

DESCRIPTIONS OF NEW ASTEROIDEA FROM THE PACIFIC.

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(Plates xxvii-xxviii.)

Among the specimens recently acquired by the Australian Museum the following have been considered to be species new to science and are described in this contribution.

Calliaster erucaradiatus¹ sp. nov.

(Plate xxvii.)

Description.—R. = 34 mm., r. = 12 mm.; R. = 2.8 r. Br. (from middle of one interbrachial to middle of another), 13 mm.; at middle of ray and between supermarginals, 5.5 mm.; between antepenultimate and penultimate supermarginals, 4 mm.

Disk relatively small, slightly elevated along radii. The rays taper gradually and evenly to a blunt tip. Abactinal surface covered by moderately sized plates of varying dimensions. Most of these plates are swollen and each carries either a single fairly long and robust spine (3 mm. high) or a nipple-like boss. The remaining plates of the abactinal surface are flat and unarmed, and most of them border the supermarginal plates. All plates of the abactinal surface are separated from one another by a single encircling belt of squarish and rectangular, flat-topped granules.

The papular pores are fairly numerous and occur singly between the plates on both actinal and abactinal surfaces.

The circular dome-like madreporite is small, but not inconspicuous. It is situated in the interradial region in a position closer to the inner edges of the supermarginals than to the centre of the disk.

Eight supermarginal plates occur on each side of each ray, counting from the centre of the interbrachial arc. Each supermarginal is moderately swollen, smooth and separated from its neighbours by a single encircling belt of squarish and roundly-rectangular, flat-topped granules, smaller than those separating plates on the disk. All supermarginals, with the exception of the first and second, meet across the ray. The first supermarginal (adjoining the interradial line) in every instance carries two, usually fairly long, spinelets (up to 3 mm. high). One is placed on the outer edge of the plate pointing outwards and slightly upwards. The other is situated on the inner edge of the plate and points directly upwards. The second supermarginal (with an occasional exception, when only a small nipple-like boss occurs) carries a single centrally-placed spinelet (about 3 millimetres tall), which is directed upwards and slightly outwards. The third supermarginal plate is armed with a similar spinelet, which is placed outwards from a central position and directed further outwards from the vertical plane than the spinelet of the previous plate. The fourth, fifth and sixth supermarginals are also armed with a spinelet, but its direction

¹In reference to the likeness of the rays to certain Australian caterpillars.

gradually drops with each successive plate to a nearly horizontal position. The penultimate and ultimate superomarginals are destitute of spinelets. The terminal plate, which is roundly rectangular, is large and robust. Two spinelets, arranged fork-like, and directed outwards and upwards, spring from the distal extremity of this plate.

The inferomarginal plates correspond in number and position to the superomarginals. The first inferomarginal (counting from interradial line) carries a single outwardly-directed spinelet, except in one instance when it is represented by a nipple-like boss. The second inferomarginal may carry either one or two spinelets. When one spinelet occurs it is directed straight outwards. When two are found, one is directed straight outwards and the other, which is lower down and a little to one side, is directed obliquely downwards. The third, fourth and fifth inferomarginals are similarly armed with one or two spinelets. The sixth, seventh and ultimate inferomarginals, without exception, carry a single slightly downwardly directed spinelet.

Actinolateral plates are wanting beyond the second inferomarginal. The first series (adjoining adambulacrals) reach only to the second inferomarginal. The remaining actinolateral plates in each interradial area are three in number and are arranged to form a triangle. All actinolaterals are slightly swollen and smooth. Most are armed with a centrally-placed, upright and well-developed spinelet. Every one is separated from its neighbours by a single belt of loosely packed, squarish, flat-topped granules.

The adambulacral plates, which reach to the tip of the ray, are roundly rectangular near the mouth, but gradually become round as the tip of the ray is approached. A comb of six to seven spinelets of almost even length spring from the inner border of each adambulacral. From the surface of each adambulacral, within the first three-quarters of the ray, spring two fairly long and stout upright spinelets, arranged one behind the other. Adambulacrals within the last quarter of the ray have only one spinelet and a nipple-like boss on their upper surfaces.

Affinities.—*Calliaster erucaradiatus* is allied to *C. elegans* Döderlein², but the presence of pedicellaria, the low, wide inferomarginals, and the spinulation of them as well as the spinulation of the first superomarginals in this latter species, are characters in themselves sufficient instantly to separate these two species.

Locality.—About 11 miles off Crowdy Head, New South Wales, bearing N. by W.; 50 fathoms. Presented Captain K. Möller, trawler "Ben Bow," September, 1935. One specimen, the holotype. Australian Museum Reg. No. J. 5996.

***Neoferdina insolita* sp. nov.**

(Pl. xxviii, figs. 2, 4 and 6.)

Description.—R. = 20 mm.; r. = 6.5 mm.; R. = 3.07 r. Disk and rays flat, except for madreporite and anus, both of which are elevated and conspicuous against the surrounding flatness. The interbranchial arcs are moderately acute. The flat plates of the abactinal surface vary in size up to 2 mm., and all (except where definite abrasion has occurred) are covered by a very fine granulation. The granules are

²Döderlein.—Bijdr. tot de Dierk., Amsterdam, xxii, 1922, p. 49, pl. i, figs. 1, 1a-1b.

slightly larger between the plates and around the papular pores than on the plates themselves. Abactinal plates irregularly arranged, except along the midradial lines, where they are, within the basal half of each ray, placed in some semblance of order. Two to three transverse series of granulated plates, which are almost imperceptibly swollen, occur on each ray. In all instances these transverse series of plates begin and end between superomarginals. Superomarginals eight in number on each side of each ray. Most are arranged in a regular manner, but in a few cases a small intervening plate occurs which tends to separate the large superomarginals. The intervening plates or spaces recalls to mind the species *N. ocellata* (H.L.C.). The first superomarginal is of the same size as, or perhaps slightly smaller than, its fellows, all of which proceed towards the terminal plate without any appreciable alteration in size. Superomarginals slightly swollen—not noticeably so. They are bare, except for an encircling basal belt of minute granules which arises from the general granulation. The rounded and bare terminal plate is fairly well developed, bigger than any ultimate superomarginal and destitute of covering or ornamentation. Papular pores conspicuous, isolated, irregularly arranged and surrounded by relatively coarse and loosely packed granules.

Inferomarginals ten in number, clearly defined. All are bare, except for a basal belt of fine granules. Most are more or less of even dimensions, but towards the tip of the ray they become gradually rounder, somewhat swollen and surmounted by a nipple-like boss or rounded eminence.

Adambulacral plates numerous, small and roughly square in shape. Each carries two (rarely three) furrow spinelets, which are short and blunt and only faintly flattened. The general granulation of the actinal surface extends up the furrow spinelets for about half their length, thus webbing them basally.

The first series of actinal intermediate plates extends at least to the antepenultimate inferomarginal. The second series ends between the fourth and fifth inferomarginal. A third and last series does not extend beyond the fourth inferomarginal. All three series are almost perfectly arranged. Actinolaterals on the disk are flat, but as they approach outwards along the rays they become increasingly swollen or elevated. All are covered by dense fine granules, which are larger near the edges of and between the plates. No pedicellariæ. No actinal or intermarginal papular pores. No record of colour in life.

Locality.—On coral reef at Samarai, Papua. Collected by Mr. M. Ward. One specimen, the holotype, Austr. Museum Reg. No. J. 5775.

Affinities.—*Neoferdina insolita* was first thought to be probably a juvenile example of *N. ocellata* (H.L.C.), but, apart from other differences, the first superomarginal in this latter species is so unique in its relative size that one could only doubt the early belief. The only possible course has been adopted and a new species erected. However, as our knowledge of these obscure species advances, there is always the possibility that these two species may be united, but from the data available no such course could reasonably be contemplated. It further differs from *N. ocellata* and also *N. cumingii* (Gray) in having narrower rays and no median radial series of bare plates on the abactinal surface. *N. insolita* differs from *N. glyptodisca* (Fisher) and *N. intermedia* (Djakonov) in having no bare abactinal plates (marginals excepted), and in having smaller and comparatively little variation in the relative size of the abactinal plates.

Ophidiaster watsoni³ sp. nov.

(Pl. xxviii, figs. 1, 3, 5, 7.)

Description.—R. = 50 mm. (allowing 4 mm. for the slight upward curl of the tips of the rays); r. = 9 mm.; R. = 5.5 r. Br. at base of ray, 10.5 mm. Disk small, raised centrally and radially, slightly depressed interradially in a dry specimen. Rays of approximately equal length, cylindrical, except for a flattened actinal surface. They taper gradually from the disk to a fairly narrow tip. Whole skeleton of the animal covered by a cloak of minute granules, closely packed everywhere except around the papular pores, where they are loosely arranged.

The plates of the abactinal surface, although not strictly in regular longitudinal series, present a degree of orderly arrangement sufficient to warrant the placing of the species in *Ophidiaster*. Many abactinal plates are arranged cone-like above their neighbours and present some definite arrangement. All such plates are of even height and size, and are surmounted by a bare, rounded, nipple-like boss. Three conical plates surround a centrally placed anus. Three others occur at the base of each ray arranged in a mid-radial line. From here outwards towards the tip of the ray the conical plates form two definite longitudinal series, which are separated by the mid-radial line. The plates of both series are arranged alternately in a zig-zag fashion. All other plates of the abactinal surface are fairly small, slightly swollen, and of uneven size. The slight irregularity in the arrangement of the abactinal plates has caused the papular pores to become somewhat uneven also. Nevertheless, eight definite longitudinal rows can be detected within the basal half of the ray. One to five pores occur to each papular area. In the distal half of the ray the papular pores are inclined to occur singly, especially so near the tip. Papular pores are confined to the abactinal surface.

Superomarginal plates twenty-two to twenty-eight in number. They are arranged in regular order, and only occasionally slightly displaced; occurring alternately large and small, every large plate being elevated cone-like and surmounted by a round, blunt, nipple-like boss as seen on some abactinal plates.

Inferomarginals twenty-two to twenty-six in number. All are moderately swollen and regularly arranged. One to three enlarged granules occur on the summit of each plate, except in the cases of the ultimate, penultimate, and antepenultimate, each of which carries a centrally placed spiniform granule.

Between the marginal series a belt of usually sixteen to eighteen moderately sized and unadorned plates occurs. This intervening series commences at the base of the ray and terminates at a point about midway along the ray.

The single madreporite is small and not readily visible. It is flat and irregularly striated by shallow channels.

Adambulacral armature in two series. Each adambulacral plate carries a furrow comb of from two to four (usually three) somewhat flattened and wedge-shaped spinelets, which are from three to four times higher than broad. The subambulacral spines are stout, round and bluntly pointed; they are almost as high as the furrow series. These spines are arranged two to three to a plate (usually three), one being always smaller than the other two. Behind the subambulacral series there are a few enlarged granules. The adambulacral plates come to lie next to the inferomarginal

³Named after Mr. Eric Watson, of Sydney, who found the specimen while touring the Great Barrier Reef.

series outwards from a point between the second and third inferomarginal, thus leaving very few actinolateral plates. The interrarial line separates an inner pair and an outer chevron of five or six of these latter plates.

Colour in Life.—Ground colour of abactinal surface a pastel brownish-purple, conspicuously darker on apices of tubercles. Bases of tubercles clearly ringed by a band of deep chocolate brown. Colour of actinal surface not recorded.

Locality.—Bushy Island (a coral cay), about 40 miles off Mackay, Queensland. Found on edge of coral reef at low tide. Collected by Mr. E. Watson, July, 1935. Single specimen, the holotype, Austr. Museum Reg. No. J. 5997.

Affinities.—The differences between *O. watsoni* and *O. armatus* Koehler are clearly obvious. *O. watsoni* differs from *Tamaria hirsuta* Koehler (apart from the number of papular series) in having no spine-like tubercles in the inferomarginals, in the degree of the tapering of the rays, and in having the plates of the abactinal surface more irregularly arranged. The intermarginal series within, or just beyond, the basal half of the ray, as well as the character of the spinulation of the adambulacral plates in *O. watsoni*, also afford good distinguishing characters.

Remarks.—With the identification of this species arises once again the vexed question of the lines of demarcation between *Ophidiaster* and *Tamaria*⁴. Here is further evidence that must be weighed when the question is reviewed in the future. There can be little doubt that at least *T. hirsuta*, *O. armatus* and *O. watsoni* are congeneric, and to keep them separated on the now doubtful character of the number of papular series seems unwarranted.

EXPLANATION TO PLATES.

PLATE XXVII.

- Fig. 1.—*Calliaster erucaradiatus* Livingstone. Side view of holotype. Slightly over natural size.
 Fig. 2.—*Calliaster erucaradiatus* Livingstone. Section of actinal surface showing adambulacral plates and furrow spines of holotype. X 3.
 Fig. 3.—*Calliaster erucaradiatus* Livingstone. Disk and inner superomarginals of holotype. X 3.
 Fig. 4.—*Calliaster erucaradiatus* Livingstone. Actinal surface of holotype. Slightly over natural size.
 Fig. 5.—*Calliaster erucaradiatus* Livingstone. Abactinal surface of holotype. Slightly over natural size.

PLATE XXVIII.

- Fig. 1.—*Ophidiaster watsoni* Livingstone. Enlarged section of actinal surface of holotype. Approx. X 3.
 Fig. 2.—*Neoferdina insolita* Livingstone. Actinal surface of holotype. Approx. X 1½.
 Fig. 3.—*Ophidiaster watsoni* Livingstone. Portion of actinal surface of holotype. Slightly over natural size.
 Fig. 4.—*Neoferdina insolita* Livingstone. Abactinal surface of holotype. Approx. X 1½.
 Fig. 5.—*Ophidiaster watsoni* Livingstone. Abactinal surface of holotype. Slightly under natural size.
 Fig. 6.—*Neoferdina insolita* Livingstone. Enlarged section of abactinal surface of holotype. Slightly under X 3.
 Fig. 7.—*Ophidiaster watsoni* Livingstone. Side view of holotype, showing the intermarginal series of plates.

⁴Livingstone, Brit. Mus. (N.H.) Sci. Reports, Great Barrier Reef Exped., 1928-29, iv, 8 Asteroidea, 1932, p. 261.