

# *Odinia* and *Ophidiaster* (Asteroidea) in New Zealand

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## *Abstract*

Two new species of *Odinia* and *Ophidiaster* are described, with a review of known New Zealand species.

THE genus *Ophidiaster* is strongly represented in Australasia, with at least six Australian species; only one specimen has hitherto been recorded from New Zealand. A second species was recently taken off East Cape and is here recorded. *Odinia*, although cosmopolitan, has hitherto been known from Australia by a single species, but has not previously been taken from New Zealand. It is here recorded on the basis of one specimen from off the Chatham Islands.

## Family LINCKIIDAE

### *Ophidiaster* Agassiz, 1835

TYPE SPECIES. *Asterias ophidiana* Lamarck.

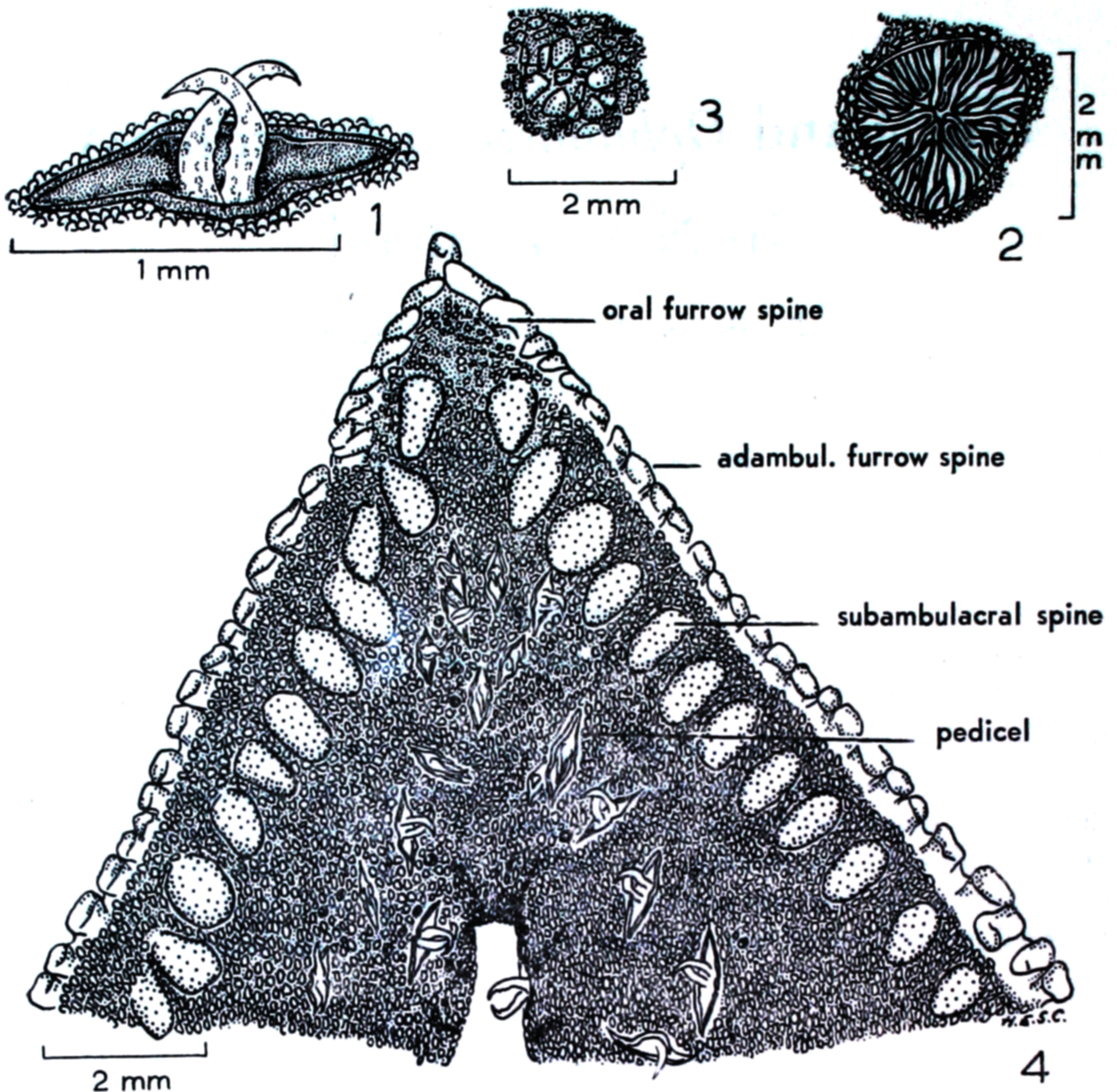
#### KEY TO THE NEW ZEALAND SPECIES

- |   |                             |
|---|-----------------------------|
| 1 (2) Granules present between the adambulacral furrow spines on the surface bordering the furrow ..... | <i>kermadecensis</i> Benham |
| 2 (1) No granules between the adambulacral furrow spines on the surface bordering the furrow .....      | <i>macknighti</i> n. sp.    |

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FIGS. 1-4.—*Ophidiaster macknighti* n. sp. 1.—A typical alveolate (excavate) pedicellaria. 2.—Madreporite. 3.—The anus, protected by a number of enlarged granules. 4.—Portion of actinal surface, showing the oral and adambulacral plates, the arrangement of the pedicellariae and the covering granules which obscure the outlines of the plates.

***Ophidiaster macknighti* n. sp. (Plate 1, figs. 1-4)**

**DIAGNOSIS.** From the small disc, the more or less cylindrical arms taper only in the last fifth of their length and each terminates in a perfectly smooth plate. Each of the eight papular areas contains from two to eight papulae. The pedicellariae are of alveolate (or excavate) type, very distinct and regularly arranged with spindle-shaped alveolae and tapering jaws. No granules occur on the inner furrow surface of the adambulacral furrow spines.

**DESCRIPTION.** The disc is small and slightly convex; the five arms are cylindrical and taper fairly rapidly only in the last fifth of their length, the arm tip being protected by a conspicuous, perfectly smooth, hemispherical plate.

There are two more or less regular series of triangular abactinal plates on each arm and these continue, rather irregularly, onto the disc; both these plates and those of the marginal and actinal series are covered by a thick skin in which are embedded numerous, small, irregularly-shaped and irregularly-arranged pin-head-like granules, all of similar size, which totally obscure the outlines of the plates; near the arm tips, however, the granules may be absent and the bare plates visible.

The alveolate (or excavate) pedicellariae (Fig. 1) are conspicuous and slightly raised, occurring in longitudinal rows between the plates of the arms, margins and actinal surfaces; on the disc the arrangement is irregular. These pedicellariae are arranged regularly in pairs, the members of a pair being placed beside each other or slightly at an angle; the alveolae are spindle-shaped (about 1 to 1.5 mm long) with often a distinct constriction in the centre, the bevelled margin is smooth. The jaws of these pedicellariae are broad basally but taper to a narrow beak-like hyaline tip bearing one or several fine teeth; in general the blades are erect with the beaks meeting or over-lapping, when not erect the beaks probably lie flat in the narrow pointed tip of the alveolae. Towards the arm tips the blades of the pedicellariae are small and inconspicuous.

From two to eight distinct papulae occur between the members of a pair of pedicellariae; these are most numerous mid-way along the arm, becoming few and indistinct near the arm tip; these are also present between the pedicellariae of the disc and the marginal and actinal plates.

The madreporite (Fig. 2), nearer the edge than the centre of the disc, is almost oblong (about 2 mm by 1.5 mm), flat, finely dissected and almost completely surrounded by a naked fold of skin.

Centrally on the disc the anus is surrounded by about 12 distinct, large, irregularly shaped granules (Fig. 3).

Both series of marginal plates are well developed, from 35 to 36 extending from the base of the arm to the tip; distally the plates are oblong, proximally they are triangular or quadrate lying more or less opposite each other. Pedicellariae and papulae occur between the supero- and infero-marginal plates.

The actinal areas are distinctive (Fig. 4) with pedicellariae and papulae similar to those of the abactinal surface, except in the interradial regions where there are from five to seven pedicellariae with their long axis directed towards the interradial angle.

No granules occur on the furrow face of the adambulacral furrow spines; each adambulacral plate bears two round-tipped, upright furrow spines which form a sturdy palisade bordering the grooves. Proximally, each plate bears a single, sturdy, round-tipped, almost convex, usually sessile subambulacral spine

which lies at a slight angle to the furrow spine; distally these subambulacral spines are absent from every second plate, and near the arm tip they are even more indistinct, smaller and sometimes upright. Granules, similar to those found abactinally, occur between the subambulacral and furrow spines.

Within the narrow, deep ambulacral grooves the tube feet are biserially arranged with distinct sucking discs.

It is difficult to determine the exact limits of the oral plates; there are apparently four furrow spines similar to those of the adambulacral plates and one larger suboral spine similar to the subambulacrals.

COLOUR. In colour photographs of the living animal taken by Mr J. S. Bullivant the abactinal surface appears orange with darker chocolate-brown blotches, the whole being rather reminiscent of snakeskin. The actinal surface is similar, but the brown markings do not extend beyond the actinal papulae and pedicellariae; the adambulacral armature and mouth plates are orange.

DISCUSSION. This new species is easily distinguished from the only other New Zealand species *O. kermadecensis* Benham, by the absence of granules between the adambulacral spines on the inner surface of the furrow; further differences occur in the arrangement and form of the pedicellariae. Although this new species is very distinct, it shows some affinities to *O. lorioli* Fisher and *O. rhabdotus* Fisher both from the Hawaiian Islands, however the present specimen differs from the former in the structure of the pedicellariae and in having only one madreporite, and from the latter in details of the adambulacral armature and in having the arms less distinctly fluted. It also shows similarities to the Torres Strait species, *O. lioderma*, but differs in having fewer papulae, a small terminal plate without tubercles and more regularly arranged pedicellariae, the blades of which vary considerably. This specimen is named for Mr D. G. MacKnight, who collected it.

MATERIAL EXAMINED. 1 specimen from off East Cape; 37° 40' S, 178° 56.4' E (N.Z. Oceanographic Institute, Wellington, Station No. C 814), 112-84 fa.

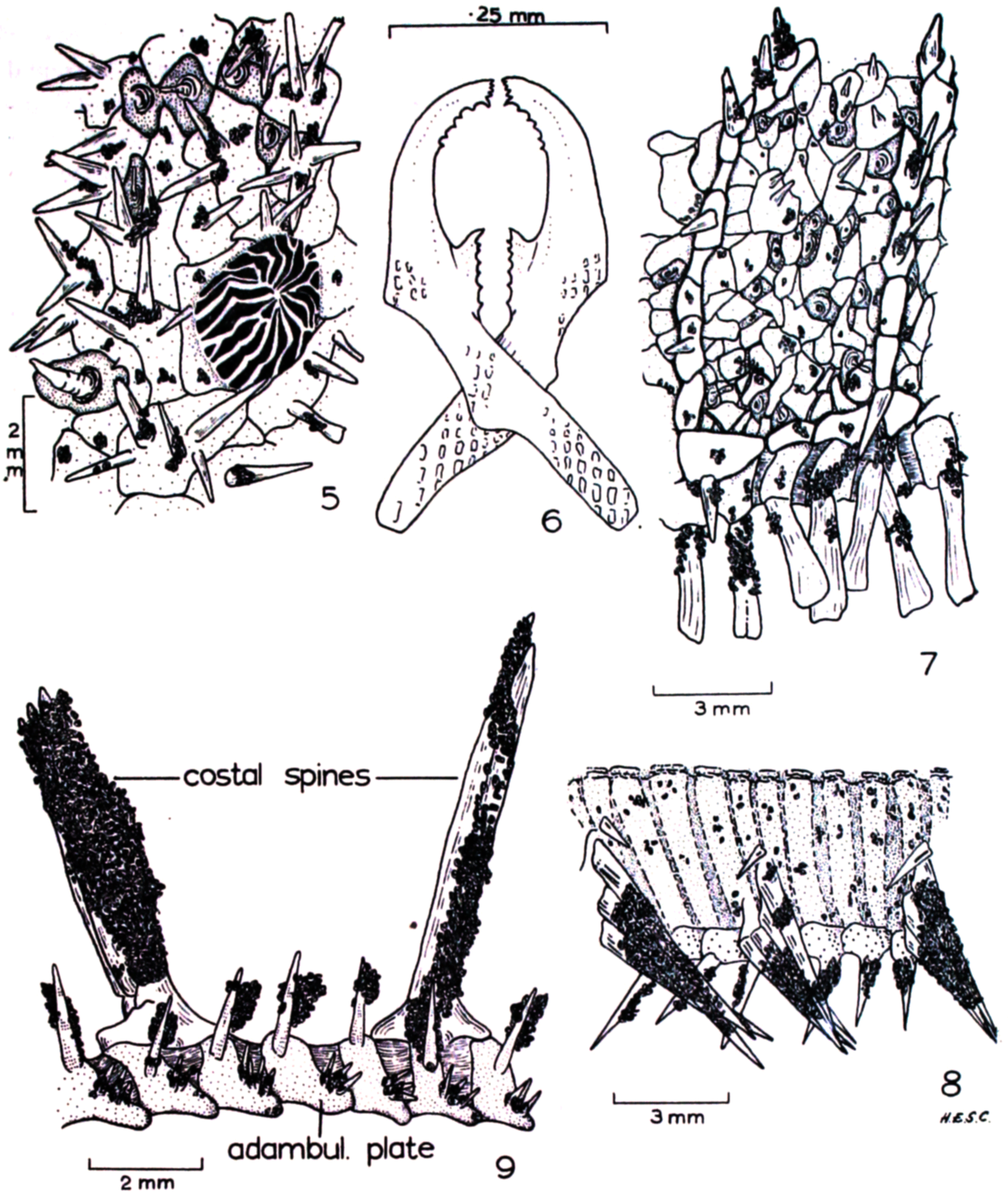
HOLOTYPE. In the collection of the Oceanographic Institute, Wellington, N.Z. Holotype Number: 8.

R = 70 mm, r = 8 mm.

Family BRISINGIDAE

*Odinia* Perrier, 1885

TYPE SPECIES. *Odinia semicoronata* Perrier, 1885.



FIGS. 5-9.—*Odinia novaezelandiae* n. sp. 5.—Portion of abactinal surface of disc, showing the raised madreporite, irregularly shaped plates, spines, pedicellariae and papulae. 6.—Crossed pedicellaria. 7.—Portion of genital inflation near the disc, showing the costae and adambulacral spines and pedicellariae. 8.—Portion of arm, beyond the genital inflation, in lateral aspect, showing the intercostal plates. 9.—Portion of arm near the tip, showing the adambulacral plates and the very conspicuous, elongate costal spines.

***Odinia novaezelandiae* n. sp. (Plate 2, figs. 5-14)**

**DIAGNOSIS.** The disc is small and the single, small madreporite is marginal in position. The 18 arms are long and tapering with conspicuous genital inflations proximally; the adambulacral plates have a distinct series of three or four slender spines and one large subambulacral spine. Crossed pedicellariae are very numerous and of a very characteristic type.

**DESCRIPTION.** The small, oval, more or less flat disc (about 33 by 24 mm) is paved by a close mesh-work of cruciform or irregularly lobed plates; near the margin these are large and sturdy extending as tongues, separated by smaller plates, onto the actinal surface. There is a covering membrane present which obscures the outlines of the plates and extends for some distance up the spines. Each plate bears from one to four or exceptionally five short (1 to 2 mm long) sturdy spines either spaced or in a compact group, occasionally the spines may almost coalesce completely, only the tips being free; these spines rise from a slightly bulbous base, narrow medially and terminate either in a round head or a number (eight or more) of fine spinelets (Fig. 5). Numerous small crossed pedicellariae (Fig. 6) with very distinctive widely separated jaws occur on the plates and spines of both the arms and actinal surface; in the living animal they are probably embedded in the covering membrane.

Single, small, slender papulae occur in the membranous spaces between the plates of the disc (Fig. 5).

The small (about 3 mm) circular madreporite is distinct, raised, marginal in position and dissected by a number of fine deep, radiating grooves (Fig. 5).

The anus is not apparent; no previous descriptions of other species mention an anus and it seems probable that it is not present in this genus.

Of the 18 long (190 to 200 mm) tapering arms only 7 remain attached to the disc. Between the genital inflation and the disc, the arms are joined laterally to each other for 6 or 7 mm; these areas are paved dorsally by small, irregularly shaped plates bearing from 1 to 3 spines which terminate either in a single, sharp, hyaline tip or more usually in a number (up to 7) of fine, needle-like spinelets, single papulae occur between the plates; along the sides of the arms the plates overlap, there are no papular areas and few spines. Crossed pedicellariae are numerous. Distally the inflated genital region rises steeply, the swelling extending for about 36 mm along each arm; these areas are paved by a close mosaic of small, irregularly lobed intercostal plates between which papulae occur and which bear either one or two blunt-tipped spines; pedicellariae, occurring on the surfaces of the plates are embedded in membrane and probably in life this completely hides the spines. Nine or ten distinct costae or ribs of small, oblong, overlapping plates or ossicles (Fig. 7) are present along the inflation, each rising from about the level of every third adambulacral plate, but they are indistinct for the first 10 or 12 mm of the genital inflation. The costal plates adjacent to

the adambulacrals bear from one to three sharp or blunt-tipped spines, proximally these do not exceed 2 or 3 mm in length, but distally, beyond the inflation, they are between 5 and 7 mm long; similar but shorter spines also occur on the intercostal ossicles, giving the area a distinctive and prickly appearance.

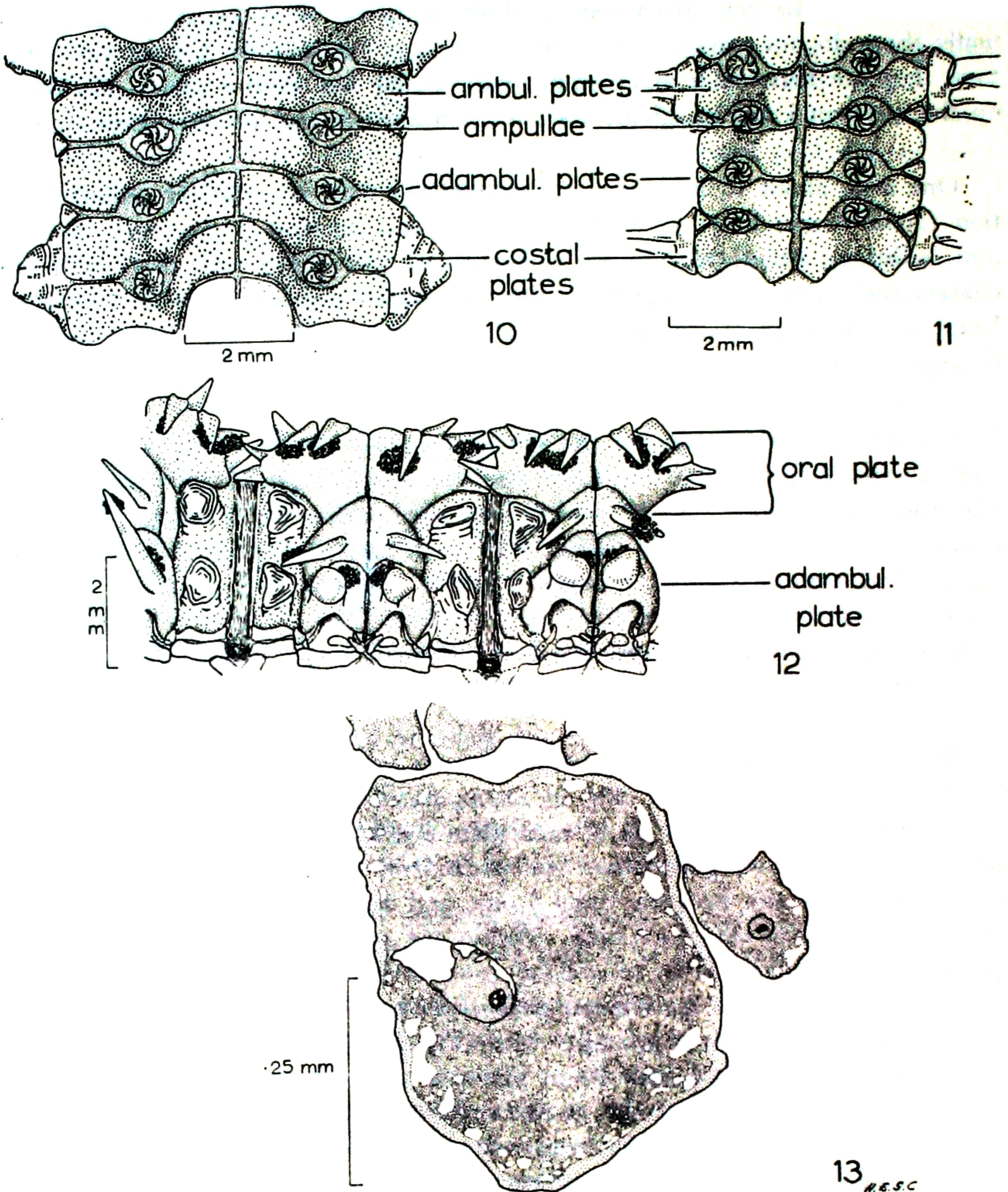
One arm, about 16 mm long, is regenerating; there is a distinct genital inflation (about 8 mm long) on which the costal and intercostal plates are crowded and indistinct; distally the lateral spines of the costae are very short with the characteristic crossed pedicellariae. On the actinal surface only the subambulacral spine is obvious, the furrow spines are either absent or one may be present; the small tube feet are biserially arranged.

Beyond the genital inflation the central elements of the costae become rudimentary and finally absent altogether and the arms are paved by narrow, strap-like intercostal plates (Fig. 8) which join with similar plates along the mid-dorsal line; the lateral costal plates, with from two to five spines persist. The most dorsal spines are small, between 2 and 4 mm long, the remainder may be up to 10 mm long and are often very close together (Fig. 8); distally they decrease in length and the arm tip terminates in a single sharp spine; all these spines are liberally covered with the characteristic crossed pedicellariae.

There is a marked adoral carina of five to seven adambulacral plates. The band-like adambulacral plates (Fig. 9) are separated by distinct muscular intervals; within the furrow the distal tip of each plate overlaps the proximal region of the adjacent plate. Each plate bears one prominent, upright subambulacral spine, measuring proximally, between 4 and 5 mm, and distally seldom exceeding 2 mm; these may be blunt-tipped or bifid. Within the groove from two to four small pointed furrow spines form an oblique row; both these and the subambulacral spines are covered with the characteristic crossed pedicellariae which are slightly larger than those on the abactinal surface (Fig. 9). The arrangement and shape of the adambulacral and ambulacral plates is most obvious when the covering membrane is removed from the abactinal surface (Figs. 10 and 11); near the disc the ambulacral plates are large and stout, distally they are considerably smaller and somewhat different in shape.

The tube feet, each with a single ampulla (Figs. 10 and 11) are regularly biserially arranged, with distinct sucking discs.

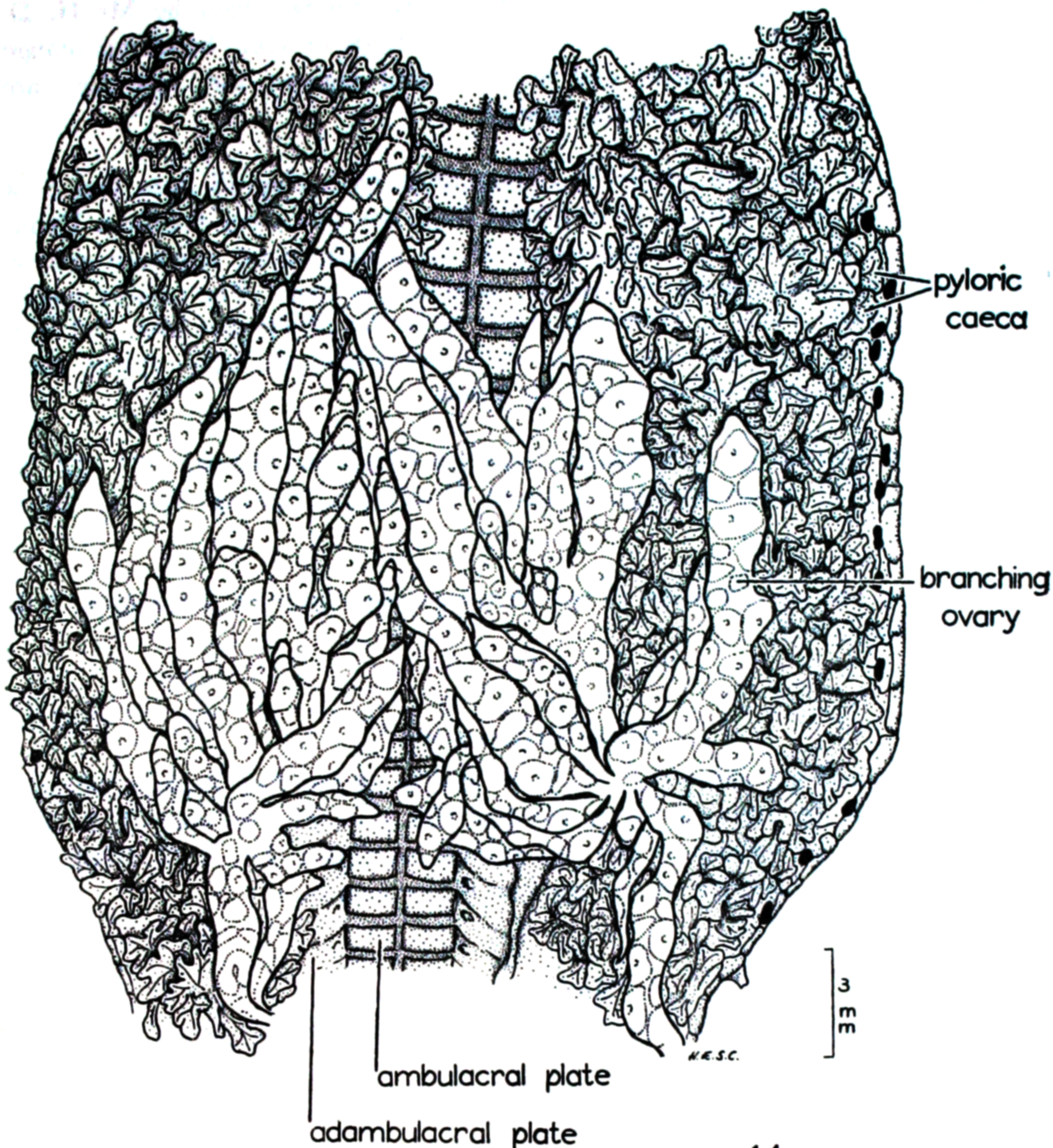
Each small, fan-shaped mouth plate almost meets with that adjacent to it, thus forming a barrier at the base of the furrow. Each plate bears four or five short, almost conical furrow spines with numerous pedicellariae, these may interlock with spines of neighbouring plates; there are no suboral spines. The first adambulacral plate bears only one slender spine (Fig. 12). A distinct cleavage zone for the arms occurs at the level of the second adambulacral plate.



FIGS. 10-13.—*Odinia novaezelandiae* n. sp. 10.—Dorsal aspect, midway along the arm, with the covering membrane removed. 11.—Dorsal aspect of arm, near the tip; the covering membrane has been removed. 12.—Actinal aspect of arm base and disc showing the fan-shaped oral plates and adjacent adambulacral plates. 13.—Sections of oocytes.

**ANATOMY.** The proximal part of the inflated genital region is packed with the long, much branched ovaries which contain oocytes of varying sizes (Fig. 13). These tubules (Fig. 14) join at a point about 5 or 6 mm from the beginning of the genital inflation and are attached to the ridge of the adambulacral plates,





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FIG. 14.—*Odinia novaeseelandiae* n sp. 14.—Dissection of the arm in the region of the genital inflation, showing the packed pyloric caeca, the much branched ovaries, and the adambulacral and ambulacral plates.

the ducts probably open to the exterior but the opening is not apparent. Fisher (1919, p. 508) reports a similar condition in *Odinia magister* from Philippines Seas.

The pyloric caeca (Fig. 14) are small, closely packed masses of tubules, these continue for only a short distance beyond the gonadal inflation and are packed with oil globules and connected to a long axial canal suspended from the body-wall by a mesentery.

COLOUR. In colour photographs of the living animal taken by Mr H. D. O'Kane, the disc and genital inflations are light fawn or grey, becoming orange on the spines and pedicellariae and in the lateral regions; the tube feet are orange-pink and the oral membrane orange.

DISCUSSION. This new species is distinguished by having 18 arms and 3 or 4 adambulacral furrow spines. It is distinct from the only other Southern Hemisphere species, *O. australis*, by differences in the adambulacral armature and by having only one madreporite, whereas *O. australis* has four. The present species seems most closely allied to *Odinia penichra* from the Philippines Seas, but it is distinct in having 18 arms and two or three adambulacral furrow spines, compared with the single spine illustrated by Fisher.

MATERIAL EXAMINED. 1 specimen from off Chatham Islands; 43° 52' S, 175° 20' E (N.Z. Oceanographic Institute, Wellington, Station No. C 618), 625-690m.

HOLOTYPE. In the collection of the Oceanographic Institute, Wellington, N.Z. Holotype Number: 7.

#### ACKNOWLEDGMENTS

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*Ophidiaster macknighti* n. sp. 1.—Abactinal surface. 2.—Actinal surface.  
Photo: M. D. King.



*Odinia novaezelandiae* n. sp. 1.—Abactinal surface. 2.—Actinal surface.

Photo: H. D. O'Kane.