

**MARINE
INVERTEBRATES
OF SOUTHERN
AUSTRALIA
PART I**



Edited by
S. A. SHEPHERD
and
I. M. THOMAS

Cassiduloida

Apatopygus occidentalis H. L. Clark

Spatangoida

Moira stygia* A. Agassiz*Moira lethe* Mortensen*Protenaster australis* (Gray)*Brissus agassizii* Döderlein*Eupatagus valensciennesii* L. Agassiz*Eupatagus dyscritus* H. L. Clark*Lissospatangus* n.sp.*Spatagobrissus* n.sp.*Spatangus* n.sp.*Paramaretia multinuberculata* MortensenEchinocardium cordatum* (Pennant)*Heterobrissus niasicus* (Döderlein)*Breynia australasiae* (Leach)

SEA-CUCUMBERS (Class HOLOTHURIOIDEA)

by F. W. E. Rowe*

The Class Holothurioidea comprises elongated, worm-like, soft bodied echinoderms which live usually with one side of the body in contact with the substrate or completely buried in the substrate. Holothurians are basically pentamerous but often with a secondarily imposed bilateral symmetry. The mouth is at the anterior end of the body and the anus at the posterior end (fig. 10.26).

The tube-feet may be restricted to the five radial (ambulacral) lines along the body or they may be scattered over the body or they may be absent. Differentiation of function of the tube-feet occurs in aspidochirotes (*Holothuria* and *Stichopus*), with those on the upper side (usually denoted the *dorsal side*) being sensory in function and called papillae, whilst those on the under side (denoted as the *ventral side*) are locomotory and retain the name tube-feet or pedicels. There is no differentiation of tube-feet and papillae in the dendrochirotes (e.g. *Staurothyone*, *Thyone*, *Lipotrapeza*) and tube-feet are absent in molpadiids (*Paracaudina*) and apodids (e.g. *Rynkatorpa*, *Leptosynapta*, *Trochodota*). The food-catching tentacles surrounding the mouth are modified tube-feet.

In holothurians the sexes may be separate or the animals hermaphroditic. They differ from the other classes of echinoderms in having a *single* gonad,

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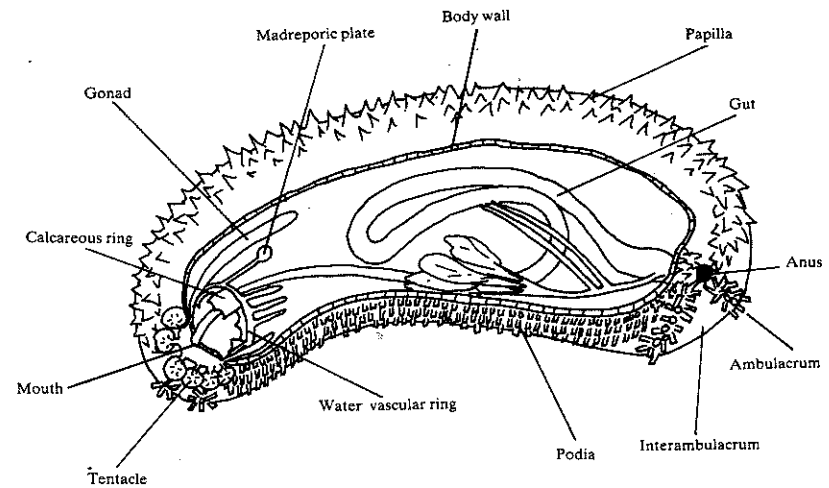


Fig. 10.26 Diagram of holothurian showing features mentioned in the text.

located in the dorsal half of the body and opening by a single pore in the mid-dorsal region close to the tentacles. Also, the madreporic plate opens internally into the coelom (except in deep-water elasipods). This also is found in the mid-dorsal position.

Surrounding the pharynx is a ring of ten plates which alternate in two sizes, the larger occurring in the radial position (i.e. adjacent to an ambulacrum) and the smaller in an interradial position. These plates, collectively called the calcareous ring, support the pharynx, associated nerve and water-vascular rings and act as the point of insertion for the longitudinal muscle bands which extend along the length of the body. The calcareous ring may be relatively short and simple (ribbon-like) or elongate, tubular and composed of a mosaic of small pieces.

The skeleton of holothurians is reduced to from a few to millions of minute calcareous two- or three-dimensional plates or spicules. The variously shaped spicules have been given appropriate names, e.g. tables, buttons, wheels, anchors, and these are illustrated in the key.

The features described are those whose design and variation are used in the identification of the holothurian species included in this paper. Examination of internal structures is carried out by a simple longitudinal incision, usually along the mid-dorsal or lateral line of the animal. Examination of spicules involves the preparation of microslides. A very thin, vertical section of body wall can be placed in the centre of a glass slide and covered with a drop of domestic bleach

(active ingredient sodium hypochloride 3.5 per cent) to dissolve the tissue and release the spicules. The bleach is then allowed to crystallise before being removed by repeatedly adding a few drops of water (to re-dissolve the crystals) and drawing off the solution using absorbent paper, until no further crystals are formed on drying. Alternatively slightly larger pieces of body wall may be dissolved in a centrifuge tube, the final washing being with 95 per cent ethanol prior to spreading the spicules on the glass slide. The spicules are then covered by mountant (e.g. Euparal), protected by a coverslip and clearly labelled.

Spicules are usually obtained from the mid-dorsal region of the holothurian, but spicules from the tentacles and introvert (dendrochirotes), from the tentacles and oral disc (apodids) and from the anal area (molpadiids and dendrochirotes) may also need to be examined.

The forty southern Australian species included here are shallow-water (to 90 m) species, the deep-water species being relatively unknown for the area. Each of the four orders: Aspidochirotida (3 spp); Dendrochirotida (25 spp); Molpadiida (4 spp) and Apodida (8 spp) is represented. At least 80 per cent of these species are endemic indicating the long geographical isolation of this fauna. The species in the order Dendrochirotida are benthic suspension feeders, passing food to the mouth by the tentacles. The other orders are deposit feeders, ingesting organic matter with mud or sand. In the following key those species marked with an asterisk (*) are currently being described or under review by the author.

Key to orders

1. Body wall thick, muscular; tube-feet and papillae present; 10-30 shield-shaped or bushy tentacles surrounding the mouth (fig. 10.27a, b,) 2
- Body wall thin, translucent; no tube-feet but papillae (*not* modified from tube-feet) may be present; twelve pinnately divided tentacles surrounding the mouth (Fig. 10.27c, d) Orders MOLPADIIDA, APODIDA 29
2. About twenty tentacles, short, with shield-shaped (peltate) head (Fig. 10.27a) Order ASPIDOCHIROTIDA 3
- 10-30 tentacles, long, branched and bush-like (dendritic) (Fig. 10.27b) Order DENDROCHIROTIDA 5

Key to Species

3. Calcareous spicules in body wall are spiny tables and slender C-shaped rods (Fig. 10.27e) *Stichopus ludwigi* (p. 462)
- Calcareous spicules do *not* include slender C-shaped rods 4
4. Spicules comprise usually tables alone, rarely small branched rods (rosettes) are present. (Fig. 10.28a) *Stichopus mollis* (p. 462)
- Spicules comprise tables associated with elongate plates, perforated by three or more pairs of holes (buttons) (Fig. 10.28b) *Holothuria (Thymiosycia) hartmeyeri* (p. 462)

5. Tube-feet scattered over the body 6
- Tube-feet restricted to five longitudinal rows (ambulacra) or scattered dorsally but ventrally restricted to three rows on a flattened 'sole' 11

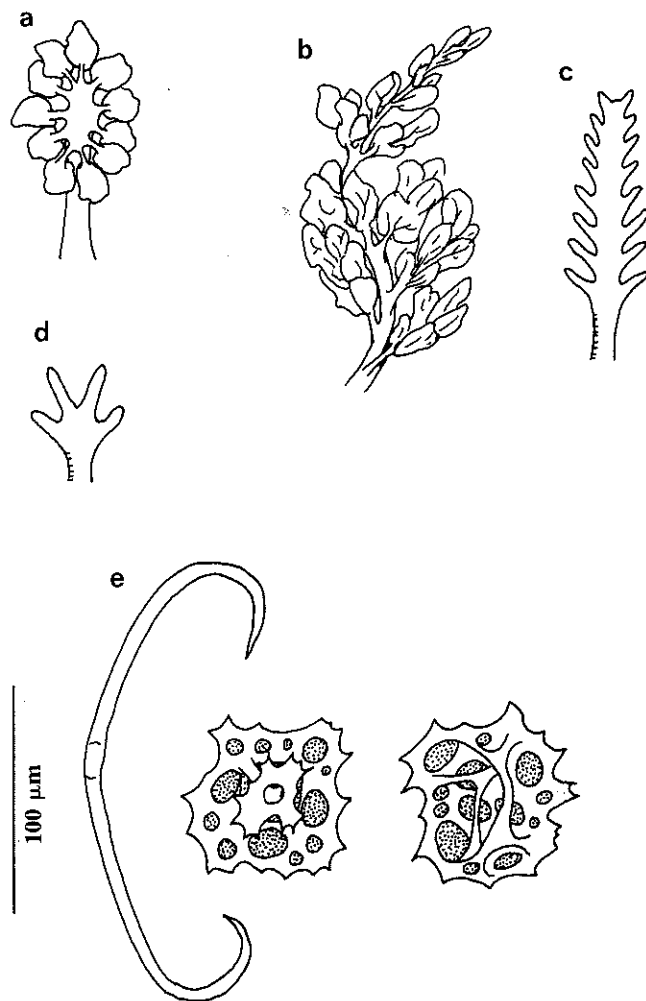


Fig. 10.27 (a)-(d) Diagram of holothurian tentacles—(a) aspidochirote; (b) dendrochirote; (c) apodid; (d) molpadiid; (e) *Stichopus ludwigi*, C-shaped rod and spiny tables.

6. Ten tentacles 7
 — Twenty tentacles 9
7. Calcareous ring simple, narrow, ribbon-like; spicules of body wall comprise X-shaped bodies and slender, branched rods or rosettes, no tables (Fig. 11.28c) *Staurothyone inconspicua* (p. 462)
- Calcareous ring tubular, composed of a mosaic of small pieces; spicules of body wall absent or comprise tables, circular perforated plates in disc of tube-feet 8
8. Spicules only circular, perforated plates in disc of tube-feet
 *Thyone okeni* (p. 462)
- Spicules include tables from body wall (Fig. 10.29a) .. *Thyone nigra* (p. 462)
9. Spicules include circular perforated plates from disc of tube-feet and thorny X-shaped bodies and rods in body wall (Fig. 10.29b)
 *'Staurothyone' vercoi** (p. 464)
- Spicules may be absent from body wall or comprise tables which may be restricted to anal region 10
10. Tube-feet evenly distributed over body; spicules only perforated plates in disc of tube-feet, none in body wall. *Lipotrapeza vestiens** (p. 462)
- Tube-feet more abundant on mid-ventral region than elsewhere; spicules may include tables in body-wall or at least near anal area
 *Lipotrapeza ventripes** (p. 464)
11. 10-15 tentacles 12
 — 20-30 tentacles 24
12. Body with a soft, distinct ventral 'sole' with sharp ventral-lateral rim; plated dorsally. 13
 — Body with firm or soft body wall, if distinct sole then without sharp ventrolateral rim, though tube-feet may be prominent in ventral part of body; no dorsal plating. 15
13. Fifteen tentacles; large dorsal plates; colour black and white
 *Ceto cuvieria* (p. 464)
- Ten tentacles; dorsal plates small. 14
14. Spicules of dorsal body wall scale-like plates only
 *Psolidium granuliferum* (p. 464)
- Spicules of dorsal body wall include scale-like plates, smaller, smooth perforated plates and x-shaped, shallow baskets (fig. 10.29c)
 *Psolidium ravum* (p. 464)
15. Body with more or less distinct ventral 'sole'; tentacles and anus dorsally directed. 16
 — Body without distinct ventral 'sole', often U-shaped; tentacles and anus not directed dorsally 20
16. Body wall relatively soft; dorsally tube-feet; spicules of body wall perforated plates only. *Psolidiella adhaerens* (p. 464)
- Body wall brittle; dorsally papillae; spicules include knobbed, perforated plates (buttons), fenestrated sphaeroidal bodies and baskets 17

17. Dorsal papillae relatively long, pointed, usually present only along the dorsal and ventral-lateral edges of X-sectionally quadrangular body; spicules comprise fenestrated sphaeroidal bodies and flattened smooth or knobbed perforated plates. 18
- Dorsal papillae short, rounded, not long and pointed, body arched or elongated-rectangular; spicules fenestrated sphaeroids, simple knobbed buttons and deep or shallow baskets 19
18. Perforated plates covered with knobs (fig. 10.30a) . *Pentacta crassa* (p. 464)
- Perforated plates smooth but with pointed projections at one end (fig. 10.30b) *Pentacta quadrangularis*(p. 464)
19. Body arched dorsally, papillae more or less scattered; spicules include deep baskets of more or less similar size (fig.10.30c)
 *Pentacta anceps* (p. 464)
- Body elongated, rectangular, papillae small and restricted to dorsal-lateral edges; spicules include shallow baskets ranging in length from about 30-75 μm (fig. 10.30 d) *Pentacta ignava** (p. 466)
20. Body tapering at both ends, body wall brittle with density of spicules; 6-12 sharp, spine-like processes protruding from the curved ventral-lateral surface; tube-feet inconspicuous (Fig. 10.31a)
 *Plesiocolochirus spinosus* (p. 466)
- Body may or may not taper at both ends; body wall firm but not brittle; no spine-like processes present; tube-feet conspicuous 21
21. Spicules smooth, perforated plates and baskets 22
 — Spicules knobbed buttons and plates, baskets present or absent 23
22. Baskets deep, with few rounded knobs (Fig. 10.31b)
 *'Cucumaria' squamatoides** (p. 466)
- Baskets very shallow; with small knobs and spines (Fig. 10.31c)
 *Trachythyone* sp.* (p. 466)
23. Spicules knobbed, four-holed buttons and shallow baskets (Fig. 10.32a)
 *Ocnus calcareus*(p. 466)
- Spicules mostly elongated or cone-shaped, knobbed perforated buttons (Fig. 10.32b) and lenticulate, scale-like plates *Pseudocnus* sp.* (p. 466)
24. Twenty-five (thirty) tentacles; spicules comprise tables with tall spire (height of spire > disc diameter) terminating in a diverging pair of spires (Fig. 10.32c) *Mensamaria intercedens* (p. 466)
- Twenty to twenty-five tentacles; spicules comprise tables with short spire (height of spire equals or < disc diameter) or perforated disc only, sometimes spicules absent from parts of body wall, being restricted in location 25
25. Calcareous ring simple, ribbon-like (Fig. 10.33a) 26
 — Calcareous ring tubular and complex (Fig. 10.33b)
 *Neothyonidium* sp.* (p. 466)
26. Twenty tentacles *Neocucumella bicolumnata* (p. 467)
- Twenty-five tentacles 27

27. Tube-feet absent from introvert; spicules tables with two-pillared spire, restricted to introvert (Fig. 10.33c) *Amphicyclus mortenseni** (p. 467)
 — Tube-feet present on introvert; spicules with 1-3 pillared spire, or reduced to perforated disc, present in the body wall 28
28. Tables 2-3 pillared spires, disc diameter 70-80 μm (Fig. 10.34a), colour cream/brown *Cucumella mutans** (p. 468)
 — Tables usually reduced to perforated disc (Fig. 10.34b) but may have 1-3 pillared spire, disc diameter 30-50 μm ; colour purple/black *Neoamphicyclus lividus** (p. 468)
29. Fifteen tentacles, only two pairs of lateral digits; spicules as rods, perforated plates, or cup-like deposits, never wheels, anchors or sigmoid hooks 30
 — 10-12 tentacles, with two but usually more pairs of lateral digits; spicules include anchors, wheels and/or sigmoid hooks 33
30. Body wall with minute rods (Figs. 10.34c) *Paracaudina* sp.* (p. 470)
 — Body wall with knobbed, perforated plates and cup-like spicules 31
31. Cup-like spicules in tail region (Fig. 10.35a) *Paracaudina luticola* (p. 471)
 — No cup-like spicules, only knobbed perforated plates 32
32. Perforated plates irregular, with about eight holes (Fig. 10.35b) *Paracaudina australis* (p. 472)
 — Perforated plates squarish, usually with four symmetrically placed holes, occasionally one or two more small holes *Paracaudina tetrapora* (p. 472)
33. Body wall with anchors and plates (Fig. 10.36a-c) 34
 — Body wall with wheels and curved (C-shaped) rods or sigmoid hooks (Fig. 10.37a, b) 36
34. Anchor plates with two large central holes surrounded by smaller holes, all smooth, and a more or less projecting posterior 'handle' (Fig. 10.36a) *Rynkatorpa hickmani* (p. 473)
 — Anchor plates pear-shaped or oval, with seven large, toothed holes, and 8-10 smaller holes posteriorly, no 'handle' 35
35. Anchor plates pear-shaped (Fig. 10.36b); colour in life black and grey, with cream/white tentacles *Leptosynapta ictinodes* (p. 473)
 — Anchor plates oval (Fig. 10.36c); colour in life whitish or pinkish *Leptosynapta dolabrifera* (p. 474)
36. Spicules only smooth sigmoid hooks *Scoliorhapis theeli* (p. 475)
 — Spicules include wheels 37
37. Spicules are wheels and curved (C-shaped) rods which are rounded and spiny at each end (Fig. 10.37a) *Chiridota gigas* (p. 474)
 — Spicules include wheels and sigmoid rods 38
38. Wheels with teeth evenly distributed around the inner rim *Taeniogyrus roebucki* (p. 474)
 — Wheels with teeth in groups around the inner rim (Fig. 10.37b) 39
39. Small forms, carmine-red to purplish in life; sigmoid hooks smooth *Trochodota allani* (p. 474)
 — Larger forms, black/olive-green in life; sigmoid hooks with small spines (Fig. 10.37b) *Trochodota shepherdii* (p. 474)

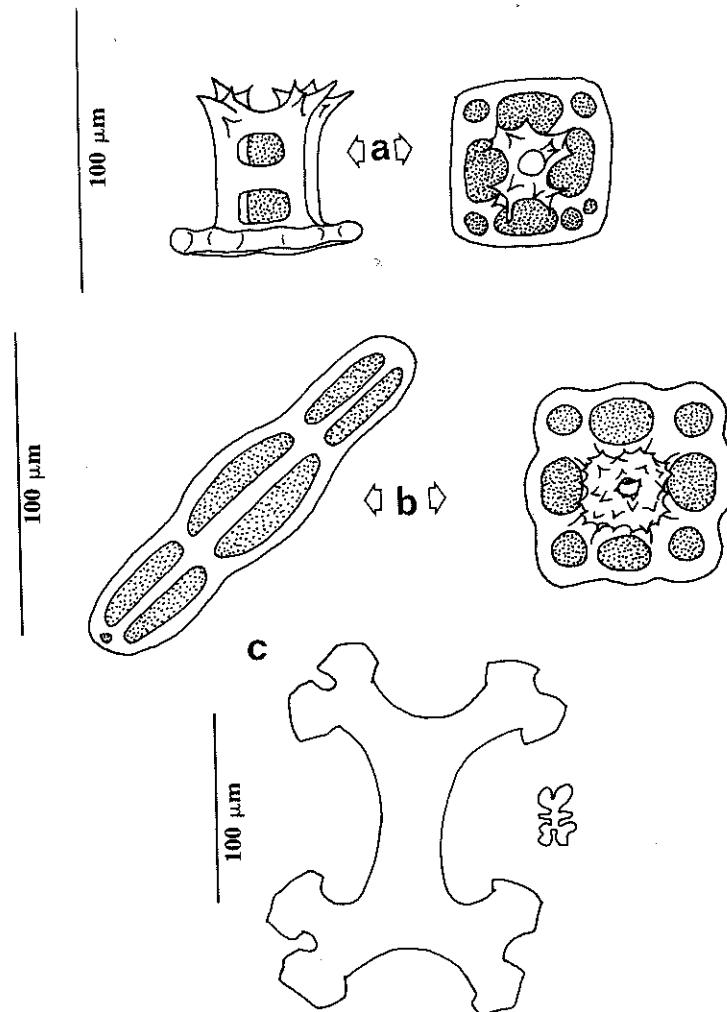


Fig. 10.28 (a) *Stichopus mollis*, tables; (b) *Holothuria (Thymiosyca) hartmeyeri*, button and table; (c) *Staurothyone inconspicua*, X-shaped body and branched rod (rosette).

DESCRIPTION OF SPECIES

Stichopus ludwigi Erwe Fig. 10.27e. Plate 29.6

A rather uncommon species which reaches about 120 mm in length. The colour is generally blotched fawn and dark brown with dorsal papillae dark brown. The species extends from south east Tas., west to the Abrolhos Is., W.A. to a depth of 25 m.

Stichopus mollis (Hutton) Fig. 10.28a. Plate 31.1

Similar in size to the preceding species, to about 175 mm in length, and extremely common along the southern coastline of Australia from central N.S.W. to the Abrolhos Is., W.A. and to a depth of 25 m. The colour is variable, usually dark brown with black rings around the papillae and lines on the body, but may be mottled with grey or cream.

Holothuria (Thymiosycia) hartmeyeri Erwe Fig. 10.28b. Plate 30.3

A rather large and handsome species reaching some 250 mm in length. It is blotched creamy/grey and brown with dark papillae and may appear somewhat similar to *S. ludwigi*, though reaching a greater size. The species is known from Gulf St Vincent, S.A. west to Abrolhos Is., W.A. to a depth of 40 m.

Staurothyone inconspicua (Bell) Fig. 10.28c

A small brown species up to about 40 mm length (tentacles extended). It occurs at low tide under rocks and stones and has been reported from Tas., Vic., and S.A.

Thyone okeni Bell

Another brownish species up to about 85 mm length. Originally described from Port Jackson, N.S.W. it also occurs in Torres Strait and Guam. Specimens from Port Phillip and Westernport Bays, Vic. have been provisionally referred to this species.

Thyone nigra Joshua and Creed Fig. 10.29a

A small purplish-black species up to about 30 mm long. It has been recorded from S.A., Vic. (Port Phillip Bay) and Cockburn Sound, W.A. to a depth of 20 m.

Lipotrabeza vestiens (Joshua) Plate 31.2

A curved, fusiform animal generally light-brown with white tube-feet and black tentacles. It has been recorded from the north coast of Tas., and west to Cottesloe, W.A. to a depth of 10 m. Joshua (1914) records that the species

covers itself with stones and shells and other debris. Hickman (1962) records specimens collected from low tide level buried in the sediments of mud, sand, and small pebbles.

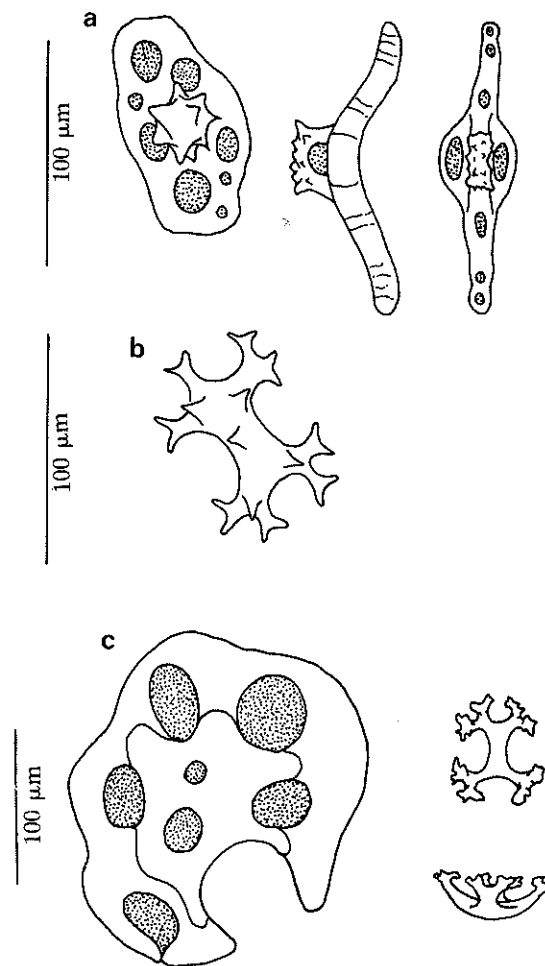


Fig. 10.29 (a) *Thyone nigra*, tables from body wall and tube feet; (b) '*Staurothyone*' *vercoi*, thorny X-shaped body; (c) *Psolidium ravum*, smooth perforated plate and X-shaped, shallow baskets.

Lipotrapeza ventripes (Joshua and Creed)

An uncommon species recorded from S.A. (probably Gulf St Vincent) and Westernport, Vic. The colour is recorded as brown with whitish tube-feet.

'Staurothyone' vercoi (Joshua and Creed) Fig. 10.29b

A rare species, coloured brown, taken in S.A. The species has twenty tentacles, not ten as in the original description. It therefore does not belong in the genus *Staurothyone*.

Ceto cuvieria (Cuvier) Plate 31.3

An easily recognised species with a large, flat 'sole', large dorsal plates and fifteen tentacles. It is generally black or mottled with creamy-white. It is distributed from Investigator Strait, S.A. westward to Shark Bay, W.A. to a depth of 90 m.

Psolidium ravum Hickman Fig. 10.29c

Known only from the Derwent Estuary S.E. Tas. It is generally greyish with white tube-feet and occurs under stones to a depth of 13 m. The related species *Psolidium granuliferum* H. L. Clark (Plate 31.4) is restricted to south west W.A. where it is found under rocks intertidally.

Psolidiella adhaerens Hickman

This species is fawn to white with white or yellowish/brown tentacles spotted golden brown and occurs in S.E. Tas., and at Cape Conran, eastern Vic.

Pentacta crassa (Ekman) Fig. 10.30a

This species is generally brownish grey to salmon red in colour. It is known from the tropical coastline of W.A. extending south and east into the Great Australian Bight.

Pentacta quadrangularis (Lesson) Fig. 10.30b

Somewhat similar in form and colour to the preceding species but distinguished from it mainly on the form of the spicules from the body wall. This tropical species extends south along the coast of W.A. and east to about longitude 128°E in the Great Australian Bight.

Pentacta anceps (Salenka) Fig. 10.30c

Often called the 'candy-striped' holothurian it has low, rounded papillae which gives the animal a knobby aspect. It is usually striped or mottled with

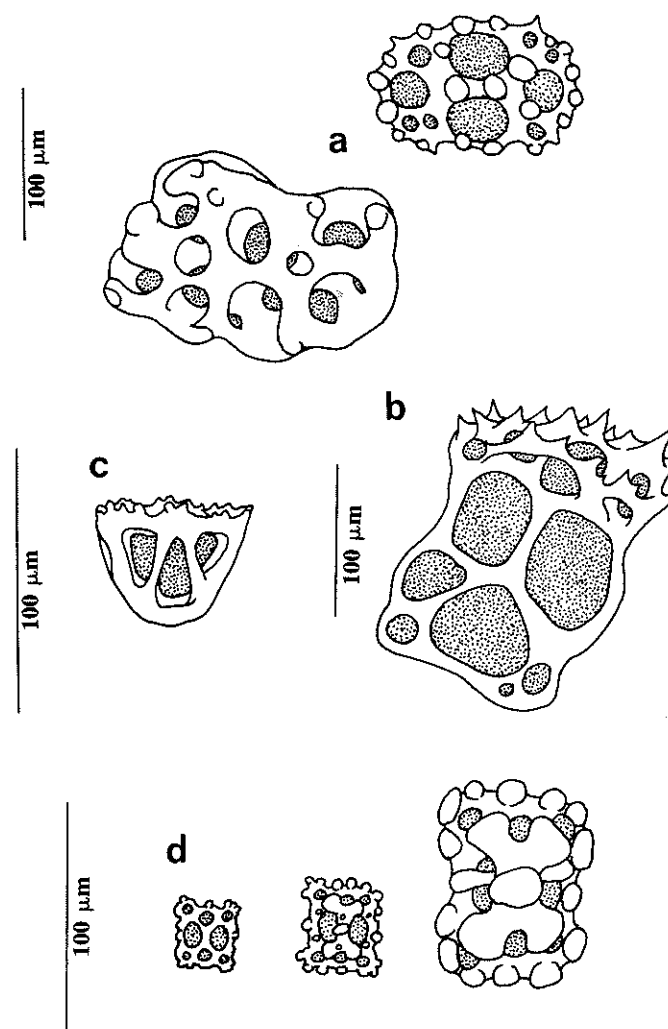


Fig. 10.30 (a) *Pentacta crassa*, fenestrated body and knobbed, perforated plate; (b) *Pentacta quadrangularis*, smooth perforated plate with projections at one end; (c) *Pentacta anceps*, deep basket; (d) *Pentacta ignava*, ventral view of 3 sizes of shallow baskets.

yellow and pink. This is another tropical species extending south along the coast of W.A. into the Great Australian Bight to at least 133°E.

Pentacta ignava (Ludwig) Fig. 10.30d. Plate 32.1

A small, rectangular, box-shaped species, varying in colour from white-orange to brown. It probably ranges southerly from Port Jackson, N.S.W. to Abrolhos Is., W.A., and may be found often in seaweed or under rocks and stones intertidally.

Plesiocolochirus spinosus (Quoy and Gaimard) Fig. 10.31a

An easily recognised species which although well known from N.S.W. and Qld has also been collected from Victorian waters. The species is muddy brown, with a pinkish hue, and extends to at least 60 m deep on coarse sediments.

'Cucumaria' squamatoides H. L. Clark Fig. 10.31b

A rare species, known only from Encounter Bay and Gulf St Vincent, S.A. One specimen was marbled grey and white with yellow tube-feet on the small flattened, yellow, sole-like area. The body is generally U-shaped with the anterior end blunt but the posterior end tapering to a relatively sharp point.

Trachythone sp. Fig. 10.31c

A small rare species measuring up to 7.5 mm in length known only from S.E. Tas.

Ocnus calcareus (Dendy) Fig. 10.32a

A small white animal known from New Zealand and recently found in southwestern W.A. and Spencer Gulf, S.A.

Pseudocnus sp. Fig. 10.32b. Plate 32.2

A surprisingly common little species (to 20 mm long) extending from the north coast of N.S.W. southward and westward to Cape Naturaliste, W.A. It is usually mottled grey and black dorsally.

Mensamaria intercedens (Lampert) Fig. 10.32c

A brightly coloured tropical species, striped purple-blue and red, extending south along the coast of W.A. into the Great Australian Bight.

Neothyonidium sp. Plates 31.5, 31.6

This species has been recorded only from S.E. Tas. by Hickman (1978) as *N. dearmatus*, a New Zealand species.

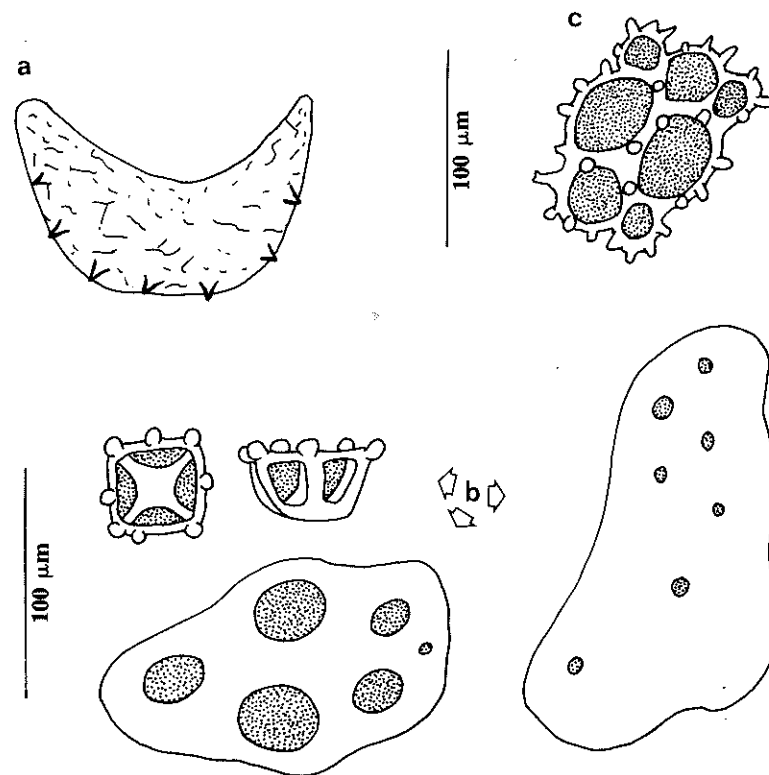


Fig. 10.31 (a) *Plesiocolochirus spinosus*, lateral view of animal; (b) *'Cucumaria' squamatoides*, smooth perforated plates and deep baskets; (c) *Trachythone* sp., shallow basket.

Neocucumella bicolumnata (Dendy and Hindle)

This N.Z. species is included in the southern Australian fauna on the basis of a single specimen from S.A.

Amphicyclus mortenseni Hedding and Panning Fig. 10.33c

This deep water eastern Bass Strait species is included on the basis of records from the Derwent, Tas.

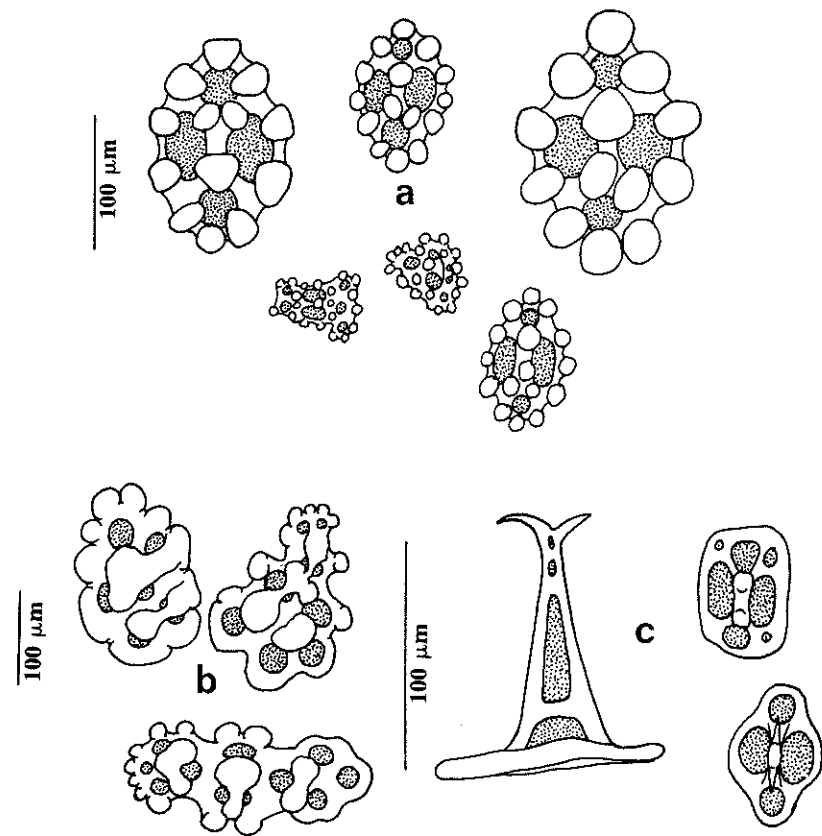


Fig. 10.32 (a) *Ocnus calcareus*, 4-holed, knobbed buttons and shallow baskets; (b) *Pseudocnus* sp., cone-shaped, knobbed, perforated buttons; (c) *Mensamaria intercedens*, tables.

***Cucumella mutans* (Joshua) Fig. 10.34a**

A brownish animal with tentacles darker brown but pedicels whitish, or it may be totally creamy/white. It is distributed from south eastern Tas., westward to the Abrolhos Is., W.A. to a depth of 12 m.

***Neoamphicyclus lividus* Hickman Fig. 10.34b**

A slatey-blue to purplish-black species reported as one of the most common

Tasmanian holothurians. It also occurs on the coasts of S.A. and Vic. in similar conditions and depths to *C. mutans*.

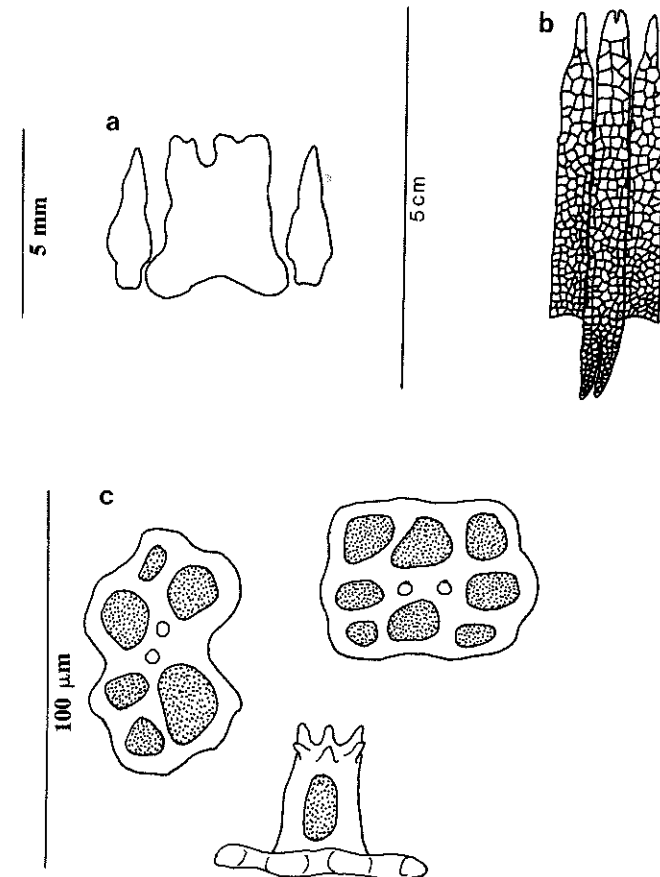


Fig. 10.33 (a) radial and adjacent interradial plates of simple, ribbon-like calcareous ring; (b) radial and adjacent interradial plates of tubular, complex calcareous ring; (c) *Amphicyclus mortenseni*, tables from introvert.

Paracaudina sp. Fig. 10.34c

An undescribed form which occurs between Port Phillip Bay, Vic. and south western W.A. to a depth of 145 m. Preserved specimens have a creamy to pinkish hue.

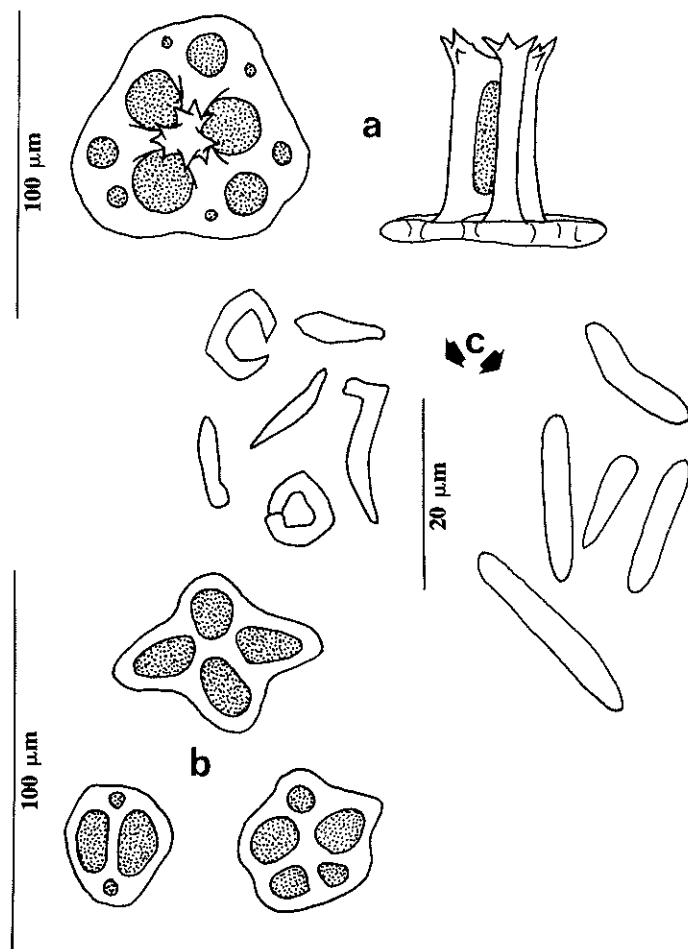


Fig. 10.34 (a) *Cucumella mutans*, tables from body wall; (b) *Neoamphicyclus lividus*, tables reduced to perforated discs; (c) *Paracaudina* sp., minute rods from the body wall.

Paracaudina luticola Hickman Fig. 10.35a

A slender, greyish animal which reaches at least 160 mm in length. It is recorded from the Derwent Estuary, Tas., Vic. and S.A.

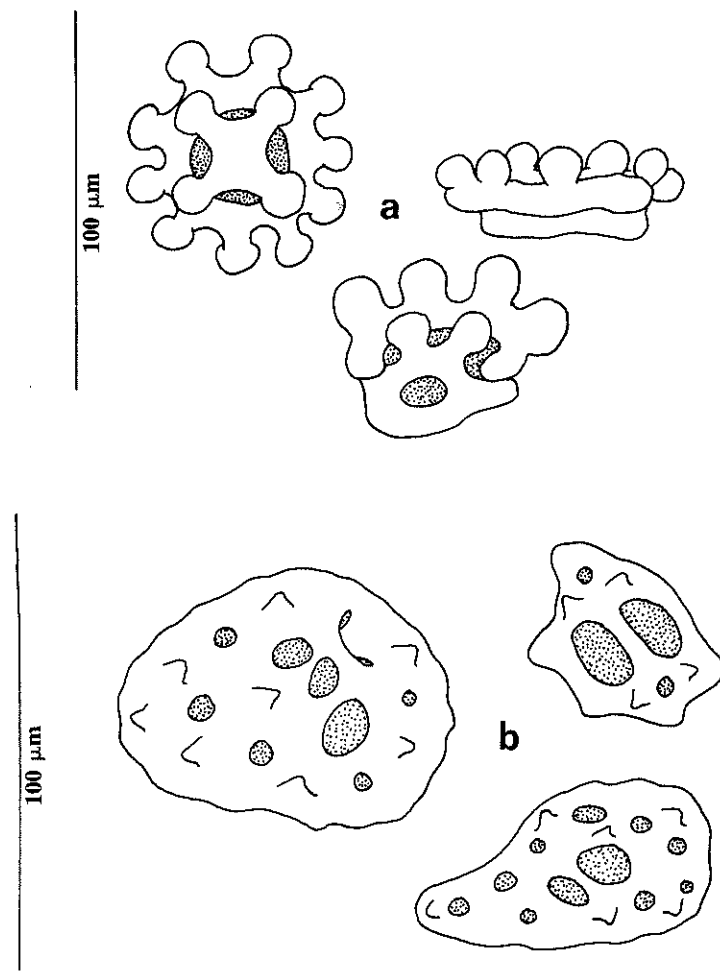


Fig. 10.35 (a) *Paracaudina luticola*, cup-like spicules from the tail region; (b) *Paracaudina australis*, perforated plates from the body wall.

Paracaudina australis (Semper) Fig. 10.35b. Plate 32.3

This species, described from Rockhampton, Qld is recorded from S.A., Vic. and Tas. In S.A. its colour is whitish with patches of rusty-pink but in Tas. it is usually brown.

Paracaudina tetrapora (H. L. Clark)

Known from Cottesloe Beach and the Abrolhos Is., W.A. and Lefevre Peninsula, S.A. Preserved specimens are described as whitish in colour.

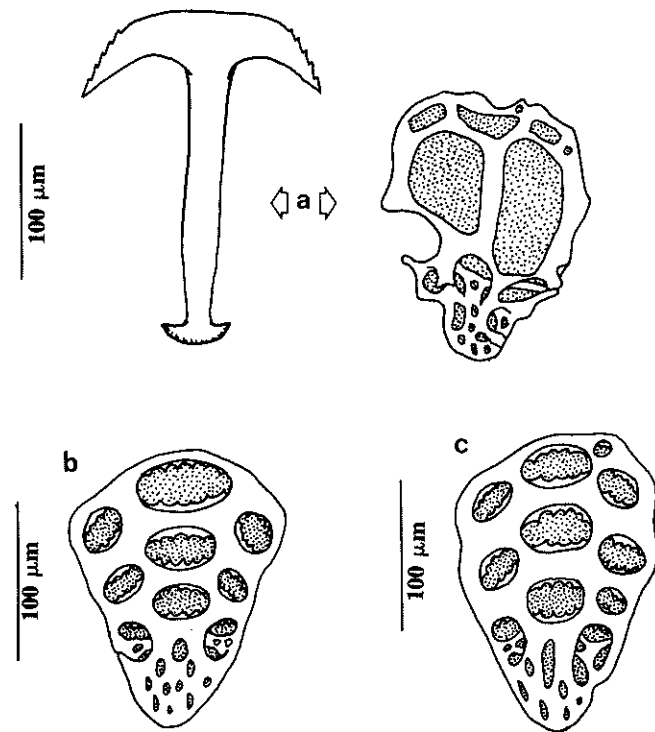


Fig. 10.36 (a) *Rynkatorpa hickmani*, anchor and anchor-plate with posterior 'handle'; (b) *Leptosynapta ictinodes*, pear-shaped anchor plate; (c) *Leptosynapta dolabrifera*, oval anchor plate.

Rynkatorpa hickmani Rowe and Pawson Fig. 10.36a

A small, pinkish species recorded from the south east and northern coasts of Tas. and off Cape Howe, Vic. to a depth of 95 m.

Leptosynapta ictinodes H. L. Clark Fig. 10.36b

A rare, small species, 45 mm long from Western Port and Wilson's Promontory, Vic. The preserved colour is light grey, anteriorly darker, almost black but tentacles contrast sharply by being cream coloured.

Leptosynapta dolabrifera (Stimpson) Fig. 10.36c. Plate 32.4

A very common pink-white species found intertidally throughout southern Australia.

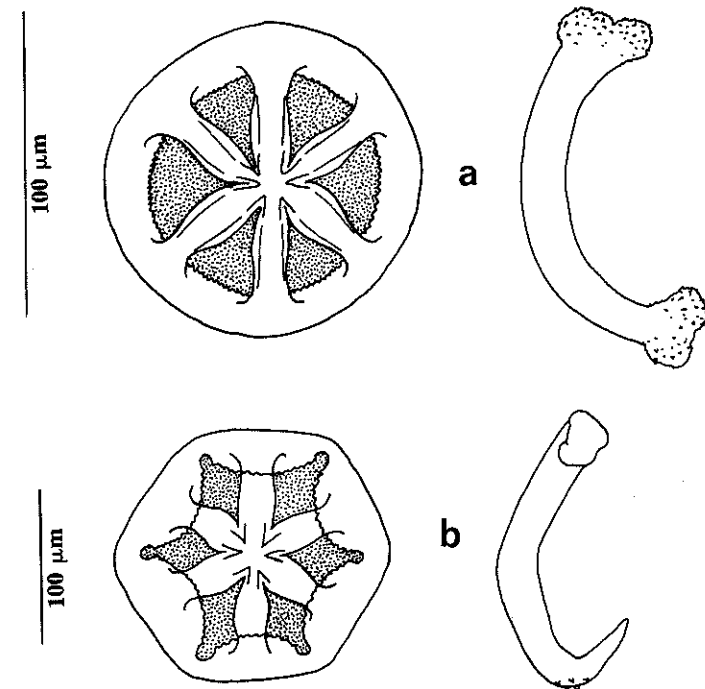


Fig. 10.37 (a) *Chiridota gigas*, wheel and curved rod; (b) *Trochodota shepherdi*, wheel and sigmoid rod.

Scoliorhapis theeli (Heding)

An uncommon pinkish-red species which extends from the coast of N.S.W. to the south-east coast of Tas. in shallow water.

Chiridota gigas Dendy and Hindle Fig. 10.37a. Plate 30.4

A New Zealand species known from the Victorian coast west to Cape Otway, and from south eastern Tas. It is a large species to 500 mm long when extended, and is scarlet-orange with white papillae.

Taeniogyrus roebucki (Joshua)

A small (up to about 75 mm) red species which occurs under stones near low water mark. It is recorded from the north coast of Tas., westward to Rottneest I., W.A.

Trochodota allani (Joshua)

A species very abundant in Port Phillip Bay, Vic. and known also from south eastern Tas. It reaches about 82 mm in length and is carmine red or dark purple in colour.

Trochodota shepherdii Rowe Fig. 10.37b. Plate 32.5

A black species reaching a length of about 60 mm and closely related to the preceding species. It occurs in Spencer Gulf and Gulf St Vincent, S.A. to a depth of 10 m.

GLOSSARY

Ambitus: periphery or edge.

Calcite: a crystalline form of calcium carbonate.

Cirrus: jointed appendage of crinoids arising from the centrodorsal plate, used for attachment to the substrate or host.

Comb: modified terminal segments of a crinoid pinnule.

Crenulate: having a minutely scalloped margin.

Fasciole: aggregation of ciliated spines in echinoids used to produce water currents in the burrow for feeding, respiration and excretion.

Interbrachial: between adjoining arm tips.

Madreporic plate: enlarged interradial plate on disc of sea-star, connecting the water vascular system to the sea.

Papilla: tube foot with sensory function in holothurians and ophiuroids.

Papula: small respiratory process projecting through pores in the sea-star body wall, mainly on the upper surface.

Paxilla (adj. *paxilliform*): modified dorsal plate of a sea-star with a vertical pillar, crowned with spinelets or granules.

Pedicellaria: a pincer-like structure on sea-stars and sea-urchins.

Pinnule: slender jointed appendage on arms of crinoids.

R/r: distance from mouth to arm tip/distance from mouth to interradial arc.

Reticulate: having a network pattern.

Spatulate: shaped like a spoon.

Tabula: flat-topped, elevated dorsal plate of a sea-star.

Tessellate: having a pattern of small squares like a tiled pavement.

Tubercle: a small knob-like prominence.

Verticillate: whorled, in an arrangement like the spokes of a wheel.

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MARINE INVERTEBRATES OF SOUTHERN AUSTRALIA PART I

ERRATA

Plate 4.1 legend—for '*calyciformis*' read '*caliciformis*'.

Plate 10.3 legend—for '*generalis*' read '*generale*'.

Plate 14.3 legend—for '(R.V.S.)' read '(J.B.P.)'.

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Cover photographs—

Top.

A benthic community on a granite substrate at fifty-two metres depth in the eastern part of the Great Australian Bight, containing sponges, a gorgonian, soft corals and the sea-star *Nectria macrobrachia* (centre). Photo, K. L. Branden.

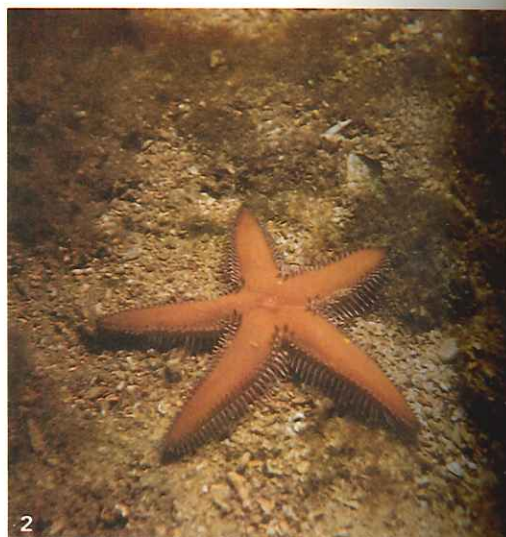
Bottom.

Ralpharia magnifica (E.M.).





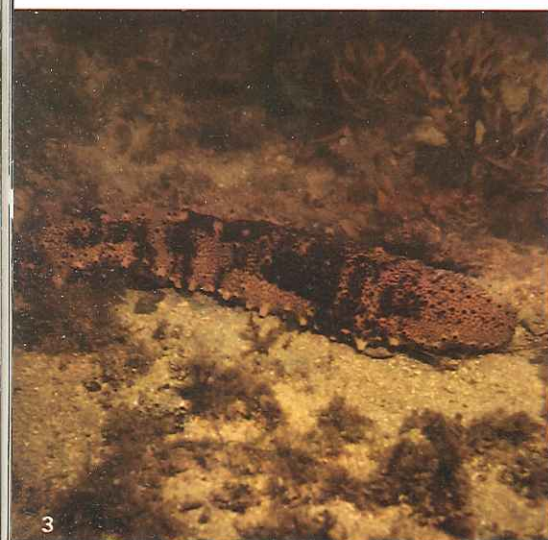
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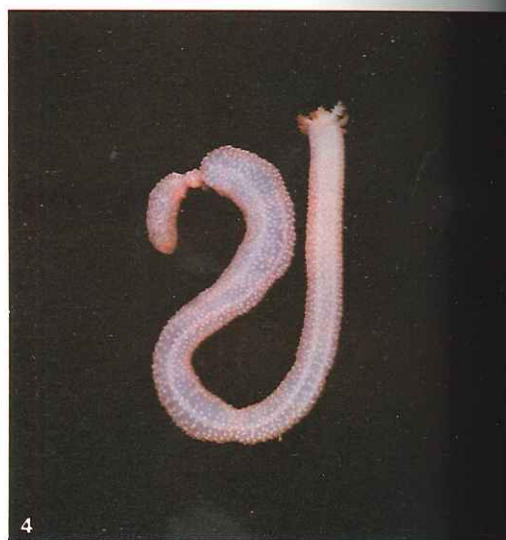
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2



3



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4



6

Plate 30. 1. *Comanthus trichoptera* (I.B.O.), 2. *Astropecten vappa* (I.B.O.),
3. *Holothuria hartmeyeri* (N.C.), 4. *Chiridota gigas* (N.C.).

Plate 31. 1. *Stichopus mollis* (N.C.), 2. *Lipotrapeza vestiens* (N.H.), 3. *Ceto cuvieria*
(N.C.), 4. *Psolidium granuliferum* (N.C.), 5. *Neothyonidium* sp. (N.C.), 6. *Neothyonidium*
sp., tentacles above sand (J.C.).

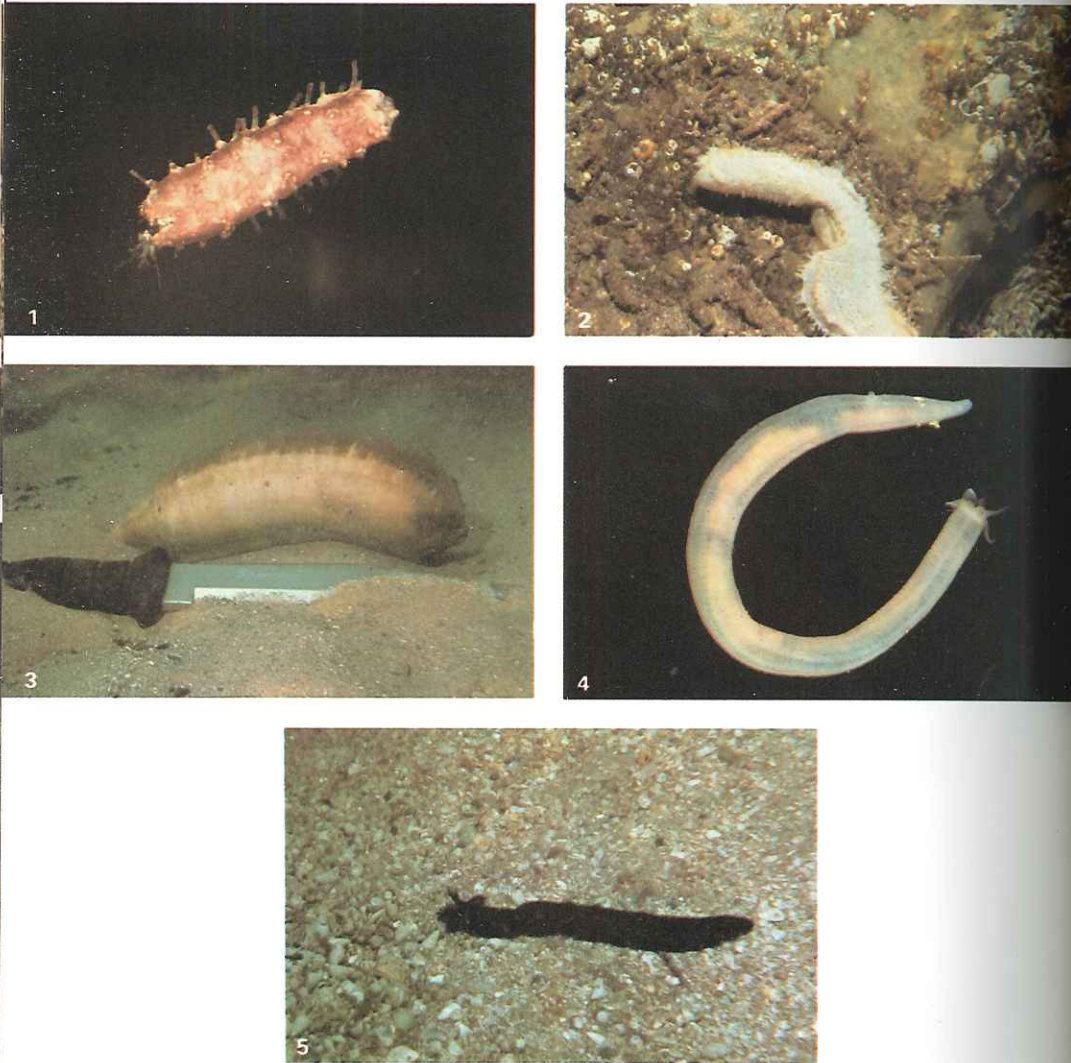


Plate 32. 1. *Pentacta igna va* (N.C.), 2. *Pseudocnus* sp. (N.C.), 3. *Paracaudina australis* (J.C.), 4. *Leptosynapta dolabrifera* (N.C.), 5. *Trochodota shepherdii* (M.K.).

supero-(upper) and infero-(lower) marginal plates on either side, and the ambulacral furrow is lined by adambulacral plates which are often armed with spines (furrow spines) to protect the furrow. In some species the plates are obscured by spines, paxillae, granules or even a thick skin.

The sexes of sea-stars are distinct and the gonads, two in each arm, occupy the lateral part of the arm near the disc. Eggs and sperm are shed into the water during the usually brief breeding season and the resultant larvae float about until they settle and begin a sedentary life. Some species like *Allostichaster polyplax* can reproduce simply by splitting in half and completely regenerating the missing parts. The ability to regenerate missing or damaged parts is well developed among asteroids and echinoderms generally, and it is not unusual to find a sea-star regenerating an arm which has been removed or damaged by a predator or by accident. Two species of *Patiriella* are viviparous i.e. the young are brooded within the disc and eventually emerge as fully developed sea-stars from the dorsal surface. This method of reproduction, usually seen in cold water species, results in fewer off-spring but with a much higher chance of survival since they are relatively large and well developed.

The diet of sea-stars differs from species to species. Sand or mud-dwelling species such as *Luidia* or *Astropecten* are probably omnivorous, feeding on small molluscs, ophiuroids, worms, micro-organisms and detritus. Voracious species such as *Coscinasterias calamaria* and its close relative *Astrostole scabra* (limited to southern Tasmania), feed on large molluscs such as scallops, mussels, razor shells and abalone and scavenge moribund animals as well. Most other species live on rocky bottom where they feed on encrusting sponges, ascidians and bryozoa. They may often be found with the stomach everted in the process of digesting their prey externally.

Key to species

Species should be readily identifiable in the field with the aid of a hand lens. The number of arms given is that normally found; occasionally specimens with more or less may occur, especially in the genera *Patiriella*, *Coscinasterias* and *Allostichaster*. The key does not include several species restricted to S.E. Tasmania e.g. *Patiriella vivipara*, and two introduced N.Z. species *Patiriella regularis* and *Astrostole scabra*. Keys for these species are given by Dartnall (1971).

- 1. Arms usually six or more, rarely five or less 2
- Arms normally five, rarely four or six 7
- 2. Arms usually seven; large *Luidia australiae* (p. 404)
- Arms rarely seven, usually six or eight or more; mostly small, if large then arms > 7 3
- 3. Arms usually six 4
- Arms usually > 6 5