

Introducing a Holothurian sea cucumber species *Stichopus hermanni* from Kish island in the Persian Gulf in IRAN

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Abstract. Holothuroids, or sea cucumbers are an abundant divers group of Echinoderms with over 1400 species. They valued so much and play an important role in the ecosystem, they prevent anoxic condition in the sediment by removing organic matter. In this study, we report a sea cucumber from Kish island. Examination of gross morphology and microscopic ossicles showed that this species is *Stichopus hermanni*. This is brownish yellow often mottled and with darker papillae giving a spotted appearance. This species inhabits shallow water common in reef habitats. It is widely distributed across the tropical Indo-Pacific region. *Stichopus Hermannii*, is a holothurians of order *Aspidochirotes* belonging to the family *Stichopodidae*. It is deposit-feeder and is mainly found on sandy bottom of fringing reefs surrounding the Kish island.

Key Words: Holothurians – Echinoderms – Stichopodidae – Aspidoshirote – Kish island – Persian Gulf

1 Introduction

Holothuroids, or sea cucumbers are an abundant divers group of marine invetebrates. The more than 1400 described and extant species constituting 160 genera (Smiley, 1994) occur in benthic environments. The past quarter century has witnessed a considerable increase in knowledge of the biodiversity of the shallow water holothuroids (Thandar, 1977, 1984, 1985, 1986, 1987a, 1989a,b,c, 1990, 1991, 1994, 1996, 2001; Thandar&Rowe, 1989). The sea cucumbers valued so much, in China the processed carcasses called hai-som are believed to have curative powers. The Japanese eat them raw, nibble on their pickled intestines over drinks and eat their dried gonads as a special treat. Malaysians bottle sea cucumbers in a pure form to cure of the extract on toothaches and cuts (Zahang, E. 1988). The sea cucumbers do the job an earthworm in soil, recycling waste and aerating the sea floor (A.Keer, 2001). In conserving biodiversity, the first stage is to know what to conserve. For that, we need to correctly identify the species. Assessing holothurian biodiversity of Kish island is not a simple endeavour because no study have been devoted to this region.

2 Material and Methods

Sampling site:

Kish island lies between 53 °, 53 ' to 54 °, 4 ' E and 26 °, 29 ' and 26 °, 35 ' N. This island has an area of 90 square kilometers and is 18 km away from the southern mainland of the Iran. It is a coral island with fringing reefs. This island is one of the most important recreational sea side along the coast and also as a free Trade Zone, imposing lots of pressure on the marine environment resulting in the destruction and disappearance of corals and coral communities in the last 10 years. Today, most of the remaining reefs as a few scattered coral reefs are located on the eastern coast of the island where the main recreational activities are taking place. This also the place where most of the sampling was done, for 16 months by local divers using the scuba diving apparatus. Altogether, 220 specimens were collected at all depths around the island but mainly from the east coast where reefs are denser and the main concentration and population of sea cucumber occur (Figure1).

3 Identification

The identification of all specimens was done on two bases: morphological and internal structures. The rough identification was made according to the appearance and morphological features just after the collection was made. This is rather a very helpful method for the rough identification in the field and underwater observations, however due to the color and shape variations within each species it is not very accurate and therefore should be combined with a precise anatomical method. This is normally done and characters were scored.

Gross Morphology

1. **Overall shape:** It is ventrally flattened and dorsally convex. (Figure 2)
2. **Maximum body length:** Average length is 35 cm
3. **Body wall:** Spiculation, musculature and thickness of the connective tissue layer largely determine the mechanical properties of holothuroid body wall (Kerr, 1993).
4. **Position of mouth:** When relaxed, the species we have examined display subterminal mouths.
5. **Position of anus:** The anus is ventral.
6. **Pharyngeal introvert:** It is a retractile portion of the anterior body wall that allows the complete retraction of the tentacles. This character is not found in this species.
7. **Ossicles:** It has ossicles dispersed in the body wall.
8. **Tentacle shape:** Tentacles consist of a terminal, smooth or papillate disc. They are 20 in number of moderate length and leaf-shaped.
9. **Tube feet:** Podia consisting of numerous crowded ventral pedices, approximately cylindrical in shape and often confined to the three ambulacra, and papillae which are smaller and less in number, scattered on the dorsal and lateral surfaces.
10. **Rete mirabile:** In the family of *Stichopodidae*, develop an extensive plexus of dorsal haemal vessels, the rete mirabile. The dorsal haemal vessel is connected to the descending small intestine by numerous parallel vessels.
11. **Oocyte diameter:** The largest oocytes in this species are found in mature stage, with 200µm diameter.
12. **Respiratory tree:** It has a pair of heavily ramified tubes used in gas exchange that arise and receive water from the cloaca.
13. **Cuvierian organ:** It hasn't Cuvierian organ.
14. **Gonads:** Gonads have two tufts of tubules located on either side of the mesentery on which saccules develop.
15. **Cloacal muscles:** Cloacal muscles adjoin the posterior body wall and the cloaca. They are well developed.
16. **Feeding:** this species is deposit feeder.

It is well-known that ossicles are the main taxonomic character in holothuroids (Thandar, 1987a). Ossicles are crystals of calcium carbonate and are a unique anatomical body features of sea cucumbers used specifically for the identification purposes. The ossicles were measured on a transect across a slide prepared from the mid-dorsal region of each specimen. Also, for the correct identification some specimen was sent to Prof. David Pawson at the National Museum of Natural history, Washington DC, United States.

ID Key for the shallow water orders of class Holothuroidea:

- 1a. Podia absent; body vermiform; body wall thin, often translucent; dominant spicules in form of anchors with associated with anchor plates tentacles pinnate; pharynx without retractor muscle; no respiratory tree **Apodia**. 1b. Podia presents; body wall moderately thick; body wall with dominant spicules in form of tables, perforated plates, buttons, rods, or rosettes →2. 2a. Tentacles peltate or pelyo-digitate; anterior end of body not introverted and associated with retractor muscles **Aspidochirotida** (The only order with commercial species in the area).

2b. Tentacles branched (dendritic); anterior end of body introverted, associated with retractor muscles **Dendrochirotida.**

ID Key for the shallow–water families of Aspidochirotida occurring in the area:

1a. Body with trivium (sole) usually flattened and dorsal bivium convex; gonads forming a single tuft appended to the left dorsal mesentery; cuvierian organs present or absent; dominant spicules of form tables, buttons (simple or modified), and rods (excluding c – and s – shaped rods)

Holothuridae. 1b. Body square – shaped or trapezoidal in cross section; cuvierian organs always absent; gonads forming 2 tufts appended on each side of the dorsal mesentery; dominant spicules in form of branched rods c – and s – shaped rods **Stichopodidae.**

ID Key for the shallow –water genus of Stichopodidae:

1a. Tentacles 20-30; body wall very thick; podia short, more or less regularly arranged on bivium and trivium.....**Parastichopus** 1b. Tentacles leaf shape, 18-20; body wall moderately thick; podia irregularly arranged on the bivium, and scattered papillae in 3 rows on trivium.....**Stichopus**

4 Results

Identify species:

The careful examination of all 140 specimen of sea cucumbers taken from the sea bottom of Kish Island and also taking into account the identification keys used for this purpose, shows that all these specimen belong only to one single species, *Stichopus hermanni* .

Systematic hierarchy:

Kingdom	Animalia
Phylum	Echinodermata
Subphylum	Eleutherozoa
Class	Holotheroidea
Subclass	Aspidochirotoacea
Order	Aspidochirotida
Family	Stichopodidae
Genus	<i>Stichopus</i>
Species	<i>hermanni</i>

5 Diagnosis

Tentacles usually twenty in number (non–retractile). Papillae which are smaller and less in number scattered on dorsal and lateral surfaces. Ossicles include tables with large discs, rosettes and c – shaped rods (sometimes very few), some of which may be c – shaped or have several branches (fig 2). Its habitat is seagrass beds, rubble and sandy– muddy bottoms. Average length is 35 cm and average weight is 1.0 kg with common size between 12 to 18 cm. Body thickness is 8 mm, upper side wrinkled deeply ridged with small black bumps (Fig 3 a & b).

6 Remarks

Stichopus hermanni is known from the ossicles, ARAMCO samples nos. 710716B/3, 790225A/10. for figure references, see Samper (1868), Theel (1880), Engel (1933), A. M. Clark & Rowe (1971), Barid (1974), Conand (1993) and David Pawson (2004).

7 Discussion

Morphological description:

A massive holothurian, body broad, considerably flattened ventrally, the dorsal side slightly arched and the lateral sides almost vertical; body wall fairly thick and soft; mouth sub-terminal; anus central; and tentacles usually 20 in number of moderate length and leaf – shaped. Podia consisting of numerous crowded ventral pedicles, approximately cylindrical in shape and often confined to the three ambulacra, and papillae which are smaller and less in number, scattered on the dorsal and lateral surfaces, sometimes in rows, and placed on small warts. Calcareous ring slender but variable in development, which radial plates approximately half the length of the inter radials. Ossicles numerous, consisting of tables with large discs having usually 7 to 15 peripheral holes, but often irregular or incomplete, and spire of moderate height ending in a groups of spinelets

(sometimes in the form of a cross) about as wide as the disc, rosettes of variable development, and c – shaped rods (sometimes very few), some of which may be c– shaped or have several branches. Color of live specimens variable, usually brownish yellow often mottled and with darker papillae giving a spotted appearance. Color (except for the papillae) partly retained after preservation in alcohol. Found on the coral reef, 4 – 8 depth at Kish Island. The gonad consist of two tafts of tubules on which saccules develop. Male’s testis tubules and saccules are larger than ovarian ones.

Family description:

The obtained results are quite surprising because even no thorough study has been conducted in this region to identify the coral communities, but we expected to find more species than one. According to the literature, the Stichopodidae family has 6 genus including *Stichopus* with 8 species including *S. chloronotus*, *S. japonicus*, *Stichopus mollis*, *S. parvimensis*, *S. regalis*, *S. tremulus* and *S. variegates (hermanni)* (Systema Naturae, 2000). Other authors provide different nomenclature with different number of genus and species. For example, according to the University of Michigan Museum of zoology (UMMZ, 2005) this family has only 4 genus and for *Stichopus* there is only 5 species. Examination of spicule morphology showed that this species is *Stichopus variegates semper*, 1864 in a large part of the literature before 1995. *Stichopus variegates* is, however, not a valid name since Rowe & Gates(1995). The specimens collected as *Stichopus variegates* before 1995 are known to belong to at least two different species(Massin,1995), *Stichopus hermanni* Semper, 1868 and *Stichopus monotuberculatus* (Quoy & Gaimard,1833). A correct naming according to the rules of zoological nomenclature allows communication between scientists in an unbiased way. Complete fauna lists for this area enables scientists to understand the faunal make-up of the landscapes and regions that need conservation. Indeed, both theoretical and experimental studies have shown that the stability of an ecosystem is influenced directly by the interactions between the various players. In coral reefs, echinoderms are unmistakably important actors(Birkeland, 1988). However, a lack of knowledge of the species and on the interaction between the other actors in the ecosystem, hinders in-depth understanding of the ecological roles of sea cucumbers in coral reefs.

The need of further studies can be demonstrated.

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Figure 1- Map of Persian Gulf and Kish Island



Figure 2- Ventral view of Stichopus hermanni

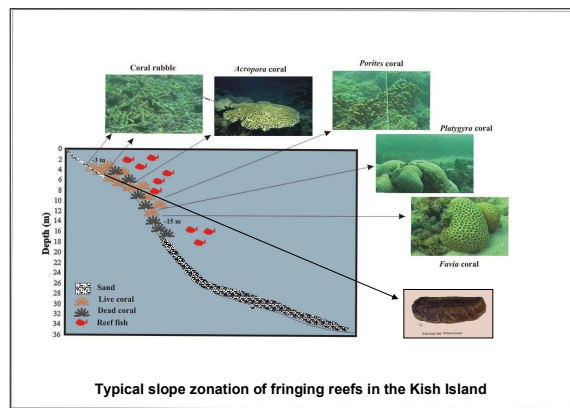


Figure 3- Typical slope zonation of fringing reefs in the Kish Island

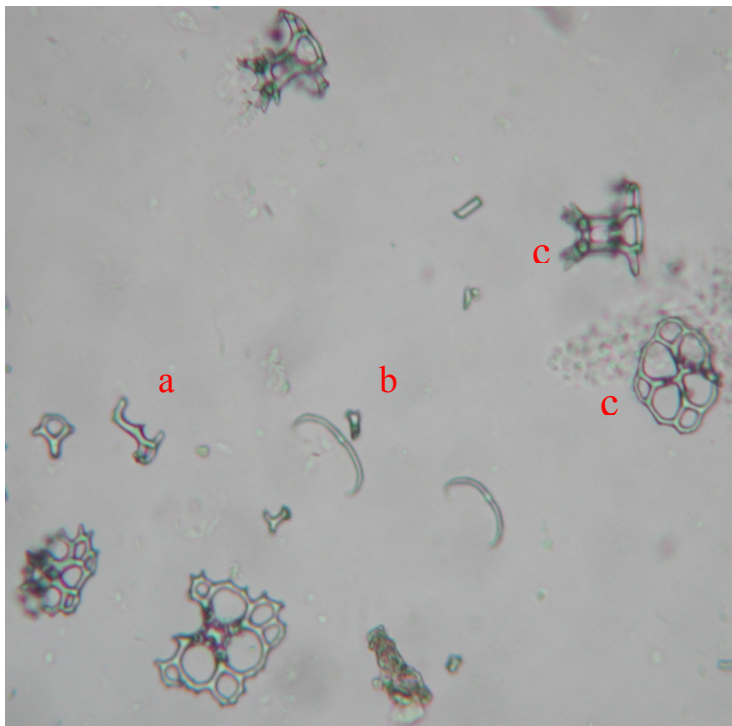


Figure 4- Ossicles of Stichopus hermanni: a; Rosset b; c-shape and c; tables

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