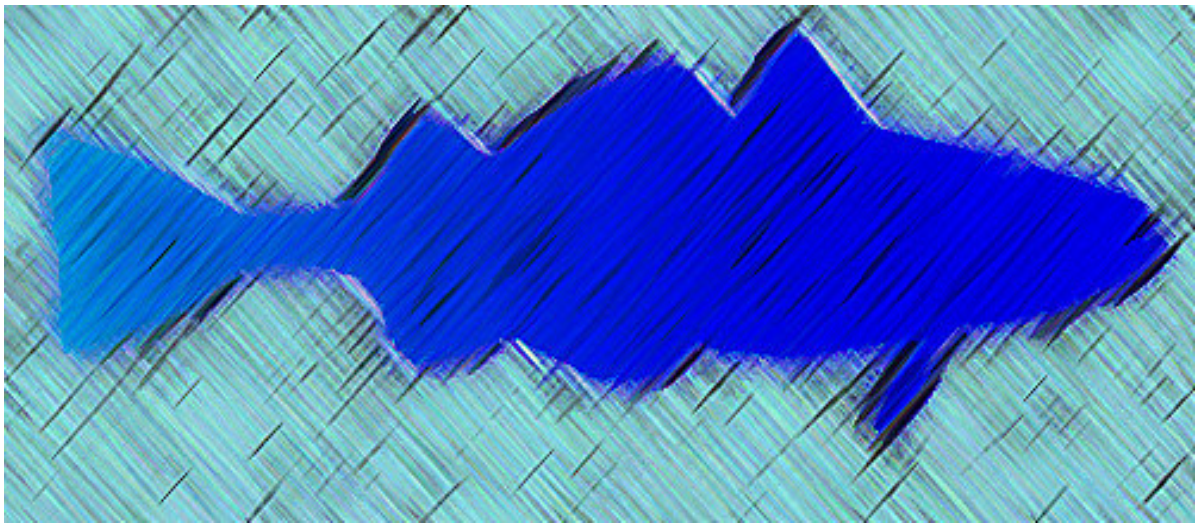
A REVIEW OF AQUACULTURE POLICY AND INSTITUTIONAL CAPACITY IN THE BCLME REGION, WITH RECOMMENDED REGIONAL POLICY OPTIONS

BCLME Project LMR/MC/03/01



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Benguela Current Large Marine Ecosystem Programme

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EXECUTIVE SUMMARY

The current study formed part of the Benguela Large Marine Ecosystem (BCLME) Project LMR/MC/03/01: Development of Responsible Aquaculture Policy for the Region. In this report an assessment of the aquaculture policies and institutional capacity for aquaculture development in Angola, Namibia and South Africa is presented. This is followed by recommended regional aquaculture options for consideration by the BCLME countries.

Aquaculture has boomed around the world since the 1980s and is set to continue to grow at a faster rate than other food producing sectors for at least the next two decades. It is expected that by 2020, 40% of the world's fish supply representing 52 million metric tonnes will come from aquaculture. The BCLME offers a favourable environment for aquaculture and the three BCLME partner countries have made the development of their aquaculture industries a political priority. The implications of the anticipated rapid growth of aquaculture for ecosystems and the associated human populations are significant. It is recognised that in order to avoid negative environmental and social consequences, and to optimise economic and social benefits, appropriate policies and long term planning are required both at a national and regional level. The BCLME programme thus presents a timeous opportunity to develop responsible aquaculture policy for the region.

At a political level the potential contribution of aquaculture to fishery production and welfare gains is now recognised in Angola, South Africa and Namibia, and recently processes to develop and implement national aquaculture policy and legislation have been implemented in all three countries. Deployment strategies to promote sector development are still fairly rudimentary in all three countries, and will have to be developed if the industry is to grow to its economic potential. At a regional level, the SADC (Southern African Development Community) protocol on fisheries includes aquaculture and is a useful guide to policy makers and planners at both the national and regional level. The SADC protocol is strongly development orientated and requires Governments to recognise and promote aquaculture as a distinct enterprise in order to optimise its economic contribution.

The national aquaculture policies of Angola, South Africa and Namibia make a distinction between freshwater aquaculture, which is seen as a potential source of food security, and marine aquaculture (mariculture) which is capital and technology intensive, and is seen as a potential source of high value fishery products for export. This distinction is reflected in the existing and proposed public sector support measures for aquaculture, which in freshwater environments are largely targeted at rural communities, and in coastal areas aimed at facilitating access to industry and capital investment.

ANGOLA

The end of civil war in Angola has introduced a new era of rebuilding, normalisation of relations with neighbours, and re-integration into the global economy. Limited resources, particularly human skills, need to be wisely deployed to achieve optimum outcomes. Government has taken a policy decision that the private sector should lead the development of the marine aquaculture sector, while communal aquaculture for food security should be promoted in rural areas. The main challenge to Government is to be able to respond appropriately to interest shown by the private sector so that potential investment is not lost, while ensuring that aquaculture is undertaken in an environmentally sustainable manner. The coast possesses a number of sensitive habitats (for example, mangrove swamps in the North) which could be compromised by inappropriately sited aquaculture operations. Furthermore, the economic pressure to introduce exotic species for which culture techniques and markets are established is high. Therefore it is essential that sound policies and protocols are established to promote and regulate the growth of aquaculture so that individual managers are not required to make *ad hoc* decisions on a case by case basis.

A policy process was initiated in Angola during 2002/2003, which has resulted in a first draft of an aquaculture policy, a description of the status of aquaculture, and a draft aquaculture master plan. During 2004 the BCLME aquaculture policy project in collaboration with IIM submitted a second aquaculture policy draft for consideration by the Angolan government. Angola's aquaculture policy is based on accepted international guidelines and protocols and is designed to facilitate the sustainable and responsible development of aquaculture for the social and economic benefit of all Angolans. The IIM facilitated the drafting of the first aquaculture legislation, which is included in the Act on Biological Aquatic Resources. This Act was recently passed by the Angolan legislature. Angola is therefore relatively well positioned to support aquaculture development and to participate in regional aquaculture policy initiatives.

While Angola is well endowed with both inland and marine aquatic resources suitable for aquaculture, infrastructure and institutional capacity are the two primary constraints to the development of aquaculture. Angola possesses a functional legislature and administration, and the public sector organisation tasked with the promotion of aquaculture in Angola is the Marine Research Institute's (IIM) Aquaculture Directorate. The task of initiating the development of the aquaculture sector for both marine and inland waters in Angola is clearly a huge one for such a small team, and this has required the prioritisation of certain tasks. The Aquaculture Directorate's primary activities during 2003/2004 have been:

- Policy development and planning.
- The drafting of legislation.
- International liaison.
- Administration of aquaculture applications.
- Liaison with other government departments at national, provincial and municipal level.
- Site surveys.

If Angola is to develop its aquaculture sector a major institution building process will be required to develop capacity to manage the environmental aspects of aquaculture, establish producer representation, perform research, certify shellfish for export, finance aquaculture and train manpower. Regional and international cooperation will therefore be required to build institutional capacity to support aquaculture development in Angola. It is suggested that a regional aquaculture policy be developed for the promotion of training, research and technology development, finance of aquaculture operations, environmental management of aquaculture including exotic species, EIA's, shellfish sanitation and "industry best practise".

NAMIBIA

Fish and fisheries play a central role in the economy, livelihoods and food security of many Namibians and hence the development of aquaculture is regarded as strategically important by the Namibian government. The aquaculture sub-sector in Namibia is relatively undeveloped and its contribution to fishery production is currently minimal, however the Namibian natural environment and infrastructure offer a significant opportunity for the expansion of production. The Namibian Government has recognized this potential and developed aquaculture policy, legislation and a deployment strategy to provide an enabling environment for aquaculture development. The temperate, nutrient rich waters of Namibia offer ideal conditions for certain types of aquaculture, particularly bivalve shellfish. Suitable sheltered bays conducive to shellfish culture or cage culture exist at Lüderitz Bay and Walvis Bay, and the diamond mining area between Oranjemund and Lüderitz Bay offers a substantial opportunity for shore based aquaculture. Namibia possesses an excellent infrastructure and has a world-class capability in handling, distribution and marketing of fish

products emanating from the marine capture fisheries sector. This provides prospective fish farmers in Namibia unparalleled access to some of the most lucrative markets for fish products in the world.

Presently, oyster farming is the most established aquaculture activity in Namibia with six farms currently in operation at Walvis Bay, Swakopmund and Lüderitz, which directly employ approximately 85 people. Both Pacific oysters (*Crassostrea gigas*) and European oysters (*Ostrea edulis*) are grown. Estimated production of the Namibian oyster industry in 2004 was 6 million oysters worth ca. N$12 million farm gate value. *Gracillaria* is cultured in a 40 ha plot in Lüderitz lagoon by Taurus Atlantic Seaweeds to supplement their collection of beach cast product. Annual production is around 120 tonnes of dry-weight sea grass per annum. The operation currently employs 50 people. Abalone farming has attracted interest in Namibia and one farm is currently operational at Lüderitz Bay. Current production is estimated to be 15 tons with employment of 15 people. Other proposed developments have not gone ahead due to difficulties in obtaining finance and access to suitable land based sites. On an experimental level there is interest in rock lobster (*Jasus lalandii*), marine fish (Dusky Kob (*Argyrosomus inodorus)* and Turbot (*Psetta maxima*)), and scallops as candidates for commercial culture.

For the existing farmers, technology and experienced manpower were identified as the primary constraints to growth. The lesson from successful aquaculture industries in other countries is that the state must provide manpower and finance research to establish new technologies and make existing technology more cost-efficient. For prospective aquaculturists, uncoordinated bureaucracy, technology, and access to land-based sites were seen as fundamental constraints. Encouragingly, Namibia's aquaculture policy and strategic plan recognises and seeks to address these constraints.

Of the three BCLME countries, Namibia's initiative to develop aquaculture policy and legislation has been the most comprehensive and has laid a sound institutional foundation for sector development. Aquaculture is specifically addressed as a development priority in Namibia's Second National Development Plan – NDP-2, and in the Government's VISION 2030 document, wherein it is envisaged that by the year 2030 aquaculture will have grown to become a thriving industry. The Namibian Government has actively sought to create an "enabling environment" for aquaculture development which has required specific policy, legislative and institutional interventions. Namibia has been fortunate to benefit from international experience in aquaculture and its Aquaculture Policy and Aquaculture Act can be viewed as a synthesis of international best practise. The objective of Namibia's aquaculture policy is "the responsible and sustainable development of aquaculture to achieve socio-economic benefits for all Namibians and to secure environmental sustainability". Namibia's Aquaculture Act was passed in 2003 and regulations to implement the Act have now been promulgated. Of the three BCLME countries, Namibia is the first to translate its policy into a comprehensive deployment strategy articulated in "Namibia's Aquaculture Development Strategy". The strategy contextualises the opportunity for aquaculture in Namibia, outlines Namibia's aquaculture policy and Act and sets tentative production targets.

The Namibian Aquaculture Policy and Act impose certain obligations on the State to provide the services required to meet the objectives set. A new Aquaculture Directorate (DoA) within the Ministry of Fisheries and Marine Resources has been established to facilitate the development of the necessary institutional capacity, both within and outside MFMR, for the implementation of Namibia's aquaculture policy. A "one stop shop" arrangement is proposed to facilitate aquaculture permitting and decision making.

In summary, Namibia has made excellent progress to create the required institutional environment to support aquaculture development as a result of its comprehensive policy making and planning process, driven by a strong political will. The institution building processes outlined in Namibia's aquaculture strategy could be strengthened through regional

collaboration, particularly in the areas of education and training, research and technology development, aquatic animal health, the management of exotic species, and financial facilities for aquaculture ventures.

SOUTH AFRICA

Although South Africa possesses a large and efficient fishery sector, the mariculture sub-sector is relatively small, currently producing abalone, mussels, oysters, turbot, and prawns. Species on the threshold of commercial production include seaweed, salmon, kob and sole. Although commercial mariculture has displayed moderate organic growth since the 1980s, and is recognized to have economic potential, government has done very little to promote sector development and has largely limited its support to legal and regulatory issues, and research. Nonetheless, South Africa's aquaculture industry is the most established in the BCLME region and enjoys significant institutional support. In 2003 the South African mariculture sub-sector produced 1,843 tons worth R152.8 million. The industry comprises 48 permitted operations employing 740 persons directly on the farms. The mariculture service industry probably employs a similar number.

South Africa has been slow to address aquaculture policy and legislative requirements and currently has a fairly fragmented and incomplete policy and legislative framework. Although mariculture was included in the Marine Living Resources Act of 1988, and a Mariculture Unit established within the Branch Marine and Coastal Management of the Department of Environment Affairs and Tourism (DEAT-MCM), no comprehensive supporting policy was developed. South African legislation and regulations pertaining to aquaculture in their current form are adequate from an environmental management perspective, but significantly "disabling" from the perspective of sectoral growth stimulation. Since 2003, there have been moves to develop a more coordinated and directed public sector approach to aquaculture sector development. For example, an Interdepartmental Mariculture Technical Committee has been formed to develop a single agency (the proposed Mariculture Institute of South Africa) to promote sector development, and DEAT-MCM has commissioned the drafting of a mariculture sector development plan. These processes have highlighted the need for a comprehensive policy statement. A mariculture policy is under development by DEAT-MCM; however, a lead has been taken by the Department of Agriculture, through a consultation conducted by the Aquaculture Association of South Africa, to develop a draft "national" aquaculture policy incorporating both freshwater and marine aquaculture.

Despite South Africa's lack of comprehensive aquaculture policy and legislation, it possesses a well developed institutional environment, which supports the mariculture sector – albeit in an uncoordinated manner. DEAT-MCM is designated as the lead agent for mariculture development and is the primary government department responsible for mariculture permitting and compliance with environmental laws. It possesses a Mariculture Unit which administers aquaculture environmental management, permitting and research.

Other departments that have legislated mandates which impinge on mariculture policy and governance include the Department of Trade and Industry, the Department of Science and Technology, the Department of Agriculture, the Department of Water Affairs and Forestry, the provincial governments and local authorities.

Mariculture producers in South Africa are well organised into producer associations. The Aquaculture Association of Southern Africa (AASA) is an umbrella body representing individual producer associations (www.aasa-aqua.co.za). The Abalone Farmer's Association of Southern Africa (AFASA) is a very active producer association, which promotes research to solve common problems and undertakes various projects to promote the interests of abalone farmers.

There is great depth in South African research organisations and mariculture is fairly well served by a number of institutions including DEAT-MCM's Sea Point research aquarium, Rhodes University's Department of Ichthyology and Fisheries Science (DIFS), Stellenbosch University's Division of Aquaculture, and individual researchers based at other Universities and the CSIR (Council for Scientific and Industrial Research).

The South African aquaculture industry is served by a fairly well established services sector, which includes consultancy services, a feed industry, an equipment and plastics manufacturing sector, engineering and other specialist skills, and specialised transport and security services. South Africa possesses a sophisticated financial sector and finance for mariculture is available from various private and public funding institutions. Public sector funding institutions with an aquaculture portfolio include the Industrial Development Corporation (IDC), Development Bank of Southern Africa, and the Land Bank.

Industrial incentives for aquaculture are provided by the Department of Trade and Industry (DTI) through its Small and Medium Enterprise Development Programme (SMEDP), Support Programme for Industrial Innovation (SPII) and the THRIP (Technology and Human Resources for Industry Programme) fund. The South African government has created Industrial Development Zones (IDZ's), which offer tax and other incentives to investors. Plans for aquaculture development nodes have been included in the Coega and East London IDZ's which should be attractive to investors in aquaculture.

Aquaculture training is offered at University level in South Africa, but there is a dearth of facilities for technical and in-service training. The only non-degree offerings are occasional short introductory courses offered by Stellenbosch University and Rhodes University.

In terms of South Africa's Animal Health Act, responsibility for aquatic animal health certification falls on the State Veterinary Service within the Department of Agriculture. While the State Vet acknowledges this role, manpower capacity within the Department to certify the health of aquatic organisms is limited.

South Africa has a well established fishery products processing sector, which exports fishery products all over the world. South Africa complies with the HACCP and other protocols required by the EU and other authorities for the export of fishery products. The South African Bureau of Standards (SABS) is recognised as a competent certification authority. However, the export of shellfish to the EU is currently banned as South Africa does not yet have an EU approved water quality monitoring programme. A shellfish sanitation and water quality monitoring project led by Marine and Coastal Management in partnership with industry has been underway for the last few years, and South Africa has made good progress towards establishing a record of harmful algae and other water quality parameters at selected aquaculture sites. It is expected that South Africa will be ready for an EU audit of its shellfish sanitation and water quality monitoring programme within one year.

South Africa is well positioned to stimulate mariculture development in the BCLME region because it has an established industry and supporting infrastructure, including very good research institutions capable of developing technology suited to local environmental conditions. However, in order to cooperate with BCLME neighbours, a regional policy, structure, and resources will have to be put in place.

REGIONAL AQUACULTURE POLICY OPTIONS

Based on the review of regional aquaculture policy and institutional capacity, regional aquaculture policy options are summarised below. The responsible development of aquaculture in the BCLME region requires regional cooperation in two broad areas:-

1. Environmental management. This involves management of the environmental aspects of aquaculture such as the use of exotic species, and disease control.
2. Industry development. Interventions are required to establish this new industry as a sustainable source of fishery products. These include technology development, manpower training, and product health certification.

Key elements of the regional aquaculture policy options include harmonisation of management protocols, information sharing, opportunity to comment on management actions which may have an effect on BCLME ecosystem health, joint actions and projects, capacity building, and sharing expertise.

Specific regional policies and strategies are suggested for:

1. The Use of Exotic Species for Aquaculture
2. Aquatic Animal Health
3. Aquaculture Products and Public Health
4. Aquaculture Research
5. Aquaculture Sector Management Capacity Building
6. Sustainable Industry Development

WAY FORWARD

Following the acceptance of regional aquaculture policy options by the BCLME partner countries, a process to define an implementation plan for regional aquaculture policy will be conducted as the final phase of the BCLME aquaculture policy project. This will take practical and resource issues into account and define a realistic plan for policy implementation. It is expected that regional aquaculture policies will be directed and reviewed by the proposed Benguela Current Commission.

Comments and recommendations on the draft “BCLME Regional Aquaculture Policy Options” were made at a workshop of BCLME national department aquaculture representatives at the AASA Conference in Grahamstown in September 2005. Additional comment was received from Ms Sandy Davies, SADC Fisheries Coordinator. The comments and suggestions were incorporated into the current document.

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LIST OF ABREVIATIONS

AASA	Aquaculture Association of Southern Africa
AFASA	Abalone Farmers Association of South Africa
AGOA	African Growth and Opportunity Act
BCLME	Benguela Current Large Marine Ecosystem
COMESA	Common Market of Eastern and Southern Africa
CPPP	Community Public Private Partnership
CSIR	Council for Scientific and Industrial Research
DEAT-MCM	Department of Environmental Affairs and Tourism, Branch Marine and Coastal Management
DIFS	Department of Ichthyology and Fisheries Science, Rhodes University
DoA	Directorate of Aquaculture
DTI	Department of Trade and Industry
EIA	Environmental Impact Assessment
EPZ	Export Processing Zone
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FDC	Fisheries Development Corporation
GDP	Gross Domestic Product
GIS	Geographical Information System
HAB	Harmful Algal Bloom
HACCP	Hazard Alert Critical Control Point
ICES	International Council for the Exploration of the Sea
IDC	Industrial Development Corporation
IIM	Instituto de Investigação Marinha (Marine Research Institute), Ministry of Fisheries, Angola
IDZ	Industrial Development Zone
IRA	Import Risk Assessment
MCM	Marine and Coastal Management
MFMR	Ministry of Fisheries and Marine Resources, Namibia
MISA	Mariculture Institute of South Africa
MLRA	Marine Living Resources Act
NSSP	National Shellfish Sanitation Programme
OIE	Office International des Épizooties
SABS	South African Bureau of Standards
SACU	Southern African Customs Union
SADC	Southern African Development Community

SMEDP	Small and Medium Size Enterprise Development Programme
SPII	Support Programme for Industrial Innovation
SPS	Shellfish Phytosanitary Agreement
THRIP	Technology and Human Resource for Industry Programme
UNAM	University of Namibia
WTO	World Trade Organisation

1. BACKGROUND AND PROJECT OBJECTIVES

This review of the aquaculture policies and institutional capacity of Angola, Namibia and South Africa was undertaken as part of the Benguela Large Marine Ecosystem (BCLME) Project LMR/MC/03/01: Development of Responsible Aquaculture Policy for the Region. The outputs from the project include:

- Development of draft aquaculture guidelines and a national policy for the Angolan Government.
- Assessment of existing regional policy and institutional capacity for aquaculture development (current report).
- Recommendations on regional aquaculture policy options and strategies including recommendations for harmonization of policies (current report).
- A plan for implementation of regional aquaculture policy.

The project was executed by a consortium made up of Enviro-fish Africa (Pty) Ltd (a consulting company based at Rhodes University), IIM (Marine Research Institute) Angola, and Ministry of Fisheries and Marine Resources, Namibia.

The objectives of the Regional Aquaculture Policy Review were:

1. To present an overview of existing aquaculture policy and institutional capacity in the three BCLME countries, namely, Angola, Namibia and South Africa.
2. To quantify existing institutional capacity in terms of personnel, skills, organizational structures and budgets for various institutions (public and private).
3. To evaluate existing national policies and institutional capacities in terms of national development objectives and legislation, SADC regional fisheries policy, and international norms for environmental stewardship, governance, best practice etc.
4. To evaluate the ability of Angola, Namibia and South Africa to implement existing and proposed policy on aquaculture.
5. To compile a “diagnostic analysis” of key issues to be addressed in the policy making and institution building processes.

The assignment was carried out between November 2003 and November 2004 and involved:

- Discussions with policy makers, public sector managers and research institutions. The project did not however require extensive consultation in Namibia and South Africa as the author has recently compiled reports on aquaculture sector development based on consultations in these countries (Britz et al., 2003, Britz, 2004).
- Collection of literature, documents and secondary sources of information relevant to the aquaculture sub-sector.
- Analysis of information and report writing.

2. RATIONALE FOR AQUACULTURE POLICY DEVELOPMENT IN THE BENGUELA LARGE MARINE ECOSYSTEM (BCLME) REGION

Aquaculture has boomed around the world since the 1980s and is set to continue to grow at a faster rate than other food producing sectors for at least the next two decades (Delgado, 2003). It is expected that by 2020 40% of the world's fish supply representing 52 million metric tonnes will come from aquaculture. The implications of such rapid change for ecosystems and the associated human populations are significant. It is recognised that in order to avoid negative environmental and social consequences, and to optimise economic and social benefits, appropriate policies and long term planning are required both at a national and regional level. The BCLME programme thus presents a timeous opportunity to develop responsible aquaculture policy for the region.

The Benguela current ecosystem offers a significant opportunity for aquaculture development. The nutrient rich ecosystem is highly productive biologically and offers a number of indigenous species with good market and culture potential. Despite this environmental potential aquaculture in the BCLME region has not developed as it has in many other parts of the world, and its contribution to fishery production in all three countries is negligible. Significant constraints to aquaculture development exist. These include a lack of technology and trained manpower, unsupportive institutional and legal frameworks, poor infrastructure in certain regions, and a lack of finance. These problems are typical of young industries in developing countries, but global experience has shown that they can be overcome through the formulation of sound policies and the implementation of long term sector development plans. In the absence of aquaculture policy and development plans two negative outcomes are likely:

1. The aquaculture industry does not grow, its potential welfare contribution is not realised, and as a result of poverty, human populations place increasing pressure on the coastal ecosystem through unsustainable practices.
2. The industry grows organically but in an uncontrolled way resulting in many negative and unforeseen environmental and social consequences. The uncontrolled growth of shrimp farming in Asia in the 1980s is an example of this scenario.

At a political level the potential contribution of aquaculture to fishery production and welfare gains is now recognised in Angola, South Africa and Namibia, and recently processes to develop and implement policy and legislation have been implemented in all three countries. These essential initiatives, which have been led by the fishery departments in the respective countries, have primarily been aimed at creating the necessary legal and regulatory frameworks to enable aquaculture to be practised. Policies and deployment strategies to promote sector development are still fairly rudimentary in all three countries, and will have to be developed if the industry is to grow to its economic potential. The main challenge here is that of institutional alignment and coordination so that public and private sector organisations responsible for economic development incorporate aquaculture into their mandates.

At a regional level, the SADC (Southern African Development Community) protocol on fisheries includes aquaculture and is a useful guide to policy makers and planners at both the national and regional level (See SADC Protocol extract in the text box below; SADC, 2001). The SADC protocol is strongly development orientated and requires Governments to recognise and promote aquaculture as a distinct enterprise in order to optimise its economic contribution.

The national aquaculture policies of Angola, South Africa and Namibia make a distinction between freshwater aquaculture, which is seen as a potential source of food security, and marine aquaculture (mariculture), which is capital and technology intensive, and is seen as a potential source of high value fishery products for export. This distinction is reflected in the existing and proposed public sector support measures for aquaculture, which in freshwater environments are

largely targeted at rural communities, and in coastal areas aimed at facilitating access to industry and capital investment.

At a macro-economic level it is predicted that the volume of high value fish exports from sub-Saharan African fisheries will decline over the next 20 years, and that real prices for high value fish will rise (Delgado, 2003). By contrast aquaculture in sub-Saharan Africa is expected to grow at 5.8% per annum, a rate higher than the projected global average of 3%. The opportunity for marine aquaculture in the BCLME region therefore clearly exists but the challenge to policy makers and planners is to define what interventions need to be made now, in order for marine aquaculture to realise its environmental and market potential over the next two decades.

In the following sections, the aquaculture sub-sectors of Angola, Namibia and South Africa are briefly described and national policies and institutional capacities reviewed. This is followed by a diagnostic analysis of regional policy requirements and interventions required to ensure that aquaculture develops to its potential in a responsible manner in the BCLME.

Extract on Aquaculture from the SADC Protocol on Fisheries Article 13 (SADC, 2001).

i) Government shall take the necessary steps to optimise the economic contribution of aquaculture to the country.
ii) Government shall review policies, legislation, plans and institutions to address the characteristics and needs of aquaculture in recognition of the fact that aquaculture is a distinct enterprise.
iii) Government shall promote on-site research, demonstrations and increased practitioner-to-practitioner extension as ways to increase economic and social benefits from aquaculture.
iv) Government shall promote private sector participation in aquaculture through access arrangements to designated areas and provide or facilitate the necessary support services and access to finance.
v) Government shall co-operate, where necessary, in the promotion of inland and marine ranching and stock enhancement.
vi) Government shall undertake research and technological development, particularly in identifying new sources of locally available raw materials for fish feed.
vii) Government shall not allow the introduction of exotic species or genetically modified species to aquatic eco-systems unless the impact has been fully investigated.
viii) Government shall establish standard guidelines and regulations for the application of environmental impact assessments.
ix) Government shall monitor diseases and the spread of diseases of relevance to cultured aquatic species.

3. ANGOLA

3.1 National Context

The end of civil war in Angola has introduced a new era of rebuilding, normalisation of relations with neighbours, and re-integration into the global economy. The war resulted in a concentration of people in urban areas and a population shift into coastal areas placing additional exploitation pressure on marine resources. Angola is well endowed with both freshwater and marine environments suitable for aquaculture and the government has been quick to recognise aquaculture as a potentially significant source of food security and economic benefit. Angola's 1600 km coast is largely undeveloped, and spans tropical to temperate habitats, while the major freshwater drainages (e.g. the Zaire, Zambezi and Cunene River systems) possess an abundance of water and aquatic habitats. The Aquaculture Directorate within the Department of Fisheries' Institute for Marine Research (Instituto de Investigação Marinha - IIM) has facilitated the drafting of aquaculture policy and legislation, conducted site surveys, and responds to applications from the private sector to undertake aquaculture.

The challenge of establishing any new industry in Angola is however huge, given the size of the country, degraded infrastructure, and limited human and financial resources. Limited resources, particularly human skills, need to be wisely deployed to achieve optimum outcomes. Government has taken a policy decision that the private sector should lead the development of the marine aquaculture sector, while communal aquaculture for food security should be promoted in rural areas. The main challenge to Government is to be able to respond appropriately to interest shown by the private sector so that potential investment is not lost, while ensuring that aquaculture is undertaken in an environmentally sustainable manner. The coast possesses a number of sensitive habitats (for example, mangrove swamps in the North) which could be compromised by inappropriately sited aquaculture operations. Furthermore, the economic pressure to introduce exotic species for which culture techniques and markets are established is high[1]. Therefore it is essential that sound policies and protocols are established to promote and regulate the growth of aquaculture so that individual managers are not required to make *ad hoc* decisions on a case by case basis.

A policy process was initiated in Angola during 2002/2003 which has resulted in a first draft of an aquaculture policy (IIM, 2003a), a description of the status of aquaculture (IIM, 2003b), and a draft aquaculture master plan (IIM, 2003c). During 2004, the BCLME aquaculture policy project in collaboration with IIM submitted a second aquaculture policy draft for consideration by the Angolan government. The IIM facilitated the drafting of the first aquaculture legislation which is included in the Act on Biological Aquatic Resources. This Act was recently passed by the Angolan legislature. Angola is therefore relatively well positioned to support aquaculture development and to participate in regional aquaculture policy initiatives.

3.2 Status of Aquaculture

Commercial aquaculture in Angola is currently restricted to a few tilapia farm developments, and at the time of writing no commercial operations were known to exist in the marine environment. Investigations during both the pre- and post- independence periods have however highlighted the potential for aquaculture in Angola and regular enquiries from prospective commercial enterprises are received by the Ministry of Fisheries.

[1] The Nile tilapia, *Oreochromis niloticus*, was introduced into a fish farm just North of Luanda by a Brazilian aquaculture venture in 2003 apparently without any due process of environmental impact assessment. This has serious implications for Angola's freshwater fish fauna as *O.niloticus* has a record of being an invasive species that interbreeds with other indigenous African tilapia species.

3.3 History of Aquaculture in Angola

Aquaculture in Angola has a history dating back to the Portuguese colonial era, when experimental freshwater fish farming was undertaken in the Provinces of Huambo, Moxico, Uige, Lunda North, Kwanza South and Cubango. There is a record of an attempted introduction of *Tilapia mossambica* in Huambo province (IIM, 2003b, c).

Trials with mussels (*Perna perna)* were conducted in Lobito Bay by the Mission for the Bioceanological Study of Fishing in Angola (MBFA) from 1970 to 1972. The study showed that it took six to seven months to rear mussels to commercial size. Experiments were also undertaken on the culture of oysters at Santiago Beach, prior to independence, with promising results (IIM, 2003b, c). After independence, further growth trials with mussels were carried out by the Institute for Marine Research (IIM) at the Sangano Beach and in Suto Bay in 1990/1991, and confirmed that it was possible to harvest two crops of *Perna perna* a year. Growth rates of the *Mytilus* species were slower and this species yielded only one crop a year.

In 1991, experiments by IIM were undertaken in collaboration with North Korean scientists to rear the Angolan prawn species *Penaeus kerathurus* and *Penaeus duorarum* under captive conditions. A biological study was also carried out on two species of lobster, namely *Panulirus regis* and the *Scyllarides herklotsii* (IIM 2003 a, c).

In Lake Kilunda, located in Bengo, a study on the suitability of the lake for stock enhancement using tilapia species (*Oreochromis angolensis* and *Oreochromis macrochir*- known locally as *cacusso*), was undertaken by IIM (IIM 2003c).

In 1994 a study by a technical team from the FAO (Food and Agriculture Organisation of the United Nations) evaluated the potential for aquaculture development in the SADC region. It confirmed that optimum environmental conditions were present for the development of aquaculture in Angola (Sen, 1994).

3.4 Identification of Aquaculture Sites

The IIM's Aquaculture Directorate established a programme to identify and characterise suitable sites for aquaculture in 2003. A series of site identification surveys of both the freshwater and marine environments was undertaken with assistance from Yugoslavian and Israeli experts (IIM 2003d, e). Observations were made on the characteristics of each site, water quality samples were taken, and recommendations made on their aquaculture potential and on how they could be developed. In the fresh water environment fish samples were collected for identification as there is a paucity of knowledge on Angola's freshwater ichthyofauna.

Sites in the marine environment which were identified to have mariculture potential included (IIM, 2003e):

Província de Luanda:	Praia do Santiago, Enseada do Caíolo
Província do Bengo:	Baía do Suto, Enseada de São Brás
Província do Kwanza Sul:	Enseada do Quicombo, Baía do Porto Amboím
Província de Benguela:	Praia da Catumbela, Baía da Caotinha, Baía Farta, Ponta da Equimina, Baía dos Elefantes

As a result of the surveys great interest and enthusiasm for aquaculture was generated amongst provincial governments, and the general public. The following recommendations on the development of aquaculture were made in the marine aquaculture survey report:

1. A "Strategic Plan for the Development of Aquaculture in Angola" must be formulated as quickly as possible, which defines policies and strategies to follow in order for these activities to be carried out and developed in a responsible and sustainable manner.

2. It is urgent that aquaculture regulations and legislation be drafted, which include those already stipulated in international legislations relating to this matter, in order to control the activity. (Such as a Code of Best Practice based on the Code of Conduct for Responsible Fisheries by the FAO etc.)

3. Funding and support must be provided for the creation and development of aquaculture, by the national government as well as by provincial governments. A system of credit for the private sector is required.

4. An awareness and education program needs to be implemented in order to ensure that the Angolan people become conscious of, and are trained in aquaculture.

5. A degree / diploma program of a level accepted by government institutions must be introduced, for communities and for the private sector in order to increase the national capacity for carrying out aquaculture projects, and also for technical assistance and support for these activities in general.

6. A research centre needs to be built for breeding crustaceans at Santiago Beach (Luanda Province), which must include suitable breeding specimens, larvae production, plankton, *Artemia*, feeds, and growth and fattening tanks. This research centre must also have a diploma / degree program running in order to start up other aquaculture activities.

7. A research centre for cultivation of mussels needs to be built at Baía dos Tigres, in order to provide technical assistance to the private sector for mollusc cultivation projects (such as those of mussels, oysters etc.)

8. Further studies and research must be undertaken on water quality, environmental and biological parameters, the monitoring of timing and heights of tides at different localities, as well as the determination of prevailing wind speed and direction.

9. The Provinces of Cabinda and Bengo, as well as Zaire and Namibia must be visited as their potential for aquaculture development has not yet been evaluated.

A recent development is the undertaking by the BCLME programme to identify aquaculture development nodes in the BCLME countries, and to provide a profile of them on a web-based GIS database. This is seen as an essential next step building on the survey undertaken by IIM.

3.5 Policy and Legislation

3.5.1 Angola's Aquaculture Policy

The first draft of Angola's aquaculture policy was developed by IIM in 2003, and then expanded as part of the current BCLME project. The policy was submitted to the Angolan Ministry of Fisheries in May 2004. It was translated into Portuguese and circulated to other relevant Government Departments for comment. The aquaculture policy was approved with small changes by the IIM Conselho de Direcção, the Ministry of Fisheries Conselho de Direcção, and by National Concelho Consultivo. In the next and final step the document will be presented at The Conselho de Ministros (Ministers Council) by the Minister of Fisheries.

The policy is based on accepted international guidelines and protocols and is designed to facilitate the sustainable and responsible development of aquaculture for the social and economic benefit of all Angolans. Important elements of this policy are:

- Freshwater and marine aquaculture is to be managed under a single policy and legislative framework.
- The Angolan aquaculture policy incorporates the obligations of the SADC aquaculture protocol.
- The Ministry of Fisheries is the lead authority governing aquaculture in Angola. The Ministry of Fisheries, through the Marine Research Institute (IIM) will take charge of aquaculture policy deployment strategies, regulation, sector promotion, facilitation of development, guidance of research, extension and support. In this regard the Ministry of Fisheries will play a key role in the formation of producer organisations and the dissemination of aquaculture technologies to expand this sector in a responsible and environmentally sensitive manner to the ultimate advantage of all Angolans. Of specific interest will be the promotion of communal -, micro -, small – and medium aquaculture enterprises developed by Angolan citizens and the integration thereof with traditional and alternative fisheries.
- The development of marine aquaculture is to be primarily private sector driven, with technical support from IIM.
- An aquaculture right is to be defined in law – in terms of the draft “Act on Aquatic Biological Resources”.
- Provision for the declaration of “aquaculture zones”.
- Provision for the drafting of sector development plans.
- Provision for fiscal incentives to promote aquaculture, including Government led technology development.
- A framework for “best management practice”.
- Control of the introduction of exotic species.
- An emphasis on the use of indigenous species for aquaculture with technical assistance from IIM.
- Equitable access to aquaculture opportunities.
- Facilitation of arrangements for product export including phyto-sanitary arrangements.
- Technical cooperation to promote aquaculture development.
- Cooperative governance on ecosystem issues, for example, the introduction of exotic species into the BCLME.

3.5.2 Aquaculture Legislation

Aquaculture development is provided for in Article 30 of the current Fisheries Law of 1992, but specific rules were never promulgated. The Angolan Government is considering revisions to the Law, and a separate law, the Act on Aquatic Biological Resources, will provide the legislative framework for aquaculture in Angola. The Act formalises the obligations of the state and aquaculturists respectively, to promote and govern aquaculture in a responsible and sustainable manner to achieve economic development and food security. The articles of the Act include provisions for:

- Development Plans
- Licensing of Activities

- Coordination with other Ministries
- Refusal of Licences
- Use of Soil and Water
- Certification of Aquaculture Products

At the time of writing the BCLME team only had access to the draft Act on Biological Aquatic Resources. The Act had been tabled in the Angolan legislature and approved, but the final version had not been published.

Articles 31 to 36 of The Fisheries Law of 1992 provide for quality of fish for export. Article 31 makes the Ministry of Fisheries responsible for establishing the regulations and mechanisms to monitor fish quality for export. The Ministry of Fisheries together with the Ministry of Health are recognized as the competent authorities to establish regulations for processing of fish products and to adopt necessary measures to ensure inspection of fish products (Article 33). Article 34 outlines the necessary conditions for the export of fish products and the requirement of a "certificate of quality" (Currie et al, 2004).

3.6 Institutional Capacity

While Angola is well endowed with both inland and marine aquatic resources suitable for aquaculture, infrastructure and institutional capacity are the two primary constraints to the development of aquaculture. A range of institutions are prerequisites for aquaculture development. These include governance and legal institutions, environmental management institutions, organisations representing producers, research and technology development institutions, product health certification institutions, international liaisons to facilitate technology transfer and product export, financial institutions, and training institutions.

3.6.1 Governance and legal institutions

Angola possesses a functional legislature and administration, and as outlined above has made a good start to putting in place the necessary policy and legislative framework, and appointing a lead Department to administer and promote aquaculture. The only public sector organisation currently tasked with the promotion of aquaculture in Angola is the Marine Research Institute's (IIM) Aquaculture Directorate. The aquaculture directorate is staffed by a core of three professional staff who are served by the administration and technical support section of IIM. The task of initiating the development of the aquaculture sector for both marine and inland waters in Angola is clearly a huge one for such a small team, and this has required the prioritisation of certain tasks. The Aquaculture Directorate's primary activities during 2003/2004 have been:

- Policy development and planning.
- The drafting of legislation.
- International liaison.
- Administration of aquaculture applications.
- Liaison with other government departments at national, provincial and municipal level.
- Site surveys.

3.6.2 Environmental management institutions

Aquaculture entails the intensive production of certain species in the aquatic environment, and therefore it is an activity whose effects require management within sustainable limits.

Internationally, certain norms and institutions for the management of aquaculture have been developed, and Angola's aquaculture policy seeks to align the country's management procedures with internationally accepted protocols and institutions.

Angola possesses the requisite governance and administrative institutions to support the management of aquaculture; however organisational capacity will have to be built in the public sector to carry out a number of specific environmental management functions. In terms of Angolan aquaculture policy, the IIM as the lead agent for aquaculture development is tasked with this process. Due to the lack of manpower capacity and resources within IIM, the development of expanded or new institutional capacity needs to be carefully evaluated on the basis of demand from industry. Angolan policy is that the private sector should lead the development of the marine aquaculture sector, and IIM has undertaken to support the development of the mariculture industry by providing the appropriate institutions.
If the mariculture industry develops in Angola, enhanced institutional capacity will be required to perform the following functions:

- Undertake and evaluate aquaculture EIA's.
- Make decisions on the use and management of exotic species.
- Monitor the effects of aquaculture operations on the environment and support the implementation of "best practice".
- Monitor disease and provide health certificates for live exports and imports.
- Set up a shellfish sanitation programme.
- Regulate and apply standards in the feed industry.
- Certify product health.

The BCLME programme provides a framework for regional environmental governance and Angolan aquaculture policy states that decisions with transboundary implications such as the introduction of exotic species should be undertaken in consultation with the BCLME partners. A BCLME project is already underway to review the effects of harmful algal blooms on aquaculture and develop a model for shellfish sanitation that is applicable in all three BCLME countries.

3.6.3 Producer organisations

There are only a few commercial tilapia operations in Angola and no marine aquaculture ventures are operational. There appears to be no aquaculture producer organisations in Angola, but IIM has good communication channels with existing producers who are consulted from time to time on aquaculture policy and other issues. It is one of the goals of Angola's aquaculture policy to promote the formation of aquaculture producer organisations. A logical step would be a linkage between an Angolan aquaculture association and the Aquaculture Association of Southern Africa (AASA), which is an umbrella body of aquaculture producer associations. AASA promotes the interests of producers and provides certain services and linkages to international bodies such as the World Aquaculture Society.

3.6.4 Research and technology development institutions

The Marine Research Institute (IIM) is primarily equipped to undertake research, and has in past years executed aquaculture technology development projects such as the evaluation of the culture potential of indigenous mussel and prawn species. At present there are no active research programmes within IIM or other Angolan research institutions; however Angola's aquaculture policy envisages a strong research and technical support role for IIM as the aquaculture sector development plan is rolled out. To achieve this, a "programme approach" will be required within

which dedicated researchers are located within IIM and collaborative links are formed with international research partners and with local universities.

Since aquaculture is a common regional undertaking with similar goals, a regional approach to aquaculture research and technology development seems logical. Regional exchange of expertise and collaboration on specific projects in Angola is a logical strategy to build both Angolan and regional capacity for aquaculture technology development. A regional policy on aquaculture research and technology development will thus be proposed as part of the BCLME Aquaculture project's development of regional policy options.

3.6.5 Product health certification institutions

Angola has an active fishing industry, and has received assistance from the European Union to set up the necessary facilities and programmes (eg. HACCP) for the export of fishery products. The Angolan Ministry of Fisheries is the recognized Competent Authority, with microbiological testing and certification carried out at IIM (Instituto de Investigaçao Marinha). Microbiological analyses are carried out on water and fish products for total plate counts, *Salmonella,* total coliforms, and *E.coli* (Currie et al., 2004).

If shellfish are to be exported, an EU approved shellfish sanitation programme needs to be developed. A suite of three BCLME Projects has been launched to promote the establishment of harmonised shellfish sanitation procedures in the three countries. The BCLME projects are:

1. BCLME Project EV/HAB/02/01 Harmonisation of Regulations for Microalgal Toxins for Application in Countries Bordering the Benguela Current Large Marine Ecosystem. The specific objective of Project EV/HAB/02/01 is to develop, via a review and a multi-stakeholder consultative process, consistent regulations and/or guidelines pertaining to microalgal toxins, which can be applied uniformly in Angola, Namibia and South Africa. These regulations will specify, *inter alia,* methods to be used and management actions to be taken, including appropriate contingency measures.
2. BCLME Project EV/HAB/02/02a: Development of an Operational Capacity for Monitoring of Harmful Algal Blooms in Countries Bordering the Northern Part of the Benguela Current Large Marine Ecosystem: Phase I – Design.
3. BCLME Project: EV/HAB/04/SHELLSAN Development of a Shellfish Sanitation Program Model for Application in consort with the Microalgal Toxins Component.

The typical components of a shellfish sanitation program include (Currie et al. 2004):

- Growing area classification for sanitary pollution.
- Water quality monitoring.
- Marine biotoxin management plans and contingency plans.
- Processing, shipping and handling of live shellfish.
- Laboratory methods for microbiological contaminants and marine biotoxins.
- Enforcement of shellfish safety regulations.

Currie et al (2004) state: “Each of these components requires a regulatory framework for the implementation and enforcement of the policies and procedures that will result in an effective shellfish sanitation program. Without appropriate regulatory authority and specific policies and procedures in place, the Competent Authority for each shellfish-producing nation will be unable to make the case that their products are safe for importation into receiving nations. It is assumed that

the importing markets are either in the EU, Canada or the United States, as these have the most stringent policies. Products acceptable to the EU, for example, will generally be acceptable to the U.S. as well."

To date no formal HAB monitoring program has existed in Angola and no routine toxin testing is carried out as no laboratory is competent or accredited to conduct these tests. Currie et al (2004) have recommended that "it would be possible to incorporate microbiological criteria, including the required sampling and analytical methods for a model shellfish sanitation program, into section V/I/4 of the Fisheries Law. In particular the procedure to be followed for the program should be included in the draft Law on Aquatic Resources, which emphasizes product quality and regulation."

The setting up of a shellfish sanitation programme is a substantial and costly undertaking both for the private and public sector. While it is desirable to have knowledge on harmful algal blooms in Angola, and a shellfish sanitation model applicable to all three BCLME countries, the actual implementation of a shellfish sanitation programme needs to be a considered decision based on the economic feasibility of a future shellfish cultivation industry in Angola. Therefore it is recommended that an economic feasibility study on an export orientated shellfish industry be undertaken to inform a decision whether or not to proceed with an EU compliant shellfish monitoring programme.

3.6.6 International Cooperation

International technical cooperation is a key strategy in Angola's rebuilding process. International linkages and cooperation will be essential to the development of the aquaculture sector because:

- It is a technology driven sector and technology and skills transfer will be essential to establish viable and competitive operations.
- Internationally accepted environmental governance and management protocols are increasingly a prerequisite for exports to developed countries.
- The export of aquaculture products is increasingly dependent on the implementation and auditing of health certification protocols as specified by the recipient countries.

Angola has received assistance from various countries in the field of aquaculture including North Korea (evaluation of the culture potential of indigenous prawn species), Israel and Yugoslavia (aquaculture site selection) and currently via the BCLME partners to develop national and regional aquaculture policy, select mariculture sites, and develop a model for shellfish sanitation and harmful algal bloom monitoring.

In 2003, President Lula of Brazil visited Angola and included expertise in aquaculture in his official delegation. This resulted in Brazilian interest in investment in aquaculture projects in Angola.

The BCLME programme presents an ideal opportunity to promote integrated regional aquaculture cooperation. The BCLME aquaculture project is developing regional policy options in consultation with the three partner countries. Areas of ongoing regional collaboration could include:

- Research and technology development.
- Sector development planning.
- Environmental management including aquaculture EIA's, best practise guidelines, and management of exotic species.
- Training of personnel.

- Product health certification.
- Finance of aquaculture ventures. For example, the South African Industrial Development Corporation and Development Bank of South Africa have a SADC wide investment mandate and both have a portfolio for investments in aquaculture.

Clearly there is a lot of work, and appropriate regional institutions will be required to implement the proposed regional cooperation. In the first half of 2005, regional aquaculture policy will be agreed and an implementation plan drafted. It is expected that the central institution responsible for promoting regional aquaculture cooperation will be the proposed Benguela Current Commission. Executing agencies such as BENEFIT[2] will probably be delegated to promote and administer various projects.

This would include active contact with the Aquaculture Association of Southern Africa (AASA) and the Benguela Current Commission. Furthermore contact with organisations such as the World Fish Centre and the FAO is important to ensure that Angolan aquaculture is aligned with the international aquaculture industry.

3.6.7 Financial Institutions

To date, there has not been a significant demand for finance for aquaculture ventures in Angola. However, global experience shows that finance for pioneer aquaculturists is usually a constraint as the establishment of new technologies in new environments is fraught with risk and conventional commercial finance facilities are often not suited to the needs of the aquaculture entrepreneur. Therefore in many countries where a planned approach to aquaculture development has been adopted, various financial facilities, support measures and institutions are provided which are tailored to the needs of the pioneer farmers.

Angola has a functional financial sector and thus there is no fundamental constraint to the development of appropriate financial institutions to serve aquaculture development. The National Bank of Angola is a development orientated institution and it has been suggested by IIM that the Angolan Government provide appropriate financial facilities for aquaculture through the National Bank. As mentioned above regional lending institutions such as the South African Industrial Development Corporation and Development Bank of Southern Africa will consider investments in Angola.

Apart from direct loans, financial incentives which have worked well in other countries to support sector development include:

- Tax breaks during the start-up phase of a new aquaculture venture.
- Grants and subsidies for research and technology development.
- Capital grants to pioneer ventures if certain milestones are achieved.
- Grants for market research and travel.

The justification for providing grants to pioneer farmers is that if the public sector shares their initial risk, more entrepreneurs will enter the sector, more will be successful, and once the technology is established others will follow their example creating a significant socio-economic benefit. The Angolan aquaculture policy suggests that Government create appropriate financial institutions to

[2] BENEFIT is a collaborative programme promoting research and training in marine science in the Benguela ecosystem region. Angola, Namibia and South Africa are participants and additional funds for the programme are provided through various international donor organisations including NORAD and GTZ.

support sector development. The task will now be to assess the needs of potential investors, as well as the demand for such facilities, and then create the necessary instruments.

3.6.8 Training institutions

If aquaculture is to develop in Angola in an equitable manner, the training of nationals in aquaculture is essential. It is expected that the initial investment in the sector will be led by foreign nationals possessing capital and technology in partnership with Angolan nationals. In order to participate meaningfully in the sector, particularly at a professional or entrepreneurial level, Angolans need to be empowered with appropriate skills. This is a major challenge as Angola does not offer an aquaculture curriculum in any of its educational institutions, and there is no existing industry where young professionals can gain experience, and be mentored to take up future leadership roles.

A strategy to provide access to aquaculture training institutions for Angolans thus needs to be devised as a matter of urgency. In the initial phase of industry development, it is suggested that the training of Angolan nationals in other countries with established aquaculture educational institutions would be most appropriate. As the local industry gains a critical mass and demand for training grows, local institutions should incorporate aquaculture into their curricula.

It is suggested that a regional approach to aquaculture training be adopted as the aquaculture industries of SADC countries are underdeveloped and the efficient use of existing resources and facilities is logical. The BCLME programme is an ideal vehicle through which to develop arrangements for the training of Angolans in aquaculture. It is suggested that the BCLME aquaculture project develop a draft regional policy on training in aquaculture.

3.7 Diagnostic Summary

- Angola possesses suitable environmental conditions for both freshwater and marine aquaculture.
- Angola has pro-actively developed an aquaculture policy, legislative framework and the basic institutions required to support sector development.
- It is Angolan policy that marine aquaculture should be private sector led, and that Government through IIM will provide the necessary institutional and technical support.
- The major constraints to aquaculture development are poor infrastructure and weak institutional capacity.
- Regional and international cooperation will be required to build institutional capacity to support aquaculture development in Angola.
- It is suggested that a regional aquaculture policy be developed to promote training, research and technology development, finance of aquaculture operations, environmental management of aquaculture including exotic species, EIA's, shellfish sanitation and "industry best practise".

4. NAMIBIA

4.1 National Context

Fish and fisheries play a central role in the economy, livelihoods and food security[3] of many Namibians and hence the development of aquaculture is regarded as strategically important by the Namibian government (MFMR, 2004). The fisheries sector in Namibia is a major contributor to GDP (gross domestic product) contributing almost N$ 1.8 billion or 7.5% of the country's GDP in 2000[4] (Britz et al., 2003). It is also one of the main sources of employment for Namibians[5]. The aquaculture sub-sector in Namibia is relatively undeveloped and its contribution to fishery production is currently minimal. However, the Namibian natural environment and infrastructure offer a significant opportunity for the expansion of production. The Namibian Government has recognized this potential and developed aquaculture policy, legislation and a deployment strategy to provide an enabling environment for aquaculture development. According to anecdotal reports by Namibian officials, President Nujoma took a personal interest in the development of this new sub-sector prior to his retirement. Namibian policy mirrors Angolan policy in that freshwater aquaculture is primarily regarded as a source of food security for inland rural populations, while marine aquaculture (mariculture) is seen as a commercial activity in the coastal zone with the potential to create jobs, entrepreneurial opportunities and high value export products. This report will focus on the mariculture sub-sector.

Previous reports on the potential for mariculture in Namibia have been fairly optimistic, but emphasised the interventions that will be required to develop the sector (Balarin, 1996; Britz et al., 2003; MFMR, 2004). The temperate, nutrient rich waters of Namibia offer ideal conditions for certain types of aquaculture, particularly bivalve shellfish. Suitable sheltered bays conducive to shellfish culture or cage culture exist at Lüderitz Bay and Walvis Bay, and the diamond mining area between Oranjemund and Lüderitz Bay offers a substantial opportunity for shore based aquaculture. Namibia possesses an excellent infrastructure and has a world-class capability in handling, distribution and marketing of fish products emanating from the marine capture fisheries sector. This provides prospective fish farmers in Namibia unparalleled access to some of the most lucrative markets for fish products in the world. The primary constraints to mariculture development in Namibia identified in Britz et al (2003) included:

- Access to land based sites.
- Experienced manpower.
- Access to technology.
- Institutional coordination.

Interventions to address these constraints have however been formulated in Namibia's Aquaculture Development Strategy (MFMR, 2004). The strategic and pro-active intervention of the Namibian government has potentially placed the development of mariculture on a sound

[3] For example, the Namibian Fish Consumption Promotion Trust was established to grow the consumption of fish, particularly in rural areas. Balarin (1996) reported that at Independence, fish consumption was 4 kg/cap/yr which rose to 8 kg/cap/yr by 1996. The NDP target is to raise this figure to 14 kg/cap/yr (± 22 500 t/yr). Fish contribute 10.2 % of total animal consumption.

[4] By comparison, in South Africa the fishing industry contributes approximately 1% of GDP and its share in the economy is decreasing.

[5] According to the estimates of the Ministry of Fisheries and Marine Resources, total employment in the fishing sector is between 12 500 and 14 000 people, of which roughly 75% are Namibians. This figure includes both offshore and onshore employees.

institutional footing. A great deal of work still needs to be carried out to implement the strategy but the strong will to approach this from a political level downwards is quite remarkable.

In this discussion the status of Namibia's aquaculture sector is briefly sketched, its aquaculture policy and legislation summarised, and its institutional capacity appraised. The section concludes with a diagnostic summary of Namibia's aquaculture policy in a regional context.

4.2 Status of Aquaculture

The status of mariculture in Namibia has recently been summarized in Britz et al (2003) and by MFMR (2004).

4.2.1 Oysters

Oyster farming is the most established aquaculture activity in Namibia with six farms currently in operation at Walvis Bay, Swakopmund and Lüderitz - which directly employ approximately 85 people. Both Pacific oysters (*Crassostrea gigas*) and European oysters (*Ostrea edulis*) are grown. Estimated output of the Namibian oyster industry in 2004 was 6 million oysters worth ca. N$12 million farm gate value. Some farmers were experimenting with alternative species such as abalone and scallops (Britz et al, 2003; MFMR, 2004).

4.2.2 Mussels

An experiment to farm mussels (*Mytilus galloprovincialis*) at Walvis Bay was abandoned due to nuisance settlement of indigenous mussel seed which have a low market value. Seaflower Lobster Corporation operated a mussel farm in the lee of Seal Island at Lüderitz Bay from 1984 until the late nineties, however production was terminated as the operation was unprofitable (Britz et al., 2003).

4.2.3 Seaweed

Gracillaria is cultured in a 40 ha plot in Lüderitz lagoon by Taurus Atlantic Seaweeds to supplement their collection of beach cast product. Annual production is around 120 tonnes of dry-weight sea grass per annum. The operation currently employs 50 people (Britz et al., 2003, MFMR, 2004).

4.2.4 Abalone

Abalone farming has attracted interest in Namibia and one farm is currently operational at Lüderitz Bay. Other proposed developments have not gone ahead due to difficulties in obtaining finance and access to suitable land based sites. Current production is estimated to be 15 tons with employment of 15 people.

4.2.5 Rock Lobster

A research project to evaluate the potential for harvesting and ongrowing juvenile rock lobsters from the Lüderitz Mariculture oyster farm was conducted in collaboration with the Ministry of Fisheries and Marine Resources and Rhodes University. The rate of puerulus settlement and juvenile abundance on the oyster farm at Lüderitz Bay was quantified and grow out trials conducted at HIK abalone farm in South Africa (Grobler and Ndjaula, 2001; Esterhuizen, 2004; Keulder, 2004). The studies indicated that sufficient puerulus could be harvested to support a commercial operation, but that the economic viability was marginal due to high production costs using currently available technology.

4.2.6 Fish

Currently there is no culture of marine finfish in Namibia but there is interest in farming an endemic species, the Dusky Kob (*Argyrosomus inodorus*). Exotic species such as the Turbot (*Psetta maxima*) are also being considered as candidates for commercial culture.

In summary, Namibian aquaculture currently comprises a few dedicated entrepreneurs but lacks the critical mass to be termed an industry. Britz et al (2003) concluded that if the industry is to grow certain state-led interventions would have to be implemented as many of the constraints identified were beyond the means of individual entrepreneurs to overcome. For the existing farmers, technology and experienced manpower were identified as the primary constraints to growth. The lesson from successful aquaculture industries in other countries is that the state must provide manpower and finance to establish new technologies and make existing technology more cost-efficient. For prospective aquaculturists, uncoordinated bureaucracy, technology and access to land-based sites were seen as fundamental constraints. Encouragingly, Namibia's Aquaculture Strategic Plan recognises and seeks to address these constraints.

4.3 Policy and Legislation

Of the three BCLME countries, Namibia's initiative to develop aquaculture policy and legislation has been the most comprehensive and has laid a sound institutional foundation for sector development. Aquaculture is specifically addressed as a development priority in Namibia's Second National Development Plan – NDP-2, and in the Government's VISION 2030 document, wherein it is envisaged that by the year 2030 aquaculture will have grown to become a thriving industry (Office of the President, 2003). The Namibian Government has actively sought to create an "enabling environment" for aquaculture development which has required specific policy, legislative and institutional interventions. Namibia has been fortunate to benefit from international experience in aquaculture and it's Aquaculture Policy (MFMR, 2001a) and Aquaculture Act (MFMR, 2002a) can be viewed as a synthesis of international best practice.

According to Namibia's Aquaculture Strategy document (MFMR, 2004); "The Government foresees the role of aquaculture of freshwater species to enhance food security, generate incomes and improve rural livelihoods and investment. Freshwater aquaculture will be mainly a community-based, co-operative activity, using labour intensive methods. Production from freshwater aquaculture activities will be destined primarily to ensure food security in local communities, as well as for local, regional and international markets."

"The Government foresees the culture of marine species through the use of intensive systems, requiring significant capital and technical expertise, producing high value species intended primarily for export markets. Consequently, there will be a major role and a great opportunity for foreign investors in the further development of marine aquaculture".

"The Government of Namibia has therefore identified aquaculture as a top priority area for development."

4.3.1 Namibia's Aquaculture Policy

The Objective of Namibia's aquaculture policy is "the responsible and sustainable development of aquaculture to achieve socio-economic benefits for all Namibians and to secure environmental sustainability". This objective will be addressed by four main strategies:

1. Putting in place an appropriate legislative and administrative framework for aquaculture.

2. Establishing appropriate institutional arrangements for aquaculture.
3. Maintaining genetic diversity and the integrity of ecosystems.
4. Ensuring responsible aquaculture production practices.

However, it is noted in Namibia's Aquaculture Strategic Plan that "economic support to the industry should also be incorporated as an objective to ensure that seed money to stimulate the industry is made available."

4.3.2 Namibia's Aquaculture Act

An important step in the implementation of Namibia's aquaculture policy was the passing of the Aquaculture Act (No. 18 of 2002) which came into force in June 2003. The Act was drafted with technical assistance from the Food and Agriculture Organisation of the United Nations (FAO), and was seen as necessary since aquaculture had not been properly provided for in previous environmental and fisheries legislation (Balarin, 1996).

Extensive consultations with stakeholders took place to develop the policy and legislative framework. In October 2002, an Aquaculture Business Development Seminar was convened by the Ministry of Fisheries and Marine Resources to promote awareness, investment and implementation of the aquaculture policy (MFMR, 2001b).

Regulations to implement the Aquaculture Act are in the process of being formulated, and an Aquaculture Strategic Plan has been drafted to guide implementation of the policy. Institutional arrangements are in the process of being formulated. These include the establishment of an Aquaculture Directorate within MFMR and a "one stop shop" arrangement to facilitate aquaculture permitting and decision making.

Significant features of the Aquaculture Act include:

- The appointment of the Ministry of Fisheries and Marine Resources as the lead agency
- The power of MFMR to make regulations
- Aquaculture permits and ownership of stock.
- Provision for Aquaculture Development Zones.
- An "Aquaculture Advisory Council".
- Environmental safety measures such as the regulation of exotic species, disease control, exports, water quality monitoring etc.
- Provision for appropriate Codes of Practice.
- Monitoring.
- Processing.
- Marketing.
- Consumer health and safety issues.

Aquaculture (Licensing) Regulations were promulgated in terms of the Aquaculture Act on 3 December 2003.

4.3.3 Other relevant legislation

Namibia is a modern democracy with appropriate legislation reflecting international best practice in most spheres of economic activity and production. Namibia's goal of creating an enabling environment for the development of aquaculture is supported by other legislation and policy such as:

- **Foreign Investment Act, Act No. 27, 1990**

  Economic growth in Namibia relies to a large extent on foreign investment. The growth of the aquaculture sector in particular is likely to be dependent on foreign investment and technology transfer. The Foreign Investment Act makes provision for the awarding of a Status Investment Certificate to foreign investors which allows the holder to:

  - Freely convert and hold foreign currency.
  - Transfer profits out of Namibia.
  - Hold payment for exported goods in foreign currency outside the country.

- **Environmental Assessment Policy 1994**

  This legislation provides for the undertaking of Environmental Assessments for activities with a potential impact on the environment. Section 12(2) of the Aquaculture Act requires the Minister of Fisheries and Marine Resources to determine in consultation with the Minister responsible for the environment whether the applicant for an aquaculture permit is required to conduct an Environmental Assessment for a proposed project. It is likely that the opening of new areas for mariculture in Namibia (both onshore based and offshore) will require Environmental Assessments, particularly where a rezoning or change in land- or resource use is involved.

4.3.4 Namibia's Aquaculture Strategy

Of the three BCLME countries, Namibia is the first to translate its policy into a comprehensive deployment strategy articulated in "Namibia's Aquaculture Development Strategy". The strategy contextualises the opportunity for aquaculture in Namibia, outlines Namibia's aquaculture policy and Act, and sets tentative production targets. The strategy conservatively estimates that the industry should grow in value from the current N$20 million to N$250 million in 2009, with direct employment expanding from the current 422 people to 1,640 people in 2009 (MFMR, 2004).

A situation analysis and series of recommendations for actions to achieve the aquaculture policy goals are motivated in the following key areas:

- Regulatory Framework
- Economic development and marketing
- Environmental matters
- Aquaculture education and training
- Research and development
- Aquatic animal health certification and quarantine inspection
- Food safety and quality assurance of aquaculture products

The Namibian Aquaculture Strategy is a striking document in that it is:

- **Realistic** in that achievable production targets are set based on available resources.
- **Practical** in that a series of specific actions, processes, structures and interventions are recommended.
- **Comprehensive** in that the recommendations for action are based on a thorough situation analysis and flow from the policy objectives.
- **Concise**, readable and specific in terms of what is to be done and why.

It is clear that the Namibia's Aquaculture Strategy will not be allowed to gather dust in Government offices and significant moves have been made to develop the necessary public institutional capacity to implement the strategy.

4.4 Institutional Capacity

The Namibian Aquaculture Policy and Act impose certain obligations on the State to provide the services required to meet the objectives set. A new Aquaculture Directorate (DoA) within the Ministry of Fisheries and Marine Resources has been established to facilitate the development of the necessary institutional capacity, both within and outside MFMR, for the implementation of Namibia's aquaculture policy. The main tasks to be carried out in terms of Namibia's Aquaculture Development Strategy are institutional building and institutional coordination.

4.4.1 Governance and Legal Institutions

Namibia has now largely completed its process to set up the necessary governance and legal institutions to support aquaculture. A powerful lead role has been allocated to the Ministry of Fisheries and Marine Resource's Aquaculture Directorate to facilitate the creation of institutional arrangements that promote aquaculture, and coordinate the various agencies and other entities involved in regulation and support. Currently in place and in force are:

- Namibia's Aquaculture Policy Towards Responsible Development of Aquaculture (March 2001; MFMR 2001a))
- The Aquaculture Act (No. 18 of 2002; MFMR, 2002a)
- Aquaculture (Licensing) Regulations (3 December 2003; MFMR 2002b)
- The Aquaculture Advisory Council, established under Section 3 of the Aquaculture Act, which includes representation from a broad spectrum of interests including industry, national, regional, local and traditional authorities. The Aquaculture Advisory Council advises on policy matters and issues pursuant to the Aquaculture Act as requested by the Minister responsible for aquaculture.

The DoA has been set up to serve as the single point of contact for all existing and prospective aquaculturists, and has set up a "one stop shop" to facilitate permitting and liaison with other departments. The Ministry actively assists all aquaculturists in the compliance with appropriate regulatory requirements. Discussions with existing and potential aquaculturists revealed that MFMR is perceived as "user friendly" and very supportive of their needs. The DoA will coordinate the streamlining of the regulatory review process as well as carry out required monitoring responsibilities to meet environmental regulations.

Britz et al (2003) discussed aquaculture development with representatives of local government, national government, and parastatals, and was impressed by the strength and efficiency of

Namibia's public institutions. They reported that: "Aquaculture was viewed in a favourable light, and individuals within the respective institutions were hungry for information which would assist them to facilitate the rational development of aquaculture within their area of jurisdiction. This bodes well for a co-ordinated institutional approach to aquaculture development led by MFMR."

4.4.2 Environmental Management Institutions

Environmental management and monitoring is primarily a government function for which the MFMR has a primary responsibility in respect of aquaculture. The Ministry of the Environment and Tourism has certain management functions which affect aquaculture, such as land use and environmental impact assessment.

The MFMR's Directorate of Aquaculture has made good progress in equipping itself to carry out the environmental management functions required for aquaculture, and is tasked with liaising with other Departments, which have legislated environmental management functions. The two main environmental considerations are site selection and site assessment. Specific actions to set efficient environmental management arrangements for aquaculture include (MFMR, 2004):

- Encouraging local communities and municipalities to develop land use and aquatic resource management plans and other coastal resource related managements plans, which incorporate opportunities for public and private aquaculture as well as commercial and recreational fisheries.
- Appointing of Aquaculture Extension Officers in the Ministry who will assist small and intermediate enterprises in meeting all site selection and monitoring requirements.
- Ensuring that intensive aquaculture enterprises meet Environmental Impact Assessment requirements.
- Government agencies will cooperate to produce a base map incorporating all relevant coastal and inland features for which data are available at the most practical scale.
- Adopting a three-step monitoring definition process which: (1) evaluates each proposed aquaculture project in terms of its potential environmental impact, (2) defines, in conjunction with the licensing process, baseline data acquisition to be implemented and (3) delineates operational (long-term) monitoring criteria, together with a regimen for their implementation, to be incorporated in the aquaculture licence conditions. This information is essential for agencies responsible for environmental protection and management.
- Integrating all collected data into a national aquaculture database to be administrated by the Directorate of Aquaculture.
- Developing an aquaculture application package which will include: basic background information on aquaculture in Namibia including regulations, licensing, site selection requirements, operational monitoring requirements, etc. This can be added as a web page on the MFMR web site.
- Identifying Aquaculture Development Zones in line with the Act using the data generated for the production of maps as described above.

4.4.3 Producer Associations

There is currently no association of aquaculture producers in Namibia, however, good communication exists between the producers and MFMR and consultations are regularly held on various issues. As the industry grows it will become important to formalise producer representation.

4.4.4 Research and technology development institutions

Technology, research facilities, and trained mariculture researchers are recognised as constraints to the development of the Namibian aquaculture sector. To address this need, a dedicated facility for mariculture research, the University of Namibia's "Marine and Coastal Resources Research Centre", was constructed at Henties Bay. In its first years of existence, the centre lacked funding and projects, and was badly sited as it is not possible to pump seawater to the facility. However, in 2003 a stakeholders' workshop identified the key areas of priority work for the centre in support of mariculture, for the next few years (MFMR, 2004). Staff and projects have now been allocated, some recirculating culture systems have been installed and the facility appears to be on a more sound footing. Experiments on kob spawning have also been carried out at the Natmirc research facility in Swakopmund (Dr. Ben Van Zyl, personal communication, 2003). Natmirc also provides support through research into environmental factors affecting aquaculture such as water quality, sulphur eruptions and harmful algal blooms.

Namibia's Aquaculture Strategic Plan recognises that "it is essential that the Ministry and UNAM coordinate research and development activities for maximum support of marine and freshwater aquaculture" (MFMR, 2004). The following recommendations are made to develop appropriate research institutions and capacity:

a) Establish a competitive grant program to foster research and development. Funds should be allocated to aquaculture research and development as an industry. The Government should set identification of Research and Development grant criteria.

b) Encourage industry-driven and -initiated research and innovation programmes. Such programmes should facilitate and expand cooperative efforts between industry and the research community while acting as an information transfer source.

c) Study the indigenous aquatic organisms in Namibia to identify those with a high potential for aquaculture, both for local and for export.

d) The Ministry to link up with international institutions specialising in aquaculture.

e) The Ministry to handle as per the Aquaculture Act the opportunities regarding the culture of alien species.

f) Study alternative ways of feeding these organisms to produce fish feed for the local market. Fish feed is a major factor influencing the cost of the final product

g) Research to be done into possible disease outbreaks as well as naturally occurring toxic conditions to enable the Ministry to have qualified people to identify, handle and if necessary refer such occurrences to the Competent Authority.

h) Research into techniques and operating systems to be done to ensure compatibility with the variable extremes of the Namibian environment.

The implementation of these recommendations will be a substantial task given Namibia's current lack of an established cadre of experienced aquaculture researchers capable of leading technology development programmes. Successful implementation of these Strategic Plan recommendations will therefore require a substantial investment in manpower training. The logical way forward would be to set up regional and international collaborations on a project basis. For the past two years a Commonwealth advisor has been based at Henties Bay to assist with the development of the centre's programmes, and collaboration between MFMR, the South African Department of Agriculture and Rhodes University saw a research project carried out on the viability of on-growing wild harvested lobster pueruli. Experienced environmental scientists do however exist within Natmirc who are capable of leading and building the required environmental monitoring and

research functions. A BCLME collaborative project aimed at promoting harmful algal bloom research and establishing a shellfish sanitation programme is already fairly well advanced.

It is suggested that a regional policy on collaboration within the BCLME be developed to address aquaculture technology and perform related environmental research. Justification for this is:

- Similar species with aquaculture potential exist within the respective BCLME countries.
- Aquaculture technology development is very expensive and regional use of scarce resources makes sense.
- The various research groups in the region possess complementary skills and therefore it makes sense to delegate tasks and projects to those best equipped to carry them out.
- Collaboration will bring experienced aquaculture personnel to Namibia who can empower nationals to carry out aquaculture research.
- The regional industry uses similar culture techniques and sells into the same international markets.

4.4.5 Financial Institutions

For individual entrepreneurs to establish a new aquaculture technology, a substantial (and often unpredictable) financial risk is incurred. Typically, it takes longer, and requires more capital than predicted to establish a new aquaculture venture. For this reason governments wishing to promote aquaculture are often prepared to share the initial financial risk with pioneer aquaculture farmers in order to establish a new sector that will yield socio-economic dividends. Namibia's Aquaculture Strategic Plan recognises the sectors' financial needs and "the Government will endeavour to provide this fledgling industry with opportunities for start-up capital, research and development funds, marketing and promotion support, and education and training" (MFMR, 2004).

Namibia possesses a sophisticated financial sector and various general fiscal and export related incentives are offered to investors in Namibia. It is claimed that these incentives are amongst the most attractive in Africa. Although the Namibian Government has endeavoured to create an enabling environment to support investment, marketing and promotion of products for export, there are currently no specific financial incentives or loan schemes for aquaculture, and most financial institutions are not aware of the sector. However, in line with the recommendations in Namibia's aquaculture policy and strategy, an Aquaculture Development Fund is in the process of being established by government. Various other governmental, parastatal and financial institutions could potentially provide finance and other assistance for aquaculture ventures such as promotional and marketing assistance, research and technology development funding.

4.4.5.1 Industrial incentives

Existing industrial incentives and support measures in Namibia are mainly directed by the Ministry of Trade and Industry and the Ministry of Finance through the following institutions (extracted from Britz et al, 2003):

a) **Export Processing Zone Company (EPZ)**
This parastatal provides tax relief and various other concessions and benefits to producers and exporters. However, at this point, fish and meat processing does not fall within the scope of activities of the EPZ regime.

b) Directorate of International Trade

This is a Ministry of Trade & Industry directorate and deals mainly with policy and trade term negotiations for and on behalf of the Government. It also serves as the focal point for membership to various organisations. Three of its subdivisions (Export Promotion; Trade Information; and Import/Export Management) could potentially be of service to aquaculture development.

c) Namibia Investment Centre

The objective of this Centre is to identify viable, bankable projects and find suitable investors locally and regionally, as well as internationally. There is no restriction on the types of projects taken on. In layman's terms, they act as investor *matchmakers* and project brokers but on a grand scale. The Investment Centre could potentially play a key role in identifying and attracting investors into the aquaculture sector, but it will require a well-packaged investment proposal.

d) Bank of Namibia

As the central bank of the country, it is not in the business of financing projects directly. However, it has a special program where it obtains funds from the European Investment Bank and channels them through commercial banks at very favourable rates (less than the prime lending rate) to borrowers. According to the Bank of Namibia itself and Bank Windhoek, not many investors are taking advantage of this arrangement. There is no minimum or maximum amount for borrowing.

e) Small Business Credit Guarantee Trust

This organisation has been established by the Government to provide guarantees for loans by borrowers with commercial banks. Basically, the Trust guarantees the loan up to 80% of the total loan amount with a ceiling guarantee amount of N$250,000.

4.4.5.2 Preferential Market Access

Preferential market access is a positive development for any exporting country. It gives a country a financial edge since the price of its products will compete favourably with those offered by products from industrialised countries. The "enabling environment" created by the Government of Namibia provides preferential access and related incentives to the following markets:

- Duty-free access for selected products to the European Union
- Duty-free access for products to Zimbabwe[6]
- Preferential access to the USA market under AGOA agreement[7]
- Preferential access to 285+ million consumers in COMESA[8]

[6] **Namibia– Zimbabwe Preferential Trade Agreement:** Goods grown, produced or manufactured in Namibia may be imported free of customs duty to Zimbabwe and vice versa. The categories include live animals born and raised in the specific country, and fish and other marine products. At least 25% of the manufacturing / production cost (local content) must be from materials and direct labour performed in the host country.

[7] **AGOA – Africa Growth & Opportunity Act:** This Act was passed by the US senate to allow African countries to export their goods duty-free to the US markets. Under AGOA II, more products will be included for export purposes.

[8] **COMESA – Common Market for Eastern and Southern Africa:** This is a regional trade integration arrangement involving the following countries: Angola, Burundi, Comoros, DRC, Egypt, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Seychelles, Sudan Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. However, Namibia as a member of a customs union (SACU) is unable to offer tariff reductions to COMESA members and is thus given derogation, that is, Namibian exporters are allowed to benefit from preferential market access into COMESA.

- Preferential access to 230+ million consumers in Southern African Development Community
- Duty-free and quota-free access to 55+ million consumers in SACU[9]

Preferential access to the above markets could be translated into very tangible benefits for aquaculture products. For example, at present Namibia is the major supplier of fresh oysters to the South African market and Namibian producers can compete with South African producers as they are not subject to any import duties.

4.4.5.3 Sources of finance

In general, Namibia offers a sophisticated financial and banking system, which makes it possible to operate an efficient international business. The Namibian Government, specifically through the Ministry of Finance and Bank of Namibia is an important and significant player in the financial sector. In line with other government agencies, these institutions play a major facilitating role in the financial sector of Namibia. In Namibia, commercial banks, asset management companies and parastatals provide project finance. These institutions include the following:

a) Commercial Banking Institutions

- Commercial Bank of Namibia
- First National Bank of Namibia
- Bank Windhoek (through Capricorn Investment Holdings)
- Standard Bank of Namibia

b) Asset Management Institutions

- Old Mutual Asset Management
- NIB Namibia
- Sanlam Investment Management (Namibia)

c) Public (Government) Institutions

The Bank of Namibia channels funds from the European Investment Bank through the commercial banks at less than prime rates. According to the Bank of Namibia, not many investors are taking advantage of this arrangement.

d) Development Bank of Namibia

e) Other institutions that offer finance include:

- Industrial Development Corporation of South Africa
- Development Bank of Southern Africa.
- Africa Development Fund – Sponsored by the USA government; decision is taken in the US; a minimum 6-month waiting period applies.

[9] **SACU- Southern African Customs Union:** As a member of SACU, Namibia is to comply with the SACU-wide export / import management regime. In Namibia, the MTI is the institution dealing with the management of the requirements. For our purposes, the following products require export permits (but which are also not granted automatically): live animals, meat and game products, and frozen, chilled fish and meat, including game.

4.4.5.4 Namibia's Aquaculture Strategy: Financial and Economic Support Recommendations

The following recommendations are contained in Namibia's Aquaculture Strategic Plan to support economic development and marketing:

a) The Ministry will work closely with the international organizations, institutions and technical societies and trade shows, to showcase Namibia aquaculture products, track information on seafood markets and international trade opportunities, coordinate with the marine capture industry in their promotion of Namibia fishery products, and incorporate Namibia aquaculture products into the Fish Consumption Promotion Project. The MFMR has produced a booklet on Namibia's aquaculture potential for prospective investors (MFMR, 2002c)

b) The Ministry will conduct an annual survey of the Namibian aquaculture industry. Information to be gathered in the survey would include annual production and value figures, employment, future expectations, current constraints to the industry, etc. and could be disseminated either as part of the Ministry's annual report, or a separate report. Such information is critical so as to monitor industry development, the marketing of products, and the documentation of the socio-economic value of the industry.

c) Develop a Namibia-Grown Seal to be put on packaging to promote Namibian aquaculture products.

d) Establish an Internet web site, linked to the Ministry's web site, which would advertise Namibia's aquaculture product availability and prices.

e) The Ministry will conduct a seminar specifically for the business institutions (including Chamber of Commerce) to acquaint business/finance-orientated organisations with the various forms of aquaculture possible in Namibia.

f) The Ministry will inform the public/private finance institutions about industry developments and successful models in order to encourage funding, and will also work with local communities to encourage aquaculture as an element of community economic development planning. Regularly scheduled seminars, distribution of printed materials, and video production focussing on economic benefits to government and local communities would be a good implementation approach.

g) Develop a buyer's guide to Namibian aquaculture products to be distributed locally, regionally, nationally and internationally. This will attract and inform buyers about Namibian aquaculture products.

h) The Government should consider options and endeavour to establish an Aquaculture Development Fund that can assist potential aquaculturists to establish self-sustaining businesses. Funds available under the Aquaculture Development Fund shall be used for the following:

   a. State funding of a revolving loan fund could serve to leverage private capital. There is a direct correlation between those countries with growing aquaculture industries and direct State funded support. Implementation could be achieved by creating lending criteria and a Steering Committee or other structure to advise with expertise from industry, academia, finance and other government agencies.

   b. Encouragement and support, as appropriate, of participation of aquaculturists at premier international seafood trade shows, the promotion of Namibian aquaculture products at regional seafood festivals, and facilitating local seafood festivals. This participation not only advances practical knowledge, state-of-the-art techniques, and updated methodology, but also provides unique opportunities to expose Namibian products to an international audience.

c. Incentives to attract and promote possible investors are to be considered e.g. tax rebate, low interest rates, EPZ status.

4.4.5.5 Conclusion

The country possesses excellent financial institutions, and the Namibian Government has created a general enabling environment and incentives for investment in various sectors. In order for these institutions to invest in aquaculture, they will require assistance to appraise and benchmark aquaculture ventures. Experience elsewhere shows that individual applications for finance are often weak and result in declined applications. Therefore technical support to both entrepreneurs and financial institutions to develop and appraise aquaculture business plans would facilitate investment and reduce business risk. Specific support measures for aquaculture sector development, including aquaculture zones, are in the process of being established in Namibia. This bodes well for successfully stimulating growth in this young industry.

4.4.6 Product health certification institutions

The movement of live aquatic organisms and products introduces certain disease and environmental risks both to the industry and the ecosystem. Namibia's aquaculture policy seeks to protect its industry through the application of internationally accepted, science-based assessments and procedures, as are outlined in the International Aquatic Animal Health Code of the Office International des Épizooties (OIE), and the Sanitary and Phytosanitary Agreement (SPS Agreement) of the World Trade Organization (WTO) (Arthur, 2003; MFMR, 2004). Aquatic animal health requirements are written into the Namibian Aquaculture Act.

Namibia's Aquaculture Strategy recognises that Namibia lacks a "competent authority" and trained manpower to administer the stated policy related to (i) quarantine inspection and health certification of aquatic animals, and (ii) the more general area of international trade (importation/exportation) of live aquatic animals. The following actions are therefore recommended in the Aquaculture Strategy to develop the necessary institutional capacity (MFMR, 2004):

a) Government is to establish a Competent Authority to deal with aquatic animal health issues, including quarantine and health certification. High-level action is needed to develop a National Aquatic Animal Health Strategy and the necessary infrastructure, capacity and expertise to implement it.

b) The Government will ensure that policies, legislation and enforcement with regard to the import/export of live aquatic animals are harmonised.

c) The Government will endeavour to harmonize its aquatic animal health policy, legislation and procedures with that of its neighbouring countries and trading partners.

d) The Ministry will conduct a review of procedures used to evaluate and conduct proposed new species introductions and adopt a process that is in harmony with international guidelines (i.e. ICES Code of Practice).

e) With regard to disease concerns, the importation process should be made more rigorous to include an Import Risk Analysis (IRA) for each request. It is also important that IRAs be done on current practices (i.e. the movement oyster spat, the ornamental fish trade), as well as on the planned introduction of such species as scallop and abalone.

f) In order to protect against incursions of exotic diseases, Namibia will develop meaningful health certification requirements to be met by exporting countries.

g) The Competent Authority will need to establish a disease surveillance and monitoring program to support reporting to the OIE.

h) To provide access to accurate data that is essential to developing an effective National Strategy for aquatic animal health and for import risk analyses, the Competent Authority should implement procedures to accurately track imports and exports of live aquatic animals (including species shipped, quantities by species, origins and destinations, importers and exporters, purposes, etc.).

i) The Competent Authority should establish an aquatic animal health laboratory to act as the national lead centre (focal point) for aquatic animal health.

j) As there is currently no aquatic animal health expertise within Namibia, the Government will need to hire and/or train specialized staff. In order to speed up the process of establishing capability, the Government will train staff in fish health diagnostics.

k) The Ministry's aquaculture extension staff will have basic aquatic animal health management included in their training programme

l) Namibia will continue to seek increased international linkages through participation in FAO regional programs, the OIE, and through bilateral donor agencies.

4.4.6.1 Diagnostic summary

It is suggested that the management of aquatic animal health is a regional policy issue because:

- Aquatic animal health has ecosystem implications as diseases and parasites of cultured organisms can spread through the ecosystem.
- Species introductions have ecosystem implications and a harmonious approach to the evaluation of new species introductions should be adopted.
- Scarce regional expertise in aquatic animal health could be efficiently deployed in service of the BCLME countries.
- Regional cooperation in the area of aquatic animal health will facilitate manpower training and mentorship.
- It may make economic sense to share specialised expertise in certain regional laboratories.

4.4.7 Aquaculture Education and Training institutions

Namibia's Aquaculture Strategy identifies education and training as essential for the growth of aquaculture. There are presently very few opportunities for aquaculture training and education in Namibia and there are very few experienced nationals who are capable of training others. Currently, the University of Namibia offers aquaculture subjects at undergraduate level and students do post-graduate studies in collaboration with Rhodes University, South Africa. The University of Namibia has unfortunately lost a few highly experienced expatriates who were leading aquaculture research programmes - due to immigration requirements which did not provide long term residence rights. A few Namibians have completed post-graduate higher degrees with a specialisation in aquaculture in other countries but many more will be required to meet the manpower needs of the sector as it grows.

Public education programs are also identified in Namibia's Aquaculture Strategy as important to achieving sectoral goals and can generate the public support necessary for aquaculture to develop.

The following actions are recommended in Namibia's Aquaculture Strategy to promote education and training:

a) The Ministry will undertake a training needs assessment study. This study will identify the training needs of the aquaculture sector and recommend appropriate actions for

developing human resource capacity in support of aquaculture in Namibia. The scope of the study will cover both marine and freshwater aquaculture training needs for researchers, students, technicians, fish farmers and fish farm workers, government administrators and managers.

b) The Government should consider grants and incentives for secondary schools to implement aquaculture curricula and develop small-scale aquaculture facilities. The emphasis of aquaculture in Namibia's curriculum goals for secondary schools should become a priority.

c) Funds should be sourced for aquaculture degree programs at Universities and Colleges. UNAM and the Polytechnic of Namibia should consider developing coordinated programs with each other, specializing in research and technical modules pertaining to aquaculture.

d) The Ministry will provide aquaculture extension services. Extension officers have been very effective in other countries in providing training and assistance to aquaculturists.

e) Government should make available adequate funding for aquaculture training, education, and extension at secondary, vocational, and college levels.

f) Develop a public relations campaign designed to enlighten citizens about what aquaculture is, how it works, and the importance and benefits of the industry.

4.4.7.1 Diagnostic Summary

Education and training of Namibian nationals is a key strategy to developing an aquaculture sector, which empowers citizens to take advantage of entrepreneurial opportunities and assume leadership roles in industry. In the short term, investment in the sector will probably require foreign participation to provide technology and skills. Education and training is a generational undertaking, and therefore a long term approach is required to build Namibia's aquaculture manpower capacity and education and training institutions.

It is suggested that a policy to promote a regional approach to aquaculture education and training is adopted in order to most efficiently share scarce resources, and to build capacity in Namibia's education institutions to offer training in aquaculture.

4.4.8 Food Safety and Quality Assurance of Aquaculture Products

Namibia is fortunate in that inspection and quality assurance of fish and fishery products for the marine capture fisheries is very well developed and can serve the aquaculture industry. It is a requirement of the Aquaculture Act that, for the purpose of aquaculture, a water quality monitoring system must be established and maintained to provide timely information to licensees, of the occurrence or imminent occurrence of any pollution or natural phenomenon such as Harmful Algal Blooms (HAB) which may have a harmful or detrimental effect on the aquatic environment or any aquaculture product. Harmful algae, in particular, represent a significant human health hazard and pose a serious threat to fisheries and aquaculture. If shellfish are to be exported a shellfish sanitation programme will be required, and Namibia has already made good progress with support from the BCLME programme to develop capacity, and set up an internationally acceptable shellfish sanitation programme (Currie et al., 2004).

The following actions were recommended by Namibia's Aquaculture Strategy:

"Within this framework Namibia will consider the following actions at short and long-term level:

a) For the foreseeable future, the Ministry of Trade and Industry will continue to be the Competent Authority for the establishment of the necessary fish inspection and quality assurance infrastructure, including the control of aquaculture products. A project could be developed with this aim, if necessary with international assistance.

b) In regard to the specific public health aspects related to the farming of bivalve shellfish (oysters, mussels, clams, and scallops), the Ministry will facilitate the establishment of a National Shellfish Sanitation Program (NSSP). A water quality and HAB monitoring programme will form an integral part of the NSSP.

c) The Ministry will, along with other appropriate Government agencies, assist commercial aquaculturists in establishing HACCP systems in the production, handling, distribution and marketing of all cultured species."

4.4.8.1 Diagnostic summary

Namibia possesses adequate capacity for the certification of fish products for export. A BCLME project to support MFMR to establish a shellfish sanitation programme is well advanced.

4.5 Concluding Diagnostic Summary

1. **Policy and Legislation.** Namibia has now completed its aquaculture policy and legislation. The process has been well planned using international experience, and is in many ways a model for others to follow.
2. **Institutional arrangements.** Namibia has made excellent progress to create the required institutional environment to support aquaculture development. This is a result of its comprehensive policy making and planning process, driven by a strong political will. The institution building processes outlined in Namibia's Aquaculture Strategy could be strengthened through regional collaboration, particularly in the areas of education and training, research and technology development, aquatic animal health, the management of exotic species, and financial facilities for aquaculture ventures.
3. **Way forward.** The challenge to the Namibian government is now to work more closely with industry and to grow production by attracting new investment into the industry.

5. SOUTH AFRICA

5.1 National Context

Although South Africa possesses a large and efficient fishery sector, the mariculture sub-sector is relatively small, currently producing abalone, mussels, oysters, turbot, and prawns. Species on the commercial threshold include seaweed, salmon, kob and sole. The industry became established in the 1980s, in a large measure as a result of the activities of the Fisheries Development Corporation (FDC) and a few pioneer entrepreneurs, who established the basic culture technologies for a number of species. When the FDC was wound up in 1986, the manpower that was trained went on to establish a number of commercial ventures, which laid the foundation for today's commercial sector.

Although commercial mariculture has displayed moderate organic growth since the 1980s, and is recognized to have economic potential, government has done very little to promote sector development and has largely limited its support to legal and regulatory matters and research. The mariculture industry has grown at a slower rate than expected due to significant constraints, particularly technical, administrative and legal ones, which have deterred investors. Government's lack of support for aquaculture sector development is seemingly anomalous as aquaculture was identified in South Africa's fishery policy development process, which culminated in the Marine Living Resources Act of 1998 (MLRA), as being a means of broadening access to marine resources for coastal communities to promote economic growth and social equity.

A comprehensive policy and strategy to support mariculture was lacking in South Africa's first decade of democracy (1994-2004), which saw the rewriting of the country's constitution and much apartheid era legislation. Although mariculture was included in the MLRA of 1998, and a Mariculture Unit established within the Branch: Marine and Coastal Management of the Department of Environment Affairs and Tourism (DEAT-MCM), no comprehensive supporting policy was developed which defined sectoral goals and development strategies. Part of the reason for this is that the fishing rights allocation processes, which aimed to transform the fishing industry to achieve racial equity, placed a huge strain on the DEAT-MCM structures, and were the primary focus of policy makers and senior managers during this period. Although DEAT-MCM was appointed as the lead agent for mariculture development, its role was largely restricted to environmental research and the administration of aquaculture permits. A consultative workshop with mariculture stakeholders in 1999 recognised the need for a mariculture sector development plan (Stenton-Dozey, 1999), but little was done until 2004 when a tender for the development of a mariculture sector plan was awarded. Following the sector planning workshop, the Trade and Investment South Africa (a unit of the Department of Trade and Industry) commissioned a study on the potential of aquaculture (Letsema, 2001). Aquaculture was subsequently included in the SMEDP (Small and Medium Size Enterprise Development Programme) industrial incentives in 2003. The coastal provincial governments (Northern Cape, Western Cape, Eastern Cape and KwaZulu/Natal), which are keen to promote new economic development opportunities, have all expressed an interest in supporting mariculture to some degree (Iyer Rothaug et al, 2003; Britz et al, 1999; Britz et al, 2001). Interventions by individual government departments have however inevitably been constrained by the lack of a national policy and deployment strategy. This was recognized and in 2003, an inter-departmental Mariculture Task Team, which included representatives of national and provincial government departments and industry, was tasked with developing a proposal for a "Mariculture Institute of South Africa - MISA" which would be an agency tasked with promoting the development of the sector on behalf of all stakeholders – public and private. Informing the activities of MISA would be a national aquaculture policy and sector development plan. This bodes well for the future of mariculture in South Africa as an appropriate

institutional environment will be created to remove constraints to sector development and allow it to grow to its potential.

South Africa is well positioned to lead mariculture development in the BCLME region. It has an established industry and supporting infrastructure, including very good research institutions capable of developing technology suited to local environmental conditions. However, in order to fulfill this role, a regional policy, structure, and resources will have to be put in place. The objective of the next phase of the BCLME Regional Aquaculture Policy project is to outline regional policy options and an implementation strategy.

5.2 Status of Mariculture

South African mariculture operations are distributed around the coastline from Alexander Bay on the west coast to Mtunzini on the east coast. The majority of the activity is concentrated in the Western Cape Province (Figure 1).

FIGURE 1. Location of South African mariculture operations. Modified from MCM, 2004.

5.2.1 National production data

Mariculture production data for 2000 and 2003 is presented in Table 1. In 2000, the sector accounted for 1,300 tons of production worth R100.7 million. By 2003, production had increased by 41% to 1,843 tons worth R152.8 million. During this period, the production of all species increased. The greatest increase in production was attributed to the abalone sub-sector where production increased by 186% - from 180 tons in 2000 to 515 tons in 2003. Oyster and mussel production increased by 47% and 13% respectively. *Gracillaria* production increased by 16%, and prawn production increased by 8%. A slight increase in production is projected for 2004 (Oellermann, 2004). The industry comprises 48 permitted operations employing some 740 persons directly on the farms (Table 2). The mariculture service industry probably employs a similar number.

Table 1. South African Mariculture Production Data 2000 / 2003

Species	Production			
	2000		2003	
	Quantity (Tons)	Value (R)	Quantity (Tons)	Value (R)
Abalone	180	36	515	134
Oysters	170	5.1	250	1.6
Mussels	790	5.1	900	5.1
Prawns	120	54.3	130	11.8
Gracillaria	40	0.17	48	0.26
Total	1,300	100.67	1,843	152.76

Source: Brink (2000, 2003)

Table 2. South African Mariculture operations profile 2004

Mariculture activity	Number of rights holders	Estimated production 2004 (tons)	Est. area under cultivation (ha)	Estimated Employment (individuals)
Abalone pump ashore	19	600	35	600
Abalone ranching	1	0	2	20
Clams	1	0	0	0
Finfish cages	1	0	0	0
Finfish pump ashore	1	10	0.03	2
Mussels	5	900	55	23
Oysters	12	376	45	75
Prawns	1	130	30	40
Scallops	2	0	0	0
Seaweed	5	200	0.20	10
Total	**48**	**2,206**	**167.23**	**770**

Source: Oellermann (2004)

5.2.2 Abalone

Abalone (*Haliotis midae*) farming was initiated in South Africa in the early 1990s, and the first 10 tons were produced in 1997. At present, there are 15 commercial farms in operation which produced 515 tons in 2003 (Brink, 2003). The industry continues to grow, and during the 2003/4 period, MCM issued 19 permits to culture the species. While most of the farms are located in the Western Cape - most notably along the South coast between Hermanus and Danger Point, and around Saldanha Bay / St Helena Bay area on the West coast; farms are also located as far north as Port Nolloth in the Northern Cape, and as far east as Haga-Haga in the Eastern Cape.

5.2.3 Oysters

Oyster farming represents the earliest recorded mariculture activity in the country. While the first attempts to culture indigenous species were made between 1673 and 1676, it was only in 1948 with the establishment of the Knysna Oyster Company that commercial operations proved successful (Hecht and Britz, 1990). Due to problems associated with the culture of the country's indigenous species (*Striostrea margaritacea)*, the industry has focused on the culture of the Pacific oyster (*Crassostrea gigas*). Oyster production was 250 tons in 2003 and is all sold on the local market (Brink, 2003). In 2003/4, Marine and Coastal Management issued 13 permits to cultivate *C. gigas*, and an additional 9 permits to cultivate indigenous species. During 2003, 9 producers activated their permits. Oyster production is limited to the Northern, Western and Eastern Cape Provinces.

5.2.4 Mussels

Mussel production in South Africa was initiated in the mid 1980s and is centered at Saldanha Bay on the West Coast of the Western Cape Province, where Portnet have allocated three hundred hectares of the bay to mussel culture. Initially, the industry expanded rapidly, and in 1989, approximately 1,800 tons were produced (Hecht and Britz, 1990). Subsequent years saw a drop in production, and in 2003, only 900 tons were produced (Brink, 2003). During the early years, production focused on three species – the exotic Spanish mussel (*Mytilus galloprovincialis*), and the indigenous black and brown mussels (*Choromytilus meridionalis* and *Perna perna*). Recently, production has shifted towards *M. galloprovincialis,* and the contribution from the local species to annual production has declined to insignificant levels.

In 2003/4, MCM issued 4 permit to culture *M. galloprovincialis*, 4 permits to culture *C. meridionalis*, and 2 permits to culture *P. perna* (Oellermann, 2004).

5.2.5 Prawns

Prawn culture operations were first initiated on the Amatikulu River estuary in 1991. Initial attempts to culture the tiger prawn (*Penaeus monodon*) proved unsuccessful, and production was switched to the indigenous white prawn (*Penaeus indicus*). Due to the high ambient water temperatures required for prawn culture, the industry is restricted to the northern coast of Kwa-Zulu Natal. To date, the sub-sector has been restricted to a single producer who has developed a hatchery and two grow-out sites. Production figures reveal that in 2003, the operation produced 130 tons of product. In 2004, the combination of a strong Rand, cheap imports from the Far East and competition from the local capture fishery rendered the operation financially unviable, and no crop was grown (L. Evans, Amatikulu Hatchery, per. comm, October 2004). The Mtunzini hatchery has now been sold to a new company planning a super-intensive prawn farming operation which is believed to be economically more competitive.

5.2.6 Seaweed

Gracillaria and *Ulva* species are reared as abalone feed on two abalone farms in the Eastern Cape Province, and projects to culture *Gracillaria* for the agar market have been attempted at Saldanha Bay and St Helena Bay. Seasonal nutrient stratification in the water column in Saldanha Bay resulted in the cessation of production, while in St Helena Bay permitting and technical constraints have delayed the initiation of a full scale commercial project.

5.2.7 Turbot

An abalone operation on the West Coast set up a pilot project to grow the European turbot (*Scophthalmus maximus*) in the late 1990s. The environmental conditions along the West Coast are well suited to this species, and the pilot operation was a success. The operation was upgraded to a commercial venture producing a small tonnage for the local market. However, the unavailability of a local feed and high production costs will probably result in its discontinuation in 2004 (C.Viljoen, Jacobsbaai Aquaculture, pers. comm., September 2004).

5.2.8 Experimental species

A project to farm the exotic Atlantic salmon (*Salmo salar*) in Gansbaai, in the Overberg district of the Western Cape Province is under development at present. The venture has been awarded a concession of 20 ha in the bay, where it intends rearing the salmon from smolts to harvest size in offshore sea-cages. The smolts will be supplied by a local hatchery, and the fish produced on the farm will be sold into the high-value fish market, through a local chain-store group. Installation of sea cages has recently been completed.

At least two local farms, the MCM research aquarium and Rhodes University are experimenting with indigenous fish species including dusky and silver kob (*Argyrosomus japonicus* and *inodorous*), yellowtail (*Seriola seriola*), white margined sole (*Synaptura marginata*), white stumpnose (*Rhabdosargus globiceps*) and red roman (*Chrysoblephus laticeps*). Provided it is economically viable, it is expected that marine fish culture will begin commercial production within the next five years.

5.3 Policy and Legislation

South Africa has been slow to address aquaculture policy and legislative requirements, and currently has a fairly fragmented and incomplete policy and legislative framework.

5.3.1 Legislation

Mariculture was recognised for the first time in law by the Marine Living Resources Act of 1998 (MLRA). Under the “objectives and principles” informing the Act, it is stated that the Minister shall have regard for “the need to utilise marine living resources to achieve economic growth, human resource development, capacity building within fisheries and mariculture branches, employment creation and a sound ecological balance consistent with the development objectives of the national government”. The MLRA further says very little about mariculture and simply classifies the activity as a “Local Fishery” for which a “right” must be granted by the Minister. This has imposed certain inappropriate legal requirements on aquaculturists. For example, it is generally accepted that foreign direct investment is beneficial for aquaculture sector development, but the MLRA does not allow foreigners to possess “fishing” rights in South Africa. Mariculture “rights” are granted for the maximum 15 year period allowed under the Act; however, the operational permit is issued annually subject to the holder complying with the permit conditions. The Minister may also require an environmental impact assessment to be submitted by the applicant.

Neither the MLRA nor any other legislation provides for the zoning of waters for the purpose of mariculture. At present the only waters where mariculture is possible are those under control of the Ports Authority (Portnet) who leases certain areas under their jurisdiction in Saldanha Bay and Port Elizabeth for aquaculture purposes. To obtain access to other sea areas under current legislation requires a decision of parliament, which is inevitably a lengthy process. As an example, this was attempted once by Maribus Industries which sought to develop a seaweed farm in St Helena Bay. The right to operate was granted but only for one year, which was not sufficient security for the investors and thus the right was not taken up.

It was recognised by policy makers who drafted the MLRA that the inclusion of mariculture within fishing legislation was simply a stop gap until more appropriate legislation could be written (M. Diemont, Feike Pty. Ltd., pers comm., November 2004.). DEAT-MCM is in the process of revising the MLRA and will draft a separate "Aquaculture Act" which is more in line with the needs of the sector in 2005. The proposed act will incorporate both freshwater and marine aquaculture as the needs of each sub-sector are similar.

The management of mariculture by DEAT-MCM is carried out in terms of regulations promulgated under the MLRA. These include:

- Guidelines for permit applications.
- Water quality and product health monitoring requirements.
- Annual reporting on production.

Other legislation which affects aquaculture is the National Environmental Management Act (Act No. 107 of 1998) and the related National Environmental Management: Biodiversity Act (Act No. 10 of 2004), both of which are powerful laws regulating environmental assessment and the use of exotic species respectively. As many cultured species are exotic, and there is an economic incentive to introduce other economically attractive species, the application of these Acts is likely to have an important effect on the future of aquaculture. If an applicant wishes to import an exotic species a prescribed assessment of risk and potential impacts on biodiversity must be carried out at the expense of the applicant. These Acts place the liability for the negative consequences of the introduction of an exotic species on the fish farmer. A permit may be issued to farm with an exotic species if it is considered to be non-invasive and having a benign effect on biodiversity. The stringent requirements of these Acts make it extremely costly for individual enterprises to carry the necessary risk and environmental impact assessments. Furthermore, because the outcome of an application is at best uncertain - DEAT-MCM has a history of rejecting applications to farm with exotic species - it is unlikely that there will be many applications to farm with new exotic species, even for those which are considered non-invasive. While these Acts are necessary and desirable, both from an environmental and aquaculture best practice perspective, uncertainty is a great deterrent to investment. If the growth of the mariculture sector is to be promoted a more managed and proactive stance will be required from DEAT-MCM in terms of the use of exotic species for aquaculture, i.e. what species may or may not be farmed, and under what conditions. If there is a good economic case for farming a non-invasive species in certain environments, government should consider carrying out the necessary risk assessments as the costs are prohibitive for the average small or medium size enterprise, but many could share the benefits if a number of enterprises begin farming a new species.

In conclusion, South African legislation and regulations pertaining to aquaculture in their current form are adequate from an environmental management perspective, but significantly "disabling" from the perspective of sectoral growth stimulation. Interactions with industry reveal that if mariculture is to be made more attractive to investors, more "enabling" legislation and policies will be required.

5.3.2 Aquaculture Policy

It is anomalous that apart from the general objective stated for mariculture in the MLRA (see above), and occasional political statements on its potential socio-economic benefit and the intention to promote sector development, there has never been a comprehensive policy statement articulating the South African government's approach to the sector. In effect, government's approach has been largely limited to providing the necessary regulatory institutions and services. For example:

- Application and permitting procedures in terms of environmental legislation.
- Shellfish sanitation and water quality monitoring in terms of EU requirements.
- A competent authority, the South African Bureau of Standards, to certify products for export as well as the shellfish sanitation programme.
- Environmental research to support sustainable and responsible aquaculture.

Public sector interventions to promote mariculture sectoral growth have been uncoordinated and *ad hoc*, and are often the outcomes of other general policies (e.g. industrial support, science and technology policies, etc.). These include:

- Research to develop aquaculture technology through the Universities, the DEAT-MCM research aquarium, the CSIR and the Department of Agriculture. Funding for mariculture research is available through the National Research Foundation's Sea and Coast Programme, the Department of Trade and Industry's THRIP (Technology and Human Resources for Industry) fund, and DEAT-MCM's Marine Living Resources Fund.
- A capital subsidy to new aquaculture ventures in the form of the Department of Trade and Industry's SMEDP (Small and Medium Size Enterprise Development Programme) fund.
- Support by provincial government agencies (e.g. Wesgro, East Cape Development Corporation, Gariep Spatial Development Initiative, and Northern Cape Province Department of Economic Affairs and Tourism) to plan, appraise and market aquaculture investments.
- Loan finance and equity investment by the Industrial Development Corporation (IDC) and Development Bank of Southern Africa.
- Grant and loan support for small farmer development through the CPPP (Community Public Private Partnership) programme funded by the Department of Trade and Industry.

Since 2003, there have been moves to develop a more coordinated and directed public sector approach to aquaculture sector development. For example, an Interdepartmental Mariculture Technical Committee has been formed to develop a single agency (the proposed Mariculture Institute of South Africa) to promote sector development, and DEAT-MCM has commissioned the drafting of a mariculture sector development plan. These processes have highlighted the need for a comprehensive policy statement. A mariculture policy is under development by DEAT-MCM; however, a lead has been taken by the Department of Agriculture, through a consultation conducted by the Aquaculture Association of South Africa, to develop a draft "national" aquaculture policy incorporating both freshwater and marine aquaculture. The Department of Agriculture's primary focus is freshwater aquaculture, and at the time of writing, the political position of DEAT-MCM in terms of the integration of its draft mariculture policy into the proposed national policy had not been decided. In Angola and Namibia both freshwater and marine aquaculture fall under the jurisdiction of the national fishery departments, however in South Africa the situation is more complicated, with responsibility split between two national departments.

5.4 Institutional Capacity

Despite South Africa's lack of comprehensive aquaculture policy and legislation, it possesses a well developed institutional environment which supports the mariculture sector – albeit in an uncoordinated manner.

5.4.1 Governance and Legal Institutions

As outlined above, DEAT-MCM is designated as the lead agent for mariculture development, and is the primary government department responsible for mariculture permitting and compliance with environmental laws. It possesses a Mariculture Unit which:

- Conducts research and funds a limited amount of research at other institutions via the Marine Living Resources Fund.
- Appraises permit applications and advises MCM administration on mariculture decision making.
- Operates a water quality monitoring programme, which will become a shellfish sanitation programme.
- Develops regulations and operational guidelines.
- Interacts with the mariculture industry on technical issues.
- Meets regularly with industry through the Mariculture Working Group.

While DEAT-MCM is the designated lead agent for mariculture development, there is currently a lack of definition as to how far its mandate extends - as other departments have legislated mandates, which impinge on mariculture policy and governance. For example:

- The Department of Trade and Industry is tasked with leading sector development, which includes providing the necessary strategic leadership and industrial support measures.
- The Department of Science and Technology is responsible for supporting the development of technology to promote economic and social development.
- The Department of Agriculture is tasked with promoting aquaculture.
- Insofar as mariculture is concerned the Department of Water Affairs and Forestry deals with onshore use of water and estuarine aquaculture activities.
- The provincial governments and local authorities have economic strategies, which include the provision of support measures for investment in new industries such as mariculture.

The designation of DEAT-MCM as “lead agent” has probably been detrimental to the growth of the mariculture sector. It is primarily a “regulatory” oriented department and has lacked staff capable of promoting economic development strategies. This shortcoming has been recognised and an “aquaculture development” function has been created within MCM’s Directorate of Coastal Management and Socio-economic Development. MCM’s ability to promote mariculture technology development is to be boosted by the appointment of six more mariculture researchers. Furthermore, an Inter-departmental Mariculture Technical Task Team has been convened to develop a more coordinated approach to mariculture governance and development. All government departments with a mandate towards aquaculture sit on the task team and it is proposed that a single agency – the proposed Mariculture Institute of South Africa (MISA) be established to support mariculture sector development. MISA would be supported by public and private aquaculture stakeholders in so far as their mandates dictate. MISA will employ a professional management to facilitate a coordinated approach to mariculture development. The creation of an agency such as MISA is seen by industry as a big step forward, and should alleviate many of their administrative and bureaucratic frustrations around sector management.

5.4.2 Environmental Management Institutions

South Africa possesses well developed environmental management policies, legislation and supporting institutions and is a signatory to various international environmental conventions and

protocols. The primary function of DEAT-MCM is environmental management and the environmental aspects of mariculture are generally well regulated and managed. Management issues such as the use of exotic species, farm siting, EIA procedures, and water quality management are all subject to due procedure in terms of environmental legislation. For shore-based aquaculture operations, the provincial nature conservation and environmental departments are responsible for advising and evaluating the required environmental assessment procedures. Shore based aquaculture is usually conducted as an intensive agricultural or industrial activity, and if land needs to be rezoned for these purposes, at the very least an environmental scoping report and public advertisement for comment is required. The pumping of water from the sea, discharge of aquaculture effluents into the sea, and estuarine aquaculture is subject to a permit issued by the Department of Water Affairs.

5.4.3 Producer Associations

Mariculture producers in South Africa are well organised into producer associations. The Aquaculture Association of Southern Africa (AASA) is an umbrella body representing individual producer associations (www.aasa-aqua.co.za). AASA enjoys official recognition by the Department of Agriculture as an interest group. AASA represents all common interests of producers and is affiliated to the World Aquaculture Society. It organises a tri-annual Aquaculture Symposium.

Abalone Farmers are represented through the Abalone Farmer's Association of Southern Africa (AFASA). AFASA is a very active producer association which promotes research to solve common problems and undertakes various projects to promote the interests of abalone farmers. A shellfish interest group representing oyster and mussel farmers has recently been formed.

5.4.4 Research and technology development institutions

There is great depth in South African research organisations and mariculture is fairly well served by a number of institutions. These include:

- DEAT-MCM, which conducts research on both the environmental and technological aspects of mariculture. The Sea Point research aquarium is a flagship facility, which is used to conduct research on various projects including the development of spawning and larval rearing protocols for indigenous fish species. DEAT-MCM's Mariculture Unit employs four scientists and a number of technical staff. With MCM's growing commitment to mariculture an additional six scientific posts have been created and are to be advertised.
- Rhodes University's Department of Ichthyology and Fisheries Science (DIFS) is an internationally recognised institution, which has a long-standing involvement in the development of abalone farming and indigenous marine fish species. The DIFS works closely with industry and its graduates often move into key industry positions.
- Stellenbosch University's Division of Aquaculture plays a key role in supporting aquaculture development, though primarily in the freshwater environment. It is developing an increasing involvement in mariculture research and has discipline specialisations in genetics and food technology.
- Other Universities, which have project-based involvement in aquaculture, include the University of Cape Town, University of the North West, Port Elizabeth University and University of Natal.
- The CSIR (Council for Scientific and Industrial Research) has promoted several aquaculture projects over the years.

5.4.6 The Services Sector

The South African aquaculture industry is served by a fairly well established services sector. This includes:

- Consultancy services. Professional aquaculture consultants offer services including technical advice, business planning and feasibility studies, policy and sector planning services.
- Feed industry. The South Africa agricultural sector includes a well developed animal feed industry with a few companies which specialise in aquaculture feeds.
- Equipment and plastics. Mariculture is an intensive farming industry, which requires large quantities of plastic products, electrical supplies, building materials, and packing materials. The manufacturing and service sectors for these components are well developed in the South Africa, and are not a constraint to industry development.
- Engineering and other specialist skills with experience in the aquaculture are readily available at competitive rates to the South African mariculture industry.
- Specialised transport and security services, which address the specific needs of mariculture producers, exist.

5.4.7 Financial Institutions

5.4.7.1 Sources of Finance

South Africa possesses a sophisticated financial sector and finance for mariculture is available from various private and public funding institutions. Most mariculture operations are funded by private venture capital. The Industrial Development Corporation (IDC) is a public sector owned financial institution which is prepared to invest in new economic sectors. It has played a significant role in financing mariculture developments, and its portfolio has included investments in abalone, prawn, oyster and seaweed farming. Discussions with representatives of the IDC revealed that its aquaculture portfolio is undersubscribed, mainly due to a dearth of viable aquaculture business proposals. Other public sector financing agencies which have an aquaculture portfolio are the Development Bank of South Africa and the Land Bank. In a recent survey, mariculture farmers expressed a need for a facility which provides long term, low interest loans, as the typical short term, high interest secured loans offered by most commercial lending institutions are usually not appropriate to the needs of new mariculture ventures (Britz, 2004).

5.4.7.2 Industrial incentives

The Department of Trade and Industry (DTI) has recognised aquaculture as a new industrial sector requiring public sector support to promote its establishment. Aquaculture has been included in the Department's Small and Medium Enterprise Development Programme (SMEDP). This provides new aquaculture enterprises, which meet certain targets, with up to a 25% rebate on specified capital items spread over a three year period.

Aquaculture enterprises may also apply for funding from the DTI's Support Programme for Industrial Innovation (SPII) which provides a subsidy to business start-ups based on technology developed by the enterprise. To date no aquaculture enterprises have made use of this facility.

The DTI provides funding for research partnerships between industry and research institutions through the THRIP (Technology and Human Resources for Industry Programme), which is administered by the National Research Foundation. Several aquaculture enterprises have taken advantage of the THRIP fund in partnership with various Universities.

The South African government has provided significant support to promote the establishment of a biotechnology sector. This includes the eGoli Biotechnology Incubator for biotech business start-ups. In theory aquaculture is classified as a form of "biotechnology" but to date no aquaculture enterprises have taken advantage of this facility.

South Africa has created Industrial Development Zones (IDZs) which offer tax and other incentives to investors. Plans for aquaculture development nodes have been included in the Coega and East London IDZs which should be attractive to investors in aquaculture.

5.4.7.3 Diagnostic summary

South Africa possesses a sophisticated financial sector and local private capital has funded most aquaculture ventures. Directed sources of public sector loan finance are available for aquaculture as well as various industrial financial subsidies. Aquaculture enterprises have however not yet taken advantage of all the financial facilities potentially available to the sector. Some public sector facilitation of access to potential incentives will be required through an institution such as the Mariculture Institute of South Africa.

5.4.8 Aquaculture Education and Training institutions

Aquaculture training is offered at a University level in South Africa, but there is a dearth of facilities for technical and in-service training. The only non-degree offerings are occasional short introductory courses offered by Stellenbosch University and Rhodes University.

5.4.8.1 Rhodes University

The Department of Ichthyology and Fisheries Science at Rhodes University (DIFS) includes an introduction to the principles of aquaculture in their undergraduate BSc major in Ichthyology and Fisheries Science. A firm theoretical grounding in aquaculture is provided in the BSc Honours course in Fisheries Science and students may do an aquaculture research project, which provides practical experience. The DIFS is a leading aquaculture research institution and supports between 10 and 15 MSc and PhD aquaculture research students. The DIFS offers an occasional one-week introductory short course in aquaculture, which is attended by prospective aquaculturists, staff of aquaculture enterprises and public sector managers with a responsibility towards aquaculture.

5.4.8.2 Stellenbosch University

Stellenbosch University possess a number of aquaculture facilities and work closely with the aquaculture industry in the Western Cape Province. Stellenbosch University includes an aquaculture option as part of their BSc Agriculture Degree. At postgraduate level MSc and PhD theses in aquaculture research are offered. A short course in aquaculture is offered to the general public.

5.4.8.3 University of Cape Town

Staff of the University of Cape Town have interests in aquaculture biotechnology and seaweed aquaculture, and support research students at MSc and PhD level. The departure of Prof P. Cook of UCT's Zoology Department unfortunately saw the end of a long-standing research programme to develop technology for abalone aquaculture. Postgraduate students in aquaculture are also co-supervised by staff of Marine and Coastal Management's mariculture unit.

5.4.8.4 Other Universities

Research students at MSc and PhD level occasionally undertake aquaculture research theses at the University of the Western Cape, University of Port Elizabeth, University of the North West and University of Natal.

5.4.8.5 Diagnostic Summary

South Africa is well endowed with Universities of international standard, which offer training in aquaculture at undergraduate and postgraduate level. A gap in aquaculture training is the lack of technical courses and in-service skills training in aquaculture.

5.4.8 Animal Health Certification Institutions

The import and export of live aquaculture products, seed stock and organisms requires a competent authority to certify that each shipment is healthy and disease free. In terms of South Africa's Animal Health Act, this responsibility falls to the State Veterinary Service within the Department of Agriculture. While the State Vet acknowledges this role, manpower capacity within the Department to certify the health of aquatic organisms is limited. As the culture of fish and other organisms increases, a greater commitment by the Department of Agriculture towards the mariculture sector will be required.

5.4.9 Food Safety and Quality Assurance of Aquaculture Products

South Africa has a well established fishery products processing sector, which exports fishery products all over the world. South Africa complies with the HACCP and other protocols required by the EU and other authorities for the export of fishery products. The South African Bureau of Standards (SABS) is recognised as a competent certification authority. However, the export of shellfish to the EU is currently banned as South Africa does not yet have an EU approved water quality monitoring programme. A shellfish sanitation and water quality monitoring project led by Marine and Coastal Management in partnership with industry has been underway for the last few years, and South Africa has made good progress towards establishing a record of harmful algae and other water quality parameters at selected aquaculture sites. It is expected that South Africa will be ready for an EU audit of its shellfish sanitation and water quality monitoring programme within one year.

5.4.9.1 Diagnostic summary

South Africa possesses adequate capacity for the certification of fish products for export. It has initiated a shellfish sanitation programme which will be ready for EU audit within the near future. South Africa has the capacity to assist Namibia and Angola to develop adequate shellfish monitoring programmes.

5.5 Concluding Diagnostic Summary

Despite the lack of a comprehensive aquaculture policy and clearly defined institutional arrangements, South Africa's aquaculture industry is the most developed of the three BCLME countries, and possesses the most substantial supporting institutional framework. Processes have been launched to develop:

- An aquaculture policy and legal framework.
- A mariculture sector development plan

- A “Mariculture Institute of South Africa” which will promote sector development.

With appropriate regional policies and resources, South Africa has the ability to assist its BCLME neighbours to build appropriate institutions to support the establishment of their aquaculture industries.

6. REGIONAL POLICY OPTIONS

Based on the review of regional aquaculture policy and institutional capacity, regional aquaculture policy options are suggested in this section. The adoption of regional policies may be motivated by the regional will and socio-economic incentive to develop aquaculture, the implementation of regional policies such as the various SADC protocols, or legal obligations arising from signing international environmental protocols. Increasingly the countries of the region are aligning their environmental management policies and laws with internationally accepted norms, guidelines and protocols and the primary goal of the BCLME programme which is sustainable management of the Benguela Current ecosystem. This requires an ongoing level of cooperation informed by agreed regional policy. The responsible development of aquaculture in the BCLME region requires regional cooperation in two broad areas:-

1. Environmental management. This involves management of the environmental aspects of aquaculture such as the use of exotic species, and disease control.
2. Industry development. Interventions are required to establish this new industry as a sustainable source of fishery products. These include technology development, manpower training, and product health certification.

Key elements of the regional aquaculture policy options are:

a. **Harmonisation.** The BCLME partner countries will endeavour to harmonise their aquaculture management protocols which have an effect on ecosystem health and align them with internationally accepted norms.
b. **Information sharing**. The BCLME countries will endeavour to share information about their aquaculture sectors which affects ecosystem health and management.
c. **Opportunity to comment**. The BCLME countries will provide their partner national departments with an opportunity to comment on decisions (e.g. the introduction of exotic species) which may have an effect on regional ecosystem health.
d. **Joint actions and projects.** The BCLME partner countries will endeavour to undertake joint actions and projects aimed at achieving responsible development of aquaculture in the BCLME.
e. **Public sector capacity building.** In view of the scarce regional aquaculture management skills and research capabilities, the BCLME partners will endeavour to jointly develop the necessary public sector management capacity to service the growing mariculture sector.
f. **Sharing expertise**. In view of the uneven distribution of skills in the region, the BCLME partner countries will endeavour to share specialist expertise and advice in order to promote responsible aquaculture development in the region.

A unifying theme arising from the early stage of development of aquaculture in the three BCLME countries is the need to train manpower and develop the institutions necessary to manage the industry according to internationally accepted standards. Aquaculture is a global industry driven by a massive investment in technology development and it is acknowledged that international collaboration will be required to establish new aquaculture industries in the three BCLME countries. Regional cooperation will promote efficient use of scarce skills and resources to promote and manage a responsible aquaculture industry.

Some realism is required in the adoption and implementation of regional policies as personnel responsible for aquaculture policy and development in the three countries are generally under-resourced to carry out their basic tasks and their priorities are the fulfilment of their national responsibilities. Furthermore regional policies, which impose an obligation to consult with neighbouring countries before taking environmental management decisions, may be resisted as

national management autonomy is eroded and consultation with neighbours can be a lengthy and inefficient process. Following the articulation of regional aquaculture policy options, a process to define an implementation plan for regional aquaculture policy will be conducted as the final phase of the BCLME aquaculture policy project. This will take practical and resource issues into account and define a realistic plan for policy implementation. It is expected that regional aquaculture policies will be directed and reviewed by the proposed Benguela Current Commission.

6.1 Aquatic Animal Health

6.1.1 Motivation

It is suggested that the management of aquatic animal health is a regional policy issue because:

- The health of cultured aquatic organisms has ecosystem implications as diseases and parasites of cultured organisms can infest wild stocks and spread through the BCLME region.
- The health of cultured aquatic organisms has economic implications for the aquaculture industry as diseases and parasites of cultured organisms can be spread within and between countries by means of the translocation and trade in cultured organisms.
- Scarce regional expertise in aquatic animal health could be efficiently deployed in service of the BCLME countries.
- Regional cooperation in the area of aquatic animal health will facilitate manpower training and mentorship.
- It may make economic sense to share specialised expertise in certain regional laboratories.

6.1.2 Policy Objectives

The BCLME countries will endeavour to:

1. Indicate a competent authority or focal point in each country to deal with aquatic animal health issues.
2. Share available information on the presence and prevalence of diseases and parasites in cultured aquatic organisms.
3. Harmonize their aquatic animal health policies, legislation and procedures and align them with those of their trading partners.
4. Establish a disease surveillance and monitoring program to support reporting within the BCLME countries and to the Office International des Épizooties (OIE)[10].
5. Notify each other of the occurrence of any new diseases or parasites, which may infest cultured organisms in the respective countries or possibly infest marine organisms in the BCLME.
6. Jointly formulate management actions and contingency plans to control the spread of diseases or parasites if required.
7. Adopt regional protocols on the treatment of diseases and parasites, which would include the use of acceptable chemicals, medications and standardized Minimum Residue Levels (MRL) for such medications.

[10] The OIE is an international organisation based in Paris which monitors diseases and formulates policy and advice for their control. The OIE has 167 members and each Member Country undertakes to report the animal diseases that it detects on its territory. The OIE then disseminates the information to other countries, which can take the necessary preventive action. This information also includes diseases transmissible to humans and intentional introduction of pathogens. Information is sent out immediately or periodically depending on the seriousness of the disease. This objective applies to disease occurrences both naturally occurring and deliberately caused.

8. Provide advice or the short-term services of specialists to neighbours requiring specific assistance in dealing with aquatic diseases or parasites.

6.2 The Use of Exotic Species for Aquaculture

6.2.1 Motivation

The use of introduced aquatic organisms for aquaculture is a regional policy issue because species introductions for aquaculture and their associated diseases and parasites can potentially establish themselves in the ecosystem. All BCLME countries currently require some form of environmental risk assessment before the culture of an exotic species is allowed, the most rigorous requirements being those of South Africa as prescribed in its National Environmental Management: Biodiversity Act. The aquaculture policies of Angola and Namibia subscribe to the ICES Codes of Practice for the introduction of exotic species for aquaculture. South Africa is yet to make a statement endorsing the ICES Codes of Practice but it is likely that they would be used by DEAT-MCM to guide decision making on the use of exotic species for aquaculture. While all the BCLME countries require some form of risk assessment for the use of exotic species, specific guidelines and criteria for the use of exotic species are lacking and each authority makes its own decisions on a case-by-case basis. Since invasive exotic species pose a real threat to ecosystem health, a harmonious approach to the evaluation and management of new specie introductions should be adopted.

6.2.2 Policy objectives

The BCLME countries will endeavour to:

1. Appoint a contact point within each country to deal with the management of exotic species. If required a liaison committee consisting of the three country representatives will be convened to deal with specific issues.
2. Conduct a review of procedures used to evaluate and conduct proposed new species introductions and adopt a process that is in harmony with international guidelines (i.e. ICES Code of Practice).
3. Establish national databases on introduced aquatic organisms documenting their location, use, invasive status and management, and share this information with each other.
4. Inform each other when considering a new species introduction, provide details on the evaluation procedure followed and request comment. The outcome of the evaluation procedure for the introduction shall be made known to BCLME partner countries.
5. Promote public sector assessments of certain key exotic species that would benefit the development of the regional aquaculture sector. This would include the zonation for the use of such candidate species.

6.3 Aquaculture Products and Public Health

6.3.1 Motivation

Shellfish culture is currently the main aquaculture activity in South Africa and Namibia, and experimental work in Angola has shown that conditions are favourable for mussel and oyster culture. The growth of mariculture in the BCLME countries is currently constrained as the export of shellfish to the European Union (EU), and the USA requires that the producer countries implement approved shellfish sanitation programmes. Harmful algal blooms (HAB's) are a feature of the BCLME ecosystem and therefore a rigorous water monitoring programme is required in order to

provide the information required to certify the health of shellfish. South Africa has developed a water quality monitoring programme and is expected to apply for EU certification of its shellfish sanitation programme in the near future. Namibia intends establishing a shellfish sanitation programme and is busy developing shellfish monitoring capacity. There is currently no shellfish culture in Angola, and the government has not yet initiated any process to establish a shellfish sanitation programme. The development of a shellfish sanitation programme has been afforded a high priority by the BCLME governments and in 2003 a BCLME programme was launched to:

- Formulate consistent methods, monitoring and regulations for microalgal toxins throughout the BCLME region and to align these to requirements of industry (BCLME Project EV/HAB/02/01; Currie et al., 2004).
- Develop operational capacity for monitoring harmful algal blooms in Namibia and Angola (BCLME Project EV/HAB/02/02a; Fernández-Tejedor et al., 2004). Feasibility study monitoring programme established.
- Develop a shellfish sanitation program model for application in consort with the microalgal toxins component (BCLME Project: EV/HAB/04/SHELLSAN).

The projects resulted in the drafting of a model monitoring programme to be used by the three BCLME partners to guide the drafting regulations and export requirements. The project has greatly assisted Namibia to develop microalgal toxin operational capacity, and a pilot project was conducted in Angola.

6.3.2 Policy Objectives

The BCLME countries will endeavour to:

1. Develop harmonised monitoring methods and regulations for microalgal toxins.
2. Collaborate to develop operational capacity for the monitoring of harmful algal blooms in Namibia and Angola.
3. Collaborate to develop a shellfish sanitation model in consort with the microalgal toxins component.
4. Share database and general information on harmful algal blooms and the monitoring of water quality for shellfish health certification.
5. Provide advice or the short term services of specialists to neighbours requesting specific assistance in dealing with HAB, shellfish sanitation or other product safety issues.

6.4 Aquaculture Research

6.4.1 Motivation

The establishment of a new aquaculture industry requires research support to develop technology, adapt it to local environmental conditions and understand the interaction between aquaculture and the environment. The primary responsibility for supporting research traditionally falls on the public sector as it is beyond the means of most small and medium size aquaculture enterprises to conduct research. South Africa possesses a well established cadre of aquaculture researchers based at Universities and DEAT-MCM. Namibia is currently building aquaculture research capacity and possesses the Henties Bay Research Centre. The IIM in Angola has an aquaculture directorate but no aquaculture research programmes are currently being promoted. The development of research infrastructure and manpower capable of leading research programmes can take many years and requires international assistance to transfer up-to-date skills and technology. Furthermore, it is a very expensive undertaking requiring a long term commitment of

public sector funds and contributions from the private sector. Since aquaculture enterprises in the BCLME are targeting similar species and markets, it makes sense for the three countries to collaborate in the field of aquaculture research in order to develop research capacity and efficiently utilise scarce regional research facilities.

6.4.2 Policy options

The BCLME partner countries will endeavour to:

1. Identify critical regional aquaculture research needs so that these can be addressed in a cooperative manner.
2. Promote joint public/private aquaculture research projects particularly for the development of culture technology for species indigenous to the BCLME.
3. Attract international research expertise and network with the international aquaculture community.
4. Actively disseminate research objectives and findings in the region.

6.5 Aquaculture Sector Management Capacity Building

6.5.1 Motivation

Aquaculture is a new industry, which requires a range of public sector management services in order to function in a responsible and sustainable manner, with a capability to deliver health certified products for export. A major constraint to the effective public sector management of the emerging aquaculture industry is a shortage of experience and skills in the three national BCLME departments responsible for sector management. A collaborative approach to developing regional mariculture sector management capacity is therefore recommended.

6.5.2 Policy options

The BCLME partner countries will endeavour to:

1. Identify aquaculture management capacity building needs in the public sector, and the mechanisms by which these can be addressed.

6.6 Responsible Industry Development

6.6.1 Motivation

Poorly sited aquaculture operations are an environmental threat and may preclude the development of other resource based economic opportunities. Since aquaculture is a new industry it is important to zone suitable areas for aquaculture development in the BCLME to promote orderly industry development and avoid possible negative environmental and social effects. Namibia and Angola have recently created the legal frameworks for aquaculture zones and a process is underway in South Africa which should result in a similar legal instrument.

6.6.2 Policy options

The BCLME partner countries will endeavour to:

1. Zone suitable sites or “development nodes” in the BCLME which are economically, socially and environmentally best suited to aquaculture development.
2. Undertake joint action to overcome non-tariff trade barriers to aquaculture export products from the region.

7. COMMENTS ON THE REGIONAL AQUACULTURE POLICY OPTIONS

7.1 Workshop of Representatives of BCLME National Aquaculture Departments Held at the AASA Aquaculture Conference, Grahamstown, 14 September 2005

Attendance

Angola
Dra Francisca Delgado, Director General, National Institute for Fisheries Research (INIP)
Ms Fátima Sebastião, Direcção Nacional De Aquicultura, (INIP)
Mr Moisés Longui, Direcção Nacional De Aquicultura, (INIP)

Namibia
Mr Ekkehard Klingelhoeffer, Director Aquaculture, NatMIRC, Ministry of Fisheries and Marine Research, Namibia

South Africa
Dr Trevor Probyn, Mariculture Unit, Marine and Coastal Management, Department of Environmental Affairs and Tourism, South Africa
Dr Grant Pitcher Mariculture Unit, Marine and Coastal Management, Department of Environmental Affairs and Tourism, South Africa
Mr Svein Munkejord. Norwegian Special Advisor to Marine and Coastal Management, Department of Environmental Affairs and Tourism, South Africa
Dr Jannette Du Toit, Directorate: Sustainable Livelihoods and Socio-Economic Development, Marine and Coastal Management, Department of Environmental Affairs and Tourism, South Africa

BCLME Aquaculture Project Team
Prof Peter Britz, Department of Ichthyology and Fisheries Science, Rhodes University
Dr Lawrence Oellermann, BCLME aquaculture project consultant, Enviro-Fish Africa (Pty.) Ltd.
Ettienne Hinrichsen, BCLME aquaculture project consultant, AquaEco (Pty.) Ltd.

Workshop format
The BCLME regional aquaculture policy options and strategies were presented by Prof Peter Britz and discussed by the group. Comments and recommendations on the policy options and strategies were made by the group as well as suggestions for the implementation plan. These were recorded by Dr Lawrence Oellermann and incorporated into the present document and implementation plan. The project consultants undertook to forward the revised document and implementation plan to the respective national departments.

Comments and Recommendations:
1. There was general support for the regional aquaculture policy options with some specific comments and suggestions.
2. The main suggestion of the workshop was the establishment of a BCLME Aquaculture Standing Committee to create a regional liaison forum for discussing aquaculture policy and management issues with ecosystem implications
3. It was suggested that sub-committees or working groups to deal with the implementation of specific issues should be established.
3. Specifically include a sub-committee to promote research. Identify a competent authority or agency to implement regional research projects (A BCC aquaculture executive officer is proposed in the implementation plan).
4. For aquatic health issues the “competent authority” in Namibia is the Ministry of Trade & Industry and SABS (accredited lab). There is no competent authority for live aquatic animals in Angola, but all activities regarding aquatic animals are dealt with within the Ministry of Fisheries (Directorate of Aquaculture Development)

5. It was suggested that the BCLME countries should adopt ICES (International Committee for the Exploration of the Sea) codes & FAO (Food and Agriculture Organisation of the United Nations) guidelines on aquatic diseases.
6. The creation of a liaison group for the introduction of exotic aquatic species was seen as urgent for Angola.
7. The policy option "Shellfish Sanitation" should be broadened to "mollusc and shellfish monitoring & control programme" or "public health for aquaculture products" so that all food and public safety issues could be addressed. Shellfish should include prawns.
8. Collaboration to develop operational capacity for the monitoring of harmful algal blooms should not be restricted to Namibia and Angola but include all BCLME partner countries.
9. Market access and fair trade for aquaculture product exports should be addressed regionally as non-tariff trade barriers related to product health certification constrained industry growth.
10. It was felt that the policy option proposing "regional harmonization of aquaculture sector development plans" should be omitted as sector planning was really a national competency.

7.2 Comments and Suggestions by Ms Sandy Davies, SADC Fisheries Coordinator

Hi
Great the review is really well done - it's very useful to have all the information gathered together – well done to you and the team and BCLME.

Of course I have a big interest in expanding this to a SADC wide policy, and for that reason bringing it in line (I am trying to avoid the use of the word harmonise - but I suppose that really I do mean to harmonise) with our other regional frameworks such as with the Protocol on Fisheries, the NEPAD fish for all process (currently in draft and including the PROFISH programme) and linking it to the future work of ASCLME and its linked programmes and also our Mangochi Action Plan (although I tend to feel that your options combined with the NEPAD work will provide a more complete and useful starting block for a strategy / implementation plan for Article 13 of the protocol rather than the Mangochi work (don't tell the WorldFish people they did it - I've attached it for you)). You mention the SADC Protocol on Fisheries in the review but then it misses out on a real comparison or follow-through of this to your proposed policy options - I think that this approach would be useful as the Protocol on Fisheries is signed and in force (August 2003) and will give extra political support to your policy.
There will be a need to prioritise the policy options or at least the interventions within the key option areas - this is vital in order to focus energy (evidently the sector is highly under human resourced) and to assist in targeting future ICP support - this could be done via a study or consultations (yet more workshops).
Sandy

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