

A three-year project on sea cucumbers in the southwestern Indian Ocean: National and regional analyses to improve management

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Introduction

This paper briefly outlines a new sea cucumber project in the southwestern Indian Ocean. The project is supported by the Western Indian Ocean Marine Science Association (WIOMSA) (www.wiomsa.org), a regional nongovernmental organisation, established in 1993 to promote and advance marine science in the Western Indian Ocean (WIO) region. The research project is funded under the Marine Science for Management grant (MASMA) of WIOMSA.

Despite their long history of consumption by Asian populations (Conand 1990, 2004a, 2005a, 2005b), sea cucumbers are a poorly understood coastal resource. Although the high demand for sea cucumbers has resulted in overexploitation in the main producing nations (Conand 1990, 2001, 2004a, 2005a, 2005b), there remains a high demand for this product worldwide, leading to the expansion of the fishery into new fishing grounds as well as the development of sea cucumber aquaculture (Lovatelli et al. 2004). Renewed interest for this fishery has risen recently in the region (Muthiga and Ndirangu 2000; Muthiga in review; Conand 2001, 2004a, 2004b, Conand et al. 2005; Rasolofonirina and Conand 1998, Rasolofonirina et al. 2004; Aumeeruddy and Skewes 2005, Aumeeruddy et al. 2005; Samyn et al. 2005).

Some sea cucumber studies have already been conducted in several countries in the WIO (Table 1), but there has been limited analysis of information relevant for fisheries management in individual countries and no attempt at a regional level.

Given that the WIO region has more than 106 species of sea cucumbers (Clark and Rowe 1971) — 20 of which are of commercial value — it is apparent that there is a great deal more information that is needed, especially studies focusing on reproduction, recruitment, growth and mortality. This information is crucial for fisheries management as recommended by FAO (Lovatelli et al. 2004) and the Convention on International Trade in Endangered Species — CITES (Conand 2004b, 2005a).

Coastal fisheries provide an important source of income for communities in the WIO region (McClanahan and Pet-Soede 2000; Cesar et al. 2002; Jid-dawi and Öhman 2003). However, the increasing need for finfish and other marine products is putting a great deal of pressure on the marine ecosystems, leading to overexploitation of species and habitat degradation (Jennings and Polunin 1996; McClanahan and Sheppard 2000; de la Torre Castro and Rönnback 2004). The opening up of international trade to China and the decline in the finfish fishery in the WIO have, in part, contributed to the current interest in alternative fisheries, such as sea cucumbers, which can divert fishing pressure away from traditional fisheries and improve incomes of coastal communities. Preliminary analysis of the sea cucumber fisheries and management systems in some countries of the region indicate rapidly developing and unregulated fisheries with some showing signs of overexploitation (Horsfall 1998; Muthiga and Ndirangu 2000; Marshall et al. 2001; Rasolofonirina et al. 2004; Mbaga and Mgaya 2004; Aumeeruddy and Skewes 2005; Uthicke and Conand 2005a). It is difficult, however, to make a thorough assessment of WIO fisheries at the present time because of inconsistencies with and poor collection and storage of catch statistics in most countries of the region.

Unfortunately, despite the potential importance of sea cucumbers to the livelihoods of coastal communities, few studies have taken into account the socioeconomic aspects of the fishery (Iida 2005). This is especially important because the characteristics of the fishery seem to vary from country to country and with different world biotic zones Conand 2001, 2004a. In addition, conservation implications (Bruckner et al. 2003) and marine protected areas have also not been addressed. The proposed project is timely because the issues of sea cucumber fisheries management, trade and conservation are increasingly being addressed at the global level as evidenced by the recent international FAO workshop in China (Lovatelli et al. 2004), at a CITES workshop in Malaysia, and at the 12th conference of parties meeting of CITES (www.cites.org). The global view of sea cucumber fisheries is similar to

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Figure 1.

Several species of dried sea cucumbers by a collector in Madagascar

issues in the WIO, where many fisheries are over-exploited and poorly managed due to poverty and lack of adequate information for fisheries management (Lovatelli et al. 2004, Conand 2004a, 2005b). Since WIO countries are signatories to CITES, it is imperative that appropriate management and reporting systems are instituted, and the proposed project has potential to contribute to this process.

Project overview

Marine resources are vital to the coastal peoples of the WIO region. Management of these resources must balance sustainable use with conservation of marine habitats containing these resources. Successful management cannot be achieved without key ecological and socioeconomic information. This project intends to address the conservation and management, and the information needs of the rapidly growing sea cucumber fishery in the region. Specifically, knowledge generated through this project will:

- Increase the understanding of the status of sea cucumbers and their management, including potential for aquaculture;
- Provide key skills and information for management, including identification skills and information on reproduction and recruitment of key commercial species that is crucial for fisheries management;
- Improve the knowledge of management systems and knowledge gaps, thereby helping to form the basis for any management plans; and
- Increase the knowledge of the fishery's impact on the socioeconomic status of coastal communities.

A general model describing the five levels of this fishery-system (Conand 2001, 2004b, 2005a) will be

useful for the analysis of the fisheries management programmes in WIO countries. The project will also use knowledge gained by different projects in the region: Madagascar — potential aquaculture of sea cucumbers (IH-SM and Belgian cooperation); Seychelles — FAO project on the biology, ecology, and socioeconomics of the fishery; Kenya — INCOFISH implemented by the Wildlife Conservation Society (WCS) mapping fisheries activity; Reunion — ECOMAR studies on ecology and biology.

The project began in October 2005, and is intended to be multidisciplinary, with close collaboration between biologists, ecologists and social scientists. Training in sea cucumber taxonomy, biology and fisheries will provide capacity to regional scientists, fishery officers and managers for monitoring and evaluating the effectiveness of the management systems currently in place. The project will focus on Kenya, Madagascar, Reunion, Seychelles and Tanzania, although information on other WIO countries will be collated from the literature and ongoing studies for a more complete regional analysis.

Main objectives

Objective 1: Species inventories and distribution

Key questions are: 1) What species occur and where? 2) Which species are the most abundant? 3) Which habitats have the highest diversity? and 4) Is there a regional distribution pattern that provides information on biogeography? This will allow us to understand which areas are at risk, which resources are shared across the region, and which species need special attention in term of management.

Objective 2: Impacts of MPAs

The effectiveness of MPAs in protecting sea cucumber resources has not been evaluated. Assuming that fishing affects the population of commercial sea cucumbers, we can hypothesise that: 1) the numbers of species (including commercial species) will be less in fished areas, and more in unfished areas, and that 2) sea cucumbers in fished areas will have smaller body sizes than in un-fished areas. This information has implications for national fisheries management processes and requirements under CITES and CBD (Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Convention on Biological Diversity CBD), and provides a better understanding of sea cucumber stocks.

Objective 3: Biology of the main species

Information on the reproduction and recruitment of sea cucumbers is crucial for the management of the fishery (Conand 1993, 1996, 2004c; Uthicke and Conand 2005). The main questions that will be explored are 1) What are the reproductive patterns and factors that control these patterns? and, 2) What are the recruitment patterns and environmental and ecological factors controlling recruitment of these species? This information will provide a better understanding of factors that control reproduction and recruitment, which are important for fisheries management and any potential aquaculture developments.

Objective 4: Socioeconomics

Sea cucumbers are highly valuable on the international market, yet the level and potential contribution of this resource to national economies, as well as to the livelihoods of coastal communities, is not known. Information under this objective should provide a comprehensive assessment of coastal fisheries and the current and potential contribution of sea cucumbers to the livelihoods, sociocultural and economic status of coastal communities and their ability to undertake potential aquaculture projects. The information could also serve to persuade fisheries authorities to pay closer attention to the management of sea cucumbers.

Objective 5: Management

While many WIO countries have sea cucumber fisheries, and while there is some basic information on the management systems, there has been no comprehensive analysis made. For example, information on management processes such as licensing, monitoring, collection of catch statistics, and fisheries policies are not readily available. Such infor-

mation should assist countries in improving the management of their sea cucumbers stocks.

Objective 6: Training

In order to manage any fishery, management authorities require some basic monitoring and assessment skills, as well as a basic understanding of the biology, ecology and taxonomy of the target fishery. Training practitioners and students, providing identification material on sea cucumbers, as well as producing guidelines for the collection of catch statistics should serve to increase this capacity in selected WIO countries.

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