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NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

BULLETIN 139 (2)

Biological Results of The Chatham Islands 1954 Expedition

PART 2

Archibenthal and Littoral Echinoderms

by H. BARRACLOUGH FELL

New Zealand Oceanographic Institute

Memoir No. 5

1960

A beam trawl from Station 7 in 280 fm including two specimens of the starfish, *Persephonaster neozelanicus* Mortensen (*top left*) and a group of echinoids, *Paramaretia multituberculata* Mortensen (*bottom left*).

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FOREWORD

The Chatham Islands 1954 Expedition was organised and led by Prof. G. A. Knox of the Zoology Department of Canterbury University. The expedition was planned to explore the distribution of benthic and pelagic animals between the New Zealand coast and the Chatham Islands over the Chatham Rise, and to investigate the faunal affinities of the Chathams group, which lies in the Sub-tropical Convergence zone.

A substantial grant towards the cost of the expedition was made by the Council for Scientific and Industrial Research on the recommendation of the N.Z. Oceanographic Committee: further financial support was given by Canterbury University, Canterbury Museum, Dominion Museum and Canterbury and Southland Branche of the Royal Society of New Zealand. The expedition was carried out from the M.V. *Alert* under the command of her owner and master, Mr A. J. Black.

The cientific taff wa drawn from the following organisation : Canterbury Museum (R. R. For ter): Canterbury University (G. A. Knox, E. W. Dawson, J. R. MacIntyre): Dominion Mu eum (R. K. Dell, J. M. Moreland); N.Z. Oceanographic In titute (D. M. Garner); Otago University (D. Marshall); Portobello Marine Biological Station (E. J. Batham); Victoria University of Wellington (J. C. Yaldwyn).

Prof. G. A. Knox has been responsible for organisation of the sorting and allocation of material. Type material from the expedition is deposited at Canterbury Museum. Preliminary technical editing of the resulting manuscripts has been carried out by Prof. Knox and Dr D. E. Hurley. Mr M. O'Connor (Information Bureau, D.S.I.R.) has been responsible for final editing.

Further results of the expedition will be published in this series as the examinations of other animal groups are completed.

J. W. BRODIE,
Director,
N.Z. Oceanographic Institute.

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Archibenthal and Littoral Echinoderms of the Chatham Islands

By H. Barraclough Fell, D.Sc., Ph.D. (Edin.)
Victoria University of Wellington,
New Zealand

Abstract

The Chatham Islands echinoderm fauna is now known to comprise 54 species, of which 5 were previously undescribed, 12 were previously unknown from New Zealand, and 31 are new records for the Chatham Islands region. Shallow-water elements show a broad relationship with other faunal sub-regions of New Zealand, from Bay of Plenty to the subantarctic islands. The archibenthal echinoderm fauna cannot be distinguished from that of New Zealand as a whole, and presents striking parallels not only with that of eastern Australia, but also with that of the central Indo-west-Pacific as well as the northern Pacific. It appears no longer feasible to recognise a distinctive Chatham Islands ("Moriorian") echinoderm fauna, since it presents no obvious differences from that of the Cook Strait sub-region in the broad sense.

HISTORICAL

Mortensen in 1925 listed eight species of echinoderms from the Chatham Islands. In 1929 Young added ten further species, making thus a total of 18 if we include (as Young himself did not) those already recorded by Mortensen. Young also included "*Henricia ornata* Perrier"—a name which probably indicates *Henricia lukinsii* (Farquhar), a similar species. A number of species were referred by Young to genera which could not in fact comprehend them, since the generic and specific characters are at variance. Thus, the diplacanthid species *Asterodon miliaris* (Gray) was referred to the monacanthid genus *Odontaster*. It is therefore not certain whether Young had collected *Asterodon miliaris*, or some monacanthid form, such as *Odontaster benhami* (Mortensen), a species which might well be expected to occur at the Chatham Islands. However, in the following check-list it has seemed preferable to accept Young's identifications at their face value, making only the consequential generic amendments. A further five species of ophiuroids were recorded from the Chatham Rise by Fell (1952). So, by 1954 when the present expedition was undertaken, a total of 23 species of echinoderms had been recorded from the Chatham Islands area.

In this report 54 species are recorded, whereof 31 have not previously been taken from the Chatham Islands, and 12 were previously unknown from the New Zealand region (including five species which were undescribed when taken).

ACKNOWLEDGMENTS

I wish to thank Mr George Knox of the University of Canterbury for the opportunity of studying the collection of echinoderms made by the Chatham Islands 1954 Expedition. With his kind permission, brief diagnoses of the new species have already been published (Fell, 1958). Fuller descriptions are given here. Careful colour observations on the living specimens were made by Dr Elizabeth Batham. The photographic illustrations were made by Mr M. King and Mr A. Eady of Victoria University of Wellington.

CHECK-LIST OF SPECIES

Forms new to the Chatham Islands fauna are given in bold-face.

ASTEROIDEA

Astropecten primigenius Mortensen
Plutonaster knoxi Fell
Persephonaster neozelanicus Mortensen
Asterodon miliaris (Gray)
Mediaster sladeni Benham
Hippasteria trojana Fell
Pentagonaster pulchellus Gray
Asterina regularis Verrill
Stegnaster inflatus (Hutton)
Echinaster farquhari Benham
Henricia lukinsii (Farquhar)
Henricia aucklandiae Mortensen
Peribolaster lictor Fell
Crossaster japonicus (Fisher)
Zoroaster spinulosus Fisher
Stichaster australis (Verrill)
Sclerasterias mollis (Hutton)
Allostichaster insignis (Farquhar)
Allostichaster polyplax (M. & T.)
Calvasterias laevigata (Hutton)
Calvasterias suteri (de Loriol)
Cosmasterias dyscrita H. L. Clark
Coscinasterias calamaria (Gray)

OPHIUROIDEA

Astrothorax waitei (Benham)
Ophiomyxa brevirima H. L. Clark
Ophiacantha vepratica Lyman
Ophiactis profundi novaezelandiae Mortensen
Amphiura norae Benham
Amphiura magellanica Ljungman
Amphiura angularis Lyman
Amphiura alba Mortensen
Amphiura heraldica Fell
Amphioplus longirima Fell
Ophiura chathamensis Fell
Ophiuroglypha irrorata (Lyman)
Ophioceres huttoni (Farquhar)
Ophiomisidium irene Fell
Ophiomastus stellamaris Fell
Pectinura maculata Verrill
Pectinura cylindrica Hutton
Pectinura gracilis Mortensen
Ophionereis fasciata Hutton

ECHINOIDEA

Goniocidaris (Aspidocidaris) parasol Fell
Ogmocidaris benhami Mortensen
Phormosoma bursarium Agassiz
Pseudechinus albocinctus (Hutton)
Pseudechinus flemingi Fell
Evechinus chloroticus (Val.)
Apatopygus recens (M.Edw.)
Spatangus multispinus Mortensen
Paramaretia multituberculata Mortensen
Brissopsis oldhami Alcock

HOLOTHUROIDEA

Cucumaria brevidentis (Hutton)
Chirodota gigas Dendy

CRINOIDEA—none.

ZOOGEOGRAPHICAL RELATIONSHIPS

The fact that more than half of the species of echinoderms now known from the Chatham Islands were first collected there by the 1954 expedition gives ground for some caution, for it certainly indicates that the total fauna must be much more extensive. Many species must await discovery in the archibenthal zone. Therefore statistical analysis of the zoogeographical affinities of the echinoderm fauna is not yet warranted. However, certain broad generalisations may be hazarded at this stage.

Firstly, a striking fact has now become obvious, and has been confirmed by more recent work in Cook Strait, namely, that the archibenthal echinoderm faunas of Australia and New Zealand present hitherto unsuspected features in common. The occurrence on both sides of the Tasman Sea of such characteristic forms as *Cosmasterias dyscrita* H. L. Clark and *Paramaretia multituberculata* Mortensen is evidence sufficient to imply that other species which are so far known only from Australia or only from New Zealand, will eventually be found to be part of a common archibenthal fauna of Australasia as a whole.

Secondly, there are present in the archibenthal waters surrounding the Chatham Islands forms such as *Zoroaster spinulosus* Fisher, *Crossaster japonicus* (Fisher), *Phormosoma bursarium* Agassiz and *Brissopsis oldhami* Alcock—species already known from deep waters about Australia and in the central Indo-west-Pacific and north Pacific. This suggests that we are really dealing with a completely generalised archibenthal Pacific fauna, whose outlines overlap the New Zealand submarine plateau. In other words, it is doubtful whether the continental slopes of New Zealand carry a distinctive "New Zealand" echinoderm fauna. The New Zealand elements are probably for the greater part restricted to the relatively narrow continental shelf—save for occasional "strays" which happen to be carried beyond the edge, or tumble into the comparatively steep-sided canyons which intersect the shelf at various points.

Thirdly, as regards the echinoderm fauna of the shelf surrounding the Chatham Islands, this too has now taken on a more generalised New Zealand aspect. It includes forms such as *Astropecten primigenius* Mortensen, previously known only from the northern (Aupourian) sub-region of New Zealand, and *Henricia lukinsii* (Farquhar), previously known only as a subantarctic species inhabiting Auckland Island and Campbell Island.

This generalised New Zealand aspect is also apparent in the archibenthal zone. Thus, *Ophiura chathamensis* Fell is now known from the Bay of Plenty (Fell, 1958) and *Amphiura heraldica* Fell, originally described from the Chatham Rise (Fell, 1952), has now been found off Otago (Fell, 1958). Conversely, other species which were previously known to range the off-shore waters of the New Zealand mainland, have now been found in the Chatham Islands area.

I am no longer able to recognise a distinctive Chatham Islands echinoderm fauna, either on the shelf, or on the continental slope, and feel that the area is best regarded as part of the Cook Strait sub-region, i.e. central New Zealand between 38° and 46° south latitude.

BATHYMETRIC DISTRIBUTION

Full details of the stations have been published by Knox (1957, Table 1). Only condensed station data are included in the following distribution list. The records are arranged in order of increasing depth. Following Knox, the abbreviations used in denoting the nature of the bottom are:

br., brown; bry., bryozoan; c., coarse; f., fine; g., gravel; gn., green; gy., grey; h., hard; m., mud; r., rock; s., sand; sft., soft; sh., shell; st., stones.

Shore collections

Sta. 9, Glory Bay, Pitt Island, 25/1/54.

Ophnonereis fasciata Hutton

Evechinus chloroticus (Val.)

Sta. 11, Owenga, 26/1/54.
Asterina regularis Verrill
Coscinasterias calamaria (Gray)
Ophionereis fasciata Hutton
Ophioceres huttoni (Farquhar)

Sta. 16, Kaingaroa, 27/1/54.
Henricia aucklandiae Mortensen
Ophiomyxa brevirima H. L. Clark

Sta. 22, The Sisters, 29/1/54.
Calvasterias suteri (de Loriol)

Sta. 26, Waitangi, 30/1/54.
Henricia aucklandiae Mortensen
Allostichaster polyplax (M. & T.)
Coscinasterias calamaria (Gray)

Sta. 49, Port Hutt, 8/2/54.
Henricia lukinsii (Farquhar)
Allostichaster insignis (Farquhar)
Allostichaster polyplax (M. & T.)
Ophiomyxa brevirima H. L. Clark
Ophionereis fasciata Hutton
Ophioceres huttoni (Farquhar)

Bottom collections from the shelf

Sta. 46, Kaingaroa, 7/2/54, 3 fm (5 m), f.gy.s.
Amphiura sp. (fragments only)

Sta. 14, S.44°00′ W.176°21′, Hanson Bay, 27/1/54, 15 fm (27 m), c.sh.s. limestone.
Henricia lukinsii (Farquhar)
Amphiura alba Mortensen
Amphiura magellanica Ljungman
Ophionereis fasciata Hutton
Apatopygus recens (M.Edw.)

Sta. 18, S.43°41′, W.176°48′, off Cape Pattison, 28/1/54, 15 fm (27 m), r.
Amphiura magellanica Ljungman
Evechinus chloroticus (Val.)

Sta. 20, S.43°38′, W.176°34·5′, off Cape Young, 28/1/54, 20 fm (37 m), c.sh.s.
Apatopygus recens (M.Edw.)

Sta. 19, S.43°38·2′, W.176°38′, off Cape Young, 28/1/54, 25 fm (46 m), r.
Ophiomyxa brevirima H. L. Clark

Sta. 15, S.43°56′, W.176°18·5′, Hanson Bay, 27/1/54, 30 fm (55 m), f.gy.s.
Amphiura alba Mortensen

Sta. 37, S.44°21·5′, W.176°13′, between South East Island and Pitt Island, 2/2/54, 30 fm (55 m), r.c.sh.s.
Ophiuroglypha irrorata (Lyman)
Pseudechinus flemingi Fell.
Apatopygus recens (M.Edw.)

Sta. 23, S.43°32·5′, W.176°47·5′, N. of The Sisters, 29/1/54, 33 fm (60 m), c.sh.s.
Pectinura maculata (Verrill)
Apatopygus recens (M.Edw.)

Sta. 24, S.43°36·2′, W.176°48·5′, S. of The Sisters, 29/1/54, 38 fm (70 m), c.sh.s.g.
Amphiura magellanica Ljungman

Sta. 3, S.43°10·1′, E.175°36·5′, Mernoo Bank, 23/1/54, 41 fm (75 m), c.bry.sh.s.
Amphiura magellanica Ljungman
Pectinura gracilis Mortensen

Sta. 28, S.43°57′, W.176°47′, Petre Bay, 30/1/54, 50 fm (92 m), f.gy.s.
Pseudechinus flemingi Fell

Sta. 29, S.43°55·5′, W.177°08′, Petre Bay, 31/1/54, 94 fm (172 m), f.gn.s.
Persephonaster neozelanicus Mortensen
Pseudechinus flemingi Fell

Archibenthal collections

Sta. 1, S.42°51·9′, E.175°26·5′, Mernoo Bank, 23/1/54, 100 fm (183 m), c.bry.sh.s.
Persephonaster neozelanicus Mortensen
Astropecten primigenius Mortensen

Sta. 51, S.44°02′, W.177°19′, Chatham Rise, 10/2/54, 125 fm (229 m), f.gn.s.
Mediaster sladeni Benham

Sta. 34, S.44°04′, W.175°23·5′, E. of Forty Fours, 1/2/54, 130 fm (238 m), f.s.g.
Plutonaster knoxi Fell
Peribolaster lictor Fell
Sclerasterias mollis (Hutton)
Cosmasterias dyscrita H. L. Clark
Astrothorax waitei (Benham)
Ophiactis profundi (Lütken & Mortensen)
Ophiomisidium irene Fell
Goniocidaris parasol Fell

Sta. 40, S.45°32′, W.176°05′, S.E. of Pitt Island, 3/2/54, 155 fm (302 m), f.gn.s.
Persephonaster neozelanicus Mortensen
Ophiura chathamensis Fell
Paramaretia multituberculata Mortensen

Sta. 4, S.43·14′, E.176°11′, Chatham Rise, 23/1/54, 200 fm (366 m), f.gn.s.
Amphiura angularis Lyman
Ophiuroglypha irrorata (Sladen)

Sta. 6, S.43°40′, E.179°28′, Chatham Rise, 24/1/54, 220 fm (403 m), f.gy.s.m.
Plutonaster knoxi Fell
Mediaster sladeni Benham
Zoroaster spinulosus Fisher
Hippasteria trojana Fell
Crossaster japonicus (Fisher)
Henricia aucklandiae Mortensen
Ophiuroglypha irrorata (Lyman)
Pseudechinus flemingi Fell
Phormosoma bursarium Agassiz
Spatangus multispinus Mortensen

Sta. 52, S.44°04′, W.178°04′, Chatham Rise, 10/2/54, 260 fm (476 m), f.gn.s.m.
Ophiomyxa duskiensis Fell
Amphiura norae Benham
Ophiuroglypha irrorata (Lyman)
Pseudechinus flemingi Fell
Paramaretia multituberculata Mortensen
Spatangus multispinus Mortensen
Brissopsis oldhami Alcock

Sta. 7, S.43°42′, E.179°55′ Chatham Rise, 24/1/54, 280 fm (512 m), f.gy.s.m.
Plutonaster knoxi Fell
**Persephonaster neozelanicus* Mortensen
Zoroaster spinulosus Fisher
Crossaster japonicus (Fisher)
Henricia aucklandiae Mortensen
Ophiuroglypha irrorata (Lyman)
Paramaretia multituberculata Mortensen
Spatangus multispinus Mortensen

Sta. 59, S.43°38′, E.177°19′, Chatham Rise, 11/2/54, 290 fm (531 m), f.gn.s.m.
Echinaster farquhari Benham
Amphiura norae Benham
Ophiuroglypha irrorata (Lyman)
Ogmocidaris benhami Mortensen
Spatangus multispinus Mortensen

Sta. 5, S.43°32′, E.178°38′, Chatham Rise, 24/1/54, 300+ fm (549+ m), f.gn.s.
Ophiacantha vepratica Lyman
Amphiura norae Benham
Ophiomisidium irene Fell

Sta. 58, S.43°40′, E.177°59′, Chatham Rise, 11/2/54, 320 fm (587 m), f.gn.m.
Mediaster sladeni Benham
Crossaster japonicus (Fisher)
Ophiuroglypha irrorata (Lyman)

Sta. 41, C.44°35·5′, W.176°04′, S.E. of Pitt Island, 3/2/54, 330 fm (604 m), f.gn.m.s.
Plutonaster knoxi Fell
Echinaster farquhari Benham
Ophiuroglypha irrorata (Lyman)
Pseudechinus flemingi Fell
Phormosoma bursarium Agassiz
Spatangus multispinus Mortensen
Brissopsis oldhami Alcock
†*Paramaretia multituberculata* Mortensen

SYSTEMATICS

ASTEROIDEA

Family ASTROPECTINIDAE

Astropecten Gray, 1840

Astropecten primigenius Mortensen

Mortensen, Th. 1925. Vid. Medd. dansk naturh. For. 79: 272–4. Figs. 2–3, pl. 12, figs. 1–2.
Fell, H. B. 1958. Zool. Pub. Victoria Univ. Wgtn. 24: 4.

Material Examined

Sta. 1, Mernoo Bank, 105 fm, 1 specimen; Sta. 2, Mernoo Bank, 61 fm, 2 specimens.

The holotype was described by Mortensen (1925) from 30 fm, off Cuvier Island in the Bay

* Appears in Knox 1957, fig. 7, though not otherwise represented in the collection.
† Appears in a colour photograph taken by Mr G. Knox at this station, though not represented in the collection.

of Plenty. The species has since been recorded from east Otago and from Cook Strait, at depths ranging down to 300 fm (Fell, 1958).

Plutonaster Sladen, 1885

The genus is characterised by its large disc, the intermediate actinal plates being arranged in several series, of which the innermost continue to about the middle of the arm. The marginals of both series are well developed. The furrow spinelets form a comb. Madreporite covered by paxillae. No pedicellariae.

The following species is the only one so far found in Australasian waters.

Plutonaster knoxi Fell. Pl. 1

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 5, pl. 1, fig. C.

Diagnosis

Each marginal plate of both series carries one prominent, robust primary spine, which is surrounded by small spinules or spiniform granules. Adambulacral armature comprising a furrow-comb of about 8 uniform spines, outside of which lies a single large, prominent, subambulacral spine. Actinal intermediate plates carrying 1–3 spines, in addition to a general coating of smaller spinules.

Description

Arms five. R 105 mm, r 33 mm, R = 3·2 r. Breadth of arm at base 33 mm. Arm tapering evenly to an acuminate tip.

Upper surface covered by crowded paxillae which are coarser on the disc than on the arms. Madreporite covered by paxillae which are more widely spaced than elsewhere. Each paxilla comprises about 20–30 slender, thorny spinules of more or less uniform size, the central spinules not differing obviously from the outer ones.

The borders of the abactinal surface are well defined by the conspicuous marginal plates. About 70 marginal plates in either series occupy the interbrachial arch from arm-tip to arm-tip. The proximal few superomarginals are broader than long, those beyond the base of the arm being more or less square, diminishing in size evenly toward the tip of the arm. Every supermarginal carries a single, erect, prominent, pointed primary spine, each spine rather longer than the plate which bears it. The surface of the superomarginals is otherwise rather densely crowded by slender, spiniform granules; on the proximal plates these granules are more elongate, and resemble the spinules of the neighbouring paxillae. Fasciolar grooves well defined between adjacent superomarginals.

The borders of the actinal surface are well defined by the inferomarginals. These plates are about twice as broad as they are long in the proximal part of the ray; beyond, they gradually become more square in outline. Each is armed with a coating of fine spinules, and one erect primary spine, resembling thus the superomarginals.

The actinal intermediate areas are large. The numerous intermediate plates are arranged in linear series, between the adambulacral and inferomarginal plates. At the proximal ends of these series, the intermediate plates correspond in size with the neighbouring adambulacral plates, whilst at the distal ends of the series the intermediate plates match the adjoining inferomarginals. Conspicuous fasciolar grooves lie between these linear series. Each intermediate plate has a coating of small spinules, among which lie from 1 to 3 primary spines. The latter are much smaller than the primary spines of the marginal plates.

The adambulacral plates are armed with a furrow-comb of about 8 uniform spines, outside of which lies a single, large and very conspicuous subambulacral spine. This spine resembles a primary spine of a marginal plate.

Material Examined

Sta. 2, Mernoo Mank, 61 fm, about 20 specimens (mostly fragmented or poorly preserved); Sta. 41, 330 fm, 5 specimens.

Holotype

From Sta. 41. In the Canterbury Museum.

Remarks

The species resembles the North Atlantic *Plutonaster bifrons* (Wyville Thomson), and, like it, is distinguished from other species of the genus by having only a single large spine on each marginal plate of both series. The adambulacral armature also resembles that of *P. bifrons*. The two species are distinguished, how-

ever, by the armature of the actinal intermediate plates. In *P. bifrons* the actinal intermediate plates carry in addition to minute spinules, a single large spine, whereas in *P. knoxi* there are from one to three large spines, these spines intergrading into the coating of spinules in the case of the distal intermediate plates.

Colour in Life

Dr Elizabeth Batham recorded that the specimens from the type locality (Sta. 41) were orange-red aborally, R YR /10, and smaller individuals were a pale yellowish pink. In spirit the specimens fade to a uniform light fawn.

Persephonaster Alcock, 1891

Persephonaster neozelanicus Mortensen

Mortensen, Th. 1925. Vid. Medd. dansk naturh. For. 79: 415, fig. 70.

Material Examined

Sta. 1, Mernoo Bank, 100 fm, 1 specimen; Sta. 40, 155 fm, 2 specimens.

The species was evidently taken also at Sta. 7, 280 fm, for two individuals are visible in a photograph published by Knox (1957, fig. 7). The species is common on the Cook Strait shelf off Cape Campbell, but occasionally ranges into the archibenthal zone. The occurrence in 280 fm at Sta. 7 is the deepest record so far. At this station it was associated with specimens of *Paramaretia multituberculata* Mortensen.

The colour in life is usually a bright salmon-pink above, the marginals paler, the lower surface cream.

Family GONIASTERIDAE

Mediaster Stimpson, 1857

Mediaster sladeni Benham. Pl. 3

Benham, W. B. 1909. Rec. Cant. Mus. 1 (2), pp. 94–7, pl. 7.
Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 10.

Material Examined

Sta. 51, Chatham Rise, 125 fm, 11 specimens; Sta. 58, Chatham Rise, 320 fm, 1 juvenile specimen.

Colour in Life

Aborally pale orange, R YR 7/8, cream below (Dr E. Batham).

The length of the arms varies considerably in this species, as can be seen in the illustration, pl. 3.

M. sladeni has been taken sporadically at stations between Cook Strait and Otago, at depths below about 40 fm, and seems to be rather uncommon.

Hippasteria Gray, 1840

Hippasteria trojana Fell. Pls. 2, 3

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24. p. 11, pl. 1, figs. A, G.

Diagnosis

With conspicuous, naked marginal plates, each carrying a single (or, rarely, two) blunt, erect, conical spine; pedicellariae present on some of the marginal plates. Adambulacral armature including 3 robust furrow-spines, which are flattened at their extremities.

Description

Arms five, R = 105 mm, r 62 mm, R = 1·7 r. Breadth of arm at base, 70 mm. Body pentagonal, inflated, defined by the conspicuous, naked superomarginal plates. Abactinal plates carry a single, erect, conical spine, or a large bivalved pedicellaria, and they are surrounded by smaller platelets or granules.

The superomarginal and inferomarginal plates number 35 or 36 in each series of an interbrachial arc. About half of marginal plates in the proximal region carry one or two large bivalved pedicellariae. Every marginal plate carries an erect, blunt, conical spine; a few plates carry a second spine. Otherwise the marginal plates are completely bare.

The actinal area is large, with numerous conspicuous bivalved pedicellariae, each surrounded by a zone of granules. Parallel to each furrow-margin the pedicellariae form a conspicuous row, on the adjacent actinal intermediate plates.

Adambulacral armature comprising 3 robust furrow-spines, which are flattened at their ex-

tremities; together with 1 to 3 robust, erect, subambulacral spines, and 1 or 2 large pedicellariae. The subambulacral spines and subambulacral pedicellariae are homologues, since the former may be replaced by an equivalent number of the latter.

Material Examined

The unique holotype from Sta. 6, Chatham Rise, 220 fm.

Colour

In life pale orange above, paler cream below (G. Knox); fading in spirit to a uniform fawn colour.

Remarks

H. trojana resembles *H. spinosa armata* Fisher in having naked marginals armed with 1 or 2 spines and pedicellariae, but differs in having 3 furrow-spines (as against a single one in *H. spinosa armata*), and 1–3 subambulacral spines (as against 1 only). From *H. heathi* and *H. falklandica,* both described by Fisher, the New Zealand form is at once distinguished by the marginal plates, which are inconspicuous and granulated in the two species named, and carry up to 5 spines. The species to which *H. trojana* appears most closely related is the one which is most remotely situated, in the Atlantic Ocean, namely *H. phrygiana* (Parelius). Both species have conspicuous marginals; *H. phrygiana* 2–3 furrow-spines, not unlike the condition in *H. trojana.* However, a specimen of *H. phrygiana* in my collection can be distinguished by its blunt, cylindrical furrow-spines, which are not at all flattened distally. *H. phrygiana* also tends to have more than one spine on each marginal plate, whereas this is exceptional in *trojana.* A still more striking difference is the complete absence of pedicellariae from the marginals in *H. phrygiana.* It does seem evident, though surprising, that the New Zealand species is closer to the Atlantic species than to the Pacific or Magellanic ones, and the specific name is intended to draw attention to the resemblance to *H. phrygiana*. The only other species of *Hippasteria* recorded from Australasia is a fossil form, *Hippasteria antiqua* Fell, which was described from upper Cretaceous sediments in Canterbury (Fell, 1956), only 600 miles west of the position in which the living species has been found. *Hippasteria antiqua* carries a single robust conical spine on each superomarginal. The condition of the adambulacrals and inferomarginals cannot be determined, but one obvious difference from *H. trojana* lies in the prominent carinal abactinal plates, lacking from the latter species.

Holotype

In the Canterbury Museum, Christchurch.

Family ECHINASTERIDAE

Echinaster Müller & Troschel, 1840

Echinaster farquhari Benham. Pl. 3

Benham, W. B. 1909. Rec. Cant. Mus. 1 (2): 98–100, pl. VIII.

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 13.

Material Examined

Sta. 41, S.E. of Pitt Id., 330 fm (604 m), 1 specimen; Sta. 59, Chatham Rise, 290 fm (531 m), 1 specimen.

Colour

Pale pink, Munsell YR 6/8.

Remarks

The species is apparently sparsely distributed from Cook Strait to Otago, mainly on the continental shelf. These are the only deep-water examples so far known.

Henricia Gray, 1840

Henricia aucklandiae Mortensen

Henricia compacta Mortensen. Th. Vid. Medd. dansk. naturh. For. 79: 307–8.

Material Examined

Sta. 6, Chatham Rise, 220 fm, 4 specimens; Sta. 7, Chatham Rise, 280 fm, 1 specimen; Sta. 16, Kaingaroa, shore, 6 specimens; Sta. 26, Waitangi, shore, 12 specimens.

Remarks

Miss A. M. Clark of the British Museum informs me that the Chatham Islands species should no longer be referred to *Henricia compacta* (Sladen) of which the holotype was taken by the *Challenger* in 275 fm, west of Cape Farewell. Some deep-water records are here included, the

species apparently ranges up to the low-tide level, and is particularly characteristic of the Chatham Islands fauna.

Colour

In life, aborally bright orange, YR 5/12, paler below, fading to uniform cream in alcohol (E. Batham).

Henricia lukinsii (Farquhar)

Cribrella lukinsii Farquhar, H. 1898. Trans. N.Z. Inst. 30: 190.
Henricia lukinsii Mortensen, Th. 1925. Vidd. Medd. dansk naturh. For. 79: 304.
Henricia lukinsii Fell, H. B. 1953. Rec. Dom. Mus. 2: 90–1.

Material Examined

Sta. 14, Hanson Bay, 15 fm, 2 specimens; Sta. 49, Port Hutt, shore, 8 specimens.

Until now, this species has been regarded as restricted to the Auckland Islands and Campbell Island (Fell, 1953). Its occurrence at the Chatham Islands is evidence of the mixed character of the shallow-water echinoderm fauna of that area, and may be compared with the distribution pattern of *Calvasterias suteri* (which see) and of *Asterina aucklandensis* Koehler (Auckland Island, Campbell Island, Lyttelton Harbour).

It is easily distinguished from *Henricia compacta* by having the adambulacral spines arranged in a single transverse series, not in compact clumps; also, the spines of the adjoining plates form vertical series on the lateral parts of the arms. The arms are relatively shorter, R = 3 r (as against R = 5 r in *H. compacta*).

Family ASTERINIDAE

Asterina Nardo, 1834

Asterina regularis Verrill

Verrill, A. E. 1867. Trans. Conn. Acad. 1: 250.

Material Examined

Sta. 11, Owenga, shore, 3 specimens. A well-known species distributed throughout New Zealand.

[**Asterina aucklandensis** Koehler

This species has not yet been recorded from the Chatham Islands, but its occurrence at Lyttelton suggests that it is probably another of the so-called sub-antarctic echinoderms which occasionally range into the central marine province of New Zealand, and it is therefore to be expected at the Chathams.]

Family KORETHRASTERIDAE

Abactinal side with paxillae formed by very long spines not covered by a supradorsal membrane. No actinolateral membrane. Marginal paxillae not enlarged. No oral interradial plates. Spines of the adambulacrals forming together with those of the lower marginals a single transverse series, not united in a web. Usually five-rayed.

Representatives of this family have not been taken by any other Australasian expedition.

Peribolaster Sladen, 1889

Abactinal surface bearing cruciform plates whose lobes overlap, or are connected by intermediate plates, to form an open network of large quadrangular meshes. On the centre of each primary plate is a boss which carries a fascicle of delicate spinelets enclosed in united membranous sheaths. No pedicellariae.

The genus has hitherto been recorded from California, from Chile and from Antarctica.

Peribolaster lictor Fell. Pl. 3

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 15, pl. 2, figs. A, B.

Diagnosis

Tube-feet biserial, five oral spines, two of which are suboral.

Description

Body pentagonal-stellate, inflated above, flat below; arms five, tapering evenly to a bluntly rounded tip. R 22 mm, r 9 mm, R = 2·5 r. Width of arm at base 11 mm.

Abactinal plates obscured by skin until dried, the plates four-lobed or sometimes three-lobed.

The lobes either overlap or, less frequently, overlie a small intermediate plate which carries no spines. The abactinal plates carry an armature of 3 (occasionally 4) slender spines, each about 2 mm long, in a fascicle. The inferomarginal plates each carry one flattened spatulate spine. No actinal intermediate plates.

Adambulacral plates do not lie exactly opposite the inferomarginals. Each carries a transverse row of flattened spines, which progressively decrease in size towards the furrow. Oral plates each carrying three furrow-spines, the median one largest, plus two recurved robust suboral spines.

Madreporite small, rounded, ca 2 mm diameter, placed beside the periproctal area. Several calcareous anal plates surround the anus. Tube-feet biserial.

Colour

In life, pale apricot above, Munsell YR 7/7 (E. Batham); in spirit, pale cream or white.

Material Examined

Sta. 34, 130 fm, 8 specimens.

Holotype

In the Canterbury Museum.

Remarks

The species is easily distinguished from the other species with biserial tubefeet by having a total of five oral spines, of which two are suboral. In *P. macleani* Koehler there are four oral spines, one of them being suboral, and in *P. biserialis* Fisher there are four oral spines, all of them furrow-spines. In regard to the flattened or spatulate character of the inferomarginal spines *P. lictor* approaches *P. macleani;* the latter is an antarctic form.

Family SOLASTERIDAE

Disc relatively large, bordered by marginal paxillae and carrying more or less prominent paxillae on the abactinal surface. Actinal interradial plates present. Adambulacral armature in two linear series at right angles to each other.

Crossaster Müller & Troschel, 1840

A single row of marginal paxillae. Actinal intermediate plates extending only part of the way along the arm.

Crossaster japonicus (Fisher). Pl. 4

Solaster japonicus Fisher, W. K. 1911. U.S. Nat. Mus. Bull. 76: 350.
Crossaster japonicus Djakonov, A. M. 1950. Morskie Zvesdi Morei SSSR, p. 74, fig. 25.
Crossaster multispinus Clark, H. L. 1950. 1916. Endeavour Rep. Dep. Trade, Cust. Fish., N.S.W. 4: 66–7, pl. 18, figs. 5–6.
Crossaster japonicus Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 17, pl. 2, fig. F.

Material Examined

Sta. 6, Chatham Rise, 220 fm, 2 specimens; Sta. 7, Chatham Rise, 280 fm, 2 specimens; Sta. 58, Chatham Rise, 320 fm, 2 juvenile specimens.

Colour

The specimens from Sta. 6 were described by Mr G. Knox as "marbled, translucent white and pink, when caught". The juvenile specimens from Sta. 58 were described by Dr E. Batham as having the disc aborally pale dull mauve, the arms yellowish pink, the adoral surface cream. All are faded in spirit to dull fawn-grey.

Remarks

Fisher (1911) did not figure his material, but his description agrees extremely well with my material, save only that all my specimens have 11 rays, as against 10 or 9 for his. There are 28–29 marginals, separated by less than their own width, in a regular series, their spinelets numerous (about 30), the peripheral spinelets shortest, all spinelets shorter than the adambulacral ones. The adambulacral armature comprises a furrow-series of about 9 webbed spinelets and a subambulacral series of 7 webbed spinelets, the latter rather longer than the furrow-series. In my material the spinelets are more closely united in the web than Djakonov (1950) shows in his East Siberian material, but this is possibly due to difference in mode of preservation. The oral plates have about 15 webbed marginal spinelets and about 9 webbed suboral spinules.

H. L. Clark (1916) has described *C. multispinus* from 150–230 fm off Tasmania, on the basis of four specimens, all of them 11-rayed like the New Zealand form. In general appearance the Tasmanian species resembles the New Zealand one, but the number of spinelets is less (6–8 furrow-spines, 7–9 subambulacral spines). The oral armature is similar. There are only about 16 marginal paxillae. Clark's material comprised individuals of a different size-range from mine, R 40 mm, r 20 mm, as against R 85 mm, r 42 mm in a typical specimen from Chatham Islands Sta. 7.

However, there are present in the Chatham Islands collection two immature specimens from Sta. 58. The larger of these, of R 11 mm, has 5 furrow-spines and 5 or 6 subambulacral spines, together with 8 to 10 marginal paxillae.

The evidence suggests, therefore, that the differences between the New Zealand and the Tasmanian forms are merely those due to varying age or degree of maturity. I believe all should be referred to *Crossaster japonicus* (Fisher), which evidently ranges the Pacific.

Family ZOROASTERIDAE

Deep-water asteroids with familial characters as follows: Rays five, long, stiff, tapering, with longitudinal series of abactinal plates, among which the carinals are prominent and carry a prominent spine. Primary plates prominent on the disc. Adambulacral plates of alternating large and small types, the large type projecting into the furrow like a keel, a keel on one side of the furrow occurring opposite a small adambulacral plate on the other side. Pedicellariae straight, never crossed.

Zoroaster Wyville Thomson, 1873

Plates of arm forming transverse, as well as longitudinal series, each plate covered by numerous small spinules or papillae, and usually bearing one enlarged spine. Mouth deep-set. Pedicellariae numerous, often large.

Zoroaster spinulosus Fisher. Pls. 3, 5

Zoroaster spinulosus Fisher, W. K. 1906. Bull. U.S. Fish Commission, 23 (3): 1102–4, pl. 24, 41, 42.
?Zoroaster macracantha Clark, H. L. 1916. Rep. Dep. Trade & Cust. Fish. N.S.W. 4: 68–9, pl. 28.
Zoroaster spinulosus Fell, H. B. 1958. Zool. Publ. Victorian Univ. Wgtn. 24: 19.

Material Examined

Sta. 6, Chatham Rise, 220 fm, 1 specimen (partly fragmented); Sta. 7, Chatham Rise, 280 fm, 1 specimen (partly fragmented).

Remarks

The spinules and papilliform granules of the arm-plates are apparently somewhat more attenuated and oblongate than in Fisher's material, but in other respects the specimens agree closely with *Zoroaster spinulosus*. The species is especially distinguished by the adambulacral armature, and by the presence of one enlarged slender spinule on each of the plates between the superomarginals and the adambulacrals. The giant straight pedicellariae are a prominent feature of the spine adjoining the innermost (furrow-) spine. My material also appears to be conspecific with H. L. Clark's (1916) *Zoroaster macracantha,* from the Great Australian Bight, 250–450 fm. It agrees in particular in having a boss only on every second carinal plate in the distal part of the arm. As in Clark's material, the spines are nearly all lacking from these carinal tubercles. I consider that the characters by which he distinguished *macracantha* from *spinulosus* are variable and unreliable, and he indicates that in separating the Australian form he was influenced by the lack of material from the region between Australia and Hawaii (where *Z. spinulosus* occurs). That lacuna is now partly filled. The New Zealand material appears to be intermediate between the Australian and the Hawaiian types, but the differences are trivial and not of specific value. As I have not handled Clark's or Fisher's material the proposed synonymy given above has been prefixed by a question-mark.

Family ASTERIIDAE

Sclerasterias Perrier *emend.* Fisher, 1924

Sclerasterias mollis (Hutton)

Asterias mollis Hutton, F. W. 1872. Cat. Echin. N.Z. p. 4.
Sclerasterias mollis Fisher, W. K. 1924. Bull. Inst. Oceanogr. 444.

Material Examined

Sta. 34, 130 fm, 1 specimen.

The species is common on the New Zealand shelf, from Cook Strait to Otago, but does occasionally occur in deeper water, as in this case.

Calvasterias Perrier, 1875

Calvasterias suteri (de Loriol)

Stichaster suteri de Loriol, 1894. Rev. Suisse Zool. 2: 477, pl. 23, fig. 2.
Stichorella suteri Koehler, 1920. Echinodermata, Asteroidea, Australian Antarct. Exped., Zool. 8: 87–9.
Calvasterias suteri Fisher, 1922. Ann. Mag. Nat. Hist. 9 (ser. 10): 597. Mortensen, 1925. Vid. Medd. dansk naturh. For. 79: 310. Fell, 1953, Rec. Dom. Mus. 2: 98–9.

Material Examined

Sta. 22, The Sisters, shore, 3 specimens.

Remarks

The species has hitherto been reported from Campbell Island and Antipodes Island (Fell, 1953), from Auckland Island (Mortensen, 1925; Fell, 1953), from Lyttelton (Mortensen, 1925; Bennett, 1927), and from the Snares (Fell, 1953).

Its presence at the Chatham Islands is therefore not surprising. When its distribution is compared with that of *Henricia lukinsii* (Farquhar), one forms the impression that both species are likely to have the same range. We may therefore expect —with some confidence—that *Henricia lukinsii* will be found living at or near Lyttelton.

[Young (1929) has recorded *Calvasterias laevigata* (Hutton) from the Chatham Islands and, relying on his record, I have included it in the check-list. I have seen no specimen, however, and as this species is the dominant one at the Auckland and Campbell Islands (Fell, 1953), whereas it is quite unknown from the New Zealand mainland area so far, its occurrence at the Chatham Islands requires confirmation. Its apparent absence from the Snares gives added reason for caution.]

Allostichaster Verrill, 1914

Allostichaster insignis (Farquhar)

Stichaster insignic Farquhar, H. 1895. Trans. N.Z. Inst. 27: 203, pl. 13 (1).
Allostichaster insignis Mortensen, 1925. Vid. Medd. dansk. naturh. For. 79: 316.

Material Examined

Sta. 49, Port Hutt, shore, 4 specimens.

Allostichaster polyplax (M. & T.)

Asterocanthion polyplax Müeller & Troschel, 1844, Arch. f. Naturgesch. p. 178.
Allostichaster polyplax Mortensen, 1925. Vid. Medd. dansk naturh. For. 79: 315.

Material Examined

Sta. 26, Waitangi, shore, 1 specimen; Sta. 49, Port Hutt, shore, 3 specimens.

Cosmasterias Sladen, 1889

Abactinal plates forming more or less well-defined longitudinal series. Actinal plates in two or more series, not overhung by spines of the inferomarginals. Adambulacral plates diplacanthid. Large, straight, unguiculate (felipedal) pedicellariae present.

Cosmasterias dyscrita H. L. Clark. Pls. 3, 6

Clark, H. L. 1916. Endeavour Rep., Dep. Trade, Cust., Fich., N.S.W. 4: 71–2, pl. 29, figs. 1–2.
Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 20, pl. 2, figs. D, E, H.

Material Examined

Sta. 34, 130 fm, portions of about 3 individual

Colour in Life

Light orange aborally, YR 7/7.

Remarks

The holotype of this species was taken by the *Endeavour* in 200 fm, south of Gabo Island, Victoria, and until now no other specimen was known. As Clark has given only photographic illustrations of the whole animal, I am obliged to rely entirely upon his careful description in making the identification. The oral plates carry four spines, namely an inner and an outer furrow-spine and a proximal and distal sub-oral spine. Small pedicellariae and large unguiculate pedicellariae occur on or beside these plates. Occasional unguiculate pedicellariae occurring on the furrow margin. Smaller crossed pedicellariae are scattered among the spines. The actinolateral series carry either one or two prominent, coarse spines.

Coscinasterias Verrill, 1867

Coscinasterias calamaria (Gray)

Asterias calamaria Gray, 1840. Ann. Mag. Nat. Hist. 1 (ser. 6): 179.
Coscinasterias calamaria Clark, H. L. 1909. Mem. Austr. Mus. 4: 531; Mortensen 1925. Vid. Medd. dansk naturh. For. 79: 320.

Material Examined

Sta. 11, Owenga, shore, 1 specimen; Sta. 26, Waitangi, shore, 1 specimen.

A common intertidal species which ranges the Indo-west-Pacific, with Stewart Island as its southern New Zealand limit.

Material Examined

Sta. 16, Kaingaroa shore, 1 specimen; Sta. 19, 25 fm, 1 juvenile specimen; Sta. 49, Port Hutt, shore, 8 specimens.

Colour

Disc dull red-brown, arms orange barred with cream (young individual from Sta. 19). See also Fell (1952, p. 12, and 1958, p. 22).

OPHIUROIDEA

Family GORGONOCEPHALIDAE

Astrothorax Döderlein, 1911

Astrothorax waitei (Benham)

Astrotoma waitei Benham, W. B. 1909. Rec. Cant. Mus. 1 (2): 19, pl. 9.
Astrotoma waitei Fell, H. B. 1952. Zool. Pub. Victoria Univ. Wgtn. 18: 13.
Astrothorax waitei Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 21.

Material Examined

Sta. 34, 130 fm, one specimen, found adhering to the long radioles of *Goniocidaris parasol.*

Colour

In life, disc yellow above Y 9/10, arms cream with pink tips.

Gorgonocephalids with unbranched arms commonly parasitise coral, living as epizoans upon the colony and feeding upon the polyps. *Astrothorax waitei* has not hitherto been recorded as epizoic upon another echinoderm. This specimen was probably browsing upon the Polyzoa and sponges which are themselves epizoic upon the long primary radioles of *Goniocidaris parasol.*

Family OPHIOMYXIDAE

Ophiomyxa Müller & Troschel, 1840

Ophiomyxa brevirima H. L. Clark

Clark, H. L. 1915. Cat. Rec. Ophiurans, p. 169.
Fell, H. B. 1952. Zool. Publ. Victoria Univ. Wgtn. 18: 12; 1958, *ibid.* 24: 22.

Family OPHIACANTHIDAE

Ophiacantha Müller & Troschel, 1842

Ophiacantha vepratica Lyman

Lyman, T. 1882. Challenger Ophiuroidea, p. 182, pl. 13.
Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 25.

Material Examined

Sta. 5, Chatham Rise, 300+ fm, 1 specimen; Sta. 52, Chatham Rise, 260 fm, 1 specimen.

Colour

Disc pale yellow with white rays, arms cream with dull orange bars. Considerable traces of the colour pattern survive in alcohol, unlike the typical dead-white appearance of most small species of *Ophiacantha,* after preservation in spirit.

The specimens are atypical in lacking the few spines present on the disc of the holotype, but agree in other respects.

Ophiactis Lütken, 1856

Ophiactis profundi var. **novaezelandiae** Mortensen

Mortensen, Th. 1924. Vid. Medd. dansk naturh. For. 77: 128–31, fig. 13.
Fell, H. B. 1950. Zool. Publ. Victoria Univ. Wgtn. 24: 26.

Material Examined

Sta. 34, 130 fm, 3 specimens.

This form occurs in Cook Strait where it has been collected at 100–120 fm.

Amphiura Forbes, 1842

Amphiura norae Benham

Benham, W. B. 1909. Rec. Cant. Mus. 1 (2): 104–5, pl. 10.
Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 26–7.

Material Examined

Sta. 5, Chatham Rise, 300+ fm, 1 specimen; Sta. 52, Chatham Rise, 260 fm, 4 specimens; Sta. 59, Chatham Rise, 290 fm, 2 specimens.

Colour in Life

Disc mauve-grey or light grey above, arms pale yellow-pink, YR-Y 8/4 (E. Batham).

Amphiura magellanica Ljungman, 1866

Mortensen, Th. 1924. Vid. Medd. dansk naturh. For. 77: 132.
Fell, H. B. 1952. Zool. Publ. Victoria Univ. Wgtn. 18: 14.

Material Examined

Sta. 3, Mernoo Bank, 41 fm, 12 specimens; Sta. 14, Hanson Bay, 15 fm, 3 specimens; Sta. 18, 15 fm, 3 specimens; Sta. 24, 38 fm, 1 specimen.

Colour

In life, the disc mauve-grey purplish grey or dark grey, the arms light red, or orange, or fawn with dark bars. Other colour records have already been recorded (Fell, 1952).

Amphiura angularis Lyman

Lyman, T. 1882. Challenger Ophiuroidea, p. 134–5, pl. 24.
Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 26.

Material Examined

Sta. 4, Chatham Rise, 200 fm, 1 juvenile specimen, apparently of this species. There are only 3 or 4 armspines at the base of the arm, the radial shields are separated by only 3 or 4 scales, and no tentacle-scales have been developed. In other respects the specimen resembles material ascribed to this species from Cook Strait, 550 fm (Fell, 1958).

Colour

In life, was recorded by Dr E. Batham as: disc purplish-black aborally, deep pink orally, the arms pale orange.

Amphiura alba Mortensen

Mortensen, Th. 1924. Vid. Medd. dansk naturh. For. 77: 147.
Fell, H. B. 1952. Zool. Publ. Victoria Univ. Wgtn. 18: 16.

Material Examined

Sta. 14, Hanson Bay, 15 fm, 3 specimens; Sta. 15, Hanson Bay, 30 fm, 6 specimens.

Colour in Life

Disc dark grey, arms fawn with dark grey bars (E. Batham).

Family OPHIOLEPIDIDAE

Ophiuroglypha Hertz, 1926

Ophiuroglypha irrorata (Lyman)

Ophioglypha irrorata Lyman, T. 1882. *Challenger* Ophiuroidea, p. 47–8, pl. 5.
Ophiuroglypha irrorata Fell 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 29–30.

Material Examined

Sta. 4, Chatham Rise, 200 fm, 1 specimen; Sta. 6, Chatham Rise, 220 fm, 6 specimens; Sta. 7, Chatham Rise, 280 fm, 1 specimen; Sta. 41, 330 fm, 2 specimens; Sta. 52, Chatham Rise, 260 fm, 2 specimens; Sta. 58, Chatham Rise, 320 fm, 1 specimen; Sta. 59, Chatham Rise, 290 fm, 1 specimen.

Colour in Life

Observations by Dr E. Batham at Sta. 4, 6, 41, 52 and 58 indicate that despite the considerable variation in the pattern of the disc-plates above, the colour-pattern is relatively stable. The disc above is variously recorded as deep pink or warm pink, R 7/3. The arms are pale orange, pale pink, pale yellow-pink, or cream YR 10/2.

Ophioceres Koehler, 1922

Ophioceres huttoni (Farquhar)

Ophioplocus huttoni Farquhar, H. 1899. Proc. Linn. N.S.W. p. 187, pl. 15: Mortensen, Th. 1924. Vid. Medd. dansk naturh. For. 77: 171–2, fig. 34.
Ophioceres huttoni Mortensen, Th. 1925 *ibid.* 79: 395; Fell, H. B. 1953. Rec. Dom. Mus. 2: 105.

Material Examined

Sta. 11, Owenga, shore, 4 specimens; Sta. 49, Port Hutt, shore, 4 specimens.

Ophiura Lamarck, 1816

Ophiura chathamensis Fell

Fell, H. B. 1952. Zool. Publ. Victoria Univ. Wgtn. 18: 25–8, figs. 15–18. 1952 *ibid.* 24: 29.

Material Examined

Two immature specimens, evidently of this species, from Sta. 40, 155 fm.

The colour in life was recorded as pale warm pink (Dr E. Batham); in spirit it is white—as in the type material.

The species is also known from Chatham Rise (holotype) at 300 m. (164 fm) and Bay of Plenty, 60 to 120 fm.

Ophiomisidium Koehler, 1914

Ophiomisidium irene Fell

Fell, H. B. 1952. Zool. Publ. Victoria Univ. Wgtn. 18: 28–30, figs. 21–22. 1958 *ibid.* 24: 30–1.

Material Examined

Sta. 5, Chatham Rise, 300 fm, 1 specimen; Sta. 34, 130 fm, 2 specimens.

Colour in Life

Disc pale mauve, the arms pale warm yellow (Sta. 5); disc cream with a grey aboral pattern, arms orange (Sta. 34). Both records are due to Dr E. Batham. Colour in spirit is white, or off-white.

Remarks

One of the specimens from Sta. 34 is larger than the holotype, having R 5 mm. It presents mature characters, having the radial shields, the first dorsal arm-plates and the second inter-radial disc-plates all ornamented with a prominence, whilst the flattened scales carried by the first two lateral arm-plates are relatively larger.

The holotype was taken from the Chatham Rise, at Discovery Station 2733, in 164 fm. Thus all specimens so far known are from the Chatham Islands area.

In the holotype no genital clefts could be observed. The larger specimen from Station 34 exhibits two minute clefts in each inter-radius, one on either side of the oral shield. It would therefore seem that these minute ophiuroids shed the sexual products in the usual manner, and not by disruption of the body-wall (as has been suggested).

Family OPHIOCHITONIDAE

Ophionereis Lütken, 1859

Ophionereis fasciata Hutton, 1872

Hutton, F. W. Cat. N.Z. Echin. p. 2.
Young, M. W. 1929. Trans. N.Z. Inst. 60: 158.

Material Examined

Sta. 9, Glory Bay, Pitt Island, shore, 1 specimen; Sta. 11, Owenga, shore, 4 specimens; Sta. 14, Hanson Bay, shore, 3 specimens; Sta. 49, Port Hutt, shore, 3 specimens.

A common littoral species found throughout New Zealand, usually sheltering beneath stones at low-tide level.

Colour (of specimens from Sta. 14)

Disc yellowish grey above, with darker speckling, arms pale pink, barred with purple-black (E. Batham).

Family OPHIODERMATIDAE

Pectinura Forbes, 1843

Pectinura maculata (Verrill, 1869)

Farquhar, H. 1898. Proc. Linn. Soc. N.S.W. 23: 306.

Material Examined

Sta. 23, 33 fm, 1 specimen.

Pertinura gracilis Mortensen

Mortensen, Th. 1924. Vid. Medd. dansk naturh. For. 77: 173, figs. 35–36.

Material Examined

Sta. 3, Mernoo Bank, 41 fm, 1 specimen.

ECHINOIDEA

Order CIDAROIDA

Family CIDARIDAE

Goniocidaris Agassiz & Desor, 1847

Subgenus **Aspidocidaris** Mortensen, 1928

Basal disc on primary radioles more or less developed, and terminal disc usually well developed, often forming large round discs which cover the whole apical side. Secondary spines flattened, with a straight-cut end.

Goniocidaris (Aspidocidaris) parasol Fell. Pl. 7

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 32-4, pl. 3, fig. B, pl. 5, fig. b.

Description

Test flattened above and below, the sides arched, ambitus rounded, apical system about half h.d., peristome one third h.d.

Ambulacra

Weakly sinuate, ca. 16% IA. At the ambitus about seven amb plates occur opposite an IA plate. Interporiferous area 3–4 times broader than the poriferous area. Pores oblique. Marginal tubercles in vertical linear series. Internal tubercles 2 or 3 to each plate, in more or less vertical linear series. The median area is sunken, completely naked, and forms a conspicuous, vertical furrow, weakly sinuous but not following a zig-zag course, and with no abrupt changes in its width from plate to plate.

Interarnbulacra

About seven interamb plates to each vertical series. Aboral areoles circular, subambital ones transversely elliptical, the lowest three confluent. Areole deeply sunken at its periphery, the boss rising as a steep cone to the terrace. Tubercle non-crenulate. Scrobicular tubercles, numerous, crowded. The secondary tubercles similar to the scrobicular tubercles, mingled with smaller ones, which become more numerous towards the admedian border, with only the median suture itself free from tuberculation.

Primary Radioles

Cylindrical, slender, the adapical ones developing a broad, conspicuous distal disc, the disc being excentric, the adapical half larger than the abapical half. In the adult a fully developed disc is as large as the apical area of the test, and about 15 to 20 such discs may be present, forming a complete shielding over the aboral surface. Oral primaries more or less spearhead-shaped, with lateral teeth sometimes evident near the base.

Dimensions

H.D. (denuded test) 27 mm, ht. 17 mm. Longest primary radioles 55 mm. Greatest disc-diameter of an adapical radiole, 14 mm.

Colour

Primary radioles pale purple or mauve, the secondary spines a rich red-brown, the scrobicular spines especially conspicuous for their deep saturated red colour (G. Knox); the test when cleaned is creamy white (without the greenish cast of *Goniocidaris umbraculum*).

Holotype

In the Canterbury Museum, a partially denuded test.

Material Examined

Sta. 34, 130 fm, 5 specimens.

Remarks

This fine species is only the third living cidarid to be discovered in New Zealand waters. Its closest allies are two exotic species, one of them *G. australiae* Mortensen, the other the Japanese form *G. clypeata* Doederlein. *G. parasol* differs from both species in having the adapical discs more highly developed in the adult stage, in its broad, almost straight, sunken naked furrow of the interporiferous area, with no trace of zig-zag furrows, in the colour of the primary radioles, and the arrangement of the internal tubercles of the ambulacral plates. It is further distinguished from *Goniocidaris clypeata* by lacking the deckled edge to the adapical discs, and by having the adapical side of the disc larger than the abapical side.

Ogmocidaris Mortensen, 1921

Ogmocidaris benhami Mortensen

Mortensen, Th. 1921. Vid. Medd. dansk naturh. For. 73: 151.

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 34.

Material Examined

Sta. 59, Chatham Rise, 290 fm, 2 specimens (one of them juvenile).

The species is especially characteristic of the archibenthos of the northern (Aupourian) marine province—as many as 56 specimens having been taken at a single station (NP 6) by the "Northern Prawn Expedition" in the Bay of Plenty.

The colour of the juvenile specimen was recorded as follows: body (i.e. test with secondaries *in situ*), pale yellowish pink, the primary radioles cream.

Order ECHINOTHURIOIDA

Family ECHINOTHURIIDAE

Phormosoma Wyville Thomson, 1874

Phormosoma bursarium Agassiz

Agassiz, A. 1881. *Challenger* Echinoidea, p. 104, pl. 12.
Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 35.

Material Examined

Sta. 6, Chatham Rise, 220 fm, 1 specimen; Sta. 41, 330 fm, 1 specimen.

The species is a wide-ranging Pacific form, but these are the only specimens so far recorded from New Zealand.

Colour

A rich saturated red-purple (G. Knox).

Order TEMNOPLEUROIDA

Family TEMNOPLEURIDAE

Pseudechinus Mortensen, 1903

Pseudechinus flemingi Fell. Pls. 7, 8, 9

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 36, pl. 3, fig. A, pl. 5, fig. a.

Description

Test hemispherical, the oral side rather flattened in the adult stage, more rounded in the juvenile form. H.D. 52 mm, ht. 29 mm. Primary radioles from 20 to 30 mm long (holotype).

Oculars all exsert.

Ambulacra

Primary ambulacral tubercles contiguous throughout the ambulacrum. Enlarged secondary tubercles forming a vertical series adradial to the primaries, these tubercles much smaller, however, than the primaries. About 31 ambulacral plates to the vertical column in the holotype. Immature specimens (not the holotype) show miliary tubercles arranged in radial lines around the primary tubercles, the miliaries feebly united by radial epistroma into a pattern of sculptured spokes. This epistroma disappears before maturity.

Interambulacra

About 23 interambulacral plates to the vertical series in the adult (holotype), the plates of the adapical surface relatively higher than those below the ambitus. Primary interambulacral tubercles not contiguous; enlarged secondary tubercles lie on either side of the primary, usually 2 larger ones on the admedian side, together with 2 or 3 smaller ones; on the adradial side lie from 2 to 6 secondaries, usually arranged in horizontal series of 2 or 3 tubercles, with either one such series, or two series, occurring on alternate plates. The miliary tubercles are scattered thinly on the surface, but around the primary tubercle they form radially arranged linear series, which *in the adult stage* are feebly united by epistroma to form radiating spokes, similar to those seen in the juvenile stages on the ambulacral plates.

Material Examined

Sta. 2, Mernoo Bank, 61 fm, 1 specimen; Sta. 6, Chatham Rise, 220 fm, 5 specimens; Sta. 28, 50 fm, 30 specimens; Sta. 29, 94 fm, 1 specimen; Sta. 30, 70 fm, 4 specimens; Sta. 37, 30 fm, 2 specimens; Sta. 41, 330 fm, about 300 specimens (mostly juveniles); Sta. 52, Chatham Rise, 260 fm, 5 specimens.

Also, from Canyon B, off east Otago, Dominion Museum Station B.S. 191, 16/8/1955, holotype, and one other smaller individual.

Holotype

In the Dominion Museum, from Dom. Mus. Sta. B.S. 191. This specimen, much the largest so

far seen, was chosen as the holotype since it exhibits mature characters. It is, unfortunately, broken.

Colour in Life (and in spirit)

The spines a brilliant orange-red, or deep salmon tint, with white tips. These are normally so densely matted as to obscure the underlying test but this, when denuded, is seen to be a rich rose-red with paler rose tubercles. The species is the most brilliantly coloured echinoid so far discovered in the New Zealand fauna, and is much brighter than *Pseudechinus albocinctus* (Hutton), a species which it otherwise much resembles.

Remarks

In the form of the test, the general preponderance of red colours, the white-tipped spines, and the arrangement of the tubercles in vertical and horizontal rows, *Pseudechinus flemingi* agrees closely with *P. albocinctus*. The two species are otherwise very different in appearance because the spines in *albocinctus,* though white-tipped, do not exceed 12 mm in length, and do not obscure the test, and their dull reddish-brown colour contrasts with the brilliant orange-red or deep salmon colour of *flemingi*. Obvious differences in the denuded test are the absence of the radiating sculpture from *albocinctus,* and the presence of weak crenulation on the primary tubercles of *albocinctus*. In the adult stage *flemingi* also presents weak admedian grooves on aboral interambulacral plates. No other species of *Pseudechinus* is at all closely related.

The presence of the weak radial sculpture and the admedian interambulacral grooves is a temnopleurid character not hitherto reported from any species of *Pseudechinus,* and provides welcome evidence that the genus is correctly placed in the family Temnopleuridae. It is desirable to state here, however, that a careful examination of very young specimens of *Pseudechinus albocinctus* and *Pseudechinus novaezelandiae* from South Island stations has revealed faint traces of such radiating sculpture on the test plates. This disappears long before maturity is reached.

Pseudechinus flemingi occurs in Castlecliffian (Pleistocene) sediments near Wanganui, and has been known to me for some time through specimens collected by Dr C. A. Fleming of the New Zealand Geological Survey. The fortunate discovery of living examples enables a recent specimen to be selected as the holotype.

Family ECHINOMETRIDAE

Evechinus Verrill, 1871

Evechinus chloroticus (Val.)

Echinus chloroticus Valenciennes, A. 1846. Voyage de Venus. Zoophytes.

Evechinus chloroticus Agassiz A. 1872. Revision of the Echini, 1 and 2, pp. 128, 502, pl. 4, 6, fig. 7.

Material Examined

Sta. 9, Glory Bay, Pitt Island, shore, 1 specimen; Sta. 18, 15 fm, 1 specimen.

A characteristic shallow-water species which ranges the New Zealand coast from Otago to the Kermadec Islands, but is absent from the Antipodian marine province, and is nowhere known from beyond New Zealand.

Order **CASSIDULOIDA**

Family ECHINOBRISSIDAE

Apatopygus Hawkins, 1940

Apatopygus recens (M.Edw.)

Nucleolites recens Edwards H. M. 1836. Zoophytes, Echinodermes, pl. 14, fig. 3.

Apatopygus recens Hawkins, H. L. Geol. Mag., 57 (No. 675): 393, pl. 7.

Material Examined

Sta. 14, 15 fm, 3 specimens; Sta. 20, 17 fm, 1 specimen; Sta. 23, 33 fm, 4 specimens; Sta. 37, 30 fm, 3 specimens (juveniles).

Colour in Life

Off-white (Sta. 23); pale dull greenish-yellow, with touch of pink aborally (juveniles, Sta. 37) (E. Batham).

Order **SPATANGOIDA**

Family SPATANGIDAE

Spatangus Gray, 1835

Spatangus multispinus Mortensen

Mortensen, Th. 1925. Vid. Medd. dansk naturh. For. 79: 412, fig. 68.

Fell, H. B. 1952. Zool. Publ. Victoria Univ. Wgtn. 18: 35; 1958, *ibid.* 24: 37.

Material Examined

Sta. 2, Mernoo Bank, 41 fm, 9 specimens; Sta. 6, Chatham Rise, 220 fm, 1 specimen; Sta. 7, Chatham Rise, 280 fm, 18 specimens plus fragments; Sta. 41, 330 fm, 1 specimen; Sta. 52, Chatham Rise, 260 fm, 10 specimens plus fragments; Sta. 59, Chatham Rise, 290 fm, 2 specimens.

Remarks

Of the above records, only the specimens from Sta. 2 are from the shelf, all the others being archibenthal. Essentially the same pattern is observed in records from Cook Strait, where the species occurs occasionally on the shelf but is mainly found between 200 and 500 fm. It is therefore evident that *Spatangus multispinus* is a deep-water form, and that the odd specimens taken on the narrow continental shelf represent derivatives from the deep-water population living nearby.

Colour

As previously recorded (Fell, 1952), the test and spines are in life a rich, deep violet, fading after preservation to a dull mauve.

Paramaretia Mortensen, 1950

Paramaretia multituberculata Mortensen. Pl. 10

Mortensen, Th. 1950. Vid. Medd. dansk naturh. For. 112: 160.

Fell, H. B. 1958. Zool. Publ. Victoria Univ. Wgtn. 24: 37–8.

Material Examined

Sta. 7, Chatham Rise, 280 fm, 2 specimens; Sta. 40, 155 fm, 21 specimens, plus fragments; Sta. 41, 330 fm [photograph only]; Sta. 52, Chatham Rise, 260 fm, 2 specimens.

The only recorded specimens of this echinoid are the original type-material from Bass Strait, and two fragmentary specimens from the Chatham Rise collected by the R.R.S. *Discovery II* in 1950. Between 1954 and 1958 the University of Wellington has worked 39 deep-water bottom-stations below the Cook Strait continental shelf, and yet no specimen or fragment of *Paramaretia* has been obtained. The reason for this remains obscure but it is quite likely that the echinoid has a sporadic distribution over the Cook Strait area, and that no colony has yet been dredged. An analogy may be drawn with the asteroid *Phitonaster knoxi,* which was found in Cook Strait only after four years of deep-water research, although the Chatham Islands Expedition took it at six stations within the space of three weeks in Jan-Feb 1954.

Family BRISSIDAE

Brissopsis L. Agassiz, 1840

Brissopsis oldhami Alcock. Pl. 9

Brissopsis oldhami Alcock 1893. J. Asiatic Soc. Bengal. 62: 174, pl. 8 (7–8).

Brissopsis zelandiae Mortensen, Th. 1921. Vid. Medd. dansk naturh. For. 73: 193, pl. 6, 33–4.

Brissopsis oldhami Fell, H. B. 1958. Zool. Pub. Victoria Univ. Wgtn. 24: 38–9.

Material Examined

Sta. 41, 330 fm, 23 specimens; Sta. 52, Chatham Rise, 260 fm, 3 specimens.

Colour in Life

Pale, dull yellow-pink, the fascioles wine-coloured. Juvenile specimens were dull pink, the fascioles purplish, and eye-spots showing up as red dots (E. Batham).

These specimens have already been discussed and compared with the richer material taken in Cook Strait (Fell, 1958, p. 38–9). Photographic figures of adult New Zealand specimens are included here, however, since none have yet been published.

Postscript

As this report was being prepared for the press, Mr G. A. Knox's "General Account of the Chatham Island 1954 Expedition", N.Z. Dep. sci. industr. Res. Bull. 122 (1957) was received. A number of echinoderms can be seen in Knox's illustrations, and the following can be identified. In fig. 6, the large asteroid on the right is *Zoroaster spinulosus* Fisher, from Sta. 6. The two echinoids seen indistinctly above appear to be *Paramaretia multituberculata* Mortensen. In fig 7, showing part of the haul from Sta. 7, two specimens of *Persephonaster neozelanicus* Mortensen are on the left, although no examples from this station were contained in the collection submitted to me. The group of echinoids below are *Paramaretia multituberculata* Mortensen, not *Spatangus multispinus* Mortensen as inadvertently stated in the caption. Fig. 9 shows part of the haul from Sta. 6. *Hippasteria trojana* Fell is at the upper left, resting upon a specimen of *Zoroaster spinulosus* Fisher. The two large echinoids beside the fish on the middle left are *Spatangus multispinus* Mortensen, and to their left again are two specimens of *Crossaster japonicus* (Fisher). The small echinoid between *Crossaster* and *Spatangus* is apparently *Pseudechinus flemingi* Fell.

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PLATE 1

Plutonaster knoxi Fell

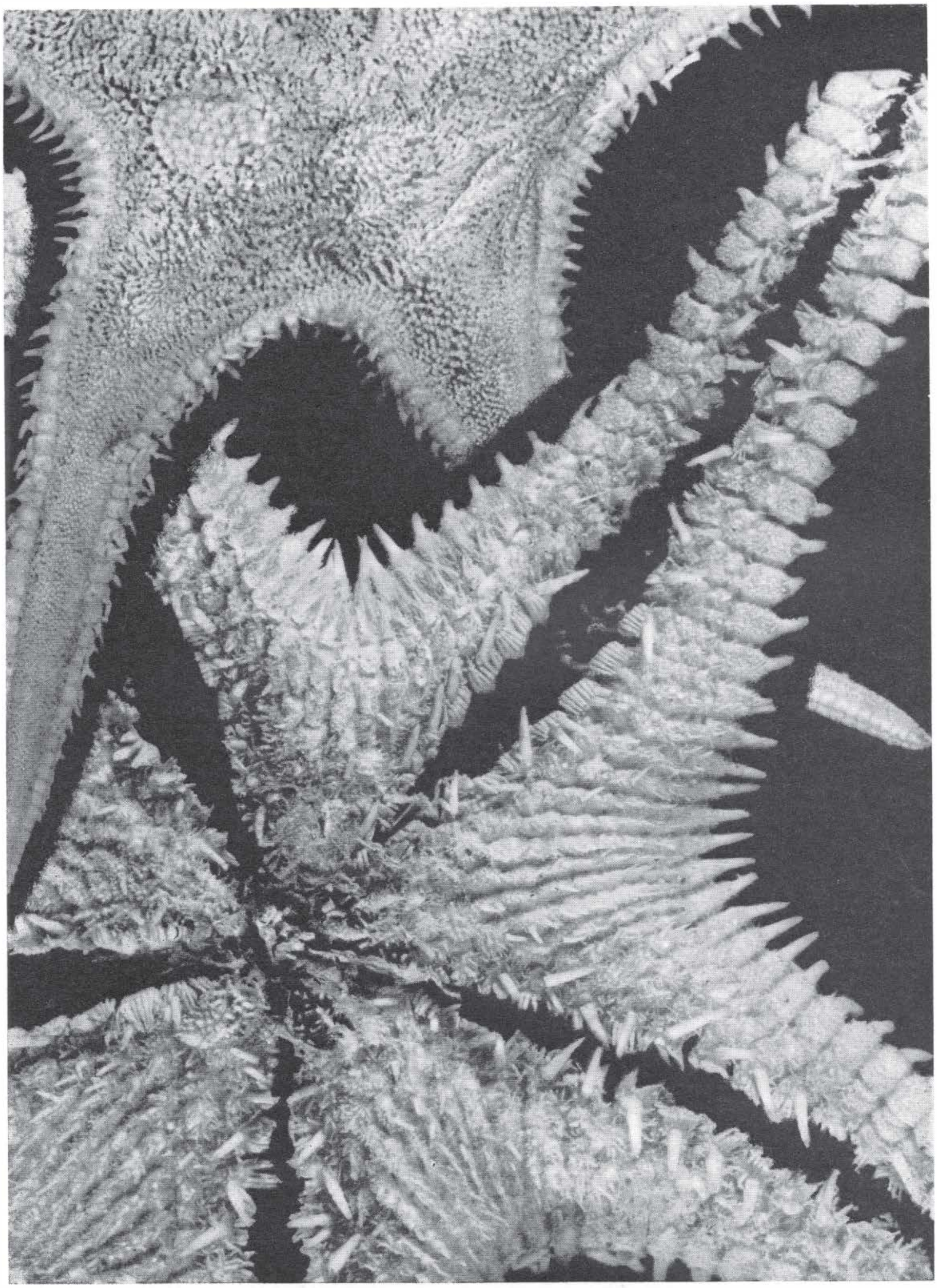
(page 60)

Holotype, Sta. 41, 330 fm.

Above: Aboral aspect, × 1.5.

Below: Adoral aspect, × 2.25.

PLATE 1



Photos: M. D. King

PLATE 2

Hippasteria trojana Fell

(page 61)

Holotype, Sta. 6, 220 fm.

Above: Aboral aspect, × 0.7.

Below: Interbrachial marginals, viewed obliquely from below, showing marginal spines and pedicellariae, × 2.3

PLATE 2

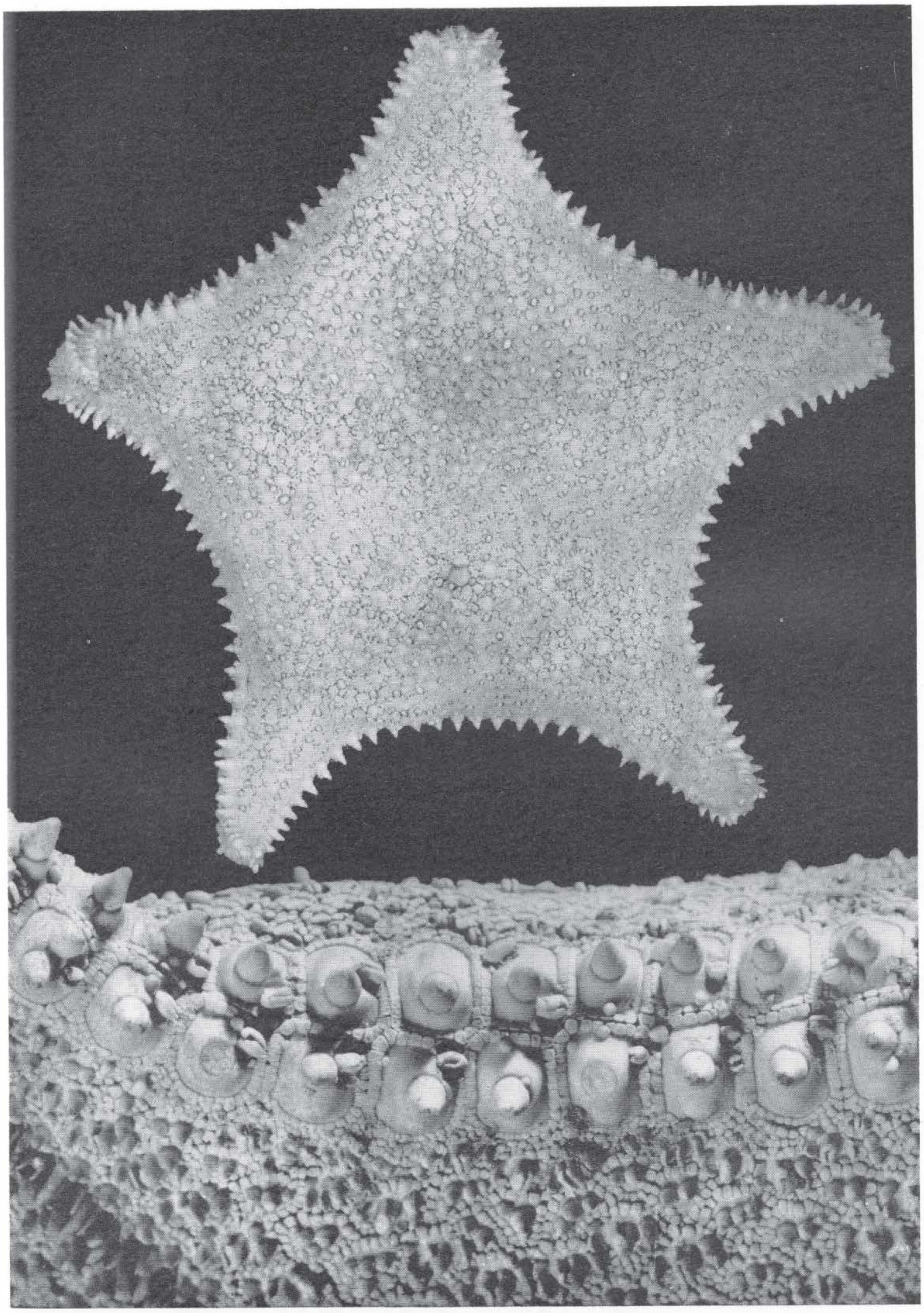


Photo: M. D. King

PLATE 3

Top row, 1 to 7

Mediaster sladeni Benham

(page 61)

× 0.5, long-armed specimen from Sta. 51, 125 fm.

Hippasteria trojana Fell

(page 61)

× 0.4, holotype, adoral aspect, Sta. 6, 220 fm.

Middle row

Mediaster sladeni Benham

(page 61)

× 0.5, Sta. 51, 125 fm.

Zoroaster spinulosus Fisher

(page 65)

× 0.4, Sta. 7, 280 fm.

Peribolaster lictor Fell

(page 63)

Holotype, × 1.7, Sta. 34, 130 fm.

Bottom row

Cosmasterias dyscrita H. L. Clark

(page 66)

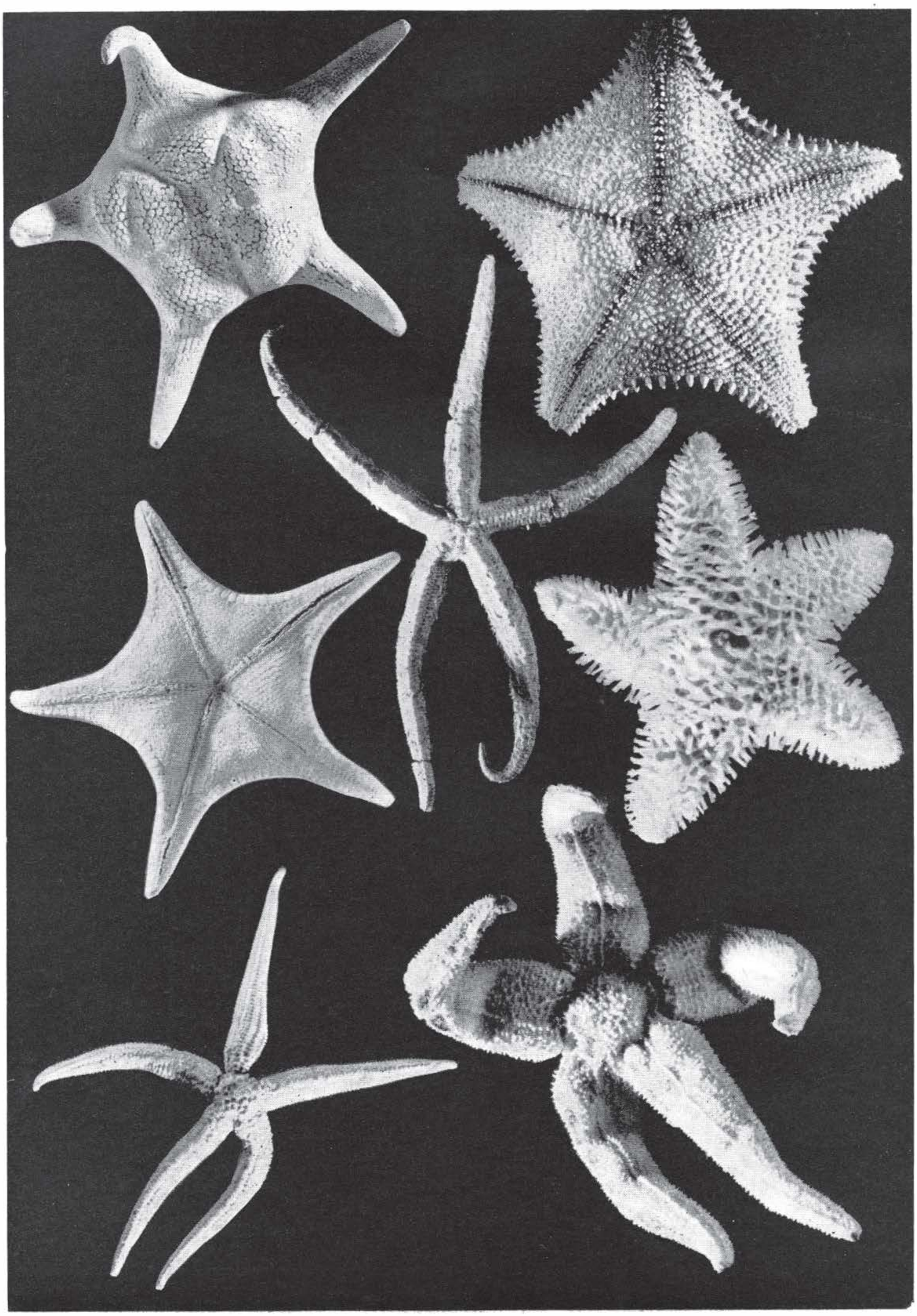
× 0.5, Sta. 34, 130 fm.

Echinaster farquhari Benham

(page 62)

× 0.4, Sta. 41, 330 fm.

PLATE 3



Photos: A. Eady

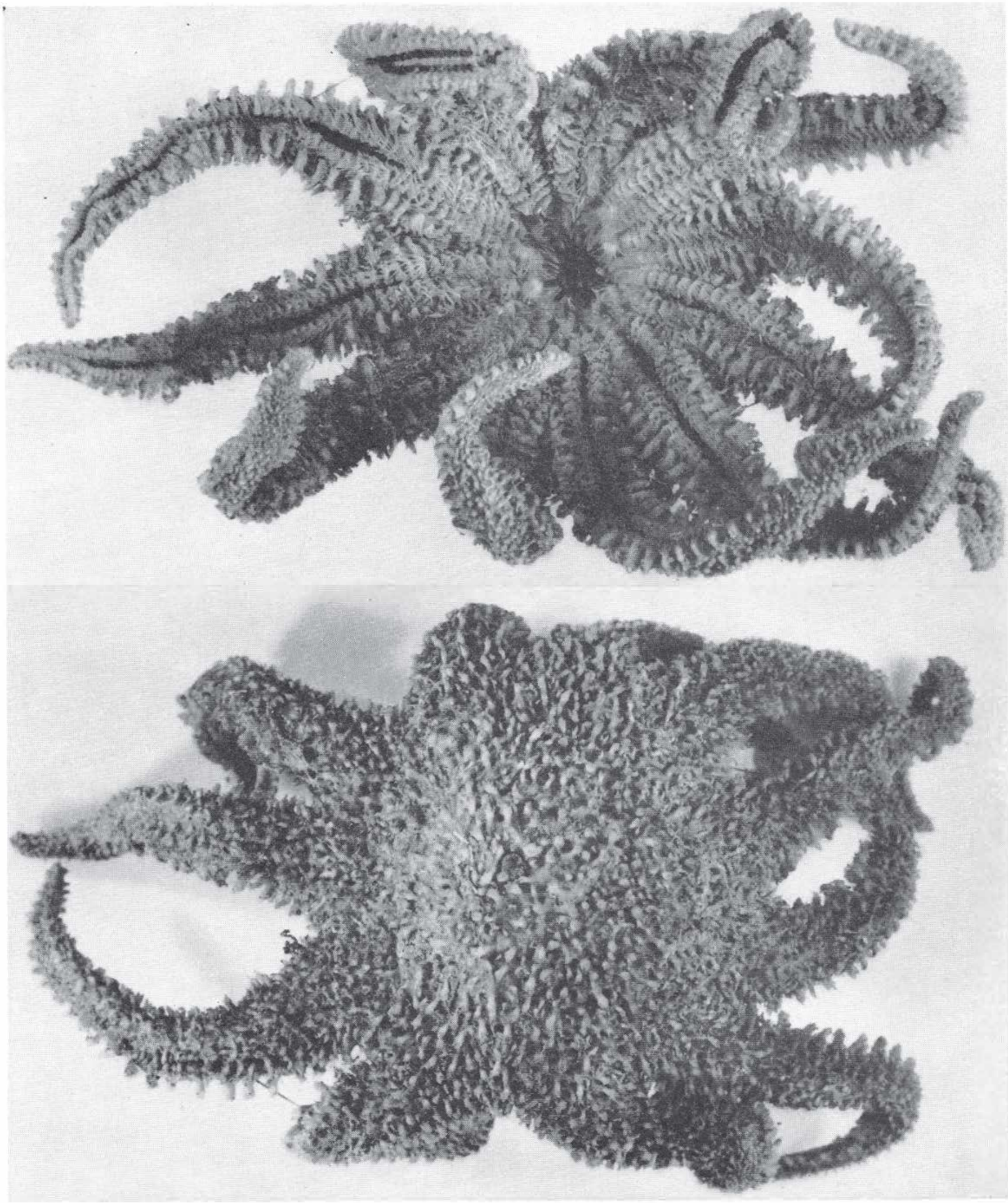
PLATE 4

Crossaster japonicus (Fisher)

(page 64)

× 1, Sta. 7, 280 fm.

PLATE 4



Photos: M. D. King

PLATE 5

Zoroaster spinulosus Fisher

(page 65)

× 2, Sta. 7, 280 fm.

PLATE 5

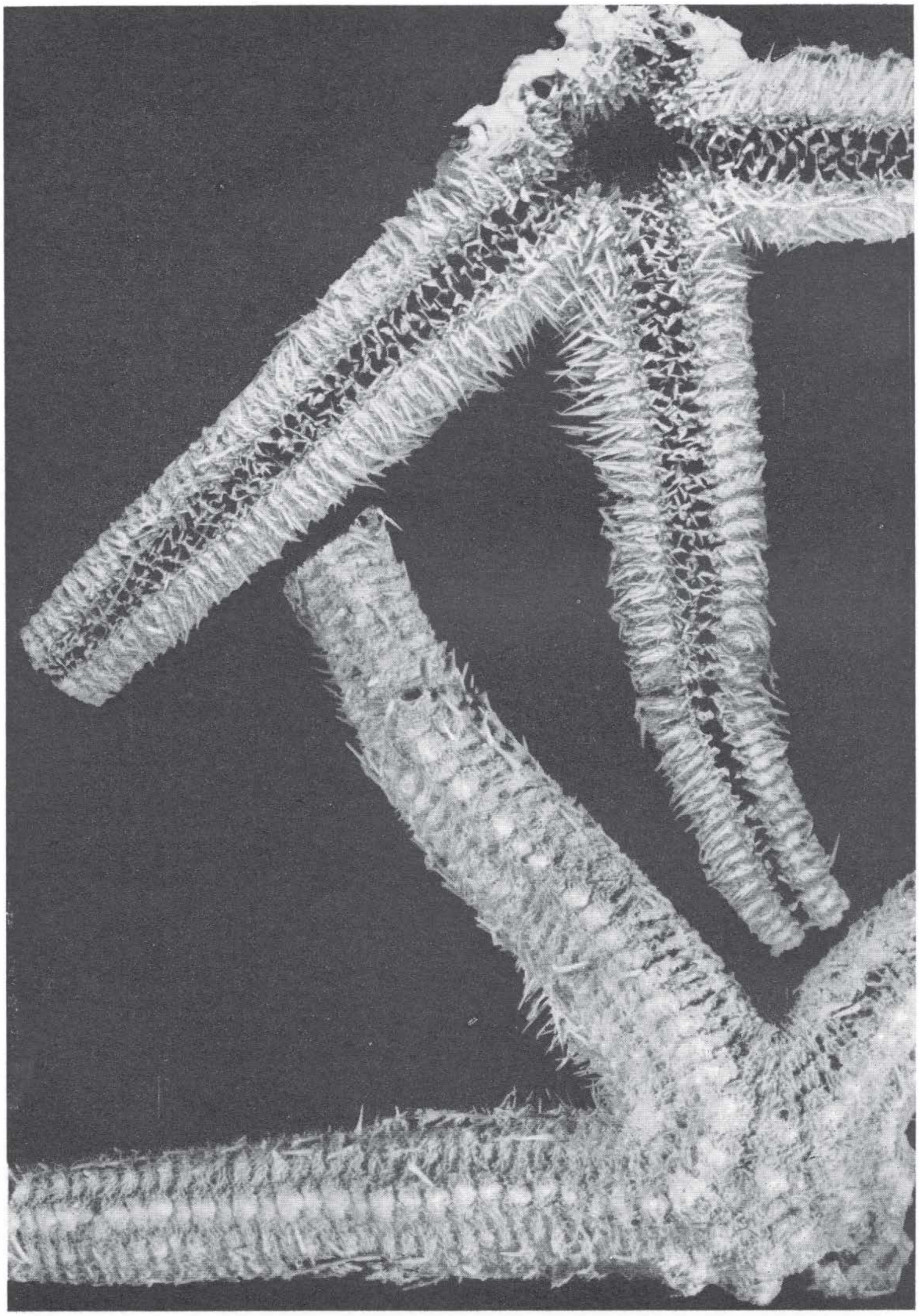


Photo: M. D. King

PLATE 6

Cosmasterias dyscrita H. L. Clark

(page 66)

× 2, Sta. 34, 130 fm.

PLATE 6

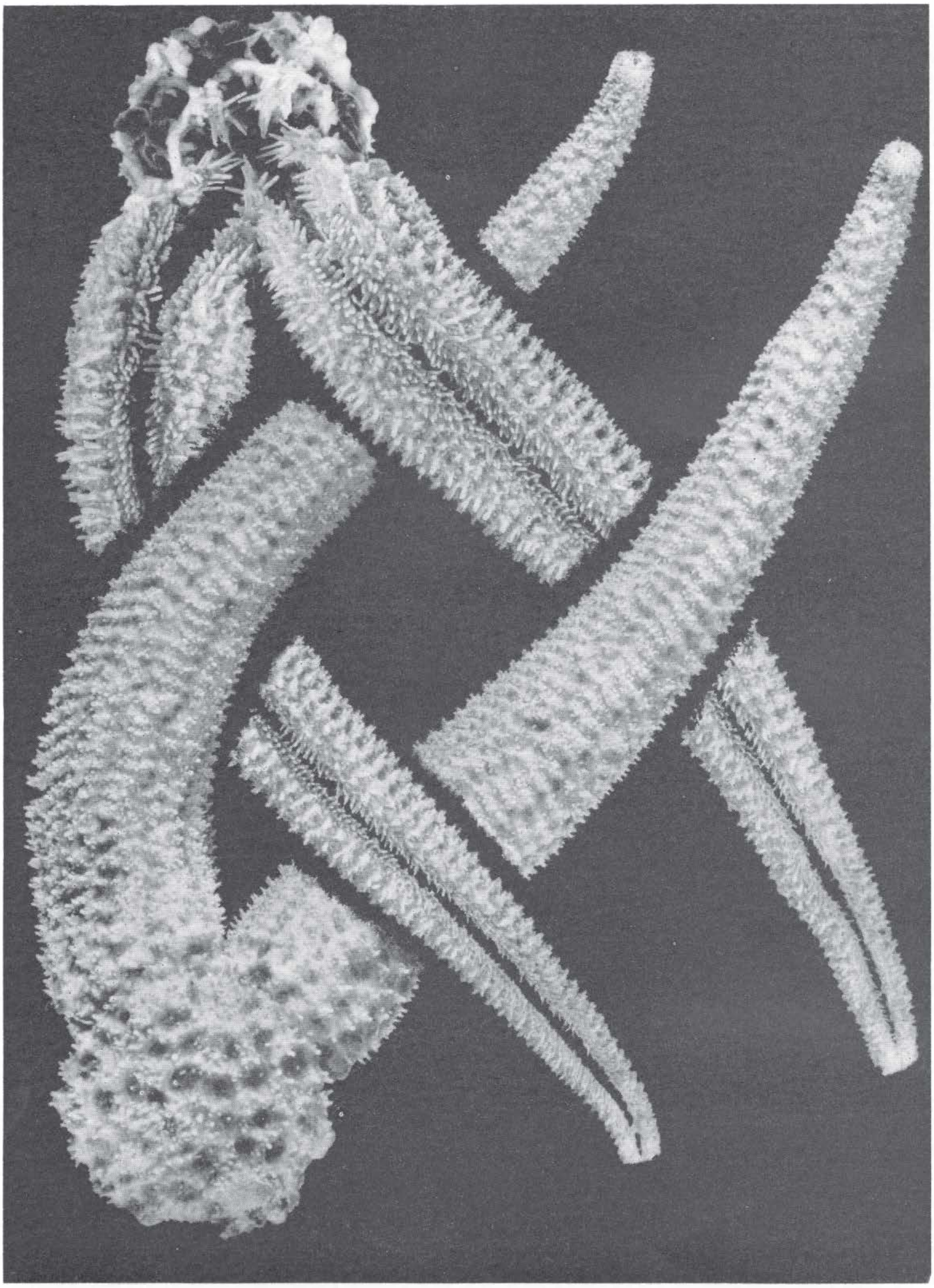


Photo: M. D. King

PLATE 7

Goniocidaris (Aspidocidaris) parasol Fell

(page 70)

Holotype × 2, Sta. 34, 130 fm.

Above: Lateral aspect.

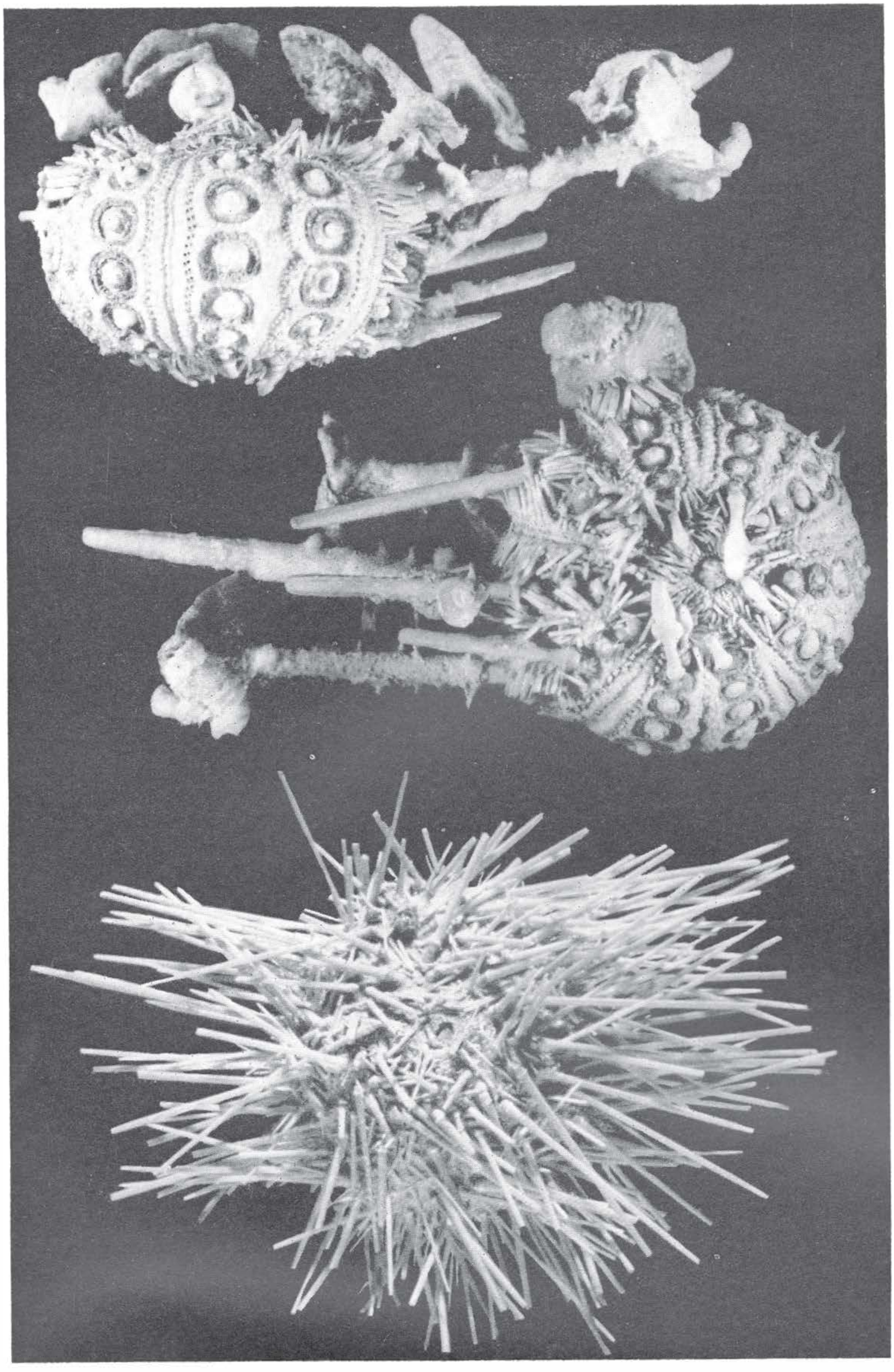
Below: Adoral aspect.

Pseudechinus flemingi Fell

(page 71)

Paratype × 2, Sta. 28, 50 fm.

PLATE 7



Photos: M. D. King

PLATE 8

Pseudechinus ftemingi Fell

(page 71)

Immature paratype test, × 5, Sta. 28, 50 fm.

Above: Aboral aspect.

Below: Adoral aspect.

PLATE 8

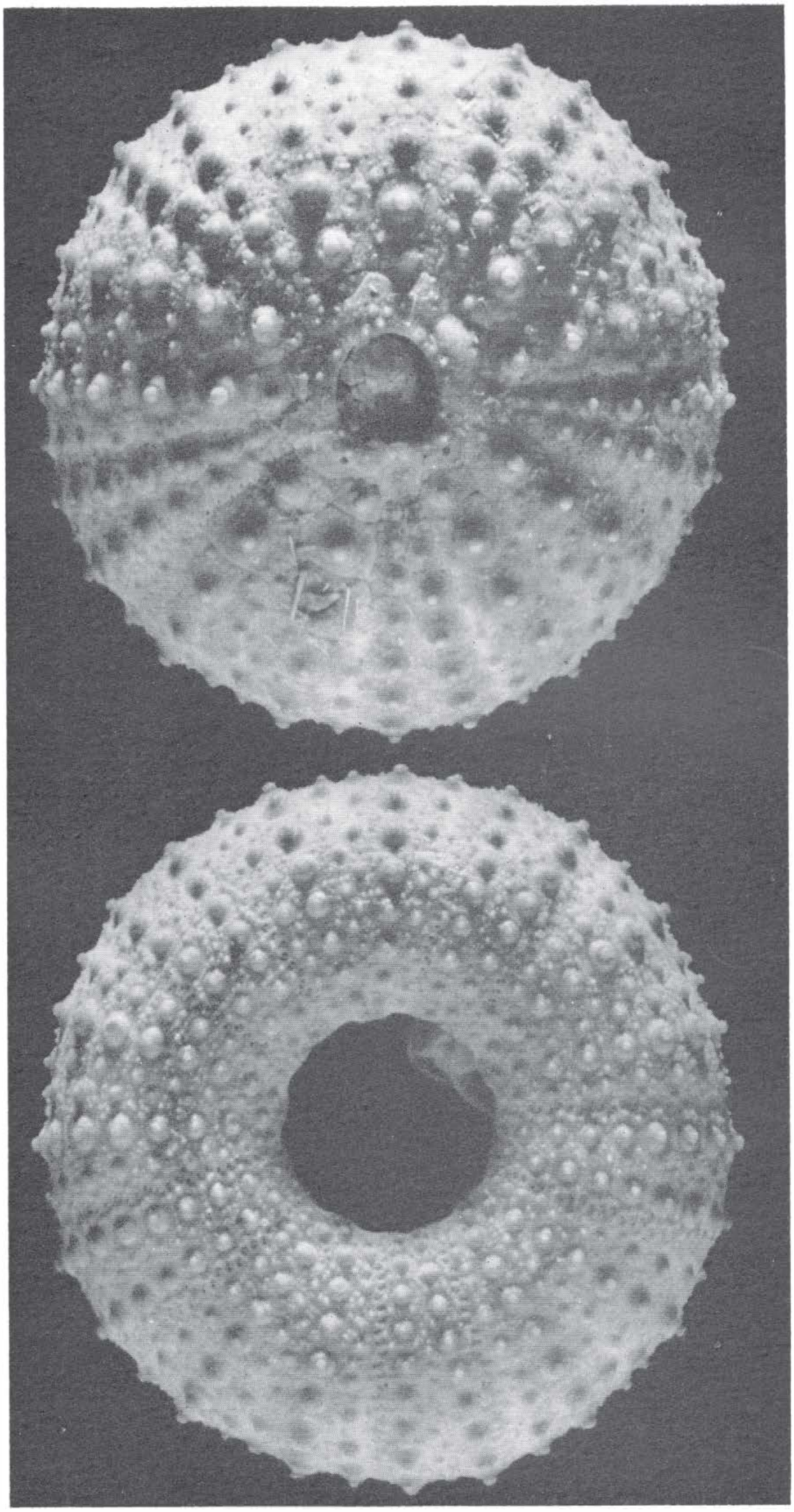


Photo: A. Eady

PLATE 8

Photo: A. Eady

PLATE 9

Brissopsis oldhami Alcock

(page 73)

Cook Strait adult specimen, × 1.2, Sta. VUZ 77, 435 fm.

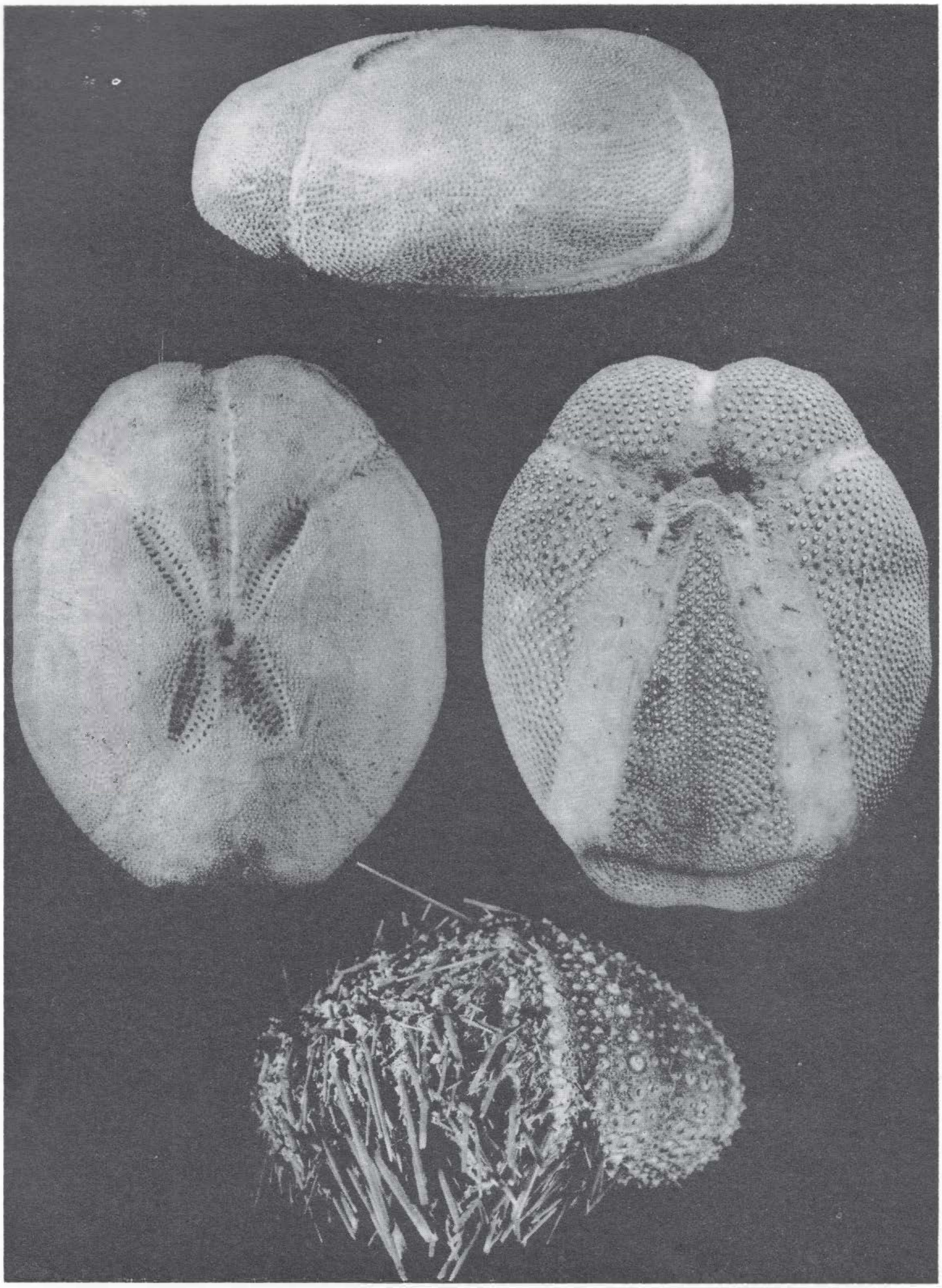
Lateral, aboral and adoral aspects.

Pseudechinus flemingi Fell

(page 71)

Holotype, × 1.5, Otago, D.M. Sta. B.S. 191, 250–300 fm.

PLATE 9



Photos: M. D. King

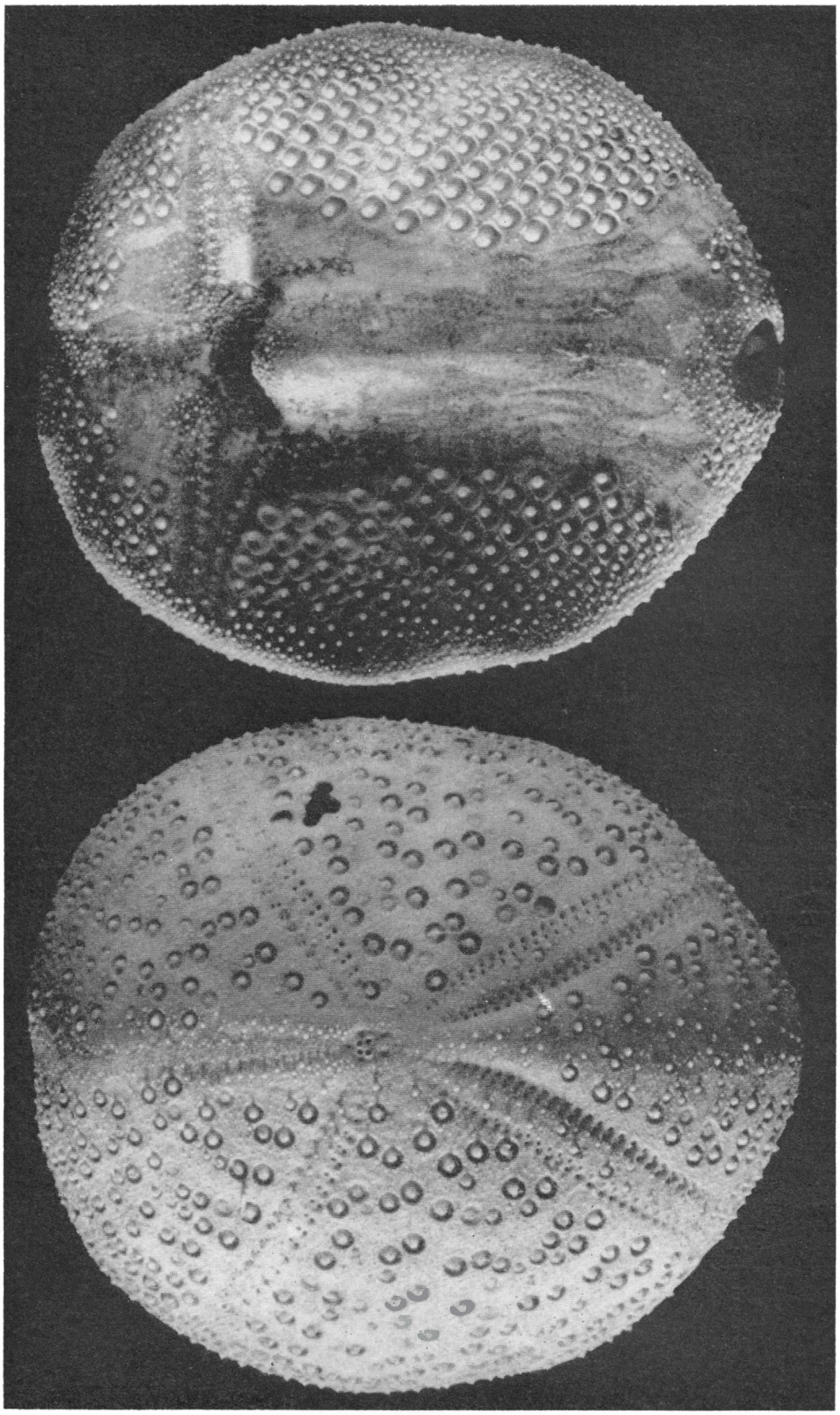
PLATE 10

Paramaretia multituberculata Mortensen

(page 73)

Aboral and adoral aspects, both × 1.1. Sta. 40, 155 fm.

PLATE 10



Photos: A. Eady

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