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Summary of Food Security from Marine Resources

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Opposite page: Fish in the basket at the Palma fish market, north Mozambique. © José Paula.

Capture fisheries have a history of many centuries in the SW Indian Ocean, where they are integral to the food security and culture of coastal communities (see Chapters 21 and 23). Conversely, mariculture is a new sector with few successful commercial ventures, while many initiatives remain at subsistence level and rudimentary (Chapter 22). Demographic pressure along the SW Indian Ocean coastline, coupled with dwindling nearshore fish resources, has emerged as a potential threat to food security in recent decades (Chapter 20). Regional countries, like many developing states worldwide, have limited economic development opportunities, and thus depend heavily on primary natural resources. As a consequence of a low Human Development Index (UNDP 2013), fishing is often a last resort, because people lack other skills or opportunities to earn a living. In Chapter 24, we summarize the outcomes of Part V, with emphasis on critical issues that may affect food security in future. Where possible, ways of alleviating the most pressing issues are suggested, with the hope that governments will be able to use these recommendations to assure sustained food security from marine resources. This will be no easy task, given the great diversity of fisheries in the SW Indian Ocean region, with high complexity in terms of species, user groups, scientific assessment and environmental sustainability.

Overfishing of marine resources is a serious concern when the numbers of fishers, methods used, and harvest quantities are not adequately controlled by authorities. Given the heavy reliance of coastal communities on fisheries for food and economic activity, placing limits on harvests cannot be done without major social, economic and political upheaval, and the provision of alternative livelihood means. Consequently, there is limited political will to effect change, even in the face of strong evidence of overfishing, and this is compounded by limited alternative livelihood options.

Expanding coastal fisheries into deeper waters is frequently tabled as an option to increase harvests from the sea. However, sustainable exploitation of deep-sea bottom fish is notoriously difficult under prevailing economic conditions and governance arrangements, mainly because these species are often slow-growing and have low productivity (Norse and others, 2012). It is therefore important to first conduct surveys of the composition and biomass of potential deep-water resources (see Everett and others, 2015), before investing in fishing fleet or infrastructure expansions. The absence of national research infrastructure with which to assess deep-water fishery resources in most regional countries remains an obstacle to their expansion; this may be overcome by leasing survey vessels.

A minority of species / fisheries have **effective management plans.** In several countries, sector management plans have been developed and even gazetted, but have not been fully implemented after several years. This may reflect a lack of institutional capacity and political will, or in some cases uncertainty in how to translate a plan into active management processes. A review of management plans and practices at a regional level - within distinct fish-

ing sectors - might be an option to identify best-practice methods for similar fisheries at a regional scale, instead of individually trying to address complex issues with stand-alone management plans.

Nearly all countries bordering on the SW Indian Ocean lack sufficient data and expertise to fully describe their fisheries and the anthropogenic pressures on stocks. **Basic information on fished species is incomplete**, and more data is required to describe distribution patterns, biological characteristics and reference points, stock status, and the effects of fishing. Recent projects at regional level (e.g. SWIOFP, WIOFish, ASCLME, WIOLab) have made good progress in compiling existing fisheries information (see van der Elst and Everett 2015) and supporting studies on key exploited species. These studies should be continued, and the information that they generate need to be incorporated into fisheries management strategies.

The **linkage between science and management** is often suboptimal, with the result that crucial studies, such as those to estimate stock status, or to provide solutions to recent or longstanding management issues, are not prioritized. In some cases studies have been done, but their conclusions are not effectively communicated or implemented. The science / management linkage can be strengthened within a governance setup, for instance through regular meetings between managers and scientists to communicate management needs and help direct research initiatives. Regional and national mechanisms of assessing integration of scientific findings into management may be a necessary link.

Modest monitoring, control and surveillance (MCS) capacity make enforcement of national and international laws and regulations patchy and ineffective in most SW Indian Ocean countries. Consequently **IUU fishing** is common in artisanal (nearshore) and industrial (further offshore) fisheries, where it is responsible for considerable economic, social and ecological losses. Successful prosecutions are needed to deter or reduce IUU fishing – possibly at a regional level, through collaborative processes. Financial and technological support for expanding and maintaining MCS systems, need to be sought from international development agencies.

Co-management of artisanal fisheries, through Beach Management Units (BMUs) empowered to manage fisheries in specific areas on behalf of fisheries departments, is a promising development in Kenya, Tanzania and Mozambique. BMU objectives are to strengthen the management of fish landing stations, facilitate broad stakeholder participation in decisions, and prevent or reduce user conflicts (see Chapter 23). Although the requirements of running BMUs are quite demanding, it remains the most promising management approach in remote areas. In Madagascar, the first seascape-scale traditional, artisanal and industrial fisheries co-management plan, for Antongil Bay, was signed by the Ministry of Fisheries in 2013.

The growing awareness and implementation of an **ecosystem approach to fisheries management** (EAF) is a notable positive development in the SW Indian Ocean. Using **ecological indicators** for evaluating and comparing the status of exploited marine ecosystems (e.g. Indiseas project) is also promising. Both systems are relative newcomers to the region and are supported by governments (see Chapter 20) – nevertheless, their implementation can be accelerated and entrenched over a broader base, by making them popular among coastal communities. The positive spin-offs of EAF management will need to be demonstrated to stakeholders, especially in the artisanal fishing sector, to encourage its acceptance and support at community level.

Transboundary fish stocks in the SW Indian Ocean range from highly migratory tunas and billfishes that move long distances through high seas and EEZ waters, to more sedentary species, such as benthic crustaceans, that are distributed across geopolitical borders. International fisheries for large pelagic species in the Indian Ocean are managed by the Indian Ocean Tuna Commission (IOTC 2014), of which most SW Indian Ocean countries are members (see Chapter 21). Benthic stocks (such as prawns) are also potentially shared across geopolitical boundaries, through alongshore migrations or larval dispersal in ocean currents. Therefore the harvesting activities of one country may impinge on the opportunities of another (Gulland 1980). Genetic studies of several crustacean species with wide distribution were recently undertaken, and showed a surprising tendency towards highly structured populations over relatively short distances; this implies that several distinct stocks exist, and that they are not necessarily shared by neighbouring countries (Groeneveld and Everett 2015).

Cooperative management of shared fish stocks among neighbouring countries may confer many ecological and economic advantages, but it is also a complex political process (see Payne and others, 2004). A move from national to regional fisheries management strategies should therefore be subject to strong and broad-based evidence that it

would be advantageous to all parties, and that it would be justified based on stock identity and boundaries, genetic diversity, exploitation patterns and management objectives. The recently concluded SWIOFP project (van der Elst and Everett 2015) showed that combining resources among countries provided a clear forward impetus, especially for transboundary stocks, compared to struggling along individually with little infrastructure and scarce logistical support.

There is a **scarcity of skilled manpower** (i.e. fisheries researchers, scientific observers, fisheries managers, surveillance technologists, hatchery and grow-out systems operators) in the region, and this is presently being addressed through the capacity-development initiatives of several regional programmes (i.e. WIOMSA, SWIOFP, SWIOFish, SmartFish). Whether the uptake of these graduates into fisheries management and research positions is successful, needs to be seen. A weakness of the present system is that skilled workers easily become isolated, without the logistical and infrastructure support that their skills might warrant. When this happens, skills erode, or are lost because individual workers leave.

Mariculture is encouraged by governments as an alternative activity to generate fish protein and wealth. It is an important emerging issue with high complexity, extending from land and sea-use planning, to finding the right species and culture technology, and to encouraging responsible practises. It requires improved governance systems to encourage and support prospective farmers.

To date, demonstration projects and **donor-driven mariculture initiatives have been generally short-lived**, with modest uptake, except for seaweed farming in Zanzibar. Whereas the impediments to sustainability may differ (i.e. lack of skills, technology, infrastructure, marketing etc.), a common problem appears to be the remoteness of most of the region from large urban centers and foreign markets. Without access to markets for cultured products, or efficient distribution networks, local marketing remains as the main driver for mariculture – and it is less attractive than capture fishing.

A more **integrated approach to mariculture** is required, as illustrated at sea cucumber farms in southwest Madagascar, where collaboration between farmers (rearing), NGOs (technology) and business (marketing) has proved successful over several years. In such a system, donor and / or private sector investment would be needed over an extended period, with a gradual transfer of skills.

Mariculture can play an important role in **empowering women** in culture and business aspects. This has been clearly demonstrated by seaweed farming in Zanzibar, and is likely to expand across the region with the further development of mariculture projects. Mariculture undoubtedly has **high growth potential** in the region over the next decade, as it starts from a relatively low base, and is generally supported by local communities, investors, NGOs and governments. Constraints to the growth of this sector (i.e. lack of skills, technology, infrastructure; access to markets; unwieldy governance systems; planning) need to be identified and addressed, to allow for the expansion of the sector. It is also important to learn lessons from collapsed intensive commercial enterprises from other parts of the world, especially shrimp farming in mangrove ecosystems, which occurred at great environmental cost (Kautsky and others, 1997, Spalding and others, 1997).

Ironically, the high biodiversity of this tropical region and multiplicity of methods used to exploit the coastal and marine environment for food and economic activity is the source of many governance headaches. Only modest governance resources are generally available to address these complex issues. Nevertheless, good progress has been made over the past decade: governance systems are in place; capacity building is progressing; governments are signatories to international treaties; a shift towards EAF instead of single-species management; co-management through development of BMUs; regionalization of research and management; and the realization that mariculture will be key to food security and social and economic systems in the near future. Finding and implementing a long-lasting solution to the conundrum of declining coastal fish stocks and increasing human populations along the coast needs to be high on the agenda of governments in the SW Indian Ocean region.

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Part VI
Assessment of Other Human Activities and the Marine Environment

Louis Celliers