

## Sea cucumbers. A global review on fishery and trade

Verónica Toral-Granda, Alessandro Lovatelli, Marcelo Vasconcellos (eds)  
and the Scientific Committee composed of:  
Chantal Conand, Jean-François Hamel, Annie Mercier, Steve Purcell and Sven Uthicke

### Introduction

Following the FAO International Workshop on the Sustainable Use and Management of Sea Cucumber Fisheries, held in Puerto Ayora, Galapagos Islands, Ecuador, in November 2007 (see Toral-Granda et al. 2008), the global sea cucumber fishery review has been finalized and will be published by the UN Food and Agriculture Organization. The document will be available in November 2008 under the following reference:

Toral-Granda V., Lovatelli A. and Vasconcellos M. (eds). 2008. Sea cucumbers. A global review on fishery and trade. FAO Fisheries Technical Paper No. 516. Rome, FAO. 319 p.

The executive summary of this document is reproduced below.

### Executive summary

Sea cucumbers (Echinodermata: Holothuroidea), or their dried form (beche-de-mer), have been a dietary delicacy and medicine for Asians over many centuries. The collection of sea cucumbers to supply the market has seen a depletion of this resource in the traditional fishing grounds close to Asia and more recently the expansion of this activity to new and more distant fishing grounds. Currently, there are fisheries harvesting sea cucumbers across most of the resource range, including remote parts of the Pacific, the Galapagos Islands, Chile and the Russian Federation. This global review shows that sea cucumber stocks are under intense fishing pressure in many parts of the world and require effective conservation measures. It also shows that sea cucumbers provide an important contribution to economies and livelihoods of coastal communities, being the most economically important fishery and non-fish export in many countries. Reconciling the need for conservation with the socio-economic importance of sea cucumber fisheries is shown to be a challenging endeavour, particularly for the countries with limited management capacity. Furthermore, no single management measure will work optimally because of the many idiosyncrasies of these fisheries, which are shown in this document through a comprehensive review of their biological and human dimensions.

The present document reviews the population status, fishery, trade, management and socio-economic importance of sea cucumbers worldwide. It includes regional reviews and hotspot case studies prepared by leading experts on sea cucumber fisheries and their management. These preceded the FAO Work-

shop on Sustainable Use and Management of Sea Cucumber Fisheries, held in Puerto Ayora, Galapagos Islands, Ecuador, from 19 to 23 November 2007 (workshop agenda, list of participants and their profiles are appended).

Reviews were prepared for five regions: Temperate areas of the Northern Hemisphere (including Canada, Iceland, Russian Federation and the United States of America); Latin America and the Caribbean; Africa and Indian Ocean; Asia; and Western Central Pacific (including Australia). In each region, specialists conducted a case study of a "hotspot" country or fishery to highlight topical or critical problems and opportunities for the sustainable management of sea cucumber fisheries. The five hotspots are: Papua New Guinea (Western Central Pacific); Philippines (Asia); Seychelles (Africa and Indian Ocean), Galapagos Islands (Latin America and the Caribbean); and the *Cucumaria frondosa* fishery of Newfoundland in Canada (Temperate areas of Northern Hemisphere).

A multitude of sea cucumber species are being exploited worldwide, with new species being brought to market as established species become scarcer and more difficult to find. Across the five regions, the number of commercially exploited species varies widely, with the highest number of species exploited in the Asia (52 species) and Pacific (36 species) regions partially due to the higher natural diversity in these areas. But still, little is known about the ecology, biology and population status of most commercial species, and in many cases, species are being commercialised without a clear taxonomic identification (e.g. the "pentard" in the Seychelles, *Actinopyga* sp. in Yap). Information on

catches is also scarce, as these fisheries operate over large scales in often remote locations. In view of the importance of international trade, export and import statistics of beche-de-mer are in many cases the only information available to quantify the magnitude of fisheries catches. Based on the most recent available catch and trade data, Asia and the Pacific are the top producing regions despite the long history of exploitation. Depending on the conversion factor used for the dry:wet weight of sea cucumbers, it is possible to infer that the combined catches for the Asia and Pacific regions are in the order of 20,000 to 40,000 tonnes (t) per year (yr). The temperate areas of the Northern Hemisphere are also responsible for a substantial share of the world catches (in the order of 9,000 t yr<sup>-1</sup>); catches being sustained almost exclusively by one species (*Cucumaria frondosa*). Sea cucumber catches are relatively less important in Africa and in the Indian Ocean (2,000–25,000 t yr<sup>-1</sup>) region and, is particularly low in Latin America and the Caribbean region (<1,000 t yr<sup>-1</sup>).

Sea cucumber capture fisheries generally target a large variety of species, which adds complexity to management and trade reporting; and those that started as single-species fisheries have now progressed to include “new” species in their catches (i.e. fisheries in Peru and Chile). Four of the five hot spots reviewed in this document present multispecies fisheries, and in all cases they have moved from low quantity-high value to high quantity-low value ventures, as the more valuable species become fully-exploited or overexploited. Some regions have seen a dramatic increase in the number of species under commercial exploitation (e.g. Galapagos Islands, Philippines, Papua New Guinea, Solomon Islands), yielding more species to fishery pressure, as well as masking overexploitation and species-specific decreases in catches.

The majority of sea cucumbers are exported for the beche-de-mer market and few species for the live trade (aquarium) market, which is currently under-reported. There is also an emerging market for the use of sea cucumbers in the pharmaceutical, nutritional and cosmetic industries. The type of fishery varies with the region and the species under exploitation. Examples of different fishery types, ranging from artisanal (Papua New Guinea and Philippines), to semi-industrial (Galapagos Islands) and industrial (*Cucumaria frondosa* fishery in northern Canada), are described in the hotspot case studies. Hand collecting, gleaning, lead bombs, SCUBA diving, hookah and dredging are examples of fishing methods used.

Effective management plans for sea cucumber fisheries are uncommon. For example, the Seychelles and Papua New Guinea have adopted management plans for their fisheries, which came into place fol-

lowing concerns about declines in catches caused by unregulated harvesting. The Galapagos Islands sea cucumber fishery also started as an open-access activity, but after a long ban it re-opened in 1999 with an adaptive and participatory management scheme. The Philippines do not have a management plan in place despite some species now becoming locally endangered through overfishing. The *C. frondosa* fishery in Newfoundland (Canada) is still under an exploratory stage but aims at being managed through ecosystem-based guidelines. This fishery, unlike other sea cucumber fisheries, has the advantage of using a precautionary approach at the start of commercialisation, and has some of the most complete set of biological and population information on which to base a management plan. In spite of the lack of management plans in most locations described in the regional reviews, some management measures have been adopted to regulate fishing pressure, including closed seasons, minimum sizes, total allowable catches, gear restrictions, spatial and temporal closures and the establishment of marine protected areas. However, the lack of enforcement capacity has posed considerable constraints on the effectiveness of such management measures. The lack of enforcement and compliance is a common denominator for the majority of the fisheries reviewed in this document, and has exacerbated illegal, unreported and unregulated fishing and trade.

Sea cucumber populations are in dire straits in many parts of the world. This unfortunately includes high profile conservation sites such as the Great Barrier Reef Marine Park and the Galapagos Islands National Park (both World Heritage listed). These locations have well documented cases of sea cucumber population collapse, and subsequent population surveys showed no recovery of overfished stocks. The temperate areas of the Northern Hemisphere offer perhaps the few exceptional cases of abundant stocks still moderately exploited and with some potential for expansion. Despite the paucity of information available on sea cucumber fisheries in Latin America and the Caribbean, it appears that high valued commercial species have been depleted and the risk of fishery collapses is high due to the small size of stocks, the strength of market forces and the unregulated nature of these fisheries. In Africa and the Indian Ocean region, at least 12 out of 17 countries where sea cucumber fisheries have been documented show evidence of overfishing of sea cucumber stocks. Species are under heavy fishing pressure throughout the Asian Pacific region, whilst the most soughtafter species in the western Pacific are largely depleted.

Recognizing the importance of international trade as a threat to the conservation of sea cucumber species, consideration has been given to the pos-

sible role of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as a complementary measure for regulating the sustainable use of sea cucumber fisheries. One species is currently listed in a CITES Appendix (*Isostichopus fuscus* in Appendix III by Ecuador) and the Galapagos Islands hotspot case study (this document) lists advantages and disadvantages based on this experience. The analysis of the situation in the Seychelles, Papua New Guinea and the Philippines asserts the possible benefits of CITES to sea cucumber populations, but indicate that a listing could lead to socioeconomic impacts as well as an increased administrative burden where institutional capacity is limited.

In many countries, particularly in the Western Pacific region, some sea cucumbers or their organs are consumed as delicacies or as a protein component to traditional diets. However, in the majority of the countries reviewed in this document, sea cucumbers are harvested to supply the Oriental market of beche-de-mer. Indonesia is the major exporter of sea cucumber from capture fisheries. On all importing countries and territories, China Hong Kong Special Administration Region (SAR), is the most important, with product arriving from most countries worldwide; whilst some countries, such as the United Arab Emirates in the Indian Ocean, have become “intermediate” markets. Although in most current fishing grounds, sea cucumber fishing is not a traditional activity the majority of rural coastal communities have developed a strong dependency on it, as alternative opportunities for income are often limited. High prices and the increasing demand from consumers have seen the expansion of the range covered by marine products agents, the development of capacity in these fisheries and an ongoing search for new species. In many regions, the socio-economic dependency on beche-de-mer is so vast, that fishers continue collecting sea cucumbers despite scant catches, further affecting the stocks capacity to reproduce and repopulate the fishing grounds. Generally, when one commercial species is depleted, or “economically extinct”, traders will encourage fishers to search for new species, or fish deeper or further a field, in order to continue their business.

Aquaculture, sea ranching and restocking have been evaluated as possible solutions to wild sea cucumber overexploitation, and some countries have started such ventures (e.g. Australia, China, Kiribati, Philippines, Viet Nam and Madagascar). Restocking has been considered an expensive remedy to overfishing. Presently, China is successfully producing an estimate of 10,000 tonnes dry weight of *Apostichopus japonicus* from aquaculture, mainly to supply local demand. This value, when converted into wet weight, is in the same order of

magnitude of the total world wild catches. A feasibility study is undergoing in Chile to evaluate the possible introduction of *A. japonicus*, as an alternative to capture fisheries of two wild species of sea cucumbers. In the Asia Pacific region aquaculture is still in the early development stages, with one species of sea cucumber (*Holothuria scabra*) in trials to ascertain the commercial viability of culture and farming options.

Many additional threats have been identified for sea cucumber populations worldwide, including global warming, habitat destruction, unsustainable fishing practices (e.g. blasting), the development of fisheries with little or no information on the species, and lack of natural recovery after overexploitation. Illegal, unregulated and unreported (IUU) fisheries are widespread in all regions, representing an indirect threat, as it fuels unsustainable practices and socio-economic demand. The critical status of sea cucumber fisheries worldwide is compounded by different factors including the lack of financial and technical capacity to gather basic scientific information to support management plans, weak surveillance and enforcement capacity, lack of political will and socio-economic pressure exerted by the communities that rely on this fishery as an important source of income. The fast pace of development of sea cucumber fisheries to supply the growing international demand for beche-de-mer is placing most fisheries and many sea cucumber species at risk. The pervasive trend of overfishing, and mounting examples of local economic extinctions, urges immediate actions for conserving stocks biodiversity and ecosystem functioning and resilience from other stressors than overfishing (e.g. global warming and ocean acidification), and therefore sustaining the ecological, social and economic benefits of these natural resources.

## Reference

Toral-Granda V., Lovatelli A., Vasconcellos M. and the Scientific Committee composed of Conand C., Hamel J.F., Mercier A., Purcell S. and Uthicke S. 2008. International Workshop on the Sustainable Use and Management of Sea Cucumber Fisheries, Puerto Ayora, Galapagos Islands, Ecuador, 19–23 November 2007. SPC Beche-de-Mer Information Bulletin 27:2–3.

Copies of FAO Fisheries Technical Paper No. 516 can be obtained by contacting Alessandro Lovatelli (Email: [alessandro.lovatelli@fao.org](mailto:alessandro.lovatelli@fao.org)).