REPORT ON THE INVASIVE SPECIES COMPONENT OF THE MEDA's, TDA & SAP FOR THE ASCLME PROJECT

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PART I: INTRODUCTION TO THE PROJECT

1. Project Background

1.1 Introduction

Invasive alien species (IAS) are now generally recognised as one of the greatest threats to global biodiversity. They also have serious economic, environmental and health impacts and, as a result, can place major constraints on development and natural resource use. In the marine realm there are examples of invasive species from all different taxonomic groups, ranging from plants, to vertebrates and even microbes.

Globally, the incidence of species invasion is increasing drastically, as ongoing development leads to growth in maritime and shipping sectors, and also other human-mediated activities involving species translocation, such as aquaculture. The impacts of invasions are similarly increasing as marine ecosystems weeken under the combined stresses of over-fishing, pollution and coastal development.

There are several significant vectors of transfer for marine organisms, including intentional introduction (e.g. for fisheries or aquaculture) and unintentional means, such as biofouling on ocean-going vessels, accidental release from aquariums, and discharge of ships' ballast water, which is thought to be the most serious modern vector. Almost any type of organism can be transferred in situations where water is transported from one ecosystem to another, due to the planktonic life stages that most marine species experience. Ballast water is taken on by ships in order to stabilise them at sea when they are not fully loaded with cargo. Large vessels can carry over 150,000 tons of ballast water on one voyage. It is estimated that upwards of 10 million tons of ballast water are transferred around the worlds oceans each year, containing up to 7,000 species of aquatic organisms at any given time.

The International Maritime Organization (IMO) has developed the *International Convention for the Control and Management of Ships' Ballast Water and Sediments*, adopted by member states in 2004, which remains the most pertinent of international legal instruments in the fight against marine IAS. The Convention on Biological Diversity (CBD) (1992) provides a comprehensive basis for protection of biodiversity from IAS generally, and the FAO has developed framework for the management of species deliberately introduced for fisheries and aquaculture purposes. Efforts to implement the provisions of these instruments are being made at local and regional levels. The ASCLME programme is aiming to help facilitate this process, and function as a medium for a collaborative partnership approach to building the appropriate capacity and networks to reduce the risk of serious impacts to the region's marine biodiversity and resources.

1.2 Scope of Project

This project focused on the countries of the Western Indian Ocean (WIO) region that are participating in the ASCLME programme, including Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa and Tanzania. The activities of the project were directed through the ASCLME Secretariat, the ASCLME Steering Committee and specifically via the National Focal Points. The project Terms of Reference detailed key deliverables, all of which are contained or summarized within this report. The report therefore aims to present the project outcomes in a manner that demonstrates the existing situation within the region and highlights the areas of concern. Recommendations and guidelines for the way forward are then given as the mechanism for engagement of the ASCLME project and associated partners within the region.

The project aimed to review existing information related to marine IAS (including HAB's), especially with respect to their key management areas and those responsible for them. This review was used to develop recommendations for further engagement of the partnership network in the region, and also increase institutional capacity for management. Guidelines for appropriate steps towards legal, policy and institutional reforms related to marine IAS have been drafted and specifically designed for the conditions of the region. In line with these, several meetings and seminars were also held within the region to catalyze action as per the guidelines. Summaries of these activities are included as action points in this report.

1.3 Project Objectives

The overall objective of this project is to provide updated, vetted summary information regarding marine invasive species and HAB's and the capacity for management of them within the region, in order to support the MEDA-TDA development process of the ASCLME project.

The specific objectives include:

a. Producing a baseline of data related to marine IAS and HAB's that can be supplemented through the ongoing work of the ASCLME project and relevant partners.
b. Summarising the key role players in the region related to the management of marine IAS and HAB's, including their current and proposed levels of involvement.
c. Developing recommendations for increasing the capacity for management of marine IAS, as well as reducing the risk within the region associated with these types of organisms.
d. Increasing the strength of key partnerships within the region and using this partnership network as a medium for a proposed way forward, using the ASCLME project as a central role-player.
e. Initiate some training on the management of marine IAS within the region through a regional training workshop and integration of further training events within the proposed regional plan of action.

2. Revisions & Additions to the Project

Beyond the basic terms of reference for this project, some activities have been incorporated into the project as ad hoc contributions to bolster the strength of the information attained and impact made within the various countries. These include:

- Regional training course on marine invasive species and port biological baseline surveys (Detailed in Part V).

- Presentations on behalf of the project at:

    - ASCLME Steering Committee meeting, Dar es Salaam, Tanzania
    - PENAf Launch Conference with Port Management Association of East & Southern Africa, Mombasa, Kenya
    - Pan African Ports Conference, Arusha Tanzania
    - ASCLME Science to Governance workshop, Grahamstown, South Africa
    - ASCLME TDA/MEDA/SAP development workshop, Maputo, Mozambique

- National ballast water management seminars were conducted for five of the ASCLME countries, with funding from IMO and in-kind support from IOI-SA. These are further detailed in the national summaries under Part II Section 8 of this report.

3. Methods

3.1 Desktop Review

A desktop study of marine IAS and HAB's was conducted, including existing records and associated data within the region, as well as institutional management capacity information. A questionnaire (see Annex I) was circulated to the national focal points in each country of the region, with a cover letter requesting that it be disseminated widely to appropriate researchers and managers in related fields, and subsequently returned with validated information. The questionnaires were received from most countries, however the information contained in the responses to the questions demonstrated that there is little existing knowledge related to marine IAS and HAB's within the region. Internet and literature searches revealed some further data, but also confirmed that outside of South Africa there are few records of this nature, and little ongoing research in this field. Follow up meetings within several of the countries allowed for further discussion of the matter, and provided some insights into how these gaps in scientific knowledge may be better addressed through the existing scientific networks.

Questionnaire responses were not received from Comoros, Madagascar or Mozambique.

3.2 Recommendations & Guidelines

The questionnaire provided some feedback on management capacity and institutional arrangements within each country. This allowed for preliminary assessment of the preparedness of the region for implementation of necessary reforms. Further to this, a series of national meetings and seminars were conducted, as possible, in collaboration with the IMO. The IMO funded the national seminars, as a collaborative exercise with the ASCLME, and to help instigate momentum within each country towards ratification of the IMO Ballast Water Management (BWM) Convention.

The countries that were able to hold national seminars on BWM were able to advance significantly in terms of national progress. This also allowed for the development of a regional approach or guidelines for developing a Draft Regional Strategy and Action Plan. The recommendations for the way forward include the finalization and adoption of this document in the region, as well as a broader set of deductions as to how the ASCLME programme and partnership network can increase protection from marine IAS and HAB's.

The activities of this project were designed to increase the collaboration with and effectiveness of the IMO-GBP interventions on ballast water, as well as other international efforts for regulating marine IAS. A significant aspect of this approach was the engagement of the maritime sector in each of the ASCLME countries. Cooperation between the maritime and environmental administrations is essential for effective marine IAS management. The project provided the right opportunity to initiate this cooperation through more formal arrangements and structures. The project also helped ensure that international best practices were used for guidance where relevant, and that the ASCLME approach is adequately harmonized with international legislation and guidelines.

3.3 Training

A customized training course was prepared for delivery within the region. It was adapted with permission from the training course titled "The Management of Invasive Species in Marine & Coastal Environments" from the Global Invasive Species Programme (GISP). A module was added to the course on Port Baseline Survey Design & Sampling Strategy, for which information was adapted from existing courses under the International Ocean Institute - Southern Africa (IOI-SA) and the GloBallast Programme (GBP) of the IMO.

This course was designed to be delivered over 2-3 days for participants with experience and professional responsibilities related to coastal biodiversity management. It is designed for a regional delivery, but could also be easily adapted for national delivery. It is intended to give an overview of the issues and range of options available for management. Several more specific courses are available within the partnership network that would be more appropriate should there be a need for training at more technical or operational levels.

PART II: DESK TOP STUDY OF RELEVANT ACTIVITIES & INFORMATION FOR MEDA/TDA/SAP

4. Baseline Information on Marine Invasive Alien Species in the Region

4.1 Invasive & Alien Species

There is an important distinction to be made between the words 'invasive' and 'alien' especially in consideration of reports of species presence in regional habitats. Several non-native or alien species may be present as the result of intentional or unintentional introductions. Examples of intentional introductions may include marine aquaculture or fisheries purposes. Escapement of aquaculture species into the wild may not be an intended outcome of such introduction, but is often likely for types of species grown in coastal environments. A more serious concern however is the possibility of the introduction of pathogens or parasites through the stock of farmed organisms.

Invasive species are the alien species that are able to spread and have an impact on the local environment. It is not always possible to determine if/when an established alien species will become invasive, and for this reason the precautionary principle must always be used for management decisions.

The review conducted as part of this study captures species records for both invasive and alien species in the WIO region, recognizing that these labels may change over time as new information becomes available. The data available in terms of species lists was very sparse, especially outside of South Africa and may be incomplete. Efforts to build upon the species list must be included in ongoing best management practices for coastal biodiversity authorities, and promoted from within the ASCLME programme. Some suggestions for how to take this forward have been incorporated into the recommendations detailed in Part III.

4.2 National IAS and HAB Records

Summary data gathered from the questionnaires, meetings, literature review and other communications is consolidated per country below. Generally, the quantity and quality of information available related to marine IAS and HAB's was very low for the region, indicating a need for greater awareness and investment in generation of baseline information and management capacity. The responsibility for these management areas falls across both environment and maritime sectors.

Records of introduced species per country also differ with respect to the various sources, and types of organisms listed. For example, the Global Invasive Species Database (GISD) lists *Vibrio cholera* as introduced for several of the countries of the region. Although this is a valid record of introduction, bacterial species are not always captured in such assessments. These are included in the species numbers of this report, although it must be noted that not all records from databases such as the GISD are included here (e.g. freshwater species listed in marine sections).

4.2.1 Comoros

No information regarding marine invasive species was supplied from the Comoros, and no records of such introductions were found through the course of this project. It is assumed that this is due to the lack of past research and capacity in this field, and not a true reflection of the state of the marine ecosystem. Therefore baseline investigations into the coastal waters of the islands of the Comoros would help increase the ability to monitor and manage ongoing risks of invasive species threats to local resources.

4.2.2 Kenya

A total of 3 introduced and 4 cryptogenic species are reported for the marine waters of Kenya. Of the introduced species, two were recorded during the port biological baseline survey (PBBS) described below. There are no invasive species currently reported.

Mombasa PBBS

A total of 345 species were reported from this survey at the Port of Mombasa. This figure will likely increase as the experts involved continue to revisit the samples for further analysis, and new identifications are made. The majority of these species are reported as typical of the species compositions known from coastal waters of Eastern Africa. Of these species, two are confirmed introductions of alien species known from other areas of the world. The number of alien or invasive species may increase as further research and monitoring is conducted, including further assessment of the samples taken, given that the unknown or hard to identify specimens may be compared with all possible records of similar species from around the world at any time.

The two species that are confirmed to be invasive alien species are both Bryozoans (*Bugula neritina* and *Tricellaria occidentalis*). Globally *Bugula neritina* is nearly cosmopolitan, probably through anthropogenic introduction, but not found in cold polar and subarctic/sub-antarctic regions. In South Africa it is prevalent in all areas that contain a harbour, from Port Nolloth to Durban, and is a common fouling organism found on the hulls of ships. The likely vector of its introduction to the Port of Mombasa is therefore hull-fouling. It was not found in high abundance during the survey, suggesting either this is a recent introduction or that the sampling effort simply wasn't adequate for its detection otherwise.

Tricellaria occidentalis is also notorious for being introduced to ports through shipping (specifically hull/bio-fouling). It is native to the northern hemisphere, where it has been recorded from British Columbia to southern California, Baja California, China, Japan and Europe. It is also found in New Zealand, where it is classified as introduced via shipping, and is also likely to be introduced to Australia. In Victoria, *T. occidentalis* is regarded as probably the most successful invader of the known introduced bryozoans.

There are also several species which have been flagged for further research which may be either introduced or new to science. It is normal for a large survey of this nature, targeting such an unknown environment, to produce new observations of species previously unrecorded. For this reason it is important to label these species as cryptogenic, until further research can verify their status as either new species or species known from other areas and alien in Kenya. Further efforts may be made by the relevant researchers to finalize these findings and publish them for public knowledge. Specimens of species sampled are archived in both Kenya and South Africa.

The information presented in this report, and the associated database produced at KMFRI, should be used as the basis for developing a comprehensive baseline of Kenyan marine species occurring in the port environment, as well as for tracking and reporting known alien species. It should also serve as the foundation for an ongoing monitoring programme to investigate the degree of invasion of reported species, and to detect any further introductions. Surveys of this kind are useful indications of the health of port marine ecosystems. However this must be incorporated into a management regime for the value to be fully realized.

4.2.3 Madagascar

Records for marine ecosystems of Madagascar reveal a total of 3 introduced species and 4 cryptogenic species. Although a few of these species have potential to become invasive, two of the species listed already present serious threats and concerns regarding their management should be further taken into account.

The Asian Mussel *Musculista senhousia* is native to East Asia and has successfully invaded New Zealand, Australia, the Mediterranean and the Pacific Coast of the USA. Known for rapid growth and the formation of dense mats on the surface of soft sediments, it is capable of causing significant habitat alteration. It can be found from intertidal to subtidal habitats at a depth up to 20 meters on soft or hard substrata. The mussel uses its byssal threads and the soft sediment to construct a cocoon to protect its soft shell. It burrows down in sand and muddy bottoms forming dense mats in these habitats, which may exclude other native species (macroinvertebrates) and alter the habitat functioning and the physical environment. On hard substrates and when densities are high, the mussels can form dense carpets through direct fusion of the byssal threads between individuals. The mussel may deposit high quantities of organic matter in the sediments which can result in the accumulation of toxic metabolites, such as sulphide. This can directly impact the growth rates of local seagrasses.

Although known widely across the Indian Ocean, the Crown-of-thorns or Coral-eating Starfish *Acanthaster planci* is considered cryptogenic due to a lack of historical distribution data from this region. It is currently widespread in the Indian and Pacific Oceans where it is having serious impacts on already significantly stressed coral reef systems. Scientific debate continues as to whether outbreaks of this starfish are natural or human induced, leaving the species to be considered

cryptogenic in several areas. What is not under debate is the significance of the impact the starfish is having in coral reef areas, where up to 90% or live coral cover may be lost. The starfish also possesses dangerous spines which may inflict serious wounds on those who come into contact with them.

4.2.4 Mauritius

A total of 10 introduced species and 5 cryptogenic species are reported from marine waters of Mauritius. All 10 of the alien species have been introduced for cultivation (aquaculture) purposes. No information on the state of containment or potential naturalization is currently available for these species. Some of these species have been known to become invasive through wild populations in other areas (e.g. *Penaeus monodon, Crassostrea gigas*). The Crown-of thorns starfish has also been reported from Mauritius, as described for Madagascar above.

4.2.5 Mozambique

In Mozambique there are 3 introduced species and 3 cryptogenic species reported. Two alien macro-algal species have been introduced for cultivation purposes. These species are grown in coastal areas for collection and exportation and use of the valuable agar that can be extracted from them. Although there have been some ad hoc reports of *Eucheuma striatu* growing outside the cultivation areas, these species are not known for wide scale invasion potential. None the less, ongoing monitoring of the reef areas near the aquaculture facilities should be conducted. There are no invasive species that present a significant threat currently reported from this area.

4.2.6 Seychelles

A total of 3 introduced species and 3 cryptogenic species have been reported from the marine waters of the Seychelles. Of the introduced species, two bryozoans were discovered during a survey conducted by the IUCN in 2004. The survey was specifically designed for the purposes of investigating invasive alien species presence, building local capacity for ongoing species monitoring, and raising awareness about invasive species and their potential impacts to the valuable marine resources of the Seychelles and surrounding region.

The coral reefs around the Seychelles have been heavily impacted and disturbed, rendering them vulnerable to potential invasion. There is also significant shipping traffic in the region, which may help facilitate the transport of species from international sources. For these reasons the Mahé marina was selected, along with some areas outside the marina, for a pilot survey project by the IUCN, to be conducted with the assistance of regional partners.

The survey revealed approximately 500 species from 29 taxa, which were identified by experts throughout the region. Although no major ecologically threatening invasions were discovered, two alien bryozoans, *Bugula neritina* and *Zoobtryon verticillatum* were identified. Beyond these two species there were a considerable number of samples that were not identified to species level or for which the status was unknown. The survey effort demonstrated a common shortcoming of surveys of this nature, which is the ongoing lack of taxonomic expertise available locally and within the region to make adequate identifications at species level.

4.2.7 Somalia

No information regarding marine invasive species was available from Somalia, and the only record of introduced species in marine environments was for *Vibrio cholera*, which has been known to cause outbreaks of cholera in this region. This bacterial invader exists in many parts of the world, and has been shown to persist in marine environments for up to 30 days. It has also been shown to survive and be transferred through the ballast tanks of ships. Ship mediated cholera outbreaks have lead to the loss of human life and can have severe trade implications.

It is assumed that the lack of baseline or invasive alien species information is due to the lack of past research and capacity in this field, and not a true reflection of the state of the marine ecosystem. Therefore baseline investigations into the coastal waters of Somalia would help increase the ability to monitor and manage ongoing risks of invasive species threats to local resources.

4.2.8 South Africa

The South African coastal waters have been relatively well surveyed over recent decades, leaving a long published trail of species records, including invasive and alien species. Accounts and descriptions have evolved and sometimes changed over the years, given updated information, and recent efforts to assess the true number of introduced species in South African waters have been extensive. The latest (2011) reports from South Africa demonstrate a marked increase in alien species numbers from previous years. This is largely due to a re-assessment of historical records by local researchers, and also the inclusion of some new field research studies.

There are currently 87 introduced species and 39 cryptogenic species listed for South African marine environments. Of these, 5 species are considered invasive, having significant impacts around the South African coast. These include two mussel species (*Mytilus galloprovincialis* and Semimytilus algosus), one crab (*Carcinus maenas*), one barnacle (*Balanus glandula*), and one oyster (*Crassostrea gigas*) that has established large wild populations outside of cultivated areas. The combined effect of the significant invasions by the two mussel species and the barnacle has been to completely alter the coastal habitat from the upper intertidal zone through to the sub-tidal zone. The three species have displaced native grazers and filter feeding invertebrates completely

changing the species composition of the invaded section of coast (predominantly West coast of South Africa).

The potential for other species to become invasive, and also for the further spread of existing invasive species has also been noted. For example, the European Shore Crab *Carcinus maenas* has established dense populations in both Table Bay and Hout Bay, where it has removed (through direct predation) the majority of other shellfish in these areas. As a voracious predator, it would have a severe impact in areas such as Saldanha Bay (approximately 100 km from Table Bay), where extensive and valuable shellfish mariculture operations exist. There have been isolated reports of the crabs presence in remote areas of the west coast, however the invader has not yet been able to establish populations of significance in these areas. This may however only be a matter of time, as the lag phase of the invasion can be variable and difficult to predict. Opportunities for biocontrol of this species have been discussed, and should perhaps be further explored before the feared impacts are realized.

South African waters have been well know (particularly along the west coast) for algal blooming events. Dinoflagellate species and Harmful Algal Bloom (HAB) forming species are further discussed in section 5 below. These species are often categorized as cryptogenic or even pan-global due to lack of adequate life history data. Some HAB species have been included in the list of introduced species in South Africa, and it is likely that even more should be included. A case study was developed in 2004 to demonstrate that the Brown-tide forming species *Aureococcus anophagefferens* was introduced from the East coast of North America. Genetic techniques were used to compare the populations and shipping connections were researched to establish the likely connection. Although this species has been having recurrent and significant impacts on the shellfish mariculture industry in Saldanha Bay, it has not been categorized as invasive, as the population has remained isolated within the Bay area.

Port biological baseline surveys targeting invasive alien species have been conducted at all major ports in South Africa, and ongoing monitoring programmes have been developed in some of these areas. Other investigative surveys have included the roles of biofouling from yachts and barnacle compositions on offshore buoys. Further assessment of the role of in-water hull and rig cleaning and the frequent movements of oil rigs through the area have been highlighted as priorities for ongoing research.

4.2.9 Tanzania

Reports from Tanzania reveal a total of 5 introduced species and 3 cryptogenic species. Of the introduced species, 3 are cultured and have not necessarily formed naturalized populations. These include one oyster species and two macro-algal species. Although these have potential to form wild populations and should be monitored, the more serious concern in Tanzanian waters is the introduction of the Asian Mussel *Musculista senhousia*. No information is currently available on the severity or extent of the invasion, which has potential to severely alter the benthic environments.

For more information on the Asian Mussel and its impacts, please refer to the detailed description under the Madagascar section above. Further assessment and monitoring of this invasion should be conducted.

4.3 Generation of Species lists

The list of current invasive and alien species in the WIO region is attached as Annex II of this report. The list is categorized by country and species type, and reflects the information provided by the specialists contacted and literature available. The strong bias in species number in South Africa does not necessarily reflect a higher number of invasive and alien species in SA, but rather increased sampling and research effort over time. The biogeographic heterogeneity of SA also contributes to the higher number of species observed in the study, as the west coast temperate environments differ greatly to the range of tropical and sub-tropical environments found on the East Coast of SA and the rest of the WIO region.

Most of the available data on marine IAS species records came from reports of surveys or research specifically targeting these types of organisms. For the majority of the countries in the region there have been no investigations of this nature conducted and therefore little to no data was obtained or available for some countries. This is unlikely a representation of the actual current state, and it is therefore recommended that such surveys be supported and carried out where possible to fill in the existing information gaps and generate adequate baseline data to support ongoing management for marine IAS.

A total of 104 introduced or alien species and 45 cryptogenic species are listed within the region. Of these only 5 are considered to be invasive. As some species have only recently been 'upgraded' to the status of invasive (e.g. *Crassostrea gigas* in South Africa) it is imperative that all species on this list are considered as potentially harmful or disruptive to native biodiversity and ecosystems. The species listed are recorded from 8 of the countries in the region, as per the table below:

Country	Alien species	Invasive species	Cryptogenic species
Comoros	0	0	0
Kenya	3	0	4
Madagascar	3	0	4
Mauritius	10	0	5
Mozambique	3	0	3
Seychelles	3	0	3
Somalia	1	0	0
South Africa	87	5	39
Tanzania	5	0	3

5. Review of HAB Events and Activities in the Region

Harmful Algal Blooms (HAB's) have received much attention due to the acute impacts some may have on coastal systems, local populations of fish and invertebrates, and human health. These microscopic species are particularly vulnerable to transport in ships' ballast water, both in planktonic and cyst resting stages in the ballast sediments. Developments in ballast water treatment technologies must take mico-algal species of this nature (including the robust resting cyst stages) into account, as dictated by the D-2 standard of the IMO BWM Convention. This standard details the level of organism removal necessary for ballast water treatment technology approvals, which has thereby increased and focused international research on micro-algal and HAB-forming species. The biogeography of these species is not always well understood, with many HAB species categorized as cryptogenic or pan-global, however it is clear that preventing further introductions of HAB's has become a priority concern of the global marine IAS management community.

The algal species that form blooms may be dinoflagellates, diatoms, cyanobacteria or other types of mico-algae, and the blooms themselves may take various forms and colors, and cause impacts due to toxicity or other mechanisms such as localized oxygen depletion. The west coast of South Africa is well known for recurrent red-tides and other HAB events, many of which are naturally occurring and others are likely to have been introduced. The East coast of Africa is less nutrient rich, and therefore experiences far fewer phenomenon of this nature. There have however been some recorded events, with impacts on a relatively large scale. Regular monitoring in Reunion Island has shown cases of ciguatera fish poisoning (amongst other HAB species impacts/records) to be relatively common, likely throughout the region. Despite the potential acute threats to fisheries and other human interests, the only ongoing monitoring for HAB's is occurring in isolated areas of the South African west coast and in Reunion Island.

Although there have been hundreds of micro-algal species recorded within the WIO region, significant HAB events in the region have only been reported from Kenya, Mauritius (including Rodrigues), Somalia, South Africa and Tanzania. This is likely a reflection of the monitoring and assessment capacity in these locations, as it is generally understood that red tides and other HAB events occur occasionally throughout the region, usually associated with the beginning of the North-east monsoon season in East Africa. Coastal upwelling associated with offshore winds brings cold nutrient rich waters to the surface forming ideal conditions for blooming species to proliferate. Impacts of these events have been documented in all recorded locations, most commonly causing mass mortalities of fish or invertebrate species. While events along the West Coast of South Africa tend to recur with some regularity, the HAB records in the Western Indian Ocean areas tend to be isolated events that are tied to less common weather or oceanographic phenomena.

Between 1998 and 2000, the UNESCO-IOC HAB programme coordinated a preliminary survey of the Western Indian Ocean region, as part of the WIOHAB programme. This programme was developed with funding from Sweden and Denmark as a partnership between:

- KMFRI (Kenya)
- Institute of Marine Sciences (Zanzibar)
- Albion Fisheries Research Centre (Mauritius)
- Centre Nationale de Recherche Oceanographique (Madagascar)
- Agence pour la Recherche et la Valorisation Marines (Reunion)
- IOC Science & Communication Centre on Harmful Algae (Denmark)

Study sites for the survey were located in Kenya, Zanzibar, Reunion, Mauritius and Madagascar (Ste Marie Island). A total of 60 potentially harmful species, representing 4 different classes, were recorded from the region during the survey (see table below). A list of the potentially harmful species found and an indication of the risks posed, as well as a guide to their sampling, handling and identification, was produced as the main publication of the programme. The publication can be downloaded from the UNESCO-IOC HAB programme website, and remains a very useful tool for researchers or those interested in HAB issues in this region.

Species Espèce	Country Pays					Toxic Toxique
	Kenya	Madagascar	Mauritius	Réunion	Zanzibar	
Cyanophytes						
Anabaena spp.	x				x	x
Lyngbya spp.					x	x
Oscillatoria spp.	x		x		x	x
Trichodesmium cf. *contortum*					x	
T. erythraeum		x	x		x	x
T. lenue					x	x
T. thiebautii					x	x
T. spp.	x			x	x	x
Diatoms						
Chaetoceros peruvianus				x		
Pseudo-nitzschia cf. *cuspidata*				x		
P. pungens	x					x
P. spp.	x				x	(x)
Dinoflagellates						
Alexandrium affine	x					
A. leei	x					
A. tamayavanichii	x					x
A. cf. *tamarense*	x					(x)
Amphidinium carterae		x	x		x	x
A. operculatum			x	x	x	x
Coolia monotis			x	x	x	
C. tropicalis				x		
C. sp			x	x		
Dinophysis acuminata	x					x
D. caudata	x					
D. doryphorum				x		
D. cf. *favus*				x		
D. hastata			x			x
D. cf. *infundibula*	x					
D. cf. *parvula*	x					
D. rapa						(x)
D. rotundata	x				x	x
D. schuettii		x				
D. spp.	x			x		
Gambierdiscus belizeanus				x		
G. toxicus			x	x	x	x
G. yasumotoi				x		x
Lingulodinium polyedrum	x					x
Ostreopsis heptagona				x	x	x
O. labens				x		
O. lenticularis			x	x		x
O. mascarenensis				x		x
O. ovata	x		x	x	x	
O. siamensis			x	x		x
O. spp.					x	
Prorocentrum arenarium		x		x		x
P. belizeanum			x	x	x	x
P. borbonicum					x	x
P. concavum		x	x	x	x	x
P. elegans			x	x	x	
P. emarginatum			x	x	x	
P. hoffmannianum			x	x		x
P. lima		x	x	x	x	x
P. maculosum					x	x
P. mexicanum	x		x	x	x	x
P. micans	x				x	
P. cf. *obtusum*	x					
P. panamensis				x		
P. sculptile				x		
P. spp.			x		x	(x)
Protoceratium reticulatum	x					x
Sinophysis canaliculata		x	x	x	x	
Haptophytes						
Prymnesium calathiferum				x		x
Silicoflagellates						
Dictyocha fibula	x					
Dictyocha speculum				x		

From: Potentially harmful microalgae of the Western Indian Ocean – a guide based on a preliminary survey. Hansen, G. *et al*. (eds.) 2001.

5.1 HAB's in Kenya and Somalia

A large scale HAB event was recorded off the coast of Kenya and Somalia in 2002, with significant impacts to coastal fish populations (see case study below, developed by WIOMSA). The event catalyzed concern and interest in further monitoring and assessment of HAB species and vulnerabilities in the area. The Kenya Marine and Fisheries Research Institute (KMFRI) in collaboration with the UNESCO-IOC HAB programme and other partners under the auspices of the WIOHAB Programme had been conducting research in the area over the years leading up to the large regional HAB event in 2002, which took place within the Somali upwelling system. As a result some taxonomic and sampling expertise was developed at KMFRI, and a case study was developed for the 2002 event (see below). There has not been any ongoing research or follow-up since the 2002 project, according to researchers at KMFRI and WIOMSA.

Case Study:

Red tide at Kiunga Marine National Reserve, Kenya

In January 2002, a HAB occurred along the East African coast from Mogadishu in Somalia to Lamu in northern Kenya associated with the strong upwelling of the Somali current and an unusually strong NE wind (force 5-6) that may have blown it onshore. In the area of Kiunga National Marine Reserve, in northern Kenya, the bloom lasted for ten days, with extensive fish mortality during the first three days and numerous fish and other marine animals, such as turtles, being washed up on the beaches or found floating on the ocean surface. Consumption of and trade in fish from the area was banned for two weeks and trade in shellfish for four weeks. There were no human fatalities but some cases of eye irritations and headaches. The economy, however, was seriously affected as local communities are almost entirely dependent on fisheries. Furthermore, media interest deterred tourists from visiting.

Because of the impact of the red tide on biodiversity and local livelihoods, Kenya Wildlife Service, WWF (which supports the MPA) and the Fisheries Department contacted HAB specialists in Kenya and South Africa. On their advice, water and tissue samples were collected and sent on ice to Nairobi, where some were analysed and others sent on to South Africa. Both laboratories identified *Gymnodinium* as a major component of the bloom, and satellite imagery for the period confirmed an increased level of chlorophyll in the area. Nevertheless, the exact reasons for the bloom remain unclear. The MPA, with support from WWF, also helped with publicity and answering the numerous queries from the local and international media.

From: WIOMSA Website.

5.2 HAB's in Mauritius and Rodrigues

Reported activity on HAB's from Mauritius includes:

- In 1996, five suspected red tides events were reported in the region of Trou aux Biches, Mon Choisy and Grand Bay. However, no information is available on the species and the causes.

- In 2000 under the UNESCO-IOC WIOHAB programme and the Indian Ocean Commission, the Albion Fisheries Research Centre implemented a project for the monitoring of HAB's in the lagoon of Mauritius to initiate some regional data production.

- In 2009, cases of fish mortality were reported, which may have been due to the recorded presence of a high density of *Oscillatoria* in the northern region of Mauritius.

Rodrigues:

During a survey of benthic dinoflagellates in the southwestern Indian Ocean a benthic bloom of *Ostreopsis mascarenensis* was observed. Dinoflagellates of this genus are common within the region, some of which produce toxins capable of harm to human populations. Results from a study of this species conducted by Lenoir et al (2004) showed that the toxicity displayed during the bloom could be a source of palytoxin poisoning in this area.

5.3 HAB's in South Africa

Numerous red tide and HAB forming species have been recorded from South African coastal waters, particularly from the west coast as associated with the Benguela upwelling system. These include internationally known species of relatively serious consequence such as *Gimnodinium mikimotoi*, *Aureococcus anophagefferens*, and *Alexandrium catanella*. Particular attention has been paid to the species that have caused mass mortalities of fish or valuable invertebrates (e.g. crayfish and abalone), or that threaten the established and developing mariculture facilities. The national Department of Environmental Affairs has established a monitoring programme for isolated facilities along the west coast of South Africa, as a protective alert mechanism for this industry. Although there is significant expertise in this field within the various South African universities and institutes, there is no other formal ongoing monitoring for HAB's in South Africa. The east coast is particularly under-represented in reported studies or research of this kind.

The number of HAB species and events occurring along the west coast of South Africa is too numerous for adequate summation in this report. The west coast of SA forms part of the Benguela Current system, which is distinct from the ASCLME with respect to HAB's and the environmental

conditions that govern them. For further information from this region, including some synthesized summaries of existing research, the following online services are available:

- Global Invasive Species Programme website: Africa Invaded - Harmful Algal Blooms. http://www.gisp.org/casestudies/showcasestudy.asp?id=70&MyMenuItem=casestudies&worldmap=&country=

- HAB.org.za - Harmful Algal Blooms in Southern Africa http://www.hab.org.za/harmful_algal_blooms.html

- SA Department of Environmental Affairs - Harmful Algal Blooms on the South African Coast http://www.environment.gov.za/Services/booklets/Fisheries/Red%20Tide%20Booklet.pdf

5.4 HAB's in Tanzania

Extensive research on HAB's and related micro-algae has been undertaken within the Department of Aquatic Sciences and Fisheries at the University of Dar es Salaam. Several potentially harmful species, particularly cyanobacteria, have been described for marine, estuarine and aquatic environments of coastal and inland (lakes) Tanzania and Zanzibar. The University of Dar es Salaam maintains these historical records and publications (up to 2009), however no ongoing studies are currently being conducted.

6. Invasive Species Contingency Planning

There are currently no existing response mechanisms in the ASCLME region concerning post-incursion management for marine invasive species. As outlined in the Toolkit for Best Management Practices of the Global Invasive Species Programme, there may be options for addressing invasive species impacts once the populations have entered local waters and become established. Comprehensively designed contingency plans of this nature exist in some countries such as New Zealand and Australia where numbers and impacts of marine IAS have been severe. The plans make it possible for local management authorities to react in a timely manner when critical decisions need to be made regarding new invasions. The ability to detect the invasions is an obvious pre-cursor to the need for IAS contingency plans, suggesting comprehensive survey and monitoring plans should be in place.

Although there are very few recorded successful eradications of marine IAS, and the eradications where success has been achieved are usually performed immediately at initial detection (i.e. before population establishment), there are a range of considerations for local authorities in this regard. The general strategies available for incursion management include:

- ***Eradication*** - seeks to completely eliminate the targeted IAS population by the end of the programme.

- ***Control*** - seeks to lower the densities of individuals and/or contain the areas of infestation.

- ***Impact mitigation*** - a form of control that aims to reduce the severity of impacts an invasive species is causing, rather than managing the population itself.

- ***Do nothing*** - other than monitoring the situation until it becomes necessary and feasible to consider new technologies.

The options available for both eradication and control of marine invasive species involve the following :

- ***mechanical/physical*** (e.g. removals by hand (divers), mechanical harvesting or the creation of physical barriers).

- ***chemical*** (e.g. dosing of biocide or herbicide).

- ***biological*** – such as the use of a target-specific pathogen, parasite, predator, biopesticide, genetic manipulation, reproduction manipulation or habitat modification (e.g. salinity change by salt dosing or freshwater inundation).

A feasibility assessment should be conducted before any actions are taken. Similarly national and regional assessments should be conducted for the potential to implement a marine invasive species contingency plan. Plans at national level should be considered as part of the national strategies being developed for invasive species management under the CBD obligations. At a regional level pilot projects may be designed to instigate awareness and training related to incursion management for invasive species. The various provisions discussed here are addressed in significantly more detail in several of the training packages described in this report, and will form part of the proposed regional technical training programme.

7. Relevant Institutions & Activities in the Region

- **ASCLME Project**

  Operating through the Secretariat based at Rhodes University in Grahamstown, South Africa, the GEF-funded regional project is aiming to establish Marine Ecosystem Diagnostic Analyses (MEDAs) that feed into a Transboundary Diagnostic Analysis (TDA), and a Strategic Action Programme (SAP). The concerns associated with marine IAS have been flagged as a priority management issue under the project, to be included in the MEDA/TDA/SAP process (this project report included) as well as the Science to governance forum and developing

Regional Alliance. The ASCLME is therefore playing a central facilitative role in the regional partnership network addressing marine IAS issues.

- **IMO-GBP**

  The international Maritime Organization (IMO) is implementing the GloBallast Partnerships (GBP) Programme with support and funding from the UNDP and GEF. The programme is in its second phase, operating through the Programme Coordination Unit in London. Although the ASCLME region is not currently one of the priority GBP regions, the programme has decided to support activities here with a view to promoting the goal of policy and legal reforms at national levels for ballast water management implementation. The work done in this region during the 1st phase of the programme laid the groundwork for the follow-up interventions now being promoted. The Partnership focus of the GBP approach is intended to ensure that other regional stakeholders are involved in co-supporting the proposed initiatives, ideally in a comprehensive regional framework, as being proposed in this report.

- **IOI-SA**

  The International Ocean Institute - Southern Africa is a non-profit organization registered in South Africa, representing the global IOI network that consists of 22 Operational Centres. The IOI-SA is co-ordinating the African region for IOI and is also representing the marine component of the Global Invasive Species Programme. The IOI-SA has developed a formal partnership with IMO-GBP, and is also the UN Train-Sea-Coast course development unit for the region. The institute specializes in training and capacity building, policy development, and project implementation in various areas of coastal and marine management, including ballast water and IAS management.

- **PMAESA/PENAf**

  The Port Management Association of East and Southern Africa operates through a Secretariat based in Mombasa, Kenya. The Environmental work plan of the association has identified ballast water management as a priority concern for ports of the region, along with other marine pollution issues. PMAESA has sought the assistance of the ASCLME and IOI-SA in the further development of the work plan, which should be harmonized with the proposed regional MoU and ongoing activities on marine IAS. The Port Environment Network for Africa (PENAf), based in Ghana, is promoting and coordinating its agenda through PMAESA, with a view to standardization around the African continent.

- **IUCN**

  The International Marine Programme of the IUCN, based in Gland, Switzerland, has been taking a more active role in marine IAS issues over recent years. Projects within the ASCLME region and neighboring countries (e.g. Seychelles, Kenya, and Maldives) have been developed with IUCN involvement and support, especially as regards ballast water management and implementation of the partnership with the IMO-GBP. Given the ongoing commitment within the region, the IUCN International Marine Programme should be included in further activities proposed on marine IAS.

- **WIOMSA**

  The Western Indian Ocean Marine Science Association (WIOMSA) is a non-governmental association based in Zanzibar. WIOMSA provides support for ongoing marine research and conservation priorities in the region, including student and educational project support. WIOMSA has played a supporting role in marine IAS projects in the region, including the regional training activities in Mombasa, Kenya, and should be further engaged through the proposed regional MoU for a formalized ongoing contribution in this field.

- **CORDIO**

  The East African and main office of Coastal Oceans Research and Development in the Indian Ocean (CORDIO) is based in Mombasa Kenya. The CORDIO strategy and expertise is mostly focused on research in coral reef protection, however there is also some capacity in taxonomy. CORDIO has played a supportive role in species identifications and training for port survey activities related to marine IAS in the region.

8. Governance, Policy & Legal Provisions Related to Invasive Species

8.1 International Frameworks

There are four international regulatory instruments with direct relevance in the ASCLME region with respect to the management of invasive alien marine species. The UN Convention on the Law of the Sea, the Convention on Biological Diversity, the IMO Ballast Water Convention, and the Nairobi Convention together comprise the existing framework backstopping the rights of member States to develop and implement provisions to prevent alien species transfers. If adequately domesticated these provide comprehensive coverage of the key areas of concern to be targeted for preventative management. Each is described in further detail below.

The Convention on Biological Diversity (CBD) (1992) is the only global instrument to provide a comprehensive basis for measures to protect all components of biodiversity against invasive alien species. Article 8(h) of the convention requires parties: *"as far as possible and as appropriate, (to) prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species"*. Beyond this the Food and Agriculture Organization (FAO) has developed a framework for the management of species deliberately introduced for fisheries and aquaculture purposes. It urges states to adopt measures to prevent or minimize harmful effects of introducing non-native species or genetically altered stocks. Although, there is currently no international instrument regulating the serious biofouling vector, the shipping pathway has been targeted by the International Maritime Organization (IMO), which has developed the *International Convention for the Control and Management of Ships' Ballast Water and Sediments* in 2004. It is anticipated that the ongoing deliberations of the IMO working group on ships' biofouling will lead to a new international regulatory instrument within a few years.

8.1.1 UN Convention of the Law of the Sea (UNCLOS), 1982

The UNCLOS is administered by the United Nations Office of Legal Affairs/Division for Ocean Affairs and the Law of the Sea (UN/DOALOS) based in New York. The Convention establishes an over-arching regulatory framework for the world's oceans and sea areas, and includes provisions for protection of marine environments under Part XII, as detailed below. Article 196 gives grounds for specific regulations preventing impacts from alien or new species, which provides adequate justification for national and regional policy action in this regard. Further articles urge Parties to cooperate and share information and capacity as regards common interests within regions, providing support for recommendations developed through this project and detailed in this report. All nine countries of the ASCLME region are Parties to the Convention.

UNCLOS Part XII - Protection and Preservation of the Marine Environment

Article 192
General obligation

States have the obligation to protect and preserve the marine environment.

Article 196
Use of technologies or introduction of alien or new species

1. States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.

Article 197
Cooperation on a global or regional basis

States shall cooperate on a global basis and, as appropriate, on a regional basis, directly or through competent international organizations, in formulating and elaborating international rules, standards and recommended practices and procedures consistent with this Convention, for the protection and preservation of the marine environment, taking into account characteristic regional features

Article 200
Studies, research programmes and exchange of information and data

States shall cooperate, directly or through competent international organizations, for the purpose of promoting studies, undertaking programmes of scientific research and encouraging the exchange of information and data acquired about pollution of the marine environment. They shall endeavour to participate actively in regional and global programmes to acquire knowledge for the assessment of the nature and extent of pollution, exposure to it, and its pathways, risks and remedies.

Article 201
Scientific criteria for regulations

In the light of the information and data acquired pursuant to article 200, States shall cooperate, directly or through competent international organizations, in establishing appropriate scientific criteria for the formulation and elaboration of rules, standards and recommended practices and procedures for the prevention, reduction and control of pollution of the marine environment.

8.1.2 Convention on Biological Diversity (CBD)

The CBD originated from the United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, 3-14 June 1992. The Convention is administered through the CBD Secretariat in Montreal, Canada with 193 Parties worldwide. The CBD provides the most comprehensive framework related to regulations on invasive species, including all major vectors. All nine of the ASCLME countries are Parties to the Convention, however it remains poorly domesticated and implemented throughout most of the region, especially with regard to marine invasive species.

Relevant Articles of the Convention, summarizing obligations and rights of Parties are detailed below, with Article 8(h) providing specific terms for invasive alien species. The Conference of the Parties to the Convention on Biological Diversity adopted Guiding Principles for the Implementation of Article 8 (h) as COP 6 Decision VI/23 (The Hague, 16 - 19 April 2002). These Guiding Principles have become the backbone of most international and national approaches to invasive species prevention and management, including the invasive species components of the Biodiversity legislation developed to for domestication and implementation of the CBD at national levels.

Article 1
Objectives

The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Article 3
Principle

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Article 6
General Measures for Conservation and Sustainable Use

Each Contracting Party shall, in accordance with its particular conditions and capabilities:

(a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and

(b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Article 14
Impact Assessment and Minimizing Adverse Impact

1. Each Contracting Party, as far as possible and as appropriate, shall:

(a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures;

(b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account;

(c) Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by

encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate;

(d) In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage; and

(e) Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and agreed by the States or regional economic integration organizations concerned, to establish joint contingency plans.

2. The Conference of the Parties shall examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter.

Article 17
Exchange of Information

1. The Contracting Parties shall facilitate the exchange of information, from all publicly available sources, relevant to the conservation and sustainable use of biological diversity, taking into account the special needs of developing countries.

2. Such exchange of information shall include exchange of results of technical, scientific and socio-economic research, as well as information on training and surveying programmes, specialized knowledge, indigenous and traditional knowledge as such and in combination with the technologies referred to in Article 16, paragraph 1. It shall also, where feasible, include repatriation of information.

Article 18
Technical and Scientific Co-operation

1. The Contracting Parties shall promote international technical and scientific cooperation in the field of conservation and sustainable use of biological diversity, where necessary, through the appropriate international and national institutions.

2. Each Contracting Party shall promote technical and scientific cooperation with other Contracting Parties, in particular developing countries, in implementing this Convention, inter alia, through the development and implementation of national policies. In promoting such cooperation, special attention should be given to the development and strengthening of national capabilities, by means of human resources development and institution building.

3. The Conference of the Parties, at its first meeting, shall determine how to establish a clearing-house mechanism to promote and facilitate technical and scientific cooperation.

4. The Contracting Parties shall, in accordance with national legislation and policies, encourage and develop methods of cooperation for the development and use of technologies, including indigenous and traditional technologies, in pursuance of the objectives of this Convention. For this purpose, the Contracting Parties shall also promote cooperation in the training of personnel and exchange of experts.

5. The Contracting Parties shall, subject to mutual agreement, promote the establishment of joint research programmes and joint ventures for the development of technologies relevant to the objectives of this Convention.

Article 8 (h)
In-Situ Conservation

Each Contracting Party shall, as far as possible and as appropriate:
(h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.

ASCLME Country*	Signed	Party
Comoros	1992-06-11	1994-09-29 (Ratified)
Kenya	1992-06-11	1994-07-26 (Ratified)
Madagascar	1992-06-08	1996-03-04 (Ratified)
Mauritius	1992-06-10	1992-09-04 (Ratified)
Mozambique	1992-06-12	1995-08-25 (Ratified)
Seychelles	1992-06-10	1992-09-22 (Ratified)
Somalia	---	2009-12-10 (Acceded)
South Africa	1993-06-04	1995-11-02 (Ratified)
United Republic of Tanzania	1992-06-12	1996-03-08 (Ratified)

*Country names in this table are hyperlinked to CBD online profiles for further information.

8.1.3 IMO Ballast Water Management (BWM) Convention, 2004

The International Convention for the Control and Management of Ship's Ballast Water and Sediments gives rights and responsibilities to Contracting Parties in order to manage the ballast water threat from both Port State and Flag State perspectives. The Convention ultimately targets the treatment of ballast water to remove or inactivate the organisms before discharge into recipient waters. The standards set within the convention call for advanced technologies to be installed throughout the world's shipping fleet. In anticipation of the time it will take to phase in such technologies, the Convention requires the open ocean exchange of ballast water as an interim

mitigation measure. The Convention will come into force one year after 30 member countries representing at least 35 percent of world tonnage have ratified the instrument.

In preparation for this, the IMO and other partner organisations, have been developing international protocols for ballast water management, and supporting initiatives to further the levels of technical capacity and standardisation in countries around the world. The process of implementing a comprehensive ballast water management regime at local, regional and international levels has been refined due to such efforts, and related recommendations from the Convention. These lessons of best practice have largely shaped the regional approach being taken in the Mediterranean Sea and associated sub-regions, as detailed in this document.

The entire Convention is relevant in the context of progressing regulatory and management frameworks for marine invasive species in the ASCLME region. The following articles and regulations are of particular interest given their relevance to components of this report.

- Article 2 (General Obligation)
- Article 4 (Control of the transfer of harmful Aquatic Organisms and Pathogens through ships' Ballast Water and Sediments)
- Article 6 (Scientific and technical research and monitoring)
- Article 13.3. (Technical assistance, co-operation and regional co-operation)

- Regulations - Section A - General
  Section B - Management and Control Requirements for ships
  Section C - Special Requirements in Certain Areas
  Section D – Standards for Ballast Water Management
  Regulation D-1 (Ballast Water Exchange Standard) and D-2 (Ballast Water Performance Standard)

A set of 16 guidelines have been developed under the BWM Convention to aid Member States in the various aspects of its implementation, as detailed below. Beyond these several publications and Guidelines have been produced through the GloBallast Programme in conjunction with partners, which address and assist with important aspects of ballast water policy development and management implementation. These are further referenced as part of the recommendations developed in Part III of this report.

The available Guidelines, which are contained in various MEPC Resolutions, are:

- Guidelines for sediments reception facilities (G1)
- Guidelines for Ballast Water Sampling (G2)
- Guidelines for ballast water management equivalent compliance(G3)
- Guidelines for Ballast Water Management and Development of Ballast Water

Management Plans (G4)
- Guidelines for ballast water reception facilities (G5)
- Guidelines for Ballast Water Exchange (G6)
- Guidelines for Risk Assessment under Regulation A-4 (G 7)
- Guidelines for approval of Ballast Water Management Systems (G8)
- Procedure for Approval of BWM systems that make use of Active Substances (G9)
- Guidelines for approval and oversight of prototype ballast water treatment technology programmes (G10)
- Guidelines for Ballast Water Exchange Design and Construction Standards (G11)
- Guidelines for sediment control on ships (G12)
- Guidelines for additional measures including emergency situations (G13)
- Guidelines on designation of areas for ballast water exchange (G14)
- Guidelines for Ballast Water Exchange in the Antarctic Treaty area

Two further Guidelines are being prepared:

- Survey Guidelines for the purpose of BWM Convention
- Guidelines on PSC under the BWM Convention

The Convention will come into force 12 months after ratification by at least 30 countries representing 35% of global tonnage. At present 31 countries representing 26.44% have become party to the Convention. Currently only South Africa and Kenya have ratified the BWM Convention from the ASCLME region. Progress, including activities through this project, towards further implementation of this legal regime within the region is detailed in the national outlines of this section below.

8.1.4 Nairobi Convention

The Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region was signed in 1985 and came into force in 1996. It is currently one of 17 regional seas conventions and action plans globally. Member States include all nine ASCLME countries, plus France (Reunion). The Convention has a number of Articles and Technical Protocols for the protection of the marine & coastal environments, and provides a coordinating mechanism for intergovernmental policy-level engagements, programme implementation and related activities.

There are no binding provisions under the Convention that are directly related to invasive alien species, however the Fourth Meeting of the Contracting Parties to the Convention agreed to the following measures:

CP 4/3. MEASURES TO ADDRESS INVASIVE ALIEN SPECIES IN MARINE AND COASTAL ENVIRONMENTS

1. *Endorse* the Regional Strategy and Action Plan on Ballast Water as developed through Globallast, with a view to incorporating it into the work programme of the Nairobi Convention.

2. Direct the Secretariat of the Nairobi Convention to develop and implement with all relevant partners a programme to address invasive species in marine and coastal environment.

The National Focal Points under the Nairobi Convention were convened through the GloBallast Programme to form a Regional Task Force for Ballast Water Management. The Task Force met twice during the first phase of the GloBallast Programme, but has not been convened since the end of that phase in 2004. A regional training workshop on ballast water management was also run under the supervision of the Regional Task Force in 2004. Further training on this subject has since been provided within the region through the joint efforts of the Global Invasive Species Programme, the International Ocean Institute - Southern Africa, the IMO Technical Cooperation Programme and the ASCLME project. Recommendations for further effective, focused and ongoing training interventions within this regional mechanism are included in sections III and V of this report.

8.2 National Provisions & Progress

The obligations and rights of countries within the ASCLME region with respect to existing international frameworks have been detailed in the sections above. National level domestication and implementation related to these instruments varies greatly between the countries of the ASCLME region. Despite the umbrella legislation provided for national application of UNCLOS, there is currently no direct regulation or mechanism for controlling the relevant vectors of invasive species being administered under the provisions of this agreement within the ASCLME region. However, the CBD has been widely domesticated in the region as described in the sections below, as well as other national progress towards provisions preventing invasive species impacts.

In order to instigate activities on the management of marine invasive species within the region, national seminars on ballast water management were held in several of the countries, with a view to catalyzing further policy level commitment and regulatory framework development. The seminars were funded by the IMO, with participation of the IMO East African Regional Co-

ordinator, J.P. Muindi, and the Director of IOI-SA, Adnan Awad (also representing this ASCLME project).

The aim of the seminars was to build awareness regarding the issue of marine invasive species and the role of shipping as a vector, including the international response. It also highlighted the latest developments, including national and regional efforts around the world, as well as the available capacity building tools and guidelines available through IMO and the GloBallast Partnerships project. The seminars functioned as awareness raising events for marine invasive species impacts and the implementation of ballast water controls and policy. The events also served the purpose of convening a provisional National Task Force for each country, representing the major national administrations, agencies and stakeholders. A way forward for official nominations to the task forces, as well as steps to be taken towards developing a national roadmap on ballast water management implementation was agreed for each country. Support was also solicited for the developing Regional Strategy approach being proposed through the ASCLME (See Part IV of this report). The conclusions and outcomes of these seminars are captured for each of the relevant countries below. The reports from the seminars are included as Annex XX of this report.

In all countries were the seminars were organized, the same format was followed. After the screening of the *Invaders from the Sea* documentary, a series of presentations were delivered by Mr. Adnan Awad while the IMO Regional Coordinator presented the provisions of the Ballast Water Convention and possible Technical Cooperation assistance on the implementation of the convention that could be available from IMO.

The presentations were followed by discussions on a road map towards ratification and implementation of the Convention in each country. Although the Ministries of Transport in each country were identified as the policy organs for ratification and implementation of the Convention, the Agencies in charge of Maritime Administration in each country were assigned to play a key role in coordinating the task force teams and coordination of all the related activities. The task force in each country through the appropriate organ would request IMO or any other institution for technical assistance when and as identified.

In each country the participants were very active during the meetings and fully engaged the presenters with many questions on the Convention and process of ratification and implementation. In most cases, a provisional task force was formed and agreed to start work as soon as possible, which could be a positive indication as regards further ratification and implementation of the IMO regime. Close follow up by the IMO Regional Coordinator will be needed to ensure ongoing progress.

8.2.1 Comoros

The Comoros has ratified or acceded to several international environmental conventions and protocols. Of these the three with direct relevance to marine invasive species management are the

UNCLOS, the CBD and the Nairobi Convention. The National Directorate on Environment and Forestry, under the National Department of Environment, established the National Biodiversity Strategy and Action Plan (NBSAP) in 2000. The plan outlines general strategic objectives consistent with the approach of the CBD, and details 2 targets originally designed for 2010:

- To reduce the pressure on endemic species and resources, rare or vulnerable, on those where sustainable development is not applied, and where overexploitation is suspected.

- To restore degraded ecosystems and encourage the reconstituting of endangered species.

Some measures have been put in place to curtail activities that have a negative impact on biological diversity. These include the measures under Objective 4d of the NBSAP related to invasive species management as per Article 8(h) of the CBD.

Objective 4d:

Control of exotic and new species *(art. 8h)*

Measures:

- Regulate the introduction of exotic species that threaten ecosystems, habitats or indigenous species
- Drive eradication activities for exotic species already introduced and that are threatening ecosystems, habitats or indigenous species

The management measures under the NBSAP have largely relied on the village associations for implementation, which has seen limited success due to shortcomings in financing and monitoring capacity. Specific restrictions on the introduction of species through non-intentional mechanisms (e.g. ballast water, hull fouling) remain lacking, although the legislative framework detailed in the NBSAP would allow for these to be incorporated.

Comoros National Ballast Water Management Seminar

The National Seminar on Ballast Water Management was held in Moroni on July 8, 2011. In Comoros the national seminar was organized by the Ministry of Transport and was attended by 20 participants drawn from the major stakeholders from the environmental sector and shipping fraternity, including governmental departments, maritime training institutes and Freight

Forwarders Association, port authorities, shipping companies etc (a list of participants is attached in the Seminar report under Annex XX).

The meeting in Comoros came up with the following recommendations to foster the ratification and implementation of the Convention;

- It was recommended that a task force on ratification of BWM Convention be formed with Ministry of Transport and Tourism as the lead agency.
- The fast task will be to prepare the instruments of ratification by the government of the Convention
- The task force will discuss the relevant laws to be enacted for the implementation of the convention.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI, in drafting the legislation on implementation of the BWM Convention.
- The taskforce will identify or ensure that there are adequate Flag State/Port state control officers to be trained for implementation of the convention.
- It will also identify personnel to be trained on technology equipment facilities on board National ships, as well as joint research on implementation of the BWMC.
- It was recommended that the taskforce should ensure that Comoros ratify and initiate implementation of the Convention before it comes into force for smooth operations of their ships.
- The National Task Force will be represented in the Regional forum (Regional Task Force) and support the development and adoption of the Regional Strategy for BW Management.
- Prepare brief to the government and to IMO on the outcome of the Status and Economic Assessments to be conducted nationally using the provided templates.
- Task Force to prepare a work plan for presentation to the Regional Workshop updating the status of the Task Force and its progress.

Proposed members of National Task Force:

1. Ministry of Transport & Tourism (Lead Agency)
2. Ministry of Coordination of Environment
3. Ministry of Fisheries
4. Ministry of Justice
5. Ministry of Health
6. Ministry of Foreign Affairs
7. Port Authority

8.2.2 Kenya

Kenya is party to the UNCLOS, the CBD, the IMO BWM Convention and the Nairobi Convention, each giving specific reference to control mechanisms for invasive species. Significant progress has been made through the Ministry of Environment and Natural Resources, through which the NBSAP for Kenya was developed in 2000, in accordance with the CBD. The NBSAP includes provisions for the protection of ecosystems and natural habitats, section (f), which details strategies for management of alien species and genetically modified organisms.

Strategies designed to contain the situation related to alien species and genetically modified organisms:

- Ensure that there are adequate legislation and enforcement mechanisms to control introductions of alien and genetically modified organisms.
- Create public awareness on the dangers of alien species and genetically modified organisms through the public service framework and the national media.
- Carry out scientific research, including an inventory of alien species and genetically modified organisms

The National Environment Management Authority (NEMA) has also developed the Draft National Invasive Alien Species strategy. NEMA remains the lead agency in Kenya as regards management of biodiversity impacts from invasive species. The Kenya Maritime Authority (KMA) and the Kenya Ports Authority (KPA) remain in charge of Flag and Port State responsibilities as related to any IMO regimes, including the BWM convention.

Significant advances have also been made in Kenya as regards ballast water management. The GloBallast programme conducted some pilot initiatives in Mombasa in 2004, which were continued under the Global Invasive Species Programme in 2005, with support from the IMO Technical Cooperation Programme. These include:

- Port biological baseline survey for Mombasa
  - Established a baseline of native and introduced species for the area around and including the Port of Mombasa
  - Several new species records established, however no major ecological threat related to invasive species was identified from the survey

- Training in port surveys, with regional component
    - Capacity at the Kenya Marine & Fisheries Research Institute was increased significantly, with 30 researchers and technical staff undergoing training on survey methods and ongoing monitoring needs.
    - Equipment and technical capacity is now considered high in Mombasa for ongoing research of this nature, and for the provision of advice and input regarding the NBSAP and BWM Convention requirements.
    - Representatives from the other countries of the region were also included in the training

- Training in marine taxonomy as related to port surveys, with regional component
    - As a follow-up to the port survey initiative, the taxonomy exercise was conducted in recognition of the lack of adequate capacity in the region for achieving species level identifications of various marine taxa.
    - Contributions to the training were given from GISP, WIOMSA, NMK, IUCN, KWS and CORDIO

- Formation of national task force on ballast water management
    - The first meeting of the task force was held in 2004, with a view to supporting an ongoing forum for advising on ballast water and invasive species management issues in Kenya

- Development of draft national strategy on ballast water management

As a result of these interventions and the national commitment to combat threats of invasive species, the government of Kenya ratified the IMO BWM Convention in 2008. Currently, the national strategy on ballast water management remains in draft form, and further implementation of the IMO regime is pending.

Kenya National Ballast Water Management Seminar

The National Seminar on Ballast Water Management was held in Nairobi on 23 November, 2010. The meeting was hosted by the Kenya Maritime Authority (KMA), and was attended by eighteen (18) participants, representing the environmental and maritime administrations, ports, ship registry, various Governmental departments, maritime training institutes.

The meeting came up with the following recommendations.

- It was recommended that a task force on implementation of BWM Convention be formed with KMA as the lead Agency.

- The task force is to discuss the relevant sections of the Kenyan Laws which will contain the BWM Convention provisions.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI in drafting the legislation on implementation of the BWM Convention.
- Port State Control officers will foresee the implementation of the Convention at the Kenyan Ports to be trained before the Convention comes into force. The inspection of ships to include BW record book, validity of certificate and BW sampling ensuring that no undue delay for ships, and will ultimately require training in line with this.
- It will also be important to train personnel on technology equipment facilities, as well as joint research on implementation of the BWMC.
- Kenya will be required to notify IMO and other parties of the national requirements that will be put in place for implementation of the Convention.

8.2.3 Madagascar

There is currently no legislation in Madagascar specific to the prevention of marine invasive species or regulations targeting the various vectors. The CBD has provided an appropriate framework for a comprehensive approach to IAS management, and the NBSAP process in Madagascar has highlighted the priority areas for further action:

(1) Conservation of biodiversity (ecosystems conservation; wild genetic resources conservation; and agrobiodiversity conservation)
(2) Sustainable valuation of biodiversity (improve knowledge regarding economic, ecological, and sociocultural values of biodiversity; improve the situation of under-valued and under-used biodiversity products; development of ecotourism)
(3) Reduction of the pressures on biodiversity resources

The urgency of the need to increase management capacity to address these concerns, as well as the limitation associated with poverty and food production are highlighted in the NBSAP. Key targets with relevance to marine invasive species management include:

- undertake environmental impact assessments
- apply the polluter-pays principle
- reduce damaging practices in natural resources sectors
- reduce degradation of the coastal and marine areas

The National Association of Protected area Management (ANGAP) has taken the lead in biodiversity conservation, including invasive alien species concerns, and the elaboration of the strategy management through the implementation of a national network integrating different types of ecosystems. A meeting was coordinated in Antananarivo by ANGAP in 2004 to convene a session on marine invasive species and ballast water management, in conjunction with the IMO GloBallast

Programme. A roadmap for a national multi-sectoral approach was discussed, however no further national actions were taken, until the IMO/IOI-SA/ASCLME intervention seminar was held in 2011. An important transition took place in the transfer of lead agency for ballast water issues to the National Maritime Safety Authority (see section below).

Madagascar National Ballast Water Management Seminar

The National Seminar on Ballast Water Management was held in Antananarivo on July 6, 2011. The seminar was organized by the National Maritime Safety Authority under the Ministry of Transport and attended by 15 participants.

The meeting came up with the following recommendations that should be undertaken by Madagascar as a Flag State and Port State:

- It was recommended that a task force on ratification of BWM Convention be formed with Maritime Affairs Authority as the lead agency.
- The task force will discuss the relevant sections of the national Laws which will contain the BWM Convention provisions once the Country ratifies.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI, in drafting the legislation on implementation of the BWM Convention.
- Flag State implementation officers will foresee the implementation of the Convention on board National Flag Ships, and will ultimately require training in line with this.
- It will also be important to train personnel on technology equipment facilities on board National ships, as well as joint research on implementation of the BWM Convention.
- It was recommended that Madagascar ratify and initiate implementation of the Convention before it comes into force for smooth operations of their ships.
- The National Task Force will be represented in the Regional forum (Regional Task Force) and support the development and adoption of the Regional Strategy for BW Management.
- The National Task Force will prepare the instruments for ratification of the BWM Convention when possible.
- Prepare brief to the government and to IMO on the outcome of the Status and Economic Assessments to be conducted nationally using the provided templates.
- Task Force to prepare a work plan for presentation to the Regional Workshop updating the status of the Task Force and its progress.

Proposed members of National Task Force:

1. Ministry of Transport

2. National Maritime Safety Authority (APMF)
3. Port Authority
4. Ministry of Justice
5. Ministry of Environment (via ANGAP)

8.2.4 Mauritius

Mauritius was the first country to ratify the CBD, and has also ratified the Cartagena Protocol on Biosafety (2000). Through its Ministry of Environment and associated National Parks and Conservation service, Mauritius has developed a comprehensive NBSAP which has included the National Environmental Strategy and National Biosafety Framework (1999), as well as the following legislation with direct relevance to invasive species management:

- *Environment Protection Act (EPA), 2002*
- *The Fisheries and Marine Resources Act 1998 & MPA regulations 2001*
- *Maritime Zones Act, 1997 (amended 2005)* - This provides for the Prime Minister to make regulations for the preservation and protection of the marine environment and the prevention and control of marine pollution.
- The Mauritius Oceanography Institute (MOI) was established under the *MOI Act (1999)* to rationalize and co-ordinate research and development activities related to Oceanography. The MOI monitors the marine environment around Mauritius, Rodrigues and the Outer Islands, and advises the Government on appropriate policies and strategies for the management of resources under its jurisdiction.

Although the existing legal and policy frameworks in Mauritius are adequate for further preventative regulatory actions on marine invasive species, the focus in terms of invasive species has been largely terrestrial to date. Recent activities by the MOI have increased the investment by the Mauritian government in research and monitoring of marine invasive species and ballast water implications. In collaboration with IOI-SA, the MOI will have results of these investigations (including risk assessment, port biological baseline survey, ship ballast tank assessment, and training) by the end of 2012, thereby increasing the baseline information and skills available for management.

In 2003, the Ministry of Public Infrastructure, National Development Unit, Land Transport & Shipping (Shipping Division) in cooperation with the GloBallast Programme hosted a first meeting of the National Ballast Water Task force. The committee includes the Ministry of Shipping, Ministry of Environment, Ministry of Fisheries, University of Mauritius, the Mauritius Oceanography Institute, and the Mauritius Marine Conservation Society. A Ballast Water Management, Education and Awareness Plan was also drafted in 2008. This task force has continued to meet in Port Louis, with a view to ultimately implementing a ballast water management regime in accordance with the IMO Convention.

8.2.5 Mozambique

In conjunction with its national obligations under the CBD, Mozambique has developed a comprehensive NBSAP (2003) under its Ministry for the Coordination of Environmental Action, which details several priority areas including invasive alien species management. The following goals are listed under the objective (1.8) of limiting the introduction and propagation of new and exotic species that threaten ecosystems, habitats and native species.

- Identification and knowledge of invasive species with the greatest impact on biodiversity
- Establishment of measures and strategies for the eradication of the main invasive species
- Reduction in the introduction of new species

A set of priority actions was established including (Priority 12) the control and know*l*edge of GMOs and of potential invasive species capable of attacking biodiversity. No further regulations specific to marine invasive species or the maritime vectors responsible for them have been developed.

Mozambique National Ballast Water Management Seminar

The National Seminar on Ballast Water Management was held in Maputo on July 4, 2011. The seminar was hosted by the National Maritime Safety Agency (INAMAR) under the Ministry of Transport and was attended by 20 participants.

The meeting in Mozambique came up with the following recommendations to foster the ratification and implementation of the convention:

- It was recommended that a task force on ratification of BWM Convention be formed with Maritime Affairs Authority INAMAR as the lead agency.
- The task force will discuss the relevant sections of the national Laws which will contain the BWM Convention provisions once the Country ratifies.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI, in drafting the legislation on implementation of the BWM Convention.
- Flag State implementation officers will foresee the implementation of the Convention on board National Flag Ships, and will ultimately require training in line with this.
- It will also be important to train personnel on technology equipment facilities on board National ships, as well as joint research on implementation of the BWM Convention.
- It was recommended that Mozambique ratify and initiate implementation of the Convention before it comes into force for smooth operations of their ships.
- The National Task Force will be represented in the Regional forum (Regional Task Force) and support development and adoption of the Regional Strategy for BWM.

- The National Task Force will prepare the instruments for ratification of the BWM Convention.
- Prepare brief to the government and to IMO on the outcome of the Status and Economic Assessments to be conducted nationally using the provided templates.
- Task Force to prepare a work plan for presentation to the Regional Workshop updating the status of the Task Force and its progress.

Proposed members of the National Task Force:

1. Ministry of Transport and Communications (Lead Agency).
2. Ministry of Coordination of Environmental Affairs
3. Ministry of Fisheries
4. Ministry of Tourism
5. Ministry of Health
6. Ministry of Building and Habitation (DNA) MOPH – Water is included
7. INAMAR
8. Nautical School
9. Port Authority
10. Institute of Hdrography and Navigation (INAHINA)
11. Universities
12. Oil Terminal
13. AMEPETROL – Petroleum Mozambique Association Companies
14. IMAF (Foreign Affairs)

8.2.6 Seychelles

The CBD has been domesticated in the Seychelles under the Department of Environment within the Ministry of Home Affairs, Environment, Transport and Energy. The Seychelles Centre for Marine Research & Technology- Marine Parks Authority (SCMRT-MPA) has played a lead role in terms of biological monitoring and research in marine environments. The NBSAP that was developed as the primary mechanism for implantation of this convention details a comprehensive list of specific policy objectives, including:

- Policy Objective 3.8 - Identify, prevent the introduction of, control, or eradicate those alien species, which threaten, or could potentially threaten, native ecosystems, habitats and species.

It is recognized in the NBSAP that legislation related to biodiversity conservation in Seychelles is extremely fragmented and institutional responsibilities may overlap or conflict leading to inconsistencies and variations in approaches. Legislation that may be used to curb marine invasive species impacts include:

- National Parks and Nature Conservancy Act (1968 as amended, last amendment 1982)
- Coast Reserves and Foreshore Leases Act (1907) (Reserves Provisions)
- Fisheries Act (1986)

While the NBSAP does recognize the importance of the marine resources and endemic species, as well as the general threats associated with invasive species, the specific threats from invasive species on marine habitats remain unquantified and are hence not ranked with priority against other perceived pressures. The document also recognizes that "Certain aspects of biodiversity legislation in the Seychelles are missing. These aspects include… control of alien species…" There has also been relatively high focus on the terrestrial impacts on the islands associated with plant and animal invasions, and a need for further attention on the vulnerabilities of the marine habitats and species.

In 2004, the IUCN undertook a survey for marine invasive species in and around the Port of Mahé. Results of this survey are discussed in section 4.2.6. The survey team also underwent further training during the regional port survey and taxonomy training exercises held in Mombasa by the GloBallast Programme and GISP. There has therefore been ongoing capacity and interest from within the Seychelles authorities for continued monitoring and preventative measures related to marine invasive species.

A marine pollution control officer was appointed by the Seychelles Maritime Safety Administration to address ballast water issues. There have since been indications that ballast water discharges have been restricted inside the port area. The Department of Environment has taken the lead in terms of invasive species management, in cooperation with SMSA as regards ballast water issues, and further assistance is being provided by the Ministry of Health for scientific and technical expertise.

8.2.7 Somalia

As a Party to the CBD, Somalia has committed to advancing implementation of biodiversity conservation and management. The process of developing the NBSAP has not yet been completed in Somalia and no national legal or policy frameworks related to the CBD or UNCLOS has been developed with respect to the possibility of regulating marine invasive species. Information supplied by the representative of the Somali government to the ASCLME programme suggests that no such legislation exists.

Somalia has played an active role in the regional ballast water management approach and strategy developed through the PERSGA (Regional Association for the Protection of the Red Sea and Gulf of Aden) and IMO-GBP efforts. A regional action plan has been adopted by all member countries, including Somalia, with national commitments outlined for pending ballast water management initiatives. As Somalia is an overlap country in terms of ASCLME and PERSGA, it is envisioned that

any activities carried out under the PERSGA regional strategy and action plan will be captured in the proposed regional strategy for the ASCLME countries.

8.2.8 South Africa

South Africa is party to several international Conventions related to the conservation of biodiversity, and as such has developed a number of national policies and legislative tools for addressing these. In terms of direct relevance to the regulatory framework for marine invasive species the most relevant are:

- National Environmental Management: Biodiversity Act (2004)
  Specific regulations have been developed for the prevention, control and management of invasive alien species, including those affecting marine environments. The regulations differentiate between intentional and non-intentional (e.g. ballast water, biofouling) introductions, and have a strong focus on the former.

- National Environmental Management: Integrated Coastal Management Act (2008)
  The Act established coastal management zones including provisions for control and management of coastal waters. Although specific regulations regarding marine invasive species have not been developed, the ongoing provisions of the Act implementation process have included the various concerns of threats associated with marine invasive species.

- National Ports Act (2005)
  Under the Protection of environment clause (69):
  (1) The Authority must in the performance of its functions ensure that a fair and reasonable balance is achieved between the protection of the environment and the establishment, development and maintenance of ports.
  (2) *(a)* The Authority must ensure that sustainable and transparent port planning processes are undertaken when formulating any port development framework.
  (b) When undertaking any port planning process, the Authority must ensure that stakeholders are consulted and that all relevant biophysical and economic aspects are taken into account.

  Under this legislation the National Ports Authority are given legal backing for the development of port regulations and associated environmental management plans. For most of the major ports of South Africa, these have included provisional or operational ballast water management plans.

- South African Maritime Safety Authority Act (1998)
  The Act established the South African Maritime Safety Authority (SAMSA), which was subsequently given responsibility under this legal authority for the administration of ballast water management oversight and inspections. Certain aspects of the Port and Flag State

controls being developed under the Department of Transport will fall under the operational auspices of SAMSA.

- National Ballast Water Act (under development)
  This pending legislation will put in place regulations consistent with the IMO ballast water Convention. The Department of Transport is undertaking the development of this Act, as well as putting in place a MoU between all government stakeholders with overlapping mandates and concerns on invasive species introductions to the marine environment.

Through the Department of Environmental Affairs, the South African National Biodiversity Institute (SANBI) has driven the activities associated with the National Biodiversity Act which have given force to the various provisions of the CBD. The ongoing process through the NBSAP (2005) has lead to the recent National Biodiversity Assessment (2011), which has identified several marine invasive species threats and vectors as significant in South African waters.

South Africa participated as a lead country in the IMO GloBallast Programme from 2000-2004. During this time a National task force, national work plan and National Policy related to ballast water management were established. The Lead agency on this matter has changed from the Department of Environmental Affairs to the Department of Transport. Activities and efforts to continue the momentum of the national task force have been ad hoc, and further coordination is needed in this regard. However, through collaborative efforts of IMO-GBP, GISP and IOI-SA, several demonstration projects for the region have been successfully implemented in South Africa. These include port biological baseline surveys, invasive species risk assessment, training course development, testing and certification of a ballast water treatment technology, and guidelines for implementation of the ballast water convention. As such, the network and capacity in South Africa for invasive species management, and specifically for ballast water management, is well established and relatively advanced by international standards.

8.2.9 Tanzania

As a Party to the CBD, Tanzania has developed and maintained a NBSAP (2001) and produced associated national reports (latest in 2009) on biodiversity status and threats. Although the NBSAP recognises the introduction of exotic species as a threat to marine biodiversity, no regulations have been promulgated in Tanzania to restrict activities in this regard. The development and implementation of the Environmental Management Act (2004) has established a framework with further potential for such regulations.

Tanzania National Ballast Water Management Seminar

The National Seminar on Ballast Water Management was held in Dar es Salaam on September 16, 2010. The meeting was hosted by Surface and Marine Transport Regulatory Authority of Tanzania

(SUMATRA), and was attended by approximately 20 participants, representing the maritime administration, ports, ship registry, various governmental departments, maritime training institutes, etc. Mr. Fredrik Haag from the GloBallast Programme also participated in the meeting.

The meeting agreed that:

- SUMATRA, being the main authority on the issue, should be the lead agency
- The meeting participants should recommend to the Government that an ongoing national task force should be convened for the purpose of BWM
- A roadmap should be developed under the national task force to include further implementation of ballast water controls and protection from marine invasive species

9. General Conclusions from Desktop Review

- There is currently very little known from most countries in the region regarding invasive species presence or management.
  - Few targeted IAS surveys have been conducted
  - Little to no monitoring of HAB's is ongoing
  - There are few IAS specialists scattered in the region
  - There are generally low levels of awareness & capacity for policy reform and management needs
- Some significant introductions/invasions exist and need to be monitored further.
- Existing legal and institutional capacity & frameworks provide an adequate base & structure for expansion of a more comprehensive regional regime.

PART III: RECOMMENDATIONS FOR INTEGRATION INTO PARTNERSHIP NETWORK

10. General Recommendations

In 2005 an international partnership meeting was coordinated by the Global Invasive Species Programme (GISP) and hosted by the CBD Secretariat in Montreal, for the purposes of developing a global partnership approach to marine invasive species management. Key gap and overlap areas were addressed and commitments towards further action were made by the various partners in the agreement. As a result, activities and collaborations addressing marine IAS have improved in some regions of the world, especially where a regional facilitative body is present and effectively driving this issue.

The Western Indian Ocean (WIO) region has been included in the approaches taken by some of the international organizations involved in marine IAS management. Over the past decade management and policy activities have been largely ad hoc, however an emerging partnership network is aiming to streamline these activities and address the issues more effectively and comprehensively. The ASCLME project is currently in position to play a key facilitative role in this process, which will aim to institutionalize a common strategy and work plan through the Nairobi Convention and the associated partners in the regional network. The following general recommendations form the basis of a road map to a successful integrated approach to marine IAS management in the WIO region.

10.1 Regional Marine IAS MoU between Key Partners

It is recommended that a MoU be developed with a broad focus on marine invasive species issues, and operational specificity with respect to all relevant vectors and pathways (e.g. ballast water, bio-fouling, aquaculture etc.). The agreement should be modelled on the CBD-GISP Global Work Plan developed in 2005, and serve to update and restore the regional progress of that plan. As such the various gaps and overlaps in both policy and management capacity should be highlighted and addressed in the agreement. Functional areas related to the various partners in the regional network should be delineated and agreed. The MoU should be driven by the ASCLME project with collaboration from the current partners with existing interests in its development. The key role players should include:

- IMO-GBP
- IUCN, the
- IOI-SA
- GISP
- FAO
- UNESCO-IOC
- PENAf/PMAESA
- ASCLME
- Nairobi Convention.

10.2 Technical Training Programme

The urgent need for further capacity building has been highlighted throughout the region at various levels and with respect to various aspects of management capacity. Although some ad hoc training interventions have been conducted, a sustained, comprehensive technical training programme is needed to address local capacity concerns. This should rely upon the suite of targeted technical short courses that are already available through the partnership network (see section 17.4), and seek to develop new formal training courses where appropriate and needed (e.g. responsible aquaculture).

Pilot management projects being conducted within the region provide unique opportunities for additional regional training. Such projects should be identified (e.g. PBBS in Mauritius) and used as possible for demonstration purposes.

10.3 Survey & Monitoring Programme

The demonstrated paucity of adequate baseline data on marine invasive alien species in the region is likely to undermine further national and regional efforts to manage marine IAS if not addressed. It is recommended that ongoing survey and monitoring programmes be designed and put in place to bolster the information available, awareness of the issues and engagement of management entities.

A new International Guideline on Port Biological Baseline Surveys is currently under development through the IMO-GBP and IOI-SA partnership. This document will form a basis for ongoing survey structures at ports around the world. It is recommended that the survey and monitoring programme be consistent with the new Guidelines, and that all countries in the ASCLME region be provided the opportunity to implement the programme in their local waters. Historical examples of such surveys (Mombasa, Seychelles, SA) have successfully demonstrated the value of the surveys in terms of local management applications and regional engagement. Building on these past efforts will provide continuity and integration between the countries and the partners involved.

A port survey is planned for the Port Louis in Mauritius in 2012, to be conducted by IOI-SA and the Mauritius Oceanographic Institute. This undertaking should be used by the regional partners to highlight the approach being taken by a vulnerable island state to initiate invasive species management and controls. It is therefore recommended that a collaborative approach be taken to ensure that the value of this project is incorporated into the regional survey and monitoring programme for demonstrative purposes.

The regional programme should seek to develop a regional database of introduced and invasive species. This should be developed in association with a credible international data management system whereby regional progress can be uploaded to the international community. The implications of a regional database include the ability to develop a regional assessment of risk associated with shipping movements between local and international ports. Further work on a risk assessment framework of this kind for the ASCLME region is planned within the partnership network for 2012 and 2013, however key baseline information will be essential to its effectiveness.

10.4 Regional Ballast Water Strategy & Action Plan

The first phase of the GloBallast Programme put in place a Regional Task Force with representatives from each of the ASCLME countries, as nominated under the Nairobi Convention. Through the Task

Force, the programme developed a draft Regional Ballast Water Management Strategy and Action Plan (SAP) in 2004 (Annex IV). The plan outlined priorities for national engagement and regional activities. The Nairobi Convention adopted a proposal to incorporate the SAP as part of a work plan addressing invasive species concerns in the region. However, since its development the SAP has not been finalized or adopted due to the end of the GloBallast support in 2004. The provisions of the SAP have become dated in terms of their relevance to the IMO BWM Convention and more recent developments related to guidelines under this Convention. It is therefore recommended that the SAP be updated and proposed for adoption under the Nairobi Convention with support from the ASCLME project and associated partners.

Although the SAP is specific to ballast water issues, it is intended to initiate the appropriate institutional and policy reforms that will catalyze action between the maritime and environment sectors on marine invasive species management more broadly. The recent national seminars on ballast water management have initiated the formation of national task forces in several countries. The Chairpersons of these task forces should serve on a regional forum to assist the effective implementation and support of the regional SAP. Ultimately the focus on ballast water management should lead to further ratifications by countries of the region of the IMO BWM Convention. The steps towards ratification for key countries should be highlighted in the updated SAP, and should include the development of national status assessments, as per the template provided in the IMO-GBP/IOI-SA Status assessment guidelines (available for download from the IMO-GBP or IOI-SA websites). The national status reports should be forwarded to the IMO as information documents to demonstrate the progress of the collaborative efforts in the region.

10.5 Science to Governance Forum & WIO Alliance

The ASCLME Secretariat has developed and initiated a regional forum for increasing science-to-governance information and value flow. The forum serve the need of taking key scientific outputs and to decision makers in the appropriate format for effective, informed and relevant policy and management outcomes to be possible. It is recommended that the forum be used to further raise the awareness of the marine invasive species issues of the region, both existing and potential. The shortcomings, both historical and present, in management interventions on this issue can often be tied to a lack of political support or continuity. The success of these proposed initiatives hinges on the backing given by the countries and the international bodies serving their interests.

The ASCLME project is also aiming to develop a regional alliance for the Western Indian Ocean Countries. This concept will allow for the integration of public and private, international and local entities to work together to address key priorities facing the marine sector in the region. The developing concept has the potential to support projects in line with the recommendations of this report, and efforts by the partnership network to address marine IAS should be focused on continuing engagement with the ASCLME project and the proposed alliance.

11. IMO-GBP

11.1 Progress to date

The International Maritime Organization and its Global Ballast Water Management Programme (GloBallast) are the most significant supporters of international management interventions for ballast water and invasive species. The WIO region was included in the first phase of the GloBallast programme from 2000-2005, during which time some preliminary groundwork was laid. A regional task force was composed of the Focal Points for the Nairobi Convention, and two meetings were assembled in Cape Town to initiate national buy-in and the development of a regional strategy. A proposed regional action plan was submitted by the programme to the Nairobi Convention COP in 2004, and ballast water management was officially adopted as a priority area under the Convention. At the end of the first GloBallast phase this momentum dissipated and no further meetings of the Regional Task force have been held, nor has their been progress with finalization and adoption of the Regional Strategy or plan of action under the Nairobi Convention.

GloBallast Phase 2 began in 2008 and did not include the WIO region as one of its official targets for further support. However, the programme has identified the need to increase support and catalyse activity to refresh the regional process and approach for ballast water management. The IMO has therefore provided some funds directly from its International Technical Cooperation Programme, which have been channeled via GloBallast for support in this region. The ASCLME partnership with IMO and GloBallast has therefore focused on developing the appropriate mechanisms for providing the technical support for the countries and aiming to increase implementation of the IMO BWM Convention in the region.

This project had the goal of strengthening this partnership and further increasing the reach and activities of the partnership between IMO/GBP and ASCLME. The following activities were supported collaboratively with this goal in mind:

- Training course in Mauritius for participants of all ASCLME countries. The course gave an overview of ballast water management issues and specifically focused on developing capacity for port biological baseline surveys. It is described in more detail later in this report.

- IMO-GBP participation and presentation at ASCLME Steering Committee Meeting, Tanzania, focusing on potential areas for further collaboration and implementation.

- National Seminars held with ASCLME and IMO Regional Co-ordinator. These were held in Tanzania, Kenya, Madagascar, Comoros, Mozambique and Ethiopia (not an ASCLME country, but largest Flag State in Africa).

- Two meetings were held at the IMO with GloBallast representatives, the IMO Ballast Water office and the Director of the ASCLME project.

11.2 Recommendations

Through this ongoing partnership a joint work plan on ballast water management is naturally evolving for the region. Some key recommendations for harmonizing and expanding this approach with respect to IMO involvement are detailed below:

- A regional workshop to be held in 2012. The workshop will aim to get buy-in from all countries of the region on an updated and finalized Regional Strategy (to be developed based on the draft GloBallast document).

- The joint work plan for all relevant partners of the region (recommended in section 10) should be agreed at the proposed workshop, and incorporated into the WIO Alliance concept of the ASCLME. This should detail the roles and responsibilities with respect to marine IAS management issues for all the major stakeholders, and should be drafted in collaboration between IMO-GBP and the ASCLME project.

- The specific technical training courses developed under the GloBallast Programme should be delivered where possible within the region. A regional course approach would be the most effective way to reach all the countries. The ASCLME project should facilitate and co-fund the training events, with the provision of the courses and some support funds from the IMO.

- The published guidelines and awareness materials of the GloBallast Programme should be disseminated widely in the region by the Secretariat of the ASCLME project. Where possible the ASCLME should encourage the development of reports (e.g. Status reports) consistent with the guidelines, to be submitted to the IMO.

- Involvement of and collaboration with the IMO Regional Coordinator in East Africa should be prioritized by the ASCLME project. Further integration of ballast water and marine pollution management issues with ongoing regional activities is needed. The efforts and support of this IMO office can help facilitate the required engagement of the maritime sector and the standardization needed in terms of the IMO approach.

12. IOI/GISP

The International Ocean Institute - Southern Africa (IOI-SA) has been increasingly playing a key role in the regional partnership network. The IOI-SA is currently the UN Train-Sea-Coast course development center for the region, and is also representing the marine programme of the Global Invasive Species Programme (GISP). Priorities for the institute are therefore the implementation of international best practices and associated training programmes. The collaborative arrangements between IOI-SA and IMO-GBP, and the current cooperation with the ASCLME countries and project, provide opportunity for increased engagement in the region with respect to marine IAS. Ongoing support is needed by the ASCLME project for the development of training and capacity building

initiatives in accordance with the proposed regional training programme. The expertise available locally through the IOI-SA/GISP network of associates provides a valuable resource for both design and implementation of this programme.

13. GEOHAB & the IOC-UNESCO HAB Programme

Although there have been some historical HAB-related projects within the region (as described in Part II, section 5), there are currently no ongoing monitoring or assessment programmes for HAB's in the ASCLME region. The GEOHAB and IOC-UNESCO HAB programmes provide international support for standardization, monitoring and taxonomy through projects and publications, and aim to build upon national and regional efforts as possible. The GEOHAB programme is not a funded programme as such, but relies upon collaborative research to be driven from within countries and regions by local specialists.

Similarly the IOC HAB programme aims to build on local expertise, and provides further opportunities for education and training, working group collaborations, and guidelines including data management aspects. Some funding for specific projects may be made available through the programme (as for the collaboration with KMFRI in Kenya), however there are no current mechanisms promoting this form of collaboration in the ASCLME region. It would be appropriate for the MoU between the partnership network to include the IOC HAB programme, with a view to expanding its interest in the region. The proposed regional survey and monitoring programme should be designed to include monitoring of HAB's by local researchers and institutes. The appropriate practices, standardization and possibly training and financial support may then be requested collaboratively through this programme.

14. PENAf/PMAESA

Appropriate engagement of the ports authorities and associations is essential in addressing the shipping pathway of marine species introductions. The port authorities vary in terms of national responsibilities for port state control and other aspects of environmental compliance in port areas. The Port Management Association of East and Southern Africa (PMAESA) is coordinating efforts from within the various ports authorities as regards several management areas including environmental concerns and invasive species. The Port Environment Network for Africa (PENAf) is focusing on ballast water management as a priority issue for all ports of Africa, and is working through PMAESA in this region. Incorporation of these organizations into the proposed MoU is essential to ensuring adequate reach of the regions marine IAS controls.

The ASCLME project was presented at a PMAESA conference, as well as at the recent Pan African Port Conference. The aims of the regional project on marine IAS, especially as regards increased cooperation with the maritime sector, were highlighted and discussed with the secretariat. The developing work plan of PENAf and PMAESA is aiming to dovetail with the proposed initiatives

under the ASCLME and partnership network. Close communication will be necessary to ensure ongoing progress. Endorsement of the PENAf/PMAESA work plan through the Nairobi Convention or regional Task Force is recommended for formalization of the dual-sector approaches. Incorporation of PMAESA into the proposed Regional Alliance will also help ensure effective and increased collaboration.

PART IV: GUIDELINES FOR LEGAL, POLICY & INSTITUTIONAL REFORM

The recommendations detailed in Part IV present steps towards developing better integration between key role players in the development of a comprehensive regime for marine IAS management in the ASCLME region. The process has been developing based on ad hoc projects and isolated areas of funding and support, creating a patchwork of successful projects and management capacity of ongoing relevance. Looking forward, what is needed is a more synthesized and coordinated approach to be driven by the appropriate international, regional and national bodies. This should be based on the lessons learned over recent experiences and build on the existing momentum and the partnership network in place. The following guidelines provide the direction and structure required to channel the proposed collaborative efforts towards a common goal of ensuring increased and ongoing protection for the region from marine invasive species.

15. General Goal of Approach and Guidelines

The conclusions drawn through various components of this report have demonstrated that a more comprehensive and coordinated approach is required to achieve meaningful and sustainable marine IAS policy and management in the ASCLME region. While the overall goal of the activities and recommendations proposed herein address the common need of the countries of the region, an institutional mechanism for governing these efforts in the long term is ultimately what is required. Given the impact and role of the Nairobi Convention and its existing protocols, it would be appropriate to target this existing framework for the inclusion of the marine IAS issues, as already agreed by the Secretariat of the Convention. In order to give adequate strength and scope for all aspects considered in this report, it is proposed that a new protocol under Nairobi Convention be developed and adopted as the mechanism for standardization, coordination and oversight of marine IAS in the region. The existing partnership network, as facilitated by the ASCLME project should aim to incorporate this milestone and goal into all agreed activities.

Proposed goal: Nairobi Convention - Protocol on the Management of Marine Invasive Alien Species for the Western Indian Ocean Region

16. Socio-Political Considerations

16.1 Assessing the Costs & Benefits

Before any actions are taken, the costs and benefits of marine invasive species management should be weighed and considered at both regional and national levels. The focus of many recent and ongoing activities has been on the legal and institutional reforms needed for the efficient and comprehensive implementation of marine IAS controls. The costs, both direct and indirect, associated with the commitment required and changes on behalf of regional and national organizations and agencies can and should be quantified and included in preliminary cost-benefit scenarios. Similarly, the real costs to the region and countries of existing and potential invasions must be assessed comprehensively before such decision support systems can be useful. The key concerns in this regard include:

- Reductions in fisheries production due to competition, predation and/or displacement of the fishery species by the invading species, and/or through habitat/ environmental changes caused by the invading species

- Impacts on aquaculture, especially from introduced harmful algal blooms and diseases of cultured species (e.g. white spot disease on shrimp)

- Physical impacts on coastal infrastructure, facilities and industry, especially by fouling species

- Impacts or even closure of recreational and tourism beaches and other coastal amenity sites due to invasive species (e.g. physical fouling of beaches and severe odors or health impacts from algae blooms)

- Secondary economic impacts from human health issues associated with introduced pathogens and toxic species, including increased monitoring, testing, diagnostic and treatment costs, and loss of social productivity due to illness and even death in affected persons

- The costs of responding to the problem, including research and development, monitoring, education, communication, regulation, compliance, management mitigation and control

Helpful tools have been developed specifically to support the process of cost-benefit analyses of this nature. These international best practices should be used and maintained as possible and available. Relevant examples of these include:

- A Toolkit for the Economic Analysis of Invasive Species. Published and available under the Global Invasive Species Programme, download at: http://www.gisp.org/publications/toolkit/index.asp

- Economic Assessment for Ballast Water Management: A Guideline. Published and available under the GloBallast Monograph Series, available for download on the GloBallast website: http://globallast.imo.org/index.asp?page=monograph.htm&menu=true

16.2 Ensuring Stakeholder Involvement

Without the support of all relevant stakeholders it is unlikely that a policy or management regime will be successful over time. The identification and engagement of the stakeholders is essential early in the process of developing the regional and national components of the proposed regimes. This report summarizes the stakeholder engagement process conducted through the ballast water seminars (Section 8), which should serve as a model for initial activities to be conducted in all areas of marine IAS management. A general list of the most essential stakeholders is detailed below:

- **Ministry of Environment**
  Overall coordination and management of invasive species problems, including monitoring and response plans. Implementation of biodiversity and environmental conventions and legislation.

- **Maritime authority** (Ministry of Transport or other agency eg. Navy, Coast Guard etc)
  Coordination and control of shipping including maritime safety and environmental aspects. Flag and Port state control. Implementation of shipping related conventions and legislation.

- **Fisheries administration**
  The national department responsible for fisheries may be separate from the ministry of environment, and will usually be responsible for aquaculture as well as fisheries management aspects of the marine IAS issues.

- **Port authority**
  Responsible for the elaboration and implementation of port ballast water management plans (consistent with national strategy) and provision of relevant infrastructure, e.g. port reception facilities.

- **Public health authority**
  Supervision and evaluation of sanitary control activities in ports and public areas.

- **Shipowners and agencies**
  Responsible for the procedures and activities on board ships. Must inform ship masters about the requirements of the ports to be visited, including port, maritime, health, immigration and customs authority regulations.

- **Shipyards, ship builders, naval architects, etc.**
  Adaptation of ships and the building of new ships, according to the principles internationally adopted for dealing with ballast water.

- **Fishing and aquaculture industry**
  Affected by negative environmental conditions brought about by invasive species, but also responsible for implementing controls to avoid possible introduction vectors.

- **Universities and Research Institutes**
  Where there are specialists in taxonomy (used to correctly identify species), marine ecology and survey/monitoring methods.

- **Environmental NGOs, recreational bodies and the general public**
  Play a facilitative and watchdog role, and may assist in monitoring for the early detection of introduced species.

17. Technical Considerations

The overall status assessment provided in the desktop review (Part II) of this report demonstrates a serious lack of capacity for implementing comprehensive preventative controls and measures for marine invasive species in the ASCLME region. Many developing regions around the world are facing similar challenges, and several of the international efforts have been designed to specifically help overcome these capacity hurdles. The technical aspects of marine IAS management may be the most difficult to implement given reliance on extensive baseline information, trained experts, advanced equipment and sustainable funding support. For this reason it is important to build and use decision support tools and management frameworks that make the best use of available capacity while allowing for further expansion and development as possible.

The use of best international management practices should be maintained for all technical areas, regardless of capacity concerns. Mechanisms for overcoming capacity shortfalls may be detailed as part of the available tools in the suite of publications supporting this field of management. Some relevant tools that should be used for technical guidance include:

From the Global Invasive Species Programme (www.gisp.org):

- Guidelines for the Prevention and Management of Marine Biofouling and Invasive Species.
- A Toolkit for Developing Legal and Institutional Frameworks for Invasive Alien Species.
- Best Practice for the Management of Introduced Marine Pests - A Review
- Invasive Alien Species: A Toolkit for Best Prevention and Management Practices
- A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species
- Best Management Practices for Preventing and Controlling Invasive Alien Species

From the IOM-GBP Programme (http://globallast.imo.org):

- Guidelines for Development of National Ballast Water Management Strategies
- Guidelines for National Ballast Water Status Assessments

The following considerations will aid the development of the technical backbone for the marine IAS management regime in the region and within each country.

17.1 Evaluating Risk

Key management decisions require a fundamental understanding of the risks being managed. Depending on the scenario, a quantitative or qualitative assessment of the risk being posed to an area by invasive species (specific or potential) will be useful in deciding the effort and support to be allocated. Risk assessments for marine IAS have become more developed in recent years, ranging from general marine species risk profiles to advanced targeted ship and port-specific ballast water risk assessments. The information required to conduct a risk assessment for marine IAS is often available within national coastal and maritime management sectors. This may include data housed in GIS format for coastal sensitivity maps, fisheries, shipping, tourism and marine protected areas.

The format and methods for the various types of risk assessment are usually designed based on the required output and decision-making scenario. Customized risk assessments already developed in South Africa, and under development in Mauritius, should be used as guides for regional replication as possible. Ultimately a standardized approach should be adopted under the proposed Nairobi Convention Marine IAS protocol for regional, national and local (e.g. port) risk assessment frameworks.

17.2 Monitoring of Invasions

The baseline activities detailed in Part II of this report demonstrate that basic survey and monitoring capacity exists in key areas of the region, and that some survey and monitoring activities are ongoing. The proposed regional survey and monitoring programme should ultimately form the basis of a technical component under the proposed Nairobi Convention protocol. All activities being conducted in preparation of this component (including the 2012 PBBS in Mauritius) should be conducted in accordance with the existing IMO-GBP protocols for port biological baseline surveys. The IMO-GBP/IOI-SA partnership is currently developing a new international guideline for conducting such surveys and monitoring, which will be published in 2012. This will form the basis for international best practice in this particular field, and should therefore govern the approach taken for such surveys throughout the region.

Standardization of the surveys is crucial for the inter-compatibility of the data and management applications. The regional partnership network should work together in the design of the survey and monitoring programme to ensure comprehensive coverage and standardization. The availability of international funding to support the programme will thereby also be increased.

A general incursion response framework should be designed in accordance with section 6 of this report, and included as part of the proposed protocol. National level buy-in and participation will be essential for the framework to be meaningful, as any response mechanism must be handled under national authority. The support for the national administrations and the processes for policy and legal reform should seek to include this aspect of contingency planning as and where possible.

17.3 Legal, Policy & Institutional Aspects

Part II of this report identified several national and international obligations regarding marine invasive species management. The provisions of these legal regimes are not all being adequately implemented throughout the region. A goal of the ASCLME project is to facilitate further ratification and implementation of these mechanisms where and how possible. The promotion of the legal backbone for the proposed marine IAS activities at national levels is an important precursor to the ability to develop a new protocol under the Nairobi Convention. The consultations and negotiations that must be coordinated at national, regional and international levels should be facilitated by the ASCLME project with assistance of the regional partnership network. It is clear from this review that the existing frameworks and institutions provide adequate legal and operational foundations upon which strong regional progress can be built. Investment from the private sector and via the ASCLME Regional Alliance may also be sought for additional support once the common framework is adopted.

17.4 Building Capacity & Training

A common denominator throughout all key policy and management areas associated with marine IAS is the lack of adequate training or capacity. The proposed regional training programme should seek to incorporate the existing network of training courses and experts, especially those components that already have a strong presence in this region. Support for ongoing training should be channeled through the proposed programme and sought from the vast list of international, regional and national stakeholders, including the private sector. A regional train-the-trainers approach should be used where possible to ensure ongoing educational expertise is provided. A list of vetted, targeted training courses, appropriate for use in the various sectors is detailed below:

Global Invasive Species Programme - Training Courses on:

- Economic Analysis of Invasive Species
- Legal and Institutional Frameworks for Invasive Species
- Management of Marine and Coastal Invasive Species
- Management of Invasive Species
- Strategies and Tools to Prevent the Introduction of Invasive Species
- Taxonomy of Marine Invasive Species

IOI-SA – Established and customized training courses on:

- Management of Marine and Coastal Invasive Species
- Ballast Water Management
- Port Biological Baseline Surveys
- Responsible Aquaculture

IMO-GBP:

- Introduction to Ballast Water Management Training Course
- Advanced Training Package on BWM for Seafarers
- Advanced Training Course on Compliance Monitoring and Enforcement
- Advanced Training Course on Legal, Policy & Institutional Aspects of BWM

PART V: REGIONAL TRAINING & WORKSHOP

18. Regional Training in Mauritius

A regional training event was coordinated in Mauritius as part of this project. The course was scheduled over three days and delivered to representatives from each of the ASCLME countries. The classroom lectures were designed and presented by Adnan Awad and Lynn Jackson. The course was custom designed for this delivery, incorporating aspects of marine IAS management, ballast water management and port biological baseline surveys. The customized course is now available for further delivery in the region, and appropriate for introductory sensitization to these issues. Detailed training should follow for relevant professional staff, given the area of specialty concerned. Targeted short-courses detailed in section 17 are available for delivery within the region. As recommended, all training of this nature should form part of the regional technical training programme (section 10.2).

AN INTRODUCTION TO THE MANAGEMENT OF MARINE INVASIVE SPECIES AND PORT SURVEYS

Module 1: Introduction to Marine and Coastal Invasive Species

- *Definitions of invasive species and related terminology*
- *Description of the invasion process*
- *Outline of intentional and unintentional introductions*
- *List of the primary pathways of invasive marine & coastal species introduction.*
- *Description of the impacts associated with invasive marine species*
- *List some of the characteristics of invasive marine species*
- *Explain the impact of globalization on the invasive marine species problem*
- *Present case studies of marine and coastal invasive alien species*
- *Briefly describes the international regulatory regime for invasive species, particularly those in marine and coastal environments*
- *Provides an overview of international initiatives to promote information sharing and provide support for invasive species management.*

Module 2 : Goals and Principles of Invasive Species Management

- *Outlines the goals and basic principles of IAS management and how they apply to marine and coastal environments*
- *Describes the steps in IAS management – prevention, early detection & rapid response, control and mitigation*
- *Indicates the points at which management action can be applied.*

Module 3: Introduction to the primary pathways and their management

Part A:

- *Overview of primary pathways*
- *Description of the biofouling problem and management initiatives*
- *Review of deliberate introductions (focussed on fisheries/mariculture) and management initiatives*

Part B:

- *Overview of the ballast water problem*
- *Global initiatives*
- *Components of a national ballast water management strategy (link to broader IAS strategy)*
- *Development of port ballast water management plans*
- *The role of risk analysis*
- *Ship/port requirements*

- *Compliance monitoring and enforcement*

Module 4 : Management of Bioinvasions

- *Describes the strategies available for managing marine and coastal invasive species, once they have become established*
- *Introduces the techniques used in incursion management*
- *Describes the decision-making process for selecting the appropriate strategy*

Module 5: Port surveys

- *Details types of surveys*
- *Describes survey implementation*
- *Gives options for alternative sampling methods and approaches*

19. Proposed Regional Workshop

The implementation of this project has included the preliminary design and planning for a regional workshop combining marine pollution & IAS issues. The workshop will require the funding support of the ASCLME project and the IMO (proposal submitted through IMO-GBP for IMO TCD funds). Further contributions and support may be available through the IOI-SA and IUCN. The workshop will present the outcomes of this report and the report on marine pollution in the region (parallel study), and seek to include the following:

- Formal adoption of all report recommendations
- Participation of key partners
  - Funding support & assimilation of work plans
- Finalize & adopt
  - Regional BW Strategy
  - Regional Partnership MoU
  - Marine pollution priorities

The schedule and timing of the workshop has not yet been established. It is recommended that the workshop should be held back-to-back with a regional activity that will engage many of the same stakeholders and representatives. Appropriate opportunities for this include meetings or conferences of the ASCLME, PMAESA, Nairobi Convention or IMO-GBP/IOI-SA (Global programme task force meeting to be held in Cape Town, September 2012). A commitment and agreement on behalf of the ASCLME Secretariat and the IMO-GBP should be sought by early 2012, for the workshop to progress as planned.

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Annex I Sample Questionnaire

ASCLME

QUESTIONNAIRE

Personal details of respondent:

Full name and title:
_____

Job title:
_____

Name and address of Employer:
_____

Contact details:
Tel:
Fax:
e-mail:
_____

Areas of expertise / special interest:

_____

*Note – Sections 1 & 2 have been omitted here as they pertained to marine pollution and offshore oil and gas activities, as related to a separate contract.

Section 3: Shipping Traffic

3.1 Does your country keep records of the shipping traffic which passes through your coastal waters – whether it enters your ports or not?

<u>If so, please provide details for the past 10 years, including the types, size etc of vessels.</u>

Section 4: Marine Invasive Species (MIS) and Harmful Algal Blooms (HABS)

4.1 Have field surveys been conducted to identify species in your marine environment, either native or alien?

If yes, please give details

4.2 Have marine or coastal invasive species been identified in your country?

If yes, please list.

4.3 How do you think these species were introduced? (aquaculture, ballast water, hull fouling etc)?

4.4 What are the main impacts of these species?

Please provide specific examples from your country.

4.5 Have the economic impacts been assessed?

If so, please provide details.

4.6 Is your country party to any international conventions which have provisions regarding the management of invasive species (CBD, UNCLOS, Ballast Water Convention)?

4.7 Does your country have any or all of the following (in final or draft form) in place for the management of invasive species generally, and marine invasives in particular?

National IAS strategy / policy / action plan / Act

If yes, please supply titles, effective dates and, if possible, copies of all of these strategies/ policies / action plans and/ or Acts?

4.8 If such instruments are currently in place or being planned, which government agency (ies) are / would be the leading implementing agents, and what management structures are in place?

4.9 What other role-players might be involved? (government, NGO's, research institutions) And is there a structure in place to facilitate communication between the different roleplayers?

4.10 Is there any existing information on past HAB events in your country?

If so, please give details of location, species, magnitude, periodicity, impact etc.

4.11 What ongoing monitoring is being conducted for HAB's, and who is responsible for this?

4.12 Is anyone from your country working with any regional organization on monitoring or management of MIS and HAB's?

Section 5: Marine pollution and MIS management capacity

5.1 Are there sufficient trained staff in your national government structures in the following categories?

a) Marine pollution management staff

b) IAS/MIS management staff

c) Marine pollution and/or IAS/MIS scientific and technical expertise

d) Ship surveyors

e) Border control and field officers

5.2 Which management skills are MOST critically needed in your country and why?

5.3 What additional needs are there to enable your government to effectively manage marine pollution and/or the growing threat posed by IAS in your country and region, and why?

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Annex II Regional Introduced Species List

List of recorded alien species

Country	*Species*	Organism type	Classification (I-Introduced, C-Cryptogenic)
Kenya	*Tricellaria occidentalis*	Bryozoan	I
	Bugula neritina	Bryozoan	I
	Vibrio cholerae	Bacteria, Asiatic Cholera	I
	Acanthophora spicifera	Red alga	C
	Gracilaria salicornia	Alga	C
	Halophila stipulacea	Sea Grass	C
	Tubastraea coccinea	Orange-cup coral	C
Madagascar	*Kappaphycus spp*	Red Algae	I, Cultured
	Musculista senhousia	Asian Mussel	I
	Vibrio cholerae	Bacteria, Asiatic Cholera	I
	Acanthaster planci	Crown of Thorns Starfish	C
	Acanthophora spicifera	Red alga	C
	Gracilaria salicornia	Alga	C
	Tubastraea coccinea	Orange-cup coral	C
Mauritius	*Crassostrea commercialis*	Oyster	I, Cultured
	Crassostrea gigas	Oyster	I, Cultured
	Crassostrea virginica	Oyster	I, Cultured
	Ostrea edulis	Oyster	I, Cultured
	Metapenaeus monoceros	Prawn	I, Cultured
	Penaeus latisulcatus	Prawn	I, Cultured
	Penaeus monodon	Prawn	I, Cultured
	Chlorella spp	Plankton	I, Cultured
	Treselmis spp	Plankton	I, Cultured
	Brachionus plicatilis	Rotifer	I, Cultured
	Halophila stipulacea	Sea Grass	C
	Acanthaster planci	Crown of Thorns Starfish	C
	Acanthophora spicifera	Red alga	C
	Gracilaria salicornia	Alga	C
	Tubastraea coccinea	Orange-cup coral	C
Mozambique	*Eucheuma striatu*	Macroalgae	I, Cultured
	Kappaphycus cottonii	Macroalgae	I, Cultured
	Vibrio cholerae	Bacteria, Asiatic Cholera	I
	Acanthophora spicifera	Red alga	C
	Gracilaria salicornia	Alga	C

	Tubastraea coccinea	Orange-cup coral	C
Seychelles	*Halophila stipulacea*	Sea Grass	I
	Bugula neritina	Bryozoan	I
	Zoobtryon verticillatum	Bryozoan	I
	Acanthophora spicifera	Red alga	C
	Gracilaria salicornia	Alga	C
	Tubastraea coccinea	Orange-cup coral	C
Somalia	*Vibrio cholerae*	Bacteria, Asiatic Cholera	I
Tanzania	*Eucheuma denticulatum*	Macro algae	I, Cultured
	Kappaphycus alvarezii	Macro algae	I, Cultured
	Saccostrea cucullata	Oyster	I, Cultured
	Musculista senhousia	Asian Mussel	I
	Vibrio cholerae	Bacteria, Asiatic Cholera	I
	Acanthophora spicifera	Red alga	C
	Gracilaria salicornia	Alga	C
	Tubastraea coccinea	Orange-cup coral	C
South Africa	*Mirofolliculina limnoriae*	Protoctista	I
	Zoothamnium sp.	Protoctista	C
	Alexandrium tamarense-complex	Dinoflagellata	I
	Alexandrium minutum	Dinoflagellata	I
	Dinophysis acuminata	Dinoflagellata	I
	Aureococcus anophagefferens	Pelagophyceae	I
	Suberites ficus	Porifera	I
	Sagartia ornata	Cnidaria, Anthozoa	I
	Metridium senile	Cnidaria, Anthozoa	I
	Eudendrium carneum	Cindaria, Hydrozoa	C
	Pachycordyle navis	Cindaria, Hydrozoa	I
	Coryne eximia	Cindaria, Hydrozoa	I
	Coryne pusilla	Cindaria, Hydrozoa	C
	Moerisia maeotica	Cindaria, Hydrozoa	I
	Pennaria disticha	Cindaria, Hydrozoa	I
	Pinauay larynx	Cindaria, Hydrozoa	I
	Pinauay ralphi	Cindaria, Hydrozoa	I
	Laomedea calceolifera	Cindaria, Hydrozoa	I
	Gonothyraea loveni	Cindaria, Hydrozoa	I
	Obelia bidentata	Cindaria, Hydrozoa	I
	Obelia dichotoma	Cindaria, Hydrozoa	I
	Obelia geniculata	Cindaria, Hydrozoa	I
	Boccardia proboscidea	Annelida, Polychaeta	I
	Neanthes succinea	Annelida, Polychaeta	I

Capitella spp.	Annelida, Polychaeta	C
Polydora hoplura	Annelida, Polychaeta	I
Dodecaceria fewkesi	Annelida, Polychaeta	I
Ficopomatus enigmaticus	Annelida, Polychaeta	I
Hydroides elegans	Annelida, Polychaeta	I
Neodexiospira brasiliensis	Annelida, Polychaeta	I
Janua pagenstecheri	Annelida, Polychaeta	I
Simplicaria pseudomilitaris	Annelida, Polychaeta	C
Balanus glandula	Crustacea, Cirripedia	I, invasive
Amphibalanus venustus	Crustacea, Cirripedia	I
Acartia spinicauda	Custacea, Copepoda	I
Dynamene bidentata	Crustacea, Isopoda	I
Sphaeroma serratum	Crustacea, Isopoda	I
Sphaeroma annandalei	Crustacea, Isopoda	C
Sphaeroma terebrans	Crustacea, Isopoda	C
Spaeroma walkeri	Crustacea, Isopoda	I
Paracerceis sculpta	Crustacea, Isopoda	I
Synidotea hirtipes	Crustacea, Isopoda	C
Synidotea variegata	Crustacea, Isopoda	C
Ligia exotica	Crustacea, Isopoda	C
Limnoria quadripunctata	Crustacea, Isopoda	I
Limnoria tripunctata	Crustacea, Isopoda	I
Chelura terebrans	Crustacea, Amphipoda	I
Ischyrocerus anguipes	Crustacea, Amphipoda	I
Erichthonius brasiliensis	Crustacea, Amphipoda	I
Cymadusa filosa	Crustacea, Amphipoda	C
Caprella equiibra	Crustacea, Amphipoda	C
Caprella penantis	Crustacea, Amphipoda	C
Paracaprella pussilla	Crustacea, Amphipoda	C
Corophium triaenonyx	Crustacea, Amphipoda	C
Apocorophium acutum	Crustacea, Amphipoda	I
Monocorophium acherusicum	Crustacea, Amphipoda	I
Melita zeylanica	Crustacea, Amphipoda	C
Jassa marmorata	Crustacea, Amphipoda	I
Jassa morinoi	Crustacea, Amphipoda	I
Jassa slatteryi	Crustacea, Amphipoda	I
Orchestia gammarella	Crustacea, Amphipoda	I
Platorchestia platensis	Crustacea, Amphipoda	I
Cerapus tubularis	Crustacea, Amphipoda	I
Xantho incisus	Crustacea, Decapoda	I
Carcinus maenas	Crustacea, Decapoda	I, invasive
Ammothella appendiculata	Pycnogonida	I
Cafius xantholoma	Insecta, Coleoptera	I
Littorina saxatilis	Mollusca, Gastropoda	I
Thais blanfordi	Mollusca, Gastropoda	I
Thais tissoti	Mollusca, Gastropoda	I

Tarebia granifera	Mollusca, Gastropoda	I
Catriona columbiana	Mollusca, Gastropoda	I
Polycera hedpethi	Mollusca, Gastropoda	C
Thecacera pennigera	Mollusca, Gastropoda	C
Anteaeolidiella indica	Mollusca, Gastropoda	C
Mytilus galloprovincialis	Mollusca, Bivalvia	I, invasive
Ostrea edulis	Mollusca, Bivalvia	I
Perna viridis	Mollusca, Bivalvia	I
Semimytilus algosus	Mollusca, Bivalvia	I, invasive
Crassostrea gigas	Mollusca, Bivalvia	I, invasive
Hiatella arctica	Mollusca, Bivalvia	C
Teredo navalis	Mollusca, Bivalvia	I
Lyrodus pedicellatus	Mollusca, Bivalvia	C
Bankia carinata	Mollusca, Bivalvia	C
Bankia Martensi	Mollusca, Bivalvia	C
Dicyathifer manni	Mollusca, Bivalvia	C
Teredo somersi	Mollusca, Bivalvia	C
Matesia striata	Mollusca, Bivalvia	C
Discinisca tenuis	Brachiopoda	I
Watersipora subtorquata	Bryozoa	I
Bugula neritina	Bryozoa	I
Bugula flabellata	Bryozoa	I
Bugula dentata	Bryozoa	I
Conopeum seurati	Bryozoa	I
Cryptosula pallasiana	Bryozoa	I
Tetrapygus niger	Echinodermata	I
Ophiactis savignyi	Echinodermata	I
Cystodytes dellechiajei	Chordata, Ascidiacea	C
Clavelina lepadiformis	Chordata, Ascidiacea	I
Didemnun granulatum	Chordata, Ascidiacea	C
Didemnun psammathodes	Chordata, Ascidiacea	C
Didemnun rodriguesi	Chordata, Ascidiacea	C
Tridemnun cerebriforme	Chordata, Ascidiacea	C
Diplosoma listerianum	Chordata, Ascidiacea	I
Ciona intestinalis	Chordata, Ascidiacea	I
Corella eumyota	Chordata, Ascidiacea	C
Ascidia sydneiensis	Chordata, Ascidiacea	I
Ascidiella aspersa	Chordata, Ascidiacea	I
Botryllus schlosseri	Chordata, Ascidiacea	I
Symplegma brakenhielmi	Chordata, Ascidiacea	C
Polycarpa insulsa	Chordata, Ascidiacea	C
Cnemidocarpa humilis	Chordata, Ascidiacea	I
Styela canopus	Chordata, Ascidiacea	C
Styela plicata	Chordata, Ascidiacea	I
Microcosmus squamiger	Chordata, Ascidiacea	I
Cyprinus carpio	Pisces	I
Schimmelmannia elegans	Rhodophyta	I

Schottera nicaeensis	Rhodophyta	C
Antithamnionella ternifolia	Rhodophyta	C
Antithamnionella spirographidis	Rhodophyta	I
Cladophora prolifera	Chlorophyta	I
Ulva fasciata	Chlorophyta	C
Codium fragile fragile	Chlorophyta	I
Ammophila arenaria	Vascular plant	I
Spartina maritima	Vascular plant	C
Stuckenia pectinata	Vascular plant	C

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INTERNATIONAL MARITIME ORGANIZATION

Kenya Ballast Water Management Training

23 November 2010

By:

J. P. Muindi
Regional Co-ordinator
Eastern and Southern Africa

And

Adnan Awad
Director
International Ocean Institute, Southern Africa

Introduction

The IMO Ballast Water Management (BWM) Convention was adopted in February, 2004. The Convention is expected to come to force, twelve (12) months after the ratification by at least thirty (30) member states representing thirty five per cent (35%) of the world merchant shipping tonnage. So far, the convention has been ratified by twenty-seven (27) member states representing 25.32%. It therefore follows that the Convention will enter into force soon, since they are only three (3) countries remaining for the Convention to be ratified. It is therefore IMO's concern that some maritime Member States with huge fleet may be caught unawares and their fleets affected when the Convention comes into force. It is for the above reason that IMO through its Globallast project and related partnerships, have been organizing national awareness-raising seminars on the Ballast Water Management Convention (BWM).

Work conducted through GloBallast between 2000-2005 laid the groundwork for a regional approach to be taken in the Eastern and Southern African region, with a draft regional strategy on ballast water management being produced. Since then, GBP has focused its support and efforts in other priority African regions, developing regional agreements covering the rest of coastal Africa. During this time there has been activity on ballast water management issues in the Eastern & Southern African region, but the regional strategy has not yet been finalized and adopted.
The recent launch of the Agulhas and Somali Current Large Marine Ecosystem (ASCLME) programme has catalyzed some new support for ballast water and invasive species issues in the region. A partnership between the ASCLME, GBP and IOI-SA is targeting the re-formation of a regional task force on ballast water, and the ultimate adoption of the regional strategy. Through this partnership, the IMO is encouraging the countries of the region to ratify the Ballast Water Convention, and to this end is supporting several of the national seminars to take place within this sub-region.
Kenya is a party to the Ballast Water Convention having ratified the Convention. Kenya is also one of the countries where a baseline study on invasive species was carried on by the Globallast project, and subsequently finalized through IOI and GISP, with a high level of awareness raising and training having been conducted on the biological aspects of the surveys and invasive species. There has been a growing need for training and awareness development in Kenya related to the maritime aspects of ballast water management, especially considering the national maritime administration's commitment to implementing a comprehensive ballast water management regime. The workshop was arranged in communications with the Kenya Maritime Authority, and was convened on 23 November 2010 in Mombasa, Kenya.

Aim of the workshop

The aim of the workshop was to build awareness regarding the issue of marine invasive species and the role of shipping as a vector, including the international response. It also highlighted the latest developments, including national and regional efforts around the world, as well as the available capacity building tools and guidelines available through IMO and the GloBallast Partnerships project. The workshop also acted as an awareness-raising and capacity building on the basic issues of Ballast Water Management and the initiation of the drafting of national roadmap developed for further national discussions, thus providing essential information and guideline to the national officials who will play a key role in the implementation of the Convention by the Republic of Kenya.

Participants

The meeting was hosted by the Kenya Maritime Authority (KMA), and was attended by eighteen (18) participants, representing the maritime administration, ports, ship registry, various Governmental departments, maritime training institutes, etc.(a list of participants is attached as annex 1). The workshop was facilitated by Mr. Adnan Awad of the International Ocean Institute (South Africa) who had agreed to provide his time in kind for the seminar and Mr. John Paul Muindi, the IMO Regional Coordinator E &SA.

Seminar Deliberations and Outcomes

After screening of the *Invaders from the Sea* documentary, a series of presentations were delivered by Mr. Adnan Awad while the IMO Regional Coordinator presented the provisions of the Ballast Water Convention and possible assistance on the implementation of the convention that could be available from IMO.

The presentations were followed by discussions on a road map towards implementation of the Convention in Kenya. In summary, the meeting agreed that KMA being the main authority on the issue should be the lead agency. The meeting came up with the following recommendations.

Recommendations

- It was recommended that a task force on implementation of BWM Convention be formed with KMA as the lead Agency.
- The task force is to discuss the relevant sections of the Kenyan Laws which will contain the BWM Convention provisions.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI in drafting the legislation on implementation of the BWM Convention.
- Port State Control officers will foresee the implementation of the Convention at the Kenyan Ports to be trained before the Convention comes into force. The inspection of ships to include BW record book, validity of certificate and BW sampling ensuring that no undue delay for ships, and will ultimately require training in line with this.
- It will also be important to train personnel on technology equipment facilities, as well as joint research on implementation of the BWMC.
- Kenya will be required to notify IMO and other parties of the national requirements that will be put in place for implementation of the Convention.

Annex 1 – List of Participants

NO.	NAME	ORGANISATION	EMAIL ADDRESS
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16.	BEATRICE KIPTOON	KMA	bkiptoon@maritimeauthority.co.ke
17.	CHARLES OGALLO	BARAKA FM	Kogallo2030@yahoo.com
18.	FATMA SAID	RADIO RATIMA	AhmedFatma48@yahoo.com

National seminar for Tanzanian stakeholders, 16 September

A national awareness-raising seminar on the Ballast Water Management Convention was convened in Dar es Salaam, to disseminate the latest information on its requirements and latest developments, as well as the tools and guidelines available through the GloBallast project, to relevant stakeholders from the public and private sectors in Tanzania.

The meeting was hosted by Surface and Marine Transport Regulatory Authority of Tanzaia (SUMATRA), and was attended by approximately 20 participants, representing the maritime administration, ports, ship registry, various governmental departments, maritime training institutes, etc.

After screening of the *Invaders from the Sea* documentary, a series of presentations were delivered by Mr. Haag and Mr. Adnan Awad (IOI), the latter having agreed to provide his time in kind for the seminar.

The presentations were followed by a discussion on a road map towards implementation of the Convention in Tanzania. In summary, the meeting agreed that SUMATRA, being the main authority on the issue, should be the lead agency, and that the meeting should recommend to the Government that a national task force should be convened for the purpose of BWM.

Summary and conclusions

The mission served several purposes and managed to achieve the following:

.1 a reinforcement of the dialogue with the ASCLME and the Nairobi Convention, regarding the implementation of the BWM Convention in the region, and an agreement on a concrete, albeit tentative, plan of joint activities;

.2 nine countries introduced to the latest developments and requirements of the Ballast Water Management Convention, and the ongoing efforts around the world to harmonize the implementation of this Convention;

.3 the initiation of a transfer of experiences in relation to BWM from the WACAF region to the East African region, as well as from other regions around the world; and

.4 key people and decision makers in Tanzania trained on the basic issues of ballast water and management measures and the initiation of the drafting of national roadmap developed for further national discussions – thus achieving a key step towards ratification and implementation of the Convention.

INTERNATIONAL MARITIME ORGANIZATION

Report of the Ballast Water Management Training for Comoros, Madagascar and Mozambique held in Moroni, Antananarivo and Maputo from 4 to 8 July 2011

By:

J. P. Muindi
Regional C0-0rdinator
Eastern and Southern Africa

And

Adnan Awad
Director
International Ocean Institute, Southern Africa

1.0 Introduction

1.1 The IMO Ballast Water Management (BWM) Convention was adopted in February, 2004. The Convention is expected to come to force, twelve (12) months after the ratification by at least thirty (30) member states representing thirty five per cent (35%) of the world merchant shipping tonnage. So far, the convention has been ratified by twenty-seven (27) member states representing 25.32%. It therefore follows that the Convention will enter into force soon, since they are only three (3) countries remaining for the Convention to be ratified. It is therefore IMO's concern that some maritime Member States with huge fleet may be caught unawares and their fleets affected when the Convention comes into force. It is for the above reason that IMO through its Globallast project (GBP) and related partnerships, have been organizing national awareness-raising seminars on the Ballast Water Management Convention (BWM).

1.2 Work conducted through GloBallast between 2000-2005 laid the groundwork for a regional approach to be taken in the Eastern and Southern African region, with a draft regional strategy on ballast water management being produced. Since then, GBP has focused its support and efforts in other priority African regions, developing regional agreements covering the rest of coastal Africa. During this time there has been activity on ballast water management issues in the Eastern & Southern African region, but the regional strategy has not yet been finalized and adopted.

1.3 The recent launch of the Agulhas and Somali Current Large Marine Ecosystem (ASCLME) programme has catalyzed some new support for ballast water and invasive species issues in the region. A partnership between the ASCLME, GBP and the International Ocean Institute, South Africa (IOI-SA) is targeting the re-formation of a regional task force on ballast water, and the ultimate adoption of the regional strategy. Through this partnership, the IMO is encouraging the countries of the region to ratify the Ballast Water Convention, and to this end is supporting several of the national seminars to take place within this sub-region.

1.4 The training in the three countries of Comoros, Madagascar and Mozambique is part of the spirited undertaking by IMO with support of the IOI-SA and the ASCLME project, to bring full awareness of the convention to member states in Eastern and Southern Africa sub region. Training has so far been undertaken in Angola, Ethiopia Kenya and Tanzania prior to the present one.

1.5 The Training in the three countries covered in this report was done back to back by Mr. Adnan Awad, Director, International Ocean Institute, South Africa and John Paul Muindi, IMO Regional Coordinator, Eastern and Southern Africa. The three countries of Comoros, Madagascar and Mozambique are among countries in the sub region that have not ratified the convention, Others who have not done so and the training is yet to be done are Eritrea, North Sudan to the North, Mauritius and Seychelles among the Islands and Namibia in the west Coast of Africa.

2.0 Aim of the workshop

2.1 The aim of the seminars was to build awareness regarding the issue of marine invasive species and the role of shipping as a vector, including the international response. It also highlighted the latest developments, including national and regional efforts around the world, as well as the available capacity building tools and guidelines available through IMO and the GloBallast Partnerships project. The seminars also acted as an awareness-raising and capacity building on the

basic issues of Ballast Water Management and the initiation of the drafting of national roadmap developed for further national discussions, thus providing essential information and guideline to the national officials who will play a key role in the ratification and implementation of the Convention in the three countries.

3.0 Participants

In Mozambique the training was hosted by the National Maritime Safety Agency (INAMAR) under the Ministry of Transport and was attended by 20 participant, In Madagascar it was organized by the National Maritime Safety Authority under the Ministry of Transport and attended by 15 participants, while in Comoros it was organized by the Ministry of Transport and was attended by 20 participants. In the three countries participants were drawn from the major stakeholders in the shipping fraternity including governmental departments, maritime training institutes and Freight Forwarders Association, port authorities, shipping companies etc (a list of participants is attached as appendix 1).

4.0 Seminar Deliberations and Outcomes

4.1 After screening of the *Invaders from the Sea* documentary, a series of presentations were delivered by Mr. Adnan Awad while the IMO Regional Coordinator presented the provisions of the Ballast Water Convention and possible Technical Cooperation assistance on the implementation of the convention that could be available from IMO.

4.2 The presentations were followed by discussions on a road map towards ratification and implementation of the Convention in each country. Although the Ministries of Transport in each country were identified as the policy organs for ratification and implementation of the Convention, the Agencies in charge of Maritime Administration in each country were assigned to play a key role in coordinating the task force teams and coordination of all the related activities. The task force in each country through the appropriate organ would request IMO or any other institution for technical assistance when and as identified

5.0 Observations

In the three countries the participants were very active during the training and fully engaged the presenters with many questions on the Convention and process of ratification and implementation, in each country, a task force was formed and they agreed to start work as soon as possible, which could be an indication that they were ready to act as discussed. Closer follow up by the Regional Coordinator will however be needed to keep the fire burning.

6.0 Recommendations

The meeting came up with the following recommendations that should be undertaken by each of the three states.

6.1 Mozambique as a Flag State and Port State.

The meeting in Mozambique came up with the following recommendations to foster the ratification and implementation of the convention

- It was recommended that a task force on ratification of BWM Convention be formed with Maritime Affairs Authority INAMAR as the lead agency.
- The task force will discuss the relevant sections of the national Laws which will contain the BWM Convention provisions once the Country ratifies.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI, in drafting the legislation on implementation of the BWM Convention.
- Flag State implementation officers will foresee the implementation of the Convention on board National Flag Ships, and will ultimately require training in line with this.
- It will also be important to train personnel on technology equipment facilities on board National ships, as well as joint research on implementation of the BWM Convention.
- It was recommended that Mozambique ratify and initiate implementation of the Convention before it comes into force for smooth operations of their ships.
- The National Task Force will be represented in the Regional forum (Regional Task Force) and support development and adoption of the Regional Strategy for BWM.
- The National Task Force will prepare the instruments for ratification of the BWM Convention.
- Prepare brief to the government and to IMO on the outcome of the Status and Economic Assessments to be conducted nationally using the provided templates.
- Task Force to prepare a work plan for presentation to the Regional Workshop (November 2011) updating the status of the Task Force and its progress.

Proposed members of the National Task Force:

15. Ministry of Transport and Communications (Lead Agency).
16. Ministry of Coordination of Environmental Affairs
17. Ministry of Fisheries
18. Ministry of Tourism
19. Ministry of Health
20. Ministry of Building and Habitation (DNA) MOPH – Water is included
21. INAMAR
22. Nautical School
23. Port Authority
24. Institute of Hdrography and Navigation (INAHINA)
25. Universities
26. Oil Terminal
27. AMEPETROL – Petroleum Mozambique Association Companies
28. IMAF (Foreign Affairs)

6.2 Recommendations for Comoros National Task Force

The meeting in Comoros came up with the following recommendations to foster the ratification and implementation of the Convention;

- It was recommended that a task force on ratification of BWM Convention be formed with Ministry of Transport and Tourism as the lead agency.
- The fast task will be to prepare the instruments of ratification by the government of the Convention
- The task force will discuss the relevant laws to be enacted for the implementation of the convention.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI, in drafting the legislation on implementation of the BWM Convention.
- The taskforce will identify or ensure that there are adequate Flag State/Port state control officers to be trained for implementation of the convention.
- It will also identify personnel to be trained on technology equipment facilities on board National ships, as well as joint research on implementation of the BWMC.
- It was recommended that the taskforce should ensure that Comoros ratify and initiate implementation of the Convention before it comes into force for smooth operations of their ships.
- The National Task Force will be represented in the Regional forum (Regional Task Force) and support the development and adoption of the Regional Strategy for BW Management.
- Prepare brief to the government and to IMO on the outcome of the Status and Economic Assessments to be conducted nationally using the provided templates.
- Task Force to prepare a work plan for presentation to the Regional Workshop (November 2011) updating the status of the Task Force and its progress.

Proposed members of National Task Force:

8. Ministry of Transport & Tourism (Lead Agency)
9. Ministry of Coordination of Environment
10. Ministry of Fisheries
11. Ministry of Justice
12. Ministry of Health
13. Ministry of Foreign Affairs
14. Port Authority

6.3 Recommendations for Madagascar National Task Force

The meeting came up with the following recommendations that should be undertaken by Madagascar as a Flag State and Port State.

- It was recommended that a task force on ratification of BWM Convention be formed with Maritime Affairs Authority as the lead agency.
- The task force will discuss the relevant sections of the national Laws which will contain the BWM Convention provisions once the Country ratifies.
- Where possible the Government is to request technical assistance from IMO, GBP or partners such as IOI, in drafting the legislation on implementation of the BWM Convention.
- Flag State implementation officers will foresee the implementation of the Convention on board National Flag Ships, and will ultimately require training in line with this.

- It will also be important to train personnel on technology equipment facilities on board National ships, as well as joint research on implementation of the BWM Convention.
- It was recommended that Madagascar ratify and initiate implementation of the Convention before it comes into force for smooth operations of their ships.
- The National Task Force will be represented in the Regional forum (Regional Task Force) and support the development and adoption of the Regional Strategy for BW Management.
- The National Task Force will prepare the instruments for ratification of the BWM Convention when possible.
- Prepare brief to the government and to IMO on the outcome of the Status and Economic Assessments to be conducted nationally using the provided templates.
- Task Force to prepare a work plan for presentation to the Regional Workshop (November 2011) updating the status of the Task Force and its progress.

Proposed members of National Task Force:

6. Ministry of Transport
7. National Maritime Safety Authority (APMF)
8. Port Authority
9. Ministry of Justice

Appendix 1

List of Participants

1. **Comoros**

N°	Name and surname	Representative	E-mail / Téléphone
1	Chamsiddine Mohamed	Coast Guard	335 26 89
2	Chabani Mbaé	Coast Guard	chabanimbae@hotmail.com
3	Bouhoudadi Charif	Technical Adviser In charge of Transport	320 24 96
4	Mohamed Saadi	In charge of Aeronautical SAR Service	333 31 16
5	Saandia Ali Hassane	Maritime Service Ministry of Transport	333 76 98
6	Djamal Djamadar	Chamber of Commerce	321 21 54
7	Ali Mohamed Assoumane	Port Authority maritime Safety service - Moroni	333 72 72
8	Djawad	Port Authority Port State control Moroni	
9	Saïd Bourhane	Port Authority environment control Moroni	sangnoir@hotmail.com
10	Ahmed Mbaé Chamasse	Chief of SAR Center Control port state	chambamed@yahoo.fr
11	Aboubacar Houmadi	Port Authority of Mutsamudu Master Harbour	332 33 10
12	Mme Siti Zene Amayd	Service Environment of Tourism	333 14 23
13	Djaffar Ben Saïd Ali	Maritime Agency ‘’Royal Transit’’ Ship owner	333 15 52
14	Maturafi Allaoui	Ship-owner maritime agency Shissiwani	333 13 44
15	Hamidou Saïd Ali	Permanent Secretary of Port Authority in charge of Regulations	338 44 22
16	Abdullah Rachid	In charge of Transport infrastructure and planification national Focal point of SAR & Ant piracy	abdullahrachid@yahoo.fr
17	Djamil Madjid	Maritime Agency SORNAV Ship-owner	339 66 36
18.	Ibrahim Mohamed Soule	Director des Custom	
19	Issouf Ben Ali	Ministry of Transports	
20	Ahmed Abdallah Youssouf	Ministry of Foreign Affairs	

2. **Madagascar**

S/NO.	NAME	INSTITUTION
1.	RAKOTON JANAHARY Cle'ment	SPAT TOANASINA
2.	CAJAMI INJONA	SPAT TOANASINA
3.	ANDRIAMANAZO Michael	APMF
4.	ROJANIARISN Pusiun	Can Tanzputs
5.	RONDVANTJOA Jane	APMF
6.	RANDCIANANTE LAINA Jean Edmond	APMF
7.	ANDRIANASON Aurulien	OLEP
8.	RANDCIANANTOANDRO Eric	MAE
9.	TAFANGY Adonis	APMF
10.	RABEFARIHY Andriamains Teterina	ONE
11.	RANDRIANBOLA Tiana	CSP
12.	RASOAMISAMANANA Christene'	Ministry of Transport
13.	RAMORASATA Ferdinand	APMF
14.	Jerome SAMBALIS	APMF
15.	RANIRIHARISON Fetre	APMF
16.	Adnan Awad	International Ocean Institute
17.	John Paul Muindi	International Maritime Organization
18.	RAKOTONDRASATA ROLAND	OLEP
19.	TOMBOHAVANA Fabtein	Ministry of Justice

3. **Mozambique**

S/NO.	NAME	INSTITUTION
1.	Elsa Maria Artiel	CFM
2.	Antonio S. D. Silva	Nquidie
3.	H. Gove	INAMAR
4.	Antonio F. de Sule	AVAHINA
5.	Anisio P. Manuel	Y. Energia
6.	Alexandre Bartolomea	MICOA
7.	Oliumpio Lelinomdj	ADNAP
8.	Sergio Simao	RM
9.	Caudilo R. Maulique	INAMAR
10.	Marlia Bene	QFM
11.	Florinda Cambula	DSTM/INAMAR
12.	Anita Beipar Luis	DSTM/INAMAR
13.	Jose Simao	O.S.C.K
14.	Tricas Pilipe Macamo	INAMAR
15.	Joan Junior Munguambe	INAHINA
16.	Martiush Mafumo	INAMAR
17.	Lucia de Silva	MICOA
18.	Carla Pereira	MICOA

Annex IV Draft Regional Ballast Water Management Strategy

REGIONAL STRATEGIC ACTION PLAN (SAP)
FOR SOUTHERN & EASTERN AFRICA
TO MINIMIZE THE TRANSFER OF HARMFUL AQUATIC ORGANISMS AND PATHOGENS IN SHIPS' BALLAST WATER

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1. Introduction and Background

Shipping carries more than 80% of the world's commodities and is an essential part of the global economy. For many years ships have been using ballast water to keep the balance, stability and structural integrity essential for their safety at sea. In the last twenty years, though, there has been growing awareness of the potential for this ballast water, and the associated sediments, together with other vectors - such as hull fouling – to translocate species from one part of the world to another. The introduction of invasive marine species is now considered by the international scientific community and many organizations to be one of the greatest threats to the world's oceans.

It is estimated that up to 10 billion tons of ballast water is transferred globally each year, and that 7,000 species of bacteria, plants and animals are carried each day in ships' ballast water around the world. While many of these non-indigenous species introductions have been and continue to be innocuous, others have had disastrous economic and environmental consequences. With the projected growth in the number of ships, and the development of faster ships and the consequent reduction in travel time between ports, the likelihood of the survival and introduction of potentially damaging non-indigenous species will also be increased. Once they have become established, it is virtually impossible to control or eradicate invasive marine species.

The consequences of these invasions include:

- Ecosystem changes.
  The original species composition and/or ecological processes may be altered by the invading species.
- Economic impacts
  Fisheries, coastal industry and other commercial activities and resources may be disrupted by the invading species resulting in loss of revenue and/or removal costs.
- Public health impacts
  People may fall ill or even die from form consumption of, or direct exposure to toxic organisms, diseases and pathogens introduced through ballast water.

Examples of catastrophes resulting from species invasions exist on almost every continent. In the U.S. between US$750 million and $1 billion was spent between 1989 and 2000 on measures to

control the introduction of the zebra mussel through shipping routes into the Great Lakes (O'Neil 2000). This species has wreaked havoc on the ecosystem as well as on shoreline industries.

In the Black Sea the introduction through ballast water of the Comb Jelly *Mnemiopsis leidyi* has lead to the collapse of the commercial fisheries. *Mnemiopsis* reduced fisheries production by more than US$200 million a year in the Black Sea and by more than US$40 million a year in the Sea of Azov in the late 1980's. These figures were for certain fish species only and did not include the flow-on effects of inactive fishing fleets, ports and factories, which are considered to have been much worse (Zaitzev & Ozturk 2001). The ecological impacts of this species have been devastating, and are now threatening to extend into the Caspian Sea, where caviar harvests may be at risk.

In Africa, Water Hyacinth has devastated vast tracts of inland waterways impacting natural resource use at high cost. The introduction of harmful algal blooms has seriously impacted both natural populations and commercially farmed species of high value leading to the failure and/or relocation of some aquaculture operations. The future of the aquaculture industry in Africa may depend heavily on the management of this threat through ships ballast water. Bacteria such as Cholera have been shown to be transferred in ships ballast tanks, and persist in marine waters long enough to pose a threat to human health. In Africa, this threat from coastal shipping is particularly pertinent.

While ballast water represents one of the most important vectors of introduction for marine alien species, other vectors should not be neglected. A comprehensive approach to stemming the tide of marine alien species introductions must consider the roles of hull fouling and mariculture introductions as part of a national biosecurity approach to management. Assistance with management of these other vectors is being addressed through other international programmes such as the Global Invasive Species Program (GISP). Partnerships and links between the appropriate programmes and management bodies will be critical to the future of this issue.

2. GloBallast

As a result of the increased awareness, ballast water control and management have become an important item on the agenda of the International Maritime Organization (IMO). This led to the establishment of a Ballast Water Working Group under the auspices of the Marine Environment Protection Committee (MEPC) of the IMO, and the adoption in 1997 of Resolution A.868(20) setting out updated "Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens". The Resolution requests Governments to take urgent action in applying these Guidelines. The management and control options recommended by the guidelines include:

- Reporting and record-keeping of ballast water operations on board ships
- Development of ship-specific ballast water management plans
- Minimizing the uptake of organisms during ballasting, by avoiding areas in ports where outbreaks or populations of harmful organisms are known to occur, in shallow water and in darkness, when bottom-dwelling organisms may rise in the water column
- Cleaning ballast tanks and removing mud and sediments that accumulate in these tanks on a regular basis
- Avoiding unnecessary discharge of ballast water
- Undertaking ballast water management procedures

Although the Guidelines are currently being implemented in a number of countries, they are of a voluntary nature. To tackle the problem more effectively, there is a need for a legally binding instrument. This has been the subject of discussion at the MEPC over the past 10 years, and there is now a draft of the International Convention for Ballast Water Management, which will hopefully be adopted by a diplomatic conference in 2004.

In addition to the initiatives above, the IMO together with the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), member governments and the shipping industry has launched a project to assist developing countries to tackle the ballast water problem. The full title of this new programme is "Removal of Barriers to the Effective Implementation of Ballast Water Control and Management Measures in Developing Countries", or more simply the "Global Ballast Water Management Programme" (GloBallast).

The GloBallast Programme is being implemented through demonstration sites (Ports) at each of the six pilot countries involved. Once activities have been successfully implemented at the demonstration site, an important aspect of the project is to ensure replication throughout the region represented. In Southeast Africa the demonstration site is located at Saldanha Bay, approximately 100km north of Cape Town on the west coast. This Regional Strategic Action Plan (SAP) represents a framework by which the activities carried out at Saldanha Bay over recent years can ultimately be replicated in other ports of the region.

3. Regional Framework

An important objective of the GloBallast programme is to establish and support Regional Task Forces to increase regional awareness and co-operation, and eventual replication of the demonstration sites across each region. Where possible, the London-based Programme Coordination Unit (PCU) and IMO in general, supported by UNDP and GEF, will apply their influence to encourage countries in the regions to raise awareness and to learn from the experiences of the initial six sites.

The countries included in the GloBallast Southeast African region so far include: Angola, Namibia, South Africa, Mozambique, Tanzania, Kenya, Madagascar, Mauritius, Seychelles and Comoros. The GloBallast Programme will seek to help support ballast water management efforts from any African country wishing to participate. A Regional Task Force (RTF) has been assembled, comprising representation from the maritime and environment ministries of each country, as well as key NGO's and coordinating bodies within the region.

4. Objectives of this Regional Strategic Action Plan (SAP)

Increasingly there is a growing global recognition of the benefits of protecting biodiversity. Natural resources are by definition a function of the ecosystems that support them. The health of such ecosystems is indicated through the diversity of associated species and habitats. Biodiversity protection is hence emerging as the prominent theme/goal of recent and developing international initiatives. The GloBallast Programme is aiming to help address this global concern through the structured objectives and activities of its international, regional and national initiatives.

The Objectives of this SAP are:

- To provide a framework for the activities that need to be developed and implemented within the Southeast African Region in order to minimize the transfer of harmful aquatic organisms in ships' ballast water, in accordance with the IMO recommendations and the developing IMO Convention

- To help build capacity within the region for effective and efficient ballast water management.

5. Existing Regional Structures

There are several existing regional structures that should be considered for implementation, partnerships and cooperation in furthering ballast water management throughout the region. Ultimately, the success of ballast water management in the region will depend on the assimilation of the responsibility for such management by national and regional bodies.

5.1 Policy & Legal Frameworks

The following legal frameworks will be targeted through the implementation of this SAP as the primary mechanisms for developing and securing national-level commitments and consistency within the region.

- The New Partnership for African Development (NEPAD)

- The Nairobi Convention

- The Abidjan Convention

5.2 Organizations

The following organizations are based within the region and represented on the GloBallast Regional Task Force. These organizations will be instrumental in facilitating on-the-ground progress with implementation of this SAP.

- The Port Management Association of East and Southern Africa (PMAESA)

- The United Nations Environment Program (UNEP)

- The International Conservation Union (IUCN)

- The Western Indian Ocean Marine Science Association (WIOMSA)

5.3 Links with Programs

Successful implementation of this SAP will rely upon the establishment of mutually beneficial links with other programs working toward similar goals within the region. This will help reduce

duplication of effort, and increase effectiveness of ongoing activities and available capacity. Examples of existing or developing programs where such links should be explored include:

- **Global Invasive Species Program (GISP)**

  - This Global program is based in South Africa aiming to help reduce impacts of invasive species in all environments. Links with the GloBallast Programme are being developed, and should continue through the implementation of this SAP.

- **Large Marine Ecosystem Programs (LME's)**

  - BCLME: The Benguela Current Large Marine Ecosystem Program is a GEF-funded program operating in Angola, Namibia and South Africa. The program is aiming to streamline sustainable resource use, conservation of biodiversity, and efforts to control pollution within the system of the Benguela Current. Links are already being explored with the GloBallast Programme, and should continue through the life of the program.

  - GCLME: The Guinea Current Large Marine Ecosystem is currently being developed, to include 16 countries of West Africa. The program's objectives are very similar to those of the BCLME. Links between this program and GloBallast are also being explored, and should continue to be through implementation of this SAP.

  - Other potential LME's: Two other programs may be developed to include some of the remaining African coast. These are likely to include areas associated with the Somali Current and the Agulhas Current.

- **SEAWASTE**

  - This regional program is based in South Africa and is focusing on marine pollution issues. Links with this program will help develop awareness issues within the shipping and coastal communities.

6. Principal Actions

The activities outlined in this action plan are structured to initiate and help support ballast water management activities throughout the region in a manner that is sustainable and consistent with international protocols. The GloBallast Programme will act as the center for coordination and management of RTF-governed activities until the programme ends. At such point this coordination center will continue as a secretariat under the appropriate convention or organization (e.g. Nairobi Convention).

For the purposes of this SAP, it is necessary to recognize three time horizons or phases, in which the proposed activities will fall. The current phase of GloBallast is scheduled to terminate in August 2004. The conclusion of this first phase of GloBallast will represent the end of Phase I under the timeline of this action plan.

Phase II of this action plan will be represented by the proposed GloBallast Partnerships Programme. This proposes a four to five-year stage of GloBallast that would pick up where the first phase leaves off, and focus primarily on replication of GloBallast activities throughout the region. The RTF and this SAP would constitute the principle tools for the implementation of GloBallast Partnerships.

The final stage, Phase III of this SAP is the long-term extension of ballast water initiatives beyond the lifetime of GloBallast. It will become the responsibility of national governments and regional bodies (e.g. Nairobi Convention), through the RTF, to ensure longevity for ballast water management.

6.1 Legal and Institutional Component

Although specific legislation regulating ballast water management must be developed at the national level, the Regional Task Force must play a role in streamlining and standardizing the approach taken and providing support for policy/legislation development where possible. The Nairobi and Abidjan Conventions provide appropriate legal frameworks for channeling these efforts sub-regionally. At a larger regional level it will be necessary to work through the NEPAD system to facilitate more comprehensive participation and implementation for African ballast water management initiatives.

The following activities are aimed at developing the appropriate enabling legal and institutional environment:

- Establish ballast water/marine invasive species task forces under the Nairobi and Abidjan Conventions (Phase I)
    - Once the IMO Ballast Water Convention is in place, each task force will need to develop a specific protocol relating to ballast water management
    - It will be necessary for each of these task forces to translate the upcoming IMO Ballast Water Convention into a legal instrument adaptable at the national level
- Establish national task forces on ballast water/marine invasive species in participating countries (Phase I)
    - National task forces will comprise representation from all relevant stakeholders at the national and port levels
    - National task forces should be co-chaired by the representatives from the maritime and environment administrations
- Work through the existing Alien Species Thematic Task Group of NEPAD to harmonise efforts and goals on a Pan-African scale (Phase I & II)
- Generate a Regional Ballast Water Management Policy to streamline efforts within the region and ensure sharing of trans-boundary information and management responsibilities (Phase II)

- The regional policy will aim to harmonize guidelines for the implementation of the IMO Convention

6.2 Communications and Public Awareness-raising

Although some regional awareness raising efforts have been made through the GloBallast Programme, information about the danger of transfers of harmful aquatic organisms and pathogens through uncontrolled discharge of ballast water is not well known in the Region. This lack of information and generally low level of awareness of the ballast water issue is seen as an extremely important, early priority of this action plan to address.

To increase the level of public awareness, the following actions will be taken at the regional and national levels:

- Dissemination of communicative materials, including IMO Resolution 868, posters and documents prepared by PCU, MEPC of IMO, South Africa and Brazil (Portuguese) (Phase I & II)

- Holding seminars at regional and national levels (Phase I, II & III)

- Work through the Regional Task Force to spread information as appropriate (Phase I, II & III)

  - To exchange information and experiences among the participating countries and with the other regions, and to enhance the regional cooperation in protection of the marine environment through existing structures

- Develop links with various regional newsletters to maintain ongoing reports of ballast water management activities (Phase I, II & III)

- Research, design and publish case studies on marine invasive alien species impacts where and as appropriate (Phase I, II & III)

- Update GloBallast South African website to function as a regional website to which links may be established from other departmental and related web sites (Phase II)

- Design and disseminate targeted interpretation materials for port authorities, shipping communities, and marine science communities (Phase II)

6.3 Port Biota Baseline Surveys

A port baseline survey is considered vital for assessing existing natural conditions and the presence or absence of introduced marine species. Such surveys should be conducted in accordance with an internationally adopted protocol and should be conducted on an ongoing basis, as a long-term biological monitoring programme for the port. This will allow any existing introductions to be tracked and managed, and any new introductions to be detected and responded to.

Under the GloBallast Programme, the port baseline survey has been completed in Saldanha Bay. The findings of the survey will be used for assessing the existing local natural conditions and the risks being posed by ballast water being discharged. The results of the survey and the protocols/manuals used will be shared among the participating countries. It is considered necessary that at least one port biota baseline survey be conducted in each participating country for assessment of the natural biological conditions, with a view towards replicating surveys at all major ports. The use of standardized protocols and methodologies will ensure inter-compatibility at the regional and international levels.

The GloBallast Programme in South Africa, with support from a national and an international expert, is proposing to help conduct a survey at the Port of Mombasa, in conjunction with a training workshop for representatives from the other countries within the region.

The following activities are designed to advance the capacity to conduct port baseline surveys within the region:

- Conduct a port survey at the Port of Mombasa, Kenya (Phase I)
  - Conduct in conjunction with a training workshop for all countries of the region to participate with scientists and coordinators
  - The survey may be held at the same time as the Coastal Sensitivity Mapping exercise to be conducted by PMAESA in order to maximize benefits from field activities
- Conduct a regional assessment of the training and capacity building needs with respect to biological surveying and monitoring (Phase II)
- Conduct sub-regional and/or national-level training & expansion workshops (Phase II)
- Conduct replicate port surveys at major ports within the region (Phase II & III)

6.4 Risk Assessment

To facilitate effective ballast water management, each country needs to know the level and types of risks of introductions that its ports may face, as well as the most sensitive resources and values that might be threatened. Risk assessments at the national/port level can function as a useful tool for such management, given that adequate background information is available.

A ballast water risk assessment using a GIS system was recently conducted in Saldanha Bay. All necessary geological and environmental information was collected, and approximately 10 years of ballast water reporting information was analyzed. The method and results of this activity may provide a model for similar risk assessments to be carried out in the region. This will differ from site to site, and will help determine the type of management response that is required.

Given that all the necessary data may not be available for each port within the region, it will be necessary to initiate collection of such data as early as possible. This will help pave the way for risk assessment methodology to be integrated into national ballast water management practices.

The following activities will help establish risk assessment as a tool for streamlining ballast water management in the region:

- Circulate IMO Ballast Water Reporting Forms for use at all ports within the region (Phase I & II)
    - PMAESA will initiate the dissemination of these forms, to be followed up through appropriate national mechanisms (e.g. Maritime administrations)
- Facilitate the installation of the Access database at all ports collecting ballast water reporting forms to aid in data collection and storage (Phase I & II)
    - Some remedial training will be required to ensure appropriate functionality of the database
- Conduct a risk assessment workshop for port managers of the region to be trained on the GloBallast standardized risk assessment system, with support from a relevant international expert and the GloBallast PCU (Phase II)

6.5 Database

A database of the existing information on ballast water management will be established. The information included in the database should include findings and results of risk assessment and baseline biota surveys, ships' compliance, research and development directory, and other information as deemed necessary. The database should help serve the needs of effective regional cooperation. This process will involve the following:

- Establish the appropriate database with updateable functions and access through the regional website (Phase II)
    - Maintenance of the database will be the responsibility of the GloBallast office during Phase II, which will become the Ballast Water Secretariat for Phase III
    - Ensure appropriate feedback mechanisms to national-level managing authorities (e.g. Incursion response alert network)

6.6 National Action Plans (NAP)

Each of the participating countries will develop their National Action Plan for ballast water management that will support, and generally follow, the SAP activities. This process will include:

- Development of National Action Plans by National Task Forces with support and guidance from the Regional Task Force (Phase I, II)
    - The first meeting of the NTF's should aim to produce the NAP
    - Each NAP should include details of its contribution to the region as well as the

contribution from the region to the country

6.7 Training

Several activities contained in this SAP address training and capacity building issues with respect to specific areas of ballast water management. This activity will focus on the regional delivery of a general training tool being developed through the GloBallast Programme.

The GloBallast Programme has developed a comprehensive ballast water training package through the Train-Sea-Coast system. This modular package uses the UN Train-X methodology that has been applied globally for training purposes in various disciplines. The benefit of this system is that the Train-X system is already being applied within the region, and this expertise can be used to facilitate the implementation of this training activity.

This training will target seafarers and port personnel, as well as administration and management-level staff. Modules can be shuffled to prepare appropriately customized course packages for a given audience.

The delivery of these training activities throughout the region will involve the following:

- Invitation to representatives from regional maritime training institutions to attend and observe the first delivery of the course in Cape Town, South Africa (Phase I)

- Identification of appropriate maritime academies or other potential training institutes in each country of the region (Phase II)

- Local adaptation of Train-X ballast water management package (Phase II)

  - Potential need to translate the package into French

- Conduct a regional train-the-trainers workshop for country representatives responsible for national implementation of ballast water training (Phase II)

7. Implementation, Funding and Sustainability of the SAP

The GloBallast Programme will be the primary instrument involved in initiating SAP activities during Phases I and II. Some funding will be available through the Programme, however national, regional and international sources will also be explored. It is also recommended that the shipping industry (including ports of the region) be kept fully aware and involved in the SAP activities.

The GloBallast office in South Africa will manage and oversee Phases I & II, and will become the secretariat for ballast water management, under the Nairobi Convention or other appropriate legal body. This secretariat will be responsible for ongoing management of SAP activities including sourcing of funds. National and port-level mechanisms (e.g. port dues) may ultimately be explored to support ongoing port-specific ballast water management systems. Implementation of all activities contained in this SAP must involve a view towards long-term sustainability and self-funding.

In order to aid in the process of developing ongoing funding mechanisms the following activity will be necessary:

- Conduct a review of potential ongoing and effective funding mechanisms to support port-level ballast water management (Phase II)

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