

ADDITIONS TO THE ECHINOID FAUNA OF NEW ZEALAND

D. G. MCKNIGHT

New Zealand Oceanographic Institute, Department of Scientific and
Industrial Research, Wellington

(Received for publication 25 August 1967)

SUMMARY

Seven species of echinoids are added to the New Zealand fauna, two being described as new species of the genera *Caenopedina* and *Spatangus*. Described species, new to the fauna, are *Gracilechinus multidentatus* (H. L. Clark), *Pourtalesia laguncula* A. Agassiz, *Hemiaster expergitus gibbosus* A. Agassiz, and *Gymnopatagus magnus* A. Agassiz and H. L. Clark. Fragments of *Spatangus*, possibly hybrid *S. thor* Fell, and fragments of *Echinocardium*, almost certainly not *E. cordatum* (Pennant), are also described.

INTRODUCTION

Species described below are from recent archibenthal collections made by the New Zealand Oceanographic Institute. Genera new to New Zealand waters are *Gracilechinus*, *Pourtalesia*, *Hemiaster*, and *Gymnopatagus*. New species of the genera *Caenopedina*, *Spatangus*, and *Echinocardium* are described. Fragments of a possible hybrid form of *Spatangus thor* Fell are described.

Described species new to the fauna are *Gracilechinus multidentatus* (H. L. Clark), *Pourtalesia laguncula* A. Agassiz, *Hemiaster expergitus gibbosus* A. Agassiz, and *Gymnopatagus magnus* A. Agassiz and H. L. Clark.

The classification adopted here follows that in Moore (1966).

SYSTEMATIC ACCOUNT

Class ECHINOIDEA

Order PEDINOIDA

Family PEDINIDAE

***Caenopedina otagoensis* n.sp.**

(Figs 1-3)

DESCRIPTION

Test ambitally circular, flattened above and below, the sides strongly arched.

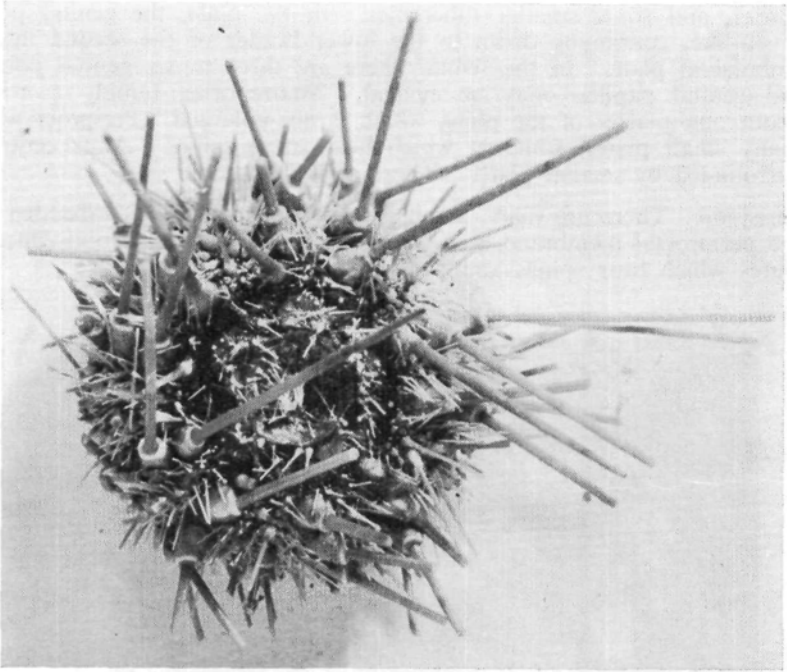


FIG. 1—*Caenopedina otagoensis* n.sp. Holotype, in aboral aspect.

Ambulacra: Plates of the diadematoid type, the central element barely enlarged carrying the primary tubercule. Primary tubercules perforate, non-crenulate, with a broad areole, forming a regular vertical series in each column, the size decreasing from the ambitus. One secondary tubercule below and median to the primary, forming a weak zig-zag series. Miliary tubercules confined to the admedian zone and the upper and lower borders of the plate. Pore-pairs in arcs of three, widening adorally. At the ambitus there are one and one half ambulacral plates to each interambulacral plate, and the ambulacra are approximately half the width of the interambulacra.

Interambulacra: One primary tubercule to each plate forming a conspicuous vertical series. Primary tubercules perforate, non-crenulate, the areoles broad and confluent. One secondary tubercule, median to the primary, enlarged ambitally, less so orally, forming a zig-zag series. Adradial to the primary tubercule there are from one to four secondaries, the inner ones forming a vertical series, the outer more irregular, largest orally. Miliary tubercules in circllets around the areole of the primary tubercule and the larger secondary tubercules.

Apical system: All oculars exsert, bearing three small tubercules. The pore is placed on the midline, near the outer border. Genitals contiguous, bearing five to seven large tubercules, confined to the adapical

border, and some smaller tubercles. In the male, the genital pore is slit-like, continuing down to the lower border of the second interambulacral plate. In the female there are three to six genital pores, and genital papillae may be evident. Madreporite, tumid, covering about one-quarter of the plate, which is not enlarged. Periproct with many small plates, some of which bear small spines. Anus central, surrounded by smaller plates. There is no anal cone.

Peristome: There are many small, naked, elongate plates embedded in the periproctal membrane, as well as the large and conspicuous buccal plates which bear spines and pedicellariae.

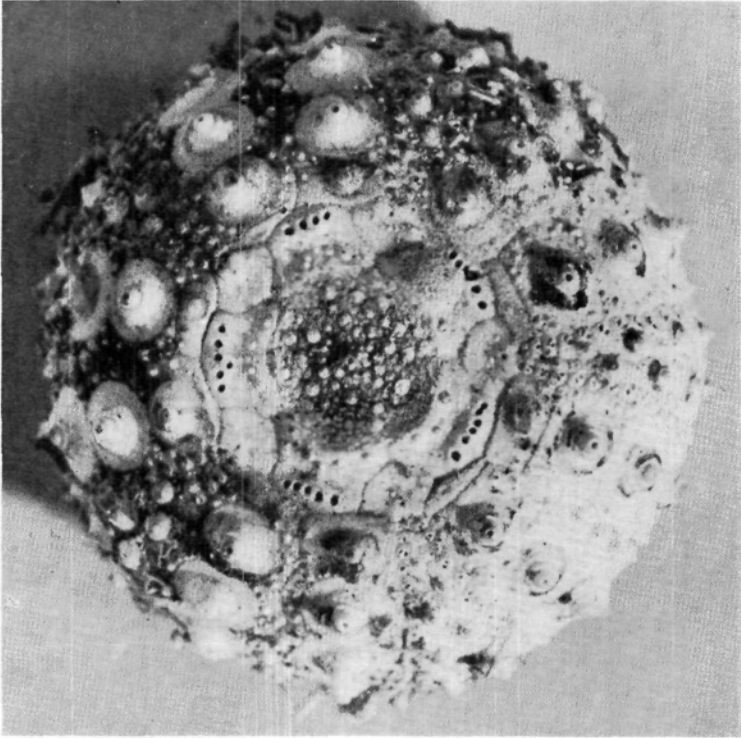


FIG. 2—*Caenopedina otagoensis* n.sp. Cleaned paratype, female, in aboral aspect.

Spines: The interambulacral primary spines are at least 50 mm long (all are broken), the ambulacral spines shorter. The spines are slender and tapering with longitudinal striations and very fine teeth. The milled ring, set at an angle across the axis of the spine, is broad and conspicuous. The secondary spines are similar, though shorter, and the milled ring is smaller in proportion and less conspicuous.

Pedicellariae: Triphyllous, tridentate, ophicephalous, and globiferous forms occur. The tridentate type occurs in two sizes and the globiferous type has conspicuous black poison glands.

Colour (ex alcohol): The test and spines are reddish brown, the apical system is dark purplish, nearly black. The spines are not banded, although distally they may be lighter in colour.

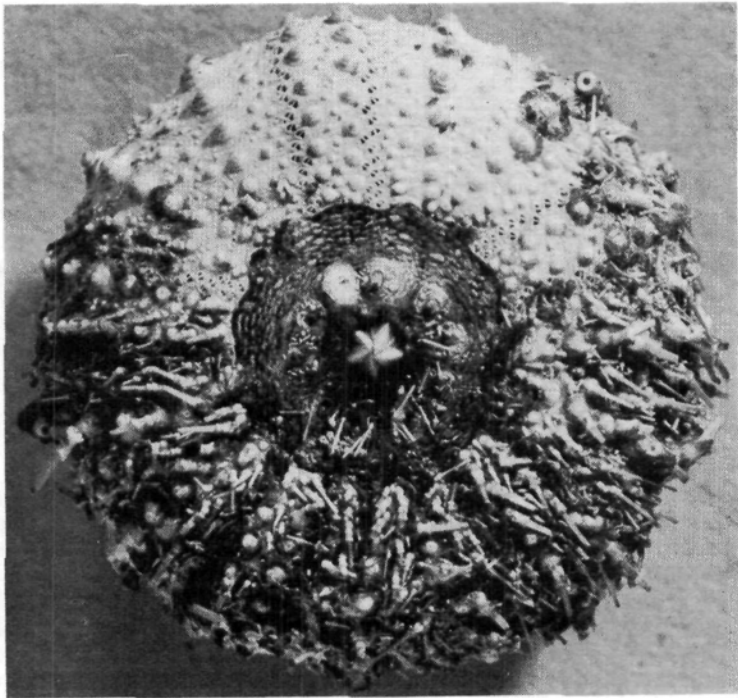


FIG. 3—*Caenopedina otagoensis* n.sp. Cleaned paratype, female, in adoral aspect.

MATERIAL EXAMINED

Sta. E 399, 46°00'S, 171°33'E, 1,214–1,222 m, 11 specimens (2 male, 9 female);
Sta. E 427, 44°54'S, 172°54'E, 1,207–1,233 m, 108 specimens (61 male, 47 female);
Sta. F 751, 45°23'S, 175°29'E, 1,227–1,258 m, 1 specimen (male).

Holotype: Deposited in the New Zealand Oceanographic Institute. No. 22 (Sta. E 427) (female).

Paratypes: Deposited in the New Zealand Oceanographic Institute. Nos P 38 (female); P 39 (male); P 40 (female); P 41 (male). (Sta. E 427).

DIMENSIONS (in mm)

| | Holotype | P | Paratypes | | |
|---------------|----------|-------|-----------|-------|-------|
| | | | P | P | P |
| H.D. | 34 | 31 | 28 | 32 | 19.5 |
| V.D. | 17 | 14 | 13 | 15 | 9 |
| Apical system | 16.5 | 15 | 15 | 16.5 | 10 |
| Peristome | 14 | 13 | 11 | 13 | 9 |
| No. of plates | | | | | |
| A | 12 | 12 | 12 | 12 | 10 |
| IA | 12-13 | 11-12 | 10-11 | 12-13 | 10-11 |

REMARKS

Both *C. indica* (de Meijere) and *C. diomedea* Mortensen have the tuberculation of the genital plates confined to the adapical edge. Both, however, have narrower ambulacra. *C. indica* lacks periproctal tubercles and has a red-brown apical system and spines which are usually banded; *C. diomedea* has whitish spines and faint purple markings on the whitish ocular plates. *C. mirabilis* (Doderlein) and *C. novaezealandiae* Pawson have the tuberculation of the genital plates not strictly confined to the adapical edge. *C. mirabilis* has a red-brown apical system and green primary spines with brown bands; *C. novaezealandiae* has narrower ambulacra, the test white except for the green apical system, and the primary spines banded green, reddish-brown, and white.

These four species and the present material show little variation in the coronal tuberculation; the colour and tuberculation of the apical system provide the main diagnostic features. Females of the present species are distinguishable by the multiple genital pores, but the slit-like genital pores of the male are present in all species except *C. novaezealandiae*, the only known specimen of which is probably female. Pawson (1964, p. 66) suggests that these four species could be reduced to sub-specific level if a polytypic species concept is adopted in the Echinoidea. The species described here would also be combined into such a grouping.

Order ECHINOIDA

Family ECHINIDAE

Gracilechinus multidentatus (H. L. Clark) (Figs 4-6)

Echinus multidentatus H. L. Clark, 1925: 115-16. Pl. VI (1-2).

Echinus multidentatus Mortensen, 1943: 88-90. Pl. LV (1-5, 8).

DESCRIPTION

Test large, circular at the ambitus, flattened orally, slightly to strongly flattened aborally, the sides arched, more so below the ambitus.

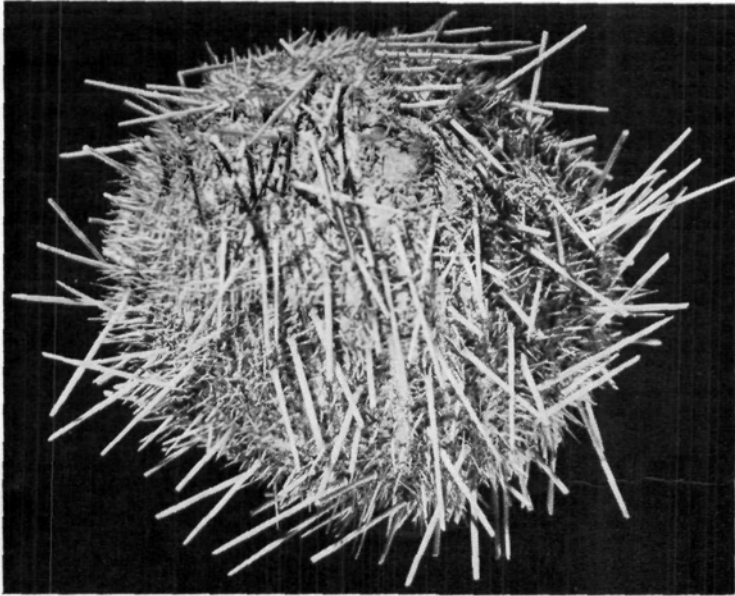


FIG. 4—*Gracilechinus multidentatus* (H. L. Clark). In oblique aboral aspect.

Ambulacra: Ambulacral plates compound, of the echinoid type, each with one primary tubercle forming a distinct vertical row. Subambitally the tubercles form a series decreasing regularly in size towards the peristome. Ambitally and aborally, normal sized primary tubercles are irregular, occurring on alternate plates or on every third to sixth plate, their size regularly decreasing towards the apical system. Smaller tubercles, of a similar size to the secondary tubercles, are present on all other ambulacral plates above the ambitus. Larger tubercles may be present on most plates of a single ambulacral column and smaller tubercles on most plates of the adjacent ambulacral column. No specimen examined had larger tubercles on all aboral plates in any one ambulacrum. Aborally, secondary and miliary tubercles are scattered over the plates, except in the admedian area which is bare, but subambitally they are more numerous. There are one or two secondary tubercles adradial and one to three admedian to the primary tubercle though they do not form conspicuous horizontal rows. Miliary tubercles and some smaller secondary tubercles partially encircle the primary tubercle and some miliaries are present in the pore zone. Median suture slightly sunken aborally, flush with the surface of the test ambitally and below. At the ambitus there are about two ambulacral plates to each interambulacral plate and the ambulacra are about one-third the width of the interambulacra.

Interambulacra: There is a primary tubercle to each plate in a distinct vertical row. Aborally, secondary and miliary tubercles are

scattered, but the admedian area is bare. Ambitally and subambitally several series of secondaries are developed; two of these approach the primary tubercle in size and form distinct vertical rows admedian and adradial to the primary. The adradial series is continuous from the ambitus to the peristome. The admedian series is similarly continuous in large specimens, but may be present on only three or four ambital plates in small specimens. A smaller series of secondary tubercles is developed near the adradial suture on the oral surface and there may be two or three adradial tubercles on the lower five

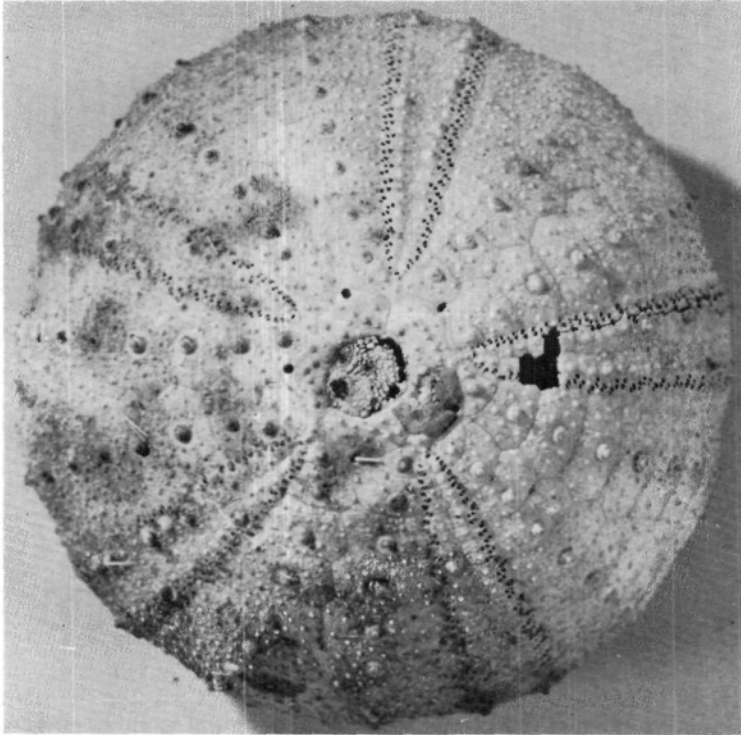


FIG. 5—*Gracilechinus multidentatus* (H. L. Clark). Cleaned test, in aboral aspect.

to ten plates. An additional admedian secondary tubercle may be present and the plates of the oral surface have distinct horizontal rows of tubercles. Median suture slightly sunken aborally, flush with surface of test ambitally and subambitally.

The apical system has all oculars exsert, the oculars and genitals with small tubercles. The madreporite covers nearly all of genital 2, and is conspicuous. The periproctal membrane lacks spines and the anus is excentric surrounded by small papillate plates.

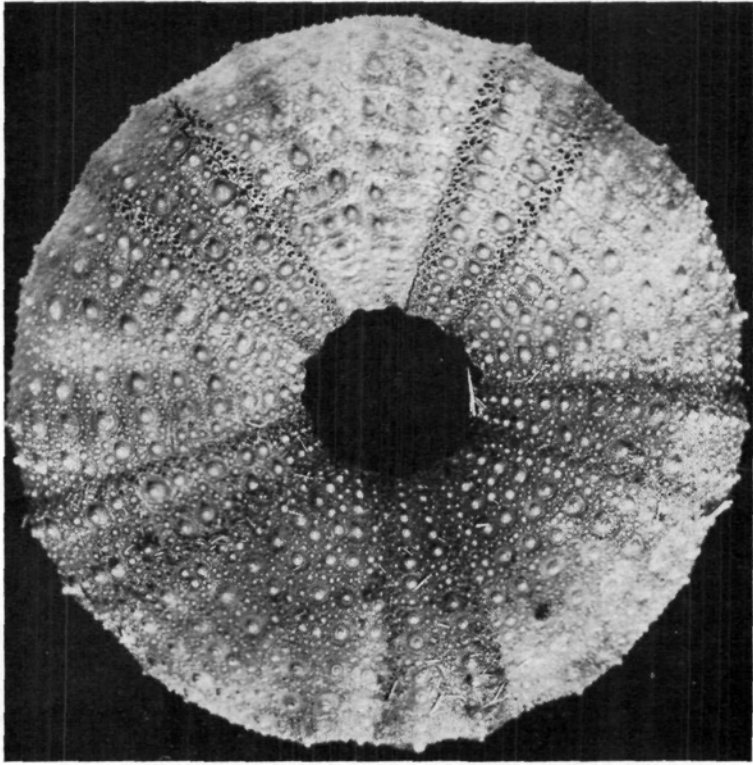


FIG. 6—*Gracilechinus multidentatus* (H. L. Clark). Cleaned test, in adoral aspect.

The buccal plates lack spines but carry numerous ophicephalous and some tridentate pedicellariae.

Ophicephalous and globicephalous pedicellariae are numerous, the rarer tridentate type occurring in a small and large size. The globicephalous pedicellariae have cross-beams linking the sides of the almost tubulose basal piece, and have two to three, sometimes four to five, lateral teeth.

The primary spines are 30 to 35 mm long, with the longest above the ambitus in the interambulacra. The shorter subambital primary and secondary spines, up to 20 mm long, may have the tip or distal third flattened and slightly expanded.

Colour: Living specimens are recorded in field notes as pale cream. Preserved specimens are whitish, cream, pale pink, or dull light brown, one being dull cream with conspicuous dull brown tube-feet. Dried specimens are straw-coloured to light brown and the cleaned test is creamy white.

This species shows considerable variation. The aboral ambulacral tuberculation varies from plate series with mainly large tubercules to plate series with nearly all small tubercules. Adjacent plate series are often completely different. In some specimens the aboral ambulacral plates are raised above the surface of the test and the periproct may be conspicuously inflated or sunken. The shape varies from high subconic forms to lower aborally flattened forms, with V.D. ranging from 45% to 63% of H.D. in the material examined. One deformed test has been examined. It has lost most of the spines in collection, is hemispherical and high, with H.D. 85 mm and V.D. 48 mm. Ambulacra I and III are strongly indented midway between the ambitus and the periproct. Ambulacrum II is apparently absent, although some of the test is missing. Ambulacrum III has a large primary tubercule on every plate while ambulacra I, IV, and V have the tuberculation described above in one plate series, and large tubercules on all plates in the adjacent series. Interambulacra 1, 3, 4, and 5 are more or less normal but in interambulacrum 2, which apparently abuts interambulacrum 1, the plates are large and of irregular size. The apical system is long, narrow, and ovoid, 28 mm \times 18 mm, with the madreporite long, narrow, and high.

MATERIAL EXAMINED

Sta. A 915, 44°25'S, 178°11.5'W, 909 m, 1 small specimen; Sta. D 138, 48°32'S, 168°19.5'E, 658 m, 1 specimen; Sta. E 76, 44°00'S, 178°00'E, 830 m, 19 specimens, fragments; Sta. E 148, 44°30'S, 177°45'W, to 44°30.2'S, 177°45.2'W, 885 m, 1 small specimen; Sta. F 754, 42°48'S, 174°32'E, 1,324 m, numerous specimens; Sta. F 761, 42°33.2'S, 176°23.5'E, 1,234-1,205 m, numerous specimens; Sta. F 767, 41°30.8'S, 176°07'E, 1,205-1,293 m, 1 small specimen.

DIMENSIONS (in mm)

| | Holotype | Studer (1880) | Sta. E 148 | Sta. D 138 | Sta. E. 76 (Fig. 5) |
|---------------|----------|------------------|---------------|---------------|------------------------|
| H.D. | 78 | 10 | 32 | 63 | 97 |
| V.D. | 52 | 5 | 15 | 33 | 58 |
| Apical system | 19 | 4 | 8.5 | 14 | 24 |
| Peristome | 22 | 5 | 10 | 18 | 26 |
| No. of plates | | | | | |
| A | 34 | 10-11 | 20 | 22 | 39 |
| IA | 16 | 8-9 | 14 | 15 | 21 |

REMARKS

H. L. Clark (1925) has described the ambulacra of this species as having "primary tubercules present on every second or third plate except orally where they may occur on two in succession". Until now the single specimen known had been referred to *Gracilechinus acutus* (Lamarck) by A. Agassiz (1881), to *G. affinis* (Mortensen) by Mor-

tensen (1903), and to *G. multidentatus* (H. L. Clark) by H. L. Clark (1925) and Mortensen (1943). Fell and Pawson (*in* Moore 1966) have restricted *Echinus* Linne and defined the new genus *Gracilechinus*; the original description of this species clearly falls into *Echinus* as now restricted. However, Miss A. M. Clark, of the British Museum (Natural History), has kindly examined the holotype of *G. multidentatus* and informs me that the primary ambulacral tuberculation is similar to that in the present material, and this is the only significant difference between the original description and Mortensen's comments (1943), and the material now at hand.

Definite records of this species are from *Challenger* Station 170, near the Kermadec Islands (the type locality), off the southern Wairarapa coast, on the Chatham Rise, and on the northern Campbell Plateau in depths of 658 to 1,326 metres. Studer (1880, p. 875) recorded a juvenile echinid from 35°21'S, 174°40'E, 1,092 m (north-east of Great Barrier Island) which Mortensen (1943, p. 89) suggests may be *G. multidentatus*. The present records support this possibility.

Order HOLASTEROIDA

Family POURTALESIIDAE

Pourtalesia laguncula A. Agassiz

(Fig. 7)

Pourtalesia laguncula A. Agassiz, 1879: 205.

Pourtalesia laguncula A. Agassiz, 1881:137-8. Pls XXIIa (7-15), XXXa (1-6), XXXIX (35), XL (61-2), XLI (53).

Pourtalesia laguncula Mortensen, 1907: 67-8. Pl. XI (12-13).

Pourtalesia laguncula Mortensen, 1951a: 147-9.

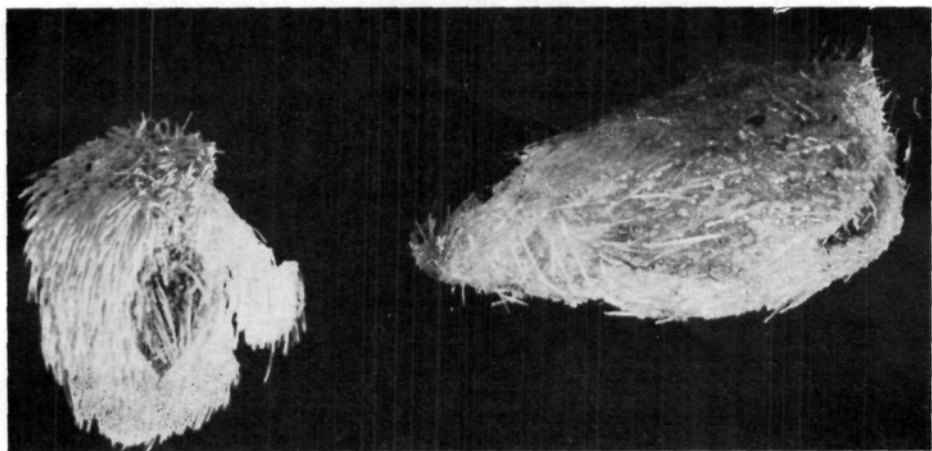


FIG. 7—*Pourtalesia laguncula* A. Agassiz (right). In oblique lateral aspect. *Echinocardium* sp. (left). Fragment in aboral aspect.

MATERIAL EXAMINED

Sta. F 125, 48°32'S, 177°59'E, 1,052 m, 1 fragment; Sta. F 752, 45°25'S, 174°30'E, 1,225–1,236 m, 1 specimen, 1 fragment.

REMARKS

The sole specimen is partially crushed. It measures 16 mm in length, 7.5 mm in width, and 8 mm in height. The test is thin and delicate, elongate and ovoid in cross section, not flattened above or below. The anterior end is obliquely truncate and grooved, the posterior end is produced into a broad subanal rostrum elevated distally, and the distal portion is almost completely covered by a broad subanal fasciole. The mouth and apical system are anterior, and the periproct is aboral, partially hidden by a distinct hood. There are four genital pores, the genital plates are more or less coalesced. The ambulacral plates are all simple and uniporous. The tubercules are perforate and crenulate, the longest spines are about 2 mm in length, and are nearly all broken; a few have the distal end flattened and widened. Mortensen (1951a, pp. 141–2) lists four species of *Pourtalesia* with an elevated subanal rostrum and a hooded periproct but of these only *P. laguncula* A. Agassiz agrees in having the test margins not parallel, the width about one-half of the length, the subanal rostrum broad, and the plastron not keeled. This species was originally recorded from New Zealand waters (*Challenger* Stations 168 and 169) by A. Agassiz (1881), but Mortensen (1951a, p. 149) considered these records to be unreliable, and the species was not listed by Fell (1958). Other definite records of this species are from Malayan and Japanese seas in depths of 220 to 1,370 m.

Order SPATANGOIDA

Family HEMIASTERIDAE

Hemiaster expergitus gibbosus A. Agassiz (Fig. 8)

Hemiaster gibbosus A. Agassiz, 1879: 210.

Hemiaster gibbosus A. Agassiz, 1881: 184. Pls XX (5–16, 22), XXIX (16).

Hemiaster expergitus var. *gibbosus* Mortensen, 1907: 102–4. Text-fig. 19. Pl. XV (42, 46).

Hemiaster expergitus gibbosus Mortensen, 1951a: 389.

MATERIAL EXAMINED

Sta. C 693, 42°32.2'S, 173°40.4'E, 878 m, 4 broken specimens; Sta. E 417, 45°12'S, 171°49'E, 827–856 m, fragments; Sta. E 437, 42°13'S, 174°33'E, 1,961–1,843 m, fragments; Sta. E 438, 41°37.5'S, 174°53'E, 966–1,061 m, 5 fragmented specimens; Sta. E 753, 41°46.2'S, 175°15'E, 1,075–1,229 m, 1 specimen; Sta. F 99, 48°32'S, 168°54.5'E, 695 m, fragments; Sta. F 753, 44°45'S, 174°30'E, 790–860 m, 9 fragmented specimens; Sta. F 755, 43°00'S, 174°30'E, 713–728 m, fragments; Sta. F 760, 42°45'S, 176°30'E, 702–710 m, fragments.

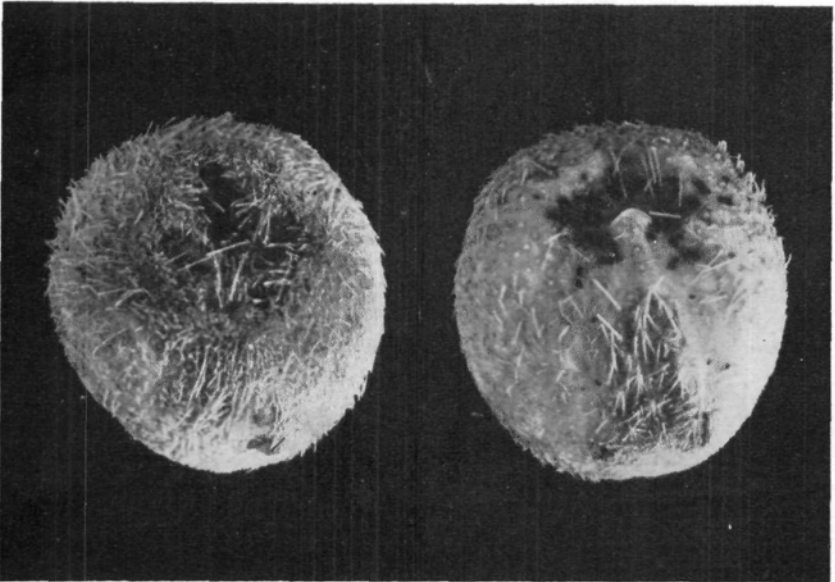


FIG. 8—*Hemiaster expergitus gibbosus* A. Agassiz. In aboral and adoral aspects.

REMARKS

The material examined ranges from 5 mm to 23 mm in length and is mostly fragmentary. The test is small and fragile, rounded in outline, nearly as wide as long, high and vertically truncate at the posterior end. It is highest posteriorly. There is only a faint indication of a frontal notch. The peristome is anterior and the periproct is placed high up on the more or less vertical posterior end. The plastron is short and broad. The peripetalous fasciole forms an ovoid figure on the aboral surface around the petals, close to their distal ends and it does not approach the ambitus. The petals are well developed, more or less straight, the posterior pair about one-third the length of the anterior pair. The tube feet of the frontal ambulacrum terminate in a relatively large disc. The apical system is central, ethmophract with four genital pores.

The colour (ex alcohol) is light brown with the peripetalous fasciole light green.

This subspecies has been previously reported from Malayan and Japanese seas in depths of 450 to 1,850 m. Mortensen (1951a, p. 388) has distinguished it from *Hemiaster expergitus* Loven, which occurs in the North Atlantic Ocean in depths of 950 to 3,200 metres, solely on the grounds of its geographic distribution. Within the New Zealand fauna the only species likely to be confused with *Hemiaster* is fragmentary *Brissopsis oldhami* Alcock. The two species may occur in

the same sample. In *Brissopsis* the peripetalous fasciole is relatively narrower, red-brown or brown in colour, and bends towards the apical system between the petals.

Family BRISSIDAE

Gymnopatagus magnus A. Agassiz and H. L. Clark (Fig. 9)

Gymnopatagus magnus A. Agassiz and H. L. Clark, 1907: 133.

Gymnopatagus magnus H. L. Clark, 1917: 231. Pls 146 (13), 159 (1).

Gymnopatagus magnus Mortensen, 1951b: 447-9. Pls XXVI (7-9), XXVII (8-10), LXI (19-26).

Gymnopatagus sewelli Koehler, 1914: 98-105. Pls XIII (1-7), XIX (51-60).

MATERIAL EXAMINED

Sta. D 221, 40°06'S, 171°16'E, 686 m, fragments; Sta. D 224, 40°47'S, 169°41'E, 803 m, fragments; Sta. D 227, 39°50'S, 169°43'E, 750 m, 1 specimen, fragments; Sta. D 229, 38°37'S, 170°56'E, 885 m, 5 fragmented specimens; Sta. D 231, 38°10'S, 170°21'E, 863-860 m, 16 specimens, mostly fragmented; Sta. D 231, 37°53'S, 169°45'E, 772 m, 21 specimens, mostly fragmented; Sta. D 237, 38°02'S, 167°42'E, 673 m, fragments.

REMARKS

The test is fragile, low, elliptical in outline, the frontal notch wide and moderately shallow aborally. The posterior end is obliquely truncate, the aboral surface proximal. Large primary tubercles occur within the peripetalous fasciole in all interambulacra, but aborally only spinules are found elsewhere. The subanal fasciole is more or less heart shaped. The presence of two fascioles and the aboral tuberculation distinguish it from all other spatangoids known from New Zealand waters. The test is buff in colour with the fascioles light brown. In New Zealand waters it is recorded only from the Challenger Plateau, i.e. the broad, shallow, southern portion of the Lord Howe Rise which abuts the western continental shelf in central New Zealand waters, and whose outer margin is more or less circumscribed by the 1,000 metre isobath. *G. magnus* is also known from Japan, the Philippine and Celebes Islands, and the Indian Ocean in 780 to 1,730 metres.

Family SPATANGIDAE

Spatangus mathesoni n.sp. (Figs 10-12)

DESCRIPTION

Test inflated cordiform with a deep frontal notch and a shallow notch in the test margin of the postero-lateral interambulacra. Transversely

truncate posteriorly, the posterior end sloping slightly obliquely forwards. Periproct terminal, not overhung by an anal rostrum, not visible from above or below. Subanal fasciole reniform or transversely ovoid with a median anterior point; one-half to three-quarters as long as wide.

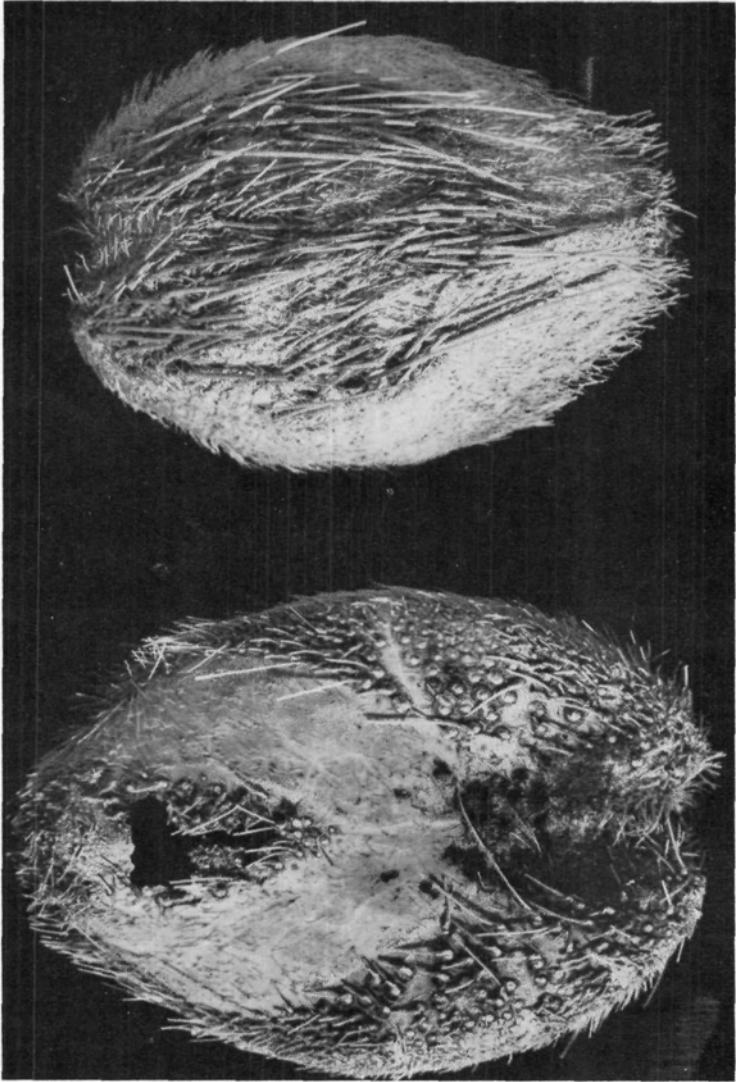


FIG. 9—*Gymnopatagus magnus* A. Agassiz and H. L. Clark. In aboral and adoral aspects.

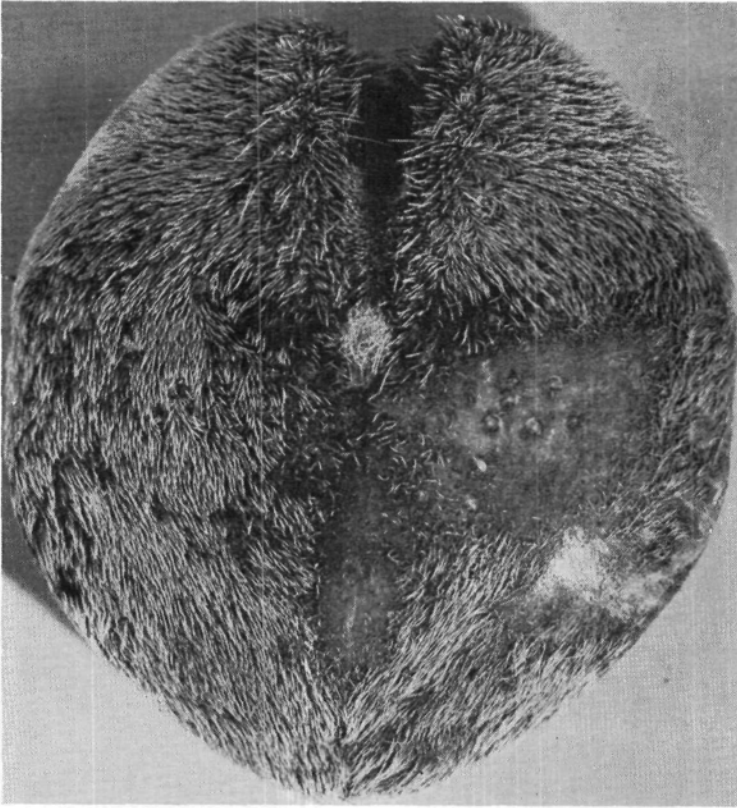


FIG. 10—*Spatangus mathesoni* n.sp. Holotype, in aboral aspect.

On the upper surface the postero-lateral ambulacra have six to eight enlarged sunken tubercles in two converging series, the tubercles being placed on the upper admedian corners of the plates and restricted to the area within the petals.

The unpaired posterior ambulacrum has eight or nine similar tubercles in two more or less parallel series placed on the upper admedian corners of the plates and adjacent to the median suture.

Smaller sunken tubercles are present in the antero-lateral interambulacra. The plate-series abutting the frontal ambulacrum has these tubercles on the upper part of the plate, and the lower edge of the tuberculated area runs diagonally across the plate from the lower admedian to the upper adradial corner leaving the lower part of the plate bare. The first six to eight adapical plates of the plate-series abutting the antero-lateral ambulacra are bare, and the plates below these have from one to four sunken tubercles near their upper admedian corners, the number increasing ambitally. These tubercles

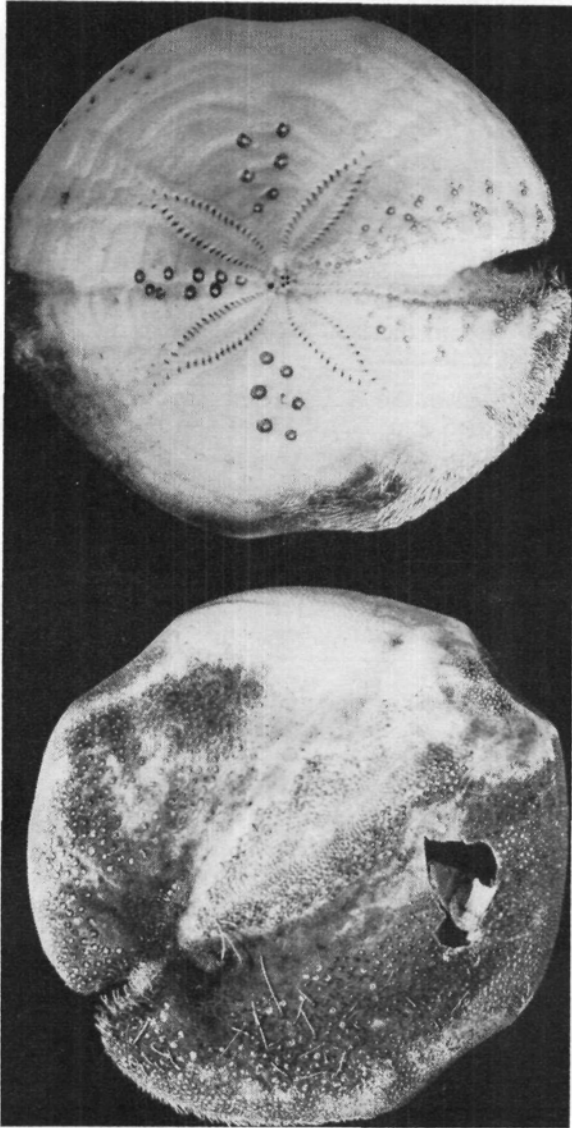


FIG. 11—*Spatangus mathesoni* n.sp. Cleaned paratype, in aboral and adoral aspects.

are larger than those in the adjacent interambulacral plate-series which about the frontal ambulacrum but are less than half as large as those in the postero-lateral and posterior unpaired interambulacra.

The upper surface is covered by a dense coating of short spinules; below, the spinules are longer though not dense, except on the plastron.

COLOUR: Deep reddish-brown, purple in preserved material.

MATERIAL EXAMINED

Sta. D 221, 40°06'S, 171°16'E, 686 m, 2 fragments; Sta. D 224, 40°47'S, 169°41'E, 903 m, 1 specimen (partially fragmented); Sta. D 226, 39°54'S, 168°40'E, 823 m, 1 specimen; Sta. D 231, 37°53'S, 169°45'E, 772 m, 2 specimens (1 partially fragmented).

Holotype: Deposited in the N.Z. Oceanographic Institute. Sta. D 226, No. 27, 102 x 93 x 46 mm.

Paratypes: Deposited in the N.Z. Oceanographic Institute. Sta. D 231, No. P 42, 94 x 90 x 45 mm; No. P 43, 99 x 91 mm (broken adorally).

REMARKS

The shape of the subanal fasciole varies. In the holotype it is transverse oval with a median anterior point, about one-half as long as wide. In one paratype (P 42) it is reniform, about three-quarters as long as wide. This paratype specimen is slightly higher than the other material.

In the frontal groove of the holotype were several small bivalve molluscs attached to the spines. These have been provisionally identified as *Coriareus* sp.

Spatangus mathesoni is intermediate in the aboral tuberculation between those species with none or few tubercles in the postero-lateral interambulacra (e.g. *S. paurituberculatus*, *S. inermis*) and those with twelve or more tubercles in these interambulacra (e.g. *S. lutkeni*, *S. pallidus*). It is therefore clearly separated from all other members of the genus (Fell 1963: 6, keys all recent species). It is readily distinguished from other members of the genus occurring in local waters. *S. multispinus* Mortensen has numerous aboral tubercles in all interambulacra which are apparent even in a specimen only 28 mm in length examined by the author. *S. beryl* Fell has one or two enlarged tubercles in the postero-lateral interambulacra and *S. thor* Fell has twelve, in a zig-zag series. In both species the tubercles are barely sunken or not sunken at all, and the periproct is subambital. All specimens examined are from the Challenger Plateau, and the species is named for Captain R. Matheson, master of the m.v. *Taranui*.

Small partial specimens of *Spatangus* (Fig. 12), 40 to 50 mm in length, from off Cape Palliser and the southern Wairarapa coast, have been examined. They differ from the above description in having

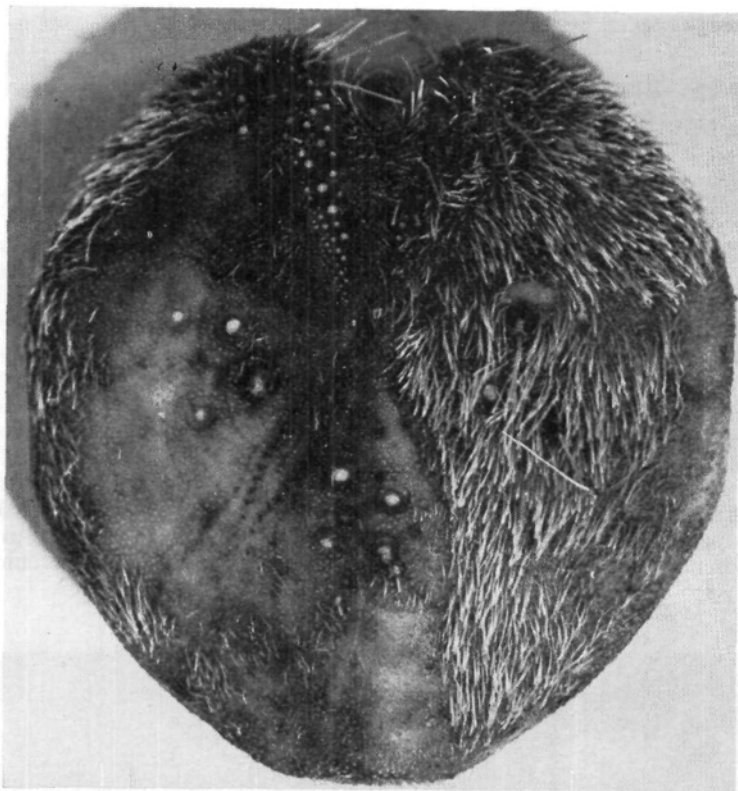


FIG. 12—*Spatangus* sp. (cf. *S. mathesoni* n.sp.). In aboral aspect.

three to five enlarged sunken tubercles in the postero-lateral interambulacra and four to eight in the posterior unpaired interambulacrum. The test is relatively longer and the frontal notch relatively shallower. The posterior end is vertically truncate and the subanal fasciole in the only partly complete specimen is transversely ovoid. Genital pores are not evident in two specimens 40 mm in length but are developed in three specimens 46 mm to 50 mm in length. The smallest specimen of *S. mathesoni* examined is incomplete, but is about 68 mm in length; genital pores are developed and the aboral tuberculation is similar to that of the type material. A suitable range of material may unite the two forms or it may show sufficient stability of the aboral tuberculation to separate them as distinct though closely related species.

MATERIAL EXAMINED

Sta. E 753, 41°46.2'S, 175°15'E, 1,075–1,229 m, 2 broken specimens; Sta. F 764, 41°05'S, 176°37.5'E, 999–1,030 m, 3 broken specimens.

Spatangus sp.

(Fig. 13)

MATERIAL EXAMINED

Sta. B 312, 39°23'S, 171°35'E, 644 m, fragments.

REMARKS

The material consists of several small fragments and three larger ones, covered with dense short spinules, some with attached remnants of the internal organs. It is light brown in colour (ex alcohol). One larger fragment is from the ambital antero-lateral interambulacrum and indicates that a frontal notch is present. The other two larger fragments are from the postero-lateral interambulacra. The fragment from the left postero-lateral interambulacrum has eleven enlarged sunken tubercles in a zig-zag series, much more crowded than in typical *S. thor* Fell (Fell 1963, Pls 3, 5, fig. 12). The fragment from the right postero-lateral interambulacrum has nine enlarged sunken tubercles in a more or less zig-zag series. While it has not been possible to reconstruct the test, the general shape deduced from the fragments is consistent with *S. thor*. The arrangement of tubercles in

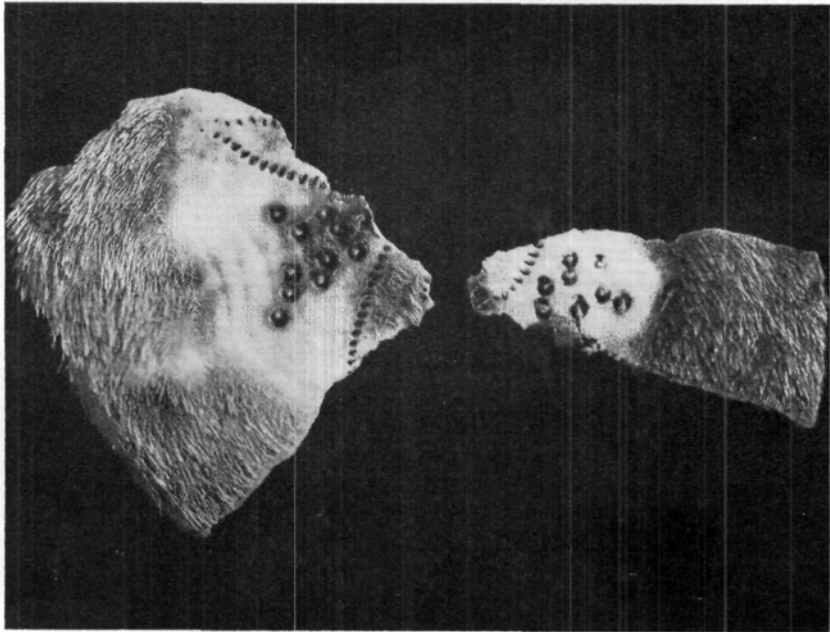


FIG. 13—*Spatangus* sp. (possible hybrid *S. thor* × *S. mathesoni*). Partially cleaned test fragments from postero-lateral interambulacra, in aboral aspect.

the postero-lateral interambulacra differs from that described by Fell. The sunken nature of the tubercles is similar to that in *S. mathesoni*. A suspected hybrid, *S. thor* × *S. beryl* is described and illustrated by Fell (1963, p. 7, Pl. 5, fig. 14) and it is possible that these fragments represent a further hybrid, *S. thor* × *S. mathesoni*.

Family LOVENIIDAE

Echinocardium sp.

(Fig. 7)

MATERIAL EXAMINED

Sta. C 602, 43°13.2'S, 176°40.3'E, 285 m, fragments of three specimens.

REMARKS

The fragments are all small; the largest measures 8 mm in length and 7 mm in width. No specimen has aboral and oral surfaces complete and no reconstruction of a test has been possible. An internal and subanal fasciole and the lack of large internal ampullae on the few primary tubercles indicate the genus *Echinocardium*.

The frontal edge of the test is high, possibly nearly vertical, with only a faint indication of a frontal notch. The frontal ambulacrum is not sunken or raised and the pores are in a single regular series. The relative lengths of the antero-lateral and postero-lateral petals cannot be determined but the outer pore-pairs are not confluent. The internal fasciole is ovoid, pointed posteriorly, and does not come near the ambitus, enclosing only about one-third the length of the broken test. Aboral primary tubercles occur within the internal fasciole and a few also border the frontal ambulacrum. There are four genital pores and the madreporite extends to just past the posterior oculars and separates them.

Echinocardium cordatum (Pennant), the only other New Zealand representative of the genus, differs in having a distinct frontal notch, a sunken frontal ambulacrum with the pores in a crowded series, and the outer pores of the lateral ambulacra more or less confluent adapically. These features are apparent in all specimens, including juveniles, examined by the author. An examination of the distribution of *E. cordatum* (McKnight, in press) shows that all records are more or less confined to the New Zealand continental shelf with over 50% of the recorded specimens occurring in depths of less than 50 m and only 3% in depths greater than the shelf edge. The latter are from regions of steep local bathymetry where species may be expected to "tumble" down the steep submarine slopes. *E. cordatum* has not been found at the Chatham Islands or at the Auckland or Campbell Islands where suitable sediments have been sampled.

The general shape of the fragments suggests a rounded test, high frontally. These features and the not-sunken frontal ambulacrum indicate a similarity with *Echinocardium keiense* Mortensen from eastern Indonesian waters.

ACKNOWLEDGMENTS

The material discussed was collected during New Zealand Oceanographic Institute investigations on HMNZS *Endeavour* and m.v. *Taranui*. Photographic illustrations were made by Mr J. J. Whalan, Information Service, D.S.I.R. Miss A. M. Clark of the British Museum (Natural History) kindly sent valuable notes on the holotype of *Gracilechinus multidentatus* (H. L. Clark).

REFERENCES

- AGASSIZ, A. 1879: Preliminary report on the *Challenger* echini. *Proc. Am. Acad. Arts Sci.* 14: 190-212.
- 1881: Report on the Echinoidea. *Rep. scient. Results explor. Voy. Challenger. Zoology* 3 (9): i-vii, 1-321; 45 pls.
- AGASSIZ, A. and CLARK, H. L. 1907: Preliminary report on the echini. *Bull. Mus. comp. Zool. Harv.* 51 (5): 109-39.
- CLARK, H. L. 1917: Hawaiian and other Pacific echini. *Mem. Mus. comp. Zool. Harv.* 46 (2): 81-283, pls 144-61.
- 1925: "Catalogue of the Recent Sea-urchins (Echinoidea) in the collection of the British Museum (Natural History)." xxviii and 250 pp. 12 pls.
- FELL, H. B. 1958: Deep-sea echinoderms of New Zealand. *Zoology Pubs Vict. Univ., Wellington*, 24. 40 pp. 5 pls.
- 1963: The spatangid echinoids of New Zealand. *Ibid.*, 32. 8 pp. 6 pls.
- KOEHLER, R. 1914: "Spatangides: Echinodermata of the Indian Museum," Pt. 8. 258 pp. 20 pls.
- MCKNIGHT, D. G. (in press): An outline distribution of the New Zealand shelf fauna: The Echinoidea. *Bull. N.Z. Dep. scient. ind. Res.*
- MOORE, R. C. (Ed.) 1966: "Treatise on Invertebrate Paleontology," Pt U, Echinodermata 3. 2 vols. XXX + 695 pp. 534 text-figs. Geol. Soc. Amer. and Univ. Kansas Press.
- MORTENSEN, TH. 1903: "The Danish Ingolf-Expedition." Vol. 4 (1). Echinoidea (1). 193 pp. 21 pls. 1 map.
- 1907: *Ibid.*, 4 (2): Echinoidea (2). 200 pp. 19 pls.
- 1943: "A Monograph of the Echinoidea" III (3). Camarodonta II 2 vols. VI + 446 pp. 23 pp. 66 pls.
- 1951a: *Ibid.* V (1). Spatangoida I. VIII + 432 pp. 25 pls.
- 1951b: *Ibid.* V (2). Spatangoida II. 2 vols. VII + 593 pp. 30 pp. 64 pls.
- PAWSON, D. L. 1964: The echinoid genus *Caenopedina* in New Zealand. *Trans. R. Soc. N.Z. Zool.* 5 (5): 63-6. 1 pl.
- STUDER, TH. 1880: Übersicht über die Echinoiden welche während der Reise "Gazelle" um die Erde 1874-76 gesammelt wurden. *Mber. K.-Preuss. Akad. Wiss. Berlin 1880*: 861-85. PIs 1-2.