MARINE RESOURCE PROFILES: SOLOMON ISLANDS

by

Timothy Skewes

FFA REPORT 90/61

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PREFACE

This report was produced in response to a request to the South Pacific Forum Fisheries Agency (FFA) from the Solomon Islands, Fisheries Division, Ministry of Natural Resources. The author spent two weeks during May 1990 working with Solomon Islands Fisheries Division staff compiling the report.

Rather than attempting to provide definitive information of a technical nature on the biology and levels of exploitation for all marine resources for the country, this report attempts to provide general information for individuals or groups interested in a broad cross section of the marine fauna and seaweed of Solomon Islands from a fishery perspective. Information on each of the resources is therefore presented in a brief, simple form which should be easily understood without requiring a strong technical background.

Special thanks are due to Mr John Legata for his assistance in compiling this report. However, the normal disclaimer applies. The author assumes full responsibility for the contents of this report. Opinions, where expressed, are his alone and in no way reflect the policy of Solomon Islands Fisheries Division, FFA or the Commonwealth Scientific and Industrial Research Organisation, Australia.

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SUMMARY

Little reliable quantative stock assessment work has been carried out to date on the coastal marine resources of Solomon Islands. There has been virtually no work at all on the main non-finfish marine species exported which, since the late 1980's, have become increasingly valuable. Ranked in order by export value, these commodities include trochus, beche-de-mer, hawksbill turtle shell, blacklip and goldlip pearl oyster, green snail, other marine shells, saltwater crocodile skin and shark fin.

Of the main exported non-finfish marine resources, trochus, beche-de-mer, hawksbill turtle shell, green snail and crocodile are probably fully if not over exploited at the present time. Currently there are no quotas on the level of catch for any resource other than tuna.

The unit price of most of the non-finfish resources have risen significantly above the rate of domestic inflation in recent years. Against the backdrop of falling cocoa and copra prices, the non-finfish marine export commodities

have experienced a significant drop in their total export volumes since 1986 while the value of their total earnings has increased above the rate of domestic inflation. If current high rates of exploitation continue, the ability of the resources to sustain continued high rates of exploitation will be threatened unless real attempts are made to rationally manage the fisheries for the various resources.

A considerable amount of information exists in the files of the main marine product trading companies that could be utilised for a broad variety of fisheries monitoring purposes. If this information is then supported with a few key stock assessment surveys, a reasonable platform for effective management could be developed and implemented.
A first step in this direction would be to establish a programme to monitor the button blank factories currently operating in Solomon Islands.

Consideration should also be given to formulating and implementing legislation that would allow for the rational management of marine resource exploitation. Specific recommendations relating to this are presented in this document.

1. **BACKGROUND**

1.1 The Country

Solomon Islands consists of many islands extending over 1,400 kilometers of ocean in the western equatorial Pacific between 5 and 13 degrees south and 155 and 158 degrees east. It has an estimated total land area of 29,000 square kilometers, a 12 mile territorial sea and approximately 1.3 million square kilometers of ocean within its 200 mile exclusive economic zone. The total coastline has been estimated to be 4,023 kilometers long. The islands have little or no continental shelf area but support some of the world's largest lagoons and extensive fringing and barrier coral reefs.

1.2 The People

In 1990 the islands supported a population of approximately 300,000 people. The population is currently increasing at one of the highest rates in the world (4.8 percent). It has limited available arable land. Fish and other marine products have traditionally provided the major source of protein.

1.3 Marine Resources

Since the early 1800s, occasional and sometimes large consignments of beche-de-mer, turtle shell, pearlshell, trochus and green snail have been shipped out of the Solomons by traders. Prior to the early 1970's, fishing involved mainly traditional techniques to catch marine resources to satisfy local food needs. While this is still of great importance, fishing for cash income now also occurs, often in tandem with subsistence fishing. Non-tuna resources (ie. reef and coastal resources) are primarily gathered by small-scale artisanal fishermen. Village-level fishing operations range from one man in a canoe to organised fishing groups using fibreglass canoes fishing distant reefs (Cook, 1988).

The reliance of Solomon Islands people on marine resources is reflected by one of the highest per capita seafood consumption rates in the world. A survey conducted by the National Statistics Office in 1983 indicated an average per capita fish consumption of 25.7 kg/year. A subsequent survey in 1988 (unpublished) indicated total seafood consumption of 34.4kg/person/year, comprising 22.4 kg of marine fish and 12kg of shellfish. Shellfish consumption appeared to be concentrated in the Western Provinces. Using these figures, the national total subsistence catch is probably of the order of 10,000 tonnes/year in 1990. Other survey results showed that the number of households selling fish in 1988 averaged 24 percent from a high of 36 percent in Temotu to a low of 10 percent in Guadalcanal (Cook, 1988).

In 1971 marine products contributed only about 14 percent of the Solomon Islands foreign exchange earnings, whereas in 1988 and 1989 they provided about 50 percent to the country's foreign exchange earnings (SI$70.8 million in 1989 equivalent to US$30 million).

An industrialised tuna fishery, taking approx 50,000t annually in the late 1980's, accounts for the bulk of this figure. However, reef fisheries are becoming increasingly important as a source of income at the village level. Part of the reason for this has been the large increase in the unit value of exports of non-tuna fisheries products. While the consumer price index (CPI) rose 223 percent during the 1980's [Jan 1980-Dec 1989] marine shell export prices rose by 1700 over the same period [from SI$0.862/kg in the first quarter of 1980 to SI$15.516/kg in the last quarter of 1989]. Much of this increase in unit export price has taken place over the last three years. Thus, from 1987-1989 with an average Solomon Islands annual inflation rate of 14.0 percent, fisheries products have increased on average by 50 percent per year with trochus shell (63 percent/yr), green snail (140 percent/yr), turtle shell (54 percent/yr), and crocodile skins (125 percent/yr) showing the greatest price rises. Overall beche-de-mer has shown the lowest increase with only a 9 percent gain since 1981, meaning an actual decrease in price of 50 percent when inflation is taken into account.

With the increase in the value of these reef resources they have been subject to increased fishing pressure. Improved monitoring and in some cases, management will be required to ensure that they are not overexploited.

1.4 Reef Tenure

Interlocked with any consideration of the reef resource is the concept of marine tenure. This is a complex and dynamic system whereby a kinship-based group exerts control over certain areas of reef or its associated resources. It is an important part of the culture Solomon Islands.

Changing reef use practices has altered the emphasis, and maybe even strengthened, the control a group has over their traditional marine area. This is especially so in regard to commercial exploitation of the inshore reef areas. Any commercial fishing venture, whether it involves indigenous or foreign capital and personnel, has to deal with many groups with varying controls/demands over local marine resources. Fisheries managers have to be attuned to local wishes in regard to fisheries management and a real challenge exists to integrate traditional values with contemporary aspirations concerning fisheries development.

Reef owners, be they individuals or large communities, have a strong interest in conserving the resources of their reefs. This can lead to conflict with those not from the ownership group wishing to utilize any resources for commercial gain. The system of reef ownership does not coincide with western ideas of land title. It must be stressed that this is a complex (perhaps more so to non-Solomon Islanders) phenomenon that needs careful consideration by any potential commercial fisheries venture.

Some religions may also have a fisheries dimension. Those communities that are members of the Seventh Day Adventist (SDA) church usually do not, by dint of that church's doctrine, consume, nor in some cases fish, marine animals without scales. Often reefs under the care of these communities have abundant resources such as shellfish, lobster and beche-de-mer that are depleted in neighbouring areas due solely to fishing pressure.

2. **THE FISHERIES**

2.1 BECHE-DE-MER

2.1.1 The Resource

Species Present: There are about 1200 species of holothurians, (beche-de-mer, trepang, sea cucumber) distributed world-wide. About a dozen are fished for human consumption (Conand, 1988). McElroy (1973) tentatively identified 15 species in the shallow waters of Ontong Java lagoon in northern Solomon Islands.

The species preferred by the market are those with a good shape, large size and thick body wall. Commonly fished species are the teat fish (Holothuria nobilis), the blackfish (Actinopyga miliaris) with smaller numbers of the prickly redfish (Thelenota ananus) and surf redfish (Actinopyga mauritiana). Other species of lower commercial value are fished on occasion.

Distribution: Holothurians are found throughout the South Pacific region. Within Solomon Islands commercial species of beche-de-mer appear to be particularly abundant in Ontong Java atoll. Other reef and lagoon areas in the Solomon Islands, especially those that have little or no terrigenous influence, usually also have commercial quantities of beche-de-mer.

Crean (1977) noted differing habitat preferences between two commercially important species at Ontong Java with H. nobilis preferring deeper water, (greater than 20m), and A. miliaris preferring shallower water.

Life History: Parameters such as growth, mortality and recruitment are at best poorly understood. Growth is particularly difficult to study in these soft bodied creatures.

A study of most commercial species in New Caledonia (Conand, 1988) showed that the sexes were separate and spawning was seasonal with H. nobilis spawning in the cooler months. The size at which 50 percent of this species reached sexual maturity was approximately 600g. However, in other species the size at sexual maturity varies quite markedly.

2.1.2 The Fishery

Utilization: Beche-de-mer is collected by small-scale artisanal fishermen who usually also process the catch. It is then exported via one of the many traders in Honiara, Gizo, Munda and Auki.

Ontong Javan fishermen are probably the largest producers of beche-de-mer in the Solomon Islands and were first taught how to catch and process the animal just before World War 2 by Japanese fishermen. It provides a major portion of this community's cash income. Traditionally they use sail-powered outrigger canoes to reach the fishing areas although increasing numbers of fibreglass canoes with outboard motors are being used. The animals are mostly collected using weighted spears on lines in deep water. In shallow water areas they are collected by walking out on the reef or by free-diving. Processing bases are often set up on uninhabited islands, with 200 to 300 fishermen active in collecting holothurians for processing (Crean, 1977).

Processing of beche-de-mer is done by a conceptually simple but exacting method consisting of gutting, boiling and drying. The final product has an average weight of seven percent of the live weight (Crean, 1977). The product is usually packed in copra sacks and sold to traders or shipped to the capital, Honiara. If processed properly it has a long storage life and the product may be safely stockpiled before being sold.

Marketing: The Chinese have utilised beche-de-mer as a food for thousands of years. It is now considered a delicacy by the Chinese community throughout the world. Most of the world trade passes through Hong Kong, Taiwan, Singapore and Malaysia. The lower value product is normally re-exported to China. Small quantities have in the past been exported to the USA and Australia.

Production: Exports of beche-de-mer, by volume and value, for the period 1981-1989 are shown in Fig. 1a. Beche-de-mer is second only to trochus in value of non finfish exports from the Solomon Islands (Table 1). The

fishery at Ontong Java, in the even years that fishing occurs (see Section 2.1.4), probably accounted for the major portion of the export figures, at least up to 1986. Since 1986, production from other areas has probably been more important in volume terms. However, in terms of the total value of the output, Ontong Java possibly remains the major producer.

While the average unit value of beche-de-mer simply kept pace with inflation in the last few years [probably in part because an increasing proportion of the rising production is of lower value species], falling real copra prices, which in areas such as Ontong Java provide one of only two other sources of income [the other being trochus], have probably driven the upsurge in interest in beche-de-mer fishing. Total exports have risen from 7.3 mt in 1982 to 147 mt in 1988.

2.1.3 Status of the Stocks

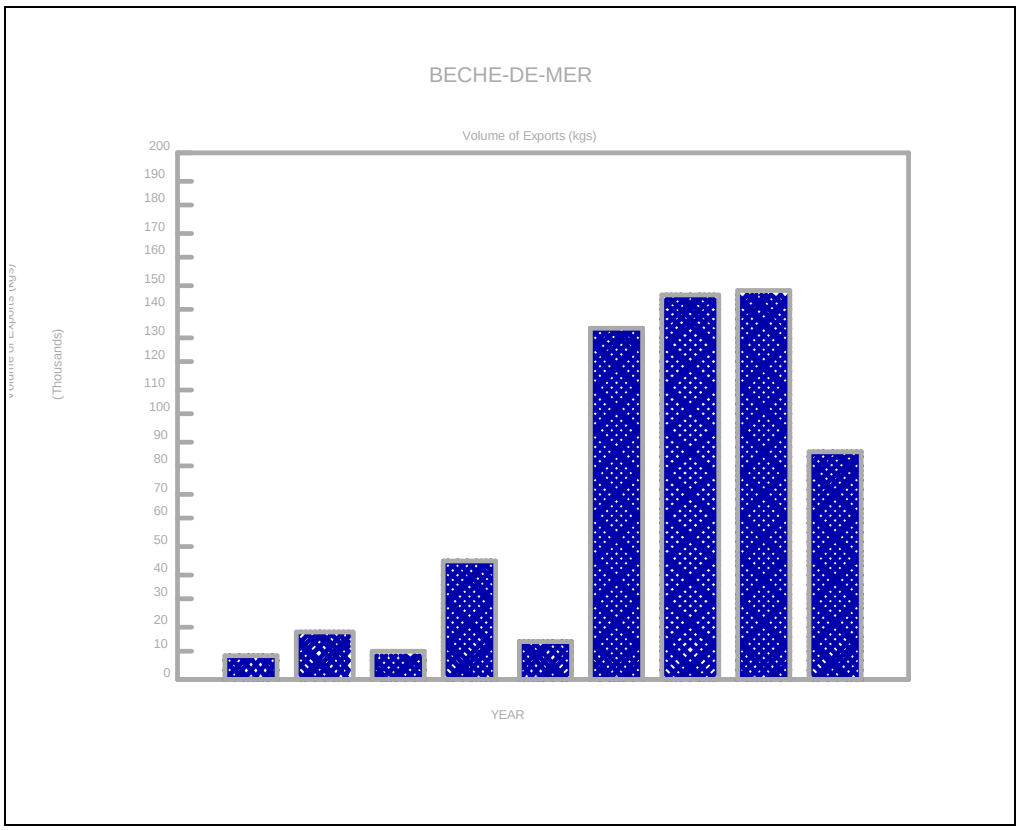
The size of the stock in Solomon Islands has not been assessed. Crean (1977) calculated a catch per unit effort of 11.1 beche-de-mer individuals per hour of fishing in Ontong Java. A visit by an anthropologist in 1986 found catch rates had dropped to 3.5/hour, although it is not known if any seasonal or other factors contributed to this result.

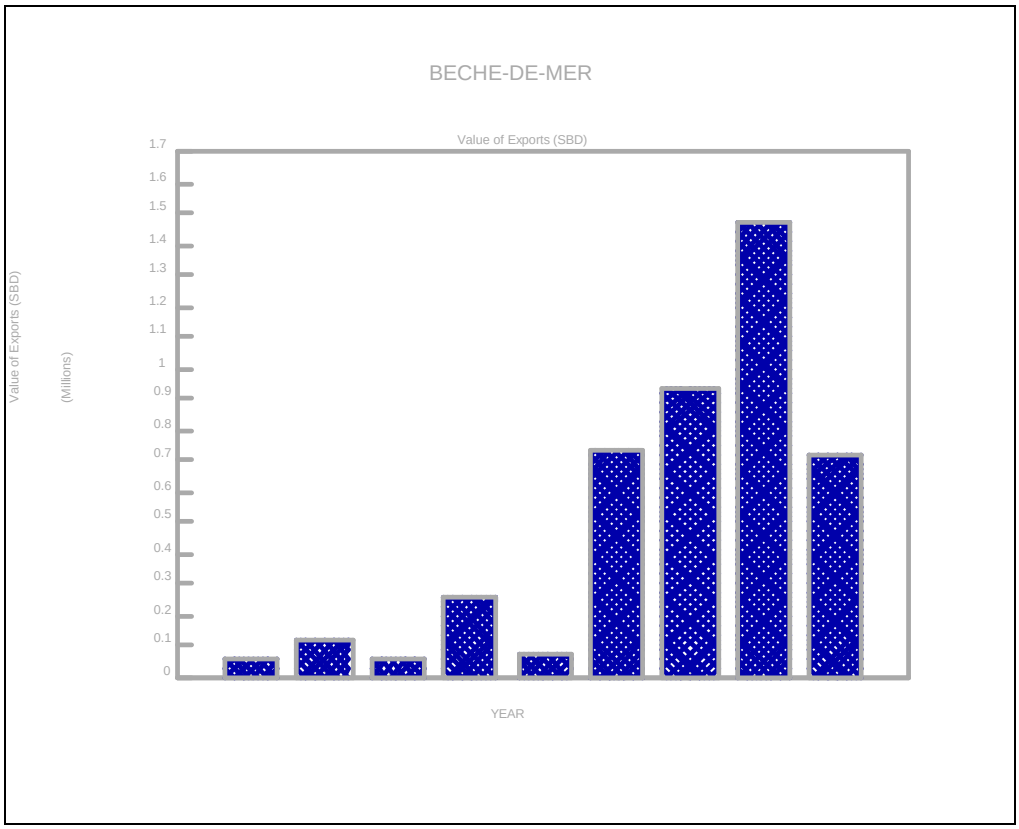
The downturn in both the average unit value and the catch rates from Ontong Java indicate at least localised depletion of the resource. Indeed, the community was so concerned that self-imposed fishing restrictions were put into place. Traders in Honiara report an increasing proportion of the catch is comprised of lower value species. It is also reported that both the average size of the preferred species, H. nobilis, and the proportion that it makes up in the catch has dropped. It would appear that the higher value beche-de-mer population in Ontong Java, at least is experiencing strong fishing pressure.

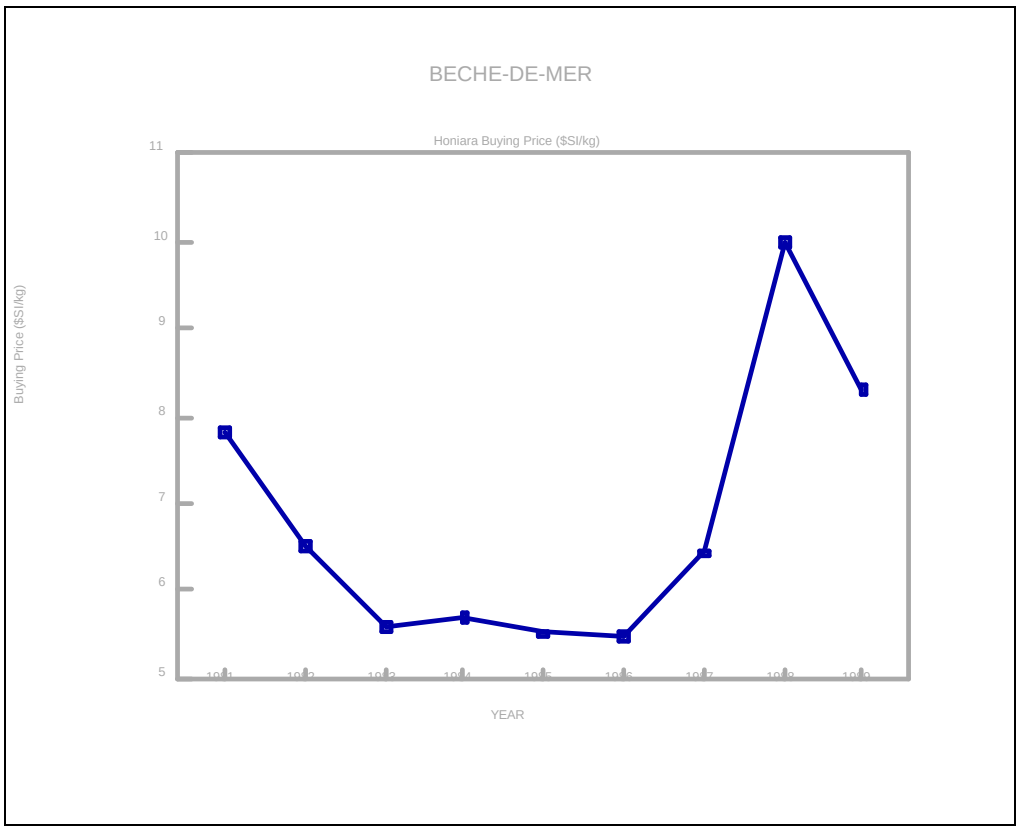
2.1.4 Management

Current Legislation/Policy: There is no national legislation concerning the exploitation of beche-de-mer. At Ontong Java, there is a self imposed ban on fishing for beche-de-mer every second even year. Because of the social structure of the community (essentially controlled by village chiefs), adherence is strict.

Recommended Legislation/Policy: Lack of scientific data on the population dynamics of these animals and the nature of their fishery makes management difficult. Baseline data on catch rates, species and size composition and total fishing effort needs to be gathered in areas of high exploitation such as Ontong Java, Temotu, Malaita and Western Provinces. Basic data such as species composition and average sizes should be gathered for other areas and the information gathered routinely by traders and exporters should be collated and analysed.




BECHE-DE-MER
Value of Exports (SBD)
Value of Exports (SBD)
(Millions)
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
YEAR


BECHE-DE-MER
Honiara Buying Price ($SI/kg)
Buying Price ($SI/kg)
11
10
9
8
7
6
5
YEAR

2.2 GIANT CLAMS

2.2.1 The Resource

Species present: Six of the seven living species of giant clam are found in Solomon Islands. These are Tridacna gigas, T. derasa, T. squamosa, T. maxima, T. crocea, and Hippopus hippopus (Govan et.al, 1988). The larger species, predominately T. gigas, are harvested and are sold locally.

Distribution: Giant clams are restricted to the Indo-Pacific region. The distributions of the smaller species are wide, generally throughout this area, but the geographical range of the larger species has been reduced, either by exploitation or a change in ecological factors.

The clam stocks of Solomon Islands were surveyed in 1988. T. gigas, T. maxima, T. squamosa, and T. crocea were all found to be widespread, whereas T. derasa and H. hippopus have a more restricted distribution (Govan et.al, 1988).

The species have different habitat requirements but all are restricted to shallow, clean water environments, usually not deeper than 15m.

Life History: The family Tridacnidae include the largest bivalve mollusc ever to exist. Their principal feature is that their mantle flesh harbours enormous numbers of symbiotic algae called zooxanthellae, which the clams "farm" utilising the by-products of photsynthesis by the zooxanthellae as food. The zooxanthellae require sunlight to grow and are thus the reason for the preferred shallow water habitat of giant clams.

Growth of giant clams is variable but may be quite rapid, (up to 10 cm a year for T. gigas). They are hermaphrodites, releasing both sperm and eggs in very large numbers one after the other. Self fertilization is usually not the norm. It has been noted that stock densities play a large part in determining reproductive success but minimum stock density for successful spawning is not known (Adams, 1988).

Low natural mortality rates have been observed especially for the larger clams. Recovery of over exploited populations is slow indicating low recruitment rates (Govan et.al, 1988).

2.2.2 The Fishery

Utilization: Apart from the kidney, the entire clam is edible but commercial exploitation of the clam has been almost entirely restricted to the adductor muscle. The mantle may be utilised for chowder and there is a demand for the shell, but that is not usually utilized because its weight makes transportation difficult. In most cases, local fishermen cut the meat from the shell in situ using a sharp chisel or knife.

Except in SDA communities, clams are a widely eaten and often highly esteemed food throughout Solomon Islands. Coastal villagers will sometimes collect clams and keep them in concentrated "clam gardens" in shallow water close to the village for later use. This is a common practice even in areas where clam meat is not normally eaten (Govan et.al, 1988). Tridacnid shells are carved for ornamental jewellery and traditional artifacts and are utilised for various utensils, including stock feeding troughs, throughout Solomon Islands.

The sale of clam meat does occur within Solomon Islands. Besides this domestic use, clams have been known to be fished commercially on at least five occasions, three of them illegally. Whereas subsistence harvesting of the clams

is usually not intensive, commercial operations will take a high proportion of the clams in an area, probably of the order of 70 percent or more (Adams, 1988).

There is evidence to suggest that poaching is not uncommon, especially in the outlying reefs where detection of illegal fishing vessels is difficult. The last legal commercial exploitation of clams occurred in 1983 and the last successful apprehension of an illegal clam fishing vessel was in 1987.

Market: Besides local demand from restaurants and hotels in the major population centres such as Honiara, frozen adductor muscle is in great demand in Taiwan, to a lesser extent other Asian countries, and in Japan [Okinawa]. High prices are paid, especially for large muscles giving adequate incentive for Taiwanese fishermen to risk prosecution by illegally fishing for giant clams throughout the Australasian and South Pacific region. Dried adductor muscle is in demand in Japan, Hong Kong and Singapore. This clam product will face increasing competition from cultured scallop muscle products.

Production: The volume of consumption at the subsistence level is unknown. Small quantities, probably of the order of 1 tonne/year, (Munro, 1988), are sold on the local market, with very small amounts (under 100 kgs) exported. Occasional large consignments have been exported in the past from legal fishing operations and apprehended illegal fishing vessels. The latest legal commercial fishing was at Marovo lagoon in 1983 when a Taiwanese fishing vessel was licenced to fish 1318 clams, principally for adductor muscle. Three Tawanese clam fishing vessels have been apprehended while fishing illegally in the 1980s, the last in 1987, held over 1 tonne of adductor muscle, most of which probably originated in Solomon Island waters.

2.2.3 Status of the Stocks

Although the stocks of the larger species are depleted throughout the Pacific, Solomon Islands is one of the few counties in the region with relatively good stocks of giant clams. Depletion is due in part to local fishing pressure and in part to the activities of poachers from Taiwan. Areas that have suffered commercial scale fishing in the past, such as Marovo lagoon, are still severely depleted after many years with low levels of fishing activity (Govan et.al, 1988). However, in some areas of the Morovo Lagoon relatively small shells are now harvested by locals to sell to tourists. Elsewhere in the South Pacific there have been local extinctions if T. gigas due to overfishing. However, there is currently no evidence of this in Solomon Islands.

2.2.4 Management

Current Legislation/Policy: There is no national legislation concerned with giant clams. Current policy is that no commercial-scale fishing operations, especially foreign, are permitted on giant clams in Solomon Islands. To be legal, all commercial fishing requires a licence issued by Fisheries Division.

Recommended Legislation/Policy: Regulation of the subsistence and small-scale, artisanal, nearshore fishery would be impossible. Fortunately reef owners in some areas have a good conservation ethic, especially in relation to giant clams. It is anticipated that giant clam mariculture pioneering work which is currently occurring in Solomon Islands, will eventually relieve the pressure on wild giant clam stocks. Furthermore, sufficient quantities of spat should be released by the hatchery and by sexually mature clams in the grow out schemes to ensure reef reseeding.

Domestic demand for clam products is no cause for concern as it is not large. However, with high prices being paid for clam meat overseas, there is potential for large increases in exports. The export of wild-caught giant clam meat therefore should be subject to a national quota.

2.3 LOBSTER

2.3.1 The Resource

Species present: Several Panulirid lobster species inhabit Solomon Islands waters but it is principally the double spined rock lobster, (Panulirus penicillatus) that is harvested. P. versicolor and P. femoristiga are also caught in

limited amounts. It is notable that the ornate rock lobster, P. ornatus is not common in Solomon Islands despite its general distribution from southern Papua New Guinea to New Caledonia.

Distribution: P. penicillatus has the widest distribution of any spiny lobster and is found in all countries in the South Pacific area. It is found in several extensive areas of the Solomon Islands, notably the weather coasts of Makira, Guadalcanal and the Western Province (Prescott, 1980).

It is a shallow water species usually living in depths less than 10 meters. At night, lobsters, especially the larger females, move up surge channels at the reef edge to forage for food on the reef face, crests and reef flat. Where there is sufficient water movement, this species is also common on the leeward side of barrier reefs and in reef passages (Prescott,1988).

Life History: Growth of P. penicillatus is faster than cold water spiny lobsters with both males and females fully recruited to the fishery by three years of age. Maximum size for males and females in the Solomon Islands has been estimated to be 14.4 cm and 11.3 cm carapace length respectively. Estimated size at sexual maturity for females was between 7.5 and 7.9 cm carapace length. Spawning appears to be continuous with up to ten spawnings per year. Fecundity increases with size in a linear relationship (Prescott 1988).

2.3.2 The Fishery

Utilisation: There are few, if any, large-scale fisheries for P. penicillatus in the world. Factors such as rough weather, the cryptic nature of the lobster during the bright phases of the moon, and the restricted nature of the resource curtail large commercial operations. In Solomon Islands a few short-lived lobster fishing operations occurred prior to 1973. They were mainly based on a refrigerated fishing vessel calling at villages on a regular basis picking up live lobster kept in sea cages by villagers. Factors that mitigated against such operations included mechanical breakdowns and highly variable lobster catches by village fishermen. Since that time the fishery has been subsistence and small-scale artisanal in nature only.

P. penicillatus in the Solomons are mostly caught when they move into shallow water at night. Fishermen use a torch or lantern and catch the lobster by hand or spear while walking on the reef top or shallow diving. On Makira, traditional fishing practices for lobster involve using chitons as bait. The two other species of lobster are usually speared during shallow diving. Lobster caught live are often kept in cages until they can be transported to a suitable market. A study in the mid-1970's investigated the best methods for storing and transporting live crayfish to enable village fishermen to sell crayfish on the local market without the need for refrigeration. It suggested a design for the holding cage and a method of transport involving layering live lobster in wet copra sacks (Prescott, 1980).

Marketing: Despite considerable interest in exporting crayfish products to lucrative overseas markets, the catch is currently subsistence and domestic market orientated [including restaurants and hotels], the later tending to be undersupplied.

Production: Because of the nature of the fishery, the annual catch is not known. Lobster sold through government-financed fish stations was about 1200 kg whole weight in 1987. It has been estimated that the total catch in the Solomons is of the order of 2 tonnes annually (A. Wata, pers. comm.**)**

A report on the commercial lobster fishing venture by Coral Sea Fishing Co. in 1972 quoted 2000 to 2500 lb of whole lobster as a "reasonable monthly catch" (McElroy, 1973).

2.3.3 Status of the Stocks

There is a paucity of data relevant to an assessment of the development potential of this fishery. A survey conducted by the SPC during the seventies shed some light on the life history, logistics and economics of P. penicillatus in Solomon Islands (Prescott, 1980; Prescott, 1988). While it did not give estimates of abundance, it concluded that the crayfish resource was exploitable but small, and that a small fishery could provide a reasonable cash income to many parts of the Solomons if access to urban markets was facilitated.

Other points were:

- there may be little requirement for management to conserve the stocks as mean size at maturity is below the size at recruitment;

- local extinctions are unlikely to occur because recruits are supplied by distant population; and

- yield per recruit analysis indicated that minimum size restrictions would actually reduce yield per recruit.

2.3.4 Management

Current Legislation/Policy: It is not permitted to catch and retain, sell or expose for sale, buy or export crayfish of the genus Panulirus with a total length less than 25cm.

Recommended Legislation/Policy: There is little data on which to formulate policy. It is doubtful that the fishery could support any significant export trade so none should be encouraged. A total allowable catch could be formulated with extra research but the subsistence fishery is by its nature hard to manage. Length frequency data should be gathered to check that size of recruitment to the fishery is still greater than size at first sexual maturity. This may also allow the size limit to be modified as it seems too high. The size at first sexual maturity calculated by Prescott (1988) would equate to an animal approximately 17 cm in total length (this relationship should be checked). Pyne (1974) while working on lobster in Papua New Guinea found a similar result for the other two species that occur in the Solomon Islands although the sample for P femoristriga was very small. Sexually mature but undersized lobsters of the latter species are found in the local market (P Nichols pers. comm.). It may be that separate size limits need to be implemented but this should be avoided if possible.

The minimum legal size should be converted to a carapace length and/or tail width measurement to avoid confusion.

2.4 PEARL OYSTER

2.4.1 The Resource

Species present: Three commercially important species of pearl oyster are taken in Solomon Islands; the blacklip pearl oyster (Pinctada margaritifera), the goldlip pearl oyster (Pinctada maxima), and the brownlip pearl oyster (Pteria penguin).

Distribution: All three species are found throughout the South Pacific, with goldlip having the most restricted distribution. It is not found in commercial quantities east of Solomon Islands.

Goldlip is found down to a depth of 80m with maximum abundance between 10 and 60 m depth. Blacklip is found down to around 40m but is naturally abundant just below the low-water mark (Sims, 1988). Pteria penguin is abundant in deep lagoons such as Marovo Lagoon and is often associated with black coral.

Life History: Initial growth of pearl oysters is rapid with blacklip reaching a shell diameter of 10 to 12 cm in two years. Maximum sizes have been calculated for blacklip and goldlip as being from 14 to 17 cm and from 20 to 25 cm diameter respectively.

These molluscs are usually hermaphrodites with full maturity generally reached in the second year but with an uneven sex ratio until the fourth or fifth year. There are greater numbers of males up until that time. Spawning is often not limited to distinct seasons and a planktonic larval stage occurs lasting two to four weeks prior to settlement (Sims, 1988).

2.4.2 The Fishery

Utilization: Pearl oysters have probably been collected in small quantities by free-divers for centuries and this small-scale, largely subsistence fishery, continues today, especially in regard to blacklip and brownlip pearl oyster

shell. Batty and Kile (1990) identified three phases of commercial exploitation in Solomon Islands, mainly of goldlip pearl oyster shell, since 1916;

(1) from 1916-1922, by Japanese divers at East Choiseul, production unknown.

(2) from 1966-1970 by the Solomon Island Mother Of Pearl Company mainly in the Wagina area. Production was estimated at around 18 tons per year.

(3) since 1987 by groups of Gilbertese divers based at Wagina and others near the Rob Roy Passage.

Most mother of pearl (MOP) shell exported from the Solomon Islands is used for the manufacture of buttons and other clothing and jewellery items. Since August 1990, one button blank factory has commenced production in Honiara and another is planned for the Gizo area.

Marketing: Prior to 1990, MOP shell was sold through several local traders, almost exclusively for export, and mainly to Japan. Much of the shell is unsuitable for export and wastage as high as 60 percent has been reported. Although a valuable export commodity in its own right, the exploitation of pearl oyster for MOP shell gives only a fraction of the return that could be obtained from pearl culture (Batty and Kile 1990). The meat can also be marketed to Chinese communities in Singapore, Hong Kong and Japan [Okinawa].

The world demand for MOP shell has strengthened in the last three years and is reflected in the substantial increase in the price for MOP (Fig 2b, 2e and 2h). Although recent world demand for blacklip and goldlip MOP shell remains strong, it has abated somewhat for brownlip.

Production: Export figures (Fig 2a, 2d and 2g) tend to underestimate the catch because of wastage. While the catch of blacklip would appear quite stable, exports of goldlip have increased considerably. This is probably due to the introduction of underwater breathing apparatus (hookah) by one Solomon Island Company, Sun King Enterprises.

2.4.3 Status of the Stocks

Recently, two resource surveys, principally for goldlip, were carried out in the Isabel Province to determine the possibility of pearl culture activities there. The second survey, concluded in April, 1990, used a visual census method of stock assessment in Kia Passage. It estimated an abundance in the Kia area of 28 goldlip pearl oyster shell per hectare. Very high densities (600/ha) were recorded in some areas and the goldlip population in these areas probably exceeded 10,000 shell, though this is probably an underestimate. Unfortunately, shell suitable for culture (chicken shell) made up only 13 percent of the pearl oyster sighted.

The report concludes that the Kia area alone could not supply the quantities needed for even a small pearl culture operation. It added that these quantities could be supplemented by blacklip, which also occur in the area and from goldlip elsewhere. Certainly, methods exist for the culture of blacklip from spat collectors elsewhere in the Pacific region and this may be the solution to the shortage of wild stocks for culture of goldlip also.

The report recommended further surveys west of Kia to look for shell and called for an assessment of the pearl oyster fishery at Wagina as a matter of urgency.

2.4.4 Management

Current Legislation/Policy: There is no national legislation relating to the pearl oyster shell fishery. The current policy is to restrict foreign investment in pearl oyster culture projects until more extensive stock assessment survey work has been completed.

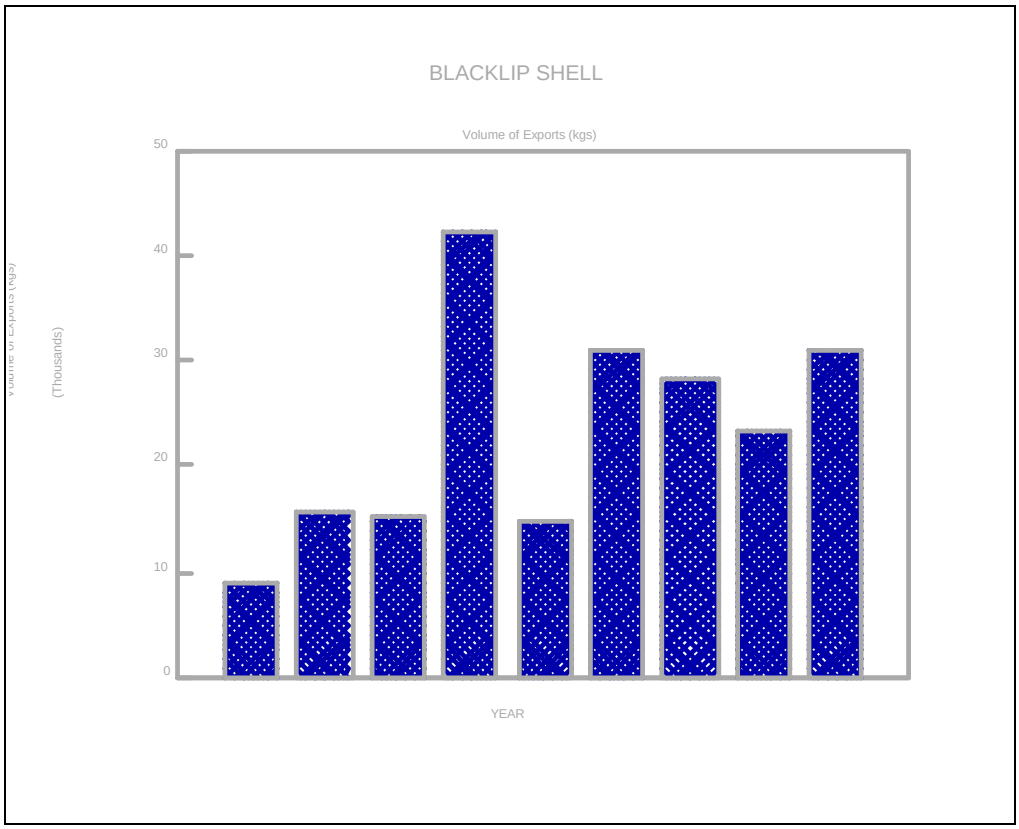
Recommended Legislation/Policy: It would seem that blacklip pearl oyster shell, because of its restricted habitat and high production, is under the most fishing pressure. It is more vulnerable to artisanal freedivers than the deeper varieties. Urgent assessment is needed of this fishery. A national annual export quota should be considered.

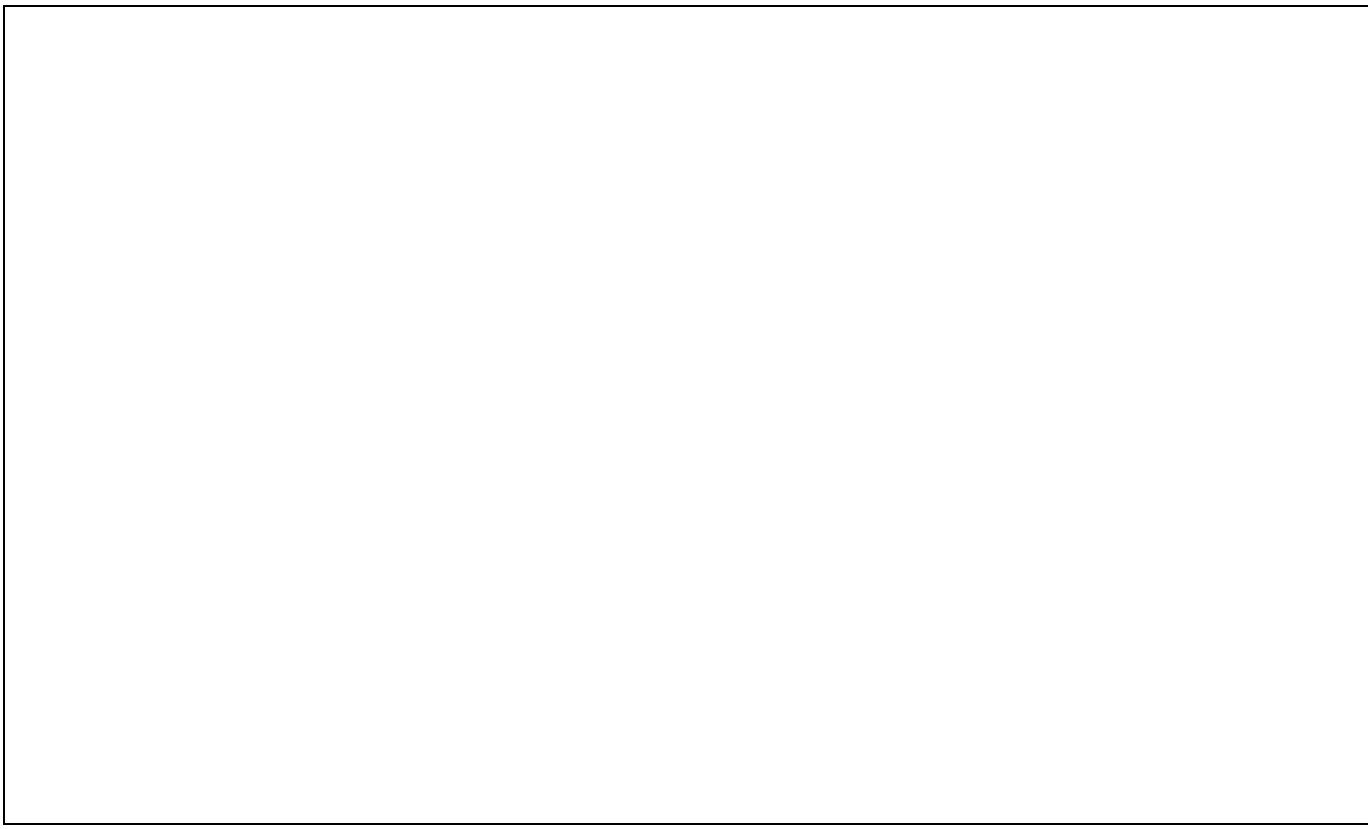
A fishery for the shell of goldlip pearl oyster is developing rapidly. Given this species is the main candidate at present for the culture of pearls in Solomon Islands, its fishery should be subject to a managed quota. The fisheries for both goldlip and blacklip must be managed jointly. Any restriction on the goldlip fishery would probably divert effort onto the blacklip fishery.

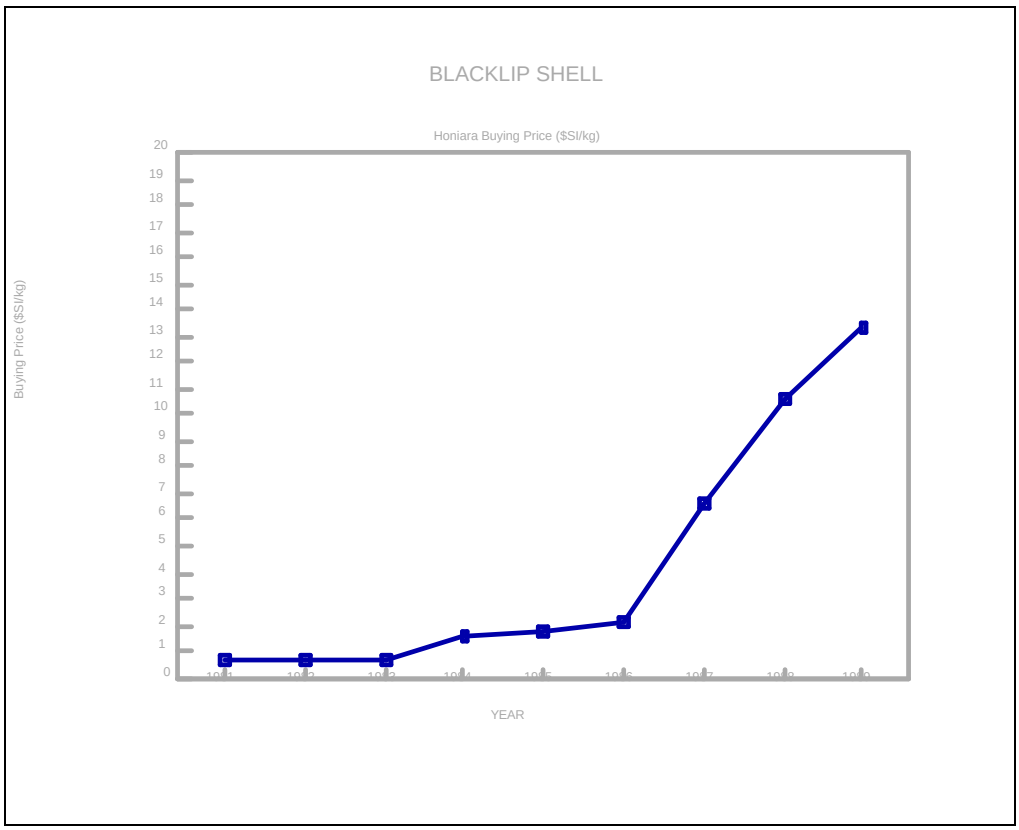
Most South Pacific countries have minimum size limits for the export of pearl oyster shell (Sims, 1988). As the pearl oyster is mostly utilized for MOP at present, some restrictions should be considered if the purpose is to encourage the culture of pearl oyster for pearl production. Although there are problems with minimum size limits, such as underestimation and ratio effects (Sims, 1988) it is recommended that;

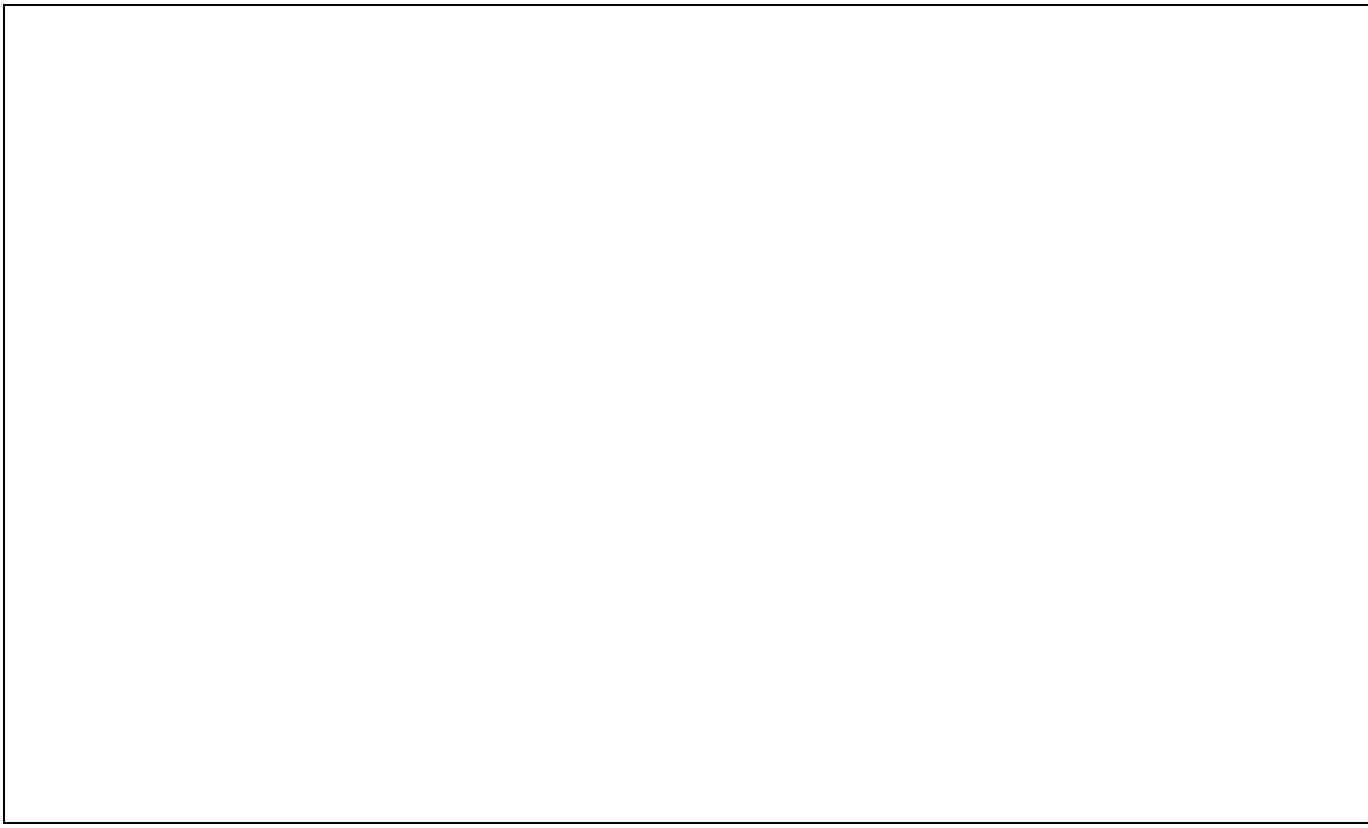
A) A minimum size restriction of 13 cm shell diameter be placed on blacklip pearl oyster shell utilised for MOP.

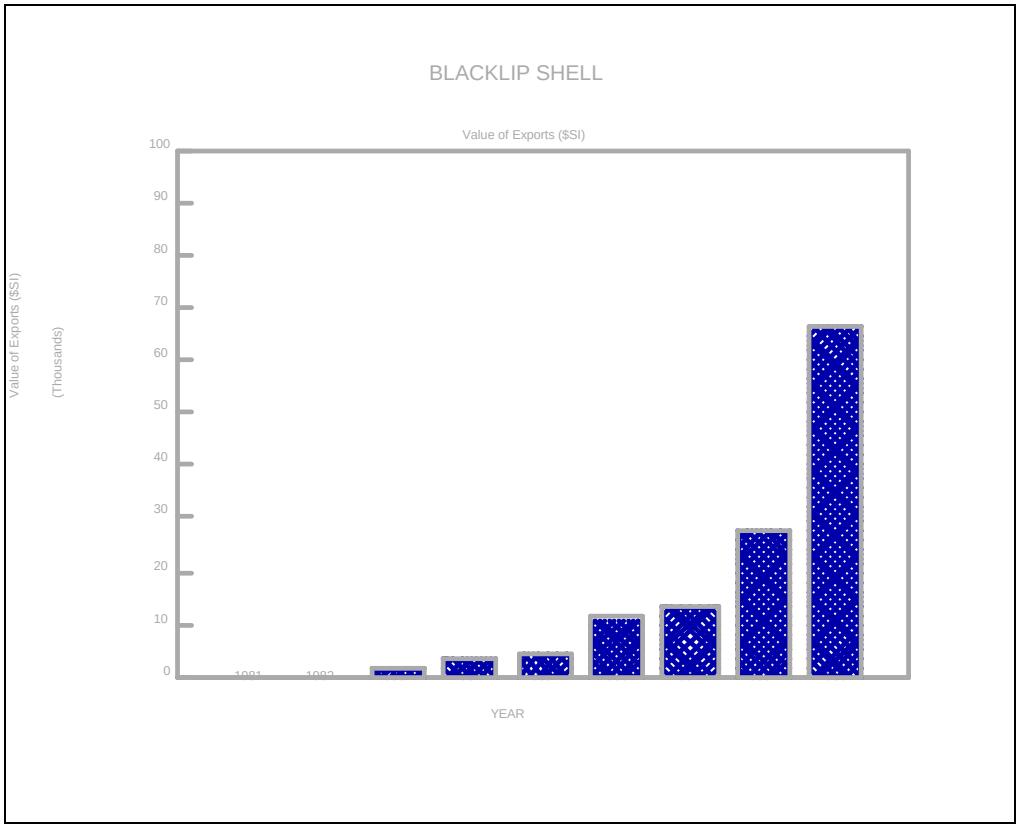
B) A minimum size restriction of 16 cm shell diameter be placed on goldlip pearl oyster shell utilised for MOP.

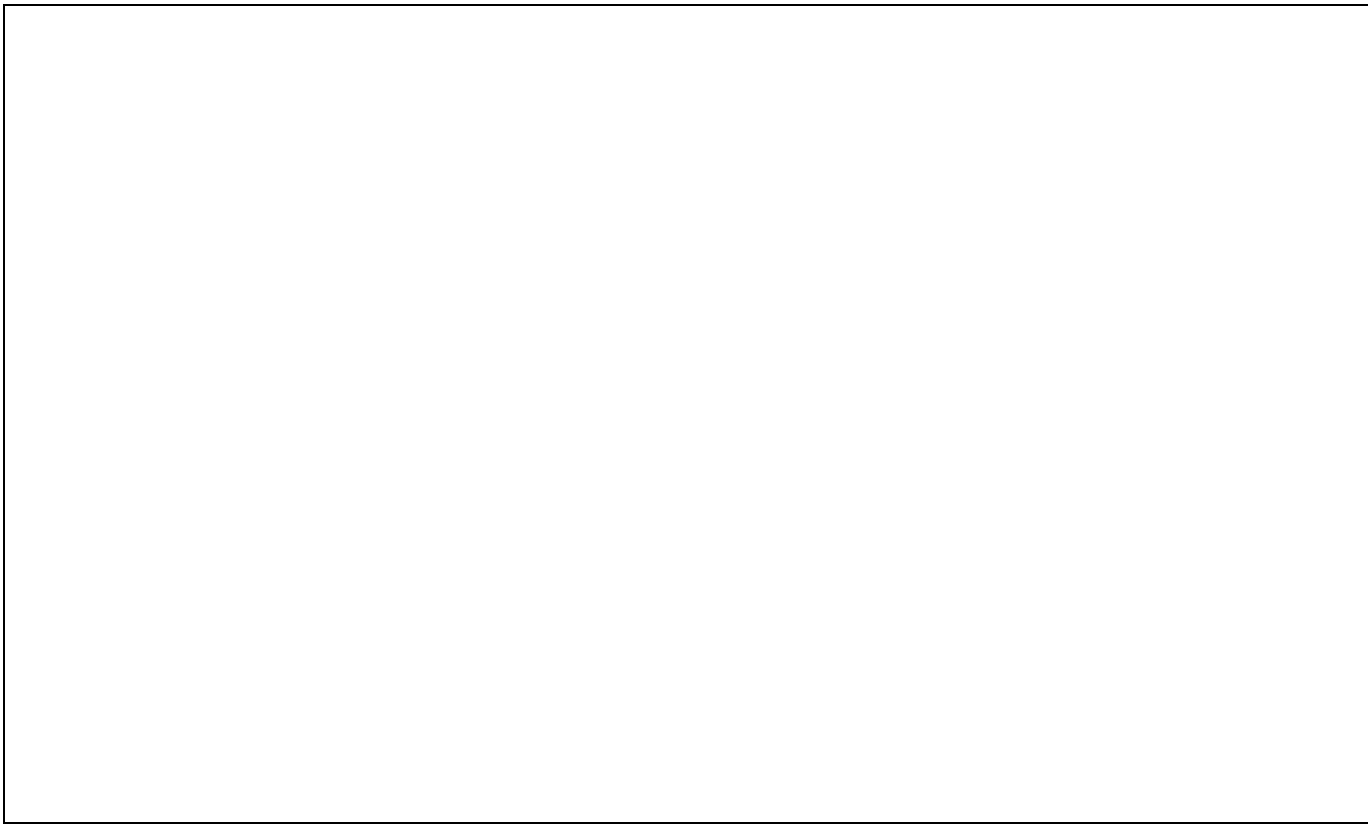


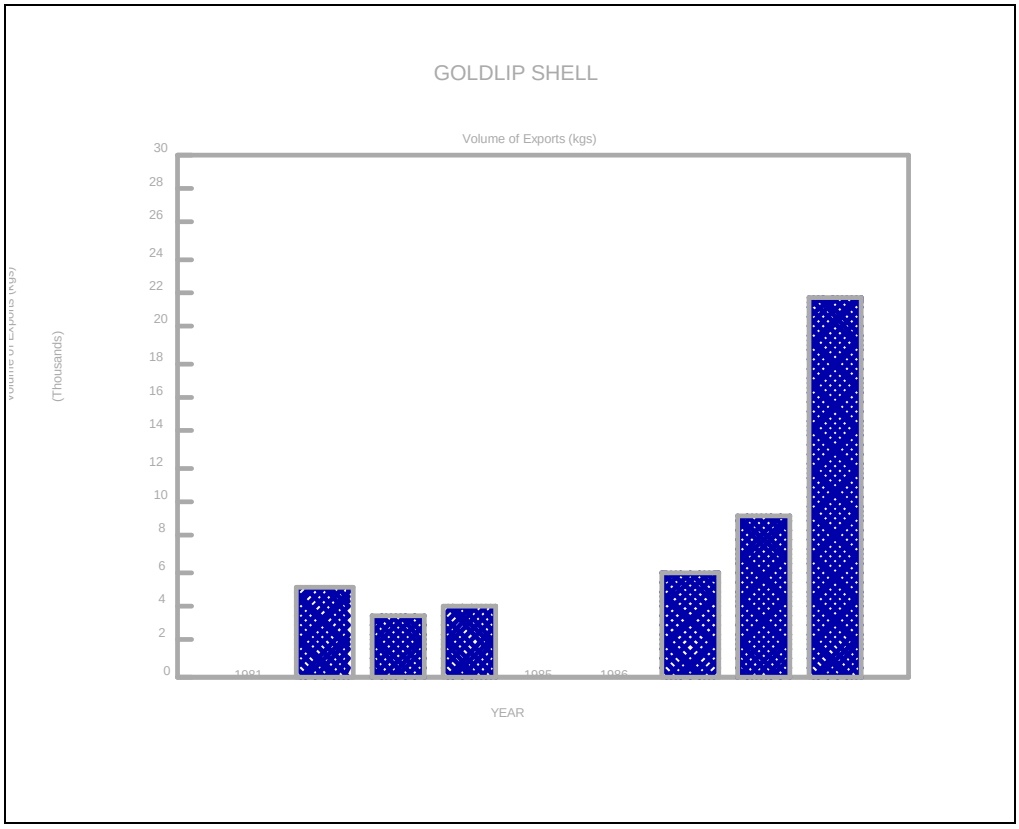


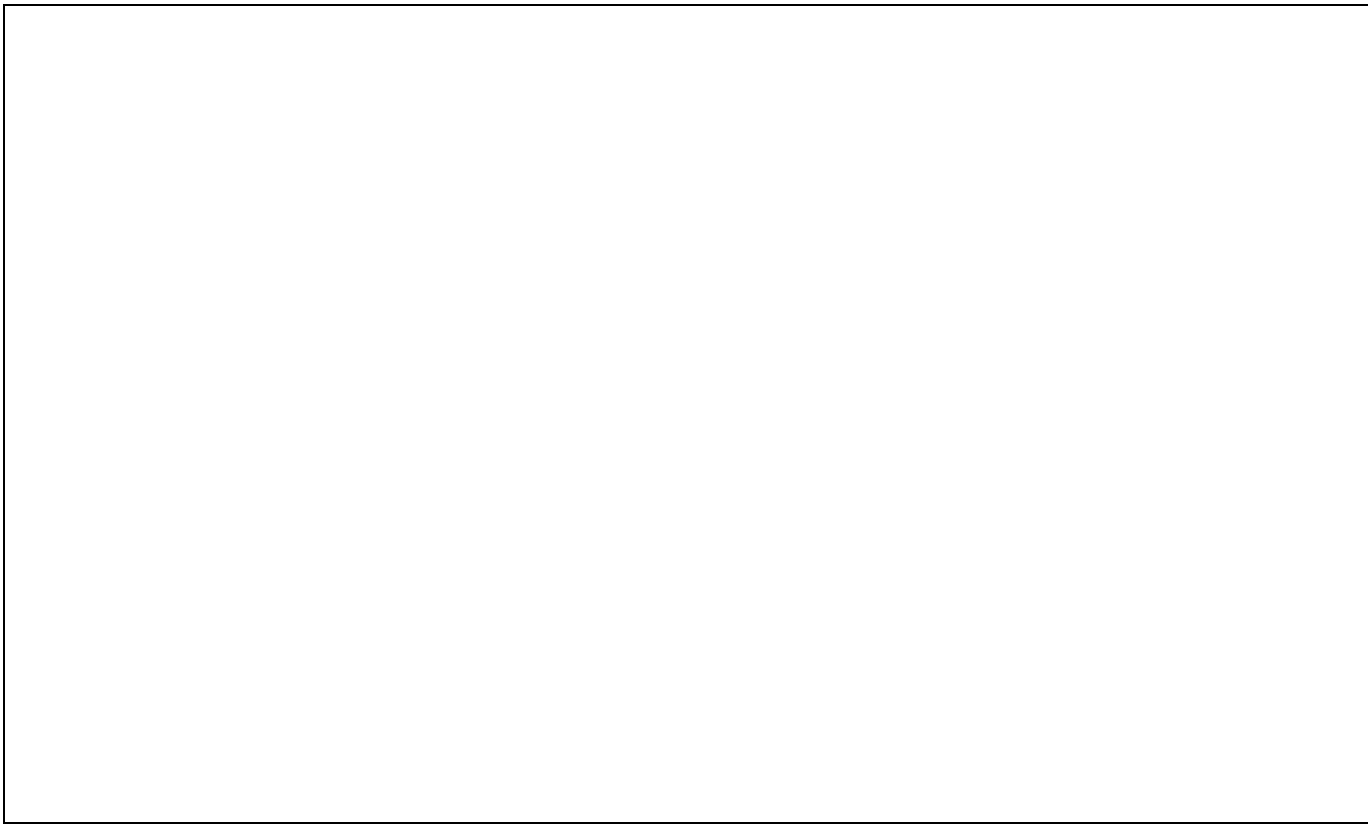

BLACKLIP SHELL
Honiara Buying Price ($SI/kg)
Buying Price ($SI/kg)
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
YEAR

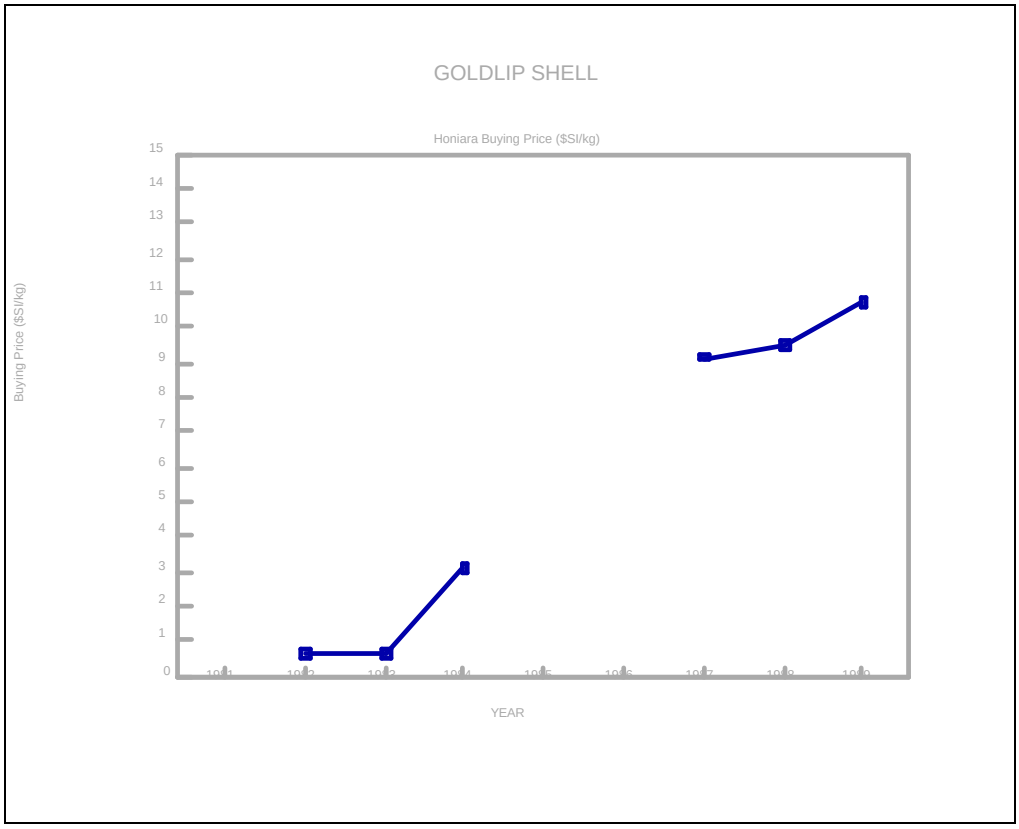



BLACKLIP SHELL
Value of Exports ($SI)
(Thousands)
Value of Exports ($SI)
100
90
80
70
60
50
40
30
20
10
0
YEAR




GOLDLIP SHELL
Volume of Exports (kgs)
(Thousands)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1981
1985
1986
YEAR





2.5 GREEN SNAIL

2.5.1 The Resource

Species present: The green snail, Turbo marmoratus.

Distribution: Green snail has a restricted distribution in the South Pacific. It is not found east of Fiji.

Adults are found along seaward reef slopes down to 15 meters. They are usually harvested from reef crest areas and are often well hidden during the daylight hours (Yamaguchi, 1988).

Life History: Growth of the green snail is variable and not well understood. Indeed there is a paucity of information on the life history of this animal.

The sexes are separate, fertilization takes place in the water column and the larvae settle out after about four days. Size at first sexual maturity has been estimated at about 15 cm shell diameter (Yamaguchi, 1988).

2.5.2 The Fishery

Utilization: Green snail is fished by local small-scale artisanal fishermen and sold to traders for export. It is used mainly in the production of buttons, and other clothing and jewellery items.

The value of green snail has increased sharply, even in relation to other marine products, in the last three years (Fig 3b). The result is that fishermen now target this species over a wide range whereas previously it was mainly taken as a bycatch in the trochus fishing.

Marketing: Exports are primarily to Japan and Korea. Prices for imports increased in recent times as imported volumes have decreased.

Production: Apart from small amounts used for jewellery and handicrafts in Solomon Islands, green snail shell is almost exclusively exported. Export figures are illustrated in Fig 3a. Despite the high relative value of this product, production is decreasing as the shell becomes harder to find.

2.5.3 Status of the Stocks

Little quantitative information is known about the status of green snail stocks in the Solomon Islands. Because of the large increase in value of this resource, an increase in fishing intensity has occurred in recent years. There is a corresponding decrease in exports during the last four years. Anecdotal reports confirm that it is becoming increasingly difficult to find new shell grounds.

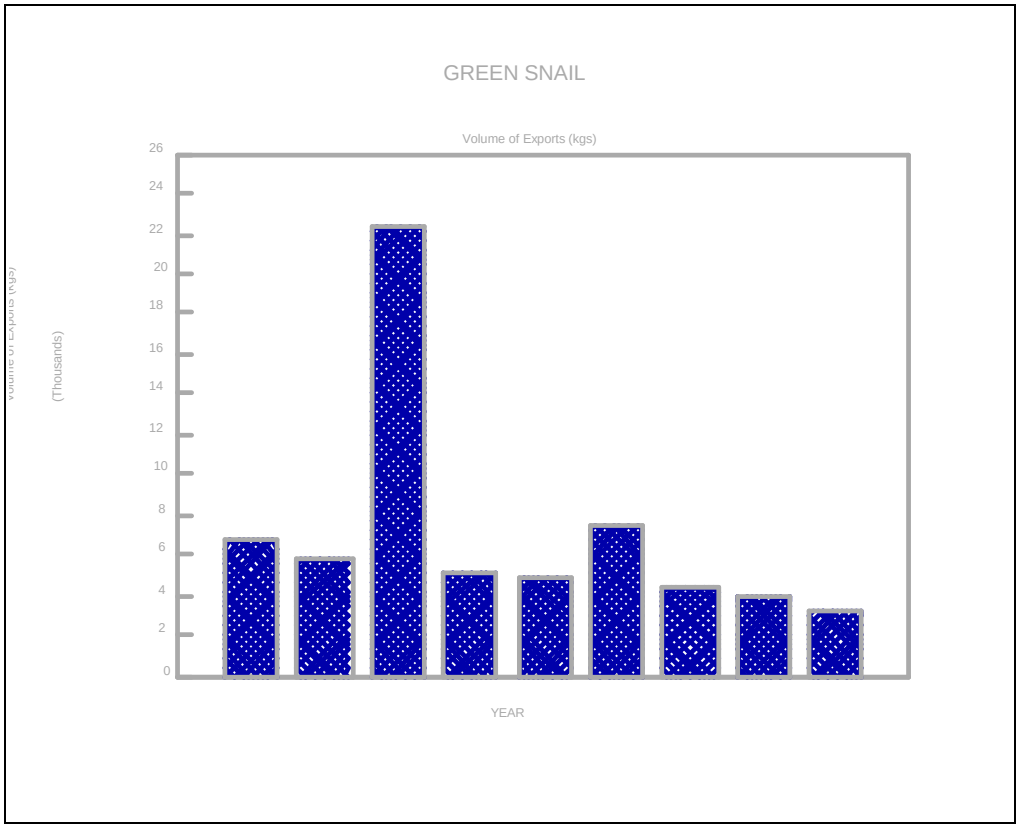
The indications are that the stock is currently overexploited.

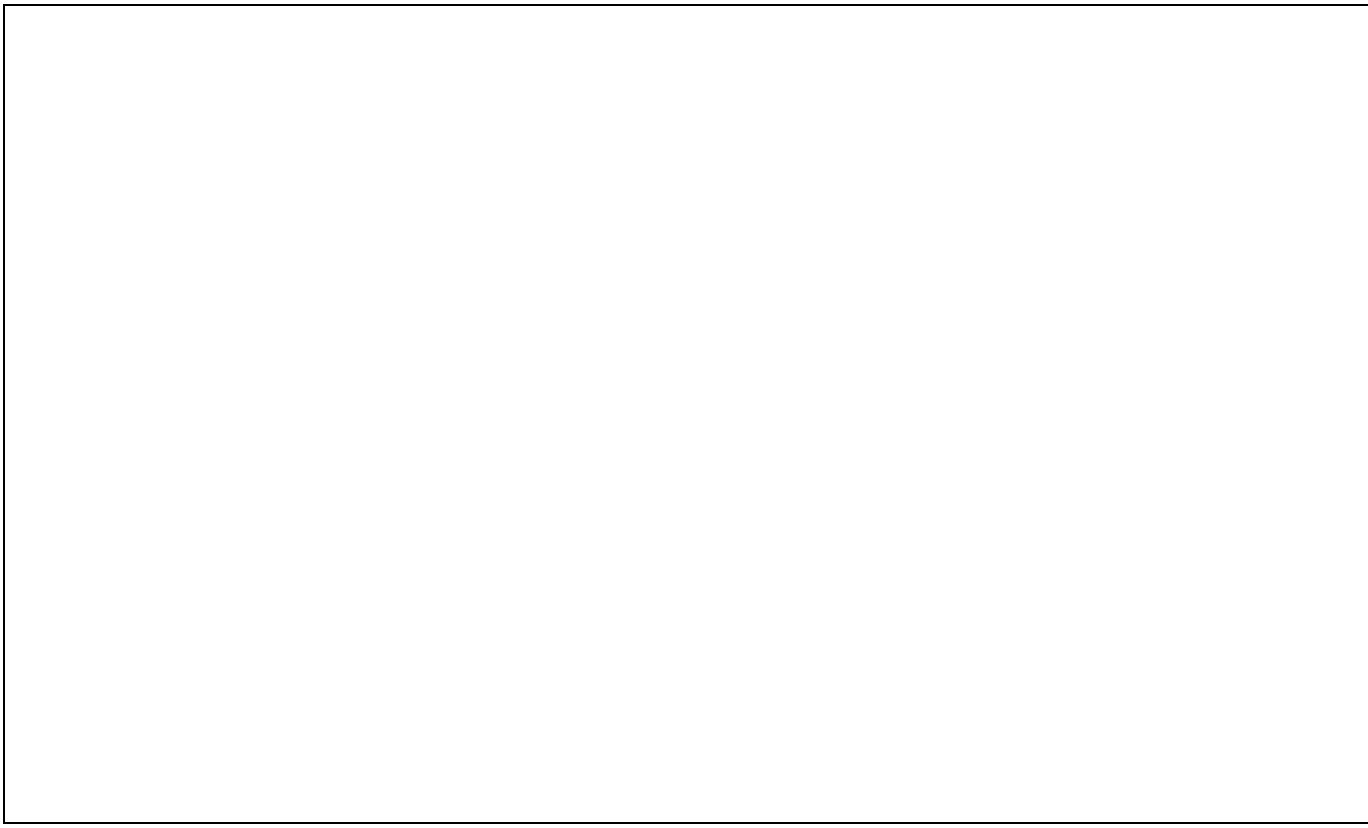
2.5.4 Management

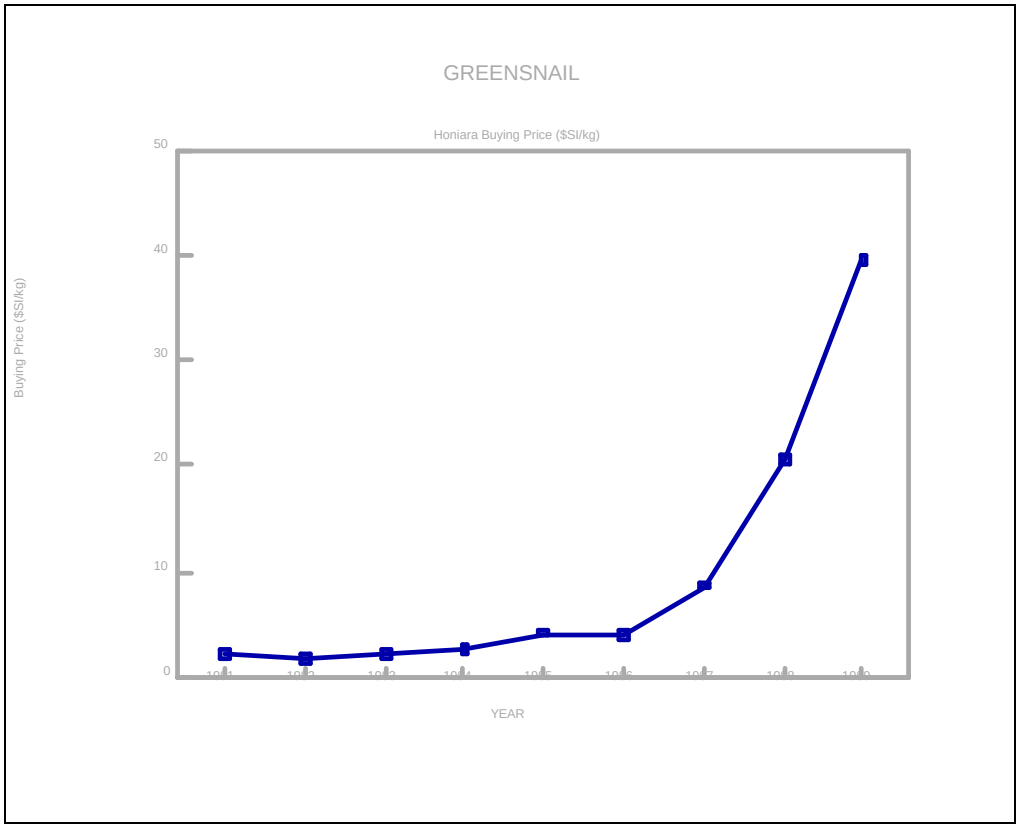
Current Legislation/Policy: There is no national legislation concerning the green snail.

Recommended Legislation/Policy: A minimum size limit should be applied but data on minimum size at first sexual maturity is incomplete. Maximum size limits would do more to prevent recruitment overfishing and should also be considered. A maximum size of 17 cm diameter should be considered.

Marine reserves may be an effective solution. Also a national quota should be instituted to limit the current level of exploitation. It would be less than is currently being fished, perhaps of the order of a couple of tonnes per year. Detailed production figures by area from the main traders purchase records and from analysis of export statistics over a long period of time should be instituted as a matter of priority to determine the long term average annual yield. This information could be utilised to estimate sustainable yields and appropriate action with respect to the establishment of marine reserves.


GREEN SNAIL
Volume of Exports (kgs)
(Thousands)
26
24
22
20
18
16
14
12
10
8
6
4
2
0
YEAR





2.6 TROCHUS

2.6.1 The Resource

Species Present: The trochus shell, Trochus niloticus.

Distribution: Trochus are naturally found from Fiji in the South Pacific westward to the Indian Ocean. Various transplantings have extended its previous natural range eastward. In the Solomon Islands they are widespread, found mainly near the edge of most reefs.

They are in greatest abundance in the top 10 meters of the reef edge and on the near-edge reef flat.

Life History: Growth is rapid in the first three to four years but it is also environment dependant and may vary from place to place. Size at first sexual maturity appears to be variable with an average of about 60 mm basal diameter.

The sexes are separate, fertilization is external and the larval phase may last from 3 to 7 days. Spawning is year-round and fecundity is very high, increasing with size.

2.6.2 The Fishery

Utilization: Up to the end of 1990, trochus shell was mainly processed overseas for the production of buttons, shell jewellery and artifacts. A feasibility study for the establishment of a trochus processing plant was conducted in 1988. It concluded that the establishment of such an industry would be both feasible and profitable for the Solomon Islands. The first factory was established in 1989 and is expected to utilize 150 mt/year when fully operational and a second, with potential to process 400 mt per year, was commissioned in Honiara in 1990.

Fishing is small-scale, artisanal and involves boiling of the shell to remove the meat which is locally consumed. There has been a growing awareness in other trochus producing countries of the export value of trochus meat. Establishment of a facility utilising trochus meat in the Solomon Islands is hampered by the large geographic area over which the animal is harvested.

Marketing: Japan and Korea are dominant in the importing and processing of trochus, both whole and in the form of button blanks, although traditional button manufacturing centres are to be found throughout Europe. In 1983, Solomon Islands was the second biggest source of trochus for the Japanese market (Carleton, 1984).

Production: Trochus is the most important non finfish resource in terms of export earnings in Solomon Islands. Except for the unknown amount used for subsistence food only and that used to make jewellery and other handicrafts, trochus shell is either exported or sold to the two button factories now operational. The export figures (Fig 4a) show a decline (which cannot be attributed to the button factory) after a peak of over 650 tonnes in 1986. Exports in the 1980's have ranged between a low of 280mt in 1982 and a high of 660mt in 1986 with exports averaging 440mt/year.

2.6.3 Status of the Stocks

No studies on the status of the stocks in Solomons Islands have been carried out. Export figures suggest a classic catch curve of an overexploited resource, but unfortunately there is no effort data to support a yield analysis. The value of trochus has increased dramatically over the last four years (Fig 4b). If there was a subsequent increase in effort with a recent decrease in production, and assuming that natural resource levels have not fluctuated for natural reasons, the resource may currently be subject to non-sustainable exploitation levels.

2.6.4 Management

Current Legislation/Policy: Current legislation states that fishermen may not catch or retain, sell or expose for sale, buy or export any trochus shell under 2.5 inches in basal diameter.

Current policy is to encourage the establishment of viable trochus processing factories in Solomon Islands. Some measure of protection to this industry may be provided by the restriction of exports until local demand has been met. At present though, export duty has been raised from 10 percent to 15 percent by value of raw shell.

Recommended Legislation/Policy: This resource is probably currently over exploited. The current size limit is possibly too small to allow viable breeding in natural situations. Other South Pacific countries have larger minimum size limits ranging from 6 to 9cm basal diameter. A maximum size limit could be imposed (e.g. 12cm) to protect the older, more highly fecund individuals. This older shell is often of low value anyway because of worm holes. If considered necessary other stock controls can be introduced such as a national annual quota, closed areas and/or closed seasons [the later with some difficulty due to the problem of hoarding].

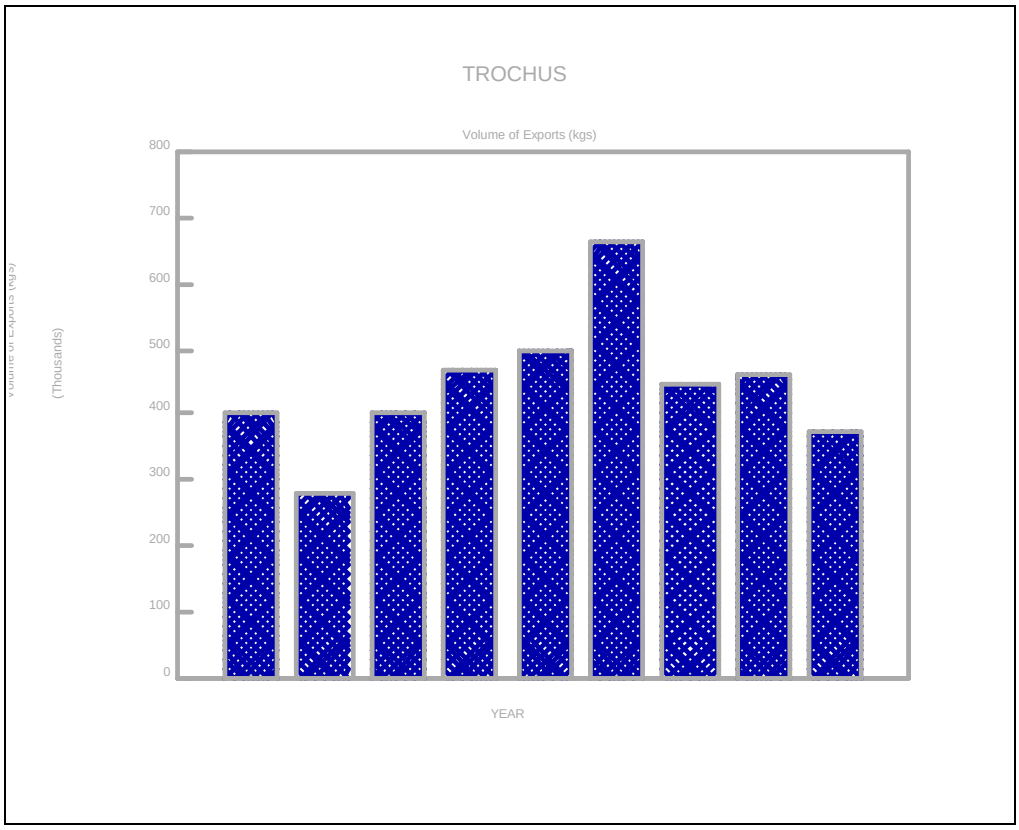
Careful monitoring and regulated expansion of trochus processing plants potential throughput should be a high priority. Care must be taken that the capacity of such facilities, in conjunction with raw shell exports does not exceed the sustainable yield of the resource which is probably no higher than 300 tonnes per year for the areas currently fished.

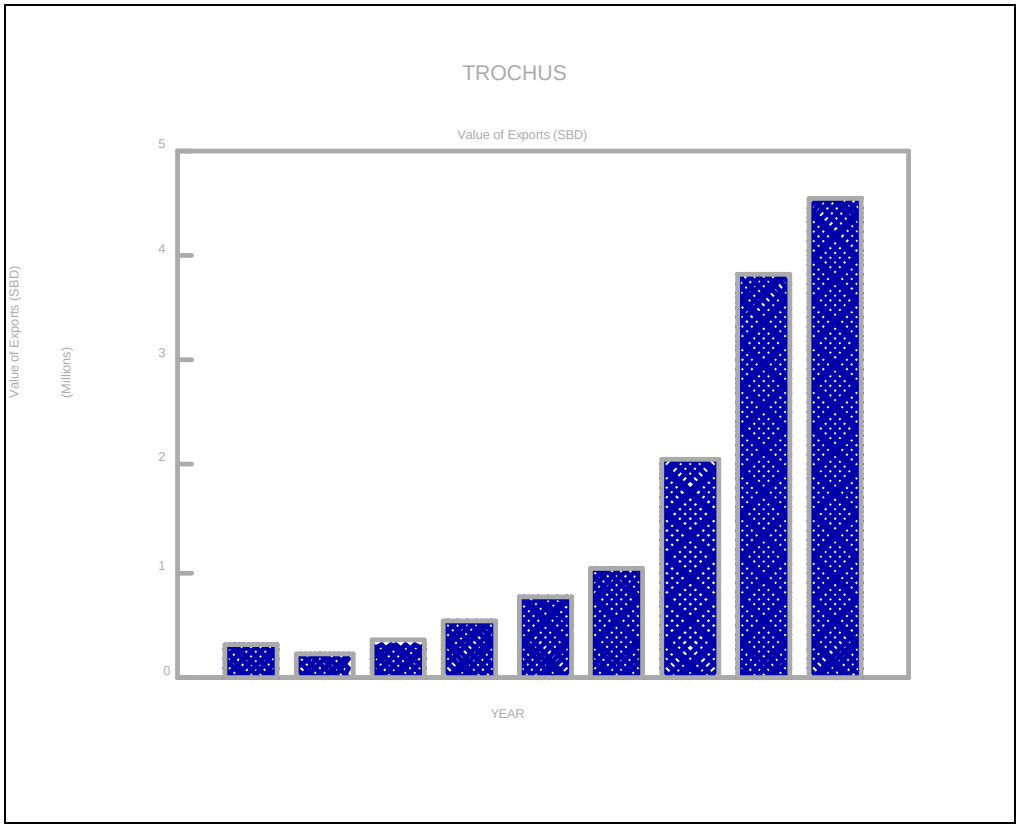
Recommendations warranting consideration (after Bour, 1988):

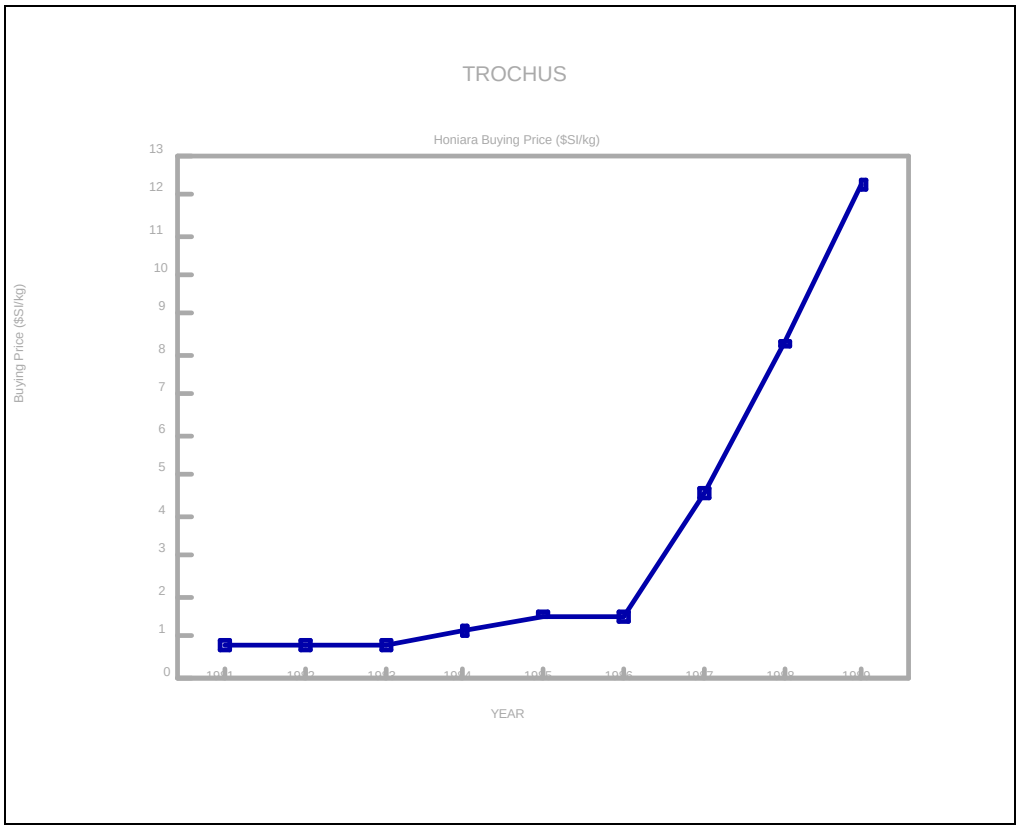
A) A minimum size of 8 cm diameter and maximum size of 12 cm diameter should be placed on commercial fishing. The maximum size should also cover subsistence food fishing if it is to be effective, although this will be difficult to enforce.

B) Provision should be made for a number of sanctuary areas that are spread throughout the main fishing areas and are easily recognizable to fishermen.

C) A publicity campaign to inform the general public of the regulations and of their rationale should be mounted.




TROCHUS
Value of Exports (SBD)
Value of Exports (SBD)
(Millions)
5
4
3
2
1
0
YEAR


TROCHUS
Honiara Buying Price ($SI/kg)
Buying Price ($SI/kg)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
YEAR

2.7 TURTLES

2.7.1 The Resource

Species Present: The green turtle (Chelonia mydas), the hawksbill turtle (Eretmochelys imbricata), and the leatherback turtle (Dermochelys coreacea) and their eggs are harvested for subsistence purposes in Solomon Islands. The olive ridley turtle also occurs in the Solomons but it is not harvested.

Distribution: All three turtle species are widespread throughout the southwest Pacific. Hawksbill turtles are especially abundant in the Wagina/Arnavon area and in Manning Strait.

Life History: Much life history information for all the turtle species is still lacking. Important biological characteristics of turtles are their slow growth, high natural mortality and the apparent compulsive return to established nesting sites. Peak nesting periods in the Solomons are November to January and May to August. The gestation period is 60 to 70 days. A mean clutch size of 97 for green turtles and 151 for hawksbill turtles was recorded at Wagina in 1980 (Vaughan, 1980).

The hawksbill turtle is probably the least migratory of the three turtle species common to the Solomons. They have extensive nesting areas in the Solomons. However, none is more important than the Arnavon/Wagina area, the only site where intensive turtle research has occurred in Solomon Islands. An extensive survey of turtle nesting beaches was first conducted in Solomon Islands between 1973 and 1974, when the regional importance of the Arnavon nesting site for hawksbill turtles was first recognised (McElroy and Alexander, 1979). Green turtles are highly migratory. They have relatively few nesting sites in the Solomons and none supports dense nesting. Leatherbacks, though less common, have a large number of nesting sites in Solomons.

2.7.2 The Fishery

Utilization: Turtles have been utilized for food at a subsistence level for many generations. Over recent years they have been increasingly hunted for their shell. While the green turtle is the main species utilized for food, the hawksbill turtle is targeted for shell as well as for food. The latter is often taken incidentally by people fishing for green turtle, fish and shell near the reef or within lagoons.

A change in fishing practice, especially for Hawksbill turtles has occurred because of a perceived decline in turtle numbers. The practice of spearing has been replaced to a certain extent in some areas by night diving for turtles with a torch and hook, usually along the weather edge of reefs. Turtles often shelter there under overhangs in depths of 3-5 meters (Vaughan, 1980).

Hunting pressure on leatherbacks is probably lower than for the other species, partly because of regulations prohibiting it, and partly because some people do not like the taste of their meat but despite the national and international moratorium on the taking of leatherbacks, they are still harvested when they come ashore especially in Isabel Province (Leary and Laumani, 1989).

Eggs of all three turtles are utilised for food at a subsistence level. Nesting beaches are visited and the eggs dug up. In addition, nesting turtles are sometimes taken during the season.

Marketing: Turtle flesh is primarily used only for subsistence purposes. Shell is exported by traders, primarily to Japan after being purchased from local subsistence or small-scale artisanal fishermen.

Production: Exports of turtleshell have increased during the 1980's (Fig 5a). As approximately 1 kg of turtleshell is produced by each adult hawksbill turtle (Fish. Dept., unpub. data.) the 1989 catch of hawksbill turtles would be over 3000. This does not take into account hawksbills whose shell is not sold to export traders.

The level of subsistence hunting for green, hawksbill (meat only) and leatherback turtles (illegally), is unknown.

2.7.3 Status of the Stocks

The extent of turtle populations in the Solomon Islands is not accurately known. Vaughan in 1980 and then Leary and Laumani in 1988 conducted an assessment of the nesting population on various beaches. Both these studies were conducted in Isabel Province alone. The 1980 study estimated that the breeding population of the study area was about 1500 and that 42 percent of hawksbill and green turtles present in the Solomon Islands nested in Isabel Province.

While the 1980 survey noted anecdotal reports of a reduction in the abundance of the catch, and that there was high predation pressure on nesting females and their eggs, a comparison of numbers nesting in 1988 showed only a small decline, although human predation had increased, due mainly to the increased use of outboard motors and fibreglass canoes. Much of this decline was in the Arnavon group, which has the most important nesting sites in the country. This was mainly attributed to the destruction of beaches by cyclone Namu.

Research in Australia has shown that recruitment to unexploited populations of hawksbills is of the order of 20% (C. Limpus, pers comm). Based on a harvest in the vicinity of 3000 hawksbill turtles in 1989, it would appear that the Solomons Islands hawksbill population is being over exploited.

All turtles are to some extent migratory and turtles of the Coral Sea basin can probably be lumped together as one breeding unit (C. Limpus, pers comm). It would follow that as Fiji has a negligible nesting population of hawksbill turtles, at least some of their hawksbill harvest is from the Solomons Islands nesting population.

2.7.4 Management

Legislation: At present no individual may sell or expose for sale, any turtle or part of turtle of less than 75 cm in carapace length. This regulation shall not apply to any turtle reared on a licensed farm.

It is an offence to fish for Dermochelys coriacea, (leatherback turtle) or to take, destroy, possess, sell or expose for sale, buy or export their eggs.

A wildlife sanctuary was set up at Arnavon, (on the recommendation of Vaughan), in 1980 but this was discontinued in 1982 for several reasons, not least of which was a dispute over tenure of the land.

In Solomon Islands, most turtle shell is sold to buyers as plates. This presents a major problem for any regulation in this fishery as there is no clear indication if the plates were taken from a turtle of legal size. From March 1989 buyers of turtle shell were required to keep the shells intact until inspected by a fisheries officer and the plates stamped. The fisheries department is also working on a conversion factor that will enable them to calculate the size of a shell that a plate was taken from.

Recommended Legislation/Policy: Scientists are currently unable to predict sustainable levels of exploitation due to insufficient knowledge of vital parameters of sea turtle biology. Most management strategies utilize maximum (not minimum) size limits and turtle nesting sanctuaries.

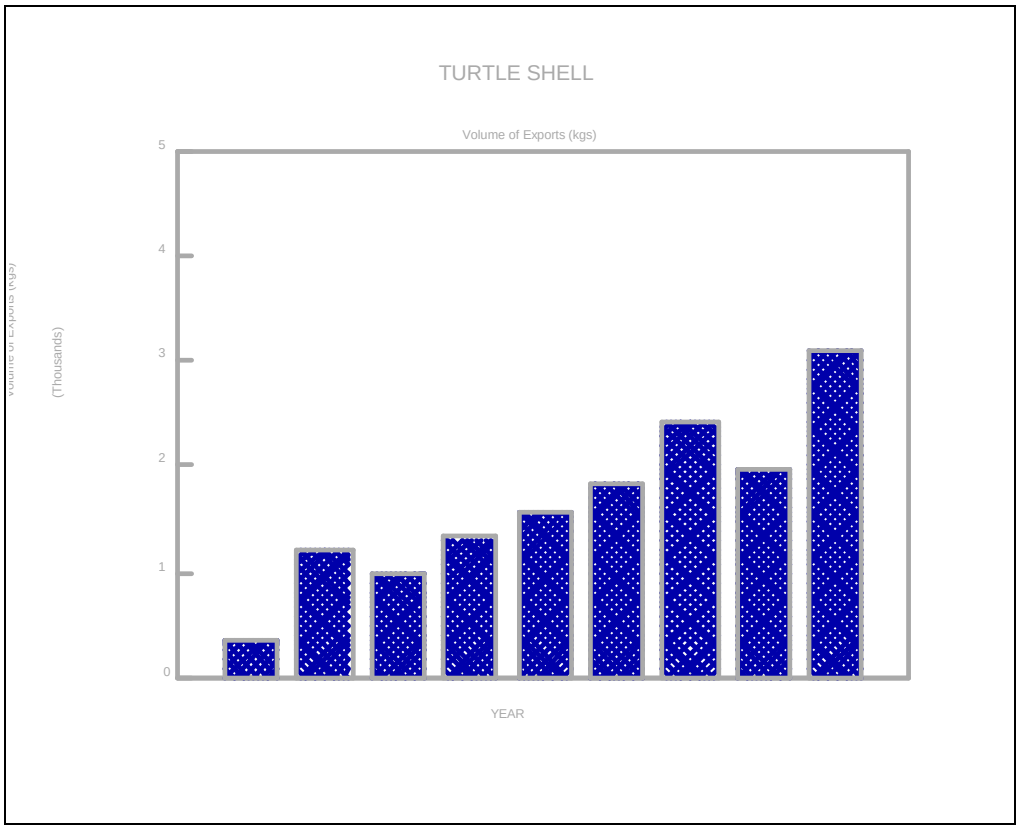
Recommendations (after Leary and Laumani, 1989; Vaughan, 1980):

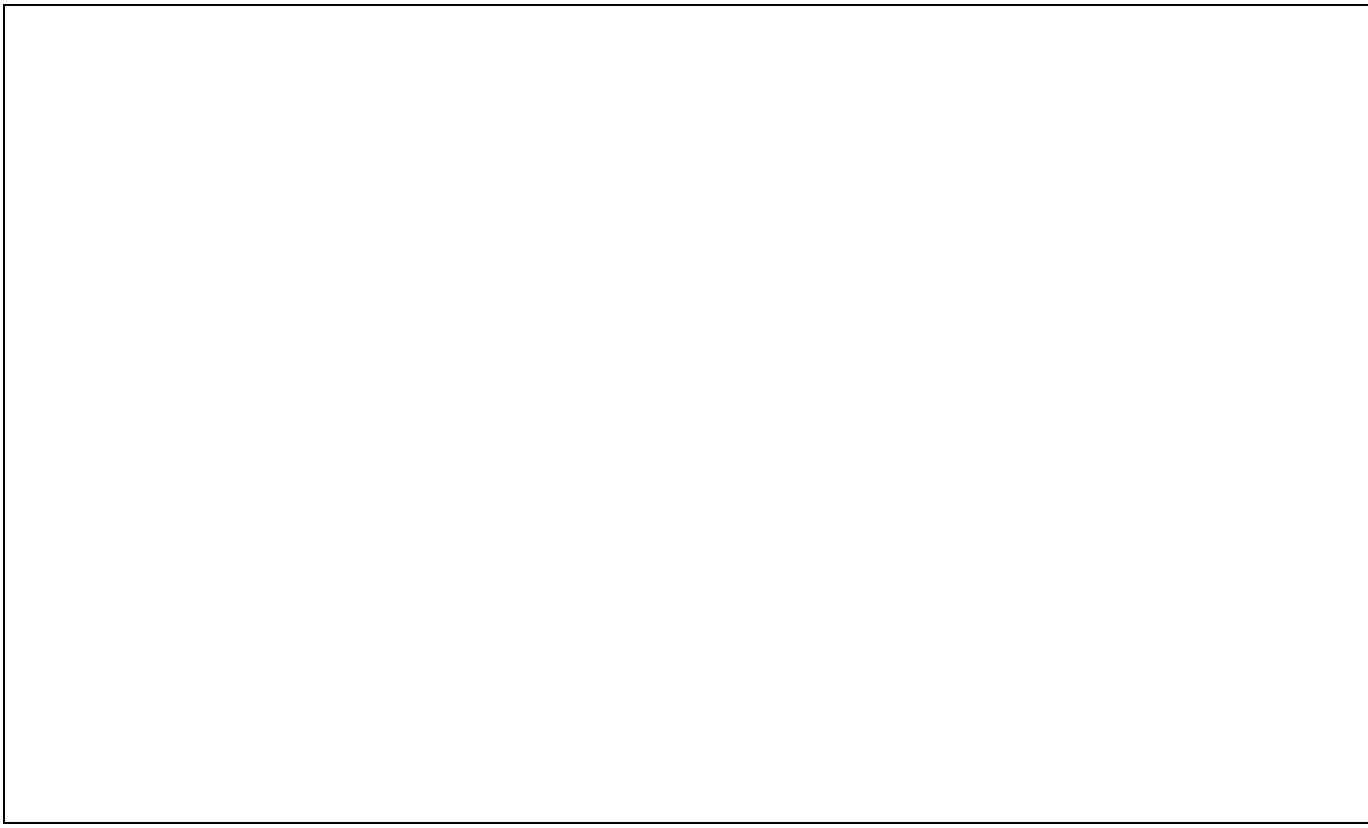
A) Prohibit trade in shells over 75 cm carapace length.

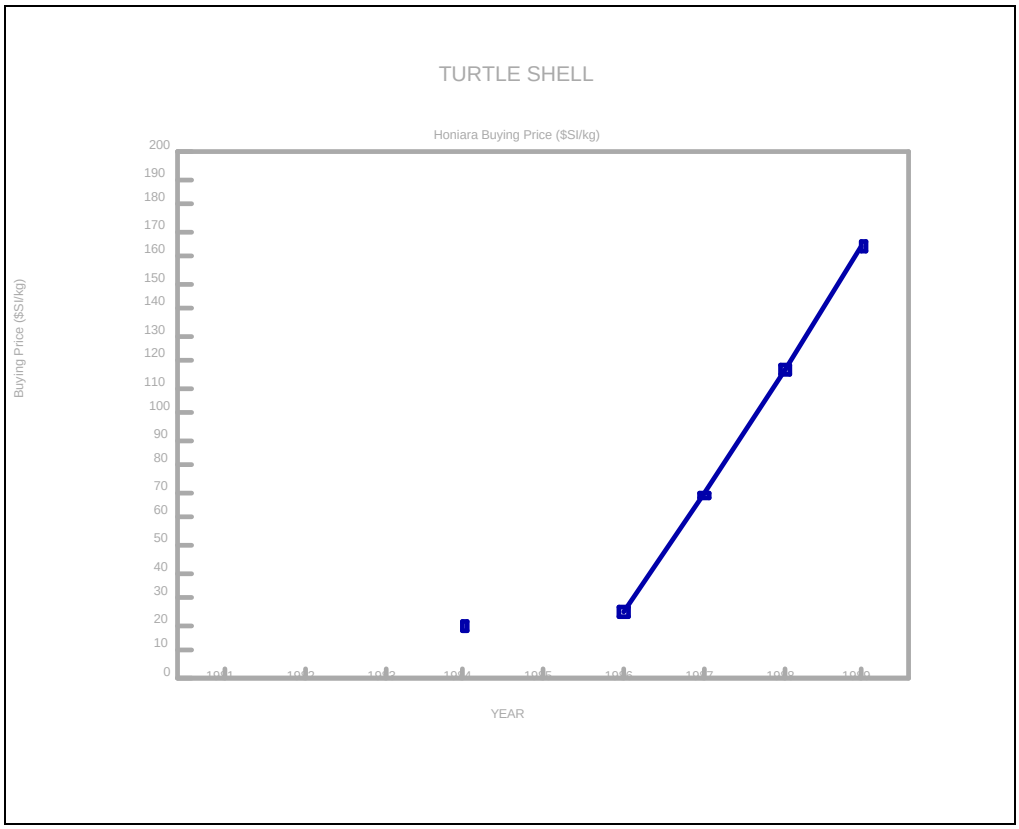
B) Re-establish the reserve at Arnavon.

C) Conduct yearly assessment of the nesting population in Isabel Province.

D) The Solomon Islands Government press for a regional management plan for Hawksbill turtles.






TURTLE SHELL
Honiara Buying Price ($SI/kg)
Buying Price ($SI/kg)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
YEAR

2.8 CROCODILES

2.8.1 The Resource

Species Present: The saltwater crocodile, Crocodylus porosis.

Distribution: The species is found throughout the Australasian region reaching highest abundance in Australia and Papua New Guinea.

Although suitable crocodile habitat has been significantly reduced by man and existing habitat is at best marginal, in former times crocodile appear to have been widespread throughout the Solomons. Presently this species occurs in Solomon Islands only as a very small, widely scattered population (Messel and King, 1989).

2.8.2 The Fishery

Utilization: In the late 1950s, expatriate hunters started shooting crocodiles for skins. The local population apparently looked upon the crocodile as vermin and the expatriates were often aided by the local inhabitants. Even after the departure of the expatriate hunters in the mid-1970's, hunting has continued by Solomon Islanders, virtually unabated.

Crocodiles are killed whenever they are encountered. Often nests are plundered and the young are held in small-scale grow-out pens until large enough to kill.

A feasibility study for a crocodile farming venture (Bolton, 1988) was conducted in 1988 and concluded that farming would be both feasible and profitable. It was based on a small scale farm near Honiara utilizing waste from the local abattoirs. Another suggested location was adjacent to the tuna processing factory at Tulagi [since relocated to Noro].

Marketing: Crocodile skin is in demand for the production of fine leather to produce luxury goods. Japan at present imports nearly all Solomons Islands crocodile skins. Because of CITES regulations, the skin cannot be legally sold in Europe.

There is international pressure on Japan to conform to CITES regulations. This would mean, because the Solomon Islands is not a member of CITES that exports to Japan would cease.

Production: In the early days of crocodile hunting, catch rates were high with, on average, 3 to 4 skins of large animals caught each night (Messel and King, 1989). Production figures, in inches of belly, as shown in Fig 6a. The high export figures for the last three years are ominous. High prices (Fig 6b), are said to have caused an all out campaign against what remains of the crocodile population in Solomon Islands.

2.8.3 Status of the Stocks

Due to the dramatic decline in numbers of crocodiles, a resource survey was conducted in 1989. This survey found that the crocodile resource of the Solomon Islands essentially had been destroyed and that the species was nearing local extinction (Messel and King, 1989).

One small real population was found at Lauvi lagoon on the south coast of Guadalcanal, a long established crocodile habitat. The report concluded that the population was too small to support crocodile ranching as has been successfully developed in Papua New Guinea and Australia.

2.8.4 Management

Current Legislation/Policy: Any crocodile or crocodile skin with a belly-width of less than 50cm may not be sold or exposed for sale.

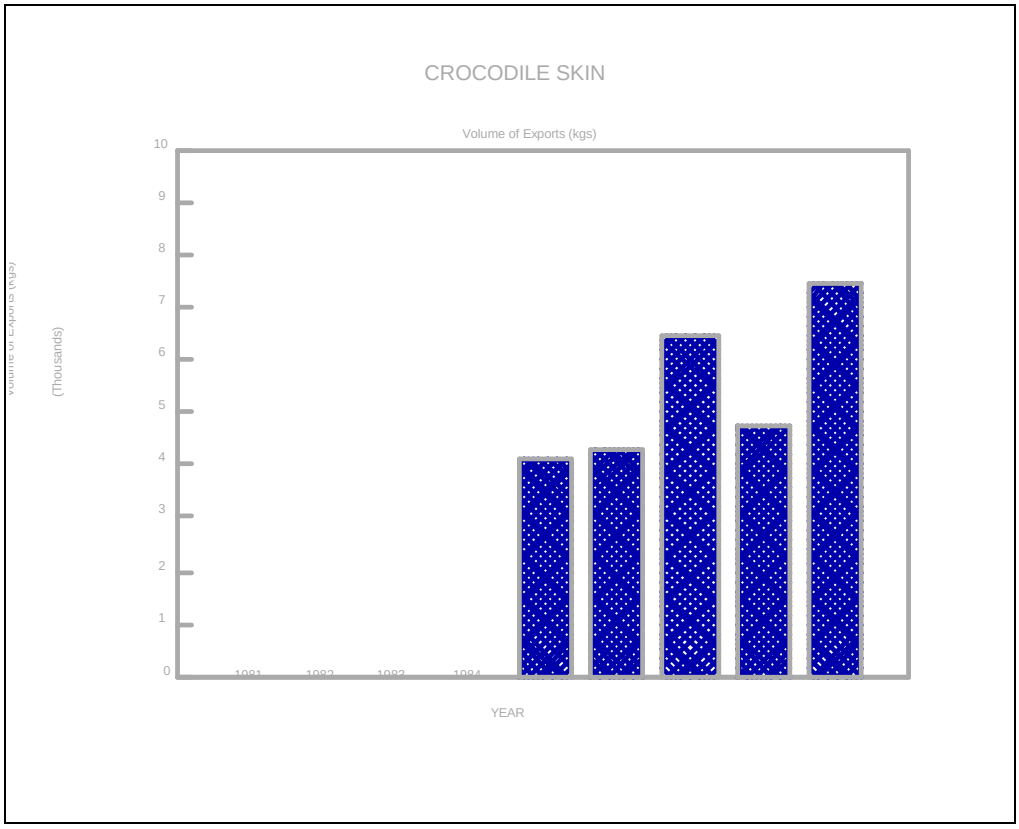
Recommended Legislation/Policy: The resource is in need of immediate protection if it is to recover. It is strongly recommended that the following regulations be put into place (after Messel and King, 1989):

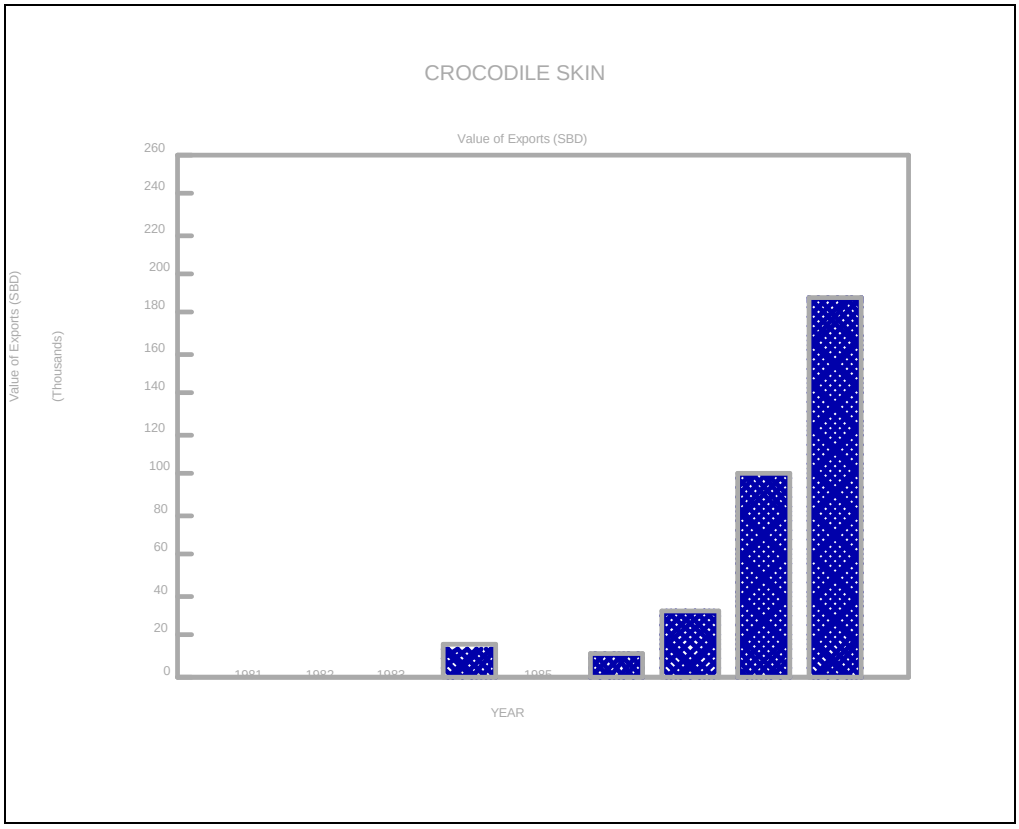
A) A total ban on the sale or export of crocodile skins of all sizes, to remain in force for at least five years;

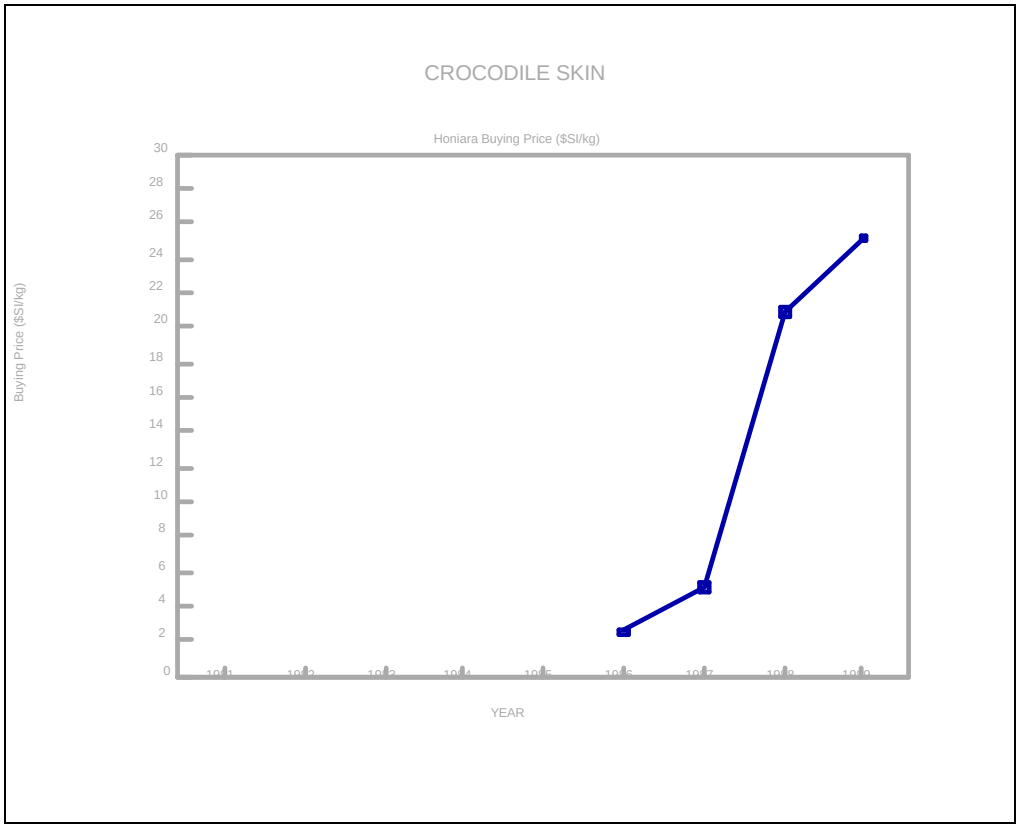
B) A permanent ban on skins with a belly width greater than 45cm, taken from the wild, should be imposed to protect the breeding stock.

C) That the central/provincial government examine a way to protect and conserve the remaining crocodile resource. Special areas of suitable habitat such as brackishwater lagoons, should be given priority.

D) The status of the crocodile populations in Lauvi and Ghahirobo Lagoons and in lakes Tatea, Korea, and Matimi and those in Renard Cove be monitored annually.


CROCODILE SKIN
Volume of Exports (kgs)
(Thousands)
10
9
8
7
6
5
4
3
2
1
0
1981
1982
1983
1984
YEAR


CROCODILE SKIN
Value of Exports (SBD)
(Thousands)
Value of Exports (SBD)
260
240
220
200
180
160
140
120
100
80
60
40
20
0
YEAR


CROCODILE SKIN
Honiara Buying Price ($SI/kg)
Buying Price ($SI/kg)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
YEAR

2.9 DEEP WATER SNAPPER

2.9.1 The Resource

Species Present: The deep water snapper resource in the Solomon Islands is dominated by Pristipomoides flavipinnis, P. filamentosis, Aphareus rutilens, Paraceasio kusakarii, Grathodentex mossambica, Etelis coruscans, E. carbunculus and E. radiosus.

Distribution: Deep water snapper are found throughout the Indo-Pacific region in waters adjacent to the shelf edge or around seamounts, generally in the depth range 80 to 400 meters.

Life history: Deepwater snapper are slow growing and vulnerable to exploitation. All are top level carnivores feeding on fish, squid and deep water shrimp. Although some may reach 40 kg in weight, the usual size caught is 1 to 5 kg.

2.9.2 The Fishery

Utilization: Although there is some limited fishing of the shallower (to 60m), deep water snapper by village fishermen (e.g. G. mossambica, P. kusakarii), the Solomon Islands deep bottom fishery is still in the initial phase of development. To date, three projects have been established under various sponsorships to set up small-scale deep water fisheries using local fishermen with small but seaworthy craft. Currently 1 project at Russell Island and one at Lambi are producing.

Marketing: Current operations supply fish to the domestic market through government- sponsored fish marketing stations. In the future it is hoped that exports of fresh fish will occur, as has happened in other developing deep water fisheries such as Fiji and Tonga. One private company exported small quantities of snapper fillets to Brisbane in 1989 but operations have since ceased. However, in 1990 a private company has established an operation at Gizo that expects to target deep water snapper.

Production: Two established projects were producing approximately 17 tonnes per year up to the end of 1989. It is hoped that this fishery will eventually produce up to 500 tonnes per year.

2.9.3 Status of the Stocks

A number of fishing surveys on deep bottom fishes have been carried out prior to 1986, leading to the establishment of the first deep bottom fishery project at Lambi in 1988. Different fishing methods were tried and species composition, length frequency and catch per unit effort data was collected. Over 11 tonnes of fish were caught and sold to the local market in Honiara. Most of the grounds fished were offshore seamounts.

The preferred fishing method was shown to be droplining. Over 60 species of fish were caught with lutjanids contributing over 81 percent by weight. The catch rates were variable averaging around 10.2 kg/reel hour. This compares well with catch rates from other island countries that now have viable deep water bottom fisheries (Wata 1988).

Using maximum sustainable yield estimates from other Pacific countries, (270 kg/mile of 200m isobath was used for Fiji (Polovina, 1987)), it appears that 500 mt/year would fall well within initial estimates of the sustainable yield for the Solomon Island fishery.

2.9.4 Management

Current Legislation/Policy: There is no national legislation on deep bottom fish. Government policy is to promote the deep water bottom fishery in rural areas using small-scale, local fishing operations in an attempt to divert fishing effort away from heavily exploited reef and lagoon finfish resources.

Recommended Legislation/Policy: No legislation is required at this time. Basic fisheries data such as length frequency and catch per unit effort data to estimate fishery parameters that will enable derivation of equilibrium yield from total biomass models (after Polovina, 1987) should however be collected.

2.10 REEF FISH

2.10.1 The Resource

Species Present: The domestic catch is made up of more than 180 species from more than 30 families of fishes. The families Lethrinidae, Scombridae, Carangidae, Lutjanidae and Serranidae dominate the catch. There is considerable site to site variation in the composition of the catch.

Distribution: Most species are associated with coral reefs, usually in shallow water. However the families Scombridae and Carangidae have a looser association with coral reefs than the other families.

Life Histories: There is great variety in the life histories of all reef fish species. Most species are demersal and remain in one area all their adult life. Some species aggregate when spawning and at such times become most vulnerable to exploitation.

2.10.2 The Fishery

Utilization: Reef fishes have formed a significant part of the diet of Solomon Islanders for many centuries. Today still the major utilisation of the resource is by the subsistence fishery. Small amounts of reef fish are used for trade and distributed through local markets in population centers such as Honiara.

Some fishing is small-scale, artisanal. However fish sold through markets is often surplus to subsistence needs. Droplining on local reefs is the most common method followed by trolling and spearfishing. Less often, netting and other traditional fishing methods are used.

Marketing: Local market demand for reef fish is good. The main problems in supplying this market are storage and transport. With this in mind, the Solomons Islands Government initiated a public company, SIACO, in 1977 to market fish both wholesale and retail in Honiara. A refrigerated fish carrying vessel was utilized for about a year in 1979 but was unsuccessful for a number of reasons. Subsequently a series of fish depots were set up in the various provinces to supply local fishermen with ice, and to buy and market fish caught by them. Although SIACO folded for various reasons in 1985, most of the fish stations are still supplying ice, and about half a dozen are marketing fish. Smoking, drying or salting of fish is rarely carried out in the Solomons because of the preference for fresh fish.

Production: Apart from fish bought by the fish stations which is of the order of 70 tonnes/year, (purchases peaked at 115 tonnes in 1982), the total production of this fishery is not known. The annual harvest of 10,000 tonnes calculated from per capita consumption data (refer Section 1.3) is probably mostly made up of reef fish.

2.10.3 Status of the Stocks

No standing stock or equilibrium yield estimates are available.

A report prompted by concerns that baitfish taken to supply the commercial pole and line tuna fishery could have a detrimental effect on the reef fishery concluded that the baitfishery had a negligible impact on the reef fish resource, except for the less reef associated, largely pelagic fishes caught by trolling (Blaber et al., 1990).

2.10.4 Management

Current Legislation/Policy: There is currently no national legislation on reef fish. Policy tends towards reserving reef fish resources for the local reef owners to manage.

Recommended Legislation/Policy: Restriction of export permits for reef fish should be considered in the light of the little stock assessment work that has been done, and the importance of this resource at a subsistence level.

2.11 COCONUT CRABS

2.11.1 The Resource

Species Present: The coconut crab, Birgus latro.

Distribution: Coconut crabs have a wide Indo-Pacific distribution, from the Seychelles to Tuamoto Archipelago in the eastern South Pacific.

The habitat of these animals has been reported to vary. They are restricted to island environments and are usually not found in the interior of high mountain islands (Brown and Fielder,1988).

Life History: The coconut crab is the largest and least marine dependant of the land crabs. Growth is estimated to be slow with a 600 gram crab possibly being 12 to 15 years old (Fletcher, 1988). Crabs, like all crustacea, must moult to grow. For coconut crabs, this process may take a month or more and is done in a shallow hole plugged with earth which often forms a small but visible mound on the surface.

Mating occurs in the summer months. The eggs are attached by hairs under the body of females. After approximately one month they are carried to the shore and released into the sea. After four to five weeks the larvae settle, develop a shell and become amphibious. It will carry a shell until about 9 months old becoming progressively more terrigenous (Brown and Fielder, 1988).

Recruitment has been found to be variable and low. Replenishment of heavily exploited populations is therefore slow (Fletcher, 1988).

2.11.2 The Fishery

Utilisation: The coconut crab forms part of the traditional diet of Solomons Islands people. Its flesh has a delicate flavour and it is highly regarded as a food item throughout the Pacific. In the past it was thought to have aphrodisiacal properties among Chinese communities. Commercial exploitation on a small-scale, artisanal basis now also occurs, the crabs being sold mainly to restaurants and hotels with small amounts exported.

Crabs are caught with coconut baits laid on trails in the bush or by searching for burrows with pointed sticks. An advantage of coconut crab is that they can be kept alive prior to consumption. Whether destined for the local market, domestic or export market, the crab can be kept alive avoiding the need for ice or freezing.

Marketing: Small amounts enter the domestic market, mainly through local restaurants and hotels, and supplied through villagers or local traders. Limited numbers are exported through local traders to major seafood centres such as Hong Kong.

Production: Annual total production is not known. A little over a tonne of live crabs was exported in 1989 and about 3 tonnes has been licensed for export so far in 1990.

2.11.3 Status of the Stocks

No stock assessment work on coconut crab has been done in Solomon Islands. Brown and Fielder (1988) noted that overharvesting and habitat destruction has caused a decrease in the coconut crab over much of its range but that it was considered abundant in the Solomons, (P. Nichols pers. comm.).

2.11.4 Management

Current Legislation/Policy: There is no national legislation directly relating to the exploitation of coconut crabs in Solomon Islands. Exporters of coconut crabs have to apply for a permit on an annual basis.

Recommended Legislation/Policy: Considering the lack of stock assessment work that has been done, and considering the vulnerability of the coconut crab to overexploitation, some quantitative restrictions should be placed on exports to avoid a possible collapse in the population. Conservation measures that have been recommended following a survey in Vanuatu (Fletcher, 1988) would seem to be suitable for Solomons Islands to consider. They are:

A. The application of a quota and a restriction in the number of vendors.

B. Regular censuses of the remaining stocks to monitor the effect of restrictions with the potential to set quotas in future years.

C. The provision of total sanctuary areas (These will be more effective if the area adjoins the sea, especially during the spawning season (Shiller,1988)).

D In the light of the subsistence level and local market demand for coconut crabs, exports should be banned.

2.12 SHARK

2.12.1 The Resource

Species Present: The catch is primarily made up of Carcharhinid sharks. An inspection of the catch of a shark longliner in 1984 found 62 percent of the catch was made up of Carcharhinus spallanzani.

Distribution: Generally widespread.

Life History: Varied.

2.12.2 The Fishery

Utilisation: Sharks are caught by subsistence and small-scale artisanal fishermen, often as a by-catch while fishing for reef and deep water bottom fish, and as a by-catch by tuna purse seine fishermen. Previously there have been several commercial-scale shark fishing operations in Solomon Islands but they have generally been of a short duration. Currently there is one venture which is targeting deep water species primarily for the production of shark liver oil.

Only the fins are utilized commercially although on occasion the skin, meat and oil is also utilized and the meat of sharks caught by subsistence fishermen is usually eaten. Local Gilbertese communities actively hunt shark for domestic consumption especially in the Wagina area in Western Province. The fins are cut off the shark soon after it is landed and then dried in the sun. Shark fin has a long storage life if processed properly and kept dry. It may be stockpiled before being sold to local or Honiara-based traders. A small quantity is sold on the local market. The majority is exported. It is processed abroad and used to make sharkfin soup, a delicacy sought by Chinese communities throughout the world.

Marketing: Exports are mainly to Hong Kong and Singapore, some for re-export to China and Chinese communities in other countries.

Production: Production statistics for the shark fin fishery are scant. Export figures are available for the last three years (Table 1).

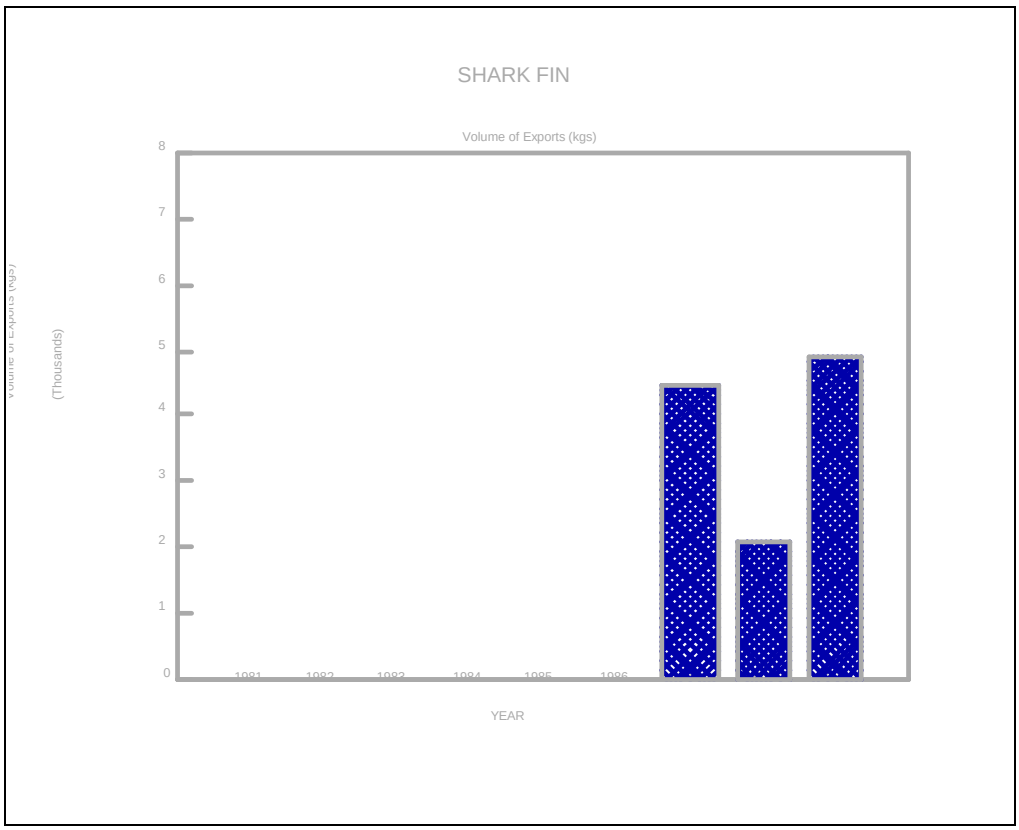
2.12.3 Status of the Stocks

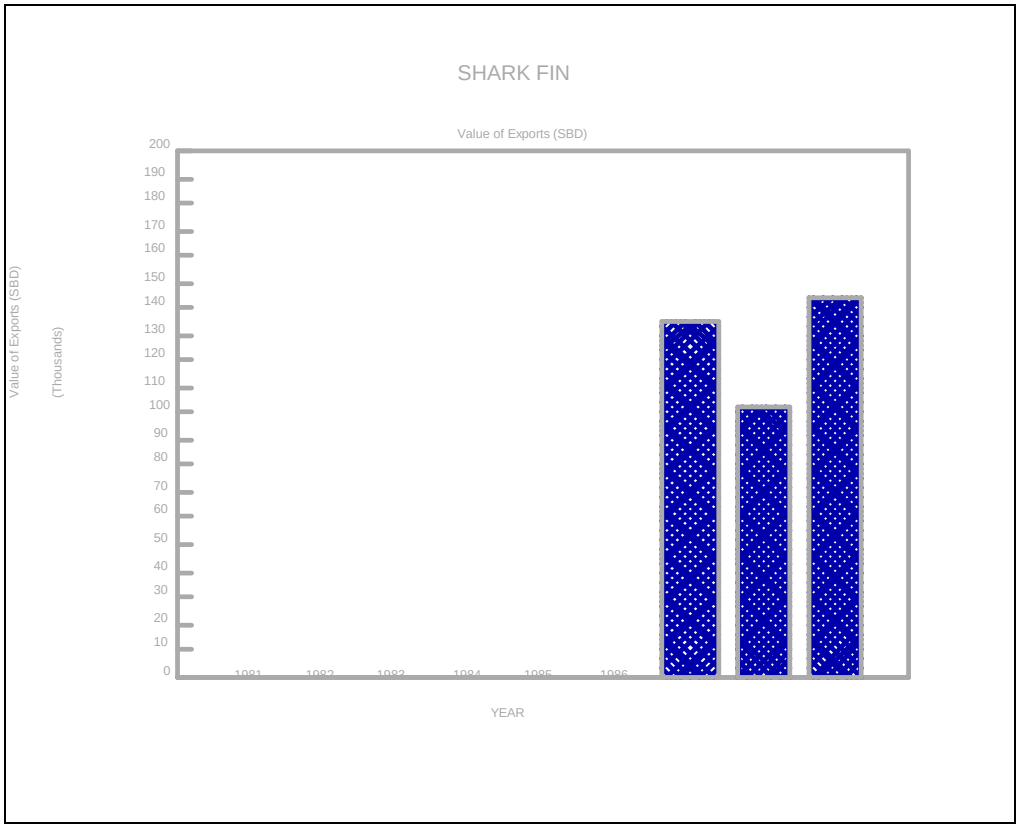
No stock assessment work has been carried out. It is considered that the resource is not under pressure any significant fishery pressure at the present time.

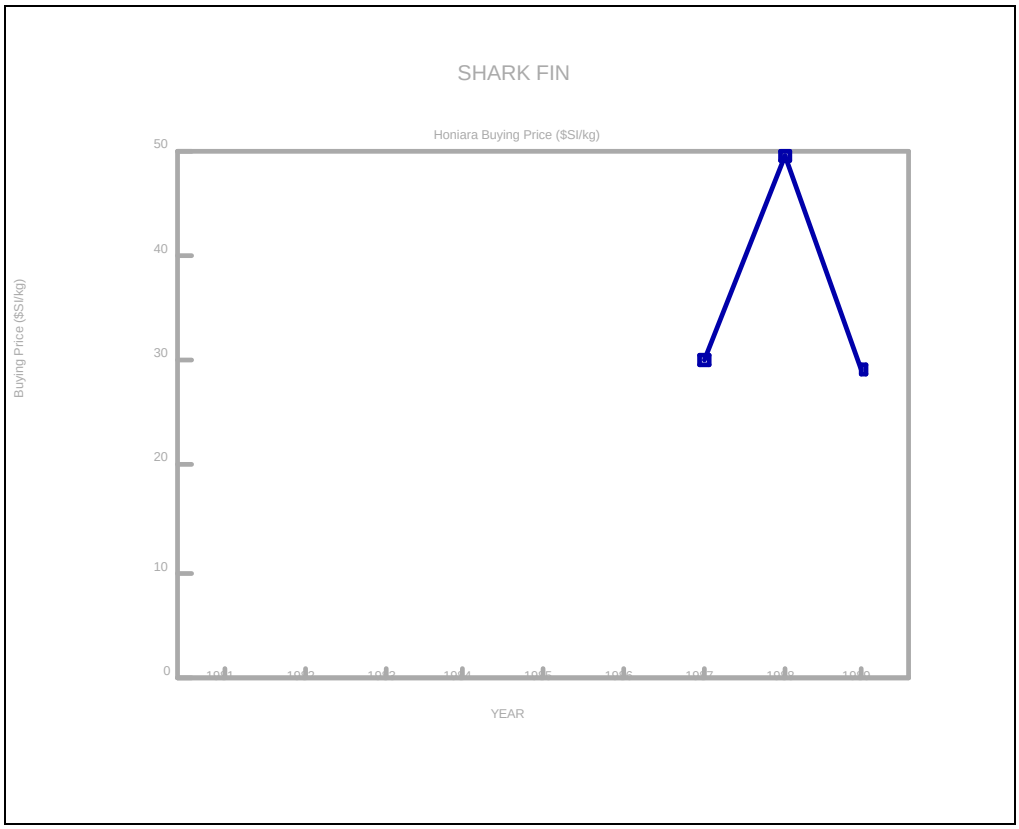
2.12.4 Management

Current Legislation/Policy: There is currrently no national legislation on sharks.

Recommended Legislation/Policy: In the near absence of any commercial scale operations in this fishery, regulation is probably not needed at this time. Species composition and catch effort data should by collected from any commercial fishery targeting shark.




SHARK FIN
Value of Exports (SBD)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Value of Exports (SBD)
(Thousands)
1981
1982
1983
1984
1985
1986
YEAR


SHARK FIN
Honiara Buying Price ($SI/kg)
Buying Price ($SI/kg)
50
40
30
20
10
0
YEAR

3. AQUACULTURE

There is little need for intensive aquaculture for domestic food production in Solomon Islands because of the abundance of marine resources still available to capture fisheries. Recently there has been a recognition of the income generating opportunities that mariculture of high market value species offers. Solomon Islands has several advantages for the setting up of aquaculture projects (Delaune, 1989);

1) The stable equatorial climate with an average daytime temperature of 28^{o}C reducing to 22^{o}C at night. The sea temperature is only affected by a variation of one degree from an average of 28 degrees throughout the year.

2) Stable democracy with a government that recognises the advantages to establishing aquaculture projects, backed up by investment incentives.

3) Low tidal variation, a small but constantly flowing freshwater network, and low pollution levels conducive to providing clean, pumpable water for aquaculture projects.

4) Low level of salaries mean labour costs are not prohibitive and give a nesessary edge to competitiveness internationally.

There are at present three aquaculture projects in the Solomon Islands, two in the developmental stage (both aid assisted), the other a private commercial venture.

3.1 Giant Clams

The International Centre for Living Aquatic Resources Management (ICLARM), in cooperation with the Solomon Islands Government and the Guadacanal Provincial Government started the Giant Clam Mariculture Project at the Coastal Aquaculture Centre on Guadalcanal west of Honiara in 1986. It was in recognition of the merits of the giant clam for mariculture that this species was chosen. Clams are phototrophic (it is dependent on sunlight), fast growing, they produce high value food and techniques for viable larval culture have been devised.

Tridacna gigas was chosen as the most suitable species for culture in Solomon Islands, although T. derasa is being cultured in other areas of the South Pacific.

There are three stages to the culture of giant clams;

i) Land based nursery stage, where the eggs and sperm are collected, and the larvae reared until about 20mm long.

ii) Ocean nursery stage, where the clams are put on the reef in protective enclosures away from strong wave action. They must be tended regularly at this stage. There are currently 13 ocean nursery sites in the Solomon Island run by various local communities.

iii) When the clams are about 10 cm long (after about one year), they can be moved to ocean grow-out areas. Here the clams need little attention. They can be harvested after about four or five years.

The growth of giant clams is quite variable. Even clams raised under the same conditions will vary considerably. This has led to the hypothesis that genetic variation is the cause and therefore clams could be bred for fast growth, an exciting prospect.

The objectives of the giant clam project (as stated in Anon. (1990b)) are as follows. It is intended that by 1992;

1) A substantial array of processed giant clam products will have been developed and test marketed.

2) Selected village groups will be maintaining ocean nurseries and grow-out systems.

3) The hatchery will be producing 750,000 one year old clams per year.

4) Progress will have been made on topics relating to genetics, selective breeding, pathology and cultivation systems, and a good understanding of the economics of giant clam cultivation should be available.

3.2 Prawns

There is currently one commercial prawn farm operating on Guadalcanal. It was established in 1983 with 100 percent private capital. The farm is situated some 30 kms west of Honiara on an old coconut plantation. Initial efforts were aimed at producing freshwater prawns (Macrobrachium rosenburgii) using post-larvae purchased from Tahiti. Production was not high, reaching 920kg/ha/yr. After two disappointing seasons in 1986 and 1987, and following a dispute over ownership of the land that the farm was based on, production of freshwater prawns ceased.

In 1986, the company started mariculture plans for saltwater prawns (Penaeus monodon), the black tiger or leader prawn on land adjacent to the first property. By 1987, four hectares of grow-out and .002 hectares of nursery ponds were in operation using nauplii and postlarvae purchased from Singapore and Australia. Production was over 5 tonnes in 1988, most of this being sold on the local market but production figures, averaging 750kg/ha/yr, were low. This has been attributed to poor pond management and technique used and poor quality food (Delaune, 1989).

There has been an attempt to establish a hatchery on the farm. Production from the nursery was sufficient in 1987 when a Chinese technician was in charge, but it ceased producing mainly because of poor training levels of technical staff manning the facility. A feasibility study in 1988 established that a natural local supply of gravid P. monodon does exist in sufficient numbers to supply a local hatchery (Delaune, 1989).

3.3 Seaweed

A project to assess the feasibility of seaweed culture (Eucheuma sp) in Solomon Islands was started in 1988 with British Government financial assistance. This seaweed is currently being farmed on a reasonably successful semi-commercial basis in Fiji and Kiribati.

Initial results in Solomon Islands were not encouraging, with grazing by rabbit fish (Siganids) being the main problem. A shift to a more exposed location for the farms saw better results. There was an export of 2.5 tonnes in early 1990 and the project is expanding. Currently there are 4 farms operational. There is reason to be optimistic about this project. The market price is currently relatively high, initial setup costs are low and limited technology and expertise is needed.

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