

12 Summary on Marine Biological Diversity

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Opposite page: Marine biodiversity in the WIO is found within varied habitats such as coastal dunes, beaches and nearshore rocky reefs. © Michael H. Schleyer.

This Part of the State of the Coast Report presents an **Assessment of Marine Biological Diversity and Habitats** in the Western Indian Ocean. Its scope is thus wide and the various chapters deal with the multiple ecosystems found in the region, as well as the full diversity of biota they support. Some of the latter are found in a number of environments at different stages of their life cycle and thus warrant inclusion in a number of chapters; the best example is that of turtles which nest on beaches, feed on reefs, seagrass beds or in pelagic waters, and traverse the open ocean in their movements. For completion, the Part also includes a chapter on human dependence on the region's biodiversity.

The region is endowed with ecosystems known for their rich biodiversity. While coral reefs are considered amongst the most biodiverse of habitats, tropical and subtropical estuaries, mangroves, seagrass beds and nearshore environments are also well-endowed with prolific life-forms. There is considerable interdependence between these ecosystems as they mutually provide shared biota with feeding, breeding and nursery grounds. Thus, while they have been given separate consideration in the preceding chapters, this interdependence must be born in mind: a threat to one will have a cascade effect on the others.

Rocky shores are robust and not particularly vulnerable but the benthic and fish resources associated with them are, and are under pressure. These resources include economically important invertebrates such as octopus and fish, for example blackfish and yellowtail. **Sandy beach**

substrata, on the other hand, are more dynamic, making beach and dune habitats more vulnerable. Degradation of these results from erosion, sedimentation and sand mining, and adds pressure to their associated fauna. In this case, iconic turtles are most under threat. Sand mining for heavy minerals is of growing concern, in particular, as it affects not only the mined dunes but also the coastal belt where the associated infrastructure is installed, the local hydrology as sand mining places demands on water resources, and the nearshore environment where transshipment of the mined product occurs. Sea level rise is also expected to affect sandy beaches in the medium- to long-term.

Extensive but shrinking **mangrove forests** in the region are also vulnerable as they and their associated fauna are heavily harvested. The effects of climate change, eg sea level rise, flooding, sedimentation and increasingly severe storms are further threatening mangroves. There are nevertheless extensive, fairly intact mangroves at various locations along the East African shoreline and they merit careful management and conservation. **Seagrass beds**, in turn, are noted for their productivity, yet the extent of their distribution in the WIO is uncertain and none are protected in their own right unless secondarily included in MPAs. They are often associated with coral reefs and provide important nursery grounds for estuarine and reef fauna. **Salt marshes** are limited in distribution to the southern subtropical region in the WIO.

Muddy shores and estuaries are dynamic systems under threat from direct perturbation and that which

occurs in the upper reaches of river catchments. Maintenance flows have been disrupted in many cases, and changes in land use have compromised their integrity. Historical records indicate that they are shrinking in area with a concomitant reduction in habitat for the species they harbour.

Coral reefs probably constitute the most vulnerable of the WIO ecosystems as they are prone to bleaching caused by elevated temperatures associated with global warming and climate change. Some parts of the region lost 50-90 per cent of their coral cover during the 1998 bleaching event and most WIO reefs are considered at risk from this and human perturbation. Additionally, reef resources are in high demand. Due to their vulnerability and importance, they have received concomitantly more attention from the media, public, scientists and authorities, but the threats are still growing. Nevertheless, there are a number of initiatives to establish more MPAs in the region; other recommendations for their conservation are dealt with below.

Relatively little information is available on **shelf sediments** in the WIO apart from areas that support demersal fisheries. Areas known to harbour productive muddy sediment derived from fluvial input are known to be diminishing; this is attributable to changes in river catchments and a reduction in maintenance flows, and results in a commensurate decline in their fisheries. Direct perturbation of the shelf sediments is believed to be caused by bottom-trawling and terrestrial pollution. Knowledge of this environment is bound to improve with growing interest in offshore prospecting on the continental shelf. However, proprietary information of this nature is usually restricted and not freely available to scientists or the public.

Deep-sea phenomena are poorly known, in this case because WIO governments have limited capacity to engage in costly deep-sea research, or to effectively manage the outer reaches of their Exclusive Economic Zones. The global move towards offshore prospecting and the adoption of Blue Economies will bring changes in this regard. Internationally-sponsored (CBD, FAO and IMO) efforts are also underway to protect representative and sensitive deep-sea areas.

A number of species in the WIO are CITES-listed as **vulnerable, threatened or endangered**, including seagrasses, corals, certain molluscs, sea cucumbers, certain rays, sharks, fish, turtles and marine mammals. The principal reasons for their threatened status are habitat loss due

to human perturbation and overexploitation. A few species are showing encouraging signs of improvement with conservation measures but most face possible extinction this century unless there is urgent remedial action. Recommended measures for their improved conservation are dealt with below.

Socio-economic information relevant to the conservation of marine species and habitats in the WIO clearly reveals that degradation of the marine environment and an associated loss of resources will continue unless economic and social issues are addressed more fully. Complex issues are involved, including increasing coastal urbanisation, a concomitant erosion of traditional fishing rights, overexploitation of resources due to human population expansion, government ignorance of traditional management systems, and a loss of livelihoods with the promulgation of MPAs without the provision of alternatives. Co-management and community-based protected areas have proven effective in the Comoros, Kenya, Tanzania and Madagascar, introducing sustainability in resource extraction and providing alternative livelihoods, but need greater management and institutional support.

Capacity issues were raised by some authors of the preceding chapters as there is concern that WIO biota and habitats are receiving neither the required attention nor protection. However, **capacity-building** was here considered in the narrower context of the regional skills and expertise needed to resolve issues such as regional taxonomy and guidelines for management; capacity-building, as such, is dealt with more extensively in Chapter 35.

In conclusion, the region has a diversity of marine resources but much of this natural capital is either threatened or declining. However, the authors of the chapters in this section have made **recommendations** to mitigate or reverse the current negative trends and the following points have been compiled to summarise these, with some elaboration where needed.

- **Raised awareness is required on a number of fronts.** Resource users and managers, the public, politicians and the authorities need to be better informed of the value and vulnerability of the WIO's natural marine capital. This is not to say that these parties are necessarily diffident or negligent in their outlook regarding the marine environment and its resources, but rather that the complexity of ecosystems is such that they are difficult to understand and even scientists are still unravelling their intricacies. Better communication of the known facts is

thus needed in a form comprehensible to the public and authorities.

- **Increased funding for research.** Knowledge is power, hence the need for a greater understanding of WIO coastal and marine ecosystems and resources for their improved management. While WIO countries do invest in marine science, the preceding chapters have revealed that the region is failing to reverse negative trends in its marine resource and environmental management; more research is needed and this requires funding.

- **Increased investigation of shelf sediments and deep sea phenomena.** As stated, little is known of the off-shore habitats and resources in the EEZ of WIO countries. Increased research is needed in this area to prevent deleterious outcomes from current prospecting initiatives and growing WIO expectations of a Blue Economy.

- **Increased funding for marine resource management.** Environmental and resource-related issues are not always given timeous attention by the relevant agencies because of poor funding. The capacity is there but cannot be mobilised and this could be remedied with improved funding.

- **Capacity building** is needed to promote regional skills and expertise on threatened species and their protection. Graduate training within appropriate fields is needed, in particular.

- **WIO Threatened Species Task Forces** were suggested as a means to mobilise capacity to deal with threatened or declining marine species and habitats, or those in need of special attention or protection. A regional Coral Reef Task Force (CRTF) already exists but similar initiatives are needed for the other WIO coastal and marine ecosystems. The WIO Mangrove Network fulfils some functions of a task force in this regard.

- **National and regional integration and cross-sectorial cooperation** will facilitate the above and also provide a more coherent approach to the management of shared, trans-boundary stocks.

- **Alternative livelihoods.** Viable alternative livelihoods are needed to alleviate pressure on overharvested resources, or where traditional fishing rights are lost to conservation or commercial initiatives. These can best be provided by material involvement in such ventures, in terms of employment opportunities and co-management.

- **Alternative food sources/equivalents** should be sought for coastal populations to alleviate overfishing where alternative livelihoods are not an option.

- **Value-adding** would improve the benefits derived from existing harvests, reducing the need for ever-increasing extraction and overfishing. Regional successes and the latest technology should be shared in this regard.

- **Monitoring the harvest of vulnerable species.** Catch monitoring of vulnerable species would provide valuable information on trends in their stock and harvest so that remedial action could be taken before they entered a precipitous decline or became endangered. **Targeted research is needed on such species.**

- **MPAs and closures** provide a valuable means to protect or conserve resources, as well as to restore stocks. However, such initiatives should only be undertaken in close liaison with all affected parties, otherwise they often harm local communities, causing opposition and discontent, leading to their failure.

- **Prioritisation of areas for protection.** The selection of areas in need of protection is important in terms of suitability, size and spacing. Amongst others, consideration must be given to a host of questions concerning the biodiversity of a proposed MPA, its suitability for targeted species, the potential for beneficial spill-over to surrounding areas, the effects on local communities, and the level of their buy-in and involvement in management of the MPA.

- **Identification of areas of resilience.** Vulnerable species vary in their sensitivity to perturbation, corals providing a classical example in their spatially variable response to elevated temperatures associated with global warming. Resilient communities need to be identified as they warrant special consideration for protection to provide refuge communities with restocking potential if their demise occurs elsewhere.

- **Restoration and rehabilitation.** Prevention is better than cure and it is preferable to avoid environmental degradation occurring to a level at which restoration or rehabilitation becomes necessary. However, the need for restoration and rehabilitation does arise on occasions, but both are costly and have proven largely impractical on an ecologically realistic scale. They thus must remain a last resort, usually to provide nodes of growth or corridors for expansion of the affected community/ies.

- **Sustainability** must be an imperative in the harvesting of renewable coastal and marine resources. The Ecosystem Approach to Fisheries rather than discrete management of species in isolation should be employed to avoid collateral fishing damage to the environment and

maintain both sustainability and ecosystem health.

- **Compliance with CBD biodiversity protection targets by 2020.** All WIO countries have adopted the CBD target of conservation of 10 per cent of their coastal

and marine territory in protected areas by 2020. To date, overall compliance with this target in the WIO stands at 2 per cent and its governments must take cognisance of the need to speed up this process.

Part IV

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