

A New Species of *Podosphaeraster* Clark & Wright, 1962 (Echinodermata; Asteroidea) from the Pacific

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Abstract—A new species in the sphaerasterid genus *Podosphaeraster* Clark & Wright is described from Guam and the Loyalty Islands, western Pacific Ocean.

Introduction

Specimens of *Podosphaeraster* reported to date are few. The type species, *P. polyplax* Clark & Wright, 1962, was described from a specimen collected in the South China Sea (British Museum (Natural History) 1894.7.3.1), having been previously reported by Bell (1894) as a juvenile *Culcita*. Since then, two new species have been recognised from North Atlantic waters in the area of the Bay of Biscay: *P. thalassae* Cherbonnier, 1970, described from two small complete specimens, and *P. crassus* Cherbonnier, 1974, from some ventral plates only. Cherbonnier (1974) also reported that five specimens of *P. thalassae* had been collected by various expeditions to the Bay of Biscay area between 1968 and 1972.

Three previously unreported specimens of *P. polyplax* in the collections of the Australian Museum extend the geographical range of the species, one specimen having been collected from the Arafura Sea (AM J11720, 8°14'S; 133°23'E, 125 m depth) and two others from between the New Hebrides and Loyalty Islands, western Pacific Ocean (AM J11721, 20°16'S; 169°59'E, 85 to 100 m depth). The larger of the two latter specimens has been completely dissected by Dr M. Jangoux, Université Libre de Bruxelles, as part of a joint investigation of the morphology of *Podosphaeraster*. A fourth, hitherto unreported, specimen of *Podosphaeraster* was collected off the island of Guam, northwestern Pacific, from a depth of 244 to 324 m in 1973. This shows features in common with a second specimen from the Loyalty Islands, similarly reported by Bell (1899) as *Culcita* sp., but subsequently referred to as *P. polyplax* (Clark & Rowe, 1971). The features these latter two specimens share, and their differences from other known species of *Podosphaeraster*, are sufficient, we believe, to establish a new species.

Table 1 sets out the currently known records of *Podosphaeraster*.

Table 1. Records of *Podosphaeraster*.

| Species | Designation | h.d. | v.d. | h.d./v.d. | Locality | Depth (m) |
|----------------------|---|-----------------|----------|-------------------|--|-----------|
| <i>P. polyplax</i> | AM J11721 | 9.5 mm | 7.5 mm | 1.26 | Loyalty Islands South Pacific | 85–100 |
| <i>P. polyplax</i> | AM J11720 | 11.5 mm | 10.5 mm | 1.1 | Arafura Sea Indonesia | 125 |
| <i>P. polyplax</i> | BM(NH) 1894. 7.3.1. Holotype | 12.0 mm | 11.0 mm | 1.1 | South China Sea | 72–90 |
| <i>P. polyplax</i> | AM J11721 | 15.0 mm | 13.25 mm | 1.1 | Loyalty Islands South Pacific | 85–100 |
| <i>P. thalassae</i> | Paris Museum Holotype | 8.5 mm | 7.4 mm | 1.15 | Gulf of Gascoyne N. Atlantic | 500–520 |
| <i>P. thalassae</i> | Paris Museum Paratype | 6.0 mm | 5.0 mm | 1.2 | as above. | |
| <i>P. thalassae</i> | Paris Museum 5 specimens | up to 9.0 mm | ? | ? | N. Atlantic | ? |
| <i>P. crassus</i> | Paris Museum holotype (Fragments) | ? 50– 70 mm | ? | ? | 250 miles off Brest, N. Atlantic | 900–120 |
| <i>P. pulvinatus</i> | BPBM W2813 Holotype | 21.5 mm | 11.8 mm | 1.82 | Guam, N. Pacific | 244–324 |
| <i>P. pulvinatus</i> | BM(NH) 1898 8.8.109 Paratype | 12.75 mm | 5.75 mm | 2.2 (Squashed) | Loyalty Islands South Pacific | ? |

Systematic Account

Podosphaeraster pulvinatus n. sp.

Figs. 1–3

Calcita sp., Bell 1899: 137, Figured.

Podosphaeraster polyplax, Clark and Rowe, 1971: 40–41, 53 (part) [non *P. polyplax* Clark and Wright, 1962].

MATERIAL EXAMINED: 1 specimen (holotype), Bernice P. Bishop Museum, Hawaii, W2813: north of Ritidian Point, Guam, northwestern Pacific, dredged (stn 2), 244 to 324 m depth, 21 October 1973, found in branches of hexactinellid sponge, collected by R. W. Grigg and L. G. Eldredge; 1 specimen (paratype), British Museum (Natural History), London, 1898.8.8.109; Sandal Bay, Loyalty Islands, southwestern Pacific, Willey Collection.

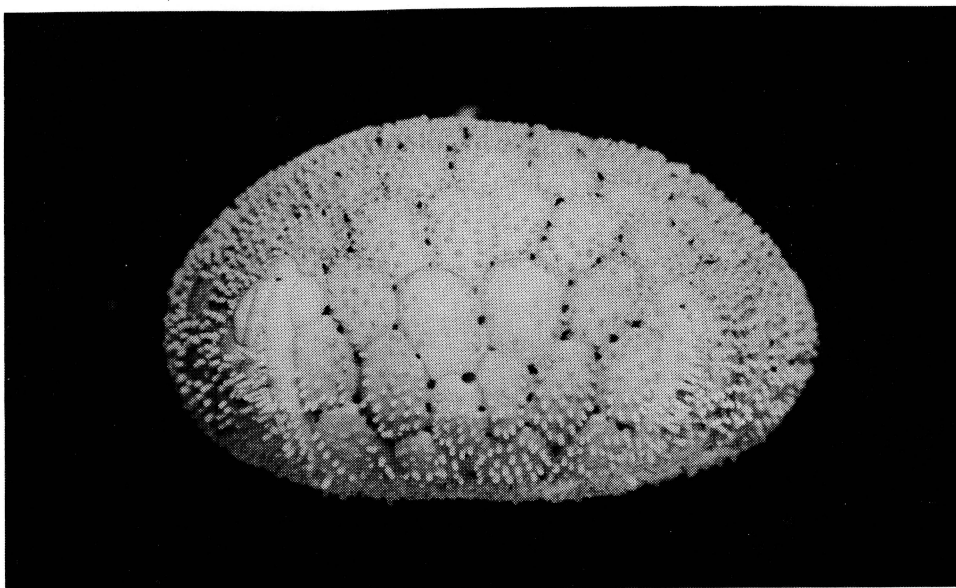


Fig. 1. *Podosphaeraster pulvinatus* n. sp., holotype, lateral view (h.d. = 21.5 mm).

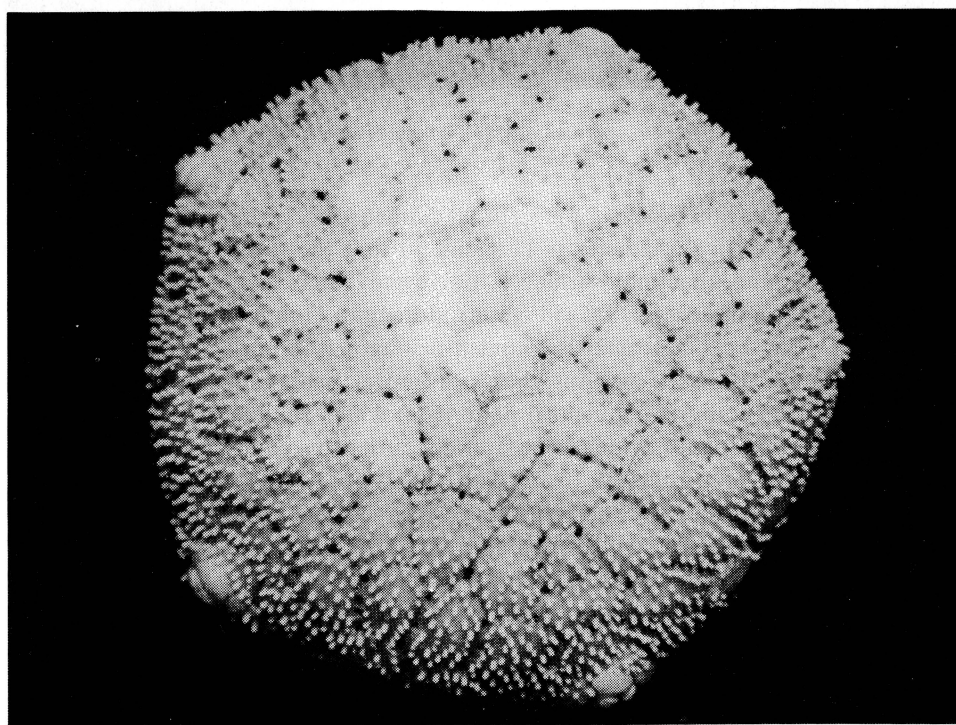


Fig. 2. *Podosphaeraster pulvinatus* n. sp., holotype, abactinal view (h.d. = 21.5 mm).

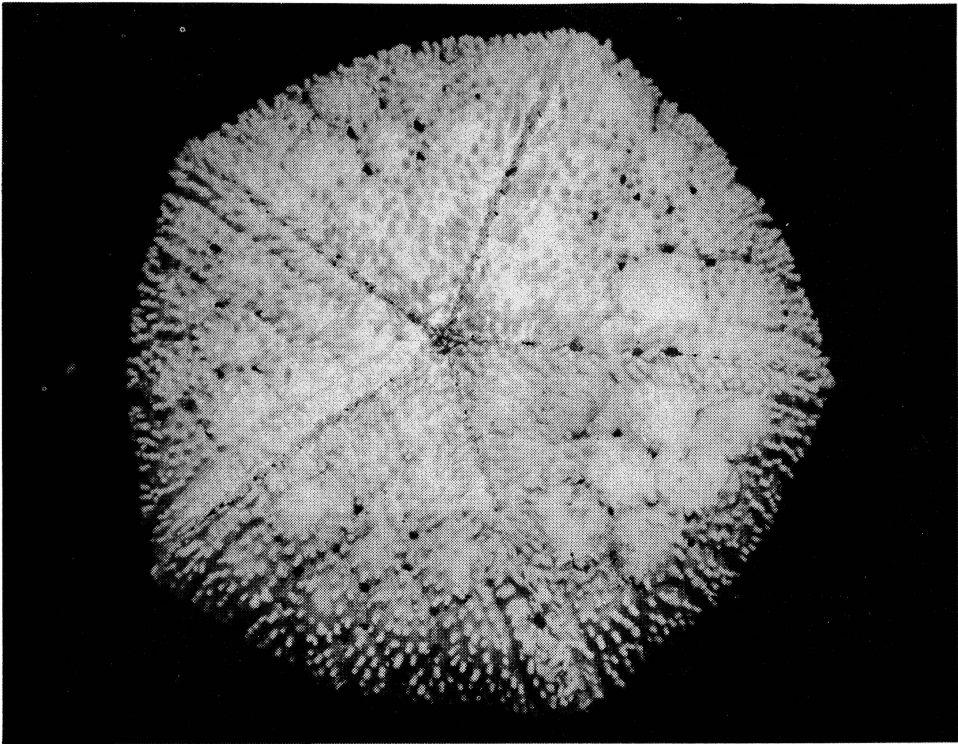


Fig. 3. *Podosphaeraster pulvinatus* n. sp., holotype, actinal view (h.d.=21.5 mm).

DESCRIPTION: The holotype has a horizontal diameter of 21.5 mm (R and r are about 10.75 mm). The vertical diameter is 11.8 mm, so that the ratio h.d./v.d. is 1.82. In vertical section the abactinal surface is not evenly arched, but is highest at the midradial point of interradius BC (11.8 mm), sloping to 11 mm at the midradial point of radius E. (Fig. 1). The seastar is rounded-pentagonal in horizontal cross-section.

Abactinally, above the ambitus, there is a central, pentagonal, apical area, 9 mm in diameter. This comprises a central plate from which radiate five larger, radially elongate interradial plates, which abut laterally at their proximally adjacent corners. The interradial in interradius BC (using Carpenter's notation) is radially cleft. In the distal angle between adjacent interradials is a wedge-shaped radial plate. The anus lies in the suture between the central plate and interradial BC, and is surrounded and protected by nine bullet-shaped granules (Fig. 2).

There is a row of four plates which extends along each dorsal radius, abutting proximally with the radial plate of the apical system and distally with the terminal plate of the ambulacrum. In the interradial triangle formed between these radial rows of plates, the apical system and the ambitus are three horizontal rows of plates. At the apex of the triangle is a row of three plates, below which are two rows each of four

plates. The two middle plates of the middle row are narrower, appearing more elongate than the polygonal plates at either end, and are slightly obliquely aligned. The middle plate of the top row in interradius CD bears the madreporite (Fig. 2).

Actinally, below the level of the ambitus, there is a row of eight plates extending between the terminal plates of adjacent ambulacra. The outer plate, at each end of this row and adjacent to the terminal plate of each ambulacrum, is very small. The central two plates of this row are, like those of the middle dorsal row, narrower than the others and similarly obliquely aligned (Fig. 1). Below this row of plates is a triangle comprising rows of four, three, two and one plates (Fig. 3).

The abactinal and actinal plates bear spaced, bullet-shaped granules. The granules occur as a ring around the periphery of the plates, with additional granules spaced within the ring. The granules are more or less of similar dimensions over the whole of the plate, with those on the abactinal plates being slightly shorter (220–265 μm) than those on the actinal plates (350–475 μm). The plates are textured with low, glassy bumps, between which run shallow furrows.

Five grooved ambulacra, each with two rows of tube-feet, radiate from the ventral mouth, and terminate just dorsal to the ambitus. The ambulacral grooves are lined by twenty-one adambulacral plates each side, each plate bearing three furrow spines on the adradial edge of the plate and two to four subambulacral spines (up to 670 μm long) on the flat surface of the plate (Fig. 3).

Each oral plate bears three furrow spines and two to three subambulacral spines.

The terminal plate of the ambulacrum has a minute, centrally placed pore. Papulae occur singly at the angles between the abactinal and actinal plates, except between the single plate and the row of two plates on the actinal surface. Additional pores occur spaced in the grooves, particularly between many of the abactinal plates (Figs. 1–3).

There are no pedicellariae.

The paratype is smaller than the holotype, with a horizontal diameter of only 13.4 mm and vertical diameter of 6 mm, h.d./v.d. = 2.2. It is slightly damaged, being dorsoventrally flattened, but the vertical diameter would be only slightly higher than presently measured. The apical system has a diameter of 3.5 mm. The arrangement of the abactinal and actinal plates is similar to that of the holotype, with the exception that there are only six plates in the first subambital row. There are sixteen pairs of adambulacral plates lining the ambulacral groove. These each bear three furrow spines and two (one larger and one smaller) subambulacral spines. Most of the plates are rubbed bare of the bullet-shaped granules.

ETYMOLOGY: *pulvinatus* (Lat.) = cushion-shaped.

REMARKS: Two characters which serve to separate *P. pulvinatus* easily from *P. polyplax* and *P. thalassae* lie in the larger size and squatter shape and in the distribution of the radial row of four plates which abut between the radial plate of the apical system and terminal plate of the ambulacrum in each radius in *P. pulvinatus*.

Further comparisons show that regular arrangement of the apical system of *P. pulvinatus* is similar to that of *P. thalassae*, but major differences lie in the presence of only three radially positioned plates in radii A, D and E in *P. thalassae*. These do not come into contact with the radial plates of the apical system, but a spherical nodule is placed at the junction of the distal edge of the radial and two contiguous dorsal plates of the first row of plates from adjacent interradii. Only in radii B and C is there a fourth plate in the radial line, which is in contact with the respective radial plate of the system. Other differences between *P. pulvinatus* and *P. thalassae* lie in the shape of the granules on the skeletal plates; acutely pointed in *P. thalassae* (Cherbonnier, 1970, fig. 2E & F) but more or less truncate (bullet-shaped) in *P. pulvinatus*. There are two to three furrow spines and two subambulacral spines in *P. thalassae* but three furrow spines and two to four subambulacral spines in *P. pulvinatus*.

In *P. polyplax*, the limit of the apical system is more difficult to determine due to the presence of small plates between adjacent interradials. However, the very irregularity of the apical system is a good character of difference from *P. pulvinatus*. That this irregularity is not because of youth, considering the size difference between the holotypes of *P. polyplax* and *P. pulvinatus*, is shown, we believe, by the regularity of the apical system in the paratype of *P. pulvinatus* which is smaller (h.d. = 12.75 mm) than the largest specimen of *P. polyplax* so far encountered (h.d. = 15.0 mm). The radial rows of four plates do not abut with the radial plates of the apical system in all of the radii in *P. polyplax*. The holotype of *P. polyplax* has two vertically aligned plates on either side of the madreporic plate, and the relatively placed plate in the other interradii, whereas *P. pulvinatus* has only one. However, these characters are variable in *P. polyplax*; in the smaller specimen from Loyalty Islands (AM J11721) there are only three additional, small plates in the apical system and sometimes only one plate either side of the dorsal interradiial plate whereas in the larger specimen the only modification to the apical system is that a second interradiial plate (AB) is longitudinally cleft. Nonetheless, the more spherical shape of the species and smaller size of *P. polyplax* (at h.d. 15.0 mm gonads are relatively mature—Rowe, Nichols & Jangoux in prep.) serve readily to distinguish the two species.

The shape, size and arrangement of abactinal plates are unknown for *P. crassus* since the species was described from only a few ventral plates. However, the adambulacral plates are shown to bear four to five furrow spines and about seven subambulacral spines. The size of the species has been estimated to be about h.d. 50–70 mm, in which case it would be the largest species in the genus. No further comparisons can really be made until whole specimens are recovered. However, two features described by Cherbonnier for *P. crassus* require mention. These are the presence of elongate, perforated and denticulated bars from the tube feet, not present in the other species of the genus, and the interpretation of a perforated actinal plate as possibly representing the madreporite. These features may separate *P. crassus* from the other species at a generic level if not a familial one. Until further material of *P. crassus* is available the species should remain in the genus *Podosphaeraster*.

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