

Heliocidaris erythrogramma (Valenciennes 1846)

Test round; hemispherical or more or less flattened on the upper side; peristome sunken; diameter of test up to 85 mm;

apical system with terminal plates I and V insert; madreporite enlarged; all plates tuberculated, also the outer periproctal ones; female specimens with larger gonopores than males;

ambulacra: pore-pairs on the aboral side in distinct arcs of 7 – 8, on the oral side in dense and oblique rows of 3 – 5, not widened adorally; two series of primary tubercles, smaller than interambulacral ones, decreasing in size on the oral side; secondaries irregularly distributed and much smaller than primaries, adorally inconspicuous;

interambulacra: two series of large tubercles, decreasing in size on the oral side; secondaries forming regular vertical rows in the median space, less regular on the outer side, smaller than primaries, but distinctly larger than the other tubercles covering the plates, adorally inconspicuous;

peristome: membrane rather bare with a few small scattered plates; notches distinct;

spines: primary spines hardly more than 25 mm long, mostly shorter; usually slender, tapering to a blunt tip, sometimes the aboral spines may be conspicuously thicker or even slightly spindle-shaped (variety *armigera*); secondaries small; over the oral side all spines are much smaller.

Colour: The spines are usually brownish-olive, sometimes with white, they may also be greenish or purplish. The cleaned test is mostly uniformly green, it may sometimes be purplish, whitish, or greenish with a purplish tint.

Biology: The development of the young is modified: The large, yolk-rich egg grows to an elongated, uniformly ciliated larva without arms. Metamorphosis is abbreviated, and the first podia and spines form on the embryo, while it drifts in the surface water without feeding. About four to five days after fertilization it sinks to the bottom. More tube-feet, spines and pedicellariae emerge, and after about 23 days the juvenile begins to feed.

Distribution: *Heliocidaris erythrogramma* is restricted to the south of Australia from Shark Bay on the west coast to Port Stephens in New South Wales on the eastern coast. The species is also known in Tasmania. It lives exclusively in the littoral zone and down to a depth of 35 m.

Remarks: This species can be distinguished from *Pachycentrotus australiae* by the pore-pairs being arranged in arcs and by its longer primary spines. The form *armigera* is always recognizable by its thick spines aborally.

Heliocidaris erythrogramma differs from *H. tuberculata* by the number of pore-pairs per arc, the former having 7-8, the latter 9-10; and by the lack of distinctly widened oral pore zones.

Literature: Williams & Anderson 1975; Rowe & Gates 1995; Miskelly 2002.

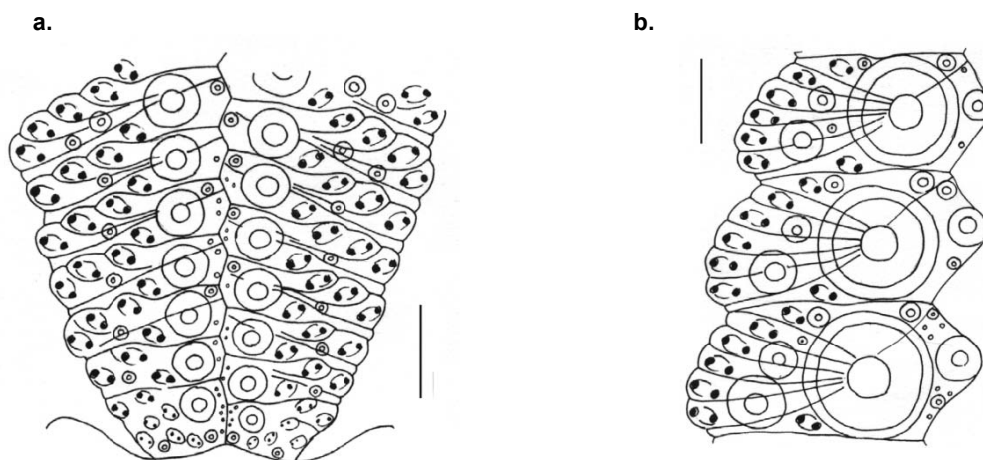


Fig. 413. *Heliocidaris erythrogramma*.

a. Ambulacral plates at the peristomial edge: The pore-pairs are arranged in dense, oblique series.

b. Plates of half an ambulacrum: The compound plates are set with 6 – 7 pore-pairs.

Scales 2 mm. (After Mortensen)

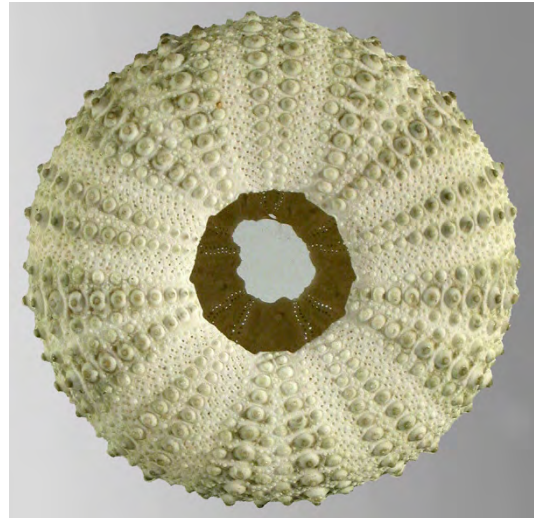


Fig. 414. *Heliocidaris erythrogramma*;
 diameter 64 mm; Tasmania, Australia.
 (Above left) Aboral side: The interambulacral
 primary tubercles are larger than the ambulacral ones.
 (Right) Close-up of aboral side: In the ambulacrum
 there are 6 – 8 pore-pairs per plate forming conspic-
 uously curved arcs.

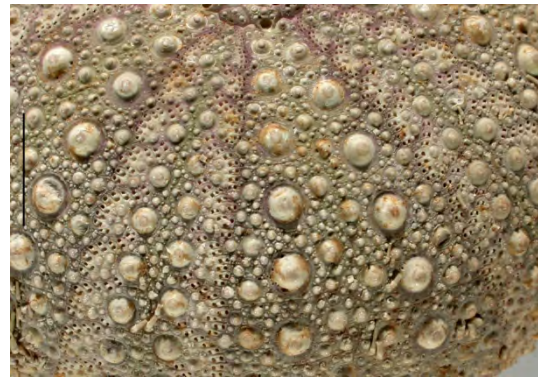


Fig. 415. *Heliocidaris erythrogramma*;
 diameter 41 mm; Victoria, Australia.
 (Above right) Oral side: The pore zones are densely
 set with oblique rows of pore-pairs, but they are not
 widened.



Fig. 416. *Heliocidaris erythrogramma*; diameter of test 78 mm; Victoria, Australia.
 (Above left) Aboral side: The primary spines are slender, in the whole the urchin looks rather sparsely spined.

Fig. 417. *Heliocidaris erythrogramma* var. *armigera*; diameter of test about 42 mm, height about 19 mm; Rottnest Island, Western Australia.
 (Above right) Aboral side: The aboral primary spines are conspicuously thick and slightly spindle-shaped. On the oral side the spines are much smaller

Heliocidaris erythrogramma is the most common sea urchin in Australia and occurs in the most diverse environments. It lives in cracks and crevices on rock shelves in the intertidal zone, where the surf waves rush in and out, excavating shallow grooves to withstand the heavy currents. Usually this species is known to settle under less rough conditions than the better adapted *Heliocidaris tuberculata*.

In this extreme habitat *H. erythrogramma* has developed a dense canopy of short, stout spines to minimize the water resistance and to protect the test. The species is also found under large stones below the tide zone, in sea grass beds in bays, in boat wrecks and even on shell rubble.



Fig. 418. *Heliocidaris erythrogramma*; diameter with spines 53 mm; Kalbarri, west coast of Australia.

(Above left) Side view: With its short spines the urchin „fits“ into the low hemispherical excavations, where it withstands the heavy surf.

Fig. 419. Habitat of *Heliocidaris erythrogramma*: Surf zone near Kalbarri, west coast of Australia,.

The breakers of the open Indian Ocean rush into the crevices of the rock shelf, and stream back again producing very strong currents.

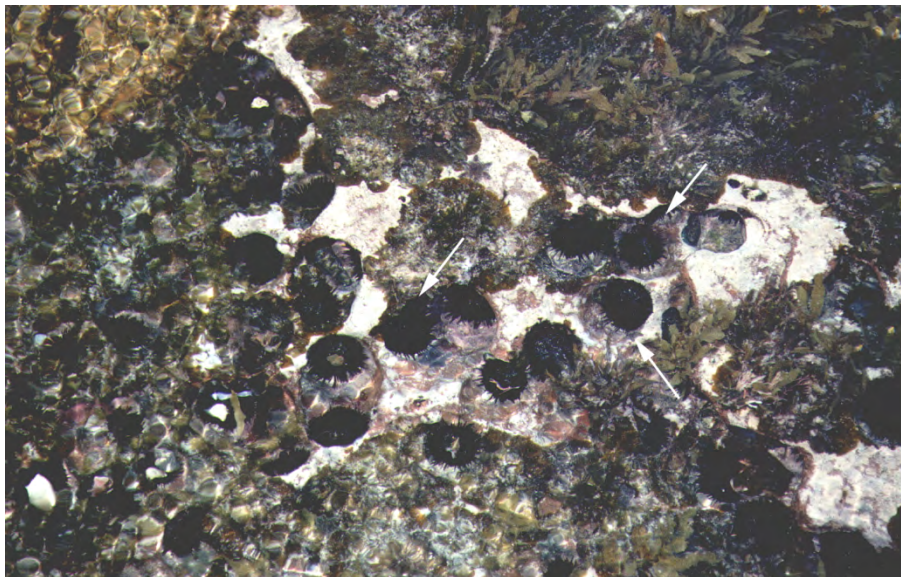


Fig. 420. *Heliocidaris erythrogramma*; Kalbarri, Western Australia.

The sea urchins inhabit grooves (arrows) in order to better withstand the surging waves. Compared with *Heliocidaris tuberculata* this species is not particularly well adapted to this extreme habitat. But here in the crevices at the bottom of rock canals the animals have developed short, stout spines to minimize water resistance and to protect their test.

Family Rotulidae Gray 1855

Biology: The rotulid echinoids live in lagoons and estuaries in very shallow water, and there has evolved quite unique adaptations to that extreme habitat. The flat test has digitations alternating with deep indentations around the posterior half. In addition in *Rotula* more or less closed holes have developed in the anterior part of the test.

The animals live in very large numbers in the muddy sediment, shallowly buried. Organic particles are caught by the tube feet, then laid into the food grooves, which reach into the distal ends of the "fingers". Here the grains are incorporated into a mucous string and transported to the central mouth.

Two extant genera, each with one species, are included in this family, restricted to the coast of West Africa:

-- *Heliophora* L. Agassiz 1840

-- *Rotula* Schumacher 1817



Fig. 628. *Rotula deciesdigitata*; test length 7 mm, 16 mm and 24 mm; Lagos, Nigeria. (ZMH)

(Above left) Aboral sides of young specimens:: First the three deep indentations in the posterior interambulacra evolve (left), later the more shallow notches in the other sutures appear. The anterior lunules, variably two to six, are formed by resorption of the test.

Fig. 699. *Heliophora orbiculus*; test length 17 mm; Luanda, Angola; (ZMH)

(Above right) Aboral side of young specimen: There are already shallow indentations at the sutures.

Heliophora orbiculus (Linné 1758)

Test fragile, flat, more or less strongly raised towards the apical system; circumference round, posterior part with eleven deep indentations, the plate columns forming more or less slender finger-like structures; max. length approximately 70 mm;

apical system knob-like, four gonopores; **petals** short and open, anterior one longest;

oral side flat, or somewhat concave; food grooves bifurcating; not reaching the margin around the anterior but expanding onto the digitations posteriorly;

periproct between peristome and posterior margin;

spines: primaries slightly club-shaped, miliaries ending in a crown.

Colour: In life the animal is brownish to greyish, turning brightly green after death. The denuded and cleaned test is whitish.

Distribution: This species is found along the coast of West Africa from Mauretania to Angola in the intertidal zone.

Remarks: Specimens can vary from having only shallow indentations around the posterior side to having digits around almost the entire margin. Between these extremes many intermediates occur.

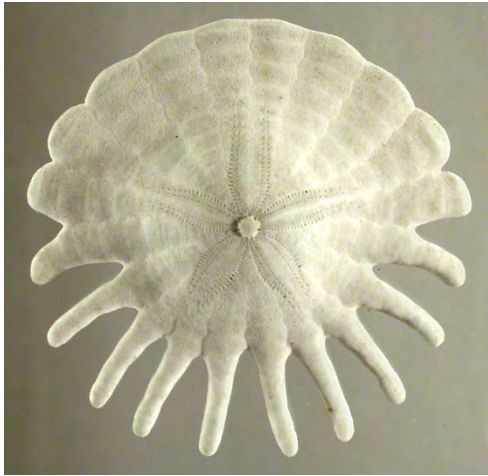


Fig. 630. *Heliophora orbiculus*; test length 35 mm; Cape Verde Is.

Aboral side: The long "fingers" are very fragile. When they break they can be regenerated.



Fig. 631. *Heliophora orbiculus*; test length 56 mm; Mauretania.

Oral side: The long food grooves are rudimentary anteriorly, and expanded to the posterior.

***Rotula deciesdigitata* (Leske 1778)**

Test thin and flat, centre raised, highest point anterior to apical system, evenly sloping posteriorly; anterior side rounded with two to six more or less open lunules, posterior side with open indentations at each suture, deepest in interambulacra; max length 77 mm;

apical system with four gonopores; **petals** long and distally open;

oral side flat to concave; food grooves expanding to distal end of digitations; poorly branched;

periproct near the posterior indentation;

spines on the aboral side short, very dense and ending in a knob, longer on the oral side; miliary spines end in a crown (fig. 633).

Colour: In life the echinoid is greenish grey to brownish, the bare test is whitish.

Distribution: *Rotula deciesdigitata* is found along the coast of West Africa from Mauretania to Angola in the intertidal zone.

Remarks: The closed lunules are formed by resorption, the posterior notches by marginal indentation.



Fig. 632. *Rotula deciesdigitata*; test length 55 mm, width 53 mm; Lagos, Nigeria.

(Left) Aboral side and (right) oral side: The anterior part of the test shows closed lunules, the posterior side is deeply indented. Often the fragile digitations break, but can be regenerated.