

Biodiversity Record: The banded sea urchin, *Echinothrix calamaris*, in Singapore

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Subject: Banded sea urchin, *Echinothrix calamaris* (Echinodermata: Echinoidea: Diadematidae).

Subject identified by: David Lane.

Location, date and time: Singapore Strait off Kusu Island; 12 August 2025; around 1425 hrs.

Habitat: Marine. Coral reef.

Observers: Daisuke Taira and Yan Le Su.

Observation: A live example of about 5 cm ambital diameter (Fig. 1) was found among coral rubble on the reef crest at around 2 m depth when the tidal height was 2.7 m above Chart Datum. It was photographed in-situ and left on site.

Remarks: *Echinothrix calamaris* (Pallas, 1774) is a pantropical, regular echinoid that is distributed abundantly and widely across the Indo-Pacific (Coppard et al., 2021). Despite its common occurrence in the region, the present observation appears to constitute the first published record of *Echinothrix calamaris* in Singapore, aside from an earlier informal mention on a local naturalist blog (see Yeo, 2008). Its presence should be included into future editions of the Singapore Red Data Book (see Iesa et al., 2024).

Phylogenetic analyses by Coppard et al. (2021) suggest the current concept of *Echinothrix calamaris* encompasses three cryptic species that diverged into three clades approximately 7.2–9.8 million years ago. Among the three clades, Clade 1 is distributed most widely across the breadth and length of the entire Indo-Pacific, Clade 2 is endemic to the Rea Sea and the Gulf of Oman, while Clade 3 is restricted to the central and western Pacific, spanning from West Malaysia to northern Japan, southern New Caledonia and eastern Moorea (Coppard et al., 2021). Clades 1 and 3 are sympatric (i.e., co-occurring on the same reefs in their overlapping distribution range) and are hypothesised to be reproductively isolated. No diagnostic morphological characters have been found to distinguish the clade members (Coppard et al., 2021). The specimen encountered at Kusu Island could be a member of either Clade 1 or Clade 3.

Echinothrix calamaris displays a wide range of colour variation, with the test epidermis and ambulacral spines ranging from white, green, red, pink, purple, brown or black (Coppard and Campbell, 2006; Coppard et al., 2021). Their interambulacral spines are typically white, green, brown, purple, or red (Coppard and Campbell, 2006; Mortensen, 1940), sometimes with distinct banding pattern, which gave rise to its common name, the banded sea urchin. However, it should be noted that the banding pattern is not a consistent diagnostic character (Coppard et al., 2021). The specimen encountered during this observation bore reddish-brown colouration, which is uniform across its test, ambulacral and interambulacral spines (Fig. 1A & B). Some white, banded interambulacral spines were sparsely scattered (Fig. 1C). Nonetheless, the work by Coppard et al. (2021) showed that the colour variations are not specific to clade nor locality. Thus, the clade identity of this specimen cannot be discerned based on either the morphology or locality alone.

This species could be mistaken for its congener *Echinothrix diadema*, which has been previously recorded in Singapore waters (e.g., Iesa et al., 2024). *Echinothrix diadema* is characterised by their darker colourations (black test with black interambulacral spines, sometimes banded dark purple and green, always with a greenish-blue sheen), with consistently banded ambulacral spines—contrasting with the ambulacral spines of *Echinothrix calamaris* which are never banded. Additionally, some *Echinothrix calamaris* specimens bear green iridescent strips running down the naked median interambulacral region of the test, with white or yellow platelets present on the periproctal membrane. Both traits are present in the featured specimen. While the presence of the periproctal platelets was cited as diagnostic in a key for this

species in Coppard & Campbell (2006), it was later found to be absent in some specimens (Coppard et al., 2021). Nonetheless, it remains an informative character when present.

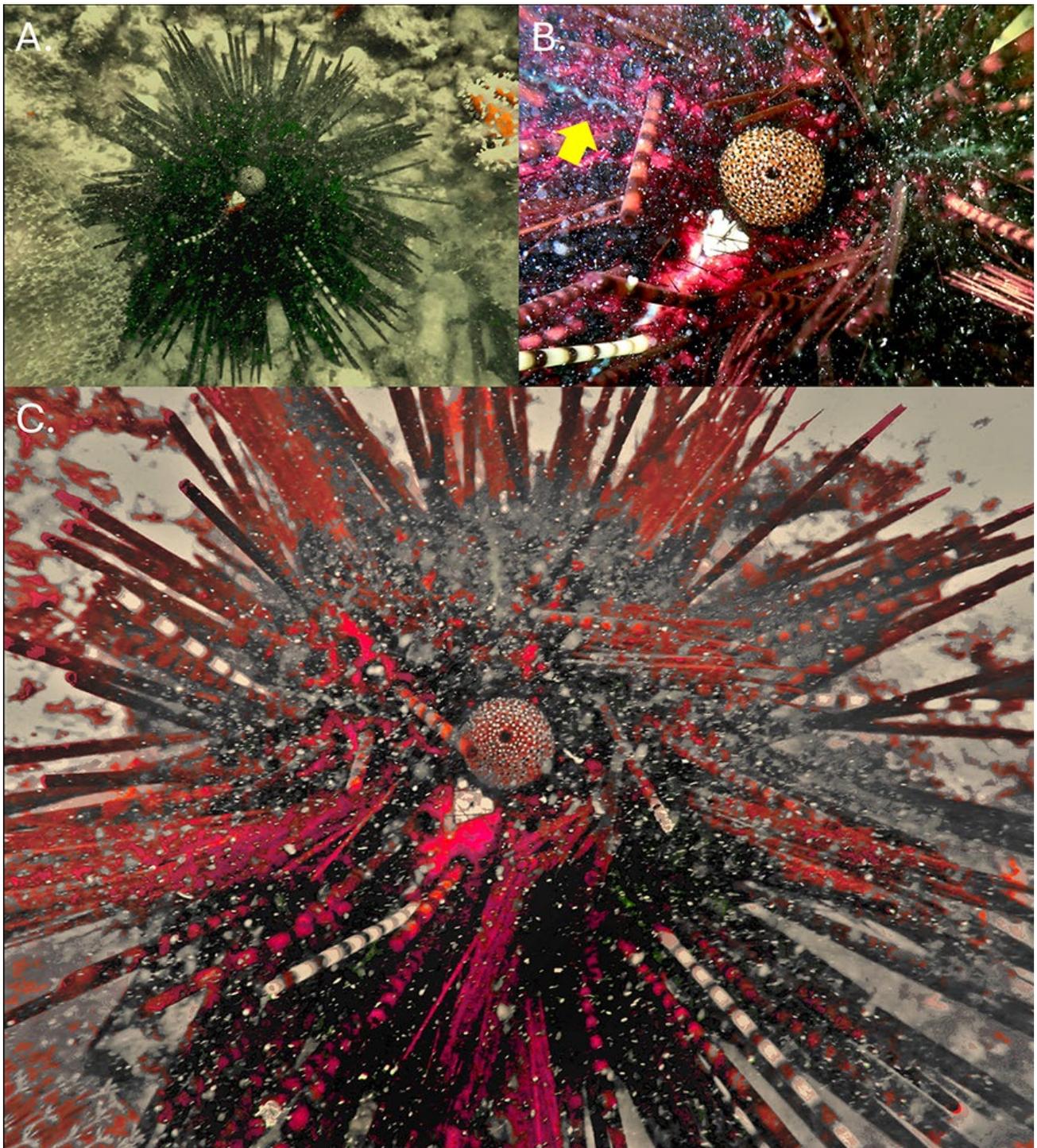


Fig. 1. In-situ images of *Echinothrix calamaris* on the reef crest of Kusu Island. (A) Aboral view of the whole specimen. (B) Close up view on the periproct, featuring the membrane covered with white and black platelets and the iridescent strip on the median ambulacral region (indicated by arrow). (C) Close up view of the aboral side, showing the banded, white or reddish-brown interambulacral spines. Images B and C were photographed with additional light source (Photographs by: Daisuke Taira).

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