

Present status of the sea cucumber fishery in Sri Lanka

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Abstract

This paper provides preliminary results on the present status of the sea cucumber fishery in Sri Lanka. At present, the fishery is restricted to the northwestern and eastern parts of the country. Sea cucumber fishing activities are greatly influenced by the monsoon. About 4,000–5,000 families are dependant on sea cucumber fishing activities. The major sea cucumber processing procedures include grading and cleaning, evisceration, boiling, store in salt or burying, boiling (second time) and drying. The entire annual production is currently exported to Singapore, Hong Kong and China. The fishery is open access, and there are no regulations or precautionary approaches used, except for issuing licenses for diving and transportation. After realizing the needs of implementing suitable management plans for the sustainable use of sea cucumber resources in Sri Lanka, the National Aquatic Resources Research Development Agency began a project under the technical assistance of the Food and Agriculture Organization of the United Nations.

Introduction

Sri Lanka is a small tropical island in the Indian Ocean southeast of the Indian sub-continent, situated at 5°55'–9°55' N and 72°42'–81°52' E. Sri Lanka's coastline is about 1,770 km long and contains several bays and shallow inlets. Since the declaration of a 200-mile exclusive economic zone in 1978, Sri Lanka has had sovereign rights over about 500,000 km² of the ocean. Fishing takes place all around the coast, but primarily within the continental shelf, which rarely extends more than 40 km and averages 25 km, with a total area of about 30,000 km².

As with many coastal fisheries, Sri Lanka's sea cucumber fishery is primarily artisanal and contributes to the livelihoods of fishermen in the coastal region. The sea cucumber industry in Sri Lanka is quite old, having been introduced by the Chinese. Hornell (1917) stated that processed sea cucumbers appear to be one of the commodities taken to China during the last thousand years when trade existed between southern India, Sri Lanka and China. However, there are no records on local consumption of sea cucumbers in Sri Lanka. Beche-de-mer is the major commodity produced in Sri Lanka, and the entire annual production is currently exported (Dissanayake and Wijeyaratne 2007).

Materials and methods

The reports presented here have been mainly gathered during 2008. Identification was done using the key prepared by Conand (1998) and available

literature (James 2001). The length and weight of some commercial sea cucumbers were measured. At landing sites, sea cucumbers were grouped according to species, and the total length of each individual was measured to the nearest 0.1 cm using a measuring board. At the time of measurement, these sea cucumbers were alive. Before taking length measurements, a slight pressure was applied to their bodies until they fully straightened out. The total length was then measured. The total weight of each individual was also measured using a field balance. The weight of each individual was taken before evisceration.

Results

Present status of the sea cucumber fishery and fishing season

Although there was a well-established sea cucumber fishery around Sri Lanka in the past (Adithiya 1969; Moiyadeen 1993), at present it is restricted to the northwestern (Puttlam to Mannar) and eastern (Trincomalee to Kalmunaei) parts of the country (Fig. 1). The rapid development of the sea cucumber fishery in Sri Lanka occurred during the last few years due to the high demand for beche-de-mer on the international market and the attractive prices offered. This has changed the previously unimportant and unregulated fishery into a commercially important one in which fishers invest considerable effort. Now, however, sea cucumber populations are showing some signs of depletion (Dissanayake and Wijerathne 2007).

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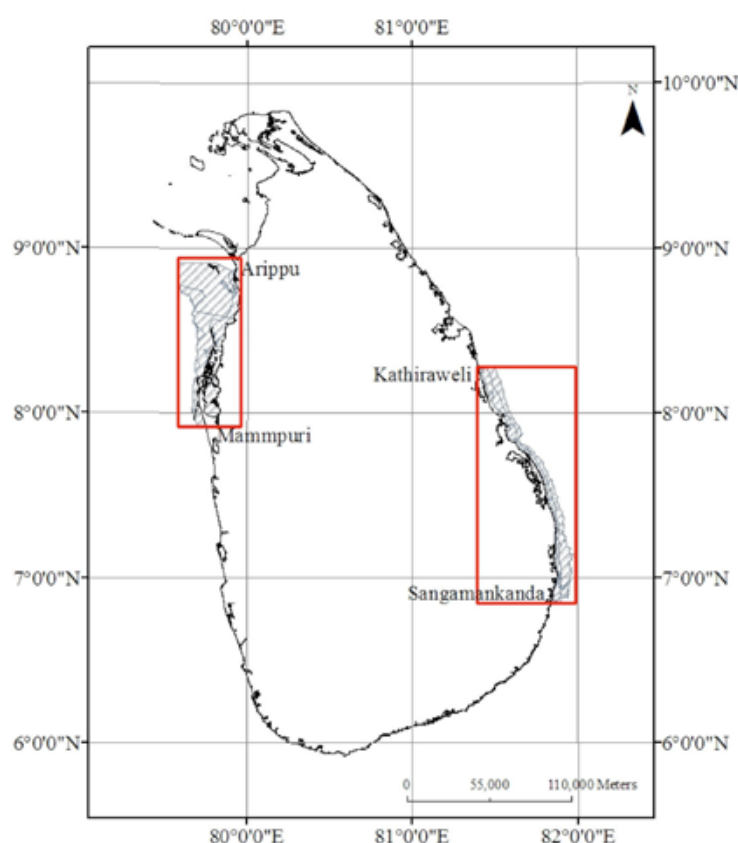


Figure 1. Sri Lanka and the major sea cucumber fishing areas on the northwestern and eastern coasts.

Sri Lanka's sea cucumber fishery is greatly influenced by monsoonal winds during the time of the southwest and northeast monsoons, which bring much wave action and currents in the sea, thereby increasing the turbidity of water and making it difficult to spot animals. Moreover, the inter-monsoonal rains also discharge water from river mouths to coastal areas making the water more turbid.

Off the northwestern coast, from Puttlam to Mannar, harvesting occurs intensively during the northeast monsoon (October to April), when the southwest monsoon (May to September) has subsided, the inter-monsoonal rains have ceased, and the water becomes clear. On the east coast, fishing occurs during the southwest monsoon (April to October). The industry, however, does not completely end during the "off season".

Work force and harvesting practices

No special gear or net is used to catch sea cucumbers, which are mainly harvested by hand, through scuba diving or skin diving. Scuba diving is carried out at all major landing sites. Fiberglass reinforced plastic boats with 15–25 hp outboard motors are the main craft used for this fishery (Fig. 2).

On a daytime fishing trip, two to three divers and a boat operator leave at 7.30–8.0 am and return at 14.30–15.30. On a night-time fishing trip, fishers leave at 18.00 and come back in the early morning hours (i.e. 02.00–03.00) the following day. The true fishing time varies from 2–3 hours for both day and night diving.

About 4,000–5,000 families are dependant on sea cucumber fishing. Around 500–600 families engage in the beche-de-mer fishery on the northwest coast, and they have permanent settlements on islands and coastal areas of Puttlam lagoon. The rest of the families are settled on the east coast while some migrate between the areas during the season to dive for fresh sea cucumbers. These families either join local divers on a contract basis or work for a dealer or processor.

Sea cucumber species in commercial catches

The sea cucumber species found in commercial catches are listed in Table 1, and are illustrated in Figure 3. Catches include three *Actinopyga* species, seven *Bohadschia*, nine *Holothuria*, two *Stichopus*, two *Thelenota* and a species identified as *Acaudina molpadioides*, and include *Holothuria scabra*, *H. nobilis* and *H. fuscogilva* as well as a species already described from the Seychelles, named "pentard".



Figure 2. Some of the boats used in the sea cucumber fishery.

Table 1. Sea cucumber species found in commercial catches around Sri Lanka.

No	Scientific name	English name	Local name
1	<i>Actinopyga echinites</i> *	Deep water redfish	Goma attaya
2	<i>Actinopyga miliaris</i> **	Blackfish	Kalu attaya
3	<i>Actinopyga mauritiana</i> **	Surf redfish	Gal attaya
4	<i>Bohadschia argus</i> **	Leopardfish	Koti attaya
5	<i>Bohadschia atra</i> **	Tigerfish	Nari nool attaya
6	<i>Bohadschia marmorata</i> **	Chalkyfish	Duburu Nool attaya
7	<i>Bohadschia similis</i> **	Brownspotted sandfish	Line nool attaya
8	<i>Bohadschia</i> unidentified sp. 1**		Sudu nool attaya
9	<i>Bohadschia</i> unidentified sp. 2**		Kiri nool attaya
10	<i>Bohadschia</i> unidentified sp. 3**		Kiri nool attaya
11	<i>Holothuria atra</i>	Lollyfish	Narri attaya
12	<i>Holothuria edulis</i>	Pinkfish	Rathu attaya
13	<i>Holothuria fuscogilva</i> *	White teatfish	Preema attaya
14	<i>Holothuria hilla</i>		
15	<i>Holothuria leucospilota</i>		
16	<i>Holothuria nobilis</i> *	Black teatfish	Polanga attaya
17	<i>Holothuria scabra</i> *	Sandfish	Jaffna attaya
18	<i>Holothuria spinifera</i>	Brown sandfish	Disco attaya
19	<i>Holothuria</i> sp. (pentard)*		Preema bathik attaya
20	<i>Stichopus chloronotus</i> **	Greenfish	Dabalaya
21	<i>Stichopus herrmanni</i> *	Curryfish	Sani attaya
22	<i>Thelenota ananas</i>	Prickly redfish	Annasi attaya
23	<i>Thelenota anax</i> *	Amberfish	Poona attaya
24	<i>Acaudina molpadioides</i> **		Uru attaya

* The scientific names of these species were confirmed by Dr Chantal Conand and Dr Sven Uthicke.

** The scientific names of these species need to be confirmed.

Table 2. Lengths and weights (mean values and ranges) of commercially exploited sea cucumbers.

No	Scientific name	Length (cm)	Mean length (cm)	Weight (g)	Mean weight (g)
1	<i>Actinopyga echinites</i>	13.5–30.7	22.6	374–1,325	669
2	<i>Actinopyga miliaris</i>	17.2–41.3	27.6	220–4,000	675
3	<i>Bohadschia marmorata</i>	19.6–56.1	33.8	150–3,125	1,148
4	<i>Bohadschia similis</i>	14.3–36.7	23.7	180–569	418
5	<i>Bohadschia</i> unidentified sp. 1	18.3–40.5	28.6	232–1,700	730
6	<i>Holothuria atra</i>	20.5–35.4	27.3	350–1,100	595
7	<i>Holothuria edulis</i>	15.9–28.5	18.3	275–450	285
8	<i>Holothuria fuscogilva</i>	25.2–46.2	35.8	1,000–3,200	1,892
9	<i>Holothuria nobilis</i>	23.8–41.7	34.8	985–2,500	1,719
10	<i>Holothuria scabra</i>	11.1–29.5	18.5	107–720	471
11	<i>Holothuria spinifera</i>	10.2–32.5	18.6	147–298	238
12	<i>Holothuria</i> sp.(pentard)	26.8–39.7	33.8	965–2,775	1,365
13	<i>Stichopus chloronotus</i>	25.2–38.7	31.3	285–950	565
14	<i>Stichopus herrmanni</i>	30.5–48.2	37.5	855–2,100	1,350
15	<i>Thelenota ananas</i>	30.3–50.9	39.8	1,050–2,900	1,725
16	<i>Thelenota anax</i>	19.3–38.5	27.4	125–495	378

The weight of each sea cucumber species is summarised in Table 2. The heaviest species include *H. fuscogilva*, *H. nobilis*, “pentard”, *B. marmorata*, *S. herrmanni* and *T. ananas*, which reach an average weight of more than 1.3 kg per individual. The mean weight for *H. scabra* is 471 g.

Sea cucumber processing

Divers use either net bags or plastic barrels to transport live sea cucumbers to the shore. Different sea cucumber species are processed in different ways. Although there are some modifications from species



Figure 3. Dominant sea cucumber species in commercial catches.

to species, the major processing procedures involve the following steps.

1. Grading and cleaning

After sea cucumbers are brought to the landing site, they are graded and cleaned in seawater to remove dried slime, sand and other extraneous particles (Fig. 4a). While cleaning, the animals are squeezed to remove the water absorbed during storage.

2. Evisceration

The internal organs (intestines, gonads and respiratory track) are then removed by making a small slit near the posterior end with a sharp knife (Fig. 4b).

3. Boiling (first time)

After evisceration, sea cucumbers are boiled in a clean 1,000-litre barrel. Sea cucumbers are stirred during boiling (Fig. 4c). Boiling time depends on

the species, and a wire mesh is used to remove the boiled product from the barrel.

4. Storage in salt or burying

The boiled product (Fig. 4d) is either stored in salt or buried in moist sand to activate bacterial decomposition. Storage time depends on the species.

5. Boiling (second time)

All species are boiled once again to destroy any bacteria, which could damage the outer layer.

6. Drying

Drying is one of the most important operations in the processing of sea cucumbers. Sun drying is considered to be better than smoking. Sun drying is quite common and boiled sea cucumbers are transferred to drying platforms or mats for sun drying (Fig. 4e, 4f)



4a. Grading sea cucumbers



4b. Removing internal organs



4c. Boiling sea cucumbers



4d. Boiled sea cucumbers



4e. Ready for sun drying



4f. Sun drying on gummy mats

Figure 4. Major steps in processing sea cucumbers.

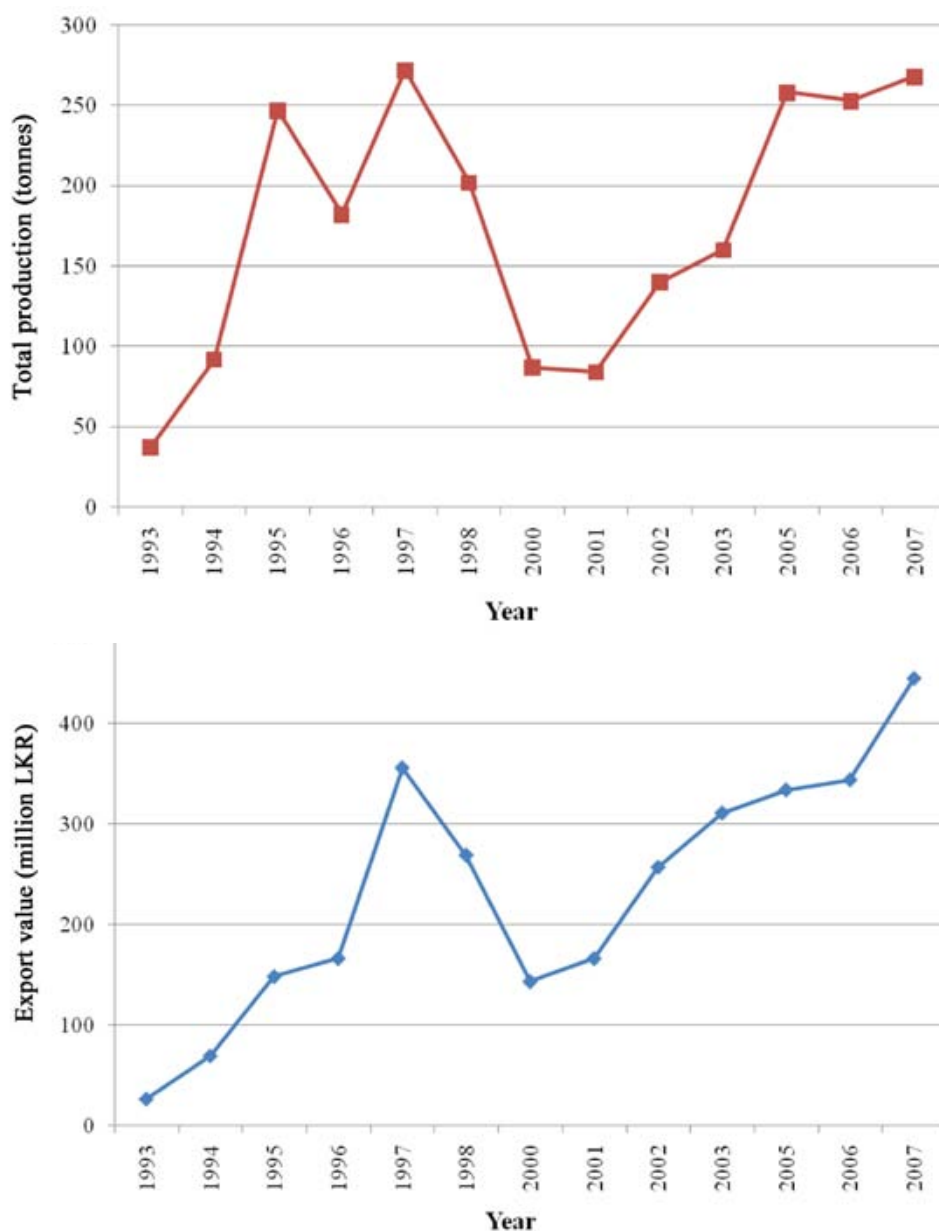


Figure 5. Annual sea cucumber production (in tonnes) and export value (million LKR).
LKR = Sri Lankan rupees. Source: Fisheries statistics 2007, Department of Fisheries

Sea cucumber trade and export

There are no records of local consumption of sea cucumbers within Sri Lanka. Beche-de-mer is the major marine commodity exported from Sri Lanka (in tonnage), and the entire annual production is currently exported to Singapore, Hong Kong and China. Because there are import and re-export mechanisms, as well as a shortage of continuous information regarding annual exports and a lack of statistical databases for catch and effort monitoring, it is difficult to give a precise estimate of sea

cucumber production. Using available data, Figure 5 summarises the annual sea cucumber production (in tonnes) and foreign exchange earnings. Annual sea cucumber production increased gradually from 1993 to 1997, when it reached a peak, then declined from 1997 to 2001, and increased again from 2001 to 2007. Export earnings ranged from 100 to 400 million Sri Lankan rupees (LKR) from 1993 to 2007,³ following the same trend as production. Because there is no proper data collection procedure in place for sea cucumbers, it is impossible to differentiate species in the total annual production.

3. In 2007, LKR 400 million were approximately equivalent to USD 3,640,000.00

Management practices

The fishery is open access, and no regulations or precautionary approach is used for management, except issuing licenses for diving and transportation, and forbidding the export of product if it exceeds 200 pieces per kg (to avoid the exploitation of undersized specimens). Hence, the fishery is almost totally unregulated. Recently there are some signs of population depletion, including lower volumes of high-value species and fishers having to travel farther, and concerns were raised regarding the sustainability of the fishery.

In Sri Lanka, research on holothurians or any other echinoderm species is at a very preliminary level. Intensive research needs to be undertaken the reproductive biology and ecology of sea cucumbers, as well as determining stocks, in order to prepare and implement a management plan for the sustainable use of this resource.

Recognizing the need to implement suitable management plans for the sustainable use of sea cucumber resources in Sri Lanka, the National Aquatic Resources Research Development Agency (NARA) has started a project on sea cucumbers under the technical assistance of the Food and Agriculture Organization of the United Nations (FAO). The project is financially supported by the Canadian International Development Agency (CIDA) and the International Fund for Agricultural Development (IFAD), and is expected to continue for three years (starting from 2008). The project aims to implement the following activities.

- Carry out both fishery dependant and fishery independent surveys in the major sea cucumber fishing areas to determine the stock status of sea cucumbers.
- Implement suitable management plans (based on survey results) to ensure the sustainable use of sea cucumber resources through the active participation of communities that are directly involved in fishing activities.
- Provide sufficient training to NARA research staff in order to enable them to carry out and supervise sea cucumber surveys in other parts of Sri Lanka.

The first phase of the independent survey was completed on the northwestern and eastern coasts of Sri Lanka, and the second phase began in late May 2009. The dependent survey activities were also implemented in 2008 and are ongoing. Survey activities were designed by NARA research staff under the guidance of Dr Brian Long, an international survey biologist recruited under the project.

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