

Two new genera of Bryozoa (Calloporidae) from New Zealand

P. L. COOK† and P. E. BOCK‡

† *Museum of Victoria, Melbourne, Victoria, Australia*

‡ *Honorary Associate, School of Ecology and Environment, Rusden Campus, Deakin University, Melbourne, Victoria, Australia;*

e-mail: pbock@deakin.edu.au

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Two new genera of the bryozoan family Calloporidae are described from New Zealand. The first, *Leptinatella*, is introduced for *L. gordonii* n. sp., specimens of which have been referred in the past to *Watersia militaris* (Waters) but are distinct from this species, which is a phase of the cribrimorph *Corbulipora tubulifera* (Hincks). The second genus, *Bryocalyx*, is introduced for *B. cinnameus* n. sp., which has small, conical colonies anchored by rhizoids. Another species of *Bryocalyx* is known from a few fragments only: and has also been referred in the past to *Watersia* sp. It is briefly discussed, but left unnamed here.

KEYWORDS: Bryozoa, Calloporidae, new taxa, *Leptinatella*, *Bryocalyx*, sand-fauna, taxonomy.

Introduction

The discovery that the flustrine anascan bryozoan known as *Watersia militaris* (Waters) was the erect, reproductive phase of the multiphased, encrusting and repent cribrimorph species, *Corbulipora tubulifera* (Hincks), has prompted re-examination of all previous records of specimens referred to *Watersia* (see Bock and Cook, 1994). Some of these, such as *W. kishakaensis* (Okada), have been assigned to the genus *Klugeflustra* Moyano (Bock and Cook, in press). Other records, such as those referred to *W. militaris* by Livingstone (1929) and by Gordon (1986), have been found to be based on species which have most affinity with the family Calloporidae, not the cribrimorph genus *Corbulipora*, and are discussed here.

Materials

Nearly all the specimens examined are part of the Collections of the New Zealand Oceanographic Institute (NZOI); one is from the University Zoological Museum, Copenhagen (UZMC). Some paratype material of *Bryocalyx cinnameus* sp. nov. is also stored at the Museum of Victoria, Melbourne (MOV).

Systematics

Family CALLOPORIDAE Norman, 1903

Calloporidae: Gordon, 1984: 26.

As defined by Gordon (1984), the Calloporidae includes a wide range of zooidal morphologies. Autozooids have an extensive membranous frontal wall, although this is often obscured by marginal spines. Interzooidal, vicarious and adventitious avicularia may be present. The ovicell is hyperstomial, and may have one or more entoocelial areas exposed frontally.

Both Ryland and Hayward (1977) and Gordon (1984) have emphasized the wide range of characters of the genera they included in this family, which almost certainly requires revision in the future. Both *Leptinatella* and *Bryocalyx* differ from other genera in having only one pair of delicate oral spines, or none at all. The colony form, and the ovicells of *Bryocalyx* are also unlike any other genus of Calloporidae.

Leptinatella n. gen.

Type species: *Leptinatella gordonii* sp.nov.

Description

Colonies encrusting; autozooids very thinly calcified; gymnocyst marginal, smooth. One pair of disto-oral spines. Ovicell not closed by the operculum, prominent, with small paired entoocelial area frontally. Avicularia interzooidal, acute, with mandible hinged on paired condyles.

Etymology

The name of the genus is constructed from *leptos* (Greek)—thin, delicate, referring to the calcification; together with the suffix *-atella* indicating similarity with the genus *Crassimarginatella*.

Leptinatella gordonii n. sp.

(figures 1, 2)

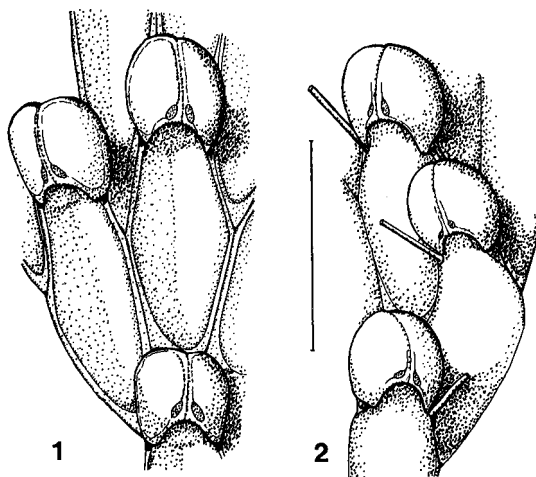
Watersia militaris: Livingstone, 1929: 53; Gordon, 1986: 28, Pl. 3C, D (not *W. militaris* (Waters) = *Corbulipora tubulifera* (Hincks) see Bock and Cook, 1994).

HOLOTYPE. Colony in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, type number H-612, from NZOI Stn B498. **PARATYPES**, P-952, from the same locality. Other material, NZOI Stn M7912, see Gordon, 1986.

Material examined

New Zealand Oceanographic Institute, Station B498, 40°46.3'S, 174°02.8'E, north end of South Island, Jag Rocks, on *Pecten* shells, 44 m, 11 June 1961. NZOI Station M791, 44°37.1'S, 167°51.5'E, south-west of South Island, East Milford Sound, 30 m, 6 April 1981.

University Zoological Museum, Copenhagen, Denmark. Three Kings Island, north of North Island, 84 m. Collected by T. Mortensen, 1915, and labelled 'Marcus ident. verified by A. Livingstone, Sydney, 1927', on algal frond.



FIGS 1, 2. *Leptinatella gordonii* gen. nov., sp. nov. (1) Ovicelled zooids from holotype colony (NZOI). (2) Ovicelled zooids from UZMC colony. Scale = 0.70 mm.

Distribution

North and South Island, New Zealand.

Etymology

The species is named for Dr D. P. Gordon (NZOI) who provided much of the material discussed in this paper.

Description

Leptinatella with autozooids virtually without gymnocyst, which forms a thin margin only; cryptocyst narrow, a little wider proximally; oral spines delicate. Zooids communicating through one or two distal and two or three groups of multiporous pore plates. Brooding zooids not dimorphic; ovicell prominent, globular, with a central suture and a pair of small, proximally placed entoecial areas frontally; not closed by the operculum. Zooids of the earlier astogenetic stages becoming closed by a porous, calcified, subfrontal lamina derived from the cryptocyst, leaving a distal, subopercular scar. Avicularia large, interzooidal, with an irregular, lateral gymnocyst, which forms an ill-defined pair of condyles, and an acute, slightly asymmetrical rostrum.

Remarks

The holotype colony encrusts a fragment of *Pecten* shell and includes about 100 zooids, approximately half of which bear ovicells, but has no avicularium present. The paratype colony, part of which was figured by Gordon (1986: 28, pl. 3C, D as *Watersia militaris*) has both avicularia and closed zooids. These closures resemble those described in the genus *Conopeum* and in other anascans by Cook (1985). The avicularia seem to occur in areas of crowding. They are slightly asymmetrical, with a subtriangular rostrum. The UZMC specimen listed by Livingstone (1929) from Three Kings Island forms an extensive colony of about 1000 zooids covering the narrow fronds of an alga on both sides. This may be one of the reasons why Livingstone identified it with the erect, flustrine, *Watersia militaris*. Neither avicularia

nor closed zooids are present but ovicells are abundant. They do resemble those of *W. militaris*, the reproductive phase of *Corbulipora tubulifera*, quite closely, differing principally in the small size and proximal position of the entoecial areas.

Leptinatella gordonii resembles many species of *Crassimarginatella* in possessing paired oral spines, interzooidal avicularia and hyperstomial ovicells. The ovicell resembles that of *C. fraudatrix* Gordon (1986: 33, pl. 6D, E) which was also from Milford Sound, Stn M791; *C. fraudatrix* has, however, numerous marginal spines and robust calcification. *Leptinatella* differs from the *Watersia*-phase in its encrusting colonies, which are not part of a multiphased cribrimorph species complex, in the form of its avicularia, and in the lack of enlarged spines on the ovicelled zooids. *L. gordonii* seems to have a fairly extensive distribution in New Zealand, the present records being from north of North Island and south-west of South Island.

***Bryocalyx* n. gen.**

Type species: Bryocalyx cinnameus n. sp.

Etymology

The name *Bryocalyx* was suggested by Dr D. P. Gordon; it is derived from a combination of Bryozoa, and *calyx* (Greek, *kalyx*—a cup), with reference to the shape of the colony.

Description

Colonies unilaminar, fan-shaped or conical, arising from an elongated ancestrula and anchored by rhizoids. Zooids with an extensive membranous frontal wall, gymnocyst marginal, cryptocyst and marginal spines absent. Ovicells large, with a partially uncalcified ectoecium and a thinly calcified entoecial capsule. Avicularia absent.

Remarks

Bryocalyx is introduced for *B. cinnameus* n. sp., of which plentiful material exists. However, Gordon (1985) referred some minute fragments of another unilaminar species from the Kermadec Ridge to *Watersia* sp., and figured the ovicells (1985: 162, figure 2). These two fragments have been re-examined. They consist of nine zooids and five ovicells in total. All zooids and ovicells are unattached, unilaminar, very thinly calcified, and somewhat shrunken and distorted. The zooids and ovicells resemble those of *B. cinnameus*, but are far smaller (see table 1). The inner entoecial capsule is globular, and the ectoecium has paired valves, meeting in a central suture, and each with a large, membrane-covered foramen laterally. The operculum appears to close the ovicell, but this may be an artifact of preservation. The basal

Table 1. Measurements (in mm) of zooids of *Leptinatella* and *Bryocalyx*.

	Lz	lz	Lov	lov	Lav
<i>Leptinatella gordonii</i>	0.61–0.99	0.22–0.45	0.23–0.25	0.25–0.38	0.25–0.39
<i>Bryocalyx</i> sp.	0.49–0.66	0.25–0.29	0.19–0.21	0.16–0.24	—
<i>B. cinnameus</i>	0.50–0.75	0.28–0.35	0.32–0.38	0.40–0.46	—

Lz, lz, length and width of autozooids; Lov, lov, length and width of ovicells; Lav, length of avicularium.

walls of some zooids have a distinct keel, and one zooid at the lower end of the larger fragment is budded with its frontal side on the basal surface. This suggests that a conical colony, like that of *B. cinnameus*, which develops in the same way, may occur later in astogeny in this species.

The fragments are so fragile that further examination is not possible without damage. They were collected by RV Tangaroa at the centre of the Kermadec Ridge (NZOI Stn K839, 30°15.4'S, 178°24.0'W, 290 m, 29 July 1974). Until further material becomes available for examination, it seems advisable to leave this species of *Bryocalyx* unnamed at present.

***Bryocalyx cinnameus* n. sp.**
(figures 3–10)

Material

HOLOTYPE: NZOI, H-611, Station S150, 45°46.0'S, 174°24.5'E, east of South Island, 164 m, 26 October 1979, epibenthic sled. PARATYPE, P951, from the same locality, including colonies in figures 3, 4; and Museum of Victoria, SEM preparation including zooids in figures 5–10, one colony and two fragments.

Etymology

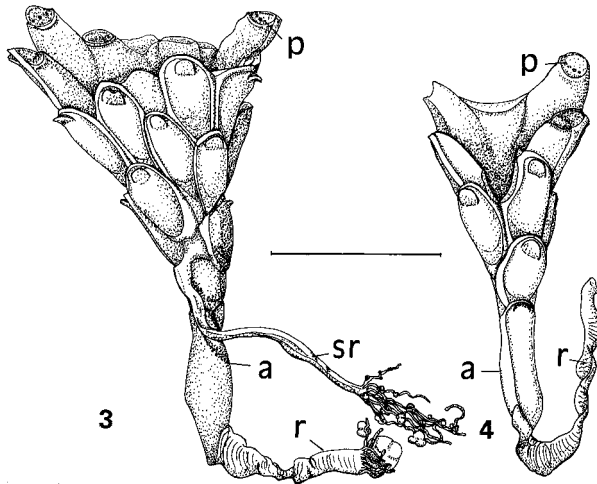
The name *cinnameus* was suggested by Dr D. P. Gordon, and is derived from the Latin, *cinnamum*, referring to the cinnamon colour of the colonies.

Distribution

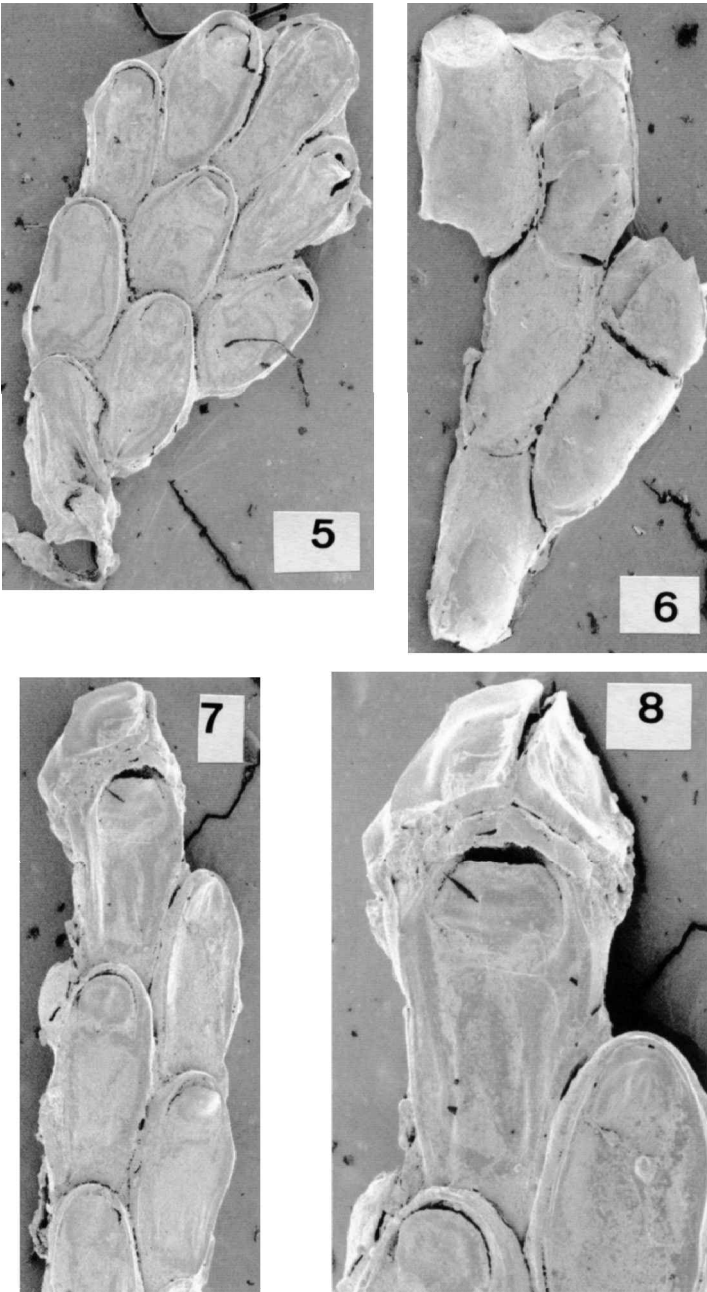
South Island, New Zealand.

Description

Colonies conical or fan-shaped, anchored by proximal rhizoids, autozooid frontals facing outwards. Ancestrula elongated, with a proximo-lateral rhizoid; other

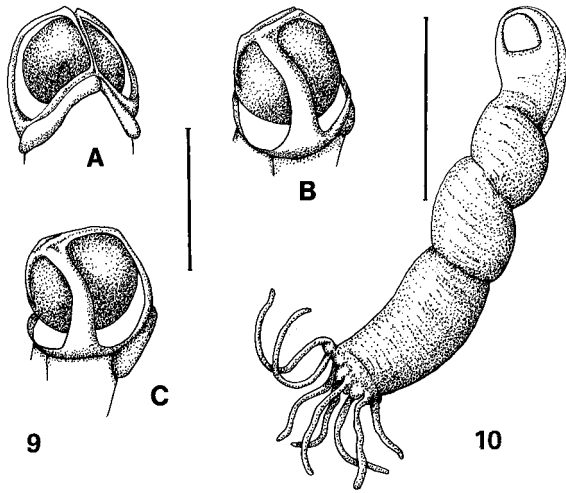


FIGS 3, 4. *Bryocalyx cinnameus* gen. nov., sp. nov.: conical paratype colonies (NZOI), showing ancestrula (a), primary (r) and secondary (sr) rhizoids, and distal pore plates (p). Scale = 1.0 mm.



FIGS 5–8. *Bryocalyx cinnameus* gen. nov., sp. nov.: scanning electron micrographs of paratype fragments (MOV). (5) Ancestrula and primary zooids; X33. (6) Zooids from basal side; X42. (7) Autozooids and one ovicelled zooid; X42. (8) Ovicell; X73.

rhizoids arising during astogeny, as a result of ontogenetic changes to the frontal membranes of proximally placed zooids. Autozooids with shallow lateral walls, raised distally, gymnocyst marginal, smooth. Frontal membrane extensive, operculum terminal, with a marginal sclerite. Zooids communicating through two or three



FIGS 9, 10. *Bryocalyx cinnameus* gen. nov., sp. nov. (9A–C) Sketches of skeletal elements of ovicell; (A) frontal, (B) latero-basal, (C) lateral. (10) Autozooid with frontal rhizoid. Scales = 0.50 mm.

lateral pore-plates, and a row of five or six distal pores within an oval plate with raised rim, which constitutes the entire disto-basal wall. Brooding zooids slightly wider than autozooids, with a wider operculum. Ovicell ectooecium a tripartite skeleton of calcification, with large, paired lateral, and a single basal, uncalcified foramen, covered by a membrane. Entooecium a thinly calcified capsule within the ectooecial structure. The ovicell is tilted backward from the zooid frontal and is bordered proximally by a pair of thick spinous processes; it is not closed by the operculum.

Remarks

The material from Stn S150 comprises more than 230 colonies or parts of colonies. These include 10 complete conical colonies, four with the ancestrula and primary rhizoid present, and 48 fan-shaped colonies with 10 zooids or more present. The remainder consist of smaller fragments of fewer than 10 zooids, some of which, however, have very large frontal rhizoids, and may have had an independent existence. The four largest conical colonies have 50, 25, 24 and 20 zooids, but no ovicells. Each of the larger, isolated, fan-shaped segments has one ovicell, and, on average, 11 autozooids. Two smaller segments of only four autozooids have one and two ovicells present, respectively. The largest colony measures approximately 3.0 mm in height and nearly 2.0 mm in diameter at the upper edge of the cone. The ancestrula is very elongated (La 0.66–0.80 mm), but the primary autozooid budded distally from it is relatively short and stout (Lz 0.50–0.60 mm); zooid length increases again with astogeny. The early colony appears to be fan-shaped, although slightly curved towards the basal side. At the second or third generation, one, or an opposing pair of marginal zooids are budded facing basally. These, together with some kenozooidal tissue complete the base of the cone. A rhizoid arises from a proximo-lateral pore and measures 1.0–1.25 mm in length. Later rhizoids arise from lateral septular pores of autozooids on the basal side of fan-shaped segments. Many secondary rhizoids are very turgid, even when preserved in alcohol, measuring 0.30–0.45 mm in diameter.

They may reach 3.0 mm in length and all subdivide terminally, ending in numerous fine rootlets, some of which may themselves reach a length of 2.0 mm. Minute foraminiferans and shell fragments, etc., occur in large numbers, adhering to the surface of the rootlets, which form a tangled mass. Some of the secondary rhizoids apparently occur later in astogeny, as an ontogenetic, intussusceptive expansion of the cuticle and epidermis of the frontal membrane of an autozoid (see figure 10). In this respect, they resemble the 'moribund' expansions observed by Cook (1985: 37), rather than rhizoids developing from a pore-plate. They function exactly like other rhizoids, but as the zoid from which they originated has an operculum, and, at one time, had an orifice, they are not strictly kenozooids.

The large ovicells somewhat resemble those of species of *Crassimarginatella* at the early stages of their ontogeny, as figured by Harmelin (1973). At this point in development, the enveloping ectoecium consists of only a pair of lateral flaps, leaving large basal and frontal foramina similar to those of *B. cinnameus* at the late stages of ovicell ontogeny. The central bar of ovicell calcification has a median suture, and the ovicell seems to be formed from two valves, like that of *Bryocalyx* sp. (see figure 8).

Bryocalyx cinnameus resembles *Parastichopora vanna* Cook and Chimonides (1981), from south-eastern Australia, which has fan-shaped colonies anchored by rhizoids. However, *P. vanna* has avicularia and a basal lamina, so that the details of colony structure are not the same. *Concertina cultrata* Gordon (1986: 27), from deep water off South Island, New Zealand, also has membraniporine zooids and robust rhizoids, but the colonies are bilaminar, and avicularia are present. The mode of life of all these colonies is almost certainly very similar, and resembles that of other sand-fauna species, anchored within, or upon, the surface layers of finely particulate sea-bottom sediments.

Acknowledgements

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