

Troglodytes of a muddy bottom: the hydroid fauna of holes in the seabed

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Watson, J.E. Troglodytes of a muddy bottom: the hydroid fauna of holes in the seabed. Zool. Verh. Leiden 323, 31.xii.1998: 247-256, figs 1-3.— ISSN 0024-1652/ISBN 90-73239-68-0. Jeanette E. Watson, Honorary Associate, Invertebrate Zoology, Museum of Victoria, Melbourne 3000 Australia, e-mail: mse@internet.com.au.

Key words: Hydroids; polychaete tubes; Port Phillip Bay; Australia.

During ecological surveys in Port Phillip Bay Victoria, Australia, colonies of minute leptothebate hydroids were found living in tubes in a muddy seabed, the tubes probably being those of polychaete worms. Three species are recorded: two are new species and the third, provisionally assigned to *Rathkea octopunctata*, is a new record for Australia.

Introduction

The Geelong Arm of Port Phillip Bay in south-eastern Australia (38°06'S 144°30'E) covers an area of 400 km² (fig. 1). It is a very sheltered part of Port Phillip Bay, subject to only mild tidal currents and short fetch wind-driven waves. The bed sediments at depths of 9-12 m are very fine unconsolidated muds of predominantly <63 µm grain size. Water temperatures vary from 9°C winter to 20°C summer. The habitat supports a very rich infauna of polychaetes, small crustaceans and bivalve molluscs, the burrow entrances of which pit the surface of the mud (Carey & Watson, 1992: 200).

During ecological surveys of the Geelong Arm, empty tubes extracted from the muddy bottom were found to contain colonies of minute leptothebate hydroids. The hydroids occur in only one kind of tube, presumed to be that of a polychaete. The extremely fragile tubes are composed of sediment grains, are about 5 mm in internal diameter with walls about 3 mm thick; they lack a mucilaginous lining and open to the sediment surface. They are recognisable in the field by slightly better consolidation than the surrounding sediments and by a faint brownish colouration around the rim contrasting with the darker grey of the bed. It has not been established whether the tubes are abandoned or are occupied by a polychaete living deeper in the burrow. Hydroid colonies were first noted on the internal walls of the tubes after staining in the laboratory with Bengal Rose.

Two species are described as new and another, provisionally assigned to *Rathkea octopunctata*, is a new record for Australia. The two new species occupy identical habitats, living in the upper 10-15 mm of the tubes; however they never occur in the same tube. They also share remarkably similar habits of growth, extending long, active moniliform tentacles, interconnected by a basal web, into the tube. The single colony of *Rathkea ?octopunctata* was found on the rim of a tube.

Collection of material

When the host tube could be confidently recognised in the field, the seabed was searched regularly during 1996 and 1997. Tubes were scooped into a container, the

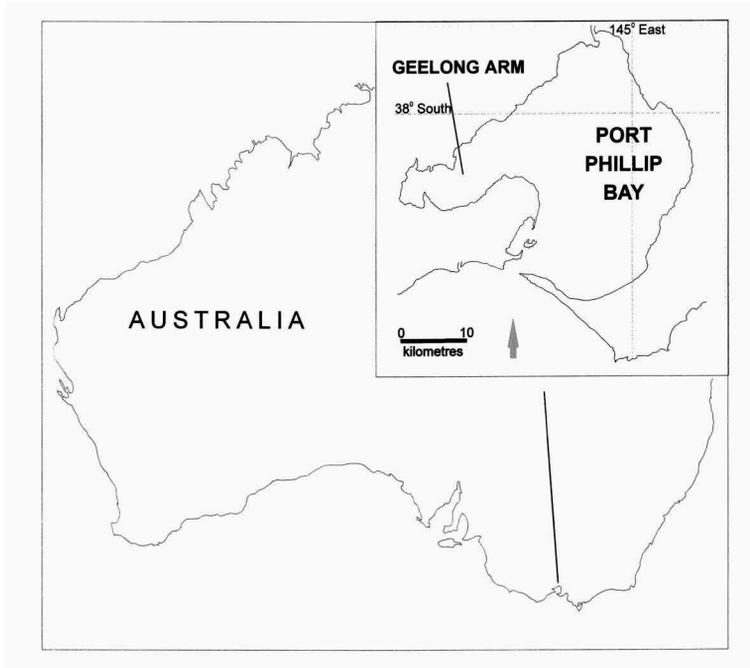


Fig. 1. Map of Australia showing location of the Geelong Arm of Port Phillip Bay

container sealed and the sediments later gently sieved to separate the tubes from the mud. Tubes kept in seawater were then returned to the laboratory where they were split open under stereo-microscope to search for hydroid colonies. Colonies consisting of a few hydranths were found in fewer than half of the tubes examined. Specimens kept in seawater for observation and dissection decomposed after about 12 hours. Descriptions are based on observations of living specimens and from microslide preparations made from other specimens preserved in 10% formaldehyde solution and later mounted in malinol.

Type and voucher specimens are held in the collection of the Museum of Victoria (MVF).

Descriptive part

Family Eirenidae Haeckel, 1879

Genus *Eirene* Eschscholtz, 1829

Eirene Eschscholtz, 1829: 94; Bouillon, 1985: 139; Calder, 1991: 6; Cornelius, 1995: 223.

Geryonopsis Forbes, 1848: 39.

?*Phortis* McCrady, 1859: 192.

Irene Haeckel, 1879: 200.

Eirine Vervoort, 1966: 106.

Diagnosis.— Hydroids colonial, stolonial or erect. Hydrothecae pedicellate, often reduced to a collar below hydranth. Hydranths extensile, tentacles with a distinct basal web of tentacles, hypostome dome-shaped, nematothecae absent. Gonophores

free medusae; gonothecae pedicellate, club-shaped with very thin perisarc, arising from hydrorhiza or pedicel adjacent to hydranth. Fully developed medusae without lateral or marginal cirri, with numerous closed marginal vesicles, tentacles lacking abaxial longitudinal groove (after Calder, 1991).

Eirene troglodyta spec. nov.
(fig. 2a-g)

Material.— Holotype, MVF 82728, microslide preparation of fertile colony mounted in malinol, Geelong Arm of Port Phillip Bay, Victoria, Australia 38°06'S 144°30'E, depth 12 m, coll. J.E. Watson, 10.ix.96. Paratype, MVF 82729 microslide preparation of infertile colony mounted in Malinol, Geelong Arm of Port Phillip Bay, Victoria, Australia 38°06'S 144°30'E, depth 12 m, coll. D.A. Staples, 21.xii.96.

Description of holotype and paratype.— Colonies minute, hydrorhiza consisting of one or two short intersecting stolons creeping on inside of worm tube; stolons thin, knobbly, transparent, sediment grains embedded in perisarc. Hydrorhiza supporting one or two hydranths on pedicels of varying length, perisarc thin, varying from almost smooth to wrinkled or rugose, terminating in a swollen, collar-like gelatinous theca supporting the hydranth. Hydranth long, spindle-shaped, very extensile; hypostome conical, mouth quadrate, surrounded by a single whorl of 14 long, monili-form tentacles, a large intertentacular web between bases of tentacles.

Hydranth with two kinds of nematocysts:

1) abundant small macrobasic mastigophores arranged in circlets around tentacles; capsule $6-7 \times 1-1.5 \mu\text{m}$, butt $10-12 \mu\text{m}$ long, tube long and thin.

2) larger, less abundant ?haplonemes in body of hydranth, around hypostome and in pedicel; capsule $11-12 \times 2-2.5 \mu\text{m}$, tube insufficiently discharged for measurement.

Medusa bud borne on a long pedicel below hydrotheca, proximal part of pedicel sheathed in perisarc, stalk thereafter long, naked; gonophore with a very thin, transparent ovoid sheath rounded apically, the developing medusa clearly visible inside.

Colour.— Colonies and medusa buds transparent and colourless.

Measurements (μm)

Hydrorhiza, diameter	50
Pedicel	
length	100-500
width	60
Hydranth (live specimen)	
width across extended tentacles	1300
width across extended tentacle web	350
Medusa bud	
length (excluding pedicel)	210
maximum width	140

Remarks.— Up to 10 hydranths may be scattered inside the upper 15 mm of tubes, the stolons penetrating only shallowly into the walls; there is, however, usually no stolonial connection between hydranth pedicels. It seems likely therefore, that sev-

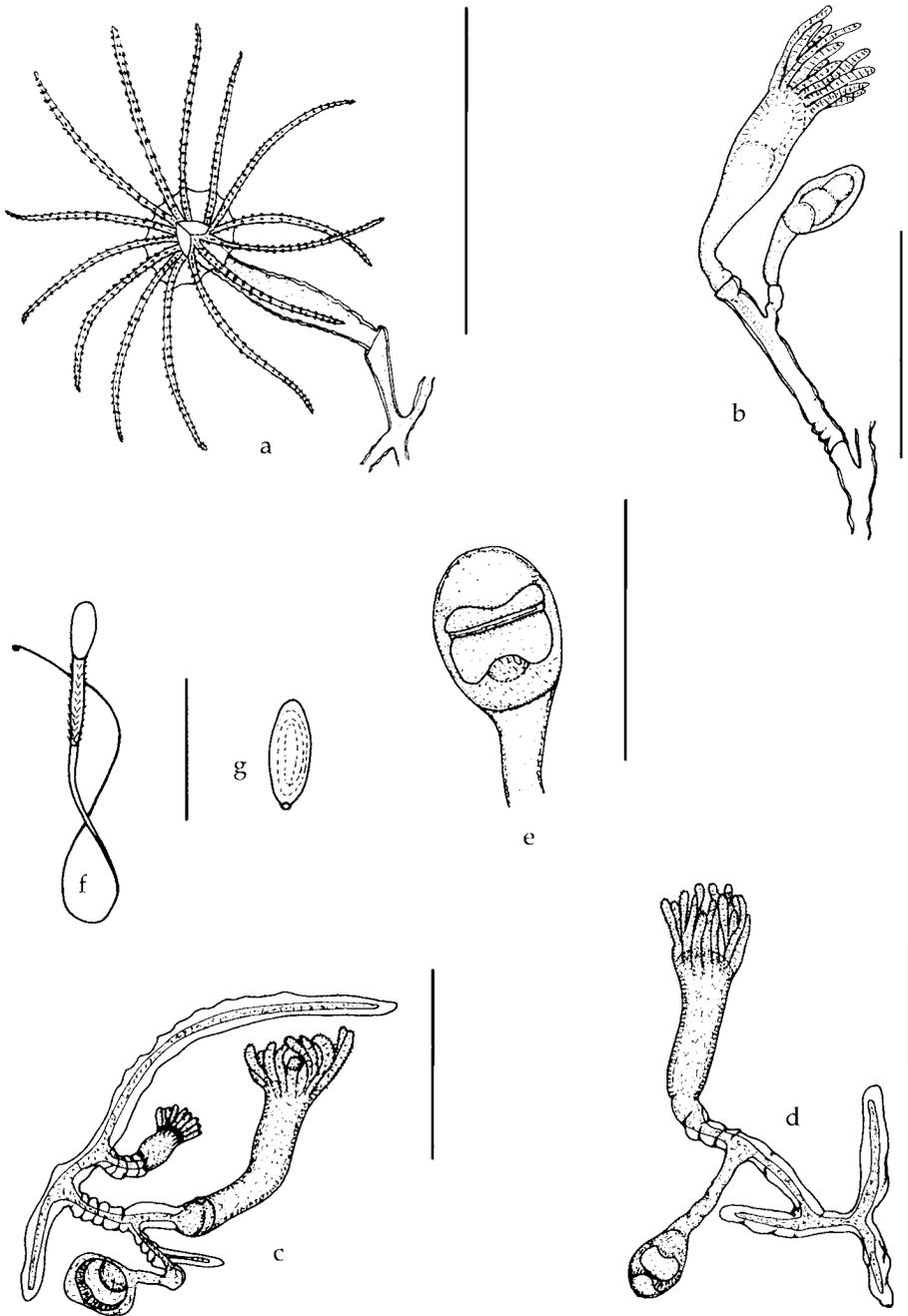


Fig. 2. *Eirene troglodyta* spec. nov.; a, a fully extended hydranth showing tentacle web, drawn from living specimen; b-d, individual colonies with hydrorhiza, pedicels, hydranths and medusa buds; e, almost mature medusa bud; f, discharged macrobasal mastigophore from tentacles; g, undischarged ?haploneme from hypostome. Bar scales: a, 1 000 μm ; b, c, d, 500 μm ; f, g, 10 μm .

eral colonies resulting from simultaneous larval settlement may occupy the same tube, or alternatively, stolonial connections are lost as a single colony matures. The pedicels are extremely variable in length, the shortest being a mere collar seated directly on the hydrorhiza while the longest exceeds the length of the extended hydranth. Fully extended hydranths are very graceful, the tentacles being held out stiffly in a single cirlet from the basal web.

The present species conforms neither to *Eutonina* Hartlaub, 1897, nor to *Tima* Eschscholtz, 1829, as the hydrothecae of these genera are said to be operculate (Cornelius, 1995: 234). Nor does it fit *Helgicirrho* Hartlaub, 1909, the medusa buds of this genus being borne on the hydranth body, not on the pedicel. It most closely agrees with the genus *Eirene*, although with some differences. Only the hydroid of *Eirene viridula* (Péron & Lesueur, 1810) is reasonably well known, Cornelius (1995: 223) describing the hydranth as having more than 20 amphicoronate tentacles while Calder (1991: 6) mentions a thin gonotheca covering the gonophore. The cnidome of the hydranth of *Eirene viridula* consists of atrichous and basitrichous haplonemes while that of the medusa consists of atrichous haplonemes and microbasic mastigophores (Bouillon, 1985: 136). In contrast, the cnidome of *Eirene troglodyta* consists of mastigophores and ?haplonemes thus more resembling the cnidome of the medusa than the hydroid of *Eirene viridula*.

Medusa buds occur in late winter (September). Although no free medusae have been found, some gonophores are sufficiently well developed to indicate a medusa with a moderately thick umbrella, probably a simple mouth, but an unknown number of tentacles. Medusae of the genus *Eirene* recorded from the Indo-Pacific region (Kramp, 1968: 89), include *Eirene ceylonensis* Browne, 1905, *Eirene hexanemalis* (Goette, 1886), *Eirene palkenensis* Browne, 1905, and *Eirene kambara* Agassiz & Mayer, 1899, the latter recorded from north-eastern Australia. With the exception of the aberrant *E. hexanemalis*, which has a solitary polyp lacking a hydrorhiza, the hydroids of the other species are unknown. It is quite likely, therefore, that the present species is the hydroid of one of these medusae.

Etymology.— Refers to the cryptic habit of the species.

Family Aequoreidae Eschscholtz, 1829

Genus *Aequorea* Péron & Lesueur, 1809

Diagnosis.— Colony stolonial or producing sparsely branched sympodial stems. Hydrotheca minute, pedicellate and free, radially symmetrical, with an operculum of many converging segments not sharply demarcated from the hydrothecal wall. Hydranth with an intertentacular web. Nematophores absent. Gonophores producing free medusae (after Millard, 1975).

Aequorea phillipensis spec. nov.
(fig. 3a-e)

Material.— Holotype, MVF82730, microslide preparation of colony mounted in malinol, Geelong Arm of Port Phillip Bay, Victoria, Australia, 38°06'S 144°31'E, depth 10 m, coll. J.E. Watson, 10.ix.96. Paratype, MVF 82731, microslide preparation of colony mounted in malinol; Geelong Arm of Port Phillip Bay, Victoria, Australia 38°6'S 144°29'E, depth 12 m, coll. D.A. Staples, 21.viii.96.

Description.— Colonies minute, infertile. Hydrorhiza consisting of several thread-like stolons creeping over internal wall of worm tube. Pedicels arising at stolonal junctions, simple, unbranched or sometimes with a single branch, cylindrical to cigar-shaped, narrowest at base, widening just above hydrorhiza, diameter then much the same throughout; perisarc firm, deeply annulated or ridged. Hydrotheca bud-shaped (when closed), radially symmetrical, floor flat, no diaphragm, perisarc very thin and transparent, somewhat thicker at base, distal half to one third consisting of many thin, folded segments converging at apex, no crease line separating segments from body. When hydrotheca is shed, the base remains as a shallow saucer-shaped platform with slightly everted rim; the base may be regenerated up to five times, the top-most platform often with a ring of desmocytes just below rim.

Hydranth with a circlet of 14-16 long moniliform tentacles held stiffly outwards and connected by a conspicuous intertentacular web. Nematocysts of two kinds present in hydranth:

1) abundant haplonemes (?holotrichous isorhizas) in tentacles; capsule elongate oval, $6-7 \times 1.5-2 \mu\text{m}$, tube isodiametric, at least $22 \mu\text{m}$ long, armed throughout length with spirals of fine bristles.

2) slightly larger haplonemes in lower part of hypostome; capsule bean-shaped, $8 \times 3 \mu\text{m}$, insufficiently discharged to enable confident identification or measurement of tube.

Colour.— Colourless and transparent.

Measurements (μm)

Diameter of hydrorhiza	50-130
Pedicel	
length	300 - 800
maximum diameter	100-120
Hydrotheca	
maximum length	550
maximum diameter	260

Remarks.— In contrast with the sturdy pedicel, the perisarc of the hydrotheca is so delicate that most collapse in mountant. Because of this, and their overlapping nature, no accurate count could be made of the number of opercular segments but there are probably about twenty. As pointed out by Millard (1975: 130) in the discussion of *Aequorea africana* Millard, 1966, the stout, saucer-shaped platform remaining after the hydrotheca is shed can easily be mistaken for the hydrophore of an haleciid, especially with the presence of a ring of desmocytes.

Although the material conforms with the description and figure of *Aequorea africana* (cf Millard, 1966) the dimensions of *Aequorea phillipensis* are considerably greater than those given by Millard for *A. africana*. Furthermore, the considerable differences in habitat, *Aequorea africana* being epizootic on gastropod shells while the present specimens are truly cryptic, suggests they are different, although closely related species.

Péron & Lesueur (1809) described the medusa *Aequorea eurhodina* from Bass Strait

(Von Lendenfeld 1884: 610) but the species has not since been recognised in Australian waters. As Port Phillip Bay connects freely with Bass Strait, it is possible that *Aequorea phillipensis* may be the hydroid of *A. eurhodina*. Confirmation of this must await linking of the hydroid with its medusa. Meanwhile *E. phillipensis* is considered a distinct species.

Etymology.— Refers to the type locality of Port Phillip Bay in southern Australia.

Family Rathkeidae Russell, 1953

Rathkea Brandt, 1838

Diagnosis.— Hydrorhiza creeping, hydranths sessile, very extensible with a ring of filiform tentacles. Gonophores borne on the stolons and rarely at the base of the polyps. Medusa with four radial canals, mouth with four lips extending into four simple oral arms with terminal nematocyst clusters; marginal tentacles in eight groups, without ocelli (after Kramp, 1965, and Bouillon, 1985).

Rathkea ?octopunctata (M. Sars, 1835)

(fig. 3f)

Cytaeis octopunctata M. Sars, 1835: 28, pl. 6, figs 14a-g.

Rathkea octopunctata; Mayer, 1910: 177, pl. 20, fig. 11; Rees & Russell, 1937: 71, figs 7, 8; Russell, 1953: 137, pl. 7, figs 3, 4, text-figs 65A-E, 66, 67A-B; Werner, 1958: 138, figs 1-13; Kramp, 1959: 103, fig. 75; Bouillon & Werner, 1965: 137, figs 1-7; Kramp, 1968: 30, fig. 74; Naumov, 1969: 212, figs 80, 81; Arai & Brinckman-Voss, 1980: 33, fig. 16; O'Sullivan, 1984: 868; Werner, 1984: fig. 93; Schuchert, 1996: 59, fig. 34.

Material.— MVF82729, microslide preparation mounted in malinol; Geelong Arm of Port Phillip Bay, 38°06'S 144°30'E, depth 12 m, coll. D.A. Staples 21.xii.96 (Note: the specimen is on same microslide as the paratype of *Eirene troglodyta* spec. nov.).

Description.— A colony consisting of two hydranths on the orifice of a worm tube. Hydrorhiza a sparingly branched, tubular, thin, sediment-coated stolon creeping on rim of worm tube. Hydranths minute, pedicel short, thick, merging imperceptibly into body of hydranth; hydranth bud-shaped, widest about mid-region (preserved material), body sheathed almost to distal end in a thin, gelatinous, sediment-coated pellicle, distal end of hydranth with four long moniliform tentacles bearing clusters of small nematocysts.

Colour.— Colourless in life.

Measurements (μm)

Hydrorhiza, maximum diameter	50
Pedicel width	40
Hydranth	
maximum length, including pedicel	280
maximum diameter	10
tentacle length (preserved material)	80

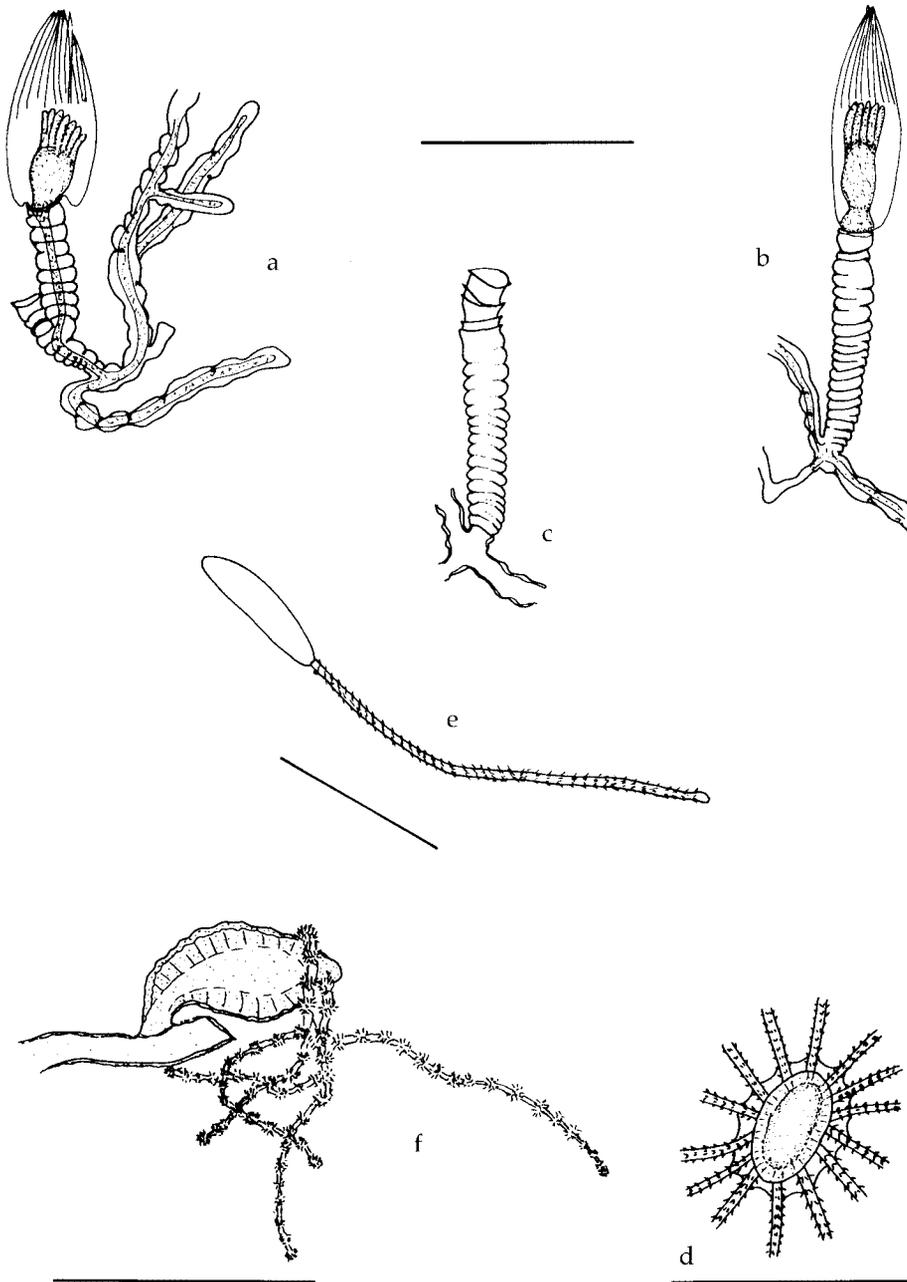


Fig. 3a-e. *Aequorea phillipensis* spec. nov.; a, b, colonies with hydrorhiza, pedicels and hydrothecae; c, pedicel without hydrothecae showing distal platform resembling hydrophore; d, view into distended hypostome showing tentacle web and extended tentacles (not fully drawn) from living specimen; e, haploneme from tentacles. Fig. 3f. *Rathkea ?octopunctata* (M. Sars, 1835), hydrorhiza and hydranth. Bar scales: a-d, 500 μm ; e, 10 μm ; f, 300 μm .

Remarks.— The few partly discharged nematocysts in the tentacles could not be identified.

The medusa of *R. octopunctata* is reasonably well known; however, because of its small size and cryptic habit, the hydroid has seldom been described, the most comprehensive account being that of Rees & Russell (1937: 71) of cultivated specimens. The present specimen does not exactly conform to the description and figures of these authors (differing chiefly in the possession of a distinct pedicel). However, the fact that the cosmopolitan medusa of *Rathkea octopunctata* has been recorded from New Zealand (Schuchert 1996: 59) suggests that the present specimen may be the hydroid of that species.

Thus, it possibly represents the first record of the hydroid of *R. octopunctata* from the Australasian region.

Acknowledgments

I thank the editors of the present volume and the Council of the Natural History Museum Leiden for the opportunity to express my deepest gratitude to Dr Wim Vervoort for his unstinting assistance and advice to those of us of lesser taxonomic stature. I also thank his wife Len for her forbearance and unfailing hospitality to the many hydroidologists who have invaded her home over the years. Lastly, I thank my diving colleagues Luke Molan and David Staples for their cheerful help in searching for 'troglodytes in the seabed'

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