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NEW RECORD OF A SEA CUCUMBER, *HOLOTHURIA OCELLATA* (JAEGER, 1833) (HOLOTHUROIDEA: ASPIDOCHIROTIDA: HOLOTHURIIDAE) IN SINGAPORE

Siyang Teo[1]* and **Chin Soon Lionel Ng[2]**
[1]Department of Biological Sciences, National University of Singapore,
14 Science Drive 4, Singapore 117543, Republic of Singapore
[2]Tropical Marine Science Institute, National University of Singapore,
18 Kent Ridge Road, Singapore 119227, Republic of Singapore
*(*Corresponding author: sassy19a@gmail.com)*

INTRODUCTION

The phylum Echinodermata consists of an estimated 7,000 species globally, of which around 1,400 are sea cucumbers (class Holothuroidea) (Lane & Vandenspiegel, 2003; Pawson, 2007). The Holothuroidea can be found in all marine habitats and have wide morphological variation, and yet are the most poorly-studied echinoderms (Kerr & Kim, 1999). In Singapore, sea cucumbers can be found in intertidal and reef areas of the northern and southern shores. Lane & Vandenspiegel (2003) compiled a list of 19 of the more common and interesting species but from our personal observations, many remain unidentified. Here, we report a new record of *Holothuria ocellata* (Jaeger, 1833) in Singapore, previously noticed by various people but only documented by a common name, the polka-dotted sea cucumber (Tan, 2009).

MATERIAL AND METHODS

The authors first noted this species on 23 Jul.2009 between 0500 to 0600 hours, at Changi Beach, beside Changi Ferry Terminal (1°22'44"N, 104° 00'14"E). Twenty individuals were counted. Photographs were taken and the species was subsequently identified as *Holothuria ocellata*. A specimen was then collected and kept for observation in an aquarium. It was later preserved in 75% ethanol after fixing in 10% formaldehyde for two weeks. The specimen was then deposited in the Zoological Reference Collection (ZRC), Raffles Museum of Biodiversity Research, National University of Singapore (ZRC ECH 0093).

To verify the identity of the specimen, ossicles were extracted using a method adapted from Toral-Granda (2005). Small pieces of the tegument and the papillae were placed in individual glass vials, and 2 ml of household liquid bleach (NaOCl) were added to each sample and left to stand for approximately 30 min. Ossicles were visible as fine white sediments after the tissues had dissolved. They were then examined under a compound microscope.

Additional information with regards to the form, colouration and distribution of *Holothuria ocellata* were obtained from photographs taken by various individuals. Three specimens from the same locality (Changi Beach) that were deposited in the ZRC (ZRC ECH.0090) on 22 Jun.2009 were also examined.

RESULTS AND DISCUSSION

***Specimen details.* –** At rest, the specimen has an elongated (115 mm) and thin (30 mm at the widest point) body tapering at both ends (Fig. 1a). The dorsal side is convex while the ventral surface is almost flat, resembling a 'sole' (Fig. 1b). The mouth is ventral and the feeding tentacles are short (approximately 4 mm when extended) with pad-like tips. The off-white and rough tegument is speckled with minute dark brown spots, the densities of which are higher on the dorsal and the mid-ventral sides. On the dorsal surface, the specks aggregate to form five faint dark bands (Fig. 1a).

The entire body surface is covered with conical papillae, which are light brown at the base and light yellow near the tip. Starting from the innermost, each papilla is surrounded by three rings—white, brown and white. These rings are sometimes absent or less pronounced. The largest and longest papillae lie along the sides of the body, forming a continuous line that is generally backward pointing from the anterior. Many of them are fused together at the base (Fig. 1c). Both the mouth and anus are also surrounded by papillae at the brim.

***Ossicle examination.* –** Ossicles from the tegument include knobbed buttons and tables. The buttons are ovoid, with irregularly arranged knobs, and perforated with typically three to five pairs of holes (Fig. 2a). The tables have spires

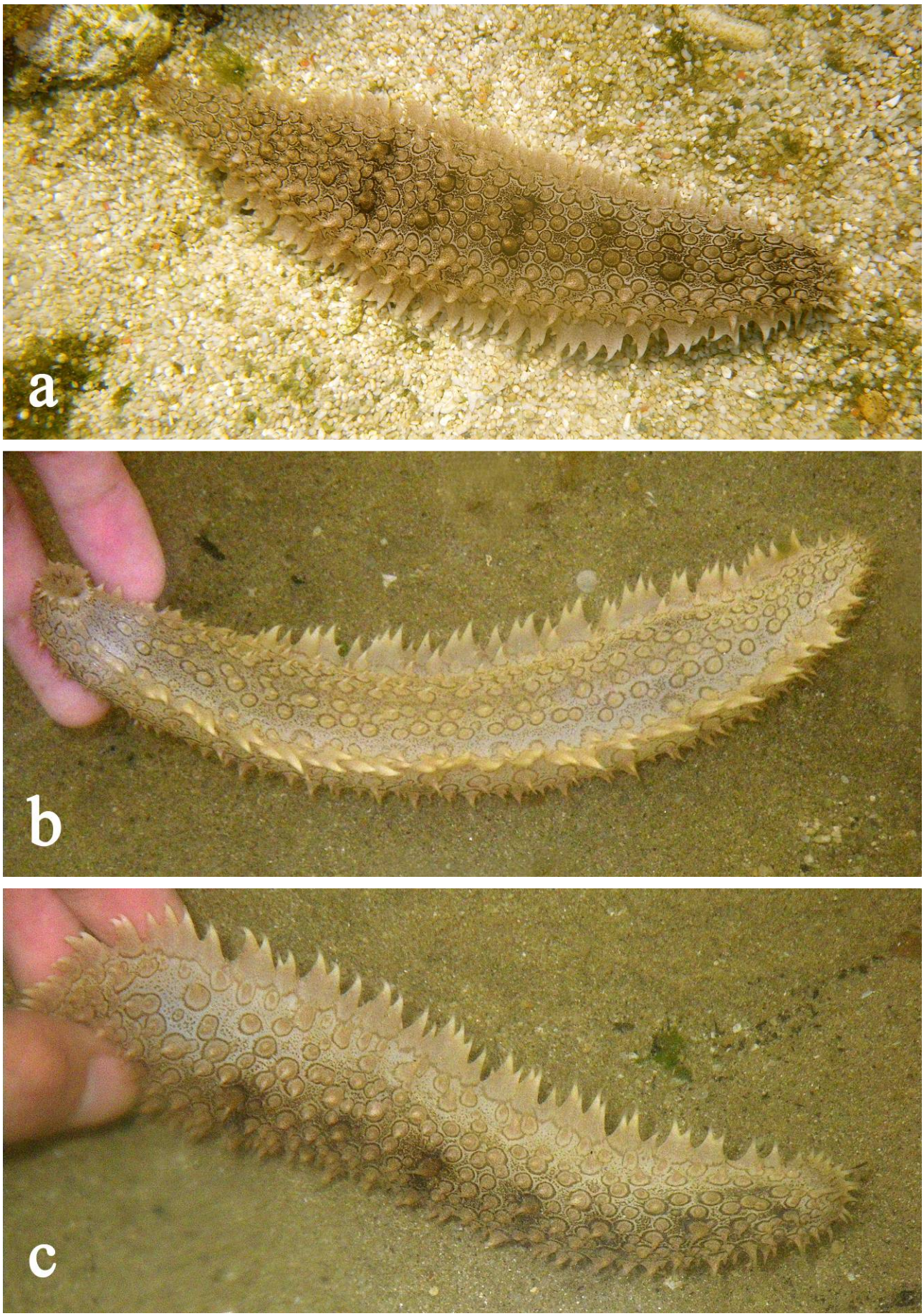

Fig. 1. Ex-situ photographs of *Holothuria ocellata* at its: (a) dorsal, (b) ventral and (c) lateral positions. Specimen length at rest = 115 mm. (Photographs by: Teo Siyang).

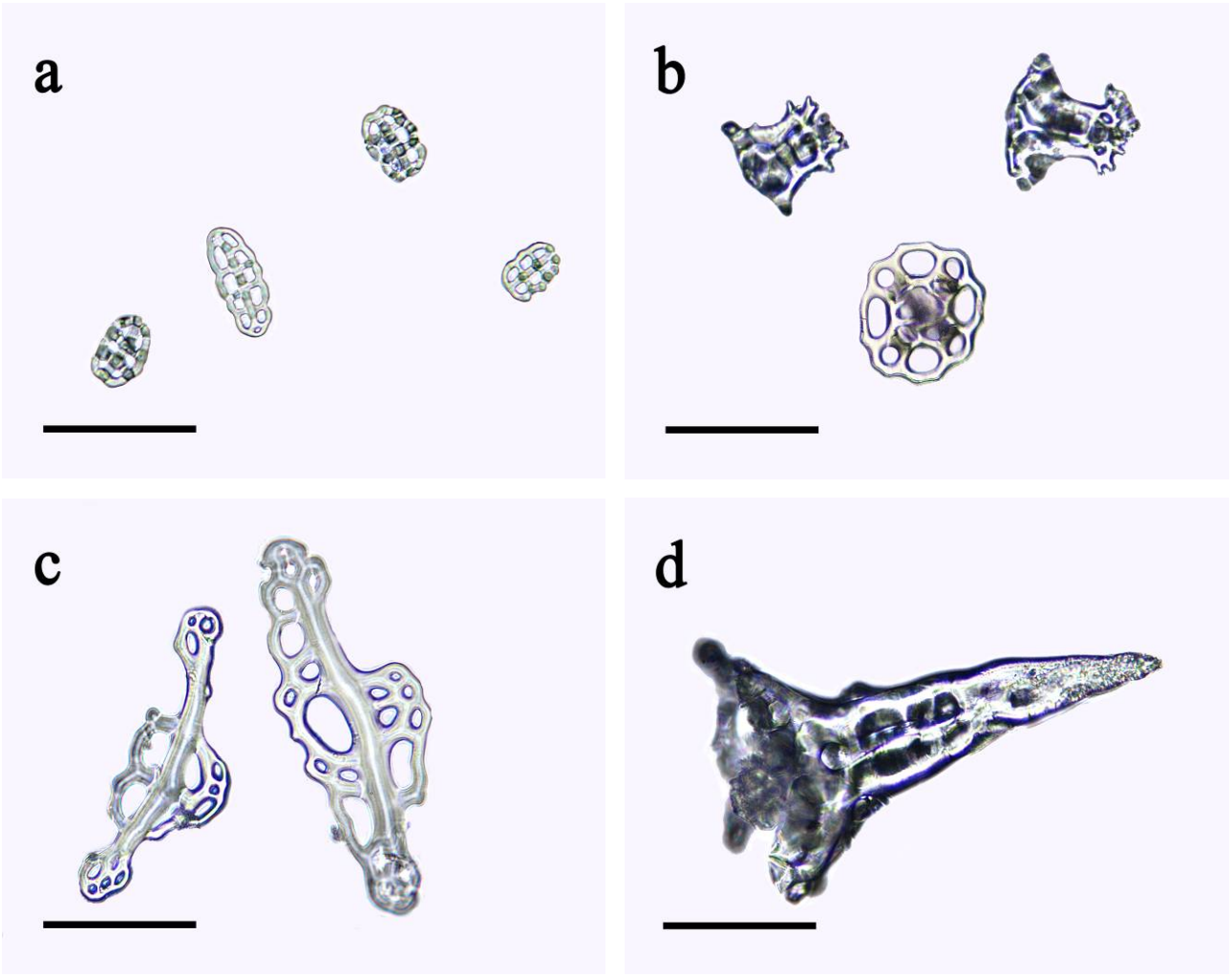

Fig. 2. Ossicles obtained from *Holothuria ocellata*. (a) Knobbed buttons; (b) Ventral and lateral views of short tables; (c) Perforated rods; (d) Tack-like table. All scale bars = 0.01 mm. (Photographs by: Teo Siyang).

which are mostly short with spiked crowns and perforated discs with smooth margins (Fig. 2b). Ossicles from the papillae include rods that are perforated at the centre and the ends (Fig. 2c), as well as the aforementioned buttons and tables. There are also large tack-like tables (Fig. 2d). These are the least common form of ossicles, and are only present in the papillae.

Distribution. **–** This species is widespread in the Indo-West Pacific region. It has been recorded in the Red Sea, Bay of Bengal, Maldives, Gulf of Thailand, South China Sea, the Philippines, Sulawesi, northern Australia, New Caledonia, China and South Japan (Clark et al., 1971; Guille et al., 1986; Long et al., 1995; Lane et al., 2000). It also has a large bathymetric distribution from 0–270 m (Guille et al., 1986). In Singapore, it has been sighted in the intertidal zone at Changi Beach and Pulau Seringat (R. Tan & L. Tang, pers. comm.). The earliest sighting with photographic record was 2 Jul.2007 at Changi Beach (R. Tan, pers. comm.).

Observations. **–** At Changi Beach, *Holothuria ocellata* was observed to inhabit fine sandy substrate. The specimen collected by the authors seemed to prefer burrowing in the sand. Guille et al. (1986) noted similar behaviour and stated that *Holothuria ocellata* is buried deeply during the day. Most sightings of the species at dawn (pers. obs.) or during pre-dawn hours in the period from June to August (R. Tan, pers. comm.), coupled with the ventral position of its mouth together with the pad-like feeding tentacles, lead the authors to suggest that *Holothuria ocellata* is a nocturnal feeder.

Discussion. **–** The external features of the specimen appeared consistent with photographs taken from earlier sightings with variations in the density of brown pigmentation. However, descriptions and illustrations by Théel (1880), Cannon & Silver (1986) and Guille et al. (1986) suggest a broader interpretation of this species, though the paucity of specimens from previous records hinders accurate comparison. Nevertheless, the characteristic tegument and papillae are distinctive enough for a positive identification (F. W. E. Rowe, pers. comm.).

Its ossicles are identical to those described in Théel (1886) and Cannon & Silver (1986) as *Holothuria* (*Metriatyla*) *ocellata* with an exception—tack-like tables (Fig. 2d) are a distinguishing feature of the subgenus *Theelothuria*. *Holothuria ocellata* was formerly placed in the subgenus *Metriatyla* (Rowe, 1969), then transferred to *Theelothuria* by some authors after discovery of the tack-like tables (e.g., Liao, 1980; Liao & Clark, 1995; Lane et al., 2000). Even though identification of all holothurians depends almost entirely on the body and ossicle form (Rowe, 1969), additional taxonomic data can be obtained with molecular studies. Hence, the subgeneric placement of *Holothuria ocellata* may be determined following molecular analysis (F. W. E. Rowe, pers. comm.).

Active research by tertiary institutions as well as exploratory field trips conducted by nature enthusiasts have increased the opportunity to notice previously unidentified organisms in Singapore's biota. With the marine environment especially, sightings of organisms are limited by logistics (e.g. requiring diving) and tidal heights. Such information is vital if a more comprehensive picture of the conservation status of our wildlife is to be obtained. With only five records listed as nationally vulnerable in The Singapore Red Data Book, 2nd Edition (Davison et al., 2008) for the Holothuroidea, the need for a more thorough re-assessment for this group cannot be over-emphasised.

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