

# **A preliminary investigation of the sea cucumber fauna and fishery of the Mergui Archipelago, Myanmar**

## **Abstract**

Thirty-two species of sea cucumber were collected from around Lampi Island and neighbouring islands of the Mergui Archipelago. Seventeen of those species were found in the catches of fishermen. Scientific names have been applied to those species wherever possible, although a few species were only seen as dried specimens, and others may be undescribed or poorly known species. Burmese names were obtained for the commercial species during interviews of fishermen. Most catches were dominated by *Stichopus* cf. *horrens*, known locally as ba gyi, of which there appeared to be two species. Other common commercial species included *Holothuria edulis*, *Holothuria atra*, *Holothuria leucospilota*, and *Bohadschia marmorata*. Most fishing was done at night by diving in shallow water, with or without compressed air. Some fishermen caught *Holothuria scabra*, probably from remote areas with seagrass meadows. Those meadows near villages had few *H. scabra*, suggesting that over-exploitation had occurred. The sea cucumber fishery in the Mergui Archipelago is completely unregulated. It is likely that it will follow the same pattern of over-exploitation and decline seen in other sea cucumber fisheries in the region. The existence of some apparently healthy stocks in the area of the national park provides an opportunity to try to conserve the fishery.

## **Introduction**

Visitors to the Mergui Archipelago will often see sea cucumbers drying in the sun around villages and temporary fishing camps in the area. It is evident that there exists a small-scale sea cucumber fishery that is an important source of income for local people. Currently, there is increased interest in sea cucumber fisheries around the Indo-Pacific region because of the increasing value of the industry, and because over-exploitation of the sea cucumber resource threaten its survival. The fishery in the Mergui Archipelago has not been documented. This study was undertaken to gather basic information about the sea cucumber fauna of the area, and to document the fishery based on that resource.

## Methods

Specimens of sea cucumbers were collected from around Lampi and neighbouring islands of the Mergui Archipelago during four trips of the Sea Nomad between January and April 2008. Sea cucumbers were found by searching intertidal areas by foot, or by snorkeling in shallow water during the day. The most productive means of finding specimens was by overturning rocks and coral rubble in shallow waters at low tide. As many species are most active at night, some searches were also attempted at night, but those proved unsuccessful. Specimens taken in the searches tended to be small non-commercial species. Many of the commercial species were most easily obtained from fishermen. Live specimens of those species were purchased from fishermen where necessary. Dried specimens were not retained, as they are difficult to identify to species.

Specimens needed to be relaxed before preservation. To relax them, they were either cooled on ice, or left in a dilution of magnesium sulphate. Those methods were entirely satisfactory, and it would probably have been better to use magnesium chloride, which is usually recommended, but not so easily obtained. Many specimens came from fishermen, and had suffered some damage and rough handling. So the condition of preserved specimens was not the best. Specimens were fixed in 5% formaldehyde, and were changed to 70% ethanol when they were brought to the Phuket Marine Biological Center (PMBC).

The specimens were identified using available references. A number of recent scientific publications concerning the taxonomy of holothurians in the Indo-Pacific region were found to be useful (Massin 1999, Massin et al. 1999, Massin et al. 2002, Clouse et al. 2005, Samyn et al. 2006, Massin 2007). To separate some of the species, it was helpful to make temporary slides of spicules from the dorsum; but no attempt was made to do a complete taxonomic study. The identifications may be refined later, when additional publications are found, especially for the Synaptidae. That family was not identified to species, but is entirely non-commercial.

Fishers were interviewed to obtain the Burmese names of the sea cucumber species, and to find out how they were caught and processed. A poster with photos of many of

the common species in Thai waters, produced by PMBC, was used to solicit the Burmese names. People took an interest in the photos, and it was a very successful way of engaging local people in conversations about sea cucumbers. Care needed to be taken when using the photos however, as not all the species that people were familiar with were on the poster, some of the species shown were not likely to be found in local waters, and some of photos poorly represented the species. So misidentifications were possible. As well, different groups of fishers sometimes applied different names to the same species. Salone (sea gypsy) people used names that were different from the Burmese names.

## Results

At least 32 species of sea cucumber were found, of which the one species, *Bohadschia marmorata*, had four distinct morphs (Table 1). Of those species, 17 were observed in the catches of fishermen. Only 6 species were found in both our own searches and fishermen's catches. The species found in searches tended to be non-commercial species, particularly the smaller species of *Holothuria* (e.g. *H. impatiens*, *H. verrucosa*, *H. pardalis*, *H. hilla*) or Synaptidae. The commercial species that was most often seen in our searches was *Holothuria leucospilota*, which is the species of lowest commercial value. Five commercial species were only seen as dried specimens (indicated in Table 1). One of those was quite distinct, even when dried, and was readily identified from photographs by fisherman as *Stichopus chloronotus*. The remaining four dried species have not been assigned scientific names, but have unique Burmese names.

The dominant sea cucumbers in most catches were *Stichopus* cf. *horrens*, known locally as ba gyi (Fig. 1 and Fig. 2). Some catches were dominated by large numbers of *Holothuria edulis*. Other species that were regularly taken were *Holothuria atra*, *Holothuria leucospilota* (Fig. 3), *Bohadschia marmorata*, and other *Stichopus* species (e.g. Fig. 4). *Stichopus* cf. *horrens* is the most valuable of those, getting approximately 1,550 Baht/dry kg. The least valuable species, *H. atra* and *H. leucospilota*, were reported to be worth only 300 Baht/dry kg.

The catches of ba gyi appeared to include at least two distinct species, which have been designated *Stichopus cf. horrens* sp. 1 and 2. The commonest form, sp. 1 (Fig. 1), was very similar in appearance to typical *S. horrens*, but an examination of the spicules showed some differences between it and the description of the species in Massin et al. (2002). As well, the distribution of *S. horrens* given in Massin et al. (2002) does not include the Indian Ocean. Like typical *S. horrens*, the species was reported to be from rocky habitats where it hid during the day. The second form was less common, but was often present among large catches of ba gyi. It was distinctly paler in colouration (Fig. 2), and differed in spicule structure. It was associated with sandy habitats. Many fishermen recognized the two forms, but do not attach much significance to them, as they are treated the same and fetched the same price.



**Fig. 1** *Stichopus cf. horrens* sp. 1 attached to the underside of a turned over rock where it was found during the day on a reef flat on Lampi Island. (Photo courtesy of Tint Tun)



**Fig. 2** A specimen of *Stichopus cf. horrens* sp. 2 obtained from a fisherman. (Photo courtesy of Tint Tun)



**Fig. 3** *Holothuria leucospilota* is a common low value species (Photo courtesy of Tint Tun)



**Fig. 4** *Stichopus vastus* is not common, but it occurs regularly in the fishermen's catches. (Photo courtesy of Eddy Gallina)

The most valuable sea cucumber species caught in the area was *Holothuria scabra* (Fig. 5), for which fishermen reported that they received 3,000 Baht/dry kg. It was the main catch of a few fishermen who probably took them in shallow water in or around seagrass meadows. *H. scabra* was not noticed in the largest seagrass meadow in the area at Nyuang Wee (Bada) Island, and only one was noted in the large meadow at Bo Cho Island. Both those islands have villages. However, many mature *H. scabra* were seen in the meadows on the east coast of Lampi Island, which are remote from villages.

Most sea cucumbers are caught by divers working from boats at night, when many of the species are most active. Some of the divers own their boats and work in family groups. Their basic equipment consists of masks, fins, snorkels, and flashlights. The

fins are usually made from a piece of plastic attached to a shoe, and the snorkels are bent pieces of plastic pipe. The flashlights are bought locally and modified to take 6 D-cell batteries. Other boats have compressors and hire young men as hookah divers. They report that they dive to about 20 feet. Although they can dive much deeper, it is usually not necessary to dive to greater depths to catch sea cucumbers in the Mergui area. They do not dive during the full moon, as the sea cucumbers are also not active at that time. The divers also preferred to avoid the strong currents at spring tides.



**Fig. 5** A juvenile *Holothuria scabra* among seagrass and algae in a meadow on Lampi Island. It is the most highly valued species. (Photo courtesy of Tint Tun)

The fishermen process the sea cucumbers during the day after their capture. Processing takes place in temporary camps set up around the archipelago, or in the villages. The procedure is similar to that followed in other sea cucumber fisheries. The viscera are squeezed out the animals, often after they are slit open at one end. They are then boiled in seawater for about two hours (Fig. 6), and then smoked over a fire for another two. They are then sun dried for about two days (Fig. 7), or until they are deemed suitably dry. However, the procedure differs somewhat for *Holothuria scabra*, which requires more labour. It is first boiled for a short period, then removed from the water and placed in a large pot where it is vigorously stirred for several minutes with a root (XXX name or type of plant) or the leaves of papaya. If the plant material is not available, the boiled sea cucumbers can be buried in sand for a day. Each animal is then scrapped on a rock in the sea to remove spicules. After scrapping, they are boiled for a second time for about two hours. They are then

skewered on a bamboo stick to keep them straight while they are smoked, and then finally sun dried. The fishermen transport the dried product themselves for sale at the port of Kawthaung, approximately 75 km (XXX is this number correct?) south of the main village of Makyone Galet, and on the border with Thailand. Only occasional is sea cucumber consumed locally.



**Fig. 6 Boiling sea cucumbers, including *Holothuria edulis* (pink), *Holothuria atra* (black), and *Stichopus cf. horrens* sp. 2 (mottled brown). (photo courtesy of Didier Roche)**



**Fig. 7 Sea cucumbers drying in Nyuang Wee village. (Photo courtesy of Tint Tun)**

The native Salone people have probably been collecting sea cucumber from around the islands for a long time. However, most of the people currently involved in the industry are recent arrivals, or people who come to the islands seasonally. They are people of Burmese, or other ethnic origin, from adjacent areas on the mainland, or from the Ayeyarwady delta. Most of the fishing takes place in the dry season, from November to April, but there is some activity throughout the year.

## **Discussion**

The Mergui Archipelago has a diverse sea cucumber fauna that supports a small-scale industry that is an important source of income for local fisherfolk. However, the experience throughout the Indo-Pacific region suggests that the fishery is a typical boom-and-bust enterprise. Sea cucumbers are easily over-exploited and stocks of the most valued species often collapse. In Myanmar, the industry is totally unregulated, and it may be inevitable that the same pattern will be followed there. Access to the fishery is unrestricted, and current demand and prices for dried sea cucumber (known as beche-de-mer or trepang) is high.

Although sea cucumbers have been caught for centuries, the industry underwent rapid expansion after the opening of markets in mainland China in the 1980s. That resulted in a boom in the fishery in the 1990s, which saw great increases in catches in the Southeast Asia region, including Thailand (Bussarawit and Thongtham 1999), Vietnam (del Mar Otero-Villanueva and Vu Ngoc Ut 2007) and Philippines (Gamboa et al. 2004). It also saw the expansion of the industry to areas where there had never been a fishery, such as the Galapagos Islands (Toral-Granda and Martinez 2004) and the Egyptian Red Sea (Lawrence et al. 2004). However, the expansion in each of those areas was followed by a rapid decline in stocks of the most valued species, sometimes after only a few years of exploitation. And where the fishery has been closed to conserve stocks, there has been very poor recovery (Uthicke 2004) (Ahmed and Lawrence 2007)

The expansion of the sea cucumber fishery has followed a characteristic pattern. The most valued species are first exploited, often to the point of local extinction, followed

by an increase in the catch of low value species, and smaller individuals. Shallow water stocks are exploited first, followed by an extension into deeper waters, and an increased use of diving equipment. The fishery also expands geographically into more remote areas as stocks are depleted in the most accessible areas. High demand and increasing prices encourage more people into the fishery even as stocks decline, and catch per unit effort decreases.

The sea cucumber fishery in the Mergui Archipelago is probably part of the typical pattern of exploitation seen in the region as a whole. Unfortunately, we know nothing of its specific history in the Mergui. Today in Thailand, sea cucumbers are difficult to find, and there are few fishermen catching them, although the product is fetching higher than ever prices. Bussarawit and Thongtham (1999) wrote that dried *H. scabra* was being sold in the market in Krabi for 270 Baht/kg, i.e less than a tenth the price currently being received by fishermen in the Mergui.

There are indications that the sea cucumber resource is also being over-exploited in the Mergui Archipelago, although fishermen have not complained of reduced catches. *Holothuria scabra* is absent, or occurs in very low numbers, in the most accessible seagrass meadows near villages. In contrast, healthy numbers of *H. scabra* and *Bohadschia marmorata* were seen around the isolated meadows on the east side of Lampi Island. The continued existence of the fishery in the Mergui is probably a result of the remoteness of the islands, the expense of operating there, and the small local population.

The collapse of sea cucumber stocks in various parts of the world has led to calls for greater regulation of the industry, and for the inclusion the sea cucumbers under CITES, the convention which governs trade in endangered species. Consequently, there has also been an interest in compiling international statistics on the harvesting of sea cucumbers and the trade in their products. Tables of such statistics up to 2001 do not show any sea cucumber harvesting or export originating from Myanmar (Buckner et al. 2003, Ferdouse 2004, Vannuccini 2004). The only exception was 1 ton of dried sea cucumber recorded entering Singapore from Myanmar in each of 1997 and 1998 (Ferdouse 2004). That was a tiny amount considering the totals of 820 and 538 tons recorded entering Singapore from all sources in that year. So the trade in sea

cucumbers from Myanmar has been almost invisible. That may be because the product is entering unrecorded into Thailand. It may then be re-exported to third countries. Some may be consumed in Thailand, where it is sold in markets and restaurants; but is not a common item.

The sea cucumber fishery in the Mergui Archipelago is multi-specific, and includes many species familiar to fisheries elsewhere in the tropical Indo-Pacific. It differs from them in that the largest part of the catch and greatest income comes from *Stichopus* spp. Some of the species are unfamiliar however, and may represent new, or at least poorer known species, especially amongst *Stichopus* spp. Therefore, there is a need for taxonomic studies. There is also a need for better documentation of the fishery in the Mergui area, and in Myanmar as a whole. We are unaware of any contemporary studies on Myanmar's sea cucumber fauna or its fishery. Knowledge about its fishery will be important if Myanmar is to participate in the current discussions taking place internationally on the regulation of trade in sea cucumber products.

The sea cucumber fishery in the Mergui Archipelago may well follow the path of similar fisheries in other areas that have led to the local extinction of the most valuable sea cucumber stocks. However, there appears to be some healthy stocks, and they lie within the bounds of the area designated as Lampi National Park. Therefore, there may be unique opportunities to try to conserve those stocks. Marine protected areas are considered to be a potential tool for the conservation of sea cucumbers (Uthicke 2004). Unfortunately, at the present time there is little knowledge or understanding of the fishery in the Mergui Archipelago, and no obvious attempt to regulate or conserve it.

Table 1 List of sea cucumber species from the vicinity of Lampi Island. + indicates species collected commercially.

Scientific name	Burmese	Transliteration	English	
<b>Holothuriidae</b>				
<i>Actinopyga lecanora</i>	ကိတ်၊ နို့မျှော့	'cake' or No hmyaw	Stonefish	+
<i>Actinopyga</i> sp. **	ကာကီ	Kaki		+
<i>Bohadschia atra</i>				+
<i>Bohadschia marmorata</i>	ချီးပန်း	Chee pan phyu	Chalkfish	+
<i>morph tenuissima</i>	ချီးပန်း	Chee pan phyu		+
<i>morph vitiensis</i>	ချီးပန်းဝါ	Chee pan war	Brown sandfish	+
<i>morph cousteaui</i>	ချီးပန်းမဲ	Chee pan mae		+
<i>Holothuria atra</i>	သွေးမျှော့	Thway hmyaw	Lollyfish	+
<i>Holothuria edulis</i>	ပါတာနီ	Pa ta ni	Pinkfish	+
<i>Holothuria fuscocinerea</i>	ခွေးသေးပန်း	Khwe the pa		
<i>Holothuria hilla</i>	ခွေးသေးပန်း	Khwe the pa		
<i>Holothuria impatiens</i>	ခွေးသေးပန်း	Khwe the pa		
<i>Holothuria leucospilota</i>	ကုလားလီး	Ka la lee		+
<i>Holothuria moebii</i>				
<i>Holothuria scabra</i>	အိတ်စပို၊ မျှော့ဖြူ	'export' or Hmyaw phyu	Sandfish	+
<i>Holothuria verrucosa</i>	ခွေးသေးပန်း	Khwe the pa		
<i>Holothuria pardalis</i>	ခွေးသေးပန်း	Khwe the pa		
<i>Holothuria</i> sp. **	မျှော့နဂါး	Hmyaw naga		+
<i>Holothuria</i> sp. **	မျှော့မိမျှော့ဘ	Hmyaw mi hmyaw pa		+
<i>Holothuria</i> sp. **	ထုံးမျှော့	Htone hmyaw		+
<i>Holothuria</i> sp.	ချီးပန်းစုတ်ဖွား	Chee pan so phwa		
<i>Pearsonothuria graeffei</i>	ခူမျှော့	Ku hmyaw	Flowerfish	
<b>Stichopodidae</b>				
<i>Stichopus chloronotus</i> **	ကြက်ဟင်းခါးသီး	Kyet hinn ka	Greenfish	+

Stichopus hermanni	ပိန္နဲ	Pane nae	Curryfish	+
Stichopus cf. horrens sp. 1	ကျောက်ဗာဂျီ	Kyaw ba gyi	Dragonfish	+
Stichopus cf. horrens sp. 2	သဲဗာဂျီ	Tae ba gyi		+
Stichopus cf. naso	ခမက်	Ku met		+
Stichopus vastus	စပါးကြီးကွက်	Sa ba gyi kwet		+

Synaptidae

Opheodesma sp. 1

Opheodesma sp. 2

Opheodesma sp. 3

Protankyra sp.

Synaptula sp. 1

Synaptula sp. 2

Phyllophoridae

Ohshimella ehrenbergii

\*\* seen only as dried specimens

Notes on table and identification:

XXXX designates places where I will ask Tint Tun to provide the name in Burmese script, or the transliteration, which ever is missing. He will also need to check over careful what I have already put in.

One distinctive *Holothuria* sp., called chee pan so phwa in Burmese, has still not been identified, even though we have a nice specimen. There are problems with the identification of some *Stichopus* species. I am convinced there are two separate species that are called ba gyi. I have designated them *Stichopus* cf. *horrens* sp1 & 2. There is also a problem with a small number of specimens that I have called *Stichopus* cf. *naso*. It is possible that there are new species among these, or at least things that are poorly known.

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