cyclosystems may or may not be covered with a lid. Colonies uniplanar and very delicate. Coenosteum white and linear-imbricate in texture; nematopores common, especially on ampullae. Gastropores double-chambered; no gastro- or dactylostyles. Gastropore ring constriction may have an additional blunt pillar that projects into gastropore tube. Ampullae superficial, occurring in proximal cyclosystem wall or encircling the cyclosystems.

TYPE SPECIES: *Astylus subviridis* Moseley, 1879, by monotypy.

REMARKS: Aside from the newly described species reported herein, only one other Recent species is known in this genus — the type-species, *A. subviridis* (Moseley 1879). No additional specimens have been collected of *A. subviridis* and the type specimen has disintegrated, but was well described and figured by Moseley (1879, 1881). It is with some hesitation that *A. aspidopora* n. sp. is included in *Astya* because it differs from the type species in two significant ways. First, it has well-developed, fixed cyclosystem lids. Second, it has a curved gastropore tube with a typical gastropore ring constriction (no protruding pillar) and an accessory upper gastropore chamber "shelf" unlike any structure known in other stylasterids. Other less significant differences are that *A. aspidopora* has fewer dactylopores per cyclosystem (10–18, average 14.36 vs 17–19 for *A. subviridis*) and has discrete ampullae not arranged in rings around the cyclosystems.

DISTRIBUTION: Philippines; Three Kings Ridge; 590–914 m.

Astya aspidopora n. sp. (Plates 66, c–f, 67, a–g)

Material examined: Types, q.v.

DISTRIBUTION: Known only from the type locality — Three Kings Ridge; 590–640 m.

DESCRIPTION: Colonies uniplanar and quite delicate, the species thus far known only from branch fragments, the largest fragment 10.4 mm tall and 8.7 mm broad, consisting of 13 cyclosystems; holotype fragment 8.2 mm broad, consisting of 8 cyclosystems. Branching appears to be dichotomous and equal, with no branch anastomosis. Branches circular in cross section and very slender; branches that support distal cyclosystems only 0.35–0.40 mm in diameter. Linear-imbricate coenosteum composed of convex strips 45–75 μm wide, bordered by slits 4–5 μm wide. Platelets continuous across a strip, exposing distalmost 10 μm. Mound-shaped to conical nematopores common on branch coenosteum; on outer, upper pseudoseptal edges; on ampullae; and even on the spurs that overhang the male efferent pores. Nematopore mounds up to 50 μm tall and 75 μm in basal diameter, with a circular apical pit 22–30 μm in diameter.

Cyclosystems circular to elliptical in shape, ranging from 1.0–1.35 mm in greater diameter. Cyclosystems orientated perpendicularly to branch and slightly flared. Based on 50 cyclosystems, the range of dactylopores per cyclosystem was 10–18, average 14.36 (σ= 2.13), and mode 14. Cyclosystem lids broadly based (attached to one-quarter to one-third of cyclosystem circumference), slightly inclined distally, and rectangular in shape, covering 50–60% of cyclosystem. Distal edge of cyclosystem lid thin; proximal portion usually greatly swollen with ampullae.

Gastropore tube quite unusual in shape — double-chambered, as in *Conopora* and *Crypthelia*, but curved 90°, as in *Crypthelia curvata*, such that lower portion of upper gastropore chamber and all of lower chamber run parallel to branch axis. Upper chamber roughly spherical, 0.50–0.55 mm in diameter, and bordered by inner edges of pseudosepta and dactylotomes; however, near base of upper chamber, at the point of tube inflection, is a thin, vertical shelf-like extension that projects from the proximal (beneath cyclosystem lid) one-third of the gastropore circumference. Shelf-like extension 18–20 μm thick, its distal edge broadly notched, often in a semi-circular (Plate 67, d, g) or V-shaped notch, which results in two rounded or triangular lateral projections. Just around the bend of the upper gastropore tube and literally on the lower side of the shelf is a well-developed gastropore ring constriction, which leads into a roughly spherical, slightly smaller lower gastropore chamber. Lower chamber and gastropore ring constriction not visible in an intact cyclosystem, but must be viewed from an excavation of the posterior face. Dactylotomes 75–80 μm wide; pseudosepta broad (1–2 times dactylotome width at outer margins) and wedge shaped, with slightly concave upper edges.

Female ampullae massive swellings 0.9–1.2 mm in diameter (often larger than the cyclosystems), one occurring in the combined space of the proximal cyclosystem wall and cyclosystem lid. Female efferent pores 0.12–0.15 mm in diameter, opening into roof of lower gastropore chamber, which is hidden behind the gastropore shelf. Male ampullae also massive hemispheres 0.8–1.0 mm in

diameter, 1–3 occurring in each cyclosystem near proximal cyclosystem wall, lateral to cyclosystem wall, or even on the posterior branch face opposite a cyclosystem. Male efferent pores apical, 80–90 μm in diameter, and invariably protected by an overhanging spur, which may be up to 0.11 mm tall and 0.18 mm long (Plate 67, e).

TYPES: Holotype: NZOI Stn U599, 1 female branch, NZOI H-585. Paratypes: NZOI Stn U599, 30 branches, NZOI P-902, 10 branches, SEM stubs 645–646, 686–687, USNM 87559.

TYPE LOCALITY: NZOI Stn U599, 30°43'S, 173°16.9'E, Three Kings Ridge; 590–640 m.

ETYMOLOGY: The species name *aspidopora* (from the Greek *aspis*, shield + poros, orifice) referes to the curious shelf-like projection of the upper gastropore tube, which tends to shield the lower gastropore chamger, and to the spurs that overhang and appear to protect the male efferent pores.

REMARKS: *See* Remarks on the genus.

Crypthelia Milne Edwards & Haime, 1849

Gastro-and dactylopores arranged in cyclosystems, which occur exclusively on anterior branch faces with only one exception (*C. trophostega*), in which they are bifacial. Colonies invariably uniplanar with slender branches. Coenosteum white and linear-imbricate in texture. Nematopores common, especially on cyclosystem lids, pseudosepta, and ampullae. Cyclosystems covered partially or entirely by one or more fixed lids. Gastropore tubes double-chambered, separated by a gastropore ring constriction; no gastro- or dactylostyles. Ampullae usually superficial and large, occurring in a variety of positions on the branch and with a variety of efferent-pore locations; female ampullae usually occur singly within cyclosystem lid and proximal cyclosystem wall; male ampullae usually clustered in compartmentalised rings encircling cyclosystems or in cyclosystem lid or proximal cyclosystem wall.

TYPE SPECIES: *Crypthelia pudica* Milne Edwards and Haime, 1849, by monotypy.

REMARKS: *Crypthelia* is one of the most highly derived stylasterid genera (Cairns 1984), having a world-wide, predominantly deep-water radiation of 30 recognised species. Twenty-five species were listed by Cairns (1986b); *C. micropoma* Cairns was added in 1985; and four new species are added herein. In an effort to subdivide the genus to facilitate comparisons, all species have been categorised (Cairns 1986b) based on the position of their male and female ampullae and efferent pores. Since there are three basic types of female arrangements and eight types of male arrangements, a total of 24 female/male combinations are theoretically possible, only nine (not 12, as I reported in 1986b) of which have been found. The following combinations (called ampullar formulae) and number of species having that combination are: A–A1 (3), A–A2 (2), A–C4 (2), B–B (2), B–C1 (9), B–C2 (1), B–C3 (1), B–C4 (1), C–D (1). Data for the remaining eight species are incomplete: A–? (1), ?–A1 (1), B–? (2), ?–C1 (1), ?–C3 (1), ?–? (2). The formula B–C1 (female ampullae in proximal cyclosystem wall and male ampullae encircling the cyclosystem and having apical efferent pores) is the most common combination and is found in four of the six New Zealand species. Other characters of value in discriminating species of *Crypthelia* are listed in Table 7, and include cyclosystem diameter; lid shape, size, and orientation; pseudoseptal width, length, and degree of concavity; range of dactylopores per cyclosystem; and gastropore shape.

DISTRIBUTION: Cosmopolitan; 140–2789 m, including the deepest living stylasterid (Cairns 1991b).

Crypthelia studeri n. sp. (Plates 68, a–f, 69, a–c)

Cryptohelia pudica: Studer 1878 : 633–634.

MATERIAL EXAMINED: Types, q.v.; *C. pudica* of Studer (1878), *Gazelle* Stn 60/44, ZMB 1779, 1 branch. Reference Material: Syntypes of *C. balia*, ZMA 7396.

DISTRIBUTION: Throughout the New Zealand region from Campbell Plateau, Macquarie Ridge, Bounty Plateau, Kermadec Ridge, and Three Kings Ridge; 343– 1940 m.

DESCRIPTION: Colonies of moderate size; holotype a colony fragment 30.5 mm tall and 22.7 mm broad; however, other paratypes from same station are slightly larger. Branches highly anastomotising, forming reticulate, uniplanar flabella. Reticulation of colony reinforced by commensal polychaete galltubes, which often bridge adjacent branches, and were present in all colonies examined, occurring exclusively on posterior branch faces. Coenosteum linear-imbricate, the strips 55–90 μm wide and

sometimes highly convex, separated by discontinuous slits about 10 µm wide. Platelets continuous across strip and corrugated; however, the platelet structure of most specimens is obscure, being replaced with a rough granular coenosteum. Nematopores occur on branch coenosteum, pseudosepta, ampullae, and cyclosystem lids; nematopores usually small (about 50 µm in diameter) and only slightly elevated, but on some coralla (e.g., NZOI Stn T243) nematopores form large (0.14 mm diameter) concave pits.

Cyclosystems unifacial, strongly flared, and elliptical to irregular in shape; up to 2.3 x 1.8 mm in diameter. Based on 50 cyclosystems, the range of dactylopores per cyclosystem was 11–22, average 16.16 (σ = 1.92), and mode 17. Cyclosystem lids relatively small, covering only 30–40% of cyclosystem, and slightly inclined upward, providing a clear view of the underlying cyclosystem; lids usually longer than broad, with a rounded distal edge that is often broken. Base of cyclosystem lid relatively narrow, less than or equal to one-quarter circumference of cyclosystem; upper edge of lid slightly concave.

Upper section of gastropore tube broad and infundibuliform, sloping gradually into the upper chamber, which is roughly spherical (diameter about 0.62 mm). Upper and lower portions of upper chamber truncate (toroidal in shape), such that its depth is less than half its width. Gastropore ring constriction well developed, about 0.5 mm in diameter. Lower chamber an inverted hemisphere (or flattened chamber) about 0.6 mm in diameter and only about 0.2 mm deep. Dactylotomes broad, 0.14–0.16 mm wide; pseudosepta thin, only about two-thirds dactylotome width at outer edges. Upper edges of pseudosepta highly concave.

Female ampullae massive swellings up to 1.5 mm in internal diameter, usually occurring in or adjacent to proximal cyclosystem wall. Occasionally, in colonies strongly modified by polychaetes, female ampullae also occur within the distal cyclosystem wall. Efferent pores circular and 0.25–0.30 mm in diameter, opening into upper gastropore chamber just beneath dactylotome level. Male ampullae form a discontinuous band encircling each cyclosystem, composed of 5 or 6 individual mounds, each mound 0.6–0.7 mm in diameter. Efferent pores apical and 33–35 µm in diameter, sometimes occurring in shallow apical depressions up to 0.16 mm in diameter. These depressions sometimes surrounded by a ring of small nematopores, the nematopores only slightly larger in diameter than the efferent pore (Plate 69, c).

TYPES: Holotype: NZOI Stn D39, 1 male col. (typical form), NZOI H-586, SEM stub 638 (USNM). Paratypes: Typical form — NZOI Stn D6, 1 male col., NZOI P-903; Stn D39, 2 male col., NZOI P-904, 2 female and 1 male col., USNM 87560; Stn D159, 2 female, 1 male col., NZOI P-905; Stn D176, 2 male col., NZOI P-906; Stn S45, 1 male col., NZOI P-907; Stn T226, 1 female, 1 male col., NZOI P-908; Stn T256, 1 female col., NZOI P-909; *Eltanin* Stn 1991, 1 female col. and SEM 639, USNM 60265. Delicate form — NZOI Stn A744, 1 female, 2 male col., NZOI P-910; Stn A745, 1 branch, NZOI P-911; Stn E821, 1 female, 1 male col., NZOI P-912; Stn E822, 1 col., NZOI P-913; Stn S53, 2 col., NZOI P-914, 3 col., USNM 87561; Stn T243, 1 male col., NZOI P-915; Stn U599, 1 col., NZOI P-916; *Eltanin* Stn 1851, 26 col. and SEM stubs 640–641, USNM 60094.

TYPE LOCALITY: NZOI Stn D39, 50°58'S, 165°45'E, southwest of Auckland Island; 465–549 m.

ETYMOLOGY: This species is named in memory of Theophil Studer, who reported the first stylasterids from the New Zealand region (Studer 1878), including a specimen of *C. studeri* that he indentified as *C. pudica*.

REMARKS: Specimens from several lots (see Types, delicate form) differ from typical *C. studeri* as defined by the holotype and preceding description, by having a smaller, more delicate corallum. The slender branches of this form, herein called the "delicate form", appear to be embedded in polychaete tube coenosteum. The colonies are slightly bushy and sparsely branched, consisting of nonbifurcating branches all of which originate from the polychaete tube coenosteum. Their cyclosystems are often slightly smaller (1.5–1.8 mm in diameter), more widely separated, and not exclusively unifacially arranged — instead, alternating between unifacial and sympodial on the same corallum. The cyclosystem lids of the delicate form are smaller or absent, often consisting only of an enlarged, exsert pseudoseptum 1–2 times the width of a typical pseudoseptum. Their gastropore ring constrictions appear to be more highly developed resulting in a smaller aperture. Although this may seem to constitute enough differences to warrant description as a separate species, it is noted that most of the characters of the delicate form grade imperceptibly with those of the typical form. Furthermore, no geographic or bathymetric differences were found between the forms. It was a specimen of the delicate form that Studer (1878) identified as *C. pudica*.

In the New Zealand region, *C. studeri* is most

similar narrow, distally inclined cyclosystem lids; a similar number of dactylopores per cyclosystem; fragile coralla; and the same ampullar formula — B–C1 (Table 7). *Crypthelia studeri* differs from *C. fragilis* and all other New Zealand species by always having a commensal polychaete relationship, which causes a high degree of branch anastomosis. Furthermore, it has narrower pseudosepta and typically larger cyclosystems than *C. fragilis*.

Outside the New Zealand region, *C. studeri* is similar to *C. balia* Hickson and England, 1905 (Indonesia, 1300–1633 m), both species having commensal polychaetes, delicate coralla, and relatively small cyclosystem lids. *Crypthelia studeri* appears to differ by having larger cyclosystems and considerably smaller nematopores. More specimens of *Crypthelia* from the Indonesian region however, are needed to better characterise the four or five species reported by Hickson and England (1905).

Crypthelia robusta n. sp. (Plates 69, d–g, 70, a–g)

MATERIAL EXAMINED: Types, q.v. *Terra Nova* Stn 91, 1 female col., BM(NH) 1950.1.11.6; *Terra Nova* Stn 96, 1 poorly preserved col., BM(NH) 1950.1.11.8.

DISTRIBUTION: Southern Norfolk Ridge; South Three Kings Ridge; 128–757 m.

DESCRIPTION: Colonies broad, uniplanar, and relatively small, the largest colony (holotype) only 41.3 mm tall and 47.3 mm broad, with a basal stem diameter of 5.1 mm. All colonies firmly attached through a massive, vertical basal branch 10–14 mm tall and 4–6 mm in diameter, above which branching is dichotomous, equal, and sometimes symmetrical, as in the holotype; branch anastomosis occurs infrequently. Distal branches slender and of lesser diameter than cyclosystems. Commensal polychaetes may or may not be present. Coenosteum linear-imbricate, the strips 60–110 µm wide and bordered by elongate slits about 10 µm wide. Platelets usually continuous across a strip but highly corrugated, each bearing 4–6 low, rounded longitudinal ridges. Nematopores low and inconspicuous, 30–40 µm in diameter, most frequently occurring on cyclosystem lids, outer cyclosystem lips, and on ampullae.

Cyclosystems predominantly unifacial, but on those colonies hosting polychaete commensals (e.g., *Terra Nova* specimens), cyclosystems are bifacial. Cyclosystems elliptical in shape and bimodal in size — 5 of the 11 colonies examined (two from NZOI Stn I97, one from Stn P9, and both from *Terra Nova* stations) have quite large cyclosystems 3.5–4.5 x 3.1–3.5 mm in diameter, whereas the remaining 6 colonies, including the holotype, have smaller cyclosystems 2.5–2.8 x 2.1–2.2 mm in diameter. Cyclosystems highly exsert and flared distally, many cyclosystems having a broad, nonseptate lip up to 0.6 mm wide encircling the distal half (cyclosystem perimeter opposite that of lid) of cyclosystem. Cyclosystem lids quite large: broader than long, up to 3.0 mm wide in larger cyclosystems and 1.8–1.9 mm wide in smaller cyclosystems, and covering 80–90% of the cyclosystem. Lids horizontal and quite low, allowing only limited access to gastropore chamber. Those colonies having large cyclosystems have a range of 19–23 dactylopores per cyclosystem, average 21.71 ($N = 11$, $\sigma = 1.10$), and mode of 22; colonies with small cyclosystems have a range of 9–17 dactylopores per cyclosystem, an average of 13.76 ($N = 50$, $\sigma = 1.89$), and mode of 15. Upper, cylindrical section of gastropore tube about 0.9– 1.0 mm deep and relatively narrow, encircled by dactylotomes and highly exsert pseudosepta. The intermediate (upper) gastropore chamber is roughly spherical with a diameter of 1.1–1.25 mm, bordered above by the lower recurved edges of the pseudosepta and below by the circular gastropore ring constriction, which is 0.65–0.75 mm in diameter. Lower chamber quite compressed, slightly wider than upper chamber, but only 0.10–0.20 mm deep (Plate 70, a, f). Dactylotomes fairly uniform in width, 0.10–0.12 mm. Pseudosepta quite slender, only about half the dactylotome width at their outer edges and having very slender, knife-like inner edges only 20–25 µm thick. Upper pseudoseptal edges smooth and solid; lower edges recurve inward to join gastropore tube wall (Plate 70, a). Pseudosepta unequal in length, some projecting far into tube, others only one-quarter to three-quarters as far. There seems to be no pattern to the relative lengths of the pseudosepta within a cyclosystem.

Female ampullae massive swellings up to 2.2 mm in diameter, occurring in proximal cyclosystem lid or within cyclosystem wall on either side of lid. Efferent pores not observed. Male ampullae form continuous bands or occur as individual ampulla surrounding each cyclosystem and also occur on proximal cyclosystem lid. Individual ampullae about 1.5 mm in diameter. Efferent pores apical and circular (50–60 µm in diameter), sometimes recessed in a circular apical depression 0.3–0.6 mm in diameter.

TYPES: Holotype: NZOI Stn I97, 1 female col., NZOI H-587. Paratypes: NZOI Stn I97, 2 female col., 2 male col., NZOI P-917, 1 male col., 1 female col., and SEM stubs 635–636, USNM 87562; Stn P8, 1 male col., NZOI P-918; Stn P9, 1 male col., NZOI P-919, SEM stub 637 (USNM).

TYPE LOCALITY: NZOI Stn I97, 32°22.9'S, 167°28.2'E, southern Norfolk Ridge; 540–544 m.

ETYMOLOGY: The species name *robusta* (from the Latin *robustus*, solid, strong) refers to the robust basal stem of each colony and the very large cyclosystems of this species.

REMARKS: *Crypthelia robusta* is the most distinctive species of *Crypthelia* in the New Zealand region, having very large cyclosystems (and a correspondingly high number of dactylopores per cyclosystem); very thin, knife-like pseudosepta of unequal lengths; large, low cyclosystem lids; and broad, nonseptate cyclosystem lips (Table 7).

Although cyclosystem diameter is believed to be fairly consistent among the specimens of various species of *Crypthelia* and has therefore been used to help discriminate species (Cairns 1986a, b, herein), in *C. robusta* and *C. polypoma* there are colonies having significantly different cyclosystem diameters. The character of having pseudosepta of unequal lengths is relatively rare among the species of *Crypthelia*, shared with only two other species — *C. dactylopoma* Cairns, 1986b and *C. curvata*, n. sp. Both *C. robusta* and *C. dactylopoma* have relatively large cyclosystems with a correspondingly high number of dactylopores per cyclosystem and the same ampullar formula, *C. robusta* differing in having much wider lids, cyclosystem lips, and much thinner pseudosepta.

Crypthelia polypoma n. sp. (Plates 71, a–g, 72, a, b)

MATERIAL EXAMINED: Types, q.v.

DISTRIBUTION: Norfolk, Three Kings, and Kermadec Ridges; 590–814 m.

DESCRIPTION: Colonies broad and uniplanar, but variable in size and robustness; the holotype (largest specimen) 50.4 mm tall and 58.2 mm broad, with a basal branch diameter of 5.7 mm and relatively robust distal branches up to 1.1 mm in diameter. A paratype from NZOI Stn G3, however, is quite delicate, with cyclosystems half the diameter as those of the holotype and slender distal branches only 0.5 mm in diameter. Branching dichotomous and equal; no polychaete commensals known. Linear-imbricate coenosteum composed of well-defined, slightly convex strips 80–110 µm wide, bordered by elongate slits 11–12 µm wide. All specimens slightly worn and thus details of platelet structure obscure, but platelets appear to be continuous across a coenosteal strip and longitudinally ridged. Circular nematopores about 60 µm in diameter common on branch coenosteum and cyclosystem lids.

Cyclosystems primarily unifacial, most occurring on anterior face (by definition), but cyclosystems on some branches also occur on opposite (posterior) branch face. Cyclosystems elliptical to "rectangular with rounded edges" in shape. Cyclosystems of holotype large, 2.0–2.2 x 1.3–1.5 mm in diameter; those of specimens from NZOI Stn U599 are much smaller, only 1.3–1.4 mm in greater cyclosystem diameter; and those from NZOI Stn G3 smaller still with greater cyclosystem diameters of only 1.1–1.3 mm. Cyclosystems exsert and slightly flared. Based on 41 cyclosystems (all that were available for analysis), there was a range of 12–27 dactylopores per cyclosystem, average of 14.54 ($\sigma = 0.98$), and mode of 15. Number of dactylopores per cyclosystem did not vary in a statistically significant way among the differently sized cyclosystems. Cyclosystem lids broad and low, each arching about three-quarters distance across a cyclosystem. Invariably (with no exceptions in the material examined) a smaller secondary (adcauline) lid originates from the opposite cyclosystem wall and fuses with the larger lid, bisecting the cyclo-system. Often a third (Plate 71, b, f) and even fourth small lid originate from the lateral edges of a cyclosystems, also fusing with the primary abcauline lid, forming a massive canopy covering most of the cyclosystem.

Upper gastropore tube cylindrical, up to 0.6 mm deep, and flanked by dactylotomes and highly exsert pseudoseptal inner edges. Upper gastropore chamber an ellipsoidal cavity about 0.8 mm broad and 0.5 mm deep. Gastropore ring constriction about 0.42 mm in diameter, leading into a flattened lower chamber only about 0.18 mm deep and of slightly greater diameter than upper chamber. Dactylotomes 83–90 µm wide. Pseudosepta wedge shaped and 1.5–3.0 times dactylotome width at their outer edges, with flat to concave upper edges. Inner edges of pseudosepta vertical, extending to upper part of upper gastropore chamber. Dimensions of gastropore tubes, dactylotomes, and pseudosepta given above pertain to holotype; dimensions of same features of smaller cyclosystems

from two other stations correspondingly smaller.

Female ampullae unknown. Male ampullae discrete mounds 0.4–0.5 mm in diameter, 6–8 of which encircle a mature male cyclosystem. Mounds bear 5 or 6 low, radiating ridges, between which are shallow depressions. In each depression is an efferent pore 25–30 µm in diameter.

TYPES: Holotype: NZOI Stn T256, 1 male col., NZOI H-588, SEM stub 648 (USNM). Paratypes: NZOI Stn G3, 1 male col., NZOI P-920, 1 fragment and SEM stub 695, USNM 87563; Stn U599, 2 male frag-ments, SEM stub 647, USNM 87564.

TYPE LOCALITY: NZOI Stn T256, 30°31'S, 178°39'W, off Curtis Island, Kermadec Islands; 710–814 m.

ETYMOLOGY: The species name *polypoma* (from the Greek *polys*, many + *poros*, orifice) refers to the multiple cyclosystem lids characteristic of this species.

REMARKS: *Crypthelia polypoma* differs from other congeners in having consistently multilidded cyclosystems. Colonies of some other species occasionally have cyclosystems with an additional lid (e.g., *C. dactylopoma* Cairns, 1986a : fig. 25B), but no other species has such consistently well-developed multiple lids. *Crypthelia polypoma* is also distinctive in having ridged male ampullae and very broad pseudosepta (Table 7).

Crypthelia fragilis Cairns, 1983
(Plates 72, c–f, 73, a–f)

Crypthelia fragilis Cairns, 1983a : 130–133, figs 31F, 37A–G, 38A–C; 1983b : 431.

MATERIAL EXAMINED: Types; NZOI Stn F127, 1 col., NZOI; Stn F132, 1 col., NZOI .

DISTRIBUTION: Pacific-Antarctic Ridge, Subantarctic Slope, Macquarie Ridge, off Antipodes Islands; 952– 2329 m.

DESCRIPTION: Colonies uniplanar and extremely delicate, the largest colony (*Eltanin* Stn 1852) only 27 mm tall and 25 mm broad, with a basal branch diameter of 1.7 mm. Branching dichotomous and equal; branch anastomosis occurs occasionally; no polychaete commensals known. Branches circular in cross section and quite slender, much smaller in diameter than cyclosystems they support, branches supporting terminal cyclosystems as little as 0.45 mm in diameter. Linear-imbricate coenosteum composed of discrete, convex strips 50–100 µm wide, bordered by discontinuous slits 6–9 µm wide. Platelets 10– 11 µm wide, several (4–11) occurring across width of a coenosteal strip. Circular nematopores 40–50 µm in diameter occur on the branch coenosteum, cyclosystem lids, ampullae, and with regularity on the upper, outer edges of each pseudoseptum.

Cyclosystems exclusively unifacial, circular to slightly elliptical in shape, and 1.0–1.8 mm in diameter. Cyclosystems exsert and slightly flared. Based on 31 cyclosystems, the range of dactylopores per cyclosystem was 13–18, average 15.71 (σ = 1.13), and mode 15 (Cairns 1983a). Cyclosystem lids usually rather slender (e.g., only twice pseudoseptal width), slightly inclined upward, and concave above, covering only 10–20% of the cyclo-system; however, in some cyclosystems, the lid is broader, covering as much as 75% of the cyclo-system.

Upper gastropore tube cylindrical, flanked by vertical inner edges of the pseudosepta and deeply incised dactylotomes. Below this section is a well-defined, smooth-walled, spherical upper chamber, which is about 0.56 mm in diameter. A gastropore ring constriction approximately 0.35 mm in diameter leads to a broad, flattened lower chamber, which is only about 40 µm deep but envelopes entire lower half of upper chamber. Dactylotomes 75–90 µm wide and extend deep into upper gastro-pore tube. Pseudosepta wedge shaped, 1.5–2.0 times dactylotome width at their outer margins, and have concave upper edges. Inner edges of pseudosepta vertical and slightly concave.

Female ampullae massive swellings about 1.4 mm in diameter, lodged within proximal cyclo-system wall and proximal cyclosystem lid. Female efferent pores circular and about 0.27 mm in diameter, opening beneath cyclosystem lid into upper gastro-pore tube above the spherical upper chamber (Plate 72, f). Male ampullae consist of hemispherical mounds 0.8–0.9 mm in diameter, 2 or 3 of which normally encircle a cyclosystem. A mature ampulla bears an apical depression 0.25–0.30 mm in diameter, which is penetrated by an irregularly-shaped efferent pore 40–50 µm in diameter.

TYPES: The holotype and most paratypes are deposited at the USNM. Additional paratypes are also deposited at the RMNH and the BM(NH) (*see* Cairns 1983a).

TYPE LOCALITY: *Eltanin* Stn 17-5, 52°10'S, 142°10'W, seamount on Pacific-Antarctic Ridge; 2305–2329 m.

REMARKS: Only two additional specimens of *C. fragilis* are reported in this account. Therefore, the preceding description was based primarily on a re-examination of the type specimens and thus reiterates the original description but adds to the interpretation of the dimorphic ampullae.

Crypthelia fragilis is distinctive among the *Crypthelia* from the New Zealand region in having a very delicate corallum with very small cyclosystems; narrow coenosteal platelets; and nematopores that regularly occur on the outer pseudoseptal edges (Table 7). It is restricted to relatively deep water and known only from the Subantarctic region. Comparisons to *C. studeri* are made in the account of that sepcies.

Crypthelia curvata n. sp. (Plates 73, g, h, 74, a–f)

MATERIAL EXAMINED: Types, q.v.; NZOI Stn P552, 2 poorly preserved fragments, NZOI.

DISTRIBUTION: Southern Norfolk Ridge; Three Kings Ridge, including off Three Kings Islands; 282–1258 m.

DESCRIPTION: Colonies uniplanar and delicate, the largest specimen examined (holotype) 35.5 mm tall and 20.6 mm broad, with a broken basal branch diameter of 2.2 mm. Branching dichotomous and equal; no polychaete commensals known. Branches circular in cross section and slender, branches supporting terminal cyclosystems about 0.6 mm in diameter. Linear-imbricate coenosteum composed of discrete, convex strips 40–60 μm wide bordered by elongate strips about 7 μm wide. Platelets continuous across a strip but longitudinally ridged. Circular nematopores 40–50 μm in diameter occur on branch coenosteum, cyclosystem lids, and often on the outer, upper edges of pseudosepta.

Cyclosystems unifacial and elliptical to irregular in shape, 1.3–1.8 mm in greater diameter. Cyclosystems exsert and slightly flared. Based on 29 cyclosystems (all that were available for analysis), there are 15–21 dactylopores per cyclosystem, average 17.79 ($\sigma = 1.40$), and mode 19. Cyclosystem lids usually rather small (e.g., 0.6 mm wide), longer than wide, slightly inclined upward, and cover only 10–20% of the cyclosystem; however, some cyclosystems have broader lids (e.g., up to 1.1 mm wide), covering a much larger percentage of the cyclosystem.

Upper gastropore tube cylindrical and elongate (Plate 74, a, c) (up to 1.2 mm deep), flanked by dactylotomes and the gradually attenuating inner edges of the pseudosepta, which extend far below the dactylotomes. Upper gastropore chamber essentially a continuation of upper gastropore section but without pseudoseptal ridges. Upper chamber cylindrical and elongate (up to 1 mm deep and about 0.7 mm in diameter), and curved as much as 90° such that its lowest point parallels the branch axis. Gastropore ring constriction about 0.45 mm in diameter; lower chamber large and spherical, 0.55–0.70 mm in diameter, and enveloping the gastropore ring constriction (Plate 74, d). Because of the great depth and curvature of the gastropore tube, the gastropore ring constriction and lower gastropore chamber usually cannot be seen in an intact cyclosystem. Dactylotomes 85–100 μm wide. Pseudosepta unequal in length — most pseudosepta within a cyclosystem are identical in length but 3 or 4 usually project less deeply into the gastropore tube, some only half the length of a typical pseudoseptum. Pseudosepta wedge shaped, 1.5–2.0 times dactylotome width at their outer edges, with flat to slightly concave upper edges; inner pseudoseptal edges vertical.

Female ampullae unknown. Male ampullae discrete hemispherical bulges 0.7 mm in diameter, several of which encircle a cyclosystem. Male efferent pores appear to be irregularly shaped, 45–50 μm in diameter, occurring on the inner, upper edges of the pseudosepta.

TYPES: Holotype: NZOI Stn E860, 1 col., NZOI H-589. Paratypes: NZOI Stn E305, 1 male col., NZOI P-923, 2 male branches and SEM stub 650, USNM 87565; Stn S568, 1 col., NZOI P-921, SEM stub 649 (USNM); Stn U599, 2 male cyclosystems, NZOI P-922, 2 male cyclosystems, USNM 87566.

TYPE LOCALITY: NZOI Stn E860, 32°21'S, 167°41'E, southern Norfolk Ridge; 1246–1258 m.

ETYMOLOGY: The species name *curvata* (from the Latin *curvatus*, curved, bent) refers to the curved gastropore tubes characteristic of this species.

REMARKS: Only one other species of *Crypthelia* has male efferent pores that open through the upper pseudosepta (C3 designation of Cairns,1986b), *C. cymas*, a species also known from the New Zealand region at similar depths. *Crypthelia curvata* is distinguished from *C. cymas* by having an elongate, curved gastropore tube; somewhat smaller cyclosystems; thinner cyclosystem lids; and thicker pseudosepta (Table 7).

Disregarding ampullar formula, *C. curvata* is most similar to *C. fragilis*, both species having delicate

uniplanar colonies and similarly sized and shaped cyclosystems, pseudosepta, and cyclosystem lids. *Crypthelia curvata* differs in having curved gastropore tubes, differently positioned male efferent pores, slightly more robust colonies, and much broader coenosteal platelets. Furthermore, although both species occur in relatively deep water, *C. fragilis* is known only from the Subantarctic region south of New Zealand, and *C. curvata* only from the ridges north of New Zealand.

Crypthelia cymas Cairns, 1986
(Plates 75, a–f, 76, a–d)

Cryptohelia [sic] sp. cf. *C. pudica*: Moseley 1876 : 548, 557 (in part: specimens off Raoul Island).
Cryptohelia [sic] *pudica*: Moseley 1881 : 82–83 (in part: *Challenger* Stn 171).
Crypthelia cymas Cairns, 1986b : 33–36, figs 22A–I, 23A–C, 27H.

MATERIAL EXAMINED: NZOI Stn E306, 1 female col., NZOI; Stn E861, 10 col. and branches, NZOI, 4 col. and SEM stubs 630–632, 694, USNM 87569; Stn P8, 1 male col., NZOI; Stn P46, 2 male col., NZOI; *C. pudica* of Moseley (1881), *Challenger* Stn 171, 6 col., BM(NH) 1880.11.25.186.

DISTRIBUTION: Norfolk Ridge, Three Kings Ridge, Kermadec Ridge (Moseley 1881), 263–757 m; Galápagos Islands; 166–806 m.

DESCRIPTION OF NEW ZEALAND SPECIMENS: Colonies uniplanar and large; the largest colony examined (NZOI Stn E861) 9.8 cm tall and 5.3 cm broad, with a basal branch diameter of 6.3 mm; however, a basal fragment (also from NZOI Stn E861) 10.5 mm in diameter attests to much larger coralla. Branches occasionally anastomose. Distal branches slender, of lesser diameter than the cyclosystems they bear. Polychaete commensals present on main basal branches of some, but not all, colonies. Linear-imbricate coenosteal strips 40–50 μm wide, bordered by thin, often obscure, slits about 5 μm wide. Platelets usually continuous across strip but corrugated, producing a rough microtexture (Plate 75, d). Relatively low (10–13 μm tall), circular to elliptical nematopores occur abundantly on branch coenosteum, as well as on cyclosystem lids (especially the edges), under the lids, and on pseudosepta, where as many as 4 may occur per cyclosystem.

Cyclosystems exclusively unifacial and elliptical in outline, up to 2.3 x 1.8 mm in diameter. Cyclosystems stand exsert from branch coenosteum as much as 1 mm, female cyclosystems being slightly flared. Mature male cyclosystems girdled with ampullae resulting in a rotund, nonflared shape. Cyclosystems toward base of colony obsolete and often filled with coenosteum. There is no sexual dimorphism regarding number of dactylopores per cyclosystem — based on 25 female cyclosystems, the range was 15–18, average 16.24 (σ = 1.20), and mode 16; based on 25 male cyclosystems, the range was 13–19, average also 16.24 (σ = 1.33), and mode 17. Cyclosystem lids longer than broad and tongue shaped to rectangular, with rounded distal edges. Cyclosystems lids horizontal and 0.65–1.0 mm wide, covering 50–70% of the cyclosystem (80–90% in gravid female cyclosystems). Proximal section of lid swollen with ampullae in sexually mature cyclosystems of both sexes.

Upper cylindrical section of gastropore tube encircled by dactylotomes and pseudosepta to a depth of about 1 mm. Intermediate (upper gastropore chamber) tube roughly spherical (about 0.6 mm in diameter), with both upper and lower edges truncate (toroidal), such that it is only about 0.3 mm deep. The lower truncate border of the upper gastropore tube is the gastropore ring constriction, which is about 0.33 mm in diameter. Lower chamber also roughly spherical and of greater diameter (e.g., 0.8 mm), its upper edges enveloping the gastropore ring constriction (Plate 76, a) and continuous with the dactylopores. Dactylotomes of fairly uniform width, 0.12–0.14 mm. Outer edges of pseudosepta equal to dactylotome width, but narrowing to very slender inner edges bordering the gastropore. Upper edges of pseudosepta slightly concave and inclined downward toward gastropore.

Female ampullae massive swellings in proximal cyclosystem lid and wall, up to 4 occurring per cyclosystem. Female efferent pores rarely seen in study material, but when present, open on underside of lid and are about 0.25 mm in diameter. Multiple male ampullae form a continuous cavity encircling each cyclosystem and produce the characteristic swollen aspect. Male efferent pores exit through upper edges of pseudosepta, the pores being 70–100 μm in diameter and irregular in outline. Male efferent pores occur in same position and are about same size as pseudoseptal nematopores, but are distinguished by the complete perforation of the pseudoseptum and their irregular outline (Plate 76, c). Numerous male efferent pores occur within each cyclosystem.

TYPES: The holotype and most paratypes are deposited at the USNM (72106, 72107, respectively); one colony is also at the BM(NH)(1984.9.28.10).

TABLE 7. Characteristics of the six New Zealand species of *Crypthelia* (cs = cyclosystem, dt = dactylotomes, gcsd = greater cyclosystem diameter, e.p. = efferent pores)

Character	*C. studeri* n.sp.	*C. robusta* n.sp.	*C. polypoma* n.sp.	*C. fragilis.* Cairns, 1983	*C. curvata* n.sp.	*C. cymas* Cairns, 1986
Cyclosystem diameter	Up to 2.3 x 1.8 mm	Bimodal; 2.5/4.5 mm in gcsd	Variable: 1.1–2.2 mm in gcsd	1.0–1.8 mm in gcsd	1.3–1.8 mm in gcsd	Up to 2.3 x 1.8 mm
Cyclosystem lid: shape; cover; orientation	Elongate; 30–40%; slightly inclined upward	Broad; 80–90%; horizontal and low	Broad; 80–90%; horizontal (arched), 1–3 accessory lids fused with primary lid	Elongate and slender; 10–20%; inclined upward	Elongate; 10–20%; slightly inclined upward	Elongate, tongue-shaped; 50–90%; horizontal
Pseudosepta: width relative to dactylotome; relative lengths; upper edge	Thinner than dt; equal; concave	Much tinner; unequal; smooth and solid	Broader (1.5–3.0 x dt width); equal; concave	Broader (1.5–2.0 x dt width); equal; concave	Broader (1.5–2.0 x dt width); slightly unequal; concave	Equal in width to dt; equal; slightly concave
Range and average no. of dactylopores/cs	11–22, x = 16.16	Large css: 19–23, x = 21.72 Small css: 9–17, x = 13.76	12–17, x = 15.71	13–18, x = 15.71	15–21, x = 17.79	13–19, x = 16.24
Ampullar formula	B–C1	B–C1	?–C1, male ampullae ridged	B–C1	?–C3	B–C3
Other distinguishing characteristics	Polychaete tubes always present; branches highly anastomosing	Broad, nonseptate cs lips present		Coenosteal platelets narrow; nematopores occur regularly	Gastropore tube elongate and curved	Colonies large; polychaete tubes present; 1–4 nematopores per ps
Distribution	Throughout New Zealand region; 343–1940 m	Southern Norfolk and Three Kings Ridges; 128–757 m	Ridges north of New Zealand; 590–814 m	Subantarctic islands and seamounts; 952–2329 m	Ridges north of New Zealand; 282–1258 m	Ridges north of New Zealand, Galápagos; 263–757 m

TYPE LOCALITY: *Albatross* Stn 2818, 0°29'S, 89°54.5'W, northeast of Santa Cruz, Galápagos; 717 m.

REMARKS: Four male colonies from NZOI Stn E861 display a pattern of variation that deserves special mention. In an otherwise homogeneous lot of specimens that do not have polychaete commensals, these four specimens do have polychaete worm tubes. Correlated with this difference is that its cyclosystems are smaller (about 1.4 mm in diameter), but have extensively flared outer lips (Plate 75, e, f) and broader cyclosystem lids. Since all other characters are the same, these differences are assumed to have been caused by the polychaete commensal and therefore fall within the range of variation of *C. cymas*.

The New Zealand specimens of *C. cymas* were carefully compared to the type series of *C. cymas* from the Galápagos Islands, and, although some slight differences were noted, all specimens are considered to be conspecific. The differences are that the Galápagan specimens do not have upper pseudoseptal edge nematopores, and they have a slightly higher average number of dactylopores per cyclosystem. Thus, although it is unusual for a stylasterid to have such a broad distribution, I cannot justify the description of a new species based on these grounds.

Only one other species of *Crypthelia* has male efferent pores that open through the upper pseudosepta — *C. curvata*. Comparisons to that species are made in the account of that species as well as in Table 7.

Pseudocrypthelia Cairns, 1983

Gastro- and dactylopores arranged in cyclosystems, which occur exclusively on anterior face of colony; fixed lids cover cyclosystems. Colonies small, delicate, and primarily uniplanar. Coenosteum white and linear-imbricate in texture. Nematopores large and mound shaped, occurring on pseudosepta, ampullae, branch coenosteum, and even within upper gastropore tube. Gastropore tube double-chambered. Small, rudimentary gastrostyles present; dactylostyles absent. Male ampullae contained in cyclosystem lids.

TYPE SPECIES: *Cryptohelia pachypoma* Hickson and England, 1905, by original designation (Cairns 1983c).

REMARKS: *Pseudocrypthelia* is a monotypic genus, recently discussed and illustrated by Boschma (1968d) and Cairns (1983c).

DISTRIBUTION: Norfolk Ridge; Sulu Sea (*Albatross* Stn 5569); Jilolo Passage, east of Halmahera, Indonesia; 555–1069 m.

Pseudocrypthelia pachypoma (Hickson & England, 1905) (Plates 76, e–h, 77, a–d)

Cryptohelia pachypoma Hickson & England, 1905 : 22–23, pl. 3, figs 24–25; England 1926 : 281.

Crypthelia pachypoma: Boschma 1953 : 167; 1956 : F100, fig. 82,1b; 1957 : 35–36 (part: not *Albatross* Stn 2818, = *Crypthelia lacunosa*).

Calyptopora pachypoma: Boschma 1968a : 107; 1968d : 315–320, pl. 1, figs 1–5, text-figs 1–2; Cairns 1983b : 430.

Pseudocrypthelia pachypoma: Cairns 1983c : 31–32, pls 1–3.

MATERIAL EXAMINED: NZOI Stn G3, 1 male col., NZOI, 1 fragment and SEM stub 651, USNM 87567; types.

DISTRIBUTION: Norfolk Ridge; Jilolo Passage, east of Halmahera; 505–1069 m.

DESCRIPTION OF NEW ZEALAND SPECIMEN (NZOI STN G3): Colony uniplanar and quite delicate, 16.5 mm tall and 14.7 mm broad, with a basal branch diameter of 1.6 mm. Colony composed of 2 main branches from which short, smaller-diameter branches originate in seriatim, some of the lateral branchlets limited to only 1 cyclosystem; branches not anastomosing. Branches circular in cross section and very slender, branches supporting terminal cyclosystems only about 0.3 mm in diameter. Linear-imbricate coenosteum composed of slender, slightly convex strips 22–52 µm wide, bordered by thin, elongate slits about 4 µm wide. Platelets continuous across strip, low in relief, and regular in arrangement, each platelet revealing 12–15 µm of its leading edge. Large, mound-shaped nematopores common on branch coenosteum, cyclosystem lids, upper and inner pseudoseptal edges, and within gastropore tube. Nematopore mounds up to 30 µm tall and 40 µm in basal diameter, each with a circular apical pit about 13 µm in diameter.

Cyclosystems circular to slightly elliptical, 0.71–0.75 mm in diameter. Based on 23 cyclosystems (all cyclosystems available for analysis), the range of dactylopores per cyclosystem is consistently 12–14, average 13.04 (σ = 0.64), and mode 13. Cyclosystem lids have a relatively narrow base but broaden to cover the entire cyclosystem, in many cases even extending beyond cyclosystem edges.

Lids horizontal and longitudinally creased above, occasionally fusing to distal cyclosystem edge.

Upper gastropore tube broad and shallow, the upper 0.2 mm flanked by dactylotomes and pseudosepta, the lower 0.15 mm (upper gastropore chamber) continuing in an infundibuliform shape to the gastropore ring constriction. Upper chamber linear-imbricate in texture bearing numerous mounded nematopores (Plate 77, d). Gastropore ring constriction about 0.20 mm in diameter; lower chamber fairly shallow, about 0.15 mm deep, containing the centrally placed gastrostyle. Gastrostyle conical (Plate 77, c, d), about 0.13 mm tall and 0.14 mm in basal diameter (H : W = 0.93), its pointed tip extending almost to gastropore ring constriction. Gastrostyle irregular in surface topography, bearing granules or small, pointed spines. Dactylotomes quite narrow (only about 20 μm wide), reduced in width by adjacent overreaching pseudoseptal edges. Pseudosepta quite broad, up to 6 times dactylotome width and having slightly concave upper edges.

Female ampullae unknown. Male ampullae small mounds about 0.5 mm in diameter occurring within cyclosystem lids.

TYPES: Lectotype and three paralectotypes are deposited at the ZMA (Coel. 7394).

TYPE LOCALITY: *Siboga* Stn 150, 0°06'N, 129°07.7'E, Jilolo Passage, east of Halmahera, Indonesia; 1089 m.

REMARKS: The specimen reported herein is the only additional specimen reported subsequent to its original description. The New Zealand specimen differs from the type specimens in having a more delicate corallum with smaller cyclosystems (0.71 mm vs 1.2 mm in the lectotype) and correspondingly fewer dactylopores per cyclosystem (12–14, average of 13.04 vs 13–19, average of 16.1 for the lectotype). Otherwise the two specimens are identical. Another specimen in this genus but not identified as *P. pachypoma* (*Albatross* Stn 5569, USNM 87568) from the Sulu Sea, has larger cyclosystems than the lectotype, up to 1.6 mm in diameter, and contains up to 21 dactylopores per cyclosystem.

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INDEX

The index covers all taxonomic and geographic categories, as well as museums and geological occurrence. Bold numerals indicate major references.

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