

## Present status of the sea cucumber fishery in southern Sri Lanka: A resource depleted industry

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### Introduction

Sri Lanka is a small tropical island situated between 5°55' and 9°55'N and 72°42' and 81°52'E, south of the Indian subcontinent. The country has a total land area of 65,000 km<sup>2</sup>, including inland water bodies and 62,705 km<sup>2</sup> excluding inland water bodies. Although the country's coastline is about 1739.3 km long, the continental shelf area is 30,000 km<sup>2</sup>, which is relatively narrow and small in area when compared with other island nations. The island's coastline contains highly productive ecosystems such as mangroves, coral reefs, sea-grass beds and marshy lands. These coastal ecosystems are a valuable resource for the people of the country, particularly for coastal communities. Coastal ecosystems have been utilized as a food source and income-generator for centuries and the rate of exploitation is increasing at an alarming rate. Collection and export of coastal ecosystem-associated organisms have contributed substan-

tially to the foreign exchange earnings of the country. The collection of sea cucumbers for export is one such industry.

A sea cucumber fishery has existed in the northern parts of the island for many years, but in the south, along the coast from Negombo to Dondra (Fig. 1) the fishery began only about 10 years ago. Regrettably, overexploitation with no effective management measures has led to its complete collapse.

### History of the sea cucumber fishery in southern Sri Lanka

Sea cucumbers are locally known as *muhudu kekiri* or *atta* but are not used locally as a food item or for any other purpose. As with most sea cucumber producing countries, production is not meant for local consumption but rather for export to Asian countries (Conand 1990). There are nearly 200

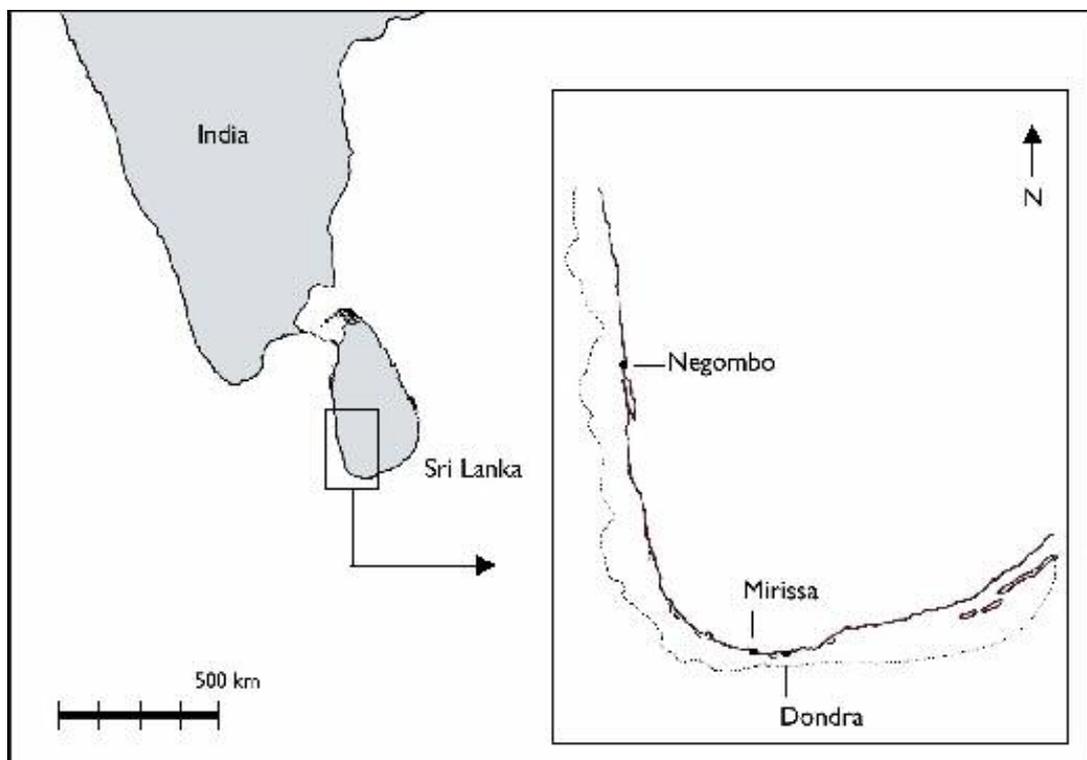


Figure 1. Major sea cucumber landing sites along the southern coast of Sri Lanka.

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**Figure 2.** *Holothuria edulis*.  
Image: Dr Malik Fernando



**Figure 3.** *Holothuria atra*.  
Image: Dr Malik Fernando

known species found in the waters around Sri Lanka. About 75 species have been shown to be present in shallow waters while nearly 50 species can be collected from the inter-tidal areas (Clark and Rowe 1971). Although sea cucumbers were abundant along the shallow coastal waters they were not harvested in the south until buyers from Singapore created a demand. The buyers primarily purchased two species, *Holothuria edulis* (Fig. 2) and *H. atra* (Fig. 3), for very low prices. Although buyers paid only one rupee per animal, fishermen earned a considerable amount of money because of the organism's abundance in shallow coastal waters. The price increased up to five rupees per animal as supplies dwindled. Harvesting at first was done by hand while wading or using snorkel gear in shallow water. As the shallow areas were fished out, scuba gear was used to exploit increasingly deeper sea cucumber beds. Over the past three to four years, the sea cucumber fishery in the shallow areas off southern Sri Lanka declined rapidly and finally collapsed. The fishermen and divers of these areas then turned to distant sea cucumber beds.

**Table 1.** Holothurians present in Sri Lankan waters. Source: Summarized from Clark and Rowe (1971).

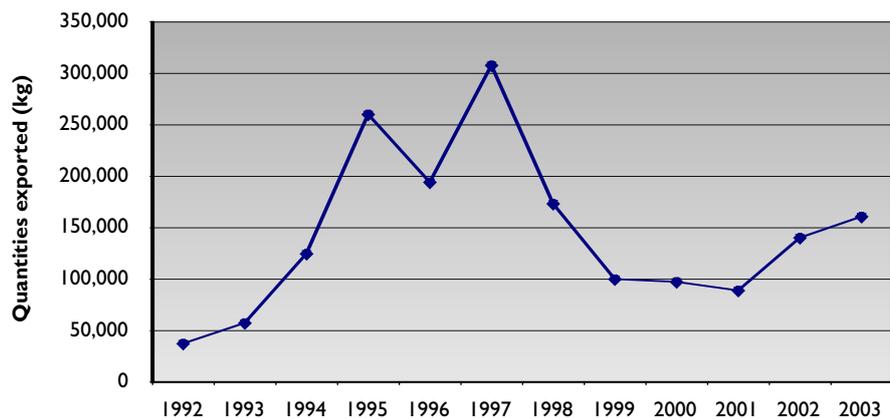
CLASS HOLOTHUROIDEA		
<p><b>Family Holothuriidae</b></p> <p><i>Actinopyga echinites</i>  <i>Actinopyga lecanora</i>  <i>Actinopyga mauritiana</i>  <i>Actinopyga miliaris</i>  <i>Actinopyga serratidens</i>  <i>Bohadschia argus</i>  <i>Bohadschia marmorata</i>  <i>Bohadschia tenuissima</i>  <i>Bohadschia vitiensis</i>  <i>Holothuria (Halodeima) atra</i>  <i>Holothuria (Halodeima) edulis</i>  <i>Holothuria (Lessonothuria) glandifera</i>  <i>Holothuria (Mertensiothuria) fuscocinerea</i>  <i>Holothuria (Mertensiothuria) leucospilota</i>  <i>Holothuria (Mertensiothuna) pervicax</i>  <i>Holothuria (Mertensiothuria) scabra</i>  <i>Holothuria (Microthele) nobilis</i>  <i>Holothuria (Platyperona) difficilis</i>  <i>Holothuria (Selenkothuria) erinaceus</i>  <i>Holothuria (Selenkothuria) moebii</i>  <i>Holothuria (Semperothuria) cinerascens</i>  <i>Holothuria (Semperothuria) imitans</i>  <i>Holothuna (Theelothuria) kurti</i>  <i>Holothuria (Theelothuria) spinifera</i>  <i>Holothuria (Thymiosyca) hilla</i>  <i>Holothuria (Thymiosyca) impatiens</i></p>	<p><b>Family Stichopodidae</b></p> <p><i>Stichopus chloronotus</i>  <i>Stichopus naso</i>  <i>Stichopus variegatus</i></p> <p><b>Family Psolidae</b></p> <p><i>Psolus complanatus</i></p> <p><b>Family Cucumariidae</b></p> <p><i>Havelockia herdmani</i>  <i>Hemithyone semperi</i>  <i>Pentacta armatus</i>  <i>Pentacta quadrangularis</i>  <i>Pseudocolochirus tricolor</i>  <i>Staurothyone rosacea</i>  <i>Stolus buccalis</i>  <i>Stolus conjugens</i>  <i>Thyone papuensis</i>  <i>Trachythyone imbricata</i>  <i>Trachythyone typica</i></p> <p><b>Family Phyllophoridae</b></p> <p><i>Actinocucumis typicus</i>  <i>Ohshimella ehrenbergi</i>  <i>Phyllophorus (Phyllophorella) parvipedes</i>  <i>Phyllophorus (Phyllothuria) cebuensis</i>  <i>Phyllophorus (Urodemella) brocki</i></p>	<p><b>Family Caudinidae</b></p> <p><i>Acaudina molpadioides</i></p> <p><b>Family Synaptidae</b></p> <p><i>Opheodesoma grisea</i>  <i>Synapta maculata</i>  <i>Synaptula recta</i>  <i>Synaptula striata</i></p> <p><b>Family Chirotidae</b></p> <p><i>Polycheira rufescens</i></p>

## Import and export trade

Sea cucumber collection in Sri Lanka "is rooted in antiquity, when Arab and Chinese merchants employed local inhabitants of western, northern and eastern maritime regions, to gather and cure the (animal) for them" (Adithiya 1969). The sea cucumber fishery in these western, northern and eastern waters flourished in later years to service increased demands from East Asian countries such as Singapore, Taiwan and Hong Kong. As shallow areas were fished out, the ready availability of scuba gear in the 1990s enabled exploitation of deeper habitats. Published Sri Lanka Customs Department statistics for the whole island show steep rises and declines in quantities exported (Fig. 4).

These fluctuations appear to correspond with the discovery of new sea cucumber beds and their subsequent depletion, as a result of unrestricted and intensive collection (Rajasuriya 1999).

Suitable shallow habitats for sea cucumbers are restricted to the southern parts of the island. Consequently, the collapse of the fishery in the south has led fishermen and divers from these areas to seek other, more distant areas where they can harvest sea cucumbers; fishing in these areas (which include the Chagos Archipelago, the Laccadive Islands and the Andaman Islands) is usually done illegally. This practice has also been reported in other parts of the island. Customs statistics for the whole country suggest that importation of sea cucumbers commenced in 1996, with small quantities from the Maldives (collected by Sri Lankans) for processing and re-export. Starting with 3 kg in 1996 the imported quantity gradually increased to 23,609 kg in 2000. The source of imports has not been established, but probably reflects clandestine operations. It should be noted that all available trade values are in dry weights after processing. Hence, the actual wet weight of the catch is at least 10 times as high as the dry weight, because 10 kg of fresh sea cucumbers yield less than 1 kg of dry product after processing (Conand 1990).



**Figure 4.** Beche-de-mer exports from Sri Lanka.

(Source: Sri Lanka customs external trade statistics and Anonymous 1999, 2000)

**Table 2.** Sea cucumber exports (kg) from Sri Lanka, 1996–2003.

	1996	1997	1998	1999	2000	2001	2002	2003
Singapore	73,266		88,959	30,905	16,479	19,739	25,519	47,223
Taiwan	27,457		68,330	45,112	39,626	48,649	50,593	44,866
Hong Kong	69,803		46,424	22,001	29,530	14,205	40,057	40,746
<b>Total</b>	<b>170,526</b>	<b>307,578</b>	<b>203,713</b>	<b>98,018</b>	<b>85,635</b>	<b>82,593</b>	<b>116,169</b>	<b>132,835</b>

Source: Sri Lanka customs external trade statistics and Anonymous 1999, 2000

## The main sea cucumber markets

Sea cucumbers are a delicacy in the Far East; the Chinese consume them in processed form while the Japanese and Koreans eat them fresh (James 2001). They are also used in the production of oils, lotions, cosmetics and tablets (Baine and Sze 1999). Exports from Sri Lanka are usually in the processed form: the dried product is called beche-de-mer or trepang (Conand 1998).

The major export destinations for sea cucumbers are Singapore, Taiwan and Hong Kong. Singapore has been the dominant buyer from Sri Lanka since 1999. Taiwan and Hong Kong are the second and third largest markets, respectively (Table 2). The mean weight of annual exports to these three countries since 1997 is 49,633 kg ( $\pm 76,498$  SD). The actual wet weight for the mean amount exported is approximately 4,966,330 kg.

## Present status of the fishery

At present, Sri Lankan fishermen from the south are exploiting sea cucumber beds in distant parts of the Indian Ocean. Although fishermen from Negombo on the west coast started the fishery in the southern part of the island, fishermen and divers from the southern fishing towns of Mirissa

and Dondra now dominate (Fig.1). Around 35 boats are engaged in the sea cucumber fishery along the southern coast. Fishermen use multi-day operating craft (MDOC) and global positioning systems (GPS) to navigate far from shore (Fig. 5). Boats range from 10.7–15.2 m (35–50 ft), but all use 45 hp inboard engines. These boats are usually four to six year old and modified to accommodate 10 to 12 crew members. The crew consists of a skipper, divers, a cook, a compressor operator, and an electricity generator operator. At times these boats operate in groups of three or four; by doing so they are able to maximise their profits by carrying fewer support personnel (such as cooks and compressor operators) and a larger number of divers.



**Figure 5.** Multi-day operating crafts used in the sea cucumber fishery. Some of these boats operate in distant areas such as the coastal waters of the Chagos Archipelago, Laccadive and Andaman islands.  
Image: Terney Pradeep Kumara

Fishing for sea cucumbers in the south is mostly done by opportunistic tuna fishermen. Whenever exploitable sea cucumber beds are located, the fishermen switch to that fishery; and when the beds are fished out, they revert to tuna fishing. The duration of each activity depends on the sea cucumber population and the number of boats and divers participating in the fishery.

The harvesting method depends on the depth of the fishing ground. Snorkelling gear is used in shallow water, and the animals are collected by hand and placed into a net bag. Sometimes, divers use small hand nets to collect sea cucumbers from gullies and crevices on rocky bottoms. In deeper water, scuba gear is used. The filled net bags are sent to the surface using lifting bags filled with air that are retrieved by the boat's crew. The catch is washed and stored on ice in the hold. Scuba divers complain that they now need to dive to increasing depths to

find holothurians, leading to diving-related accidents. Divers also complain that they are constantly forced to look for new fishing grounds, as described by Conand et al. (1997) for Madagascar.

Examination of the fresh sea cucumbers (using photo guides as a reference) as well as the cured product, indicates that there are three principal species collected by Sri Lankan divers from the south. These sea cucumbers have been given local names based on their appearance. *Holothuria fuscogilva* (white teatfish) is called *prima* locally. It occurs in deeper waters, around 60–90 feet deep, and is common on coral slabs near reef passages or at the foot of reef slopes (James 2001). This is a high value species, and good quality animals command a price of around Sri Lankan rupees (LKR) 1200 each<sup>1</sup>. *Holothuria nobilis* (black teatfish) is known locally as *polanga*. This species is found in shallow reef beds and on turtle grass beds to a depth of 15 feet (James 2001). The market value is LKR 400 each. *Holothuria spinifera* (brown sandfish) has the local name *gal atta* or *weli atta*. This species has a comparatively low market value ranging from LKR 40 to 50.

The majority of the catch goes through collectors or middlemen for processing, which is mainly a cottage industry involving families of collectors and middlemen. During processing, sea cucumbers are gutted, cleaned, cooked in boiling water for half an hour and dried (Figs. 6, 7 and 8). Processed products are then stored in plastic boxes and channelled to the export market.

### Future development of the industry

The sea cucumber fishery in the south is not expected to grow much beyond the current level; it is instead likely to decrease in the near future due to the scarcity of the resource. Demand will continue to rise, however. As a result, it is expected that new species will be introduced to the market. The depletion of wild sea cucumber stocks may have the effect of increasing the value of those that remain, so that low value species become medium value, and medium value species become high value. Although the principal markets for beche-de-mer are East Asian countries, there is a possibility that the market will expand towards Europe, America and Canada, where many East Asians live. Improved processing and cooking methods, and increased awareness of the antiviral, antitumoral, anticancerous, and pro-fertility properties of this product could also increase demand (James 2001).

1. LKR 100 ≈ USD 9.8 (July 2005)



**Figure 6.**  
Straining fresh sea cucumbers.  
Image: Dr Malik Fernando

**Figure 7.**  
Laying out *Holothuria scabra*  
in the sun to dry.



**Figure 8.**  
*Holothuria scabra* left to sun dry.  
Image: Dr Malik Fernando

### Management measures

There are no effective management measures in place to ensure sustainability of the sea cucumber fishery in Sri Lanka. Although most sea cucumber fishermen are aware of the negative impacts of the fishery and the rate of resource depletion, the high revenue that this fishery brings, the low amount of fishing effort required, and the scarcity of alternate sources of income of the same magnitude, drive

them towards harvesting all available sea cucumbers in the shortest possible time.

There is a lack of coordination at different levels of government, particularly at the provincial level where authorities do not have the required knowledge or understanding to manage the environment (Rajasuriya et al. 1995). Monitoring stocks and trade in sea cucumbers has been severely hampered in the past due to lack of expertise to identify

both live animals and the cured products at the point of export. This matter has been addressed, however, by the National Aquatic Resources Agency, which now has an ongoing programme to identify harvested species. The Fisheries Ministry has also set up a working party to investigate all aspects of sea cucumber extraction, with the intention of ensuring sustainability of the fishery. Considerable work needs to be done as almost nothing is documented about the diversity and distribution of sea cucumbers in Sri Lanka at the present time.

Sustainable use can be achieved through management of the resource. Replenishment of stocks by artificial culture and re-introduction is an option to consider. Financial constraints are the major obstacle to the implementation of an effective management system. Primary management costs are likely to be those associated with enforcement, provision of technical assistance, training, monitoring, and evaluation. These problems can be resolved with better understanding and dialogue between scientists and politicians.

### Conclusion

The sea cucumber fishery in southern Sri Lanka has collapsed due to overexploitation. As a result, Sri Lankan fishermen and divers exploit sea cucumber beds well away from Sri Lankan waters as an illegal fishery because of the high demand and the high income provided by the industry. Factors that limit the sustainability of the industry in Sri Lanka are inadequate information about current stocks, exploitation rates, fishing grounds, and absence of resource management regulations and awareness programmes. Research into improved processing techniques and possible culturing techniques are advisable.

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