



Field observations of shallow-water sea cucumbers in Gulf of Thailand and Andaman Sea

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Article published on October 12, 2014

Key words: Sea cucumber, species diversity, distribution, Gulf of Thailand, Andaman Sea.

Abstract

This study aims to investigate the species presence and distribution of sea cucumbers in the main habitats of coral reefs, sea grass beds, rocky shores and sandy shores in the Gulf of Thailand and Andaman Sea during May 2009 to March 2010. Results showed that a total of 21 sea cucumber species from 5 families were found. The average density of each sea cucumber in all study sites was lower than 1 individual per m⁻² and the most abundant species in all study areas was *Holothuria leucopilota*. The Upper Gulf of Thailand contained 14 sea cucumber belonging to 4 families, followed by the lower Gulf of Thailand (13 species of 4 family) and Andaman sea (12 species of 5 family). All sea cucumbers found can be categorized into abundant species (3), common species (8) and rare species (12).

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Introduction

Sea cucumbers are benthic invertebrates generally found in coastal water with diverse species. They play the roles in ecosystem as decomposers and nutrients releasers in food chain. Sea cucumber habitats are found in coral reef and sea grass ecosystems, from intertidal zone to the deep sea of about 20 m. In general, sea cucumber occur in clear water, fine sand bottom or mud mixed with sand with water plants such as seagrasses (*Enhalus*) and seaweeds (*Sargasum* and *Laminaria*) that may protect directly sea cucumbers from sun shine and strong sea current. For human being, sea cucumbers have their history as the traditional medical components and food. Thus, they are economically important in many countries in Asia, especially in the Indian Ocean and South Pacific regions, for high-protein food, medical products, and supplementary food, resulted in a trend towards overfishing on the commercial species (SEAFDEC 2008). A multitude of sea cucumbers species are being exploited worldwide, with new species being placed on the market whilst valuable species become scarcer and more difficult to find. 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 (FAO 2008). Overfishing is the main problem contributing to the depletion of sea cucumber resources. Various Asian countries are generally lacking in management measures to conserve and sustain their sea cucumber fisheries. Sea cucumbers clearly represent an economically important fisheries resource and alternative livelihoods for local communities in the Asian regions (Choo 2008). The present trend towards overfishing of sea cucumbers in diverse geographical areas to supply international market demand has become an urgent concern in the national community. Improvement of existing information and gathering mechanism related to data collection, taxonomic identification and assessment of current status and trend of sea cucumbers at the regional level is needed. This study aims to investigate the species presence and distribution of sea cucumbers in the main habitats of coral reefs, sea

grass beds, rocky shores and sandy shores in the upper Gulf of Thailand, the lower Gulf of Thailand and the Andaman Sea.

Materials and methods

This study aims to investigate the species presence and distribution of shallow-water sea cucumbers in various habitats of coral reefs and sea grass beds during May 2009 to March 2010. A total of ten study sites were located in the Upper Gulf of Thailand (Sichang Island, Kham Island and Phi Island, Choburi province), the Lower Gulf of Thailand (Tao Island, Phangan Island and Samui Island, Surattani province) and Andaman Sea (Prathong Island, Phangnga province and Muk Island, Trang province) were selected as the study sites. At each study site, sampling was carried out at two locations on the reef: the outer reef and the inner reef. At each sampling site, a minimum of two transects of 100 m in length and 4 m width were made at random, parallel to the shore, resulting in a sampled area of 800 m for each sampling site. Two divers observed the sea cucumber along line transect and recorded number of each sea cucumber found in line transect. The living sea cucumbers were photographed and identified to the species level on the basis of their gross morphological characteristics, habitat and posture. The unidentified sea cucumbers were collected for identification in laboratory. Sea cucumbers were placed in 10 l of seawater containing 5-10 g of magnesium sulfate ($MgSO_4$), and were left for 5-10 min until completely relaxing took place. The identification of sea cucumber specimens were based on various references (SPC 1994; Conand 1998; Desurmont 2003; Desurmont and Purcell 2008; Kerr 2006, Kamarudin 2009; Putchakarn and Sonchaeng 2004). The frequency of observation (number of stations where the species has been observed / total number of stations) was estimated for each sea cucumber.

Results

A low level of shallow-water sea cucumber diversity (21 sea cucumber species of 5 family) were found to date at various coral reef, sea grass bed, sandy shore

and rocky shore habitats in the Gulf of Thailand and Andaman sea, Thailand (Table 1). The average density of each sea cucumber in all study sites was lower than one individual per m⁻² and the most abundant species was *Holothuria leucopilota* in the Gulf of Thailand. The present of sea cucumbers expressed as frequency of observation can be categorized into three abundant species (*Holothuria leucospilota*, *Synapta* sp. and *Synaptula* sp.), eight common species (*Holothuria atra*, *H. scabra*, *bohadschia vitiensis*, *B. marmorata*, *Stichopus horrens*, and *Cercodemas anceps*) and 12 rare species (*Holothuria edulis*, *H. impatiens*, *H. arenicola*, *Actinopyga* sp., *Holothuria* sp. *Stichopus chloronotus*, *stichopus* sp., *Phyllophorus* sp1., *phyllophorus* sp2., and 3 unidentified sea cucumbers.

Based on the study areas, the upper Gulf of Thailand contained 14 sea cucumber of 4 family, followed by the lower Gulf of Thailand (13 species of 4 family) and Andaman sea (12 species of 5 family). Based on study sites, at the upper Gulf of Thailand, the study sites of Sichang Island contained the highest species number (12), followed by Phi Island (11) and Kham Yai Island (5), and the lower Gulf of Thailand, Phang Nga Island had the highest species number (12), followed by Tao Island (8) and Samui Island (4). For Andaman Sea, Prathong Island and Muk Island had the species number of 8 and 10, respectively. This study also showed that most of the economic sea cucumbers were decline in both species number and abundance.

Table 1. List of shallow water sea cucumbers in the Gulf of Thailand and Andaman Sea, Thailand.

Family	Scientific name	Upper Gulf of Thailand			Lower Gulf of Thailand			Andaman Sea		Frequency of Occurrence (%)	Status
		Sichang Island	Phi Island	Kham Island	Phangan Island	Tao Island	Samui Island	Prathong Island	Muk Island		
Holothuriidae	<i>Holothuria leucospilota</i>	+	+	+	+	+	+	+	+	100	A
	<i>Holothuria atra</i>	-	+	-	+	+	-	-	+	60	C
	<i>Holothuria scabra</i>	+	+	-	+	-	-	+	+	50	C
	<i>Holothuria edulis</i>	-	-	-	+	+	-	-	-	20	R
	<i>Holothuria impatiens</i>	+	-	-	-	-	-	+	-	20	R
	<i>Bohadschia vitiensis</i>	+	+	+	+	-	-	+	+	60	C
	<i>Bohadschia marmorata</i>	-	-	+	+	-	-	+	+	40	C
	<i>Holothuria arenicola</i>	+	+	-	-	-	-	-	-	20	R
	<i>Actinopyga</i> sp.	+	-	-	-	-	-	-	-	10	R
	<i>Holothuria</i> sp.1	-	-	-	+	-	-	-	-	10	R
Stichopodidae	<i>Stichopus chloronotus</i>	-	-	-	-	+	-	-	-	10	R
	<i>Stichopus horrens</i>	+	+	-	+	+	-	+	-	50	C
	<i>Stichopus</i> sp.	+	+	-	-	-	-	-	-	20	R
Phyllophoridae	<i>Phyllophorus</i> sp.1	-	-	-	-	-	-	+	+	50	R
	<i>Phyllophorus</i> sp.2	-	-	-	-	-	-	+	+	50	R
Synaptidae	<i>Synapta</i> sp.	+	+	+	+	+	+	-	+	90	A
	<i>Synaptula</i> sp.	+	+	+	+	+	+	-	+	90	A
Cucumariidae	<i>Cercodemas anceps</i>	+	+	-	+	+	-	+	+	60	C
Others	Unidentified species 1	+	+	-	-	-	-	-	-	20	R
	Unidentified species 2	-	-	-	+	-	-	-	-	10	R
	Unidentified species 3	-	-	-	-	-	-	+	-	10	R
Total		12	11	5	12	8	4	8	10		

Remarks : A = Abundant (>70% occurrence) C = Common (40-70% occurrence) R = Rare (<40% occurrence) - = Not found

Discussion

The present study showed a low species diversity of 5 family and 21 species of shallow-water sea cucumbers

found in various habitats of coral reefs and sea grass beds located in the upper Gulf of Thailand, the lower Gulf of Thailand and Andaman Sea. In addition, the

average density of each sea cucumber in all study sites was lower than 1 individual per m^{-2} and the most abundant species was *Holothuria leucopilota* in the Gulf of Thailand. The Upper Gulf of Thailand contained 14 sea cucumber of 4 family, followed by the Lower Gulf of Thailand (13 species of 4 family) and Andaman sea (12 species of 5 family). This study indicated that the present status of sea cucumbers in Thai waters declined sharply which may due to the over fisheries of sea cucumber particularly the economic sea cucumbers in all fishing grounds in the Gulf of Thailand and Andaman Sea. However, it might be possible that this sampling technique was not the optimum one for this type of animal. The use of larger number of transects or quadrats along radials perpendicular to the shore might make it possible to gain a better picture of the abundance of these animals on the various habitats. However, this study was correspondence to the study of Kunkomnoed *et al.* (2005) that sea cucumbers were found at a total of 1 family, 1 genera and 8 species in sandy shores, 1 family, 2 genera and 4 species in rocky shore and 2 family, 2 genera and 2 species in sea grass beds at Lanta Yai Island, Krabi province, Thailand. The average abundance of sea cucumber was 1 individual / m^2 . However, Putchakarn and Sonchaeng (2004) reported a total of 8 families with 54 species, and 7 family with 65 species of sea cucumbers in the Gulf of Thailand and in the Andaman Sea. Munprasit (2008) reviewed that a high species diversity of sea cucumbers recorded at 102 species in 8 families mainly Holothuriidae in Thai waters but he did not mention the number of study sites and year of investigations. He also mentioned that the most commercially important species is *H. scabra* and *H. atra*. In contrast, Kamarudin *et al.* (2009) found that the dominant species of sea cucumbers in Malaysia was also *H. leucospilota*. As many as 37 species were found in Sabah and 21 species in Peninsular Malaysia. These finding may due to the extensive distribution of coral reefs and low level of marine pollution. In contrast, low level of species diversity was observed in Peninsular Malaysia especially in Langkawi Island may possibly due to anthropogenic threats. Pouget (2005) reported a total

of nine species of holothurians sea cucumbers were found during the sampling carried out on the fringing reef flats of Grande Terre, Mayotte, Indian Ocean. Kerr *et al.* (2006) also reported a total of 49 species of the shallow-water sea cucumber in the central Philippines. Hung (2008) also reported that statistics obtained from continuing studies in 2004 indicated that there were about species of sea cucumber in Vietnamese waters. Research on species diversity and population structures and regular monitoring would make it possible to introduce sustainable management measures for this animal resource. Choo (2008) reported that overfishing is the main problem contributing to the depletion of sea cucumber resources in Asia covers the east and southeast Asian regions including Indonesia, Philippines, Thailand, Malaysia, Myanmar, Vietnam, Singapore, Korea, China, Hong Kong and Taiwan, except Japan are generally lacking in management measures to conserve and sustain their sea cucumber fisheries. The two most important producing countries, Indonesia and Philippines do not have management plans specific to sea cucumber conservation. Other threats to sustaining the sea cucumber resources included habitat loss, lack of accurate statistics, global warming and new controlled uses (such as for pharmaceuticals and nutraceuticals) for sea cucumber resources. Conand (2008) reported there were several projects underway investigating commercial sea cucumbers in Africa region with the main goals to: (i) increase the understanding of the status of sea cucumbers and their management including their potential for aquaculture and farming; (ii) 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; (iii) improve the knowledge of the management systems and the gaps in knowledge that will form the basis for any management plans; (iv) increase the knowledge of the impact of fishery on the socio-economic status of coastal communities. It is intended to be multidisciplinary, with a close collaboration between biologists, ecologists, and social scientists. Training in sea cucumber taxonomy, biology

and fisheries will provide the capacity for monitoring and evaluating the effectiveness of the management systems currently in place. There is also an attempt to conserve and manage sea cucumber in commercial species by various national organizations. There are a number of common problem in data and information collection including statistical records do not reflect the actual sea cucumber fisheries; existing research capacity limit the appropriate data collection including biological data, resource status, its habitat, trade status and fisheries; existing taxonomical knowledge limit the appropriate identification of sea cucumber species; and lack of trained staff. These identified problem areas should be strengthened so as to provide good results in the near future (SEAFDEC 2008).

Acknowledgement

This research was funded by Biodiversity Research and Training Program (BRT) in the fiscal year of 2009. We wish to thank Aquatic Resources Research Institute, Chulalongkorn University and Faculty of Science and Industrial Technology, Prince of Songkla University, Surattani campus for their encouragements and facilitate during the field study.

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