish spawning aggregation sites, and the implementation of the National Management and Development Plan for the Live Reef Food Fish Fishery;
- Develop Management and Development Plans for other food fishes and the Aquarium Industry;
- Speed-up the appointment and establishment of the Fishery Advisory Council as provided for under the Fisheries Act 1998, to ensure proper Fisheries Management and Development Plans are implemented;
- Develop alternative offshore fisheries such as, raft fishing for tuna, squid fishing and deep water snapper fishing to ease fishing pressure on the inshore resources; and
- Establish long term monitoring of key fisheries resources, and their use in subsistence and artisanal fisheries in the Solomon Islands

Introduction

Fisheries in the Solomon Islands comprise two distinct sectors: the industrial sector which is predominantly off-shore and depends on the abundant tuna resources found in the country's exclusive economic zone (EEZ), and the subsistence-artisanal sector which is based on inshore resources found in the coastal regions. Although the off-shore fisheries contribute more to the national economy in terms of foreign exchange earning (Gillett and Lightfoot 2002), the subsistence-artisanal sector is by far the most important to the bulk of the population with annual production estimated at SI$60 million (Kile 2000) and US$9.963 million (Gillett and Lightfoot 2002). This sector provides food, income and employment for many inhabitants of coastal communities throughout the country, and will become increasing important as the population of the Solomon Islands increases.

Reef fin-fishes are the mainstay of the subsistence-artisanal fisheries in the Solomon Islands, and have always formed a major component of the protein diet of Solomon Islanders (Leqata *et al*. 1990, Leqata and Oreihaka 1995, Oreihaka and Ramohia 2000). Reef fin-fish resources are also becoming an important source of income for inhabitants of many coastal communities. Many rural fishers now have access to provincial fisheries centres and urban market outlets where they sell reef fish and other marine products, and a substantial amount of income is now generated each year through fish sales to these centres. For example, between April 1, 2001 and February 28, 2003, six fisheries centres supported by the European Union in Isabel, Malaita, Western and Central Islands provinces produced 132.092mt of reef fish worth SI$909,778 (Russell and Buga 2004).

The Live Reef Food Fish Trade (LRFFT: Donnelly *et al*. 2000; Donnelly 2000; Kile *et al*. 2000) and Aquarium Trade (Kinch 2004a, b) have also attracted some commercial opportunities for fishers in rural coastal communities. However in the case of the LRFFT, these economic opportunities have often come at a significant ecological and social cost (Johannes & Lam, 1999; Donnelly, 2000; Donnelly *et al*., 2000). In order to be cost effective, LRFFT operations in the Solomon Islands have been pulse fishing events that target grouper spawning aggregations during known reproductive seasons. This fishing practice is extremely destructive and can eliminate breeding populations of fish in as little as two or three years (Johannes, 1997; Sadovy & Vincent, 2002). For example, between 1996 and 1997 local fishers from Roviana Lagoon in the Western Solomon's dramatically overfished a historically large grouper aggregation site in order to supply a LRFFT operation. This aggregation site has been monitored continuously since May 2004, but to date has shown few if any signs of recover (Hamilton *et al*., 2005). The long term ecological and economic implication of destroying spawning aggregations means that we strongly recommended that this fishery is not engaged with in the future.

Despite being a major provider of food and income, the status of the reef fin-fish stocks in Solomon Islands is not well understood. This relates to both the small scale multi-species nature of most coastal fisheries in the Solomon Islands and the limited amount of funds that have been committed to this type of work.

Although there is little quantitative data available on reef fin-fish population dynamics in the Solomon Islands, many coastal communities have detailed bodies of local knowledge about their environment, and researchers have frequently drawn on local knowledge to assist them in their research. Past experience has shown the local knowledge of Solomon Island communities can be very valuable for providing detailed information on; harvesting strategies (Aswani, 1998; Johannes *et al*. 2000), the locations of critical habitats such as nursery and spawning areas (Johannes 1989; Johannes and Hviding 2001; Hamilton, 2004; Hamilton *et al*., 2005), and changes in the status of local fisheries over time (Hamilton, 2003; Hamilton 2004). The general lack of understanding of reef fin-fish population dynamics is closely related to the absence of empirical data and the complexity of reef fin-fish communities. A summary of some of the work undertaken on reef fin-fish resources since the mid 1980s is provided below.

- A Baitfish Research Project funded by the Australian Centre for Agricultural Research (ACIAR) was carried out between 1986 and 1990. This study investigated the important baitfish species in the commercial bait fishery, and the predatory species that feed on them. This study also investigated which of the major baitfish predators were also important food fishes in the subsistence-artisanal fisheries. (Blaber *et al*. 1990a, b; Leqata *et al*. 1990). In addition to these investigations, the study also established a checklist of coral reef and mangrove fish species for six locations in the country: Munda, Vonavona, Kolombangara, Rendova, Guadalcanal and Tulagi (Blaber *et al*. 1991). A total of 774 species from 91 families were recorded.

- Stock assessment aspects of the coral reef fin-fisheries were addressed during another ACIAR funded project which was completed in 1995 (Legata and Oreihaka 1995; Samoilys *et al*., 1995). This study investigated the application of Underwater Visual Census (UVC) to assess reef fin-fish stocks and demonstrate how UVC estimates of biomass can be used to predict catch rates or potential yields.

- Various aspects of the LRFFT industry were studied through another ACIAR funded project (Sustainable Management of the Live Reef Fish Trade-Based Fishery in Solomon Islands) commissioned in 1998 at three locations in the country, namely Roviana Lagoon, Marovo Lagoon and Ontong Java. This study focused on the biology of LRFFT species, and the socio-economic and management aspects of the fishery (Donnelly 2000; Donnelly *et al*. 2000; Kile *et al*. 2000).

- A rapid ecological assessment of marine resources of Rennell Island and Indispensable reef was conducted in 1994, which recorded 170 species of reef fishes (Cole 1994).

- In 1998, a coral reef fish biodiversity survey was jointly conducted in the Santa Cruz Islands, Temotu province by the Australian Museum, Smithsonian Institution, Field Museum of Natural History, Milwaukee Public Museum and the Department of Fisheries and Marine Resources (DFMR) of the Solomon Islands Government (McGrouther 1999). This study recorded 725 species of reef fishes, which included many new species.

- The feasibility of a new artisanal fishery based on the capture and culture of pre-settlement coral reef fish targeted for the LRFFT has been investigated in Solomon Islands by the WorldFish Centre (Bell *et al*. 1999: Hair *et al*. 2002, Hair and Doherty 2004). This project was carried out in the Western province and Ontong Java in Malaita province.

- Hamilton (2003; 2004) investigated the age-based demographics and status of the humphead parrotfish (*Bolbometopon muricatum*) stocks in the New Georgia region of the Western Solomon Islands. He found that the population turnover rates for this species are slow. This biological factor, coupled with the technological and social shifts that have occurred in subsistence fisheries in recent decades, has resulted in this species being rapidly overfished in Roviana Lagoon.

- Indigenous knowledge of spawning aggregations of the longfin emperor species *Lethrinus erythropterus* was investigated in Roviana lagoon by Hamilton (2005).

Although these studies have been very useful in contributing to our understanding of different aspects of reef fin fish resources in Solomon Islands, many are dated, location and species specific or based on export data (fisheries dependent).

Coral reef fish resources are facing high exploitation pressures in the Solomon Islands due to the increasing human population, the change from subsistence to a cash economy, and the use of highly efficient and destructive fishing methods (particularly blast fishing, gill nets, and night spear fishing). Effective fisheries management will be required for the sustainable management of these critically important resources in the long term.

The Solomon Islands Marine Assessment has also demonstrated that the coral reef communities in the Solomon Islands are highly diverse and a high priority for marine conservation (see *Executive Summary* this report). As such, there is an urgent need for more up to date and detailed information on the status of coral reef fish communities and the populations of key fisheries species, to provide a more scientific basis for the effective conservation and management of these resources in the Solomon Islands.

This study represents the first broad scale survey of coral reef fish communities and populations of key fisheries species in the Solomon Islands. The primary objective was to conduct a quantitative baseline assessment of the status of these resources throughout the main island chain of the Solomon Islands, encompassing seven of the nine provinces. The results will help provide a scientific basis for the conservation and management of coral reef fish communities and fisheries resources through fisheries management at the national, provincial and community levels; education and awareness programs for communities and schools; and the development of a National Biodiversity Strategic Action Plan (NBSAP) for Solomon Islands. This survey will also establish a baseline for the long term monitoring of these resources.

Methods

Survey Area and Sites

The survey focused on the core island group of the Solomon Islands, from Choiseul and Shortland Islands in the northwest to the Makira in the southeast (Figure 1). Sixty-six sites were surveyed in seven provinces: Isabel, Choiseul, Western, Central, Guadalcanal, Malaita and Makira (Figures 1 & 2).

Study sites were distributed to provide maximum geographic coverage of the main islands and island groups within the study area. The number of sites sampled in each island or group depended on its size and habitat complexity, and as well as logistic constraints (time and weather). Four to 12 sites were surveyed on each of the large islands and groups (Isabel, Choiseul, New Georgia, Guadalcanal, Makira and Malaita), and one to four sites were surveyed on each of the smaller islands (Arnavons, Shortlands, Russells, Floridas, Three Sisters, Ugi, and Savo Islands).

Survey sites were also selected to represent both exposed and sheltered habitats on each island or island group. Exposed sites were located on the outside of reefs, where exposure to waves and oceanic influences were high. Sheltered sites were located in protected lagoons and bays, where exposure to wave activity and oceanic influences was low. Of the 66 sites surveyed, 35 and 31 were located in exposed and sheltered areas respectively.

Survey Methods

Coral Reef Fish Communities

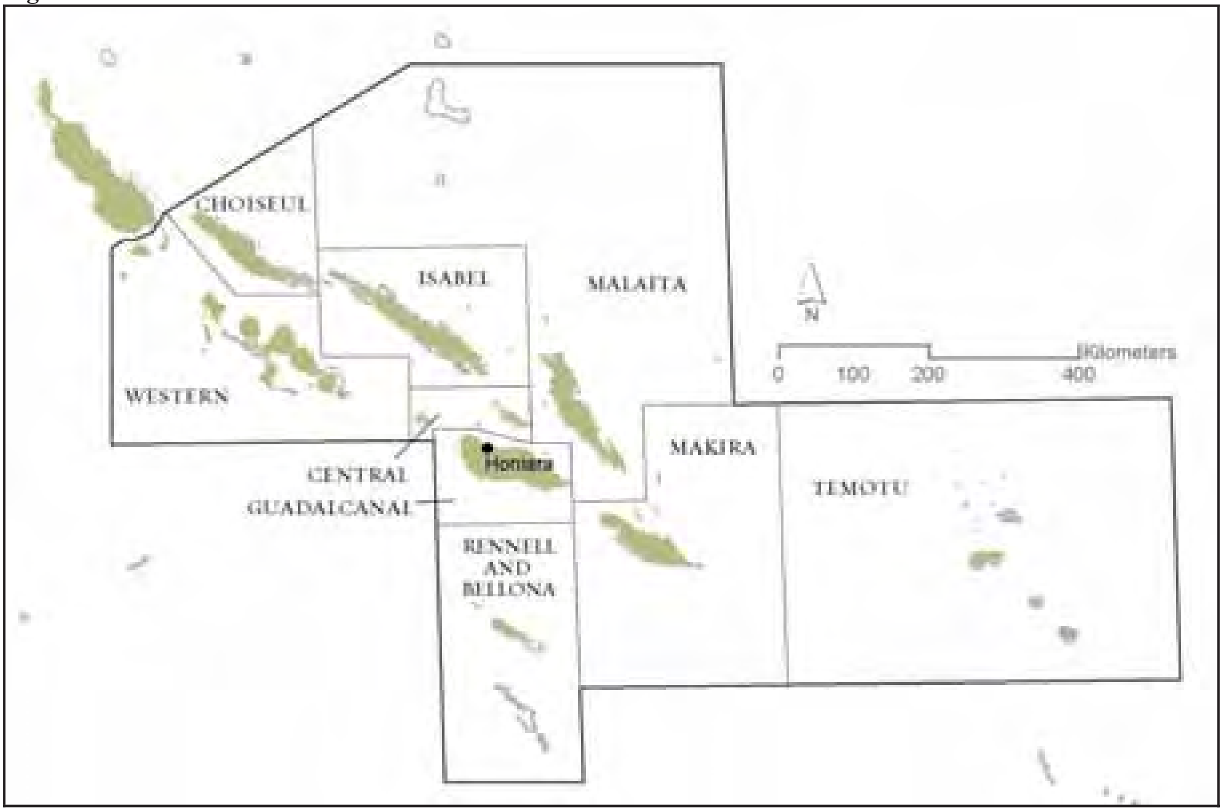
Coral reef fish communities were surveyed using underwater visual census techniques along five replicate transects on the reef slope (depth=10m) at each site. Fishes were surveyed by three passes along the transect counting different species in each pass, using different transect dimensions for each group (based on their behaviour, size and abundance):

- Large, highly mobile species that are most likely to be disturbed by the passage of a diver (such as parrotfishes, snappers and emperors) were surveyed on the first pass using transect dimensions of 50m x 5m.
- Medium sized mobile species (including most surgeonfishes, butterflyfishes and wrasses) that are less disturbed by the presence of a diver, were counted on the second pass using transect dimensions of 50m x 3m.
- Small, site attached species (mostly damselfishes) that are least disturbed by the presence of a diver, were counted on the third pass using transect dimensions of 30m x 1m.

Small and medium sized reef fishes were not surveyed at four sites in the Western Province due to logistic constraints (Figure 1): two sites in the Shortland Islands (Sites 27 and 28: Onua and Faisi respectively) and two sites in New Georgia (Sites 29 and 30: Vella Levella and Njari respectively).

Figure 1. Survey track (in red) and location of each survey site in the Solomon Islands.

Figure 2. Solomon Island Provinces.



During each pass of the transect, the number of individuals of each species was counted and recorded onto underwater paper. The size of each individual (length in cm) was also estimated and recorded. Fish identifications were based on Allen (2003).

Transect lengths were measured using 50m tapes, and transect widths were estimated using known body proportions. Transect tapes were laid during the first pass by an assistant following the observer (to minimize disturbance to the fish communities being counted). The tapes then remained *in situ* until all the surveys were completed at that site. Fish counts (i.e. each pass of the transect) were separated by a waiting period of ~5 minutes between counts. Benthic communities and key macroinvertebrates were surveyed along the same transects after the fish counts were completed (see *Benthic Communities* this report; and *Fisheries Resources: Commercially Important Macroinvertebrates* this report).

A restricted list of 37 families was used comprising only those families that are amenable to visual census techniques, because they are relatively large, diurnally active and conspicuous in coloration and behaviour (Table 2). This method excludes species that are not amenable to the technique because they are very small, nocturnal or cryptic in behaviour (eg gobies, blennies, cardinalfish).

Reef fish communities were compared among provinces, islands and sites based on their species richness, density and biomass. Where: fish species richness was the total number of species recorded on the transects, and fish density was converted to the number of individuals per hectare (ha). Fish biomass was calculated by converting estimated fish lengths to weights using the allometric length-weight conversion formulae [weight (kg) = $(\text{total length in cm} \times \text{constant a})^b$]

where a and b are constants for each species. Constants were not available for most species in the Solomon Islands, so they were obtained from New Caledonia (Kulbicki *unpubl data*: Appendix 1), which was the closest geographic area where this information was available. Where constants were not available for a species, the constants for a similar species (usually a congeneric species) were used.

This survey established a quantitative baseline for the long term monitoring of coral reef fishes in the Solomon Islands.

Table 2. Reef fish families surveyed in the Solomon Islands.

Class (common name)	Family	Family Common Name
Chondrichtyes (sharks and rays)	Carcharinidae	whaler or requiem sharks
	Ginglymostomatidae	nurse sharks
	Hemigaleidae	weasel sharks
	Myliobatidae	eagle rays
Osteichthyes (bony fishes)	Acanthuridae	surgeonfishes and unicornfishes
	Aulostomidae	trumpetfishes
	Balistidae	triggerfishes
	Caesionidae	fusiliers
	Carangidae	trevallies
	Chaetodontidae	butterflyfishes
	Diodontidae	porcupinefishes
	Echeneidae	suckerfish
	Ephippidae	batfishes
	Fistularidae	flutemouths
	Haemulidae	sweetlips
	Kyphosidae	drummers
	Labridae	wrasses
	Lethrinidae	emperors
	Lutjanidae	snappers
	Malacanthidae	sand tilefishes
	Monacanthidae	leatherjackets
	Mugilidae	mullets
	Mullidae	goatfishes
	Nemipteridae	coral breams
	Ostracidae	boxfishes
	Pinguipedidae	sandperches
	Pomacanthidae	angelfishes
	Pomacentridae	damselfishes
	Scaridae	parrotfishes
	Scomberidae	mackerels
	Scorpaenidae	scorpionfishes
	Serranidae	groupers
	Siganidae	rabbitfishes
	Sphyraenidae	barracudas
	Synodontidae	lizardfishes
	Tetraodontidae	puffers
	Zanclidae	moorish idol

Key Fisheries Species: Food Fishes

Key food fish species were defined as those targeted by commercial, artisanal and subsistence fisheries, which comprise important components of the catch in the Solomon Islands. A list of these species was compiled based on advice from the Solomon Islands Department of Fisheries and Marine Resources, local scientists, managers and fishermen (Table 3). All key fisheries species were counted (and their size estimated) during the survey of the coral reef fish communities described above (see *Coral Reef Fish Communities*).

Key fisheries species were compared among provinces, islands and sites based on the density and biomass of all species and key families (see *Coral Reef Fish Communities* above for calculations). Bony fishes and cartilaginous fishes (sharks and rays) were analysed separately. Density and biomass of large bony food fishes (30cm or more in size) were compared among provinces, so as not to identify individual sites where they were abundant.

Table 3. Key species of food fishes in the Solomon Islands.

Taxa/Family	Species	Common Name
Sharks	All species	Sharks
Mobulidae (manta rays)	*Manta* spp.	Manta rays
Myliobatidae (eagle rays)	*Aetobatus narinari*	Spotted eagle ray
Labridae (wrasses)	*Cheilinus undulates*	Humphead wrasse
	Cheilinus fasciatus	Redbreasted wrasse
Scaridae (parrotfishes)	*Bolbometopon muricatum*	Humphead parrotfish
	Hipposcarus longiceps	Pacific longnose parrotfish
	Chlorurus microrhinos	Steephead parrotfish
Serranidae (groupers)	*Plectropomus areolatus*	Squaretail coral grouper
	Plectropomus laevis	Blacksaddle coral grouper
	Plectropomus oligacanthus	Highfin coral grouper
	Plectropomus leopardus	Leopard coral grouper
	Epinephelus fuscoguttatus	Brown-marbled grouper
	Epinephelus polyphekadion	Camouflage grouper
	Epinephelus lanceolatus	Giant grouper
	Cromileptes altivelis	Barramundi cod
	Variola louti	Yellow-edged lyretail
	Variola albimarginata	White-edged lyretail
	Epinephalus merra/quoyanus	Honeycomb groupers
	Cephalopholis argus	Peacock grouper
	Cephalopholis cyanostigma	Bluespotted grouper
	Cephalopholis miniata	Coral grouper
Haemulidae (sweetlips)	*Plectorhinchus albovittatus*	Giant sweetlips
	Plectorhinchus vittatus	Oriental sweetlips
	Plectorhinchus lineatus	Diagonal-banded sweetlips
	Plectorhinchus chaetodonoides	Many-spotted sweelips

Taxa/Family	**Species**	**Common Name**
Lutjanidae (snappers)	*Aprion virescens*	Green jobfish
	Lutjanus gibbus	Humpback snapper
	Lutjanus bohar	Red snapper
	Lutjanus argentimaculatus	Mangrove red snapper
	Macolor niger	Black snapper
	Macolor macularis	Midnight snapper
	Symphorichthys spilurus	Sailfin snapper
	Small yellow and spot (= *L. monostigma, L. fulviflamma, L. ehrenbergii* etc)	Longspot/blackspot/onespot snapper
	Small & yellow lines (= *L. quinquelineatus, L. kasmira*)	Five-lined/bluestripe snapper
Lethrinidae (emperors)	*Lethrinus olivaceus*	Longface emperor
	Lethrinus erythropterus	Longfin emperor
	Lethrinus rubrioperculatus	Spotcheek emperor
	Lethrinus xanthochilus	Yellowlip emperor
	Monotaxis grandoculis	Humpnose bigeye bream
	Small lethrinids (*Lethrinus* spp.)	Small emperors
Acanthuridae (surgeonfishes)	*Naso hexacanthus*	Sleek unicornfish
	Naso lituratus	Orangespine unicornfish
	Naso unicornis	Bluespine unicornfish
	Naso brevirostris	Spotted unicornfish
	Large ringtails (*Acanthurus xanthopterus, A. mata, A.* nigricauda A. dussumieri, A. *blochi, A. fowleri* etc)	Ringtails
	Small surgeonfish: *Acanthurus lineatus* and *Ctenochaetus* species	Lined surgeonfish and Bristletooth
Siganidae (rabbitfishes)	*Siganus lineatus*	Lined rabbitfish
	Siganus vermiculatus	Vermiculate rabbitfish
	Siganus fuscescens	Dusky rabbitfish
	Siganus puellus	Masked rabbitfish
Mullidae (goatfishes)	*Parupeneus bifasciatus/trifasciatus*	Doublebar/Indian doublebar goatfish
	Parupeneus cyclostomus	Goldsaddle goatfish
	Parupeneus barberinus	Dash-dot goatfish
	Parupeneus vanicolensis	Yellowfin goatfish
Kyphosidae (drummers)	*Kyphosus* spp.	Drummer
Ostracidae (boxfishes)	*Ostracion cubicus*	Yellow boxfish
Caesionidae (fusiliers)	*Caesio cuning*	Yellowtail fusilier
Balistidae (triggerfishes)	*Balistoides viridescens*	Titan triggerfish
	Pseudobalistes flavimarginatus	Yellowmargin triggerfish
	Balistapus undulatus	Orange-lined triggerfish
Chanidae (milkfishes)	*Channos channos*	Milkfish
Holocentridae (soldierfishes and squirrelfishes[1])	*Sargocentron spiniferum*	Sabre squirrelfish
Carangidae (trevally)	*Caranx ignobilis*	Giant trevally
	Caranx sexfasciatus	Bigeye trevally
	Caranx papuensis	Brassy trevally
	Caranx melampygus	Bluefin trevally
Sphyraenidae (barracudas)	*Sphyraena* spp.	Barracuda

[1] Not counted in this survey, because they are nocturnal and not amenable to visual census methods.

Key Fisheries Species: Large and Vulnerable Reef Fishes

Key fisheries species of food fish that are large and particularly vulnerable to overfishing were counted (and their size estimated) using long swim methods specifically developed for this purpose (Choat and Spears 2003). They included:

- Sharks (all species), manta rays (*Manta* spp.) and eagle rays (*Aetobatus narinari*);
- Maori wrasse (*Cheilinus undulatus*);
- Humphead parrotfish (*Bolbometopon muricatum*) and steephead parrotfish (*Chlorurus microrhinos*);
- Large groupers (*Epinephelus fuscoguttatus, Epinephelus polyphekadion, Epinephelus lanceolatus, Cromileptes altivelis, Variola louti* and *Variola albimarginata*);
- Giant trevally (*Caranx ignobilis*); and
- Large and uncommon emperors (*Lethrinus olivaceus*, *Lethrinus erythropterus*, *Lethrinus rubrioperculatus* and *Lethrinus xanthochilus*).

This method was developed to improve estimates of the abundance of these species, since they tend to be uncommon and clumped in distribution, so smaller transects dimensions (eg 50m x 5m) are not suitable for obtaining reasonable estimates of their abundance. In this method, the observer surveys a wide area during a single pass of the reef slope over a set time period (15 mins) scanning the reef slope for these species. When a standard width is used (20m), these estimates can be converted to a standardised area (density per hectare).

Density and biomass of large, vulnerable species were compared among provinces only, so as not to identify individual sites where they are abundant.

Key Fisheries Species: Aquarium Fishes

Aquarium fishes were defined as those targeted for export by the aquarium trade in the Solomon Islands. A list of these species was defined based on advice from the Solomon Islands Department of Fisheries and Marine Resources, local scientists, managers and fishermen (Table 4). These species were counted (and their size estimated) during the survey of the coral reef fish communities described above (see *Coral Reef Fish Communities*).

Aquarium fish densities were compared among provinces, islands and sites based on the density of all species, key families and key species. Data analysis focused on density only, since aquarium fish are sold by the “piece” and not by weight.

Reptiles and Mammals

Observations of rare and threatened species (sea turtles, crocodile, dugong, and cetaceans) were recorded during the long swims (see *Key Fisheries Species: Large and Vulnerable Reef Fishes* above).

Table 4. Key species of aquarium fishes in the Solomon Islands.

Family	Taxa	Species
Acanthuridae	*Acanthurus* spp.	All *Acanthurus* species
	Paracanthurus hepatus	*Paracanthurus hepatus*
	Zebrasoma spp.	All *Zebrasoma* species
Balistidae	*Balistoides* spp.	All *Balistoides* species
	Odonus niger	*Odonus niger*
	Rhinecanthus spp.	All *Rhinecanthus* species
	Sufflamen spp.	All *Sufflamen* species
Chaetodontidae	All species	All chaetodontid species
Cirrhitidae	*Cirrhitichthys* spp.	All *Cirrhitichthys* species
	Paracirrhites spp.	All *Paracirrhites* species
Haemulidae	*Plectorhinchus* spp.	All *Plectorhinchus* species
Labridae	*Anampses* spp.	All *Anampses* species
	Bodianus spp.	All *Bodianus* species
	Cirrhilabrus spp.	All *Cirrhilabrus* species
	Coris gaimard	*Coris gaimard*
	Halichoeres spp.	All *Halichoeres* species
	Labrichthyes spp.	All *Labrichthyes* species
	Labroides spp.	All *Labroides* species
	Labropsis spp.	All *Labropsis* species
	Macropharyngodon spp.	All *Macropharyngodon* species
	Pseudocheilinus hexataenia	All *Pseudocheilinus hexataenia*
	Stethojulis spp.	All *Stethojulis* species
	Thalassoma spp.	All *Thalassoma* species
Monacanthidae	*Oxymonacanthus longirostris*	*Oxymonacanthus longirostris*
Pomacanthidae	*Apolemichthys* spp.	All *Apolemichthys* species
	Centropyge spp.	All *Centropyge* species
	Pygoplites spp.	All *Pygoplites* species
	Pomacanthus navarchus	All *Pomacanthus navarchus*
	Pomacanthus imperator	All *Pomacanthus imperator*
	Pomacanthus spp.	All *Pomacanthus* species
Pomacentridae	*Amphprion* spp.	All *Amphprion* species
	Chromis viridis	All *Chromis viridis*
	Chromis spp.	All *Chromis* species
	Chrysiptera cyanea	All *Chrysiptera cyanea*
	Chyrisptera spp.	All *Chyrisptera* species
	Dascyllus spp.	All *Dascyllus* species
	Plectroglyphidodon dickii	All *Plectroglyphidodon dickii*
	Premnas biaculeatus	*Premnas biaculeatus*
Scaridae	*Cetoscarus bicolor*	*Cetoscarus bicolor*
Serranidae	*Cephalopholis* spp.	All *Cephalopholis* spp.
	Pseudanthias spp.	All *Pseudanthias* spp.
Tetraodontidae	*Arothron* spp.	All *Arothron* spp.

Results

A total of 110,640 coral reef fishes were counted on reef slopes at 66 sites in seven provinces in the Solomon Islands. The following is a general description the coral reef fish communities (all species recorded), and key fisheries species (food fishes and aquarium fishes) based on the transect data. Special consideration is given to large, vulnerable species that are particularly vulnerable to overfishing based on the long swim data. Observations of rare and threatened species (dugong and turtle) from the long swim data are also recorded.

Small to medium size reef fishes were not surveyed at four sites in the Western Province due to logistic constraints (Figure 1): two sites in the Shortland Islands (Sites 27 and 28: Onua and Faisi respectively) and two sites in New Georgia (Sites 29 and 30: Vella Levella and Njari respectively). Therefore, the following results should be considered an underestimate for those sites.

Coral Reef Fish Communities

Coral reef fish communities are described based on their species richness, density and biomass.

Species Richness

A total of 37 families and 383 species were counted during this survey (Appendix 1). Species richness varied among provinces, islands and sites (Figure 3), ranging from 20 to 50 species at most sites. There was no clear pattern associated with province or island, although species richness tended to be highest in the Central (Russell Islands and Savo Island), Choiseul, Isabel (Arnavon Islands), Makira (particularly Ugi Island), and Western Provinces (both New Georgia and Shortland Islands). With some exceptions, species richness tended to be higher at exposed than sheltered sites in adjacent areas.

Density

Bony fishes were most abundant, accounting for 99.9% of the fish counted (Table 5). The most abundant families were damselfishes, fusiliers, surgeonfishes, snappers and wrasses, followed by fairy basslets, parrotfishes and emperors. Sharks and rays were uncommon, accounting for less than 0.1% of the fishes counted (Table 5).

Density was highly variable among provinces, islands, exposures and sites (Figure 4). The highest densities were recorded in Central, Choiseul, Isabel (including the Arnavon Islands), Makira (particularly the offshore islands of Three Sisters and Ugi Island) and the Western Provinces, with lower densities recorded in Guadalcanal and Malaita. There was no clear pattern associated with exposure, with higher densities recorded on exposed sites at some locations and at sheltered sites at others, although the highest overall densities were recorded at sheltered sites. In general, sites with the highest densities were due to high densities damselfishes, with fusiliers, snappers, surgeonfishes, fairy basslets, wrasses, emperors, parrotfishes, drummers, and triggerfishes also abundant at some sites (Appendix 2).

Table 5. Relative abundance of each fish family in the Solomon Islands.

Order	Family	Common Name	Relative Density (% of total)	Relative Biomass (% of total)
Bony Fishes	Pomacentridae	Damselfishes	67.7	5.7
	Caesionidae	Fusiliers	7.8	8.2
	Acanthuridae	Surgeonfishes	4.8	10.6
	Lutjanidae	Snappers	4.5	21.2
	Labridae	Wrasses	4.2	1.3
	Serranidae (Anthiinae)	Fairy Basslets	2.1	0.1
	Scaridae	Parrotfishes	2.1	14.6
	Lethrinidae	Emperors	2.0	7.8
	Chaetodontidae	Butterflyfishes	0.8	0.8
	Balistidae	Triggerfishes	0.7	2.8
	Kyphosidae	Drummers	0.7	3.9
	Mullidae	Goatfishes	0.6	0.7
	Pomacanthidae	Angelfishes	0.5	0.4
	Siganidae	Rabbitfishes	0.4	1.4
	Carangidae	Trevallies	0.2	1.3
	Serranidae (Epinephelinae)	Groupers	0.2	0.8
	Nemipteridae	Coral Breams	0.1	0.1
	Haemulidae	Sweetlips	0.1	1.2
	Chanidae	Milkfish	0.1	0.1
	Zanclidae	Moorish Idols	0.1	0.1
	Cirrhitidae	Hawkish	0.1	<0.1
	Scombridae	Mackerels	<0.1	<0.1
	Tetraodontidae	Puffers	<0.1	0.1
	Monacanthidae	Leatherjackets	<0.1	<0.1
	Pinguipedidae	Sandperches	<0.1	<0.1
	Aulostomidae	Trumpetfishes	<0.1	<0.1
	Synodontidae	Lizardfishes	<0.1	<0.1
	Ostracidae	Boxfishes	<0.1	<0.1
	Malacanthidae	Sand Tilefishes	<0.1	<0.1
	Platacidae	Batfishes	<0.1	<0.1
	Sphyraenidae	Barracudas	<0.1	0.5
	Echneneidae	Remoras	<0.1	<0.1
	Fistularidae	Flutemouths	<0.1	<0.1
		Total	**99.9**	**84.0**
Sharks & Rays	Carcharinidae	Whaler Sharks	<0.1	3.0
	Hemigaleidae	Weasel Sharks	<0.1	0.3
	Unidentified sharks	Unident. Sharks	<0.1	0.2
	Mobulidae	Manta Rays	<0.1	12.3
	Myliobatididae	Eagle Rays	<0.1	0.1
		Total	**<0.1**	**15.9**

Biomass

Bony fishes accounted for most of the biomass (84.0%: Table 5), although sharks and rays were also important (15.9%: Table 5). Most of the biomass of bony fishes was accounted for by snappers, parrotfishes, surgeonfishes, fusiliers and emperors, with damselfishes, drummers, sharks and triggerfishes also important (Table 5, Appendix 3). While most of the biomass of sharks and rays was accounted for by manta rays, with whaler sharks also important.

Biomass was highly variable among provinces, islands, exposures and sites (Figure 5). The particularly high biomass at Site 55 on Malaita was due to the presence of the large manta ray, while the high biomass at Site 27 in the Shortland Islands was due to the presence of large schools of snappers, emperors, surgeonfishes, and parrotfishes (Appendices 2 and 3).

The highest biomass of bony fishes was recorded in the Central (Russell Islands Sites 38 and 41), Choiseul (Sites 17, 21, and 22), Isabel (Site 11, and Site 15 in the Arnavon Islands), Makira (Site 44) and Western Provinces (New Georgia Site 29, and Site 27 in the Shortland Islands: Appendix 3).

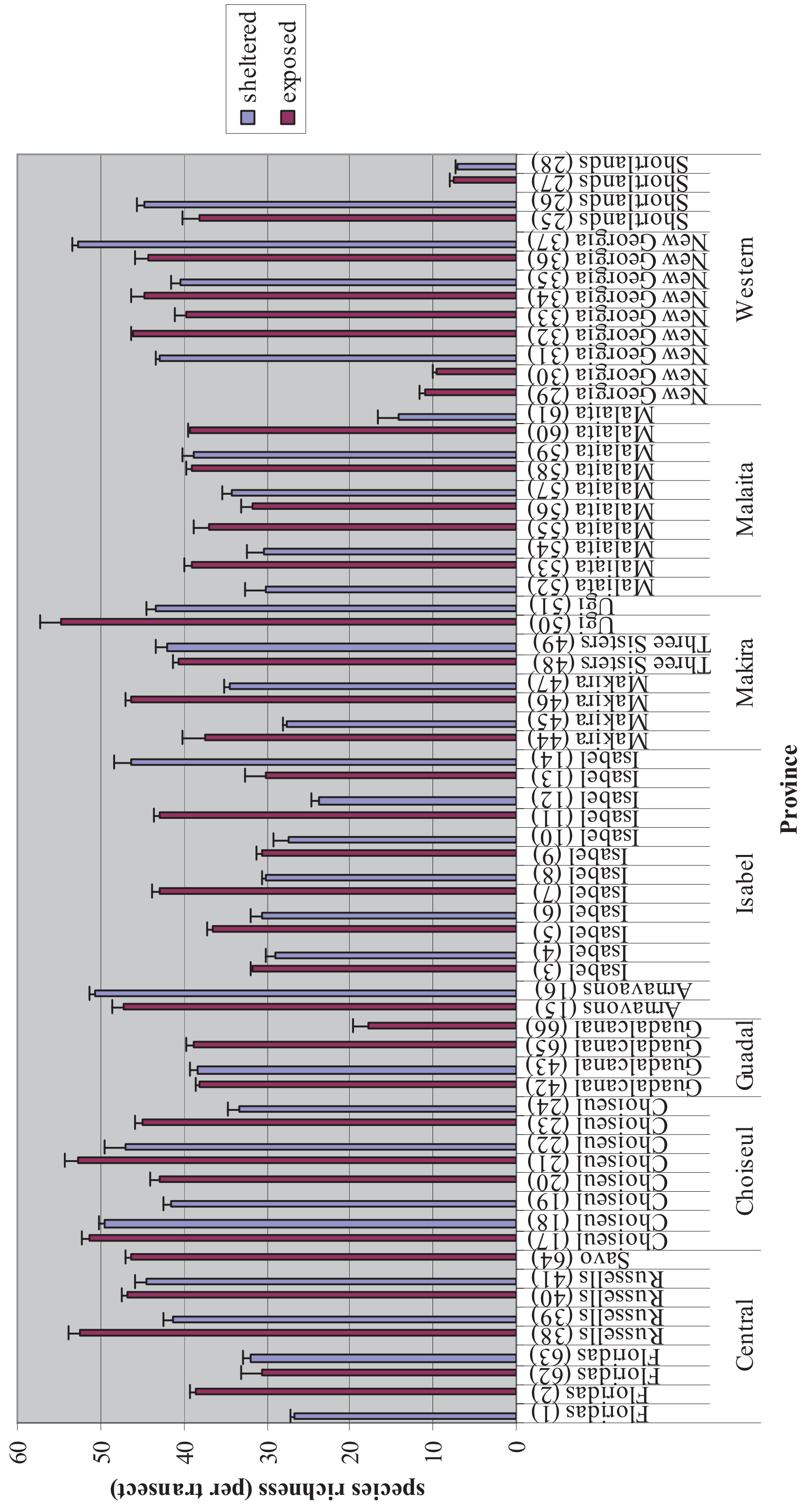
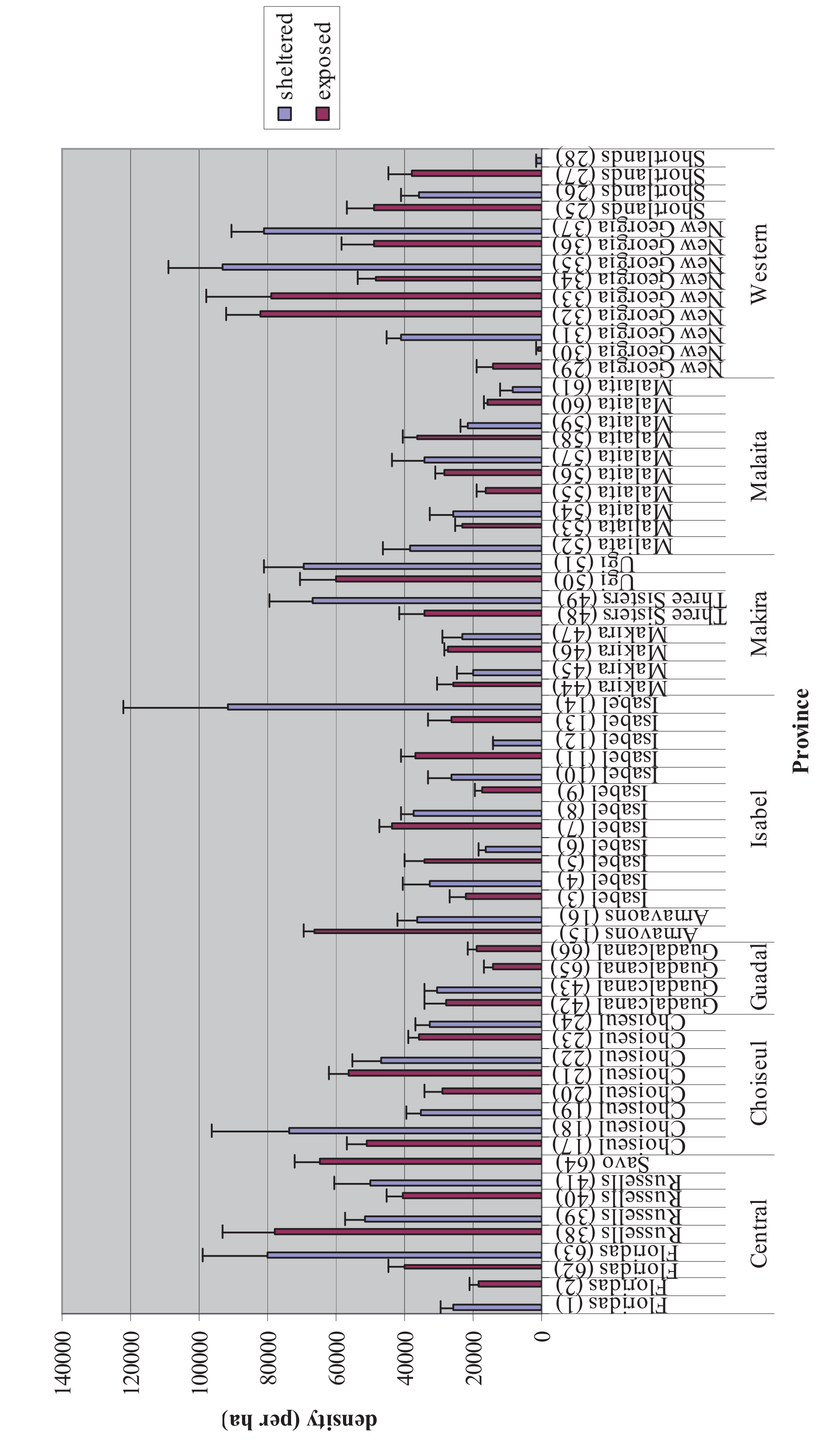


Figure 3. Mean species richness (+ se) of coral reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Figure 4. Mean density (+ se) of coral reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.



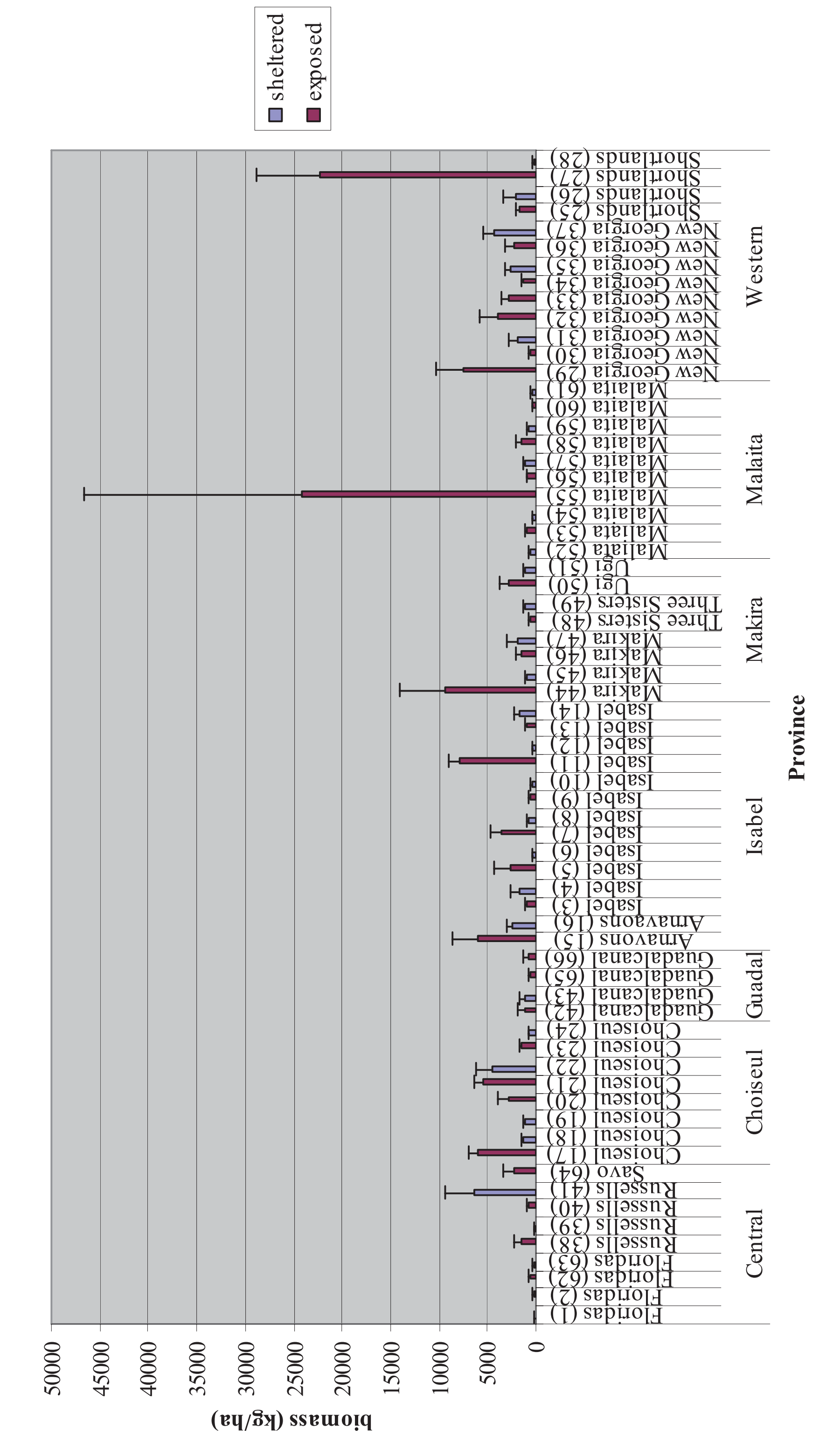


Figure 5. Mean biomass (+ se) of coral reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

KEY FISHERIES SPECIES: FOOD FISHES SIGHTED ON TRANSECT SWIMS

A total of 54,792 food fishes (bony fishes, sharks and rays), comprising 20 families and 87 species, were counted throughout seven provinces during this survey. Populations of food fishes are described based on their distribution and abundance (density and biomass) throughout the survey area.

Density

Bony fishes were most abundant, accounting for 99.9% of the food fishes counted (Table 6). The most abundant families were snappers, fusiliers and surgeonfishes, followed by emperors, parrotfishes, drummers, goatfishes and triggerfishes (Table 6). Sharks and rays were much less abundant, accounting for less than 0.1% of the fishes counted (Table 6).

Density of bony food fishes was highly variable among provinces, islands, exposures and sites (Figure 6). The highest densities were recorded in Western, Central (Russell Islands), Choiseul, Isabel (including Arnavon Islands), and Makira Provinces, with lower densities recorded in Guadalcanal, Malaita and Central (Florida Islands) Provinces. There was no clear pattern associated with exposure at adjacent sites, with higher densities recorded at exposed sites at some locations and at sheltered sites at others. The high densities recorded at some sites were due to high densities of snappers, surgeonfishes, emperors, parrotfishes and fusiliers (e.g. Shortlands Site 27), with drummers, goatfishes and triggerfishes also important at some sites (Appendix 4).

The highest densities of key fisheries species of snappers, surgeonfishes, emperors, and parrotfishes were recorded in Western, Isabel (including Arnavon Islands), Choiseul, Central (Russell Islands), and Makira Provinces (Figures 7-10, Appendix 4). The most abundant genera of food fishes were (Appendices 5 and 6): *Lutjanus* and *Macolor* (snappers), *Acanthurus*, *Ctenochaetus* and *Naso* (surgeonfishes), *Lethrinus* and *Monotaxis* (emperors), *Hipposcarus* (parrotfishes) and *Caesio* (fusiliers).

In contrast, only low densities of snappers, emperors and parrotfishes, were recorded in Guadalcanal and Malaita Provinces, and in the Florida Islands and Savo Island in Central Province (Figures 7, 9 and 10). This pattern was most pronounced for the key fisheries species of parrotfishes (Figure 10), which were rare on Guadalcanal.

Key fisheries species of grouper were not abundant in the survey area, with the highest density recorded in the Arnavon Islands (Figure 11), were *Plectropomus* and *Variola* were most abundant (Appendix 5). Only low densities of *Epinephelus* and *Cromileptes* were recorded throughout the survey area (Appendix 5), particularly those species targeted by the live reef food fish trade (Appendix 7): brown-marbled grouper (*Epinephelus fuscoguttatus*), camouflage grouper (*E. polyphekadion*), and squaretail coral grouper (*Plectropomus areolatus*).

Table 6. Relative abundance of each family of food fish in the Solomon Islands.

Order	Family	Common Name	Relative Density (% of total)	Relative Biomass (% of total)
Bony Fishes	Lutjanidae	Snappers	24.76	25.40
	Caesionidae	Fusiliers	22.72	4.92
	Acanthuridae	Surgeonfishes	22.13	11.78
	Lethrinidae	Emperors	9.75	8.96
	Scaridae	Parrotfishes	5.14	14.25
	Kyphosidae	Drummers	3.62	4.69
	Mullidae	Goatfishes	2.57	0.64
	Balistidae	Triggerfishes	2.57	3.07
	Siganidae	Rabbitfishes	1.97	1.61
	Carangidae	Trevally	1.24	1.52
	Labridae	Wrasses	1.21	0.86
	Serranidae	Groupers	0.89	0.86
	Haemulidae	Sweetlips	0.68	1.46
	Chanidae	Milkfishes	0.67	0.17
	Ostracidae	Boxfishes	0.02	0.02
	Sphyraenidae	Barracuda	0.01	0.67
		Total	**99.9**	**80.9**
Sharks & Rays	Carcharinidae	Whaler sharks	0.03	3.60
	Hemigaleidae	Weasel Sharks	0.02	0.36
	Unidentified Sharks	Unidentified sharks	0.01	0.22
	Myliobatididae	Eagle rays	<0.01	0.09
	Mobulidae	Manta rays	<0.01	14.83
		Total	**<0.1**	**19.1**

Density of large reef fishes (30cm or more in size) was highest on exposed reefs slopes in most provinces (Figure 12). Density was highest in Western Province, followed by Isabel, Makira, Choiseul and Central Provinces. Density was lower in Guadalcanal and Malaita. The moderate to high densities of large reef fishes on the exposed reef slopes in most provinces was due to a high density of snappers, with emperors, parrotfishes, drummers and emperors also important in some locations (Appendix 8).

Sharks and rays were uncommon throughout the Solomon Islands (Appendix 4). Sharks were recorded in low densities in all provinces except Malaita, while rays were recorded in two provinces only: Malaita and Guadalcanal.

Biomass

Bony fishes accounted for most of the biomass of food fishes (80.9%: Table 6), although sharks and rays were also important (19.1%: Table 6). Most of the biomass of bony fishes was accounted for by snappers, parrotfishes, surgeonfishes, emperors, fusiliers, drummer and triggerfishes (Table 6, Appendix 9). While most of the biomass of sharks and rays was accounted for by manta rays, with whaler sharks also important.

Biomass of bony fishes was highly variable among provinces, islands, sites and exposure (Figure 13). The highest biomass was recorded in the Western Province (Shortland Islands Site 27), with moderate to high biomass recorded at some sites in the Makira, Central (Russell Islands), Choiseul and Isabel Provinces (including the Arnavon Islands). Only low biomass was recorded in Guadalcanal, Malaita, and Central Provinces (Florida Islands). The high biomass of bony fishes at most sites were due to a high biomass of snappers, parrotfishes, drummers, emperors, and surgeonfishes, with fusiliers and triggerfishes also important at some sites (Appendix 9).

The highest biomass of key fisheries species of snappers, surgeonfishes, emperors, and parrotfishes were recorded in Western, Isabel (including Arnavon Islands), Choiseul, Makira and Central Provinces (Russell Islands: Figures 14-17, Appendix 9). Genera that accounted for most of the biomass of these families were (Appendices 10 and 11): *Lutjanus* and *Macolor* (snappers), *Bolbometopon* and *Hipposcarus* (parrotfishes). *Acanthurus* and *Naso* (surgeonfishes), and *Monotaxis* (emperors).

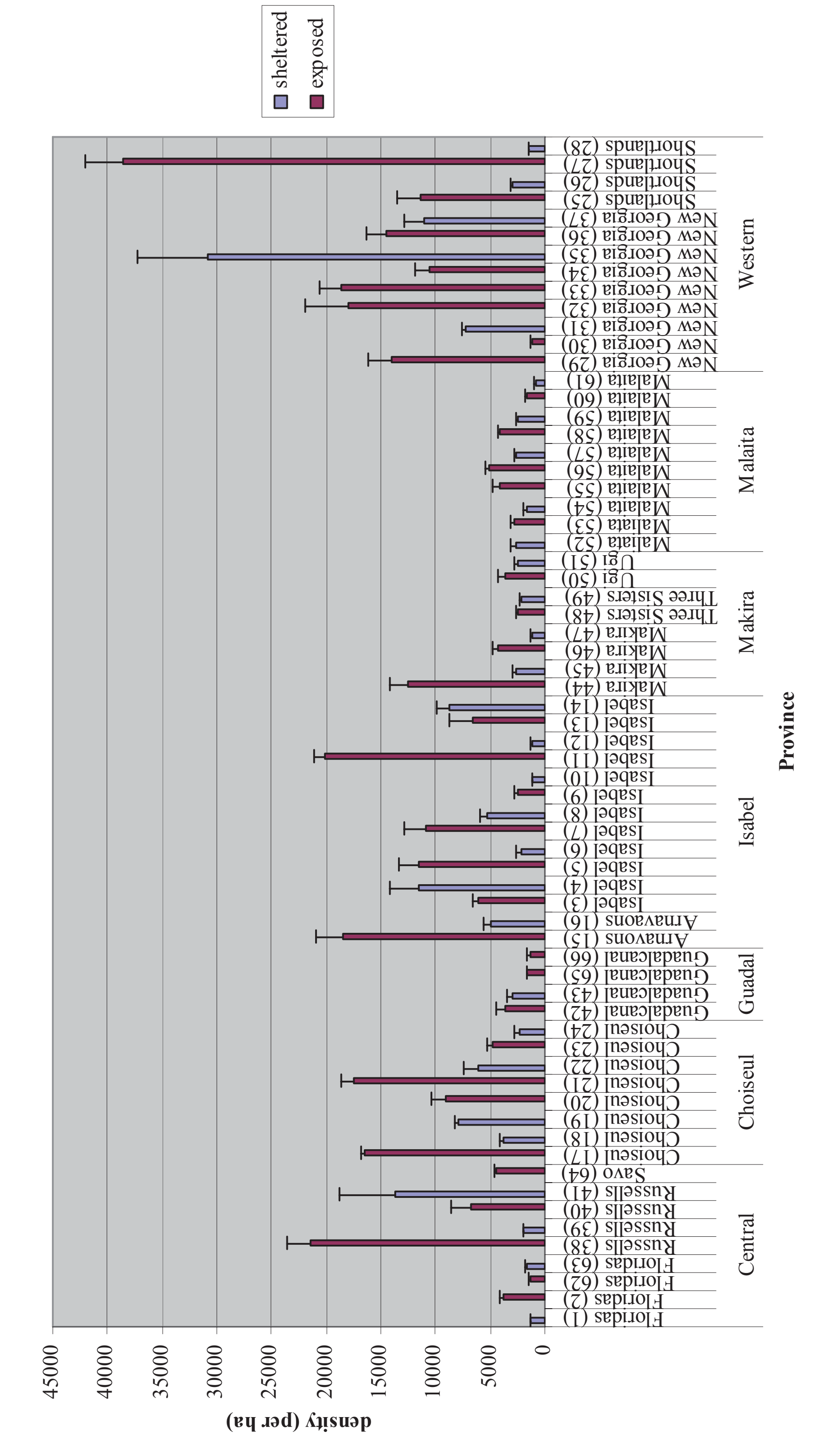
In contrast, only low biomass of snappers, emperors and parrotfishes, were recorded in Guadalcanal and Malaita Provinces, and in the Florida Islands and Savo Island in Central Province (Figures 14-17, Appendix 9). This pattern was most pronounced for the key fisheries species of parrotfishes (Figure 17), which were rare on Guadalcanal.

Only low biomass of key fisheries species of grouper were recorded throughout the survey area, with the highest biomass recorded in the Arnavon Islands (Figure 18). The highest biomass was recorded by coral trout (*Plectropomus*) and lyretail groupers (*Variola*), with the highest biomass recorded in the Arnavon Islands, Choiseul and New Georgia (Appendix 10). Only low biomass of *Cephalopholis*, *Cromileptes* and *Epinephelus* were recorded throughout the survey area (Appendix 10), particularly those species targeted by the live reef food fish trade (Appendix 12): brown-marbled grouper (*Epinephelus fuscoguttatus*), camouflage grouper (*E. polyphekadion*), and squaretail coral grouper (*Plectropomus areolatus*).

The biomass of large reef fishes (30cm or more in size) was highest on exposed reefs slopes in most provinces (Figure 19). Biomass was highest in Western Province, followed by Makira, Isabel, Choiseul and Central Provinces. Biomass was lowest in Guadalcanal and Malaita. The moderate to high biomass of large reef fishes on the exposed reef slopes in most provinces was due to a high biomass of snappers, emperors, surgeonfishes and parrotfishes, with drummers and triggerfishes also important in some locations (Appendix 13).

Low to moderate biomass of sharks was recorded in all provinces except Malaita where no sharks were recorded (Appendix 9 and 13). A high biomass of rays was recorded at one site in Malaita (Site 55) due to the presence of a large manta ray at that site. A low biomass of rays was also recorded at one site on Guadalcanal (Site 43).

Figure 6. Mean density (+ se) of bony food fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.



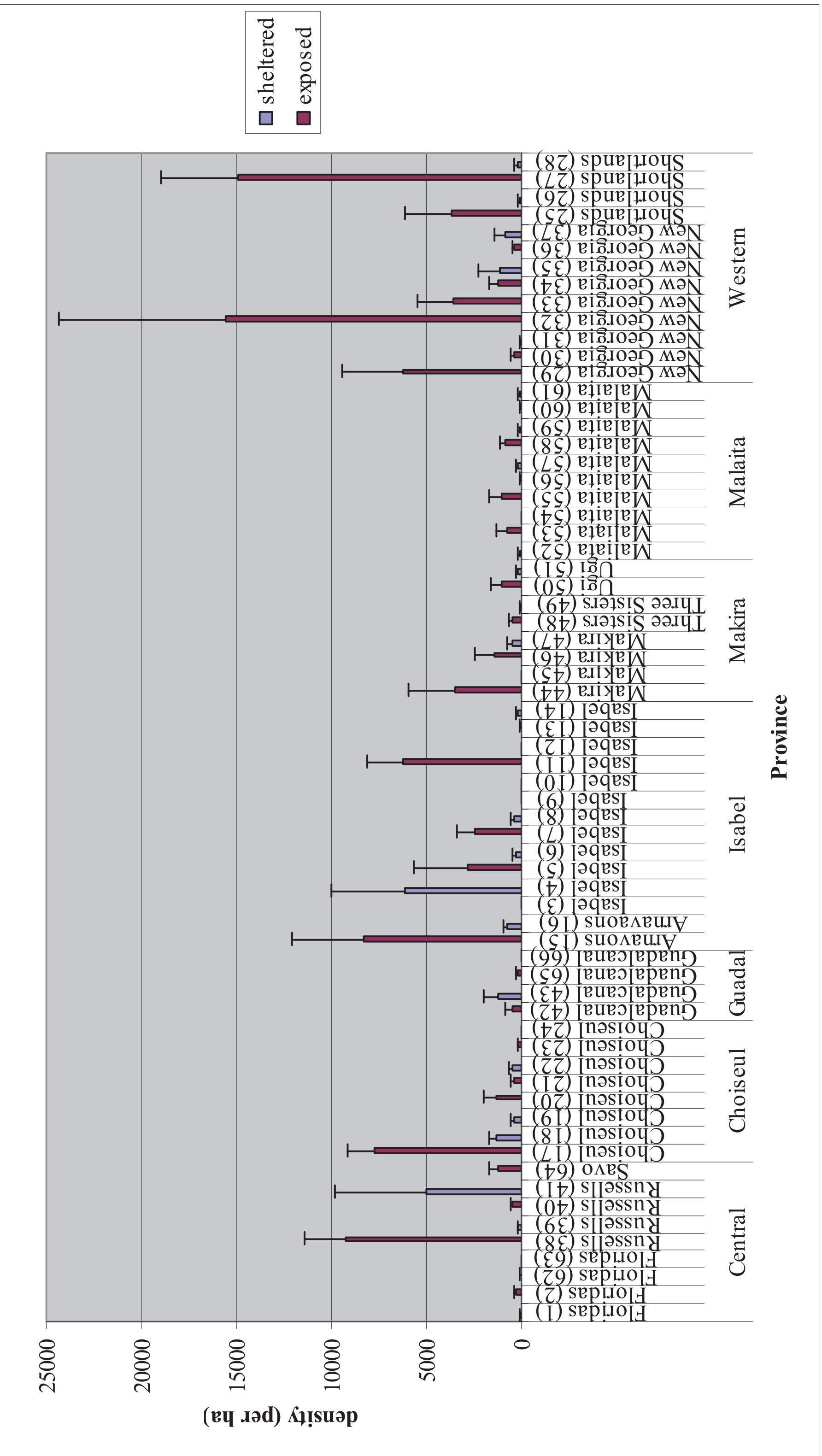


Figure 7. Mean density (+ se) of key fisheries species of snappers on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Figure 8. Mean density (+ se) of key fisheries species of surgeonfishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

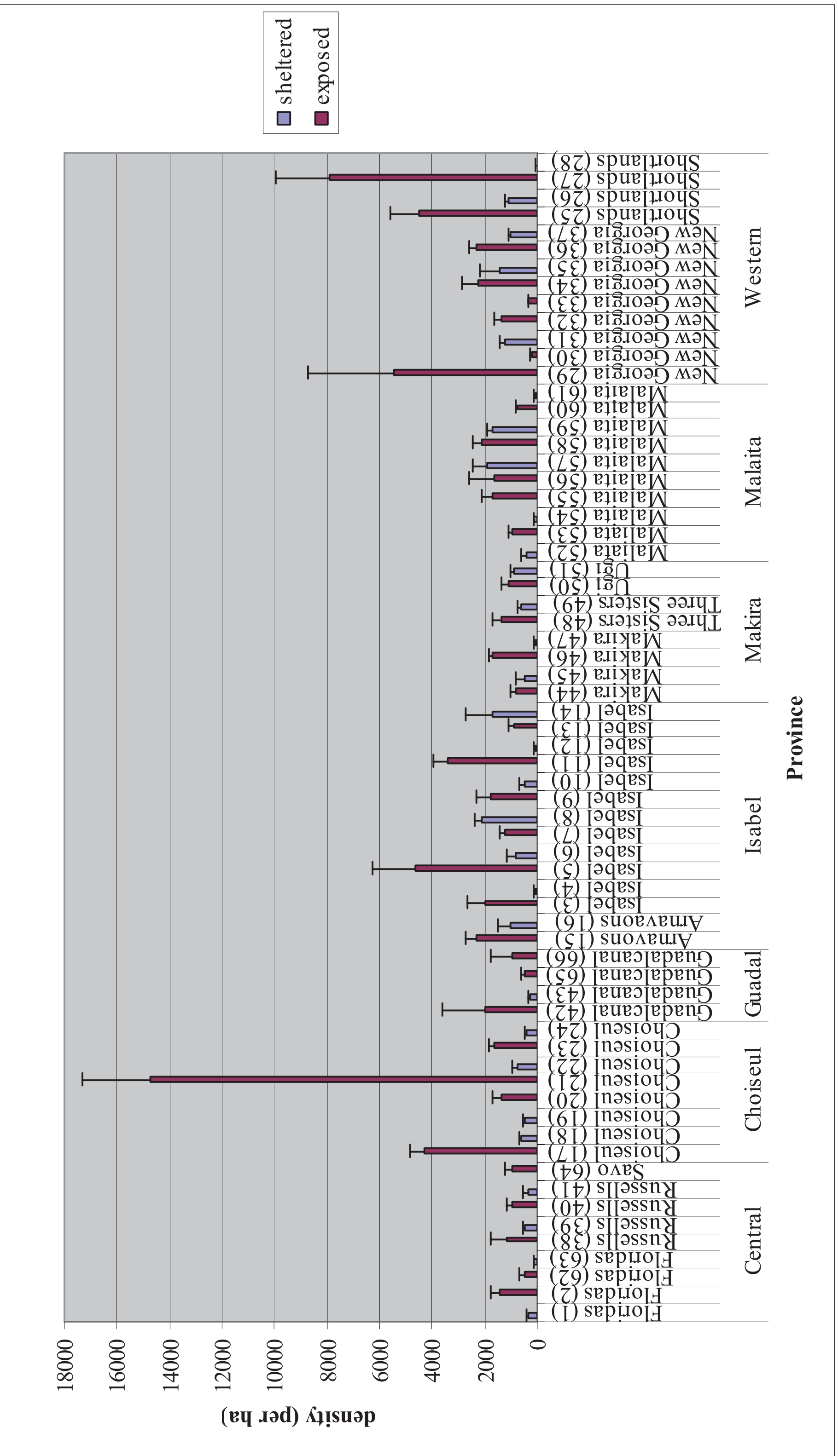


Figure 9. Mean density (+ se) of key fisheries species of emperors on sheltered and exposed reef slopes (10m) in the Solomon Islands.

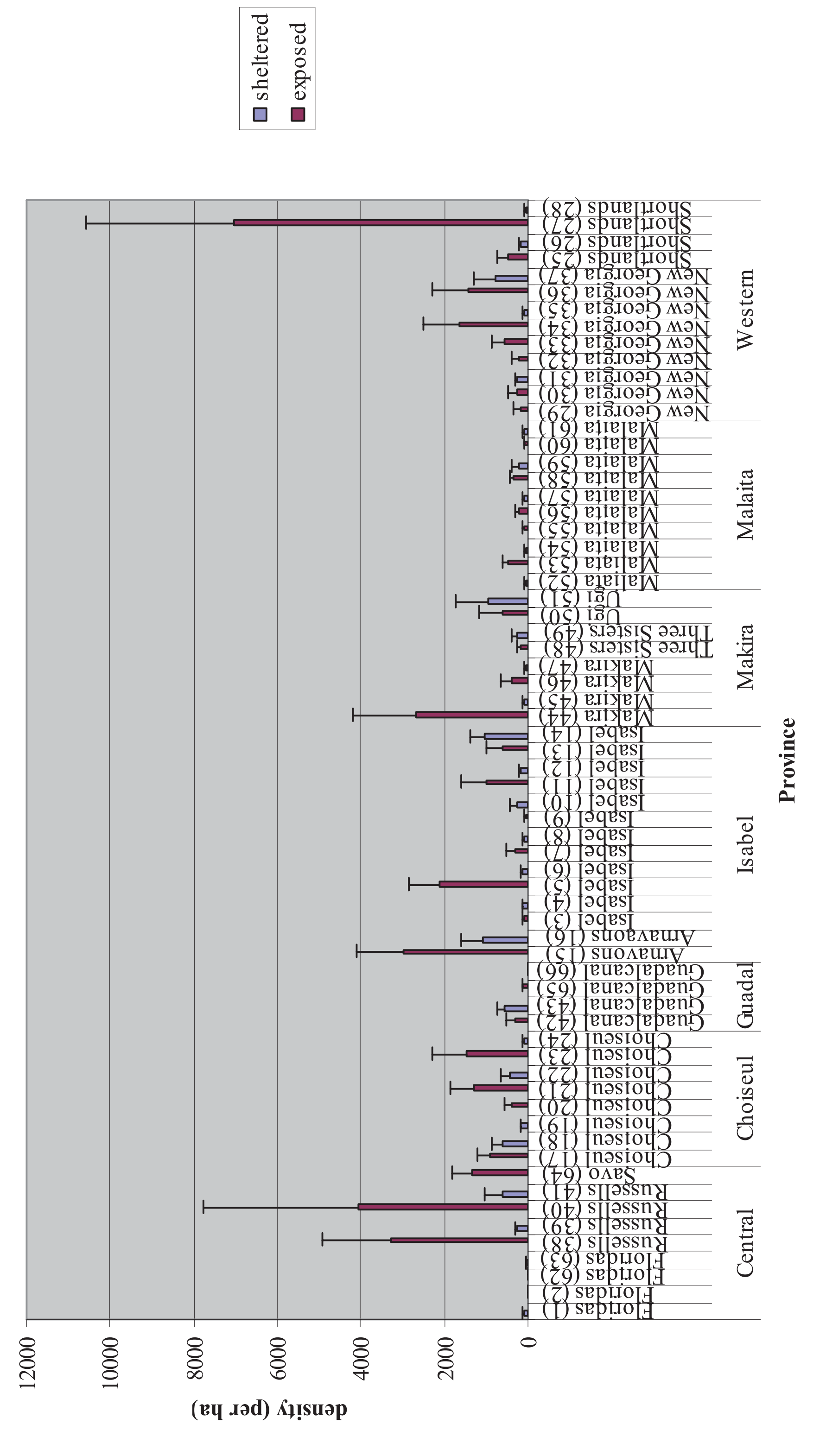
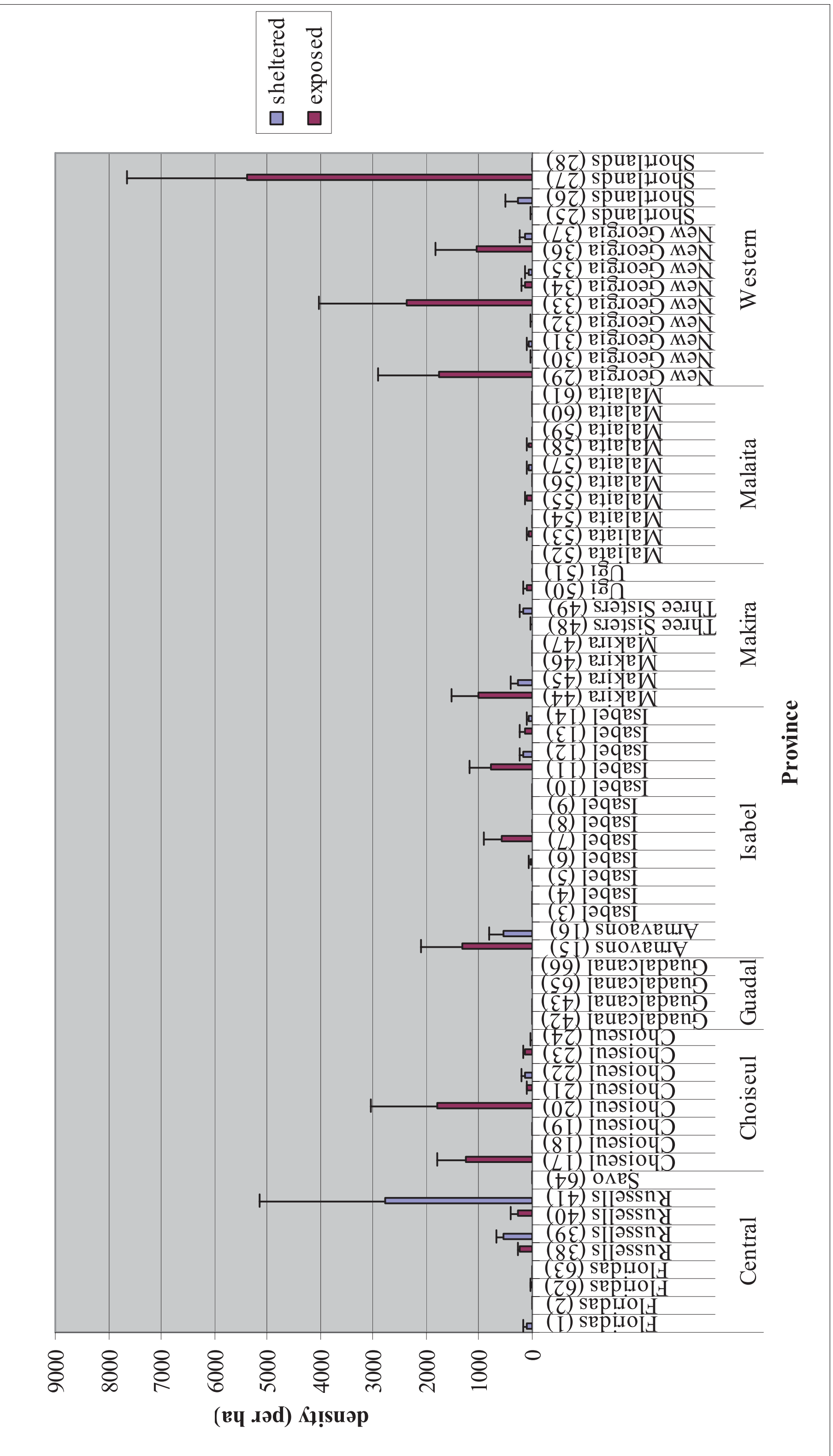


Figure 10. Mean density (+ se) of key fisheries species of parrotfishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.



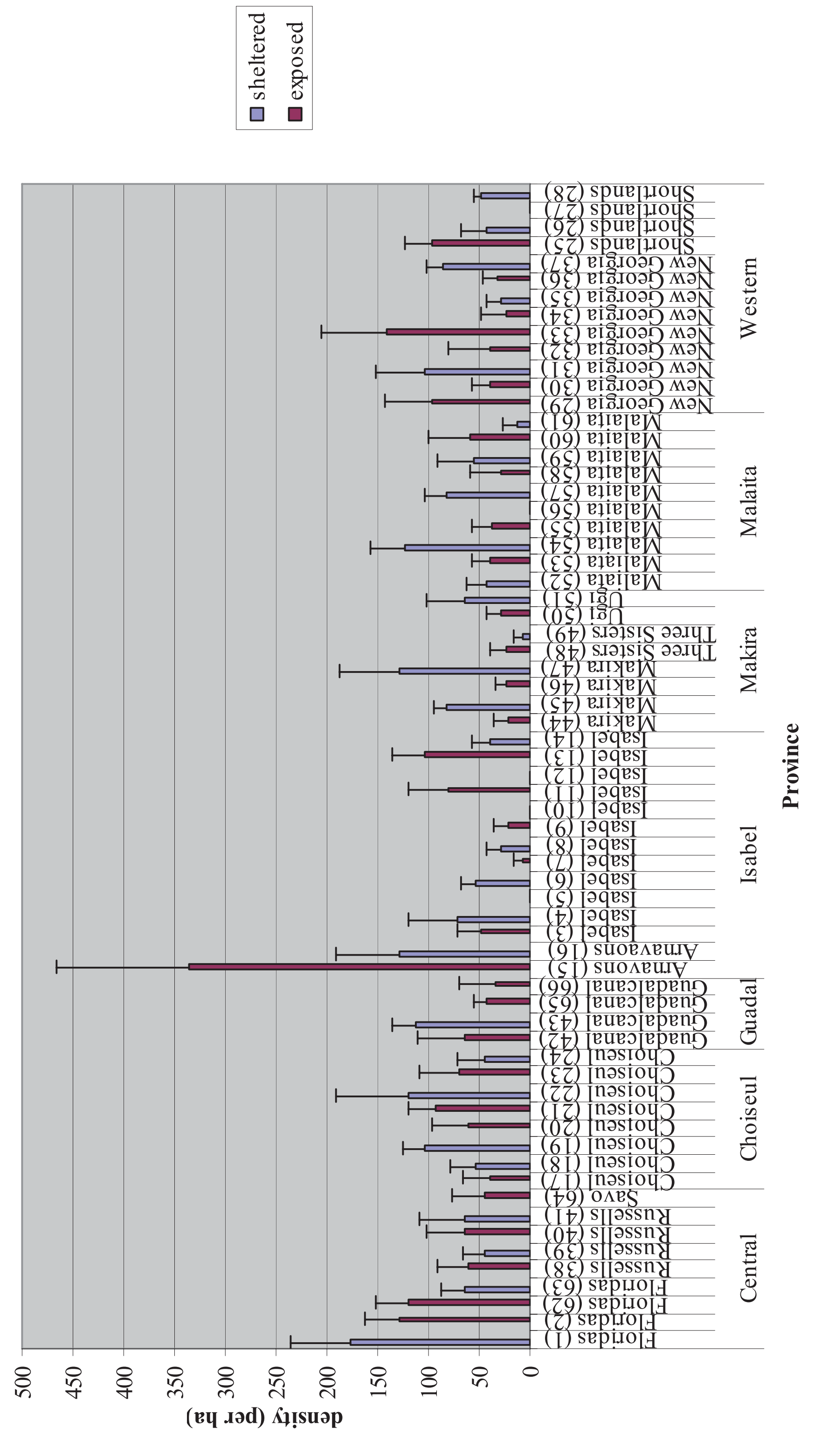


Figure 11. Mean density (+ se) of key fisheries species of groupers on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Figure 12. Mean density (+ se) of large bony reef fishes (≥30cm) on sheltered and exposed reef slopes (10m) in the Solomon Islands.

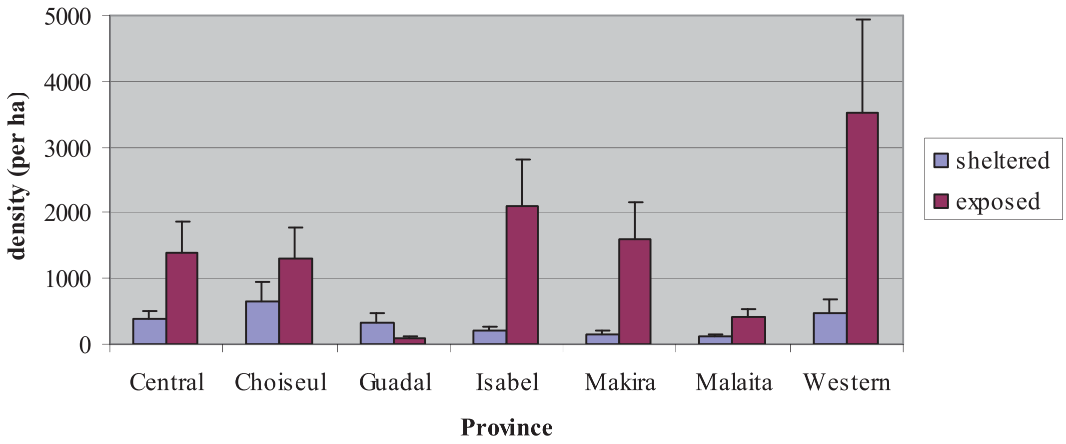
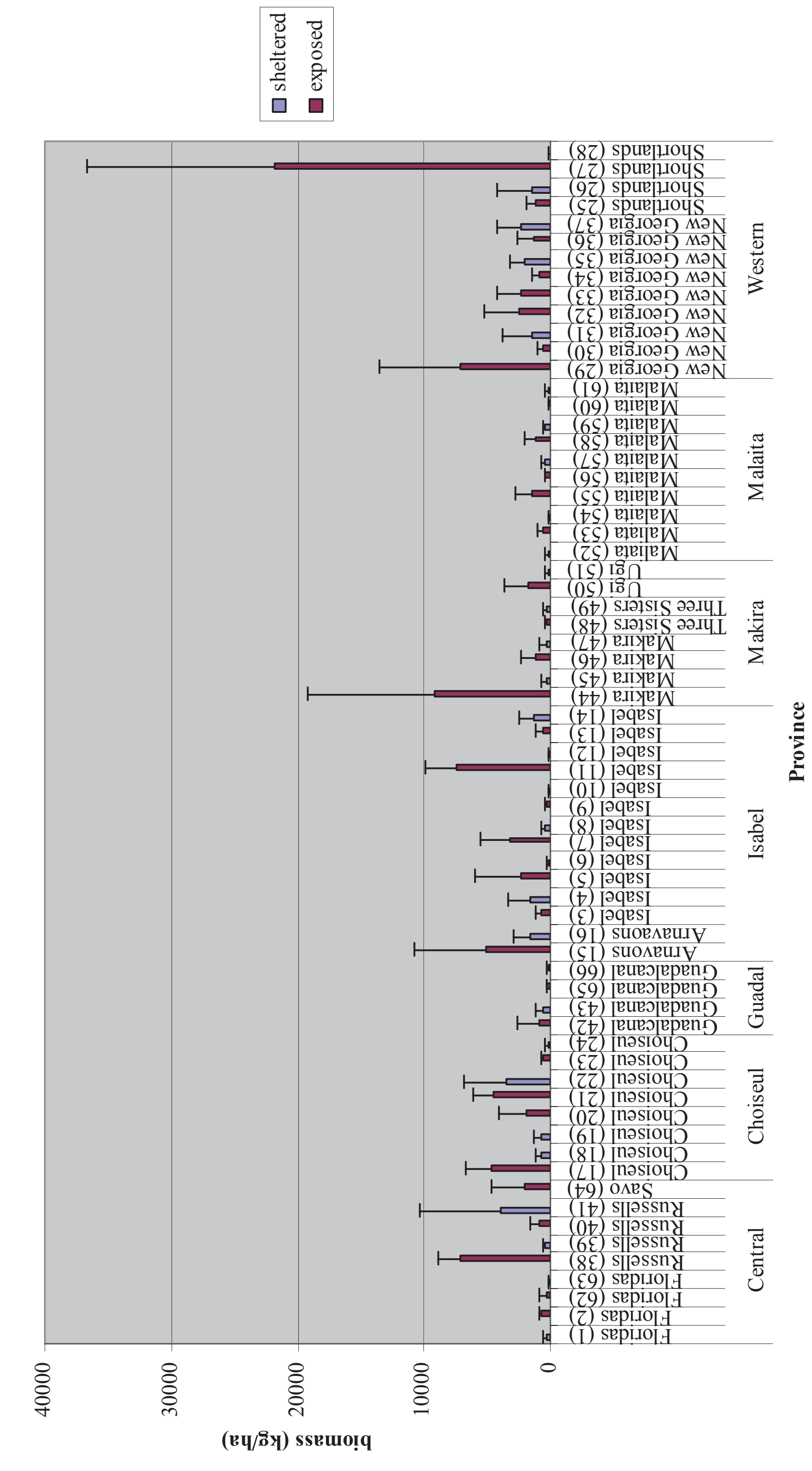


Figure 13. Mean biomass (+-se) of bony food fishes on protected and exposed reef slopes (10m) in the Solomon Islands.



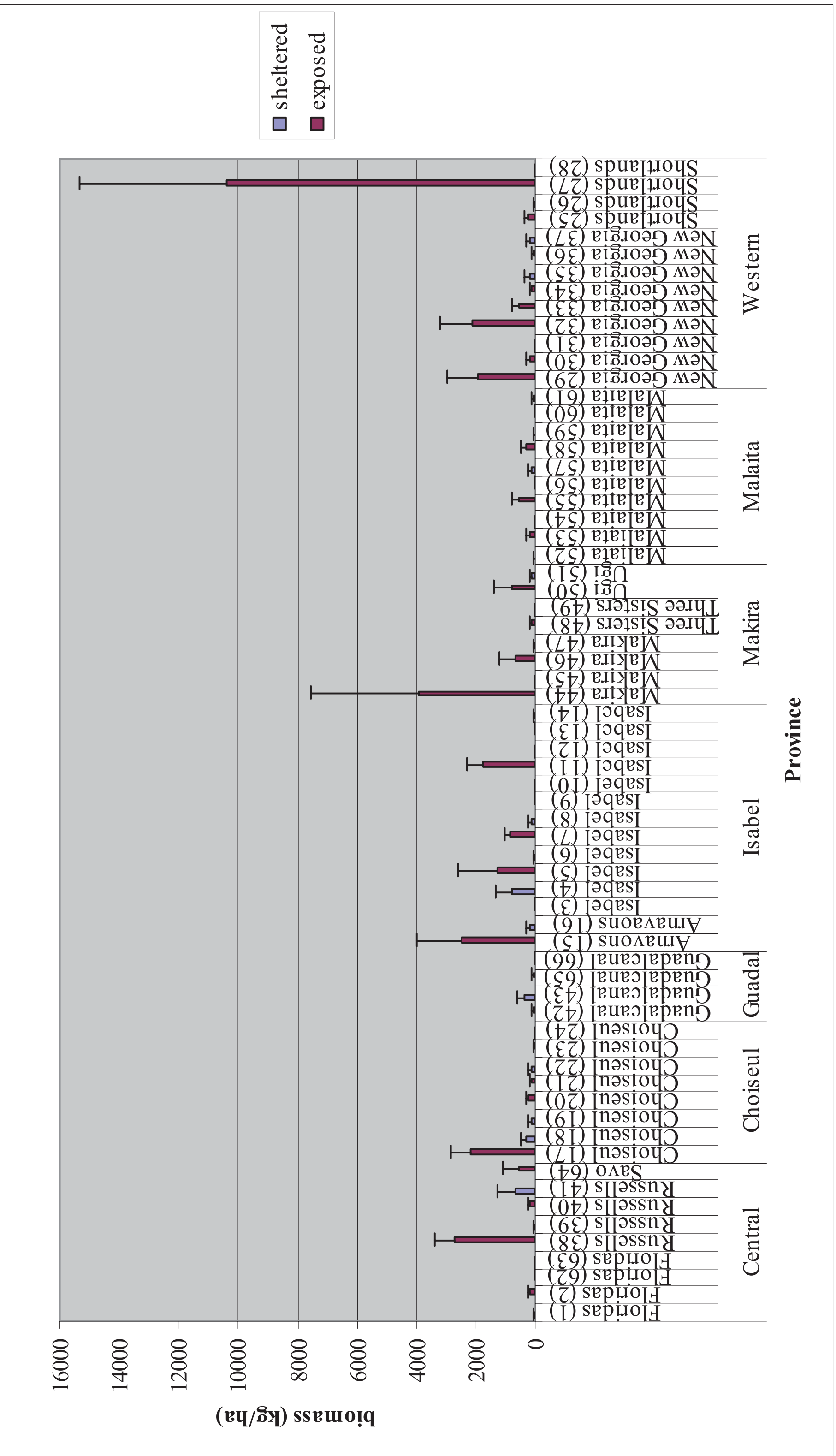
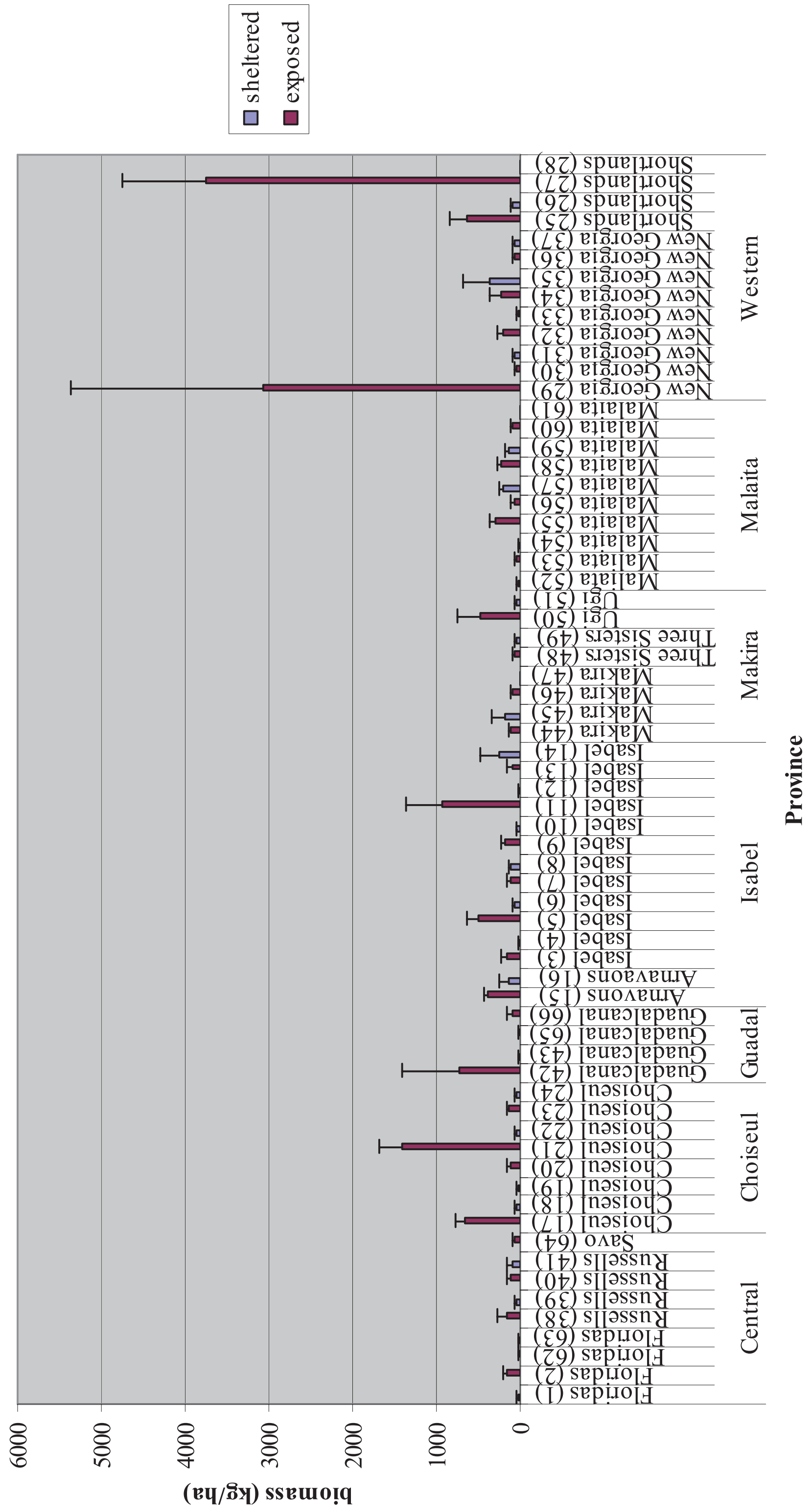


Figure 14. Mean biomass (+ se) of key fisheries species of snappers on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Figure 15. Mean biomass (+ se) of key fisheries species of surgeonfishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.



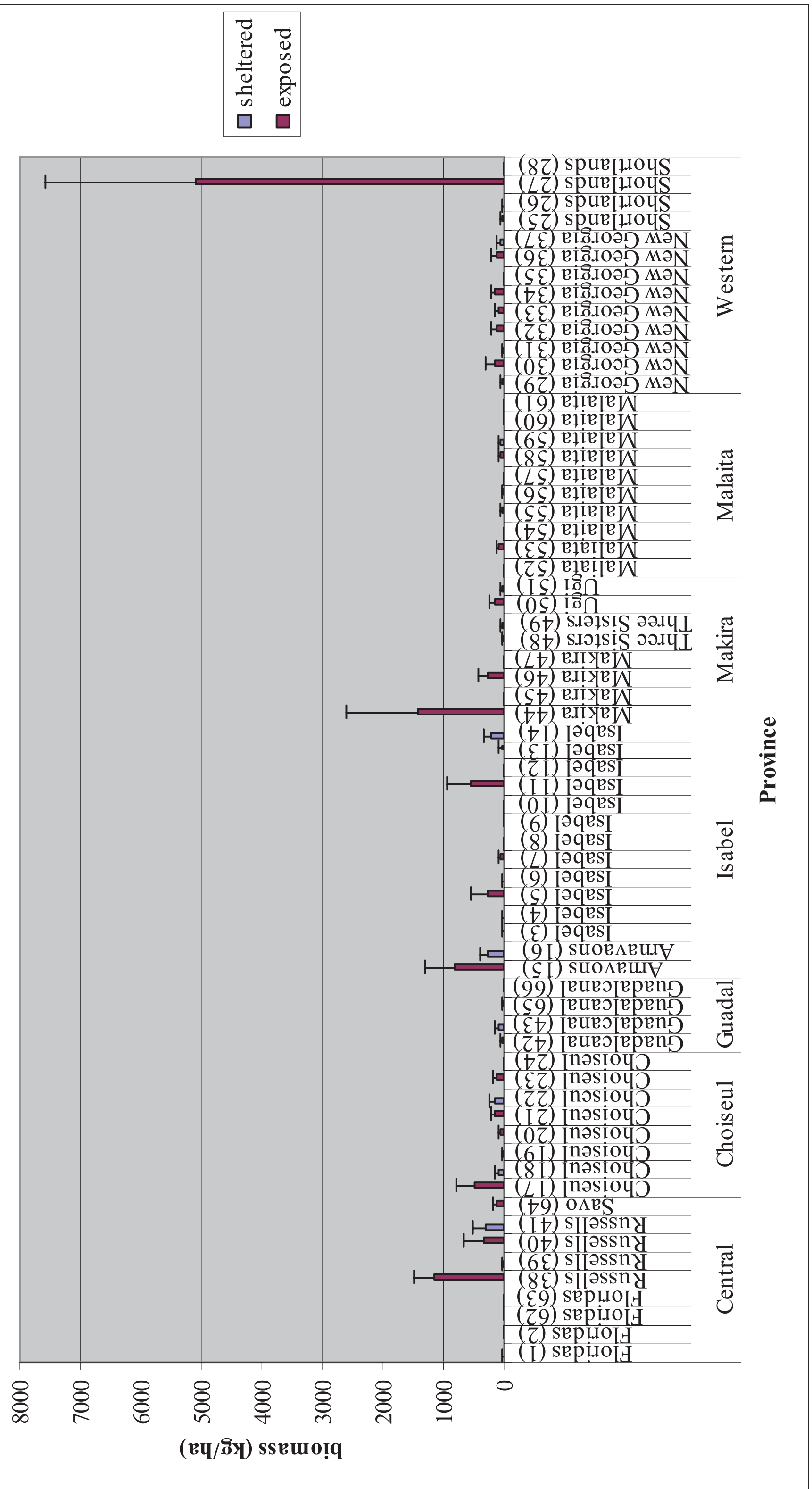


Figure 16. Mean biomass (+ se) of key fisheries species of emperors on sheltered and protected reef slopes (10m) in the Solomon Islands.

Figure 17. Mean biomass (+ se) of key fisheries species of parrotfishes on sheltered and protected reef slopes (10m) in the Solomon Islands.

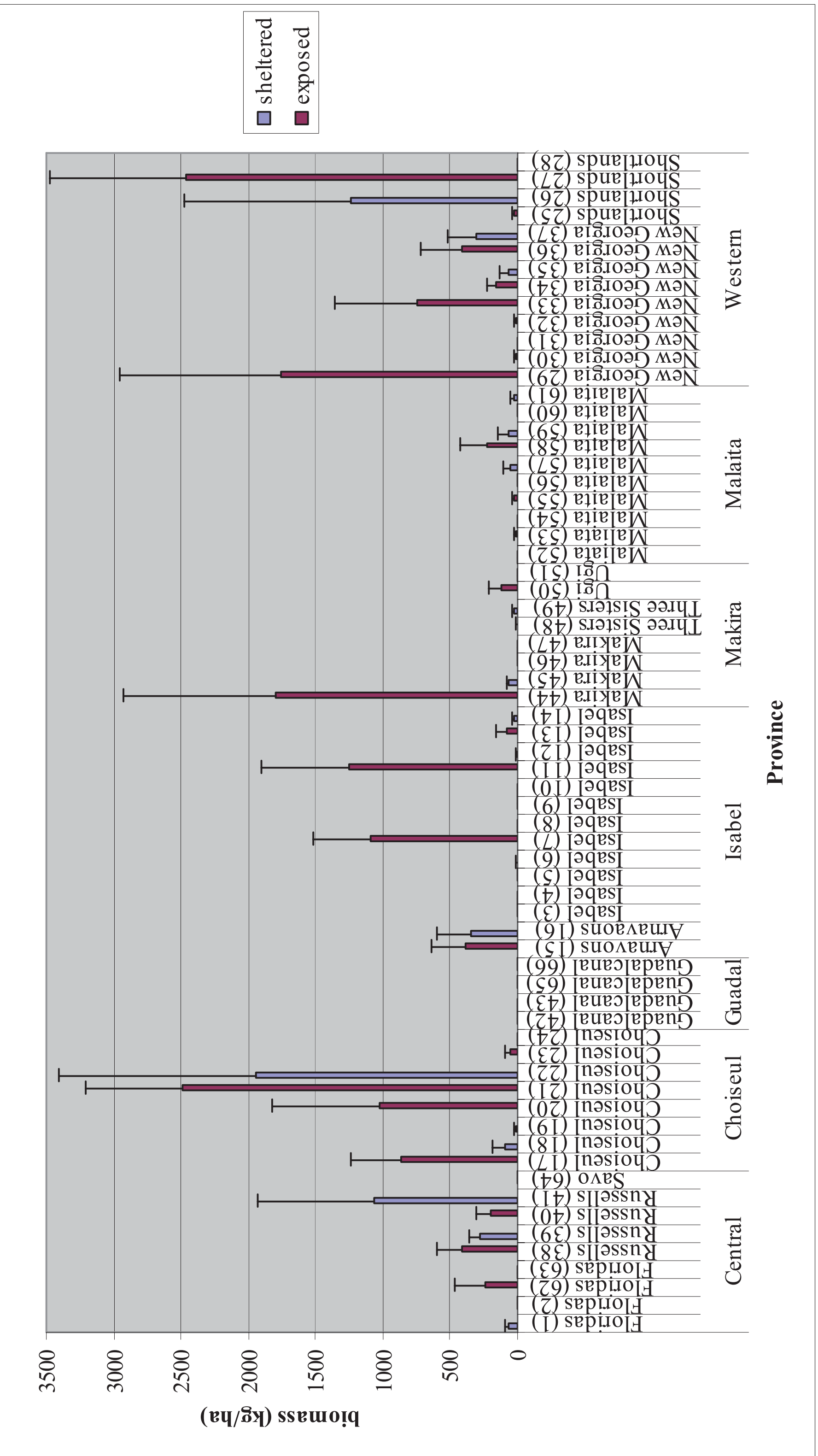


Figure 18. Mean biomass (+ se) of key fisheries species of groupers on sheltered and exposed reef slopes (10m) in the Solomon Islands.

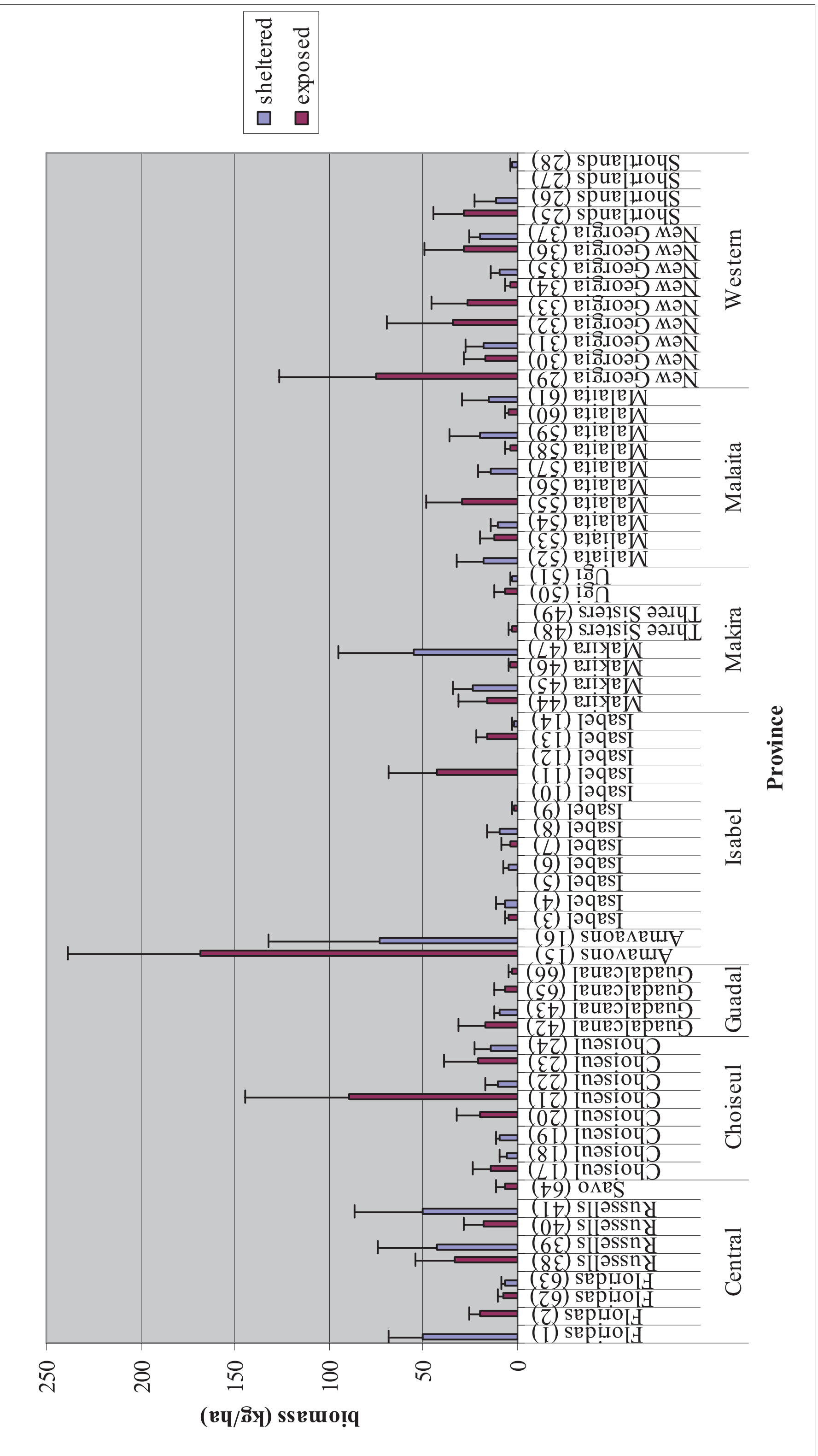
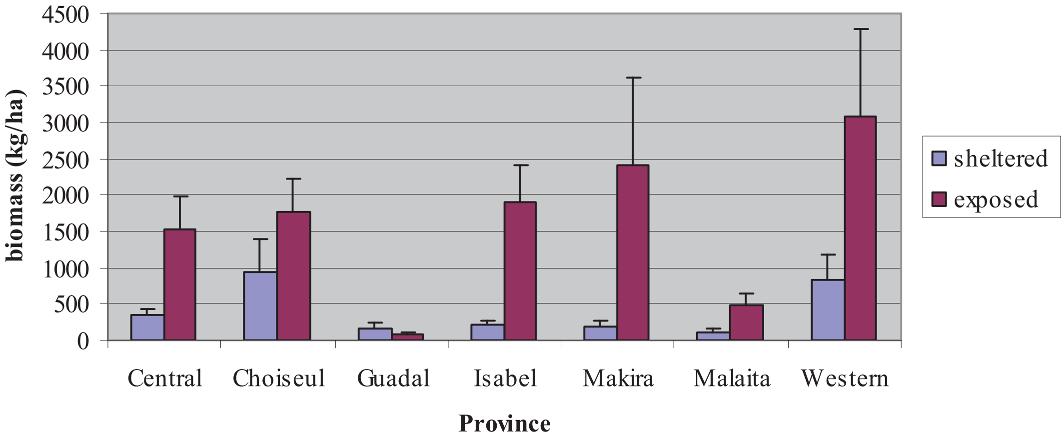


Figure 19. Mean biomass (+ se) of large bony reef fishes (>30cm) on sheltered and exposed reef slopes (10m) in the Solomon Islands.



KEY FISHERIES SPECIES: LARGE, VULNERABLE REEF FISHES SIGHTED ON LONG SWIMS

Density

The density of large, vulnerable reef fishes sighted along long timed swims was low throughout the study area, and varied among provinces and exposures (Figure 20). Density was highest on exposed than sheltered reef slopes in most provinces, except Makira and Isabel. The highest densities were recorded in Makira, Choiseul and Western Provinces, followed by Isabel, Guadalcanal, Malaita and Central Provinces.

However, the species that comprised the highest densities varied among sites. For example, the relatively high density recorded on sheltered sites in Makira was largely comprised of emperors, particularly longface emperors (Appendix 14). In contrast, the relatively high density recorded on exposed sites in Choiseul Province was largely due to a mixture of groupers, humphead wrasses, steephead parrotfishes, and emperors, while the moderately high density recorded in Western Province was due to a mixture of parrotfishes and humphead wrasses.

Different patterns of abundance were apparent when each species was considered individually. Humphead wrasses were more abundant on exposed than sheltered reef slopes in most provinces, except Central Province (Figure 21). The highest densities of this species were recorded in Choiseul and Central Provinces, followed by Western, Makira, Guadalcanal, Isabel and Malaita (Figure 21, Appendix 14).

Humphead parrotfishes were also most abundant on exposed reef slopes, with the highest density recorded in the Western Province, followed by Isabel Province (Figure 22, Appendix 14). This species was less abundant in the other provinces, and was not recorded on Guadalcanal at all. Similarly, a low to moderate density of the steephead parrotfish was recorded in all provinces, except Guadalcanal (Appendix 14).

Barramundi cod and giant trevally were rare throughout the survey area, and were only observed in Isabel Province (Appendix 14). Two species of grouper targeted by the live reef food fish trade, the brown-marbled grouper and camouflage grouper were also rare, with only a few individuals recorded in a few provinces (Figures 23 and 24, Appendix 14). The yellow-edged lyretail and white-edge lyretail were relatively more abundant, particularly in Choiseul, Guadalcanal, Central and Isabel Provinces (Appendix 14). In contrast, large emperors were most abundant in Makira, Isabel, Choiseul, and Malaita Provinces.

Sharks were uncommon, but recorded in low numbers in most Provinces except Central and Isabel. Rays were also uncommon, and were only recorded in Isabel and Western Provinces.

Biomass

A different pattern was apparent when biomass was considered (Figure 25). While the biomass of all large, vulnerable reef fishes combined also tended to be higher on the exposed than protected reef slopes, the highest biomass recorded was in the Western Province. This was due to a high biomass of humphead parrotfish, manta rays and humphead wrasse recorded in that province (Appendix 15). Most of the biomass at the other sites was also accounted for by humphead parrotfishes and humphead wrasses, except for Guadalcanal where a white tip reef shark was observed.

Different patterns were apparent when each species was considered individually. The highest biomass of humphead wrasse was recorded in Choiseul Province, followed by Western Province (Figure 26, Appendix 15), with lower densities recorded elsewhere. In contrast, biomass of humphead parrotfishes was highest in Western Province, followed by Isabel Province (Figure 27, Appendix 15). This species was less abundant in the other provinces, and was not recorded on Guadalcanal at all. Similarly, a low to moderate biomass of the steephead parrotfish was recorded in all provinces, except Guadalcanal (Appendix 15).

Biomass of most other species was low throughout the survey area (Appendix 15), particularly for two species targeted by the live reef food fish trade: brown-marbled grouper and camouflage grouper (Figures 28 and 29 respectively). Exceptions were the low to moderate biomass recorded for longface emperor in Makira Province, manta rays in Western Province, and whitetip reef sharks in Guadalcanal.

Figure 20. Mean density (+ se) of large, vulnerable reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

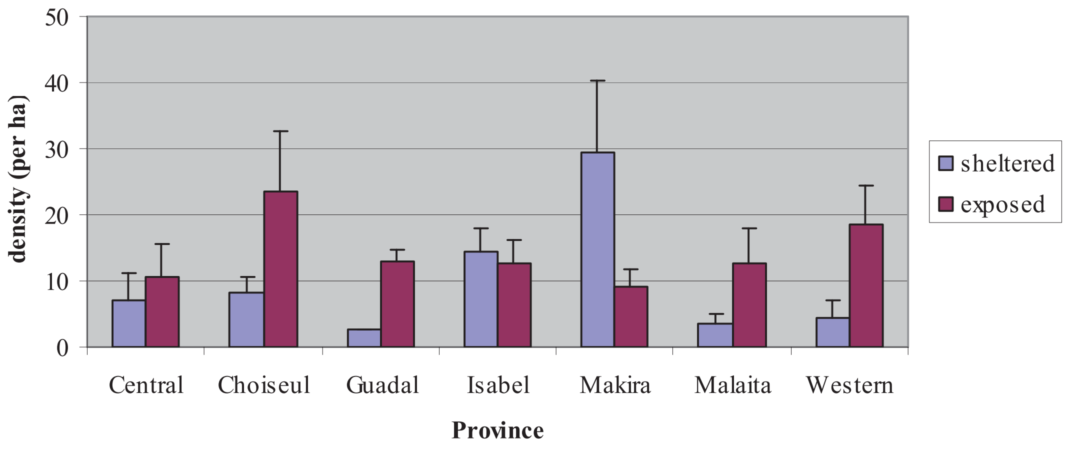


Figure 21. Mean density (+ se) of humphead wrasse on sheltered and exposed reef slopes (10m) in the Solomon Islands.

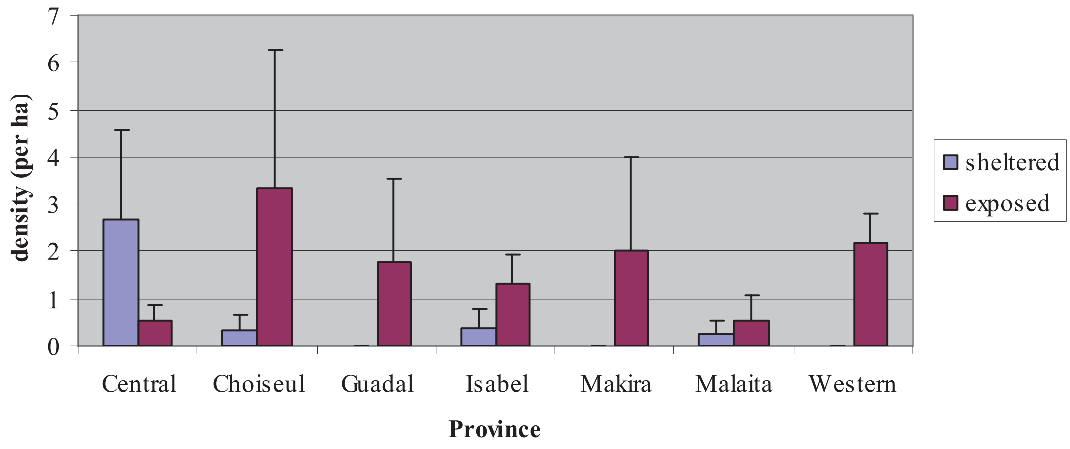


Figure 22. Mean density (+ se) of humphead parrotfish on sheltered and exposed reef slopes (10m) in the Solomon Islands.

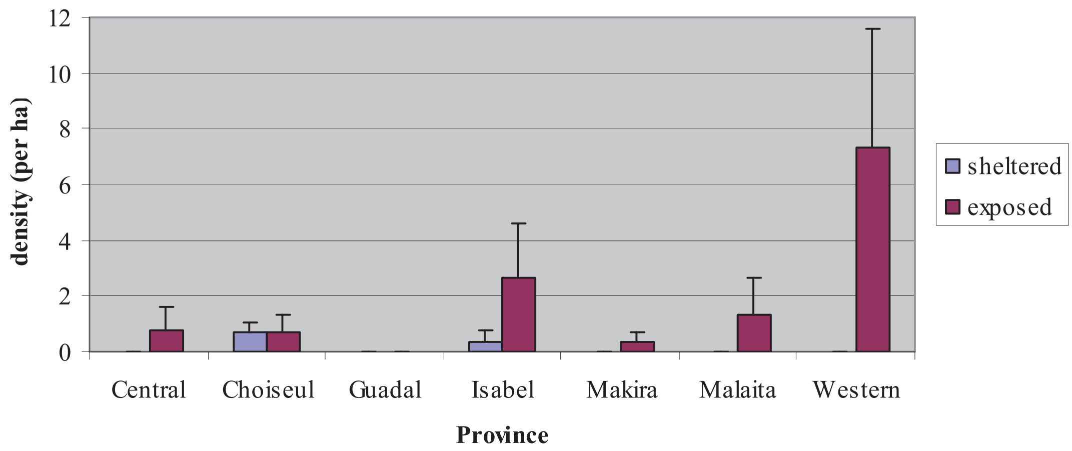


Figure 23. Mean density (+ se) of brown-marbled grouper on sheltered and exposed reef slopes (10m) in the Solomon Islands.

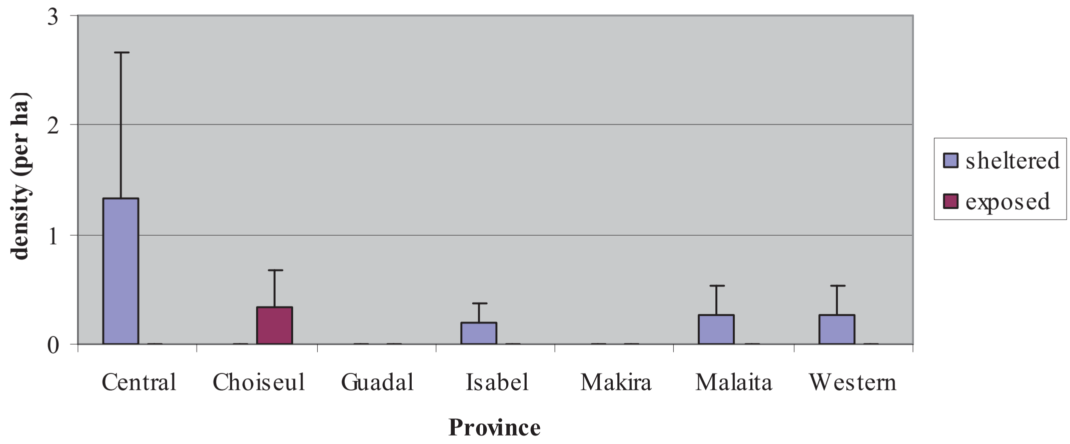


Figure 24. Mean density (+ se) of camouflage grouper on sheltered and protected reef slopes (10m) in the Solomon Islands.

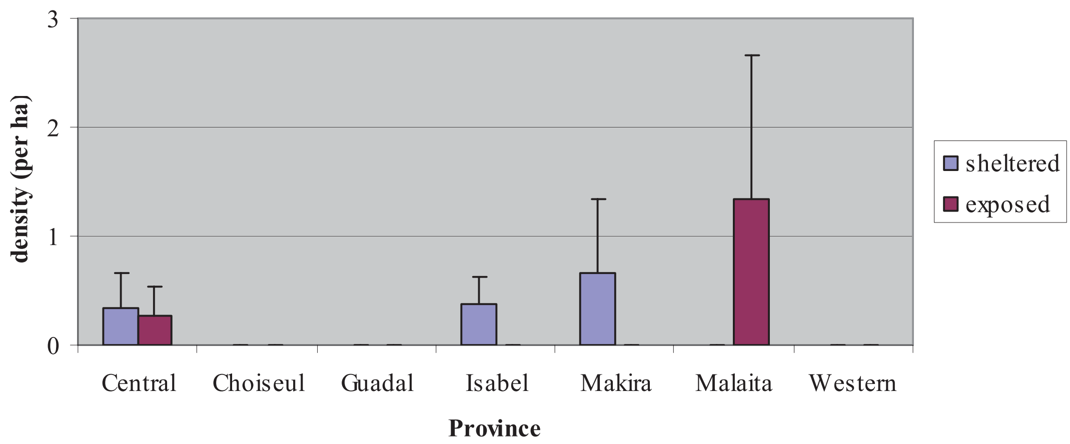


Figure 25. Mean biomass (+ se) of large, vulnerable reef fishes on sheltered and exposed reefs slopes (10m) in the Solomon Islands.

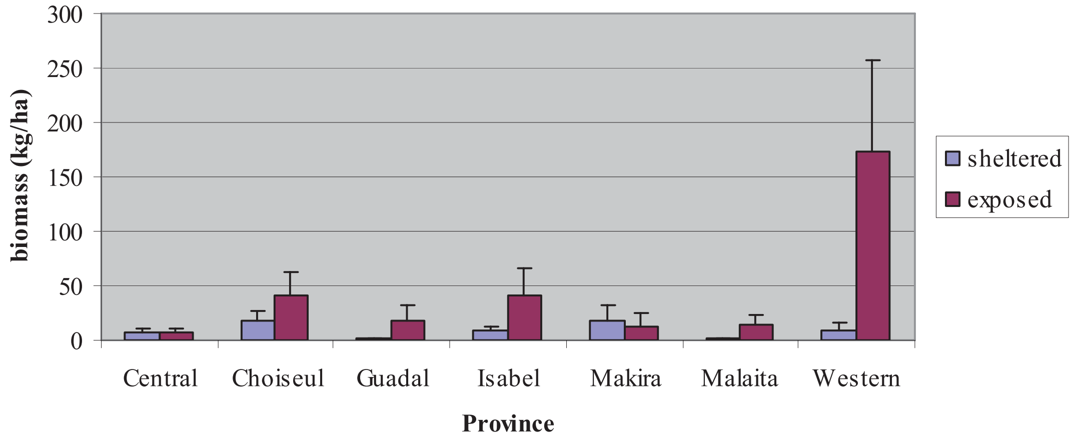


Figure 26. Mean biomass (+ se) of humphead wrasse on sheltered and exposed reef slopes (10m) in the Solomon Islands.

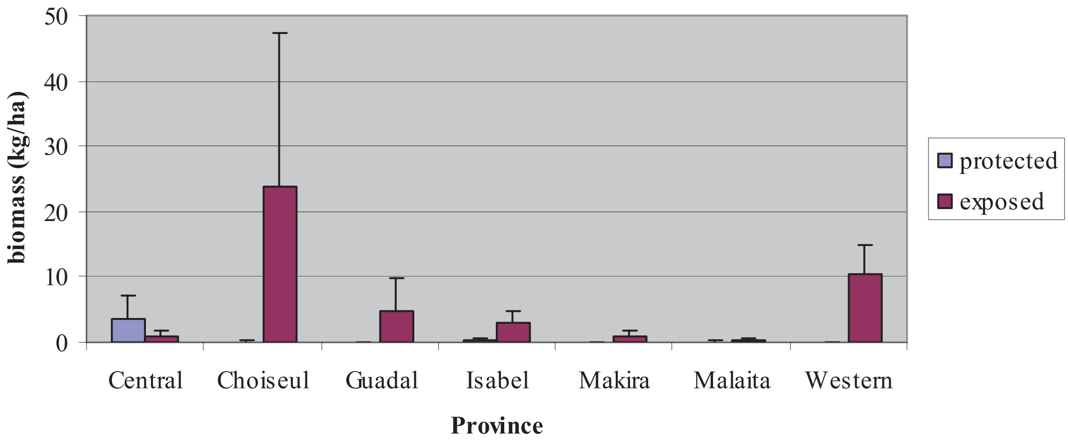


Figure 27. Mean biomass (+ se) of humphead parrotfish on sheltered and exposed reef slopes (10m) in the Solomon Islands.

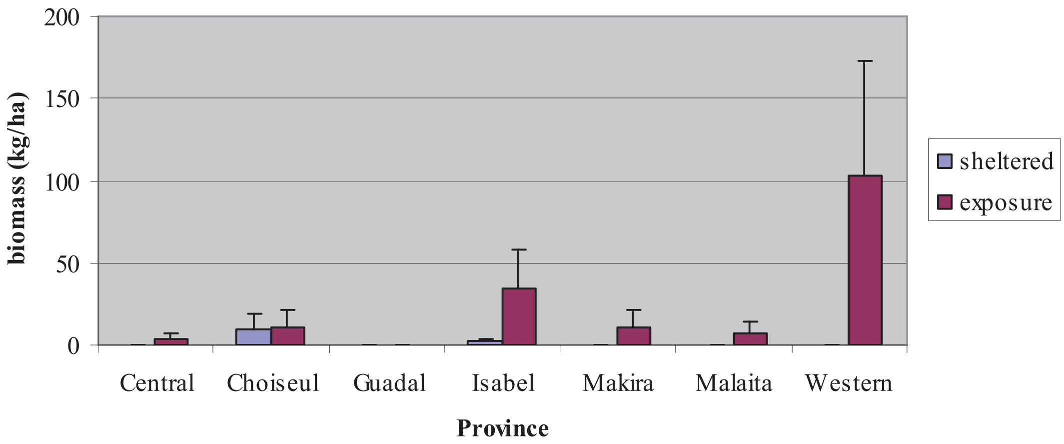


Figure 28. Mean biomass (+ se) of brown-marbled grouper on sheltered and exposed reef slopes (10m) in the Solomon Islands.

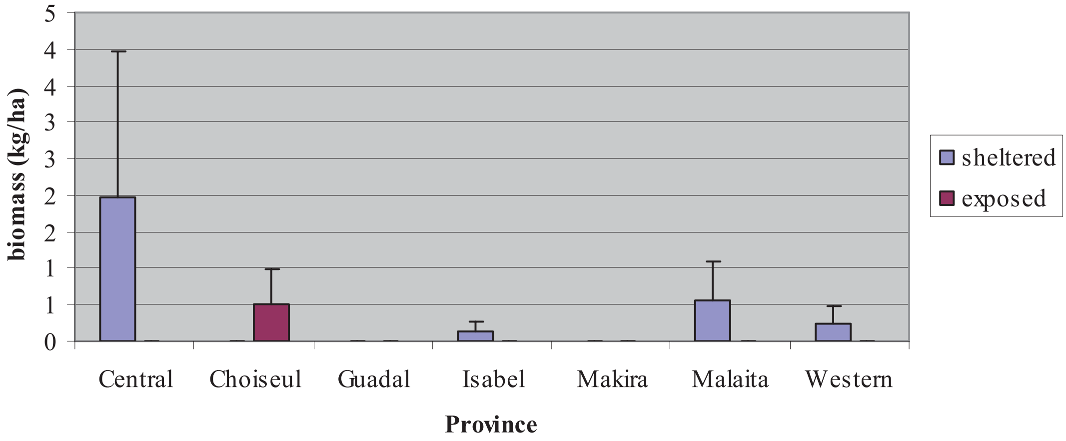
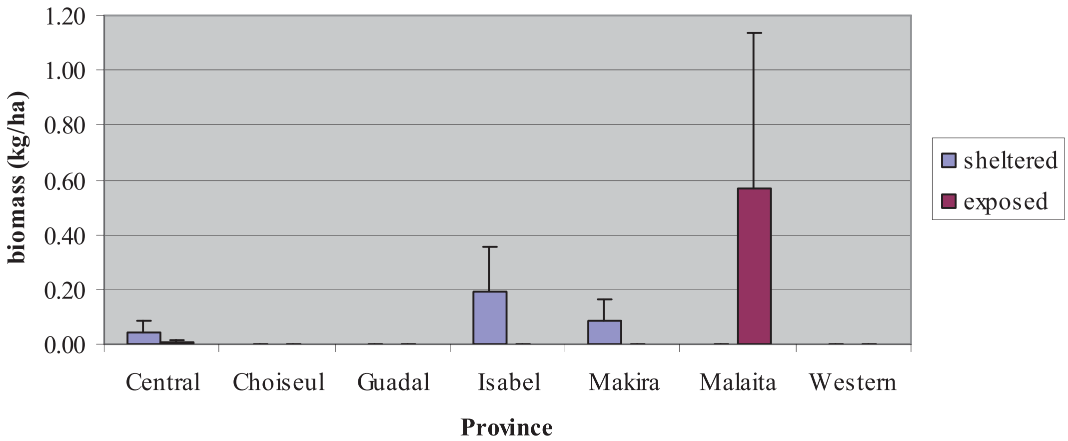


Figure 29. Mean biomass (+ se) of camouflage grouper on sheltered and protected reef slopes (10m) in the Solomon Islands.



KEY FISHERIES SPECIES: AQUARIUM FISHES

Density

Density of aquarium fishes was highly variable among exposure, with no clear pattern apparent (Figure 30). Density was also highly variable among locations (provinces, islands, and sites), with the highest densities recorded in Isabel, Choiseul, Western, Makira, and Central (Russell Islands) Provinces, and with lower densities recorded Guadalcanal, Malaita and Central (Florida Islands) Provinces.

The most abundant families of aquarium fishes were damselfishes, followed by wrasses, surgeonfishes, fairy basslets, butterflyfishes and angelfishes (Table 7). The most abundant species were a wrasse *Cirrhilabrus punctatus*, two species of damselfish (*Chromis ternatensis* and *C. amboinensis*), a surgeonfish (*Acanthurus tuka*), and a fairy basselet (*Pseudanthias tuka*), which each accounted for more than 5% of the total number counted (11%, 11%, 6%, 10% and 10% respectively).

Table 7. Relative densities of aquarium fish families in the Solomon Islands.

Family	Common Name	Relative Density (% of total)
Pomacentridae	Damselfishes	37.52
Labridae	Wrasses	22.13
Acanthuridae	Surgeonfishes	15.44
Serranidae (Anthiinae)	Fairy Basslets	12.57
Chaetodontidae	Butterflyfishes	5.14
Pomacanthidae	Angelfishes	2.93
Balistidae	Triggerfishes	1.69
Haemulidae	Sweetlips	1.17
Cirrhitidae	Hawkfishes	0.39
Scaridae	Parrotfishes	0.13
Serranidae (Epinephelinae)	Groupers	0.08
Tetraodontidae	Puffers	0.06
Monacanthidae	Leatherjackets	0.04

The key target species were much less abundant with anemonefishes accounting for only 0.4% of the total, and two species of angelfish (*Pomacanthus navarchus* and *P. imperator*) accounting for <0.1% each. Two other key target species of the aquarium trade, the blue devil (*Chrysiptera cyanea*) and blue tang (*Paracanthurus hepatus*), were not recorded in this survey, since they tend to occur in other habitat types and depths (Myers 1999).

Most of the variation in density among sites was accounted for by the damselfishes (Appendix 16). For example, the high densities at Isabel (Site 14), Choiseul (Site 18), Three Sisters (Site 49) and New Georgia (Sites 32 and 33) were all due to a high abundance of damselfishes. Fairy basslets, surgeonfishes, triggerfishes and wrasses were also abundant at some sites (Appendix 16: Site 35).

Different patterns of distribution and abundance were apparent when each of the four most abundant families (damselfishes, wrasses, surgeonfishes, and fairy basslets) and three of the main target families (butterflyfishes, angelfishes, and hawkfishes) of aquarium fishes were examined individually (Figures 31-37). The highest density of damselfishes and wrasses were recorded in Isabel, Choiseul, Western, Makira and Central Provinces (Figures 31 and 32, Appendix 16), with only low to moderate densities recorded in Guadalcanal and Malaita Provinces. In contrast, the highest densities of surgeonfishes were recorded at two sites in Choiseul (Site 21) and Western (Site 27) Provinces, with low to moderate densities recorded elsewhere (Figure 33), while the highest density of fairy basslets was recorded in Western Province, followed by Central, Choiseul and Makira Provinces (Figure 34). No clear pattern of abundance was apparent for three of the main target families of aquarium fish, with a range of abundances recorded in each province (Figures 35-37).

Different patterns were also apparent when some of the target species or species groups were examined individually. For example, anemonefishes were most abundant in Makira, followed by Guadalcanal, Central and Choiseul Provinces (Figure 38). While the blue-girdled angelfish (*Pomacanthus navarchus*) was only recorded in Central, Choiseul, Malaita, Western and Isabel Provinces (Figure 39), and the emperor angelfish (*P. imperator*) was only recorded in Choiseul, Guadalcanal and Isabel Provinces (Figure 40).

Reptiles and Mammals

Density

Only one dugong (Dugongidae, *Dugong dugong*) was observed during the long swim surveys in the Solomon Islands. It was observed at Site 59 on the island of Malaita, and was estimated to be 250cm in length.

Eleven sea turtles were observed during the survey – four hawksbills, one green, and six unidentified individuals (Table 8). Three turtles were observed in each of Isabel and Choiseul Provinces, two in Central Province, and one in each of Western, Malaita and Guadalcanal Provinces. No crocodiles or cetaceans were recorded during the long swims.

Table 8. Sea turtles observed on long swim surveys in the Solomon Islands.

Province	Site	Species	Size*	N
Isabel	Isabel (Site 13)	Unidentified	45	1
Isabel	Arnavon Islands (Site 15)	Unidentified	60	1
Isabel	Arnavon Islands (Site 15)	Unidentified	65	1
Choiseul	Choiseul (Site 22)	Unidentified	35	1
Choiseul	Choiseul (Site 24)	Unidentified	60	1
Choiseul	Choiseul (Site 24)	Unidentified	65	1
Western	New Georgia (Site 33)	Hawksbill (*Eretmochelys imbricata*)	50	1
Central	Russell Islands (Site 41)	Hawksbill (*Eretmochelys imbricata*)	40	1
Central	Savo Island (Site 64)	Hawksbill (*Eretmochelys imbricata*)	100	1
Malaita	Malaita (Site 53)	Green (*Chelonia mydas*)	60	1
Guadalcanal	Guadalcanal (Site 65)	Hawksbill (*Eretmochelys imbricata*)	100	1

*Carapace length in cm.

Figure 30. Mean density (+ se) of reef fishes targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

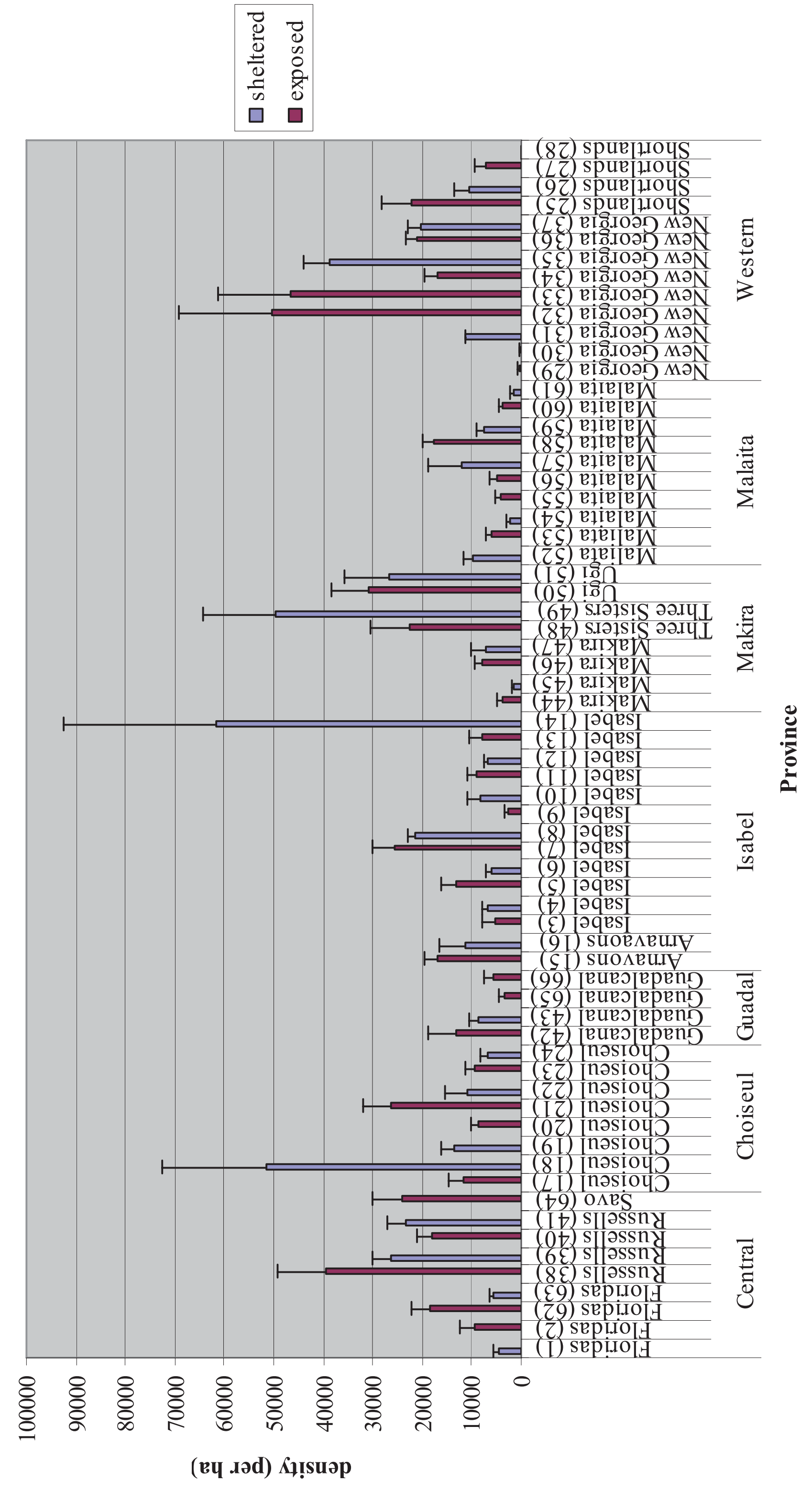


Figure 31. Mean density (+ se) of damselfishes targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

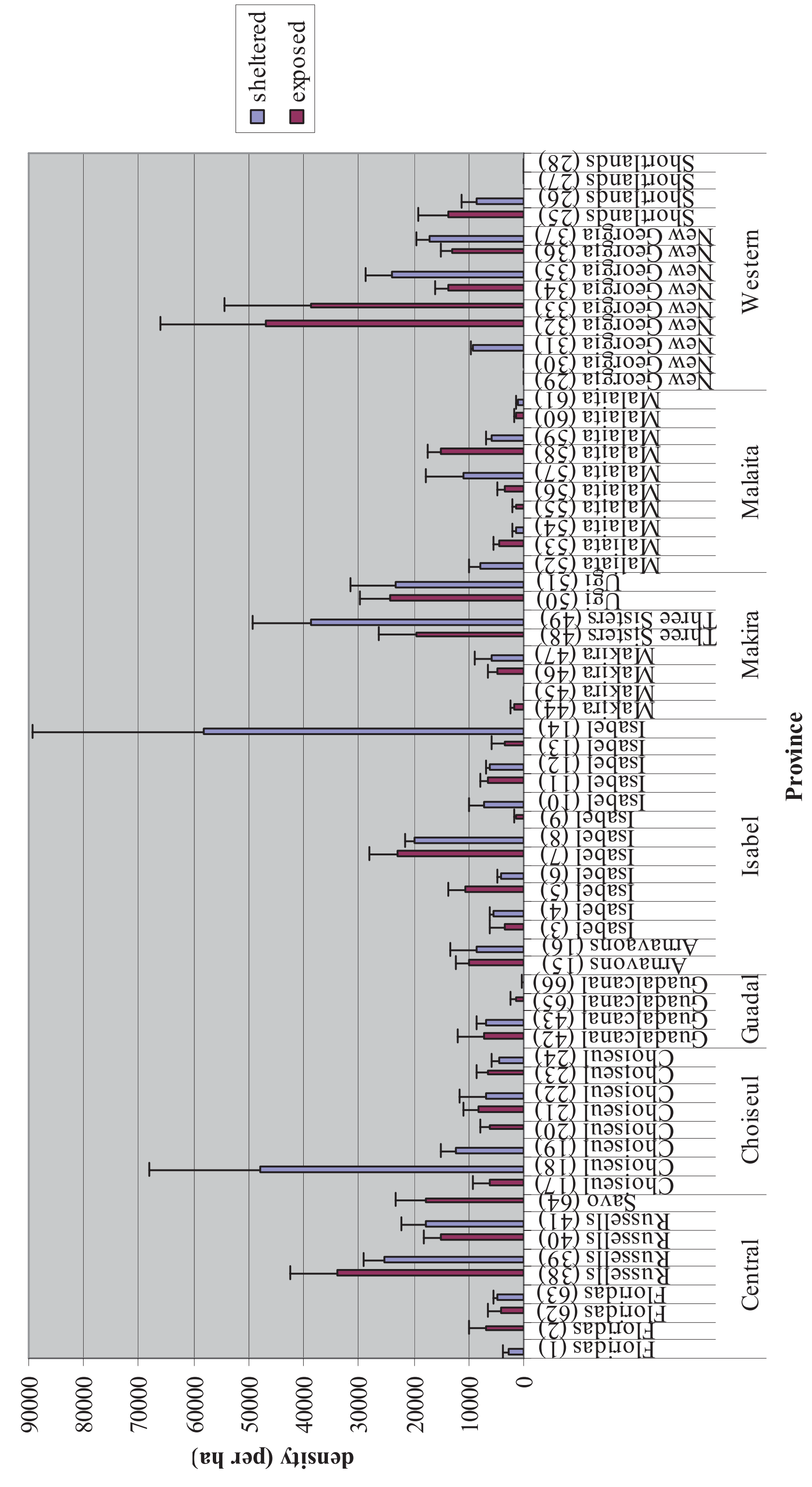
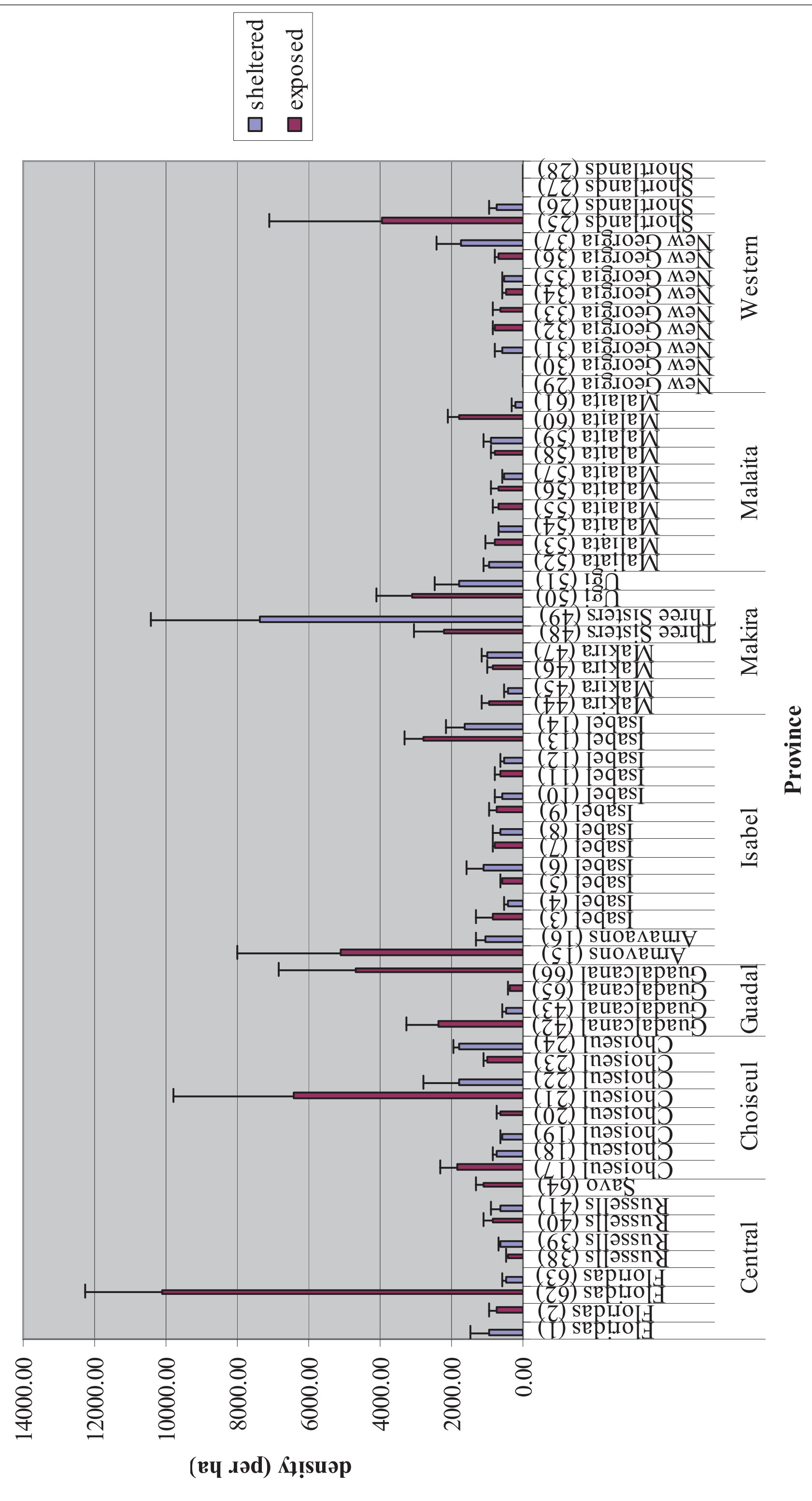


Figure 32. Mean density (+ se) of wrasses targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.



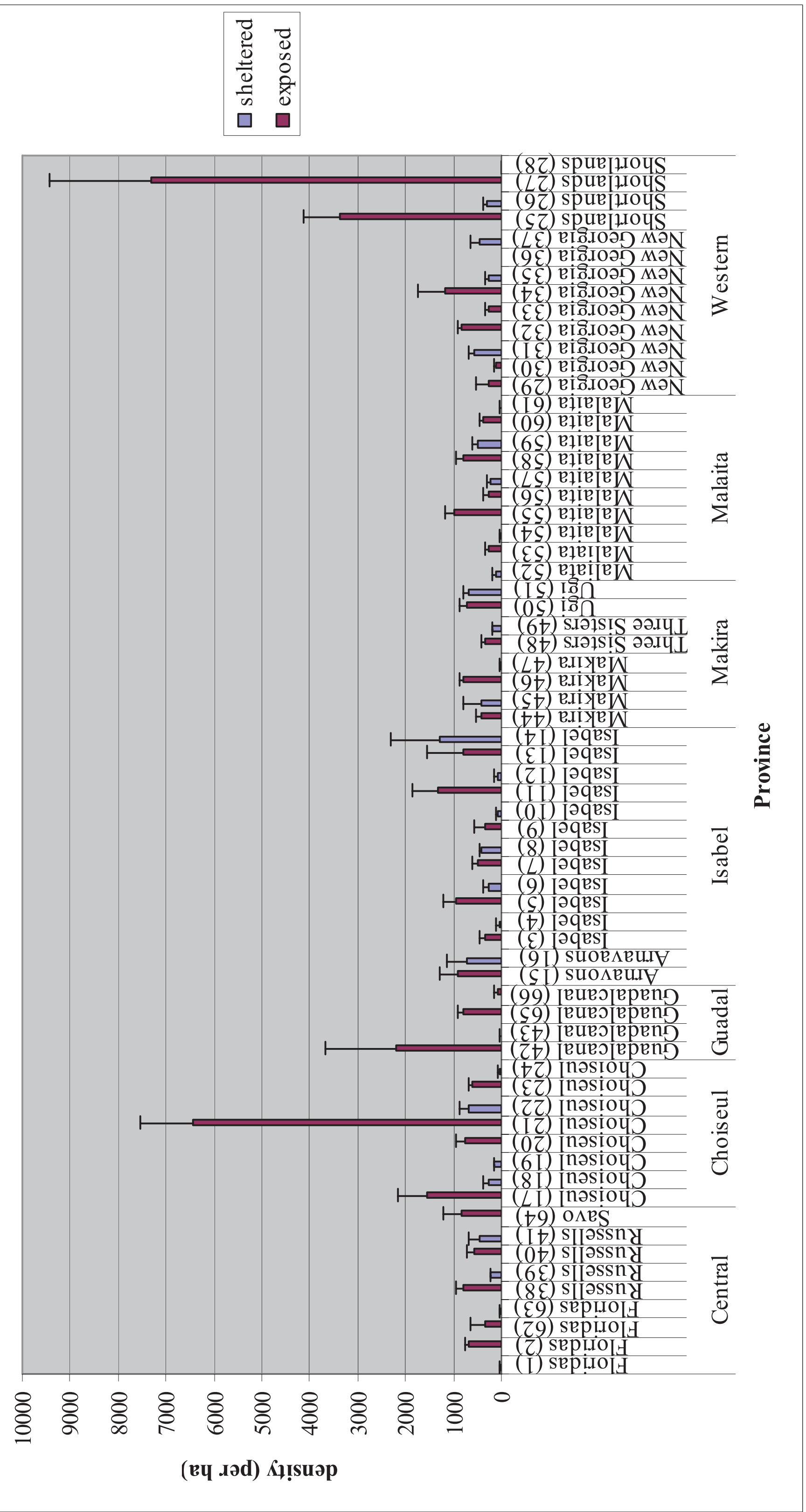
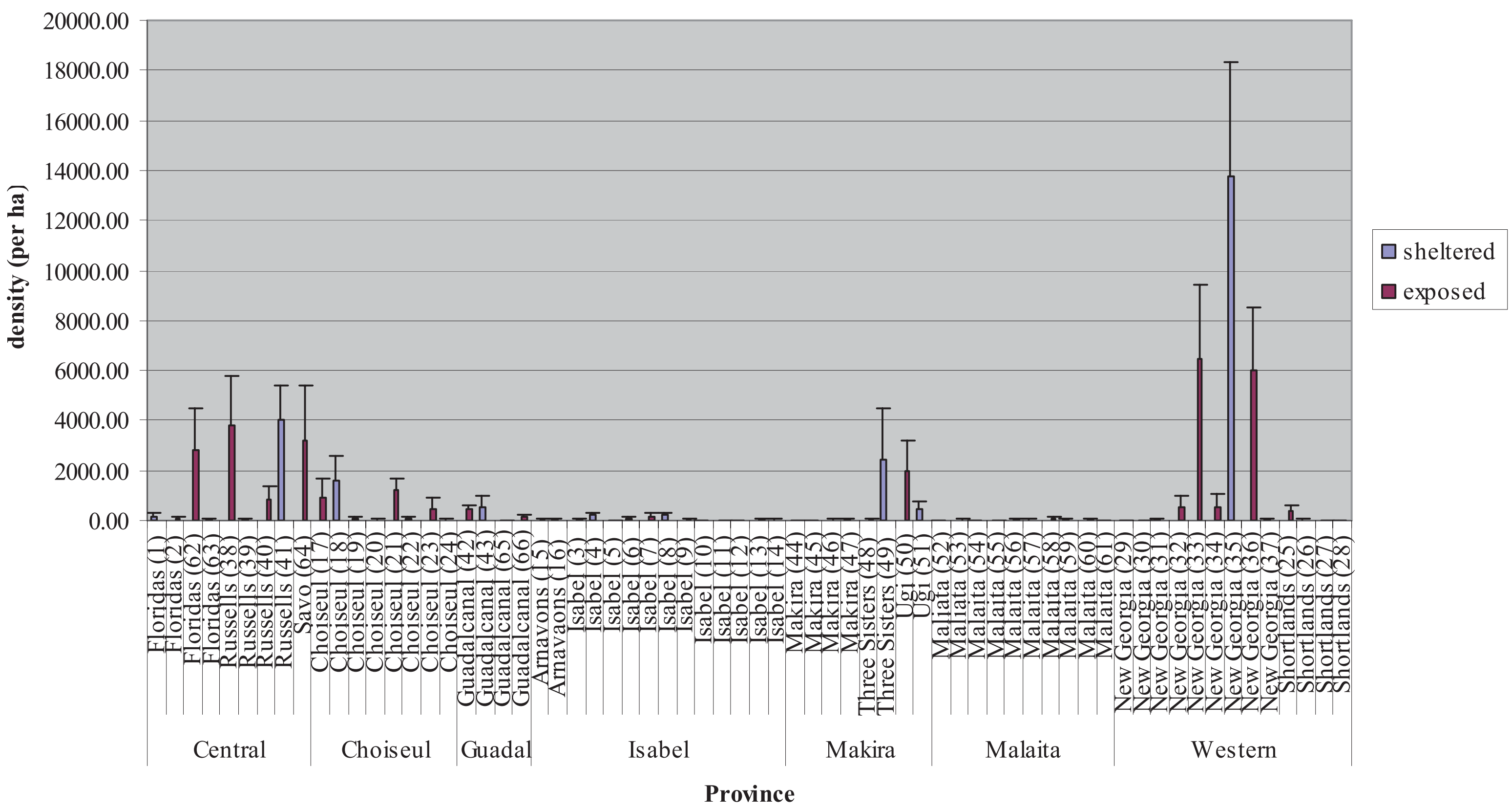


Figure 33. Mean density (+ se) of surgeonfishes targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Figure 34. Mean density (+ se) of fairy basslets targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.



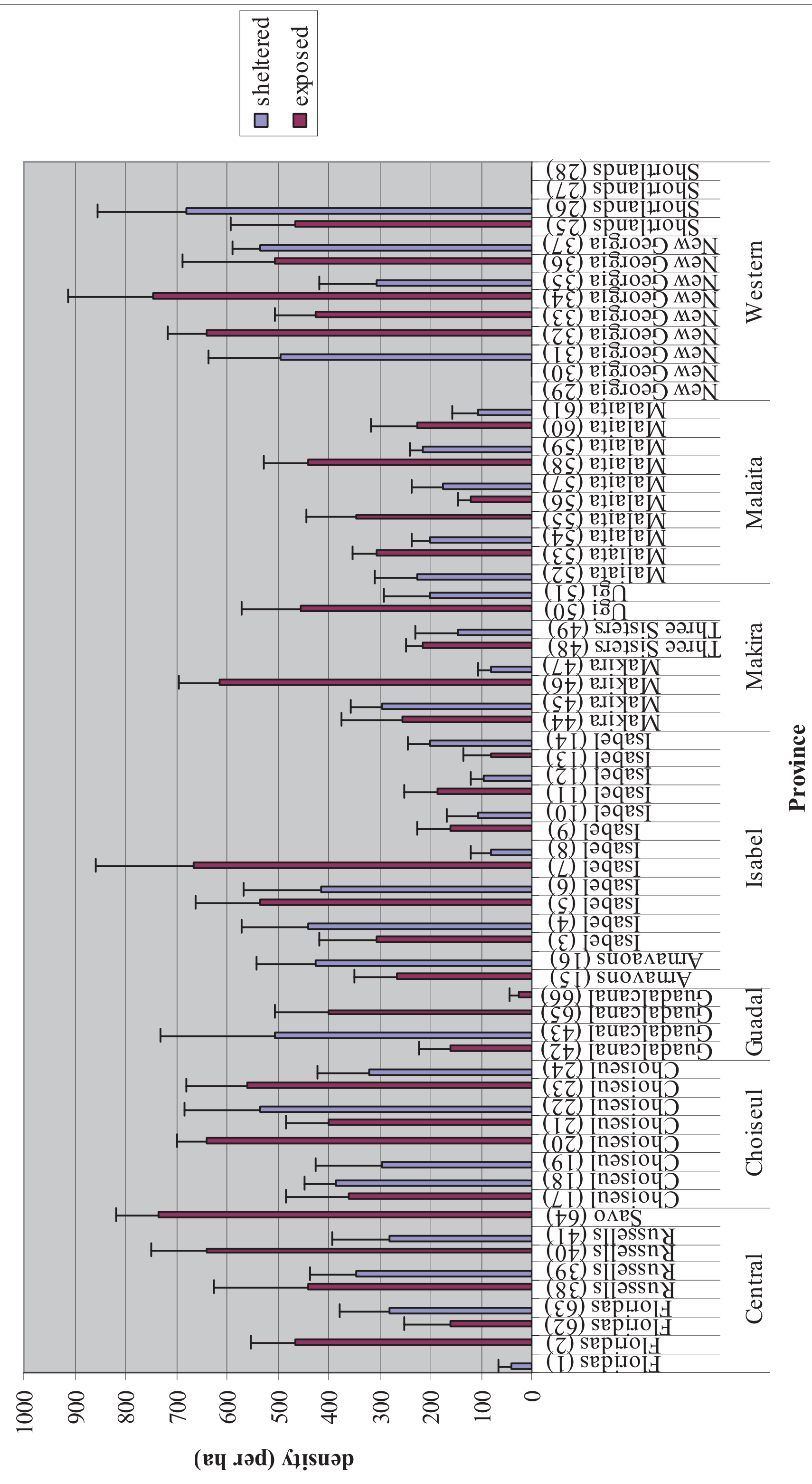


Figure 35. Mean density (+ se) of butterflyfishes targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

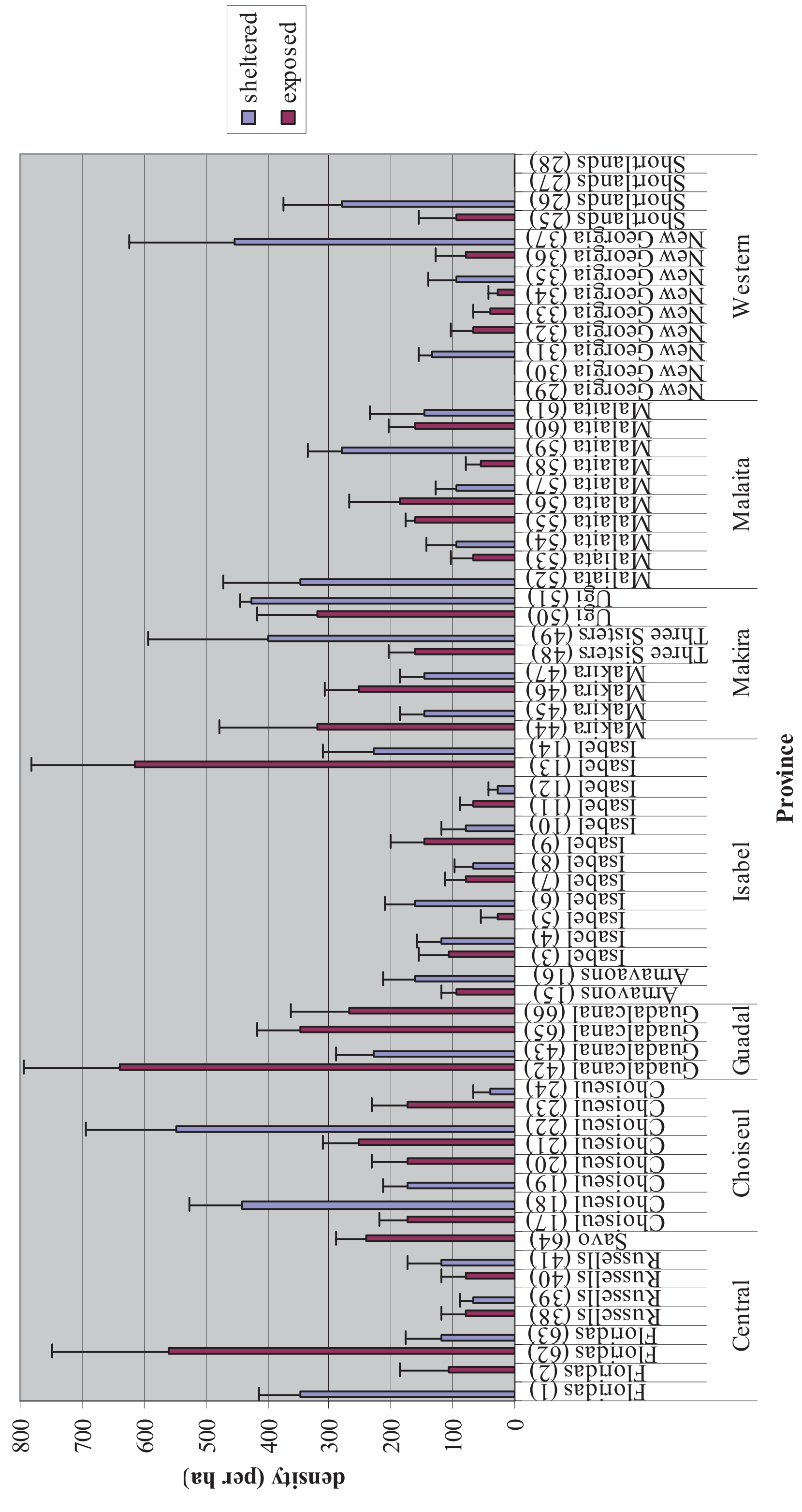


Figure 36. Mean density (+ se) of angelfishes targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Figure 37. Mean density (+ se) of hawkfishes targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

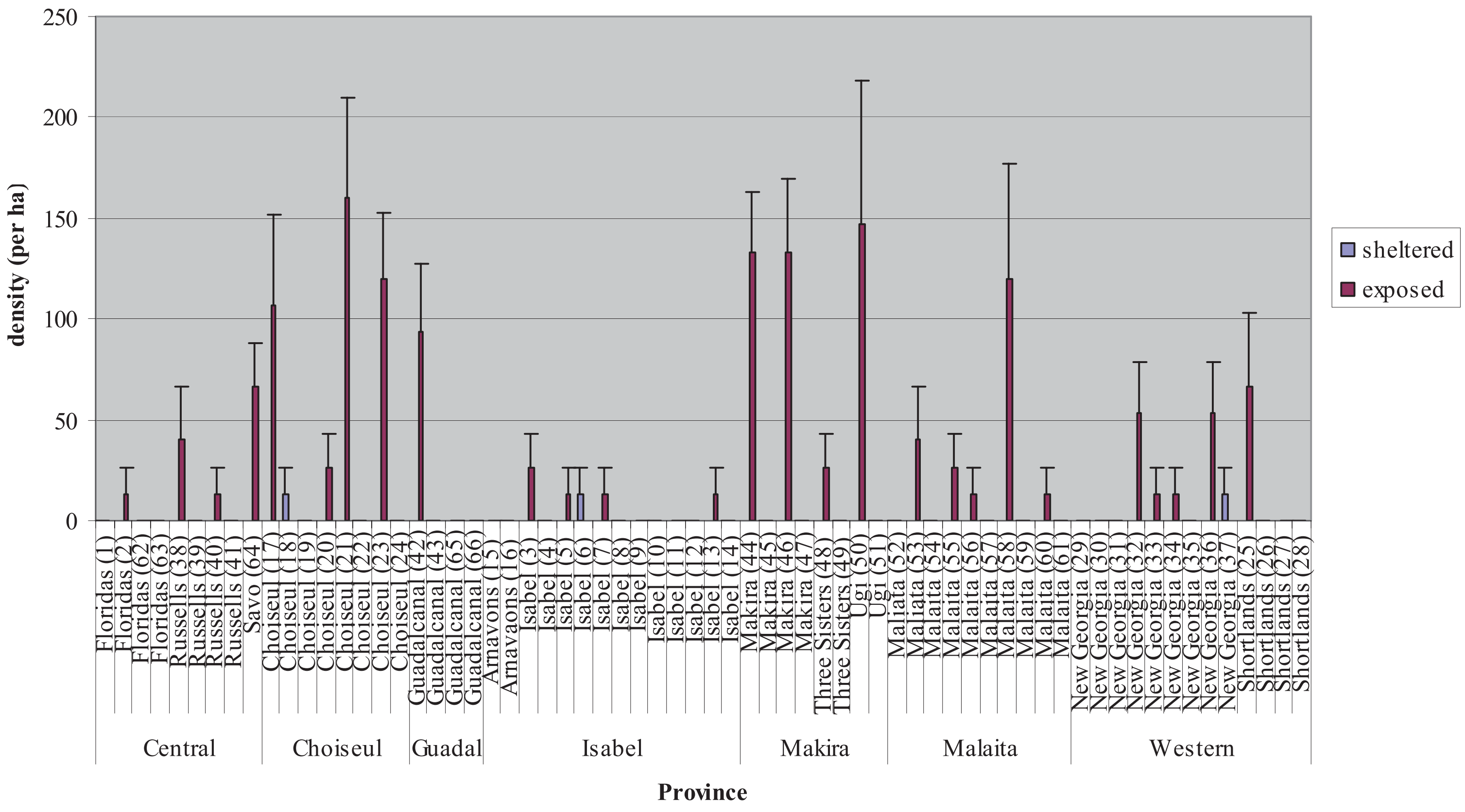


Figure 38. Mean density (+ se) of anenomefishes targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

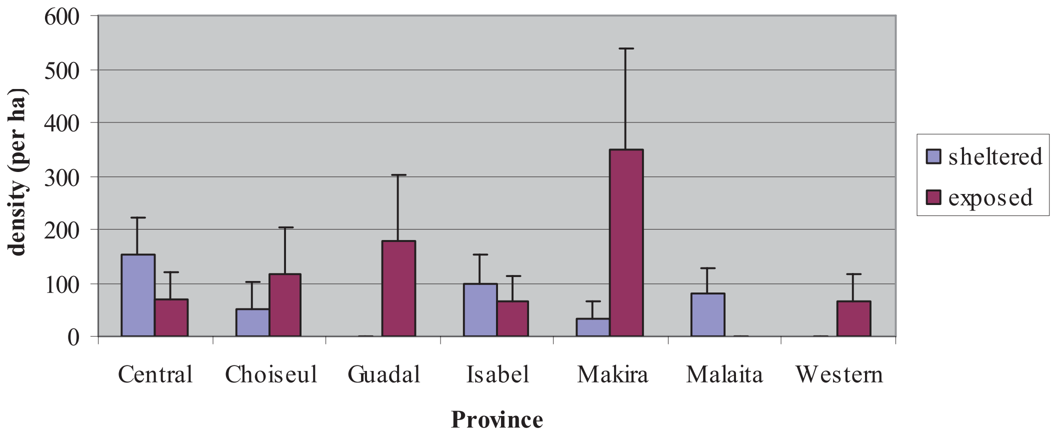


Figure 39. Mean density (+ se) of the blue-girdled angelfish targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

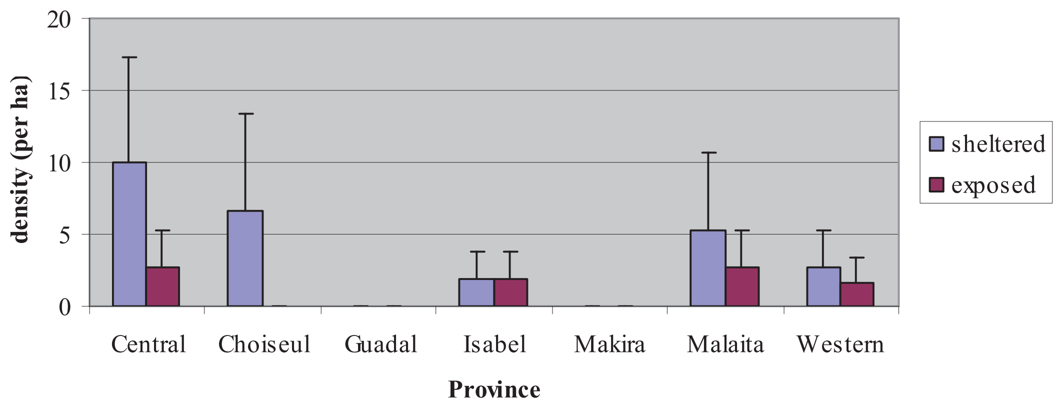
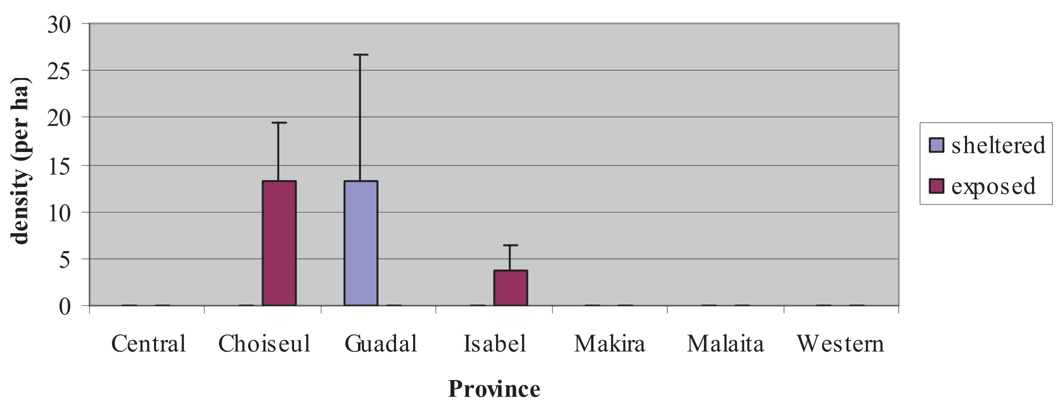


Figure 40. Mean density (+ se) of the emperor angelfish targeted by the aquarium trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.



Discussion

This survey represents the first broad scale, quantitative survey of coral reef fish communities and fisheries resources conducted in the Solomon Islands. The results will contribute to our understanding of the status of reef fish resources, which provide an important resource for the people of the Solomon Islands.

The results suggest that overfishing of reef fish populations may be occurring in some provinces, particularly in Guadalcanal, Malaita and Central (Florida Islands) Provinces. Given the rapidly rising population in the Solomon Islands, this problem may become more serious and widespread in future. These results will help provide a scientific basis for the National Government to review the status of key fisheries species (food and aquarium fishes), and for reassessing management arrangements for these fisheries.

The following is a summary of the results of the survey, and management recommendations for the future.

Coral Reef Fish Communities

A total of 37 families and 383 species were counted during this survey. Since this study focused on one habitat only (reef slopes at 10m), and did not include nocturnal and cryptic species that are not amenable to visual census techniques, the survey included 45% and 38% of the total number of families and species recorded in the Solomon Islands respectively, and 49% of the species observed during the Solomon Islands Marine Assessment (82 families and 1019 species have been recorded for the Solomon Islands, of which 786 species were observed this survey: see *Coral Reef Fish Diversity* this report). The most abundant families were damselfishes, fusiliers, surgeonfishes, snappers and wrasses, followed by fairy basslets, parrotfishes and emperors.

There was a high degree in variability among coral reef fish communities both within and among provinces. In general, the coral reef fish communities were in good condition (in terms of fish species richness, density and biomass) throughout most of the Solomon Islands, with those in the Central (Russell Islands and Savo Island), Choiseul, Isabel (particularly the Arnavon Islands), Makira (particularly the offshore islands of Three Sisters and Ugi), and Western Provinces (both New Georgia and the Shortland Islands), tending to be in better condition than those in Guadalcanal, Malaita and Central (Florida Islands) Provinces (Table 9). Similar patterns on the status of coral reef communities were recorded for other key components of these habitats (see *Coral Communities and Reef Health* this report, and *Benthic Communities* this report).

The reasons for the varying status of coral reef fish communities throughout the Solomon Islands cannot be determined with certainty, due to the lack of previous surveys for the area. However, the variation at the site level (within provinces and islands), is most likely due to the variation in the coral reef habitat at each site, which is quite variable and ranges from low to high on most islands or island groups (see *Coral Communities and Reef Health* this report, and *Benthic Communities* this report). Some of the variation among provinces is also likely to be due to the impact of human activities, particularly fishing, on reef fish populations (see below).

Table 9. Species richness, density and biomass of coral reef fish communities in each major island or island group surveyed

Province	Island or Island Group	Species Richness (per transect)	Density (per ha)	Biomass (kg/ha)
Central	Russell Islands	High	Medium-High	Low-Medium
	Florida Islands	Medium	Low-High	Low
	Savo Island	High	High	Low
Choiseul	Choiseul	Medium-High	Medium-High	Low-Medium
Guadalcanal	Guadalcanal	Low-Medium	Low-Medium	Low
Isabel	Isabel	Medium-High	Low-High	Low-Medium
	Arnavon Islands	High	Medium-High	Low-Medium
Makira	Makira	Medium-High	Low-Medium	Low-Medium
	Three Sisters Islands	High	Medium-High	Low
	Ugi Island	High	Medium-High	Low
Malaita	Malaita	Low-Medium	Low-Medium	Low-High
Western*	New Georgia	Medium-High	Medium-High	Low-Medium
	Shortland Islands	Medium-High	Medium	Low-High

Where: High, medium and low species richness equal >40, 20-40, and <20 species respectively; high, medium and low densities equal >60,000, 20-60,000, and <20,000 per ha respectively; and high, medium and low biomass equal >15,000, 5-15,000, and<5000 kg/ha respectively. *Sites were excluded where no surveys were conducted for small or medium sized fishes.

KEY FISHERIES SPECIES: FOOD FISHES

Richards *et al*. (1994) reported 180 species from 30 families being taken by local fishermen in the domestic reef fish fisheries. In this study, we focused on 109 species or species groups targeted by fisheries in the Solomon Islands (67 and 42 for food and aquarium fisheries respectively). Healthy populations of bony food fishes (medium to high density and low-medium biomass) were encountered in some locations in Central (Russell Islands), Choiseul, Isabel (particularly the Arnavon Islands), Makira (Makira Island), and Western Provinces. In contrast, healthy populations of food fishes were not observed in Central (Florida Islands and Savo Islands), Guadalcanal, Makira (Three Sisters Islands and Ugi Island) or Malaita Provinces, where density and biomass were always low (Table 10) despite the healthy coral reef communities recorded at some of those locations (Table 9, see also *Coral Communities and Reef Health* this report, *Benthic Communities* this report).

Similar patterns were recorded for four of the five major food fish families (snappers, surgeonfishes, emperors and parrotfishes). This pattern was most pronounced for key fisheries species of parrotfishes (including the humphead parrotfish), which were not observed on Guadalcanal. The other major food fish family (groupers), was uncommon throughout the survey area, with the highest densities recorded in the Arnavon Community Marine Conservation Area. The most abundant genera of food fishes were snappers (*Lutjanus* and *Macolor*s), surgeonfishes (*Acanthurus*, *Ctenochaetus* and *Naso*), emperors (*Lethrinus* and *Monotaxis*), parrotfishes (*Hipposcarus*), and fusiliers (*Caesio*).

The reasons for the varying status of food fish populations throughout the Solomon Islands cannot be determined with certainty, because of the lack of previous surveys and historical catch data for the study area. However, the variation at the site level (within provinces and islands), is most likely due to the variation in the coral reef habitat at each site, which is quite variable and ranges from low to high on most islands or island groups (see *Coral Communities and Reef Health* this report, *Benthic Communities* this report).

In contrast, the variation in food fish populations among provinces or major islands or island groups, may be due to a combined effect of the variation in coral reef habitat and the impact of human activities, particularly fishing. This is likely because the healthiest populations of food fishes (with medium to high densities and biomass) were observed in areas with small human populations, while those in worse condition (where only low densities and biomass were recorded) were located in or close to the most heavily populated areas in Guadalcanal and Malaita, including areas where the coral reef communities were otherwise healthy such as Marau Sound on Guadalcanal, the Three Sisters Islands and Ugi Island in Makira Province, and Savo Island in Central Province. The healthy condition of the food fish populations at one site on northwest side of Makira may be due in part to the protection afforded by the weather conditions on the exposed coastline.

A high human population implies high fishing pressure on reef fish stocks and other marine resources. Two provinces, Guadalcanal and Malaita, host the two largest populated urban centers in the Solomon Islands - Honiara and Auki respectively. The demand for reef fish in these areas is high and expected to increase as these urban areas grow. Unlike other provinces such as the Western, Isabel or Choiseul, which have large extensive coral reef systems and therefore larger unit areas of coral reef per number of people, both Malaita (excluding Ontong Java) and Guadalcanal have less extensive reef systems or small reef area per number of people. With the present high population levels of these provinces, the level of fishing pressure on reef fish stocks and other marine resources may already be too high, particularly in places like Langa Langa and Lau Lagoons on Malaita, and Marau Sound on Guadalcanal.

While it is easy to monitor the amount of catch that goes through provincial fisheries centres and marine product buyers in urban areas like Honiara, Auki or Gizo, the largest portion goes unmonitored through public fish markets in urban areas and private sales. For example, there is no information on how much reef fish is going through the Honiara public fish market every year, although it is known that catches from nearby areas like the Florida Islands and Marau Sound make up a large proportion of the sales (*P. Ramohia* pers. obs.). Furthermore, a great volume of fish is consumed by fishers for subsistence purposes and never enters a market. During this survey, low densities and biomass have been recorded for reef food fishes in the Florida Islands, Marau Sound and other locations close to these urban areas, but whether this is due to high fishing effort to meet the high fish demand in Honiara or not is unknown due to a lack of baseline information for these areas. Appropriate steps need to be taken by the DFMR and Honiara City Council to monitor this situation in future.

Table 10. Density and biomass of bony food fishes in each province and major island or island group surveyed.

Province	Island or Island Group	Density (per ha)	Biomass (kg/ha)
Central	Russell Islands	Low-High	Low-High
	Florida Islands	Low	Low
	Savo Island	Low	Low
Choiseul	Choiseul	Low-High	Low-Medium
Guadalcanal	Guadalcanal	Low	Low
Isabel	Isabel	Low-High	Low-Medium
	Arnavon Islands	Medium-High	Low-High
Makira	Makira	Low-Medium	Low-High
	Three Sisters Islands	Low	Low
	Ugi Island	Low	Low
Malaita	Malaita	Low	Low
Western*	New Georgia	Medium-High	Low-High
	Shortland Islands	Medium-High	Low-High

Where: High, medium and low densities equal >15,000, 5-15,000, and <15,000 per ha respectively; and high, medium and low biomass equal >5,000, 2-5,000, and<2,000 kg/ha respectively. *Sites were excluded where no surveys were conducted for small or medium sized fishes.

Key Fisheries Species: Large and Vulnerable Reef Fishes

The highest densities and biomass of large bony reef fishes (>30cm) were recorded in Western, Isabel, Makira, Central and Choiseul Provinces, with less recorded in Guadalcanal or Malaita Province. The high densities and biomass recorded in some provinces were due to high densities of snappers, emperors, parrotfishes, drummers and emperor at some sites.

Large and vulnerable reef fish species, particularly those targeted by the live reef food fish trade (LRFFT: humphead wrasse, humphead parrotfish, and large groupers) were uncommon or rare throughout the survey area. Humphead wrasses and humphead parrotfishes were uncommon throughout the survey area, with the highest densities and biomass recorded in Choiseul and Western Provinces. Large groupers (brown-marbled grouper, camouflage grouper and squaretail coral grouper) were rare throughout the survey area, as were barramundi cod, giant trevally, sharks and rays. Large and vulnerable emperor species were most abundant in Makira, Choiseul, and Isabel Provinces.

The low densities and biomass of large reef fishes in some locations is of major concern, since they are particularly vulnerable to overfishing. Species targeted by the LRFFT form spawning aggregation at specific locations, which are particularly vulnerable to overfishing if their location is known and unprotected. In the past, known spawning aggregations have been targeted by the LRFFT in some parts of the country such as Marovo Lagoon, Roviana Lagoon and Ontong Java. The adverse effect of this fishing practice has now been recognised, and a Management Plan has been developed (but not yet implemented) by the DFMR, with the aim of managing this fishery for conservation and long term sustainable production. Because the LRFFT activities were more or less localised at these locations and ceased some years prior to this survey, it is difficult to say whether the low densities and biomass recorded for these species in the study area is related to past fishing activities or other factors. However, the higher density and biomass recorded in the ACMCA for some grouper species could be attributed to the effect of more than 10 years of protection. Protecting spawning aggregations of key target species is crucial to the long term sustainability of these species, and important spawning aggregation sites should be identified and protected through relevant national or provincial laws, and reinforced at the local community level.

Target species like parrotfishes and surgeonfishes, including large and vulnerable species such as the humphead parrotfish, humphead wrasse or large groupers, are also extremely vulnerable to night spear fishing (Hamilton 2003, Hamilton *et al*., 2005) and gill netting. These species are good indicators of high fishing pressure and the fact that some species are absent or only present in low densities or biomass in some areas suggests that these stocks may have been overexploited. Though the true extent of their use in the country is unknown, gill netting and night spear fishing are very popular in the Solomon Islands, and it will be difficult to control the use of these methods without intervention at the national or provincial levels and cooperation at the local community level.

KEY FISHERIES SPECIES: AQUARIUM FISHES

Healthy populations of aquarium fishes (medium to high densities) were encountered in some locations in this study, particularly in Central (Russell Islands and Savo Island), Choiseul, Isabel, Makira (particularly Three Sisters Islands and Ugi Island), and Western Provinces (New Georgia and Shortland Islands: Table 11). In contrast, only low densities of aquarium populations of aquarium fishes were encountered in Guadalcanal and Malaita Provinces, and some locations in Central (Florida Islands), Makira (Makira Island) and Isabel (Arnavon Islands) Provinces.

The most abundant families were damselfishes, wrasses, surgeonfishes and fairy basslets, which accounted for most of the variation among sites, while other target families (butterflyfishes, angelfishes and hawkfishes) were less abundant. Key target species such as anemonefishes, blue-girdled angelfish, and emperor angelfish, were uncommon or rare throughout the survey area. However, two other key target species, the blue devil and blue tang, were not included in this survey, since they tend to occur in habitat types and depths not included in the study (see Myers 1999).

Harvesting of aquarium species for the Aquarium Trade started in the Solomon Islands in 1996 (Kinch, 2004a). The Florida Islands, Marau Sound and Rarumana (Kinch 2004a,b) are the main collection sites for this Trade, and this survey confirmed that the densities of aquarium fishes are low in these areas. Whether this is a natural situation or due to overexploitation is not clear since there is no baseline data for these areas. However, overexploitation of aquarium fishes (particularly key target species) should be of concern, particularly in locations close to urban areas in Guadalcanal and Malaita. This may be even more important in future if the demand for aquarium species increases.

Table 11. Density of aquarium fish species in each province and major island or island group surveyed.

Province	Island or Island Group	Density (per ha)
Central	Russell Islands	Low-Medium
	Florida Islands	Low
	Savo Island	Medium
Choiseul	Choiseul	Low-High
Guadalcanal	Guadalcanal	Low
Isabel	Isabel	Low-Medium
	Arnavon Islands	Low
Makira	Makira	Low
	Three Sisters Islands	Medium-High
	Ugi Island	Medium
Malaita	Malaita	Low
Western*	New Georgia	Low-High
	Shortland Islands	Medium

Where: High, medium and low densities equal >40,000, 20-40,000, and <20,000 per ha respectively. *Sites were excluded where no surveys were conducted for small or medium sized fishes.

Reptiles and Mammals

Only one dugong was observed during the underwater survey of the Solomon Islands, which was in the vicinity of the extensive seagrass beds recorded on the northeastern side of Malaita. Eleven sea turtles were also observed in four provinces: three in Isabel Province (two at the Arnavon Islands), two at the northern end of Choiseul, one in New Georgia, two in Central Province (Russell Islands and Savo Island), and one each on Malaita and Guadalcanal. More detailed information regarding the distribution of dugong and sea turtles and their habitat is provided in *Seagrasses and Mangroves* (this report). No crocodiles or cetaceans were observed underwater. More detailed information on cetaceans in the Solomon Islands is provided in *Oceanic Cetaceans and Associated Habitats* (this report).

Conservation and Management Recommendations

Because of the importance of coral reef fish resources to the livelihood of the Solomon Island people, as well as threats posed to these resources as result of their increased exploitation in future, it is very important that exploited coral reef fish resources are managed to ensure their long term sustainability. As the country's population increases, the reliance on reef fish resources is also expected to increase. In light of this inevitable scenario, the government is strongly urged to undertake appropriate measures to safeguard these important coral reef fish resources. This study has helped provide a scientific basis for the National Government to reassess the status of these resources, and the management arrangements for these fisheries.

At present, two of the most destructive fishing methods to the reef fish resources (and other marine resources like marine turtles) in the Solomon Islands are the use of gillnets and night spear fishing. These methods can be compared with the highly efficient and destructive use of SCUBA or hookah gear for harvesting sea cucumbers (see *Fisheries Resources: Commercially Important Macroinvertebrates* this report). There is widespread use of these fishing methods in the Solomon Islands, and it will be very difficult to control their use without appropriate Fisheries Regulations, although it is acknowledge that historically effective enforcement of Fisheries regulations has been difficult in the Solomon Islands.

Evidence of blast fishing was also noted in Langa Langa Lagoon on Malaita and in the Florida Islands during this survey. Blast fishing is very destructive, because it is a highly effective method for harvesting reef fishes and it damages the coral reef habitat. This method is prohibited in the Solomon Islands by the Fisheries Act 1998. However, enforcement of Fisheries Regulations is difficult, due to the large area and lack of manpower and resources at both the National and Provincial levels. For that reason, education and awareness programs may be more effective at addressing this problem.

Effective management of coral reef fish fisheries will not only ensure the long term sustainability of these resources for the people of the Solomon Islands, it will also allow the country to better appreciate the full potential and benefits that these fisheries can provide in the long term. Human activities affect the density and biomass of coral reef fishes and their habitat. Habitat features may in turn affect abundance of key fisheries species. Therefore, ensuring the long term sustainability of these habitats and associated resources should be one of our primary responsibilities.

Based on these considerations, and the results of this study, we recommend that the National Government seriously consider taking appropriate action to:

1. Ban the use of highly efficient and destructive fishing methods, particularly gillnets and night spear fishing;
2. Undertake a nationwide education and awareness program to help fishermen understand the importance of conservation and management of fisheries resources, and the important habitats these resources depend on for their well being;
3. Implement a vigorous education and awareness program on blast fishing targeted towards ensuring that young people understand the effect of these methods on marine resources and their habitats, and that this activity is prohibited and penalties apply for breaching this law;
4. Recruit more enforcement officers to work closely with other law enforcement agencies (eg Police, Customs and Immigration) and rural fishing communities to monitor and enforce fisheries laws and regulations;
5. Facilitate and support the establishment of Marine Protected Areas to protect key fisheries species (food and aquarium fishes);
6. Protect large and vulnerable fish species (humphead wrasse and large groupers) through the protection of fish spawning aggregation sites, and the implementation of the National Management and Development Plan for the Live Reef Food Fish Fishery;
7. Develop Management and Development Plans for other food fishes and the Aquarium Industry;
8. Speed-up the appointment and establishment of the Fishery Advisory Council as provided for under the Fisheries Act 1998, to ensure proper Fisheries Management and Development Plans are implemented; and
9. Develop alternative offshore fisheries such as raft fishing for tuna, squid fishing and deep water snapper fishing to ease fishing pressure on the inshore resources.

This survey has also provided the basis for the long term monitoring of reef fish resources. However, information on the levels of subsistence use is still lacking. To gain a better appreciation of the status of reef fin-fish fishery in the country, information on subsistence harvest is required. Therefore, we recommend that the government and other stakeholders like non-governmental organizations and local communities should work together to come up with ways of monitoring reef fish resources and their use in subsistence and artisanal fisheries in the Solomon Islands.

Acknowledgements

We thank Alec Hughes for being an important member of the coral reef fish survey team. Without his help, it would not be possible to collect data for this study. We also thank Dr. Richard Hamilton who reviewed and edited an earlier draft of this report. We also thank Captain Russell Slater and crew of the *FeBrina* as well as the rest of Solomon Islands Marine Assessment team. This study would not have been possible without you. The Nature Conservancy funded and supported this study.

References

Allen, G.R., Steene, R., Humann, P., Deloach, N. 2003 Reef Fish Identification. Tropical Pacific. New World Publications, 470 pp.

Aswani, S. (1998). Patterns of marine harvest effort in South western New Georgia, Solomon Islands: resource management or optimal foraging? Ocean and Coastal Management 40: 207-235.

Bell, J., Doherty, P., Hair, C. 1999 The capture and culture of postlarval coral reef fish: potential for new artisanal fisheries. SPC Live Reef Fish Information Bulletin 6:31-34.

Blaber, S. J. M., Milton, D. A., Rawlinson, N. J. F., Tiroba, G., Nichols, P. V. 1990a Reef fish and fisheries in Solomon Islands and Maldives and their interaction with baitfisheries. In: Tuna Baitfishing in the Indo-Pacific Region (eds S. J. M. Blaber and J. W. Copland), ACIAR Proceedings No.30, pp. 159-168.

Blaber, S. J. M., Milton, D. A., Rawlinson, N. J. F. 1990b Diets of the fishes of the Solomon Islands: predators of tuna baitfish and trophic effects of baitfishing on the subsistence fishery. Fisheries Research 8, 263- 286.

Blaber, S. J. M., Milton, D. A., Rawlinson, N. J. F. 1991 A checklist of fishes recorded by the baitfish research project in Solomon Islands. CSIRO Marine Laboratories. Report 212. Australia.

Cole, R. G. 1994 Fishes of Rennell Island and Indispensable Reefs, Pp 99-124 in R. C. Babcock (ed.) Marine Resources of Rennell Island and Indispensable Reef. University of Auckland Leigh Marine Laboratory, New Zealand.

Choat, H., Pears, R. 2003 A rapid, quantitative survey method for large, vulnerable reef fishes. In: Wilkinson, C., Green, A., Almany, J., and Dionne, S. Monitoring Coral Reef Marine Protected Areas. A Practical Guide on How Monitoring Can support Effective Management MPAs. Australian Institute of Marine Science and the IUCN Marine Program Publication. 68pp.

Donelly, R.J. 2000 Socio-economic environment and the effect of the Live Reef Food Fish Trade in Marovo Lagoon, Roviana Lagoon and Ontong Java, Solomon Islands. Discussion Paper No. 5. Report to Australian Centre for International Agricultural Research (ACIAR). Canberra, 81pp.

Donelly, R. J., Davis, D. C, Lam, M. 2000 Socio-economic and biological aspects of the Live Reef Food Fish Trade and its development in Solomon Islands. Discussion Paper No. 1. Report to Australian Centre for International Agricultural Research (ACIAR). Canberra, 51pp.

Gillett, R., Lightfoot, C. 2002 The contribution of fisheries to the economies of Pacific Island Countries. Pacific Studies Series, Asian Development Bank, World Bank, Forum Fisheries Agency, Secretariat of the Pacific Community, 218 pp.

Hair, C., Doherty, P. 2004 Development of a new fisheries based on the capture and culture of post-larval coral reef fish: Extension Report. Final Report for the Australian Centre for the International Agriculture Research, Sydney, NSW, Australia.

Hair, C., Bell, J., Doherty, P. 2002 The use of wild-caught juveniles in coastal aquaculture and its application to coral reef fishes. In Stickney, R. and McVey, J(eds). Responsible Marine Aquaculture. Pp: 327-353. New York: CAB International.

Hamilton, R. 2003 The role of indigenous knowledge in depleting a limited resource: a case study of the bumphead parrotfish (Bolbometopon muricatum) artisanal fishery in Roviana Lagoon, Western Province, Solomon Islands. Putting Fishers' Knowledge to Work Conference Proceedings, August 27-30, 2001. University of British Colombia Fisheries Centre Research Reports. 11(1): 68-77.

Hamilton, R.J. (2004) The demographics of Bumphead Parrotfish (*Bolbometopon muricatum*) in lightly and heavily fished regions of the Western Solomon Islands. PhD thesis, University of Otago, Dunedin, New Zealand.

Hamilton, R. 2005 Indigenous ecological knowledge of the aggregating and nocturnal spawning behaviour of the longfin emperor, Lethrinus erythropterus. SPC Traditional Marine Resource Management and knowledge information Bulletin 18: 9-17.

Hamilton, R., Matawai, M., Potuku, T., Kama, W., Lahui, P., Warku, J., Smith, A 2005 Applying local knowledge and science to the management of grouper aggregation sites in Melanesia. SPC Live Reef Fish Information Bulleting 14: 7-19.

Johannes, R. E. 1989 Spawning aggregations of the group Plectropomus areolatus (Ruppell) in the Solomon Islands. p. 751-755 (vol. 2). In: Choat, J. H. et al. (eds). Proceedings of the 6th International Coral Reef Symposium, Townsville, 8-12 August.

Johannes, RE (1997). Grouper spawning aggregations need protection. *SPC Live Reef Fish Information Bulletin* 3: 13-14.

Johannes, R. E., Hviding, E. 2001 Traditional knowledge possessed by the fishers of Marovo Lagoon, Solomon Islands, concerning fish aggregation behaviour. SPC Traditional Marine Resource Management and Knowledge Information Bulletin 12: 22-29.

Johannes, R. E., Freeman, M. R., Hamilton, R. 2000 Ignore fishers' knowledge and miss the boat. Fish and Fisheries 1: 257-257

Kile, N. 2000 Solomon Islands Marine Resources Overview. Pacific Economic Bulletin 15(1): 143-147.

Kile, N., Lam, M., Davis, D. C., Donnelly, R. J. 2000 Managing the Live Reef Food Fish Trade in Solomon Islands: the Role of Village Decision-making Systems in Ontong Java, Roviana and Marovo Lagoons. Discussion Paper No. 2. Report to Australian Centre for International Agricultural Research (ACIAR). Canberra, 28pp.

Kinch, J. 2004a The Marine Aquarium Trade in the Solomon Islands, with specific notes on Marau Sound, Guadalcanal. A report prepared for the Marine Aquarium Council and the Foundation of the Peoples of the South Pacific International, Suva, Fiji.

Kinch, J. 2004b The Marine Aquarium Trade in the Solomon Islands, with specific notes on Rarumana, Vona Vona Lagoon, Western Province. A report prepared for the Marine Aquarium Council and the Foundation of the Peoples of the South Pacific International, Suva, Fiji.

Leqata, J.L., Rawlinson, N.J.F., Nichols, P.V., Tiroba, G. 1990 Subsistence fishing in Solomon Islands and the possible conflict with commercial baitfishing. In: Blaber S.J.M. and COPLAND J.W. eds 1990. - Tuna baitfish in the Indo-Pacific region etc. Australian Centre for International Agricultural Research (ACIAR) Proceedings No. 30: 169-178.

Leqata, J, Oreihaka, E. 1995 Application of underwater visual census to assessing coral reef fish stocks in the Tropical Pacific. A report prepared for the Fisheries Division and the Australian Centre for International Agricultural Research (ACIAR), Project #9304. Honiara, Solomon Islands. 50pp.

Myers, R. F. 1999 Micronesian Reef Fishes. A comprehensive guide to the coral reef fishes of Micronesia. Coral Graphics Publications, 330pp.

McGrouther M.A., 1999 Report on the 1998 marine fish survey of the Santa Cruz Group, Solomon Islands, conducted by the Australian Museum, Smithsonian Institution, Field Museum of Natural History, Milwaukee Public Museum and Solomon Islands Fisheries. Unpublished report 57p. Mark McGrouther, Australian Museum 6 College Street, Sydney, Australia (markm@amsg.austmus.gov.au).

Oreihaka, E., Ramohia, P. 2000 The status of Inshore Fisheries Project funded by ObFCF: status of the fishery and its management. A report prepared for the Division of Fisheries and Marine Resources, Ministry of Natural Resources, Honiara, the Solomon Islands.

Richards, A. H., Bell, L.J., Bell, J.D. 1994 Inshore fisheries resources of Solomon Islands. Marine Pollution Bulletin 29(1-3): 90-98.

Russell, D., Buga, B. 2004 Marketing Unit: Final Report. A Report prepared for the Solomon Islands Government and the European Union's Rural Fishing Enterprise Project, Phase 3, Honiara, the Solomon Islands.

Sadovy Y.J. & Vincent A.C.J. (2002). The trades in live reef fishes for food and aquaria: issues and impacts. In: Sale PF, editor. *Coral reef fishes. Dynamics and diversity in a complex ecosystem*. Academic Press, San Diego, p 391-420.

Samoilys, M., Fuentes, H., Tuwai, I., Tikomainiusiladi, B., Leqata, J., Oreihaka, E., Mobiha, A., Potuku, T., Die, D., Connell, S., Lincoln-Smith, M., Wilson, M & Watson, R. (1995). Application of underwater visual census to assessing coral reef fish stocks in the tropical pacific. Project Number 9304. Department of Primary Industries, Queensland.

Appendix 1. Families and species recorded in the survey of coral reef resources in the Solomon Islands, and constants used to convert size (length) to biomass (based on Kulbicki *unpubl. data*)

Family	Genus and Species	biomass constant a	biomass constant b
ACANTHURIDAE	*Acanthurus blochii*	0.280526155	3.106776812
	Acanthurus fowleri	0.294117647	3.039513678
	Acanthurus lineatus	0.294117647	3.039513678
	Acanthurus mata	0.28217182	3.007953028
	Acanthurus nigricans	0.338180588	2.865329513
	Acanthurus nigricauda	0.294117647	3.039513678
	Acanthurus nigrofuscus	0.300687673	3.029210679
	Acanthurus nubilis	0.282485876	3.012048193
	Acanthurus olivaceus	0.294117647	3.039513678
	Acanthurus pyroferus	0.294117647	3.039513678
	Acanthurus thompsoni	0.294811321	3.034901366
	Acanthurus xanthopterus	0.234991117	3.266404701
	Acanthurus spp.	0.294117647	3.039513678
	Ctenochaetus binotatus	0.289855072	3.105590062
	Ctenochaetus cyanocheilus	0.297619048	3.039513678
	Ctenochaetus striatus	0.296785222	3.031745406
	Ctenochaetus tominiensis	0.297619048	3.039513678
	Zebrasoma scopas	0.332530826	2.845759818
	Zebrasoma veliferum	0.296525609	2.918327682
	Naso brevirostris	0.24935666	3.224683014
	Naso hexacanthus	0.257731959	3.067484663
	Naso lituratus	0.257731959	3.067484663
	Naso unicornis	0.262352197	3.05587048
	Naso spp.	0.261780105	3.058103976
AULOSTOMIDAE	*Aulostomus chinensis*	0.068965517	4.545454545
BALISTIDAE	*Balistapus undulatus*	0.290275762	2.895193978
	Balistoides conspicillum	0.289855072	2.898550725
	Balistoides viridescens	0.523560209	2.487562189
	Melichthys vidua	0.289855072	2.898550725
	Melichthys sp	0.215982721	3.424657534
	Odonus niger	0.215982721	3.424657534
	Pseudobalistes flavimarginatus	0.523560209	2.487562189
	Sufflamen bursa	0.272479564	3.125
	Sufflamen chrysopterus	0.280898876	3.086419753
	Xanthichthys auromarginatus	0.215982721	3.424657534
CAESIONIDAE	*Caesio cuning*	0.281214848	3.035822708
	Caesio lunaris	0.281214848	3.035822708
	Caesio teres	0.281214848	3.035822708
	Caesio spp.	0.222106727	3.360779701
	Pterocaesio digramma	0.225637369	3.341319086
	Pterocaesio marri	0.22496107	3.38890372
	Pterocaesio pisang	0.225733634	3.341129302
	Pterocaesio tile	0.210084034	3.676470588
	Pterocaesio trilineata	0.238389252	3.196695895
	Pterocaesio spp.	0.22496107	3.38890372
CARANGIDAE	*Caranx ignobilis*	0.240945857	3.234466475
	Caranx melampygus	0.270652842	3.000363044
	Caranx papuensis	0.265956032	3.040474801
	Caranx sexfasciatus	0.27100271	3.003003003
	Caranx spp.	0.27027027	3.03030303

Family	Genus and Species	biomass constant a	biomass constant b
	Gnathanodon speciosus	0.26805627	3.009546281
CARCHARINIDAE	*Carcharhinus melanopterus*	0.189753321	3.176620076
CHAETODONTIDAE	*Chaetodon auriga*	0.287429831	3.126846794
	Chaetodon baronessa	0.284090909	3.300330033
	Chaetodon bennetti	0.284090909	3.300330033
	Chaetodon citrinellus	0.295817729	3.083098761
	Chaetodon ephippium	0.284090909	3.300330033
	Chaetodon kleinii	0.310559006	3.012048193
	Chaetodon lunula	0.287356322	3.236245955
	Chaetodon melannotus	0.327862403	2.914975981
	Chaetodon mertensii	0.233759555	3.904450292
	Chaetodon meyeri	0.287356322	3.236245955
	Chaetodon ocellicaudus	0.327862403	2.914975981
	Chaetodon octofasciatus	0.310559006	3.012048193
	Chaetodon ornatissimus	0.287356322	3.236245955
	Chaetodon oxycephalus	0.287356322	3.236245955
	Chaetodon pelewensis	0.30965025	3.010778587
	Chaetodon rafflesi	0.284090909	3.300330033
	Chaetodon reticulatus	0.284090909	3.300330033
	Chaetodon semeion	0.287356322	3.134796238
	Chaetodon speculum	0.284090909	3.300330033
	Chaetodon trifascialis	0.287356322	3.236245955
	Chaetodon trifasciatus	0.307755753	3.054768953
	Chaetodon ulietensis	0.310559006	3.012048193
	Chaetodon unimaculatus	0.284090909	3.300330033
	Chaetodon vagabundus	0.287356322	3.125
	Coradion chrysozonus	0.3125	3.125
	Forcipiger flavissimus	0.27027027	3.125
	Heniochus acuminatus	0.302153143	3.133244349
	Heniochus chrysostomus	0.27192534	3.442625208
	Heniochus monoceros	0.284337281	3.207019524
	Heniochus singularius	0.3125	3.125
	Heniochus varius	0.303030303	3.134796238
CHANIDAE	*Chanos chanos*	0.204416626	3.391417002
CIRRHITIDAE	*Cirrhitichthys falco*	0.246395845	3.199385718
	Paracirrhites arcatus	0.257731959	2.923976608
	Paracirrhites forsteri	0.257731959	2.923976608
ECHNENEIDAE	*Echeneis naucrates*	0.110687057	3.459345769
FISTULARIDAE	*Fistularia commersonii*	0.076277651	3.205128205
HAEMULIDAE	*Plectorhinchus albovittatus*	0.286369663	2.884770718
	Plectorhinchus chaetodonoides	0.276243094	2.93255132
	Plectorhinchus chrysotaenia	0.202807258	3.355896142
	Plectorhinchus lineatus	0.202807258	3.355896142
	Plectorhinchus vittatus	0.202839757	3.355704698
	Plectorhinchus spp.	0.2356823	3.089280198
HEMIGALEIDAE	*Triaenodon obesus*	0.322580645	2.680965147
KYPHOSIDAE	*Kyphosus* spp.	0.263157895	3.125
LABRIDAE	*Anampses caeruleopunctatus*	0.27027027	2.702702703
	Anampses meleagrides	0.27027027	2.702702703
	Anampses neoguinaicus	0.27027027	2.702702703
	Anampses twistii	0.263157895	2.770083102
	Bodianus diana	0.27027027	2.857142857

Family	Genus and Species	biomass constant a	biomass constant b
	Bodianus mesothorax	0.245212231	3.143566691
	Cheilinus chlorourus	0.300840548	2.803397718
	Cheilinus fasciatus	0.251889169	3.115264798
	Cheilinus oxycephalus	0.257731959	2.923976608
	Cheilinus trilobatus	0.264550265	3.003003003
	Cheilinus undulatus	0.243902439	3.225806452
	Cheilinus spp.	0.243902439	3.125
	Cheilio inermis	0.158478605	3.25732899
	Choerodon anchorago	0.243309002	3.195909236
	Cirrhilabrus punctatus	0.251889169	2.801120448
	Cirrhilabrus spp.	0.240096038	2.893518519
	Coris batuensis	0.27173913	2.717391304
	Coris gaimard	0.303030303	2.702702703
	Diproctacanthus xanthurus	0.206185567	3.205128205
	Epibulus insidiator	0.264550265	3.003003003
	Gomphosus varius	0.251889169	2.801120448
	Halichoeres biocellatus	0.27173913	2.717391304
	Halichoeres chloropterus	0.263157895	2.770083102
	Halichoeres chrysus	0.27173913	2.717391304
	Halichoeres hortulanus	0.27173913	2.717391304
	Halichoeres marginatus	0.27173913	2.717391304
	Halichoeres melanurus	0.263157895	2.770083102
	Halichoeres nebulosus/margaritaceus/miniatus	0.26601831	2.75251917
	Halichoeres prosopeion	0.263157895	2.770083102
	Halichoeres richmondi	0.27173913	2.717391304
	Halichoeres scapularis	0.263123966	2.771042605
	Halichoeres spp.	0.263157895	2.770083102
	Hemigymnus fasciatus	0.244498778	3.174603175
	Hemigymnus melapterus	0.244498778	3.174603175
	Hologymnosus annulatus	0.222222222	2.631578947
	Hologymnosus sp	0.222222222	2.631578947
	Labrichthys unilineatus	0.206185567	3.205128205
	Labroides bicolor	0.200803213	3.378378378
	Labroides dimidiatus	0.200737913	3.369011162
	Labroides pectoralis	0.200803213	3.378378378
	Labroides rubrolabiatus	0.200803213	3.367003367
	Labropsis alleni	0.206185567	3.205128205
	Labropsis australis	0.206185567	3.205128205
	Labropsis xanthonota	0.206185567	3.205128205
	Leptojulis cyanopleura	0.236406619	3.012048193
	Macropharyngodon meleagris	0.25	3.125
	Macropharyngodon negrosensis	0.25	3.125
	Novaculichthys taeniourus	0.333333333	2.702702703
	Oxycheilinus celebicus	0.257731959	2.923976608
	Oxycheilinus diagrammus	0.257731959	2.923976608
	Paracheilinus filamentosus	0.240096038	2.893518519
	Pseudocheilinus evanidus	0.25	3.125
	Pseudocheilinus hexataenia	0.25	3.125
	Pseudocoris yamashiroi	0.27173913	2.717391304
	Pseudodax moluccanus	0.27027027	2.702702703
	Stethojulis bandanensis	0.236406619	3.012048193
	Stethojulis strigiventer	0.236406619	3.012048193

Family	Genus and Species	biomass constant a	biomass constant b
	Stethojulis trilineata	0.249326818	2.915366899
	Thalassoma amblycephalum	0.251889169	2.801120448
	Thalassoma hardwicke	0.251889169	2.801120448
	Thalassoma jansenii	0.251889169	2.801120448
	Thalassoma lunare	0.252725646	2.793967266
	Thalassoma quinquevittatum	0.25	3.225806452
LETHRINIDAE	*Gnathodentex aurolineatus*	0.267364667	3.098853424
	Lethrinus erythracanthus	0.222717149	3.278688525
	Lethrinus erythropterus	0.260241139	3.056916733
	Lethrinus olivaceous	0.263781947	3.00928364
	Lethrinus rubriopeculatus	0.222767259	3.268304959
	Lethrinus xanthochilus	0.222717149	3.278688525
	Lethrinus spp.	0.260416667	3.058103976
	Monotaxis grandoculis	0.290881166	2.997574962
LUTJANIDAE	*Aphareus furca*	0.263157895	2.941176471
	Aprion virescens	0.263281914	2.916132042
	Lutjanus argentmaculatus	0.291405858	2.814126917
	Lutjanus biguttatus	0.256757208	3.000255022
	Lutjanus bohar	0.252301622	3.063706717
	Lutjanus carponotatus	0.276283544	2.962164276
	Lutjanus fulviflamma	0.271452188	2.949104357
	Lutjanus fulvus	0.276283544	2.962164276
	Lutjanus gibbus	0.25	3.012048193
	Lutjanus monostigma	0.23255814	2.994011976
	Lutjanus quinquelineatus	0.271024745	3.003535161
	Lutjanus semicinctus	0.242718447	3.067484663
	Lutjanus vitta	0.242309109	3.064842881
	Lutjanus sp	0.23255814	2.994011976
	Macolor macularis	0.252525253	3.067484663
	Macolor niger	0.252525253	3.067484663
	Macolor spp.	0.25252525	3.06748466
	Symphorichthys spilurus	0.275016157	2.943678597
MALACANTHIDAE	*Aluterus scriptus*	0.217864924	3.262642741
	Malacanthus latovittatus	0.17921147	3.344481605
MOBULIDAE	*Manta birostris*	0.229357798	3.50877193
MONACANTHIDAE	*Amanses scopas*	0.289855072	2.898550725
	Cantherhines dumerilii	0.263157895	2.898550725
	Cantherhines pardalis	0.263157895	2.898550725
	Oxymonacanthus longirostris	0.25	2.777777778
MULLIDAE	*Mulloides flavolineatus*	0.200649704	3.706421746
	Mulloides vanicolensis	0.203665988	3.649635036
	Parupeneus barberinus	0.252870075	3.097682314
	Parupeneus bifasciatus	0.263157895	3.125
	Parupeneus cyclostomus	0.254452926	3.125
	Parupeneus multifasciatus	0.252525253	3.125
	Parupeneus pleurostigma	0.254452926	3.125
	Upeneus tragula	0.246891025	3.06732471
MYLIOBATIDIDAE	*Aetobatus narinari*	0.229042602	3.50877193
NEMIPTERIDAE	*Pentapodus* sp.	0.230946882	3.333333333
	Scolopsis affinis	0.263157895	2.976190476
	Scolopsis bilineatus	0.256012452	3.18571779
	Scolopsis ciliatus	0.263157895	2.976190476

Family	Genus and Species	biomass constant a	biomass constant b
	Scolopsis margaritifer	0.256012452	3.18571779
	Scolopsis trilineatus	0.255754476	3.184713376
	unid nemipterid	0.256012452	3.18571779
OSTRACIDAE	*Ostracion cubicus*	0.410160496	2.594255799
	Ostracion meleagris	0.5	2.415458937
PINGUIPEDIDAE	*Parapercis miillipunctata*	0.221238938	3.184713376
	Parapercis sp.	0.221238938	3.184713376
PLATACIDAE	*Platax pinnatus*	0.333333333	2.976190476
POMACANTHIDAE	*Apolemichthys trimaculatus*	0.362581581	2.616841995
	Centropyge bicolor	0.338983051	2.808988764
	Centropyge bispinosus	0.386681154	2.408402434
	Centropyge flavissimus	0.348432056	2.645502646
	Centropyge nox	0.386681154	2.408402434
	Centropyge vroliki	0.338983051	2.811357886
	Chaetodontoplus mesoleucus	0.281690141	3.225806452
	Pomacanthus imperator	0.281690141	3.225806452
	Pomacanthus navarchus	0.281690141	3.225806452
	Pomacanthus semicirculatus	0.281690141	3.225806452
	Pomacanthus sexstriatus	0.281690141	3.225806452
	Pomacanthus xanthometopon	0.281690141	3.225806452
	Pygoplites diacanthus	0.281690141	3.225806452
POMACENTRIDAE	*Abudefduf vaigiensis*	0.298329356	3.17510716
	Acanthochromis polyacanthus	0.279490433	3.534693012
	Amblyglyphidodon aureus	0.302160447	3.173595684
	Amblyglyphidodon curacao	0.302159534	3.173988529
	Amblyglyphidodon leucogaster	0.302114804	3.174603175
	Amphiprion chrysopterus	0.297450846	3.132243313
	Amphiprion clarkii	0.294117647	3.125
	Amphiprion leucokranos	0.294117647	3.125
	Amphiprion ocellaris	0.294117647	3.125
	Amphiprion perideraion	0.294117647	3.125
	Chromis acares	0.326797386	2.72479564
	Chromis alpha	0.279490433	3.534693012
	Chromis amboinensis	0.319488818	2.923976608
	Chromis atripes	0.326797386	2.72479564
	Chromis delta	0.319488818	2.923976608
	Chromis elerae	0.319488818	2.923976608
	Chromis iomelas	0.298002193	3.025974969
	Chromis lepidolepis	0.326615932	2.720836712
	Chromis lineata	0.326797386	2.72479564
	Chromis margaritifer	0.319488818	2.923976608
	Chromis retrofasciata	0.308667698	4.366831296
	Chromis ternatensis	0.297038232	3.408002672
	Chromis viridis	0.326970488	2.723808538
	Chromis weberi	0.319488818	2.923976608
	Chromis xanthochira	0.279485746	3.534817957
	Chromis xanthura	0.279485746	3.534817957
	Chromis spp.	0.326797386	2.72479564
	Chrysiptera cymatilis	0.282050053	3.170265446
	Chrysiptera flavipinnis	0.282050053	3.170265446
	Chrysiptera oxycephala	0.282050053	3.170265446
	Chrysiptera parasema	0.282050053	3.170265446
	Chrysiptera rex	0.294985251	3.115264798

Family	Genus and Species	biomass constant a	biomass constant b
	Chrysiptera rollandi	0.304878049	2.824858757
	Chrysiptera talboti	0.304878049	2.824858757
	Dascyllus aruanus	0.348608182	2.946341233
	Dascyllus melanurus	0.348432056	2.949852507
	Dascyllus reticulatus	0.352112676	2.857142857
	Dascyllus trimaculatus	0.352112676	2.857142857
	Dischistodus melanotus	0.366300366	2.873563218
	Dischistodus perspicillatus	0.366300366	2.873563218
	Dischistodus prosopotaenia	0.366300366	2.873563218
	Hemigylphidodon plagiometopon	0.366300366	2.873563218
	Lepidozygus tapeinosoma	0.265251989	2.88184438
	Neoglyphidodon melas	0.303030303	3.03030303
	Neoglyphidodon nigroris	0.303030303	3.03030303
	Neoglyphidodon thoracotaeniatus	0.303030303	3.03030303
	Neopomacentrus nemurus	0.296735905	3.460207612
	Plectroglyphidodon dickii	0.277777778	3.03030303
	Plectroglyphidodon lacrymatus	0.277777778	3.03030303
	Pomacentrus adelus	0.35335689	2.666666667
	Pomacentrus amboinensis	0.353581783	2.66771241
	Pomacentrus aurifrons	0.278551532	3.067484663
	Pomacentrus bankanensis	0.35335689	2.673796791
	Pomacentrus brachialis	0.308033514	3.031772981
	Pomacentrus burroughi	0.35335689	2.666666667
	Pomacentrus coelestis	0.298507463	2.857142857
	Pomacentrus grammorhynchus	0.338778635	2.729585431
	Pomacentrus lepidogenys	0.3129293	3.107877537
	Pomacentrus moluccensis	0.319665502	3.024455749
	Pomacentrus nagasakiensis	0.307125307	3.046922608
	Pomacentrus nigromanus	0.338778635	2.729585431
	Pomacentrus philippinus	0.272466201	3.516817421
	Pomacentrus reidi	0.279490433	3.534693012
	Pomacentrus simsiang	0.319665502	3.024455749
	Pomacentrus vaiuli	0.338778635	2.729585431
	Premnas biaculeatus	0.297450846	3.132243313
	Stegastes albifasciatus	0.366300366	2.873563218
	Stegastes fasciolatus	0.366032211	2.876869965
	Stegastes gascoynei	0.366032211	2.876869965
	Stegastes spp.	0.366300366	2.873563218
PRIACANTHIDAE	*Priacanthus hamrur*	0.272300751	2.851984839
SCARIDAE	*Bolbometopon muricatum*	0.277777778	3.225806452
	Calotomus carolinus	0.252079657	3.111387679
	Cetoscarus bicolor	0.24691358	3.236245955
	Chlorurus bleekeri	0.266240682	3.076923077
	Chlorurus microrhinos	0.215517241	3.401360544
	Chlorurus pyrrhurus	0.24691358	3.236245955
	Chlorurus sordidus	0.289646024	2.94134084
	Hipposcarus longiceps	0.24691358	3.236245955
	Scarus altipinnis	0.24691358	3.236245955
	Scarus chameleon	0.24691358	3.236245955
	Scarus dimidiatus	0.215517241	3.412969283
	Scarus flavipectoralis	0.266240682	3.076923077
	Scarus forsteni	0.24691358	3.236245955
	Scarus frenatus	0.24691358	3.236245955

Family	Genus and Species	biomass constant a	biomass constant b
	Scarus ghobban	0.298507463	2.906976744
	Scarus niger	0.24691358	3.236245955
	Scarus oviceps	0.24691358	3.236245955
	Scarus prasiognathos	0.298507463	2.906976744
	Scarus psittacus	0.24691358	3.236245955
	Scarus quoyi	0.24691358	3.236245955
	Scarus rivulatus	0.266230049	3.077889061
	Scarus rubroviolaceus	0.298507463	2.898550725
	Scarus schlegeli	0.28304557	2.971573924
	Scarus spinus	0.289687138	2.941176471
	Scarus tricolor	0.24691358	3.236245955
	unid scarid	0.24691358	3.236245955
SCOMBRIDAE	*Rastrelliger kanagurta*	0.143612132	3.205004936
	unid scombrid	0.238663484	2.840909091
SERRANIDAE	*Aethaloperca rogae*	0.23433092	3.14698443
	Anyperodon leucogrammicus	0.248756219	2.976190476
	Cephalopholis argus	0.229186434	3.18139014
	Cephalopholis boenak	0.239143484	3.124121341
	Cephalopholis cyanostigma	0.23923445	3.125
	Cephalopholis leopardus	0.23923445	3.125
	Cephalopholis microprion	0.23923445	3.125
	Cephalopholis miniata	0.246840442	3.032618848
	Cephalopholis sexmaculata	0.24691358	3.039513678
	Cephalopholis urodeta	0.23923445	3.125
	Cephalopholis spp.	0.23433092	3.14698443
	Cromileptes altivelis	0.262398321	3.055300947
	Diploprion bifasciatum	0.333333333	3.125
	Epinephelus corallicola	0.236966825	3.039513678
	Epinephelus fasciatus	0.264135893	2.911123403
	Epinephelus fuscoguttatus	0.240384615	3.067484663
	Epinephelus melanostigma	0.252525253	2.941176471
	Epinephelus merra	0.252504848	2.942223556
	Epinephelus polyphekadion	0.24026506	3.065556935
	Epinephelus spilotoceps	0.252525253	2.941176471
	Epinephelus spp.	0.229357798	3.058103976
	Gracila albomarginata	0.227272727	3.144654088
	Luzonichthys waitei	0.255918106	3.14861461
	Plectropomus areolatus	0.315457413	2.770083102
	Plectropomus laevis	0.315457413	2.770083102
	Plectropomus leopardus	0.222137316	3.135769408
	Plectropomus oligacanthus	0.315457413	2.770083102
	Plectropomus spp.	0.315457413	2.770083102
	Pseudanthias dispar	0.278551532	3.072196621
	Pseudanthias huchti	0.278551532	3.072196621
	Pseudanthias pascalus	0.278551532	3.072196621
	Pseudanthias tuka	0.278551532	3.072196621
	Pseudanthias spp.	0.285714286	3.333333333
	Variola albimarginata	0.227331627	3.138899439
	Variola louti	0.227331627	3.138899439
	Variola sp	0.227331627	3.138899439
SIGANIDAE	*Siganus argenteus*	0.240226966	3.157482602
	Siganus corallinus	0.273972603	3.021148036
	Siganus doliatus	0.27359332	3.020098757

Family	Genus and Species	biomass constant a	biomass constant b
	Siganus fuscescens	0.247297655	3.06954672
	Siganus lineatus	0.278947809	3.009972037
	Siganus puellus	0.251889169	3.184713376
	Siganus punctatissimus	0.25	3.067484663
	Siganus vermiculatus	0.278947809	3.009972037
	Siganus vulpinus	0.25	3.067484663
	Siganus spp.	0.251889169	3.184713376
SPHYRAENIDAE	*Sphyraena barracuda*	0.185117652	3.006334346
	Sphyrna sp.	0.189899258	3.175974389
SYNODONTIDAE	*Synodus* spp.	0.200803213	3.215434084
TETRAODONTIDAE	*Arothron mappa*	0.313116448	2.760905577
	Arothron nigropunctatus	0.303030303	2.777777778
	Arothron sp.	0.303030303	2.777777778
	Canthigaster papua	0.321543408	2.865329513
	Canthigaster valentini	0.321458651	2.862737464
	Diodon sp	0.423642649	2.618925403
ZANCLIDAE	*Zanclus cornutus*	0.257731959	3.067484663

Appendix 2. Mean density of each of the most abundant families of reef fishes on sheltered and exposed reefs slopes (10m) in the Solomon Islands.

Province	Island	Site	Exposure	Mean Density (per ha)	Butterflyfishes	Damselfishes	Emperors	Fusiliers	Groupers & Fairy Basslets	Parrotfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Wrasses
Central	**Floridas**	**1**	**shelt**	**mean**	**40.00**	**21733.33**	**74.67**	**0.00**	**309.33**	**965.33**	**0.00**	**80.00**	**336.00**	**277.33**	**1344.00**
				sd	59.63	8470.21	145.63	0.00	278.63	801.59	0.00	116.62	218.56	197.41	910.75
		2	**exp**	**mean**	**466.67**	**11800.00**	**0.00**	**1653.33**	**234.67**	**360.00**	**0.00**	**280.00**	**2037.33**	**184.00**	**1008.00**
				sd	194.37	5603.77	0.00	1597.25	130.84	224.10	0.00	234.95	728.80	147.09	578.63
		62	**exp**	**mean**	**160.00**	**21400.00**	**0.00**	**2226.67**	**2960.00**	**549.33**	**0.00**	**40.00**	**773.33**	**88.00**	**10880.00**
				sd	203.31	10012.21	0.00	3455.62	3566.35	856.58	0.00	59.63	806.42	140.03	5244.98
		63	**shelt**	**mean**	**280.00**	**72933.33**	**24.00**	**4272.00**	**130.67**	**266.67**	**0.00**	**53.33**	**170.67**	**93.33**	**1042.67**
				sd	218.07	44880.33	21.91	4548.62	95.41	235.70	0.00	73.03	43.61	102.42	286.81
Central	**Russells**	**38**	**exp**	**mean**	**440.00**	**48266.67**	**3397.33**	**4000.00**	**3861.33**	**1024.00**	**2589.33**	**9304.00**	**1752.00**	**144.00**	**853.33**
				sd	417.93	25041.52	3969.56	4013.59	4433.45	268.56	626.34	4869.75	1176.16	98.16	216.02
		39	**shelt**	**mean**	**346.67**	**46400.00**	**336.00**	**733.33**	**85.33**	**1405.33**	**0.00**	**184.00**	**552.00**	**29.33**	**1018.67**
				sd	196.64	12134.43	102.59	1639.78	20.22	319.11	0.00	87.64	305.88	28.91	191.51
		40	**exp**	**mean**	**640.00**	**29680.00**	**4538.67**	**0.00**	**877.33**	**712.00**	**0.00**	**474.67**	**1293.33**	**186.67**	**1165.33**
				sd	243.13	7655.85	8311.99	0.00	1133.47	280.57	0.00	290.38	483.41	58.88	500.19
		41	**shelt**	**mean**	**280.00**	**27066.67**	**610.67**	**2917.33**	**4117.33**	**3578.67**	**3869.33**	**5112.00**	**642.67**	**184.00**	**744.00**
				sd	251.22	7338.63	1006.79	5137.53	3027.10	5400.77	8607.44	10604.92	517.03	154.17	668.56
Central	**Savo**	**64**	**exp**	**mean**	**733.33**	**42533.33**	**1706.67**	**10693.33**	**3218.67**	**146.67**	**392.00**	**1296.00**	**1528.00**	**165.33**	**1221.33**
				sd	188.56	11582.07	1675.89	11394.99	4916.00	128.24	876.54	905.71	1041.14	113.76	571.21
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**360.00**	**19200.00**	**912.00**	**12733.33**	**973.33**	**1474.67**	**128.00**	**7712.00**	**4693.33**	**258.67**	**2029.33**
				sd	273.25	8002.08	650.24	4085.20	1670.69	1052.68	286.22	3311.21	1336.36	114.93	1108.49
		18	**shelt**	**mean**	**386.67**	**64400.00**	**608.00**	**2018.67**	**1640.00**	**314.67**	**0.00**	**1346.67**	**858.67**	**186.67**	**1056.00**
				sd	136.63	48101.40	587.47	1558.48	2101.83	120.96	0.00	847.32	215.74	146.36	426.40
		19	**shelt**	**mean**	**293.33**	**23866.67**	**168.00**	**7653.33**	**117.33**	**341.33**	**0.00**	**413.33**	**626.67**	**133.33**	**930.67**
				sd	292.88	9349.99	57.81	2495.95	64.22	293.42	0.00	327.14	121.11	38.87	426.92
		20	**exp**	**mean**	**640.00**	**13000.00**	**381.33**	**7613.33**	**74.67**	**1973.33**	**0.00**	**1325.33**	**2064.00**	**85.33**	**936.00**
				sd	129.96	4203.17	417.14	9843.94	78.66	2847.46	0.00	1409.67	875.62	68.38	339.59
		21	**exp**	**mean**	**400.00**	**24680.00**	**1413.33**	**1573.33**	**1306.67**	**389.33**	**0.00**	**421.33**	**15117.33**	**3530.67**	**6618.67**
				sd	188.56	6505.62	1480.93	2239.84	1051.77	203.39	0.00	243.78	5825.56	2707.97	7714.91

Province	Island	Site	Exposure	Mean Density (per ha)	Butterflyfishes	Damselfishes	Emperors	Fusiliers	Groupers & Fairy Basslets	Parrotfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Wrasses
	Choiseul (con't)	**22**	**shelt**	**mean**	**533.33**	**34266.67**	**413.33**	**1320.00**	**120.00**	**776.00**	**0.00**	**461.33**	**1344.00**	**197.33**	**2216.00**
				sd	339.93	13772.76	511.82	1681.53	157.48	510.55	0.00	483.29	674.38	23.85	2563.68
		23	**exp**	**mean**	**560.00**	**21533.33**	**3957.33**	**4277.33**	**522.67**	**584.00**	**8.00**	**205.33**	**2122.67**	**120.00**	**1101.33**
				sd	269.16	2652.04	5809.89	5860.08	940.75	318.25	17.89	112.59	703.35	32.66	168.02
		24	**shelt**	**mean**	**320.00**	**26866.67**	**101.33**	**453.33**	**45.33**	**106.67**	**0.00**	**29.33**	**426.67**	**24.00**	**2176.00**
				sd	228.04	7858.47	74.60	712.05	60.07	76.01	0.00	40.44	173.85	53.67	439.03
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**160.00**	**18933.33**	**397.33**	**0.00**	**517.33**	**453.33**	**0.00**	**469.33**	**2530.67**	**520.00**	**2874.67**
				sd	138.24	12200.64	700.12	0.00	428.06	327.96	0.00	795.17	3315.18	263.48	2212.96
		43	**shelt**	**mean**	**506.67**	**24533.33**	**686.67**	**24.00**	**632.00**	**600.00**	**0.00**	**1500.00**	**288.00**	**597.33**	**842.67**
				sd	498.00	6890.41	345.90	53.67	1058.24	235.70	0.00	1796.44	184.17	573.75	237.47
		65	**exp**	**mean**	**400.00**	**9266.67**	**112.00**	**0.00**	**69.33**	**808.00**	**0.00**	**200.00**	**1266.67**	**152.00**	**605.33**
				sd	235.70	4968.79	17.89	0.00	43.61	727.16	0.00	165.19	561.74	126.70	141.92
		66	**exp**	**mean**	**26.67**	**11000.00**	**0.00**	**400.00**	**154.67**	**280.00**	**0.00**	**21.33**	**1013.33**	**296.00**	**4973.33**
				sd	36.51	5174.72	0.00	894.43	200.13	366.36	0.00	47.70	1943.31	139.33	4738.87
Isabel	**Arnavons**	**15**	**exp**	**mean**	**266.67**	**41266.67**	**2978.67**	**1120.00**	**416.00**	**2088.00**	**1200.00**	**8288.00**	**2432.00**	**261.33**	**5461.33**
				sd	182.57	10401.39	2518.95	1752.71	352.57	2052.07	1788.85	8472.10	797.59	157.93	6619.84
		16	**shelt**	**mean**	**426.67**	**27933.33**	**1248.00**	**973.33**	**154.67**	**984.00**	**0.00**	**773.33**	**1144.00**	**146.67**	**1386.67**
				sd	256.47	9900.62	1033.77	1214.36	120.22	511.42	0.00	589.92	941.41	151.73	716.66
Isabel	**Isabel**	**3**	**exp**	**mean**	**306.67**	**14266.67**	**80.00**	**3061.33**	**48.00**	**226.67**	**576.00**	**0.00**	**2181.33**	**154.67**	**893.33**
				sd	252.10	9813.26	138.56	802.58	52.15	153.48	1111.97	0.00	1435.16	57.81	1067.29
		4	**shelt**	**mean**	**440.00**	**19240.00**	**109.33**	**4069.33**	**232.00**	**280.00**	**432.00**	**6186.67**	**80.00**	**146.67**	**776.00**
				sd	296.65	7495.87	62.11	4102.63	153.65	172.56	597.60	8616.44	119.26	136.95	166.91
		5	**exp**	**mean**	**533.33**	**20400.00**	**2208.00**	**720.00**	**13.33**	**120.00**	**0.00**	**2893.33**	**5189.33**	**384.00**	**741.33**
				sd	286.74	6317.52	1597.35	995.99	29.81	136.63	0.00	6313.34	3448.56	334.32	87.74
		6	**shelt**	**mean**	**413.33**	**11666.67**	**133.33**	**504.00**	**120.00**	**224.00**	**0.00**	**290.67**	**1080.00**	**304.00**	**1261.33**
				sd	341.24	2415.23	109.95	1126.98	127.54	51.12	0.00	303.23	938.84	128.37	1085.36
		7	**exp**	**mean**	**666.67**	**29533.33**	**298.67**	**4386.67**	**154.67**	**1010.67**	**893.33**	**2469.33**	**1565.33**	**170.67**	**1040.00**
				sd	429.47	12506.89	528.53	6293.98	309.92	1061.84	1266.32	1982.22	590.94	171.89	306.38

Province	Island	Site	Exposure	Mean Density (per ha)	Butterflyfishes	Damselfishes	Emperors	Fusiliers	Groupers & Fairy Basslets	Parrotfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Wrasses
	(Isabel con't)	**8**	**shelt**	**mean**	**80.00**	**30066.67**	**96.00**	**2562.67**	**269.33**	**200.00**	**16.00**	**354.67**	**2464.00**	**178.67**	**794.67**
				sd	86.92	6024.95	104.31	2639.70	125.22	163.30	35.78	410.92	695.73	273.35	575.16
		9	**exp**	**mean**	**160.00**	**12066.67**	**48.00**	**906.67**	**88.00**	**480.00**	**0.00**	**309.33**	**1810.67**	**64.00**	**1106.67**
				sd	146.06	3378.03	52.15	2027.37	103.54	190.90	0.00	619.85	1179.02	53.67	347.82
		10	**shelt**	**mean**	**106.67**	**23866.67**	**277.33**	**408.00**	**13.33**	**186.67**	**0.00**	**8.00**	**504.00**	**16.00**	**754.67**
				sd	138.24	13710.50	357.45	752.69	29.81	184.99	0.00	17.89	430.54	21.91	653.10
		11	**exp**	**mean**	**186.67**	**13333.33**	**997.33**	**7906.67**	**80.00**	**1298.67**	**0.00**	**6266.67**	**3834.67**	**1848.00**	**768.00**
				sd	144.53	5359.31	1374.87	3980.40	89.94	1090.30	0.00	4040.73	1216.43	1288.22	316.59
		12	**shelt**	**mean**	**93.33**	**11600.00**	**170.67**	**466.67**	**0.00**	**578.67**	**0.00**	**29.33**	**90.67**	**56.00**	**781.33**
				sd	59.63	760.12	94.00	689.61	0.00	302.52	0.00	28.91	109.30	21.91	296.44
		13	**exp**	**mean**	**80.00**	**14800.00**	**706.67**	**4320.00**	**184.00**	**640.00**	**0.00**	**53.33**	**1648.00**	**128.00**	**3016.00**
				sd	119.26	5053.05	1109.15	9659.81	96.79	538.72	0.00	41.10	1656.41	86.72	1235.60
		14	**shelt**	**mean**	**200.00**	**78466.67**	**1018.67**	**5194.67**	**106.67**	**322.67**	**0.00**	**202.67**	**1850.67**	**269.33**	**2130.67**
				sd	94.28	66277.45	831.31	5493.44	116.62	230.63	0.00	112.11	2399.73	109.71	1247.13
Makira	**Makira**	**44**	**exp**	**mean**	**253.33**	**9826.67**	**2696.00**	**533.33**	**34.67**	**1562.67**	**4229.33**	**3458.67**	**1130.67**	**72.00**	**1098.67**
				sd	272.44	4595.31	3356.38	1192.57	57.81	1679.72	5648.98	5631.80	595.94	75.78	540.83
		45	**shelt**	**mean**	**293.33**	**13866.67**	**85.33**	**2653.33**	**82.67**	**698.67**	**16.00**	**0.00**	**496.00**	**56.00**	**866.67**
				sd	138.24	7911.31	112.59	3522.12	27.33	663.23	35.78	0.00	836.68	35.78	226.08
		46	**exp**	**mean**	**613.33**	**18133.33**	**405.33**	**1120.00**	**50.67**	**968.00**	**0.00**	**1405.33**	**2490.67**	**162.67**	**1002.67**
				sd	178.89	3927.11	585.95	1137.64	39.33	600.19	0.00	2389.73	329.36	102.59	300.43
		47	**shelt**	**mean**	**80.00**	**17133.33**	**69.33**	**2226.67**	**154.67**	**80.00**	**0.00**	**541.33**	**106.67**	**101.33**	**1240.00**
				sd	55.78	11729.83	99.51	1619.74	148.05	86.92	0.00	515.85	101.11	94.56	493.51
Makira	**Three Sisters**	**48**	**exp**	**mean**	**213.33**	**27866.67**	**176.00**	**0.00**	**90.67**	**640.00**	**0.00**	**456.00**	**1658.67**	**186.67**	**2381.33**
				sd	73.03	15015.92	175.73	0.00	78.54	378.89	0.00	511.16	647.15	129.27	1998.77
		49	**shelt**	**mean**	**146.67**	**49933.33**	**266.67**	**3266.67**	**2461.33**	**458.67**	**160.00**	**101.33**	**784.00**	**354.67**	**7562.67**
				sd	184.99	23760.85	284.72	7304.49	4603.35	212.21	357.77	146.55	280.22	140.35	6810.54
Makira	**Ugi**	**50**	**exp**	**mean**	**453.33**	**43866.67**	**618.67**	**3573.33**	**2082.67**	**1637.33**	**0.00**	**1040.00**	**1818.67**	**416.00**	**3458.67**
				sd	259.91	17245.93	1235.28	3995.72	2621.88	1041.68	0.00	1326.88	559.65	64.22	2311.30
		51	**shelt**	**mean**	**200.00**	**57066.67**	**1546.67**	**3853.33**	**1410.67**	**400.00**	**0.00**	**194.67**	**1442.67**	**317.33**	**2117.33**
				sd	205.48	23013.76	2040.30	4311.07	2498.06	235.70	0.00	249.02	379.17	472.48	1413.03

Province	Island	Site	Exposure	Mean Density (per ha)	Butterflyfishes	Damselfishes	Emperors	Fusiliers	Groupers & Fairy Basslets	Parrotfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Wrasses
Malaita	**Malaita**	**52**	**shelt**	**mean**	**226.67**	**32400.00**	**56.00**	**1786.67**	**42.67**	**808.00**	**0.00**	**104.00**	**541.33**	**429.33**	**1221.33**
				sd	186.19	14244.69	56.88	2757.78	45.61	482.92	0.00	144.35	504.08	333.92	371.14
		53	**exp**	**mean**	**306.67**	**17733.33**	**453.33**	**1160.00**	**66.67**	**541.33**	**202.67**	**826.67**	**1184.00**	**165.33**	**1088.00**
				sd	101.11	5688.19	302.14	1342.97	40.00	432.93	303.37	1200.56	234.08	120.59	523.29
		54	**shelt**	**mean**	**200.00**	**20960.00**	**45.33**	**0.00**	**122.67**	**1400.00**	**13.33**	**56.00**	**136.00**	**136.00**	**925.33**
				sd	81.65	16043.59	70.30	0.00	76.25	426.87	29.81	87.64	97.25	111.71	149.84
		55	**exp**	**mean**	**346.67**	**9733.33**	**85.33**	**0.00**	**104.00**	**378.67**	**0.00**	**1069.33**	**2096.00**	**138.67**	**861.33**
				sd	212.92	4361.45	134.20	0.00	64.22	183.93	0.00	1336.11	955.10	82.52	388.11
		56	**exp**	**mean**	**120.00**	**19466.67**	**232.00**	**4165.33**	**40.00**	**440.00**	**0.00**	**80.00**	**1901.33**	**160.00**	**1210.67**
				sd	55.78	5096.84	156.23	2868.26	59.63	363.93	0.00	61.82	2417.89	126.49	683.29
		57	**shelt**	**mean**	**173.33**	**26666.67**	**69.33**	**2813.33**	**109.33**	**586.67**	**0.00**	**186.67**	**2138.67**	**82.67**	**970.67**
				sd	138.24	15396.61	99.51	5889.43	28.91	589.54	0.00	243.49	1337.68	67.59	232.17
		58	**exp**	**mean**	**440.00**	**27466.67**	**349.33**	**1453.33**	**96.00**	**760.00**	**104.00**	**829.33**	**2861.33**	**106.67**	**957.33**
				sd	192.06	9311.28	144.35	2001.33	77.97	410.53	232.55	775.48	1078.67	120.37	177.74
		59	**shelt**	**mean**	**213.33**	**15466.67**	**237.33**	**133.33**	**82.67**	**1328.00**	**0.00**	**109.33**	**2162.67**	**160.00**	**1082.67**
				sd	55.78	5585.70	331.11	188.56	115.62	182.96	0.00	166.64	474.17	56.57	437.30
		60	**exp**	**mean**	**226.67**	**8600.00**	**80.00**	**1920.00**	**72.00**	**666.67**	**21.33**	**61.33**	**1082.67**	**98.67**	**2117.33**
				sd	197.77	3294.78	61.82	1688.79	101.37	385.86	30.70	48.63	434.96	61.54	625.28
		61	**shelt**	**mean**	**106.67**	**6266.67**	**69.33**	**853.33**	**13.33**	**194.67**	**0.00**	**93.33**	**106.67**	**13.33**	**240.00**
				sd	111.55	6563.37	133.80	1227.83	29.81	180.52	0.00	208.70	111.55	29.81	197.77
Western	**New Georgia**	**29**	**exp**	**mean**	**0.00**	**0.00**	**168.00**	**0.00**	**96.00**	**1776.00**	**0.00**	**6216.00**	**5424.00**	**200.00**	**56.00**
				sd	0.00	0.00	353.72	0.00	104.31	2515.01	0.00	7282.34	7383.58	162.48	104.31
		30	**exp**	**mean**	**0.00**	**0.00**	**264.00**	**0.00**	**40.00**	**40.00**	**16.00**	**344.00**	**216.00**	**120.00**	**72.00**
				sd	0.00	0.00	480.50	0.00	40.00	0.00	35.78	508.02	143.11	80.00	33.47
		31	**shelt**	**mean**	**493.33**	**31200.00**	**242.67**	**5040.00**	**104.00**	**853.33**	**0.00**	**77.33**	**1818.67**	**144.00**	**760.00**
				sd	318.33	9136.62	166.37	2523.49	108.07	246.76	0.00	110.92	389.03	60.66	458.50
		32	**exp**	**mean**	**640.00**	**58733.33**	**290.67**	**1813.33**	**600.00**	**162.67**	**0.00**	**15533.33**	**2168.00**	**613.33**	**1037.33**
				sd	173.85	40339.81	277.51	3061.74	933.33	154.46	0.00	19692.46	568.16	901.41	218.56
		33	**exp**	**mean**	**426.67**	**48333.33**	**541.33**	**10653.33**	**6528.00**	**2474.67**	**1520.00**	**3642.67**	**512.00**	**178.67**	**773.33**
				sd	180.12	36611.32	685.18	4257.12	6643.56	3836.56	1396.28	4188.04	241.40	200.13	391.24

Province	Island	Site	Exposure	Mean Density (per ha)	Butterflyfishes	Damselfishes	Emperors	Fusiliers	Groupers & Fairy Basslets	Parrotfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Wrasses
	New Georgia (con't)	34	exp	mean	**746.67**	**34413.33**	**1642.67**	**3400.00**	**584.00**	**810.67**	**0.00**	**1256.00**	**2568.00**	**64.00**	**698.67**
				sd	369.38	8702.54	1948.98	3376.72	1204.23	342.33	0.00	1070.01	1214.75	66.93	379.54
		35	shelt	mean	**306.67**	**53600.00**	**96.00**	**21213.33**	**13749.33**	**312.00**	**0.00**	**1160.00**	**1632.00**	**45.33**	**693.33**
				sd	252.10	17805.12	72.66	19996.36	10288.77	263.41	0.00	2504.72	1711.65	41.74	146.06
		36	exp	mean	**506.67**	**23800.00**	**1418.67**	**10392.00**	**6032.00**	**1346.67**	**648.00**	**482.67**	**2776.00**	**181.33**	**882.67**
				sd	401.66	7879.65	1987.57	9992.64	5501.94	1738.48	1426.72	473.23	387.29	108.98	268.23
		37	shelt	mean	**533.33**	**61200.00**	**794.67**	**9349.33**	**125.33**	**698.67**	**0.00**	**853.33**	**1448.00**	**341.33**	**2008.00**
				sd	124.72	11329.90	1099.64	12782.96	67.07	253.44	0.00	1169.43	561.00	265.93	1810.28
Western	Shortlands	25	exp	mean	**466.67**	**32000.00**	**1030.00**	**2033.33**	**482.67**	**453.33**	**0.00**	**4646.67**	**4805.33**	**390.00**	**4106.67**
				sd	278.89	12018.50	1488.22	600.00	477.72	440.71	0.00	5814.38	2287.70	279.97	6997.47
		26	shelt	mean	**680.00**	**26400.00**	**165.33**	**4026.67**	**42.67**	**861.33**	**0.00**	**143.33**	**1426.67**	**125.33**	**1200.00**
				sd	387.01	8351.31	138.11	2647.68	54.49	607.48	0.00	88.69	296.65	20.22	447.91
		27	exp	mean	**0.00**	**0.00**	**7016.00**	**2400.00**	**0.00**	**5392.00**	**0.00**	**14896.00**	**7888.00**	**168.00**	**0.00**
				sd	0.00	0.00	7984.46	5366.56	0.00	5037.73	0.00	9074.39	4656.47	127.75	0.00
		28	shelt	mean	**0.00**	**0.00**	**64.00**	**736.00**	**48.00**	**0.00**	**0.00**	**184.00**	**24.00**	**208.00**	**56.00**
				sd	0.00	0.00	87.64	718.67	17.89	0.00	0.00	368.35	53.67	121.33	77.97

Appendix 3. Mean biomass of each of the most abundant families of reef fishes on sheltered and exposed reefs slopes (10m) in the Solomon Islands.

					Bony Fishes									Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Damselfishes**	**Emperors**	**Fusiliers**	**Parrotfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**TOTAL (all bony fishes)**	**Sharks**	**Rays**
Central	**Floridas**	**1**	**shelt**	**mean**	**125.30**	**11.93**	**0.00**	**127.69**	**0.00**	**52.13**	**29.68**	**103.65**	**559.87**	**0.00**	**0.00**
				sd	81.18	16.76	0.00	66.64	0.00	58.92	23.29	130.10	74.30	0.00	0.00
		2	**exp**	**mean**	**143.92**	**0.00**	**160.81**	**53.05**	**0.00**	**160.67**	**212.56**	**37.01**	**1032.35**	**0.00**	**0.00**
				sd	95.25	0.00	161.97	27.34	0.00	114.23	103.45	67.02	237.97	0.00	0.00
		62	**exp**	**mean**	**56.06**	**0.00**	**206.10**	**294.85**	**0.00**	**2.58**	**44.90**	**3.13**	**688.82**	**0.00**	**0.00**
				sd	26.64	0.00	381.35	489.55	0.00	4.73	82.17	5.12	545.59	0.00	0.00
		63	**shelt**	**mean**	**270.34**	**0.49**	**135.31**	**44.20**	**0.00**	**5.71**	**15.13**	**2.21**	**617.16**	**0.00**	**0.00**
				sd	99.91	0.49	185.50	45.12	0.00	8.05	1.89	2.38	249.76	0.00	0.00
Central	**Russells**	**38**	**exp**	**mean**	**179.17**	**1174.34**	**272.00**	**594.07**	**1036.40**	**2730.29**	**202.39**	**99.09**	**7614.71**	**281.50**	**0.00**
				sd	124.01	697.26	315.24	359.86	168.71	1393.11	246.63	117.19	1760.75	264.56	0.00
		39	**shelt**	**mean**	**181.01**	**24.54**	**21.05**	**343.69**	**0.00**	**41.86**	**52.22**	**1.28**	**797.02**	**0.00**	**0.00**
				sd	45.39	7.12	47.07	189.24	0.00	49.41	48.54	1.44	172.68	0.00	0.00
		40	**exp**	**mean**	**126.78**	**349.61**	**0.00**	**269.11**	**0.00**	**172.71**	**151.59**	**40.06**	**1242.63**	**0.00**	**0.00**
				sd	50.76	502.94	0.00	249.83	0.00	160.51	93.76	49.09	662.08	0.00	0.00
		41	**shelt**	**mean**	**123.14**	**301.45**	**142.06**	**1262.75**	**1391.47**	**692.76**	**112.51**	**189.47**	**4455.61**	**78.34**	**0.00**
				sd	78.95	492.20	166.65	1984.24	3103.39	1344.31	164.52	227.42	6461.75	50.30	0.00
Central	**Savo**	**64**	**exp**	**mean**	**133.11**	**163.64**	**1501.91**	**26.15**	**1232.38**	**564.25**	**132.30**	**6.80**	**3919.65**	**0.00**	**0.00**
				sd	33.70	163.87	1771.79	26.66	2755.68	1120.40	104.72	9.38	2268.36	0.00	0.00
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**229.10**	**481.77**	**831.19**	**944.91**	**46.13**	**2195.99**	**690.82**	**184.96**	**5923.19**	**0.00**	**0.00**
				sd	144.88	699.02	596.76	807.67	103.14	1485.70	293.35	106.87	2401.30	0.00	0.00
		18	**shelt**	**mean**	**311.17**	**103.42**	**155.82**	**126.99**	**0.00**	**320.62**	**71.53**	**31.09**	**1263.82**	**0.00**	**0.00**
				sd	183.67	129.79	132.02	212.87	0.00	355.26	17.51	52.55	471.84	0.00	0.00
		19	**shelt**	**mean**	**176.71**	**15.19**	**338.25**	**52.22**	**0.00**	**143.58**	**39.18**	**17.28**	**1079.26**	**0.00**	**0.00**
				sd	95.82	7.31	59.93	20.64	0.00	193.49	12.56	23.90	538.81	0.00	0.00
		20	**exp**	**mean**	**237.31**	**57.27**	**467.05**	**1080.53**	**0.00**	**249.43**	**219.52**	**19.37**	**2596.00**	**186.75**	**0.00**
				sd	88.87	45.18	600.24	1816.33	0.00	173.32	122.52	31.72	2459.33	186.75	0.00
		21	**exp**	**mean**	**81.51**	**185.99**	**266.00**	**2528.50**	**0.00**	**145.55**	**1433.68**	**454.13**	**5385.19**	**124.42**	**0.00**
				sd	19.37	195.46	402.88	1624.62	0.00	62.48	636.75	342.03	1506.94	124.42	0.00

					Bony Fishes									Sharks & Rays	
Province	Island	Site	Exposure	Mean Biomass (kg/ha)	Damselfishes	Emperors	Fusiliers	Parrotfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	TOTAL (all bony fishes)	Sharks	Rays
	(Choiseul (con't)	**22**	**shelt**	**mean**	**460.27**	**137.70**	**104.92**	**2158.38**	**0.00**	**147.61**	**114.02**	**26.37**	**4565.72**	**0.00**	**0.00**
				sd	229.34	228.44	135.62	3421.19	0.00	169.68	52.18	32.29	3505.35	0.00	0.00
		23	**exp**	**mean**	**90.69**	**384.90**	**421.24**	**121.76**	**1.44**	**62.27**	**155.77**	**4.84**	**1427.94**	**0.00**	**0.00**
				sd	18.67	553.84	576.81	141.99	3.21	66.89	90.93	3.29	706.31	0.00	0.00
		24	**shelt**	**mean**	**307.42**	**10.82**	**25.08**	**18.08**	**0.00**	**1.75**	**50.49**	**1.70**	**680.17**	**0.00**	**0.00**
				sd	103.77	9.55	35.40	21.03	0.00	3.73	34.86	3.80	350.59	0.00	0.00
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**77.61**	**41.25**	**0.00**	**87.86**	**0.00**	**55.00**	**751.52**	**35.02**	**1164.37**	**0.00**	**0.00**
				sd	98.13	58.94	0.00	127.49	0.00	102.40	1539.54	16.21	1609.26	0.00	0.00
		43	**shelt**	**mean**	**205.51**	**88.09**	**1.90**	**202.27**	**0.00**	**347.16**	**13.07**	**37.91**	**1009.89**	**27.93**	**135.27**
				sd	50.05	137.34	4.24	102.94	0.00	517.44	8.13	36.70	718.75	27.93	135.27
		65	**exp**	**mean**	**139.14**	**21.44**	**0.00**	**133.02**	**0.00**	**63.86**	**72.89**	**27.74**	**621.31**	**0.00**	**0.00**
				sd	134.65	15.01	0.00	94.88	0.00	95.34	33.32	25.99	325.96	0.00	0.00
		66	**exp**	**mean**	**18.22**	**0.00**	**43.11**	**40.97**	**0.00**	**0.04**	**84.13**	**8.44**	**231.87**	**555.44**	**0.00**
				sd	13.13	0.00	96.39	59.01	0.00	0.10	174.97	7.07	216.85	555.44	0.00
Isabel	**Arnavons**	**15**	**exp**	**mean**	**294.68**	**931.05**	**88.51**	**693.30**	**287.69**	**2449.47**	**380.07**	**93.28**	**5921.78**	**0.00**	**0.00**
				sd	114.40	1297.74	138.51	817.10	393.94	3421.32	143.98	128.95	6047.47	0.00	0.00
		16	**shelt**	**mean**	**616.76**	**299.41**	**45.67**	**430.22**	**0.00**	**213.32**	**150.39**	**9.28**	**2420.67**	**23.39**	**0.00**
				sd	217.22	261.80	53.63	510.49	0.00	172.54	219.14	10.78	1280.55	23.39	0.00
Isabel	**Isabel**	**3**	**exp**	**mean**	**105.83**	**13.23**	**208.11**	**10.66**	**234.63**	**0.00**	**173.72**	**5.05**	**858.55**	**0.00**	**0.00**
				sd	48.92	28.14	44.39	5.32	452.96	0.00	119.80	2.03	469.97	0.00	0.00
		4	**shelt**	**mean**	**102.33**	**10.75**	**411.54**	**28.68**	**174.72**	**801.27**	**17.20**	**11.85**	**1762.26**	**0.00**	**0.00**
				sd	24.47	11.95	439.94	24.87	242.52	1166.39	29.87	13.77	1784.42	0.00	0.00
		5	**exp**	**mean**	**94.10**	**287.29**	**35.36**	**15.77**	**0.00**	**1292.28**	**517.11**	**100.02**	**2604.53**	**0.00**	**0.00**
				sd	40.23	582.61	69.07	14.96	0.00	2878.33	302.75	142.53	3646.34	0.00	0.00
		6	**shelt**	**mean**	**83.50**	**13.39**	**20.23**	**25.78**	**0.00**	**32.62**	**90.96**	**5.70**	**352.52**	**0.00**	**0.00**
				sd	33.05	27.60	45.24	13.92	0.00	66.72	90.93	5.94	248.79	0.00	0.00
		7	**exp**	**mean**	**86.00**	**54.15**	**536.37**	**1179.45**	**220.60**	**839.11**	**137.14**	**41.88**	**3549.35**	**0.00**	**0.00**
				sd	40.42	91.03	770.62	943.85	341.60	408.66	95.35	64.26	2323.11	0.00	0.00
		8	**shelt**	**mean**	**241.85**	**5.45**	**118.57**	**17.85**	**10.19**	**141.70**	**124.90**	**7.96**	**715.22**	**0.00**	**0.00**
				sd	125.90	7.05	169.25	18.95	22.79	178.69	41.72	10.01	457.31	0.00	0.00

					Bony Fishes									Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Damselfishes**	**Emperors**	**Fusiliers**	**Parrotfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**TOTAL (all bony fishes)**	**Sharks**	**Rays**
	Isabel (con't)	**9**	**exp**	**mean**	**273.84**	**0.73**	**5.72**	**53.80**	**0.00**	**13.74**	**179.78**	**1.54**	**624.84**	**0.00**	**0.00**
				sd	36.97	1.08	12.79	30.73	0.00	26.68	120.73	1.27	185.02	0.00	0.00
		10	**shelt**	**mean**	**279.76**	**8.24**	**14.47**	**35.26**	**0.00**	**0.43**	**43.08**	**0.47**	**456.87**	**0.00**	**0.00**
				sd	99.85	12.50	26.17	41.84	0.00	0.96	35.56	0.68	152.48	0.00	0.00
		11	**exp**	**mean**	**142.51**	**535.03**	**405.12**	**1372.57**	**0.00**	**1754.08**	**986.49**	**2428.45**	**7885.53**	**0.00**	**0.00**
				sd	47.90	929.74	330.32	1510.47	0.00	1268.99	936.45	1732.02	2282.92	0.00	0.00
		12	**shelt**	**mean**	**134.70**	**8.59**	**20.97**	**31.79**	**0.00**	**6.11**	**16.38**	**12.76**	**287.51**	**0.00**	**0.00**
				sd	53.29	4.41	45.65	18.70	0.00	8.48	25.71	23.90	116.61	0.00	0.00
		13	**exp**	**mean**	**73.98**	**54.66**	**144.46**	**142.04**	**0.00**	**18.12**	**200.90**	**7.10**	**853.99**	**0.00**	**0.00**
				sd	23.62	85.83	323.02	244.08	0.00	23.55	230.82	6.08	796.48	0.00	0.00
		14	**shelt**	**mean**	**299.58**	**204.60**	**618.33**	**68.31**	**0.00**	**32.09**	**267.26**	**20.29**	**1726.02**	**0.00**	**0.00**
				sd	159.26	285.31	781.46	101.79	0.00	16.05	473.23	28.78	1312.28	0.00	0.00
Makira	**Makira**	**44**	**exp**	**mean**	**67.54**	**1424.59**	**42.15**	**1900.76**	**1856.13**	**3894.63**	**115.62**	**12.18**	**9422.92**	**0.00**	**0.00**
				sd	26.64	2632.75	94.25	2602.50	2716.37	8162.98	70.05	25.63	10238.68	0.00	0.00
		45	**shelt**	**mean**	**229.68**	**9.50**	**74.65**	**234.66**	**0.00**	**0.00**	**183.39**	**2.88**	**881.50**	**0.00**	**0.00**
				sd	72.23	11.91	90.88	192.22	0.00	0.00	363.53	2.77	399.34	0.00	0.00
		46	**exp**	**mean**	**90.85**	**263.70**	**109.32**	**113.50**	**2.87**	**655.33**	**114.34**	**7.80**	**1448.69**	**41.47**	**0.00**
				sd	50.32	380.23	152.86	148.57	6.42	1256.49	40.07	6.83	1288.40	41.47	0.00
		47	**shelt**	**mean**	**128.69**	**2.83**	**101.75**	**12.33**	**0.00**	**34.16**	**8.49**	**8.28**	**656.14**	**1289.05**	**0.00**
				sd	70.06	4.54	106.88	18.21	0.00	35.38	7.22	13.95	607.47	1095.58	0.00
Makira	**Three Sisters**	**48**	**exp**	**mean**	**169.63**	**26.66**	**0.00**	**88.98**	**0.00**	**109.27**	**97.44**	**4.30**	**609.18**	**0.00**	**0.00**
				sd	87.87	18.04	0.00	72.91	0.00	197.14	34.56	3.58	196.41	0.00	0.00
		49	**shelt**	**mean**	**245.02**	**34.71**	**352.06**	**62.77**	**16.79**	**18.83**	**57.99**	**127.14**	**1037.36**	**0.00**	**0.00**
				sd	134.54	35.59	787.22	41.82	37.55	22.18	51.91	147.77	739.79	0.00	0.00
Makira	**Ugi**	**50**	**exp**	**mean**	**144.18**	**140.09**	**328.88**	**431.06**	**0.00**	**803.38**	**544.05**	**82.53**	**2740.58**	**0.00**	**0.00**
				sd	99.32	211.57	328.37	452.21	0.00	1363.05	587.16	97.63	2294.51	0.00	0.00
		51	**shelt**	**mean**	**207.23**	**91.38**	**419.08**	**60.21**	**0.00**	**100.86**	**100.08**	**15.72**	**1067.45**	**0.00**	**0.00**
				sd	75.97	164.14	422.56	40.22	0.00	138.67	27.68	30.27	569.21	0.00	0.00
Malaita	**Malaita**	**52**	**shelt**	**mean**	**149.70**	**2.32**	**196.70**	**73.73**	**0.00**	**27.35**	**43.62**	**16.50**	**590.48**	**0.00**	**0.00**
				sd	97.51	2.21	293.58	52.33	0.00	59.12	36.34	14.98	487.18	0.00	0.00

					Bony Fishes									Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Damselfishes**	**Emperors**	**Fusiliers**	**Parrotfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**TOTAL (all bony fishes)**	**Sharks**	**Rays**
	Malaita (con't)	**53**	**exp**	**mean**	**103.44**	**90.54**	**0.00**	**152.79**	**91.48**	**196.93**	**82.62**	**7.07**	**869.44**	**0.00**	**0.00**
				sd	75.64	98.45	0.00	116.93	125.80	231.16	18.69	5.90	552.76	0.00	0.00
		54	**shelt**	**mean**	**140.10**	**2.49**	**59.44**	**63.99**	**0.00**	**3.62**	**14.34**	**6.89**	**373.88**	**0.00**	**0.00**
				sd	101.86	4.46	86.08	28.54	0.00	7.34	11.07	5.97	151.41	0.00	0.00
		55	**exp**	**mean**	**52.20**	**34.99**	**0.00**	**111.78**	**4.80**	**521.98**	**314.19**	**6.62**	**1759.42**	**0.00**	**22435.27**
				sd	18.22	65.89	0.00	79.34	10.74	608.87	183.19	4.55	1169.21	0.00	22435.27
		56	**exp**	**mean**	**146.14**	**21.89**	**372.16**	**83.06**	**0.00**	**4.76**	**78.49**	**4.60**	**881.07**	**0.00**	**0.00**
				sd	130.95	18.56	264.41	70.44	0.00	4.08	86.21	5.98	223.17	0.00	0.00
		57	**shelt**	**mean**	**398.91**	**5.36**	**125.54**	**91.45**	**0.00**	**135.97**	**208.84**	**2.13**	**1068.51**	**0.00**	**0.00**
				sd	249.10	8.18	253.74	111.84	0.00	251.05	123.20	2.33	567.61	0.00	0.00
		58	**exp**	**mean**	**73.11**	**52.58**	**136.26**	**298.00**	**61.31**	**282.36**	**275.15**	**19.28**	**1557.59**	**0.00**	**0.00**
				sd	17.27	66.59	203.21	434.93	137.10	459.86	138.16	39.13	1058.36	0.00	0.00
		59	**shelt**	**mean**	**145.92**	**49.50**	**12.49**	**273.37**	**0.00**	**27.86**	**170.03**	**3.40**	**816.21**	**0.00**	**0.00**
				sd	43.44	62.71	17.10	149.25	0.00	39.32	71.99	2.68	120.54	0.00	0.00
		60	**exp**	**mean**	**49.73**	**4.47**	**52.17**	**54.12**	**11.38**	**4.28**	**111.96**	**1.99**	**357.51**	**0.00**	**0.00**
				sd	25.95	3.32	60.22	30.63	18.47	4.92	44.78	1.42	84.93	0.00	0.00
		61	**shelt**	**mean**	**59.47**	**3.29**	**44.75**	**37.23**	**0.00**	**47.90**	**5.81**	**0.29**	**314.12**	**0.00**	**0.00**
				sd	81.60	6.05	62.13	64.69	0.00	107.11	6.97	0.65	394.05	0.00	0.00
Western	**New Georgia**	**29**	**exp**	**mean**	**0.00**	**40.97**	**0.00**	**1757.36**	**0.00**	**1953.68**	**3062.22**	**126.25**	**7104.23**	**388.12**	**0.00**
				sd	0.00	68.03	0.00	2673.76	0.00	2295.36	5128.26	117.11	6421.35	323.93	0.00
		30	**exp**	**mean**	**0.00**	**153.81**	**0.00**	**19.89**	**25.05**	**177.40**	**49.36**	**37.90**	**534.16**	**0.00**	**0.00**
				sd	0.00	328.03	0.00	28.35	56.00	219.71	43.95	49.23	496.12	0.00	0.00
		31	**shelt**	**mean**	**115.89**	**20.32**	**331.16**	**68.87**	**0.00**	**6.35**	**110.14**	**23.75**	**1764.58**	**22.54**	**0.00**
				sd	25.15	13.75	222.66	26.12	0.00	10.07	28.57	15.85	2334.05	22.54	0.00
		32	**exp**	**mean**	**71.37**	**122.30**	**152.49**	**43.25**	**0.00**	**2083.54**	**259.33**	**70.42**	**2927.44**	**991.21**	**0.00**
				sd	47.21	174.74	310.71	45.58	0.00	2482.72	202.09	92.13	2567.89	991.21	0.00
		33	**exp**	**mean**	**75.13**	**81.86**	**732.91**	**772.46**	**278.52**	**540.23**	**45.97**	**88.05**	**2831.63**	**0.00**	**0.00**
				sd	19.58	133.09	395.57	1381.50	243.73	517.99	23.26	178.44	1781.80	0.00	0.00
		34	**exp**	**mean**	**113.53**	**143.52**	**132.02**	**268.54**	**0.00**	**121.05**	**235.34**	**11.52**	**1251.39**	**0.00**	**0.00**
				sd	59.91	156.08	125.12	108.38	0.00	119.32	298.79	16.93	562.54	0.00	0.00

					Bony Fishes									Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Damselfishes**	**Emperors**	**Fusiliers**	**Parrotfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**TOTAL (all bony fishes)**	**Sharks**	**Rays**
	New Georgia (con't)	**35**	**shelt**	**mean**	**161.45**	**6.91**	**1527.79**	**83.01**	**0.00**	**181.93**	**381.28**	**1.77**	**2505.59**	**107.81**	**0.00**
				sd	40.85	6.08	1561.91	160.91	0.00	397.89	705.24	2.32	1352.58	107.81	0.00
		36	**exp**	**mean**	**131.54**	**126.18**	**418.51**	**479.60**	**116.27**	**77.78**	**104.36**	**139.38**	**1728.80**	**563.04**	**0.00**
				sd	28.57	178.53	510.05	667.42	256.00	93.62	46.22	222.15	1269.09	553.59	0.00
		37	**shelt**	**mean**	**220.00**	**68.29**	**807.86**	**357.35**	**0.00**	**163.70**	**105.53**	**101.23**	**3139.74**	**1155.24**	**0.00**
				sd	74.49	96.56	1089.58	455.44	0.00	247.95	35.78	149.17	1942.87	963.38	0.00
Western	**Shortlands**	**25**	**exp**	**mean**	**174.28**	**80.87**	**88.45**	**209.22**	**0.00**	**241.62**	**675.13**	**33.04**	**1698.04**	**5.00**	**0.00**
				sd	99.04	141.02	96.07	155.07	0.00	294.08	421.14	49.12	789.01	5.00	0.00
		26	**shelt**	**mean**	**221.79**	**13.67**	**247.67**	**1326.90**	**0.00**	**40.69**	**108.43**	**14.12**	**2118.79**	**0.00**	**0.00**
				sd	124.76	9.08	148.18	2756.48	0.00	45.13	31.23	13.60	2809.14	0.00	0.00
		27	**exp**	**mean**	**0.00**	**5090.59**	**189.67**	**2464.48**	**0.00**	**10357.05**	**3750.86**	**8.39**	**21863.35**	**343.17**	**0.00**
				sd	0.00	5555.93	424.11	2256.92	0.00	11100.92	2228.50	10.63	14860.17	210.49	0.00
		28	**shelt**	**mean**	**0.00**	**7.94**	**15.48**	**0.00**	**0.00**	**3.19**	**0.06**	**13.00**	**53.94**	**142.40**	**0.00**
				sd	0.00	15.65	30.29	0.00	0.00	4.99	0.13	17.42	25.68	110.83	0.00

Appendix 4. Mean density of key families of food fishes on sheltered and exposed reefs slopes (10m) in the Solomon Islands.

					Bony Fishes								Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	**Emperors**	**Fusiliers**	**Goatfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**Parrotfishes**	**Sharks**	**Rays**
Central	**Floridas**	**1**	**shelt**	**mean**	**74.67**	**0.00**	**0.00**	**0.00**	**80.00**	**309.33**	**264.00**	**112.00**	**0.00**	**0.00**
				sd	145.63	0.00	0.00	0.00	116.62	188.42	216.52	117.98	0.00	0.00
		2	**exp**	**mean**	**0.00**	**1333.33**	**13.33**	**0.00**	**280.00**	**1410.67**	**184.00**	**0.00**	**0.00**	**0.00**
				sd	0.00	1491.93	29.81	0.00	234.95	783.35	147.09	0.00	0.00	0.00
		62	**exp**	**mean**	**0.00**	**480.00**	**29.33**	**0.00**	**40.00**	**506.67**	**48.00**	**29.33**	**0.00**	**0.00**
				sd	0.00	715.54	46.57	0.00	59.63	357.27	86.72	40.44	0.00	0.00
		63	**shelt**	**mean**	**24.00**	**792.00**	**16.00**	**0.00**	**0.00**	**144.00**	**93.33**	**0.00**	**0.00**	**0.00**
				sd	21.91	1062.22	21.91	0.00	0.00	28.91	102.42	0.00	0.00	0.00
Central	**Russells**	**38**	**exp**	**mean**	**3277.33**	**2840.00**	**288.00**	**2589.33**	**9277.33**	**1138.67**	**117.33**	**250.67**	**16.00**	**0.00**
				sd	3708.98	4396.36	490.86	626.34	4883.67	1345.10	117.91	40.44	9.80	0.00
		39	**shelt**	**mean**	**269.33**	**0.00**	**80.00**	**0.00**	**184.00**	**445.33**	**29.33**	**552.00**	**0.00**	**0.00**
				sd	116.77	0.00	82.19	0.00	87.64	259.68	28.91	289.61	0.00	0.00
		40	**exp**	**mean**	**4058.67**	**0.00**	**416.00**	**0.00**	**448.00**	**960.00**	**186.67**	**285.33**	**0.00**	**0.00**
				sd	8300.98	0.00	757.15	0.00	274.00	449.10	58.88	278.82	0.00	0.00
		41	**shelt**	**mean**	**597.33**	**384.00**	**0.00**	**3869.33**	**5045.33**	**349.33**	**157.33**	**2778.67**	**16.00**	**0.00**
				sd	977.63	858.65	0.00	8607.44	10641.17	378.23	131.79	5256.22	9.80	0.00
Central	**Savo**	**64**	**exp**	**mean**	**1320.00**	**0.00**	**288.00**	**392.00**	**1269.33**	**941.33**	**112.00**	**0.00**	**0.00**	**0.00**
				sd	1100.18	0.00	343.39	876.54	905.07	688.10	111.00	0.00	0.00	0.00
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**912.00**	**1360.00**	**154.67**	**128.00**	**7712.00**	**4306.67**	**205.33**	**1261.33**	**0.00**	**0.00**
				sd	650.24	2616.87	94.56	286.22	3311.21	1248.32	116.08	1168.08	0.00	0.00
		18	**shelt**	**mean**	**608.00**	**712.00**	**120.00**	**0.00**	**1346.67**	**618.67**	**160.00**	**8.00**	**0.00**	**0.00**
				sd	587.47	618.64	191.83	0.00	847.32	168.55	115.85	17.89	0.00	0.00
		19	**shelt**	**mean**	**168.00**	**6053.33**	**136.00**	**0.00**	**386.67**	**493.33**	**133.33**	**8.00**	**0.00**	**0.00**
				sd	57.81	2165.59	239.33	0.00	306.09	121.11	38.87	17.89	0.00	0.00
		20	**exp**	**mean**	**381.33**	**3200.00**	**21.33**	**0.00**	**1325.33**	**1384.00**	**85.33**	**1786.67**	**8.00**	**0.00**
				sd	417.14	4604.35	30.70	0.00	1409.67	700.12	68.38	2787.83	8.00	0.00

					Bony Fishes								Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	**Emperors**	**Fusiliers**	**Goatfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**Parrotfishes**	**Sharks**	**Rays**
	Choiseul (con't)	**21**	**exp**	**mean**	**1280.00**	**0.00**	**362.67**	**0.00**	**421.33**	**14744.00**	**304.00**	**96.00**	**8.00**	**0.00**
				sd	1255.49	0.00	251.82	0.00	243.78	5751.49	176.48	49.35	8.00	0.00
		22	**shelt**	**mean**	**413.33**	**0.00**	**2069.33**	**0.00**	**461.33**	**744.00**	**197.33**	**136.00**	**0.00**	**0.00**
				sd	511.82	0.00	3375.50	0.00	483.29	414.88	23.85	168.76	0.00	0.00
		23	**exp**	**mean**	**1450.67**	**1064.00**	**138.67**	**8.00**	**192.00**	**1602.67**	**106.67**	**130.67**	**0.00**	**0.00**
				sd	1888.76	1571.14	188.00	17.89	86.72	581.52	32.66	105.58	0.00	0.00
		24	**shelt**	**mean**	**101.33**	**320.00**	**216.00**	**0.00**	**16.00**	**400.00**	**24.00**	**13.33**	**0.00**	**0.00**
				sd	74.60	452.55	121.98	0.00	35.78	156.35	53.67	29.81	0.00	0.00
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**304.00**	**0.00**	**240.00**	**0.00**	**469.33**	**1997.33**	**440.00**	**0.00**	**0.00**	**0.00**
				sd	496.87	0.00	254.56	0.00	795.17	3571.96	283.78	0.00	0.00	0.00
		43	**shelt**	**mean**	**549.33**	**24.00**	**13.33**	**0.00**	**1200.00**	**274.67**	**584.00**	**0.00**	**8.00**	**8.00**
				sd	428.99	53.67	29.81	0.00	1694.23	161.82	582.13	0.00	8.00	8.00
		65	**exp**	**mean**	**112.00**	**0.00**	**237.33**	**0.00**	**200.00**	**506.67**	**112.00**	**8.00**	**0.00**	**0.00**
				sd	17.89	0.00	220.99	0.00	165.19	304.05	92.66	17.89	0.00	0.00
		66	**exp**	**mean**	**0.00**	**0.00**	**146.67**	**0.00**	**21.33**	**946.67**	**176.00**	**0.00**	**13.33**	**0.00**
				sd	0.00	0.00	327.96	0.00	47.70	1863.33	104.31	0.00	13.33	0.00
Isabel	**Arnavons**	**15**	**exp**	**mean**	**2965.33**	**1120.00**	**90.67**	**1200.00**	**8274.67**	**2312.00**	**261.33**	**1314.67**	**0.00**	**0.00**
				sd	2493.45	1752.71	100.40	1788.85	8485.19	872.78	157.93	1716.14	0.00	0.00
		16	**shelt**	**mean**	**1088.00**	**373.33**	**58.67**	**0.00**	**733.33**	**1050.67**	**146.67**	**557.33**	**8.00**	**0.00**
				sd	1138.37	695.38	82.52	0.00	565.29	968.77	151.73	583.89	8.00	0.00
Isabel	**Isabel**	**3**	**exp**	**mean**	**80.00**	**3061.33**	**16.00**	**576.00**	**0.00**	**1981.33**	**154.67**	**0.00**	**0.00**	**0.00**
				sd	138.56	802.58	35.78	1111.97	0.00	1443.35	57.81	0.00	0.00	0.00
		4	**shelt**	**mean**	**109.33**	**4069.33**	**0.00**	**432.00**	**6093.33**	**80.00**	**146.67**	**0.00**	**0.00**	**0.00**
				sd	62.11	4102.63	0.00	597.60	8651.22	119.26	136.95	0.00	0.00	0.00
		5	**exp**	**mean**	**2128.00**	**720.00**	**778.67**	**0.00**	**2866.67**	**4642.67**	**370.67**	**0.00**	**0.00**	**0.00**
				sd	1617.75	995.99	1089.53	0.00	6291.06	3583.26	306.43	0.00	0.00	0.00
		6	**shelt**	**mean**	**133.33**	**504.00**	**0.00**	**0.00**	**290.67**	**840.00**	**304.00**	**37.33**	**0.00**	**0.00**
				sd	109.95	1126.98	0.00	0.00	303.23	728.53	128.37	51.98	0.00	0.00

Province	Island	Site	Exposure	Mean Density (per ha)	Bony Fishes								Sharks & Rays	
					Emperors	Fusiliers	Goatfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Parrotfishes	Sharks	Rays
		7	exp	mean	**298.67**	**3786.67**	**32.00**	**893.33**	**2469.33**	**1218.67**	**144.00**	**584.00**	**0.00**	**0.00**
				sd	528.53	5582.19	71.55	1266.32	1982.22	540.01	180.22	763.47	0.00	0.00
		8	shelt	mean	**96.00**	**2562.67**	**16.00**	**16.00**	**341.33**	**2104.00**	**32.00**	**0.00**	**0.00**	**0.00**
				sd	104.31	2639.70	35.78	35.78	412.32	654.79	33.47	0.00	0.00	0.00
		9	exp	mean	**48.00**	**240.00**	**82.67**	**0.00**	**16.00**	**1784.00**	**64.00**	**0.00**	**0.00**	**0.00**
				sd	52.15	536.66	109.30	0.00	35.78	1172.33	53.67	0.00	0.00	0.00
		10	shelt	mean	**277.33**	**141.33**	**34.67**	**0.00**	**8.00**	**464.00**	**16.00**	**0.00**	**0.00**	**0.00**
				sd	357.45	196.32	77.52	0.00	17.89	416.06	21.91	0.00	0.00	0.00
		11	exp	mean	**997.33**	**6506.67**	**29.33**	**0.00**	**6253.33**	**3434.67**	**1848.00**	**765.33**	**0.00**	**0.00**
				sd	1374.87	3960.25	65.59	0.00	4065.84	1205.97	1288.22	963.03	0.00	0.00
		12	shelt	mean	**170.67**	**466.67**	**42.67**	**0.00**	**16.00**	**77.33**	**56.00**	**178.67**	**0.00**	**0.00**
				sd	94.00	689.61	45.61	0.00	21.91	116.77	21.91	100.93	0.00	0.00
		13	exp	mean	**600.00**	**4320.00**	**112.00**	**0.00**	**53.33**	**874.67**	**128.00**	**120.00**	**0.00**	**0.00**
				sd	894.43	9659.81	168.29	0.00	41.10	464.34	86.72	268.33	0.00	0.00
		14	shelt	mean	**1018.67**	**3781.33**	**13.33**	**0.00**	**189.33**	**1717.33**	**256.00**	**69.33**	**0.00**	**0.00**
				sd	831.31	4107.98	29.81	0.00	120.15	2246.39	101.72	71.43	0.00	0.00
Makira	**Makira**	44	exp	mean	**2696.00**	**0.00**	**168.00**	**4229.33**	**3458.67**	**837.33**	**45.33**	**1016.00**	**0.00**	**0.00**
				sd	3356.38	0.00	179.78	5648.98	5631.80	397.03	62.25	1116.64	0.00	0.00
		45	shelt	mean	**85.33**	**1120.00**	**565.33**	**0.00**	**0.00**	**456.00**	**56.00**	**258.67**	**0.00**	**0.00**
				sd	112.59	1559.49	746.94	0.00	0.00	858.86	35.78	294.33	0.00	0.00
		46	exp	mean	**405.33**	**320.00**	**34.67**	**16.00**	**1405.33**	**1704.00**	**96.00**	**8.00**	**24.00**	**0.00**
				sd	585.95	715.54	57.81	35.78	2389.73	235.02	100.40	17.89	24.00	0.00
		47	shelt	mean	**56.00**	**0.00**	**264.00**	**0.00**	**514.67**	**66.67**	**101.33**	**0.00**	**16.00**	**0.00**
				sd	104.31	0.00	119.78	0.00	512.04	81.65	94.56	0.00	9.80	0.00
Makira	**Three Sisters**	48	exp	mean	**176.00**	**0.00**	**117.33**	**0.00**	**429.33**	**1365.33**	**186.67**	**13.33**	**0.00**	**0.00**
				sd	175.73	0.00	175.22	0.00	502.12	760.44	129.27	29.81	0.00	0.00
		49	shelt	mean	**253.33**	**0.00**	**125.33**	**160.00**	**74.67**	**637.33**	**261.33**	**165.33**	**0.00**	**0.00**
				sd	290.90	0.00	158.77	357.77	123.86	190.30	123.86	166.16	0.00	0.00

					Bony Fishes								Sharks & Rays	
Province	Island	Site	Exposure	Mean Density (per ha)	Emperors	Fusiliers	Goatfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Parrotfishes	Sharks	Rays
Makira	**Ugi**	**50**	**exp**	**mean**	**618.67**	**0.00**	**328.00**	**0.00**	**1026.67**	**1098.67**	**322.67**	**104.00**	**0.00**	**0.00**
				sd	1235.28	0.00	325.18	0.00	1338.06	593.04	158.72	151.26	0.00	0.00
		51	**shelt**	**mean**	**933.33**	**0.00**	**88.00**	**0.00**	**181.33**	**882.67**	**277.33**	**0.00**	**0.00**	**0.00**
				sd	1762.37	0.00	121.33	0.00	232.97	318.25	383.37	0.00	0.00	0.00
Malaita	**Malaita**	**52**	**shelt**	**mean**	**56.00**	**1360.00**	**101.33**	**0.00**	**104.00**	**434.67**	**282.67**	**8.00**	**0.00**	**0.00**
				sd	56.88	2109.03	60.81	0.00	144.35	391.31	228.11	17.89	0.00	0.00
		53	**exp**	**mean**	**453.33**	**0.00**	**21.33**	**202.67**	**800.00**	**944.00**	**152.00**	**61.33**	**0.00**	**0.00**
				sd	302.14	0.00	30.70	303.37	1213.26	267.23	103.54	82.52	0.00	0.00
		54	**shelt**	**mean**	**45.33**	**880.00**	**226.67**	**0.00**	**16.00**	**109.33**	**136.00**	**0.00**	**0.00**	**0.00**
				sd	70.30	1213.26	44.22	0.00	35.78	80.77	111.71	0.00	0.00	0.00
		55	**exp**	**mean**	**85.33**	**0.00**	**26.67**	**13.33**	**1069.33**	**1696.00**	**138.67**	**85.33**	**0.00**	**8.00**
				sd	134.20	0.00	36.51	29.81	1336.11	877.24	82.52	129.82	0.00	8.00
		56	**exp**	**mean**	**232.00**	**2712.00**	**37.33**	**0.00**	**53.33**	**1661.33**	**146.67**	**0.00**	**0.00**	**0.00**
				sd	156.23	2104.93	54.49	0.00	49.89	2141.73	121.11	0.00	0.00	0.00
		57	**shelt**	**mean**	**69.33**	**0.00**	**34.67**	**0.00**	**160.00**	**1912.00**	**82.67**	**66.67**	**0.00**	**0.00**
				sd	99.51	0.00	57.81	0.00	224.50	1174.15	67.59	115.47	0.00	0.00
		58	**exp**	**mean**	**349.33**	**0.00**	**376.00**	**104.00**	**829.33**	**2088.00**	**93.33**	**53.33**	**0.00**	**0.00**
				sd	144.35	0.00	542.62	232.55	775.48	764.41	95.68	73.64	0.00	0.00
		59	**shelt**	**mean**	**237.33**	**80.00**	**104.00**	**0.00**	**109.33**	**1682.67**	**160.00**	**8.00**	**0.00**	**0.00**
				sd	331.11	178.89	82.95	0.00	166.64	551.39	56.57	17.89	0.00	0.00
		60	**exp**	**mean**	**80.00**	**480.00**	**85.33**	**21.33**	**61.33**	**722.67**	**32.00**	**0.00**	**0.00**	**0.00**
				sd	61.82	715.54	38.41	30.70	48.63	226.16	33.47	0.00	0.00	0.00
		61	**shelt**	**mean**	**69.33**	**320.00**	**133.33**	**0.00**	**93.33**	**93.33**	**13.33**	**8.00**	**0.00**	**0.00**
				sd	133.80	715.54	230.94	0.00	208.70	89.44	29.81	17.89	0.00	0.00
Western	**New Georgia**	**29**	**exp**	**mean**	**168.00**	**0.00**	**0.00**	**0.00**	**6216.00**	**5424.00**	**200.00**	**1776.00**	**16.00**	**0.00**
				sd	353.72	0.00	0.00	0.00	7282.34	7383.58	162.48	2515.01	9.80	0.00
		30	**exp**	**mean**	**264.00**	**0.00**	**16.00**	**16.00**	**344.00**	**216.00**	**120.00**	**16.00**	**0.00**	**0.00**
				sd	480.50	0.00	21.91	35.78	508.02	143.11	80.00	21.91	0.00	0.00

					Bony Fishes								Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	**Emperors**	**Fusiliers**	**Goatfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**Parrotfishes**	**Sharks**	**Rays**
	New Georgia (con't)	**31**	**shelt**	**mean**	**242.67**	**5040.00**	**133.33**	**0.00**	**77.33**	**1258.67**	**144.00**	**53.33**	**8.00**	**0.00**
				sd	166.37	2523.49	45.22	0.00	110.92	454.27	60.66	86.92	8.00	0.00
		32	**exp**	**mean**	**237.33**	**480.00**	**61.33**	**0.00**	**15533.33**	**1394.67**	**106.67**	**16.00**	**13.33**	**0.00**
				sd	307.30	1073.31	116.08	0.00	19692.46	527.52	99.33	35.78	13.33	0.00
		33	**exp**	**mean**	**541.33**	**6720.00**	**589.33**	**1520.00**	**3616.00**	**312.00**	**152.00**	**2354.67**	**0.00**	**0.00**
				sd	685.18	3871.95	506.35	1396.28	4195.01	135.19	165.89	3770.32	0.00	0.00
		34	**exp**	**mean**	**1642.67**	**3160.00**	**1741.33**	**0.00**	**1202.67**	**2221.33**	**64.00**	**144.00**	**0.00**	**0.00**
				sd	1948.98	3106.12	3589.97	0.00	1051.96	1430.57	66.93	118.66	0.00	0.00
		35	**shelt**	**mean**	**96.00**	**16800.00**	**74.67**	**0.00**	**1160.00**	**1432.00**	**45.33**	**72.00**	**24.00**	**0.00**
				sd	72.66	17064.58	50.42	0.00	2504.72	1698.35	41.74	161.00	24.00	0.00
		36	**exp**	**mean**	**1418.67**	**8112.00**	**133.33**	**648.00**	**336.00**	**2336.00**	**181.33**	**1040.00**	**21.33**	**0.00**
				sd	1987.57	7237.59	88.44	1426.72	294.45	539.17	108.98	1781.91	13.73	0.00
		37	**shelt**	**mean**	**794.67**	**5056.00**	**26.67**	**0.00**	**853.33**	**994.67**	**261.33**	**125.33**	**21.33**	**0.00**
				sd	1099.64	7788.69	59.63	0.00	1169.43	217.58	199.69	236.38	13.73	0.00
Western	**Shortlands**	**25**	**exp**	**mean**	**456.00**	**266.67**	**13.33**	**0.00**	**3717.33**	**4512.00**	**72.00**	**13.33**	**8.00**	**0.00**
				sd	625.84	596.28	29.81	0.00	5447.34	2367.49	111.40	29.81	8.00	0.00
		26	**shelt**	**mean**	**173.33**	**720.00**	**117.33**	**0.00**	**114.67**	**1106.67**	**125.33**	**261.33**	**0.00**	**0.00**
				sd	126.84	715.54	104.73	0.00	100.04	292.88	20.22	584.36	0.00	0.00
		27	**exp**	**mean**	**7016.00**	**2400.00**	**0.00**	**0.00**	**14896.00**	**7888.00**	**168.00**	**5392.00**	**16.00**	**0.00**
				sd	7984.46	5366.56	0.00	0.00	9074.39	4656.47	127.75	5037.73	9.80	0.00
		28	**shelt**	**mean**	**64.00**	**736.00**	**48.00**	**0.00**	**184.00**	**24.00**	**208.00**	**0.00**	**16.00**	**0.00**
				sd	87.64	718.67	65.73	0.00	368.35	53.67	121.33	0.00	9.80	0.00

Appendix 5. Mean density of each genera of food fishes in two key families (snappers and groupers) of reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
Central	**Floridas**	**1**	**shelt**	**mean**	**0.00**	**48.00**	**32.00**	**0.00**	**40.00**	**8.00**	**0.00**	**96.00**	**32.00**
				std	0.00	52.15	71.55	0.00	89.44	17.89	0.00	72.66	52.15
		2	**exp**	**mean**	**0.00**	**136.00**	**144.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**128.00**
				std	0.00	140.29	199.20	0.00	0.00	0.00	0.00	0.00	76.94
		62	**exp**	**mean**	**0.00**	**0.00**	**40.00**	**0.00**	**16.00**	**0.00**	**21.33**	**0.00**	**82.67**
				std	0.00	0.00	59.63	0.00	21.91	0.00	47.70	0.00	27.33
		63	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**64.00**	**0.00**
				std	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.67	0.00
Central	**Russells**	**38**	**exp**	**mean**	**0.00**	**7573.33**	**1704.00**	**0.00**	**13.33**	**0.00**	**0.00**	**48.00**	**0.00**
				std	0.00	4159.08	1852.79	0.00	29.81	0.00	0.00	71.55	0.00
		39	**shelt**	**mean**	**0.00**	**168.00**	**16.00**	**0.00**	**0.00**	**0.00**	**0.00**	**45.33**	**0.00**
				std	0.00	99.60	35.78	0.00	0.00	0.00	0.00	47.70	0.00
		40	**exp**	**mean**	**0.00**	**104.00**	**344.00**	**0.00**	**24.00**	**0.00**	**0.00**	**24.00**	**16.00**
				std	0.00	104.31	207.29	0.00	53.67	0.00	0.00	35.78	35.78
		41	**shelt**	**mean**	**0.00**	**4840.00**	**205.33**	**0.00**	**8.00**	**0.00**	**8.00**	**48.00**	**0.00**
				std	0.00	10755.54	158.77	0.00	17.89	0.00	17.89	65.73	0.00
Central	**Savo**	**64**	**exp**	**mean**	**0.00**	**861.33**	**408.00**	**0.00**	**45.33**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	951.99	853.16	0.00	70.30	0.00	0.00	0.00	0.00
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**64.00**	**5821.33**	**1826.67**	**0.00**	**16.00**	**0.00**	**0.00**	**0.00**	**24.00**
				std	72.66	3414.03	1224.82	0.00	21.91	0.00	0.00	0.00	35.78
		18	**shelt**	**mean**	**8.00**	**808.00**	**530.67**	**0.00**	**45.33**	**0.00**	**0.00**	**8.00**	**0.00**
				std	17.89	534.71	365.93	0.00	38.41	0.00	0.00	17.89	0.00
		19	**shelt**	**mean**	**0.00**	**216.00**	**170.67**	**0.00**	**82.67**	**0.00**	**13.33**	**0.00**	**8.00**
				std	0.00	209.00	128.72	0.00	55.30	0.00	29.81	0.00	17.89
		20	**exp**	**mean**	**0.00**	**805.33**	**520.00**	**0.00**	**21.33**	**0.00**	**0.00**	**32.00**	**8.00**
				std	0.00	1565.08	382.62	0.00	47.70	0.00	0.00	43.82	17.89

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	Choiseul (con't)	**21**	**exp**	**mean**	**13.33**	**0.00**	**408.00**	**0.00**	**29.33**	**0.00**	**0.00**	**0.00**	**64.00**
				std	29.81	0.00	261.04	0.00	28.91	0.00	0.00	0.00	60.66
		22	**shelt**	**mean**	**0.00**	**141.33**	**320.00**	**0.00**	**104.00**	**0.00**	**0.00**	**0.00**	**16.00**
				std	0.00	171.68	322.21	0.00	137.40	0.00	0.00	0.00	21.91
		23	**exp**	**mean**	**0.00**	**120.00**	**72.00**	**0.00**	**40.00**	**0.00**	**0.00**	**13.33**	**16.00**
				std	0.00	129.61	52.15	0.00	69.28	0.00	0.00	29.81	21.91
		24	**shelt**	**mean**	**0.00**	**0.00**	**8.00**	**8.00**	**21.33**	**0.00**	**16.00**	**8.00**	**0.00**
				std	0.00	0.00	17.89	17.89	47.70	0.00	21.91	17.89	0.00
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**0.00**	**408.00**	**61.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**64.00**
				std	0.00	805.18	41.74	0.00	0.00	0.00	0.00	0.00	104.31
		43	**shelt**	**mean**	**0.00**	**1008.00**	**192.00**	**0.00**	**32.00**	**0.00**	**0.00**	**80.00**	**0.00**
				std	0.00	1358.35	429.33	0.00	33.47	0.00	0.00	61.82	0.00
		65	**exp**	**mean**	**0.00**	**48.00**	**152.00**	**0.00**	**0.00**	**0.00**	**26.67**	**0.00**	**16.00**
				std	0.00	65.73	195.64	0.00	0.00	0.00	36.51	0.00	21.91
		66	**exp**	**mean**	**0.00**	**0.00**	**21.33**	**0.00**	**34.67**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	0.00	47.70	0.00	77.52	0.00	0.00	0.00	0.00
Isabel	**Arnavons**	**15**	**exp**	**mean**	**64.00**	**7069.33**	**1141.33**	**0.00**	**8.00**	**0.00**	**21.33**	**133.33**	**173.33**
				std	60.66	6998.99	1550.53	0.00	17.89	0.00	30.70	151.73	160.28
		16	**shelt**	**mean**	**32.00**	**322.67**	**378.67**	**0.00**	**24.00**	**0.00**	**0.00**	**72.00**	**32.00**
				std	43.82	345.95	360.57	0.00	53.67	0.00	0.00	99.60	52.15
Isabel	**Isabel**	**3**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**	**0.00**	**0.00**	**0.00**	**8.00**
				std	0.00	0.00	0.00	0.00	56.57	0.00	0.00	0.00	17.89
		4	**shelt**	**mean**	**0.00**	**6093.33**	**0.00**	**0.00**	**58.67**	**0.00**	**0.00**	**13.33**	**0.00**
				std	0.00	8651.22	0.00	0.00	110.19	0.00	0.00	29.81	0.00
		5	**exp**	**mean**	**0.00**	**2528.00**	**338.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	5608.17	685.18	0.00	0.00	0.00	0.00	0.00	0.00
		6	**shelt**	**mean**	**0.00**	**64.00**	**218.67**	**8.00**	**37.33**	**0.00**	**0.00**	**0.00**	**16.00**
				std	0.00	60.66	239.00	17.89	37.00	0.00	0.00	0.00	21.91

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	Isabel (con't)	**7**	**exp**	**mean**	**96.00**	**1616.00**	**757.33**	**0.00**	**0.00**	**0.00**	**0.00**	**8.00**	**0.00**
				std	214.66	1994.11	464.89	0.00	0.00	0.00	0.00	17.89	0.00
		8	**shelt**	**mean**	**0.00**	**56.00**	**285.33**	**0.00**	**8.00**	**0.00**	**0.00**	**21.33**	**0.00**
				std	0.00	66.93	350.06	0.00	17.89	0.00	0.00	30.70	0.00
		9	**exp**	**mean**	**0.00**	**0.00**	**16.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.33**	**0.00**
				std	0.00	0.00	35.78	0.00	0.00	0.00	0.00	30.70	0.00
		10	**shelt**	**mean**	**0.00**	**8.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	17.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		11	**exp**	**mean**	**0.00**	**6085.33**	**168.00**	**0.00**	**13.33**	**0.00**	**13.33**	**45.33**	**8.00**
				std	0.00	3987.10	230.48	0.00	29.81	0.00	29.81	62.25	17.89
		12	**shelt**	**mean**	**0.00**	**8.00**	**0.00**	**8.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	17.89	0.00	17.89	0.00	0.00	0.00	0.00	0.00
		13	**exp**	**mean**	**8.00**	**21.33**	**24.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**104.00**
				std	17.89	47.70	21.91	0.00	0.00	0.00	0.00	0.00	72.66
		14	**shelt**	**mean**	**8.00**	**45.33**	**136.00**	**0.00**	**24.00**	**0.00**	**0.00**	**0.00**	**16.00**
				std	17.89	41.74	92.09	0.00	35.78	0.00	0.00	0.00	21.91
Makira	**Makira**	**44**	**exp**	**mean**	**0.00**	**3261.33**	**197.33**	**0.00**	**0.00**	**0.00**	**0.00**	**21.33**	**0.00**
				std	0.00	5676.80	304.98	0.00	0.00	0.00	0.00	30.70	0.00
		45	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**16.00**	**0.00**	**13.33**	**53.33**	**0.00**
				std	0.00	0.00	0.00	0.00	21.91	0.00	29.81	18.86	0.00
		46	**exp**	**mean**	**0.00**	**680.00**	**725.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**24.00**
				std	0.00	975.29	1451.30	0.00	0.00	0.00	0.00	0.00	21.91
		47	**shelt**	**mean**	**0.00**	**485.33**	**29.33**	**0.00**	**16.00**	**0.00**	**58.67**	**32.00**	**21.33**
				std	0.00	479.31	46.57	0.00	21.91	0.00	54.65	52.15	47.70
Makira	**Three Sisters**	**48**	**exp**	**mean**	**0.00**	**224.00**	**205.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**24.00**
				std	0.00	285.10	285.59	0.00	0.00	0.00	0.00	0.00	35.78
		49	**shelt**	**mean**	**8.00**	**0.00**	**66.67**	**0.00**	**0.00**	**0.00**	**8.00**	**0.00**	**0.00**
				std	17.89	0.00	127.89	0.00	0.00	0.00	17.89	0.00	0.00
Makira	**Ugi**	**50**	**exp**	**mean**	**8.00**	**378.67**	**640.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**29.33**
				std	17.89	780.35	1319.60	0.00	0.00	0.00	0.00	0.00	28.91

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	Ugi (con't)	**51**	**shelt**	**mean**	**0.00**	**72.00**	**109.33**	**0.00**	**8.00**	**0.00**	**48.00**	**0.00**	**8.00**
				std	0.00	99.60	133.80	0.00	17.89	0.00	86.72	0.00	17.89
Malaita	**Malaita**	**52**	**shelt**	**mean**	**0.00**	**58.67**	**45.33**	**0.00**	**8.00**	**0.00**	**13.33**	**21.33**	**0.00**
				std	0.00	131.18	101.37	0.00	17.89	0.00	29.81	30.70	0.00
		53	**exp**	**mean**	**0.00**	**720.00**	**80.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**
				std	0.00	1233.53	74.83	0.00	0.00	0.00	0.00	0.00	40.00
		54	**shelt**	**mean**	**0.00**	**0.00**	**16.00**	**0.00**	**0.00**	**0.00**	**56.00**	**66.67**	**0.00**
				std	0.00	0.00	35.78	0.00	0.00	0.00	80.22	28.28	0.00
		55	**exp**	**mean**	**21.33**	**656.00**	**392.00**	**0.00**	**0.00**	**0.00**	**0.00**	**37.33**	**0.00**
				std	30.70	864.68	520.91	0.00	0.00	0.00	0.00	43.61	0.00
		56	**exp**	**mean**	**0.00**	**0.00**	**53.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	0.00	49.89	0.00	0.00	0.00	0.00	0.00	0.00
		57	**shelt**	**mean**	**0.00**	**24.00**	**136.00**	**0.00**	**8.00**	**0.00**	**26.67**	**40.00**	**8.00**
				std	0.00	53.67	220.18	0.00	17.89	0.00	36.51	28.28	17.89
		58	**exp**	**mean**	**0.00**	**586.67**	**242.67**	**0.00**	**21.33**	**0.00**	**0.00**	**0.00**	**8.00**
				std	0.00	681.24	506.18	0.00	47.70	0.00	0.00	0.00	17.89
		59	**shelt**	**mean**	**0.00**	**88.00**	**21.33**	**0.00**	**40.00**	**0.00**	**8.00**	**8.00**	**8.00**
				std	0.00	155.95	30.70	0.00	59.63	0.00	17.89	17.89	17.89
		60	**exp**	**mean**	**0.00**	**0.00**	**61.33**	**0.00**	**26.67**	**0.00**	**0.00**	**0.00**	**32.00**
				std	0.00	0.00	48.63	0.00	59.63	0.00	0.00	0.00	43.82
		61	**shelt**	**mean**	**0.00**	**64.00**	**29.33**	**0.00**	**0.00**	**0.00**	**0.00**	**13.33**	**0.00**
				std	0.00	143.11	65.59	0.00	0.00	0.00	0.00	29.81	0.00
Western	**New Georgia**	**29**	**exp**	**mean**	**32.00**	**4592.00**	**1592.00**	**0.00**	**0.00**	**0.00**	**0.00**	**64.00**	**32.00**
				std	52.15	4949.13	2533.36	0.00	0.00	0.00	0.00	104.31	71.55
		30	**exp**	**mean**	**0.00**	**64.00**	**280.00**	**0.00**	**8.00**	**0.00**	**8.00**	**16.00**	**8.00**
				std	0.00	100.40	407.92	0.00	17.89	0.00	17.89	35.78	17.89
		31	**shelt**	**mean**	**0.00**	**8.00**	**69.33**	**0.00**	**48.00**	**0.00**	**0.00**	**56.00**	**0.00**
				std	0.00	17.89	96.79	0.00	52.15	0.00	0.00	66.93	0.00
		32	**exp**	**mean**	**0.00**	**15293.33**	**240.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**
				std	0.00	19895.48	492.34	0.00	0.00	0.00	0.00	0.00	89.44

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	New Georgia (con't)	**33**	**exp**	**mean**	**0.00**	**3280.00**	**336.00**	**0.00**	**93.33**	**8.00**	**0.00**	**40.00**	**0.00**
				std	0.00	3902.41	381.16	0.00	151.73	17.89	0.00	89.44	0.00
		34	**exp**	**mean**	**0.00**	**1173.33**	**21.33**	**8.00**	**8.00**	**0.00**	**0.00**	**16.00**	**0.00**
				std	0.00	1068.87	30.70	17.89	17.89	0.00	0.00	35.78	0.00
		35	**shelt**	**mean**	**0.00**	**552.00**	**608.00**	**0.00**	**13.33**	**0.00**	**0.00**	**16.00**	**0.00**
				std	0.00	1212.07	1292.87	0.00	29.81	0.00	0.00	21.91	0.00
		36	**exp**	**mean**	**0.00**	**208.00**	**128.00**	**0.00**	**16.00**	**0.00**	**0.00**	**16.00**	**0.00**
				std	0.00	172.97	142.86	0.00	21.91	0.00	0.00	21.91	0.00
		37	**shelt**	**mean**	**32.00**	**656.00**	**165.33**	**0.00**	**8.00**	**0.00**	**13.33**	**40.00**	**24.00**
				std	52.15	895.59	228.35	0.00	17.89	0.00	29.81	40.00	35.78
Western	**Shortlands**	**25**	**exp**	**mean**	**0.00**	**3626.67**	**90.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**96.00**
				std	0.00	5418.81	81.87	0.00	0.00	0.00	0.00	0.00	60.66
		26	**shelt**	**mean**	**8.00**	**106.67**	**0.00**	**0.00**	**29.33**	**0.00**	**13.33**	**0.00**	**0.00**
				std	17.89	97.07	0.00	0.00	28.91	0.00	29.81	0.00	0.00
		27	**exp**	**mean**	**0.00**	**8760.00**	**6136.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	5807.58	13342.37	0.00	0.00	0.00	0.00	0.00	0.00
		28	**shelt**	**mean**	**0.00**	**184.00**	**0.00**	**0.00**	**16.00**	**0.00**	**8.00**	**0.00**	**24.00**
				std	0.00	368.35	0.00	0.00	21.91	0.00	17.89	0.00	21.91

Appendix 6. Mean density of each genera of food fishes in four key families (parrotfishes, surgeonfishes, emperors and fusiliers) of reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
Central	**Floridas**	**1**	**shelt**	**mean**	**0.00**	**56.00**	**56.00**	**0.00**	**253.33**	**56.00**	**8.00**	**66.67**	**0.00**
				std	0.00	77.97	60.66	0.00	144.53	77.97	17.89	149.07	0.00
		2	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**66.67**	**1160.00**	**184.00**	**0.00**	**0.00**	**1333.33**
				std	0.00	0.00	0.00	81.65	810.49	108.07	0.00	0.00	1491.93
		62	**exp**	**mean**	**16.00**	**13.33**	**0.00**	**80.00**	**426.67**	**0.00**	**0.00**	**0.00**	**480.00**
				std	35.78	29.81	0.00	138.56	281.27	0.00	0.00	0.00	715.54
		63	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**	**104.00**	**0.00**	**24.00**	**792.00**
				std	0.00	0.00	0.00	0.00	59.63	60.66	0.00	21.91	1062.22
Central	**Russells**	**38**	**exp**	**mean**	**8.00**	**234.67**	**8.00**	**178.67**	**293.33**	**666.67**	**824.00**	**2453.33**	**2840.00**
				std	17.89	50.42	17.89	299.42	121.11	1061.19	1776.20	2025.20	4396.36
		39	**shelt**	**mean**	**0.00**	**72.00**	**480.00**	**112.00**	**266.67**	**66.67**	**16.00**	**253.33**	**0.00**
				std	0.00	82.52	280.00	190.58	81.65	75.42	21.91	95.68	0.00
		40	**exp**	**mean**	**8.00**	**13.33**	**264.00**	**229.33**	**560.00**	**170.67**	**96.00**	**3962.67**	**0.00**
				std	17.89	29.81	250.76	180.47	332.00	113.29	111.71	8331.75	0.00
		41	**shelt**	**mean**	**0.00**	**192.00**	**2586.67**	**176.00**	**120.00**	**53.33**	**56.00**	**541.33**	**384.00**
				std	0.00	262.91	5266.89	350.54	86.92	44.22	45.61	956.46	858.65
Central	**Savo**	**64**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**240.00**	**600.00**	**101.33**	**960.00**	**360.00**	**0.00**
				std	0.00	0.00	0.00	536.66	312.69	107.74	920.87	349.86	0.00
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**16.00**	**45.33**	**1200.00**	**1157.33**	**1333.33**	**1816.00**	**224.00**	**688.00**	**1360.00**
				std	35.78	70.30	1104.54	1327.53	1170.94	632.20	436.90	737.48	2616.87
		18	**shelt**	**mean**	**8.00**	**0.00**	**0.00**	**40.00**	**546.67**	**32.00**	**296.00**	**312.00**	**712.00**
				std	17.89	0.00	0.00	89.44	218.07	71.55	391.51	233.92	618.64
		19	**shelt**	**mean**	**8.00**	**0.00**	**0.00**	**0.00**	**493.33**	**0.00**	**32.00**	**136.00**	**6053.33**
				std	17.89	0.00	0.00	0.00	121.11	0.00	17.89	69.54	2165.59
		20	**exp**	**mean**	**0.00**	**26.67**	**1760.00**	**96.00**	**826.67**	**461.33**	**24.00**	**357.33**	**3200.00**
				std	0.00	36.51	2794.28	179.73	578.50	353.97	21.91	434.25	4604.35

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
	Choiseul (con't)	**21**	**exp**	**mean**	**96.00**	**0.00**	**0.00**	**6080.00**	**1146.67**	**7517.33**	**704.00**	**576.00**	**0.00**
				std	49.35	0.00	0.00	2379.26	303.32	4403.57	828.30	649.06	0.00
		22	**shelt**	**mean**	**96.00**	**40.00**	**0.00**	**64.00**	**680.00**	**0.00**	**16.00**	**397.33**	**0.00**
				std	173.44	89.44	0.00	89.64	366.36	0.00	35.78	478.09	0.00
		23	**exp**	**mean**	**0.00**	**130.67**	**0.00**	**72.00**	**1293.33**	**237.33**	**1280.00**	**170.67**	**1064.00**
				std	0.00	105.58	0.00	103.97	484.42	162.32	1841.74	110.51	1571.14
		24	**shelt**	**mean**	**0.00**	**13.33**	**0.00**	**26.67**	**373.33**	**0.00**	**0.00**	**101.33**	**320.00**
				std	0.00	29.81	0.00	59.63	167.33	0.00	0.00	74.60	452.55
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**1666.67**	**306.67**	**24.00**	**192.00**	**112.00**	**0.00**
				std	0.00	0.00	0.00	3607.66	281.27	53.67	429.33	142.55	0.00
		43	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**213.33**	**61.33**	**8.00**	**541.33**	**24.00**
				std	0.00	0.00	0.00	0.00	98.88	68.38	17.89	434.67	53.67
		65	**exp**	**mean**	**0.00**	**8.00**	**0.00**	**40.00**	**466.67**	**0.00**	**0.00**	**112.00**	**0.00**
				std	0.00	17.89	0.00	59.63	329.98	0.00	0.00	17.89	0.00
		66	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**26.67**	**133.33**	**786.67**	**0.00**	**0.00**	**0.00**
				std	0.00	0.00	0.00	36.51	156.35	1759.04	0.00	0.00	0.00
Isabel	**Arnavons**	**15**	**exp**	**mean**	**0.00**	**381.33**	**933.33**	**797.33**	**973.33**	**541.33**	**1760.00**	**1205.33**	**1120.00**
				std	0.00	687.51	1195.36	773.41	711.18	393.12	1791.09	1056.27	1752.71
		16	**shelt**	**mean**	**16.00**	**149.33**	**392.00**	**632.00**	**386.67**	**32.00**	**472.00**	**616.00**	**373.33**
				std	35.78	131.11	463.38	1006.54	264.15	52.15	765.45	444.56	695.38
Isabel	**Isabel**	**3**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**141.33**	**1680.00**	**160.00**	**40.00**	**40.00**	**3061.33**
				std	0.00	0.00	0.00	139.08	1494.73	160.00	56.57	89.44	802.58
		4	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**53.33**	**26.67**	**0.00**	**56.00**	**53.33**	**4069.33**
				std	0.00	0.00	0.00	119.26	59.63	0.00	82.95	55.78	4102.63
		5	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**400.00**	**3893.33**	**349.33**	**1584.00**	**544.00**	**720.00**
				std	0.00	0.00	0.00	429.47	3501.30	448.15	749.72	1046.75	995.99
		6	**shelt**	**mean**	**0.00**	**21.33**	**16.00**	**16.00**	**680.00**	**144.00**	**101.33**	**32.00**	**504.00**
				std	0.00	47.70	35.78	35.78	483.97	260.15	47.70	71.55	1126.98

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
		7	**exp**	**mean**	**112.00**	**0.00**	**472.00**	**152.00**	**866.67**	**200.00**	**216.00**	**82.67**	**3786.67**
				std	117.98	0.00	662.36	192.67	464.28	193.91	417.23	124.51	5582.19
		8	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**48.00**	**1426.67**	**629.33**	**96.00**	**0.00**	**2562.67**
				std	0.00	0.00	0.00	65.73	415.26	309.32	104.31	0.00	2639.70
		9	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**304.00**	**1480.00**	**0.00**	**48.00**	**0.00**	**240.00**
				std	0.00	0.00	0.00	537.10	1188.28	0.00	52.15	0.00	536.66
		10	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**37.33**	**426.67**	**0.00**	**200.00**	**77.33**	**141.33**
				std	0.00	0.00	0.00	51.98	372.98	0.00	337.05	151.55	196.32
		11	**exp**	**mean**	**64.00**	**213.33**	**488.00**	**938.67**	**2373.33**	**122.67**	**264.00**	**733.33**	**6506.67**
				std	92.09	315.67	663.57	1366.47	1078.68	142.17	434.14	1185.09	3960.25
		12	**shelt**	**mean**	**0.00**	**0.00**	**178.67**	**69.33**	**0.00**	**8.00**	**32.00**	**138.67**	**466.67**
				std	0.00	0.00	100.93	121.25	0.00	17.89	33.47	98.70	689.61
		13	**exp**	**mean**	**0.00**	**0.00**	**120.00**	**37.33**	**733.33**	**104.00**	**400.00**	**200.00**	**4320.00**
				std	0.00	0.00	268.33	54.49	405.52	166.37	894.43	447.21	9659.81
		14	**shelt**	**mean**	**0.00**	**13.33**	**56.00**	**1160.00**	**440.00**	**117.33**	**237.33**	**781.33**	**3781.33**
				std	0.00	29.81	77.97	2128.66	203.31	119.03	325.43	760.74	4107.98
Makira	**Makira**	**44**	**exp**	**mean**	**144.00**	**40.00**	**832.00**	**114.67**	**426.67**	**296.00**	**0.00**	**2696.00**	**0.00**
				std	216.52	89.44	978.73	122.78	341.89	174.46	0.00	3356.38	0.00
		45	**shelt**	**mean**	**32.00**	**61.33**	**165.33**	**392.00**	**13.33**	**50.67**	**8.00**	**77.33**	**1120.00**
				std	33.47	67.72	311.36	854.35	29.81	69.54	17.89	117.91	1559.49
		46	**exp**	**mean**	**0.00**	**8.00**	**0.00**	**0.00**	**1573.33**	**130.67**	**8.00**	**397.33**	**320.00**
				std	0.00	17.89	0.00	0.00	224.10	17.38	17.89	592.43	715.54
		47	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**66.67**	**0.00**	**0.00**	**56.00**	**0.00**
				std	0.00	0.00	0.00	0.00	81.65	0.00	0.00	104.31	0.00
Makira	**Three Sisters**	**48**	**exp**	**mean**	**0.00**	**13.33**	**0.00**	**53.33**	**1266.67**	**45.33**	**0.00**	**176.00**	**0.00**
				std	0.00	29.81	0.00	86.92	681.50	50.42	0.00	175.73	0.00
		49	**shelt**	**mean**	**0.00**	**13.33**	**152.00**	**26.67**	**546.67**	**64.00**	**32.00**	**221.33**	**0.00**
				std	0.00	29.81	145.33	59.63	310.56	72.66	52.15	291.91	0.00
Makira	**Ugi**	**50**	**exp**	**mean**	**24.00**	**80.00**	**0.00**	**0.00**	**560.00**	**538.67**	**16.00**	**602.67**	**0.00**
				std	53.67	101.98	0.00	0.00	285.19	505.14	21.91	1244.17	0.00

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
	Ugi (con't)	**51**	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**109.33**	**746.67**	**26.67**	**808.00**	**125.33**	**0.00**
				std	0.00	0.00	0.00	244.48	384.13	36.51	1784.47	100.04	0.00
Malaita	**Malaita**	**52**	**shelt**	**mean**	**0.00**	**0.00**	**8.00**	**21.33**	**413.33**	**0.00**	**0.00**	**56.00**	**1360.00**
				std	0.00	0.00	17.89	30.70	392.71	0.00	0.00	56.88	2109.03
		53	**exp**	**mean**	**0.00**	**53.33**	**8.00**	**26.67**	**800.00**	**117.33**	**8.00**	**445.33**	**0.00**
				std	0.00	86.92	17.89	59.63	278.89	240.63	17.89	314.76	0.00
		54	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**16.00**	**93.33**	**0.00**	**32.00**	**13.33**	**880.00**
				std	0.00	0.00	0.00	21.91	76.01	0.00	71.55	29.81	1213.26
		55	**exp**	**mean**	**0.00**	**53.33**	**32.00**	**602.67**	**840.00**	**253.33**	**0.00**	**85.33**	**0.00**
				std	0.00	73.03	71.55	352.06	345.12	395.53	0.00	134.20	0.00
		56	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**40.00**	**1560.00**	**61.33**	**0.00**	**232.00**	**2712.00**
				std	0.00	0.00	0.00	89.44	2148.18	50.42	0.00	156.23	2104.93
		57	**shelt**	**mean**	**0.00**	**53.33**	**13.33**	**0.00**	**1666.67**	**245.33**	**8.00**	**61.33**	**0.00**
				std	0.00	119.26	29.81	0.00	1126.45	156.23	17.89	82.52	0.00
		58	**exp**	**mean**	**13.33**	**0.00**	**40.00**	**8.00**	**1880.00**	**200.00**	**16.00**	**333.33**	**0.00**
				std	29.81	0.00	56.57	17.89	792.18	118.13	21.91	138.88	0.00
		59	**shelt**	**mean**	**8.00**	**0.00**	**0.00**	**0.00**	**1426.67**	**256.00**	**40.00**	**197.33**	**80.00**
				std	17.89	0.00	0.00	0.00	423.22	294.00	40.00	332.32	178.89
		60	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**573.33**	**149.33**	**24.00**	**56.00**	**480.00**
				std	0.00	0.00	0.00	0.00	328.63	137.73	35.78	76.83	715.54
		61	**shelt**	**mean**	**8.00**	**0.00**	**0.00**	**0.00**	**93.33**	**0.00**	**16.00**	**53.33**	**320.00**
				std	17.89	0.00	0.00	0.00	89.44	0.00	21.91	119.26	715.54
		29	**exp**	**mean**	**0.00**	**72.00**	**1704.00**	**280.00**	**0.00**	**5144.00**	**8.00**	**160.00**	**0.00**
				std	0.00	99.60	2567.74	521.54	0.00	7365.19	17.89	357.77	0.00
		30	**exp**	**mean**	**0.00**	**16.00**	**0.00**	**128.00**	**0.00**	**88.00**	**16.00**	**248.00**	**0.00**
				std	0.00	21.91	0.00	86.72	0.00	86.72	21.91	490.22	0.00
		31	**shelt**	**mean**	**0.00**	**53.33**	**0.00**	**0.00**	**1160.00**	**98.67**	**8.00**	**234.67**	**5040.00**
				std	0.00	86.92	0.00	0.00	534.58	121.33	17.89	168.29	2523.49
		32	**exp**	**mean**	**0.00**	**16.00**	**0.00**	**61.33**	**1106.67**	**226.67**	**96.00**	**141.33**	**480.00**
				std	0.00	35.78	0.00	82.52	372.98	170.49	171.11	236.94	1073.31

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Density (per ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
	Malaita (con't)	**33**	**exp**	**mean**	**0.00**	**8.00**	**2346.67**	**80.00**	**160.00**	**72.00**	**0.00**	**541.33**	**6720.00**
				std	0.00	17.89	3775.97	109.54	192.06	99.60	0.00	685.18	3871.95
		34	**exp**	**mean**	**88.00**	**8.00**	**48.00**	**826.67**	**1226.67**	**168.00**	**24.00**	**1618.67**	**3160.00**
				std	86.72	17.89	65.73	1421.95	891.44	271.88	21.91	1955.77	3106.12
Western	**New Georgia**	**35**	**shelt**	**mean**	**0.00**	**72.00**	**0.00**	**56.00**	**400.00**	**976.00**	**56.00**	**40.00**	**16800.00**
				std	0.00	161.00	0.00	87.64	249.44	1785.63	53.67	89.44	17064.58
		36	**exp**	**mean**	**16.00**	**96.00**	**928.00**	**66.67**	**1733.33**	**536.00**	**24.00**	**1394.67**	**8112.00**
				std	21.91	143.11	1736.06	75.42	567.65	878.45	35.78	2005.80	7237.59
		37	**shelt**	**mean**	**8.00**	**101.33**	**16.00**	**13.33**	**800.00**	**181.33**	**0.00**	**794.67**	**5056.00**
				std	17.89	204.96	35.78	29.81	188.56	107.74	0.00	1099.64	7788.69
Western	**Shortlands**	**25**	**exp**	**mean**	**0.00**	**13.33**	**0.00**	**3072.00**	**1146.67**	**293.33**	**456.00**	**0.00**	**266.67**
				std	0.00	29.81	0.00	1743.98	713.99	239.07	625.84	0.00	596.28
		26	**shelt**	**mean**	**48.00**	**213.33**	**0.00**	**0.00**	**1106.67**	**0.00**	**72.00**	**101.33**	**720.00**
				std	107.33	477.03	0.00	0.00	292.88	0.00	71.55	79.22	715.54
		27	**exp**	**mean**	**0.00**	**80.00**	**5312.00**	**7328.00**	**0.00**	**560.00**	**0.00**	**7016.00**	**2400.00**
				std	0.00	113.14	4957.85	4712.74	0.00	931.67	0.00	7984.46	5366.56
		28	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**8.00**	**0.00**	**16.00**	**16.00**	**48.00**	**736.00**
				std	0.00	0.00	0.00	17.89	0.00	35.78	35.78	71.55	718.67

Appendix 7. Mean density of three key species targeted by the live reef food fish trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Province	Exposure	Mean Density (per ha)	Brown-marbled grouper	Camouflage grouper	Squaretail coral grouper
Central	**exp**	**mean**	**0.00**	**0.00**	**3.20**
		std	0.00	0.00	11.08
	shelt	**mean**	**0.00**	**2.00**	**36.00**
		std	0.00	8.94	56.42
Choiseul	**exp**	**mean**	**0.00**	**0.00**	**8.00**
		std	0.00	0.00	24.62
	shelt	**mean**	**2.00**	**2.00**	**4.00**
		std	8.94	8.94	12.31
Guadalcanal	**exp**	**mean**	**0.00**	**0.00**	**0.00**
		std	0.00	0.00	0.00
	shelt	**mean**	**0.00**	**0.00**	**48.00**
		std	0.00	0.00	55.46
Isabel	**exp**	**mean**	**1.14**	**0.00**	**23.62**
		std	6.76	0.00	66.36
	shelt	**mean**	**0.00**	**0.00**	**7.62**
		std	0.00	0.00	20.01
Makira	**exp**	**mean**	**0.00**	**0.00**	**0.00**
		std	0.00	0.00	0.00
	shelt	**mean**	**2.00**	**0.00**	**0.00**
		std	8.94	0.00	0.00
Malaita	**exp**	**mean**	**0.00**	**0.00**	**4.80**
		std	0.00	0.00	13.27
	shelt	**mean**	**1.60**	**0.00**	**12.80**
		std	8.00	0.00	19.04
Western	**exp**	**mean**	**0.00**	**2.00**	**17.00**
		std	0.00	8.83	51.15
	shelt	**mean**	**0.00**	**0.00**	**20.80**
		std	0.00	0.00	40.20

Appendix 8. Mean density of large reef fishes (30cm or more in size) of sharks, rays and some key families of bony fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

			Bony Fishes											Sharks & Rays	
Province	**Exposure**	**Mean Density (per ha)**	**Emperors**	**Groupers**	**Parrotfishes**	**Rabbitfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Sweetlips**	**Trevallies**	**Triggerfishes**	**Wrasses**	**Sharks**	**Rays**
Central	**exp**	**mean**	**287.47**	**14.40**	**85.33**	**144.00**	**153.07**	**625.07**	**12.27**	**28.80**	**0.00**	**27.20**	**20.80**	**3.20**	**0.00**
		std	661.76	38.09	148.52	641.66	520.43	1211.71	35.05	57.18	0.00	57.41	49.15	11.08	0.00
	shelt	**mean**	**104.00**	**23.33**	**172.00**	**0.00**	**0.00**	**45.33**	**0.00**	**5.33**	**0.00**	**38.00**	**6.00**	**4.00**	**0.00**
		std	365.55	44.30	229.72	0.00	0.00	72.31	0.00	23.85	0.00	71.64	19.57	12.31	0.00
Choiseul	**exp**	**mean**	**86.00**	**25.33**	**584.00**	**6.67**	**0.00**	**416.67**	**31.33**	**27.33**	**7.33**	**82.00**	**8.00**	**4.00**	**0.00**
		std	357.36	38.67	1500.45	29.81	0.00	954.82	72.29	65.39	18.59	109.72	20.93	12.31	0.00
	shelt	**mean**	**22.00**	**7.33**	**68.00**	**303.33**	**0.00**	**112.00**	**3.33**	**22.00**	**40.67**	**12.00**	**6.00**	**0.00**	**0.00**
		std	98.39	18.59	164.83	1356.55	0.00	185.83	14.91	61.52	181.87	32.05	14.65	0.00	0.00
Guadalcanal	**exp**	**mean**	**0.00**	**13.33**	**22.22**	**4.44**	**0.00**	**24.00**	**0.00**	**22.22**	**0.00**	**8.00**	**0.00**	**4.44**	**0.00**
		std	0.00	41.86	54.43	17.21	0.00	92.95	0.00	53.73	0.00	16.56	0.00	17.21	0.00
	shelt	**mean**	**0.00**	**0.00**	**93.33**	**0.00**	**0.00**	**192.00**	**0.00**	**0.00**	**0.00**	**8.00**	**0.00**	**8.00**	**8.00**
		std	0.00	0.00	101.11	0.00	0.00	429.33	0.00	0.00	0.00	17.89	0.00	17.89	17.89
Isabel	**exp**	**mean**	**131.05**	**29.71**	**183.62**	**7.62**	**0.00**	**1180.57**	**171.43**	**69.33**	**20.19**	**284.57**	**16.38**	**0.00**	**0.00**
		std	495.40	80.66	392.77	45.07	0.00	2948.33	577.03	148.40	55.39	769.03	40.40	0.00	0.00
	shelt	**mean**	**17.52**	**16.38**	**25.90**	**0.00**	**2.29**	**72.38**	**0.00**	**30.10**	**11.43**	**2.29**	**3.81**	**1.14**	**0.00**
		std	57.56	48.30	69.50	0.00	13.52	168.54	0.00	77.09	31.54	9.42	15.70	6.76	0.00
Makira	**exp**	**mean**	**177.33**	**6.67**	**194.00**	**0.00**	**300.00**	**805.33**	**78.00**	**6.00**	**20.00**	**9.33**	**2.00**	**6.00**	**0.00**
		std	447.37	20.52	336.80	0.00	1341.64	1832.71	189.42	19.57	61.56	23.73	8.94	26.83	0.00
	shelt	mean	4.00	8.00	73.33	0.00	0.00	20.00	17.33	0.00	18.00	12.00	0.00	4.00	0.00
		std	12.31	20.93	148.13	0.00	0.00	55.82	44.98	0.00	46.65	45.14	0.00	12.31	0.00
Malaita	**exp**	**mean**	**15.47**	**14.93**	**51.73**	**5.33**	**28.80**	**131.20**	**34.67**	**108.80**	**4.80**	**1.60**	**9.60**	**0.00**	**1.60**
		std	40.86	33.40	86.86	26.67	90.65	322.67	71.28	280.07	24.00	8.00	20.91	0.00	8.00
	shelt	**mean**	**1.60**	**10.13**	**27.20**	**0.00**	**0.00**	**52.27**	**0.00**	**8.53**	**5.87**	**0.00**	**0.00**	**0.00**	**0.00**
		std	8.00	24.43	63.18	0.00	0.00	128.17	0.00	23.69	16.81	0.00	0.00	0.00	0.00
Western	**exp**	**mean**	**895.00**	**27.67**	**501.33**	**0.00**	**2.00**	**1422.00**	**619.67**	**15.67**	**1.00**	**28.00**	**7.67**	**9.33**	**0.00**
		std	3470.03	57.87	1524.53	0.00	12.65	4984.42	2627.83	51.50	6.32	57.43	22.77	19.61	0.00
	shelt	**mean**	**0.00**	**12.27**	**99.73**	**0.00**	**0.00**	**37.87**	**78.40**	**0.00**	**200.00**	**22.40**	**5.87**	**13.87**	**0.00**
		std	0.00	23.70	282.30	0.00	0.00	100.12	392.00	0.00	1000.00	72.18	16.81	29.18	0.00

Appendix 9. Mean biomass of key families of food fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

					Bony Fishes								Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Emperors**	**Fusiliers**	**Goatfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**Parrotfishes**	**Sharks**	**Rays**
Central	**Floridas**	**1**	**shelt**	**mean**	**11.93**	**0.00**	**0.00**	**0.00**	**52.13**	**27.17**	**103.50**	**61.77**	**0.00**	**0.00**
				sd	16.76	0.00	0.00	0.00	58.92	21.19	130.25	67.15	0.00	0.00
		2	**exp**	**mean**	**0.00**	**133.93**	**1.72**	**0.00**	**160.67**	**154.95**	**37.01**	**0.00**	**0.00**	**0.00**
				sd	0.00	133.83	3.85	0.00	114.23	106.49	67.02	0.00	0.00	0.00
		62	**exp**	**mean**	**0.00**	**43.41**	**1.23**	**0.00**	**2.58**	**17.36**	**1.46**	**235.22**	**0.00**	**0.00**
				sd	0.00	67.52	1.74	0.00	4.73	28.30	2.79	511.21	0.00	0.00
		63	**shelt**	**mean**	**0.49**	**1.61**	**0.32**	**0.00**	**0.00**	**13.67**	**2.21**	**0.00**	**0.00**	**0.00**
				sd	0.49	1.58	0.64	0.00	0.00	4.47	2.38	0.00	0.00	0.00
Central	**Russells**	**38**	**exp**	**mean**	**1164.12**	**224.44**	**30.54**	**1036.40**	**2726.01**	**165.62**	**95.89**	**413.66**	**281.50**	**0.00**
				sd	691.19	347.44	54.85	168.71	1398.49	262.50	120.26	425.86	264.56	0.00
		39	**shelt**	**mean**	**21.22**	**0.00**	**4.63**	**0.00**	**41.86**	**47.76**	**1.28**	**275.71**	**0.00**	**0.00**
				sd	8.04	0.00	6.59	0.00	49.41	46.78	1.44	182.10	0.00	0.00
		40	**exp**	**mean**	**327.35**	**0.00**	**9.79**	**0.00**	**162.64**	**121.14**	**40.06**	**197.03**	**0.00**	**0.00**
				sd	511.01	0.00	15.48	0.00	156.71	96.46	49.09	250.28	0.00	0.00
		41	**shelt**	**mean**	**300.18**	**52.78**	**0.00**	**1391.47**	**679.36**	**84.35**	**189.15**	**1061.86**	**78.34**	**0.00**
				sd	489.48	118.03	0.00	3103.39	1351.25	148.48	227.67	1933.40	50.30	0.00
Central	**Savo**	**64**	**exp**	**mean**	**128.61**	**0.00**	**16.06**	**1232.38**	**560.94**	**65.60**	**6.06**	**0.00**	**0.00**	**0.00**
				sd	130.77	0.00	19.01	2755.68	1122.20	53.49	9.82	0.00	0.00	0.00
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**481.77**	**112.15**	**9.76**	**46.13**	**2195.99**	**655.03**	**170.46**	**867.03**	**0.00**	**0.00**
				sd	699.02	205.82	9.25	103.14	1485.70	282.58	101.63	819.13	0.00	0.00
		18	**shelt**	**mean**	**103.42**	**56.27**	**5.46**	**0.00**	**320.62**	**49.74**	**29.42**	**90.51**	**0.00**	**0.00**
				sd	129.79	48.89	10.71	0.00	355.26	17.75	49.02	202.38	0.00	0.00
		19	**shelt**	**mean**	**15.19**	**275.16**	**21.11**	**0.00**	**141.25**	**31.00**	**17.28**	**12.29**	**0.00**	**0.00**
				sd	7.31	75.97	46.37	0.00	191.63	9.23	23.90	27.47	0.00	0.00
		20	**exp**	**mean**	**57.27**	**252.89**	**2.89**	**0.00**	**249.43**	**117.80**	**19.37**	**1022.17**	**186.75**	**0.00**
				sd	45.18	363.87	5.18	0.00	173.32	86.30	31.72	1804.60	186.75	0.00
		21	**exp**	**mean**	**159.96**	**0.00**	**25.09**	**0.00**	**145.55**	**1406.12**	**168.62**	**2483.05**	**124.42**	**0.00**
				sd	146.77	0.00	15.90	0.00	62.48	637.19	127.18	1616.31	124.42	0.00

					Bony Fishes								Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Emperors**	**Fusiliers**	**Goatfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**Parrotfishes**	**Sharks**	**Rays**
	Choiseul (con't)	**22**	**shelt**	**mean**	**137.70**	**0.00**	**308.67**	**0.00**	**147.61**	**52.40**	**26.37**	**1947.45**	**0.00**	**0.00**
				sd	228.44	0.00	516.10	0.00	169.68	32.54	32.29	3270.58	0.00	0.00
		23	**exp**	**mean**	**112.60**	**116.81**	**11.62**	**1.44**	**60.96**	**125.82**	**3.24**	**55.80**	**0.00**	**0.00**
				sd	127.48	192.78	16.90	3.21	64.11	80.21	1.99	74.43	0.00	0.00
		24	**shelt**	**mean**	**10.82**	**14.55**	**15.47**	**0.00**	**1.69**	**45.36**	**1.70**	**1.10**	**0.00**	**0.00**
				sd	9.55	22.31	16.48	0.00	3.77	34.81	3.80	2.47	0.00	0.00
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**34.34**	**0.00**	**25.96**	**0.00**	**55.00**	**722.79**	**32.69**	**0.00**	**0.00**	**0.00**
				sd	45.63	0.00	35.61	0.00	102.40	1555.52	15.18	0.00	0.00	0.00
		43	**shelt**	**mean**	**88.09**	**1.90**	**8.49**	**0.00**	**347.16**	**12.77**	**37.69**	**0.00**	**27.93**	**135.27**
				sd	137.34	4.24	18.99	0.00	517.44	7.64	36.87	0.00	27.93	135.27
		65	**exp**	**mean**	**21.44**	**0.00**	**8.12**	**0.00**	**63.86**	**27.88**	**24.32**	**1.15**	**0.00**	**0.00**
				sd	15.01	0.00	12.18	0.00	95.34	12.69	28.49	2.58	0.00	0.00
		66	**exp**	**mean**	**0.00**	**0.00**	**0.17**	**0.00**	**0.04**	**81.23**	**5.29**	**0.00**	**555.44**	**0.00**
				sd	0.00	0.00	0.39	0.00	0.10	170.58	6.87	0.00	555.44	0.00
Isabel	**Arnavons**	**15**	**exp**	**mean**	**822.42**	**88.51**	**7.92**	**287.69**	**2448.24**	**376.89**	**93.28**	**379.62**	**0.00**	**0.00**
				sd	1065.05	138.51	11.34	393.94	3422.25	144.59	128.95	575.08	0.00	0.00
		16	**shelt**	**mean**	**279.21**	**31.45**	**3.83**	**0.00**	**209.99**	**146.43**	**9.28**	**349.15**	**23.39**	**0.00**
				sd	279.95	54.75	5.45	0.00	173.24	221.17	10.78	548.92	23.39	0.00
Isabel	**Isabel**	**3**	**exp**	**mean**	**13.23**	**208.11**	**0.75**	**234.63**	**0.00**	**162.73**	**5.05**	**0.00**	**0.00**	**0.00**
				sd	28.14	44.39	1.67	452.96	0.00	122.31	2.03	0.00	0.00	0.00
		4	**shelt**	**mean**	**10.75**	**411.54**	**0.00**	**174.72**	**795.11**	**17.20**	**11.85**	**0.00**	**0.00**	**0.00**
				sd	11.95	439.94	0.00	242.52	1167.73	29.87	13.77	0.00	0.00	0.00
		5	**exp**	**mean**	**280.44**	**35.36**	**11.57**	**0.00**	**1289.35**	**489.23**	**98.66**	**0.00**	**0.00**	**0.00**
				sd	586.43	69.07	14.98	0.00	2875.22	309.07	139.56	0.00	0.00	0.00
		6	**shelt**	**mean**	**13.39**	**20.23**	**0.00**	**0.00**	**32.62**	**58.12**	**5.70**	**4.72**	**0.00**	**0.00**
				sd	27.60	45.24	0.00	0.00	66.72	50.59	5.94	6.59	0.00	0.00
		7	**exp**	**mean**	**54.15**	**476.47**	**1.28**	**220.60**	**839.11**	**117.08**	**38.92**	**1096.05**	**0.00**	**0.00**
				sd	91.03	737.21	2.86	341.60	408.66	94.10	66.28	933.54	0.00	0.00
		8	**shelt**	**mean**	**5.45**	**118.57**	**0.21**	**10.19**	**138.33**	**109.26**	**3.28**	**0.00**	**0.00**	**0.00**
				sd	7.05	169.25	0.48	22.79	179.27	39.79	5.92	0.00	0.00	0.00

					Bony Fishes								Sharks & Rays	
Province	Island	Site	Exposure	Mean Biomass (kg/ha)	Emperors	Fusiliers	Goatfishes	Drummers	Snappers	Surgeonfishes	Triggerfishes	Parrotfishes	Sharks	Rays
	Isabel (con't)	**9**	**exp**	**mean**	**0.73**	**5.54**	**4.20**	**0.00**	**2.30**	**178.16**	**1.54**	**0.00**	**0.00**	**0.00**
				sd	1.08	12.39	5.83	0.00	5.14	121.99	1.27	0.00	0.00	0.00
		10	**shelt**	**mean**	**8.24**	**8.72**	**3.11**	**0.00**	**0.43**	**39.42**	**0.47**	**0.00**	**0.00**	**0.00**
				sd	12.50	13.81	6.96	0.00	0.96	35.14	0.68	0.00	0.00	0.00
		11	**exp**	**mean**	**535.03**	**363.43**	**4.82**	**0.00**	**1752.85**	**940.39**	**2428.45**	**1254.55**	**0.00**	**0.00**
				sd	929.74	300.72	10.78	0.00	1271.04	957.30	1732.02	1459.38	0.00	0.00
		12	**shelt**	**mean**	**8.59**	**20.97**	**3.99**	**0.00**	**4.42**	**15.17**	**12.76**	**10.52**	**0.00**	**0.00**
				sd	4.41	45.65	6.72	0.00	8.73	26.45	23.90	15.86	0.00	0.00
		13	**exp**	**mean**	**40.78**	**144.46**	**9.06**	**0.00**	**18.12**	**98.48**	**7.10**	**78.28**	**0.00**	**0.00**
				sd	86.87	323.02	18.51	0.00	23.55	120.28	6.08	175.03	0.00	0.00
		14	**shelt**	**mean**	**204.60**	**570.23**	**0.24**	**0.00**	**30.39**	**260.04**	**20.19**	**28.12**	**0.00**	**0.00**
				sd	285.31	731.67	0.53	0.00	18.64	469.72	28.85	37.21	0.00	0.00
Makira	**Makira**	**44**	**exp**	**mean**	**1424.59**	**0.00**	**26.83**	**1856.13**	**3894.63**	**104.55**	**11.83**	**1794.97**	**0.00**	**0.00**
				sd	2632.75	0.00	43.18	2716.37	8162.98	66.47	25.01	2538.33	0.00	0.00
		45	**shelt**	**mean**	**9.50**	**3.15**	**11.67**	**0.00**	**0.00**	**180.80**	**2.88**	**61.57**	**0.00**	**0.00**
				sd	11.91	4.39	23.26	0.00	0.00	364.77	2.77	51.97	0.00	0.00
		46	**exp**	**mean**	**263.70**	**25.29**	**1.27**	**2.87**	**655.33**	**99.80**	**5.74**	**1.15**	**41.47**	**0.00**
				sd	380.23	56.55	1.80	6.42	1256.49	38.20	7.18	2.58	41.47	0.00
		47	**shelt**	**mean**	**2.77**	**0.00**	**15.28**	**0.00**	**30.62**	**6.74**	**8.28**	**0.00**	**1289.05**	**0.00**
				sd	4.58	0.00	11.08	0.00	30.37	7.66	13.95	0.00	1095.58	0.00
Makira	**Three Sisters**	**48**	**exp**	**mean**	**26.66**	**0.00**	**9.11**	**0.00**	**104.33**	**70.90**	**4.30**	**4.10**	**0.00**	**0.00**
				sd	18.04	0.00	14.92	0.00	193.62	46.73	3.58	9.17	0.00	0.00
		49	**shelt**	**mean**	**33.44**	**0.00**	**4.48**	**16.79**	**12.03**	**52.04**	**124.25**	**30.79**	**0.00**	**0.00**
				sd	36.81	0.00	9.38	37.55	23.64	54.45	146.54	32.22	0.00	0.00
Makira	**Ugi**	**50**	**exp**	**mean**	**140.09**	**0.00**	**29.85**	**0.00**	**800.78**	**476.18**	**78.54**	**125.22**	**0.00**	**0.00**
				sd	211.57	0.00	41.60	0.00	1364.78	605.51	93.93	181.96	0.00	0.00
		51	**shelt**	**mean**	**29.17**	**0.00**	**3.51**	**0.00**	**97.46**	**54.23**	**13.68**	**0.00**	**0.00**	**0.00**
				sd	39.83	0.00	4.81	0.00	133.59	29.12	25.71	0.00	0.00	0.00
Malaita	**Malaita**	**52**	**shelt**	**mean**	**2.32**	**107.48**	**1.69**	**0.00**	**27.35**	**25.54**	**9.88**	**1.40**	**0.00**	**0.00**
				sd	2.21	166.67	0.64	0.00	59.12	21.99	9.29	3.14	0.00	0.00

					Bony Fishes								Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Emperors**	**Fusiliers**	**Goatfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**Parrotfishes**	**Sharks**	**Rays**
	Malaita (con't)	**53**	**exp**	**mean**	**90.54**	**0.00**	**1.72**	**91.48**	**192.62**	**56.11**	**6.75**	**13.83**	**0.00**	**0.00**
				sd	98.45	0.00	2.68	125.80	228.08	4.91	5.69	15.65	0.00	0.00
		54	**shelt**	**mean**	**2.49**	**20.60**	**8.76**	**0.00**	**0.27**	**13.13**	**6.89**	**0.00**	**0.00**	**0.00**
				sd	4.46	44.48	5.02	0.00	0.61	11.07	5.97	0.00	0.00	0.00
		55	**exp**	**mean**	**34.99**	**0.00**	**1.85**	**4.80**	**521.98**	**286.94**	**6.62**	**27.13**	**0.00**	**22435.27**
				sd	65.89	0.00	2.54	10.74	608.87	190.70	4.55	37.72	0.00	22435.27
		56	**exp**	**mean**	**21.89**	**214.32**	**0.96**	**0.00**	**3.28**	**66.56**	**4.54**	**0.00**	**0.00**	**0.00**
				sd	18.56	166.35	1.32	0.00	3.12	80.25	5.99	0.00	0.00	0.00
		57	**shelt**	**mean**	**5.36**	**0.00**	**1.77**	**0.00**	**131.22**	**195.32**	**2.13**	**55.04**	**0.00**	**0.00**
				sd	8.18	0.00	3.91	0.00	252.16	116.48	2.33	119.24	0.00	0.00
		58	**exp**	**mean**	**52.58**	**0.00**	**41.74**	**61.31**	**282.36**	**228.27**	**17.92**	**220.62**	**0.00**	**0.00**
				sd	66.59	0.00	55.44	137.10	459.86	120.65	36.10	450.84	0.00	0.00
		59	**shelt**	**mean**	**49.50**	**6.32**	**1.85**	**0.00**	**27.86**	**137.06**	**3.40**	**69.91**	**0.00**	**0.00**
				sd	62.71	14.14	1.38	0.00	39.32	76.97	2.68	156.32	0.00	0.00
		60	**exp**	**mean**	**4.47**	**5.63**	**5.26**	**11.38**	**4.28**	**88.24**	**0.40**	**0.00**	**0.00**	**0.00**
				sd	3.32	8.39	6.59	18.47	4.92	51.09	0.76	0.00	0.00	0.00
		61	**shelt**	**mean**	**3.29**	**25.29**	**27.22**	**0.00**	**47.90**	**4.03**	**0.29**	**27.64**	**0.00**	**0.00**
				sd	6.05	56.55	42.63	0.00	107.11	3.85	0.65	61.80	0.00	0.00
Western	**New Georgia**	**29**	**exp**	**mean**	**40.97**	**0.00**	**0.00**	**0.00**	**1953.68**	**3062.22**	**126.25**	**1757.36**	**388.12**	**0.00**
				sd	68.03	0.00	0.00	0.00	2295.36	5128.26	117.11	2673.76	323.93	0.00
		30	**exp**	**mean**	**153.81**	**0.00**	**0.64**	**25.05**	**177.40**	**49.36**	**37.90**	**19.89**	**0.00**	**0.00**
				sd	328.03	0.00	1.08	56.00	219.71	43.95	49.23	28.35	0.00	0.00
		31	**shelt**	**mean**	**20.32**	**331.16**	**8.76**	**0.00**	**6.35**	**76.00**	**23.75**	**2.99**	**22.54**	**0.00**
				sd	13.75	222.66	5.32	0.00	10.07	33.11	15.85	5.53	22.54	0.00
		32	**exp**	**mean**	**118.35**	**37.93**	**4.74**	**0.00**	**2083.54**	**196.65**	**28.70**	**15.45**	**991.21**	**0.00**
				sd	177.83	84.82	9.06	0.00	2482.72	194.25	37.34	34.55	991.21	0.00
		33	**exp**	**mean**	**81.86**	**401.27**	**48.37**	**278.52**	**532.88**	**28.86**	**85.09**	**745.47**	**0.00**	**0.00**
				sd	133.09	322.78	37.72	243.73	520.22	21.04	176.15	1381.87	0.00	0.00
		34	**exp**	**mean**	**143.52**	**110.97**	**125.59**	**0.00**	**113.74**	**228.62**	**11.52**	**157.12**	**0.00**	**0.00**
				sd	156.08	113.59	273.40	0.00	112.54	302.07	16.93	144.16	0.00	0.00

					Bony Fishes								Sharks & Rays	
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	**Emperors**	**Fusiliers**	**Goatfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Triggerfishes**	**Parrotfishes**	**Sharks**	**Rays**
	New Georgia (con't)	**35**	**shelt**	**mean**	**6.91**	**1327.67**	**8.05**	**0.00**	**181.93**	**364.80**	**1.77**	**69.53**	**107.81**	**0.00**
				sd	6.08	1348.58	11.50	0.00	397.89	706.96	2.32	155.48	107.81	0.00
		36	**exp**	**mean**	**126.18**	**350.14**	**12.64**	**116.27**	**70.82**	**77.78**	**139.38**	**414.66**	**563.04**	**0.00**
				sd	178.53	424.23	18.77	256.00	82.93	41.16	222.15	685.68	553.59	0.00
		37	**shelt**	**mean**	**68.29**	**399.57**	**2.59**	**0.00**	**163.70**	**75.10**	**96.60**	**306.19**	**1155.24**	**0.00**
				sd	96.56	615.53	5.80	0.00	247.95	22.11	144.58	464.41	963.38	0.00
Western	**Shortlands**	**25**	**exp**	**mean**	**41.04**	**50.47**	**1.30**	**0.00**	**241.62**	**646.26**	**1.51**	**20.28**	**5.00**	**0.00**
				sd	54.65	112.86	2.90	0.00	294.08	424.48	2.59	45.35	5.00	0.00
		26	**shelt**	**mean**	**13.67**	**26.41**	**3.03**	**0.00**	**40.69**	**91.23**	**14.12**	**1235.93**	**0.00**	**0.00**
				sd	9.08	55.94	4.27	0.00	45.13	30.48	13.60	2763.63	0.00	0.00
		27	**exp**	**mean**	**5090.59**	**189.67**	**0.00**	**0.00**	**10357.05**	**3750.86**	**8.39**	**2464.48**	**343.17**	**0.00**
				sd	5555.93	424.11	0.00	0.00	11100.92	2228.50	10.63	2256.92	210.49	0.00
		28	**shelt**	**mean**	**7.94**	**15.48**	**2.18**	**0.00**	**3.19**	**0.06**	**13.00**	**0.00**	**142.40**	**0.00**
				sd	15.65	30.29	3.55	0.00	4.99	0.13	17.42	0.00	110.83	0.00

Appendix 10. Mean biomass of each genera of food fishes in two key families (snappers and groupers) of reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
Central	**Floridas**	**1**	**shelt**	**mean**	**0.00**	**36.18**	**15.95**	**0.00**	**5.04**	**0.77**	**0.00**	**37.77**	**7.07**
				std	0.00	36.04	35.67	0.00	11.27	1.72	0.00	31.41	9.71
		2	**exp**	**mean**	**0.00**	**67.19**	**93.47**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20.02**
				std	0.00	66.60	128.37	0.00	0.00	0.00	0.00	0.00	12.04
		62	**exp**	**mean**	**0.00**	**0.00**	**2.58**	**0.00**	**1.20**	**0.00**	**1.36**	**0.00**	**5.02**
				std	0.00	0.00	4.73	0.00	1.75	0.00	3.03	0.00	3.92
		63	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.61**	**0.00**
				std	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.56	0.00
Central	**Russells**	**38**	**exp**	**mean**	**0.00**	**1779.90**	**946.11**	**0.00**	**1.07**	**0.00**	**0.00**	**32.38**	**0.00**
				std	0.00	1087.18	940.64	0.00	2.39	0.00	0.00	46.21	0.00
		39	**shelt**	**mean**	**0.00**	**29.07**	**12.80**	**0.00**	**0.00**	**0.00**	**0.00**	**43.00**	**0.00**
				std	0.00	22.98	28.61	0.00	0.00	0.00	0.00	70.68	0.00
		40	**exp**	**mean**	**0.00**	**18.14**	**144.51**	**0.00**	**1.30**	**0.00**	**0.00**	**16.44**	**0.75**
				std	0.00	15.02	143.03	0.00	2.91	0.00	0.00	23.62	1.68
		41	**shelt**	**mean**	**0.00**	**622.40**	**56.96**	**0.00**	**0.77**	**0.00**	**16.32**	**33.43**	**0.00**
				std	0.00	1382.84	41.47	0.00	1.71	0.00	36.50	43.00	0.00
Central	**Savo**	**64**	**exp**	**mean**	**0.00**	**47.33**	**513.61**	**0.00**	**6.76**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	62.04	1147.23	0.00	11.04	0.00	0.00	0.00	0.00
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**38.40**	**888.66**	**1268.94**	**0.00**	**2.03**	**0.00**	**0.00**	**0.00**	**12.00**
				std	42.92	303.47	1274.32	0.00	2.78	0.00	0.00	0.00	18.98
		18	**shelt**	**mean**	**3.31**	**146.18**	**171.12**	**0.00**	**3.28**	**0.00**	**0.00**	**2.44**	**0.00**
				std	7.41	183.13	183.48	0.00	2.75	0.00	0.00	5.46	0.00
		19	**shelt**	**mean**	**0.00**	**63.90**	**77.35**	**0.00**	**7.81**	**0.00**	**1.15**	**0.00**	**0.38**
				std	0.00	103.81	92.68	0.00	6.24	0.00	2.56	0.00	0.84
		20	**exp**	**mean**	**0.00**	**102.26**	**147.17**	**0.00**	**2.21**	**0.00**	**0.00**	**17.28**	**0.93**
				std	0.00	199.57	99.90	0.00	4.94	0.00	0.00	27.14	2.07

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	Choiseul (con't)	**21**	**exp**	**mean**	**41.70**	**0.00**	**103.85**	**0.00**	**2.02**	**0.00**	**0.00**	**0.00**	**86.97**
				std	93.24	0.00	65.10	0.00	2.47	0.00	0.00	0.00	121.20
		22	**shelt**	**mean**	**0.00**	**25.28**	**122.33**	**0.00**	**5.64**	**0.00**	**0.00**	**0.00**	**5.18**
				std	0.00	25.75	166.41	0.00	7.45	0.00	0.00	0.00	7.54
		23	**exp**	**mean**	**0.00**	**51.29**	**9.67**	**0.00**	**4.47**	**0.00**	**0.00**	**14.96**	**1.30**
				std	0.00	67.43	6.84	0.00	8.90	0.00	0.00	33.44	2.03
		24	**shelt**	**mean**	**0.00**	**0.00**	**0.48**	**1.21**	**6.21**	**0.00**	**7.45**	**0.59**	**0.00**
				std	0.00	0.00	1.06	2.70	13.89	0.00	11.98	1.33	0.00
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**0.00**	**52.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.96**
				std	0.00	102.62	2.62	0.00	0.00	0.00	0.00	0.00	32.99
		43	**shelt**	**mean**	**0.00**	**251.46**	**95.70**	**0.00**	**1.73**	**0.00**	**0.00**	**7.35**	**0.00**
				std	0.00	341.12	214.00	0.00	1.81	0.00	0.00	7.04	0.00
		65	**exp**	**mean**	**0.00**	**5.53**	**58.33**	**0.00**	**0.00**	**0.00**	**1.11**	**0.00**	**5.75**
				std	0.00	8.57	98.94	0.00	0.00	0.00	1.58	0.00	11.84
		66	**exp**	**mean**	**0.00**	**0.00**	**0.04**	**0.00**	**2.57**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	0.00	0.10	0.00	5.75	0.00	0.00	0.00	0.00
Isabel	**Arnavons**	**15**	**exp**	**mean**	**35.92**	**1708.40**	**703.92**	**0.00**	**0.43**	**0.00**	**8.96**	**92.42**	**66.65**
				std	34.62	2435.74	995.17	0.00	0.97	0.00	18.21	146.45	74.88
		16	**shelt**	**mean**	**10.52**	**103.11**	**96.36**	**0.00**	**1.30**	**0.00**	**0.00**	**69.03**	**2.61**
				std	15.20	91.06	84.56	0.00	2.91	0.00	0.00	134.26	4.85
Isabel	**Isabel**	**3**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**3.25**	**0.00**	**0.00**	**0.00**	**1.25**
				std	0.00	0.00	0.00	0.00	4.86	0.00	0.00	0.00	2.80
		4	**shelt**	**mean**	**0.00**	**795.11**	**0.00**	**0.00**	**5.62**	**0.00**	**0.00**	**1.18**	**0.00**
				std	0.00	1167.73	0.00	0.00	10.56	0.00	0.00	2.64	0.00
		5	**exp**	**mean**	**0.00**	**1168.43**	**120.93**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	2610.29	264.97	0.00	0.00	0.00	0.00	0.00	0.00
		6	**shelt**	**mean**	**0.00**	**6.12**	**20.22**	**6.28**	**3.67**	**0.00**	**0.00**	**0.00**	**0.95**
				std	0.00	10.70	42.10	14.04	7.92	0.00	0.00	0.00	2.06

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	Isabel (con't)	**7**	**exp**	**mean**	**23.37**	**313.66**	**502.08**	**0.00**	**0.00**	**0.00**	**0.00**	**4.04**	**0.00**
				std	52.26	288.37	332.64	0.00	0.00	0.00	0.00	9.04	0.00
		8	**shelt**	**mean**	**0.00**	**7.15**	**131.18**	**0.00**	**0.12**	**0.00**	**0.00**	**9.18**	**0.00**
				std	0.00	11.06	168.29	0.00	0.27	0.00	0.00	14.69	0.00
		9	**exp**	**mean**	**0.00**	**0.00**	**2.30**	**0.00**	**0.00**	**0.00**	**0.00**	**1.97**	**0.00**
				std	0.00	0.00	5.14	0.00	0.00	0.00	0.00	2.70	0.00
		10	**shelt**	**mean**	**0.00**	**0.43**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		11	**exp**	**mean**	**0.00**	**1579.12**	**173.73**	**0.00**	**6.15**	**0.00**	**0.44**	**35.13**	**0.93**
				std	0.00	1313.19	254.43	0.00	13.75	0.00	0.98	48.24	2.07
		12	**shelt**	**mean**	**0.00**	**0.43**	**0.00**	**3.99**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	0.96	0.00	8.92	0.00	0.00	0.00	0.00	0.00
		13	**exp**	**mean**	**5.20**	**10.80**	**2.12**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**15.70**
				std	11.62	24.16	2.66	0.00	0.00	0.00	0.00	0.00	14.12
		14	**shelt**	**mean**	**1.95**	**3.76**	**24.68**	**0.00**	**0.68**	**0.00**	**0.00**	**0.00**	**0.94**
				std	4.36	4.32	16.54	0.00	0.99	0.00	0.00	0.00	2.07
Makira	**Makira**	**44**	**exp**	**mean**	**0.00**	**3773.74**	**120.88**	**0.00**	**0.00**	**0.00**	**0.00**	**16.27**	**0.00**
				std	0.00	8225.27	197.92	0.00	0.00	0.00	0.00	32.83	0.00
		45	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**0.87**	**0.00**	**0.67**	**21.95**	**0.00**
				std	0.00	0.00	0.00	0.00	1.19	0.00	1.50	25.06	0.00
		46	**exp**	**mean**	**0.00**	**299.27**	**356.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.46**
				std	0.00	534.88	726.62	0.00	0.00	0.00	0.00	0.00	3.87
		47	**shelt**	**mean**	**0.00**	**30.44**	**0.18**	**0.00**	**4.96**	**0.00**	**44.48**	**4.11**	**1.91**
				std	0.00	30.16	0.25	0.00	7.00	0.00	93.10	6.45	4.27
Makira	**Three Sisters**	**48**	**exp**	**mean**	**0.00**	**50.23**	**54.11**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.62**
				std	0.00	91.87	102.10	0.00	0.00	0.00	0.00	0.00	4.88
		49	**shelt**	**mean**	**10.81**	**0.00**	**1.22**	**0.00**	**0.00**	**0.00**	**0.03**	**0.00**	**0.00**
				std	24.18	0.00	2.69	0.00	0.00	0.00	0.06	0.00	0.00
Makira	**Ugi**	**50**	**exp**	**mean**	**14.70**	**133.75**	**652.32**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.69**
				std	32.88	211.82	1432.07	0.00	0.00	0.00	0.00	0.00	11.85

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	Ugi (con't)	**51**	**shelt**	**mean**	**0.00**	**15.73**	**81.73**	**0.00**	**0.12**	**0.00**	**1.38**	**0.00**	**0.93**
				std	0.00	24.14	111.95	0.00	0.27	0.00	3.05	0.00	2.07
Malaita	**Malaita**	**52**	**shelt**	**mean**	**0.00**	**0.74**	**26.61**	**0.00**	**0.12**	**0.00**	**0.81**	**16.68**	**0.00**
				std	0.00	1.65	59.51	0.00	0.27	0.00	1.81	32.69	0.00
		53	**exp**	**mean**	**0.00**	**129.71**	**62.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.74**
				std	0.00	163.08	120.54	0.00	0.00	0.00	0.00	0.00	15.65
		54	**shelt**	**mean**	**0.00**	**0.00**	**0.27**	**0.00**	**0.00**	**0.00**	**2.04**	**8.66**	**0.00**
				std	0.00	0.00	0.61	0.00	0.00	0.00	3.05	8.33	0.00
		55	**exp**	**mean**	**52.51**	**83.61**	**385.87**	**0.00**	**0.00**	**0.00**	**0.00**	**29.24**	**0.00**
				std	90.29	110.20	528.10	0.00	0.00	0.00	0.00	43.96	0.00
		56	**exp**	**mean**	**0.00**	**0.00**	**3.28**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	0.00	3.12	0.00	0.00	0.00	0.00	0.00	0.00
		57	**shelt**	**mean**	**0.00**	**3.06**	**128.16**	**0.00**	**0.43**	**0.00**	**1.16**	**12.18**	**0.93**
				std	0.00	6.84	253.10	0.00	0.97	0.00	1.79	13.75	2.07
		58	**exp**	**mean**	**0.00**	**77.73**	**204.63**	**0.00**	**2.42**	**0.00**	**0.00**	**0.00**	**0.93**
				std	0.00	86.13	457.50	0.00	5.41	0.00	0.00	0.00	2.07
		59	**shelt**	**mean**	**0.00**	**22.91**	**4.95**	**0.00**	**7.14**	**0.00**	**11.89**	**1.32**	**0.00**
				std	0.00	41.31	8.24	0.00	9.89	0.00	26.59	2.94	0.00
		60	**exp**	**mean**	**0.00**	**0.00**	**4.28**	**0.00**	**0.72**	**0.00**	**0.00**	**0.00**	**3.58**
				std	0.00	0.00	4.92	0.00	1.61	0.00	0.00	0.00	5.16
		61	**shelt**	**mean**	**0.00**	**28.58**	**19.32**	**0.00**	**0.00**	**0.00**	**0.00**	**14.96**	**0.00**
				std	0.00	63.90	43.21	0.00	0.00	0.00	0.00	33.44	0.00
Western	**New Georgia**	**29**	**exp**	**mean**	**43.25**	**896.47**	**1013.95**	**0.00**	**0.00**	**0.00**	**0.00**	**71.79**	**3.71**
				std	70.49	801.80	1826.84	0.00	0.00	0.00	0.00	117.00	8.30
		30	**exp**	**mean**	**0.00**	**18.21**	**159.20**	**0.00**	**0.43**	**0.00**	**3.41**	**12.40**	**0.93**
				std	0.00	22.75	202.99	0.00	0.97	0.00	7.63	27.72	2.07
		31	**shelt**	**mean**	**0.00**	**0.43**	**5.93**	**0.00**	**3.18**	**0.00**	**0.00**	**14.83**	**0.00**
				std	0.00	0.96	9.19	0.00	3.49	0.00	0.00	20.03	0.00
		32	**exp**	**mean**	**0.00**	**1948.37**	**135.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.56**
				std	0.00	2536.98	235.88	0.00	0.00	0.00	0.00	0.00	77.29

					snappers				groupers				
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Aprion***	***Lutjanus***	***Macolor***	***Symphorichthys***	***Cephalopholis***	***Cromileptes***	***Epinephelus***	***Plectropomus***	***Variola***
	New Georgia (con't)	**33**	**exp**	**mean**	**0.00**	**347.12**	**185.76**	**0.00**	**6.03**	**0.77**	**0.00**	**20.22**	**0.00**
				std	0.00	372.90	205.99	0.00	8.30	1.72	0.00	45.22	0.00
		34	**exp**	**mean**	0.00	108.62	2.79	2.33	0.41	0.00	0.00	3.03	0.00
				std	0.00	111.27	4.94	5.22	0.91	0.00	0.00	6.78	0.00
		35	**shelt**	**mean**	**0.00**	**29.71**	**152.23**	**0.00**	**1.28**	**0.00**	**0.00**	**8.09**	**0.00**
				std	0.00	65.23	332.67	0.00	2.86	0.00	0.00	11.08	0.00
		36	**exp**	**mean**	**0.00**	**21.23**	**49.59**	**0.00**	**0.81**	**0.00**	**0.00**	**27.88**	**0.00**
				std	0.00	23.19	71.68	0.00	1.11	0.00	0.00	46.97	0.00
		37	**shelt**	**mean**	**63.43**	**25.13**	**75.13**	**0.00**	**0.43**	**0.00**	**0.35**	**13.78**	**5.17**
				std	127.82	32.21	103.09	0.00	0.97	0.00	0.78	16.53	7.53
Western	**Shortlands**	**25**	**exp**	**mean**	**0.00**	**199.55**	**42.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**28.98**
				std	0.00	300.65	54.26	0.00	0.00	0.00	0.00	0.00	34.79
		26	**shelt**	**mean**	**0.44**	**40.25**	**0.00**	**0.00**	**11.08**	**0.00**	**0.67**	**0.00**	**0.00**
				std	0.98	44.45	0.00	0.00	22.37	0.00	1.50	0.00	0.00
		27	**exp**	**mean**	**0.00**	**4495.51**	**5861.55**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
				std	0.00	4762.97	12853.90	0.00	0.00	0.00	0.00	0.00	0.00
		28	**shelt**	**mean**	**0.00**	**3.19**	**0.00**	**0.00**	**0.87**	**0.00**	**0.98**	**0.00**	**0.86**
				std	0.00	4.99	0.00	0.00	1.19	0.00	2.20	0.00	0.96

Appendix 11. Mean biomass of each genera of food fishes in four key families (parrotfishes, surgeonfishes, emperors and fusiliers) of reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
Central	**Floridas**	**1**	**shelt**	**mean**	**0.00**	**35.79**	**25.98**	**0.00**	**18.79**	**8.38**	**4.91**	**7.03**	**0.00**
				std	0.00	49.84	28.14	0.00	11.50	13.79	10.97	15.71	0.00
		2	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**13.12**	**130.18**	**11.65**	**0.00**	**0.00**	**133.93**
				std	0.00	0.00	0.00	21.33	115.63	6.84	0.00	0.00	**133.83**
		62	**exp**	**mean**	**229.89**	**5.33**	**0.00**	**11.80**	**5.56**	**0.00**	**0.00**	**0.00**	**43.41**
				std	514.06	11.91	0.00	18.26	10.53	0.00	0.00	0.00	67.52
		63	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**3.37**	**10.29**	**0.00**	**0.49**	**1.61**
				std	0.00	0.00	0.00	0.00	4.89	7.68	0.00	0.49	1.58
Central	**Russells**	**38**	**exp**	**mean**	**215.03**	**195.74**	**2.89**	**55.18**	**12.62**	**97.82**	**53.16**	**1110.96**	**224.44**
				std	480.82	86.46	6.47	77.98	3.67	189.82	114.60	669.89	347.44
		39	**shelt**	**mean**	**0.00**	**20.56**	**255.15**	**29.53**	**12.18**	**6.05**	**1.03**	**20.19**	**0.00**
				std	0.00	20.81	178.02	43.39	5.38	7.67	1.41	6.66	0.00
		40	**exp**	**mean**	**114.95**	**20.28**	**61.81**	**90.76**	**18.55**	**11.83**	**19.50**	**307.85**	**0.00**
				std	257.03	45.35	69.93	91.73	7.83	9.47	23.96	520.24	0.00
		41	**shelt**	**mean**	**0.00**	**162.14**	**899.72**	**72.32**	**6.26**	**5.77**	**23.16**	**277.02**	**52.78**
				std	0.00	242.53	1922.81	152.13	5.13	4.82	41.32	484.67	118.03
Central	**Savo**	**64**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**21.85**	**36.06**	**7.68**	**21.27**	**107.34**	**0.00**
				std	0.00	0.00	0.00	48.87	22.63	7.45	19.72	119.89	0.00
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**181.01**	**31.17**	**654.85**	**282.21**	**93.03**	**279.78**	**25.23**	**456.54**	**112.15**
				std	404.75	43.74	626.36	251.42	82.45	100.51	49.23	716.06	205.82
		18	**shelt**	**mean**	**90.51**	**0.00**	**0.00**	**8.73**	**37.06**	**3.95**	**13.29**	**90.13**	**56.27**
				std	202.38	0.00	0.00	19.53	13.76	8.82	26.04	104.01	48.89
		19	**shelt**	**mean**	**12.29**	**0.00**	**0.00**	**0.00**	**31.00**	**0.00**	**2.06**	**13.13**	**275.16**
				std	27.47	0.00	0.00	0.00	9.23	0.00	1.15	7.47	75.97
		20	**exp**	**mean**	**0.00**	**13.65**	**1008.51**	**10.96**	**51.78**	**55.06**	**1.54**	**55.72**	**252.89**
				std	0.00	18.90	1809.44	19.91	38.24	64.58	1.41	46.42	363.87

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
	Choiseul (con't)	**21**	**exp**	**mean**	**2483.05**	**0.00**	**0.00**	**637.29**	**41.46**	**727.37**	**58.73**	**101.24**	**0.00**
				std	1616.31	0.00	0.00	247.99	15.76	558.79	54.01	124.98	0.00
		22	**shelt**	**mean**	**1941.68**	**5.77**	**0.00**	**12.64**	**39.76**	**0.00**	**15.47**	**122.23**	**0.00**
				std	3274.84	12.90	0.00	18.72	16.08	0.00	34.60	194.30	0.00
		23	**exp**	**mean**	**0.00**	**55.80**	**0.00**	**26.93**	**80.18**	**18.71**	**82.58**	**30.02**	**116.81**
				std	0.00	74.43	0.00	50.91	41.78	14.44	118.82	18.25	192.78
		24	**shelt**	**mean**	**0.00**	**1.10**	**0.00**	**15.72**	**29.64**	**0.00**	**0.00**	**10.82**	**14.55**
				std	0.00	2.47	0.00	35.15	13.19	0.00	0.00	9.55	22.31
Guadalcanal	**Guadalcanal**	**42**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**709.34**	**11.93**	**1.52**	**12.39**	**21.96**	**0.00**
				std	0.00	0.00	0.00	1556.07	7.52	3.40	27.69	27.95	0.00
		43	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**9.21**	**3.56**	**0.51**	**87.58**	**1.90**
				std	0.00	0.00	0.00	0.00	4.21	3.86	1.15	137.71	4.24
		65	**exp**	**mean**	**0.00**	**1.15**	**0.00**	**6.00**	**21.88**	**0.00**	**0.00**	**21.44**	**0.00**
				std	0.00	2.58	0.00	8.80	16.63	0.00	0.00	15.01	0.00
		66	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**2.90**	**5.22**	**73.10**	**0.00**	**0.00**	**0.00**
				std	0.00	0.00	0.00	4.61	7.47	163.47	0.00	0.00	0.00
Isabel	**Arnavons**	**15**	**exp**	**mean**	**0.00**	**203.73**	**175.90**	**175.87**	**53.02**	**148.00**	**159.08**	**663.35**	**88.51**
				std	0.00	398.76	225.28	185.34	46.80	148.59	152.07	921.92	138.51
		16	**shelt**	**mean**	**160.41**	**55.35**	**133.38**	**121.68**	**22.72**	**2.03**	**32.73**	**246.48**	**31.45**
				std	358.70	57.16	165.29	225.89	15.68	3.30	51.93	233.75	54.75
Isabel	**Isabel**	**3**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**35.32**	**109.58**	**17.83**	**1.30**	**11.92**	**208.11**
				std	0.00	0.00	0.00	34.53	115.00	21.10	1.84	26.66	44.39
		4	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**13.80**	**3.40**	**0.00**	**7.49**	**3.26**	**411.54**
				std	0.00	0.00	0.00	30.85	7.61	0.00	13.62	3.73	439.94
		5	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**57.44**	**328.35**	**103.44**	**13.27**	**267.17**	**35.36**
				std	0.00	0.00	0.00	61.49	328.94	198.17	14.53	572.18	69.07
		6	**shelt**	**mean**	**0.00**	**2.72**	**2.00**	**0.74**	**43.58**	**13.80**	**1.15**	**12.25**	**20.23**
				std	0.00	6.09	4.47	1.65	26.97	24.12	0.76	27.38	45.24
		7	**exp**	**mean**	**950.00**	**0.00**	**146.05**	**33.34**	**67.39**	**16.35**	**32.06**	**22.09**	**476.47**
				std	875.00	0.00	142.94	46.10	53.84	17.78	44.68	47.58	737.21

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
	Isabel (con't)	**8**	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**6.53**	**47.85**	**54.88**	**5.45**	**0.00**	**118.57**
				std	0.00	0.00	0.00	10.68	13.55	32.05	7.05	0.00	169.25
		9	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**63.01**	**115.15**	**0.00**	**0.73**	**0.00**	**5.54**
				std	0.00	0.00	0.00	117.68	82.32	0.00	1.08	0.00	12.39
		10	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**10.82**	**28.60**	**0.00**	**1.84**	**6.40**	**8.72**
				std	0.00	0.00	0.00	20.36	22.48	0.00	1.98	12.54	13.81
		11	**exp**	**mean**	**919.85**	**138.41**	**196.28**	**685.78**	**221.09**	**33.51**	**32.30**	**502.73**	**363.43**
				std	1388.48	203.71	233.92	1035.76	112.82	64.37	68.92	934.85	300.72
		12	**shelt**	**mean**	**0.00**	**0.00**	**10.52**	**15.14**	**0.00**	**0.03**	**0.73**	**7.87**	**20.97**
				std	0.00	0.00	15.86	26.47	0.00	0.07	1.08	4.81	45.65
		13	**exp**	**mean**	**0.00**	**0.00**	**78.28**	**7.10**	**40.50**	**50.88**	**1.57**	**39.21**	**144.46**
				std	0.00	0.00	175.03	10.97	24.48	109.53	3.50	87.68	323.02
		14	**shelt**	**mean**	**0.00**	**0.90**	**27.23**	**229.82**	**19.05**	**11.18**	**5.61**	**198.99**	**570.23**
				std	0.00	2.01	37.97	464.37	10.10	15.82	7.29	278.10	731.67
Makira	**Makira**	**44**	**exp**	**mean**	**1468.91**	**22.87**	**303.20**	**68.01**	**15.13**	**21.41**	**0.00**	**1424.59**	**0.00**
				std	2418.59	51.13	349.88	74.71	19.39	22.54	0.00	2632.75	0.00
		45	**shelt**	**mean**	**6.86**	**24.45**	**30.26**	**166.92**	**1.23**	**12.64**	**0.51**	**8.99**	**3.15**
				std	8.53	32.06	54.75	368.39	2.76	24.24	1.15	12.33	4.39
		46	**exp**	**mean**	**0.00**	**1.15**	**0.00**	**0.00**	**94.54**	**5.25**	**0.51**	**263.19**	**25.29**
				std	0.00	2.58	0.00	0.00	39.49	3.39	1.15	380.67	56.55
		47	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**6.74**	**0.00**	**0.00**	**2.77**	**0.00**
				std	0.00	0.00	0.00	0.00	7.66	0.00	0.00	4.58	0.00
Makira	**Three Sisters**	**48**	**exp**	**mean**	**0.00**	**4.10**	**0.00**	**6.28**	**62.19**	**2.42**	**0.00**	**26.66**	**0.00**
				std	0.00	9.17	0.00	9.86	37.65	3.23	0.00	18.04	0.00
		49	**shelt**	**mean**	**0.00**	**4.10**	**26.69**	**2.99**	**10.49**	**38.56**	**4.51**	**28.93**	**0.00**
				std	0.00	9.17	25.52	6.69	8.07	53.12	8.72	38.17	0.00
Makira	**Ugi**	**50**	**exp**	**mean**	**56.71**	**68.52**	**0.00**	**0.00**	**29.95**	**446.23**	**8.76**	**131.32**	**0.00**
				std	126.80	85.42	0.00	0.00	16.09	601.73	14.01	216.69	0.00
		51	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**13.17**	**36.69**	**4.37**	**21.24**	**7.93**	**0.00**
				std	0.00	0.00	0.00	29.44	23.37	6.86	31.04	10.89	0.00

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
Malaita	**Malaita**	**52**	**shelt**	**mean**	**0.00**	**0.00**	**1.40**	**3.86**	**21.68**	**0.00**	**0.00**	**2.32**	**107.48**
				std	0.00	0.00	3.14	5.32	22.36	0.00	0.00	2.21	166.67
		53	**exp**	**mean**	**0.00**	**10.94**	**2.89**	**7.85**	**40.01**	**8.24**	**0.51**	**90.03**	**0.00**
				std	0.00	16.80	6.47	17.55	18.68	17.05	1.15	98.93	0.00
		54	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**6.88**	**6.25**	**0.00**	**2.06**	**0.44**	**20.60**
				std	0.00	0.00	0.00	9.42	5.80	0.00	4.60	0.97	44.48
		55	**exp**	**mean**	**0.00**	**15.56**	**11.57**	**135.20**	**89.54**	**62.20**	**0.00**	**34.99**	**0.00**
				std	0.00	25.46	25.87	82.60	36.39	124.31	0.00	65.89	0.00
		56	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**5.03**	**57.61**	**3.92**	**0.00**	**21.89**	**214.32**
				std	0.00	0.00	0.00	11.25	81.37	4.00	0.00	18.56	166.35
		57	**shelt**	**mean**	**0.00**	**53.66**	**1.38**	**0.00**	**173.15**	**22.17**	**0.51**	**4.85**	**0.00**
				std	0.00	119.98	3.09	0.00	117.51	20.15	1.15	7.11	0.00
		58	**exp**	**mean**	**191.58**	**0.00**	**29.04**	**1.75**	**175.37**	**51.15**	**1.03**	**51.55**	**0.00**
				std	428.38	0.00	39.97	3.91	87.67	92.57	1.41	67.28	0.00
		59	**shelt**	**mean**	**69.91**	**0.00**	**0.00**	**0.00**	**114.38**	**22.68**	**20.86**	**28.64**	**6.32**
				std	156.32	0.00	0.00	0.00	49.02	35.45	42.38	58.74	14.14
		60	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**24.90**	**63.34**	**2.08**	**2.39**	**5.63**
				std	0.00	0.00	0.00	0.00	15.38	65.04	3.41	3.44	8.39
		61	**shelt**	**mean**	**27.64**	**0.00**	**0.00**	**0.00**	**4.03**	**0.00**	**2.84**	**0.45**	**25.29**
				std	61.80	0.00	0.00	0.00	3.85	0.00	5.06	1.01	56.55
Western	**New Georgia**	**29**	**exp**	**mean**	**0.00**	**139.49**	**1617.88**	**120.44**	**0.00**	**2941.77**	**9.61**	**31.37**	**0.00**
				std	0.00	205.02	2763.10	224.34	0.00	5135.76	21.48	70.14	0.00
		30	**exp**	**mean**	**0.00**	**19.89**	**0.00**	**36.43**	**0.00**	**12.94**	**1.03**	**152.78**	**0.00**
				std	0.00	28.35	0.00	26.10	0.00	20.78	1.41	328.63	0.00
		31	**shelt**	**mean**	**0.00**	**2.99**	**0.00**	**0.00**	**70.55**	**5.45**	**0.90**	**19.42**	**331.16**
				std	0.00	5.53	0.00	0.00	38.17	7.44	2.01	13.93	222.66
		32	**exp**	**mean**	**0.00**	**15.45**	**0.00**	**12.59**	**82.03**	**102.04**	**75.10**	**43.25**	**37.93**
				std	0.00	34.55	0.00	18.04	30.35	175.64	165.06	80.34	84.82
		33	**exp**	**mean**	**0.00**	**4.57**	**740.90**	**18.21**	**6.09**	**4.56**	**0.00**	**81.86**	**401.27**
				std	0.00	10.23	1384.75	24.18	7.45	6.30	0.00	133.09	322.78

					parrotfishes			surgeonfishes			emperors		fusiliers
Province	**Island**	**Site**	**Exposure**	**Mean Biomass (kg/ha)**	***Bolbometopon***	***Chlorurus***	***Hipposcarus***	***Acanthurus***	***Ctenochaetus***	***Naso***	***Lethrinus***	***Monotaxis***	***Caesio***
	New Georgia (con't)	**34**	**exp**	**mean**	**141.77**	**2.46**	**12.89**	**178.03**	**39.96**	**10.63**	**1.54**	**141.98**	**110.97**
				std	144.23	5.50	19.34	313.48	22.04	17.21	1.41	156.50	113.59
		35	**shelt**	**mean**	**0.00**	**69.53**	**0.00**	**10.19**	**19.67**	**334.94**	**3.60**	**3.31**	**1327.67**
				std	0.00	155.48	0.00	18.98	14.44	715.93	3.45	7.40	1348.58
		36	**exp**	**mean**	**31.19**	**49.41**	**334.06**	**10.48**	**33.37**	**33.93**	**2.99**	**123.19**	**350.14**
				std	44.28	71.35	628.68	12.11	21.63	55.61	5.37	180.74	424.23
		37	**shelt**	**mean**	**215.03**	**80.73**	**10.44**	**2.11**	**62.18**	**10.81**	**0.00**	**68.29**	**399.57**
				std	480.82	159.79	23.34	4.73	23.35	6.14	0.00	96.56	615.53
Western	**Shortlands**	**25**	**exp**	**mean**	**0.00**	**20.28**	**0.00**	**479.72**	**83.72**	**82.82**	**41.04**	**0.00**	**50.47**
				std	0.00	45.35	0.00	307.44	51.70	141.77	54.65	0.00	112.86
		26	**shelt**	**mean**	**1113.97**	**121.96**	**0.00**	**0.00**	**91.23**	**0.00**	**4.63**	**9.04**	**26.41**
				std	2490.92	272.71	0.00	0.00	30.48	0.00	4.60	6.30	55.94
		27	**exp**	**mean**	**0.00**	**64.65**	**2399.83**	**3594.54**	**0.00**	**156.32**	**0.00**	**5090.59**	**189.67**
				std	0.00	101.48	2171.04	2289.61	0.00	328.47	0.00	5555.93	424.11
		28	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**0.03**	**0.00**	**0.03**	**1.03**	**6.91**	**15.48**
				std	0.00	0.00	0.00	0.06	0.00	0.07	2.30	13.36	30.29

Appendix 12: Mean biomass of three key species tarteted by the live reef food fish trade on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Province	Exposure	Mean Biomass (kg/ha)	Brown-marbled grouper	Camouflage grouper	Squaretail coral grouper
Central	**exp**	**mean**	**0.00**	**0.00**	**2.05**
		std	0.00	0.00	7.26
	shelt	**mean**	**0.00**	**4.08**	**16.81**
		std	0.00	18.25	28.72
Choiseul	**exp**	**mean**	**0.00**	**0.00**	**4.32**
		std	0.00	0.00	14.63
	shelt	**mean**	**1.38**	**0.49**	**0.76**
		std	6.15	2.18	2.77
Guadalcanal	**exp**	**mean**	**0.00**	**0.00**	**0.00**
		std	0.00	0.00	0.00
	shelt	**mean**	**0.00**	**0.00**	**6.21**
		std	0.00	0.00	7.16
Isabel	**exp**	**mean**	**1.18**	**0.00**	**16.14**
		std	7.00	0.00	60.06
	shelt	**mean**	**0.00**	**0.00**	**2.14**
		std	0.00	0.00	5.88
Makira	**exp**	**mean**	**0.00**	**0.00**	**0.00**
		std	0.00	0.00	0.00
	shelt	**mean**	**10.55**	**0.00**	**0.00**
		std	47.17	0.00	0.00
Malaita	**exp**	**mean**	**0.00**	**0.00**	**2.86**
		std	0.00	0.00	8.10
	shelt	**mean**	**2.38**	**0.00**	**2.59**
		std	11.89	0.00	4.92
Western	**exp**	**mean**	**0.00**	**0.43**	**16.86**
		std	0.00	2.70	49.64
	shelt	**mean**	**0.00**	**0.20**	**6.20**
		std	0.00	0.98	13.22

Appendix 13. Mean biomass of large reef fishes (30cm or more in size) of sharks, rays and some key families of bony fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

			Bony Fishes											Sharks & Rays	
Province	**Exposure**	**Mean Biomass (kg/ha)**	**Emperors**	**Groupers**	**Parrotfishes**	**Rabbitfishes**	**Drummers**	**Snappers**	**Surgeonfishes**	**Sweetlips**	**Trevallies**	**Triggerfishes**	**Wrasses**	**Sharks**	**Rays**
Central	**exp**	**mean**	**200.71**	**9.77**	**184.94**	**191.72**	**294.04**	**526.77**	**15.40**	**21.51**	**0.00**	**30.89**	**37.90**	**56.30**	**0.00**
		std	471.90	24.99	343.79	909.96	1243.72	959.42	47.83	47.03	0.00	69.39	101.43	267.45	0.00
	shelt	**mean**	**69.51**	**23.32**	**126.68**	**0.00**	**0.00**	**30.21**	**0.00**	**3.20**	**0.00**	**69.05**	**11.03**	**19.59**	**0.00**
		std	242.52	51.83	175.84	0.00	0.00	43.18	0.00	14.29	0.00	144.14	38.77	62.25	0.00
Choiseul	**exp**	**mean**	**86.98**	**31.26**	**1041.53**	**3.99**	**0.00**	**369.58**	**61.61**	**15.95**	**11.67**	**90.46**	**10.10**	**77.79**	**0.00**
		std	374.95	68.00	1484.50	17.85	0.00	861.90	174.59	39.52	37.65	116.80	27.46	244.72	0.00
	shelt	**mean**	**19.55**	**3.65**	**553.15**	**181.57**	**0.00**	**85.06**	**2.50**	**13.42**	**38.70**	**12.22**	**9.67**	**0.00**	**0.00**
		std	87.43	9.18	1808.70	812.02	0.00	159.04	11.16	36.10	173.05	31.33	25.00	0.00	0.00
Guadalcanal	**exp**	**mean**	**0.00**	**6.21**	**23.48**	**2.66**	**0.00**	**15.10**	**0.00**	**16.52**	**0.00**	**11.09**	**0.00**	**185.15**	**0.00**
		std	0.00	18.00	59.49	10.30	0.00	58.49	0.00	42.47	0.00	22.96	0.00	717.07	0.00
	shelt	**mean**	**0.00**	**0.00**	**55.80**	**0.00**	**0.00**	**95.70**	**0.00**	**0.00**	**0.00**	**11.09**	**0.00**	**27.93**	**135.27**
		std	0.00	0.00	60.45	0.00	0.00	214.00	0.00	0.00	0.00	24.80	0.00	62.46	302.48
Isabel	**exp**	**mean**	**149.58**	**27.37**	**391.86**	**4.56**	**0.00**	**655.61**	**129.38**	**81.23**	**17.26**	**374.88**	**27.93**	**0.00**	**0.00**
		std	592.54	71.18	788.66	26.98	0.00	1550.02	431.88	205.73	52.58	1039.02	80.50	0.00	0.00
	shelt	**mean**	**16.00**	**13.78**	**42.78**	**0.00**	**1.46**	**41.12**	**0.00**	**40.03**	**8.31**	**3.17**	**19.03**	**3.34**	**0.00**
		std	53.79	53.49	151.29	0.00	8.61	95.10	0.00	139.51	23.91	13.06	106.43	19.77	0.00
Makira	**exp**	**mean**	**325.08**	**5.12**	**494.06**	**0.00**	**191.12**	**1221.82**	**113.82**	**4.31**	**29.65**	**19.54**	**4.54**	**10.37**	**0.00**
		std	1094.35	17.52	1422.09	0.00	854.71	3815.79	315.20	14.06	96.33	55.31	20.31	46.37	0.00
	shelt	**mean**	**5.52**	**15.20**	**48.50**	**0.00**	**0.00**	**24.36**	**11.40**	**0.00**	**61.76**	**21.45**	**0.00**	**322.26**	**0.00**
		std	17.53	48.50	90.05	0.00	0.00	67.28	30.24	0.00	223.98	83.81	0.00	1261.52	0.00
Malaita	**exp**	**mean**	**15.12**	**9.07**	**79.78**	**3.19**	**18.35**	**147.32**	**25.43**	**138.02**	**10.70**	**3.09**	**34.48**	**0.00**	**4487.05**
		std	41.01	23.73	209.20	15.96	57.75	334.28	54.15	349.10	53.49	15.46	80.80	0.00	22435.27
	shelt	**mean**	**3.76**	**9.78**	**38.50**	**0.00**	**0.00**	**44.23**	**0.00**	**12.44**	**7.18**	**0.00**	**0.00**	**0.00**	**0.00**
		std	18.80	23.80	89.30	0.00	0.00	124.68	0.00	36.27	22.07	0.00	0.00	0.00	0.00
Western	**exp**	**mean**	**665.68**	**24.23**	**423.48**	**0.00**	**3.13**	**1428.76**	**464.59**	**12.44**	**0.86**	**44.24**	**15.36**	**286.32**	**0.00**
		std	2459.94	55.10	1273.41	0.00	19.80	4917.59	1990.20	40.58	5.43	101.19	47.91	924.38	0.00
	shelt	**mean**	**0.00**	**6.55**	**328.71**	**0.00**	**0.00**	**33.68**	**51.58**	**0.00**	**178.86**	**21.16**	**4.05**	**285.60**	**0.00**
		std	0.00	13.69	1241.05	0.00	0.00	97.56	257.91	0.00	894.28	68.20	11.44	996.79	0.00

Appendix 14. Mean density of large vulnerable reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands

			BONY FISHES													SHARKS & RAYS				
Province	Exposure	Mean Density (per ha)	Humphead Wrasse	Humphead Parrotfish	Steephead Parrotfish	Giant Trevally	Baramundi Cod	Brown-marbled grouper	Camouflage grouper	White-edged lyretail	Yellow-edged lyretail	Longfin emperor	Longface emperor	Spotcheek emperor	Yellowlip emperor	Manta rays	Spotted eagle ray	Blacktip Reef Shark	White Tip Reef Shark	Unid Shark
Central	exp	mean	**0.53**	**0.80**	**1.33**	**0.00**	**0.00**	**0.00**	**0.27**	**0.53**	**5.07**	**2.13**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	0.73	1.79	2.98	0.00	0.00	0.00	0.60	0.73	9.26	2.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	shelt	mean	**2.67**	**0.00**	**1.00**	**0.00**	**0.00**	**1.33**	**0.33**	**0.33**	**0.33**	**1.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	3.77	0.00	2.00	0.00	0.00	2.67	0.67	0.67	0.67	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Choiseul	exp	mean	**3.33**	**0.67**	**3.67**	**0.00**	**0.00**	**0.33**	**0.00**	**0.00**	**8.00**	**3.00**	**0.00**	**3.67**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	5.81	1.33	4.27	0.00	0.00	0.67	0.00	0.00	11.98	2.00	0.00	7.33	2.00	0.00	0.00	0.00	0.00	0.00
	shelt	mean	**0.33**	**0.67**	**0.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**4.00**	**0.00**	**0.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.33**	**0.00**
		sd	0.67	0.77	0.67	0.00	0.00	0.00	0.00	0.00	1.72	4.75	0.00	1.33	0.00	0.00	0.00	0.00	0.67	0.00
Guadalcanal	exp	mean	**1.78**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.45**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.33**	**0.00**
		sd	3.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	0.00
	shelt	mean	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Isabel	exp	mean	**1.33**	**2.67**	**1.33**	**0.00**	**0.19**	**0.00**	**0.00**	**0.00**	**4.76**	**0.57**	**0.57**	**0.95**	**0.00**	**0.00**	**0.19**	**0.00**	**0.00**	**0.00**
		sd	1.54	5.11	1.89	0.00	0.50	0.00	0.00	0.00	8.43	1.05	1.51	1.99	0.00	0.00	0.50	0.00	0.00	0.00
	shelt	mean	**0.38**	**0.38**	**0.38**	**0.19**	**0.00**	**0.19**	**0.38**	**1.71**	**3.24**	**5.14**	**1.14**	**1.14**	**0.00**	**0.00**	**0.19**	**0.00**	**0.00**	**0.00**
		sd	1.01	1.01	1.01	0.50	0.00	0.50	0.65	2.63	4.61	9.28	1.95	1.62	0.00	0.00	0.50	0.00	0.00	0.00
Makira	exp	mean	**2.00**	**0.33**	**0.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.33**	**3.33**	**0.00**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.33**	**0.00**
		sd	4.00	0.67	0.77	0.00	0.00	0.00	0.00	0.00	1.09	3.85	0.00	2.00	0.00	0.00	0.00	0.00	0.67	0.00
	shelt	mean	**0.00**	**0.00**	**4.00**	**0.00**	**0.00**	**0.00**	**0.67**	**1.33**	**1.00**	**4.00**	**17.33**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	0.00	0.00	7.14	0.00	0.00	0.00	1.33	2.67	2.00	5.44	25.83	2.00	0.00	0.00	0.00	0.00	0.00	0.00
Malaita	exp	mean	**0.53**	**1.33**	**0.27**	**0.00**	**0.00**	**0.00**	**1.33**	**0.00**	**1.33**	**0.80**	**2.93**	**2.67**	**0.80**	**0.00**	**0.00**	**0.00**	**0.53**	**0.00**
		sd	1.19	2.98	0.60	0.00	0.00	0.00	2.98	0.00	2.31	1.19	6.56	3.77	1.79	0.00	0.00	0.00	1.19	0.00
	shelt	mean	**0.27**	**0.00**	**0.00**	**0.00**	**0.00**	**0.27**	**0.00**	**1.07**	**0.80**	**1.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	0.60	0.00	0.00	0.00	0.00	0.60	0.00	1.74	1.79	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			BONY FISHES														SHARKS & RAYS				
Province	Exposure	Mean Density (per ha)	Humphead Wrasse	Humphead Parrotfish	Steephead Parrotfish	Giant Trevally	Baramundi Cod	Brown-marbled grouper	Camouflage grouper	White-edged lyretail	Yellow-edged lyretail	Longfin emperor	Longface emperor	Spotcheek emperor	Yellowlip emperor	Manta rays	Spotted eagle ray	Blacktip Reef Shark	White Tip Reef Shark	Unid Shark
Western	**exp**	**mean**	**2.17**	**7.33**	**3.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**1.33**	**1.83**	**0.83**	**0.83**	**0.00**	**0.17**	**0.00**	**0.17**	**0.00**	**0.00**
		sd	1.74	11.93	5.19	0.00	0.00	0.00	0.00	0.69	1.59	2.46	1.41	1.88	0.00	0.47	0.00	0.47	0.00	0.00
	shelt	**mean**	**0.00**	**0.00**	**1.33**	**0.00**	**0.00**	**0.27**	**0.00**	**0.00**	**1.07**	**1.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.27**	**0.27**
		sd	0.00	0.00	2.98	0.00	0.00	0.60	0.00	0.00	1.74	2.39	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60

Appendix 15. Mean biomass of large vulnerable reef fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

			BONY FISHES													SHARKS & RAYS				
Province	**Exposure**	**Mean Biomass (kg/ha)**	**Humphead Wrasse**	**Humphead Parrotfish**	**Steephead Parrotfish**	**Giant Trevally**	**Baramundi Cod**	**Brown-marbled Grouper**	**Camouflage Grouper**	**White-edged Lyretail**	**Yellow-edged Lyretail**	**Longfin Emperor**	**Longface Emperor**	**Spotcheek Emperor**	**Yellowlip Emperor**	**Manta Ray**	**Spotted Eagle Ray**	**Blacktip Reef Shark**	**Whitetip Reef Shark**	**Unid Shark**
Central	**exp**	**mean**	**1.02**	**3.57**	**0.55**	**0.00**	**0.00**	**0.00**	**0.01**	**0.40**	**1.29**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	1.44	7.98	1.23	0.00	0.00	0.00	0.02	0.88	2.69	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	shelt	**mean**	**3.55**	**0.00**	**0.53**	**0.00**	**0.00**	**1.98**	**0.04**	**0.03**	**0.02**	**0.11**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	6.90	0.00	1.05	0.00	0.00	3.96	0.08	0.06	0.03	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Choiseul	**exp**	**mean**	**23.90**	**10.58**	**1.48**	**0.00**	**0.00**	**0.50**	**0.00**	**0.00**	**2.48**	**0.18**	**0.00**	**1.86**	**0.51**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	46.91	21.15	1.72	0.00	0.00	0.99	0.00	0.00	3.86	0.12	0.00	3.73	1.01	0.00	0.00	0.00	0.00	0.00
	shelt	**mean**	**0.11**	**9.75**	**0.32**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.35**	**0.27**	**0.00**	**0.11**	**0.00**	**0.00**	**0.00**	**0.00**	**6.72**	**0.00**
		sd	0.23	17.46	0.64	0.00	0.00	0.00	0.00	0.00	0.27	0.29	0.00	0.22	0.00	0.00	0.00	0.00	13.44	0.00
Guadalcanal	**exp**	**mean**	**4.90**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.73**	**0.00**	**0.00**	**0.66**	**0.00**	**0.00**	**0.00**	**0.00**	**10.53**	**0.00**
		sd	8.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	0.00	0.00	1.15	0.00	0.00	0.00	0.00	18.25	0.00
	shelt	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Isabel	**exp**	**mean**	**3.00**	**33.81**	**0.64**	**0.00**	**0.06**	**0.00**	**0.00**	**0.00**	**0.57**	**0.05**	**0.14**	**0.20**	**0.00**	**0.00**	**1.88**	**0.00**	**0.00**	**0.00**
		sd	4.82	64.56	1.06	0.00	0.16	0.00	0.00	0.00	1.08	0.11	0.37	0.44	0.00	0.00	4.96	0.00	0.00	0.00
	shelt	**mean**	**0.23**	**1.85**	**0.37**	**0.06**	**0.00**	**0.13**	**0.19**	**0.66**	**0.52**	**0.33**	**0.73**	**0.08**	**0.00**	**0.00**	**3.22**	**0.00**	**0.00**	**0.00**
		sd	0.62	4.89	0.97	0.17	0.00	0.35	0.44	1.32	0.77	0.60	1.32	0.14	0.00	0.00	8.52	0.00	0.00	0.00
Makira	**exp**	**mean**	**0.93**	**10.77**	**0.38**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.19**	**0.38**	**0.00**	**0.36**	**0.00**	**0.00**	**0.00**	**0.00**	**0.32**	**0.00**
		sd	1.86	21.55	0.44	0.00	0.00	0.00	0.00	0.00	0.29	0.51	0.00	0.72	0.00	0.00	0.00	0.00	0.63	0.00
	shelt	**mean**	**0.00**	**0.00**	**1.79**	**0.00**	**0.00**	**0.00**	**0.08**	**0.09**	**0.01**	**0.25**	**15.65**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	0.00	0.00	3.46	0.00	0.00	0.00	0.16	0.18	0.03	0.35	28.64	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Malaita	**exp**	**mean**	**0.29**	**7.39**	**0.26**	**0.00**	**0.00**	**0.00**	**0.57**	**0.00**	**0.29**	**0.08**	**1.14**	**1.32**	**0.41**	**0.00**	**0.00**	**0.00**	**2.76**	**0.00**
		sd	0.66	16.52	0.58	0.00	0.00	0.00	1.27	0.00	0.63	0.13	2.55	1.96	0.91	0.00	0.00	0.00	6.17	0.00
	shelt	**mean**	**0.09**	**0.00**	**0.00**	**0.00**	**0.00**	**0.55**	**0.00**	**0.08**	**0.19**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		sd	0.20	0.00	0.00	0.00	0.00	1.22	0.00	0.14	0.42	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			BONY FISHES													SHARKS & RAYS				
Province	**Exposure**	**Mean Biomass (kg/ha)**	**Humphead Wrasse**	**Humphead Parrotfish**	**Steephead Parrotfish**	**Giant Trevally**	**Baramundi Cod**	**Brown-marbled Grouper**	**Camouflage Grouper**	**White-edged Lyretail**	**Yellow-edged Lyretail**	**Longfin Emperor**	**Longface Emperor**	**Spotcheek Emperor**	**Yellowlip Emperor**	**Manta Ray**	**Spotted Eagle Ray**	**Blacktip Reef Shark**	**Whitetip Reef Shark**	**Unid Shark**
Western	**exp**	**mean**	**10.42**	**103.02**	**3.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.29**	**0.53**	**0.12**	**1.26**	**0.38**	**0.00**	**51.50**	**0.00**	**1.92**	**0.00**	**0.00**
		sd	12.37	197.92	4.79	0.00	0.00	0.00	0.00	0.53	1.08	0.16	2.37	0.93	0.00	145.66	0.00	5.42	0.00	0.00
	shelt	**mean**	**0.00**	**0.00**	**1.29**	**0.00**	**0.00**	**0.24**	**0.00**	**0.00**	**0.43**	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.35**	**7.28**
		sd	0.00	0.00	2.88	0.00	0.00	0.53	0.00	0.00	0.81	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.78	16.29

Appendix 16. Mean density of aquarium fishes on sheltered and exposed reef slopes (10m) in the Solomon Islands.

Province	Island	Site	Exposure	Mean Density (per ha)	Angelfishes	Butterflyfishes	Damselfishes	Fairy basslets	Hawkfishes	Leatherjackets	Parrotfishes	Puffers	Surgeonfishes	Sweetlips	Triggerfishes	Wrasses
Central	**Floridas**	**1**	**shelt**	**mean**	**346.67**	**40.00**	**2840.00**	**173.33**	**0.00**	**0.00**	**0.00**	**0.00**	**26.67**	**0.00**	**13.33**	**960.00**
				std	152.02	59.63	1762.32	238.51	0.00	0.00	0.00	0.00	36.51	0.00	29.81	1121.11
		2	**exp**	**mean**	**106.67**	**466.67**	**7013.33**	**93.33**	**13.33**	**0.00**	**0.00**	**0.00**	**693.33**	**253.33**	**0.00**	**746.67**
				std	173.85	194.37	6630.80	101.11	29.81	0.00	0.00	0.00	138.24	186.43	0.00	425.31
		62	**exp**	**mean**	**560.00**	**160.00**	**4200.00**	**2842.67**	**0.00**	**0.00**	**0.00**	**0.00**	**346.67**	**0.00**	**40.00**	**10093.33**
				std	417.93	203.31	5525.70	3596.09	0.00	0.00	0.00	0.00	694.17	0.00	59.63	4849.65
		63	**shelt**	**mean**	**120.00**	**280.00**	**4733.33**	**40.00**	**0.00**	**0.00**	**13.33**	**0.00**	**26.67**	**21.33**	**0.00**	**480.00**
				std	128.24	218.07	1935.06	59.63	0.00	0.00	29.81	0.00	59.63	47.70	0.00	237.58
Central	**Russells**	**38**	**exp**	**mean**	**80.00**	**440.00**	**33733.33**	**3813.33**	**40.00**	**0.00**	**53.33**	**0.00**	**792.00**	**120.00**	**80.00**	**426.67**
				std	86.92	417.93	19366.92	4416.48	59.63	0.00	86.92	0.00	309.35	74.83	93.81	138.24
		39	**shelt**	**mean**	**66.67**	**346.67**	**25200.00**	**40.00**	**0.00**	**0.00**	**0.00**	**0.00**	**218.67**	**0.00**	**0.00**	**613.33**
				std	47.14	196.64	8342.00	36.51	0.00	0.00	0.00	0.00	249.91	0.00	0.00	159.16
		40	**exp**	**mean**	**80.00**	**640.00**	**15133.33**	**810.67**	**13.33**	**0.00**	**0.00**	**0.00**	**562.67**	**16.00**	**32.00**	**853.33**
				std	86.92	243.13	6555.74	1187.39	29.81	0.00	0.00	0.00	320.61	21.91	52.15	508.59
		41	**shelt**	**mean**	**120.00**	**280.00**	**17733.33**	**4034.67**	**0.00**	**0.00**	**13.33**	**0.00**	**469.33**	**0.00**	**106.67**	**613.33**
				std	119.26	251.22	9869.71	2996.33	0.00	0.00	29.81	0.00	491.29	0.00	80.55	620.75
Central	**Savo**	**64**	**exp**	**mean**	**240.00**	**733.33**	**17933.33**	**3218.67**	**66.67**	**0.00**	**0.00**	**13.33**	**826.67**	**32.00**	**101.33**	**1080.00**
				std	111.55	188.56	11793.12	4916.00	47.14	0.00	0.00	29.81	851.93	52.15	143.79	477.03
Choiseul	**Choiseul**	**17**	**exp**	**mean**	**173.33**	**360.00**	**6266.67**	**949.33**	**106.67**	**0.00**	**0.00**	**0.00**	**1544.00**	**120.00**	**192.00**	**1826.67**
				std	101.11	273.25	6580.27	1683.39	101.11	0.00	0.00	0.00	1416.27	164.92	114.93	1098.08
		18	**shelt**	**mean**	**440.00**	**386.67**	**47933.33**	**1632.00**	**13.33**	**0.00**	**0.00**	**0.00**	**280.00**	**32.00**	**37.33**	**733.33**
				std	192.06	136.63	44995.31	2090.58	29.81	0.00	0.00	0.00	196.64	71.55	54.49	290.59
		19	**shelt**	**mean**	**173.33**	**293.33**	**12266.67**	**96.00**	**0.00**	**0.00**	**0.00**	**0.00**	**133.33**	**8.00**	**8.00**	**560.00**
				std	89.44	292.88	6121.00	75.07	0.00	0.00	0.00	0.00	47.14	17.89	17.89	197.77
		20	**exp**	**mean**	**173.33**	**640.00**	**6266.67**	**34.67**	**26.67**	**13.33**	**0.00**	**0.00**	**776.00**	**53.33**	**16.00**	**613.33**
				std	129.96	129.96	3226.63	49.53	36.51	29.81	0.00	0.00	353.70	77.17	35.78	232.86
		21	**exp**	**mean**	**253.33**	**400.00**	**8213.33**	**1229.33**	**160.00**	**0.00**	**0.00**	**0.00**	**6453.33**	**40.00**	**3320.00**	**6426.67**
				std	128.24	188.56	5868.45	1045.18	111.55	0.00	0.00	0.00	2447.40	69.28	2685.17	7503.72
		22	**shelt**	**mean**	**546.67**	**533.33**	**6933.33**	**104.00**	**0.00**	**0.00**	**186.67**	**0.00**	**664.00**	**165.33**	**16.00**	**1773.33**
				std	331.33	339.93	10441.37	137.40	0.00	0.00	280.48	0.00	426.40	186.09	35.78	2326.94

Province	Island	Site	Exposure	Mean Density (per ha)	Angelfishes	Butterflyfishes	Damselfishes	Fairy basslets	Hawkfishes	Leatherjackets	Parrotfishes	Puffers	Surgeonfishes	Sweetlips	Triggerfishes	Wrasses
	Choiseul (con't)	23	exp	mean	173.33	560.00	6466.67	480.00	120.00	0.00	0.00	0.00	592.00	56.00	0.00	1000.00
				std	129.96	269.16	4337.18	963.74	73.03	0.00	0.00	0.00	212.62	66.93	0.00	258.20
		24	shelt	mean	40.00	320.00	4600.00	21.33	0.00	0.00	0.00	0.00	53.33	0.00	0.00	1786.67
				std	59.63	228.04	2994.44	47.70	0.00	0.00	0.00	0.00	55.78	0.00	0.00	378.30
Guadalcanal	Guadalcanal	42	exp	mean	640.00	160.00	7200.00	440.00	93.33	0.00	0.00	0.00	2200.00	0.00	88.00	2386.67
				std	341.89	138.24	10720.18	451.17	76.01	0.00	0.00	0.00	3325.47	0.00	47.70	1963.22
		43	shelt	mean	226.67	506.67	6800.00	552.00	0.00	0.00	40.00	13.33	13.33	8.00	21.33	466.67
				std	138.24	498.00	3602.47	1055.97	0.00	0.00	36.51	29.81	29.81	17.89	30.70	194.37
		65	exp	mean	346.67	400.00	1333.33	13.33	0.00	0.00	0.00	0.00	800.00	237.33	24.00	386.67
				std	159.16	235.70	2260.78	29.81	0.00	0.00	0.00	0.00	253.86	381.39	21.91	73.03
		66	exp	mean	266.67	26.67	133.33	154.67	0.00	0.00	0.00	13.33	93.33	0.00	93.33	4706.67
				std	216.02	36.51	182.57	200.13	0.00	0.00	0.00	29.81	129.96	0.00	59.63	4791.57
Isabel	Arnavons	15	exp	mean	93.33	266.67	10066.67	74.67	0.00	0.00	13.33	0.00	917.33	301.33	48.00	5106.67
				std	59.63	182.57	4996.67	83.59	0.00	0.00	29.81	0.00	824.00	294.03	65.73	6492.83
		16	shelt	mean	160.00	426.67	8466.67	50.67	0.00	0.00	13.33	0.00	725.33	240.00	0.00	1066.67
				std	121.11	256.47	10825.89	51.12	0.00	0.00	29.81	0.00	958.41	173.08	0.00	609.19
Isabel	Isabel	3	exp	mean	106.67	306.67	3533.33	40.00	26.67	26.67	0.00	0.00	341.33	112.00	0.00	840.00
				std	111.55	252.10	5781.20	56.57	36.51	59.63	0.00	0.00	255.19	148.05	0.00	1024.80
		4	shelt	mean	120.00	440.00	5440.00	218.67	0.00	0.00	13.33	40.00	53.33	109.33	0.00	413.33
				std	86.92	296.65	1872.97	152.78	0.00	0.00	29.81	36.51	119.26	116.77	0.00	207.63
		5	exp	mean	26.67	533.33	10733.33	0.00	13.33	0.00	0.00	0.00	946.67	45.33	88.00	600.00
				std	59.63	286.74	6767.57	0.00	29.81	0.00	0.00	0.00	620.75	47.70	111.00	124.72
		6	shelt	mean	160.00	413.33	4000.00	77.33	13.33	0.00	0.00	0.00	256.00	0.00	0.00	1120.00
				std	111.55	341.24	1929.31	116.77	29.81	0.00	0.00	0.00	238.77	0.00	0.00	1067.08
		7	exp	mean	80.00	666.67	23000.00	146.67	13.33	13.33	0.00	0.00	498.67	232.00	32.00	773.33
				std	73.03	429.47	11105.55	292.12	29.81	29.81	0.00	0.00	264.26	355.35	52.15	153.48
		8	shelt	mean	66.67	80.00	19733.33	221.33	0.00	0.00	0.00	0.00	408.00	0.00	154.67	613.33
				std	66.67	86.92	4009.71	143.17	0.00	0.00	0.00	0.00	110.59	0.00	287.61	548.53
		9	exp	mean	146.67	160.00	1200.00	66.67	0.00	0.00	40.00	0.00	330.67	0.00	0.00	733.33
				std	119.26	146.06	869.23	94.28	0.00	0.00	59.63	0.00	519.18	0.00	0.00	421.64
		10	shelt	mean	80.00	106.67	7333.33	0.00	0.00	0.00	26.67	0.00	77.33	0.00	0.00	560.00
				std	86.92	138.24	6032.32	0.00	0.00	0.00	36.51	0.00	80.77	0.00	0.00	566.86

Province	Island	Site	Exposure	Mean Density (per ha)	Angelfishes	Butterflyfishes	Damselfishes	Fairy basslets	Hawkfishes	Leatherjackets	Parrotfishes	Puffers	Surgeonfishes	Sweetlips	Triggerfishes	Wrasses
	Isabel (con't)	**11**	**exp**	**mean**	**66.67**	**186.67**	**6600.00**	**13.33**	**0.00**	**0.00**	**13.33**	**0.00**	**1338.67**	**53.33**	**32.00**	**653.33**
				std	47.14	144.53	3209.36	29.81	0.00	0.00	29.81	0.00	1177.06	55.78	71.55	317.63
		12	**shelt**	**mean**	**26.67**	**93.33**	**6000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**82.67**	**0.00**	**0.00**	**520.00**
				std	36.51	59.63	1615.89	0.00	0.00	0.00	0.00	0.00	115.24	0.00	0.00	218.07
		13	**exp**	**mean**	**613.33**	**80.00**	**3466.67**	**53.33**	**13.33**	**0.00**	**0.00**	**0.00**	**810.67**	**0.00**	**0.00**	**2786.67**
				std	375.35	119.26	5362.42	55.78	29.81	0.00	0.00	0.00	1628.67	0.00	0.00	1150.27
		14	**shelt**	**mean**	**226.67**	**200.00**	**58266.67**	**37.33**	**0.00**	**0.00**	**0.00**	**0.00**	**1293.33**	**56.00**	**13.33**	**1653.33**
				std	186.19	94.28	69733.38	37.00	0.00	0.00	0.00	0.00	2276.86	61.39	29.81	1177.95
Makira	**Makira**	**44**	**exp**	**mean**	**320.00**	**253.33**	**1600.00**	**13.33**	**133.33**	**0.00**	**13.33**	**0.00**	**408.00**	**0.00**	**21.33**	**933.33**
				std	354.02	272.44	1876.76	29.81	66.67	0.00	29.81	0.00	264.76	0.00	30.70	498.89
		45	**shelt**	**mean**	**146.67**	**293.33**	**66.67**	**16.00**	**0.00**	**0.00**	**26.67**	**13.33**	**432.00**	**0.00**	**0.00**	**426.67**
				std	86.92	138.24	149.07	21.91	0.00	0.00	36.51	29.81	833.23	0.00	0.00	213.96
		46	**exp**	**mean**	**253.33**	**613.33**	**4933.33**	**26.67**	**133.33**	**53.33**	**13.33**	**0.00**	**786.67**	**66.67**	**53.33**	**853.33**
				std	119.26	178.89	3662.12	36.51	81.65	73.03	29.81	0.00	228.04	46.19	55.78	292.12
		47	**shelt**	**mean**	**146.67**	**80.00**	**5866.67**	**42.67**	**0.00**	**0.00**	**0.00**	**13.33**	**40.00**	**0.00**	**0.00**	**986.67**
				std	86.92	55.78	6747.84	45.61	0.00	0.00	0.00	29.81	36.51	0.00	0.00	425.31
Makira	**Three Sisters**	**48**	**exp**	**mean**	**160.00**	**213.33**	**19533.33**	**66.67**	**26.67**	**0.00**	**0.00**	**0.00**	**346.67**	**0.00**	**0.00**	**2200.00**
				std	101.11	73.03	15539.56	94.28	36.51	0.00	0.00	0.00	144.53	0.00	0.00	1939.07
		49	**shelt**	**mean**	**400.00**	**146.67**	**38800.00**	**2453.33**	**0.00**	**0.00**	**0.00**	**0.00**	**173.33**	**0.00**	**106.67**	**7373.33**
				std	432.05	184.99	23687.31	4605.17	0.00	0.00	0.00	0.00	59.63	0.00	85.89	6867.25
Makira	**Ugi**	**50**	**exp**	**mean**	**320.00**	**453.33**	**24133.33**	**1986.67**	**146.67**	**0.00**	**13.33**	**0.00**	**720.00**	**0.00**	**109.33**	**3106.67**
				std	218.07	259.91	12932.73	2678.47	159.16	0.00	29.81	0.00	337.97	0.00	129.07	2265.00
		51	**shelt**	**mean**	**426.67**	**200.00**	**23133.33**	**474.67**	**0.00**	**0.00**	**13.33**	**0.00**	**669.33**	**0.00**	**40.00**	**1813.33**
				std	36.51	205.48	18737.37	639.35	0.00	0.00	29.81	0.00	254.80	0.00	89.44	1426.26
Malaita	**Malaita**	**52**	**shelt**	**mean**	**346.67**	**226.67**	**7866.67**	**8.00**	**0.00**	**0.00**	**13.33**	**0.00**	**128.00**	**0.00**	**146.67**	**933.33**
				std	276.49	186.19	4500.62	17.89	0.00	0.00	29.81	0.00	137.15	0.00	109.54	349.60
		53	**exp**	**mean**	**66.67**	**306.67**	**4400.00**	**26.67**	**40.00**	**0.00**	**0.00**	**0.00**	**266.67**	**0.00**	**13.33**	**813.33**
				std	81.65	101.11	2639.44	36.51	59.63	0.00	0.00	0.00	176.38	0.00	29.81	570.38
		54	**shelt**	**mean**	**93.33**	**200.00**	**1333.33**	**0.00**	**0.00**	**0.00**	**0.00**	**26.67**	**42.67**	**0.00**	**0.00**	**666.67**
				std	111.55	81.65	1452.97	0.00	0.00	0.00	0.00	36.51	27.33	0.00	0.00	47.14

Province	Island	Site	Exposure	Mean Density (per ha)	Angelfishes	Butterflyfishes	Damselfishes	Fairy basslets	Hawkfishes	Leatherjackets	Parrotfishes	Puffers	Surgeonfishes	Sweetlips	Triggerfishes	Wrasses
	Malaita (con't)	**55**	**exp**	**mean**	**160.00**	**346.67**	**1466.67**	**13.33**	**26.67**	**0.00**	**0.00**	**26.67**	**1002.67**	**533.33**	**0.00**	**693.33**
				std	36.51	212.92	1464.39	29.81	36.51	0.00	0.00	59.63	388.66	651.63	0.00	314.82
		56	**exp**	**mean**	**186.67**	**120.00**	**3466.67**	**40.00**	**13.33**	**0.00**	**0.00**	**0.00**	**280.00**	**0.00**	**13.33**	**706.67**
				std	178.89	55.78	3060.50	59.63	29.81	0.00	0.00	0.00	259.91	0.00	29.81	396.09
		57	**shelt**	**mean**	**93.33**	**173.33**	**10866.67**	**34.67**	**0.00**	**0.00**	**0.00**	**13.33**	**226.67**	**0.00**	**0.00**	**506.67**
				std	76.01	138.24	15181.49	33.47	0.00	0.00	0.00	29.81	192.06	0.00	0.00	138.24
		58	**exp**	**mean**	**53.33**	**440.00**	**15000.00**	**88.00**	**120.00**	**53.33**	**0.00**	**13.33**	**781.33**	**112.00**	**8.00**	**813.33**
				std	55.78	192.06	5651.94	73.39	128.24	73.03	0.00	29.81	389.26	172.46	17.89	196.64
		59	**shelt**	**mean**	**280.00**	**213.33**	**5666.67**	**40.00**	**0.00**	**0.00**	**0.00**	**0.00**	**480.00**	**29.33**	**0.00**	**920.00**
				std	119.26	55.78	3009.25	59.63	0.00	0.00	0.00	0.00	246.76	40.44	0.00	440.71
		60	**exp**	**mean**	**160.00**	**226.67**	**1266.67**	**40.00**	**13.33**	**0.00**	**0.00**	**0.00**	**360.00**	**0.00**	**53.33**	**1813.33**
				std	101.11	197.77	1011.05	59.63	29.81	0.00	0.00	0.00	213.96	0.00	86.92	624.32
		61	**shelt**	**mean**	**146.67**	**106.67**	**1000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**13.33**	**13.33**	**26.67**	**0.00**	**226.67**
				std	196.64	111.55	1105.54	0.00	0.00	0.00	0.00	29.81	29.81	36.51	0.00	192.06
Western	**New Georgia**	**29**	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**280.00**	**56.00**	**104.00**	**0.00**
				std	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	521.54	125.22	115.24	0.00
		30	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**8.00**	**0.00**	**0.00**	**0.00**	**0.00**	**128.00**	**48.00**	**8.00**	**0.00**
				std	0.00	0.00	0.00	17.89	0.00	0.00	0.00	0.00	86.72	65.73	17.89	0.00
		31	**shelt**	**mean**	**133.33**	**493.33**	**9333.33**	**48.00**	**0.00**	**0.00**	**0.00**	**13.33**	**560.00**	**0.00**	**32.00**	**586.67**
				std	47.14	318.33	408.25	52.15	0.00	0.00	0.00	29.81	243.13	0.00	33.47	433.08
		32	**exp**	**mean**	**66.67**	**640.00**	**46800.00**	**546.67**	**53.33**	**0.00**	**0.00**	**0.00**	**834.67**	**13.33**	**490.67**	**813.33**
				std	81.65	173.85	42700.25	963.10	55.78	0.00	0.00	0.00	151.32	29.81	965.60	119.26
		33	**exp**	**mean**	**40.00**	**426.67**	**38733.33**	**6480.00**	**13.33**	**0.00**	**0.00**	**0.00**	**280.00**	**8.00**	**56.00**	**653.33**
				std	59.63	180.12	35284.87	6658.86	29.81	0.00	0.00	0.00	136.63	17.89	125.22	363.32
		34	**exp**	**mean**	**26.67**	**746.67**	**13746.67**	**554.67**	**13.33**	**0.00**	**13.33**	**13.33**	**1173.33**	**0.00**	**8.00**	**466.67**
				std	36.51	369.38	5188.75	1218.03	29.81	0.00	29.81	29.81	1267.96	0.00	17.89	298.14
		35	**shelt**	**mean**	**93.33**	**306.67**	**23866.67**	**13733.33**	**0.00**	**0.00**	**0.00**	**13.33**	**256.00**	**0.00**	**0.00**	**546.67**
				std	101.11	252.10	10704.62	10277.92	0.00	0.00	0.00	29.81	175.47	0.00	0.00	119.26
		36	**exp**	**mean**	**80.00**	**506.67**	**13133.33**	**6016.00**	**53.33**	**0.00**	**0.00**	**0.00**	**506.67**	**0.00**	**48.00**	**666.67**
				std	109.54	401.66	4488.26	5517.49	55.78	0.00	0.00	0.00	148.77	0.00	52.15	235.70
		37	**shelt**	**mean**	**453.33**	**533.33**	**17000.00**	**48.00**	**13.33**	**0.00**	**0.00**	**0.00**	**466.67**	**0.00**	**130.67**	**1720.00**
				std	381.23	124.72	5472.15	55.46	29.81	0.00	0.00	0.00	429.47	0.00	142.49	1618.23

Province	Island	Site	Exposure	Mean Density (per ha)	Angelfishes	Butterflyfishes	Damselfishes	Fairy basslets	Hawkfishes	Leatherjackets	Parrotfishes	Puffers	Surgeonfishes	Sweetlips	Triggerfishes	Wrasses
Western	**Shortlands**	**25**	**exp**	**mean**	**93.33**	**466.67**	**13800.00**	**373.33**	**66.67**	**0.00**	**0.00**	**0.00**	**3365.33**	**45.33**	**186.67**	**3960.00**
				std	138.24	278.89	12323.42	453.63	81.65	0.00	0.00	0.00	1697.91	80.88	347.69	7073.52
		26	**shelt**	**mean**	**280.00**	**680.00**	**8640.00**	**29.33**	**0.00**	**0.00**	**0.00**	**0.00**	**320.00**	**0.00**	**0.00**	**746.67**
				std	207.63	387.01	5703.14	28.91	0.00	0.00	0.00	0.00	128.24	0.00	0.00	450.68
		27	**exp**	**mean**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7328.00**	**0.00**	**0.00**	**0.00**
				std	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4712.74	0.00	0.00	0.00
		28	**shelt**	**mean**	**0.00**	**0.00**	**0.00**	**16.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.00**	**0.00**	**8.00**	**0.00**
				std	0.00	0.00	0.00	21.91	0.00	0.00	0.00	0.00	17.89	0.00	17.89	0.00

June 2006
TNC Pacific Island Countries
Report No 1/06

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

Chapter 6

Fisheries Resources: Commercially Important Macroinvertebrates

Solomon Islands Marine Assessment

Peter Ramohia
Solomon Islands Deparment of Fisheries & Marine Resources

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
Peter Ramohia: PO BOX 759, Honiara, Solomon Islands
E-mail address: peter_tnc@solomon.com.sb

Suggested Citation:
Ramohia, P. 2006. Fisheries Resources: Commercially Important Macroinvertebrates. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds). 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: © David Wachenfeld, Triggerfish Images

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Contents

Executive Summary

A total of 66 sites were surveyed for key invertebrates throughout the main Solomon Islands group. At each site, transects were sampled within shallow habitat at depths 5-10m and within deep habitat at depths 18-30m. Sites were also selected so that some were representative of exposed and others sheltered habitats. Although no statistical analysis was done on the data collected, species composition, distribution, abundance and size frequency distribution were determined for the two different habitats and geographical locations surveyed and mean numbers and standard errors calculated for the species found within each of the two habitats surveyed at each site.

During the survey, 19 species of sea cucumbers, 10 species of bivalves (giant clams and oyster shells), 4 species of gastropods (*Trochus* and trochus-like species and the triton shell), 3 species of lobsters and the coral predator crown of thorns starfish (*Acanthaster planci*) were recorded. These species occurred in varying numbers (and sizes) not only in the two habitats surveyed (shallow and deep) but also at the different geographical (sheltered and exposed) locations of the survey sites.

Of the 19 species of sea cucumber recorded, only 17 were encountered in sampled transects. The low valued species *Holothuria edulis* (pinkfish) and *Pearsonothuria graeffei* (orangefish) were the most common species encountered during the survey. The high valued species *Holothuria fuscogilva* (white teatfish) was seen often in the deep habitat but not common in the shallow habitat. While some species like the *Thelenota ananas* (prickly redfish), *Actinopyga lecanora* (stonefish), *Stichopus chloronotus* (greenfish), *Holothuria nobilis* (black teatfish) and *Stichopus hermanni* (curryfish) were seen in low numbers, others like the *Actinopyga mauritiana* (surf redfish), *Holothuria scabra* (sandfish), *Bohadschia similis* (chalkfish), *Stichopus horrens* (peanutfish) and *Holothuria coluber* (snakefish) were not recorded at all in the sampled transects and only a few specimens were recorded of the species *Actinopyga miliaris* (blackfish), *Actinopyga crassa* (a species similar to blackfish), *Thelenota rubralineata* (lemonfish) and *Stichopus pseudohorrens*, a species very similar to the peanutfish (*Stichopus horrens*).

The white rock shell *Beguina semiorbiculata* (locally known as Ke'e) was the most common species of bivalve encountered in sampled transects occurring at 50% of the sites. *Pinctada margaritifera* (Blacklip pearl oyster) was recorded at 24 sites in the shallow habitat and 3 in the deep but the *Pteria penguin* (brownlip pearl oyster) was present at only 4 sites in the shallow and 8 in the deep. The *Pinctada maxima* (goldlip pearl oyster) was not seen during the survey. The large horse mussel *Atrina vexillum* (locally known as Kurila) was not seen at many sites. *Tridacna maxima* was the most abundant species of giant clams but *T. squamosa* was the most widely distributed species, occurring at 66.6% of the sampled sites. *T. crocea* was a common species but the two larger species *T. gigas* and *T. derasa* were seen in low numbers. *Hippopus hippopus* was encountered the least.

The *Tectus pyramis* (false trochus) was the most commonly encountered gastropod, but *Trochus niloticus* was encountered at only 13 sites. High mean abundance was recorded for *T. niloticus* at Toi reef (site 58) in North Malaita and the Arnavon Community Marine Conservation Area (ACMCA). Greensnail (*Turbo marmoratus*) was not seen at all during the survey.

Panulirus versicolor was the only lobster species observed in sampled transects. The other two species *P. penicillatus* and *P. femoristriga* were seen caught by fishermen in Choiseul Province. *P. ornatus* was not seen during the survey.

Crown of thorns starfish (*Acanthaster planci*) was encountered at 11 sites, but in relatively low numbers. No major coral damage relating to this species was observed. The *Charonia*

tritonis (Triton shell) was rarely seen during the survey. Only one specimen was recorded at Naone Island (site 46) in Makira Province.

Introduction

Solomon Islands is located between the latitudes 5 degrees and 12 degrees south and longitudes 152 degrees and 170 degrees east and consists of a double chain of archipelagic mountainous islands and low lying coral atolls extending over 1,700 km in the southwest tropical Pacific (Figure 1). It has a total land area of approximately 29,000 km^2, an exclusive economic zone (EEZ) of 1.6 million km^2 and an estimated coastline of 4,023 km (Skewes, 1990).

According to the national census held in 1999, Solomon Islands support a population of 409,042. A majority of these people live on or near the coast with limited good agricultural farm land (or land based income generating alternatives), and therefore have always relied on the marine environment and the resources therein for their livelihood for generations.

The marine environment of Solomon Islands encompasses the foreshore, inter-tidal sea grass beds, lagoons, mangroves and estuaries, coral reefs, coastal waters and the deep ocean. These are some of the most biologically diverse ecosystems in the world, supporting numerous marine resources that Solomon Islanders depend on for food, income and for cultural purposes.

Fishing has always been one of the main activities sustaining Solomon Islanders. Oreihaka (1997) reported that 83% of households engage in some form of fishing activities. A high dependency on marine resources has been reported by Skewes (1990) and Sulu *et al*., (2000). The former reported a high per capita seafood consumption rate of 34 kg/person/year whereas the latter estimated the annual domestic coral reef and lagoon species consumption in the range of 10–14,000 tonnes.

Marine resources have contributed substantially towards the national economy in terms of foreign exchange earning in the past. Before the logging boom of the early 1990s, the fisheries sector was contributing between 35 – 50%. In 1994, fisheries sector contribution was estimated at SBD$117 million, representing 25% of foreign exchange earning for that year (SIG Fisheries Annual Report, 1994). Excluding tuna resources, coral reef fisheries (including sea cucumber and Trochus) has earned between SBD$10 and 12 million each year between 1997 and 1999 (Sulu *et. al*., 2000). Ramofafia (2004) reported that the contribution of sea cucumbers alone to the national economy fluctuated between SBD$1.9 and 4.8 million since 1997 and it was about SBD$2 million in 2003.

There is potential for Solomon Islands to increase revenue from non extractive means such as tourism, an industry that rely primarily of the coastal environment. The abundant and the diverse marine life, spectacular lagoons, natural lakes and white sandy beaches have continued to attract visitors to our shores. Nature based tourism in Solomon Islands will grow in future and therefore the development of this industry must be guided to ensure it is not done at the expense of the coastal environment and resources.

Not only are inshore marine resources sources of food and income for Solomon Islanders, many have important traditional (cultural) values. For example, the white shell *Beguina semiorbiculata* locally known as Ke'e and the large horse mussel *Atrina vexillum* (Kurila) are used for making custom shell-money and other traditional shell artifacts. Certain tribes or groups of people revere some marine species such as sharks and crocodiles or are restricted from consuming certain species of fish or shellfish because of certain beliefs or ideologies.

The sea and its resources therefore, play an important role in the economy, livelihood and customs of Solomon Islanders.

However, the high dependency on sea resources, coupled with a fast growing population, the development of a cash economy, destructive fishing methods and weakening traditional leadership in coastal communities, sea resources face the threat of possible overexploitation. For sustainable production of sea resources, coastal communities need to maintain and keep their traditional leadership strong and government support, especially through law and enforcement, is vital.

Rationale for the Survey

The Solomon Islands' government, through the Department of Fisheries and Marine Resources, is mandated with ensuring that marine resources are exploited on a sustainable basis so as to derive maximum benefit for Solomon Islanders. To achieve this, the government needs to implement effective management strategies for marine resource utilization. Unfortunately, effective management strategies cannot be implemented in the absence of scientific data that allows for the assessment of stocks of exploited resources. Previous stock assessment efforts on commercial marine invertebrates in Solomon Islands included Adam *et al*., (1991), Lincoln-Smith and Bell, (1996), Lincoln-Smith *et al*., (2000) and Ramohia, (2004). These are either outdated or limited to small geographical areas or reefs. Other work such as Sulu *et al.*, (2000) and Ramofafia, (2004) are based on export data. There is, therefore, a general lack of information on stock level of marine resources exploited in Solomon Islands.

In an effort aimed at narrowing this gap, The Nature Conservancy (TNC), the Government and other partners conducted a first ever "broad-brush" and multi-discipline marine assessment, surveying commercially important species (invertebrates, fish, sharks), corals, coral reef conditions, coral reef fishes, cetaceans (whales and dolphins) and seagrasses of the main Solomon Islands archipelago from 12th May to 17th June 2004. The primary objectives of this rapid assessment are:

(1) to make available scientific information for conservation planning of the Solomon Islands and hence assist in the identification of priority sites for conservation,

(2) provide information necessary for development of the Solomon Islands National Biodiversity Strategic Action Plan (NBSAP) – critical for access to funds for conservation through the World Conservation Union (IUCN),

(3) to gather and make available scientific information for marine resources management and

(4) to determine if Solomon Islands is part of the coral triangle.

This report presented the results of the survey on key invertebrate species.

Methods

Study Sites

The area covered by this "broad-brush" marine assessment includes the core island group of the Solomon Islands, stretching from Choiseul and Shortland Islands in the northwest to the Three Sisters and San Cristobal (Makira) in the southeast (Figure 1). It was not possible to survey the more remote islands and atolls (Temotu, Ontong Java, Rennell and Bellona) due to logistic reasons. Nevertheless, as much as possible, the study sites include representatives of the different marine habitats. Specifically, the invertebrate survey focused on the coral reef ecosystem. Within this marine habitat, stocks and distribution (including size frequency distribution) of key invertebrate species were surveyed. A list of key invertebrates surveyed is given in Appendix 2.

Survey sites were selected so that some were representative of "exposed" coral reef habitats and others "sheltered". Exposed sites consist of coral reef habitats located on exposed part of islands which are prone to direct wind and high wave actions with higher oceanic influence. Sheltered sites are coral reef habitats located out of direct wind and high wave action with lower to moderate oceanic influence. These sites were normally located in sheltered lagoon areas and bays.

A total of 66 sites were surveyed for key invertebrates throughout the main Solomon Islands group. Of these, 35 were located in exposed and 31 in sheltered areas.

SURVEY PROCEDURES

The procedures used in the assessment of key invertebrate species are adopted from the Arnavon Community Marine Conservation Area (ACMCA) study as described in detail by Lincoln-Smith and Bell (1996). Methods were modified to cater for limitation in the number of divers available for the survey, taking into account safe diving measures and the quality of data collected.

At each site, the number and size of key invertebrate species were surveyed using SCUBA in two different habitats (shallow and deep) and geographical locations (sheltered and exposed). In the shallow habitat, sixty-six (66) surveys were conducted at depths between 5 - 10m. Thirty (30) of these were at sheltered location while the remaining thirty-six (36) were within exposed locations. Sampling was done using 50m long by 2m wide transects. Six (6) transects were laid over the terrace or slope at each site within this habitat.

In the deep habitat, sixty-three (63) surveys were done at depths between 18 – 30m. Thirty (30) of these were located in sheltered areas whereas thirty-three (33) where at exposed areas. Sampling was done using 50m long by 5m wide transects. Five (5) transects were laid approximately parallel to the reef crest and over soft substratum or rubble (hard or rocky bottoms avoided). No sampling was done at sites where the reef base or the perceived sea cucumber habitat was deeper than 30m. The deep survey was not done at three sites because they were deeper than 30m. These sites were Veru point (site 33), Lisamata (site 38) and Honoa Island (site 42). The deep habitat included the slope below the terrace to the base of the reef. In this habitat, only sea cucumbers were surveyed. However, the larger species of giant clams and pearl oysters were also recorded when encountered in transects.

Although no statistical analysis was done on the data collected, species composition, distribution and abundance were determined for the two different habitats and geographical locations surveyed and mean numbers and standard errors calculated for the species found within each of the two habitats surveyed at each site. These mean values were converted to overall and non-zero averages per hectare by extrapolation. Non-zero averages were calculated to show the average density of invertebrate species when they do occur at a site. No effort was made to statistically analyse size measurement data in this report due to the insufficient numbers of many of the key invertebrates surveyed. However, size frequency distributions were determined for a selected number of the invertebrate species surveyed in both the shallow and deep habitats.

Results

General

Detailed information on the exact coordinates for each site surveyed and a list of key invertebrates included in the survey along with other descriptive data, are given in Appendices 1 and 2. The invertebrates listed in Appendix 2 are those known to be utilized as food resources (e.g. giant clams and beche-de-mer) or have other commercial value (e.g. trochus and pearl oysters) or have traditional, cultural and custom values (e.g. *B. semiorbiculata* and *A. vexillum*) and indicators of coral reef health (e.g. triton shell and *Acanthaster planci*). During the survey, 19 species of sea cucumbers, 10 species of bivalves (giant clams and oyster shells), 4 species of gastropods (trochus and the triton shell), 3 species of lobsters and the coral predator crown of thorns were recorded (Appendix 2 and also Table 1).

These species occurred in varying numbers not only in the two habitats surveyed (shallow and deep) but also at the different geographical (sheltered and exposed) locations of the survey sites. For example, in the shallow habitat, the mean number of species recorded ranged from 0.50 (±0.22) species per transect at Buala reef (site 3) and Namunga (site 47) (0.50 (±0.34)) to 4.33 (±0.56) and 3.83 (±0.40) at Kerehikapa (site 16) and Tuma Island (site 15) in the Arnavon Community Marine Conservation Area (ACMCA) respectively (Figure 2). Rohae Island (site 26) in the Shortland Islands and Suafa bay (site 59) on Malaita recorded second highest mean numbers of 3.50 (±0.67) and 3.33 (±0.49) species per transect respectively. All other sites recorded less than 3 key invertebrate species per transect.

In the deep habitat, the mean number of species recorded ranged from 0 species per transect at Boeboe (site 19), Haipe reef (site 32) and Arai peninsula (site 54) to 3.0 (±0.71) at Kerehikapa (site 16) in ACMCA (Figure 3). Tuma Island (site 15), also in the ACMCA, recorded the second highest with 2.4 (±0.51) species per transect followed by Gavutu Island (site 63) with 2.0 (±0.84). Rohae reef (site 25), Putuputuru Island (site 22), Tulagi Switzer Island (site 1), Leili Island I (site 56) and Leili Island II (site 57) all recorded 1.6 (±SE) species per transect while the rest of the sites recorded 1.4 (±SE) or less (Figure 3).

The rest of this Section provides more detail on the key marine invertebrate species surveyed.

Sea Cucumbers

<u>Species composition</u>

Of the 19 species of sea cucumbers or beche-de-mer found during the survey, 17 were recorded within transects while two (*Holothuria scabra* and *Bohadschia similis*), were collected from seagrass beds by the seagrass Survey Team (Table 1). Furthermore, of those 19 species, 11 species were found in both shallow and deep habitats while 4 species (*Actinopyga lecanora*, *B. similis*, *H. scabra* and *Stichopus chloronotus*) were found only in the shallow habitat and another 4 (*Actinopyga crassa*, *Actinopyga miliaris*, *Stichopus pseudohorrens* and *Thelenota rubralineata* encountered only in the deep habitat (Table 1).

<u>Species distribution and abundance</u>

The distribution of species is grouped according to the habitats surveyed as presented in Table 1. Occurrence of species is variable with some occurring at a high number of sites while others at low numbers (Table 2).

In the shallow habitat, *Pearsonothuria graeffei* was the most widely distributed species, occurring at 38 (57.6%) of the sites (Table 2). *Holothuria edulis* was encountered at 33 (50%) of the sites, *Bohadschia argus* at 12 (18.2%) and *A. lecanora* 9 (13.6%). Other species, including the *Holothuria fuscogilva* and *Thelenota ananas* were present at 4 (6.1%) or less of the sites (Table 2). While the species *A. crassa*, *A. miliaris*, *S. pseudohorrens* and *T. rubralineata* were not encountered in the shallow habitat, *Actinopyga mauritiana* (surf redfish) was not seen at all at any of the sites surveyed.

In the deep habitat, *H. fuscogilva* was the most widely distributed species, occurring at 27 (42.9%) of the sites (Table 2). *H. edulis* and *Thelenota anax* were the second most widely distributed species, both occurring at 21 (33.3%) of the sites. *B. argus* and *Holothuria atra* occurred at 12 (19.1%), *Holothuria fuscopunctata* and *T.* ananas at 10 (15.9%), *P. graeffei* at 8 (12.7%) and *Stichopus hermanni* at 7 (11.1%) of the sites. The remaining species, including *A. miliaris*, *Bohadschia vitiensis*, *Holothuria nobilis*, *S. pseudohorrens*, *T. rubralineata* and *A. crassa* were present at 4 (6.4%) or less of the sites (Table 2). *A. lecanora* and *S. chloronotus* were not encountered in the deep habitat.

Occurrence of species by site is also variable with some sites having more sea cucumbers than others in the two habitats surveyed (Figures 4 and 5).

In the shallow habitat, the Munda (site 31) recorded the highest mean number of sea cucumbers per transect with 4.00 (±0.45) (Figure 4). Toatelava (site 36) and Nuhu Island (site 62) recorded the second highest mean numbers with 2.17 (±0.54) and 2.17 (±0.60) respectively. The rest of the sites recorded mean numbers of less than 2 sea cucumbers per transect (Figure 4).

Matavaghi Island (site 9) recorded the highest mean number of sea cucumbers per transect with 5.00 (±1.84) in the deep habitat (Figure 5). Leili Island I (site 56) and II (site 57) recorded mean numbers of 4.60 (±0.93) and 4.00 (±0.89), Tuma Island (site 15) and Kerehikapa (site 16) in the ACMCA 4.20 (±1.28) and 4.00 (±1.0) and Gavutu Island (site 63) 4.00 (±2.05). Sites recording mean numbers higher than 2.00 (±SE) sea cucumbers per transect included Falabulu Island I (site 60), Tirahi Island (site 4), Bonegi reef (site 66), Tambea reef (site 65), Buala reef (site 3) and Marautewa Island (site 45). These sites recorded mean numbers of 3.00 (±0.71), 2.80 (±2.08), 2.60 (±0.75), 2.20 (±1.02), 2.20 (±0.92) and 2.20 (±1.46) respectively. The rest of the sites recorded mean numbers of 2.00 (±SE) or less sea cucumbers per transect (Figure 5).

Abundance is variable for the sea cucumber species surveyed (Table 3a). In the shallow habitat, *H. edulis* and *P. graeffei* made up the bulk of sea cucumbers with 151 (48.7%) and 104 (33.6%) animals recorded respectively. Other species recorded included *B. argus* 16 (5.2%), *A. lecanora* 10 (3.2%), *T. ananas* 6 (1.9%) and the rest of the species 5 (1.6%) or less (Table 3a).

The mean abundance of *H. edulis* range from 0.17 (±0.17) per transect at 5 sites to 2.33 (±0.33) at the Munda (site 31) (Figure 6). Nuhu Island (site 62) and Bonegi (site 66) recorded the second highest mean numbers with 1.67 (±0.67) respectively. The rest of the sites recorded mean numbers of 1.33 (±SE) or less (Figure 6). The mean numbers for *P. graeffei* ranged from 0.17 (±0.17) per transect at 17 sites to 2.00 (±0.63) at Toatelava Island (site 36) (Figure 7). Munda (site 31) recorded the second highest mean abundance with 1.67 (±0.42) while the rest of the sites 1.17 (±SE) or less. Of the 12 sites that *B. argus* was encountered, Babao point (site 6) in Isabel recorded the highest with a mean number of 0.67 (±0.33) per transect (Figure 8). Putuputuru Island (site 22) in Choiseul recorded the next highest mean abundance of 0.33 (±0.21) while the remaining 10 sites all recorded 0.17 (±0.17) per transect. *A. lecanora* was recorded at 9 sites. Of these, Onua Island (site 27) in the Shortland Islands recorded the highest mean number with 0.33 (±0.21) per transect (Figure 9). The other 8 sites all recorded 0.17 (±0.17).

In the deep habitat, *H. edulis* was also the most abundant species with 138 (38.4%) individuals counted in transects followed by *H. fuscogilva* with 59 (16.4%), *T. anax* 36 (10.0%), *H. atra* 32 (8.9%), *B. argus* 24 (6.7%), *H. fuscopunctata* 16 (4.5%), *S. hermanni* 15 (4.2%), *T. ananas* and *P. graeffei* 10 (2.8%) and *A. miliaris* 8 (2.2%). The rest of the species recorded 3 (0.8%) or less (Table 3a).

The mean abundance of *H. edulis* in the deep habitat ranged from 0.20 (±0.20) per transect at 7 sites to 4.20 (±1.83) at Matavaghi Island (site 9) (Figure 10). Leili Island I (site 56) and II (site 57) recorded the second highest mean numbers of 4.00 (±0.89) and 3.80 (±0.86) respectively while Gavutu Island (site 63) 2.20 (±1.36). The rest of the sites recorded mean numbers less than this (Figure 10). The mean numbers for *H. fuscogilva* ranged from 0.20 (±0.20) per transect at 12 sites to 1.20 (±0.49) at Putuputuru Island (site 22) and 1.20 (±0.97) at Marautewa Island (site 45) (Figure 11). Tuma Island (site 15), Lumalihe (site 35) and Falabulu Island I (site 60) recorded mean numbers of 0.80 (±0.58), 0.80 (±0.49) and 0.80 (±0.37) respectively. The rest of the sites recorded mean numbers less than this (Figure 11). Four other sea cucumber species present at sites in the deep habitat are *T. anax*, *H. atra*, *B. argus* and *T. ananas*. Raverave Island (site 17) recorded the highest mean number of *T. anax* per transect of 1.40 (±0.51) followed by Three Sisters I (site 48) with 1.00 (±0.45) (Figure 12). The remaining sites recorded mean numbers less than this. Buala reef (site 3) recorded the highest mean numbers of *H. atra* per transect with 1.40 (±0.68) followed by Rohae reef (site 25) in the Shortland Islands with 1.20 (±0.37) (Figure 13). Kerehikapa (site 16) and Tuma Island (site 15) in ACMCA recorded 1.00 (±0.55) and 0.80 (±0.20) respectively. Of the 12 sites that *B. argus* was observed, Tuma Island (site 15) and Kerehikapa (site 16) recorded the highest mean numbers of the species with 1.80 (±0.80) and 0.80 (±0.37) per transect respectively (Figure 14). The remaining sites recorded lower mean numbers than these. *T. ananas* was found at 10 sites only with each site recording a mean number of 0.20 (±0.20) per transect (Figure 15).

There were more sea cucumbers at sites located in sheltered areas than exposed ones with 373 and 296 respectively (Table 3b). The abundance of individual species also varied with some more abundant than others and this observation is the same for both geographical locations. One hundred and ninety two (192) or 51.5% of total number of sea cucumbers recorded at sites in sheltered locations were *H. edulis* (Table 3b). *P. graeffei* was the second most abundant species with 55 (14.7%). Other species recorded included *H. fuscogilva* 34 (9.1%), *B. argus* 20 (5.4%), *H. atra* and *S. hermanni* 13 (3.5%), *H. fuscopunctata* 12 (3.2%), *T. anax* 11 (1.9%), *B. similis* 6 (1.6%) and *A. miliaris* 5 (1.3%) (Table 3b). *T. ananas*, *A. lecanora*, *H. nobilis* and *A. crassa* were recorded with 3 (0.8%) or less. *S. chloronotus* and *T. rubralineata* were not recorded at sites in sheltered locations.

At exposed habitats, *H. edulis* was also the most common species with 97 (32.8%), followed by *P. graeffei* 59 (19.9%), *T. anax* 30 (10.0%), *H. fuscogilva* 29 (9.8%), *H. atra* 24 (8.1%), *B. argus* 20 (6.8%) and *A. lecanora* 7 (2.3%) (Table 3b). The rest of the species recorded 5 (0.8%) or less (Table 3b). *A. crassa* and *Bohadscia marmoratus* were not recorded at sites in exposed locations.

Density data (mean numbers or averages) for each species of sea cucumbers found during the survey in shallow (mean numbers per transect or $100m^2$) and deep (mean numbers per transect or $250m^2$) habitats are presented in Appendices 3 and 4. These data have been converted to mean numbers or averages per hectare in Table 4.

The overall averages for sea cucumbers in both habitats are low (Table 4). In the shallow habitat, the two most abundant species *H. edulis* and *P. graeffei* were found with overall averages of 38 and 26 animals per hectare respectively (Table 4). All other species were recorded with overall averages of 4 or less animals per hectare. Excluding sites with zero values shows that these species tend to have a higher density at the sites where they do occur (Table 4). For example, the average for *H. edulis* increased to 76 animals per hectare, *P. graeffei* 46, *S. chloronotus* 50, *H. nobilis* 33, *T. anax* 28, *T. ananas* 25, *B. argus* 22, *A. lecanora* 19, *B. marmoratus*, *H. atra*, *H. fuscogilva*, *H. fucsopunctata* and *S. hermanni* 17 per hectare (Table 4).

In the deep habitat, the overall averages for the sea cucumber species are also low. The two most abundant species encountered in this habitat *H. edulis* and *H. fuscogilva* were found at 17.6 and 7.6 animals per hectare respectively (Table 4). Other species such as *T. anax*, *H. atra* and *B. argus* were recorded with mean densities of 4.4, 4.0 and 3.2 animals per hectare. The rest of the species were found with overall averages of 2.0 or less animals per hectare. Excluding zero values, the mean densities for *H. edulis* increased to 52.4 animals per hectare, *T. rubralineata* 24, *H. atra* 19.6, *H. fuscogilva* 17.6, *S. hermanni* 17.2, *A. lecanora* and *A. miliaris* 16, *T. anax* 13.6, *H. fuscopunctata* 12.8, *P. graeffei* 10, *A. crassa*, *B. marmoratus*, *H. nobilis*, *S. pseudohorrens* and *T. ananas* 8 animals per hectare.

Size Frequency

H. edulis and *P. graeffei* were the most abundant species of sea cucumbers in the shallow habitat. The size frequency distribution for these two species is shown in Figure 16. Size frequency distribution was not determined for the other species because of the low number of individuals counted (Table 3a). The average size of *H. edulis* is 33cm (n=138) compared to 35cm (n=96) for *P. graeffei* (Figure 16). From the graph, it is obvious that most of the individual sea cucumber measured for the two species are large individuals i.e. belonging to sizes 26cm or above. All the individuals measured for the species *P. graeffei* are larger than 25cm.

Figure 17 shows the size frequency distribution for the five common (n=20 or more) sea cucumber species recorded in the deep habitat. The average size of *H. edulis* is 30cm (n=135), *H. fuscogilva* 41cm (n=59), *T. anax* 62cm (n=36) *H. atra* 46cm (n=26) and *B. argus* 38cm (n=20). From this figure, it is also obvious that most of the individuals measured are large animals, belonging to sizes 26cm or above.

BIVALVES

Species composition

Ten bivalve species recorded during this survey are given in Table 1 (see also Appendix 2). These included six species of giant clams (five of the genus *Tridacna* and one *Hippopus*), two species of pearl oysters (*Pinctada margaritifera* and *Pteria penguin*) and two other shell species that are used for making custom shell-money (*Beguina semiorbiculata* and *Atrina vexillum*). The gold lip pearl oyster *Pinctada maxima*, was not seen during the survey.

Seven of the ten species, *Tridacna crocea*, *T. maxima*, *T. derasa*, *T. gigas*, *Hippopus hippopus*, *B. semiorbiculata* and *A. vexillum* were observed only at sites in the shallow habitat. The giant clam *T. squamosa*, blacklip pearl oyster *Pinctada margaritifera* and the brownlip pearl oyster *Pteria penguin* were recorded at sites in both the shallow and deep habitats (Table 1).

Species distribution and abundance

The distribution of the ten important bivalve species is grouped according to the habitats surveyed (Table 1). Like sea cucumbers, occurrence of these bivalves is also variable with some occurring at a high number of sites while others at lower numbers (Table 5).

Seven species occurred only in the shallow habitat and three in both the shallow and deep habitats at the sites surveyed (Table 5). *T. squamosa* was the most widely distributed bivalve species, occurring at 44 (66.7%) of the sites in the shallow habitat. This species was also observed at 3 (4.8%) of the sites in the deep habitat (Table 5). *T. maxima* was the second most widely distributed species occurring at 35 or 53.0% of the sites while *B. semiorbiculata* (shell money species) was the third most widely distributed species occurring at 33 or 50.0% of the sites. The other species including the *P. margaritifera*, *T. crocea*, *A. vexillum*, *T. gigas*, *T. derasa*, *Pteria penguin* and *H. hippopus* were recorded at 24 (36.4%), 16 (24.2%), 10 (15.2%), 9 (13.6%), 7 (10.6%), 5 (7.6%) and 2 (3.0%) of the sites respectively (Table 5).

B. semiorbiculata, was the most abundant species of bivalve recorded in the shallow habitats. A total of 543 were recorded. This represents 57.9% of the total number of bivalves recorded in that habitat (Table 6). Other abundant species included *T. maxima* with 115 (12.3%), *T. squamosa* 95 (10.1%), and *T. crocea* 60 (6.4%). *P. penguin* and *P. margaritifera* recorded 41 (4.4%) and 39 (4.2%) respectively. *T. derasa* recorded 17 (1.8%) while *T. gigas* and *A. vexillum* 12 (1.3%). *H. hippopus* was encountered the least with only 4 (0.4%) individuals recorded (Table 6). The abundance of *B. semiorbiculata* varied greatly between sites (Figure 18). Mean numbers ranged from 0.17 (0.17) per transect at 4 sites to 20.67 (±6.79) at Lumalihe (site 35) in the Marovo lagoon. High mean numbers were also recorded at Rohae Island (site 26) in the Shortlands with 9.00 (±4.66), Gavutu (site 63) 8.50 (±3.46), Tirahi Island (site 4) 6.17 (±0.87), Wakao (site 12) 6.00 (±2.31) and Vurango (site 24) 5.33 (±1.63) while the rest of the sites recorded 4 or less per transect (Figure 18).

Occurrence of giant clams by site is variable with some sites having more clams than others (Figure 19). The mean number of giant clams per transect ranged from 0 at nine sites to 3.33 (±0.92) at Kerehikapa (site 16) in the ACMCA. Tuma Island (site 15) and Rohae Island (site 26) in the Shortland Islands recorded 3.17 (±0.48) and 3.17 (±1.08) respectively. Landoro (site 34) in Marovo Lagoon recorded 2.50 (± 1.15). The rest of the sites recorded less than 2.00 (±SE) giant clams per transect (Figure 19).

Occurrence of individual clam species by sites is also variable with some sites having more than others (Figures 20, 21, 22, 23 and 24). *T. maxima*, the most abundant of the clam species, occurred at 35 sites with mean numbers ranging from 0.17 (±0.17) per transect at 10 sites to 1.67 (±0.56) at Landoro (site 34), Marovo Lagoon and 1.67 (±1.12) at Pio Island (site 50) (Figure 20). Kerehikapa (site 16) recorded a mean of 1.33 (± 0.67) per transect.

T. squamosa was recorded at 44 sites with mean numbers ranging from 0.17 (±0.17) per transect at 21 sites to 1.17 (± 0.17) at Tuma Island (site 15) in the ACMCA (Figure 21). Babao Point (site 6) and Rohae Island (site 26) recorded 1.00 (±0.37) and 1.00 (±0.26) respectively while the rest of the sites recorded less than 1.00 per transect. *T. crocea* was seen at 16 sites with mean numbers ranging from 0.17 (±0.17) per transect at 4 sites to 2.00 (±1.06) at Rohae Island (site 26) (Figure 22).

The largest of the giant clam species *T. gigas* was present at 9 sites, with mean numbers ranging from 0.17 (±0.17) per transect at 6 sites and 0.33 (±0.21) per transect at the remaining 3 sites (Figure 23). The second largest species *T. derasa* was observed at only 7 sites with mean numbers ranging from 0.17 (±0.17) per transect at 3 sites to 0.83 (±0.31) at Tuma Island (site 15) in the ACMCA (Figure 24). *H. hippopus* was recorded at only 2 sites. Wakao Island (site 12) in Isabel recorded 0.33 (±0.21) and Kerehikapa (site 16) 0.33 (±0.33) per transect.

P. margaritifera was recorded at 24 sites with mean numbers ranging from 0.17 (±0.17) per transect at 16 sites to 0.67 (± 0.33) at Falabulu Island I (site 60) and 0.67 (±0.33) Gavutu Island (site 63) (Figure 25).

The 3 species recorded in the deep habitat comprised 48 individuals. Of these, *P. penquin* was the most abundant of the three species with 40 (83.3%), *T. squamosa* 4 (8.3%) and *P. margaritifera* 4 (8.3%) respectively (Table 6).

A majority of the bivalves i.e. 705 (71.8%) were recorded at sites in sheltered locations compared to 277 (28.2%) at exposed locations (Table 7). Of these, *B. semiorbiculata* accounted for 478 (67.8%), *P. penguin* 67 (9.5%) and *T. crocea* 56 (7.9%). Other species such as *T. derasa, H. hippopus,* and *A. vexillum* were also commonly encountered at sheltered sites than exposed locations. On the other hand, *T. maxima*, *B. semiorbiculata* and *T. squamosa* made up the bulk of bivalves recorded at sites in exposed locations with 94 (33.9%), 65 (23.5%) and 56 (20.2%) respectively (Table 7). *T. gigas* and *P. margaritifera* were also seen more at sites in exposed locations than sheltered ones.

Appendices 5 and 6 present density data for the important bivalve species surveyed during the trip in the shallow habitat (mean numbers per transect or 100m^2) and deep habitat (mean numbers per transect or 250m^2). These data have been converted to numbers per hectare in Table 8. Overall averages (mean densities) were inclusive of zero values which occurred for all species but these were excluded from density ranges. *B. semiorbiculata*, the most abundant bivalve species was recorded during the survey with an overall average of 137 animals per hectare (range: 17 – 2067). Excluding zero values, this increased to 274 animals per hectare (Table 8).

Of the six species of giant clams recorded in the shallow habitat, *T. maxima*, *T. squamosa* and *T. crocea* were the most common species recorded at sites surveyed with overall averages of 28 animals per hectare (range: 17 – 167), 24 animals per hectare (range: 17 – 117) and 15 per hectare (range: 17 – 200) respectively. Excluding zero values, these averages increased to 52, 36 and 64 animals restively respectively. The larger species of giant clams *T. gigas* and *T. derasa* as well as the horse shoe clam *H. hippopus* were recorded with lower overall mean densities of 4 or less animals per hectare (Table 8).

P. margaritifera and *P. penguin* (pearl oysters) were recorded with overall averages of 9 animals per hectare (range: 17 – 83) and 11 animals per hectare (range: 33 – 233) respectively. *A. vexillum* was recorded with a mean density of 3 animals per hectare (range: 17 – 33).

With the exception of *T. squamosa*, *P. margaritifera* and *P. penguin*, the distribution of the other seven species seemed to be restricted to the shallow habitats only. These three species were also recorded in the deep habitat with average densities of 0.4 (range: 8 – 16) for *T. squamosa* and *P. margaritifera* and 4 (range: 8 – 184) animals per hectare for *P. penguin*. Excluding zero value sites, the average densities increased to 10.8 for *T. squamosa* and *P. margaritifera* and 32 animals per hectare for *P. penguin*.

<u>Size Frequency</u>

The size frequency distribution of the five Tridacnid clam species recorded during the survey in the shallow habitat is given in Figure 26. The average size of the most abundant clam species *T. maxima* is 23cm (n=115), *T. squamosa* 33cm (n=95), *T. crocea* 11cm (n=60), *T. derasa* 51cm (n=17) and *T. gigas* 70cm. This figure shows that most of the clams measured are large animals.

The average size of *P. margaritifera* measured in the shallow habitat is 14cm (n=39) (Figure 27). Under a Fisheries Regulation, this is a protected species. From the graph, it is obvious that most of the individuals measured are large animals, belonging to sizes 12cm or above.

GASTROPODS

Species composition

The four species of gastropods surveyed during the trip are listed in Table 1 (see also Appendix 2). These are *Trochus niloticus*, *Tectus pyramis*, *Trochus maculatus*, and *Charonia tritonis*. None of these four species were observed in the deep habitat. The species *Turbo marmoratus* (Greensnail) was not recorded at all during the survey.

Species distribution and abundance

The false trochus *Tectus pyramis* was the most widely distributed of the four species of gastropods occurring at 27 (40.9%) of the sites surveyed in the shallow habitat (Table 9). *T. niloticus* was recorded at only 13 (19.7%) of the sites, *T. maculatus* at 11 (16.7%) and *C. tritonis* at only 1 (1.5%) site.

T. pyramis was also the most abundant species of the gastropods with 91 (62.3%) of the combined total of 146 gastropods recorded during the survey (Table 10). The mean abundance of the species ranged from 0.17 (±0.17) per transect at 8 sites to 1.50 (±0.90) at Honoa Island (site 42) in Marau Sound (Figure 28). *T. niloticus* was the second most abundant species with 38 (26.0%) recorded and mean numbers ranging from 0.17 (±0.17) per transect at 4 sites to 1.83 (±0.60) at Toi reef (site 58) in North Malaita (Figure 29). Tuma Island (site 15) and Kerehikapa (site 16) in the ACMCA recorded mean numbers of 0.83 (±0.40) and 0.5 (±0.22) respectively while Honoa (site 42) in Marau recorded 0.67 (±0.49). *T. maculatus* was recorded with 16 (11.0%) and *C. tritonis* with only 1 (0.7%) specimen (Table 10). The single *C. tritonis* was recorded at Naone Island (site 46) in Makira Province.

One hundred and twenty eight or 87.7% of the gastropod species were recorded at sites in exposed locations compared to 18 or 12.3% in sheltered locations (Table 11). *T. pyramis* constituted the majority with 86 or 67.2%, followed by *T. niloticus* with 34 or 26.6%. In contrast, higher numbers of *T. maculatus* were recorded at sites in sheltered locations than those in exposed locations (Table 11).

Appendix 7 presents abundance data for gastropod species found during the survey in the shallow (mean numbers per 100m^2) habitat. These data have been converted to mean numbers per hectare in Table 12. Overall average densities were inclusive of zero values which occurred for all species but these were excluded from density ranges.

Of the four species of gastropods, *T. pyramis* was the most abundant and widely distributed with an overall average of 23 animals per hectare (range: 17 – 150). Excluding zero values, the average density increased to 56 animals per hectare. *T. niloticus* and *T. maculatus* were recorded with lower overall average densities of 10 (range: 17 – 183) and 4 (range: 17 – 33) animals per hectare respectively. Excluding zero values, the average densities of these two species respectively increased to 49 and 24 animals per hectare (Table 12). The triton shell (*C. tritonis*) was found with very low densities.

Size Frequency

The size frequency distribution for *T. niloticus* is given in Figure 30. The average size of the 38 individuals measured during the survey is 10cm. *T. niloticus* is one of the important commercial species in Solomon Islands and is currently being managed through a Fisheries licensing system and size limit Regulation. A majority of the *T. niloticus* measured during the survey are big animals and fall within the legal size limits of 8 – 12cm maximum shell diameter. Only a small number of animals are either smaller or larger than this legal size range (Figure 30). No *T. niloticus* of size 6cm or less were recorded.

Other Invertebrates Observed

Lobsters

Spiny lobsters were recorded at 9 sites in Choiseul, Shortland Islands, Isabel, Russell Islands and the Three Sisters (Table 13). The painted spiny lobster *Panulirus versicolor*, was the only species observed in the survey habitats. A total of 33 individuals were counted from 9 sites. Two other species, the *Panulirus penicillatus* and *P. fomoristriga* were only identified from 37 individuals caught by fishermen at night at Boeboe and Poro villages in Choiseul.

Crown of Thorns

The crown of thorns starfish (*Acanthaster planci*) was recorded at 11 (16.7%) sites with 17 (2.1%) individuals counted. No extensive *A. planci* related coral reef damage was observed at any of the sites. However, Lisamata reef (site 38) in the Russell Islands and Wainipareo (site 43) in Marau Sound recorded higher mean densities of 0.67 and 0.50 per transect or equivalent to 67 and 50 per hectare respectively.

Discussion

This survey represents the first time quantitative data is collected on various key species of invertebrates from different sites throughout the main Solomon Islands group. While Holland (1994) reported 22 and Ramofafia (2004) a possible 32 species of sea cucumbers being harvested in Solomon Islands respectively, this survey identified only 17 in sampled transects. Some species such as the *A. mauritiana*, *H. scabra*, *B. similis* and *H. coluber* were not encountered in sampled transects although they were recorded outside our study sites. Of the 17 species recorded in sampled transects, 11 occurred in both shallow and deep habitats. In the shallow habitat, 13 species were recorded while in the deep 15. Whether the low number of sea cucumber encountered is related to heavy exploitation or not is not clear, considering the fact that no historical harvest data for these species is available for the sites surveyed.

Ramofafia (2004) lists 10 species which have high commercial value in Solomon Islands: *H. fuscogilva*, *S. chloronotus*, *H. scabra*, *S. hermanni*, *S. horrens*, *T. ananas*, *A. lecanora*, *A. miliaris*, *A. mauritiana* and *H. nobilis*. All except *H. scabra*, *S. horrens* and *A. mauritiana* were encountered in survey transects, possibly because our surveys were conducted outside their specific habitats. Transects sampled in the shallow habitat were laid in depths 5–10m but *A. mauritiana* is known to be more specific to the surf break areas of the reef which was not sampled. *H. scabra* is an inner reef-flat species (Preston, 1993) whereas *S. horrens* is a nocturnal species in many of its known ranges in Solomon Islands like Marovo (personal communication with fishermen in Marovo Lagoon). In both habitats, not all sites recorded these high valued sea cucumber species and their mean numbers in sampled transects were always low (0 – 5). Overall mean densities found for high valued species indicate that their relative abundance at the sites surveyed were lower than reported elsewhere in the Solomons and the South Pacific region (Lincoln and Bell, 1996 and Preston, 1993). For example, *H. fuscogilva*, *S. hermanni*, *T. ananas*, *A. miliaris* and *H. nobilis* were found with overall mean densities of 7.6, 2.0, 1.2, 1.2 and 0.4 individuals per hectare in the deep habitat whereas in the shallow, *A. lecanora*, *T. ananas*, *H. fuscogilva*, *S. chloronotus*, and *H. nobilis* were found with overall mean densities of 3.0, 2.0, 1.0, 1.0 and 1.0 per hectare. This is very low compared to mean densities of up to 18 individuals per hectare reported by Preston (1993) for *H. fuscogilva* in Tonga, 4,258 and 456 for *S. chloronotus* and *S. hermanni* in Papua New Guinea, up to 18 for *T. ananas* in New Caledonia, 78,900 for *A. miliaris* in Fiji and 16.3 for *H. nobilis* in Great Barrier Reef and 18.7 in Tonga. In the ACMCA region, Lincoln-Smith and Bell (1996) reported higher mean densities for *S. chloronotus*, *H. fuscogilva* and *S. hermanni* with 31, 16 and 8.4 individuals per hectare respectively but similar low densities of up to 2 individuals per hectare for *T. ananas*, *H. nobilis* and *A. miliaris*. Although the overall mean densities of sea cucumber species are lower, their mean densities when zero value sites excluded are higher. For example, in the deep, the mean density of *H. fuscogilva* became 17.6 animals per hectare, *T. ananas* 8.0, *S. hermanni* 17.2 and *A. miliaris* 16.0.

In contrast, low valued species like *H. edulis* and *P. graeffei* were the most abundant in the two habitats surveyed. *H. edulis* was encountered with overall mean densities of 38 and 17.6 per hectare in the shallow and deep habitats respectively. *P. graeffei* on the other hand, was abundant in the shallow habitat with overall mean densities of 26 per hectare. When zero value sites are excluded, the mean densities per hectare for these low value species are even higher.

There is lack of information on average size at first maturity for sea cucumbers in Solomon Islands. However, within the Pacific region, Conand (1989) gave the size at first maturity for selected sea cucumber species in New Caledonia. Among the species the author worked with were *H. atra* and *H. fuscogilva*. The author estimated the average size at maturity of these two species to be 16.5 and 32cm respectively. Taking his result into consideration, this would mean that most of the individuals of these two species recorded during this survey in the deep habitat were mature animals. Although Conand (1989) gave the average size at first maturity for other species such as *H. scabra, H. scabra* var *versicolor*, *H. nobilis*, *H. fuscopunctata, A. echinites, A. mauritiana, S. hermanni,* and *T. ananas* the low sample sizes obtained for these species prevented any meaningful size frequency distribution to be determined for them. The size frequency distribution for common species such as *H. edulis, P. graeffei, B. argus,* and *T. anax*, indicated that most of the individuals recorded for these species were large animals.

The bivalve species sampled during this survey were more abundant in the shallow habitat compared to the deep. *B. semiorbiculata* was the most abundant species with 137 per hectare. Excluding zero value sites, the mean density increased to 274 (range: 17 – 2067) per hectare. This species prefers sheltered reef habitats over exposed ones. Lumalihe (site 35) in Marovo Lagoon, Rohae Island (site 26) in the Shortlands and Gavutu (site 63) in the Florida group recorded high densities of this species. The species was less abundant or absent at many sites (Figure 16) including the Langalanga Lagoon sites Falabulu I (site 60) & Falabulu II (site 61), a well known shell money making region of the Solomon Islands. It may be worthwhile to undertake a detailed stock assessment study in the lagoon so as to ascertain the current status and stock levels of the species.

All six species of giant clams known from the Solomon Islands were recorded during this survey. Although *T. squamosa* was the most widely distributed of the six species, *T. maxima* was the most abundant with estimated overall average density of 28 per hectare. The species is more abundant on lagoonal reef edge and windward reef slopes. Excluding zero value sites, the mean density increased to 52 per hectare (range: 17 – 167). Compared to mean densities reported in other studies in Solomon Islands and elsewhere, this is very low. Creese and Friedman (1995) reported very high densities for Indispensable reef of 1,400 per hectare while Munro (1993) reported densities well over 1,000 individuals per hectare in French Polynesia. Lincoln Smith and Bell (1996) reported a mean density range of 98 -194 animals per hectare for the ACMCA region. *T. squamosa* was the second most common giant clam species with an overall mean density of 24 per hectare. Excluding zero value sites, the mean density increased to 36 per hectare (range: 17 – 117). Again, this is well below mean densities reported in other studies for the species. Creese and Friedman (1995) reported a mean density of up to 500 per hectare for the species on the Indispensable Reefs. *T. crocea* was recorded with an overall mean density of 15 per hectare and a non-zero density of 64 per hectare (range: 17 – 200). This is also low compared to densities of more than 3,000 reported by Munro (1993) for the species. The densities of the larger giant clam species such as *T. gigas* and *T. derasa* were similar to that reported by Munro (1993) and Lincoln-Smith and Bell (1996). The majority of these two larger species were recorded at sites in Northern Isabel, ACMCA, Southern Choiseul and the Shortland Islands. *H. hippopus*, however, was the less commonly encountered species of the giant clams. The species was seen at only two sites with densities much lower than what is reported by Munro (1993) and Lincoln-Smith and Bell (1996). Higher numbers of the species were counted in the ACMCA but outside the study sites.

The calculated average sizes of the Tridacnid clams recorded during this survey were well within their known size ranges as reported in Copland and Lucas, (1988). Based on their size frequency distribution, most of the clams recorded are mature animals.

Giant clams (genus *Tridacna* and *Hippopus*) are protected under a Fisheries Regulation which banned wild harvest of the species for commercial purposes. However, there was no restriction on subsistence use. Although there is currently no fishery based on any of these species in the country, the fact that there is no restriction on the subsistence use of the resource makes the larger species such as *T. gigas* and *T. derasa* vulnerable to over-exploitation. The low numbers recorded for the two species during this survey is a concern but whether this is due to over-exploitation or not is not clear as there was no historical catch data for these species at the sites surveyed.

P. margaritifera was more widely distributed than *T. niloticus*. This species was encountered at 24 sites in the shallow habitat and 3 in the deep. Mbili passage (site 37) in Marovo Lagoon recorded the highest density of 0.83 per transect or equivalent to 83 per hectare. Gavutu (site 63) in Ngella and Falabulu I (site 60) in Langalanga Lagoon recorded mean densities of 67 per hectare. In the shallow habitat, the highest density of *P. penquin* was recorded at Airasi (site 52) in Are'Are Lagoon with mean density of 2.33 per transect or equivalent to 233 per hectare. In the deep habitat, the species was recorded at eight sites. Airasi (site 52) in Are'Are Lagoon also recorded the highest density in this habitat with 4.60 per transect or equivalent to 460 per hectare (Appendix 5 & 6). *P. maxima* was not recorded during this survey but this was because this species is more specific to deeper habitats where there is very strong current flow.

Most of the *P. margaritifera* measured during the survey are large animals and according to Sims (1993), larger shells should maintain an even sex ratio in the wild. Whilst objective surveys like this Marine Assessment Survey provide baseline measures of abundance, Sims (1993) suggested that permanent survey sites are needed for monitoring stock changes.

T. niloticus was encountered in low numbers and at less number of sites during the survey. In contrast, *T. pyramis* was encountered at twice as many number of sites and numbers. Since these two species are known to occupy the same habitat and space on the reef, this would imply a significant reduction in the stocks of *T. niloticus*. Specifically, *T. niloticus* prefer the exposed habitats compared to the sheltered reefs. The species was found with an overall mean density of 10 per hectare but for the sites which the species was present, the mean density was 49 per hectare (range: 17 – 183). The highest density for the species was recorded at the exposed Toi reef (site 58) in North Malaita with mean densities up to 1.83 per transect. This is equivalent to 183 per hectare. Tuma (site 15) and Kerehikapa (site 16) in the ACMCA recorded mean densities of 0.83 and 0.50 per transect or equivalent to 83 and 50 per hectare respectively. Leary (1993) found low numbers of 28 per hectare for the ACMCA whilst Lincoln-Smith and Bell (1996) up to 38 per hectare. Although higher densities are found during this study compared to Leary (1993) and Lincoln-Smith and Bell (1996), mean densities found in other parts of the South Pacific region are much higher. In Vanuatu, Ayling *et,al.*, (1990) found densities of up to 750 per hectare and Nash *et. al.*, (1995) reported densities well over 2,500 individuals per hectare in the Cook Islands. Leary (1993) also reported that densities of 100 per hectare are considered normal for a well-fished healthy population (Leary, 1993).

Although the number of *T. niloticus* found during the survey is low, size measurements indicated that a majority of the *T. niloticus* recorded during the survey are large mature animals. Nash (1993) reported that the onset of sexual maturity in *T. niloticus* occurs between 5 and 9cm maximum shell diameter. With an average shell size of 10cm, it can be assumed that most of the *T. niloticus* recorded during the survey are sexually mature. In addition to this, most of the *T. niloticus* are also within the legal harvesting size limits of 8 – 12cm maximum shell diameter.

The fact that no *T. niloticus* less than 6cm were found also confirm that all the *T. niloticus* recorded are mature adults. Juvenile *T. niloticus* are however, difficult to find due to their cryptic nature (Heslinga et al., 1984 and Nash, 1985) and larval settlement predominantly on the reef flat in the intertidal zone. This survey was carried out mainly on the reef slopes at depths 5 to 10m which are known adult habitats.

T. marmoratus was absent from this study. It is most likely that this species which has limited larval dispersal abilities (Creese and Friedman, 1994) has been depleted throughout the main island group. A total protection of this species is needed and a possible reseeding program should be initiated to rebuild its population.

Lobsters were present but in low abundances. These species were seen more often from fishermen's catch than observed in transects sampled. Similarly, the crown of thorns starfish was not abundant in sampled transects and overall, coral damage due to the species was minimal. However, the Lisamata reef (site 38) in Russell Islands and Wainipareo (site 43) in Marau Sound should be monitored closely. These two sites recorded mean densities 50 and higher per hectare for the species.

An important result from this study was the contrast between the ACMCA and the rest of the sites. The mean abundance of many of the invertebrates sampled during this survey was higher in the ACMCA. For example, the ACMCA recorded all the species of giant clams including the largest of the species *T. gigas*. This species was not seen at most of the sites sampled (Figure 21). *T. derasa* was found mainly in the ACMCA and the nearby surrounding Northern Isabel and Southern Choiseul reefs. One specimen was recorded in Marau sound at the Honoa Island (site 42). Compared to many of the sites sampled, the two sites in the ACMCA recorded high mean densities of the giant clam species. The sites in the ACMCA also recorded the highest number of sea cucumber and *T. niloticus* during the survey.

The result of this study high-lighted a number of points, one of which is that a Marine Protected Area (MPA) is not simply a demarcated no-fishing zones but they are areas that help to enhance and maintain higher numbers of marine species. Spill over from the protected area could help to replenish over-fished reefs. Another finding was that, Toi reef (site 58) in North Malaita, sites in Leili Island, Shortland Islands and Marovo Lagoon recorded reasonably higher densities of some of the species compared to other sites. Preston (1993) reported high density patches among a generally low background abundance for 18 species in

Vanuatu. However, no high density patches were found for sea cucumber species during this study. Whether this is natural to the sites surveyed or due to past fishing activities cannot be determined without further long-term monitoring.

Marine resources, especially marine invertebrates, are very important to Solomon Islands. These multi-species fisheries deliver incomes directly to the village fisher and even the more remote coastal communities. However, the low densities found for these important invertebrate species could be telling us that these resources are under increasing pressure as coastal communities rely more heavily on them for income, food and other benefits. In Solomon Islands, there is limited understanding and knowledge (biological and ecological) on many of these key invertebrate species and fishing operations in rural communities are difficult to monitor. Available export data reveal little information on points of species capture or shifts in catches from high to low value species. As a result of this, Fisheries Managers do not have evidence to support management measures such as setting quotas, total allowable catches or other conservative fishing measures. MPAs offer an alternative management option. The ACMCA has been successful in maintaining stocks of these invertebrates. A seven year ban on the sea cucumber fishery has helped increased the numbers of sea cucumbers on reef-flats in Tonga (personal experience). If a ban is not possible, community MPAs could be established in many parts of the country to enhance the dwindling stocks of these important invertebrates.

Conclusions

The key invertebrates surveyed are not abundant at the sites sampled. Most of the high valued species such as sea cucumbers, giant clams, *Trochus niloticus* and pearl oysters are low in abundance at the sites surveyed in both the shallow and deep habitats. However, most of the animals recorded are large and mature.

Although the smaller of giant clam species were seen in larger numbers, the large species like *T. gigas* and *T. derasa* were present in low abundance. *T. derasa* was however, the more abundant of the two species and localized at sites in Northern Isabel, ACMCA and Waghena area in Choiseul.

P. margaritifera was more widely distributed than *T. niloticus* and this is probably a result of a government ban on the export of the species for the past 13 or so years. The apparent absence of *T. marmoratus* in areas where there is plenty of suitable habitats is a major concern. It is hoped that past high fishing pressure has not been the main factor. Although there is no ban on this species, there is currently no fishery on this species. It is high time that a formal ban is imposed on future harvesting of the species.

T. niloticus abundance is very low except for some sites like Toi reef (site 58), the ACMCA (sites 15 & 16), Honoa (site 42) in Marau and Onua Island (site 27) in the Shortlands. The wide spread low abundance of this species is also a major concern. Management intervention is required for the management of this species is Solomon Islands. MPAs like the ACMCA has proved very effective in enhancing and maintaining stocks of *T. niloticus*, sea cucumbers and other commercial invertebrate species. It will be better to establish more community MPAs for the management and conservation of commercial invertebrate to enable sustainable production of these resources in the country.

Conservation Recommendations

The following recommendations are made in light of the importance of the results of this survey.

1) Marine Conservation Areas like the ACMCA help to maintain and enhance stocks of commercially important marine invertebrates. Similar experience like this can also be seen from other parts of the Pacific. It will be in the best interest of the country and the multi-species invertebrate fisheries that our rural communities rely on to establish more community managed “Pocketed MPAs” in Solomon Islands for the protection and management of these fisheries. Such MPAs are small in size but they are strategically located and habitat specific for these invertebrate resources. A number of these small MPAs have already been established by communities in Marau Sound, Ngella, Marovo Lagoon, Tetepare, Roviana Lagoon and Gizo. Similar networks should be set up in the Shortland Islands, Russell Islands, Three Sisters Islands, Leili Island, Lau Lagoon, Suafa Bay, Langalanga Lagoon, Are’Are Lagoon and small Malaita, Northern Isabel and Northern Choiseul. Although such community MPAs would be managed by the communities themselves, government and partner (e.g. NGO’s) support would be essential. The government through relevant department(s) should take appropriate steps to legalize these small MPAs as provided for under provisions of the Fisheries Act 1998. Any reviews planned for this Act in future should ensure that this provision is firmly and clearly addressed or provided for.

2) The nature of multi-species invertebrate fisheries made it difficult to monitor them. Harvest data is not specific to species and location and not readily available. Data collection by important Departments like the Fisheries and Marine Resources is always geared towards earning or increasing revenue. It is now time data collection is also aimed at the conservation of resources. It is highly recommended that the Department of Fisheries and Marine Resources consider utilizing existing structures like Fisheries Centres and Extension arrangement already in place to improve data collection and awareness work in the rural areas.

3) The Fisheries Regulation banning the use of SCUBA and Hookar gear for harvesting of valuable invertebrate resources like sea cucumber should be vigorously enforced. Awareness programs on all Fisheries Regulations should be targeted at rural communities, schools and the public at large. Funding should be sought for radio awareness programs. A meeting should be held with each Provincial Police Commanders to discuss with them aspects relating to the enforcement of Fisheries Regulations.

4) The Department of Fisheries and Marine Resources should start looking at alternative management options for the Sea cucumber and Trochus fisheries in Solomon Islands. A number of options are suggested:
    (1) Limiting the numbers of export permits
    (2) Set annual export quotas for these resources
    (3) Set size limits for sea cucumbers species (wet and dry size limits)

5) The Department of Fisheries and Marine Resources should impose a total protection of the species greensnail (*Turbo marmoratus*) through a Fisheries Regulation. A reseeding program should be initiated to rebuild its population.

Acknowledgements

I thank Alec Hughes, Tingo Leve, Michael Ginigele and Dr. Alison Green for assisting me during the survey. Without their help, it would not be possible to collect data for this study. I thank also Captain Russell Slater and crew on the *FeBrina*. Dr. Christain Ramofafia and Ferral Lasi reviewed and made constructive comments on an earlier draft of this report. This study was financially supported by The Nature Conservancy.

References

Adams, T.J.H., Leqata, J., Ramohia, P., Amos, M. and Lokani, P. (1992). Pilot survey of the status of trochus and beche-de-mer resources in the Western Province of the Solomon Islands with options for management. Inshore Fisheries Research Project (IFRP) South Pacific Commission (SPC). IFRP Unpublished country report. 34pp.

Ayling, A. M., Andrews, G. J., Navin, K.F. and Benzie, J.A.H. (1990). Quantitative surveys around Malekula Island, pp 119-135 in: Done, T.J. and K.F Navin (Eds.), *Vanuatu Marine Resources*. Australian Institute of Marine Science, Townswille.

Babcock, R.C. (1994). *Marine Resources of Rennell Island and Indispensable Reef.* University of Auckland Leigh Marine Laboratory, New Zealand.

Conand, C. (1989). Les Holothuries Aspidochirote du Lagon de Nouvelle-Caledonie: Biology, Ecologie et Exploitation. *Ph.D thesis*, University of Western Brittany, Brest, France. 393pp.

Creese, B and Friedman, K. (1994). Shellfish and Other Reef Resources, Pp 125-158 in R. C. Babcock (ed.) *Marine Resources of Rennell Island and Indispensable Reef.* University of Auckland Leigh Marine Laboratory, New Zealand.

Heslinga, G. A., Perron, F. E. and Orak, O. (1984). Mass culture of giant clams (F. Tridacnidae) in Palau. *Aquaculture* **39**, 197-215.

Holland, A. (1994). The beche-de-mer industry in the Solomon Islands: recent trends and suggestions for management. SPC Beche-de-Mer Information Bulletin 6: 2-8.

Leary, T. (1993). Arnavon Islands Marine Conservation Area Project, Solomon Islands. SPREP/5th South Pacific Conf. Nat. Cons. And Prot. Areas/CSI.4, pp 1-9.

Lincoln Smith, M. P. and Bell, J. D. (1996). *Testing the use of marine protected areas to restore and manage tropical multispecies invertebrate fisheries at the Arnavon Islands, Solomon Islands: Abundance and size distributions of invertebrates, and the nature of habitats, prior to declaration of the Marine Conservation Area*. Prepared for the Great Barrier Reef Marine Park Authority, Canberra and the Australian Centre for International Agricultural Research, Sydney.

Lincoln Smith, M. P., Bell, J. D., Ramohia, P. and Pitt, K. A. (2000). *Testing the use of marine protected areas to restore and manage tropical multispecies invertebrate fisheries at the Arnavon Islands, Solomon Islands: TERMINATION REPORT*. Prepared for the Great Barrier Reef Marine Park Authority, Canberra and the Australian Centre for International Agricultural Research, Sydney.

Lucas, J. S. (1988). Giant Clams: Description, Destribution and Life History, Pp 21 – 32 in, Copland, J. W. and Lucas, J. S. (eds), *Giant Clams in Asia and the Pacific*. Australian Centre for International Agricultural Research, Canberra, Australia.

Munro, J. L. (1993). Giant clams, Pp 431-450 in, A. Wright and L. Hill (eds), *Nearshore Marine Resources of the South Pacific*. Institute of Pacific Studies, Suva, Forum Fisheries Agency, Honiara and International Centre for Ocean Development, Canada.

Nash, W. J. (1985). Aspects of the biology of Trochus niloticus (Gastropoda: Trochidae) and its fishery in the Great Barrier Reef region. *Report to the*

Queensland Department of Primary Industries and the Great Barrier Reef Marine Park Authority. 210pp

Nash, W.J. (1993). Trochus, Pp 371-408 in, A. Wright and L. Hill (eds), *Nearshore Marine Resources of the South Pacific*. Institute of Pacific Studies, Suva, Forum Fisheries Agency, Honiara and International Centre for Ocean Development, Canada.

Oreihaka, E. (1997). Freshwater and Marine Aquatic resources in Solomon Islands. Unpublished report for Fisheries Division, Department of Agriculture and Fisheries, Honiara, Solomon Islands, 60pp.

Preston, G. L. (1993). Beche-de-mer, Pp 371-408 in, A. Wright and L. Hill (eds), *Nearshore Marine Resources of the South Pacific*. Institute of Pacific Studies, Suva, Forum Fisheries Agency, Honiara and International Centre for Ocean Development, Canada.

Preston, G.L. and Lokani, P. (1990). Report of a Survey of the Sea Cucumber Resources of Ha'apai, Tonga. Inshore Fisheries Research Project (IFRP) South Pacific Commission (SPC). IFRP Unpublished country report. 17pp.

Ramofafia, C. (2004). The Sea Cucumber Fisheries in Solomon Islands: Benefits and Importance to Coastal Communities. WorldFish Centre, Nusa Tupe Field Station, 10pp.

Ramohia, P. (2004). Baseline Survey: Assessing Abundance of Commercially Important Invertebrates of the Marapa and Simeruka Marine Protected Areas, Marau Sound, Guadalcanal. Department of Fisheries and Marine Resources, Honiara. Unpublished report. 24pp.

SIG, (1994). Fisheries Division Annual Report. Department of Agriculture and Fisheries, Honiara, Solomon Islands. Unpublished.

Sims, N. A. (1993). Pearl Oysters, Pp 409 - 430 in, A. Wright and L. Hill (eds), *Nearshore Marine Resources of the South Pacific*. Institute of Pacific Studies, Suva, Forum Fisheries Agency, Honiara and International Centre for Ocean Development, Canada.

Skewes, T. (1990). Marine Resource profiles, Solomon Islands. South Pacific Forum Fisheries Agency, Honiara, 52 pp.

Sulu, R., Hay, C., Ramohia, P. and Lam, M. (2000). The status of Solomon Islands'coral reefs. A report prepared for the Global Coral Reef Monitoring Network. 59 pp.

Wright, A and Hill, L. E. (1993). *Nearshore Marine Resources of the South Pacific*. Institute of Pacific Studies, Suva, 710 pp.

Tables

Table 1. Invertebrate species composition and distribution for the two habitats surveyed.

Shallow Habitat	Deep Habitat	Shallow and Deep habitats
Sea Cucumbers		
Actinopyga lecanora (stonefish)	*A. crassa* (spp. Similar to blackfish)	*B. argus* (tigerfish)
*Bohadschia similes** (chalkfish)	*A. miliaris* (blackfish)	*B. vitiensis* (brown sandfish)
*Holothuria scabra** (sandfish)	*S. pseudohorrens* (spp. Similar to peanutfish)	*H. edulis* (pinkfish)
Stichopus chloronotus (greenfish)	*T. rubralineatus* (lemonfish)	*H. fuscogilva* (white teatfish)
		H. fuscopunctata (elephant trunkfish)
-	-	*H. nobilis* (black teatfish)
-	-	*H. atra* (lollyfish)
-	-	*Pearsonothuria graeffei* (orangefish)
-	-	*S. hermanni* (curryfish)
-	-	*Thelenota ananas* (prickly redfish)
		T. anax (Amberfish)
Bivalves		
Tridacna crocea	-	*Tridacna squamosa*
Tridacna maxima	-	*Pinctada margaritifera*
Tridacna derasa	-	*Pteria penguin*
Tridacna gigas	-	-
Hippopus hippopus	-	-
Beguina semiorbiculata (Ke'e)	-	-
Atrina vexillum (Kurila)	-	-
Gastropods		
Trochus niloticus	-	-
Tectus pyramis (False trochus)	-	-
Trochus maculates	-	-
Charonia tritonis (triton shell)	-	-

**Found in sea grass beds by Seagrass Team.*

Table 2: Occurrence (%) of sea cucumber species found in the different habitats

Species	Shallow Habitat		Deep Habitat	
	No. sites species present*	Percent occurrence (%)	No. sites species present*	Percent occurrence (%)
Actinopyga crassa	-		1	1.6
A. lecanora	9	13.6	-	-
A. miliaris	-		4	6.4
Bohadschia argus	12	18.2	12	19.1
B. vitiensis	3	4.5	3	4.8
Holothuria atra	4	6.1	12	19.1
H. edulis	33	50.0	21	33.3
H. fuscogilva	3	4.6	27	42.9
H. fuscopunctata	1	1.5	10	15.9
H. nobilis	1	1.5	2	3.2
Pearsonothuria graeffei	38	57.6	8	12.7
Stichopus chloronotus	1	1.5	-	-
S. hermanni	1	1.5	7	11.1
S. pseudohorrens	-	-	2	3.2
Thelenota ananas	4	6.1	10	15.9
T. anax	3	4.5	21	33.3
T. rubralineata	-	-	1	1.6

**Total sites surveyed were 66 (shallow habitats) and 63 (deep habitats).*

Table 3a. Abundance (%) of sea cucumber species recorded in the different habitats. ***n*** are total numbers of individuals found.

Species	Habitat			
	Shallow (*n*)	**% of Total**	**Deep (*n*)**	**% of Total**
Actinopyga crassa	-	-	1	0.3
A. lecanora	10	3.2	-	-
A. miliaris	-	-	8	2.2
Bohadschia argus	16	5.2	24	6.7
B. vitiensis	3	1.0	3	0.8
Holothuria atra	5	1.6	32	8.9
H. edulis	151	48.7	138	38.4
H. fuscogilva	3	1.0	59	16.4
H. fuscopunctata	1	0.3	16	4.5
H. nobilis	2	0.6	2	0.6
Pearsonothuria graeffei	104	33.6	10	2.8
Stichopus chloronotus	3	1.0	-	-
S. hermanni	1	0.3	15	4.2
S. pseudohorrens	-	-	2	0.6
Thelenota ananas	6	1.9	10	2.8
T. anax	5	1.6	36	10.0
T. rubralineata	-	-	3	0.8
Total	**310**		**359**	

Table 3b. Abundance (%) of sea cucumber species recorded at different geographical locations. ***n*** are total numbers of individuals found.

Species	Geographical Location			
	Sheltered (n)	**% of Total**	**Exposed (n)**	**% of Total**
Actinopyga crassa	1	0.3	-	-
A. lecanora	3	0.8	7	2.3
A. miliaris	5	1.3	3	1.0
Bohadschia argus	20	5.4	20	6.8
B. vitiensis	6	1.6	-	-
Holothuria atra	13	3.5	24	8.1
H. edulis	192	51.5	97	32.8
H. fuscogilva	34	9.1	29	9.8
H. fuscopunctata	12	3.2	5	1.7
H. nobilis	3	0.8	1	0.3
Pearsonothuria graeffei	55	14.7	59	19.9
Stichopus chloronotus	-	-	3	1.0
S. Hermanni	13	3.5	3	1.0
S. pseudohorrens	1	0.3	1	0.3
Thelenota ananas	4	1.1	12	4.0
T. anax	11	2.9	30	10.0
T. rubralineata	-	-	3	1.0
Total	**373**		**296**	

Table 4: Mean densities (rounded to whole numbers per hectare) for holothurian species found at the shallow and deep habitats during the survey.

	Habitat					
	Shallow (No./ha)			**Deep (No./ha)**		
Species	**Range (exclude zero values)**	**Overall average**	**Average (exclude zero values)**	**Range (exclude zero values)**	**Overall average**	**Average (exclude zero values)**
Actinopyga crassa	-	-	-	8	0.1	8.0
A. lecanora	17 - 33	3.0	19.0	-	-	-
A. miliaris	-	-	-	8 – 32	1.2	16.0
Bohadschia argus	17 - 67	4.0	22.0	8 – 72	3.2	16.0
B. vitiensis	17	1.0	17.0	8	0.4	8.0
Holothuria atra	17 - 33	1.0	17.0	8 – 56	4.0	19.6
H. edulis	17 - 233	38.0	76.0	8 – 168	17.6	52.4
H. fuscogilva	17	1.0	17.0	8 – 48	7.6	17.6
H. fuscopunctata	17	0.003	17.0	8 – 24	2.0	12.8

Species	Habitat					
	Shallow (No./ha)			Deep (No./ha)		
	Range (exclude zero values)	Overall average	Average (exclude zero values)	Range (exclude zero values)	Overall average	Average (exclude zero values)
H. nobilis	33	1.0	33.0	8	0.4	8.0
Pearsonothuria graeffei	17 - 200	26.0	46.0	8 – 16	1.2	10.0
Stichopus chloronotus	50	1.0	50.0	-	-	-
S. hermanni	17	0.003	17.0	8 - 40	2.0	17.2
S. pseudohorrens	-	-	-	8	0.4	8.0
Thelenota ananas	17 – 50	2.0	25.0	8	1.2	8.0
T. anax	17 – 33	1.0	28.0	8 – 56	4.4	13.6
T. rubralineata	-	-	-	24	0.4	24.0

Table 5: Occurrence (%) of bivalve species found in the different habitats

Species	Shallow Habitat		Deep Habitat	
	No. sites species present*	Percent occurrence (%)	No. sites species present*	Percent occurrence (%)
Tridacna crocea	16	24.2	-	-
Tridacna maxima	35	53.0	-	-
Tridacna squamosa	44	66.7	3	4.8
Tridacna derasa	7	10.6	-	-
Tridacna gigas	9	13.6	-	-
Hippopus hippopus	2	3.0	-	-
Pinctada margaritifera	24	36.4	3	4.8
Pteria penguin	4	6.1	8	12.7
Beguina semiorbiculata	33	50.0	-	-
Atrina vexillum	10	15.2	-	-

**Total sites surveyed were 66 in the shallow and 63 n the deep habitats*

Table 6: Abundance (%) of bivalve species recorded in the different habitats. ***n*** are total numbers of individuals found.

Species	Habitat			
	Shallow (*n*)	% of Total	Deep (*n*)	% of Total
Tridacna crocea	60	6.5	-	-
Tridacna maxima	115	12.3	-	-
Tridacna squamosa	95	10.3	4	8.3
Tridacna derasa	17	1.8	-	-
Tridacna gigas	12	1.3	-	-
Hippopus hippopus	4	0.4	-	-
Pinctada margaritifera	39	4.2	4	8.3
Pteria penguin	41	4.4	40	83.3
Beguina semiorbiculata	543	57.9	-	-
Atrina vexillum	12	1.3	-	-
Total	**938**		**48**	

Table 7: Abundance (%) of bivalve species recorded at different geographical locations. ***n*** are total numbers of individuals found.

Species	Geographical Location			
	Sheltered (n)	% of Total	Exposed (n)	% of Total
Tridacna crocea	55	7.8	5	1.8
Tridacna maxima	21	3.0	94	33.9
Tridacna squamosa	39	5.5	56	20.2
Tridacna derasa	10	1.4	7	2.5
Tridacna gigas	1	0.1	11	4.0
Hippopus hippopus	4	0.6	-	-
Pinctada margaritifera	19	2.7	22	8.0
Pteria penguin	67	9.5	13	4.7
Beguina semiorbiculata	478	67.8	65	23.5
Atrina vexillum	9	1.3	3	1.1
Total	**705**		**277**	

Table 8: Mean densities (numbers per hectare) for bivalve species found at the shallow and deep habitats during the survey.

Species	Habitat					
	Shallow (No./ha)			Deep (No./ha)		
	Range (exclude zero values)	Overall average	Average (exclude zero values)	Range (exclude zero values)	Overall average	Average (exclude zero values)
Tridacna crocea	17 – 200	15	64	-	-	-
Tridacna maxima	17 – 167	28	52	-	-	-
Tridacna squamosa	17 – 117	24	36	8 – 16	0.4	10.8
Tridacna derasa	17 – 83	4	40	-	-	-
Tridacna gigas	17 – 33	3	22	-	-	-
Hippopus hippopus	33	1	33	-	-	-
Pinctada margaritifera	17 – 83	9	27	8 – 16	0.4	10.8
Pteria penguin	33 – 233	11	143	8 – 184	4	32
Beguina semiorbiculata	17 – 2067	137	274	-	-	-
Atrina vexillum	17 – 33	3	20	-	-	-

Table 9: Occurrence (%) of target gastropod species found in the shallow habitats

Species	Shallow Habitat	
	No. sites species present*	Percent occurrence (%)
Trochus niloticus	13	19.7
Tectus pyramis	27	40.9
Trochus maculates	11	16.7
Charonia tritonis	1	1.5

**Total sites surveyed were 66 (shallow habitats)*

Table 10: Abundance (%) of target gastropod species recorded in the shallow habitat. ***n*** are total numbers of individuals found.

Species	Habitat	
	Shallow (n)	Percent (%) of Total
Trochus niloticus	38	26.0
Tectus pyramis	91	62.3
Trochus maculates	16	11.0
Charonia tritonis	1	0.7
	146	

Table 11: Abundance (%) of gastropod species recorded at different geographical locations. ***n*** are total numbers of individuals found.

Species	Geographical Location			
	Sheltered (n)	% of Total	Exposed (n)	% of Total
Trochus niloticus	4	22.2	34	26.6
Tectus pyramis	5	27.8	86	67.2
Trochus maculates	9	50.0	7	5.5
Charonia tritonis			1	0.8
	18		**128**	

Table 12: Mean densities (numbers per hectare) for gastropods species found at the shallow habitat during the survey.

Species	Shallow Habitat (No./ha)		
	Range (exclude zero values)	Overall average	Average (exclude zero values)
Trochus niloticus	17 – 183	10	49
Tectus pyramis	17 – 150	23	56
Trochus maculates	17 – 33	4	24
Charonia tritonis	17	0	17

Table 13: Number of spiny Lobsters observed during the survey.

Species	Sites	Number observed in Shallow habitat	Number Observed in Deep habitat	Fishermen catch (Night diving)
Panulirus versicolor	Sirovanga	7	1	
	Putuputuru	7	1	
	Raverave Island	2		
	Sunda Island	1		
	Sibau Island	3		
	Lisamata (Russ.)	2		
	Three Sisters Is.	2		
	Rohae Reef		5	
	Onou Island		2	
Panulirus versicolor	Boeboe			8
Panulirus penicillatus				7
Panulirus femoristriga				2
Panulirus versicolor	Poro			1
Panulirus penicillatus				8
Panulirus femoristriga				9
Total		**24**	**9**	**37**

Figure 1. Track and survey sites of the Solomon Islands Marine Assessment

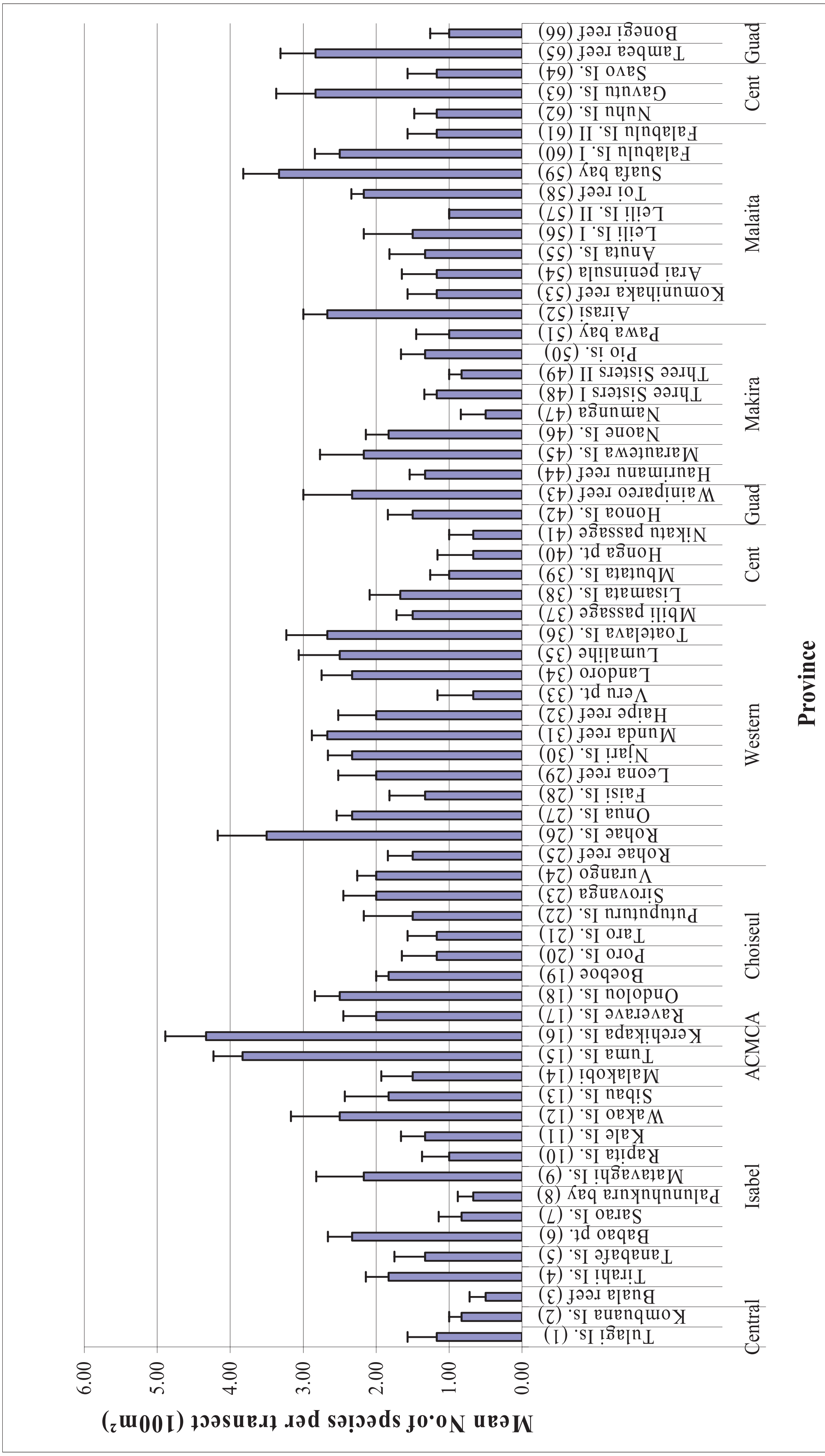


Figure 2: Mean number (±SE, n=6) of commercially important invertebrate species per site in the shallow habitat.

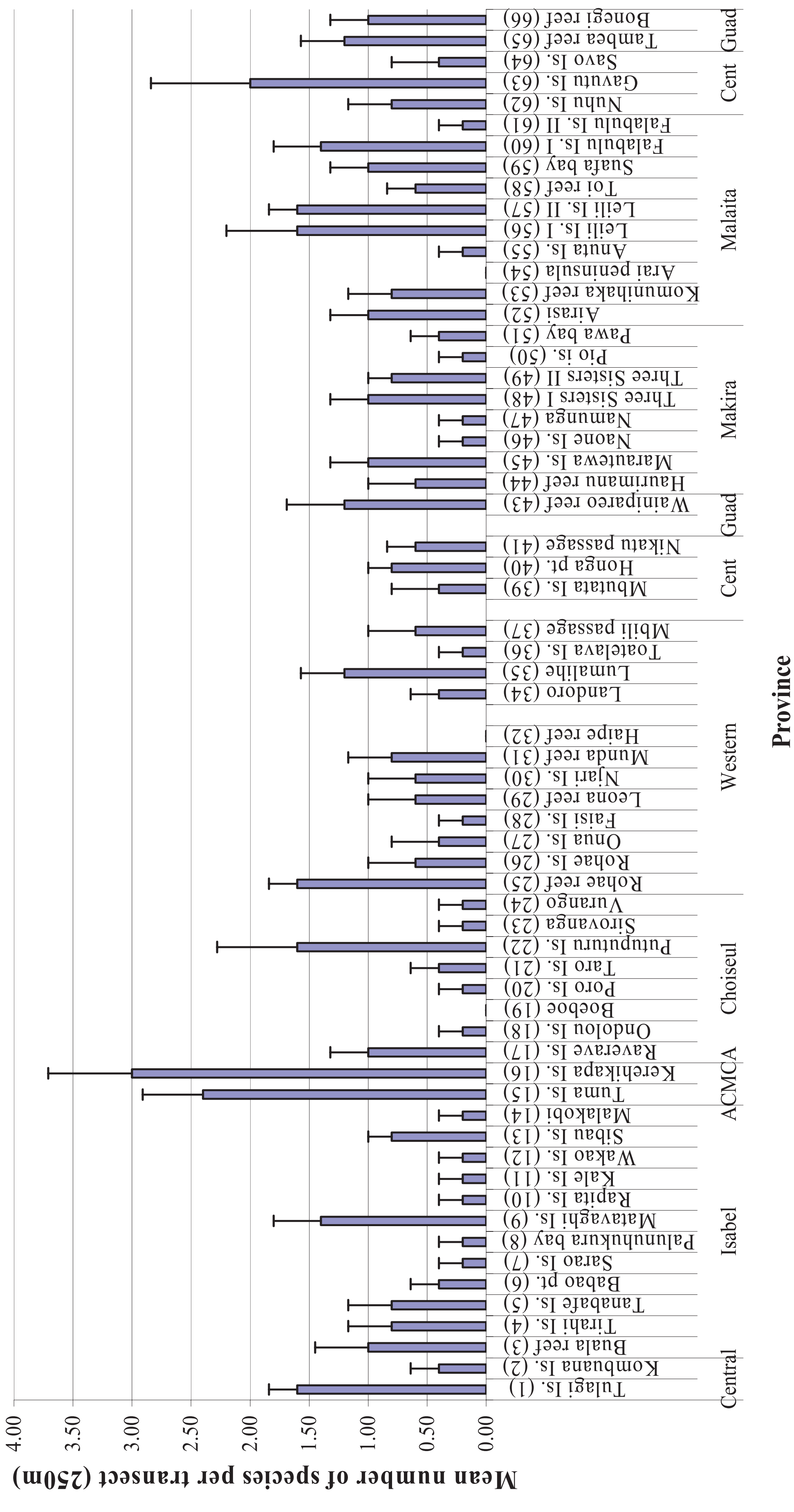


Figure 3: Mean number (±SE, n=5) of commercially important invertebrate species per site in the deep habitat

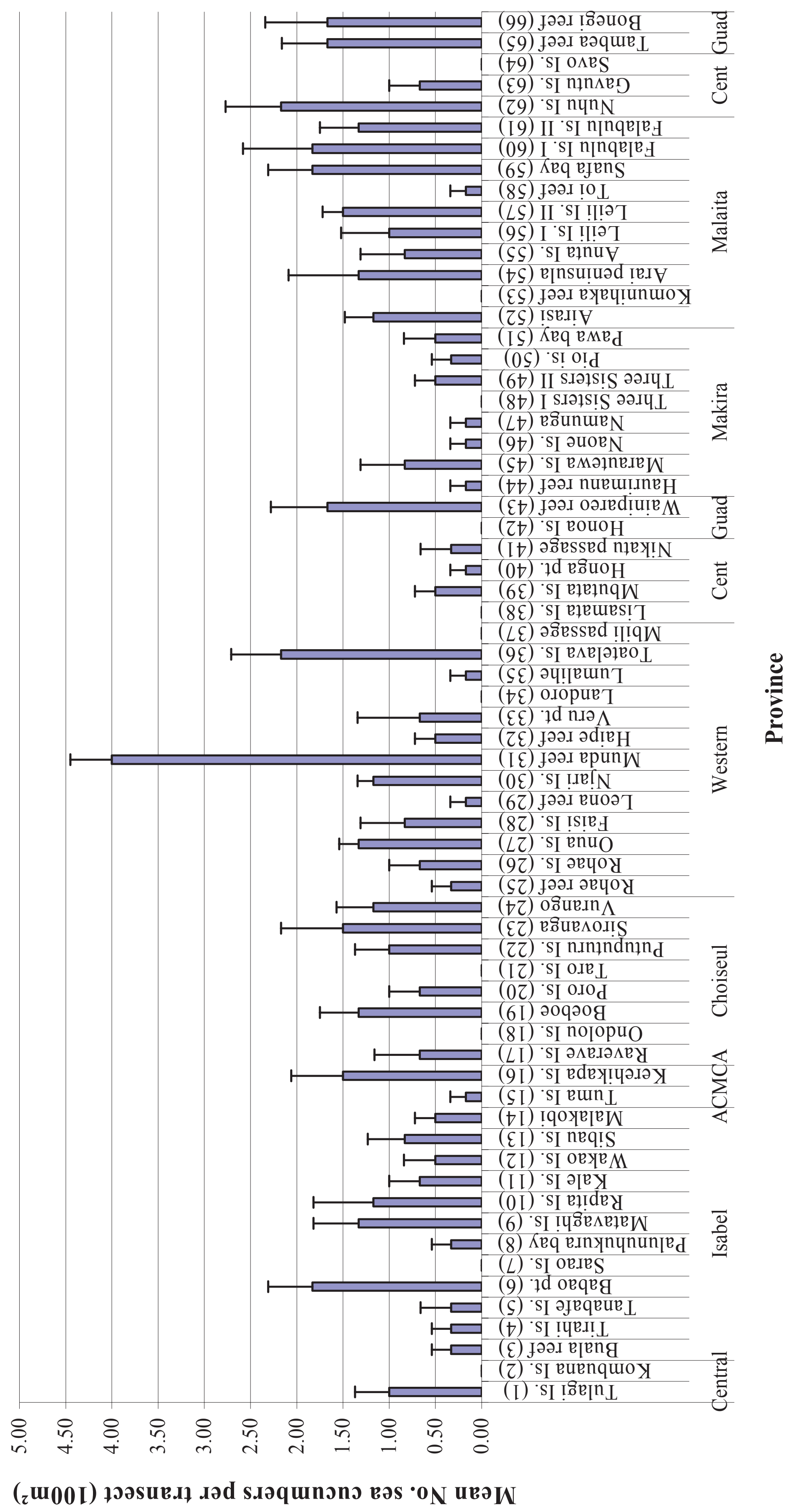


Figure 4: Mean number (±SE, n=6) sea cucumbers per site in the shallow habitat.

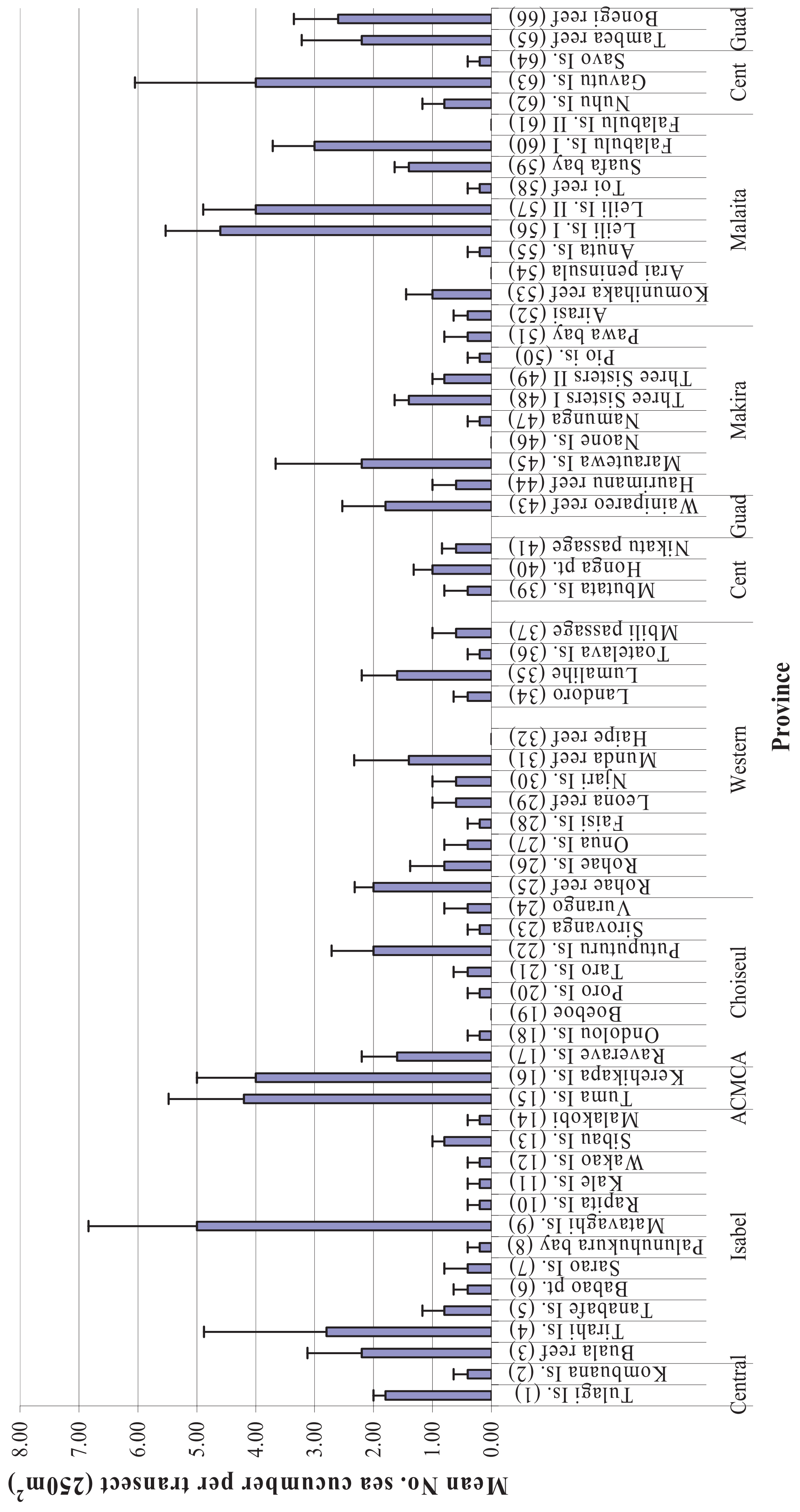


Figure 5: Mean No. (±SE, n=5) sea cucumbers per site in the deep habitat.

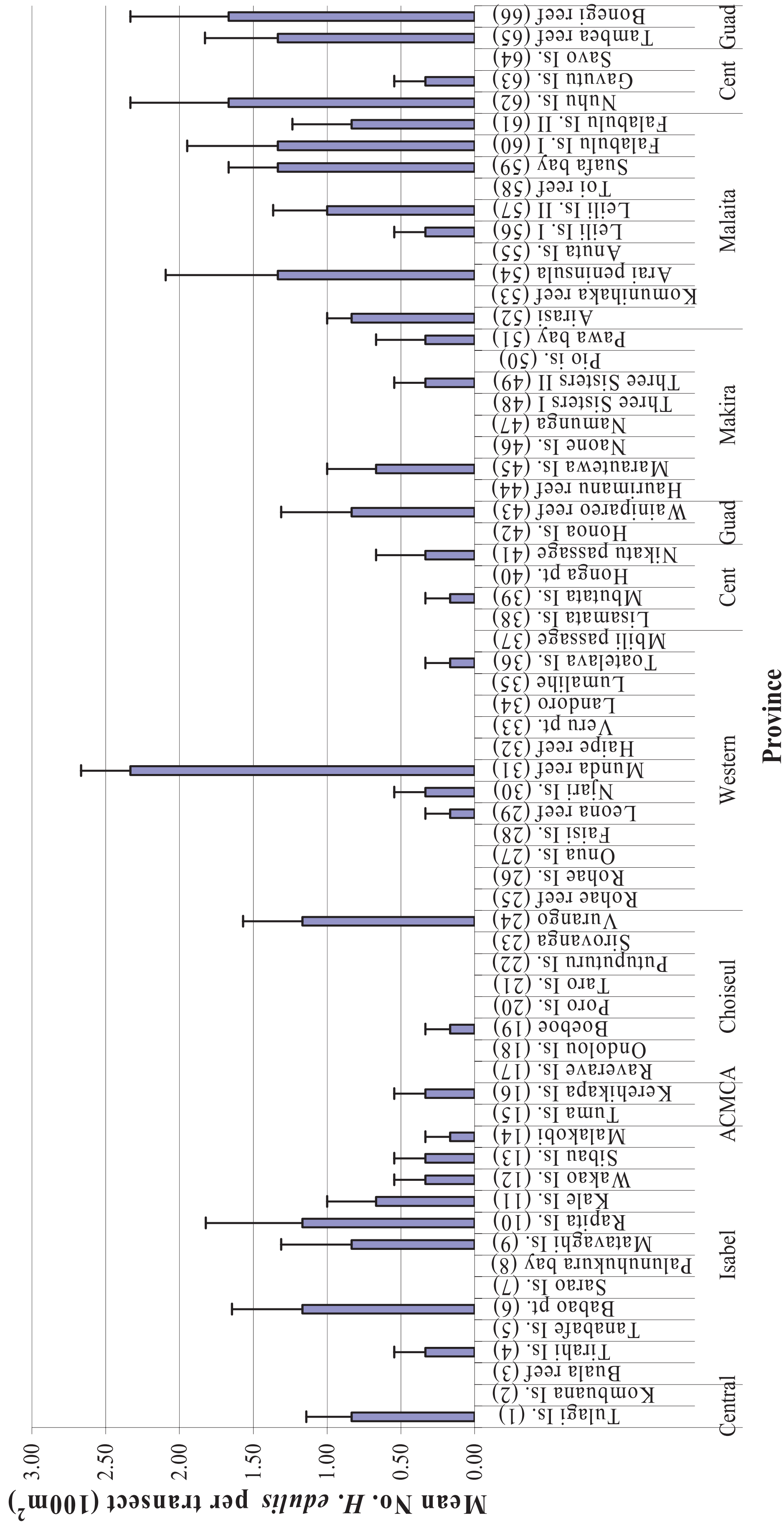


Figure 6: Mean number (±SE, n=6) of *Holothuria edulis* per site in the shallow habitat.

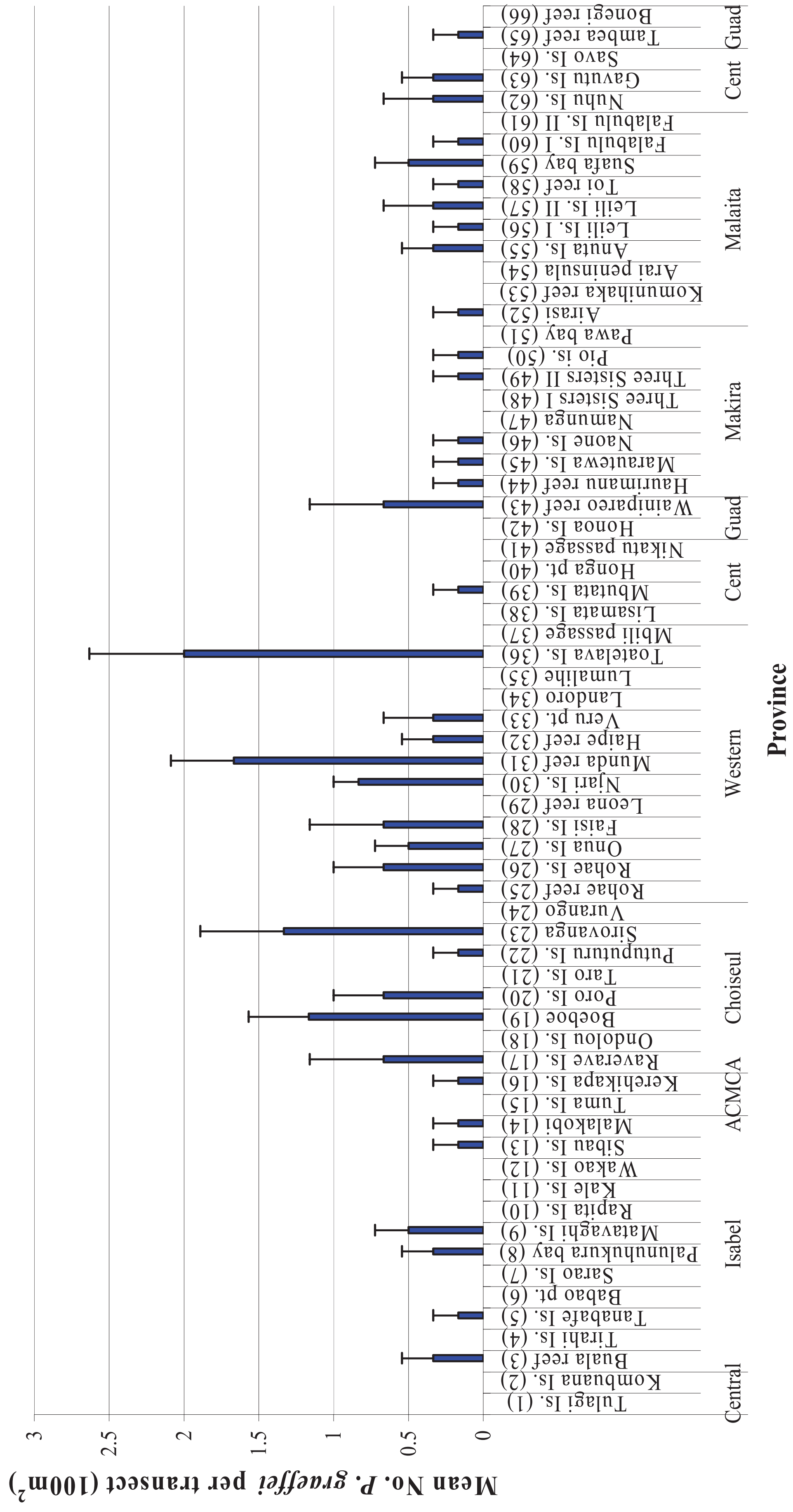


Figure 7: Mean number (±SE, n=6) *Pearsonothuria graeffei* per site in the shallow habitat.

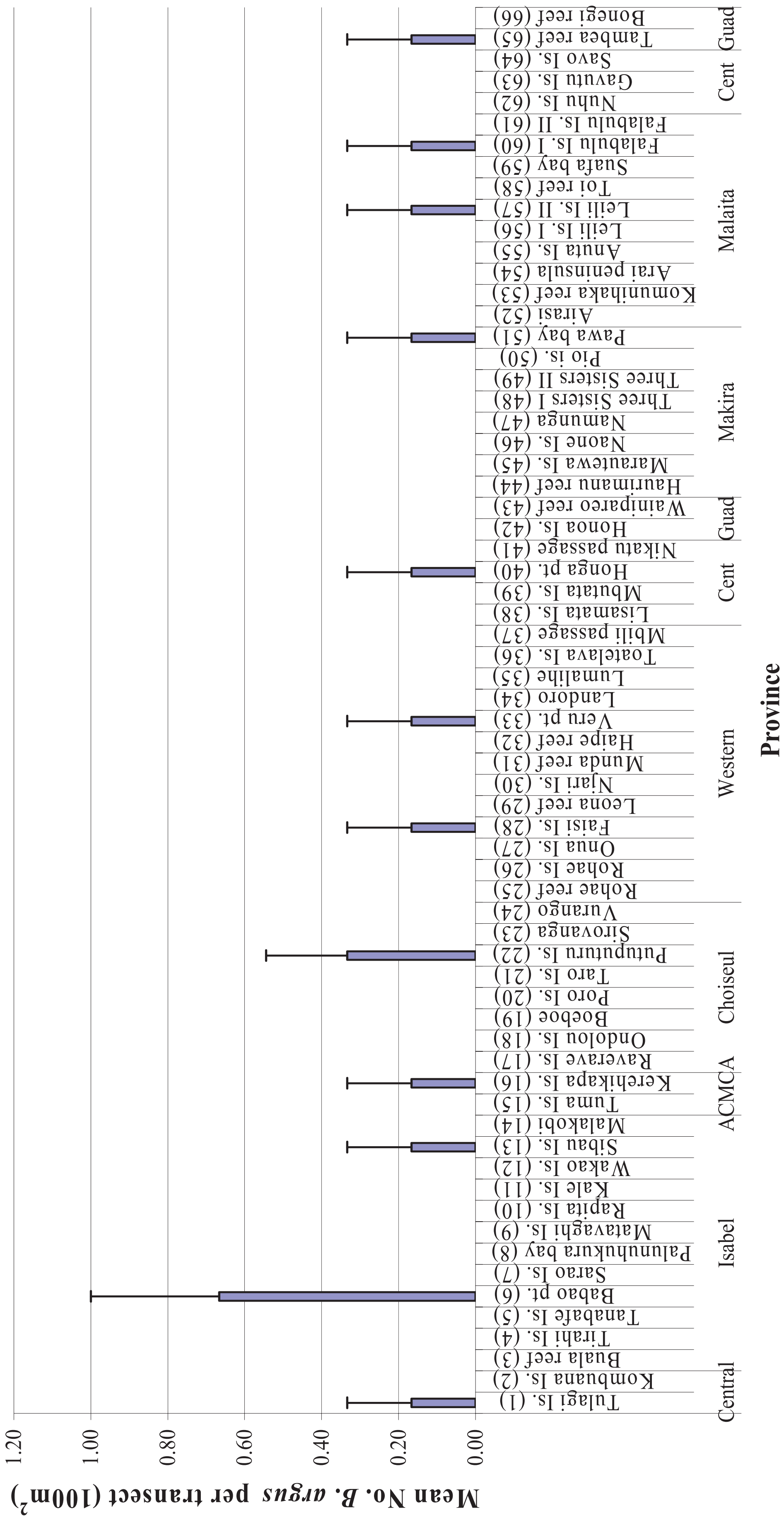


Figure 8: Mean number (±SE, n=6) of *Bahadschia argus* per site in the shallow habitat.

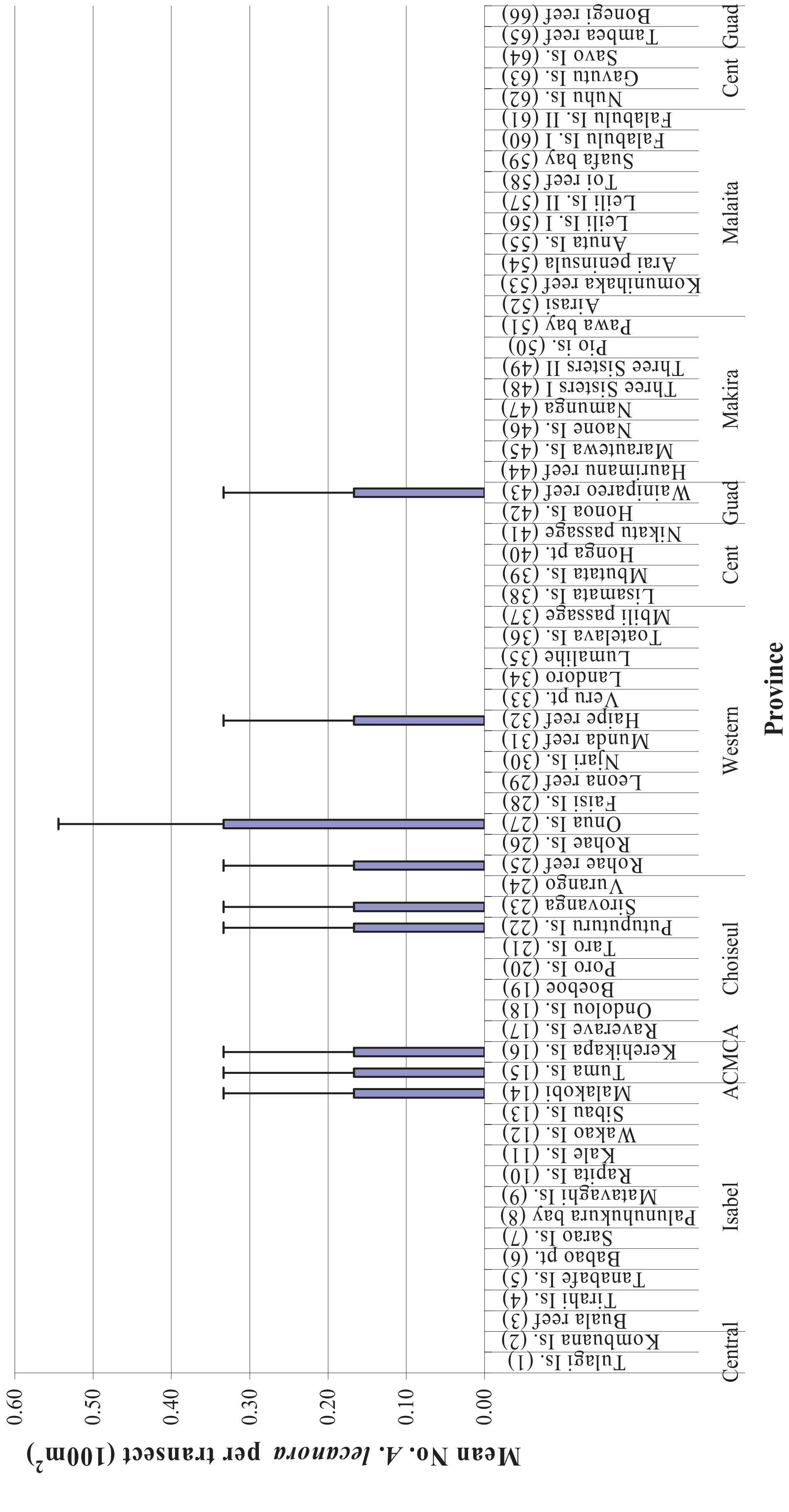


Figure 9: Mean number (±SE, n=6) of *Actinopyga lecanora* per site in the shallow habitat.

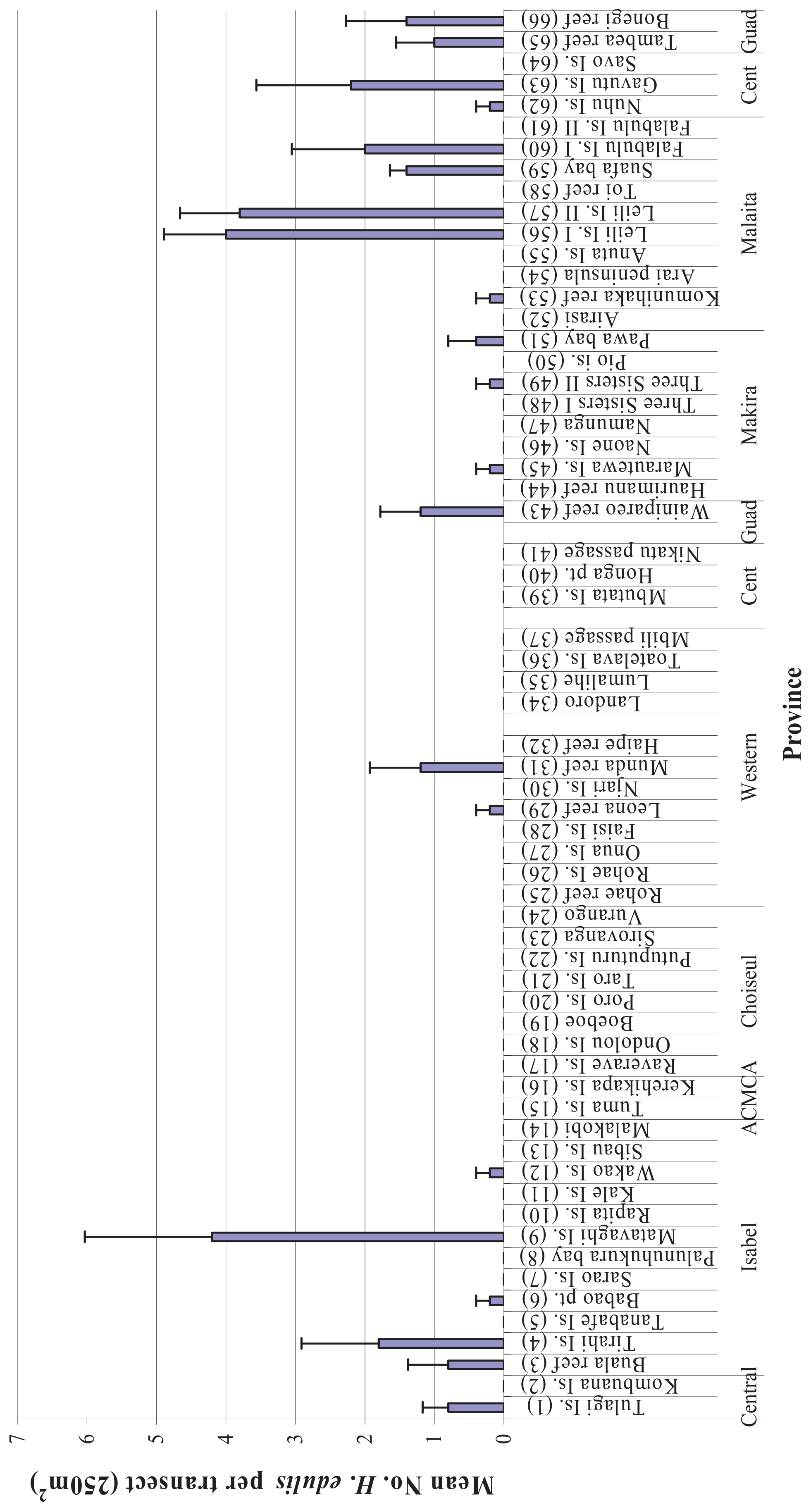


Figure 10: Mean number (±SE, n=5) of *Holothuria edulis* per site in the deep habitat.

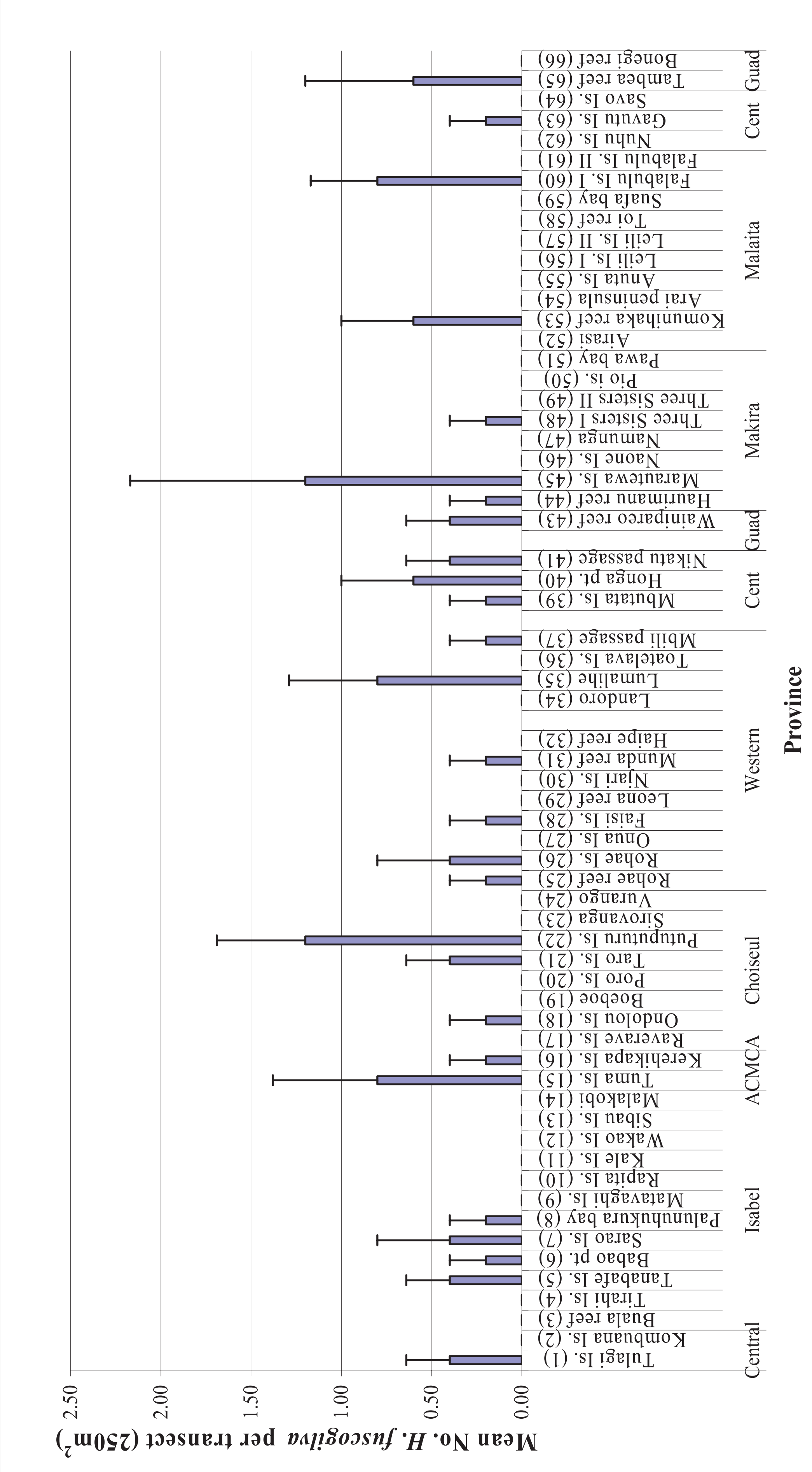


Figure 11: Mean number (±SE, n=5) of *Holothuria fuscogilva* per site in the deep habitat.

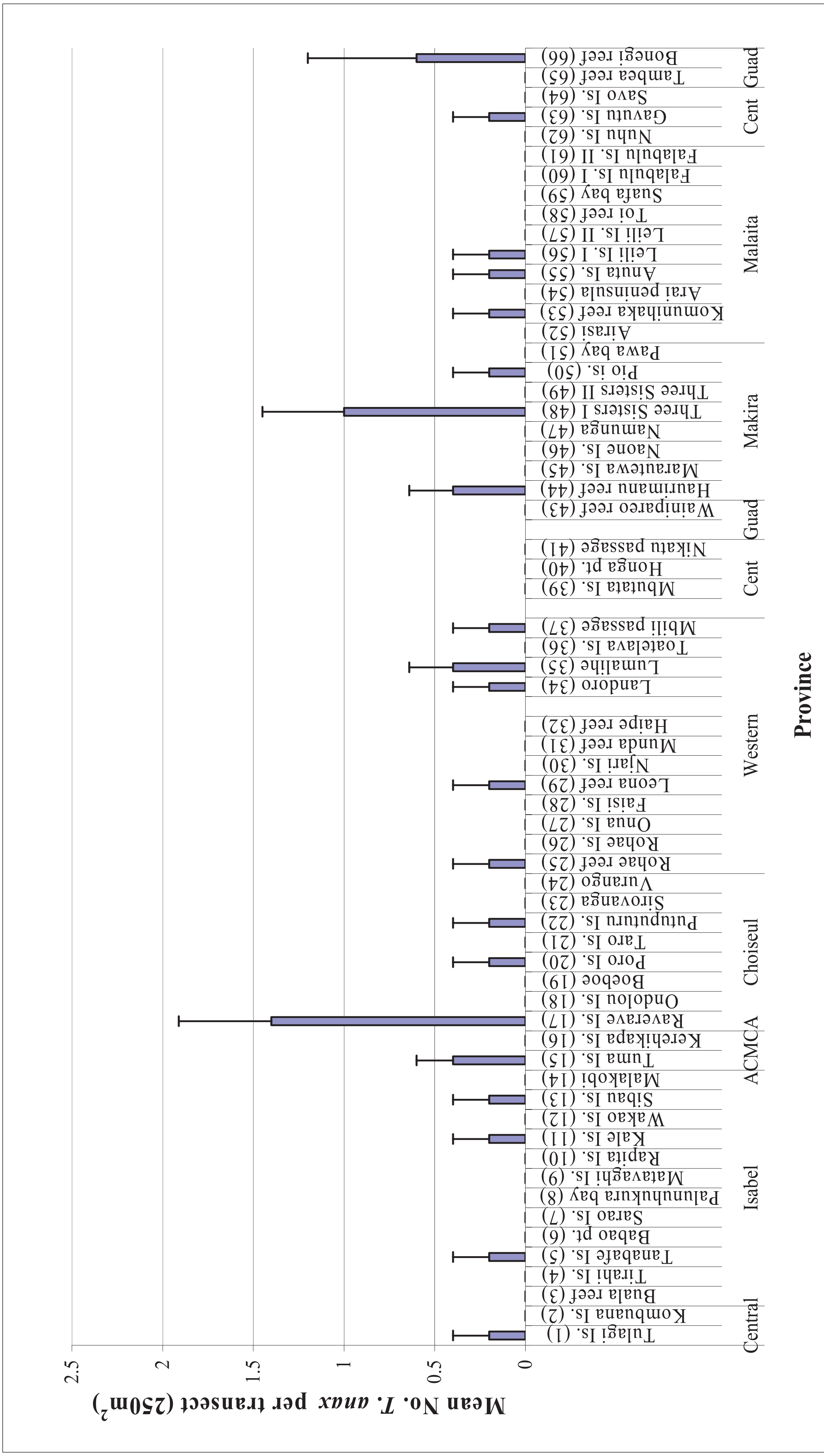


Figure 12: Mean number (±SE, n=5) of *Thelenota anax* per site in the deep habitat.

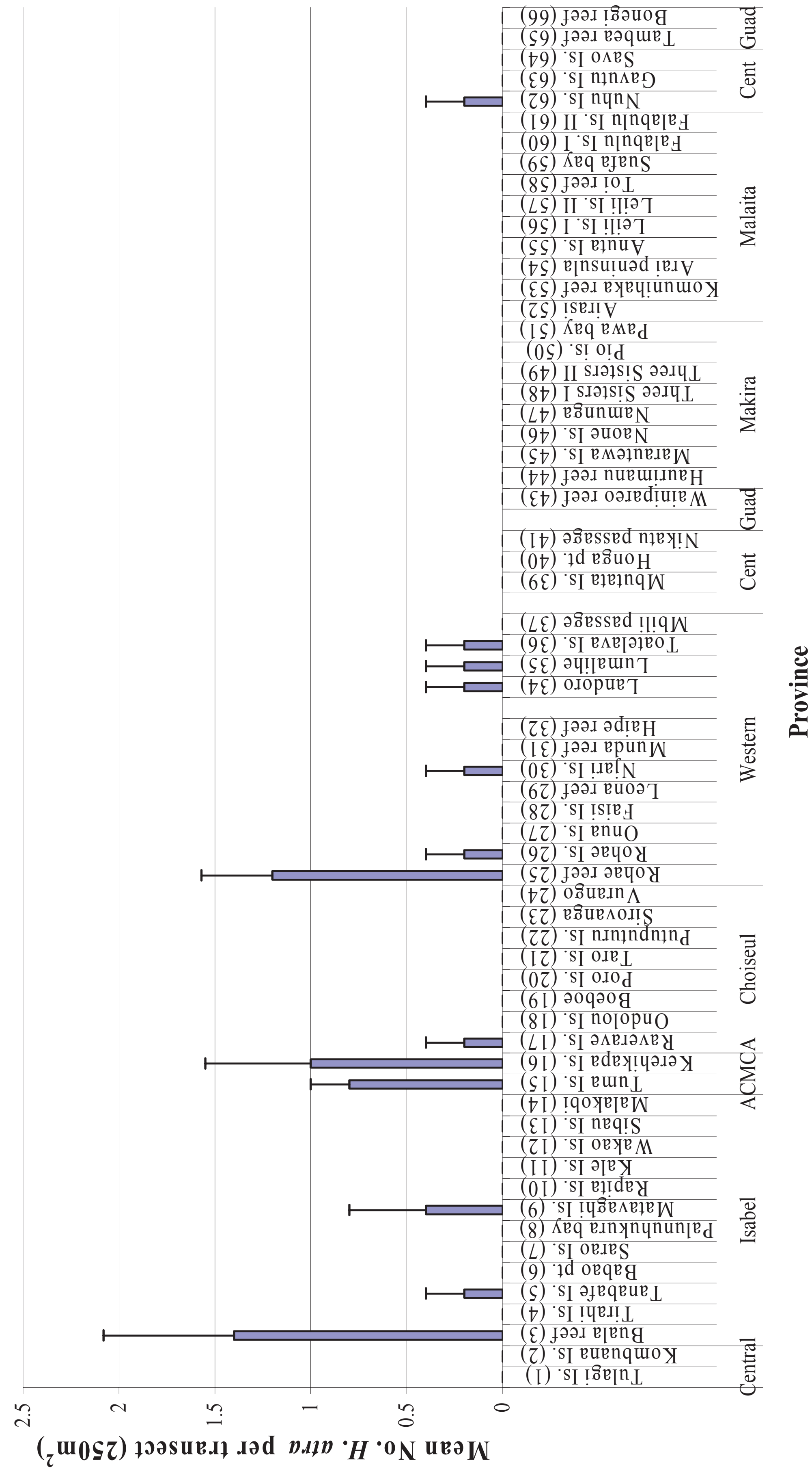


Figure 13: Mean number (±SE, n=5) of *Holothuria atra* per site in the deep habitat.

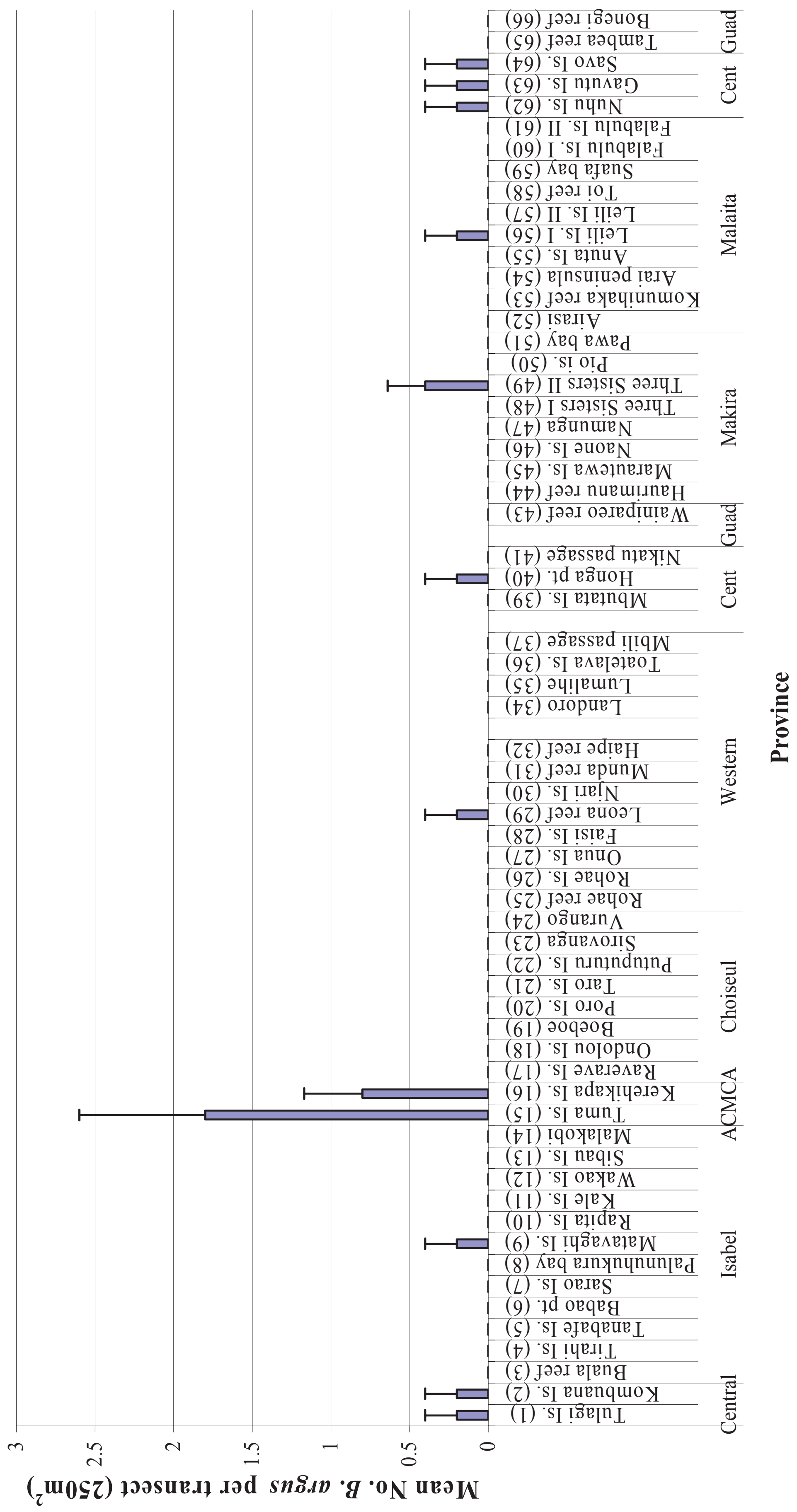


Figure 14: Mean number (±SE, n=5) of *Bohadschia argus* per site in the deep habitat.

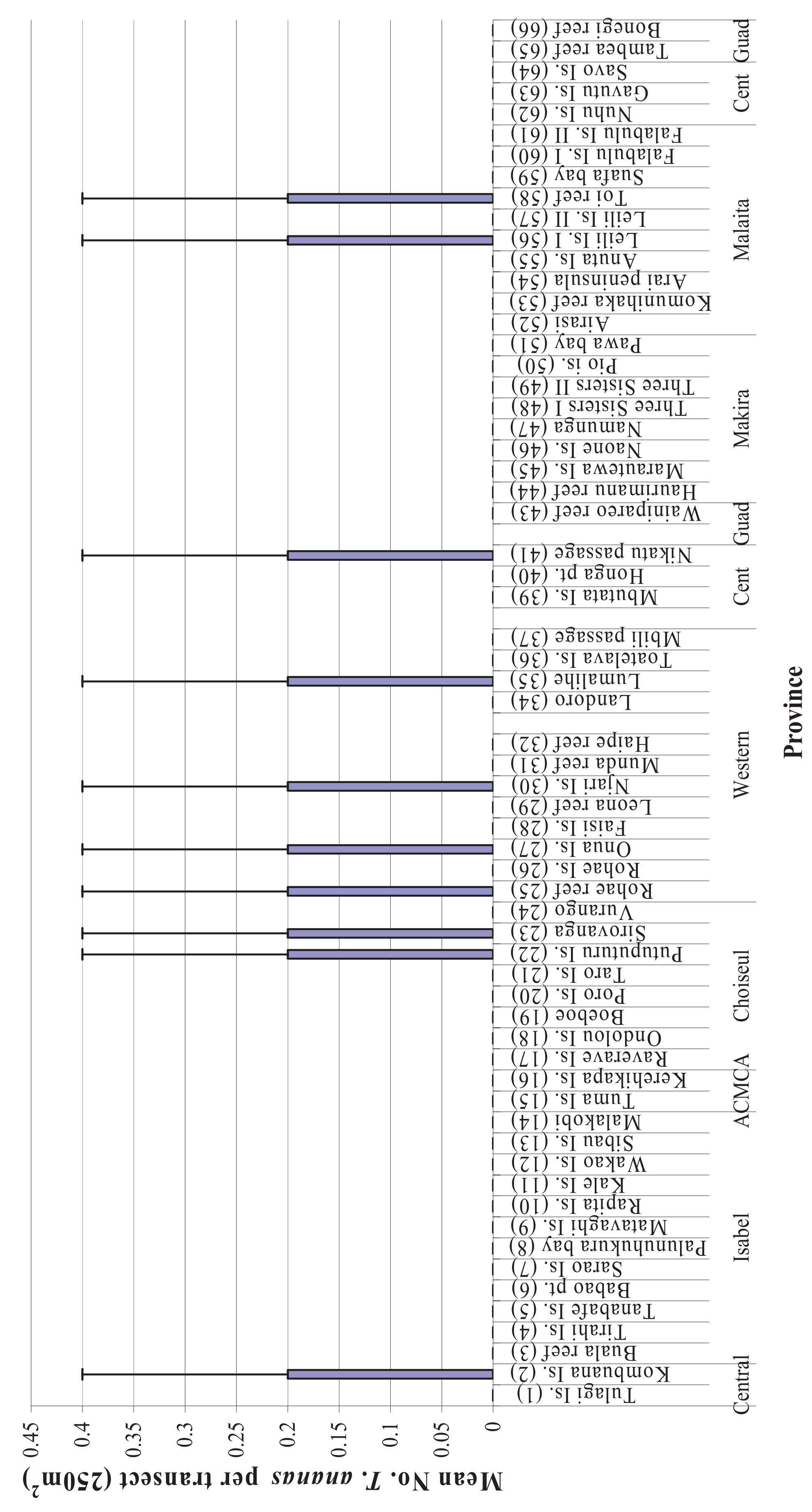


Figure 15: Mean number (±SE, n=5) of *Thelenota ananas* per site in the deep habitat.

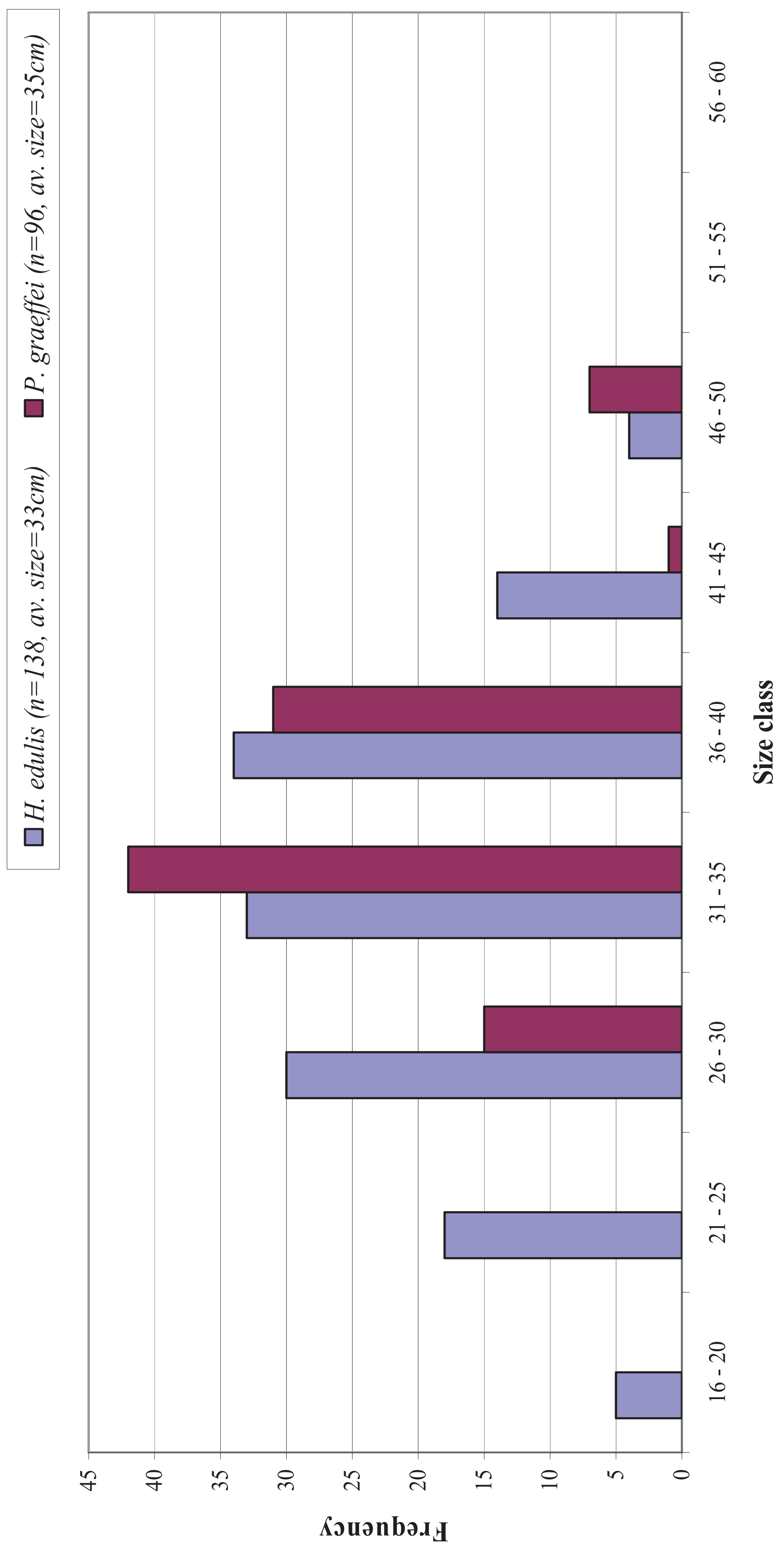


Figure 16: Size frequency distribution graph for *H. edulis* and *P. graeffei* in the shallow habitat.

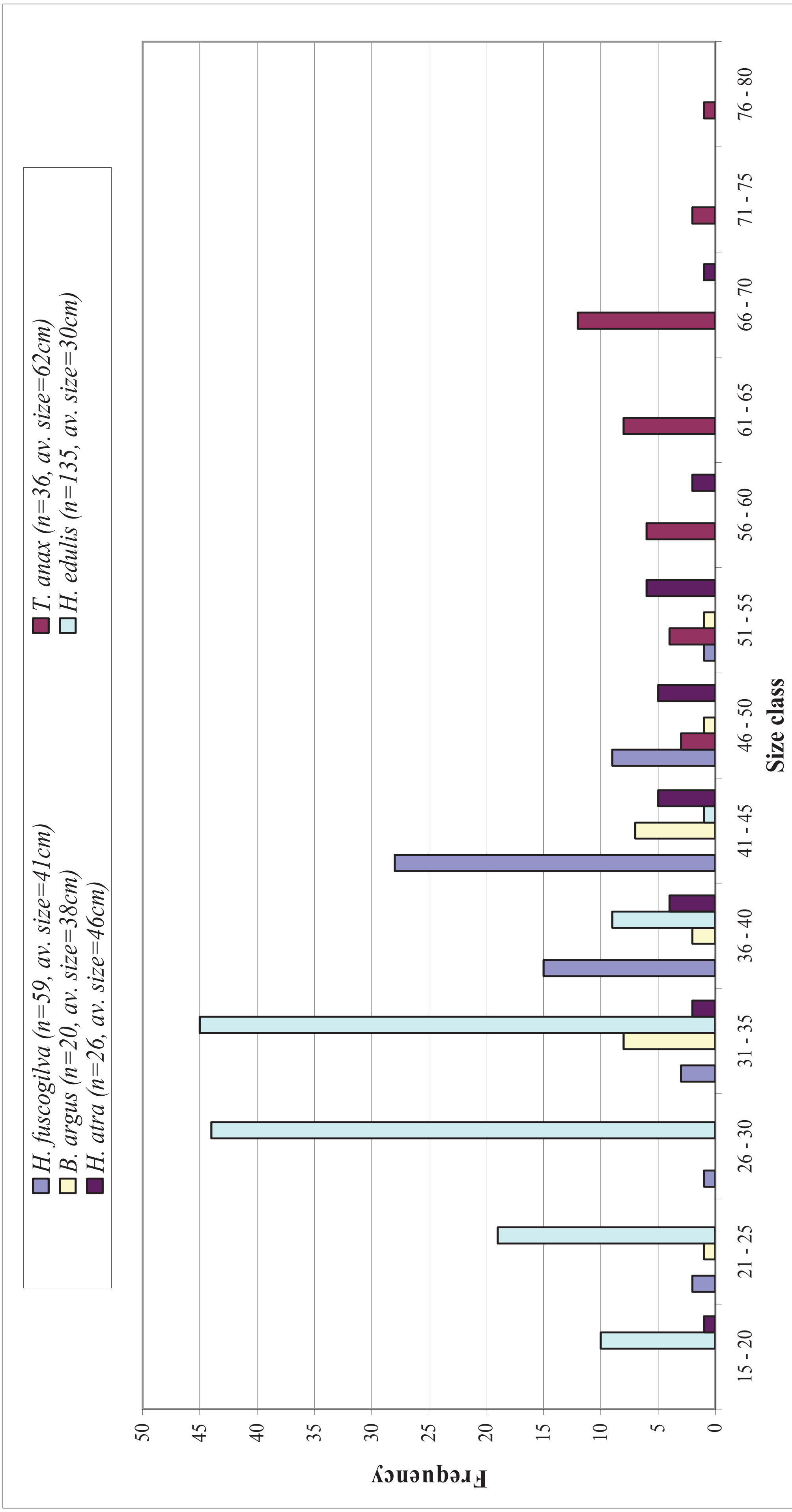


Figure 17: Size frequency distribution graph for the five most common sea cucumber species (20 or more recorded) in the deep habitat.

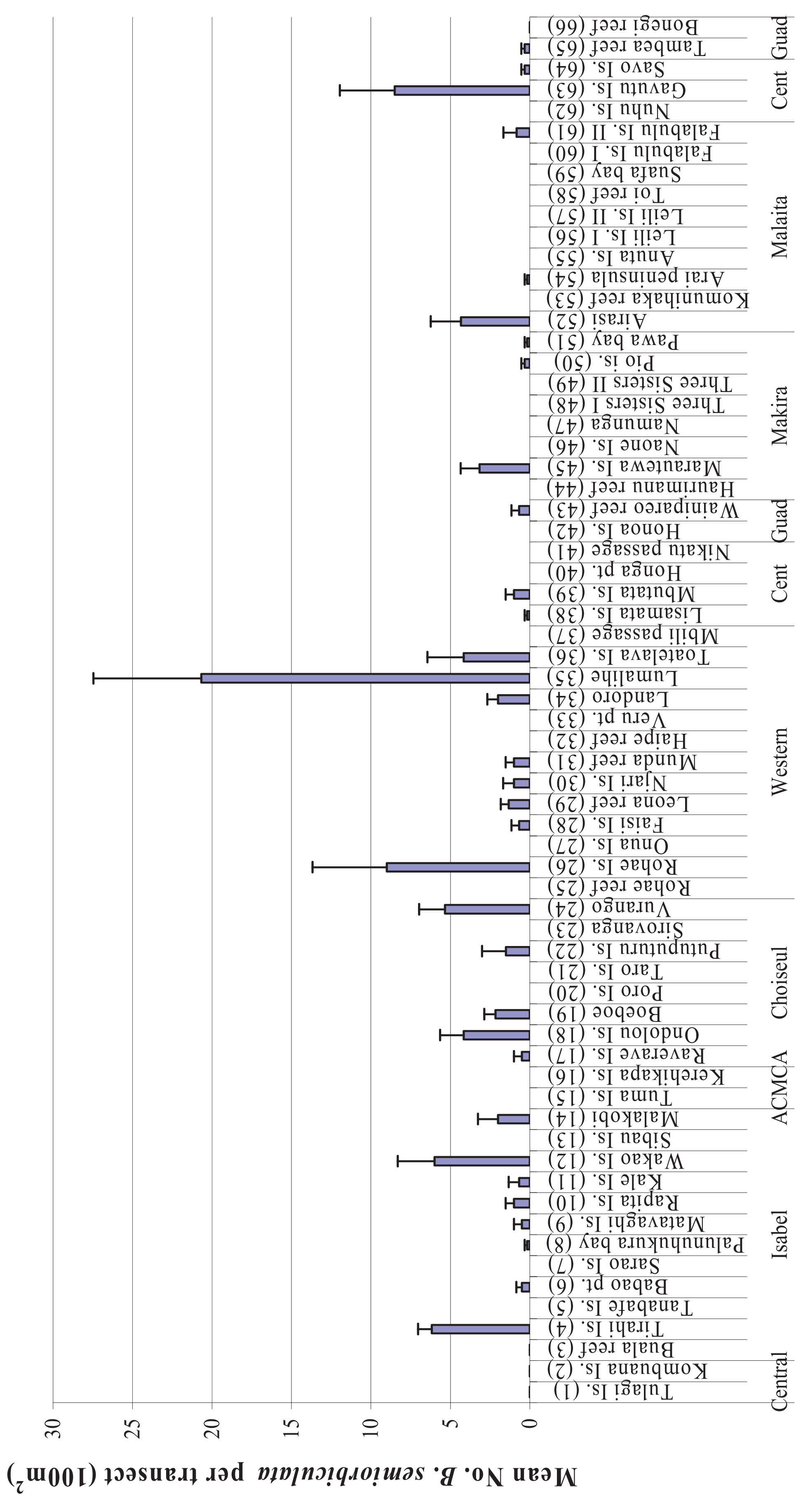


Figure 18: Mean number (±SE, n=6) of *Beguina semiorbiculata* per site in the shallow habitat.

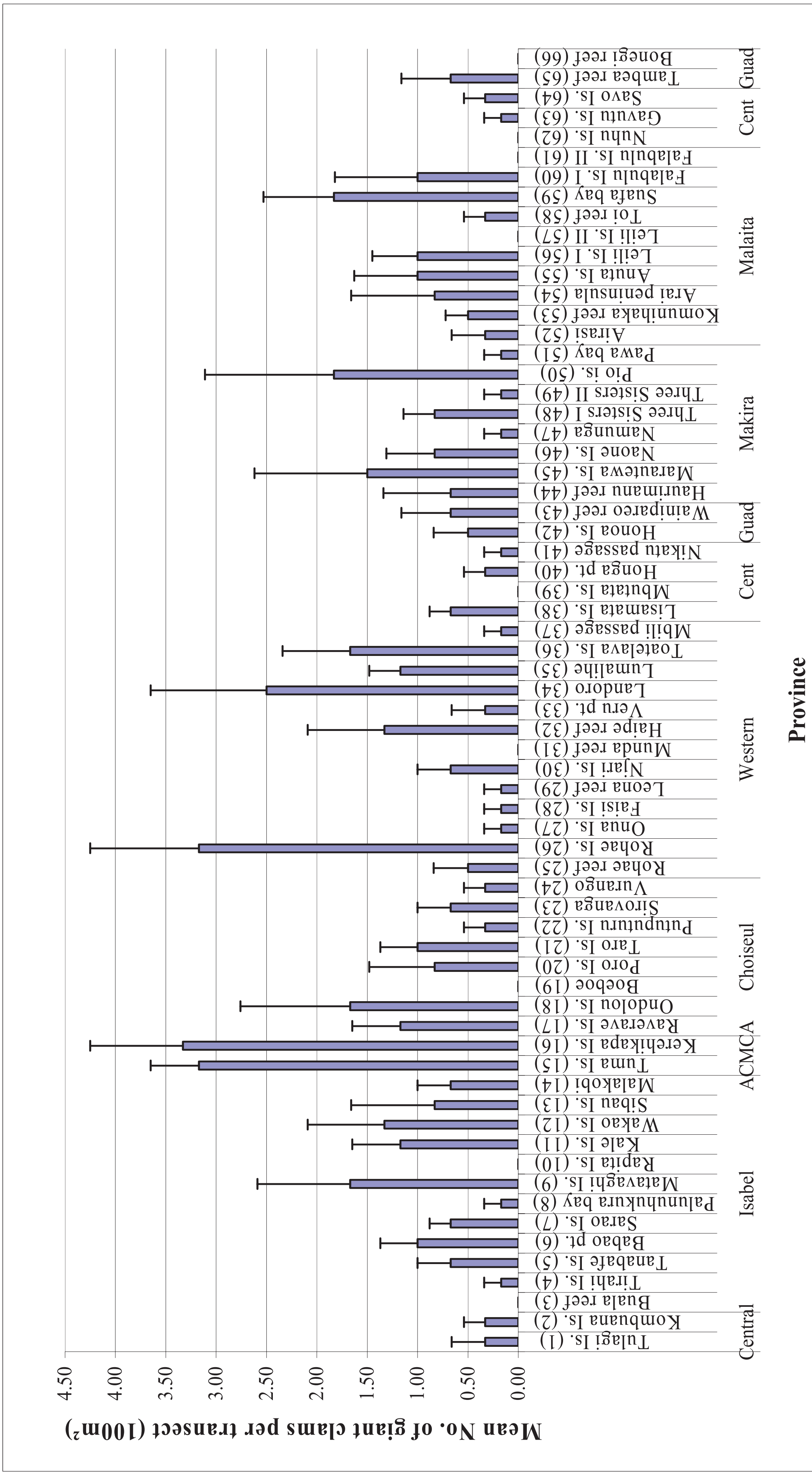


Figure 19: Mean number (±SE, n=6) of species of giant clams per site in the shallow habitat.

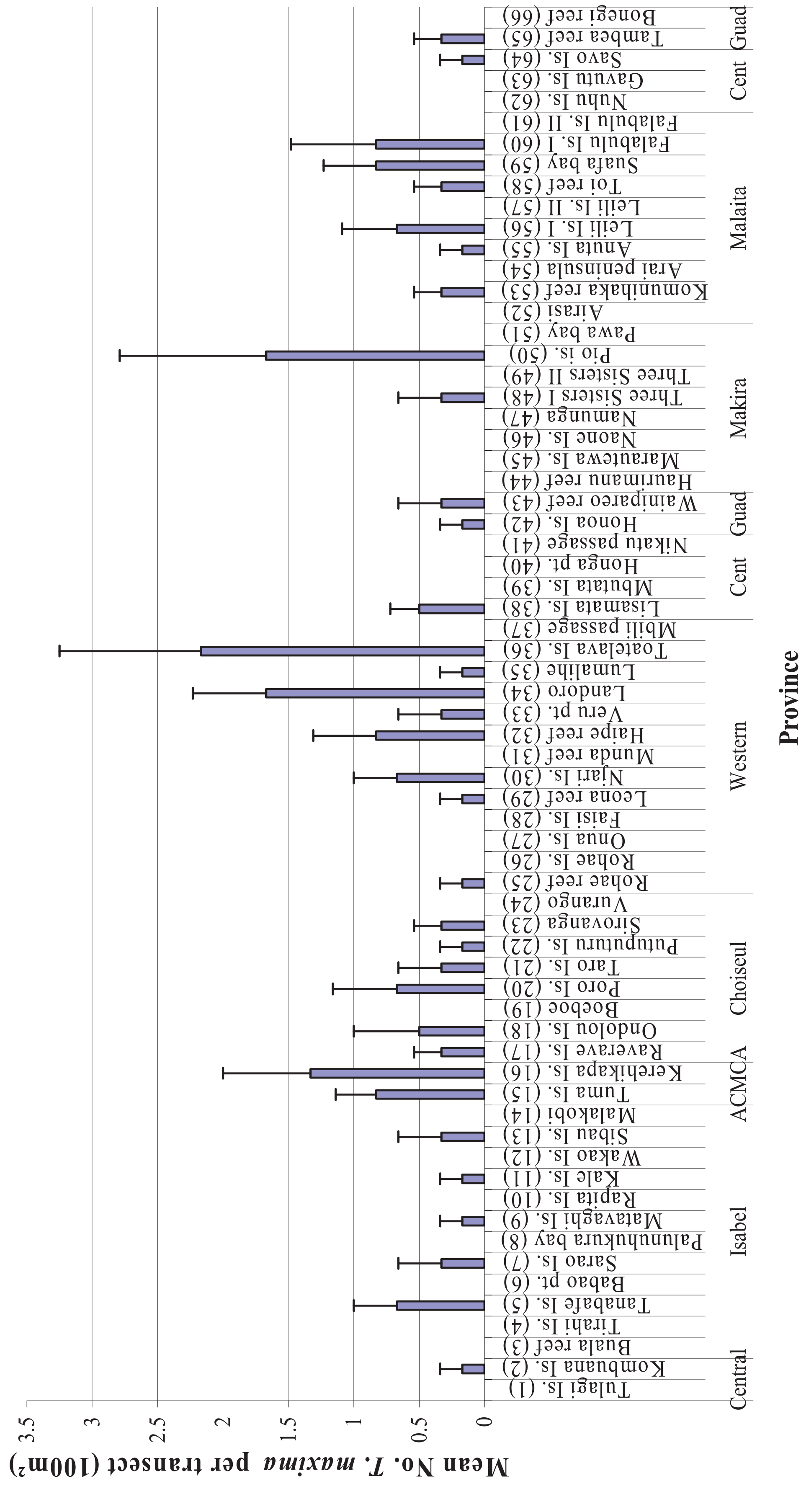


Figure 20: Mean number (±SE, n=6) of *Tridacna maxima* per site in the shallow habitat.

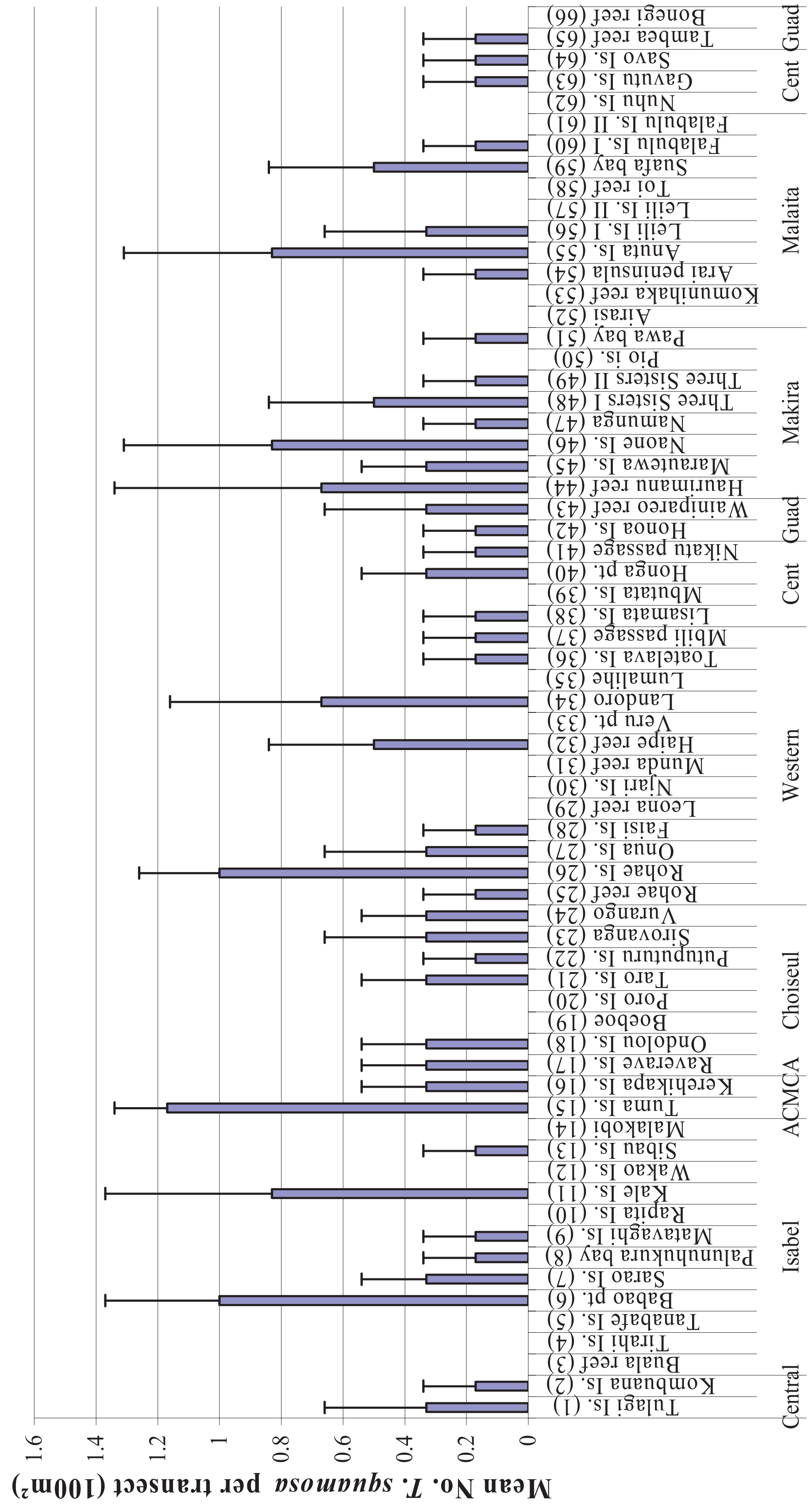


Figure 21: Mean number (±SE, n=6) of *Tridacna squamosa* per site in the shallow habitat.

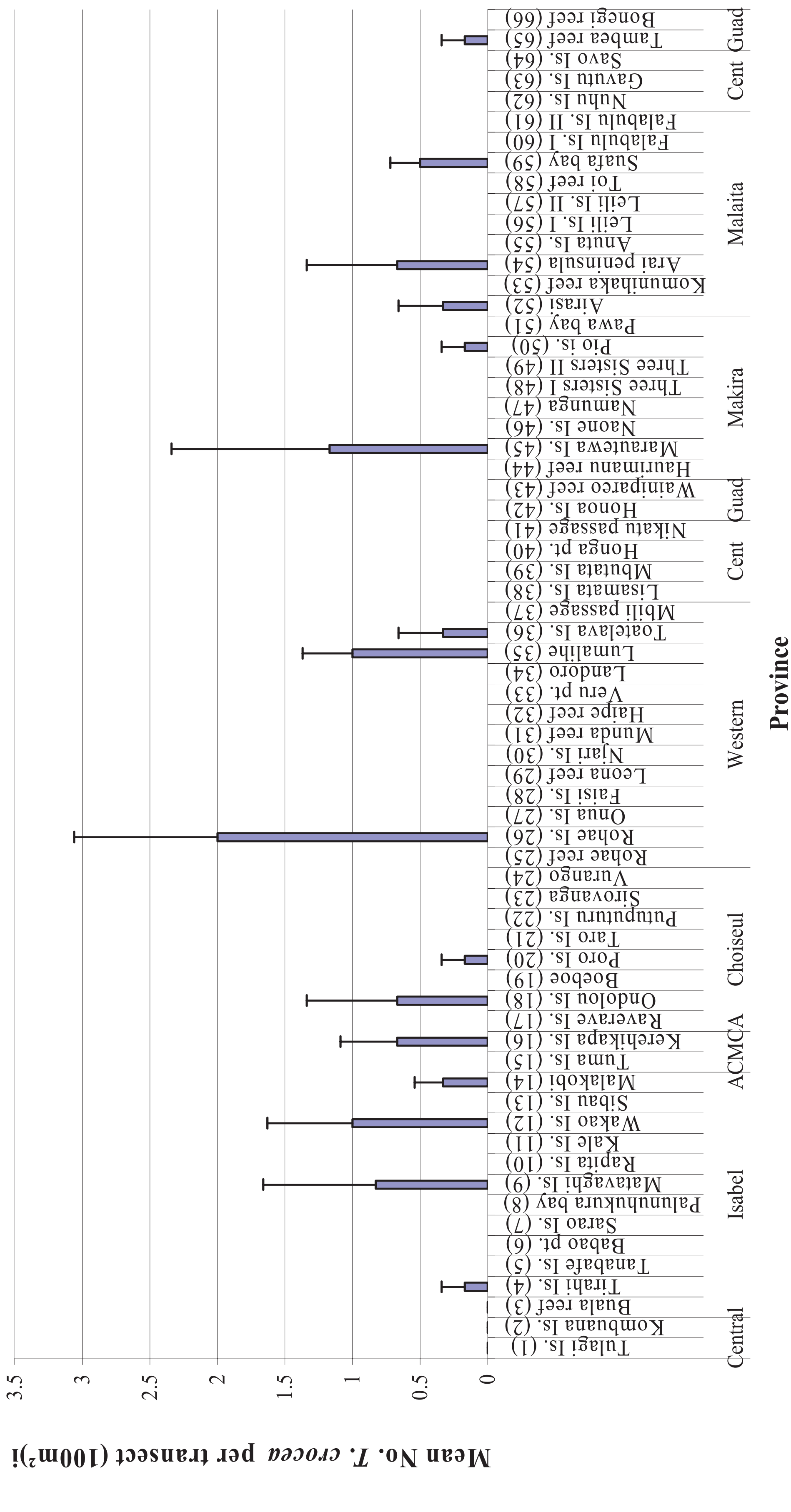


Figure 22: Mean number (±SE, n=6) of *Tridacna crocea* per site in the shallow habitat.

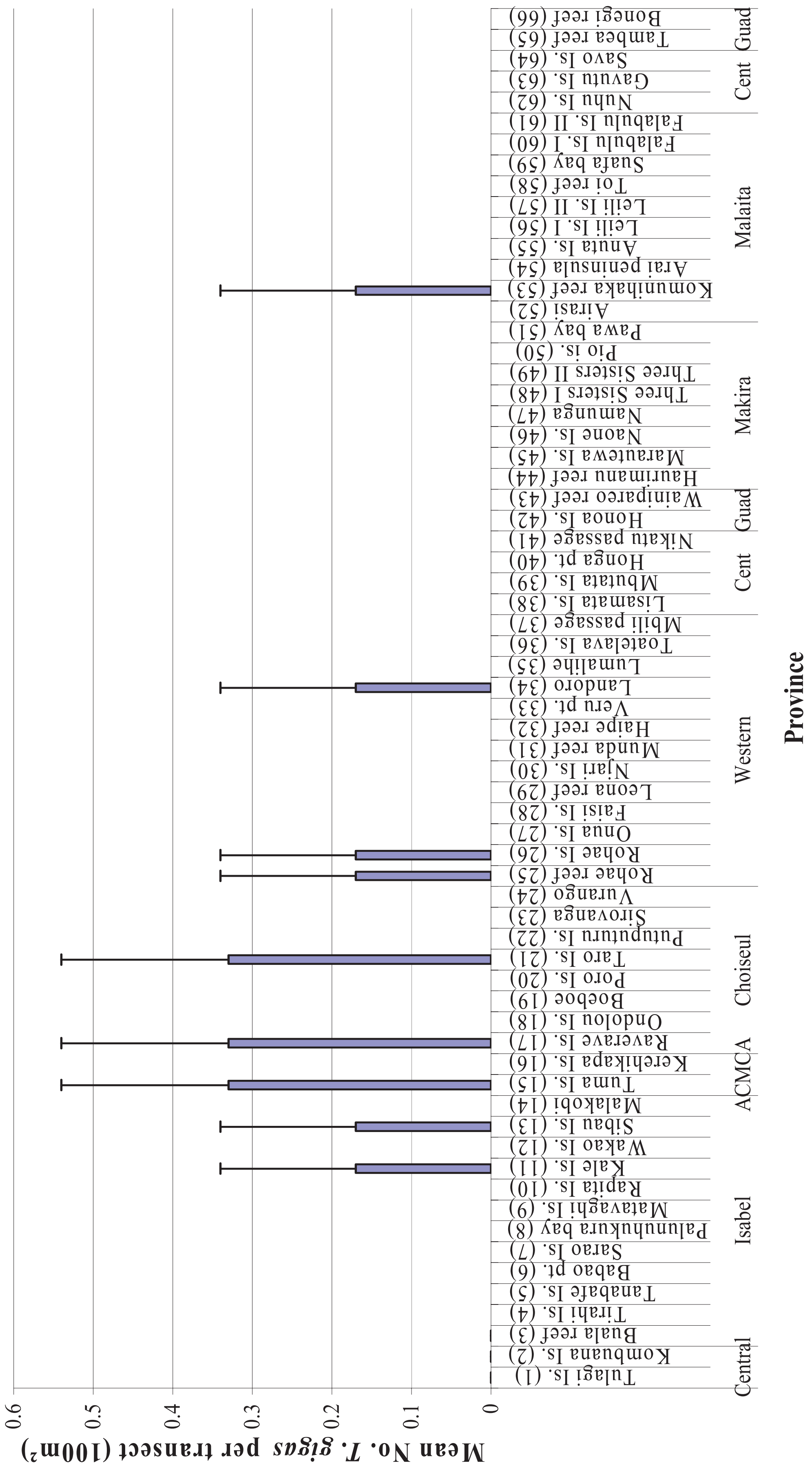


Figure 23: Mean number (±SE, n=6) of *Tridacna gigas* per site in the shallow habitat.

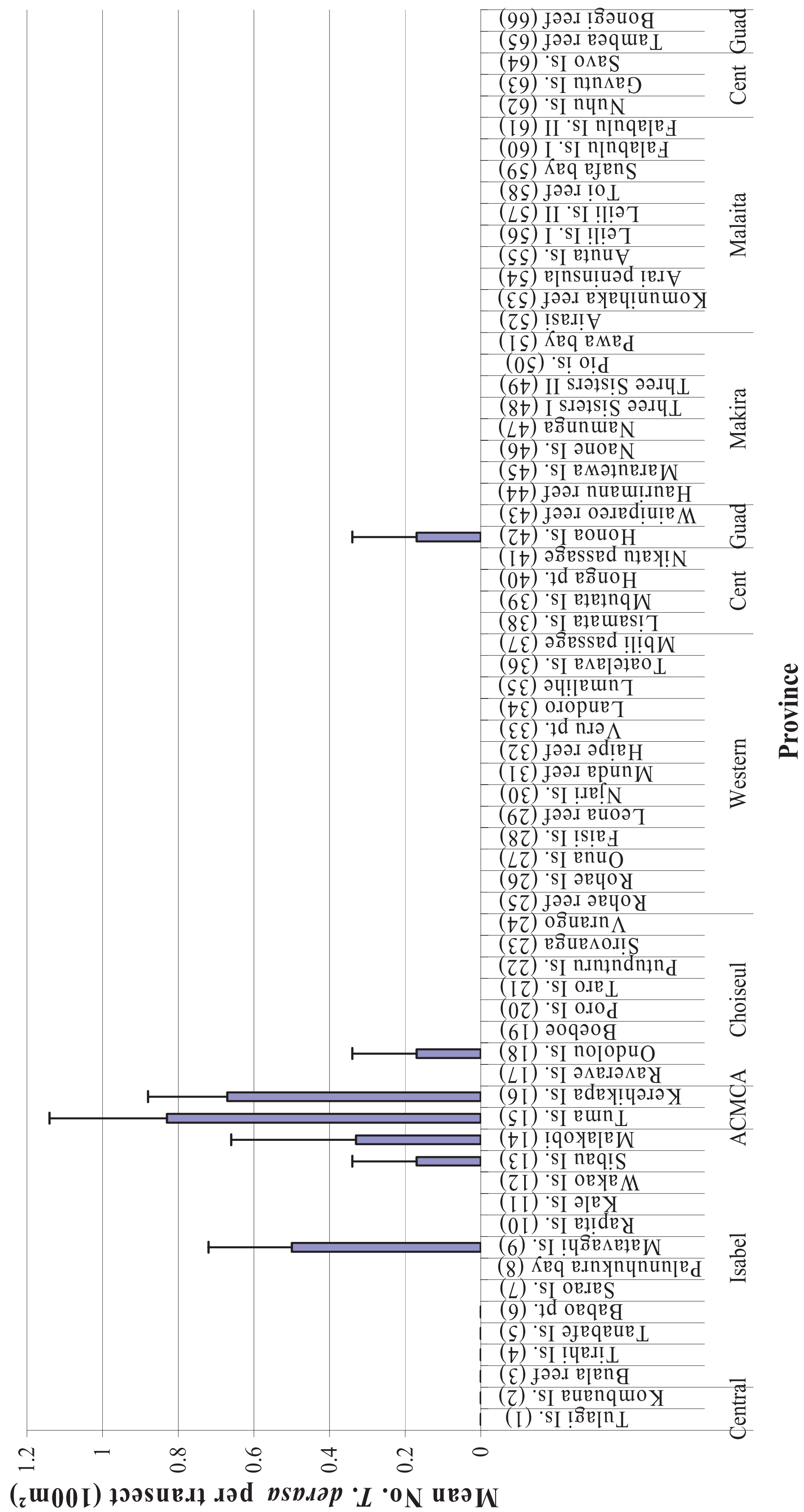


Figure 24: Mean number (±SE, n=6) of *Tridacna derasa* per site in the shallow habitat.

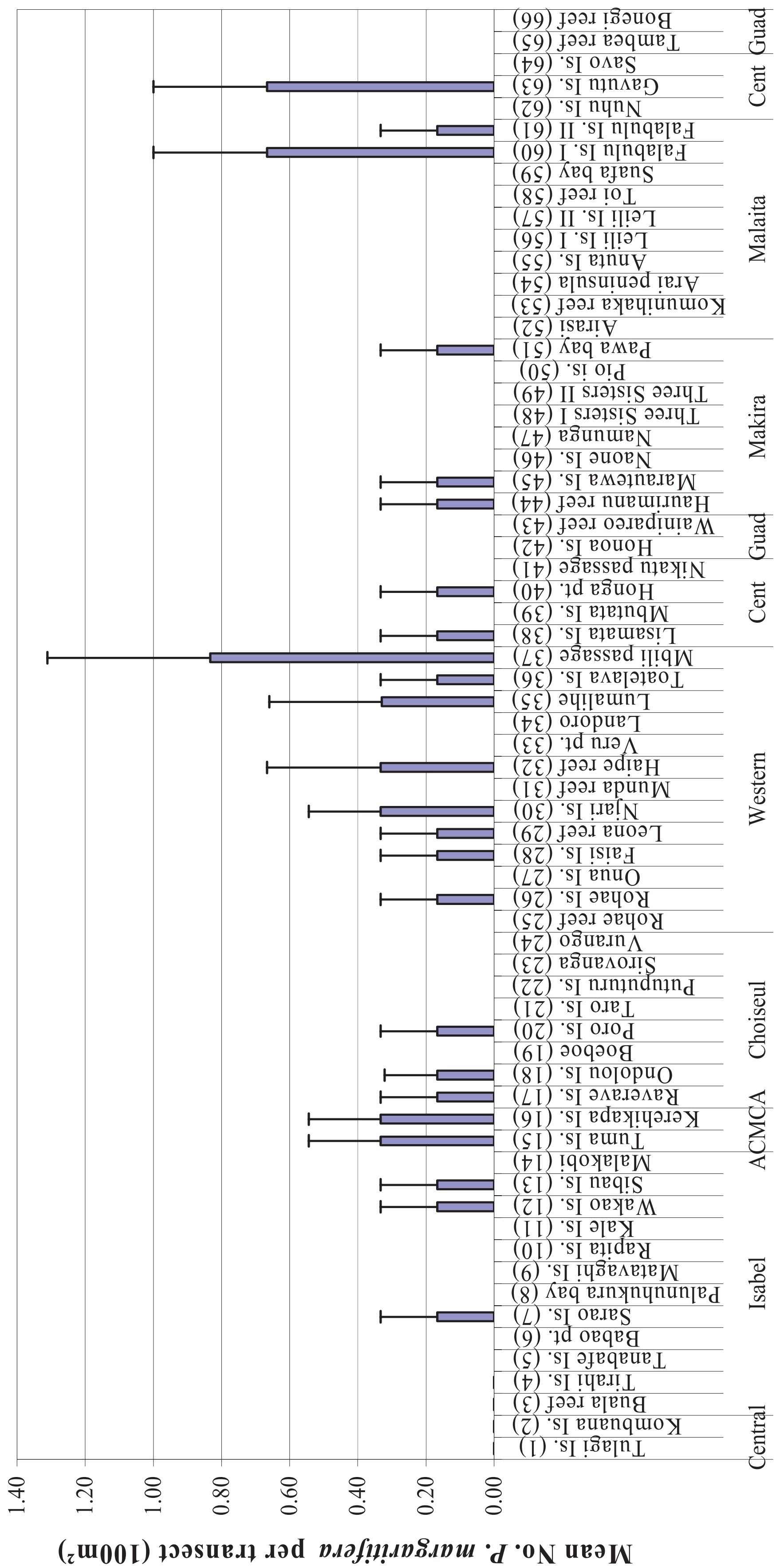


Figure 25: Mean number (±SE, n=6) of *Pinctada margaritifera* per site in the shallow habitat.

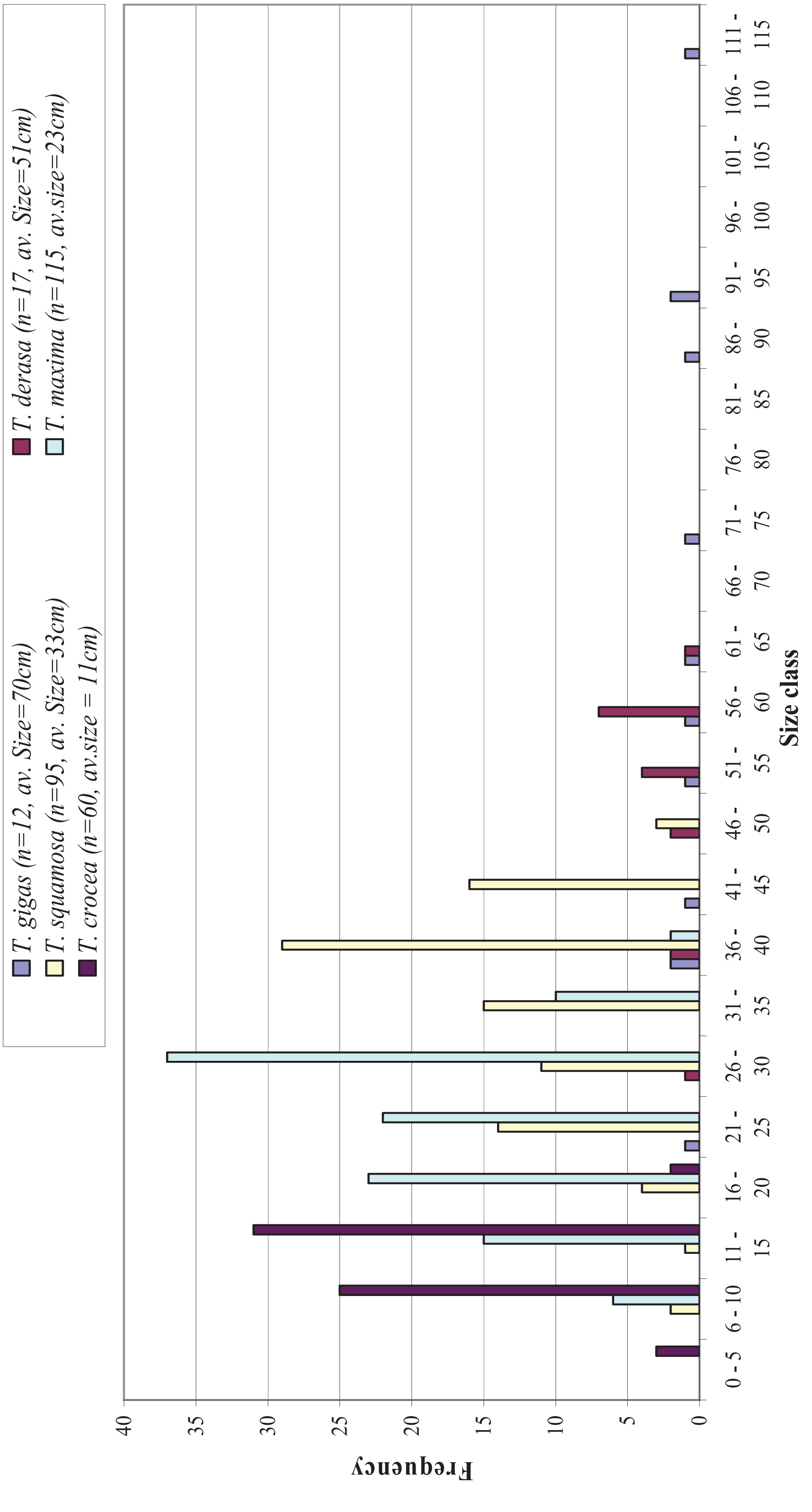


Figure 26: Size frequency distribution graph for the five Tridacnid clam species encountered during survey in the shallow habitat.

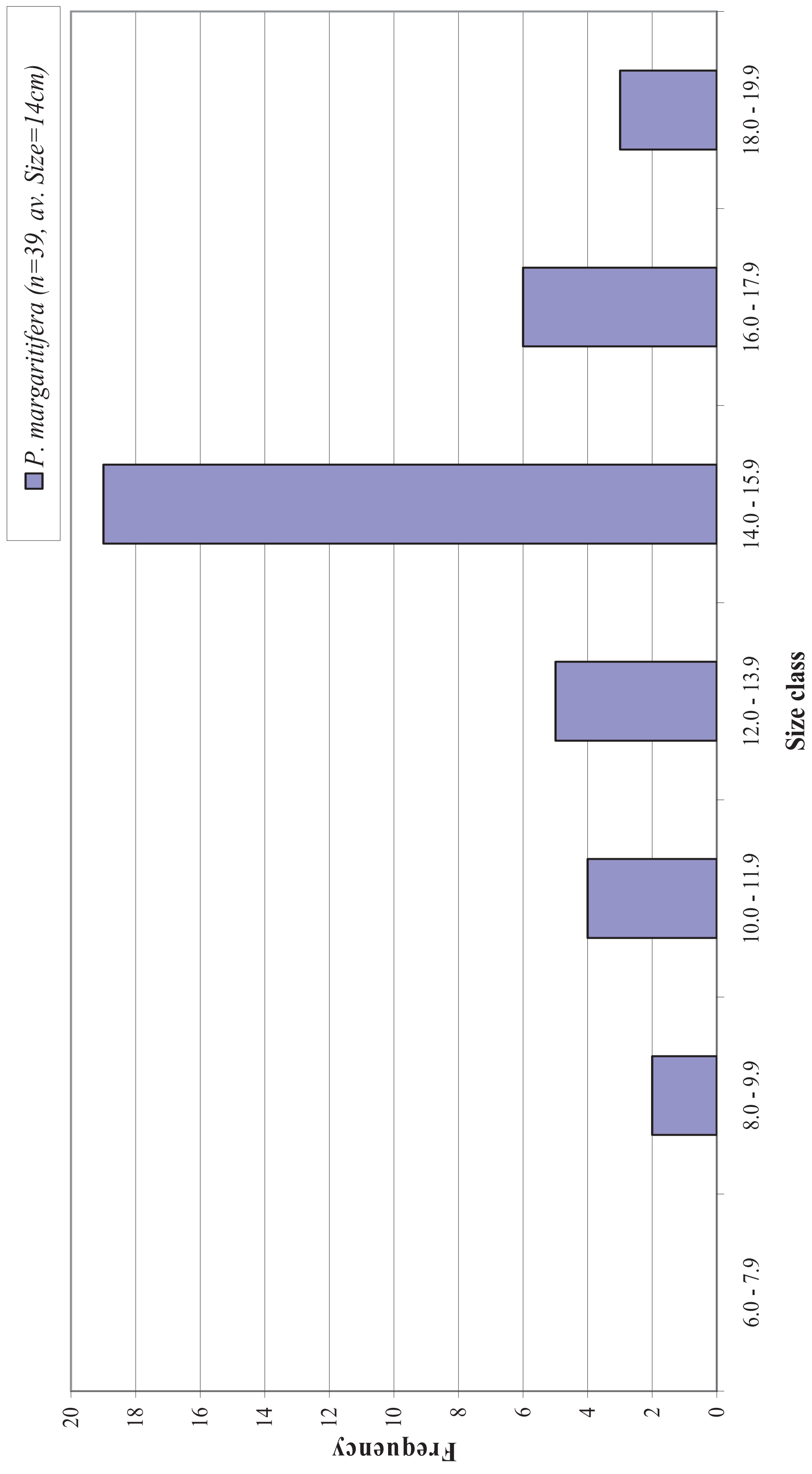


Figure 27: Size frequency distribution graph of *P. margaritifera* recorded during the survey in the shallow habitat.

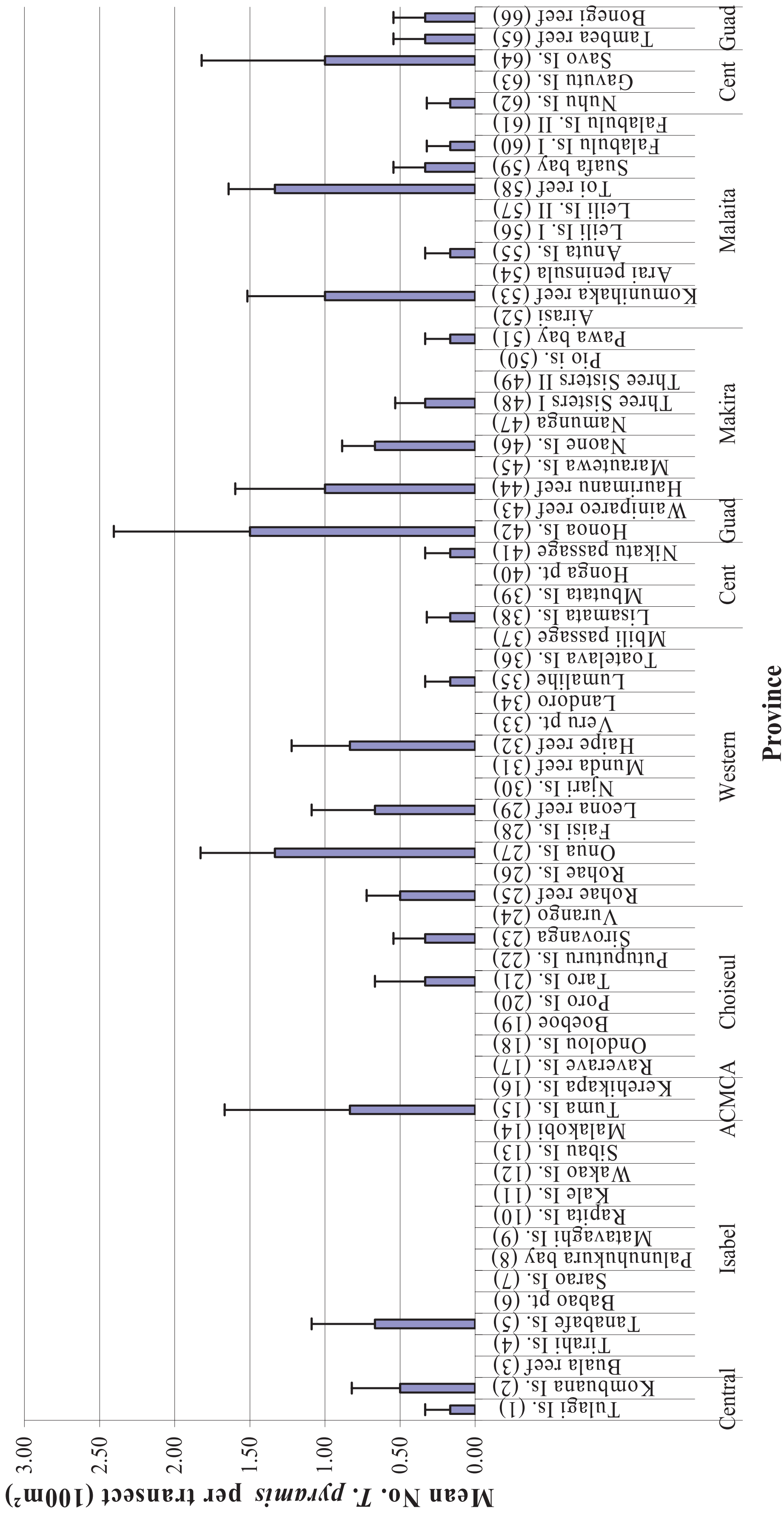


Figure 28: Mean number (±SE, n=6) of *Tectus pyramis* per site in the shallow habitat.

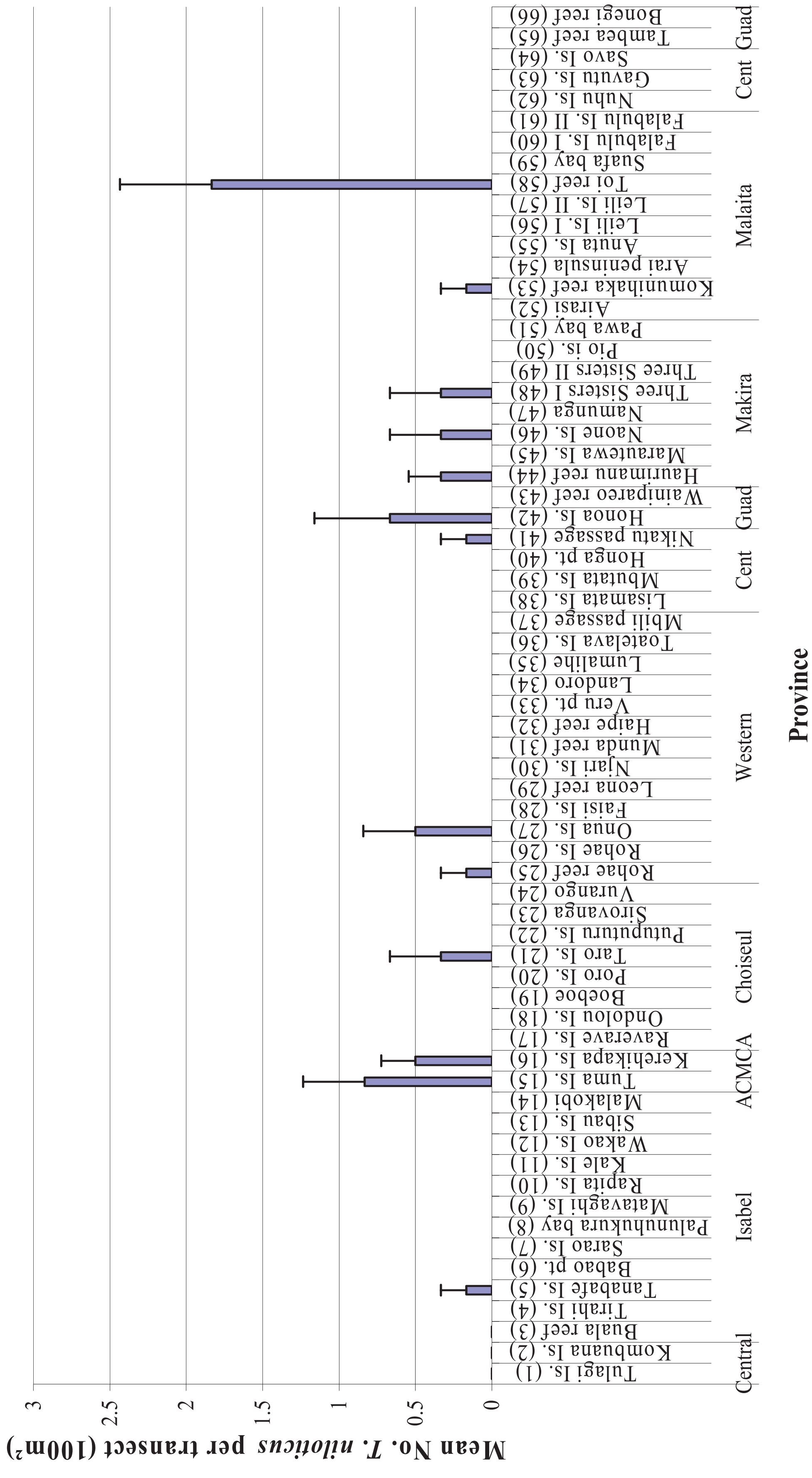


Figure 29: Mean number (±SE, n=6) of *Trochus niloticus* per site in the shallow habitat.

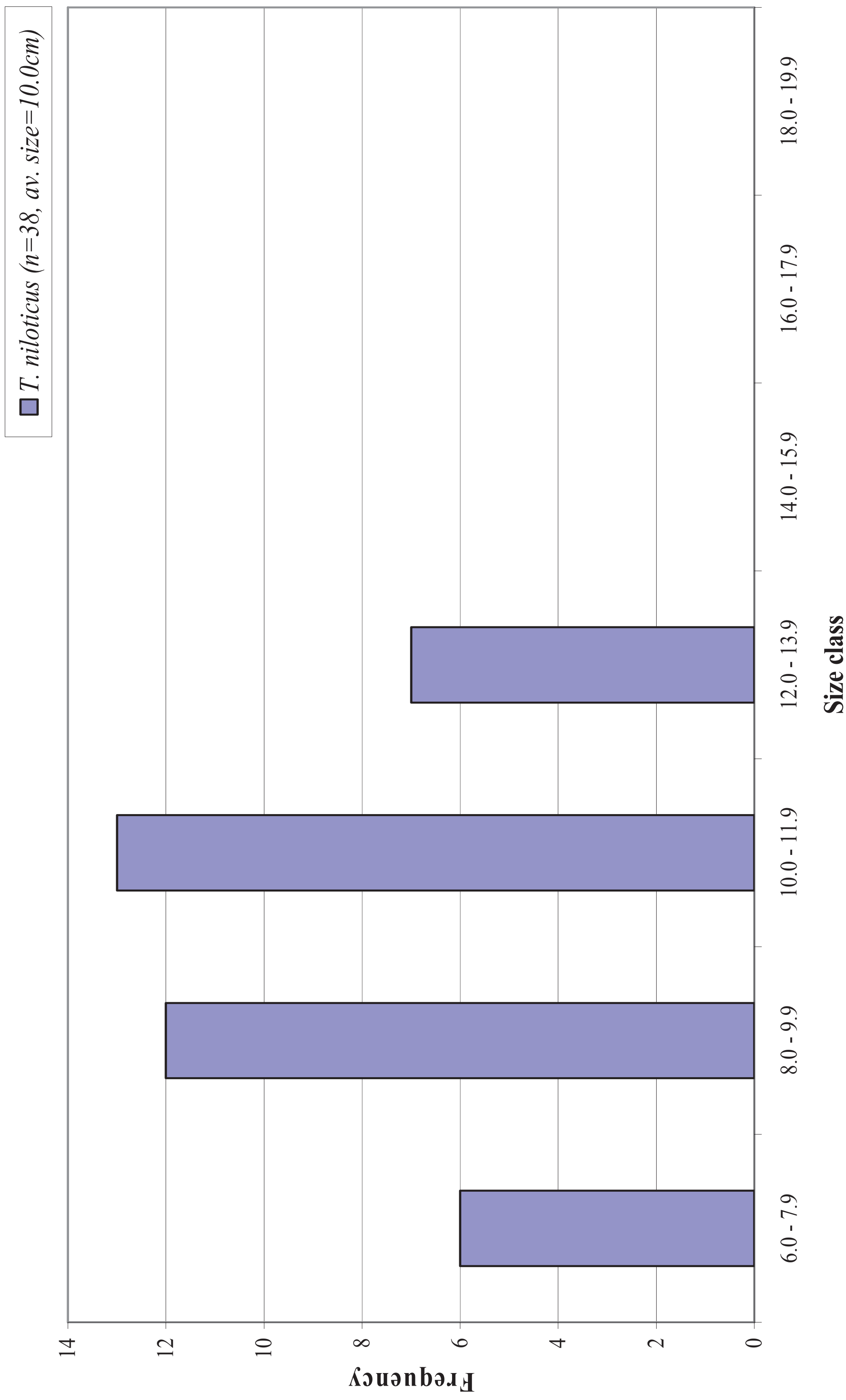


Figure 30: Size frequency distribution graph for *T. niloticus* recorded during the survey.

Appendices

Appendix 1: Islands, sites and habitats surveyed in the Solomon Islands Marine Assessment. GPS coordinates are provided for each site, and the geographical location of each site is provided in Figure 1.

Island	Site No.	Site Name	Reef Habitat	GPS	Co-ordinates
Florida Is	1	Tulagi Switzer Is. (1)	Sheltered	S 08 02.106	E160 06.302
Florida Is	2	Kombuana Is. (2)	Exposed	S 08 50.631	E160 02.215
Isabel Is	3	Buala reef (3)	Exposed	S 08 08.810	E159 38.158
Isabel Is	4	Tirahi Is. (4)	Sheltered	S 08 24.692	E159 47.671
Isabel Is	5	Tanabafe Is. (5)	Exposed	??	??
Isabel Is	6	Babao pt. (6)	Sheltered	S 08 12.393	E159 13.873
Isabel Is	7	Sarao Is. (7)	Exposed	S 08 00.100	E158 54.531
Isabel Is	8	Palunuhukura bay (8)	Sheltered	S 07 50.769	E158 43.315
Isabel Is	9	Matavaghi Is. (9)	Sheltered	S 07 33.562	E158 18.733
Isabel Is	10	Rapita Is. (10)	Sheltered	S 07 28.914	E158 23.995
Isabel Is	11	Kale Is. (11)	Exposed	S 07 25.872	E158 19.062
Isabel Is	12	Wakao Is. (12)	Sheltered	S 07 26.148	E158 18.145
Isabel Is	13	Sibau Is. (13)	Exposed	S 07 23.267	E158 05.241
Isabel Is	14	Malakobi (14)	Sheltered	S 07 23.110	E158 09.065
Arnavon Is	15	Tuma Is. (15)	Exposed	S 07 28.381	E158 02.584
Arnavon Is	16	Kerehikapa Is. (16)	Sheltered	S 07 27.625	E158 02.505
Choiseul Is	17	Raverave Is. (17)	Exposed	S 07 32.809	E157 47.160
Choiseul Is	18	Ondolou Is. (18)	Sheltered	S 07 31.162	E157 43.671
Choiseul Is	19	Boeboe (19)	Sheltered	S 07 24.721	E157 23.841
Choiseul Is	20	Poro Is. (20)	Exposed	S 07 21.545	E157 05.524
Choiseul Is	21	Taro Is. (21)	Exposed	S 06 43.358	E156 23.528
Choiseul Is	22	Putuputuru Is. (22)	Sheltered	S 06 42.106	E156 24.261
Choiseul Is	23	Sirovanga (23)	Exposed	S 06 36.878	E156 33.907
Choiseul Is	24	Vurango (24)	Sheltered	S 06 36.083	E156 34.603
Shortland Is	25	Rohae reef (25)	Exposed	S 07 00.015	E156 04.408
Shortland Is	26	Rohae Is. (26)	Sheltered	S 07 00.015	E156 03.262
Shortland Is	27	Onua Is. (27)	Exposed	S7 05.177	E155 53.973
Shortland Is	28	Faisi Is. (28)	Sheltered	S7 03.744	E155 52.240
Vela Lavella	29	Leona reef (29)	Exposed	S7 43.597	E156 30.615
Gizo	30	Njari Is. (30)	Exposed	S8 00.853	E156 45.614
Munda	31	Munda reef (31)	Sheltered	S8 20.267	E157 13.741
Munda	32	Haipe reef (32)	Exposed	S8 26.174	E157 16.191
Marovo	33	Veru pt. (33)	Exposed	S8 26.174	E157 16.191
Marovo	34	Landoro (34)	Exposed	S8 26.174	E157 16.191
Marovo	35	Lumalihe (35)	Sheltered	S8 28.324	E158 03.610
Marovo	36	Toatelava Is. (36)	Exposed	S8 39.010	E158 11.848
Marovo	37	Mbili passage (37)	Sheltered	S8 40.381	E158 11.538
Russell Is	38	Lisamata Is. (38)	Exposed	S8 57.954	E159 08.811
Russell Is	39	Mbutata Is. (39)	Sheltered	S8 59.689	E159 07.055
Russell Is	40	Honga pt. (40)	Exposed	S9 08.541	E159 06.194
Russell Is	41	Nikatu passage (41)	Sheltered	S9 07.376	E159 09.288
Guadalcanal	42	Honoa Is. (42)	Exposed	S9 49.032	E160 53.362
Guadalcanal	43	Wainipareo reef (43)	Sheltered	S9 48.651	E160 51.659
Makira Is	44	Haurimanu reef (44)	Exposed	S10 20.932	E161 22.797
Makira Is	45	Marautewa Is. (45)	Sheltered	S10 28.591	E161 30.501

Island	Site No.	Site Name	Reef Habitat	GPS	Co-ordinates
Makira Is	46	Naone Is. (46)	Exposed	S10 48.414	E162 17.014
Makira Is	47	Namunga (47)	Sheltered	S10 48.998	E162 16.818
Makira Is	48	Three Sisters I (48)	Exposed	S10 13.919	E161 57.127
Makira Is	49	Three Sisters II (49)	Sheltered	S10 16.236	E161 58.242
Pio	50	Pio is. (50)	Exposed	S10 11.361	E161 40.634
Makira Is	51	Pawa bay (51)	Sheltered	S10 11.361	E161 40.634
Malaita	52	Airasi (52)	Sheltered	S9 23.790	E161 11.383
Malaita	53	Komunihaka reef (53)	Exposed	S8 29 539	E161 14.641
Malaita	54	Arai peninsula (54)	Sheltered	S9 20.188	E161 19.996
Malaita	55	Anuta Is. (55)	Exposed	S9 19.415	E161 18.089
Malaita	56	Leili Is. I (56)	Exposed	S8 46.389	E161 01.036
Malaita	57	Leili Is. II (57)	Sheltered	S8 45.377	E161 01.232
Malaita	58	Toi reef (58)	Exposed	S8 19.046	E160 39.987
Malaita	59	Suafa bay (59)	Sheltered	S8 20.164	E160 41.698
Malaita	60	Falabulu Is. I (60)	Exposed	S8 50.450	E160 43.597
Malaita	61	Falabulu Is. II (61)	Sheltered	S8 50 416	E160 43.833
Ngella Is	62	Nuhu Is. (62)	Exposed	S9 16.969	E160 20.779
Ngella Is	63	Gavutu Is. (63)	Sheltered	S9 06.493	E160 11.332
Savo Is	64	Savo Is. (64)	Exposed	S9 07.975	E159 46.981
Guadalcanal	65	Tambea reef (65)	Exposed	S9 15.780	E159 39.389
Guadalcanal	66	Bonegi reef (66)	Exposed	S9 23.623	E159 52.841

Appendix 2: Invertebrates included in the survey

SPECIES	COMMON NAME	COMMENTS
(1) Holothurians	***Sea cucumbers***	
Actinopyga crassa	?	Only 1 specimen recorded in deep transect in Mbili (site 37). Also identified from a specimen by seagrass team.
A. lecanora	Stonefish	Only 10 individuals recorded from six sites in shallow habitat from Isabel, Arnavons, North Choiseul, shortlands and Marau.
A. mauritiana	Surf redfish	Not seen in transects. (Only found in surf break areas and reef flats on fringing reefs).
A. miliaris	Blackfish	Encountered only in deep habitat. Only 8 recorded from 4 sites. 6 of these 8 were recorded in the Arnavon Islands (ACMCA).
Bohadschia argus	Tigerfish	Recorded at many sites in both deep and shallow habitats. ACMCA sites (15 & 16) recorded the highest numbers.
B. similis	Chalkfish	Not encountered in transects but one specimen identified in seagrass areas in Florida.
B. vitiensis	Brown Sandfish	Only 6 individuals recorded from both deep and shallow habitats in Isabel, ACMCA, Choiseul, Florida and Malaita .
Holothuria atra	Lollyfish	Low numbers in shallow habitat transects. High counts in deep transects at ACMCA, Shortlands and Buala reef (site 3).
H. coluber	Snakefish	Not seen in transects.
H. edulis	Pinkfish	The most common species in both deep and shallow habitats. Seen at the most number of sites during the survey.
H. fuscogilva	White Teatfish	Only 3 specimens recorded in shallow. Seen at many sites in deep habitat (second common species to pinkfish).
H. fuscopunctata	Elephant's Trunkfish	Seen at least 10 sites in deep habitat. Uncommon in shallow habitat (only 1 specimen recorded in transects).
H. nobilis	Black Teatfish	Only seen in the ACMCA and one other site on Isabel in both deep and shallow habitats.
H. scabra	Sandfish	Not seen in transects but identified in seagrass areas in Isabel (near San George Island).
Pearsonothuria graeffei	Orangefish	Second most common species to pinkfish in the shallow habitat. Not seen at some sites in the deep habitat.
Stichopus chloronotus	Greenfish	Seen in very low numbers. Only 3 recorded in the shallow habitat at Onua Island (site 27) in the Shortland Islands.
S. horrens	Dragonfish/Peanutfish	Not recorded during the survey.
S. hermanni	Curryfish	Seen in low numbers. Only 15 recorded from 7 sites in deep habitat. Not seen in the shallow habitat.
S. pseudohorrens	?	Not seen in shallow habitat. Only 2 specimens were recorded in transects at two sites (48 & 49) in the Three Sister Islands.
Thelenota ananas	Prickly Redfish	Seen in low numbers in both deep and shallow habitats.
T. anax	Amberfish	Seen at many sites in the deep habitat but at less number of sites and low numbers in shallow habitat.
T. rubralineata	Lemonfish	Only recorded at Bonegi (site 66) in deep habitat. 3 specimens in transect.
(2) Bivalves	***Clams & Oysters***	
Tridacna gigas	Giant clam	Only 12 recorded from 9 sites in Isabel, ACMCA, Waghena, Taro, Shortland, Marovo and Are'Are lagoon.
Tridacna derasa	Smooth giant clam	Only 17 recorded during the survey. Most of these from sites in Isabel and the ACMCA.
Tridacna squamosa	Fluted giant clam	Encountered at about 70% of sites. Four individuals were also recorded in the deep habitat.
Tridacna maxima	Rugose giant clam	The most abundant clam species on the survey but encountered at less number of sites compared to *T. squamosa*.
Tridacna crocea	Burrowing giant clam	A common clam species. High counts made in Shortlands and Marovo. Seagrass team recorded high density near site 8 in Isabel.
Hippopus hippopus	Horseshoe clam	Very low numbers. Only 4 animals recorded during the survey (mainly in Isabel and ACMCA).
Pinctada margaritifera	Blacklip pearl oyster	Seen at many sites (at least 23 sites).
Pinctada maxima	Goldlip pearl oyster	None seen during the survey.
Pteria penquin	Brownlip pearl oyster	Encountered at 5 sites but 95 % of specimen recorded at sites 18 (Ondolou Is.), 29 (Leona reef), 37 (Mbili) and 52 (Airasi).
Beguina semiorbiculata	White rock shell	The most common bivalve. Present at many sites (33) especially at sheltered sites.
Atrina vexillum		Not seen at many sites. Prefer sandy bottom habitats.
(3) Gastropods	***Snails***	
Trochus niloticus	Trochus	Seen at least 13 sites. Some sites like Toi reef (site58) on Malaita and ACMCA recorded high numbers.
Turbo marmoratus	Greensnail	None seen.
Pyramis tectus	False trochus	Commonly encountered or recorded at many sites.

SPECIES	COMMON NAME	COMMENTS
(4) Crayfish		
Panulirus penicillatus	Double-spinned rock lobster	Not seen on transect but common in fishermen catch.
Panulirus versicolor	Painted rock lobster	Occasionally seen – Seen at 9 sites during the survey.
Panulirus femoristriga	Stripe-leg spiny lobster	Only seen from fishermen catch in Choiseul.
Panulirus ornatus	Ornate spiny lobster	Not seen.
(5) Others		
Acanthaster planci	Crown of thorns starfish	Seen at least 12 sites in but relatively low numbers.
Charonia tritonis	Triton shell	Only 1 specimen recorded at Naone Is. (site 46) in Makira.
Parribaccus spp.	Slipper lobster	None seen in transects but two were seen in fishermen (night diving) catch in Choiseul .

Appendix 3: Survey data for sea cucumber in shallow habitat. **n** are numbers found at sites (all transects) and **m** are mean numbers per transect (100m^2)

SITES	SPECIES																									
	H. fuscogilva		*B. argus*		*H. edulis*		*P. graeffei*		*T. ananas*		*T. anax*		*S. hermanni*		*H. nobilis*		*H. fuscpunctata*		*H. atra*		*S. chloronotus*		*B. vitiensis*		*A. lecanora*	
	n	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**
Tulagi Is. (1)			1	0.17	5	0.83																				
Kombuana Is. (2)																										
Buala reef (3)							2	0.33																		
Tirahi Is. (4)					2	0.33																				
Tanabafe Is. (5)							1	0.17																		
Babao pt. (6)			4	0.67	7	1.17																				
Sarao Is. (7)																										
Palunuhukura bay (8)							2	0.33																		
Matavaghi Is. (9)					5	0.83	3	0.50																		
Rapita Is. (10)					7	1.17																				
Kale Is. (11)					4	0.67																				
Wakao Is. (12)					2	0.33							1	0.17												
Sibau Is. (13)			1	0.17	2	0.33	1	0.17	1	0.17																
Malakobi (14)					1	0.17	1	0.17															1	0.17	1	0.17
Tuma Is. (15)																									1	0.17
Kerehikapa Is. (16)			1	0.17	2	0.33	1	0.17							2	0.33			2	0.33					1	0.17
Raverave Is. (17)							4	0.67																		
Ondolou Is. (18)																										
Boeboe (19)					1	0.17	7	1.17																		
Poro Is. (20)							4	0.67																		
Taro Is. (21)																										
Putuputuru Is. (22)	1	0.17	2	0.33			1	0.17															1	0.17	1	0.17
Sirovanga (23)							8	1.33																	1	0.17
Vurango (24)					7	1.17																				
Rohae reef (25)							1	0.17																	1	0.17
Rohae Is. (26)							4	0.67																		
Onua Is. (27)							3	0.50													3	0.50			2	0.33
Faisi Is. (28)			1	0.17			4	0.67																		
Leona reef (29)					1	0.17																				
Njari Is. (30)					2	0.33	5	0.83																		
Munda reef (31)					14	2.33	10	1.67																		
Haipe reef (32)							2	0.33																	1	0.17
Veru pt. (33)			1	0.17			2	0.33											1	0.17						
Landoro (34)																										
Lumalihe (35)									1	0.17																

Toatelava Is. (36)					1	0.17	12	2.00																		
Mbili passage (37)																										
Lisamata Is. (38)																										
Mbutata Is. (39)					1	0.17	1	0.17											1	0.17						
Honga pt. (40)			1	0.17																						
Nikatu passage (41)					2	0.33																				
Honoa Is. (42)																										
Wainipareo reef (43)					5	0.83	4	0.67																	1	0.17
Haurimanu reef (44)							1	0.17																		
Marautewa Is. (45)					4	0.67	1	0.17																		
Naone Is. (46)							1	0.17																		
Namunga (47)											1	0.17														
Three Sisters I (48)																										
Three Sisters II (49)					2	0.33	1	0.17																		
Pio is. (50)	1	0.17					1	0.17																		
Pawa bay (51)			1	0.17	2	0.33																				
Airasi (52)					5	0.83	1	0.17											1	0.17						
Komunihaka rf (53)																										
Arai peninsula (54)					8	1.33																				
Anuta Is. (55)							2	0.33	3	0.50																
Leili Is. I (56)					2	0.33	1	0.17	1	0.17	2	0.33														
Leili Is. II (57)			1	0.17	6	1.00	2	0.33																		
Toi reef (58)							1	0.17																		
Suafa bay (59)					8	1.33	3	0.50																		
Falabulu Is. I (60)			1	0.17	8	1.33	1	0.17									1	0.17								
Falabulu Is. II (61)					5	0.83					2	0.33											1	0.17		
Nuhu Is. (62)	1	0.17			10	1.67	2	0.33																		
Gavutu Is. (63)					2	0.33	2	0.33																		
Savo Is. (64)																										
Tambea reef (65)			1	0.17	8	1.33	1	0.17																		
Bonegi reef (66)					10	1.67																				
TOTAL	3		16		151		104		6		5		1		2		1		5		3		3		10	
OVERALL AVER.	0.05	0.01	0.24	0.04	2.29	0.38	1.58	0.26	0.09	0.02	0.08	0.01	0.02	0.00	0.03	0.01	0.02	0.00	0.08	0.01	0.05	0.01	0.05	0.01	0.15	0.03
NON-ZERO AVE.	1.00	0.17	1.33	0.22	4.58	0.76	2.74	0.46	1.50	0.25	1.67	0.28	1.00	0.17	2.00	0.33	1.00	0.17	1.25	0.21	3.00	0.50	1.00	0.17	1.11	0.19

Appendix 4: Survey data for sea cucumber in deep habitat. **n** are numbers found at each site. **m** are mean numbers per transect ($250m^2$). Note: No deep survey was done at sites 33, 38 and 42

SITES	SPECIES																													
	H. fuscog.		*B. argus*		*H. edulis*		*P. graeffei*		*T. ananas*		*T. anax*		*S. herman.*		*H. nobilis*		*H. fuscopunctata.*		*H. atra*		*A. miliaris*		*B. vitiensis*		*A. crassa*		*S pseudohor.*		*T. rubralinea.*	
	n	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**
Tulagi Is.(1)	2	0.40	1	0.20	4	0.80	1	0.20			1	0.20																		
Kombuana Is.(2)			1	0.20					1	0.20																				
Buala Reef (3)					4	0.80													7	1.40										
Tirahi Is.(4)					9	1.80							5	1.00																
Tanabafe Is.(5)	2	0.40									1	0.20							1	0.20										
Babao pt. (6)	1	0.20			1	0.20																								
Sarao Is. (7)	2	0.40																												
Palunuhukura (8)	1	0.20																												
Matavaghi Is.(9)			1	0.20	21	4.20													2	0.40	1	0.20								
Rapita Is.(10)																							1	0.20						
Kale Is.(11)											1	0.20																		
Wakao Is.(12)					1	0.20																								
Sibau Is.(13)							2	0.40			1	0.20			1	0.20														
Malakobi Is.(14)																	1	0.20												
Tuma Is.(15)	4	0.80	9	1.80							2	0.40							4	0.80	2	0.40								
Kerehikapa Is.(16)	1	0.20	4	0.80			1	0.20					2	0.40	1	0.20	1	0.20	5	1.00	4	0.80	1	0.20						
Raverave Is.(17)											7	1.40							1	0.20										
Ondolou Is.(18)	1	0.20																												
Boeboe (19)																														
Poro Is. (20)											1	0.20																		
Taro Is. (21)	2	0.40																												
ıtuputuru Is.(22)	6	1.20							1	0.20	1	0.20					2	0.40												
Sirovanga (23)									1	0.20																				
Vurango (24)													2	0.40																
Rohae reef (25)	1	0.20					1	0.20	1	0.20	1	0.20							6	1.20										
Rohae Is. (26)	2	0.40					1	0.20											1	0.20										
Onua Is.(27)									1	0.20											1	0.20								
Faisi Is.(28)	1	0.20																												
Leona Reef (29)			1	0.20	1	0.20					1	0.20																		
Njari Is.(30)									1	0.20							1	0.20	1	0.20										
Munda Reef (31)	1	0.20			6	1.20																								
Haipe Reef (32)																														
Veru pt (33)																														
Landoro (34)											1	0.20							1	0.20										
Lumalihe (35)	4	0.80							1	0.20	2	0.40							1	0.20										

Toatelava Is.(36)																			1	0.20										
Mbili Passage (37)	1	0.20									1	0.20													1	0.20				
Lisamata Is. (38)																														
Mbutata Is.(39)	1	0.20											1	0.20																
Honga Point (40)	3	0.60	1	0.20													1	0.20												
Nikatu (41)	2	0.40							1	0.20																				
Honoa Is. (42)																														
Wainipareo (43)	2	0.40			6	1.20	1	0.20																						
Haurimanu (44)	1	0.20									2	0.40																		
Marautewa Is. (45)	6	1.20			1	0.20	1	0.20									3	0.60												
Naone Is.(46)																														
Namuga .(47)													1	0.20																
Three Sisters I(48)	1	0.20									5	1.00															1	0.20		
Three Sisters II(49)			2	0.40	1	0.20																					1	0.20		
Pio Is. (50)											1	0.20																		
Pawa Bay (51)					2	0.40																								
Airasi (52)																	2	0.40												
Komunihaka (53)	3	0.60			1	0.20					1	0.20																		
Arai (54)																														
Anuta Is.(55)											1	0.20																		
Leili Is. I (56)			1	0.20	20	4.00			1	0.20	1	0.20																		
Leili Is. II (57)					19	3.80							1	0.20																
Toi Reef (58)									1	0.20																				
Suafa Bay (59)					7	1.40																								
Falabulu Is. I (60)	4	0.80			10	2.00											1	0.20												
Falabulu Is. II (61)																														
Nuhu Is. (62)			1	0.20	1	0.20											1	0.20	1	0.20										
Gavutu Is. (63)	1	0.20	1	0.20	11	2.20	2	0.40			1	0.20					3	0.60					1	0.20						
Savo Is. (64)			1	0.20																										
Tambea (D65)	3	0.60			5	1.00							3	0.60																
Bonegi (66)					7	1.40					3	0.60																	3	0.60
TOTAL	59		24		138		10		10		36		15		2		16		32		8		3		1		2		3	
OVERALL AVER.	0.94	0.19	0.38	0.08	2.19	0.44	0.16	0.03	0.16	0.03	0.57	0.11	0.24	0.05	0.03	0.01	0.25	0.05	0.51	0.10	0.13	0.03	0.05	0.01	0.02	0.00	0.03	0.01	0.05	0.01
NON-ZERO AVER.	2.19	0.44	2.00	0.40	6.57	1.31	1.25	0.25	1.00	0.20	1.71	0.34	2.14	0.43	1.00	0.20	1.60	0.32	2.46	0.49	2.00	0.40	1.00	0.20	1.00	0.20	1.00	0.20	3.00	0.60

Appendix 5: Survey data for bivalves in the shallow habitat. **n** are numbers found in all transects. **m** are mean numbers per transect (100 m^2).

		SPECIES																			
		T. gigas		*T. derasa*		*T. squamosa*		*T. maxima*		*T. crocea*		*H. hippopus*		*P. margarit*		*P. penquin*		*B. semiorbicu*		*A. vexillum*	
SITES	**No.**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**
Tulagi Is.	1					2	0.33														
Kombuana Is.	2					1	0.17	1	0.17												
Buala Reef	3																				
Tirahi Is.	4									1	0.17							37	6.17	1	0.17
Tanabafe Is.	5							4	0.67												
Babao pt.	6					6	1											3	0.50		
Sarao Is.	7					2	0.33	2	0.33					1	0.17						
Palunuhukura bay.	8					1	0.17											1	0.17		
Matavaghi Is.	9			3	0.5	1	0.17	1	0.17	5	0.83							3	0.50		
Rapita Is.	10																	6	1.00		
Kale Is.	11	1	0.17			5	0.83	1	0.17									4	0.67		
Wakao Is.	12									6	1	2	0.33	1	0.17			36	6.00		
Sibau Is.	13	1	0.17	1	0.17	1	0.17	2	0.33					1	0.17						
Malakobi Is.	14			2	0.33					2	0.33							12	2.00		
Tuma Is.	15	2	0.33	5	0.83	7	1.17	5	0.83					2	0.33						
Kerehikapa Is.	16			4	0.67	2	0.33	8	1.33	4	0.67	2	0.33	2	0.33						
Raverave Is.	17	2	0.33			2	0.33	2	0.33					1	0.17			3	0.50	1	0.17
Ondolou Is.	18			1	0.17	2	0.33	3	0.5	3	0.50			1	0.17	9	1.50	25	4.17	1	0.17
Boeboe	19																	13	2.17		
Poro Is.	20							4	0.67	1	0.17			1	0.17						
Taro Is.	21	2	0.33			2	0.33	2	0.33												
Putuputuru Is.	22					1	0.17	1	0.17									9	1.50		
Sirovanga	23					2	0.33	2	0.33												
Vurango	24					2	0.33											32	5.33		
Rohae reef	25	1	0.17			1	0.17	1	0.17												
Rohae Is.	26	1	0.17			6	1			12	2			1	0.17			54	9.00	2	0.33
Onua Is.	27					2	0.33														
Faisi Is.	28					1	0.17							1	0.17			4	0.67	1	0.17
Leona Reef	29							1	0.17					1	0.17	11	1.83	8	1.33		
Njari Is.	30							4	0.67					2	0.33			6	1.00		
Munda Reef	31																	6	1.00		
Haipe Reef	32					3	0.5	5	0.83					2	0.33						
Veru pt.	33							2	0.33												
Landoro	34	1	0.17			4	0.67	10	1.67									12	2.00		
Lumalihe	35							1	0.17	6	1			2	0.33		0.33	124	20.67	1	0.17
Toatelava Is.	36					1	0.17	13	2.17	2	0.33			1	0.17			25	4.17		
Mbili Passage	37					1	0.17							5	0.83	7	1.17			1	0.17
Lisamata Is.	38					1	0.17	3	0.5					1	0.17			1	0.17		

Mbutata Is.	39																	6	1.00		
Honga Point	40					2	0.33							1	0.17						
Nikatu passage	41					1	0.17														
Honoa Is.	42			1	0.17	1	0.17	1	0.17												
Wainipareo reef	43					2	0.33	2	0.33									4	0.67		
Haurimanu reef	44					4	0.67							1	0.17						
Marautewa Is.	45					2	0.33			7	1.17			1	0.17			19	3.17		
Naone Is.	46					3	0.50														
Namuga	47					1	0.17														
Three Sisters I	48					3	0.5	2	0.33												
Three Sisters II	49					1	0.17														
Pio Is.	50							10	1.67	1	0.17							2	0.33		
Pawa Bay	51					1	0.17							1	0.17			1	0.17		
Airasi	52									2	0.33					14	2.33	26	4.33		
Komunihaka reef	53	1	0.17					2	0.33												
Arai peninsula	54					1	0.17			4	0.67							1	0.17		
Anuta Is.	55					5	0.83	1	0.17												
Leili Is. I	56					2	0.33	4	0.67												
Leili Is. II	57																				
Toi Reef	58							2	0.33												
Suafa Bay	59					3	0.5	5	0.83	3	0.5										
Falabulu Is. I	60					1	0.17	5	0.83					4	0.67						
Falabulu Is. II	61													1	0.17			5	0.83		
Nuhu Is.	62																				
Gavutu Is.	63					1	0.17							4	0.67			51	8.50	2	0.33
Savo Is.	64					1	0.17	1	0.17									2	0.33	1	0.17
Tambea	65					1	0.17	2	0.33	1	0.17							2	0.33	1	0.17
Bonegi	66																				
TOTAL		12		17		95		115		60		4		39		41		543		12	
OVERALL AVERAGE		0.18	0.03	0.26	0.04	1.44	0.24	174	0.29	0.92	0.15	0.06	0.01	0.59	0.09	0.62	0.11	8.23	1.37	0.18	0.03
NON-ZERO AVERAGE		1.33	0.22	2.43	0.41	2.16	0.36	3.29	0.55	3.81	0.63	2.00	0.33	1.63	0.26	10.25	1.79	16.45	2.74	1.20	0.20

Appendix 6: Survey data for bivalves in the deep habitats. **n** are numbers found in all transects. **m** are mean numbers per transect ($250m^2$).

SITES	No.	*P. margaritifera* n	*P. margaritifera* m	*Pteria penquin* n	*Pteria penquin* m	*T. squamosa* n	*T. squamosa* m
Tulagi Is.	1						
Kombuana Is.	2						
Buala Reef	3						
Tirahi Is.	4						
Tanabafe Is.	5						
Babao pt.	6						
Sarao Is.	7						
Palunuhukura bay.	8						
Matavaghi Is.	9						
Rapita Is.	10						
Kale Is.	11						
Wakao Is.	12						
Sibau Is.	13						
Malakobi Is.	14						
Tuma Is.	15						
Kerehikapa Is.	16						
Raverave Is.	17						
Ondolou Is.	18						
Boeboe	19						
Poro Is.	20						
Taro Is.	21						
Putuputuru Is.	22						
Sirovanga	23						
Vurango	24						
Rohae reef	25						
Rohae Is.	26			2	0.40		
Onua Is.	27						
Faisi Is.	28						
Leona Reef	29	1	0.20	1	0.20		
Njari Is.	30						
Munda Reef	31						
Haipe Reef	32						
Veru pt.	33						
Landoro	34						
Lumalihe	35						
Toatelava Is.	36	2	0.40				
Mbili Passage	37			10	2.0		
Lisamata Is.	38						
Mbutata Is.	39						
Honga Point	40						
Nikatu passage	41			1	0.20		
Honoa Is.	42						
Wainipareo reef	43						

Haurimanu reef	44						
Marautewa Is.	45						
Naone Is.	46					1	0.20
Namuga	47						
Three Sisters I	48						
Three Sisters II	49						
Pio Is.	50						
Pawa Bay	51	1	0.20				
Airasi	52			23	4.60		
Komunihaka reef	53						
Arai peninsula	54						
Anuta Is.	55						
Leili Is. I	56						
Leili Is. II	57			1	0.20	1	0.20
Toi Reef	58					2	0.40
Suafa Bay	59						
Falabulu Is. I	60						
Falabulu Is. II	61			1	0.20		
Nuhu Is.	62						
Gavutu Is.	63						
Savo Is.	64			1	0.20		
Tambea	65						
Bonegi	66						
TOTAL		4		40		4	
OVERALL AVERAGE		0.06	0.01	0.63	0.10	0.06	0.01
NON-ZERO AVERAGE		1.30	0.27	5.00	0.80	1.30	0.27

Appendix 7: Survey data for gastropods in the shallow habitat. **n** are numbers found in all transects. **m** are mean numbers per Transect ($100m^2$)

		SPECIES							
		Trochus niloticus		***Tectus pyramis***		***Trochus maculatus***		***Charonia tritonis***	
SITES	**No.**	**n**	**m**	**n**	**m**	**n**	**m**	**n**	**m**
Tulagi Is. (1)	1			1	0.17				
Kombuana Is.(2)	2			3	0.50				
Buala Reef (3)	3					2	0.33		
Tirahi Is. (4)	4								
Tanabafe Is. (5)	5	1	0.17	4	0.67				
Babao pt. (6)	6								
Sarao Is. (7)	7					1	0.17		
Palunuhukura bay. (8)	8								
Matavaghi Is. (9)	9								
Rapita Is. (10)	10								
Kale Is. (11)	11								
Wakao Is. (12)	12								
Sibau Is. (13)	13								
Malakobi Is. (14)	14					1	0.17		
Tuma Is. (15)	15	5	0.83	5	0.83				
Kerehikapa Is. (16)	16	3	0.50						
Raverave Is. (17)	17								
Ondolou Is. (18)	18								
Boeboe (19)	19								
Poro Is. (20)	20								
Taro Is. (21)	21	2	0.33	2	0.33				
Putuputuru Is. (22)	22								
Sirovanga (23)	23			2	0.33				
Vurango (24)	24					2	0.33		
Rohae reef (25)	25	1	0.17	3	0.50				
Rohae Is. (26)	26								
Onua Is. (27)	27	3	0.50	8	1.33				
Faisi Is. (28)	28								
Leona Reef (29)	29			4	0.67				
Njari Is. (30)	30								
Munda Reef (31)	31								
Haipe Reef (32)	32			5	0.83				
Veru pt. (33)	33								
Landoro (34)	34								
Lumalihe (35)	35			1	0.17	1	0.17		
Toatelava Is. (36)	36								
Mbili Passage (37)	37								
Lisamata Is. (38)	38			1	0.17				
Mbutata Is. (39)	39								
Honga Point (40)	40								
Nikatu passage (41)	41	1	0.17	1	0.17				

Honoa Is. (42)	42	4	0.67	9	1.50				
Wainipareo reef (43)	43					1	0.17		
Haurimanu reef (44)	44	2	0.33	6	1.00				
Marautewa Is. (45)	45								
Naone Is. (46)	46	2	0.33	4	0.67			1	0.17
Namuga (47)	47					1	0.17		
Three Sisters I (48)	48	2	0.33	2	0.33				
Three Sisters II (49)	49								
Pio Is. (50)	50								
Pawa Bay (51)	51			1	0.17				
Airasi (52)	52								
Komunihaka reef (53)	53	1	0.17	6	1.00				
Arai peninsula (54)	54								
Anuta Is. (55)	55			1	0.17				
Leili Is. I (56)	56								
Leili Is. II (57)	57					1	0.17		
Toi Reef (58)	58	11	1.83	8	1.33				
Suafa Bay (59)	59			2	0.33	2	0.33		
Falabulu Is. I (60)	60			1	0.17	1	0.17		
Falabulu Is. II (61)	61								
Nuhu Is. (62)	62			1	0.17				
Gavutu Is. (63)	63								
Savo Is. (64)	64			6	1.00				
Tambea (65)	65			2	0.33	3	0.50		
Bonegi (66)	66			2	0.33				
TOTAL		38		91		16		1	
OVERALL AVERAGE		0.58	0.10	1.38	0.23	0.24	0.04	0.02	0.00
NON-ZERO AVERAGE		2.92	0.49	3.37	0.56	1.45	0.24	1.00	0.17

June 2006
TNC Pacific Island Countries
Report No 1/06

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

Chapter 7

Seagrasses & Mangroves

Solomon Islands Marine Assessment

Len McKenzie[1], Stuart Campbell[2] & Ferral Lasi[3]
[1]*CRC Reef/Department Primary Industries & Fisheries*
[2]*Wildlife Conservation Society*
[3] *The Nature Conservancy*

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
Len McKenzie: CRC Reef/Department Primary Industries & Fisheries, Northern Fisheries Centre, PO Box 5396, Cairns Qld, 4870, Australia
Tel.: +61 7 4035 0131; fax: +61 7 4035 4664.
E-mail address: Len.McKenzie@dpi.qld.gov.au

Suggested Citation:
McKenzie, L., S. Campbell and F. Lasi. 2006. Seagrasses and Mangroves. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds). 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No 1/06.

Design: Jeanine Almany

Artwork: Nuovo Design

Maps: Stuart Sheppard & Jeanine Almany

Cover Photo: © David Wachenfeld, Triggerfish Images

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

Contents

Executive Summary

- This is the first extensive survey of seagrass resources in the Solomon Islands.
- 10 species of seagrass were identified in the Solomon Islands. The survey involved examination of 1,426 sites and identified 486 individual meadows.
- 6,633 ±1,446 hectares (ha) of predominately intertidal and shallow subtidal seagrass meadows were mapped in the Solomon Islands between 13 May and 16 June 2004.
- 54% of all seagrass meadows (per hectare basis) were found in Malaita Province. All other provinces each included less than 12% of the seagrass meadows.
- Most Solomon Islands seagrasses were found in water less than 10m deep and meadows were monospecific or consisted of multispecies communities, with up to 6 species present at a single location.
- The dominant species encountered were *Enhalus acoroides* and *Thalassia hemprichii*.
- Seagrass distribution appears to be primarily influenced by the degree of wave action (exposure) and nutrient availability.
- Solomon Islands' seagrass habitats can be generally categorised into four broad habitats: estuaries (incl. large shallow lagoons), coastal (incl. fringing reef), deep-water and reef (e.g., barrier or isolated)
- Seagrass meadows in the region as a whole are in relatively healthy condition compared to many other regions globally.
- Coastal fringing mangrove communities appear to be generally intact, with only localised impacts.
- High sedimentation/turbidity in coastal waters, primarily the result of logging activities, was identified as a major threat at some locations.
- Other impacts were similarly localised, and included soil erosion related to coastal agriculture (coconut plantations), sewage discharge (human and agriculture), industrial pollution, port/village infrastructure/dwellings and overfishing. Most of these impacts can be managed with appropriate environmental guidelines.
- Future recommendations include: establishing more protected areas, promoting seagrass and mangrove conservation through development of education resource materials, and establishing a Pacific Island monitoring program of seagrass and mangrove ecosystem health.

Introduction & Background

The primary goal of the survey was to provide a comprehensive inventory of seagrass species and to map their distribution in the Solomon Islands.

The Solomon Islands is the third largest archipelago in the South Pacific, comprising a total of 992 islands, scattered in a chain in a south-easterly direction from PNG (Figure 1). The bulk of the land area comprises seven large volcanic islands, which form a double chain running from northwest to southwest and converging on the island of Makira. The Santa Cruz Islands (Temotu Province) are a second group of three larger volcanic islands lying to the east, and separated from the main archipelago of the country by the 6000m deep Torres Trench. These however are outside the boundaries of the scope of the assessment and are not included in this report.

The coastal marine ecosystem of the Solomon Islands includes wide areas still largely unimpacted by human activities, although there are also areas where such pressures are increasing. The islands have one of the fastest population growth rates in the world, and 86 percent of the people are rural. Dependence on coastal marine ecosystems for protein remains high and subsistence fishing is widespread.

Figure 1. Map of the Solomon Islands Marine Assessment survey route.

Seagrass Meadows

Seagrass meadows are a significant coastal habitat of the Solomon Islands. Seagrasses are a functional grouping referring to vascular flowering plants, which grow fully submerged and rooted in soft bottom estuarine and marine environments. In the Solomon Islands, they are found in habitats extending from the intertidal to subtidal, along mangrove coastlines, estuaries, shallow embayments, as well as coral-reef, inter-reef and offshore island situations.

Seagrasses rank as one of the major marine ecosystems on world terms. In the last few decades, seagrass meadows have received greater attention with the recognition of their importance in stabilising coastal sediments, providing food and shelter for diverse organisms, as a nursery ground for fish and invertebrates of commercial and artisanal fisheries importance, as carbon dioxide sinks and oxygen producers, and for nutrient trapping and recycling. Seagrass are rated the 3rd most valuable ecosystem globally (on a per hectare basis) and the average global value for their nutrient cycling services and the raw product they provide has been estimated at ^{1994}US$19,004 ha^{-1} yr^{-1} (Costanza *et al.* 1997). This value would be significantly greater if the habitat/refugia and food production services of seagrasses were included.

Seagrasses are also food for the endangered green sea turtle (*Chelonia mydas*) and dugong (*Dugong dugon*) (Lanyon *et al.* 1989), which are found throughout the Solomon Islands, and used by traditional communities for food and ceremonial use. Tropical seagrasses are also important in their interactions with mangroves and coral reefs. All these systems exert a stabilizing effect on the environment, resulting in important physical and biological support for the other communities. Seagrasses slow water movement, causing suspended sediment to fall out, and thereby benefiting corals by reducing sediment loads in the water.

MANGROVES

Mangroves are a taxonomically diverse group of predominantly tropical shrubs and trees growing in the intertidal zone between Mean Sea Level (MSL) and Highest Astronomical Tide (HAT) bordering the banks of estuaries and foreshores along protected parts of the coastline (Duke 1992).

Areas of deposition of mud and silt at the mouths of rivers and creeks and in the lee of larger offshore islands protected from strong wave action support the most extensive mangrove communities (Dowling and McDonald 1982). Mangroves can tolerate a wide range of sediment types, water temperatures, flow rates, salinity, nutrient and oxygen levels. Mangroves vary in their tolerance of these environmental factors, and a pattern of species zonation occurs (Lovelock 1993).

Mangroves form complex systems in coastal waters providing physical, biological and ecosystem functions which include:

- Habitat, shelter and structural complexity for resident and transient birds, fish, crustaceans and reptiles. Many prawns and fish that inhabit mangroves are of commercial and recreational importance or important to traditional fishing communities (Rönnbäck 1999);
- Providing a major marine source of carbon for complex food webs through direct grazing or through detrital pathways (Clough 1992);
- Assisting in the stabilisation of coastlines, assimilating wastes, mitigating flood water by controlling the outflow, buffering pollution and storms and reclaiming land (i.e. helping in the formation of islands and the extension of shorelines);
- Providing for human uses, including recreational (fishing and boating) and indigenous uses (food, medicine, weapons and other tools).

Mangrove roots, debris, and other vegetation structures provide structural complexity in intertidal habitat. The structural complexity that mangrove roots and debris form are often referred to as “snags”, and enhances the refuge aspect of the marine environment. Mangroves provide a sub-surface shelter by trapping soft muds suitable for burrowing (Rönnbäck 1999). Mangroves also have the hydrodynamic ability to retain immigrating fish, crustacean and mollusc larvae and juveniles. Spatio-temporal variations in the availability of food and shelter, and retention capacity, affect the quality of individual mangrove microhabitats for fish and shellfish (Rönnbäck 1999).

The presence of wetland vegetation improves water quality of estuaries and near-shore waters through nutrient storage in plant tissues and their regulated release into the surrounding water, and also by removal of water-borne contaminants (e.g. heavy metals and pesticides) and suspended sediments. Extensive tidal wetlands also stabilise channel banks and protect shorelines from erosion and store and dissipate the energy of floodwaters.

A study from a mangrove forest in north-eastern Australia has found that mangrove primary productivity and associated leaf litterfall can be substantial (Clough 1992). The annual litterfall has been estimated at 8-10t dry weight per ha, with a maximum of up to 20t dry weight per hectare (Clough 1992). The mangrove crab can consume or store 30-80% of this litterfall (Robertson *et al.* 1992). These crabs are subsequently consumed by fishes and therefore constitute an important link at the primary consumer level in food webs, beginning with mangrove plant production and leading to higher level consumers harvested by humans.

Mangrove communities have long been recognised for their value to fisheries production. Mangrove habitat (particularly *Rhizophora stylosa*) is important as a feeding and nursery area for fish species that contribute to fisheries values (Halliday and Young 1996). Fishes inhabiting tropical mangroves (eg sardines and herring) eat plankton and small bottom-dwelling prey and support fisheries indirectly by providing a food source for larger pelagic species (eg mackerel, tuna, trevally and sharks) that may not use the forest directly (Halliday and Young 1996).

The economic value of natural products and ecosystem services generated by mangrove forests is generally underestimated (Saenger *et al.* 1983). As a consequence mangrove ecosystems have become prime candidates for conversion into large-scale development activities such as agriculture, aquaculture, forestry, salt extraction and infrastructure. More than 50% of the world's mangroves have been removed (World Resources Institute 1996).

It has been estimated that the total value to ecosystem services per hectare of mangroves is [1994]US$9990, with a large portion of this value from waste treatment, food production, and recreation provision (Costanza *et al.* 1997). The value of ecosystem goods (such as food) and services (such as waste assimilation) represent the benefits human populations derive, directly or indirectly, from ecosystem functions.

Mangroves form an interface between terrestrial and marine environments. Harmful land use and marine activities can threaten mangrove distribution and abundance. Potential threats to mangrove populations include: natural sources (pathogens, violent storms, fluctuations in rainfall and climatic patterns); land uses (habitat modifications, excess nutrients, toxic chemical leachate, pesticides, herbicides, algicides and insecticides); or marine activities (oil and other contaminant spills) (Duke *et al.* 2005).

Small-scale modifications to the physical structure of mangrove forests can lead to significant effects on the diversity and abundance of macro benthic organisms in mangrove habitats (Skilleter and Warren 2000). Such modifications have the potential to cause cascading effects at higher trophic levels with deterioration in the value of these habitats as nursery and feeding grounds (Skilleter and Warren 2000).

SEAGRASSES OF THE SOLOMON ISLANDS

There is some confusion regarding the number of seagrass species in the Solomon Islands, due to the lack of any comprehensive surveys. Green & Short (2003) list 3 species, however Johnstone (1982) and Womersley & Baily (1969) suggested there could be at least 7. Reviews by Coles and Kuo (1995) and Coles & Lee Long (1999) failed to locate any validated records from herbarium collections or available scientific literature on the seagrasses of the Solomon Islands. Nevertheless, Coles and Lee Long (1999) predicted between 5 and 10 species may occur in the Solomon Islands based on a probability model of species diversity across the Pacific; high in the west and declining towards the east.

The total area of seagrass meadows in the Solomon Islands is also unknown, as no broad scale mapping exercises have been conducted (Coles *et al.* 2003). This is because mapping in tropical systems is generally from field observations, since remotely sensed data (satellite and aerial imagery) is generally ineffective for detecting tropical seagrasses of low biomass and/or in turbid water (McKenzie *et al.* 2001). Some estimation could be possible using a simple modelling approach, based on the high likelihood that between 4% and 5% of almost all shallow water areas of reef and continental slope within the depth range of most seagrasses (less than 10 metres below MSL) would have at least a sparse seagrass cover. This however, has not been attempted. The closest attempt so far is a new dataset prepared by the United Nations Environment Programme World Conservation Monitoring Centre (http://stort.unep-wcmc.org/maps). These maps however should be interpreted with caution as they have been migrated to GIS based on literature review and outreach to expert knowledge. Much of the information is from only a few localities and is generally historic.

Mangroves of the Solomon Islands

The area of mangroves in the Pacific Islands is estimated at 343,735ha, approximately 2.4 percent of the worlds mangroves (Ellison 1999). 20 species and 2 hybrids of mangrove have been reported in the Solomon Islands (Ellison 1995). They include: *Heritiera littoralis, Aegiceras corniculatum, Sonneratia alba, S caseolaris, S x gulngai, Osbornia octodonata, Lumnitsera littorea, Rhizophora apiculata, R stylosa, R x lamarckii, R mucronata, Bruguiera gymnorrhiza, B parviflora, B sexangula, Ceriops tagal, Excoecaria agallocha, Xylocarpus granatum, X mekongensis, Avicennia alba, A marina, Scyphiphora hydrophyllacea* and *Nypa fruticans* (from Ellison 1995, Spalding *et al.* 1997). These mangroves are of the Indo-Malayan assemblage. The greatest diversity of mangroves is found in northern Australia and southern PNG, and decline in diversity from west to east across the Pacific, reaching a limit at American Samoa. The Solomon Islands is the eastern limit for some mangrove species. 4 species do not extend beyond the Solomon Islands to the rest of the Pacific Islands, and 8 other species do not extend past the Solommon, Vanuato and New Caledonia island groups (Ellison 1999).

Larger areas of mangrove are limited in the Solomon Islands due to the lack of suitable intertidal habitat. In the Solomon Islands, Hansell & Wall (1976) mapped 642km^2 (64,200 ha) of mangroves from air photographs, which constitutes 2.6 percent of the total forest area. The largest area (208km^2 on Isabel, followed by Rennell & Shortland (137km^2), Malaita (124km^2) and New Georgia (97km^2). This area has been reduced by clearance for subsistence agriculture and commercial logging (Scott 1993).

In the Solomon Islands, mangroves are protected under the Forest Resources and Timber Act (Kwanairara 1992). However, although legislation exists to control the use of mangroves, is not always exercised (Spalding *et al*. 1997). Mangroves are exploited for firewood, and areas are degraded by siltation or lost to landfill and settlements.

Mangrove areas in the Pacific Islands are traditionally used for fishing and gathering of clams and crabs, wood for construction and handicrafts, and for fuelwood. Tannins from the Rhizophoraceae are also used for protection of nets and fish traps owing to their fungicidal properties. The prop roots of *Rhizophora* are frequently used for the construction of fish traps, fuelwood or light construction. A brown dye is obtained from the bark.

Scientific information about mangroves in the Pacific Islands tends to be generally poor and not well documented, though the local knowledge in some locations is very detailed. Studies in the Solomon Islands have shown significant fish stocks in association with mangroves. There is an endemic subspecies of the mangrove monitor *Varanus indicus spinulosus* with very limited distribution and populations of the saltwater crocodile *Crocodylus porosus* are threatened in the Solomon Islands (Messel & King 1989)

Methodology

Survey Strategy

The survey focused on the main island group of the Solomon Islands, stretching from Choiseul Island in the northwest to Makira in the southeast (Figure 1). While a comprehensive survey of the entire Solomon Islands archipelago, including the outer islands, would be desirable, it was beyond the scope of this assessment. Similarly, due to the size of the SI coastline (over 6000 km), locations were selected for detailed assessment based on the probability of significant seagrass communities, logistic constraints and with the guidance of the Solomon Islands Marine Assessment Coordinating Committee(SIMACC) (see *Conservation Context,* this report). These areas included representative examples of marine habitats of interest and special and unique areas.

The survey was conducted from 13 May to 16 June 2004, and primarily focused on to providing detailed information (distribution & abundance) on high priority intertidal and shallow subtidal seagrass ecosystems in the regions. Where possible, similar observations were made for mangrove forests.

Within each location, field sites were chosen for examination (ground truthing) to ensure all suitable/possible seagrass habitats were assessed. Intertidal and sub-tidal areas were surveyed using boats and divers. This was done with points and transects approximately 100-500 m apart. Benthos was examined at sites along transects (sites every 1 m depth contour), which extended from the upper intertidal to depths beyond the outer edge of seagrass meadows (usually 5-6m). Points (sites) between transects were also dived to check for continuity of habitat types. Some locations were surveyed at a lower intensity, with sites >500 m apart, but sufficient to map and describe the major seagrass habitats.

Fringing mangroves were examined at coastal sites, and generally incorporated a 10m section of frontage to a visual depth of approximately 20m inland (depending on type of mangrove community).

Data Collection

Seagrass habitat characteristics including visual estimates of above-ground biomass/percentage cover (3 replicates of a 0.25 m^2 quadrat), species composition, % algae cover, sediment type, water depth and geographic location were recorded at each site. A Global Positioning System (GPS) was used to accurately determine geographic location of sampling sites (±5 m). Seagrass species were identified where possible according to Waycott *et al.* (2004) and voucher specimens were collected for taxonomic verification. Depths of survey sites were recorded with an echo-sounder and field descriptions of sediment type from hand or grab samples were recorded for each site: shell grit, rock gravel, coarse sand, sand, fine sand and mud.

Above-ground biomass was determined by a "visual estimates of biomass" technique modified from Mellors (1991). At each intertidal and shallow sub-tidal site, observers recorded an estimated rank of seagrass biomass and species composition in three replicates of a 0.25 m^2 quadrat per site. To ensure standardisation over the survey period, a standard set of photographs was used as a guide. On completion of the survey (conducted back in Australia), each observer ranked ten quadrats that were harvested and the above-ground dry biomass (g DW. m^{-2}) measured. The regression curve representing the calibration of each observer's ranks was used to calculate above-ground biomass from all their estimated ranks during the survey. Observers had significant linear regressions (r^2 >0.9) when calibrating above-ground biomass estimates against a set of harvested quadrats.

Seagrass community types were determined by dominant seagrass species found within each meadow (Table 1) and their landscape structure (Figure 2). Seagrass habitat types were determined by species composition and physical attributes (ie intertidal or subtidal, coastal or fringing reef) influencing each seagrass community.

Table 1. Nomenclature for community types in the Solomon Islands.

Community type	Species composition
Species A	Species A is 100% of composition
Species A with Species B	Species A is 60% of composition
Species A with Species B/Species C	Species A is 50% of composition
Species A/Species B	Species A is 50% - 60% of composition

Isolated seagrass patches - The majority of area within the meadows consisted of unvegetated sediment interspersed with isolated patches of seagrass.

Aggregated seagrass patches - Meadows are comprised of numerous seagrass patches but still featured substantial gaps of unvegetated sediment within the meadow boundaries.

Continuous seagrass cover - The majority of area within the meadows was comprised of continuous seagrass cover interspersed with a few gaps of unvegetated sediment.

Figure 2. Seagrass meadow patchiness categories used in the seagrass survey.

At each of the locations visited, mangrove species and riparian vegetation were also assessed. Assessments only included the immediate (seaward) mangrove fringe, and did not continue up-stream into brackish/freshwaters. All mangroves at each site were identified to species level in the field according to Lovelock (1993). Other riparian vegetation was identified as far as possible in the field. Where positive field identifications could not be made, voucher specimens of species were collected to confirm field identifications.

Geographic Information Systems (GIS)

A GIS of seagrass community distribution was created in MapInfo® and ArcMap® using the above survey information. A CD Rom copy of the GIS with metadata has been archived at TNC Brisbane offices and the original archived with the custodians (QDPI&F) at the Northern Fisheries Centre, Cairns.

Errors in GIS maps include those associated with digitising and rectifying basemaps and with Global Positioning System (GPS) fixes for survey sites. The point at which divers estimated bottom vegetation may be up to 5 m from the point at which a GPS fix was obtained. These errors are considered to be within the errors associated with distance between survey sites.

In the survey, each seagrass meadow was assigned a qualitative mapping value, determined by the data sources and likely accuracy of mapping. Boundaries of seagrass habitat were interpreted using one or more of the following: seagrass data at each dive site, extent of habitat visible from the vessel, satellite imagery and bathymetry. Boundaries of meadows in intertidal depths were usually mapped with greatest reliability (identified from surface observations, from dive sites usually less than 100 m apart). Boundaries in sub-tidal depths were mapped with less reliability because of a) very gradual changes in habitat and b) poor underwater visibility. Where the depth of outer boundaries were established, bathymetry was used to help outline the meadow boundary between survey sites where possible. Estimates of reliability in mapping meadow boundaries ranged from 7.5 m to 500 m.

The Biogeography of the Solomon Archipelago Seagrasses

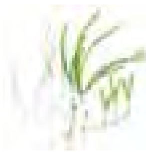
Ten seagrass species were recorded/collected during the Solomon Islands Rapid Ecological Assessment (SIREA), from 13 May to 16 June 2004. They included:

Family **CYMODOCEACEAE** Taylor

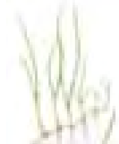
Cymodocea rotundata Ehrenb. & Hemp. Ex Aschers

Cymodocea serrulata (R. Br.) Aschers. & Magnus

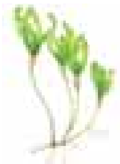
Halodule uninervis (wide- & narrow-leaf) (Forsk.) Aschers.



Syringodium isoetifolium (Aschers.) Dandy



Thalassodendron ciliatum (Forsk.) den Hartog[†]

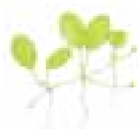


Family **HYDROCHARITACEAE** Jussieu

Enhalus acoroides (L. *f*) Royle

Halophila decipiens Ostenfeld

Halophila minor (Zollinger) den Hartog



Halophila ovalis (R. Br.) Hook f.

Thalassia hemprichii (Ehrennb.) Aschers in Petermann

Approximately 6,633 ±1,446 hectares (ha) of predominately intertidal and shallow subtidal seagrass meadows were mapped in the Solomon Islands between 13 May to 16 June 2004. 485 individual meadows were identified and mapped from 1,428 ground truthed sites. A conservative estimate of the total area of seagrass meadows in the Solomon Islands would be ~10,000 ha, taking into account locations which could not be visited during the survey which possibly have seagrass present. In interpreting the maps and seagrass distribution it is essential to note that not all coastal areas were surveyed. The seagrass distribution mapped for this report

[†] *Thalassodendron ciliatum has also been reported from East Rennell & Southern Malaita (WCMC, Seagrass Atlas Appendix 1.)*

is for intertidal and shallow subtidal seagrasses in the provinces of Choiseul, Western, Isabel, Malaita, Central, Makira and Guadalcanal (Figure 3).

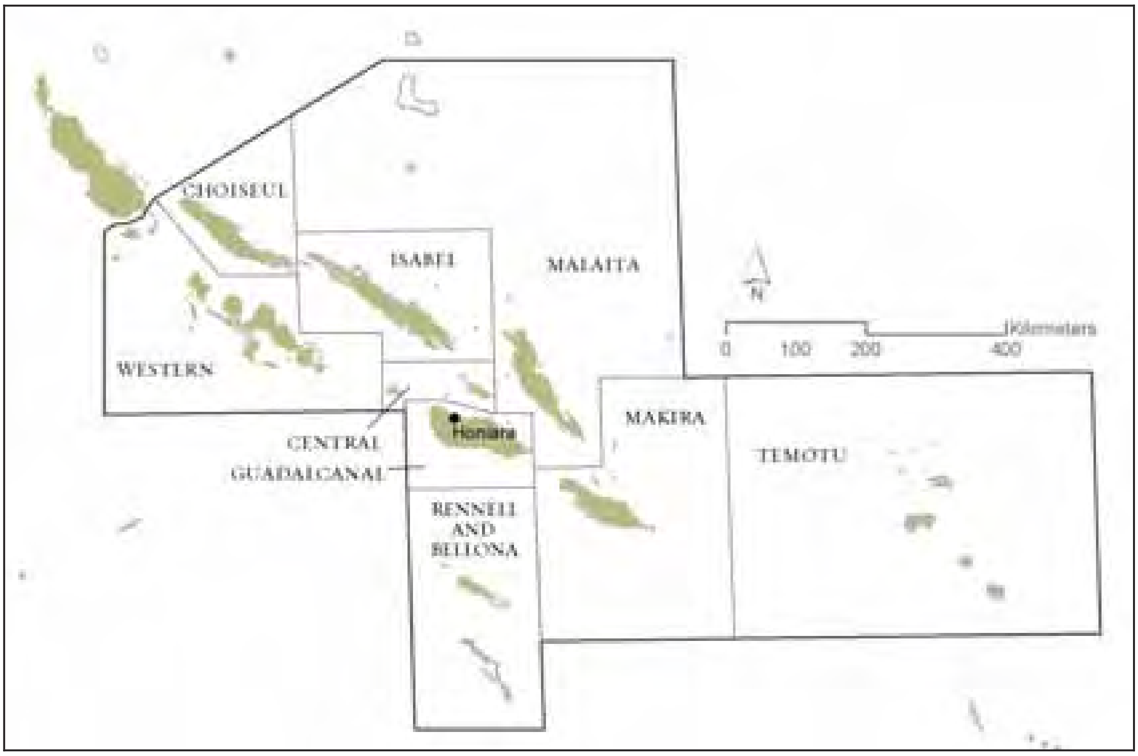


Figure 3. The provinces of the Solomon Islands.

Meadows are predominately on fringing reef flats and mostly continuous (93% of all meadow area) in landscape structure (Table 2). Meadows dominated by *Thalassia hemprichii* were the most common, comprising approximately 42% of area of all meadows encountered. The most dominant single seagrass community (21%) was monospecific *Enhalus acoroide*s meadows. Meadows of the greatest cover were dominated by *Cymodocea* spp.

Table 2. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Solomon Islands – May/June 2004.

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
H. uninervis/T. hemprichii/C. rotundata		49.5 ±1.45			0.19	0.19
H. minor	3.52 ±0.78	42.22 ±2.70			0.50 (4)	0.50
E. acoroides with *H. uninervis*		26.67 ±6.67		0.87 (1)		0.87
T. hemprichii/H. ovalis with *E. acoroides*	6.70 ±1.77				0.99 (1)	0.99
C. serrulata with mixed species	1.79 ±1.79	83.84			1.07 (1)	1.07
H. uninervis with *H. ovalis*		37.78 ±4.80			1.10 (3)	1.10
H. decipiens		6 ±2.08			1.12 (1)	1.12
C. rotundata		45.40 ±3.87		0.83 (2)	0.38 (3)	1.21
H. ovalis with mixed species	2.68 ±0.67	41.78 ±4.25	0.19 (1)	1.10 (2)	0.15 (1)	1.45
H. uninervis	2.01 ±1.16			1.98 (1)		1.98
C. rotundata/ H. uninervis with mixed species	32.81 ±1.77	48 ±1.89		1.86 (2)	0.13 (1)	1.99
C. rotundata with *E. acoroides*		74.33 ±12.21			2.43 (2)	2.43
E. acoroides/H. ovalis	15.07 ±15.07	12 ±6.24		2.98 (1)		2.98
T. ciliatum		0		3.72 (2)		3.72
T. hemprichii with *H. uninervis* & mixed species		58 ±12.81			4.67 (2)	4.67
H. minor with *H. uninervis*		24.17 ±2.63			5.12 (2)	5.12
H. ovalis with *E. acoroides*	5.86 ±2.06	42.29 ±4.68	0.09 (1)	3.00 (1)	2.15 (3)	5.23
T. ciliatum/C. rotundata with mixed species					5.36 (1)	5.36
H. uninervis with *E. acoroides* & mixed species	2.34 ±0.39	33.83 ±6.61		0.97 (2)	4.41 (1)	5.38
H. uninervis with *H. ovalis* & mixed species	0.36 ±0.36	24.75 ±6.57		5.54 (2)		5.54

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
T. hemprichii with *H. ovalis* & mixed species	5.69 ±2.44	34.75 ±6.00	0.01 (1)		6.74 (2)	6.75
T. hemprichii/E. acoroides with *C. rotundata*		71.11			6.79 (1)	6.79
E. acoroides/Cymodocea spp with mixed species		50.73 ±8.90		0.29 (1)	6.75 (4)	7.04
H. uninervis with *Cymodocea* spp/*T. hemprichii* & mixed species		51.5 ±2.68		0.10 (1)	8.04 (1)	8.14
H. uninervis with *T. hemprichii* & mixed species	23.77 ±8.88	52.33 ±12.32			8.22 (6)	8.22
S. isoetifolium with mixed species	111.82 ±5.95	65.00 ±10.63		0.25 (1)	8.69 (3)	8.94
T. hemprichii with *H. ovalis*	16.54 ±7.31	68.61 ±5.40	1.61 (3)	1.49 (1)	8.25 (2)	11.35
E. acoroides/H. uninervis with *T. hemprichii*		63.33 ±3.33			11.84 (1)	11.84
E. acoroides with *H. ovalis*	0.39 ±0.39	36.36 ±4.77	0.56 (1)	5.85 (3)	7.89 (5)	14.30
Cymodocea spp with *T. hemprichii*					14.59 (2)	14.59
H. ovalis	2.72 ±1.52	44.24 ±2.24	0.64 (3)	10.61 (11)	3.87 (9)	15.12
C. serrulata/S.isoetifolium with mixed species	128.56	85.72 ±5.53			15.80 (2)	15.80
H. uninervis/H. ovalis		38.59 ±6.45			16.36 (3)	16.36
T. hemprichii/C. rotundata with mixed species	112.49 ±1.16	57.50 ±9.34			16.73 (4)	16.73
T. hemprichii with mixed species		42.21 ±8.19			19.31 (1)	19.31
E. acoroides with *Cymodocea* spp & mixed species	20.53 ±20.53	50.56 ±8.02			19.95 (3)	19.95
Cymodocea spp with *E. acoroides* & mixed species		77.27 ±4.72	2.81 (1)		21.27 (4)	24.08
T. hemprichii/H. ovalis	4.35 ±0.91	42.33 ±3.18		0.35 (1)	25.09 (3)	25.43
E. acoroides/T. hemprichii with mixed species	39.97 ±17.53	61.79 ±7.03		0.11 (1)	29.54 (5)	29.64
C. rotundata with mixed species	27.99 ±7.00	54.99 ±6.42	1.30 (2)	0.46 (2)	32.12 (7)	33.88
C. serrulata with *E. acoroides* & mixed species		79.00 ±5.84		0.28 (1)	36.14 (4)	36.43
E. acoroides/T. hemprichii		56.48 ±7.59	0.001 (1)		39.11 (7)	39.11
C. rotundata with *T. hemprichii*		75.2 ±6.56			46.08 (6)	46.08
C. rotundata/T. hemprichii with mixed species	35.99 ±27.82	59.04 ±10.41			49.03 (10)	49.03
C. rotundata with *T. hemprichii* & mixed species	50.00 ±21.55	58.97 ±6.29	1.73 (2)	2.22 (2)	46.53 (10)	50.47
C. rotundata with *E. acoroides* & mixed species		81.28 ±7.10			51.57 (2)	51.57
E. acoroides/S.isoetifolium/C. rotundata & mixed species		53.44 ±4.70		66.19 (1)		66.19
C. rotundata/E. acoroides/T. hemprichii with mixed species	9.37	58.22 ±4.91			88.18 (1)	88.18
T. ciliatum/T. hemprichii/C. rotundata with mixed species		50.60			90.75 (1)	90.75
T. hemprichii with *C. rotundata*	25.62 ±18.71	51.44 ±5.45	1.10 (3)	1.94 (3)	90.64 (8)	93.69
H. ovalis/T. hemprichii with *E. acoroides*		31.42 ±2.00			99.67 (1)	99.67
T. hemprichii	12.26 ±3.23	37.08 ±3.30	1.40 (8)	37.16 (19)	64.58 (18)	103.14
C. rotundata/T. hemprichii/H. uninervis with mixed species		51.15 ±2.33			136.42 (1)	136.42
E. acoroides with *T. hemprichii/H. ovalis*		31.43 ±2.61			139.09 (3)	139.09
E. acoroides with *T. hemprichii/Cymodocea* spp & mixed species	15.49 ±18.85	59.80 ±5.51			150.16 (7)	150.16
C. rotundata with *E. acoroides/T. hemprichii*	6.92 ±6.92	63.33 ±2.89			156.46 (3)	156.46
C. rotundata/T. hemprichii	60.60 ±7.70	48.33 ±13.13		14.84 (2)	243.99 (4)	258.83
T. hemprichii/E. acoroides	65.29 ±65.29	43.42 ±5.03	0.09 (1)	11.13 (2)	281.59 (3)	292.81
E. acoroides with *T. hemprichii*	27.50 ±15.95	46.10 ±5.46	0.13 (1)	1.673 (3)	297.31 (18)	299.11
T. hemprichii with *C. rotundata* & mixed species	38.61 ±16.16	48.26 ±5.58			347.83 (12)	347.83
E. acoroides with *T. hemprichii* & mixed species	2.01 ±2.00	46.32 ±7.54	6.17 (1)		360.26 (5)	366.43
T. hemprichii with *E. acoroides* & mixed species	20.57 ±14.47	67.19 ±8.54		3.63 (3)	399.95 (8)	403.58
T. hemprichii/E. acoroides with *S.isoetifolium*		65.33 ±4.26			700.14 (1)	700.14
T. hemprichii with *E. acoroides*	9.56 ±2.77	46.461 ±6.62	3.92 (4)	149.49 (3)	630.93 (10)	784.34
E. acoroides	6.39 ±3.85	25.78 ±5.24	50.35 (51)	44.70 (35)	1322.07 (51)	1417.13
Total			**72.08 (85)**	**375.60 (112)**	**6186.13 (289)**	**6633.82**

Halophila decipiens was the rarest species in the Solomon Islands, being found at only one site in Tambea, north western Guadalcanal. This however, may be an artefact of the sampling design, as the survey concentrated on areas down to 6m depth and *Halophila decipiens* is generally found in deeper waters. Other species that were also relatively rare inlcude: *Thalassodendron ciliatum*, being found only on the eastern coastline of Malaita; *Halophila minor*, only found at six sites (incl. southern Choiseul, Florida Islands, and northern Guadacanal & Savo). *Syringodium isoetifolium* was absent from Central and Guadalcanal provinces, and *Cymodocea serrulata* was mainly restricted to islands south of 8 degrees latitude. The only location north that *Cymodocea serrulata* was found was on the fringing reefs between Chirovanga and Polo (NE Choiseul). All other species were widely distributed throughout the Solomon Islands.

Rhizophora stylosa, was the most common mangrove encountered and it had the widest distribution in the survey area, occurring throughout the Solomon Islands. Where *R. stylosa* occurred it also tended to be the dominant species.

MALAITA PROVINCE

Long stretches of white-sand beaches line the shore of northern Malaita Island (Figure 4). 3607.62 hectares of seagrass was mapped in 59 meadows in the province between 10 - 14 June 2004. 99 percent of seagrass meadows in the province were of continuous cover (Table 3) and located on large intertidal reef/mud flats in protected bays, lagoon and on the leeward side of vegetated islands. Most of the meadows (90%) identified were either *Thalassia* or *Enhalus* dominated communities (<1m depth) adjacent to mangroves and coral reefs in lagoons, protected bays or on the leeward side of larger islands. Seagrass cover was moderately high and often associated with the macro-alage *Caulerpa racemosa*, *Halimedia cylindrical* and *Halimedia opuntia*. Meadows of *Halophila ovalis* (2-3 m depth) were found in sheltered lagoon channels, usually on coarse sand, associated with *Halimedia cylindrica*. On fringing reefs, inside the reef crest on exposed coast, *Thalassia* and *Cymodocea* meadows dominated (<1 m depth) on coarse sand, shell, reef substrate associated with *Halimedia* and turf algae.

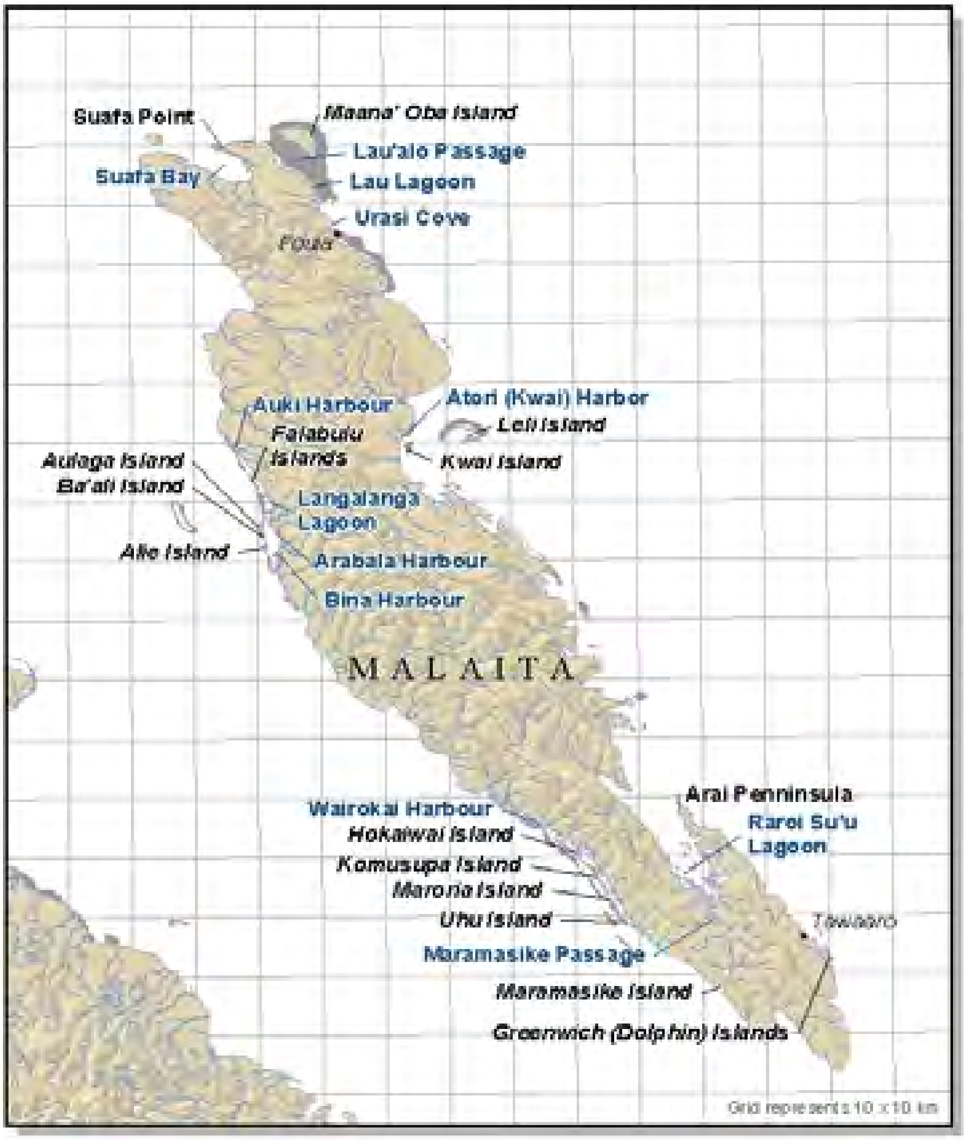


Figure 4. Malaita Province

Extensive intertidal and subtidal meadows were present in Lau Lagoon. The large shallow (~1.5m deep) lagoon stretched 3-5 km along the coast between Maana'oba Island and Malaita (Lau'alo Passage), on the north-eastern coast.

The lagoon is up to 1 km wide and fringed by significant stands of mangroves (*Rhizophora stylosa*) on the mainland side. The landward edge was dominated by *E. acoroides* (mean quadrat cover = 34%) in mud sediments. Towards mid regions of the lagoon communities of *E. acoroides*, *Thalassia hemprichii*, *Cymodocea rotundata*, *Halophila ovalis* dominated and were interspersed with reef. Seagrass cover was generally more abundant (mean quadrat cover = 52%) in the mixed species meadows. The mid region represented the dominant community type, surviving in relatively sheltered waters and coarse sand and shell sediments. On the seaward edges of the island expansive *Cymodocea rotundata*, *Thalassia hemprichii* and *Halophila ovalis* were present inside the reef crest. The area possibly represents the largest stand of seagrass in the eastern Solomon Islands. Seagrass stretched north into a large embayment and also continued southward through numerous sea-based communities inhabiting dwellings built on modified coral reefs.

Along the north western part of the passage, meadows of *Thalassia hemprichii/Enhalus acoroides* with *Syringodium isoetifolium* were present on the large fringing reef flats adjacent to the main coastline. *Thalassia hemprichii* with *Enhalus acoroides* meadows and *Thalassia hemprichii* with *Cymodocea rotundata* & mixed species meadows surrounded Maana'oba Island. The region is believed to be significant dugong and green turtle feeding grounds (Bruno Manele, Ruben Sulu Pers comm.). *Thalassodendron ciliatum* was reported from Urasi Cove, Malaita (Johnstone 1982) near Fouia village, just south of Lau Lagoon. Also aggregated patches of *Thalassodendron ciliatum* were found in Suafa Bay on the western side of Suafa Point on the edge of the fringing reef.

Table 3. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Malaita Province, Solomon Islands – June 2004.

CATEGORY	Cover (%)	Area in hectares (number of meadows)			Total (ha)
		Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
C. rotundata/T. hemprichii with mixed species	86 ±12			0.1 (1)	0.1
C. rotundata/T. hemprichii/H. uninervis with mixed species	51 ±2			136.42 (1)	136.42
E. acoroides	17 ±3	0.19 (3)	21.11 (8)	1024.17 (12)	1045.47
E. acoroides with *T. hemprichii*	40 ±3			68.89 (4)	68.89
E. acoroides with *T. hemprichii* & mixed species	54 ±7			357.25 (2)	357.25
E. acoroides with *T. hemprichii/Cymodocea* spp & mixed species	47 ±5			4.81 (2)	4.81
E. acoroides with *T. hemprichii/H. ovalis*	38 ±2			2.14 (1)	2.14
H. ovalis	39 ±5	0.18 (1)			0.18
H. ovalis/T. hemprichii with *E. acoroides*	31 ±2			99.67 (1)	99.67
T. hemprichii	50 ±5		1.33 (1)	10.06 (3)	11.39
T. hemprichii with *C. rotundata*	39 ±3			22.77 (2)	22.77
T. hemprichii with *C. rotundata* & mixed species	55 ±4			215.32 (3)	215.32
T. hemprichii with *E. acoroides*	24 ±5			535.15 (4)	535.15
T. hemprichii with *H. uninervis* & mixed species	58 ±12			3.71 (1)	3.71
T. hemprichii with *H. ovalis* & mixed species	35 ±6			4.72 (1)	4.72
T. hemprichii with mixed species	42 ±8			19.31 (1)	19.31
T. hemprichii/E. acoroides	33 ±1			280.34 (2)	280.34
T. hemprichii/E. acoroides with *Syringodium isoetifolium*	65 ±4			700.15 (1)	700.15
T. ciliatum			3.72 (2)		3.72
T. ciliatum/C. rotundata with mixed species				5.36 (1)	5.36
T. ciliatum/T. hemprichii/C. rotundata with mixed species	51 ±0			90.75 (1)	90.75
Total		**0.37 (4)**	**26.16 (11)**	**3581.09 (44)**	**3607.62 (59)**

Aggregated patches of *Enhalus acoroides* line the edges of the mangroves of Auki Harbour, in northern Langalanga Lagoon. Meadows were only 30-40m wide and were generally scattered southward throughout the lagoon. Communities were very patchy with some sheltered *Enhalus acoroides*, *Thalassia hemprichii* and *Halophila ovalis* assemblages near the mangroves. Larger meadows of continuous and aggregated patches of *Thalassia hemprichii* with *Enhalus acoroides* were located on the reef flats of the Falabulu Islands. Only a few small aggregated patches of *Enhalus acoroides* were present in the Harbours of Bina and Arabala, south of Langalanga Lagoon. No seagrasses were present on the seaward edges of Alite, Ba'ali and Aulaga Islands due to exposure from oceanic swells.

The lagoons immediately south and north of Wairokai Harbour were devoid of seagrass, and there was no seagrass in the entrances from the ocean. Rocky shore platforms on the outer coast were too exposed and did not appear to support seagrass growth. Mangroves (predominately *R. stylosa*) and coral reef fringe much of the lagoon except for areas where settlement occurs and numerous mangrove islands occur throughout the lagoon.

South of Wairokai Harbour, in the lagoon between Hokaiwai Island and the mainland, a patch (30mx60m) of *Halophila ovalis* was found in a small sheltered channel. Further south, patchy *Enhalus acoroides* meadows were located on the eastern lagoon side of Komusupa Island extending its entire length to the oceanic entrance with Maroria island. No seagrass was found on the mainland coast opposite Komusupa Island but patches of monospecific *Enhalus acoroides* were found on the mainland coast inside Maroria Island. Fringing reefs on Maroria Island (north and south) supported *Thalassia hemprichii* and *Cymodocea rotundata* meadows along the shoreward fringe extending about 50m seaward. The reef crest was situated about 200-300m from shore providing sufficient protection for the largest seagrass meadow in the region. At the entrance between Maroria and Uhu Islands, *Thalassia hemprichii* meadows were found on the oceanic fringing reefs of Maroria Island but not on Uhu Island (too exposed and rocky). Meadows of *Enhalus acoroides* on the lagoon side of Uhu Island ranged from isolated patches to continuous meadows and were also found as isolated patches on the mainland coast inside Uhu Island. A deep-water *Halophila ovalis* meadow was found at 22m on western exposed side of Uhu island, outside the entrance of Maroria and Uhu island.

On the mainland eastern coast of Malaita, very patchy *Enhalus acoroides* meadows (few plants only) were scattered around the edges of Kwai Harbour, fringing the mangroves. Larger continuous *Thalassia hemprichii* meadows were located around Kwai Island, further south. On the mainland coast a large expanse (~500m wide) of seagrass in a lagoon on the landward side of the reef crest dominated the area. Typically communities of seagrass (*Thalassia hemprichii, Cymodocea rotundata, Enhalus acoroides, Halophila ovalis*) were scattered across the coastline (~3-5km) with small islands and reefs interspersed among seagrass which dominate near the reef crest. In sheltered bays *Enhalus acoroides* grew adjacent to mangroves in mud sediments and interspersed with sheltered reefs. Also in areas along the open coast but sheltered by reefs more than 500m from the coast are *Enhalus acoroides* meadows growing to 3m adjacent to black sand beaches. The waters here were typically brownish in color, possibly tannins from nearby coastal vegetation. Local men harvest coral for building materials. Numerous small dwellings are built on coral reefs modified by additions of coral blocks.

About 3 km off the Maliata east coast is horseshoe shaped Leli island. In the protected lagoon were extensive *Thalassia hemprichii, Cymodocea rotundata* and *Halophila ovalis* meadows growing in sand dominated sediments. On the outer side of the island were mangroves and communities of *Thalassia hemprichii* and *Halophila ovalis* on coarse sediments.

Off southern Malaita is Maramasike Island. It is separated from Malaita Island proper by the 20km long Maramasike Passage which in places is only 400m wide. Nietschmann *et al.* (2000) reported significant seagrass meadows in the region, but no further description is given.

Although not ground truthed, northern Raroi Su'u Lagoon in the northern part of the passage was visited during the survey. Seagrasses may be extensive in the area, as it is a calm, protected waterway fringed by mangroves. At the end of the Maramasike Passage was a number of small mangrove fringed islands possibly surrounded by small (<50m) fringing reefs and *Enhalus* *acoroides* meadows. The sheltered habitat of this embayment is suitable for *Enhalus acoroides* and likely to be present. Mangroves also fringed the mainland coast on both sides of the embayment and scattered patchy *Enhalus acoroides* meadows may be present. *Thalassodendron ciliatum, Halophila ovalis* and *Cymodocea rotundata* were found near the cape of Arai Peninsula.

On the south eastern coast of Maramasike Island are the Greenwich (Dolphin) Islands. This region had high seagrass diversity and extensive seagrass meadows consisting of sheltered *Enhalus acoroides* habitat, lagoon communities of *Thalassia hemprichii, Halophila ovalis*, *Cymodocea* spp, *Halodule uninervis* and *Thalassodendron ciliatum*. A large, abundant and continuous *Cymodocea rotundata/Thalassia hemprichii/Halodule uninervis* with mixed species meadow was located across the extensive reef flat adjacent to Tawaaro. Here the people hunt dolphin, capturing up to 700 at one time (see *Oceanic Cetaceans & Associated Habitats*, this report). A population of about 20 dugong were reported to regularly feed in the area.

CHOISEUL PROVINCE

Choiseul Island is a long, narrow, densely wooded island, with a shoreline consisting of long narrow beaches, some of which are bordered by large, shallow freshwater wetlands (Figure 5). 753.93 hectares of seagrass was mapped in 49 meadows in the province between 21 – 24 May 2004. Approximately 80 percent of seagrass meadows were dominated by *Thalassia hemprichii*, with *Enhalus acoroides* or other species present. 70 percent of seagrass meadows in the province were of continuous cover (Table 4) and located on large intertidal fringing reef flats in protected bays, lagoons and on the leeward side of vegetated islands. Meadows located on the narrow fringing reefs adjacent to mangroves (predominately *R. stylosa*) were predominately aggregated *Enhalus* communities (<1m depth).

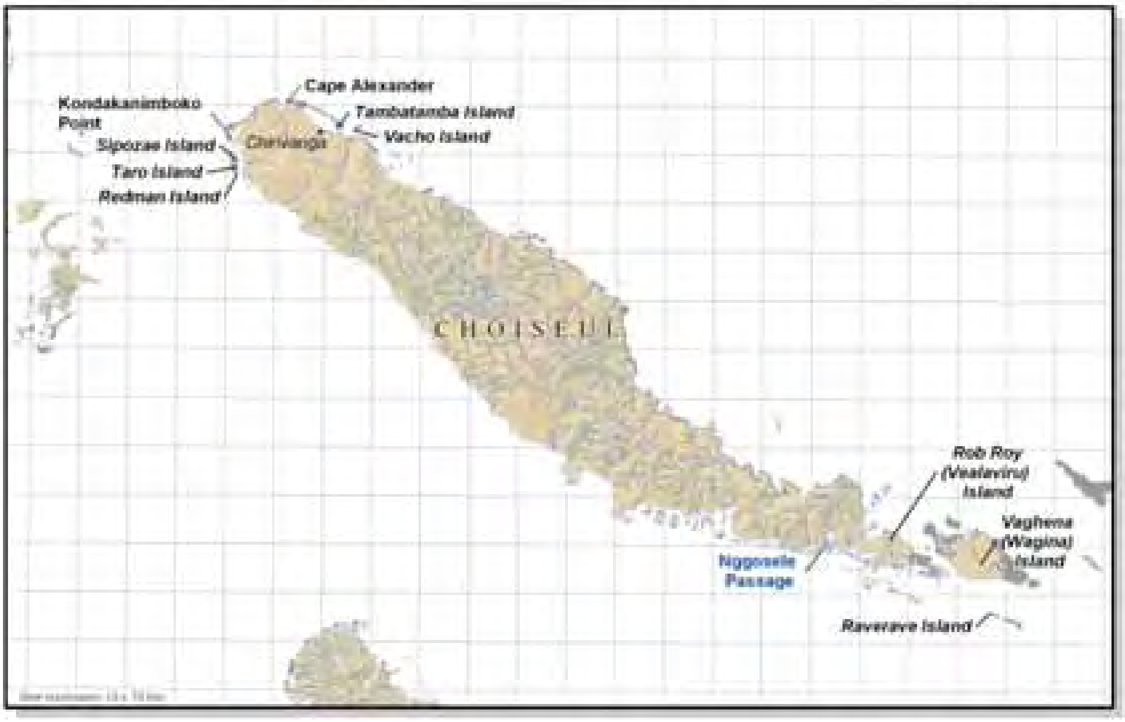


Figure 5. Choiseul Province

Table 3. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Choiseul Province, Solomon Islands – May 2004.

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
C. rotundata/H. uninervis with mixed species		69 ±4		1.7 (1)		1.7
C. serrulata with *E. acoroides* & mixed species		90 ±6			17.41 (1)	17.41
C. serrulata/S.isoetifolium with mixed species		77 ±9			8.75 (1)	8.75
E. acoroides		25 ±6	2.45 (6)	2.82 (2)	5.97 (2)	11.24
E. acoroides with *T. hemprichii*		38 ±3			0.91 (1)	0.91
E. acoroides with *T. hemprichii/Cymodocea* spp & mixed species		58 ±3			24.07 (1)	24.07
E. acoroides/S.isoetifolium/C. rotundata & mixed species		53 ±5		66.19 (1)		66.19
E. acoroides/T. hemprichii		10 ±4	0.005 (1)			0.005
E. acoroides/T. hemprichii with mixed species	64.95 ±31.6				0.06 (1)	0.06
H. minor	3.515 ±0.77	63 ±5			0.03 (2)	0.03
H. ovalis	2.845 ±1.18	54 ±4		1.12 (2)	0.36 (3)	1.48
H. ovalis with mixed species		56 ±3			0.15 (1)	0.15
T. hemprichii	13.11 ±2.60		0.2 (2)	0.68 (1)	5.71 (5)	6.59
T. hemprichii with *C. rotundata*	6.361 ±1.00				1.63 (1)	1.63
T. hemprichii with *E. acoroides*	7.085 ±1.74	48 ±7	1.66 (1)	148.72 (1)	79.58 (3)	229.96
T. hemprichii with *E. acoroides* & mixed species	15.89 ±7.71	64 ±4			374.48 (4)	374.48
T. hemprichii with *H. ovalis*	7.756 ±7.47	71 ±4	0.79 (2)		8.14 (1)	8.93
T. hemprichii with *H. ovalis* & mixed species	9.374 ±3.72		0.01 (1)			0.01
T. hemprichii/H. ovalis	0.669 ±0.66				0.33 (1)	0.33
Total			**5.12 (13)**	**221.23 (8)**	**527.58 (28)**	**753.93 (49)**

Rob Roy and Wagina Islands, off Choiseul's south-eastern coast, are partly mangrove and surrounded by large intertidal/shallow subtidal (<10m) reef and sandflats. On the eastern side of Wagina Island at the shoreward extent of the large banks were significant meadows of *Enhalus acoroides* and *Thalassia hemprichii*, with *Cymodocea* spp & mixed species covering an estimated combined total of 200ha. Elsewhere, meadows are reduced to narrow intertidal/shallow subtidal fringes along the sheltered shorelines of the many scattered islands. Small patches of seagrass can be found within the sheltered lagoons of barrier reef islands (e.g., Raverave Is).

John Pita reported seagrass meadows in Nggosele Passage near Taora village, however due to time constraints we were unable to examine the Passage. They were likely to be *Enhalus acoroides* and *Halophila* species bordering the mangroves. Similarly, reports of seagrass meadows in the Kuliu region (mid-western coast) and Nanago Reef (mid-eastern coast) could not be verified.

A few kilometers to the west of Nggosele Passage, toward Ndololo Island, are several narrow inlets (fjords) with significant freshwater influence. Small patches (<100m^2) of *Halophila minor* were located on the narrow banks.

Seagrass (*Thalassia hemprichii* and *Halophila ovalis*) was scattered across the reef-flats on the western sides of Sipozae, Taro and Redman Islands (~120ha), Choiseul Bay. Significantly more *Halophila ovalis* is present between on the intertidal sandbanks between Taro and Redman Islands than has been recorded throughout the remaining Choiseul Island. These meadows would appear suitable for dugong (a few individuals), confirmed by the sighting of a large individual on the morning of our survey. The remaining seagrasses of Choiseul Bay, were *Enhalus acoroides* and *Thalassia hemprichii* meadows (~6ha) along the eastern shores of Sipozae and Taro Islands and the southern shores of Kondakanimboko Point (West Cape). A few isolated *Enhalus acoroides* along the eastern shores of Choiseul Bay, although not of any significant size.

Some of the most extensive seagrass meadows in the province can be found in the north-eastern corner. Large intertidal and shallow subtidal meadows dominated by *Enhalus acoroides* and *Thalassia hemprichii* can be found across the expansive barrier reef-flats, particularly associated with vegetated islands. The most extensive meadows encountered in the province were on the reef flats out from Tambatamba Island and Cape Alexander. The meadows covered an area of approximately 106ha and 260ha, respectively. The meadow off Tambatamba Island was significantly greater biomass, and appeared productive for artisinal fisheries as 5 groups of fishers were observed using nets and lines during the time of our examination. The meadow was abundant with goatfish (*Barberinus* sp), three-line wrasse (*Stethojulis strigiventer*) and hiding on the seabed with the grass were several white-spotted puffer fish (*Arothron hispidus*).

The coastal meadows sheltered behind the fringing reef flat in the vicinity of Chirivanga, were diverse with up to 7 species present at a single site. Two of the larger meadows encountered, were on the eastern sides of small points opposite Tambatamba and Vacho Islands. These meadows (9 and 17ha respectively) were dominated by *Cymodocea serrulata* and *Syringodium isoetifolium*, with a combination of other species (*E. acoroides, H. ovalis, H. uninervis (wide & narrow leaf form), C. rotundata, T. hemprichii*). These meadows were of high biomass for the species mix, and were abundant fish such as the barred halfbeak (*Hemiramphus far*), scribbled rabbitfish (*Siganus spi*nus) and threespot damselfishes (*Pomacentrus tripunchtatus*).

The remainder of the coastal meadows fringed the mangroves and were dominated by aggregated patches of *Enhalus acoroides/Syringodium isoetifolium/Cymodocea rotundata* & mixed species. In the mangrove islands surrounding the Chirivanga village, meadows were dominated by *Enhalus acoroides* with relatively few other species present.

ISABEL PROVINCE

Isabel is the longest island in the Solomon's and dominates the province (Figure 6). It is a large, mainly volcanic landmass with steep mountain ranges and mangrove and freshwater wetlands prevalent along the coast. 535.99 hectares of seagrass was mapped in 99 meadows in the province between 14 – 20 May 2004. Seagrass communities are dominated by *Enhalus acoroides* (74% of seagrass area), 86% of which were continuous cover (Table 5). Meadows were located on large intertidal reef/mud flats in protected bays and lagoons. Seagrass cover was moderately high and often associated with the macro-alage *Caulerpa* and *Halimeda*.

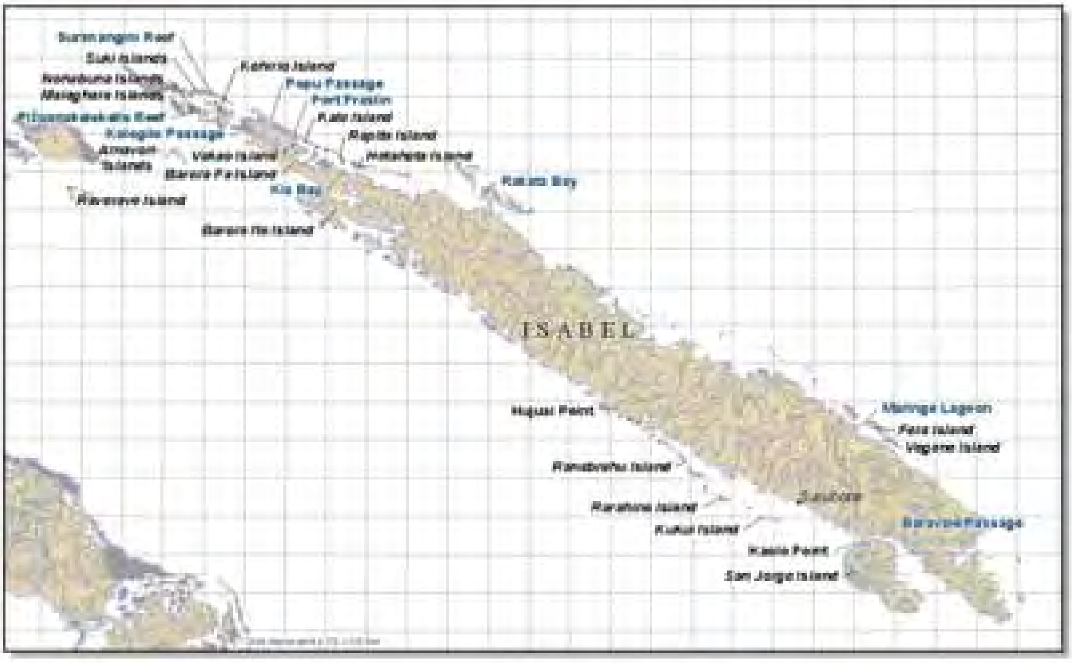


Figure 6. Isabel Province

Table 4. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Isabel Province, Solomon Islands – May 2004.

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
C. rotundata		38 ±2			0.2 (2)	0.2
C. rotundata with *E. acoroides*		88 ±4			1.91 (1)	1.91
C. rotundata with *mixed species*	34.23 ±8.66	57 ±5	0.82 (1)	0.46 (2)	1.56 (3)	2.84
C. rotundata with *T. hemprichii* & mixed species		50 ±3		1.84 (1)	1.45 (1)	3.29
C. rotundata/T. hemprichii		77 ±9			0.93 (1)	0.93
C. rotundata/T. hemprichii with mixed species	6.026 ±3.06	59 ±3			21.25 (2)	21.25
C. serrulata with *E. acoroides* & mixed species		70 ±6			1.5 (1)	1.5
E. acoroides	10.82 ±5.87	25 ±4	20.27 (10)	2.1 (6)	202.65 (11)	225.02
E. acoroides with *H. uninervis*		27 ±7		0.87 (1)		0.87
E. acoroides with *H. ovalis*	0.334 ±0.33	48 ±9		0.31 (1)	2.21 (1)	2.52
E. acoroides with *T. hemprichii*	54.23 ±31.1	57 ±7		0.17 (1)	112.5 (4)	112.67
E. acoroides with *T. hemprichii* & mixed species	2.008 ±2.00	15 ±5	6.17 (1)			6.17
E. acoroides with *T. hemprichii/Cymodocea* spp & mixed species		80 ±6			0.13 (1)	0.13
E. acoroides/Cymodocea spp with mixed species		64 ±7			4.48 (1)	4.48
E. acoroides/H. uninervis with *T. hemprichii*		63 ±3			11.84 (1)	11.84
E. acoroides/T. hemprichii		69 ±9			34.93 (3)	34.93
H. uninervis	2.008 ±1.15			1.98 (1)		1.98
H. uninervis with *E. acoroides* & mixed species		53 ±12			4.41 (1)	4.41
H. uninervis with *H. ovalis*		11 ±3			0.24 (1)	0.24
H. uninervis with *T. hemprichii* & mixed species	17.40 ±2.41				4.2 (1)	4.2
H. uninervis/H. ovalis		27 ±15			0.54 (1)	0.54
H. ovalis	3.162 ±1.92		0.45 (1)	9.14 (7)	0.64 (1)	10.23
H. ovalis with *E. acoroides*	5.859 ±2.05	48 ±6			2.15 (3)	2.15
S.isoetifolium with mixed species		46 ±4		0.25 (1)		0.25
T. hemprichii	11.66 ±2.32	48 ±2	0.66 (1)	18.55 (6)	0.57 (1)	19.78
T. hemprichii with *C. rotundata*	42.85 ±39.8	50 ±12		1.63 (1)	3.98 (2)	5.61
T. hemprichii with *C. rotundata* & mixed species	40.25 ±9.52				15.22 (2)	15.22
T. hemprichii with *E. acoroides*	10.79 ±3.27	63 ±7	0.8 (1)		5.64 (2)	6.44
T. hemprichii with *E. acoroides* & mixed species		89 ±5			0.26 (1)	0.26
T. hemprichii with *H. ovalis*	70.30 ±17.1	63 ±9			0.11 (1)	0.11
T. hemprichii with *H. ovalis* & mixed species	2.008 ±1.15				2.02 (1)	2.02
T. hemprichii/E. acoroides	65.28 ±65.2	62 ±6		5.77 (1)	1.25 (1)	7.02
T. hemprichii/H. ovalis	8.035 ±1.15	55 ±6		0.35 (1)	23.64 (1)	23.99
T. hemprichii/H. ovalis with *E. acoroides*	6.696 ±1.77				0.99 (1)	0.99
TOTAL			**29.17 (15)**	**43.42 (30)**	**463.4 (54)**	**535.99 (99)**

On the south-eastern coast, seagrasses are located in sheltered lagoons or reef flats. In Maringe Lagoon, seagrasses are predominately *Enhalus acoroides* and *Thalassia hemprichii* with some *Halodule uninervis* and *Halophila ovalis* in places. In the south of Maringe Lagoon, large seagrass meadows cover much of the fringing reef flats with *Enhalus acoroides* and *Thalassia hemprichii* inshore, becoming more isolated patches of *Enhalus acoroides* toward the reef crest amongst the corals (e.g. *Porities*). Along the western shores, the fringing reef is narrow and drops to deep water (~25m) within 100m from the shore. Large beds of *Sargassum* dominate. Seagrass in these areas in restricted to a narrow shallow subtidal fringe on 5-10m wide, dominated by *Thalassia hemprichii* and *Enhalus acoroides*. To the north of the lagoon, seagrasses are absent due to the high exposure to waves. The seabed is barren with isolated patches of *Sargassum* on dark fine highly mobile sands. Turbidity is also noticeably higher. On the leeward sides of Fera and Vegane Islands, seagrasses cover the nearshore shallow subtidal areas adjacent to patches of *Rhizophora stylosa*. Seagrass is also present on the protected side of the main reef. Dominated by *Cymodocea rotundata* and *Halodule uninervis*, with *Thalassia hemprichii* and *Halophila ovalis*, these meadows are relatively small (<1 ha).

On the southern coast, along the eastern side of the main island, the presence of seagrass depends on the level of protection from the prevailing winds and seas. In Huali Bay, Seagrass meadows are only found on the fringing reefs around Tanabuli Island and Tatamba.

Seagrass was absent in the turbid waters of Kaolo Point, near the mouth of Baravale Passage, which is lined with extensive intact mangrove stands (*Rhizophora*). The sands are finer and darker in colour and exposed to the waves and oceanic swell. *Sargassum* is abundant (25-100% cover). On the north-western side of San Jorge Island, isolated plants of *Enhalus acoroides* are present within a few metres of the shore, particularly if a narrow fringing reef is present. On the northern sides of headlands where the waters are more protected, small meadows dominated by *Cymodocea serrulata* with *Enhalus acoroides* can be found, of significant abundance (60-80% cover). There also appears to be significant mixing of freshwater, as the top few centimetres of the waters are low salinity. These areas are heavily fished for trevally and baitfish. On the seaward edge and reef crest, *Sargassum* is abundant. In bays where the reef flat is much wider the seagrass meadows are larger. Inshore, adjacent to the mangroves (*Rhizophora stylosa*) the meadows is almost exclusively *Enhalus acoroides*, this changes to a *Thalassia hemprichii* and *Cymodocea rotundata* dominated meadows with isolated *Enhalus acoroides* plants at approximately 10-15m from shore. Towards the reef crest, *Syringodium isoetifolium* is present, before the reef flat becomes more coral/*Sargassum* dominated with a few isolated *Enhalus acoroides* plants.

Heading northward along the coast between Baravale Passage and Susubona Village, seagrasses are limited to the protected northern sides of headlands, within relatively narrow fringing reefs (50-100m). These areas are protected from oceanic swells and the prevailing trade winds. Seagrass meadows are generally small and dominated by *Cymodocea rotundata* with *Thalassia hemprichii* and isolated *Enhalus acoroides* plants. Seagrasses are also found on the leeward (northern) intertidal/shallow subtidal flats of vegetated islands. These meadows can be very extensive and diverse. They are mainly dominated by *Thalassia hemprichii* and *Cymodocea rotundata*, with *Halophila ovalis, Halodule uninervis* and the occasional *Enhalus acoroides* plant. Smaller islands with smaller reef flats are generally dominated by *Thalassia hemprichii* with *Halophila ovalis* on coarse sand.

Along the parts of the coastline, which are protected by an outer barrier reef (Kukui, Rarahina and Tanabrahu), the waters are generally more turbid and the size of the meadows dependent on the size of the fringing reef. Much of the coast in these sheltered waters is fringed by dense mangroves and within 10m of deep-water (20-30m) drop-offs and larger rivers which drain catchments into the lagoon. The turbidity of the coastal waters may be a consequence of the logging activities. With such narrow fringing reefs, only a few isolated plants of *Enhalus acoroides* are able to exist. On the much larger fringing reef flats, the meadows are sometimes more extensive and dominated by abundant (60-80% cover) *Thalassia hemprichii*/*Cymodocea rotundata* and *Enhalus acoroides* with *Halodule uninervis*. Islands along the barrier reef are more exposed and if vegetated often have some *Thalassia hemprichii* and *Halophila ovalis* present (30-50% cover). Unvegetated cays are often associated with more mobile sediments and seagrass appears unable to establish.

Further northward along the coast, the reefs are fringing and are quite extensive in size. Seagrasses are generally confined to the lee side of large headlands (e.g., Hujuai Point), or are confined to the very shoreward portion of the reef. Behind headlands, isolated *Enhalus acoroides* plants are present just inside the reef crest, associated with *Caulerpa* and *Sargassum*. Moving shoreward, *Thalassia hemprichii* becomes more abundant and along the shore a narrow band of seagrass (5-10m wide) is generally dominated by *Halodule uninervis*/*Thalassia hemprichii* with *Halophila ovalis*. On the southern sides of large bays, *Halophila ovalis* is often found subtidally (down to 4m), and in the calmer inshore waters are *Enhalus acoroides*/*Thalassia hemprichii*/*Halodule uninervis* shoreward. These areas also often have high amounts of macroalgae (*Caulerpa* and *Halimeda*) and benthic micro-algae.

On the large fringing reefs, the seagrass meadows can be very different, depending on the size of the reef-flat, the presence of any islands, and the level of water movement. *Thalassia hemprichii* is often scattered across the reef-flat, and the occasional *Enhalus acoroides* plant is present within the protected environments of *Porites* corals. Shoreward the meadows become more continuous forming a distinct meadow dominated by *Thalassia hemprichii*/*Cymodocea rotundata*/*Halodule uninervis* with *Enhalus acoroides* and *Halophila ovalis*, often adjacent to mangroves (*Rhizophora* and *Brugeria*). On the very large reefs, often mangrove islands have established and a back lagoon is present. These reef-flats are predominately bare sand with isolated pockets of reef. *Halophila ovalis* is scattered across the sandy banks and can be quite abundant behind the mangrove islands. Isolated *Enhalus acoroides* plants are also present, often adjacent to small *Porites* bommies. Inshore of these large fringing reefs, the back lagoons can be quite deep (15-20m), rising quickly to the edge of the mangroves. *Enhalus acoroides* is sometimes present in sheltered pockets, but otherwise the extensive mangrove fringe is often bare.

Seagrass was found surrounding the north western bays of Barora Ite Island. Meadows were generally narrow, dominated by *Enhalus acoroides* and fringe intact *Rhizophora stylosa* and *Bruguiera*. Often the *Enhalus* plants are mixed in with coral (e.g., *Porities*) and macro-alage (*Valonia* & *Caraesmosa*). Juveniles of targeted reef fish (e.g., coral trout) were also abundant.

On the wider fringing reef flats, meadows are predominately *Thalassia hemprichii* with *Cymodocea rotundata*. On the eastern facing reef flats protected by small islands, meadows are generally continuous *Enhalus acoroides/Cymodocea spp* with mixed species. These meadows are often in highly turbid waters, with abundant fish (e.g., trevally, sardines) and high epiphytes. Seagrass was generally absent from the barrier reefs. Small patches of *Thalassia hemprichii* however were found on vegetated barrier reef islands (e.g., Hilihavo Island).

Within Rob Roy Channel, aggregated patches of *Enhalus acoroides, Thalassia hemprichii* (with *Cymodocea rotundata*) or *Halophila ovalis* were found on the fringing reef flats.

A small aggregated patch of *Enhalus acoroides* was the only seagrass located along the passage between Barora Ite Island and Isabel Island, contrary to previous reports from the region. The passage in generally deep (25-50m), narrow (~10m at the narrowest point), has high currents, turbid (2m visibility) and bordered by *Rhizophora stylosa* and narrow fringing reefs.

Between Kia Bay and Port Praslin, seagrasses communities can be found bordering the mangroves adjacent to narrow fringing reefs which surround some of the medium sized mid shelf islands (e.g., Ghateghe & Viketongana Islands). Between these islands and the larger island of Barora Fa, seagrasses are less common. Mangroves are more extensive, turbidity is higher and the sediments muddier. No seagrass was found on the western sides of Ghateghe or Vakao Islands. Seagrass was not common on the barrier reef islands. No seagrass was found surrounding Koropagho, Rapita or Hetaheta Islands, although a small meadow of *Thalassia hemprichii/Cymodocea rotundata/Halodule uninervis* was found on the western side of Kale Island. The large shallow reef flats were generally barren or contained patches of *Halimeda/Caulerpa*.

Unfortunately, Rakata Bay and its surrounds the reefs and islands could not be surveyed due to time constraints. It is highly likely that significant seagrass meadows may cover the sheltered fringing reefs in the area. Seagrasses have also been reported from Tina biro on the mid-eastern coast (Paul Riju pers comm.) but these were similarly not examined due to time constraints.

The Western Islands are a collection of more than 100 islands, along with the tiny Arnavon Islands, located off the northern coast of Isabel. Some of these islands are mangrove and have extensive reefs and sandbars. Seagrasses were not common on the fringing reef flats west of Popu Passage. Due to the strong currents passing through Kologilo Passage, seagrasses are restricted to isolated meadows behind larger islands. These meadows are sparse *Thalassia hemprichii* and *Halophila ovalis*. In some sites (eg Kohirio Is) the meadows also contain *Cymodocea rotundata* and form a more cohesive meadow within a few metres of the shore. The larger shallow reef flats are generally bare substrate with isolated patches of *Halimeda* and *Caulerpa*.

Seagrass was absent from the large shallow reef flats across the very northern tip of Isabel Island (Maduko, Surimangini & Pizuanakelekele Reefs). Seagrass was generally absent from the reef flats surrounding the exposed barrier reef islands of Suki and Malaghara. However, small meadows of *Halophila ovalis*.and *Halodule uninervis* were sometimes present in more sheltered locations adjacent to the slightly larger Nohabuna and Sibau Islands. Isolated patches of *Enhalus acoroides* were adjacent to the mangroves which bordered the passage between Kohirio and Kohirio Islands. No seagrass was on the exposed western reef flats of Kohirio Island.

The Arnavon Islands contain one of the largest nesting grounds in the world for the endangered hawksbill turtle (*Eretmochelys imbricata*) and is a declared MPA. Seagrass was virtually absent from the Arnavon Islands, with the exception of a small-scattered *Cymodocea rotundata* meadow adjacent to the TNC Research Station on Kerehikapa Island The remaining reef-flats and sandbars contained significant amounts of *Caulerpa*. Can you say any more about the mangroves in the Arnavons please?

WESTERN PROVINCE

The province includes the New Georgia, Treasury and Shortland Islands (Figure 7). 754.5 hectares of seagrass was mapped in 134 meadows in the province between 25 May - 1 June 2004. The Western Province had the highest diversity of seagrass communities in the Solomon Islands, with 37 different categories identified (Table 6). Most (89%) of seagrass meadows in the province were of continuous cover (Table 6) and approximately 50% of the meadows were *Cymodocea rotundata* dominated communities (<4m depth) located on large intertidal reef/mud flats in protected bays and lagoons. Of the remaining meadows, 22% were *Enhalus acoroides* dominated and 19% *Thalassia hemprichii* and *Halodule uninervis* dominated.

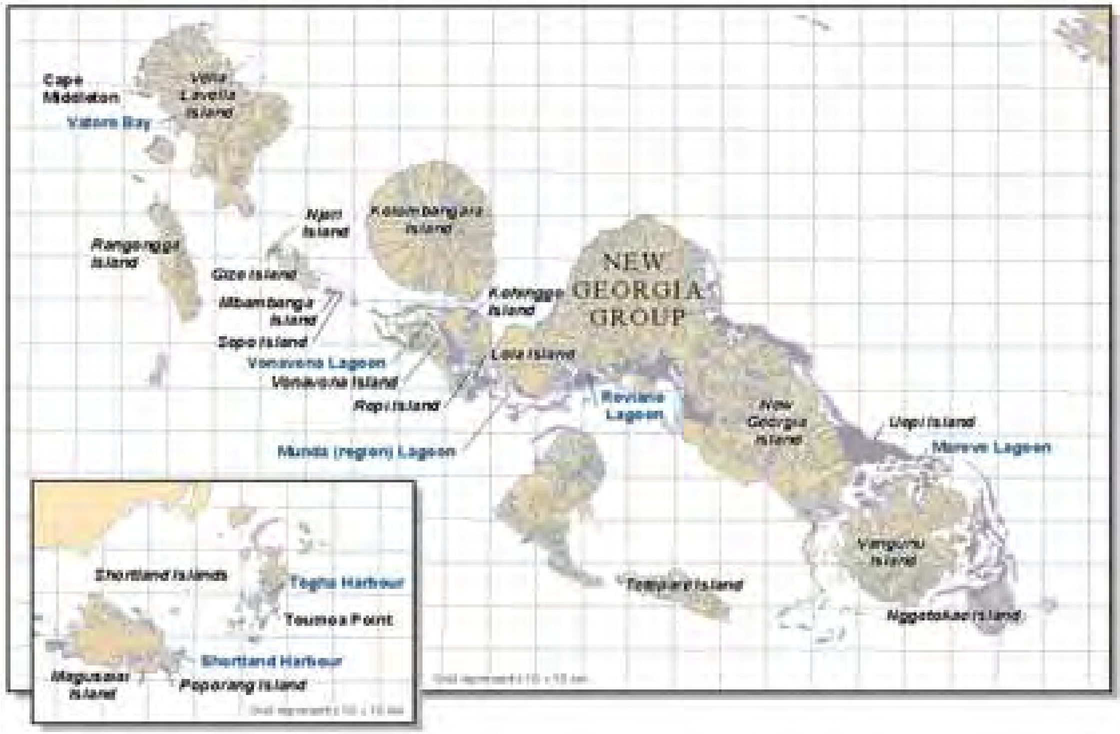


Figure 7. Western Province

Table 4. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Western Province, Solomon Islands – May/June 2004.

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
C. rotundata		42 ±3		0.23 (1)	0.18 (1)	0.41
C. rotundata with *E. acoroides* & mixed species		81 ±7			51.57 (2)	51.57
C. rotundata with *E. acoroides/T. hemprichii*	6.919 ±6.91	63 ±3			156.46 (3)	156.46
C. rotundata with *mixed species*	3.013 ±0.33		0.42 (1)		27.78 (1)	28.2
C. rotundata with *T. hemprichii*		84 ±2			43.36 (3)	43.36
C. rotundata with *T. hemprichii* & mixed species	31.47 ±26.2	70 ±3	0.62 (1)	0.37 (1)	20.07 (2)	21.06
C. rotundata/E. acoroides/T. hemprichii with mixed species	9.374 ±9.37	58 ±5			88.18 (1)	88.18
C. rotundata/T. hemprichii with mixed species		80 ±9			2.67 (1)	2.67
C. serrulata with *E. acoroides* & mixed species		78 ±6		0.28 (1)	17.24 (2)	17.52
C. serrulata with mixed species	1.785 ±1.78				1.07 (1)	1.07
C. serrulata/S.isoetifolium with mixed species	128.5 ±4.63	95 ±2			7.04 (1)	7.04
Cymodocea spp with *E. acoroides* & mixed species		78 ±4	2.81 (1)		14.97 (2)	17.78
Cymodocea spp with *T. hemprichii*					14.59 (2)	14.59
E. acoroides	0.502 ±0.50	33 ±7	25.3 (26)	15.46 (14)	65.77 (13)	106.53
E. acoroides with *Cymodocea* spp & mixed species	16.74 ±16.7	62 ±8			14.92 (1)	14.92
E. acoroides with *H. ovalis*		43 ±11	0.56 (1)	3.95 (1)	0.18 (1)	4.69
E. acoroides with *T. hemprichii*		47 ±6	0.13 (1)	0.88 (1)	9.17 (3)	10.18
E. acoroides with *T. hemprichii* & mixed species		42 ±12			2.52 (2)	2.52
E. acoroides/Cymodocea spp with mixed species		46 ±8		0.29 (1)	1.71 (2)	2
E. acoroides/H. ovalis	15.06 ±15.0	12 ±6		2.98 (1)		2.98
E. acoroides/T. hemprichii		84 ±3			0.69 (1)	0.69
E. acoroides/T. hemprichii with mixed species	88.38 ±31.3	61 ±9			19.42 (3)	19.42
H. uninervis with *Cymodocea* spp/*T. hemprichii* & mixed species		38 ±1			8.04 (1)	8.04
H. uninervis with *E. acoroides* & mixed species	2.343 ±0.33			0.61 (1)		0.61
H. uninervis with *H. ovalis*		51 ±6			0.87 (2)	0.87
H. uninervis with *H. ovalis* & mixed species	0.357 ±0.35	23 ±2		3.79 (1)		3.79
H. uninervis with *T. hemprichii* & mixed species		41 ±11			1.29 (1)	1.29
H. uninervis/H. ovalis		34 ±4			15.48 (1)	15.48
H. uninervis/T. hemprichii/C. rotundata		50 ±1			0.19 (1)	0.19
H. ovalis	0.334 ±0.17	36 ±3	0.01 (1)	0.02 (1)	0.4 (2)	0.43
H. ovalis with mixed species	2.678 ±0.66	8 ±3	0.19 (1)	0.62 (1)		0.81
T. hemprichii	10.95 ±4.88	32 ±3	0.36 (3)	6.3 (4)	16.1 (4)	22.76

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
T. hemprichii with *C. rotundata*	16.74 ±9.96				60.13 (2)	60.13
T. hemprichii with *C. rotundata* & mixed species	0.167 ±0.16	45 ±12			0.78 (1)	0.78
T. hemprichii with *E. acoroides*		63 ±14	1.47 (2)			1.47
T. hemprichii with *E. acoroides* & mixed species	25.17 ±21.2	75 ±22		3.62 (2)	15.02 (1)	18.64
T. hemprichii/E. acoroides		37 ±5		5.36 (1)		5.36
TOTAL			**31.87 (38)**	**44.76 (32)**	**677.86 (64)**	**754.49 (134)**

The Shortland Islands are a scattered group at the north-western tip of the Solomon Island chain and only 9km from Bougainville, Papua New Guinea. The north-western side of Shortland Island is dotted with reefs and islets. Seagrass meadows were found fringing the eastern shores of Togha Harbour and in front of Toumoa (Togha Point). *Cymodocea rotundata*, *Thalassia hemprichii* and *Cymodocea rotundata* dominated these meadows with aggregated *Enhalus acoroides* plants (generally amongst the reef). *Halophila ovalis* was also present but only bordering the main meadows. The remainder of fringing reefs in Togha Harbour were either devoid of seagrass or had a small scattering of *Halodule uninervis*. Larger meadows of *Enhalus acoroides* were located on patch reefs within Togha Harbour.

Surrounding the many scattered islands in the area, were smaller seagrass meadows. A narrow meadow of *Enhalus acoroides* and *Thalassia hemprichii* surrounded Rohae Island with scattered patches of *Halophila ovalis* extending down to 12m depth. Mainly intertidal and shallow sand flats, with the occassional scattering of *Halophila ovalis* and *Thalassia hemprichii*, surrounded other islands. Denser meadows were located along the sheltered shoes of the larger islands (e.g. Mania Is) and headlands. These meadows were mainly *Thalassia hemprichii* and *Cymodocea rotundata* with aggregated patches of *Enhalus acoroides* and a mixture *Halophila ovalis* and *Halodule uninervis*.

Significant seagrass meadows were located throughout Shortland Harbour, surrounding the main islands. These were predominately *Cymodocea rotundata/Thalassia hemprichii* in the northern parts, but the remainder were dominated by *Enhalus acoroides*. On the larger sandflats on the eastern sides of Poporang and Magusaiai Islands, *Thalassia hemprichii* was scattered across, with a narrow meadow of *Enhalus acoroides* bordering the mangrove shoreline.

The Treasury Islands include Mono and Stirling, and are the western most islands of the group. Only very small isolated patches of *Halophila ovalis* were found within Blanche Harbour, within a small cove west of Wilson Point on Stirling Island. Local villagers also reported small patches of *Halophila ovalis* along the eastern shores of Falamae, however these may be fairly isolated due to the compact nature of the sandy substrate and the exposure to oceanic waves. No larger meadows were encountered in the remainder of the harbour, a consequence of the relatively small area of fringing reef and the steeply sloping banks into deep (~30m) water.

The western region of the New Georgia Islands includes the Gizo, Kolombangara, Vella Lavella and Ranongga Islands. Most of these larger islands are volcanic (e.g., Kolombangara, Simbo, Vella Lavella), and there are also submarine volcanoes in the region.

In Vatoro Bay (Vella Lavella Island) seagrasses were restricted to the shoreline behind the larger reef flats (Cape Middleton) and in shallow sandy bays sheltered behind headlands. On the reef flats, seagrass were predominately scattered *Thalassia hemprichii* with a narrow *Cymodocea rotundata/Thalassia hemprichii* meadow along the shore. In the sheltered bays, sparse meadows of *Halodule uninervis* (narrow leaf) with *Halophila ovalis* were present on the sandy substrates.

Much of Gizo Island is protected by barrier reefs, sand and coral shoals. Smaller islands and cays with long sandy shores surround the main island. On the barrier reef islands, small patches of *Cymodocea rotundata* were present on the sheltered sides (e.g. Njari Island). Narrow (~15m) *Enhalus acoroides* dominated meadows border the northern shores of Gizo Island. Larger subtidal meadows dominated by *Cymodocea rotundata, Cymodocea serrulata, Thalassia hemprichii, Halodule uninervis* with some *Halophila ovalis* and *Enhalus acoroides* surround the islands of Mbambanga and Sepo. Two Seagrass-Watch monitoring sites were established on either side of Mbambanga Island in April 2004 and are monitored by WWFSPP-Gizo.

Two of the larger islands, which could not be examined due to time contratints, were Kolombangara and Ranongga. It is likely however, that the presence of seagrass would be limited as most of Kolombangara coastline is narrow coral-sand beaches/bays, and on the south east are several small protected coves. Kolombangara has also been heavily logged. The western coast of rugged narrow Ranongga Island falls abruptly into deep water, while the eastern coast is much lower, with terraces and onshore reefs.

In the Munda region of the Western New Georgia Islands is Vonavona Lagoon. The lagoon (>10m deep) is 28km long and located between Vonavona and Kohinggo Islands, and also protected by barrier reefs. Mangrove forests (predominately *Rhizophora*) fringe many parts of the lagoon. Within the lagoon are many islets, ringed by coral-encrusted shallows interspersed with deeper seas. Most of the inner chain of islets are surrounded by white coral-debris beaches, connected by sandbars at low tide. Seagrass meadows in the lagoon are predominantly subtidal with a narrow intertidal fringe, often adjacent to mangroves. Species include *Thalassia hemprichii, Cymodocea rotundata, Cymodocea serrulata, Halodule uninervis, Enhalus acoroides* and *Halophila ovalis*. Approximately 250 ha of seagrass was mapped across the intertidal and shallow-subtidal banks between the islands of Lola and Repi in southern Vonovona Lagoon. These large continuous meadows of relatively low cover and biomass were dominated by *Cymodocea rotundata* with *Thalassia hemprichii* and isolated patches of *Enhalus acoroides.* Dugongs are known to frequent these meadows, particularly between Repi and Lola Islands. The remaining meadows appear important for turtle feeding and subsistence fisheries. Vonavona is also an area with important hawksbill and green turtle nesting areas.

Mercier *et al.* (2000) and Dance *et al.* (2003) in a study of *Holothuria scabra* recruitment, reported significant seagrasses in Kogu Veke, Vonavona Lagoon, along the western coast of Kohinggo Island between 1997 and 1998. The bay of Kogu Veke covers an area of ca. 12 000 m^2 in a semi-enclosed lagoon with no freshwater input except for rain. The area was characterised by *Enhalus acoroides* and *Thalassia hemprichii* meadows on sandy and/or muddy sediment, and by coarse coral and shell substrata. An extensive mangrove swamp inundated at high tide for a distance of ca. 70 m bordered the northern limit of the area uniformly. The subtidal area along the southern limit was characterized by the presence of numerous coral patch reefs. Most of the area was exposed at low tide (excluding the mangrove area), while the deepest areas had a maximum depth of ca. 3 m. The bay was protected from storms by its geographical location and limited fetch.

Roviana Lagoon in the north-west New Georgia Group east of Munda, is protected from oceanic swells by barrier reefs and offshore islands 20-40m high. Within the lagoon are many small islets formed from coral shoals. The lagoon contains predominately subtidal seagrass meadows with a narrow intertidal fringe. Species include *Thalassia hemprichii, Cymodocea rotundata, Cymodocea serrulata, Halodule uninervis, Enhalus acoroides* and *Halophila ovalis*. The lagoon is a significant dugong and turtle feeding area and is also important to subsistence fishery. Significant hawksbill and green turtle nesting areas are also present. Tabu shells are also known to be collected from the seagrass meadows of Roviana Lagoon and North New Georgia, and are of cultural significance as they are traded to New Britain (Papua New Guinea) where stocks have been depleted.

Marovo Lagoon, on New Georgia Island's eastern seaboard is the world's largest island-enclosed lagoon. This shallow lagoon is protected along much of it's north-eastern side by narrow raised barrier islands, 5-60m high. It was unsuccessfully nominated for World Heritage Area status. Mangroves are found in estuaries shoreward of many fringing reefs and on many of the lagoon's islets. The landmass the lagoon partially surrounds is Vangunu Island. Seagrass meadows in the lagoon are predominately shallow subtidal with a narrow intertidal fringe. Species include *Thalassia hemprichii, Cymodocea rotundata, Halodule uninervis, Enhalus acoroides* and *Halophila ovalis*. The lagoon is a significant dugong and turtle feeding area with important hawksbill and green turtle nesting areas. The meadows are also important to subsistence fisheries.

Halophila ovalis and *Halodule uninervis* dominated meadows were located on the gently sloping bays on the western sides of the barrier reef islands (e.g., Uepi Island) in the northern section of the lagoon. The central lagoon islands had predominately rocky shorelines with relatively narrow fringing reefs and no seagrass. On the eastern sides of the larger islands (New Georgia and Vanguru), seagrass was generally isolated plants or patches of *Enhalus acoroides* along the mangrove shoreline. Aggregated patches of *Enhalus acoroides* were common on the nearshore islands with larger fringing reef flats bordered by *R. stylosa*. *Halophila ovalis* was found on the sheltered sides of some smaller inshore islands with sandy shorelines.

In southern Marovo Lagoon, there appears a habitat gradient with freshwater influenced reefs adjacent to Vangunu Island in the west, across patch reefs, shallow lagoon areas, to barrier islands in the east with pinnacle reefs and double barrier reef south of Uepi Island to Nggatokae Island. These barrier reefs, with narrow deep channels exiting the main lagoon, are one of the world's best examples of double barrier reefs. Narrow aggregated *Thalassia hemprichii/Enhalus acoroides* meadows were present along the outer reefs (e.g., Mbili) and *Halodule uninervis* (with *Halophila ovalis* & mixed species) or *Enhalus acoroides* lined many of the leeward shorelines of the inner barrier reefs. Isolated patches of *Enhalus acoroides* were often present on the protected sides of larger mid-lagoon islands adjacent to sandy beaches. The most significant meadow was a narrow meadow along the eastern shoreline of Tengomo Island, with dense *Cymodocea serrulata* inshore and spare *Halodule uninervis* and *Halophila ovalis* seaward. A large meadow dominated by *Cymodocea rotundata* with mixed species was also located on the large shallow intertidal banks adjacent to the northern coastline Gatokae.

Most of the larger bays and inlets of Marovo Lagoon had significantly higher turbidity that the outer barrier islands. This is possibly a consequence of the larger size and shallow depth of the lagoon, with a naturally high sediment load from adjacent major rivers and catchments. The level of turbidity however has been exacerbated by the presence of logging operations around much of the lagoon. Assessments of inshore areas adjacent to logging camps in some localities (e.g., Merusu) found seagrass absent and higher than considered natural levels of turbidity. In some instances, the point source of large plumes of very turbid red/brown water was logging camps.

South of New Georgia is Tetepare Island, the largest uninhabited tropical island in the world. The island covers and areas of 120 km^2 and is surrounded by fringing reefs with large seagrass meadows which support abundant dugong, fish and invertebrates. Unfortunately, Tetepare Island could not be surveyed due to weather and time constraints. Visits to the islands are planned by WWFSPP and TNC in the near future and this may be an opportunity to surveys seagrasses in the area.

CENTRAL PROVINCE

The province comprises the Melanesian islands of the Nggela (or Florida) Group, Savo and the Russell's (Figure 8). 651.5 hectares of seagrass were mapped in 56 meadows in the Central

Province. These meadows were mostly continuous in character (98% of seagrass area) and communities were dominated either by *E. acoroides* or *C. rotundata* (56% and 39% of seagrass meadow area respectively) (Table 7).

Figure 8. Central Province and Guadalcanal Province

In calm localities with a relatively wide lagoon (100-300m), such as Tetel Island (Florida Islands), the sand-mud flats are generally dominated by *T. hemprichii* shoreward and *E. acoroides* seaward and often bordered by mangroves (*Avicennia, Rhizophora* and *Bruguiera*) when near rivers or streams (Womersley & Bailey (1969).

Table 5. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Central Province, Solomon Islands – June 2004.

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
C. rotundata with *E. acoroides*		60 ±20			0.52 (1)	0.52
C. rotundata with *T. hemprichii* & mixed species	87.04 ±12.0	63 ±7	1.11 (1)		1.11 (1)	2.22
C. rotundata/H. uninervis with mixed species	32.81 ±1.77			0.16 (1)		0.16
C. rotundata/T. hemprichii	60.59 ±7.70	26 ±14		0.24 (1)	243.06 (3)	243.3
C. rotundata/T. hemprichii with mixed species	65.95 ±52.5				10.6 (1)	10.6
Cymodocea spp with *E. acoroides* & mixed species		76 ±5			6.3 (2)	6.3
E. acoroides	0.479 ±0.47	24 ±5	2.09 (5)	2.4 (3)	16.37 (4)	20.86
E. acoroides with *Cymodocea* spp & mixed species	24.32 ±24.3	47 ±1			1.88 (1)	1.88
E. acoroides with *H. ovalis*	0.435 ±0.43	19 ±2		1.59 (1)	3.89 (1)	5.48
E. acoroides with *T. hemprichii*	0.770 ±0.77	37 ±6		0.62 (1)	80.51 (3)	81.13
E. acoroides with *T. hemprichii/Cymodocea* spp & mixed species	15.49 ±14.8	57 ±7			107.77 (2)	107.77
E. acoroides with *T. hemprichii/H. ovalis*		24 ±3			136.6 (1)	136.6
E. acoroides/Cymodocea spp with mixed species		51 ±15			0.56 (1)	0.56
E. acoroides/T. hemprichii		42 ±15			0.31 (1)	0.31
E. acoroides/T. hemprichii with mixed species	3.270 ±3.52	63 ±5		0.11 (1)	10.07 (1)	10.18
H. uninervis with *T. hemprichii* & mixed species	30.13 ±15.3				0.31 (1)	0.31
H. minor		32 ±2			0.48 (2)	0.48
H. ovalis	1.774 ±0.72			0.33 (1)	0.58 (1)	0.91
H. ovalis with *E. acoroides*		45 ±4	0.09 (1)			0.09
S.isoetifolium with mixed species	111.8 ±5.95				0.3 (1)	0.3
T. hemprichii	18.74 ±2.91	90 ±3		0.65 (2)		0.65
T. hemprichii with *C. rotundata*	35.50 ±25.7	71 ±5	0.72 (2)	0.15 (1)	2.12 (1)	2.99

CATEGORY	Biomass (g DW m^{-2})	Cover (%)	Area in hectares (number of meadows)			Total (ha)
			Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
T. hemprichii with *C. rotundata* & mixed species	56.19 ±30.7	36 ±1			8.94 (2)	8.94
T. hemprichii with *H. ovalis*	2.845 ±2.14		0.82 (1)	1.49 (1)		2.31
T. hemprichii/C. rotundata with mixed species	112.4 ±1.15				6.56 (1)	6.56
T. hemprichii/E. acoroides		33 ±12	0.09 (1)			0.09
Total			**4.92 (11)**	**7.74 (13)**	**638.84 (32)**	**651.5 (56)**

The Russell Islands consist of two adjacent larger islands, Mbanika and Pavuvu, plus many smaller islets. Huge coconut plantations cover the islands. Pavuvu Island is the largest island in the Russell's group with extensive reefs to the north and many small, sandy islands within them. *Cymodocea rotundata/Thalassia hemprichii* meadows with some *Halopihla ovalis* dominate the barrier reefs and the extensive fringing reef flats to the north of the region, which are popular Green turtle foraging areas (Job Upo, Karol Kisokau pers comm).

Extensive continuous *Enhalus acoroides* with *Thalassia hemprichii/Cymodocea* spp & mixed species meadows are found bordering the edges of Pipisala Bay, which is surrounded by coconut plantations. These meadows are abundant (58% mean cover) and extend to approximately 3m in the clear water on coarse sand substrates. Large and abundant holothurians of commercial and artisinal importance are also abundant in the deeper waters of the bay. Similarly, these meadows are found in the shallow bays at the northern end of Sera Me Ohol (Sunlight) Channel. Mark Savi (pers comm.) reported a large patch of seagrass in Yadina Bay. Narrow meadows of aggregated *Enhalus acoroides* plants, border Sera Me Ohol (Sunlight) Channel, Kokolaonohol Sound, and small inlets, along the edges of the *Rhizophora stylosa* fringe. These meadows are also adjacent to coconut plantations and villages, receiving high nutrients from point sources such as drains and pig sties.

Two large islands, Nggela Sule and Nggela Pile, separated by narrow Utaha Passage, dominate the Florida Islands. The Florida Islands has a rich coastline consisting of coastal islands replete with exposed and sheltered seagrass communities. On the mainland coast are a series of embayment inhabited by coastal peoples and inlets feeding into the inner reaches of Florida Island (Negella Sule). In the region from Mbungana Islands to Tulaghi Harbour exists a large system of inlets with their waterways reaching into coastal riverine systems. It is likely that this high-energy coastline, subject to strong onshore winds and currents has resulted in dominance by sand shell sediments with a negligible mud component throughout tens of kilometers of seagrass habitat.

These habitats are fringed by mangroves and contain dense stands of *Enhalus acoroides* with *Thalassia hemprichii* and *Halophila ovalis*. Also found in this sheltered habitat were small patches of *Halophila minor* in sand dominated sediments. Inside the inlet interspersed along then mangrove fringed coastline, are areas of sand deposition and beach formation. Low to moderate stands of *Enhalus acoroides* and *Thalassia hemprichii* were found in these sheltered "harbours". On the open coast areas of beach were found in association with lagoons containing a high diversity of seagrass species including *Cymodocea serrulata, Cymodocea rotundata*, *Enhalus acoroides*, *Halophila ovalis*. These lagoonal areas with moderate exposure to the open coast were diverse in their assemblage of seagrass yet only represent about 10% of the area relative to all meadow types in the region. These areas form a protective barrier and harbour to coastal communities.

Sandfly Passage, between Nggela Sule and Mbokonimbeti Island, has deep waters (70-120m), which rise rapidly to narrow (50-100m) shallow fringing reef flats adjacent to mangroves lined shores. Inshore is a 10m wide band of *Enhalus acoroides* mixed with *Thalassia hemprichii* and *Halophila ovalis*. On wider reef flats (100-400m), seagrass communities are dominated by *Syringodium isoetifolium* and *Thalassia hemprichii*, mixed with *Halodule uninervis*, *Cymodocea rotundata*, *Halophila ovalis* and patches of *Enhalus acoroides*. In these meadows, the sea urchin *Tripneutus* and juveniles of the emperor (*Lutjanus harak*) were abundant.

In the far north of the Florida Islands are the Bueno Vista islands. Patches of *Enhalus acoroides* are scattered along the shores between the shoreline and the reef. In the north facing bays (e.g., Sambani Island & Tadhi village seafront), meadows of aggregated *Thalassia hemprichii/Halophila ovalis* or *Enhalus acoroides*/*Thalassia hemprichii* patches are abundant, inside the reef with isolated *Enhalus acoroides* patches in close to beach. In more protected bays (Mbodhoghori Island and Hanesavo Harbour), the seagrass communities are dominated by *Cymodocea rotundata* and *Thalassia hemprichii*, with patches of *Halophila ovalis* and *Enhalus acoroides*. In these areas, the meadow is a relatively narrow band (50-100m wide), before mixing into the reef (e.g., *Porites*) proper. In the shallows, the sea cucumbers *Holothuria atra* and *H scarbra* were fairly common.

Savo is a cone shaped island on Iron Bottom Sound, off northern Guadalcanal Island. A dormant volcano dominates the island, and although it has a significant population (14 villages), its 31 km^2 shores have limited fringing reefs and a reputation to be shark-infested. A small patchy meadow of *Halophila minor* (unconfirmed identification) was observed at 25m during a dive off the island. It is likely that these deeper water meadows may be more extensive across the Sound and off the northern shore of Guadalcanal.

GUADALCANAL PROVINCE

Totally 5,302 km^2, Guadalcanal is the largest island in the Solomon's group (Figure 8). The northern coastal plain contrasts with the weathered southern coast. The southern coast is exposed to the south-easterly trade winds and heavy rainfall, associated with strong currents and large oceanic swells. The likelihood of seagrass persisting in such environments is very low.

Only 101.25 hectares of seagrass was mapped in 31 meadows in the province between 5 - 16 June 2004. 76 percent of seagrass meadows in the province were of continuous cover (Table 8) and restricted to the calmer bays and fringing reefs along the north western shores and the extensive reef complexes at the islands most easterly extent. In these locations the seagrass meadows were generally continuous in structure and predominately (57% of total seagrass area) *T. hemprichii* dominated communities.

Table 8. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Guadalcanal Province, Solomon Islands – June 2004.

CATEGORY	Cover (%)	Area in hectares (number of meadows)			Total (ha)
		Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
C. rotundata with *T. hemprichii*	67 ±13			0.67 (1)	0.67
C. rotundata with *T. hemprichii* & mixed species	59 ±7			9.8 (2)	9.8
C. rotundata/T. hemprichii	42 ±17		14.61 (1)		14.61
C. rotundata/T. hemprichii with mixed species	54 ±13			11.03 (3)	11.03
E. acoroides	15 ±4	0.06 (1)	0.81 (2)	3.21 (6)	4.08
E. acoroides with *T. hemprichii*	50 ±8			25.34 (3)	25.34
E. acoroides with *T. hemprichii/H. ovalis*	33 ±3			0.35 (1)	0.35
E. acoroides/T. hemprichii	52 ±6			3.18 (2)	3.18
H. uninervis with *Cymodocea* spp/*T. hemprichii* & mixed species	65 ±4		0.1 (1)		0.1
H. uninervis with *T. hemprichii* & mixed species	67 ±10			1.18 (1)	1.18
H. decipiens	6 ±2			1.12 (1)	1.12
H. minor with *H. uninervis*	24 ±3			5.12 (2)	5.12
H. ovalis with *E. acoroides*	28 ±3		3 (1)		3
H. ovalis with mixed species	61 ±7		0.49 (1)		0.49
T. hemprichii	16 ±3	0.18 (2)	4.4 (2)		4.58
T. hemprichii with *E. acoroides*	17 ±1		0.11 (1)	10.56 (1)	10.67
T. hemprichii with *E. acoroides* & mixed species	60 ±3			1.97 (1)	1.97

CATEGORY	Cover (%)	Area in hectares (number of meadows)			Total (ha)
		Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
T. hemprichii/C. rotundata with mixed species	63 ±15			3.96 (1)	3.96
Total		**0.24 (3)**	**23.52 (6)**	**77.49 (22)**	**101.25 (31)**

On the north west of Guadacanal, near Cape Esperance, the coast is semi-exposed and beaches form a uniform stretch of sloping black sand. Close to shore seagrass were mostly absent as these areas are characterized by high-energy wave-dominated forces that may inhabit colonization by seagrass seedlings or vegetative shoots. A moderate to dense stand of *Halodule uninervis* and *Halophila ovalis* followed the coastline inside the reef crest in shallow subtidal waters (1 to 5m deep). Here the reef crest is permanently subtidal and the coral reef slopes to >50m. These meadows provide dugong foraging habitat, which are known to inhabit the area. *Halophila decipiens* was found at 37 m and was observed in the 36-40m zone, an area with a flat shell sand substrate and low light penetration. Survival in very deep waters suggests that sufficient light is available for seagrass growth. The absence of seagrass in areas shallower than 40m and deeper than 5m is likely due to the lack of available sand substrate, and dominance of hard coral substrate unsuitable for seagrass growth.

In moderate wave action localities, such as Mamara and Kukum (west and east of Honiara respectively) on north-west Guadalcanal, the reef is narrow. Seagrasses have been reported from the Catholic Mission (Visale Village), west of Cape Esperance. In calm localities with a relatively wide lagoon (100-30m), such as Komimbo (north-west Guadalcanal) the sand-mud flats are generally dominated by *Thalassia hemprichii* shoreward and *Enhalus acoroides* seaward and often bordered by mangoves (*Avicennia, Rhizophora* and *Bruguiera*) when near rivers or streams (Womersley & Bailey 1969).

Marau Sound on the eastern tip of Guadalcanal has the island's largest expanse of fringing reef. Here fringing reefs were dominated by *Enhalus acoroides*/*Cymodocea rotundata* close to shore (0-10m from beach), *Thalassia hemprichii*/*Cymodocea rotundata* (20-50m from beach) and *Thalassia hemprichii*/*Halophila ovalis* (50+m from shore). Most meadows however, were only 30m wide fringing mangrove habitats and islands (e.g., Marapa Island). No seagrass was present in the channels between mainland and large islands, yet mangroves dominated the shoreline. Some fringing reef meadows extended 50-100m from smaller islands in the Marau Sound (e.g., Beura, Henera Islands). Sheltered bays on the southern mainland area of Marau Sound were dominated by *Enhalus acoroides*, *Thalassia hemprichii* and *Cymodocea rotundata*. Substrate consists of mainly sand, shell and coral reef with algal dominants including *Halimedia, Caulerpa, Dityota* and turf algae. No seagrass was found below 2-3 m.

MAKIRA PROVINCE

Makira (San Cristobal) Island is the largest landmass of the province (Figure 9). It is a mountainous island, with steep cliffs along its southern coast. The north-western coast of Marika Island is rugged. Elsewhere, the island has long black-sand beaches in its many bays, interspersed with mangrove forests.

Figure 9. Makira Province

Off the southern eastern tip of Makira Island are the raised coral atolls of Santa Ana and Santa Catalina Islands. Santa Ana has beaches on its western side which support nesting sites for South West pacific Hawksbill turtle populations (Ian Bell QPWS pers comm.), however seas are too rough for this to occur on the island's eastern shore. These islands were not examined during this survey as information available indicated that the possibility of seagrass presence would be low.

229.05 hectares of seagrass was mapped in 52 meadows in the province between 6 - 9 June 2004. In general, Makira Province has large fringing reefs on the leeward or protected sides of land masses/islands, where continuous seagrass meadows of predominantly (58% of seagrass area) *Thalassia hemprichii* or *Cymodocea rotundata* (10% of seagrass area) communities dominated (Table 9). On the more exposed coastlines, seagrasses were generally absent, unless a significant reef crest was present.

On the north-western coast of Makira, along the exposed coast between Di'una and Oneibia, seagrass meadows in the lagoon (fringing reef) were dominated by *Enhalus acoroides, Cymodocea rotundata, Halodule uninervis* and *Cymodocea serrulata*, *Halophila ovalis* close to shore. Mid and edge of the lagoon was dominated by *Thalassia hemprichii* and *Halophila ovalis* with some *Cymodocea rotundata*. Sediment was white coarse sand and shell with reef.

Inside the bay, towards Oneibia, seagrass meadows were dominated by *Enhalus acoroides* and *Thalassia hemprichii* (shallow) and *Halophila ovalis* (2-3 m deep). As the coast extends towards Oneibia, the sediments were darker in color and of terrestrial origin with high mud and dark components. *Enhalus acoroides* dominated the sheltered regions of Anuta Island with some *Thalassia hemprichii* and *Halophila ovalis*. Dense stands of *Syringodium isoetifolium*, *Cymodocea rotundata* and *Halodule uninervis* dominated inside the reef crest on the western shores of Anuta Island. Meadows extended only 30-40 m from shore. *Halophila ovalis* was found at 26 and 37m on western shore of Anuta island. *Halimedia* and turf algae were abundant.

At Cape d'Entrecasteaux, small (30-50 m wide) reefs on the eastern side had some seagrasses, including *E. acoroides, C. rotundata, T. hemprichii, S. isoetifolium* and *H. ovalis*. Seagrass distribution was patchy and also found on the dark sediments of Marautewa Island (*E. acoroides* and *H. ovalis*). *E. acoroides* was found inside the mangrove lined inlets, particularly near the mouths, but generally did not penetrate far into the inlets. Instead, coral and algae were found dominating deep into the interior, with little or no freshwater influence. Despite the presence of extensive mangroves, seagrass habitat was restricted, possibly a consequence of high currents and steep sandy slopes with dark colored waters. In smaller bays (e.g., Hunihu) seagrass (*H. ovalis*, *H. uninervis*) was found on dark sediments with lots of algae (e.g., turf, *Halimeda*). The area however, was not extensively surveyed due to time and local community constraints.

Table 6. Meadow categories, total area (hectares) and numbers of intertidal/shallow subtidal meadows in Makira Province, Solomon Islands – June 2004.

CATEGORY	Cover (%)	Area in hectares (number of meadows)			Total (ha)
		Isolated seagrass patches	Aggregated seagrass patches	Continuous seagrass cover	
C. rotundata	68 ±9		0.6 (1)		0.6
C. rotundata with mixed species	52 ±9			2.78 (3)	2.78
C. rotundata with *T. hemprichii*	70 ±8			2.05 (2)	2.05
C. rotundata with *T. hemprichii* & mixed species	54 ±10			14.09 (4)	14.09
C. rotundata/H. uninervis with mixed species	27 ±0			0.13 (1)	0.13
C. rotundata/T. hemprichii with mixed species	43 ±10			3.38 (2)	3.38
E. acoroides	24 ±0			3.93 (3)	3.93
E. acoroides with *Cymodocea* spp & mixed species	42 ±15			3.15 (1)	3.15
E. acoroides with *H. ovalis*	31 ±8			1.61 (2)	1.61
E. acoroides with *T. hemprichii* & mixed species	72 ±3			0.49 (1)	0.49
E. acoroides with *T. hemprichii/Cymodocea* spp & mixed species	72 ±6			13.38 (1)	13.38
H. uninervis with *E. acoroides* & mixed species	14 ±1		0.36 (1)		0.36
H. uninervis with *H. ovalis* & mixed species	27 ±11		1.75 (1)		1.75
H. uninervis with *T. hemprichii* & mixed species	50 ±14			1.24 (2)	1.24
H. uninervis/H. ovalis	55 ±0			0.34 (1)	0.34
H. ovalis				1.89 (2)	1.89
S.isoetifolium with mixed species	74 ±14			8.39 (2)	8.39
T. hemprichii	36 ±5		5.25 (3)	32.14 (5)	37.39
T. hemprichii with *C. rotundata*	38 ±2	0.38 (1)	0.17 (1)		0.55
T. hemprichii with *C. rotundata* & mixed species	47 ±6			107.577 (4)	107.577
T. hemprichii with *E. acoroides*	77 ±6		0.66 (1)		0.66
T. hemprichii with *E. acoroides* & mixed species	59 ±14		0.01 (1)	8.22 (1)	8.23
T. hemprichii with *H. uninervis* & mixed species	58 ±14			0.96 (1)	0.96
*T. hemprichii/C. rotundata w*ith mixed species	55 ±7			6.21 (2)	6.21
T. hemprichii/E. acoroides with C. rotundata	71 ±0			6.79 (1)	6.79
T. hemprichii/H. ovalis	17 ±1			1.12 (1)	1.12
Total		**0.38 (1)**	**8.8 (9)**	**219.87 (42)**	**229.05 (52)**

At the east end of Makira Island is Star Harbour, the most secure anchorage in the region, which around Na Mugha has extensive fringing coral reefs. On the northern part of coast towards Io Harbour, the large fringing reefs were covered with *E. acoroides/C. rotundata* meadows immediately inshore, which changed to *C. rotundata/T. hemprichii/H. ovalis* mid-reef and *T. hemprichii/H. ovalis* on the seaward edge inside the reef crest. Meadows in shallow nearshore areas extended from the open coast into the mouth of Star Harbour. Meadows were 70-150m wide on the open coast but only 20-40m wide on north-western shores of Star harbour.

Further west into Star Harbour, away from the open coast, mangroves and beaches fringe the western mainland shore, however seagrass meadows were absent. Sediments were finer and of terrestrial origin (dark in color, high organic content) closer to shore, especially near villages, which may explain the paucity of seagrass. Corals and macro-algae (e.g., *Halimedia, Dictyota,*) were abundant.

Nevertheless, in the lower southern reaches of Star harbour, large expansive intertidal meadows of *E. acoroides/T. hemprichii* and *C. rotundata* dominated around reefs/islands and mangroves. Much (about 60—70%) of this U-shaped reef, opposite Na Mugha, was covered by seagrass, restricted to coarse sand and shell sediments and fringed by rocky/reef. The meadows were up to 500m long and 50-200m wide and restricted to shallow waters.

Along the sheltered mainland coast west of Na Mugha, seagrass was absent on the dark brown sediments, especially near to beaches and villages. However intertidal meadows dominated by *E. acoroides/T. hemprichii/C. rotundata* were found closer to Na Mugha adjacent to mangroves (*R. stylosa* and *Brugiera*) on the small fringing reefs. No seagrass was found inside the inlet near Na Mugha, as water clarity was low due to high suspended matter and tannin content. Mudflats exist deep inside the inlet and mangroves line the inlet in a continuous cover. East of Na Mugha point, a large expanse of intertidal reef is present and dominated in part by *Thalassia hemprichii* with *Enhalus acoroides* & mixed species (41-90% cover).

Small islands within greater Star Harbour had some patchy *T. hemprichii* and isolated *Rhizophora* trees. These areas were more exposed to wave action and surrounded by coral reef and rocky outcrops. The coral reef was in poor to good condition and at one site *Lyngbya* was found smothering corals. The dark color of the inshore sediments and high abundance of mangroves suggests high nutrient availability which may promote *Lyngbya* and other macro-algal growth (80-90% cover).

Off the northern coast of Makira, are located a couple of islands groups; the Three Sister and Ugi Islands. Seagrass meadows exist on the leeward side of each Three Sister island, as the eastern shores were too rocky and exposed to waves. On Alite Island (the northern most), very patchy *T. hemprichii* was found on the western shore. On Malaulalo Island a more extensive meadow consisting of *T. hemprichii*, *C. rotundata* and *H. ovalis* was found extending the western shore inside the reef crest. This meadow was on coarse sand/shell and macro-alage (incl. *Halimeda*, turf, *Lyngbya*) was abundant. The north and southern most points had no seagrass. On Malaupaina Island (the southern most island), no seagrass was found on the exposed northern tip but *T. hemprichii*, *H. ovalis* and *C. rotundata* meadows dominated the bays along the western leeward shores. Inside the lagoon fringed by mangroves, seagrass meadows (20-30m wide) fringed the lagoon and were dominated by *E. acoroides, H. uninervis*, *C. rotundata* and *H. ovalis*. The sediments were coarse sand and meadows ranged from isolated patches to continuous stands and were associated with coral reef patches and macro-algae (e.g., *Halimeda*, turf). No seagrass was found south of the lagoon and no seagrass is likely to be found on the exposed eastern shores of the island.

The Uki Ni Masi Islands are two islands located west of the Three Sister Islands. Seagrass meadows were only present on the western leeward, protected, shores of Pio Island (the northern island). At the northern, southern and eastern shores of the island, the reefs are exposed to prevailing north and south easterly swells and dominated by surf beaches and rocky intertidal regions devoid of seagrass. Small, patchy, *T. hemprichii* meadows were found on the northwestern reef flats. Moving south, meadows approximately 20-40 m wide consisted of *C. rotundata* close to shore and mixed stands of *C. rotundata*, *T. hemprichii* and *H. ovalis* further offshore. These fringing reef meadows were constrained by a reef crest relatively close to shore (<200m).

The larger island of the two, Uki Ni Masi island, has extensive seagrass meadows along its western border and south-eastern coast. Typically these meadows are dominated by *C. rotundata*, *T. hemprichii*, and *H. ovalis* along the fringing reef coast. On the south-western coast, characterised by a large embayment, meadows are patchy and very narrow (10-20 m). *H. uninervis* was present within *T. hemprichii*/*C. rotundata* meadows, which were interspersed with coral reef that reaches the shore and precludes seagrass growth. Further south inside the fringing reef, seagrass meadows persisted in narrow bands around the southern sections of the main island. On the south-eastern coast the reef crest lies approximately 400m off the coast and an extensive fringing reef/lagoon area exited shoreward of this reef. Extending from the south for approximately 1-2km past the village of Makia, and north up to the village of Tawarodo, exited a large (50-60m wide) meadow of *C. rotundata*, *T. hemprichii* and *H. ovalis*. This coast is exposed to strong prevailing winds and wave action, yet the reef crest approximately 400m from shore protects the seagrass meadows. At Tawarodo village, *S. isoetifolium* was found within a boat access channel (approx 200m long, <1m deep), which had been created by destroying 1-2 m of coral reef. Further along the north-eastern coast of Uki Ni Masi Island, the coast is dominated by rocky platforms close to shore and open sandy beaches. Wave action is close to shore and not inhibited by a reef crest making this coast unsuitable for seagrass growth.

Discussion

Seagrass

This survey was the first detailed assessment of the seagrasses in the Solomon Islands. Most Solomon Islands seagrasses are found in water less than 10m deep and meadows may be monospecific or consist of multispecies communities, with up to 6 species present at a single location. The number of seagrass species identified is within the range expected.

Seagrass distribution appears to be primarily influenced by the degree of wave action (exposure) and nutrient availability. Where wave action is slight to moderate the widest fringing reefs occur, commonly with either sand-debris beach at their rear or sand-mud areas of mangroves when near rivers. Under conditions of heavy wave action the reef is usually narrower (10-20m), and there is little or no sediment depth in the lagoon. Seagrasses frequently grow on protected intertidal reef platforms and coastal/estuarine mud flats influenced by pulses of sediment laden, nutrient rich freshwater, resulting from high volume seasonal summer rainfall. On reef platforms and in lagoons the presence of water pooling at low tide prevents drying out and enables seagrass to survive tropical summer temperatures. Often, the sediments are unstable and their depth on the reef platforms can be very shallow, restricting growth and distribution. Seagrass habitats in the Solomon Islands are disturbed by factors that vary between regions and between seasons. A complex set of interactions may impact a single region including the type of habitat, the time of year and the species growing there. There is however, little known about long-term natural cycles in the abundance and distribution of seagrasses in the Solomon Islands.

An extensive and diverse assemblage of seagrass habitats exists along the coastlines of the Solomon Islands and associated reefs. These can be generally categorised into four main habitats (Table 10), similar to those in tropical northern Australia (see Carruthers *et al.* 2001). In their natural state, these habitats are characterised by very low nutrient concentrations, are primarily nitrogen limited and are influenced by seasonal and episodic coastal runoff. Among these four seagrass habitat types in the Solomon Islands, both estuarine (incl. large shallow lagoons) and coastal seagrass habitats are of primary concern with respect to water quality due to their location immediately adjacent to catchment inputs.

In general seagrass growth is limited by light, disturbance and nutrient supply, and changes to any or all of these limiting factors may cause seagrass decline. All seagrass habitats in the Solomon Islands are influenced by high disturbance and are both spatially and temporally variable. However, the spatial and temporal dynamics of the different types of seagrass habitat are poorly understood.

Episodic terrigenous runoff events result in pulses of increased turbidity, nutrients and a zone of reduced salinity in nearshore waters. Seagrasses, especially structurally large species, affect coastal and reefal water quality by absorbing nutrients and trapping sediments acting as a buffer between catchment inputs and reef communities. Unlike neighbouring Australia, where small species (e.g. *Halodule* and *Halophila*) comprise the majority of the coastal nearshore seagrass meadows, Solomon Island seagrass are dominated by structurally large seagrasses (*Thalassia, Enhalus, Cymodocea*). Seagrasses have the ability to act as a bio-sink for nutrients, sometimes containing high levels of tissue nitrogen and phosphorous. They also provide food and shelter for many organisms, and are a nursery grounds for commercially important prawn and fish species. Macro-grazers, dugongs (*Dugong dugon*) and green sea turtles (*Chelonia mydas*) may also be an important feature in structuring seagrass communities in the Solomon Islands.

Table 10. Summary of seagrass habitats of the Solomon Islands.

Habitat	Limiting factor	Seagrass species	Feature/threats
Estuaries *(incl. large shallow lagoons)*	Terrigenous runoff	*Cymodocea rotundata* *Cymodocea serrulata* *Halodule uninervis* *Enhalus acoroides* *Halophila minor* *Halophila ovalis*	Highly productive High denisity, low diversity Often associated with mangroves Highly threatened
Coastal (*incl. Fringing reef*)	Physical disturbance	*Cymodocea rotundata* *Cymodocea serrulata* *Halodule uninervis* *Syringodium isoetifolium* *Enhalus acoroides* *Halophila ovalis* *Thalassia hemprichii*	Very diverse Highly productive Important for fisheries Supports dugongs Dynamic Threatened by development
Deep-water	Low light	*Halophila decipiens* *Halophila minor* *Halophila ovalis*	>10m deep Monospecific High turnover Least known habitat Threats unknown
Reef *(e.g., barrier or isolated)*	Low nutrients	*Cymodocea rotundata* *Halodule uninervis* *Syringodium isoetifolium* *Thalassodendron ciliatum* *Halophila ovalis* *Thalassia hemprichii*	Support high biodiversity Shallow unstable sediment Variable physical environment Little studied Least threatened

Globally, seagrass loss has generally been linked to declining water quality. Seagrass growth in general is limited by light, disturbance and nutrient supply, and changes to any or all of these limiting factors may cause seagrass decline. The most common cause of seagrass loss being from the reduction of light availability due to chronic increases in dissolved nutrients leading to proliferation of algae reducing the amount of light reaching the seagrass (e.g. phytoplankton, macroalgae or algal epiphytes on seagrass leaves and stems) or chronic and pulsed increases in suspended sediments and particles leading to increased turbidity (Schaffelke *et al.* 2005). In addition, changes of sediment characteristics may also play a critical role in seagrasses loss.

There were no indications during the present survey that nutrients appear to be having a negative effect on seagrass growth and distribution throughout the Solomon Islands. This is not an unexpected observation as the region as a whole is in relatively healthy condition compared to many other regions globally. There was, however, evidence (supported by a number of anecdotal reports) that the delivery of sediments into coastal waters has increased at some locations, primarily the result of logging activities (esp. Marovo Lagoon). These sediments settle out of the water column, particularly in the protected nearshore areas where seagrasses are most likely to be found. Thus coastal seagrass habitats are vulnerable to changes in water quality as they are directly exposed to increased sediment loads. These additional sediments usually reduce habitat quality as a result of the combined effects of additional sediments and nutrients locally.

Loss of seagrass due to storms, flooding and cyclones has undoubtedly occurred in the Solomon Islands from time to time due to the influx of freshwater and sediment in the water which cuts light penetration underwater. However, without an adequate baseline (until now) to compare, these large-scale changes would occur relatively undetected. Fortunately tropical seagrasses are relatively resilient, having evolved and adapted to such natural impacts/change.

Defined habitats contain a large range of life history strategies, which provides some insight into the dynamic but variable physical nature of Solomon Island seagrass habitats. *E. acoroides* is a slow turnover, persistent species with low resistance to perturbation (Walker *et al.,* 1999), suggesting that there are some coastal habitats that are quite stable over time. *Cymodocea* and *Syringodium* are seen as intermediate genera that can survive a moderate level of disturbance, while *Halophila* and *Halodule* are described as ephemeral species with rapid turnover and high seed set, well adapted to high disturbance and high rates of grazing (Walker *et al.,* 1999). Therefore the species present in the different habitats reflect the observed physical and biological impacts, suggesting that reef, deep water and coastal environments are particularly variable and dynamic, while estuarine/lagoonal habitats have stable areas but are extremely harsh.

The capacity of seagrasses to recover requires either recruitment via seeds or through vegetative growth. The recovery of tropical seagrasses depends on the species and location. Some plants are fairly resilient in unstable environments. The ability of seagrass meadows to recover from large scale loss of seagrass cover observed during major events such as cyclones will usually require regeneration from seed bank (Campbell & McKenzie 2004). Chronic levels of sediment as well as higher exposure levels during river flood events may reduce growth and reproductive effort, important processes in the recovery of seagrass meadows after disturbance by turbidity and freshwater runoff (Waycott *et al.* 2005).

In many areas, it is difficult to estimate changes in seagrass because the maps of the distribution of seagrasses area and biomass are still imprecise. Support for continued extensive mapping of seagrasses studies similar to the present one is commendable. This will help to better understand the anthropogenic and climatic factors that drive changes in seagrass meadows. Precise mapping of seagrass meadow parameters (at appropriate scales) will enable changes to be more accurately measured and tracked.

All identified seagrass habitats have high ecological and/or economic value, whether supporting fisheries or biodiversity. Estuary/lagoonal and coastal habitats are considered to be the most threatened, due to extensive coastal development, however the limited knowledge of deeper water seagrass habitats suggests that impacts to these habitats are extremely difficult to determine.

MANGROVES

Rhizophora stylosa had the most extensive distribution, was the most abundant species and tended to dominate habitat types along the coastlines. Generally, *Rhizophora stylosa* is a pioneering species that is often found on mud flats and on islands in tidal estuaries. Bunt and

Williams (1980) found that *Rhizophora* spp. emerged as predominant close to the lower tidal limit. *Rhizphora stylosa* is often associated with *Avicennia, Ceriops* and *Bruguiera* (Claridge and Burnett 1993), as was found in the present survey. *Lumnitsera* was also found associated with *Rhizophora* spp.

Rhizophora spp. contributes greatly to primary productivity in estuaries through litter fall, and secondary productivity, with prop roots contributing complex structural habitat, or "snags". Snags provide suitable habitat for many juvenile fish (protection from predatory fish) and adult fish (hiding spaces for ambush).

Avicennia marina was not common and was found at northern Isabel sites. *A. marina* has efficient salt secreting mechanisms and tends to be more dominant in higher salinity areas (Scholander *et al.* 1962; Waisel, *et al*. 1986). The closed *Rhizophora stylosa* forest that dominated much of the coastlines may have inhibited the establishment of *A. marina*.

Other remaining species known from the Solomon Islands mangrove species were not encountered as they are found more commonly further upstream in estuaries. The upstream environment is more protected from wave energy and currents, and most of these species require some freshwater input, or grow along the landward edge or margin of mangrove forests (Claridge & Burnett 1993; Dowling & McDonald 1982).

Youssef & Saenger (1999) suggested that specific segregation of species is the outcome of the cumulative interaction between different environmental gradients on one-hand and tolerance boundaries of each species to each particular gradient on the other. Zones of mangroves species are a response of individual mangrove species to the gradients of inundation frequency, waterlogging, nutrient availability and soil salt concentrations across the intertidal area (Hutchings & Saenger, 1987).

The number of mangrove species recorded in this survey was low compared with previous records, as only the fringing mangroves of coastlines were surveyed, so mangrove species growing along the more landward edges of wide bands of mangrove forests or high tide regions were missed. While this survey indicates that the riparian zone appears to be relatively healthy, the area is subject to several threats. Human activities that may affect water quality and mangrove health.

Threats

The major changes in Solomon Island seagrass meadows would have occurred post World War Two and are related to coastal development, agricultural land use, or population growth. In general though there is insufficient information and no long-term studies from which to draw direct conclusions on historic trends. Munro (1999) reported that 2000 year old mollusc shell middens in neighbouring PNG have basically the same composition as present day harvests suggesting indirectly that the habitats including seagrass habits and their faunal communities are stable and any changes occurring are either short term or the result of localised impacts. It can be assumed that the same could be concluded for the Solomon Islands.

These localised impacts are likely to be from soil erosion related to coastal agriculture (e.g., coconut plantations), land clearing (e.g., logging and mining) and bush fires. Other effects include sewage discharge (human and agriculture), industrial pollution, port/village infrastructure/dwellings and overfishing. Most of these impacts can be managed with appropriate environmental guidelines, however climate change and associated increase in storm activity, water temperature and/or sea level rise has the potential to damage seagrasses in the region or to influence their distribution. Sea level rise and increased storm activity could lead to large seagrasses losses. Mangrove swamps, particularly those of low islands, are likely to be sensitive to sea-level rise. The response of mangroves to climate change is uncertain, and research and monitoring is required.

To provide an early warning of change, long-term monitoring sites have been established near Gizo as part of Seagrass-Watch, Global Seagrass Monitoring Network (www.seagrasswatch.org McKenzie *et al.* 2005). The program hopes to expand to include other regions of the Solomon Islands. By working with both scientists and local communities, it is hoped that many anthropogenic impacts on seagrass meadows which are continuing to destroy or degrade these coastal ecosystems and decrease their yield of natural resources can be avoided.

Recommended Actions

- Promote seagrass and mangrove conservation in the Pacific Islands as they have had a low priority in conservation programs in the region.
- More protected areas to be established, to ensure that examples of seagrass and mangrove ecosystem remain in the Solomon Islands for use by future generations
- Legislation for the protection of mangroves needs to be enforced.
- Seagrass and mangrove conservation values need to be enhanced by development of education resource materials, to be used in schools and community groups
- A Pacific Island monitoring program of seagrass and mangrove ecosystem health needs to be established. This could be linked to existing region/global monitoring programs (e.g., Seagrass-Watch, www.seagrasswatch.org) for monitoring climate change/sea level rise impact.
- Detailed maps of seagrasses are needed in locations which are highly threatened by poor water quality (e.g., Marovo Lagoon).
- Detailed surveys and studies on dugong/turtle-seagrass distribution based on the known seagrass habitats identified in this survey.
- Studies on importance, ecology, and population dynamics of subsistence fisheries (e.g., rabbit fish) which seagrass/mangrove ecosystems support

Acknowledgements

We are grateful to Louise Goggin (CRC Reef), Ivan Rotu Peoko and Tingo Leve for their assistance in the field surveys. We thank Stu Shepard (TNC) for providing the basemaps and GIS support, the crew of the “FeBrina” – skipper Russell Slater, and our boatman Elijah for his boating skills and patience. We also thank Rudi Yoshida for his assistance with data entry/ management.

This survey was funded by TNC and the David & Lucile Packard Foundation and supported by CRC Reef and the Department of Primary Industries & Fisheries, Queensland.

References

Blaber, JM and Milton, DA (1990) Species composition, community structure, and zoogeography of fishes of mangrove estuaries in the Solomon Islnads. *Marine Biology* 105: 259-267.

Bunt, J.S. and Williams, W.T. (1980). Studies in the analysis of data from Australian tidal forests (‘Mangroves’). I. Vegetational sequences and their graphic representation. *Australian Journal of Ecology* 5: 385-390.

Carruthers TJB, Dennison WC, Longstaff BJ, Waycott M, Abal EG, McKenzie LJ and Lee Long WJ. (2001). Seagrass habitats of north east Australia: models of key processes and controls. *Bulletin of Marine Science* **71(3)**: 1153-1169.

Campbell SJ and McKenzie LJ. (2004) Flood related loss and recovery of intertidal seagrass meadows in southern Queensland, Australia. *Estuarine, Coastal and Shelf Science* **60**: 477 – 490.

Claridge, D. and Burnett, J. (1993). Mangroves in Focus. Wet Paper. 160pp.

Clough, B.F. (1992). Primary productivity and growth of mangrove forests. *In* “Coastal and Estuarine Studies - Tropical mangrove ecosystems”(Eds. A.I. Robertson and D.M. Alongi), Chapter 8, pp 225-250.

Coles RG and Kuo J (1995) Seagrasses. Chpt 3 *In* Marine and Coastal biodiversity in the tropical islands Pacific region. Vol 1: Species systematics and information management priorities. Proceedings of two workshops held at the East-West Center, Honolulu, in November 1994. (JE Maragos, MNA Peterson, LG Eldredge, JE Bardach and HF Takeuchi eds) (East-West Center, Honolulu) Pp 39-57.

Coles RG and Lee Long WJ (1999) Seagrass. Chpt 2 *In* Marine and Coastal biodiversity in the tropical islands Pacific region. Vol 2: Population, development and conservation priorities. Proceedings of two workshops held at the East-West Center, Honolulu, in November 1994. (LG Eldredge, JE Maragos, PF Holthus and HF Takeuchi eds) (East-West Center, Honolulu) Pp 21-46.

Coles RG, McKenzie LJ and Campbell SJ. (2003). The seagrasses of eastern Australia. Chapter 11 *In:* World Atlas of Seagrasses. (EP Green and FT Short eds) Prepared by the UNEP World Conservation Monitoring Centre. (University of California Press, Berkeley. USA). Pp 119-133.

Costanza, R, D'Arge, R., de Groot, R., Farber, S. Grasso, M., Hannon, B. Limburg, K. Naeem, S., O'Neill, R.V., Paruelo, J. Raskin, R.G.; Sutton, P. and van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature* 387 (15 May), 253-260.

Dowling, R.M. and McDonald, T.J. (1982). Mangrove Communities of Queensland In “Mangrove Ecosystems of Australia – Structure, function and management” (Ed B.F. Clough) Chapter 5, pp 81-93.

Duke, N.C. (1992). Mangrove floristic biogeography. In “Coastal and Estuarine Studies - Tropical mangrove ecosystems”. (Eds A.I. Robertson and D.M. Alongi) Chapter 4, pp 63-100.

Dance SK, Lane I and Bell JD. (2003) Vairation in short-term survival of cultured sandfish (Holothuria scabra) released in mangrove-seagrass and coral reef flat habitats in Solomon Islands. *Aquaculture* 220: *495-505*.

Duke, NC, Bell, Pederson ADK, Roelfsema CM, Bengtson Nash S. (2005) Herbicides implicated as the cause of severe mangrove dieback in the Mackay region, NE Australia: consequences for marine plant habitats of the GBR World Heritage Area *Marine Pollution Bulletin* 51: 308–324

Ellison, JC. (1999) Status report on Pacific Island mangroves. *In* Eldridge, LG., Maragos, JE., Holthus, PF. And Takeuchi, HF (Eds) Marine and Coastal biodiversity in the tropical Island Pacific region: Volume 2: Population, development and conservation priorities. Proceedings of two workshops held at the East-West Centre, Honolulu, in November 1994. (Pacific Science Association, Honolulu) Chapter 1. pp2-19.

Ellison, JC. (1995) Systematics and distributions of Pacific Island mangroves. *In* Maragos, JE., Peterson, MN., Eldridge, LG., Bardach, JE. and Takeuchi, HF (Eds) Marine and Coastal biodiversity in the tropical Island Pacific region: Volume 1: Species systematics and information management priorities. Proceedings of two workshops held at the East-West Centre, Honolulu, in November 1994. (East-West Centre, Honolulu) Chapter 4. pp59-74.

Green E and FT Short (eds) 2003 World Atlas of Seagrasses. Prepared by the UNEP World Conservation Monitoring Centre. (University of California Press, Berkeley. USA). 298pp.

Halliday, I.A. and Young, W.R. (1996). Density, biomass and species composition of fish in a subtropical Rhizophora stylosa mangrove forest. *Marine and Freshwater Research* 47(4): 609-615.

Hansell, JRF and Wall, JRD (1976) Land resources of the Solomon Islnds. In Vol 1, Introduction nd recommendations. Land Resources Study 18, Land Resources Division, Ministry of Overseas Development, London.

Hutchings, P. and Saenger, P. (1987). Ecology of Mangroves. (Queensland University Press, Brisbane) 388pp.

Johnstone, I.M. (1982) Ecology and distribution of seagrasses. *In*: Biogepgraphy and ecology of New Guinea (J.L. Gressitt ed). Monographiae Biologicae Vol 42. (Dr W Junk Publishers, The Hague). Pp 497-512.

Kwanairara, DE. (1992) Country report mangrove forests of the Solomon Islands. In T. Nakamura (ED) Proceedings Second Seminar and Workshop on Integrated Research on mangrove ecosystems in Pacific Islands Region. (Japan International Associtio of mangroves, Tokyo). Pp169-173.

Lovelock, C. (1993). Field Guide to Mangroves in Queensland. (Australian Institute of Marine Science, Townsville). 72pp.

Lanyon, J.M., Limpus, C.J. and Marsh, H. (1989). Dugongs and turtles: grazers in the seagrass system. In 'Biology of Seagrasses: A treatise on the biology of seagrasses with special reference to the Australian region'. A.W.D. Larkum, A.J. McComb and S.A. Shepherd (Eds). Elsevier: Amsterdam, New York. pp. 610-34.

McKenzie LJ, Finkbeiner MA and Kirkman H. (2001). Methods for mapping seagrass distribution. Chapter 5. In: Global Seagrass Research Methods. (FT Short and RG Coles eds) (Elsevier Science B.V., Amsterdam). Pp 101-122.

McKenzie, LJ., Yoshida, RL., Coles, RG. & Mellors, JE. (2005). Seagrass-Watch. www.seagrasswatch.org. 144pp.

Mellors, J.E. (1991). An evaluation of a rapid visual technique for estimating seagrass biomass. *Aquatic Botany* 42, 67-73.

Mercier, A, Battaglene, SC & Hamel1, JF. (2000) Periodic movement, recruitment and size-related distribution of the sea cucumber *Holothuria scabra* in Solomon Islands. *Hydrobiologia* 440: 81–100.

Messel, H and King W. (1989) Report on CITES and Solomon Islands:Government national survey of crocodile populations in the Solomon Island, 20 July-8 September. IUCN, Switzerland.

Munro JL (1999) Utilization of coastal molluscan resources in the tropical Insular Pacific and its impacts on biodiversity. *In*: Marine/Coastal biodiversity in the tropical island Pacific region: Vol 2: Population, development and conservation priorities. Workshop proceedings, Pacific Science Association. (JE Maragos, MNA Peterson, LG Eldredge, JE Bardach, HF Takeuchi eds). (East-West Center, Honolulu) Pp 127-144

Nietschmann, B.Q., Norris, T.B., Rose, R.S., and Roswell, J.M., 2000, Coral world map (scale 1:28,510,000) and virtual reefscape poster, *In* Williams, R.S., Steele, J., deBlij, H.J., and Nietschmann, B.S., eds., National Geographic Society: Committee for Research and Exploration, Washington, D.C.

Robertson, A.I., Alongi, D.M. and Boto, K.G. (1992). Food chains and carbon fluxes In"Coastal and Estuarine Studies - Tropical mangrove ecosystems". (Eds. A.I. Robertson and D.M. Alongi), Chapter 10, pp 293-326.

Rönnbäck, P. (1999). The ecological basis for economic value of seafood production supported by mangrove ecosystems, *Ecological Economics* 29(2): 235-252.

Saenger, P., Hegerl, E.J. and Davie, J.D.S. (Eds.) (1983). Global status of mangrove ecosystems. Environ. 3 (Suppl. 3) 88.

Schaffelke B, Mellors JE and Duke NC. (2005) Water quality in the Great Barrier Reef region: responses of mangrove, seagrass and macroalgal communities. *Marine Pollution Bulletin* **51:** 279–296

Scholander, P.F., Hammel, H.T., Hemmingsen, E.A. and Garety, W. (1962). Salt balance in mangroves. *Plant Physiology* 37: 722-729.

Scott, DA (1993) A directory of wetlands in Oceania. International Waterfowl and Wetlands Research Bureau, Slimbridge, U.K., and Asian Wetland Bureau, Kuala Lumpur, Malaysia.

Skilleter, G.A. and Warren, S. (2000). Effects of habitat modification in mangroves on the structure of mollusc and crab assemblages. *Journal of Experimental Marine Biology and Ecology* 244 (1): 107-129.

Spalding, MD., Blasco F. and Field CD. (Eds) (1997) World Mangrove Atlas. (The International Society for Mangrove Ecosystems, Okinawa), Japan 178 pp.

Walker DI, Dennison WC, Edgar G (1999) Status of Australian seagrass research and knowledge. *In*: Seagrass in Australia: Strategic review and development of an R & D plan. (A Butler and P Jernakoff eds) (CSIRO, Collingwood). Pp 1-24.

Waycott M.,McMahan K., Mellors, JE., Calladine, A. and Kleine, D. (2004) A guide to tropical seagrasses of the Indo-west Pacific. (JCU Press, Townsville)72pp.

Waycott M, Longstaff BJ and Mellors JE. (2005) Seagrass population dynamics and water quality in the Great Barrier Reef region: A review and future research directions. *Marine Pollution Bulletin* **51**: 343-350.

Womersley HBS and Bailey A. (1969) The marine algae of the Solomon Islands and their place in biotic reefs. *Phil. Trans. Roy. Soc.* B 255:*433-442.*

Waisel, Y., Eshel, A., Agami, M. (1986). Salt balance of leaves of the mangroves *Avicennia marina. Plant Physiology* 67: 67-72.

World Resources Institute (1996). World Resources 1996-1997 Oxford University Press, Oxford. The World Resources Institute, UNEP, UNDP, World Bank 365pp.

Youssef, T. and Saenger, P. (1999). Mangrove zonation in Mobbs Bay – Australia. *Estuarine, Coastal and Shelf Science.* 49A: 43-50.

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Solomon Islands Government

June 2006
TNC Pacific Island Countries
Report No 1/06

Chapter 8

Oceanic Cetaceans & Associated Habitats

Solomon Islands Marine Assessment

Benjamin Kahn
APEX Environmental

Published by: The Nature Conservancy, Indo-Pacific Resource Centre

Author Contact Details:
Benjamin Kahn: P.O. Box 59 Clifton Beach, Cairns 4879 QLD Australia.
e-Mail: bkahn@apex-environmental.com

Suggested Citation:
Kahn, B. 2006. Oceanic Cetaceans and Associated Habitats. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06

Design: Jeanine Almany

Artwork: Nuovo Design

Cover Photo: © Benjamin Kahn, APEX Environmental

Available from:

Indo-Pacific Resource Centre
The Nature Conservancy
51 Edmondstone Street
South Brisbane, QLD 4101
Australia

Or via the worldwide web at: www.conserveonline.org

CONTENTS

Executive Summary

The Solomon Islands Marine Assessment – Oceanic Cetaceans and Associated Habitats was conducted from 10 May to 16 June 2004. Because of the broad and multi-faceted nature of the Solomon Island Marine Assessment's activities and goals, this program was not designed as a dedicated cetacean survey. As such the Solomon Island Marine Assessment could not address certain species- or habitat-specific conservation and management issues for cetaceans – such as the estimation of relative abundances (which can only be estimated through more structured and periodic surveys). Instead, this program was structured as a Rapid Ecological Assessment on Solomon Islands' oceanic cetaceans and associated habitats (the SI Cetacean REA) and included the following activities:

1. To conduct a visual and acoustic survey on Solomon Islands' whale and dolphin species diversity, distribution, ranking of total individual count and their associated habitats (near shore, yet deep-water);
2. To canvass community knowledge on local cetacean sighting patterns, strandings and cetaceans' role in cultural heritage and folklore;
3. To conduct an on-board capacity building program on cetaceans for local scientists and marine conservationists;
4. To assist with the identification of migratory corridors of national and regional importance, as well as other critical cetacean habitats;
5. To strengthen national conservation policies for large cetaceans and marine bio-diversity in general;
6. To evaluate the potential for sustainable and responsible (sperm) whale and dolphin watch activities.

The SI Cetacean REA was conducted during 36 survey days in the central and western provinces of the Solomon Islands and included 160.0 hours of visual survey time, covering 1228.1 nautical miles. Cetaceans were sighted on 52 separate encounters in which 815 animals were counted, belonging to 10 species. The species sighted include (ranked by sighting frequency): Spinner dolphin (*Stenella longirostris*); Pantropical spotted dolphin (*Stenella attenuata*); Common bottlenose dolphin (*Tursiops truncatus*); and single sightings for the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*); Orca or killer whale (*Orcinus orca*); Risso's dolphin (*Grampus griseus*); Rough-toothed dolphin (*Steno bredanensis*); Short-finned pilot whale (*Globicephala macrorhynchus*); Mesoplodon beaked whale (*Mesoplodon sp.*); Rorqual baleen whale (*Balaenoptera sp.* – either the common Bryde's or Sei whale; *B. brydei* or *B. borealis* respectively).

Acoustic surveys included 49 offshore listening stations. In total, cetacean presence was acoustically detected on 51% of all listening stations. Sperm whales (*Physeter macrocephalus*) were positively identified acoustically, bringing the total of species for the SI Cetacean REA to 11. Acoustic contacts were dominated by oceanic dolphins, followed by sperm whales. Both sighting frequencies and counts of individuals were dominated (>95%) by the same 3 species: spinner dolphins, common bottlenose dolphins and spotted dolphins. Sighting and acoustic results were corrected for survey effort and an initial comparison with similar REAs in other regions was made. There were unfavourable sighting conditions during a substantial number of days. These were spread evenly over all SI Cetacean REA Legs.

The SI Cetacean REA visual and acoustic results strongly indicate a relatively low cetacean species diversity and relative low abundance throughout most of the western Solomon Islands' provinces, at least during the SI Cetacean REA period. In several areas, however, spinner and spotted dolphins were locally abundant. This outcome needs to be further investigated, as – when confirmed by additional dedicated cetacean surveys - it has significance for management of cetacean use and fisheries interactions. Issues highly relevant to the Solomon Islands are the traditional dolphin drives, the licensed live dolphin captures

for tourism ventures (for local 'swim with the dolphins' programs and trade/international export), and possibly the large-scale tuna purse-seine tuna fisheries in Solomon Islands' waters.

Throughout the survey, local knowledge on cetaceans proved very valuable. Many coastal communities, such as the Shortlands and Savo Island, have important spinner dolphin resting areas at their local reef lagoons. These preferred dolphin habitats seem stable for exceptional long periods and often have been known to villagers for over five generations. Responsible, well regulated, wild cetacean watching may be feasible in these locations (and presumably in many more similar areas and communities not visited by the Marine Assessment.

Traditional dolphin hunting villages of Fanalei and Bita 'Ama were also visited. In Fanalei, elders explained that the traditional dolphin drive is practiced with strong cultural heritage and minimal modernisation in fishery methods. Essentially, dolphins are driven from the ocean into the local reef lagoon by creating an "acoustic net" through strategic placement of canoes around the pod and well-timed banging of rocks underwater. The aftermath of a recent capture of spotted dolphins for a live-display facility did cause significant disturbance amongst the village and this modern influence may not be easily integrated within an otherwise largely traditional community.

Although the traditional dolphin drives in Fanalei are largely non-modernized, several aspects raise serious concerns. The long-term disappearance of the valued melonheaded whales (robo au) in local waters, the increased effort due to population growth and new market forces clearly indicate that depletion of SI marine mammal resources can and does happen. Hence, additional dedicated cetacean surveys need to be conducted by the SI Government to determine the sustainability of the traditional dolphin drives, and ultimately, to ensure the preservation of the unique cultural heritage of the SI.

The Bita' Ama community (a second village with a history of traditional dolphin drives) has not hunted dolphins for numerous years. All dolphin hunting canoes – which are different in wood type and design from fishing canoes - are in a state of deterioration. Preparations are being made by elders to build new canoes and resume traditional dolphin hunting in the northern Indispensable Strait within 2 years.

Important cetacean habitats that have been identified are reef lagoons, especially for spinner dolphins, and the northern Indispensable Strait region, where, according to community knowledge, large baleen whales are common seasonally. After detailed interviews with elders from Bita 'Ama it seems that the most likely species involved are blue whales. Other anecdotal sighting information also strongly indicates that blue whales are present in these waters. If confirmed, the Indispensable Strait region, as well as several other narrow yet deep island passages in the western Solomon Seas, are likely to function as marine migratory corridors for large cetaceans. Such corridors (also called migratory bottlenecks) are often used by multiple species of large migratory marine vertebrates - including cetaceans, marine turtles, sharks, billfish and tuna - and have already been recognised to be of regional conservation importance in several other nations of the Indo-Pacific.

Marine corridor conservation can be effectively achieved via habitat-based management frameworks including multi-use Marine Protected Areas. Key issues for corridor conservation in the Indo-Pacific include fisheries interactions; especially gill and/or drift netting practices in or near corridors which may effectively cordon off a passage. Because of the seasonal migrations of whales, dolphins and other migratory marine life, even short periods of intensive fishing with gillnets in the vicinity of corridors can result in very significant by-catch and entanglement rates. Overall, management measures may vary substantially between corridor sites and ideally are incorporated within long-term management plans.

On several occasions during the SI Marine Assessment specific reef lagoon areas were identified where spinner dolphins were known to 'rest'. These sites were often known by local communities for many generations, indicating long-term site fidelity. In these locations community-based marine management approaches, in collaboration with provincial and national government agencies, may be an effective management framework to ensure these important dolphin habitats are conserved, and where feasible, regulate any economic opportunities such as local dolphin watching activities.

At the Arnavon Islands Marine Protected Area, the complete skeleton of a previously stranded false killer whale, *Pseudorca crassidens*, was located on a remote beach. With help of the Conservation Officers, the bones and skull were transported to the Arnavon research station. The 6m skeleton was assembled into an educational display at the station's entrance. Furthermore, the Arnavons central location in the Manning Strait (one of the major marine corridors of the Solomon Islands), in combination with on-going marine conservation projects and trained staff which are permanently on-site, mean that conservation activities (i.e. monitoring) on whales and other large migratory marine life could be implemented relatively cost-effectively.

The Gavutu live-capture dolphin facility was visited, and included a detailed tour and inspection. The main business of the facility is a local 'swim-with-dolphin tourism' venture and international export of dolphins. The recommendations of a recent IUCN Species Survival Commission report on the facility and dolphin trade were brought forward during discussions with staff. In addition, an indirect – and unintended - effect of the facility may be over-exploitation of local fish stocks due to high daily food requirements for the dolphins, as well as price incentives to local fishermen.

Key recommendations focus on additional cetacean surveys, ecological research, training and policy. In particular, SI would benefit from additional cetacean surveys to estimate relative abundance for cetacean species of interest and to further identify and confirm high priority areas for conservation. In order to address the knowledge gap on SI cetaceans, it is vital to improve the local expertise and build capacity for long-term cetacean survey and ecological research programs in the Solomon Seas. A national cetacean workshop with field-oriented training components has been agreed upon by Marine Assessment stakeholders as an effective tool to address this. Areas of interest for possible follow-up cetacean training, survey and research activities include: The Gizo/New Georgia Group, Malaita, Indispensable Strait, Florida Islands, Fauro (Shortlands), and the St. Cruz Islands – the latter being the vast eastern-most province of the SI. St. Cruz province has exceptional oceanic habitat diversity and consistent anecdotal sightings of large whales (including sperm whales and orcas). Due to logistical constraints St. Cruz was not part of the area of interest for the Solomon Islands Marine Assessment.

Lastly, SI would benefit from becoming a signature state of the Convention of International Trade of Endangered Species (CITES). CITES is an internationally recognized mechanism to sustainably manage wildlife trade in endangered species, including cetaceans. By joining CITES the Solomon Islands would improve CITES coverage and effectiveness and in doing so would be welcomed by the wider international community. In addition, Solomon Islands export a considerable quantity of fauna. While most SI species as reported by CITES may sustain such a trade, there are several cases where CITES has recommended a ban on imports of several species from the Solomon Islands. By not being a CITES member, the Solomon Islands has no mechanism to officially oppose such trade restrictions.

The Solomon Islands Marine Assessment provided a good basis for these recommendations. In addition to the significant collection of cetacean data, it increased awareness and active participation amongst key government and non-government stakeholders, and assisted with the development of local capacity that may be involved in future projects on Solomon Islands' diverse whale and dolphin species and habitats.

Introduction

The Cetaceans of the Solomon Islands

The limited scientific literature, in combination with traditional knowledge and anecdotal records, suggests that cetaceans are relatively frequently observed in Solomon Islands' waters. Based on combined sighting information reported for the Solomon Islands, Papua New Guinea, wider Melanesia and eastern Indonesia, it is likely that over 30 species of whales and dolphins inhabit the waters under Solomon Islands' national jurisdiction (Table 1). This means that more than one third of all known whale and dolphin species worldwide can be found in the Solomon Island Seas, including residential, migratory and endangered cetacean species (IUCN 2003).

However, despite the numerous and major advances in marine science for the tropical Indo-Pacific region, the lack of information on the ecology and conservation status of whales and dolphins – and their associated coastal and offshore habitats - is one of the largest 'knowledge gaps' concerning the marine biology of this exceptionally diverse part of the world's oceans. This is especially so for the waters of the Solomon Islands. According to the IUCN Species Survival Commission – Cetacean Specialist Group (CSG), numerous whale and dolphin species which occur in the Solomon Islands are considered data-deficient on the taxonomic, species, stock and population level (Ross et al. 2003, R. Reeves pers. comm.).

The Solomon Islands have a narrow continental shelf, and as a result its overall length of the 200m isobath (4600 km) is only marginally longer than its coastline. This means that oceanic cetaceans and their associated pelagic and deep-sea habitats (>2000m) are often located relatively close to shore. This combination of coastal-oceanic habitat diversity and proximity to shore creates opportunities for marine (mammal) resource conservation and management (Hyrenbach et al. 2000, Kahn and Pet 2003, Kahn 2001a, 2003, Fortes et al. 2003, Malakoff 2004, Hoyt 2004).

Several whale species that are known or suspected to occur in the Solomon Seas are IUCN listed as vulnerable (humpback, sperm, 'Pacific' blue whales) or endangered species (i.e. fin, 'Antarctic' blue whales, sei whales). Vital information for management such as stock structure and population estimates and dynamics are virtually non-existent. A similar situation exists for local species diversity and distribution and ecology. A very limited number of scientific studies have been done in these waters on cetacean species diversity, distribution and relative abundance (the latter can only be estimated through structured and periodic surveys), and none on species-specific cetacean ecology and habitat use (see Appendix 1 for a shortlist of relevant references).

Cetaceans in the Asia-Pacific are thought to be vulnerable to the region's ever-increasing coastal and marine resource usage (IUCN 2003). These range from broad region-wide issues such as:

- fisheries by-catch,
- chemical pollution and
- habitat destruction (including impacts of deforestation on coastal cetacean habitats, and presumably to a lesser extent, noise pollution from seismic oil and gas exploration, military/navy activities involving sonar, shipping)

to more specific Solomon Islands issues such as:

- The licensed live-capture trade of catching and exporting bottlenose dolphins (T. aduncus) in SI waters for local and international cetacean displays and 'swim-with-the dolphins' tourism venues. The Solomon Islands policy to develop a sustainable export industry for SI's cetacean resources has been detailed in government statements (Kile and Watah 2003). A recent export in 2003 to Mexico received wide-spread attention from international regulatory bodies such as CITES as well as the scientific and civil community. To avoid any misunderstandings on this complex issue, the IUCN's Species Survival Commission – Cetacean Specialist Group and Veterinary Specialist Group deployed a joint fact-finding team in late 2003, with the assistance of the SI government, and its report is publicly available (Ross et al. 2003). This SI Cetacean REA was not designed nor conducted to address any of these issues specifically (see section: Limitations of the SI Cetacean REA), and this paper will report on the SI Cetacean REA's field activities and outcomes. However, it is important to note that in early 2005, the government of the Solomon Islands announced a complete ban on further exports of dolphins. A joint declaration by the Minister for Fisheries and Marine Resources and the Minister for Forests, Environment and Conservation detailed that this new policy is effective immediately (see Appendix 5).
- The status of the traditional dolphin drives on Malaita and Makira Islands (see Section C for a detailed account).

The preparations for the Solomon Islands Marine Assessment – Oceanic Cetaceans and Associated Habitats component (the SI Cetacean REA) included the sourcing and review of numerous papers and technical reports related to the survey area (Appendix 1). These documents were further analysed to produce a preliminary species list for the Solomon Islands and (where possible) to shortlist potential cetacean habitats and other points of interest during the Solomon Islands Marine Assessment. However, a more detailed literature review was beyond the scope of this project.

SOLOMON ISLANDS CETACEAN SPECIES AND HABITATS

A preliminary cetacean species list for the Solomon Islands includes resident and migratory species; several rare, vulnerable and/or endangered whale species - including blue, Bryde's, sperm, and beaked whales; as well as numerous coastal and oceanic dolphin species (Fam. Balaenopteridae, Physeteridae, Kogiidae, Ziphiidae and Delphinidae respectively – Table 1). The preliminary cetacean species list for the Solomon Islands is very similar to that of Indonesia (Rudolph et al. 1997). This may be expected as both nations are tropical Asia-Pacific archipelagos with similar coastal and oceanic cetacean habitats.

It seems likely that cetaceans are an important component of coastal and oceanic ecosystems in the national and EEZ waters of the Solomon Islands (Reeves et al. 1999). Cetacean habitats may include Solomon Islands' major rivers (although no riverine species are known to occur in the SI at this date), mangroves as well as its diverse coastal habitats. Open ocean environments include many oceanic islands, oceanic fronts and upwellings, seamounts, guyots, canyons, deep-sea trenches and the water column itself. These diverse habitats are often in close proximity to one another because of the Solomon Islands' narrow continental shelf, abundant oceanic islands and extreme depth gradients. Examples of cetacean habitats within the Solomon Islands Marine Assessment (SI MA) survey route included coastal 'hotspots' for whales and dolphins, local communities engaged in traditional dolphin drive fisheries and narrow yet deep island passages that are known or suspected to function as migratory corridors of regional significance (WWF 2003).

Solomon Islands Marine Corridors

From a broader – and regional - marine conservation perspective, data on cetacean species diversity, distribution, relative abundance, species-specific sighting frequencies, total individual counts and ecology is also crucial when considering the location and complex oceanography of the survey area. The Solomon Islands are one of the few equatorial regions worldwide where hemispherical oceanic exchange of a wide variety of marine life occurs. Cetacean movements between the South Pacific and North Pacific are known or suspected (depending on the species) to occur through the major island passages of the Solomon Islands' archipelago, such as Indispensable Strait, Bougainville Strait - separating the Solomon Islands from Papua New Guinea (PNG), Manning Strait and New Georgia Sound (also known as The Slot). The ecological significance of these passages as migration corridors for whales and dolphins (and other large migratory marine life) remains poorly understood (but see Kahn et al. 2000, Kahn 2002a and 2003, Kahn and Pet 2003 for more on marine corridors in the Indo-Pacific).

Yet Solomon Islands' cetaceans which include these passages in their local or long-range movements may be increasingly vulnerable to numerous regional and local environmental impacts such as habitat destruction, subsurface noise disturbances, net entanglement, marine pollution and over-fishing of marine resources (Hofman 1995, Fair and Becker 2000, Gordon and Moscrop 1998). At least some of these impacts on cetaceans are known to occur in the waters of the Solomon Islands (IUCN 2003, Local government officials, pers. comm.). These impacts would affect residential whale and dolphin populations as well as several endangered migratory species (such as the sperm, blue and fin whale - *Physeter macrocephalus*, *Balaenoptera musculus* and *B. physalus* respectively) which may include these passages in their long-range movements.

This is of special concern in the Solomon Islands, where a strictly limited number of deep inter-island channels are suspected to function as migration corridors for cetaceans. These passages have considerable ecological significance and conservation value:

1. The Solomon Islands' (SI) straits and passages may form an important migration corridor network for large cetaceans travelling from the southern and northern parts of the Pacific Ocean, and may even travel to the Indian Ocean via the eastern Indonesian Seas, and vice versa. In addition, residential whale and dolphin populations are also likely to use these corridors as part of their home range.

2. The SI straits and passages are also likely to function as sensitive bottlenecks to numerous other species of large migratory marine life such as green, hawksbill and leatherback sea turtles, tuna and billfishes, as well as elasmobranchs such as manta rays and (whale) sharks.

Local activities such as destructive fishing practices and gill/drift netting near these straits can result in regional environmental impacts on cetacean populations and affect large marine ecosystem dynamics (Agardy 1997, Kahn et al. 2000, Kahn 2003, Perrin et al. in press).

THE SOLOMON ISLANDS MARINE ASSESSMENT'S CONTRIBUTION TO THE 'CETACEAN DATA GAP'

To better understand and manage the Solomon Islands' (SI) cetaceans, scientists and managers need to obtain information about their diversity and distribution, life histories - including their feeding and breeding habits, long and short-term movements, the locations of their critical habitats, how they use each habitat, when they travel between them and the routes the various species take - as well as current and emerging threats.

This data is difficult and costly to obtain for most marine mammals, even for developed nations with ample resources, let alone for the Solomon Islands. Therefore, the Solomon Islands Marine Assessment presented a valuable opportunity to make a significant contribution to address this knowledge gap and increase the understanding of the diverse assemblage of cetacean species in these remote waters of the tropical western Pacific. Importantly, the Solomon Islands Marine Assessment – Oceanic Cetaceans and Associated Habitats (the SI Cetacean REA) component included the involvement of the Marine Assessment's community team, as the local communities were a key data source. Through the informal on-board capacity building of local scientists and conservationists, the SI Cetacean REA also contributed to improved local cetacean expertise and promoted the possible establishment of long-term cetacean conservation programs in the Solomon Islands (see *Recommendations*, below).

Limitations of the SI Cetacean REA

It must be noted that because of the broad and multi-faceted nature of the Solomon Islands Marine Assessment's activities and goals[1], this program could not be designed as a dedicated cetacean survey. As such the SI Cetacean REA could not address species- or habitat-specific conservation and management issues – such as the estimation of relative abundances - which can only be estimated through more structured and periodic cetacean surveys. The SI Cetacean REA's modus operandi had to be adjusted to accommodate for the complex day-to-day schedule of various site visits as well as logistical limitations. Another factor limiting species-specific outcomes of the SI Cetacean REA was the relatively short time scale of the project. Hence, certain key issues (i.e. regarding tourism and traditional dolphin drives) need to be further investigated. For example, management of the export trade of dolphins for the live-display and 'swim-with-captive-dolphins' tourism programs must rely on accurate estimates of stock boundaries and population abundance of the species targeted. This type of data can best be obtained through multiple dedicated surveys and longer-term ecological research on particular cetacean populations. A similar situation may apply to the traditional dolphin drives – a unique cultural heritage for the SI (see also Sections C and D of this chapter). The SI Cetacean REA provided a good basis for such work: in addition to the significant biological data, it has increased awareness and active participation amongst key government and non-government stakeholders, promoted the establishment of long-term cetacean survey and research programs, and assisted with the development of local capacity that may be involved in future projects.

The Goals for the SI Cetacean REA

The SI Cetacean REA goals were to:

1. Conduct visual and acoustic surveys of the Solomon Islands' whale and dolphin species diversity, distribution, ranking of species-specific sighting frequencies and total individual count and their associated habitats;
2. Assist with the identification of near-shore yet deepwater habitats that may be of significance to oceanic cetaceans and associated pelagic deep-sea species (i.e. canyons, knolls, seamounts, trenches, upwelling zones);
3. Assist with the identification of migratory corridors of national and regional importance, as well as other critical habitats;
4. Identify, and assess, wherever possible, interactions with coastal and pelagic fisheries (small and large scale);
5. Assist with the identification, and assessment of current or emerging threats to cetaceans;

[1] see *Solomon Islands Marine Assessment*, this report

6. Use visits to coastal villages to canvass community knowledge on local cetacean sighting patterns, strandings, and cetaceans' role in cultural heritage and folklore;
7. Conduct an on-board capacity building program on cetaceans for local scientists and marine conservationists and improve awareness through participatory field work and hands-on training (i.e. research techniques; cetacean species identification at sea; ecology, conservation and management issues);
8. Assist with the identification of opportunities for national cetacean conservation and management strategies; SI Cetacean REA outcomes may be incorporated in national programs, regional initiatives and international conventions of relevance to cetaceans.[2]
9. Assist with the identification of potential sites with economic opportunities for responsible cetacean watching. The development of possible sperm whale watching has already been indicated to be of national interest by the SI government.

Survey Methods

The visual and acoustic cetacean survey component during the SI Cetacean REA was carried out from 10 May[3] – 16 June 2004 on the live-aboard the MV FeBrina, a purpose build 22m dive vessel with long range live-aboard capacity. The field work was conducted for a total of 36 sea days.

Visual Cetacean Assessment

While underway between daytime anchorages or longer-range passages, an expert cetacean observer (BK) conducted visual surveys of the surrounding waters. The sighting efforts by the observer were further assisted by the vessel's captain and to a lesser extent the other Solomon Islands Marine Assessment participants. The majority of sighting efforts were made from the bridge deck area, which increased observer height to approximately 5m above sea level.

Regular scanning of the surrounding seas with marine binoculars (35x8 Steiner Commander) further increased the visual survey range. Once cetaceans were sighted or a possible cue observed more than once, the vessel's course and speed was adjusted to allow for a discreet approach and close observation.

For each sighting, a positive species identification (ID) was made whenever conditions and animal behaviour allowed this to be done safely and with minimal disturbance. Other standard data recorded for each sighting included: Date and time; GPS location and area description; species identified and any cetacean species associations, group size(s) and composition - including the presence of newborn calves; distance from vessel; direction of travel when first sighted; any natural markings; occurrence of 10 behavioural categories – including feeding, resting, bow riding, aerials, avoidance and data on other behaviours observed; surface interval and dive durations whenever possible; photo; video data whenever

---

[2] Programs and organizations include the SI's National Biodiversity Strategic Action Plan (NBSAP), South Pacific Regional Environment Programme (SPREP), South Pacific Commission (SPC) and IUCN Species Survival Commission (SSC) Cetacean Action Plans, as well as various international treaties such as the Conventions on Biodiversity and Migratory Species – CBD and CMS);

[3] These dates include two additional cetacean survey days, as counted from the Papua New Guinea – Solomon Islands (PNG-SI) border to Honiara, Guadalcanal during the relocation passage of the survey vessel FeBrina, prior to the start of other Solomon Islands Marine Assessment activities.

possible; and sighting condition (a 1-5 ranking of the overall visual conditions for spotting cetaceans, incorporating sea state, ambient light, rain and other weather factors).

A Canon 300 Rebel Digital EOS, equipped with a 70-300mm optically stabilized lens, was used to obtain photo-identifications of individual animals with distinctive colourations, marks or scars. Photographs were used to 'mark' individuals during most sightings and for the majority of cetacean species encountered. These photographic data are crucial for longer-term ecological focus research including studies on local movements/site fidelity and population/stock assessments. In addition, a Panasonic CCD MZ-350 professional digital video camera was also frequently used to record the diversity of cetacean species and surface behaviours.

ACOUSTIC CETACEAN ASSESSMENT

During off-shore routes the visual surveys were complimented by periodical acoustic listening stations using either omni-directional or directional custom VHLF hydrophones (20Hz-20kHz) connected to a custom-made amplifier equipped with multi-channel high/low pass filters. Detection range for sperm whales was estimated to be 8-10 nm in good conditions, whereas the detection range for smaller cetaceans was estimated to be 2-3 nm. In order to minimise any coastal interference, the acoustic assessment was conducted once the vessel was located 4 or more nautical miles offshore. Listening stations were conducted at least 8 nautical miles apart, depending on daily schedules and offshore conditions. Digital audio recordings of cetacean vocalizations were recorded with a Sony Portable MiniDisc Recorder (MZ-R70) during several stations.

Each listening station was conducted for at least five minutes, after which the following data was recorded: Date and time, GPS location and area description; position of high and low pass audio filters; any acoustic contact with cetaceans[4]; direction of contact (priority species only); species identification (when applicable), abundance estimate (when applicable); listening conditions (a 1-5 ranking of the overall audio quality of listening station incorporating sea state, vessel and ambient noise); and the recording's segment numbers.

The acoustic survey component is especially valuable to locate priority cetaceans such as sperm whales and other deep-diving oceanic cetaceans. These animals spend the majority of time underwater, and thus while present in the surveyed area, are not often seen at the surface. However, these same species routinely echolocate and/or communicate underwater during foraging dives and the hydrophones are able to detect (and locate) the clicks and other vocalizations from most odontocete (toothed whales and dolphins) cetacean species.

In addition to data on presence/absence of cetaceans within the estimated listening range, the acoustic assessment can also provide more detailed data for each listening station including: species identification; group size estimates; indications of foraging and/or social behaviours; and determination of local (underwater) movement patterns by conducting acoustic tracking activities. The acoustic survey results are important for comparative analysis between and within sites over time. However, during the SI Cetacean REA the collection of species-specific data was restricted due to operational constraints.

After the visual and acoustic data collection was completed for each cetacean encounter and listening station, the vessel would depart from the area slowly and return to the predetermined route. Routes were occasionally adjusted to allow for all Solomon Islands Marine Assessment activities to be conducted at maximum effectiveness, as well as environmental

[4] Depending on the species heard, positive identifications can be made and abundance categories estimated from these acoustic assessments of cetacean presence in the proximity of the vessel.

factors such as unfavourable currents and/or winds. A more extensive description of methodologies and data analysis has been described elsewhere (Whitehead and Kahn 1992; Kahn et al. 1993; Kahn et al. 2000; Kahn and Pet 2003).

CETACEAN ACTIVITIES AND OTHER SOLOMON ISLANDS MARINE ASSESSMENT COMPONENTS – coral diversity and health status, reef fish, sea grass, commercial species, community interviews

The majority of cetacean activities were conducted when the vessel was underway. Transit time is usually 'down-time' for coastal (reef and sea grass) field assessments and 'up-time' for cetacean surveys. Thus interference with other (mostly site-based) activities was minimal. Some additional travel distance was necessary during longer periods in transit (i.e. passages) to identify any cetacean species seen or pass closer to associated habitats (i.e. canyons, seamounts) that were located nearby the original route. While on-site, the cetacean component of the Solomon Islands Marine Assessment also had strong links with the community-based activities (see below). The surveying and boat-handling techniques were especially designed to cause minimal disturbance to cetaceans while allowing for discrete and close observations.

PASSAGES BETWEEN SITES – VISUAL CETACEAN SURVEY

During these relatively short inter-site transfers a visual cetacean survey was conducted.

The Solomon Islands Marine Assessment travelled along large sections of the Solomon Islands' coastline that lack a significant continental shelf and include diverse deep-sea habitats close to shore (i.e. canyons, knolls, seamounts, trenches). This route presented a clear opportunity to do cetacean work, as such extreme habitat proximity from coastal to oceanic ecosystems, has yielded substantial whale and dolphin sightings in other comparable areas of the Asia-Pacific region where cetacean surveys have been conducted. During the Solomon Islands Marine Assessment, both coastal as well as more oceanic cetacean species were encountered relatively close to shore.

LONG PASSAGES BETWEEN SITES AND ISLANDS – VISUAL AND ACOUSTIC CETACEAN SURVEY

The passages between the major islands of the Solomon Islands are known or suspected migratory corridors for oceanic cetaceans as well as other large migratory marine life. Constant visual surveys from the upper deck and opportunistic acoustic 'listening stations' were conducted to assess this key habitat. During listening stations an easily deployed directional hydrophone was lowered in the water. The stations took approximately 5-10 minutes and were usually spaced 2-3 hours apart depending on vessel speed and travel schedule. Acoustic contacts with cetaceans were digitally recorded, depending on sea conditions.

Because of logistical restraints it was not possible to switch from survey mode to tracking mode. Priority species such as sperm whales may be tracked acoustically once detected (usually during a deep foraging dive of approximately 45 min). This would result in close range observations during their surface intervals (approx. 8-10 min, a pod usually consists of 4-12 individuals who may all surface in the same general area). Once sperm whales are heard on the hydrophone, it routinely takes 1-2 hours before close observations (<50m) of sperm whales can be made - depending on initial distance, swimming speed and dive cycle. However, it is *not necessary* to actually see or track sperm whales to: a) positively identify this species or b) obtain an estimate of their total individual count. A positive identification can be inferred acoustically due to the characteristics of their clicks (Whitehead and Weilgart

1990). Thus, the routine listening stations provided valuable data for the SI Cetacean REA on sperm whales and other species; whether or not acoustic contacts are followed-up by tracking and/or subsequent sightings.

Anchored on Site – Canvassing of Local Community Knowledge on Cetaceans

The SI Cetacean REA included a strong linkage with the Solomon Islands Marine Assessment community team when making landfall during site visits. The team assisted with efforts to canvass local knowledge on cetaceans for the majority of coastal SI communities visited. This was done with relative ease by incorporating several questions on cetaceans during the routine request to the village elders to be allowed to conduct marine assessment activities in local waters. Six questions were of particular interest to a) fill the data gap on cetaceans and b) assist with the identification of conservation issues and strategies:

1. Are there any areas of consistent whale and/or dolphin sightings known in the local area, and if so are these seasonal?
2. What are the local names for the species seen, and how would the local community rank these according to perceived local abundance category for each species (i.e. from common to rare)?
3. Is there any information available on whale strandings (live or dead, single or group) in the local area? When, where and what ultimately happened to the animal(s)?
4. Are there any fisheries interactions with cetaceans in local waters? This includes positive interactions such as fishermen using schools of dolphins as a proxy for tuna and other large pelagics, as well as (by-)catch and depredation (stolen catch) by cetaceans.
5. Is there significant historical, traditional or modern usage of cetacean products in the community or local area?
6. Do cetaceans feature in the community's cultural heritage (i.e. storytelling, legends, and myths)?

Depending on such information on cetaceans, the proximity of deepwater habitats nearby and availability of tenders, a quick assessment of local waters was conducted from the tender at a limited number of sites. In addition, assistance with the in-water survey activities of the coral, reef fish and commercial species teams was given, including underwater photo and video recordings of species and activities of interest.

Other Activities - Large Marine Life Sightings (Non-Cetacean)

While underway, sighting details for other large (and often migratory) marine life were recorded on a separate 'non-cetacean' data sheet (i.e. all marine turtles, manta rays, [whale] sharks, mola mola, all large billfish and tuna sightings).

Results and Discussion

Visual Survey Results

Visual Survey Effort

The SI Cetacean REA was conducted over 36 field days and covered an estimated 1228.1 nautical miles (nm) and included 7 of Solomon Islands' 9 provinces (Figs 1-4, Table 2). The survey included 160.0 active visual survey hours, spread over 3 habitat zones – coastal, oceanic and straits/corridors (Fig 5a). Daily survey distances ranged between 22.0 and 91.3 nm. The majority of survey days covered between 21-40 nm (Fig 5b).

Cetaceans where sighted during the majority of the 36 survey days (72.2%, Fig 5c). Sighting frequencies ranged between1-4 separate encounters per day, totalling 1-3 separate species. A routine survey day included 1-2 sightings per day (52.8% of survey days), consisting of 1-2 species (63.9% of survey days; Figs 5c-d resp.).

During the SI Cetacean REA survey period a total of 10 cetacean species were identified visually in 52 sightings. In addition, sperm whales (*Physeter macrocephalus*) were identified acoustically on 4 occasions (operational restraints restricted the time needed to make subsequent visual contact), bringing the total species positively identified during the SI Cetacean REA to 11. All cetacean sighting coordinates were transcribed to a GIS format and assigned species-specific colour-coded data points (Figure 3). Cetaceans were assigned the following general symbols according to taxonomic classification, or occasionally, broader cetacean categories depending on the resolution of the field data.

Cetacean species category	Symbol
Sub-order Mysticeti – baleen whales	●
Families Physeteridea and Kogiidae - sperm whales	■
Family Ziphiidae - beaked whales	◈
Family Delphinidae –dolphins (mostly oceanic species)	▲
Globicephalinae - a Delphinidae subfamily of six species[5], similar to the historical 'blackfish' grouping.	✚
Unidentified small cetacean (< 6 metre)	△
Unidentified large cetacean – toothed whale (> 6 metre)	□
Unidentified large cetacean – baleen whale (> 6 metre)	○
Unidentified beaked whale (Fam. Ziphiidae)	◇

The species identified included toothed whales and dolphins (Suborder Odontoceti), baleen whales (Suborder Mysticeti) as well as the rare and relatively unknown beaked whales (Fam. Ziphiidae). In total, the cetacean species sighted belong to 4 taxonomic families, 9 genera and 11 different species:

1. Spinner dolphin (*Stenella longirostris*)
2. Pantropical spotted dolphin (*Stenella attenuata*)
3. Common bottlenose dolphin (*Tursiops truncatus*)
4. Indo-Pacific bottlenose dolphin (*Tursiops aduncus*)
5. Orca (*Orcinus orca*)
6. Risso's dolphin (*Grampus griseus*)

[5] The Globicephalinae subfamily is based on a systematic revision of the Delphinidae and includes six species: *Feresa attenuata*, *Peponocephala electra*, *Globicephala macrorhynchus* and *G. melas*, *Pseudorca crassidens* and *Griseus grampus* (LeDuc *et al*. 1999). It replaces the historical blackfish category that includes the majority of these species as well. Globicephalinae sightings are recorded when sightings of members of the subfamily can not be identified to species. This occurs infrequently and is mostly due to the similarities of *P. electra*, *F. attenuata* and juvenile or subadult *G. griseus*, in particular during unfavourable sighting conditions.

7. Rough-toothed dolphin (*Steno bredanensis*)
8. Short-finned pilot whale (*Globicephala macrorhynchus*)
9. Mesoplodon beaked whale (*Mesoplodon sp.*)
10. Rorqual baleen whale (*Balaenoptera sp.* – either the common Bryde's or Sei whale; *B. brydei* or *B. borealis* respectively)
11. Sperm whale (*Physeter macrocephalus* – acoustic identification only).

An estimated total of 815 individual cetaceans were counted during the 52 separate species sightings (Table 2). This cetacean count is a known underestimate as only minimal counts of individual cetaceans at the surface per sighting were used in the calculation. Because of the new survey routes each day and significant distances covered each day, the likelihood of 'double counts' (observing and recording the same dolphins or pods more than once) was considered negligible. The limited photographic identification efforts supported this, as no individuals were matched between encounters. Comparisons were carried out in near real-time due to the high-quality digital cameras, equipped with powerful tele-lenses.

Sightings were dominated by two species, the spinner dolphin and to a lesser extend the common bottlenose dolphin. The sighting frequency (Figure 6) shows that over 80% of all sightings consist of 3 species:

Spinner dolphin - *Stenella longirostris* (55.8 %)
Common bottlenose dolphin – *Tursiops truncatus (17.31 %)*
Pan-tropical spotted dolphin - *Stenella attenuata (9.62 %)*

Figure 7 shows that over 90% of the total individual count is due to the same 3 species, albeit in different ranking:

Spinner dolphin - *Stenella longirostris* (68.83 %)
Pan-tropical spotted dolphin - *Stenella attenuata (12.27 %)*
Common bottlenose dolphin – *Tursiops truncatus (9.20 %)*

These ranked species-specific sighting frequencies and total individual count results imply a relatively low species diversity and abundance in these waters during the SI Cetacean REA when corrected for survey effort (Table 2). In most other Asia-Pacific regions where comparable studies have been conducted, the species composition accounting for such a high percentage routinely consists of at least 5-6 species (Kahn et al. 2000, Kahn 2002a, Kahn and Pet 2003, Kahn 2004). It is interesting to note that several oceanic odontocetes known to occur in the deep-water habitats of the Solomon Seas - and often assumed to be relatively common here - were not sighted at all during the SI Cetacean REA:

Melon-headed whale – *Peponocephala electra*
Fraser's dolphin – *Lagenodelphis hosei*
Pygmy killer whale – *Feresa attenuata*
False killer whale – *Pseudorca crassidens*
Sperm whale – *Physeter macrocephalus* (although present in the survey area, as identified through acoustic contacts)
Pygmy and Dwarf sperm whales – *Kogia sp.*

These oceanic odontocetes are either exclusively teuthophagous cephalopod specialists – squid, cuttlefish and octopus - or rely on cephalopods for a substantial part of their diet. Other species with a similar feeding ecology that were sighted include the:

Short-finned pilot whales - *Globicephala macrorhynchus* (n=1)
Risso's dolphin - *Grampus griseus* (n=1).

This relatively low species diversity and abundance for these oceanic odontocetes may indicate that the deep-sea waters and habitats surveyed during the SI Cetacean REA period did not include pelagic cephalopod prey in high abundance.

Interestingly, several cetacean species were sighted during the SI Cetacean REA which are considered to be relatively rare in tropical Indo-Pacific waters (as based on the limited survey efforts in this region):

Orcas - *Orcinus orca* (n=1)
Rorqual whales *Balaenoptera brydei* or *B. borealis sp.* (n=1)
Beaked whales - *Mesoplodon sp.* (n=1)
Rough-toothed dolphins - *Steno bredanensis* (n=1).

<u>Bryde's and Blue Whales in the Solomon Seas</u>

In addition to the whale species visually or acoustically identified above, several reports from Japanese research and scientific whaling expeditions indicate that SI waters include important habitats for Bryde's (see Appendix 1) and possibly pygmy Bryde's whales especially (*Balaenoptera brydei* and *B. edeni* resp.). Although blue whales (*B. musculus*) were not encountered during the SI Cetacean REA effort reported here, anecdotal evidence from local communities and reported sightings indicate that blue whales inhabit the Solomon Seas and its western waters may include important (seasonal) habitats for this endangered whale species.

Interviews with Bita 'Ama community elders on Malaita Island revealed the presence of 'very large whales' in the northern section of the Indispensable Strait. Community interviews identical to those conducted in Fanalei (positive species identification using a process of elimination, assisted by illustrated cetacean identification handbooks) strongly suggest that these sightings are blue whales (see also Section C). Secondly, FeBrina's crew reportedly sighted a blue whale 'mother and calf' (15:30; 18 June 2004; 9^{o} 01.6S and 159^{o} 29.4E, R. Slater, pers. comm.) in The Slot, just west of the Russell Islands, which are mid-way between Guadalcanal and New Georgia province. These sightings were made outside the SI Marine Assessment, during the vessel's passage back to Papua New Guinea.

It is important to note that in this case the observers had a full 6-weeks of informal cetacean field training at that stage and were familiar with species identification procedures at sea (i.e. the process of elimination according to species-specific features and behaviours). The observers also had identification experiences with both humpback whales and sperm whales – the only two other species of large whales with tropical ranges to routinely fluke-up upon diving – and these two species were ruled out from the start of their observations.

The whales were sighted in windy conditions but in close proximity to the vessel (25 + knots, less than 100m from vessel's bow) and were clearly visible. Identification features described include an extremely large body size (>23m), tall straight blow, even in the rough conditions and fluking behaviour upon diving. These and several other reported features all indicated a blue whale mother/calf pair were sighted. In addition, some hours earlier that same day another 'very large whale' was sighted in the distance and no location or species data could be recorded due to rough sea conditions. The observed travel direction for the whales in both observations was estimated to be due south.

SI Cetacean REA Results Corrected for Active Survey Effort - Time and Distance.

Visual cetacean results were corrected for survey effort - time and distance actively surveyed. Both corrections produced very similar results, thus only distance (nautical miles 'on-survey') will be included here for most parameters. Cetacean sightings per survey day and cetacean species positively identified per survey day averaged 1.44 and 1.14 respectively. Comparable surveys of priority cetacean areas in eastern Indonesia resulted in maximum values of 8.8 and 4.6 resp. (Kahn 2001b, 2002b, 2003, Kahn and Pet 2003, for corrected results from other regions). The average cetacean sighting rate was 1 sighting per 25 nautical mile surveyed (0.04 sightings/nm). Comparable surveys of priority cetacean areas in eastern Indonesia resulted in maximum values of 0.17 sightings/nm. Total individual count estimates were also corrected for survey effort. An average of 22.64 individual cetaceans were counted per survey day, and an average of 0.66 cetaceans per nautical mile surveyed (Table 2). Comparable surveys of priority cetacean areas in eastern Indonesia resulted in maximum values of 385.4 individual cetaceans per survey day, and an average of 7.60 cetaceans per nautical mile surveyed. These regional comparisons must be viewed with caution as seasonal and environmental differences between survey areas and years must be taken into account. In addition, even when observers and methods are identical, several other factors are not (i.e. different vessels - and average vessel speed -, unexpected logistical constraints due to working in remote areas).

However, the SI Cetacean REA results strongly indicate that the waters assessed in the Solomon Islands may have a relatively low cetacean species diversity and low total individual count when compared to REAs conducted in eastern Indonesia and northern Papua New Guinea (i.e. an order of magnitudes less, at least during the SI Cetacean REA period; Kahn *et al*. 2000, Kahn 1999, 2001b, Kahn 2002b, Kahn and Pet 2003, Kahn unpubl. data for PNG).

Visual Survey Results per SI Cetacean REA Leg

The effort and summary results of the visual surveys were also compared by survey legs (1-5). Survey legs usually comprised of an area that was covered within a single week and have a similar visual survey effort. (Table 3, Figure 8a-f). The variability between REA legs was relatively low for visual survey effort, number of species identified and to a lesser extent visual conditions (Figure 8a, b and f resp.). Substantial variability between REA legs was recorded for species diversity index, sightings/nm and abundance/nm (Figs 8 c, d and e resp.). The latter three parameters all have maximum values in REA leg 4, indicating this leg included relatively important cetacean habitats for several species.

Acoustic Cetacean Survey Results

A total of 49 listening stations were conducted during the survey, the majority while the vessel was making passage at night to new islands (Fig 2, 4). Acoustic contact with cetaceans was recorded during 51.02 % of all the listening stations. Sperm whales were heard on 8.16 % of all listening stations with acoustic contacts (Table 4). Acoustic detection range was estimated in the field at 6.0 nautical mile (nm) for sperm whales and 2.5 nm for small odontocetes. Total acoustic coverage was calculated to be 5541.8 nm2 for sperm whales and 962.1 nm2 for small cetaceans respectively (Table 4).

All coordinates of acoustic contacts with cetaceans during the SI Cetacean REA were transcribed to a GIS format and assigned symbols according to species categories (Fig 4). Acoustic contacts with cetaceans were analysed in situ for vocalization characteristics and assigned a particular 'cetacean category', ranging from a single species which can be clearly distinguished in the field (such as sperm whales, orcas) to broader species assemblages (i.e.

small oceanic dolphins from the Fam. Delphinidae, such as spotted, spinner and bottlenose dolphins), which have relatively similar vocalizations and may group together (see species associations). Cetacean categories were assigned when vocalizations could not be confidently separated to the species level in the field (or during subsequent on-board analysis of recordings).

A total of 53 categories[6] were assigned to the 49 listening stations (4 stations included 2 categories, as more than 1 species was detected; sperm whales and oceanic dolphins). Acoustic categories were dominated by 'oceanic dolphins' and 'no contact' (both 45.3%), and followed by 'sperm whales' (7.5%) and 'blackfish' (1.9%) categories. (Figure 9). When selecting only those listening stations on which cetaceans were heard, oceanic dolphins were again the most frequently heard (82.76% of all cetacean categories, followed by sperm whales (13.8 %) and blackfish (3.5 %) (Figure 10).

The highly distinctive vocalizations or 'clangs' (Weilgart 1988) of sexually and socially mature sperm whale males were not heard (so-called sperm whale bulls, which grow to 18m and are thus much larger than 10-11m females; Table 4). Sperm whale bulls are highly migratory and prefer cold, high latitude waters, and only infrequently venture into tropical seas in order to breed (Rice 1989). Frequent acoustic or visual contact with sperm whale bulls in low latitudes may indicate the vicinity of a tropical breeding ground, such as recently observed off Komodo National Park and the Solor-Alor Islands in eastern Indonesia (i.e. Kahn 2002b, Kahn and Pet 2003, Kahn 2004).

These acoustic survey results for cetaceans in general, and sperm whales in particular, are relatively low when compared to more extensive survey efforts conducted in East Indonesia and the Bismarck Sea, northern Papua New Guinea (Kahn et al. 2000, Kahn 1999, 2001b, Kahn 2002b, Kahn and Pet 2003, Kahn unpubl. data). Hence, the overall acoustic results are in accordance with the results of the visual surveys (due to the long dive cycles of many oceanic species acoustic and visual survey results may differ substantially). These combined results strongly indicate that the cetacean diversity and abundance in the coastal and off-shore habitats surveyed in the western provinces of the Solomon Islands are both relatively low, at least for the limited number of survey days reported here.

<u>Acoustic Survey Results per SI Cetacean REA Leg</u>

The effort and summary results of the acoustic surveys were also analysed by separate survey legs (1-5). Survey legs usually comprised of an area that was covered within a single week of the SI Cetacean REA (Table 4, Figure 11a-d). Both acoustic conditions as well as acoustic contact with all species display relatively low variance between SI Cetacean REA legs. Both the number of listening stations as well as the acoustic contact with sperm whales displayed more variability between SI Cetacean REA legs. In the latter case, this is to be expected as the relatively low abundance of sperm whales, combined with the known social organization into clusters of this species, resulted in zero values for the majority of SI Cetacean REA legs. The high value for the PNG-SI leg (50% of all acoustic contacts) is most likely due to the extremely low sample size of that leg (n=2). The low number of listening stations during leg 3 is due to a combination of extreme visual and acoustic conditions in completely open water passages (see also the sections below on environmental conditions). This caused operational difficulties for the Marine Assessment as a whole.

---

[6] Acoustic cetacean categories reflect the best possible identification outcome (ultimately a species) through a process of elimination. As such they are not mutually exclusive. Thus, while all 'blackfish' are indeed part of the oceanic dolphin family Delphinidae, this does not hold for vice versa. To maximize data resolution, when specific vocalizations allowed for the identification of this subfamily it was recorded.

Cetacean Species Associations – Multi-Species or Mixed Groups

The SI Cetacean REA cetacean survey also recorded the cetacean species association rate. This rate was defined as the simultaneous observation of two or more cetacean species in mixed groups or in close proximity (<10 body lengths) to one another. Mixed-species groups of cetaceans were observed routinely during the SI Cetacean REA. Overall, 10 occurrences of species association were recorded (19.2 % of all sightings; Figure 12). Cetacean species associations predominantly involved interactions between spinner dolphins (n=4) and bottlenose dolphins (n=3), and to a lesser extend spotted dolphins (n=2) and pilot whales (n=1).

The ecological significance and possible function(s) of cetacean species associations is still poorly understood (e.g. Mann et al. 2000). However, such associations may be an indication of preferred cetacean habitat, especially if there are oceanic species involved. Ideally, periodic dedicated surveys should be conducted to determine whether cetacean associations are consistently observed in such areas. Cetacean REAs can be conducted in new areas of interest. The logistical constraints of the multi-task SI Cetacean REA format did not allow for long observation times (i.e. hours-days) to estimate the duration of each association or conduct ecological/behavioural focus studies.

Environmental Conditions During the SI Cetacean REA

Sighting Conditions

Each sighting was allocated a visual condition on a 1-5 scale, ranging from perfectly calm and clear weather to extremely unfavourable conditions such as strong winds and high seas combined with heavy rainfall. In the absence of any cetacean observations for long periods, sighting conditions were recorded every 2 hours. All recorded sighting conditions were then averaged for each survey day. The visual surveys were halted in sighting conditions greater than 5.

During the SI Cetacean REA conditions varied widely and ranged from 1.5 to 5. Ideal conditions (1-1.5) were recorded for a total of 3 survey days only. The majority of surveying was done in mediocre conditions of 2-3 (53% of survey days). Unfavourable sighting conditions of >3-5 were recorded for a substantial number of days (39% of survey days; Figure 13a). The seaworthy and stable vessel (even up to conditions 4) and the high position of the sighting platform ensured that the effect of these less than ideal survey conditions on detection rates was kept to a minimum.

Acoustic Listening Conditions

Listening stations were ranked according a 1-5 scale, depending on ambient noise and interference from the ship and tenders. Sighting conditions of less or equal to 4 were not considered a major factor influencing acoustic survey efforts. In general, acoustic conditions were more favourable in May than in June, when the seasonal southeasterly trade winds became more frequent and increased in strength.

Acoustic listening conditions varied widely during the SI Cetacean REA and were less than optimal for a significant part of the survey. Most listening stations (63.3%) were conducted on survey days with overall conditions of 2-3 (10-15 knots wind, building seas in open waters). Over 8.1 % of all stations was conducted in category 4 or 5 (20-25 knots wind, high seas in open waters) and 2.0 % of stations were conducted in near perfect acoustic conditions (Figure 13b). Several planned listening stations had to be cancelled altogether during 5 survey days (including several passages) due to extreme weather conditions (Figure 13c, condition >5).

Importantly, the acoustic detection of most odontocete (toothed) cetaceans can be optimized for each acoustic condition, by selecting different (or no) low and high 'pass filters' within the amplifier for each station. Such filters can minimize wave, wind and boat noise when need be, allowing overall volume to be increased. Appropriate adjustment of (any) filters to prevalent conditions may take 1-2 minutes and ensures that any reduction in the detection range remains minimal (according to our field tests with cetaceans and ships detected at known distances and a gradient of conditions (Kahn unpubl. data). High/low pass filter settings were recorded for each station.

<u>The Arnavon Islands: Cetacean Educational Display and Manning Strait Corridor Site</u>

At the Arnavon Island Marine Protected Area, a recent whale stranding was reported by the local Conservation Officers. The stranded whale was initially noticed on a remote beach on 22 Jan 2004, and was already heavily decomposed at that stage. After 2 hours searching by speedboat the complete skeleton of a false killer whale *Pseudorca crassidens* was found. Its bones and skull were carefully collected and then transported to the Arnavon research station. Here the false killer whale skeleton was re-assembled into a 6m educational display at the entrance to the research station (see Figure 15).

Furthermore, the Arnavon's central location in the Manning Strait (one of the major marine corridors of the Solomon Islands), in combination with on-going marine conservation projects and trained staff which are permanently on-site, mean that conservation activities (i.e. monitoring) on whales, dolphins and other large migratory marine life could be implemented relatively quickly and cost-effectively.

<u>Cetacean strandings reported by communities during the SI Cetacean REA</u>

Several strandings of large cetacean were reported by local communities while the SI Cetacean REA was in New Georgia waters (Leg 3, Table 4), but no more details were given that could assist in species identification. The remote locations of strandings on exposed coasts (Vangunu) and windy conditions during this period prevented site visits. Thus the species and number of animals involved in these strandings could not be determined.

NON-CETACEAN SIGHTINGS

Non-cetacean sightings during the survey included surface observations during active survey effort unless otherwise specified. Sightings include the following species or categories (number of sightings + estimated abundance; comments);

- Billfish - marlin or sailfish (3+3);
- Marlin - *Makaira* or *Tetrapturus* sp.(2+2)
- Sailfish - *Istiophorus platypterus* (1+1)
- Mantas - *Manta sp*. (1 + 12)
- Sharks (no data)
- Marine turtles (no data)

- Leatherback turtles - *Dermochelys coriacea* (1+1)
- Leatherback nesting beaches (n=3) – as reported by Fanalei community and other assessment teams; no data;
  - SE Malaita (Mabo beach, just to the S of Fanalei – no further data)
  - Central S coast of St Isabel (approx. 28 turtles/night in season, P. Ramohia, pers. comm.);
  - Rendova – Tetepare S and coast (more information available from WWF Solomon Islands)
- Large yellowfin tuna (1+1)
- Dugong - Dugong dugon, as sighted on survey and reported by other assessment teams (2 +3 [including 1 calf])
- Dugong feeding grounds – as reported by Fanalei community – 1 + 20-50; SE Malaita; 'regular afternoon sightings with high tide' in coastal bays of NW Fanalei/Walande reef lagoon).
- Saltwater crocodiles - *Crocodylus porosus* – as sighted and reported upon by sea grass assessment team (3+3).

Traditional Dolphin Hunters of Malaita.

The Fanalei and Bita 'Ama Communities

The Solomon Islands Marine Assessment route in Malaita was specifically planned to include visits to two traditional dolphin hunting villages:

- Fanalei on SE Malaita with hunting grounds in the coastal and open waters adjoining the western Pacific and
- Bita 'Ama on NW Malaita, with (currently inactive) hunting grounds in the coastal and open waters of the northern parts of Indispensable Strait, connecting the Solomon Seas to the western Pacific.

The practices and cultural heritage of the dolphin hunters of Malaita are relatively well documented in the scientific literature and other more anecdotal reports. Numerous background papers were analysed prior to the Solomon Islands Marine Assessment and the community interviews. A literature review of these papers would be valuable, yet is beyond the scope of the Solomon Islands Marine Assessment report (see Appendix 1 for short listed references).

Community Interviews

Community members of these two unique coastal communities were interviewed to record their traditional knowledge in, and experience with, the traditional Solomon Islands' dolphin hunt. In addition, an assessment of the degree of modernisation was made whenever possible.

Interviews were not focused on other national and international issues and conservation concerns associated with this fishery. Thus questions where geared towards community knowledge, traditional values and changes in historical catch per unit effort (H-CPUE). In addition, extensive interview experience with another community of traditional sea hunters in Lembata, east Indonesia - who target sperm whales (see Barnes 1996, Kahn 2002b, 2003) - was used to ensure a neutral demeanour was given to all questions and traditional values were honoured.

The Traditional Dolphin Drives off Fanalei

In Fanalei, elders explained that the traditional dolphin drive is practiced with strong cultural heritage and minimal modernisation in the fishery. Essentially, the fishery is based on an acoustic drive technique. Dolphins are driven from the ocean into the local reef lagoon by creating an "acoustic net", through strategic placement of canoes around the pod and well-timed banging of rocks underwater. Certain species of small cetaceans can thus be controlled - primarily spotted dolphins and to a lesser extend spinner dolphins - and driven towards a relatively narrow (approximately 100m), yet deep channel between the outer islands of the reef lagoon (Figure 15 c-d).

The traditional methods as practiced in Fanalei seemed completely intact. Canoes are dug-out without outriggers, and are fully traditional with no modern influences or modifications. In addition, communication at sea during the hunt has not been modernised. A traditional system of flags and hand signals continues to be used at sea to signal when and where dolphins have been sighted and to coordinate the hunt. This coordination of the dolphin drive is crucial and requires exceptional skills, leadership and teamwork of all involved, often for long periods (6-12 hours) and under difficult conditions. While at sea, the canoes' distance from land is measured according to landmarks that are just visible – beach, palm trees, land, open sea – and each distance category has a specific term in the local language.

Outboards are not used as the noise under water alarms the dolphins and gives the boats' position away, thereby reducing the element of surprise used to startle the dolphins when clapping the stones underwater. Outboard engines are also not used for any scouting trips. The dolphin school is driven from open ocean through a narrow reef passage and into the lagoon. Then the dolphins are further herded towards a sheltered mangrove bay, which is closed off with a net once the dolphins have entered. The dolphins are then pulled into the canoes one by one, killed with knives and transported by canoe to the village for further processing. The teeth especially are considered essential for wedding dowries and are also a highly valuable commodity (teeth function as money in the village, throughout Malaita and in other selected parts of the Solomon Islands), as is the meat for local consumption. As this practice is fairly well-documented (i.e. Takekawa 1996 a-c, see Appendix 1), the drive methods and cultural significance of the hunt are not discussed in further detail in this report.

Both villages were informed prior to arrival of the survey vessel by the community liaison team and outreach programs. Because of time constraints of the Solomon Islands Marine Assessment, only several hours were spend in each village. Not all village elders were present as most people were on the Malaita mainland tending to farmlands. Six senior persons with extensive knowledge (often passed on for generations) and long-term experience in traditional dolphin drives were available for the interview:

- Mr. Ernest Afia – Elder of the Malaqualo tribe who were the 'original founders of the Fanalei dolphin hunt more than 100 years ago' (The Fanalei community is made up of six separate tribes).
- Mrs. Elisabeth Au (wife of Fanalei village leader Mr. Joseph Au).
- Unnamed elders (2) and community members (2) with extensive experience in the drive.

The interview was predominantly held with Mr. Afia and Mrs. Au with frequent input and agreement from the other community members present. The interview was structured in 4 components.

1. Catch and effort data, which included questions on:
2. Species diversity and group abundance in the hunting grounds.
   - Species targeted as well as others that are not easily controlled by traditional driving methods.
   - Key behaviours of target and non-target species.
   - Successful drives per season.
   - Catch composition.
   - Group sizes per catch ('normal' and 'maximum').
   - Seasonal or/and annual trends in these components.
   - Trends in whale and dolphin sightings and behaviours (with an emphasis on behaviours indicative of feeding and migration).

3. Dolphin hunt techniques
   - Equipment and manpower involved.
   - Activities prior, during and after the hunt.
   - Securing of the catch in lagoon waters.

4. Use of dolphin products– teeth and meat.
   - Catch processing.
   - Market values.

- Distribution and role of teeth in community traditions.
- Area of trading (village, island or/and inter-island scales).
- Other sources of teeth.
- Strandings.
- Trade with commercial fishers.

5. Indications of modernisation of traditional techniques.

<u>Key Outcomes of the Interview with Fanalei Elders and Other Community Members</u>

As mentioned above, the practices and cultural heritage of the dolphin hunters of Malaita are relatively well documented in the scientific literature and other more anecdotal reports. Thus this section focuses on outcomes of the interviews without providing much context. Detailed background papers can be found in Appendix 1.

Traditional names of Fanalei cetaceans

Traditional names for numerous cetacean species were recorded and then assigned to a particular species by using illustrated cetacean reference and identification books (Fig 15d). The majority of traditional names mentioned during the interview were identical to those recorded by previous researchers (Table 1).

Dolphins – Kirio
Spinner dolphin – Raa
Spinner dolphin (offshore small body) – Raa matakwa
Spinner dolphin (offshore, robust body) – Subo raa
Pantropical spotted dolphin – Unbulu
Striped dolphin – Robo tetefa
Common dolphin (Dephinus sp.) – Rabo manole
Melonheaded dolphin - Robo au/ Robo tafungai
Fraser's dolphin – not known (Takekawa 1996b in Appendix 1 notes that the name robo au may also apply to Fraser's dolphin teeth but this could not be verified).
Bottlenose dolphin - Olo folosi
False killer whale – Ga ia robo
Risso's dolphin – Gwon mudu
Beaked whales – Sao
Large whale – Busu asi
Dugong – Ia tekwa

Hunting season and effort

The Fanalei dolphin hunting season is from January – April and coincides with seasonal periods of calm weather. During these months the men of the village go out in their small wooden canoes (without outriggers) every day. The season is sometimes extended into May depending on fair weather. During the remainder of the year no hunting is done and the main activity of the men and women is tending to their crops on small parcels of farmland on mainland Malaita.

An average season would include 8-10 successful drives. The number of animals that can be controlled during the acoustic drive is highly variable between days and seasons. Dolphin groups of 20-40 animals are routinely caught. Groups of 200-300 animals are caught with some regularity and occasionally a group may consist of an estimated 700 individual dolphins. On these rare occasions that such a large group can be successfully controlled and caught, it takes the villagers all night to kill and process the dolphins. Estimated numbers of dolphin catches for each Jan.-April hunting season were given by Fanalei elders as 'mixed' species - spinner and spotted dolphins (Raa and unbulu, respectively):

2004	- 600
2003	- 1200
2002	- 700
2001	- no data
2000	- 800
1999	- 700
1965	- 2000 (mentioned as a record year for this generation)

Cetacean sightings off Fanalei

The local names, occurrence and relative frequency of cetaceans sighted during the Fanalei dolphin drive season is given in Table 1. As expected – and in accordance with the SI Cetacean REA visual survey results - the most common sightings are of spinner, spotted and bottlenose dolphins. Various other species of oceanic odontocetes are sighted but infrequently. Comments by elders and other community members on key species for Fanalei included:

- Unbulu (spotted dolphins) – easy to control, reacts predictably to the noise made during the hunt, often playful. Groups often include 200 animals; groups of 700 individuals occur infrequently (1-2 sightings/season).
- Raa (spinner dolphins) – much more difficult to hunt than unbulu, a large pod would consist of approximately 200-300 individuals, but routinely a group would include 50 animals.
- Robo teta or tetefa (striped dolphins) – similar in group size to unbulu, but have been sighted much less frequent in the area for many years.
- Robo au (melon-headed whales) – has not been sighted in the area ('finished') for many decades. The last generation who hunted Robo au were the grandfathers of the elders interviewed. As the elders interviewed approached or exceeded 50 years of age, it seems reasonable to assume the period of Robo au drives was approximately 100-125 years ago. They were considered common then and catches of 1000/drive were achieved, albeit occasionally. It appears this species is now exceptionally rare or even extirpated from Fanalei waters (and possibly populations are significantly reduced throughout the Solomon Seas).
- Gwon mudu (Risso's dolphins) – occasionally sighted and sometimes targeted for the drive fishery with success. However, this is rarely done. A large group would consist of 14 animals but more often a group would consist of 3-5 animals.
- Ga ia robo (false killer whales) – sighted occasionally, but never hunted as they do not react to the noise and dive under the canoes to open sea.
- Pilot whales are not seen (or possibly wrongly identified as false killer whales).
- Orcas – infrequently sighted. Interestingly, a single large male has been seen during 3 consecutive seasons and it is thought to be the same animal. This orca is said to 'harass people' and approaches the canoes and dives under them. The hunters are afraid of this behaviour and will scatter when the orca is sighted, even if that means heading out further to sea. The appearance of the orca will disrupt and halt any drive activities for as long as the animal is in the general area.
- Sao (beaked whales) - sighted sporadically, but are never hunted.
- 'Whales' are sighted with regularity and often include periods of whale sightings 'for several days at a time', followed by periods of no whale sightings in the hunting grounds. Interestingly, the hunters do not differentiate between different baleen whale species.

- The sperm whale does not seem to be known and has not been sighted at all in the Fanalei area – despite the relatively deep water nearshore, and its distinctive and easily recognizable blow, body shape and diving behaviours.

The elders explained that the Fanalei and Walande people originated from northern Malaita – where dolphin drives were practiced at the time – and later migrated to the Sa'a region of Malaita. Here they continued the dolphin drive practice. Their skills were especially valuable as the land in the Sa'a area was already owned and occupied by other tribes, so the 'newcomers' had to settle on the relatively barren islands without much freshwater. The islands were also harder to approach and lessened the chance of attack by the other tribes. These islands proved an ideal base for traditional dolphin drives.

The nearby Walande village has a similar cultural heritage to Fanalei and also conducts dolphin drives. Effort is similar to Fanalei, with 30-40 canoes involved during the same season. However, it seems that the success of these drives is minimal. This is thought to be due to problems with coordination of the drive. As a result Fanalei produced all teeth for sale this year.

Significance and value of dolphin teeth

The teeth of the Raa (spinner dolphin) is used for necklaces only. It has no value for dowry or trade. The teeth of the Unbulu are used for both dowry and trade. Unbulu teeth are essential for weddings, as practiced throughout Malaita. At least 1000 teeth are needed as a dowry (a spotted dolphin produces approximately 100 teeth). These teeth are also used for day-to-day trade (i.e. 12 teeth for a large tobacco stick) as well as land purchases and leases. Again, these activities have been documented (see Appendix 1), so this report will not go into further detail on what is locally considered 'standard practice'. It is noteworthy that Unbulu tooth have become more valuable over the last 4 years. While in 2001 the price for a single tooth was S$0.30 in 2003 that increased to S$0.50 and doubled to S$1.00/tooth in 2004. During the interviews it was explained that dolphin teeth always 'sold out' and that it was getting 'a bit hard to catch dolphins'. This was thought to be caused by natural variation in seasons rather than any effect of overexploitation. The sale of dolphin teeth is considered essential to the well-being of the community. In particular school fees for the village children are seen as a major financial burden that can be met, at least in part, by the sale of dolphin teeth. The 'high price' did not affect demand and all teeth caught in the 2004 season (which ended in May, one month prior to our visit) were sold to buyers 'from all over Malaita'.

Use and value of dolphin meat

The meat is either consumed locally or fried with numerous spices and sold quickly in local markets for approximately S$5.00 per 1/4th of a strip (approx S$5.00/kg). Increasingly during the last years, dolphin meat has also been sold outside Malaita. This occurs mostly at markets in Honiara where prices can be doubled.

<u>Modern Influence on Traditional Dolphin Drive Activities</u>

Although the traditional dolphin drive activities were assessed to have minimal modern influences overall (see above), there are some factors that were recorded during the interviews with village elders and other community members:

Increased effort – annual seasons

According to Mr. Afia, the original hunting season was not practiced every single year by past generations. The annual season became routine once the practice was adopted by the local church 'several generations ago', and annual blessings for the seasons were incorporated in church services.

Expanded community involvement

The village elders decided 'several generations ago' that women and children would be allowed to assist with the final capture of the dolphins in the sheltered lagoon and the transport to the village. This was originally prohibited and in some villages remains so to this day (i.e. nearby Walande).

Increased effort – population growth

A more recent factor affecting hunting effort has been the population growth of Fanalei. More people participate in the drive. Fanalei elders estimated that in 2004 between 40-60 canoes participated in the season. Three generations ago the estimated number of canoes involved in the drive was estimated to be 10-16. This equates to roughly a doubling of canoes per generation.

The interviews were unable to quantify the effect this may have had on success rates and increases in catch, but the consensus was that it made the drive more effective – but only if it was coordinated and lead by a strong and knowledgeable frontman. Population growth would also further increase the financial responsibilities of the community – especially school fees - and may thus be a major driving force for increased efforts in the future.

Use of gillnet in final moments of the drive

One aspect of the actual drive modernised. During the final moments of the drive, a long nylon gillnet is used to cordon off the final escape route of the dolphin catch. This occurs once the dolphin group has been successfully driven from open ocean through the narrow lagoon passage and well into the local mangrove bay. The impact of this equipment on the traditional methods of the drive effort seems minimal as the net is solely used at the very last stage of the capture. No other modern equipment such as ropes or radios are used during the drive itself.

The use of a gillnet does free up the men and women who otherwise may have been preoccupied with controlling the dolphins. However, at this stage of the hunt the dolphins are almost without exception 'tired and calm'. Any escapes of individual dolphins at this stage have been very rare at best, according to the elders. So, although the introduction of a modern gillnet may have allowed more people to be involved to get the dolphins into the canoes and transported, it seems unlikely that this would have increased the overall success or the historical catch per unit effort (H-CPUE) of the traditional dolphin hunt.

New markets forces

Increasingly, the meat is taken to the market in Honiara, Guadalcanal by ferry and sold for better prices (often double the local Malaita price/kg).

Commercialisation of the drive activities

Dolphins caught with traditional drive methods for intended use in local and international live-display facilities and 'swim-with-the-dolphin' tourism projects.

One issue of concern is that the Fanalei community has sold live dolphins caught during traditional drives. According to the interviews, in 2002-2003 a local company with a dolphin facility near Honiara requested a total of 45-55 spotted dolphins to be kept alive and penned in the local bay. Of these, 12 animals were transported by a big vessel or barge to the display facility in the Florida islands, near Honiara. The spotted dolphins proved sensitive to such relocations and during the transport 10 animals died. Another animal died in the holding pen some time after arrival.

The aftermath of the 2003 capture of spotted dolphins for a live-display facility did cause significant disturbance amongst the village. One of the main issues was the distribution of the revenue of the sale of live dolphins (an unprecedented event in Fanalei) amongst community members. Apparently this did not proceed according to traditional regulations. Hence the elders officially decided that specific captures of live dolphins for sale will not occur in the 2004 season and will most likely remain prohibited for subsequent seasons. The acoustic drives and traditional use of dolphins' teeth and meat will continue.

Overall, the sale of live dolphins caused significant social tension within the Fanalei village and its surroundings. The export/display facility involved has indicated that the survival rate of the species in transport and captivity is regrettable and that the species will not be considered again as a candidate for display and/or export. Its main species of commercial interest is the Indo-Pacific bottlenose dolphin (Tursiops aduncus). Apart from significant national and international legal aspects of displaying and/or exporting live dolphins, this modern influence may not be easily integrated within an otherwise largely traditional Fanalei community.

In conclusion, although the traditional dolphin drives in Fanalei are largely non-modernized, several aspects raise serious concerns. The long-term disappearance of the valued melonheaded whales (robo au) in local waters, the increased effort due to population growth and new market forces clearly indicate that depletion of SI marine mammal resources can and does happen. Hence, additional dedicated cetacean surveys need to be conducted by the SI Government to determine the sustainability of the traditional dolphin drives, and ultimately, to ensure the preservation of the unique cultural heritage of the SI.

The Traditional Dolphin Drives off Bita 'Ama

Bita 'Ama is located on the NW side of Malaita. The interviews with the Bita 'Ama community were conducted at night and the information obtained was limited due to logistical constraints. Information was provided by an anonymous elder, who had been active as a hunter himself and was well informed. The interview was structured as described above for the Fanalei community.

Bita 'Ama dolphin hunting traditions are older than the Fanalei community (whose families migrated there from N Malaita). However, the Bita 'Ama community has not been hunting for numerous years. The reason(s) for this are not clear. All dolphin hunting canoes – which are different in wood type and design from fishing canoes - are in a state of deterioration. Preparations are being made by elders to build new canoes. The actual trees that have already been earmarked for this use were shown. Hunting techniques and catch composition are largely identical to Fanalei (although the time limits of the interview meant some differences could have been missed). The species predominantly hunted is the Pantropical spotted dolphin. According to the Bita 'Ama elder interviewed, traditional dolphin hunting will resume in the hunting grounds of the northern Indispensable Strait within 2 years.

Interestingly, from April to August the Bita 'Ama community routinely have close encounters with 'very large whales' while fishing offshore in the Indispensable Strait. After detailed questioning on a) ecological, morphological and behavioural aspects (e.g. group size estimates, blow angle and height, colour patterns, fluke-ups, other attributes), and b) an independent species identification by the elder through illustrations of 'very large whales' in cetacean field handbooks, it seems most likely that the whales sighted are blue whales (Balaenoptera musculus). Other anecdotal sighting information also strongly indicates that blue whales are present in these waters. If confirmed, the Indispensable Strait region, as well as several other narrow yet deep islands passages in the western Solomon Seas are likely to function as marine migratory corridors for large cetaceans.

Local knowledge of cetaceans during the Solomon Island Marine Assessment

Throughout the survey, local knowledge on cetaceans proved very valuable. Many coastal communities have shown us important spinner dolphin resting areas at their local reef lagoons. These preferred dolphin habitats are highly site-specific and seem stable for exceptional long periods. Certainly the village knowledge of the significance of certain reef lagoon areas to spinner dolphins spans over five generations.

In places such as the Shortlands and Savo Islands, an inspection of dolphin habitat as pointed out by the respective communities, could be conducted. The Shortlands resident local group consisted of an estimated 85 animals. These dolphins were accustomed to speedboats and would approach nearby speedboats in order to bow ride and perform spectacular leaps, often jumping just in front and above the observers in the bow. In Savu, the estimated 50 spinner dolphins were again exactly where the local community had predicted. In this case, the dolphins also approached the speedboat to bow ride, but this behaviour was quickly followed by resting and socializing. An attempt was made on SCUBA to inspect an underwater cave that was locally thought to be the main reason for the dolphin's frequent occurrence in this particular area. However, no cave was found and no dolphins were sighted during this 25-min. dive, although dolphins were heard close by.

It is interesting to note that spinner dolphins where often observed near lagoon entrances – both by local communities (long-term knowledge) and during our visual surveys (single passes through a previously unknown area). These sightings are consistent with the view that spinner dolphins use local reef lagoons habitat as resting and socializing areas during the day. Here spinner dolphins are relatively safe from large predators such as sharks, as the clear waters and sandy bottom (light background) would allow early visual predator detection. For the mostly nocturnal species, this is especially important during periods of daytime rest and acoustic inactivity (no echolocation information on surroundings). TNC – Solomon Islands Program's on-going socio-economic survey will further solicit input from local communities through a cetacean questionnaire (W. Atu, pers. comm.).

Other SI Cetacean REA Activities

SI Cetacean REA visit to the Gavutu captive dolphin facility

Background and recommendations for the dolphin facility, husbandry practices, dolphin health and export can be found in a fact-finding paper by the IUCN's Species Survival Commission – Cetacean Specialist Group (CSG) and the Veterinary Specialist Group (Ross et al. 2003). This report focuses on several related issues and concerns, as discussed on-site with the facility's manager, M. Schultz, who offered the Solomon Islands Marine Assessment cetacean team a tour, organized a demonstration/training session and answered many questions on dolphin capture, husbandry, training and trade.

Potential Impact on Local Fish Stocks and Marine Environment of the Florida Bay Islands

A substantial proportion of the captive dolphins' diet consists of locally captured fish (as well as frozen fish specifically imported for this purpose). While this increased demand on local fish resources has a positive effect on the local economy, it may result in overexploitation of local fish stocks. The Gavutu facility offers a higher price per kilo for larger transactions (S$8/kg for > 25 kg vs. S$7/kg for <25kg of local fish). This measure minimizes operational time spend on processing many transactions of small quantities of fish at the facility.

However, such incentives to local fishermen (i.e. a 14% increase in price/kg for more than 25kg fish/transaction) may unintentionally increase the fishing pressure to higher levels. It may also unintentionally lead to a local increase in destructive fishing practices such as reef bombing – a common fishing technique for schooling and reef fish in SE Asia. Unconfirmed reports of reef bombing have been noted by the SI Fisheries Department. In addition to devastating effects on the marine habitats and fish stock, reef bombing is likely to impact directly on wild cetaceans in the vicinity of the underwater explosion as well. This may include lethal as well as sub-lethal tissue damage and can result in severe acoustic habitat degradation (Ketten 1998, Kahn et al. 2000). Because of these and other concerns, the impacts of the increased pressure on local fish stocks due to the captive dolphin food requirements should be further evaluated.

INTERNATIONAL LIVE DOLPHIN EXPORT TRADE

While acknowledging that the absence of data on population estimates in the near term will hinder any scientific assessment of the current dolphin export situation in the SI, a recent IUCN report specifically notes that:

> *'the Indo-Pacific bottlenose dolphin* [Tursiops aduncus – Fig 15e] *is a coastal species in most of its range and large-scale removals such as the captures to date in the Solomon Islands could have serious impacts on local island populations'* (Ross et al. 2003).

Currently the local price for a 'swim-with-the-dolphins' experience in the SI is S$200/swim/pp. (approx. U$27.-). According to the facilities manager, these 'swim-with programs' are increasingly popular worldwide and Asia in particular, where prices for such activities can be up to 3-4 times higher than charged at Gavutu. The rise in demand for captive dolphins has been described as an 'explosive expansion' by the industry. As mentioned above, meeting such market demand is likely to result in unsustainable levels of dolphin catches. Clearly, additional data is needed on SI dolphin resources (on local species population estimates and ecology) to ensure that any export will not cause detrimental effects to SI dolphins. In the meantime the precautionary principle may need to be applied by government licensing agencies.

Another, related issue is the negative view of the international press on dolphin exports. The protesting (and occasionally misinformed) news articles that surround SI dolphin exports to date may substantially decrease the overall tourism potential of the Solomon Islands. This 'negative press' effect should not be underestimated and could be viewed as a potential economic loss – especially as marine/nature-based tourism (diving, recreational fishing, birding, trekking, in combination with SI rich cultural heritage) is widely regarded by government as a major contributor to the national economy in the future. Responsible wild cetacean watching ventures may be a viable component of such an industry, even in developing, remote island nations (Hoyt 2001, Kahn 2002c).

However, such tourism ventures are difficult to reconcile with live-dolphin captures that are often perceived by foreign tourists as high-impact and unsustainable. Hence, it is important to note that in early 2005, the government of the Solomon Islands announced a complete ban on further exports of dolphins. A joint declaration by the Minister for Fisheries and Marine Resources and the Minister for Forests, Environment and Conservation detailed that this new policy is effective immediately (see Appendix 5).

Potentially Significant Cetacean-Fisheries Interactions: The SI Purse Seine Tuna Fishery

The western and central Pacific Ocean currently supports the largest industrial tuna fishery in the world (Bailey et al. 1996). Within this vast region, the Solomon Islands is one of the most productive waters for skipjack and yellow-fin tuna in the tropical Pacific Ocean (Fig 14). Because of the diversity of oceanic cetaceans known or suspected to inhabit SI waters (Table 1), and the intense pelagic fishing pressures, such interactions may be significant.

Although no reliable data exists on any significant oceanic cetacean-tuna fisheries interactions - such as potential entanglement and (by) catch, or depredation - the region's tuna fisheries management agency, The Secretariat of the Pacific Community (SPC), notes that

'While we remain largely ignorant about the impacts of tuna fisheries on by-catch species and pelagic ecosystems, it is obvious that these impacts have increased very significantly over the last 50 years as tuna fisheries worldwide have expanded their catches and effort by orders of magnitude. However, we have little or no information on the relative abundances or biomasses of many components of the pelagic ecosystem' (see also Appendix 4).

Many national and indeed regional stakeholders agree that a cetacean by-catch assessment is urgently needed for the western Pacific (see www.cetaceanbycatch.org for a Call to Action by the world's leading cetacean by-catch experts). A SPC report by (Bailey et al. 1996) includes one of the few relevant references on cetacean by-catch for the Solomon Islands' marine fisheries. The report lists by-catch in the tropical western Pacific for each gear type (purse-seine, longline, others). It notes that the number of marine mammal landings in these fisheries is 'minor'. Thus it seems that cetacean by-catch for pelagic tuna fisheries in this region does not warrant concern.

However, this report was based on log sheet data as recorded by the fishermen themselves and this may have underestimated such occurrences. It would be interesting to confirm the minimal cetacean by-catch with data from the SPC independent observer program. Unfortunately, such independent data is limited as the observer program in the Solomon Islands was initiated in 1998 and there was minimal data collection during most of 2001 due to the civil unrest (D. Brogan, SPC Secretariat, pers comm. in Sept 2004).

Hence, observer data is only available until the end of 2002. The 2003 observer sheets are currently being processed. Observer data collected during the 1998 - 2002 period included mandatory reporting of all marine mammal landings but there were no official guidelines to record cetacean-fisheries interactions or sightings. This situation is currently being addressed by SCP, through implementation of several key recommendations of an expert workshop on cetacean-tuna fisheries interactions. SCP has provided additional training of observers and introduced specific data forms to record cetacean landings, fisheries interactions and sightings. Improved data on cetaceans should be available from 2003 onwards (D. Brogan, pers. comm.). SCP has been helpful with further inquiries and noted that additional - and up to the most recent - data will be released upon request from officials of the Solomon Islands Ministry of Fisheries. Such a request is currently being completed.

The potential for cetacean-tuna fisheries interactions in the SI may warrant further investigation, especially as the SI Cetacean REA indicated an apparent low total individual count or absence of many oceanic dolphin species. Thus, a comprehensive assessment of cetacean-pelagic fisheries is needed for SI. As pelagic fisheries data is often pooled for large sections of the South Pacific, such a study may need to include adjacent fishing grounds such as Papua New Guinea. More detailed statistics on the pelagic tuna fishery in SI waters, and other small scale, in-shore marine fisheries of the SI are provided in Appendices 3 and 4, including a summary of discard and by-catch.

Potential for Cetacean Watching in the Solomon Islands

The SI Cetacean REA's activities included an initial assessment of the potential for local cetacean watch opportunities, especially for sperm whales and coastal dolphins. Whale- and dolphin watching in the wild is a fast-growing industry with world-wide revenue of over 1.5 billion US$ dollars each year, and practiced in over 87 countries (Hoyt 2001). Many coastal nations have benefited from the development of well-managed whale watching operations. Interestingly, this potential can be realised fairly quickly (< 5 years) if conditions are right and the activities are regulated properly (Hoyt 2001, see also Kahn 2002c for a review on cetacean watch development options in Indonesia, which faces similar challenges to SI for assessing and realizing its cetacean-watch potential).

Cetacean watching may be a valuable new marine tourism industry to developing archipelagic nations such as the Solomon Islands. Consistent sightings of cetaceans in local waters may provide coastal communities with a valuable opportunity to establish new eco-ventures such as responsible cetacean watching. From this socio-economic perspective, there is also a need to evaluate the ecological significance of SI's waters for cetaceans. In particular, an assessment of the role cetaceans can play in regional eco-tourism development and economic diversification in remote regions of SI was an important aspect of the SI Cetacean REA (ecotourism is broadly defined here as: responsible nature-based tourism which causes minimal environmental impacts, as guided and/or regulated by best industry practices which are periodically reviewed).

The SI government has already expressed keen interest in developing responsible sperm whale watching in the archipelago, as part of a national marine tourism strategy. No substantial work has been conducted yet to attempt to assess the feasibility (i.e. identify possible species and promising areas) for such marine tourism ventures in SI waters. It is a noteworthy trend that increased protective measures for cetaceans have often 'kick started' or accelerated the development of a whale and/or dolphin watching industry in new locales and nations. In addition, benign research and monitoring of living whales and dolphins have been incorporated at most, if not all, highly successful and responsible cetacean watch industries. Outcomes of these programs help to evaluate the potential impacts of tourism activities on cetaceans over time and fine-tune the regulations (Hoyt 2001).

The SI Cetacean REA determined that several coastal communities, such as the Shortlands and Savo Island, have important spinner dolphin resting areas at their local reef lagoons. These preferred dolphin habitats seem stable for exceptional long periods and often have been known to villagers for over five generations. Responsible, well regulated, wild cetacean watching may be feasible in these locations. The passage between Honiara, Guadalcanal and the Florida Islands is also locally known for its frequent dolphin sighting, as well as the occasional whale. Indeed in this area the SI Cetacean REA sighted a large rorqual baleen whale. It seems that this area has wild dolphin tourism potential (but see the section on International dolphin export trade). Presumably, similar accessible and reliable dolphin habitats can be found in other areas and communities not visited by the Solomon Islands Marine Assessment, such as the eastern provinces.

Judging from reports of frequent sightings of large whales close to shore, the St. Cruz area may hold significant potential for (sperm) whale watching. Additional feasibility studies in all these areas are needed to evaluate the economic viability and sustainability of such ventures. Importantly, any developments in cetacean watching should be coupled with operator-endorsed codes of conduct and appropriate regulatory frameworks, including the establishment of Marine Protected Areas.

Overall, responsible wild cetacean watching may have considerable potential in the Solomon Islands. However, the development of such a tourism industry will be hard to reconcile with the Solomon Islands' dolphin export trade, which often generates considerable negative, high-profile, international (and occasionally misinformed) press coverage for the SI – and is likely to influence visitation numbers and thus hamper national tourism growth.

Recommendations

Capacity Building for Improved National and Local Cetacean Expertise

SI needs to build local capacity for cetacean monitoring and research programs by additional training of government and NGO personnel, as well as interested resort dive staff and community groups. In particular, a national workshop is needed to build capacity for improved local expertise on cetacean conservation and management. The workshop would target key stakeholders (government officials, NGOs, community groups) and provide an introduction to:

- The diversity and ecology of Solomon Islands' whale and dolphin species.
- Cetacean identification at sea (resident and migratory species), methods for dedicated surveys (i.e. line transect, photographic mark-recapture studies) and basic cetacean REAs (new areas of interest, limited funds), standardized data collection and data management.
- Government and community-based sighting/stranding networks (incl. rescue and data collection techniques from live and dead strandings; raise awareness with management agencies and the general public).
- Responsible whale watching – international guidelines.
- Conservation and management issues that are particularly relevant to SI's cetaceans.

Ideally, such a workshop would be coupled with a small field component (1-2 days). This field activity would focus on practicing skills learned during the workshop, while at the same time addressing an important data gap for local waters. Overall the workshop would build on the outcomes of the SI Cetacean REA and a) greatly improve cetacean awareness and b) promote the establishment of, and active involvement in, cetacean conservation and management programs amongst SI stakeholders.

In addition to these expected outcomes, the workshop is also an important tool to share existing information and increase high-quality data gathering on SI cetacean diversity, distribution and ranking of species-specific sighting frequencies and total individual counts.

Addressing the Knowledge Gap on SI Cetaceans – A National Approach

The waters of the Solomon Islands are expected to inhabit an exceptional cetacean diversity (at least 33 species, Table 1), yet there has been minimal survey effort and ecological research to date. Currently, there exists a major knowledge gap on the diversity, abundance and distribution of whales and dolphins in Solomon Islands' territorial waters.

The SI Cetacean REA has started to fill this nation-wide data-deficiency, and has provided initial information for the ecosystem-based management of the marine (mammal) resources of the Solomon Islands. To build on this baseline REA, there is a need to develop a national cetacean program with national and site-specific components:

1. Cetacean biodiversity mapping – Cetacean surveys (line-transect; photographic mark-recapture) as well as visual and acoustic REAs (especially in large data-deficient areas), and dedicated surveys rapid assessments and surveys.
2. Focus research on priority whale and dolphin species, including work on population estimates and stock boundaries for commercially exploited species (such as the Indo-Pacific bottlenose dolphin, as well as the major species targeted in the traditional drives) and ecology (i.e. breeding, feeding, migration).
3. Education, outreach and local capacity building.
4. Policy development for marine mammal conservation and management, for both national and provincial governments.

The multi-disciplinary approach of such a national cetacean program for SI will address the need for:

1. Additional data on whales and dolphins in national waters for improved, ecosystem-based management – including responsible wild cetacean watch development.
2. A framework to guide consistent national policy on cetacean management and conservation.
3. Broadened environmental awareness, institutional capacity and marine resource management perspectives.

The policy development aspect of the program is of importance as the Solomon Island Seas are comprised of international (EEZ), national and provincial waters which may have different jurisdictions, affecting different species assemblages and habitats. Thus, SI legislation may include different and potentially conflicting, legal frameworks of direct relevance to the management and conservation of cetaceans.

Therefore, a multi-pronged cetacean program - with both provincial and national components - will provide Solomon Islands with the initial ecological know-how, educational initiatives and policy advice. It will assist with the identification of management and conservation measures – both species and habitat specific - that may be considered for the diverse assemblage of whales and dolphins inhabiting the waters of the Solomon Islands.

This current knowledge gap for SI's cetaceans should be addressed in the near future to assist both government and conservation organizations in their decision making on (often shared) marine resource management decisions of national and regional importance, and to meet responsibilities for various international conventions and treaties of which the SI is a signatory or member state.

SHORT-TERM PROJECTS TO ADDRESS THE KNOWLEDGE GAP

There are clear and practical opportunities in the SI to maximize the amount of information available for such a national management approach. Several projects can be implemented in the short term which are both cost-effective and of high management value (Kahn 2003c) and would improve the protective management of the SI's residential and migratory cetaceans:

a) Existing information (past and present) on SI cetacean and large migratory marine life sightings needs to be canvassed and consolidated by seeking further input from provincial and national government agencies, coastal communities, local NGOs, dive shops, dive resorts and other knowledgeable stakeholders.
b) A local cetacean sighting and stranding network for each province needs to be established, and coordinated as part of a national Solomon Islands Marine Mammal Network (reporting of sightings and strandings - including tissue sampling of dead animals - and rescues).
c) New sightings and human-interactions (fisheries, tourism) need to be recorded nation wide on standardized data sheets, preferably identical to those used by APEX Environmental in other Asia-Pacific nations or other appropriate format.
    - Include detailed behavioural and habitat use data whenever possible (i.e. indications of feeding, diving, migrating, mating, resting, active avoidance behaviours).
d) Periodic and dedicated cetacean REAs should be conducted in areas of interest, as well as population estimate surveys and ecological research on priority species. Fieldwork should be implemented by an expert team including local members from marine resource management government agencies, coastal communities and NGOs.
e) Innovative ways for opportunistic cetacean surveys should be explored (i.e. during other marine monitoring projects or related field activities; 'ships of opportunity').
f) Investigate the sustainability of the SI traditional dolphin drives (see also Section C).
g) Investigate and record all other reported interactions of cetaceans with
    - Fisheries – by-catch and targeted catch; coastal and pelagic, artisanal, small and large scale fisheries.
    - Marine tourism – surface observations and 'swim-with-cetacean' encounters.
    - Other commercial uses of marine mammals including the captive-dolphin export trade.

IDENTIFYING IMPORTANT CETACEAN HABITATS FOR PROTECTIVE MANAGEMENT

As mentioned above, the cetaceans of the Solomon Islands are extremely data-deficient, and the Solomon Islands would benefit from additional cetacean work in most of its provinces. Therefore, it is not possible to prioritize areas for protection on a national level at present, as habitats such as preferred breeding, feeding, resting areas, migratory routes and corridors are not known for most whale and dolphin in the Solomon Islands.

However, best available information suggests that the following areas may be important cetacean habitats in the SI, and further studies are required to confirm their status. Thus, this shortlist should be regarded as preliminary and is likely to change and become more specific once more data becomes available.

a) N Guadalcanal – Florida Islands waters and inter-island passages (consistent sightings of small cetaceans, extremely large schools of dolphins reportedly 'passing through', as well as occasional 'whale' sightings).

b) New Georgia Group, especially the wider Gizo – Kolombangara – Simbo Isl. area (diverse deep water habitats, reportedly frequent sightings of pilot whales, unidentified large whales).
c) Malaita, especially the waters around Fanalei and Bita 'Ama.
d) Fauro Islands - Shortlands Island Group ('resident' spinner dolphin groups, population and ecology research – reef lagoon habitat use).
e) Russell Islands - diverse deep water habitats, reportedly frequent sightings of orcas, and to a lesser extend sperm whales.
f) Southern oceanic waters off New Georgia – frequent Bryde's whale sightings, major target area for tuna fisheries (purse seine fleet).
g) All deep, yet relatively narrow passages separating the main islands of the Solomon Islands from the South Pacific Ocean or the Solomon Sea, which are known or suspected multi-species migratory corridors.
    - Indispensable Strait – Bita 'Ama – large baleen whales (possibly blue whales),
    - Manning Strait including the Arnavon Islands.
    - Iron Bottom Sound
    - Gizo Strait and Vella Gulf
    - Blanche Channel
    - Bougainville Strait.

h) St. Cruz Province (diverse deep water habitats, reportedly frequent sightings of sperm whales and to a lesser extend orcas) – all waters of the eastern and southern provinces of SI have not been covered by the REA.

Conservation Options – Marine Corridors and Local Dolphin Resting Lagoons

Marine Corridors

Marine corridors are site-specific habitats (as opposed to the much more dynamic off-shore habitats for these wide ranging species) which are critical to numerous species of large migratory marine life, including oceanic cetaceans such as sperm whales, (whale) sharks and mantas, marine turtles, sunfish, as well as straddling fish stocks such as billfish and tuna. We also know that these passages are often located within the Indo-Pacific region's many archipelagic nations - such as Indonesia, Philippines, Solomon Islands and Papua New Guinea, Maldives, Seychelles (Kahn 2003, 2002a. Here they play an important role in ensuring the integrity and functionality of Large Marine Ecosystems (LMEs). Yet these very same passage areas are increasingly vulnerable to local disturbances. Such localized impacts can have major regional ramifications for marine conservation and sustainable fisheries initiatives (Agardi 1997). Marine corridors are usually coastal habitats and offer an important opportunity to improve migratory species conservation. They are relatively easy to include in coastal resource management programs (again, when compared to habitats in EEZ waters or high seas; Kahn 2003).

Corridor conservation can be effectively achieved via habitat-based management frameworks including multi-use Marine Protected Areas. Key issues for corridor conservation in the Solomon Islands include fisheries interactions; especially gill and/or drift netting practices in or near corridors which may effectively cordon off a passage. Because of the seasonal migrations of whales and other migratory marine life, even short periods of intensive fishing with gillnets in the vicinity of corridors can result in very significant by-catch and entanglement rates. Whale entanglements in gillnets are a lose-lose situation: the whale often loses its life, the fishermen often lose their expensive nets.

A destructive fishing practice (DFP) known as reef blasting is common and widespread throughout Indonesia and the Philippines. It is not known whether this practice is used in the Solomon Islands, but unconfirmed reports suggest it may occur in certain locations. Numerous direct lethal and sub-lethal effects, as well as indirect impacts, of the pressure wave of an underwater blast on cetaceans have been described (i.e. Ketten 1998, see Kahn et al. 2000 for a summary on potential impacts of reef bombing on corridor habitat in Indonesia).

Reef bombing in or near corridors may be a potentially significant threat to cetaceans as underwater explosions may cause a) direct harm to animals close by and b) substantial acoustic habitat degradation which may lead to corridor avoidance. Long-term sources of noise pollution such as shipping and off-shore oil and gas activities near corridors may also contribute to acoustic habitat degradation; although the impact of such increased under sea noise levels on whales and dolphins may differ greatly between species and remains poorly understood. Overall, management measures may vary substantially between corridor sites and ideally are incorporated within long-term management plans (i.e. Kahn 2002a, 2003). For example, Komodo National Park World Heritage and Biosphere Reserve includes two major corridor passages for whales and other migratory marine life. Providing better protection for these habitats was an important factor to justify and gather local support to establish a complete ban on gillnetting in Park waters through new district-level legislation (Kahn and Pet 2003).

<u>Dolphin Resting Lagoons</u>

On several occasions during the SI Marine Assessment the local community knowledge on cetaceans included information on specific reef lagoon areas where spinner dolphins were known to 'rest'. Other species such as bottlenose dolphins may have similar preferred reef habitats but this could not be verified. Community interviews showed that pods of spinner dolphins used the same area every day and these sites where often known for many generations, indicating long-term site fidelity.

These reef habitats have been identified as resting areas for spinner dolphins in other regions of the tropical Pacific (i.e. Hawaii, Tahiti) and it is likely that the several populations of spinner dolphins use Solomon Island lagoons in a similar fashion. Reef lagoons may function as safe daytime resting areas for this mostly nocturnal species. Its clear, sheltered waters and sandy bottoms provide an effective environment for early predator detection and avoidance (such as sharks).

From a management perspective two issues may be of importance:

1. The opportunity to work with local communities to ensure these reef habitats are not degraded. Indeed it seems that the coastal communities we encountered regard these areas as special and provide them de facto protection by excluding some fishing activities for example and
2. The dolphin watch tourism potential in local waters - such as dolphin resting lagoons (see Section D).

In these locations community-based marine management approaches, in collaboration with provincial and national government agencies, may be an effective management framework to ensure these important dolphin habitats are conserved, and where feasible, regulate any economic opportunities such as local dolphin watching activities.

Traditional Dolphin Drives - Fanalei

Dedicated Cetacean Surveys to Assess Relative Abundance for Species of Special Interest

Although the traditional dolphin drives in Fanalei are largely non-modernized, several aspects raise serious concerns. The long-term disappearance of the valued melonheaded whales (robo au) in local waters; increased effort due to population growth; and new market forces all clearly indicate that depletion of SI marine mammal resources can and does happen.

These aspects of the dolphin drives clearly indicate that depletion of SI marine mammal resources can and does happen. Clearly more work is needed to determine the sustainability of the traditional dolphin drives, and ultimately, to ensure the preservation of the unique cultural heritage of the SI. The SI Government may consider the following activities in particular:

Dedicated cetacean surveys in Fanalei waters to determine bio-diversity in local waters, estimate relative abundances of target species, habitat use as well as more socio-economic factors of the drives (incl. cultural heritage and aspirations of this community).

Such surveys would also be required to address the sustainability of the live-dolphin capture and international export trade.

Genetic analysis of samples from teeth included in Fanalei wedding dowries and other cultural artefacts (designed to incorporate a time-series, spanning >100 years) may be a cost-effective and realistic option to obtain information on the long-term population trends of target cetacean species in Fanalei.

Finally, it must be noted that just because the traditional dolphin drives are a highly visible impact on local spotted dolphin populations, this activity may not be the only or even the greatest impact on the population status of this and other target species (i.e. other factors acting throughout the populations' home range may include habitat degradation, potential effects of pelagic and coastal fisheries).

Canvassing of Community Knowledge on Local Cetacean Species and Habitats

TNC– Solomon Islands Program's on-going socio-economic survey will further solicit input from local communities through a cetacean questionnaire (W. Atu, pers. comm.).

Gavutu Captive Dolphin Facility

In addition to the recommendations of the IUCN Species Survival Commission report, the effect of the increased pressure on local fish stocks due to the captive dolphin food requirements should be further evaluated.

Potentially Significant Cetacean-Fisheries Interactions: the SI Purse Seine Tuna Fishery

The potential for cetacean-tuna fisheries interactions in the SI may warrant further investigation, especially as the SI Cetacean REA indicated an apparent low total individual count or absence of many oceanic dolphin species. Thus, a comprehensive assessment of cetacean-pelagic fisheries is needed for SI.

As pelagic fisheries data is often pooled for large sections of the South Pacific, such a study may need to include adjacent fishing grounds such as Papua New Guinea. More detailed statistics on the pelagic tuna fishery in SI waters, and other small scale, in-shore marine fisheries of the SI are provided in Appendices 3 and 4, including a summary of discard and by-catch.

THE CASE FOR SI TO BECOME A SIGNATORY STATE OF CITES[7].

CITES, the Convention of International Trade of Endangered Species, (see Appendix 2 for convention details) is an internationally recognized mechanism to sustainably manage wildlife trade in endangered species, including cetaceans. In order to strengthen the management and conservation of the relatively high level of endemic species and endangered species (both terrestrial and marine), the SI government should seriously consider to become a member of CITES.

CITES is widely recognized and respected as an effective conservation agreement with broad membership – 167 parties to date. It regulates trade in species between contracting parties, and to a lesser extent between Parties and non-Parties, but countries who stay outside the convention reduce the effectiveness of the regulations: CITES is only as effective as its coverage.

By joining CITES the Solomon Islands would improve CITES coverage and effectiveness and in doing so would be welcomed by the wider international community. In addition, Solomon Islands export a considerable quantity of fauna. While most SI species as reported by CITES may sustain such a trade, these are several cases where CITES has recommended a ban on imports of several species from the Solomon Islands. By not being a CITES member, the Solomon Islands has no mechanism to defend this commercial trade or officially oppose any trade restrictions.

The process of joining CITES is relatively straightforward and assistance can be provided through its Secretariat. Key obligations as a Party include:

1. The annual payment of a minimal fee based on GNP (i.e. less than $50- in the case of Palau),
2. Designating a Management Authority and a Scientific Authority to manage the trade of endangered species.
3. Adopt the provisions of CITES into its national legislation so that it can fully implement and enforce the provisions of the treaty.
4. Maintain records of all trade in CITES listed species,
5. Submit annual reports on trade to the World Conservation Monitoring Unit, a department of the United Nations Environment Programme (UNEP) and biennial reports on all measures taken to enforce the CITES provisions.

CITES may provide financial assistance to these National Authorities. Some of the other obligations do include a significant workload (i.e. points 4 and 5). However, developing nations routinely recover administration costs through the issuance of CITES permits.

The CITES treaty requires a country that wishes to join, to formally affirm its intent to be bound by the treaty. To join CITES, the Solomon Islands would have to deposit an appropriate legal instrument with the Swiss Government (the Depository Government). What

[7] Including technical advice on CITES obligations as kindly provided by Sue Miller, Whale and Dolphin Conservation Society (WDCS), UK.

constitutes an appropriate legal instrument for the Solomon Islands will be defined by its national law (e.g. ratification of the treaty by the Head of State or otherwise).

Acknowledgements

Firstly, I would like to thank all members of the Conservation Council of the Solomon Islands (CCOSI) for their support and the whole Solomon Islands Marine Assessment Team. In particular, many thanks to Alison Green and Paul Lokani, Willie Atu, Ferral Lasi and Rudi Susurua and the community liaison team from the TNC Pacific Island Programme, Peter Ramohia (Department of Fisheries) and John Pita (Department of Environment and Conservation), Alec Hughes and Tingo Leve from WWF Solomon Islands, Michael Ginigele (Tiola Marine Protected Area Project, Roviana Lagoon) (your assistance with local communities was invaluable), Lisette Wilson (WWF South Pacific Programme) and as well as Gerry Allen, Emre Turak, Charlie Veron, David Wachenfeld and Louise Goggin.

A special thanks to: the villages and coastal communities of the Solomon Islands whose assistance is very much appreciated, and especially the elders of Fanalei and Bita 'Ama; the wonderful crew of M.V. FeBrina - and especially Capt. Russell Slater (who was always willing to assist with visual sightings during the daytime and then accommodate for listening stops during the nighttime passages – often in challenging conditions); the many dive operators and local NGOs who provided cetacean sighting and stranding information; Randall Reeves for the numerous papers on the Solomon Islands he made available; The IUCN SSC – Cetacean Specialist Group, especially Nick Gales, Bill Perrin and Randall Reeves for their constructive comments on earlier versions of this report; Yvonne James-Kahn for SI Cetacean REA program support, data transcription, comments and editing. Mike Schultz for allowing us to inspect the Gavutu dolphin facility; Peter Ramohia and Deidre Brogan (Fishery Monitoring Supervisor, Secretariat of the Pacific Community) for the discussions on Solomon Islands' pelagic fisheries; and Max Benjamin (Walindi Resort, PNG) for making the FeBrina available for cetacean surveys during the PNG-SI relocation passage.

References

Agardy, T.S. 1997. Marine protected areas and ocean conservation. Academic Press Limited, London UK. 244pp.

Bailey K., P. Williams and D.G. Itano (1996). By-catch and discards in central and western Pacific tuna fisheries: A review of SPC data holdings and literature. OFP Technical Report No. 34 :Tuna and Billfish Assessment Programme (TBAP). South Pacific Commission (SPC). Noumea. New Caledonia.http://www.spc.int/OceanFish/Html/TEB/Bill&Bycatch/Bycatch/index.htm (especially Section 3: 3.3.4 and table 3.14 also Section 4: 4.3.2.3 and table 4.13)

Barnes, R.H. 1996. Sea Hunters of Indonesia, Fishers and Weavers of Lamalera. Clarenford Press. Oxford. England. 362pp.

Department of Fisheries and Marine Resources. 2003. Dolphin assessment and monitoring project. Solomon Islands Government. 10 pp.

Fair, P.A. and P.R. Becker. 2000. Review of stress in marine mammals. Journal of Aquatic Ecosystem Stress and Recovery 7: 335-354.

Fortes, M., Djohani, R. and B. Kahn (eds). 2003. Introducing the Regional Action Plan (RAP) to Strengthen a Resilient Network of Effective Marine Protected Areas in Southeast Asia 2002-2012: Technical Background and RAP Description. Final Report to the IUCN World Commission for Protected Areas (WCPA), Gland, Switzerland. 128pp.

Gordon, J. and A. Moscrop. 1998. Underwater noise pollution and its significance for whales and dolphins. In: The conservation of whales and dolphins: Science and practice. By M. Simmonds and J. Hutchington (eds). Wiley and Sons. England. pp 281-320.

Hampton J., Lawson T. and P. Williams. 1995. Status of Interactions of Pacific Tuna Fisheries in 1995. In: Richard S. Shomura, R.S., Majkowski J. and R. F. Harman (eds): Proceeding of the Second FAO Expert Consultation on Interactions of Pacific Tuna Fisheries Shimizu, Japan 23 to 31 January 1995.

Hofman. R.J. 1995. The changing focus of marine mammal conservation. Trends. Ecol. & Evol. Vol. 10. No. 11: 462-465.

Hoyt, E. 2004. Marine Protected Areas for Whales, Dolphins and Porpoises: A World Handbook for Cetacean Habitat Conservation. Whale and Dolphin Conservation Society and Earthscan Publishers. London, UK. 512 pp.

Hoyt, E. 2001. Whale Watching 2001: Worldwide Tourism Numbers, Expenditures, and Expanding Socioeconomic Benefits. The International Fund for Animal Welfare (IFAW). 175pp. Available at www.ifaw.org.

Hyrenbach, K.D., K. A. Forney and P. K. Dayton A. 2000. Viewpoint: Marine protected areas and ocean basin management. Aquat. Conserv.: Mar. Freshwat. Ecosyst. 10, 437–458.

IUCN. 2003. The 2003 IUCN Red List of Threatened Species. Available at www.redlist.org.

Kahn, B. 2004. Indonesia Oceanic Cetacean Program Activity Report October-December 2003: Solor-Alor Visual and Acoustic Cetacean Survey and Applied Ecological Research; Indonesia Marine Mammal Management Area (IM3A) and Solor-Alor Marine Protected Area Development. APEX Environmental/TNC Indonesia Program Technical Report. 29pp.

Kahn, B. 2003. The Indo-Pacific Marine Corridors of Eastern Indonesia: Ecological Significance for Oceanic Cetaceans and other Large Migratory Marine Life and Implications for MPA networks in Southeast Asia. Paper presented at the Vth World Parks Congress (WPC). WPC Marine Stream workshop 'Scaling Up to Build MPA Networks: Benefits for Fisheries and Endangered Species'. Durban, South Africa, 8-17 September 2003.

Kahn, B. 2002a. Indonesia's migratory corridors for large marine life: Scientific and management perspectives. In: Proceedings of the 1st Regional Session of the Global Biodiversity Forum for the Pacific (GBF): 'Global Forces and their Impacts on the Pacific's Biodiversity: Towards Local and Regional Response Strategies. Rarotonga, Cook Islands July 5-8, July 2002.

Kahn, B. 2002b. The Solor - Alor Rapid Ecological Assessment – Visual and acoustic cetacean surveys and evaluation of traditional whaling practices, fisheries interactions and nature-based tourism potential: October 2001 and May 2002 Survey Periods. Solor - Alor Rapid Ecological Assessment (REA). Technical Report for WWF - Wallacea and TNC Coastal and Marine Program/Indonesia. 36pp.

Kahn, B. 2002c. Discussion paper on the establishment of a Protected Marine Mammal Fisheries Area in Indonesia's national and EEZ waters. APEX Environmental/TNC Indonesia Program Technical Report prepared for the Government of the Republic of Indonesia - the Ministry of Marine Affairs and Fisheries. 55pp.

Kahn, B. 2001a. Important criteria for selecting/establishing protected habitat regions for cetaceans in Papua New Guinea. In: Transcripts of the New Guinea Marine Mammal Forum. July 16-17 2001, Port Moresby Papua New Guinea. 6-8p.

Kahn, B. 2001b. Rapid ecological assessment in the Sangihe-Talaud Archipelago, North Sulawesi, Indonesia: Visual and acoustic cetacean survey component. Technical Report - APEX Environmental/TNC Coastal and Marine Program/Indonesia. 16pp.

Kahn, B. 1999. Oceanic cetacean surveys and sperm whale (Physeter macrocephalus) research of Northern Sulawesi, Indonesia. In: Proceedings of the 13th Biennial Conference on the Biology of Marine Mammals, Hawaii Nov.28 - Dec. 3 1999. 226pp.

Kahn, B. and J. Pet. 2003. Long-term visual and acoustic cetacean surveys in Komodo National Park, Indonesia 1999-2001: Management implications for large migratory marine life. In: Proceedings and publications of the World Congress on Aquatic Protected Areas 2002. Australian Society for Fish Biology. 625-637p.

Kahn, B., James-Kahn, Y. and J. Pet. 2000. Komodo National Park cetacean surveys - A rapid ecological assessment of cetacean diversity, distribution and abundance. Indonesian Journal of Coastal and Marine Resources 3(2). 41-59.

Kahn B., Wawandono N. B. and Subijanto, J. 2001. Protecting the cetaceans of Komodo National Park, Indonesia: Positive identification of the rare Pygmy Bryde's whale (Balaenoptera edeni) with the assistance of genetic profiling. Final Report to the Indonesian Institute of Sciences (LIPI). 11pp.

Kahn, B. Whitehead, H. and M. Dillon. 1993. Indications of density-dependent effects from comparisons of sperm whale populations. Marine Ecology Progress Series 93, 1-7.

Ketten, D. 1998. Marine mammal auditory systems: a summary of audiometric and anatomical data and its implications for underwater acoustic impacts. NOAA-TM-NMFS-SWFSC-256. 74p.

Kile, N and A. Watah. 2003. The dolphin fishery of the Solomon Islands. Statement by the Minister of the Department of Fisheries and Marine Resources, Solomon Islands Government. 9pp.

LeDuc, R.G., Perrin, W.F. and Dizon, A.E. 1999. Phylogenetic relationships among the delphinid cetaceans based on full cytochrome b sequences. Marine Mammal Science 15, 619-48.

Lehodey, P. 2001. The pelagic ecosystem in the tropical Pacific Ocean: dynamic spatial modelling and biological consequences of ENSO. Progress in Oceanography 49: 439-468.

Malakoff, D. 2004. New tools reveal treasures at ocean hot spots. Science 304: 1104-1105.

Mann, J. Connor, R.C., Tyack, P.L. and H. Whitehead. 2000. Cetacean societies - Field studies of dolphin and whales. 433pp.

Marsh, H., C. Eros, H. Penrose and J. Hugues. 2001. The dugong (*Dugong dugon*) status reports and action plans for countries and territories in its range. IUCN, Gland Switzerland. 160pp.

Perrin, W.F., R.R. Reeves, M.L.L. Dolar, T.A. Jefferson, H. Marsh, J.Y. Wang, and J. Estacion (eds.). In press. Report of the Second Workshop on the Biology and Conservation of Small Cetaceans and Dugongs of Southeast Asia, Silliman University, Dumaguete City, Philippines, 24-26 July 2002. Technical Report Series, Convention on Migratory Species, Bonn, Germany.

Reeves, R.R., S. Leatherwood, G.S. Stone, and L.G. Eldredge. 1999. Marine Mammals in the Area Served by the South Pacific Regional Environment Programme (SPREP). South Pacific Regional Environment Programme, Apia, Western Samoa. 48 pp.

Rice, D. 1989. Sperm whale Physeter macrocephalus Lineaus 1758. In handbook of marine mammals, vol. 4, River dolphins and the larger toothed whales. Ed. S.H. Ridgeway and R Harrison. London, Academic Press.

Ross, G. Gulland, F, Gales, N. Brownell, R and R. Reeves. 2003. A report of a fact-finding visit to the Solomon Islands. Report by the IUCN Species Survival Commission – Cetacean Specialist Group. 9 pp).

Rudolph, P., C. Smeenk and S. Leatherwood. 1997. Preliminary checklist of cetacea in the Indonesian Archipelago and adjacent waters. Zoologische Verhandelingen 312: 1-48.

Wada, S., Oishi, M. and T. K. Yamada. 2003. A newly discovered species of living baleen whale. Nature Vol. 426: 287-81.

Weilgart, L. 1988. Distinctive vocalizations from mature sperm whales (*Physeter macrocephalus*). Can . J. Zool. 66: 1931-37.

Whitehead, H. and B. Kahn. 1992. Temporal and geographical variation in the social structure of female sperm whale. Can. J. Zool. 70: 2145-49.

Whitehead , H and L. Weilgart. 1990. Click rates from sperm whales. J. Acoust. Soc. Am. 87:1798-1806.

WWF. 2003. Bismarck Solomon Seas Ecoregion – A Cradle of Marine Biodivesity. Ecoregional vision workshop report published by WWF South Pacific Programme. 25pp.

Tables

Table 1. Preliminary marine mammal species list for Solomon Islands waters, with positive identifications during SI Cetacean REA and Fanalei names and relative catch frequency.

Generic identification (ID)	Scientific ID (Order Cetacea)	SI REA	Other reports[1]	Fanalei ID[2]	Targeted catch[3]	Relative frequency of catch[4]	Comments
Dolphins	*Fam. Delphinidae*	•	All	kirio	Yes		Highly diverse coastal and oceanic species (incl. the largest dolphin, the orca or killer whale), no riverine species known.
Beaked whales	*Fam. Ziphiidae*	•		Sao	No		At least 3 genera likely to inhabit SI waters.
Large whales	*Fam. Balaenopteridae; Physeter macrocephalus*	•	14	Busu asi	No		Rorqual baleen whales, sperm whale.
Dugong	*Dugong dugon (Order Sirenia)*	•	5, 14	Ia tekwa	No		Locally common but not extensively hunted. Highly data-deficient and thought to be at risk of extirpation throughout much of its range (Marsh et al. 2001).
Sperm whale	*Physeter macrocephalus*	•	8, 7, 12		No	(acoustic ID only)	
Dwarf sperm whale	*Kogia simus*				No		
Pygmy sperm whale	*Kogia breviceps*		9		No		
Short-finned pilot whale	*Globicephala macrorhynchus*	•	7,9		No		
Orca	*Orcinus orca*	•	8, 9		No		Avoided when sighted, same individual male seen in separate years

Species identification (ID)	Scientific ID	SI REA	Other reports[1]	Fanalei ID[2]	Targeted catch[3]	Relative frequency of catch[4]	Comments
False killer whale5	*Pseudorca crassidens*	•	8, 9, 7, 11, 14	Ga ia robo	No		Sometimes sighted
Pygmy killer whale	*Feresa attenuata*		7		No		Sometimes sighted
Melon-headed whale	*Peponocephala electra*		8, 9, 11, 16, 14 (teeth, no recent sightings)	Robo au/ Robo tafungai	Yes		Teeth are considered the most valuable, yet this species has not been caught (or seen) for many decades, and indeed, many generations (>100 years).
Spinner dolphin	*Stenella longirostris*	•	8, 6, 7, 9, 11, 14,16	Raa	Yes	Almost every year	
Spinner dolphin (offshore small body)				Raa matakwa	Yes	Almost every year	
Spinner dolphin (offshore, robust body)				Subo raa	Yes	Almost every year	
Pan-tropical spotted dolphin	*Stenella attenuata*	•	8, 7, 9, 6, 11, 14,16	Unbulu	Yes	Every year, main target species	
Striped dolphin	*Stenella coeruleoalba*		8, 7, 9, 14	Robo tetefa	No		
Rough-toothed dolphin	*Steno bredanensis*	•	8, 7, 9, 6		No		
Risso's dolphin	*Grampus griseus*	•	7, 9, 6, 14	Gwon mudu	No		
Bottlenose dolphin	*Tursiops truncatus*	•	8, 9, 14	Olo folosi	No		Do not react to noise of clapping stones

Species identification (ID)	Scientific ID	SI REA	Other reports[1]	Fanalei ID[2]	Targeted catch[3]	Relative frequency of catch[4]	Comments
Indo-Pacific Bottlenose dolphin	*Tursiops aduncus*	•			No		Do not react to noise of clapping stones
Short-beaked common dolphin	*Delphinus delphis*		5, 14	Rabo manole	No		
Long-beaked common dolphin	*Delphinus capensis*			Rabo manole	No		
Fraser's dolphin	*Lagenodelphis hosei*		14	Not known[6]	Yes	Every year	
Indo-Pacific Humpback dolphin	*Sousa chinensis*				No		Likely but no record found
Irrawaddy dolphin	*Orcaella brevirostris*		9		No		
Beaked whales	*Mesoplodon sp.*				No		
Blainville's beaked whale	*Mesoplodon densirostris*		7				
Gingko-toothed beaked whale	*Mesoplodon ginkgodens*						Likely but no record found
Indo-Pacific beaked whale	*Indopacetus pacificus*						Likely but no record found
Cuvier's beaked whale	*Ziphius cavirostris*		8		Yes	Sometimes	
Bottlenose whales	*Hyperoodon sp.*				No		
Common minke whale	*Balaenoptera acutorostrata*		12		No		
Antarctic minke whale	*Balaenoptera bonaerensis*						Likely but no record found

Species identification (ID)	Scientific ID	SI REA	Other reports[1]	Fanalei ID[2]	Targeted catch[3]	Relative frequency of catch[4]	Comments
Bryde's whale	*Balaenoptera brydei*		8, 12		No		
Pygmy Bryde's whale	*Balaenoptera edeni*				No		Highly likely but no record found (see Kahn et al. 2001)
Omurai's whale	*Balaenoptera omurai*						Reported recently as new baleen whale species from SI waters (Wada et al. 2001), but uncertainty remains on similarities with *B. edeni*, and the overall taxonomic status of the sei-bryde's whale complex
Sei whale	*Balaenoptera borealis*				No		Highly likely but no record found
Fin whale	*Balaenoptera physalus*				No		Likely but no record found
Blue whale	*Balaenoptera musculus*				No		Highly likely but no record found , see Bita 'Ama community interviews, sightings reported from experienced dive industry operators (to be verified)
Humpback whale	*Megaptera novaeangliae*				No		Highly likely but no record found, sightings reported from experienced dive industry operators (to be verified)

1 - As listed in Appendix 1.
2- Fanalei ID as reported during SI Cetacean REA interviews and literature (Takekawa 1996a,b in Appendix 1).
3- Targeted catch was assessed through SI Cetacean REA interviews.
4- Relative catch frequencies were assessed through SI Cetacean REA interviews.
5 -Identified species from the Arnavon Isl. Stranding and interviews with Conservation Officers.
6 -Takekawa notes that the name robo au may also apply to the Fraser's dolphin (*Lagenodephis hosei*) . This could not be verified during the SI Cetacean REA.

Table 2. Visual survey summary for the SI Cetacean REA May-June 2004.

Solomon Islands Cetacean REA	**May 10 – June 16 2004**
Survey effort	
Total days surveyed	36
Estimated survey distance (nm)	1228.1
Active visual survey effort (hr)[8]	160.0
Oceanic habitat zone (hr)	60.0
Coastal habitat zone (hr)	67.5
Straits and corridors habitat zone (hr)	32.5
Survey results	
Cetacean sightings	52
Cetacean total individual count [9]	815
Cetacean species diversity (total includes one acoustic species identification – the sperm whale)	11
Survey results corrected for effort	(average)
Species identified/survey day	1.14
Sightings/survey day	1.44
Total individual count /survey day	22.64
Sightings/survey distance (nm)	0.04
Total individual count /survey distance (nm)	0.66

[8] Active visual survey effort = Total hours - hours spend off effort (due to sea time spend on species identification and/or tracking and ecological research on priority species, logistical constraints).
[9] Cetacean total individual count = Direct count of cetaceans surveyed (total of *minimal* abundance estimates of cetaceans at the surface/sighting). See methods for more details.

Table 3. The SI Cetacean REA legs, including key parameters.

REA Leg No.	Area Description	Days	Distance (nm)
1	Guadalcanal - Florida Isl. - St. Isabel	7	204.30
2	Arnavon Isl. - Choiseul – Shortland Isl. - Mono Isl.	8	261.60
3	New Georgia Group – Russell Isl. - Guadalcanal	7	232.40
4	Guadalcanal - Makira - Florida Isl. - Savo	6	159.60
5	3 Sisters - Malaita - N Indispensable Strait	6	210.20
All - SI	All Solomon Islands Legs	34	1068.10
PNG-SI	SE Bougainville – Guadalcanal, Honiara	2	160.00
TOTAL	All Solomon Island Cetacean REA Legs	36	1228.10

Table 4. Acoustic survey summary for the SI Cetacean REA May-June 2004.

Solomon Islands Cetacean REA	May 10 – June 16 2004
Listening stations	49
Acoustic encounter rate (% of contacts/stations) – all cetacean species.	51.0
Acoustic encounter rate (%) – sperm whales	8.2
Estimated acoustic coverage (nm^2) -sperm whales (6.0 nm detection radius/station)	5541.8
Estimated acoustic coverage (nm^2) -oceanic dolphins (2.5 nm detection radius/station)	962.11

Figures

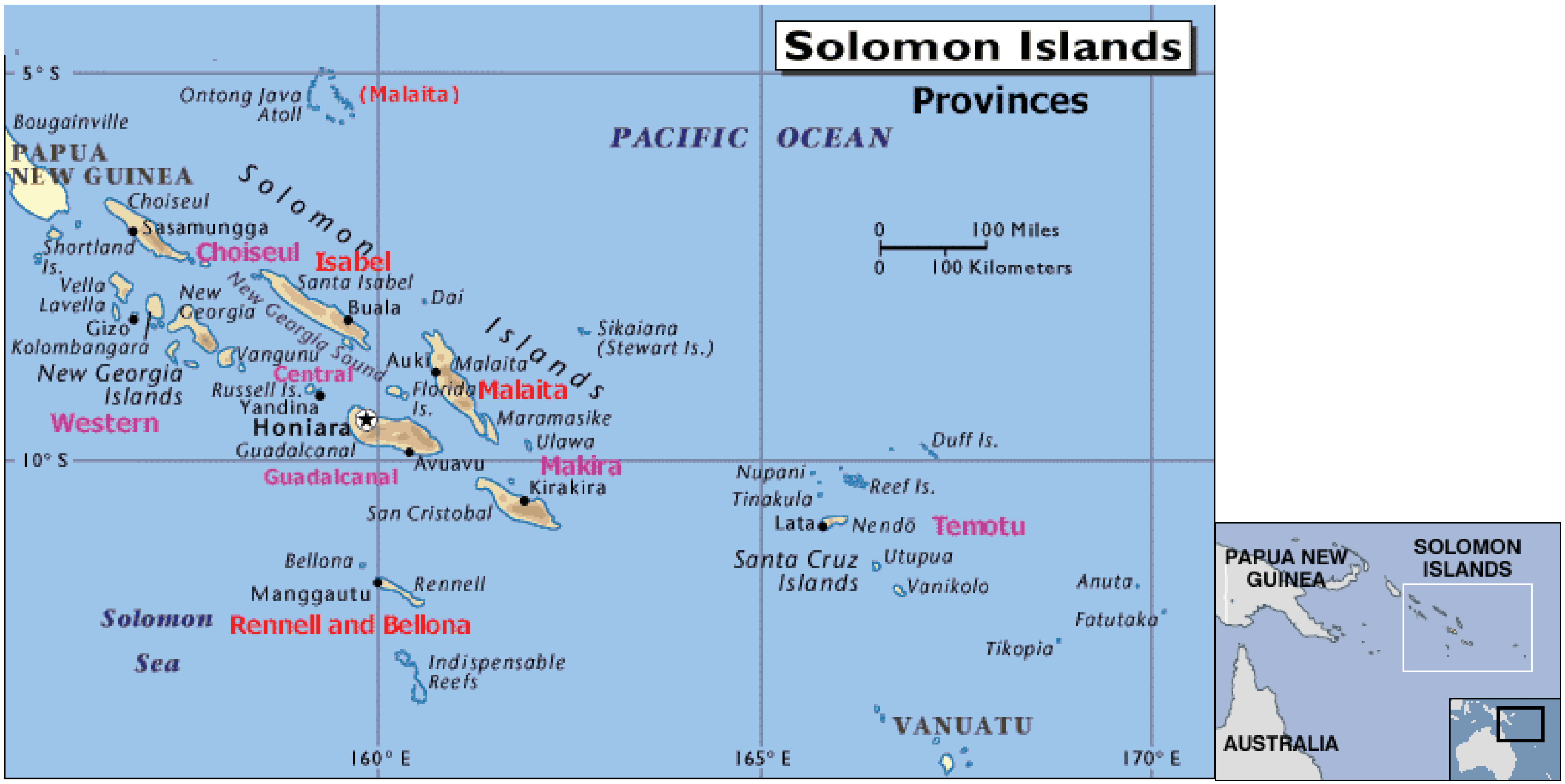


Figure 1. Solomon Islands' provinces and main islands (including eastern provinces not included in this Marine Assessment) and geographic location of the Solomon Islands in the Pacific (insert).

Figure 2. Approximate track of vessel FeBrina during the SI Cetacean REA (as digitized from the passage charts), not including the passages to/from Papua New Guinea.

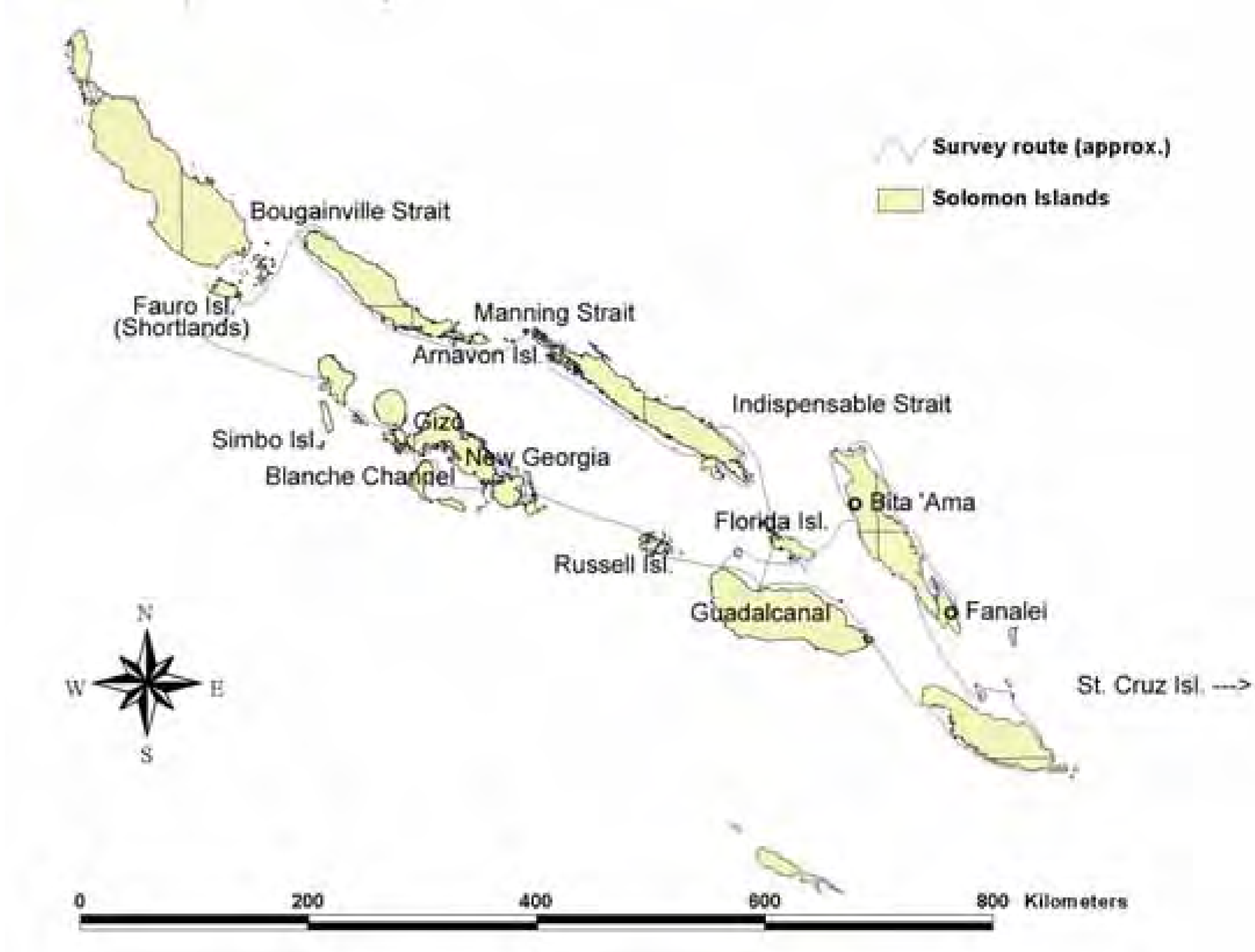


Figure 3. Cetacean species diversity and distribution in the SI Cetacean REA: May – June 2004 (n=52).

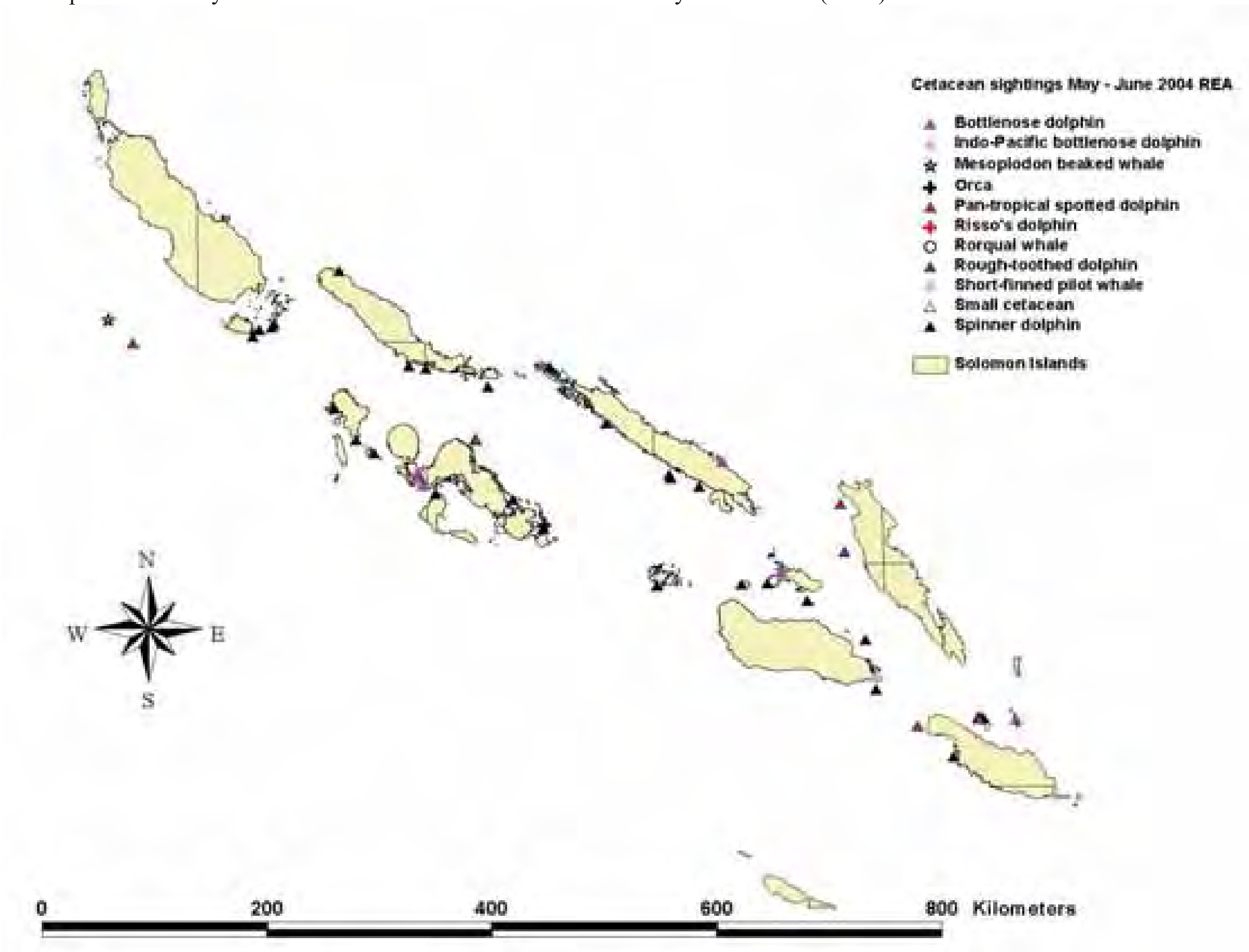


Figure 4. Distribution and diversity of acoustic contacts recorded on listening stations conducted during the SI Cetacean REA: May – June 2004. (n=49). Note: track does not include PNG-SI passage during which 3 listening stations were made on the Mono Isl. – Guadalcanal leg – in The Slot to the N of New Georgia.

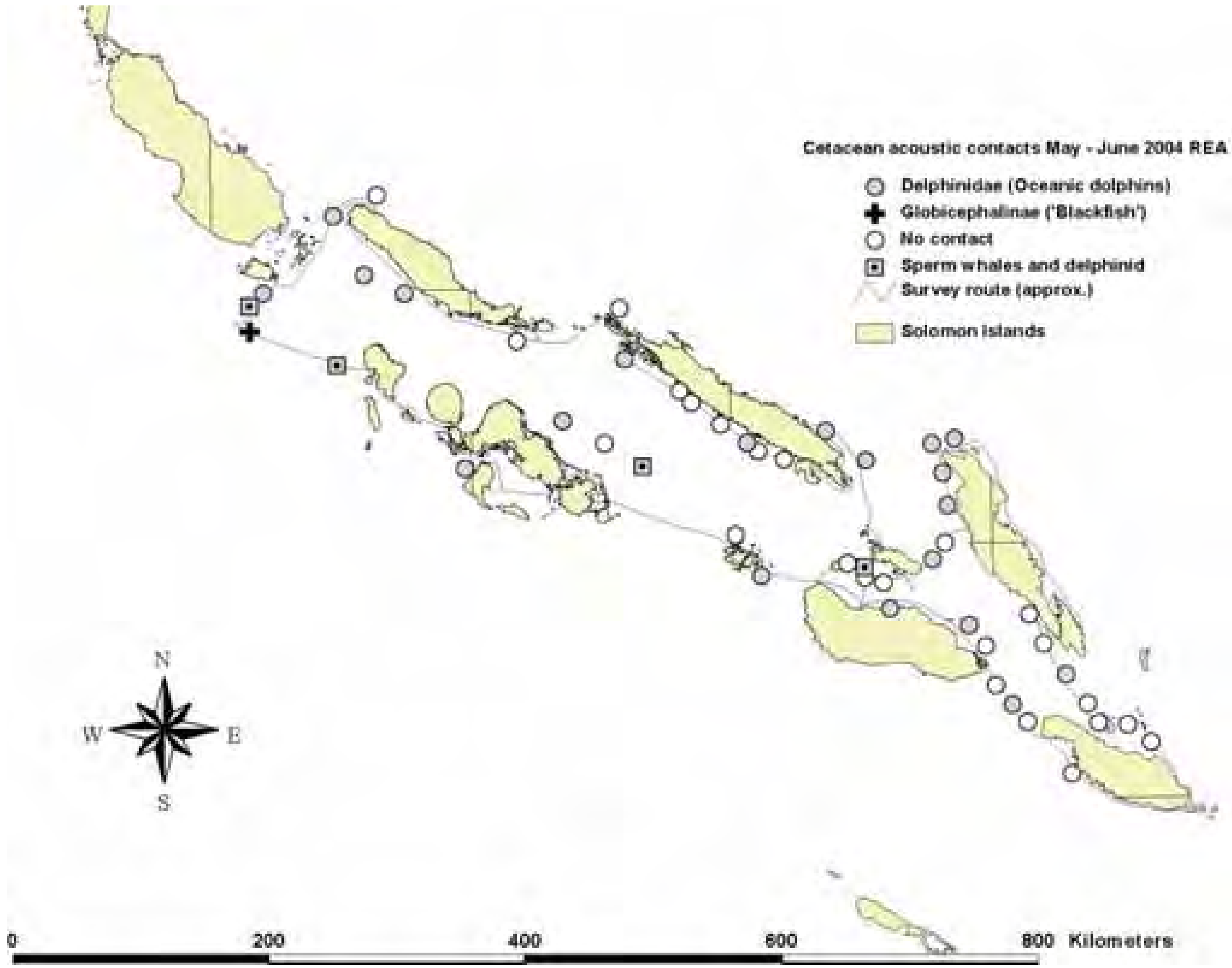


Figure 5a-d. Summary of visual survey effort for the SSI Cetacean REA: May – June 2004

Figure 5a. Active visual survey time per habitat zone (n = 160.0 survey hours)

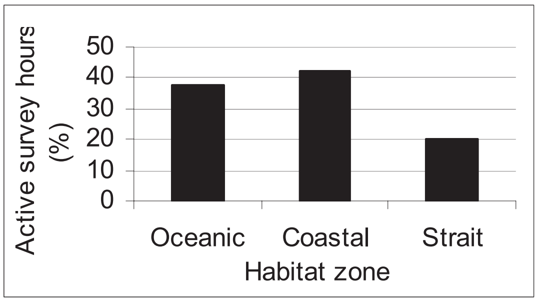


Figure 5b. Visual survey distance ranges (n = 1228.1 nautical mile) for each survey day (n=36 days).

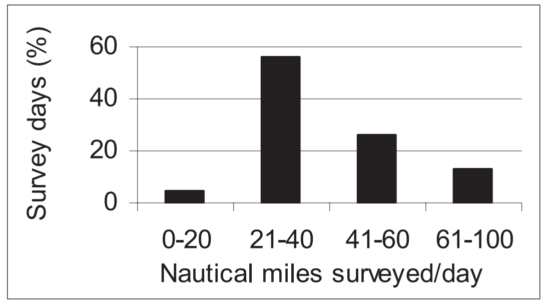


Figure 5c. Number of cetacean sightings per survey day (total survey days n=36).

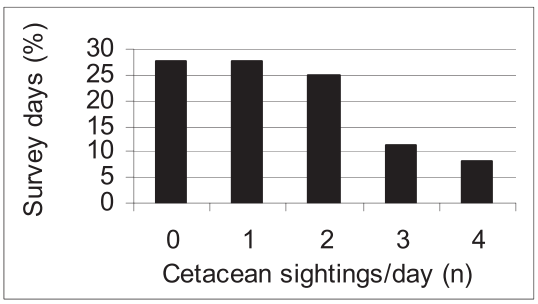


Figure 5d. Number of species identified per survey day (total survey days n=36).

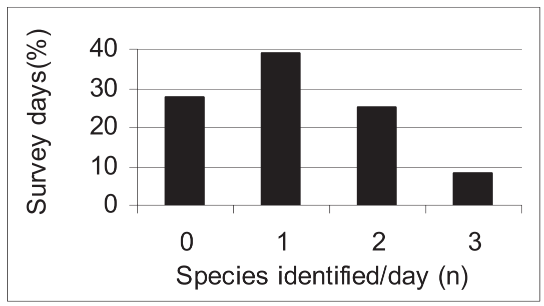


Figure 6. Species-specific sighting frequencies for the SI Cetacean REA: May – June 2004 (% of total sightings, n=52).

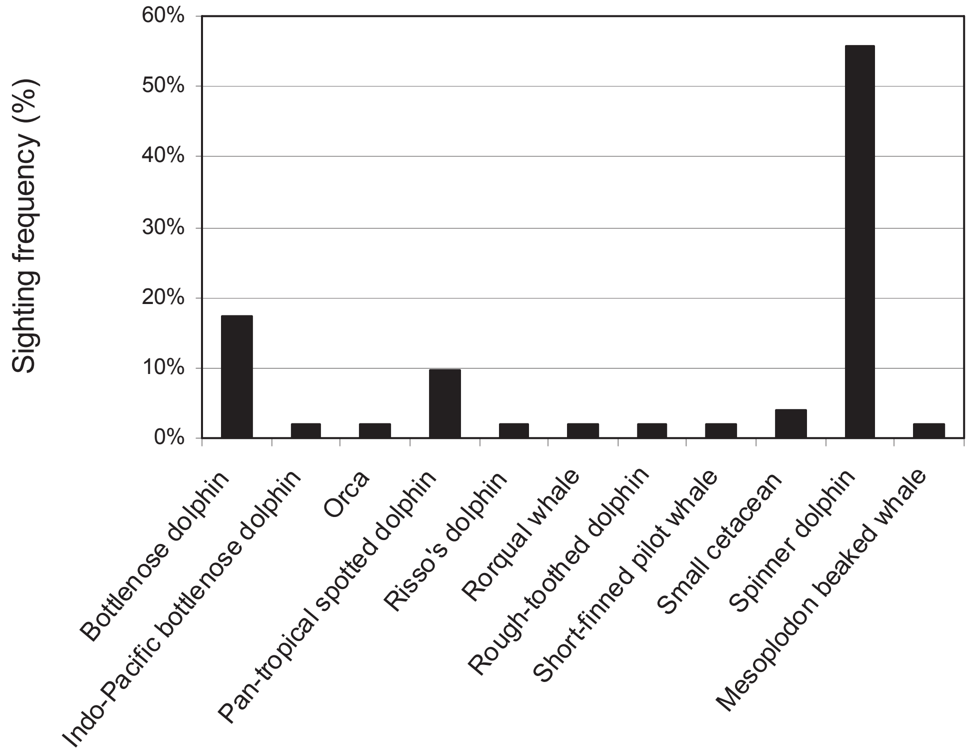


Figure 7. Species-specific frequency of total individual count (n=815) for the SI Cetacean REA: May – June 2004.

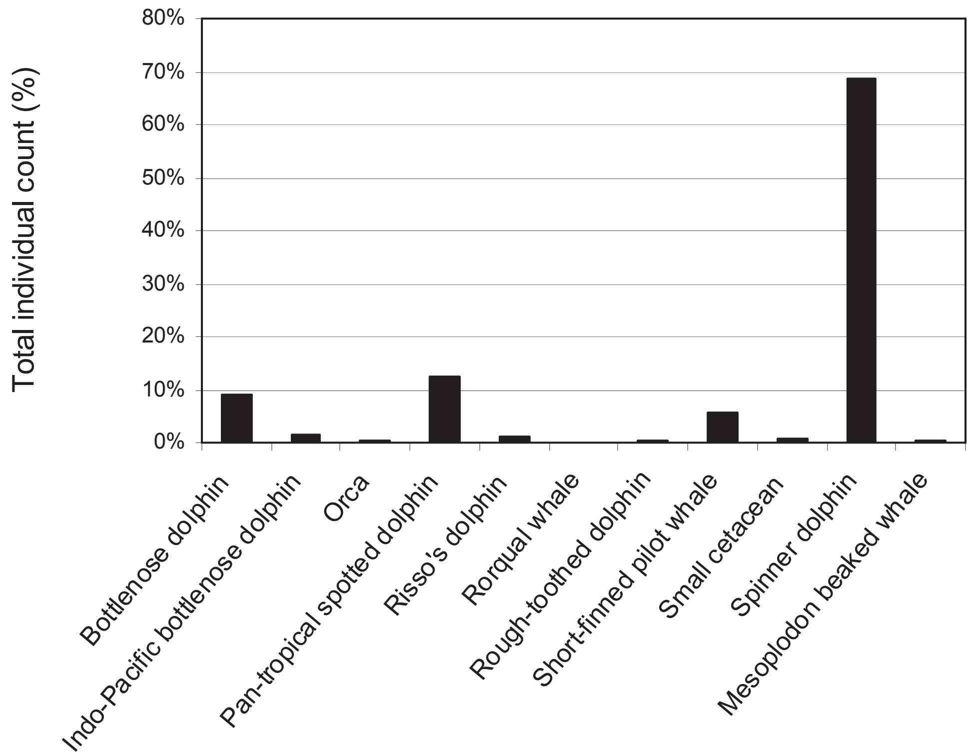


Figure 8a-f. Summary of visual survey effort and results for each SI Cetacean REA leg.

Figure 8a. Visual survey effort per SI Cetacean REA leg

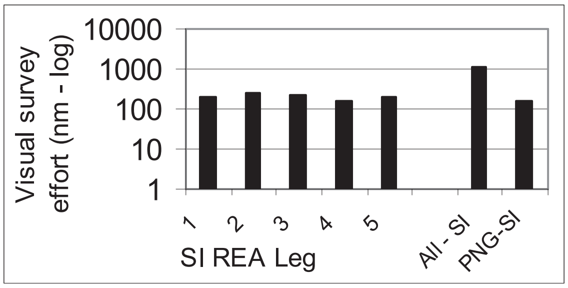


Figure 8b. Number of cetacean species positively identified per SI Cetacean REA leg.

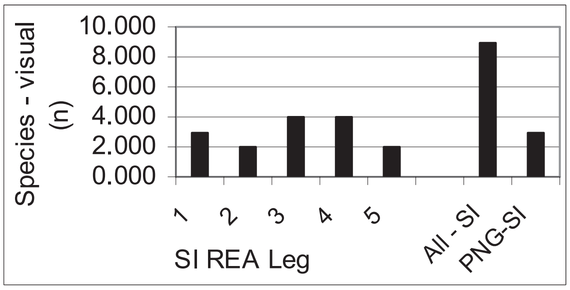


Figure 8c. Species diversity index (species identified/nm) per SI Cetacean REA leg.

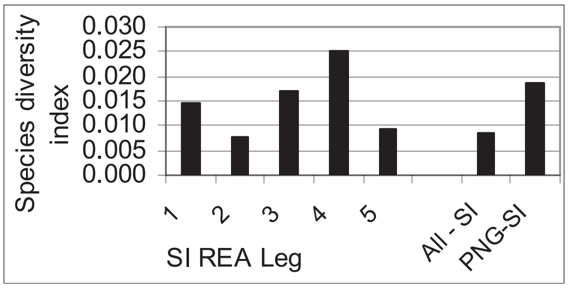


Figure 8d. Sightings index (sightings/nm) per SI Cetacean REA leg.

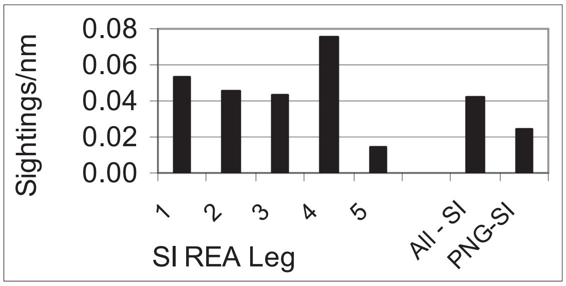


Figure 8e. Total individual count index (count/nm) per SI Cetacean REA leg.

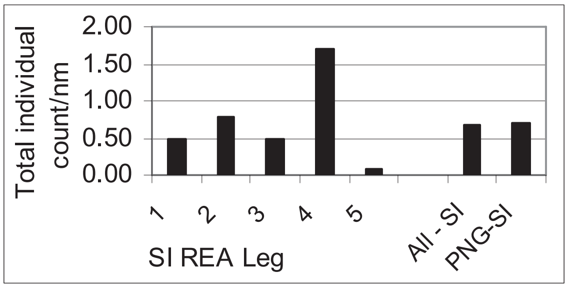


Figure 8f. Average visual conditions per SI Cetacean REA leg.

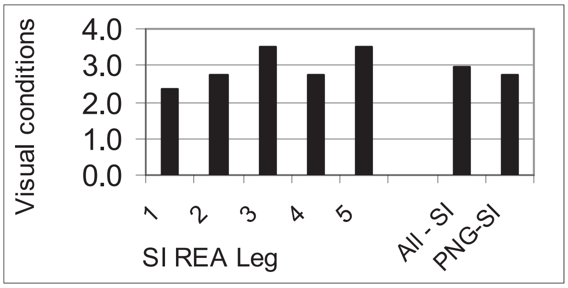


Figure 9. Acoustic survey categories for all listening stations conducted during the SI Cetacean REA: May – June 2004.

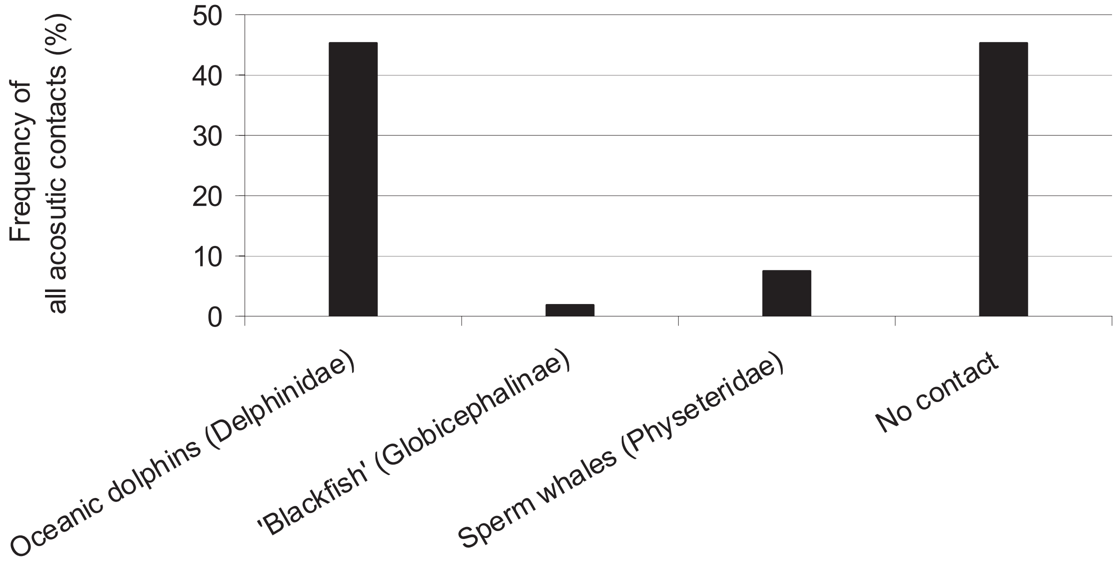


Figure 10. Acoustic survey categories for positive cetacean contacts only.

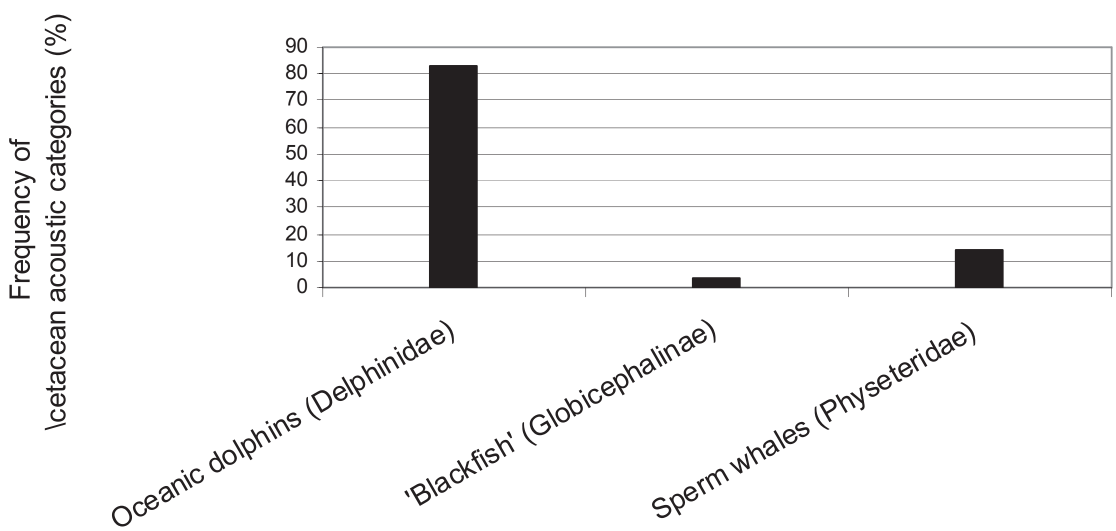


Figure 11a-d. Summary of acoustic survey effort and results for the SI Cetacean REA legs, including the PNG-SI passage.

Figure 11a. Hydrophone listening stations (passive bio-acoustic monitoring) conducted for each leg.

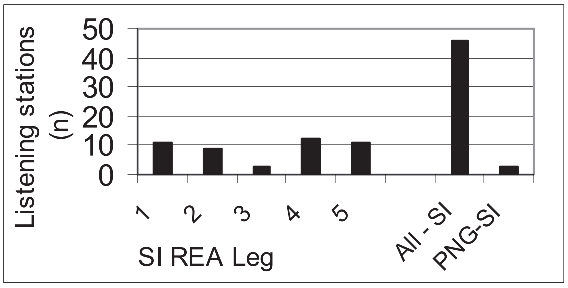


Figure 11b. Percentage of acoustic contact with cetaceans during the hydrophone listening stations conducted each leg.

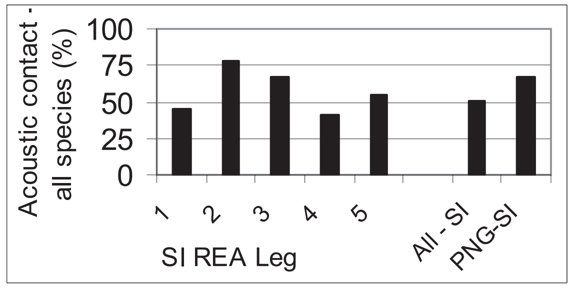


Figure 11c. Ratio of acoustic contact with sperm whales over all acoustic contacts for each leg.

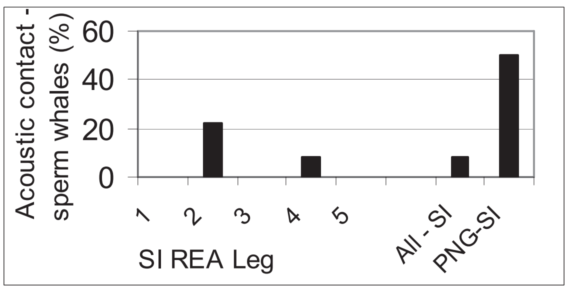


Figure 11d. Average acoustic conditions during each leg.

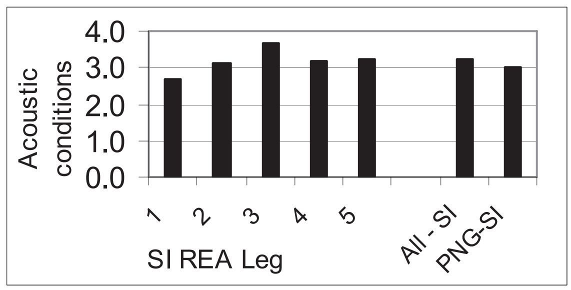


Figure 12. Frequencies of cetacean species associations (% of total sightings) recorded during the SI Cetacean REA: May – June 2004.

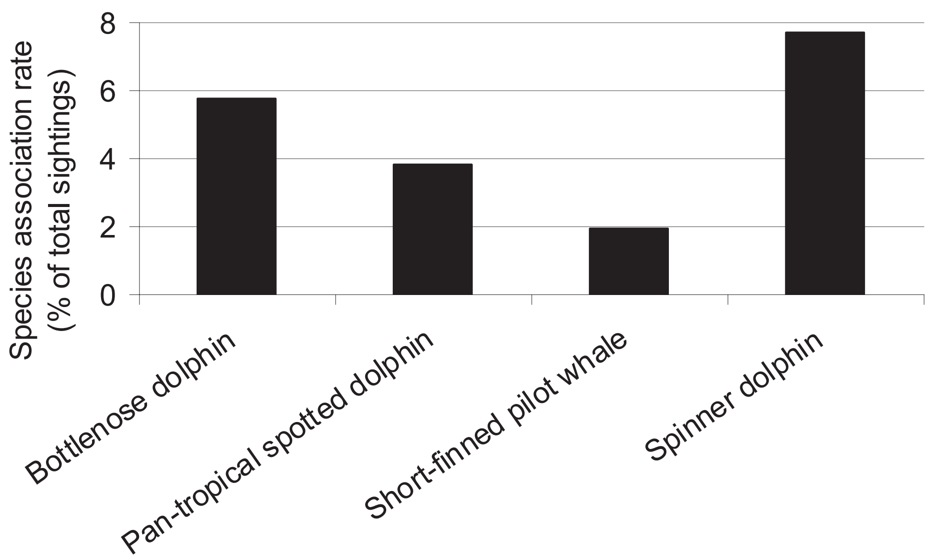


Figure 13a-b. Environmental conditions – visual and acoustic – during the SI Cetacean REA.

Figure 13a. Frequency of sighting conditions during the SI Cetacean REA.

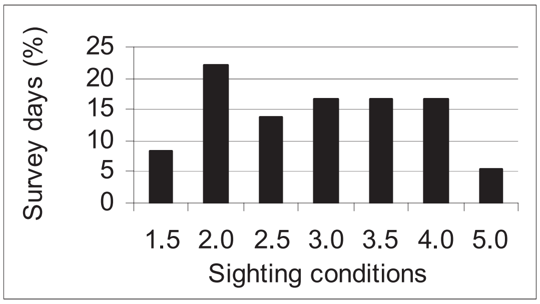


Figure 13b. Frequency of acoustic conditions/listening station during the SI Cetacean REA.

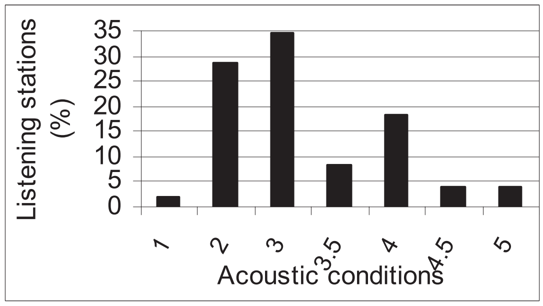
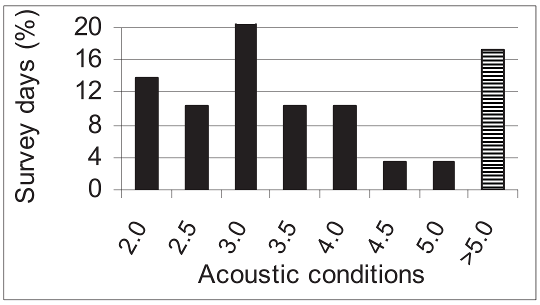
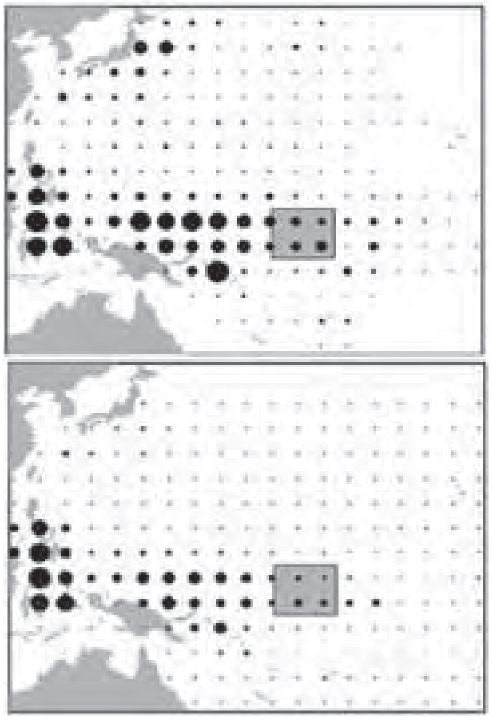


Figure 13c. Frequency of acoustic conditions/survey day during the SI Cetacean REA.



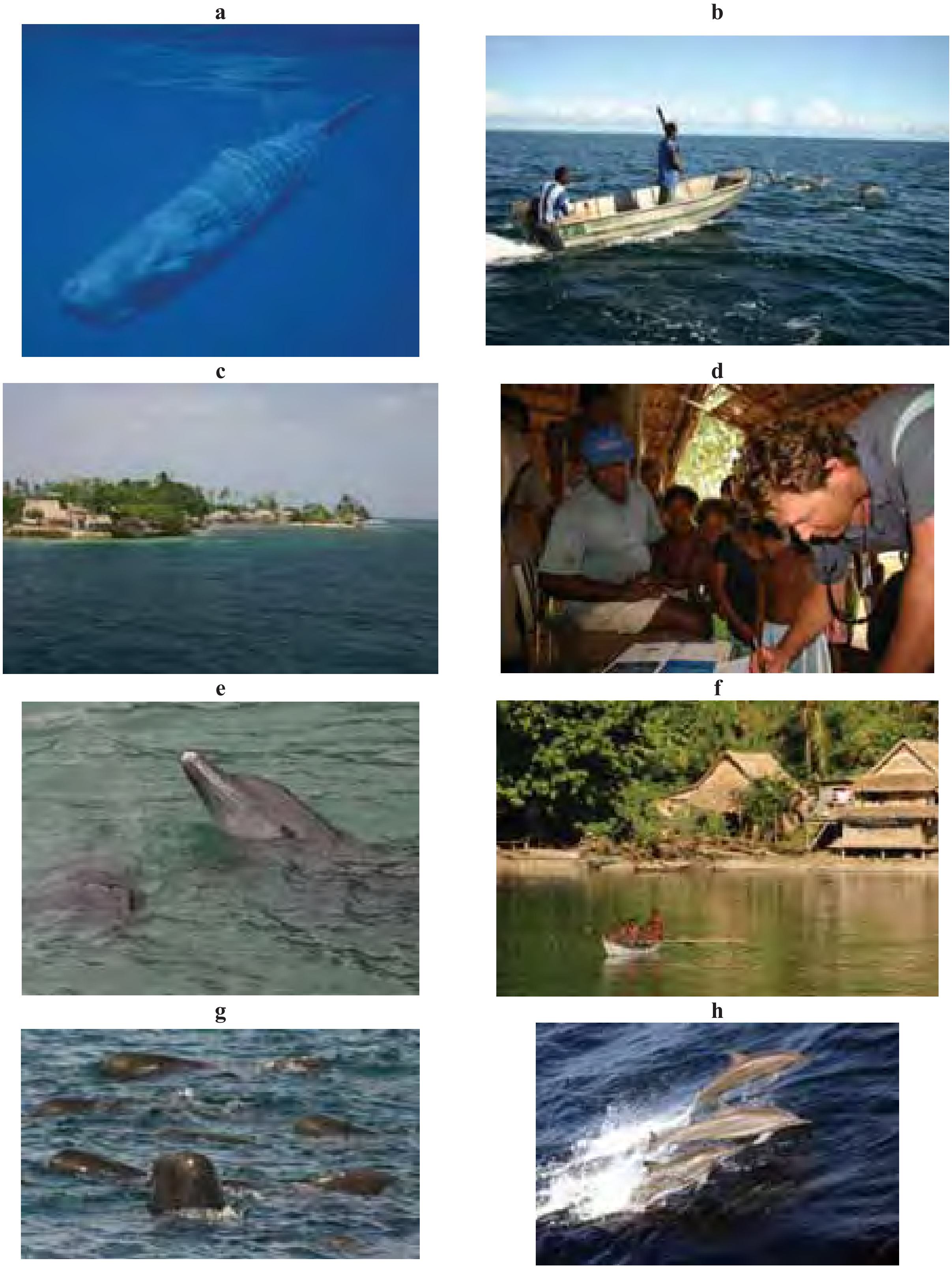
Please refer to relevant sections for more details.

Figure 14. Distribution of skipjack (top) and yellowfin (bottom) average catch in the western Pacific Ocean, 1988-1992.



The maximum circle size represents annual catches of 39,200 mt for skipjack and 26,000 mt for yellowfin. The rectangle indicates the Gilbert Islands area (from Hampton and Sibert 1995, as reproduced and quoted in Hampton et al. 1995).

Figure 15: Photos of several cetacean species and activities during the Solomon Islands Marine Assessment.



i

j

k

l

a) A sperm whale (*Physeter macrocephalus*) commences a deep a foraging dive, Sulawesi Sea, Indonesia (acoustic identification only during the Solomon Islands Marine Assesment).
b) Fauro Island residents (Shortland Islands) 'call' spinner dolphins (*Stenella longirostris*) to bow ride with their speedboat, by banging a paddle against the inside of the hull.
c) The narrow reef lagoon entrance of Fanalei village, part of the most difficult phase of the traditional dolphin hunt.
d) Interviews canvassing information on local cetaceans and traditional dolphin hunting with Fanalei elders and community members (photo by D. Wachenfeld).
e) Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), Gavutu live-capture and dolphin display facility, Florida Islands.
f) Members of a Makira village paddle out to greet the survey vessel. Such encounters were routine in most anchorages and an opportunity to ask for local knowledge on cetaceans.
g) Short-finned pilot whales (*Globicephala macrorhynchus*) log (rest) and spy hop (head rising vertically above the surface) near a reef lagoon entrance.
h) Spinner dolphins (*Stenella longirostris*) approach the survey vessel to bow ride.
i) Pantropical spotted dolphins (*Stenella attenuata*) travelling at high speed.
j) Traditional Solomon Islands bamboo band and dances.
k) Orcas (*Orcinus orca*) traveling along coral reef drop-off (photo by W.Atu).
l) Stranded false killer whale (*Pseudorca crassidens*) skeleton reassembled as an educational display – Arnavon Island research station.

Photos © APEX Environmental 2004 except where noted.

Appendices

Appendix 1. Shortlisted references and historical records relating to Solomon Islands cetaceans and traditional dolphin drives of Malaita[10].

1. Akimichi. 1992. The surviving whale-tooth: Cultural significances of whale products in Oceania. Bull. National Mus. Ethnol. 17:121-142.
2. Akin, D. 1981. Porpoise teeth in East Kwaio Artwork Journal of the traditional money association Vol. 2(1).
   Akin, D. (1993). Negotiating culture in East Kwaio, Malaita Appendix 2: Kwaio shell money making and use of porpoise teeth. PhD dissertation. Dept. of Anthropology, Univ. of Hawaii, USA.
3. Boyd, D (date uncertain). Introduction to porpoise hunting on Fanifi, Solomon Islands. Columbia University (typescript manuscript, 40pp).
4. British Solomon Islands Protectorate – Special Duties Fisheries). 1973. Dried porpoise meat. Government Memorandum No. 443/4/10 (currently the Fisheries Department of the Solomon Islands).
5. British Solomon Islands Protectorate – Office of the District Commissioner. 1965. Background paper: Malaita porpoise hunting. Government Memorandum No. M/22/7/1 from Pepys-Cockerell J.L., former District Officer Of North Malaita.
6. Dawbin, W.H. (1966). Porpoise and porpoise hunting in Malaita. Australian Natural History 15(7): 207-211.
7. Dawbin, W.H. 1974 Cetacea of the south western Pacific Ocean. Background paper to FAO/ACMRR, La Jolla, USA.
8. Goto, M. Nagatome, I. and Shimada, H. Cruise report of the cetacean sighting survey in waters off the Solomon Islands in 1994. Paper presented to the International Whaling Commission - IWC SC/47/SH12 (survey conducted between September 17th and October 5th, 1994).
9. Hill, L 1989. Traditional Porpoise Harvest in the Solomon Islands. A preliminary report from the University of Papua New Guinea, Port Moresby, PNG.
10. Ivens Rev. W.G. 1902. Porpoise hunting. The Southern Cross Log July 1: 21-22. (letter and notes on Malaita dolphin hunting).
11. Leatherwood. S. (date uncertain) Introduction to porpoise hunting of Fanifi, Solomon Islands. Colombia University. Report F/10/13 and Appendix 6 from unpublished M.Sc. thesis.
12. Miyashita, T. Kato, H and T. Kasuya, eds. 1995. Worldwide map of cetacean distribution based on Japanese sighting ata (Volume 1). National Research Institute of Far Seas Fisheries, Shizuoka, Japan. 140pp.
13. Miyazaki, N. and Wada, S. (1978). Observations of cetacea during whale marking cruise in the western tropical Pacific, 1976. Scientific Reports of the Whales Research Institute, Tokyo 30: 179-195.
14. Takekawa, D. (1996a). Ecological knowledge of Fanalei villagers about dolphins: dolphin hunting in Solomon Islands 1. Senri Ethnological Studies No. 42. Osaka: National Museum of Ethnology, 5565. Japan.
15. Takekawa, D. (1996b). The method of dolphin hunting and the distribution of teeth and meat: dolphin hunting in Solomon Islands 2. Senri Ethnological Studies No. 42. Osaka: National Museum of Ethnology, 6780. Japan.
16. Takekawa, D. (1996c). Hunting method and the ecological knowledge of dolphins among the Fanalei villagers of Malaita, Solomon Islands. South Pacific Commission (SPC) Traditional Marine Resource Management and Knowledge Information Bulletin #12.

[10] These papers were kindly made available by R. Reeves, Chair IUCN SSC – Cetacean Specialist Group.

Appendix 2. Brief summary of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. States (countries) adhere voluntarily to CITES. States that have agreed to be bound by the Convention ('joined' CITES) are known as Parties. Although CITES is legally binding on the Parties - in other words they have to implement the Convention - it does not take the place of national laws. Rather it provides a framework to be respected by each Party, which has to adopt its own domestic legislation to make sure that CITES is implemented at the national level.

CITES works by subjecting international trade in specimens of selected species to certain controls. These require that all import, export, re-export and introduction from the sea of species covered by the Convention has to be authorized through a licensing system. ('Re-export' means export of a specimen that was imported.) The species covered by CITES are listed in three Appendices, according to the degree of protection they need. Appendix I includes species threatened with extinction (most whale species and some dolphin species are listed).

Trade in specimens of these species is permitted only in exceptional circumstances. Appendix II includes species not necessarily threatened with extinction (all cetacean species not listed under Appendix I are listed here), but in which trade must be controlled in order to avoid utilization incompatible with their survival. An export permit may be issued only if the specimen was legally obtained; the trade will not be detrimental to the survival of the species; and in case of an Appendix I-listed species, an import permit has already been issued. Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade (Further information on www.cites.org).

Appendix 3. Summary of marine fisheries in the Solomon Islands.

The tuna purse seine fleet of the Solomon Islands is currently made up of three domestic vessels and up to 80 vessels in the licensed foreign fleet (P. Ramohia – Senior Fisheries Officer, SI Fisheries Department, pers. comm. in June 2004). The latter includes vessels from the USA (the largest foreign flag fleet operating in the SI with up to 40 vessels licensed), Japan, Korea, Taiwan and other nations. Tuna purse seiners catch tuna all over the Pacific, and are not restricted to SI waters. Typically, the USA vessels have bilateral agreements with up to 30 Pacific nations (P. Ramohia, pers. comm.). Most ships are licensed for 500 tonnes.

The vessel's captain decides in which nation/port the catch is landed and processed.
There are two landing and refueling ports in SI: Honiara (Guadalcanal) and Noro (Gizo area, New Georgia). Honiara is the main longline port as sashimi is landed and flown overseas 2-3 times a week. Noro is the preferred port for processing tuna through its cannery. The civil unrest (2000-2002) has had a major impact on this component of the industry especially. There are 40 trained Solomon Islands observers on the fleet, as part of the Pacific observer program. Total Allowable Catch (TAC) is monitored via this observer program (P. Ramohia, pers. comm.).

The fisheries situation of the Solomon Islands is characterized by (from FAO and SCP sources - http://www.fao.org/fi/fcp/en/SLB/profile.htm):

A. The large importance of both subsistence fisheries and the offshore industrial fisheries for tuna;
'Solomon Islands coastal and offshore waters are rich tuna grounds and have traditionally been exploited by distant-water fishing fleets. Japanese long liners have fished in the zone since at least 1962 and annual catches have ranged up to 9,500 t (1978), but have been around 3,000 - 4,000 t in the late 1990s. Catches are dominated by yellowfin tuna (typically 60%) with albacore and bigeye making up the balance. Effort is directed to more northern and western areas. Domestically-based fishing operations commenced in 1971. The domestic pole-and-line fleet has also operated since 1971 with catches approaching 40,000 t in 1986, a peak year. Effort is concentrated around the Main Group Archipelago where baitfish supplies are most readily available. The fishery shows strong cyclical variation, with peaks every three or four years, a feature which seems to be linked to El Niño events (Lehodey 2001). Initially the domestic tuna fishery was primarily a pole-and-line fishery, but group seining was commenced in 1984 and later single-seining was undertaken using two government-owned vessels as well as vessels chartered from Australia, Taiwan and Japan. In the late 1990s the purse seine fishery was basically comprised of three domestic vessels which caught around 11,000 t per year. Operations are concentrated around the Main Group Archipelago. Other vessels have been licensed in recent years, but little information on their activities is available. US purse seine vessels also have access to a small part of the zone under the Multi-lateral Treaty, but in recent years the US fleet has fished to the east of the Solomon Islands zone. Since 1995 several joint-venture tuna long lining enterprises have operated from shore-bases in the Solomon Islands. The total catch of tunas in the Solomon Islands EEZ in 1999 was 73,493 t. The local industrial tuna fleet in that year consisted of 20 long liners, 5 purse seiners, and 30 pole/line boats. The catches by country in the Solomon zone in 1999 were:

Fishing Nation	**Fiji**	**FSM**	**Japan**	**Kiribati**	**Korea**	**PNG**	**Solomon**	**Taiwan**	**USA**	**TOTAL**
Metric tonne	1	49	4	85	909	18	69,092	2,228	1,107	73,493

(Units: metric tonnes, Source: SPC Catch and Effort Log sheet Database with adjustments)

Since 1999 the tuna fishing situation has deteriorated due to the social unrest. Catches in 2000 have been estimated to be less than half of the 1999 level.

B. Lesser important small-scale commercial fisheries near the urban centres:

About 90% of the Solomon Islands' population is living in rural areas, so subsistence and artisanal fishing activities are widespread and of great importance. These fisheries are concentrated on coastal and nearshore reefs and lagoons. The target resources are reef associated finfish, beche de mer, trochus, giant clam, lobster, and turbo. About 180 species of reef finfish, from 30 families, are caught by the small-scale rural fisheries. The catch is comprised, mostly, of Lutjanids (snappers), Serranids (groupers and rock cods), Lethrinids (emperors), Scombrids (mackerels) and Carangids (trevallies). The small-scale commercial fisheries are mainly located near the main urban area of Honiara, and to a much lesser extent, around the towns of Auki on Malaita Island and Gizo in the west. These fisheries are oriented to providing primarily finfish to wage-earning residents. The other common form of small-scale commercial fishing is that for non-perishable fishery products for export. The most important of these items are trochus shells, beche-de-mer, and shark fins. These commodities are an important source of cash for Solomon Islanders, especially in the isolated villages since the demise of the copra industry. With an average production of about 400 t per year of trochus, the Solomon Islands is the largest producer in the Pacific Islands region.'

Appendix 4. By-catch and discard in western Pacific tuna fisheries.

(Source: The Secretariat of the Pacific Community (SPC) – Oceanic Fisheries Programme reports - http://www.spc.int/oceanfish/Html/TEB/Bill&Bycatch/index.htm).

'The Western and Central Pacific Ocean (WCPO) currently supports the largest industrial tuna fishery in the world, with an estimated catch in 1992 of 1,089,607 mt in the SPC statistical area alone. Skipjack is the most important of the four major tuna species in the fishery, accounting for 67 per cent of the catch by weight in 1992, followed by yellowfin (24.5%), bigeye (5%) and albacore (3%). Purse seine gear was responsible for 80 per cent of the total catch, with pole-and-line gear accounting for 7 per cent, longline gear 12 per cent and troll gear 1 per cent. All of these fisheries invariably have some level of catch of non-target species (termed 'by-catch'). A portion of this by-catch is discarded because it has little or no economic value, and, if retained, would take up storage capacity best used for the more valuable tuna species. A portion of the target catch is also often discarded for economic reasons, or because it is damaged, physically too small for efficient processing, or lost because of gear failures during fishing operations.

Billfish and by-catch growth studies.

While we remain largely ignorant about the impacts of tuna fisheries on by-catch species and pelagic ecosystems, it is obvious that these impacts have increased very significantly over the last 50 years as tuna fisheries worldwide have expanded their catches and efforts by orders of magnitude. However, we have little or no information on the relative abundances or biomasses of many components of the pelagic ecosystem.

Observer programs, conducted by regional and national organizations, have developed over the last two to three decades. In general, these observer programs were created to monitor activities such as compliance with licensing agreements and restrictions on incidental catches. In addition to providing information required for meeting those objectives, observer programs provide essentially the only reliable, detailed information on catches discarded at sea. Based on such observer programs in the WCPO the main by-catch species of tuna fisheries are billfish, sharks, escolar, wahoo, mahi-mahi, rainbow runner, and opah.'

Appendix 5. Media Statement from Solomon Island Government Communications Unit on new policy banning dolphin export trade

GOVERNMENT COMMUNICATIONS UNIT

Department of the Prime Minister and Cabinet
P O Box G1
HONIARA, SOLOMON ISLANDS TEL: + (677) 25 369
DIRECTOR: + (677) 28153 FAX: + (677) 28 154
Mobile Tel: + (677) 95235
E-mail Address: alomae@solomon.com.sb

SOLOMON ISLANDS GOVERNMENT SLAPS BAN ON DOLPHIN EXPORT

The Government of Solomon Islands today announced a ban on dolphin export, saying its action is to ensure Solomon Islands maintains its good standing in the international community. The Minister for Fisheries and Marine Resources, Hon Paul Maenu and the Minister for Forests, Environment and Conservation, Hon David Holosivi jointly announced in Honiara today that the ban is immediate.

Hon Maenu and Hon Holosivi said the measure was taken to address concerns raised by members of the international community following export of dolphins from Solomon Islands last year. "As a responsible member of the international community, Solomon Islands has a duty to ensure concerns regarding its conduct are given due consideration. In this regard, we are pleased to announce that the Solomon Islands Government, through Cabinet has approved a new policy on further exports of dolphins from Solomon Islands," the Ministers said.

"Under this new policy which Cabinet approved yesterday, no dolphins would be exported from Solomon Islands".

Appropriate regulations to bring this policy into effect are being developed and would be implemented jointly by the Department of Fisheries and Marine Resources and the Department of Forestry, Environment and Conservation. The Ministers said the new policy initiative does not and will not affect the domestic use of dolphins inherent in Solomon Islands traditional practices.

-END-

Alfred Maesulia
Director
Government Communications Unit

***Please attribute all press releases to** Government Communications Unit,*
Department of the Prime Minister and Cabinet.
*For further information please contact telephones: (677) 25369, 28153 **Mobile**: 95235*

APPENDIX I. GPS Coordinates for Coral Reef Surveys

The two coral reef teams surveyed adjacent sites in the same general vicinity (see *Solomon Islands Marine Assessment* this report). The following is a summary of GPS coordinates for the Coral Reef Biodiversity and Reef Health team (Table A) and the Coral Reef Resources team (Table B).

Table A. Site names and GPS Coordinates (Decimal Degree format) for sites surveyed by the Coral Reef Biodiversity and Reef Health team (see *Coral Diversity, Coral Communities and Reef Health, and Coral Reef Fish Diversity* Chapters, this report).

ISLAND/ ISLAND GROUP	SITE NUMBER	SITE NAME	LATITUDE	LONGITUDE
Florida Islands	1	Sandfly FL	-9.03563	160.10538
Florida Islands	2	Kombuana	-8.84300	160.03378
Isabel	3	Buala	-8.14553	159.63475
Isabel	4	Tatamba	-8.41667	159.78333
Isabel	5	Tanabafe	-8.35168	159.44102
Isabel	6	Popongori	-8.20510	159.23058
Isabel	7	Sarao	-8.00617	158.91263
Isabel	8	Palunuhukura	-7.84648	158.72198
Isabel	9	Isabel	-7.56270	158.31747
Isabel	10	Kia	-7.55668	158.42577
Isabel	11	Barora Fa	-7.49885	158.39593
Isabel	12	Ghaghe	-7.41797	158.21097
Isabel	13	Pt Praslin	-7.39557	158.24097
Isabel	14	Malaghara	-7.39378	158.13192
Isabel	15	Malakobi	-7.35482	158.05443
Arnavon Islands	16	Kerehikapa 1	-7.46093	158.04323
Arnavon Islands	17	Kerehikapa 2	-7.47467	158.04790
Choiseul	18	Raverave	-7.54053	157.78977
Choiseul	19	Vealaviru	-7.42580	157.53825
Choiseul	20	Ndolola	-7.41437	157.41735
Choiseul	21	Poro	-7.35647	157.27855
Choiseul	22	Emerald	-6.69260	156.39090
Choiseul	23	Taro	-6.69473	156.40087
Choiseul	24	Chirovanga	-6.61540	156.56642
Choiseul	25	Vurango	-6.63830	156.57695
Shortland Islands	26	Haliuna	-6.92110	156.10438
Shortland Islands	27	Rohae	-7.00947	156.06863
Shortland Islands	28	Tua	-7.07117	155.89607
Shortland Islands	29	Stirling 1	-7.40790	155.54375
Shortland Islands	30	Stirling 2	-7.41133	155.54738
New Georgia	31	Vella Lavella	-7.73845	156.51415
New Georgia	32	Njari	-8.01360	156.75697
New Georgia	33	Nusazango	-8.31488	157.22275
New Georgia	34	Roviana	-8.39502	157.33248
New Georgia	35	Penguin	-8.64518	157.80345
New Georgia	36	Uepi	-8.42595	157.95213
New Georgia	37	Vangunu	-8.53748	158.02502
New Georgia	38	Minjanga	-8.70433	158.21452
New Georgia	39	Mbili	-8.66158	158.20388
Russell Islands	40	Mbaisen	-8.99313	159.09675
Russell Islands	41	Kovilok	-8.97085	159.12422

ISLAND/ ISLAND GROUP	SITE NUMBER	SITE NAME	LATITUDE	LONGITUDE
Russell Islands	42	Sunlight	-9.12080	159.15682
Russell Islands	43	Taina	-9.13338	159.13647
Guadalcanal	44	Cormorant	-9.83770	160.90382
Guadalcanal	45	Marapa	-9.81472	160.86343
Makira	46	Anuta	-10.35182	161.35832
Makira	47	Makira	-10.47495	161.51008
Makira	48	Star 1	-10.78293	162.27208
Makira	49	Star 2	-10.81508	162.27698
Three Sisters Islands	50	Malaupaina 1	-10.24743	161.95470
Three Sisters Islands	51	Malaupaina 2	-10.27158	161.97045
Makira	52	Bio	-10.18663	161.67692
Makira	53	Ugi	-10.28982	161.71963
Malaita	54	Komusupa	-9.40617	161.18963
Malaita	55	Umu	-9.48707	161.25217
Malaita	56	Pt Adams	-9.56397	161.55210
Malaita	57	Leili1	-8.75833	160.99167
Malaita	58	Leili 2	-8.77833	161.02500
Malaita	59	Toi	-8.32220	160.65962
Malaita	60	Suafa	-8.31333	160.67833
Indispensible Strait	61	Alite 1	-8.87910	160.61017
Indispensible Strait	62	Alite 2	-8.87333	160.61000
Nughu Island	63	Nughu	-9.28848	160.33718
Florida Islands	64	Tulaghi	-9.09773	160.19223
Savo Island	65	Savo	-9.11790	159.78538
Guadalcanal	66	Tambea	-9.25150	159.67660

Table B. Site names and GPS Coordinates (Decimal Degree format) for sites surveyed by the Coral Reef Resources team (see *Benthic Communities, Fisheries Resources: Food and Aquarium Fishes, and Fisheries Resources: Commercially Important Macroinvertebrates* Chapters, this report).

ISLAND/ ISLAND GROUP	SITE NUMBER	SITE NAME	EXPOSURE	LATITUDE	LONGITUDE
Florida Islands	1	Tulaghi Switzer	Sheltered	160.09846	-9.03581
Florida Islands	2	Kombuana	Exposed	160.03690	-8.84390
Isabel	3	Buala	Exposed	159.63600	-8.14680
Isabel	4	Tirahi	Sheltered	159.79450	-8.41150
Isabel	5	Tanabafe	Exposed	159.31162	-8.30549
Isabel	6	Babao	Sheltered	159.23120	-8.20660
Isabel	7	Sarao	Exposed	158.90890	-8.00170
Isabel	8	Palunuhukura	Sheltered	158.72190	-7.84620
Isabel	9	Matavaghi	Sheltered	158.31220	-7.55940
Isabel	10	Rapita	Sheltered	158.39990	-7.48190
Isabel	11	Kale	Exposed	158.31770	-7.43120
Isabel	12	Vakao	Sheltered	158.30240	-7.43580
Isabel	13	Sibau	Exposed	158.08740	-7.38780
Isabel	14	Malakobi	Sheltered	158.15110	-7.38520
Arnavon Islands	15	Tuma	Exposed	158.04310	-7.47300
Arnavon Islands	16	Kerehikapa	Sheltered	158.04180	-7.46040
Choiseul	17	Raverave	Exposed	157.78600	-7.54680
Choiseul	18	Ondolou	Sheltered	157.72790	-7.51940

ISLAND/ ISLAND GROUP	SITE NUMBER	SITE NAME	EXPOSURE	LATITUDE	LONGITUDE
Choiseul	19	Boe Boe	Sheltered	157.39740	-7.41200
Choiseul	20	Poro	Exposed	157.09210	-7.35910
Choiseul	21	Taro	Exposed	156.39210	-6.72260
Choiseul	22	Putuputurau	Sheltered	156.40440	-6.70180
Choiseul	23	Sirovanga	Exposed	156.56510	-6.61460
Choiseul	24	Vurango	Sheltered	156.57670	-6.60140
Shortland Islands	25	Rohae 1	Exposed	156.07350	-7.00030
Shortland Islands	26	Rohae 2	Sheltered	156.05440	-7.00030
Shortland Islands	27	Onua	Exposed	155.89960	-7.08630
Shortland Islands	28	Faisa	Sheltered	155.87070	-7.06240
Vella Lavella	29	Vella Lavella	Exposed	156.51030	-7.72660
Gizo	30	Njari	Exposed	156.76020	-8.01420
New Georgia	31	Munda	Sheltered	157.22900	-8.33780
New Georgia	32	Haipe	Exposed	157.26990	-8.43620
Marovo	33	Veru	Exposed	157.79790	-8.64134
Marovo	34	Landoro	Exposed	157.92935	-8.42073
Marovo	35	Lumalihe	Sheltered	158.06020	-8.47210
Marovo	36	Toatelave	Exposed	158.19750	-8.65020
Marovo	37	Mbili	Sheltered	158.19230	-8.67300
Russell Islands	38	Lisamata	Exposed	159.14690	-8.96590
Russell Islands	39	Mbutata	Sheltered	159.11760	-8.99480
Russell Islands	40	Alokan	Exposed	159.10320	-9.14240
Russell Islands	41	Mbanika	Sheltered	159.15480	-9.12290
Guadalcanal	42	Honoa	Exposed	160.88940	-9.81720
Guadalcanal	43	Wainipareo	Sheltered	160.86100	-9.81090
Makira	44	Haurmanu	Exposed	161.38000	-10.34800
Makira	45	Marautewa	Sheltered	161.50840	-10.47600
Makira	46	Naone	Exposed	162.28360	-10.80600
Makira	47	Na Mugha	Sheltered	162.28030	-10.81600
Three Sisters Islands	48	Malaupaina 1	Exposed	161.95210	-10.23200
Three Sisters Islands	49	Malaupaina 2	Sheltered	161.97070	-10.27000
Uki Ni Masi Island	50	Pio	Exposed	161.67720	-10.18900
Uki Ni Masi Island	51	Pawa	Sheltered	161.71523	-10.26279
Malaita	52	Airasi	Sheltered	161.18970	-9.39650
Malaita	53	Maroria	Exposed	161.22758	-9.45748
Malaita	54	Arai	Sheltered	161.33330	-9.33650
Malaita	55	Anuta	Exposed	161.30150	-9.32360
Malaita	56	Leli 1	Exposed	161.01730	-8.77320
Malaita	57	Leli 2	Sheltered	161.02050	-8.75630
Malaita	58	Suafa 1	Exposed	160.66650	-8.31740
Malaita	59	Suafa 2	Sheltered	160.69500	-8.33610
Malaita	60	Falaubulu 1	Exposed	160.72660	-8.84080
Malaita	61	Falaubulu 2	Sheltered	160.73060	-8.84030
Florida Islands	62	Nughi	Exposed	160.34630	-9.28280
Florida Islands	63	Ghavutu	Sheltered	160.18890	-9.10820
Savo Island	64	Savo	Exposed	159.78300	-9.13290
Guadalcanal	65	Tambea	Exposed	159.65650	-9.26300
Guadalcanal	66	Bonegi	Exposed	159.88070	-9.39370