

Habitats of the Heart Urchins *Protenaster* and *Rhynobrissus*

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Accurate published quantitative data on the depth of burial and substratum preferences of living heart urchins are, as Smith (1980: 43) has noted, sadly lacking; they are recorded for only 13 heart urchin genera (Smith 1980). The only information recorded on *Protenaster* is that it has been collected from a depth of 6 fathoms (Hall 1904). Our knowledge of the habitat of *Rhynobrissus* is only marginally better. Clark (1917) recorded that specimens were collected from between 23 and 39 fathoms. Mortensen (1951) noted that *R. hemiasteroides* Agassiz, 1879 is a littoral species which lives to a depth of at least 75 m. McNamara (1982) noted the presence of calcareous sand, 0.1-1.0 mm in diameter, within the gut of *R. tumulus* McNamara, 1982. During early 1983 living specimens of *Protenaster australis* (Gray, 1857) and *Rhynobrissus hemiasteroides* Agassiz, 1879 were collected by C.B. Two specimens of each were discovered living buried in sand. The aim of this short note is to provide details of the habitats of these species, principally water depth, depth of burial in the sediment and the sediment grain size and composition.

Protenaster australis (Gray, 1857)

Two specimens, WAM 740.83 and 741.83 (test lengths 90 mm and 77 mm respectively), were collected off Trigg Beach, Western Australia. They were found living in sand in a pocket in the limestone reef platform. The sediment/water interface was about 1.5 m below the surface of the reef platform and at a water depth of about 1.8 m. The sand pocket was connected to the open sea via channels within the reef. It was located about 30 m from the shore. Within the sand, the echinoids were buried to a depth of about 10 cm. The location of each echinoid was marked by the presence of a slightly raised, darker patch of disturbed sand that was about twice the area of each animal. We consider it likely that the echinoids were connected to the surface by a mucus-lined funnel although we have not observed this directly. On exposing the echinoids and leaving them on the sediment surface, they proceeded to burrow, the anterior of the test descending more rapidly than the posterior, initially. The echinoids completely covered themselves with sand within 15-20 minutes.

The sand in which the echinoids were buried is a fine-grained calcareous sand. The sediment grain size ranged from about 0.02 mm up to 1.3 mm. However, the diameter of most grains lay in the range of 0.125 to 0.25 mm (see Table 1 for grain-size analysis). The grains have been poorly rounded; sphericity of the grains is generally low. A proportion of the sand consists of unworn foraminifers, sponge spicules, broken bryozoan fragments, complete small bivalves and echinoid spines. The major part of the sand, however, consists of worn molluscan fragments.

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Rhynobrissus hemiasteroides Agassiz, 1879

Two specimens, WAM 742.83 and 743.83 (test lengths 38.5 mm and 33 mm respectively) were collected off White Tops Reef, Port Denison, Western Australia. They occurred at a water depth of 10 m, buried in sand on the exposed, south-westerly side of the reef. The sand surface was strongly current rippled. The echinoid's presence, as with *P. australis*, was indicated by a disturbed area on the substratum which was darker in colour than the surrounding sand. Both specimens were covered by about a 10 cm thickness of sand. When uncovered they would immediately begin to bury themselves with a forward, sinking motion. Complete coverage was accomplished in only 20-30 seconds.

The sand is predominantly calcareous, although it does contain a minor proportion of quartz and lithic fragments. The sand grains range in diameter from about 0.05 to 2 mm, although the majority of grains are in the range of 0.125 mm to 0.5 mm (see Table 1 for grain-size analysis). Compared with the nature of the sand in which *P. australis* was discovered, the sand inhabited by *R. hemiasteroides* is more mature, the grains being more rounded, and displaying a higher degree of sphericity and larger grain size. Identifiable components include bryozoans, sponge spicules and foraminifers.

Table 1 Sediment grain-size analysis.

Grain size (in mm)	< 0.063	> 0.063	> 0.125	> 0.25	> 0.5	> 1.0
<i>P. australis</i> sand	< 0.5%	6.9%	74.5%	17.5%	0.9%	< 0.5%
<i>R. hemiasteroides</i> sand	trace	2.3%	47.5%	42.5%	5.7%	1.6%

Discussion

Smith (1980) attempted to correlate aboral tubercle density with sediment grain size. He noted how, particularly in spatangoids, inhabitants of finer grained sediments possess a greater number of tubercles per mm². *Rhynobrissus*, with about 10 tubercles/mm² and inhabiting fine sand, compares with *Echinocardium* (Smith 1980, Fig. 109) and fits the general trend which Smith observed. However, *Protenaster*, found inhabiting an even finer-grained sand than *Rhynobrissus*, has, at a comparable size to *Rhynobrissus*, a density of only 3 tubercles/mm². Thus although the trend observed by Smith may be valid in a very general sense, *Protenaster* forms an exception. Presumably factors other than sediment grain size are also influencing the density of aboral tuberculation.

References

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