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TRENDS IN HYDROZOAN BIOLOGY - IV. *C.E. MILLS, F. BOERO, A. MIGOTTO and J.M. GILI (eds.)*

Redescription of *Tripoma arboreum* Hirohito, 1995 (Hydrozoa: Campanulinidae) from the Tasman Sea with notes on quasi-parasitism of the species*

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SUMMARY: *Tripoma arboreum* Hirohito, 1995 has been found in deep water in the Tasman Sea south of Australia, the Norfolk Ridge north of New Zealand and Sagami Bay, Japan. The species exhibits unusual quasi-parasitic behaviour towards its host species.

Key words: *Tripoma, Tetrapoma,* Campanulinidae, taxonomy, Tasman Sea, Australia.

INTRODUCTION

A study of the hydroid fauna from deep water seamounts in the Tasman Sea south of Tasmania, Australia, and from the Norfolk Ridge, north of New Zealand, found a species of the family Campanulinidae that has led to critical review of the systematic status of the genus *Tetrapoma* Levinsen, 1893, type *Calycella quadridentatum* Hincks, 1874 and *Tripoma* Hirohito 1995, type *Tripoma arboreum* Hirohito, 1995.

Bouillon (1985) redefined the genus *Tetrapoma* Levinsen, 1893, limiting it to stolonal colonies with nearly cylindrical, pedicellate hydrothecae with four triangular opercular valves distinctly demarcated from the margin. The gonotheca was unknown.

Hirohito (1995) further modified the generic description of *Tetrapoma* to accommodate erect, arborescent colonies from Sagami Bay, Japan. Although his specimens were fertile he did not include the gonosome in the generic description. Nor was his concept of a hydrothecal operculum of four flaps, not demarcated from the hydrothecal body, in accord with the generic diagnosis of *Tetrapoma*.

We have examined a paratype colony of *Tetrapoma fasciculatum* Hirohito 1995 (NSMT-Hy R: 3010, alcohol preserved), a microslide preparation No. 6212 from the same colony, four microslide preparations No. 5139, 5143, 5145, from the holotype colony of *Tetrapoma fasciculatum* (NSMT-Hy R: 3002), and the holotype specimen (NSMT-Hy R: 3009, alcohol preserved) and three microslide preparations (No. 6206, 6207, 6211) of *Tripoma arboreum* Hirohito 1995, loaned by the Showa Memorial Institute, Japan.

The heavily fascicled lower branches of the preserved specimen of *Tripoma arboreum* bear many

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hydrothecae, some pedicellate and others partially immersed in the polysiphonic tubes of the branches as described by Hirohito. The few reasonably well preserved pedicellate hydrothecae have the same range of dimensions as those of *T. fasciculatum* and clearly show four, not the three opercular valves characterised by Hirohito as diagnostic of the genus *Tripoma*. We therefore conclude that Hirohito's genus *Tripoma* cannot possibly be separated from *Tetrapoma* as defined in Hirohito's 1995 paper, *Tetrapoma fasciculatum* Hirohito, 1995 and *Tripoma arboreum* Hirohito, 1995 being evidently conspecific. However, since the colonies are not stolonal but are erect and arborescent and the hydrothecal operculum is not demarcated from the margin, we consider *Tetrapoma quadridentatum* (Hincks, 1874) is so far removed from the arborescent species as to necessitate generic separation. The arborescent species without demarcation of the operculum from the hydrothecal margin is here placed in the genus *Tripoma* Hirohito, 1995, where it should stand as *Tripoma arboreum* Hirohito, 1995. The species name "*arboreum"* is here given preference over "*fasciculatum"* since it represents the type of *Tripoma* Hirohito 1995.

MATERIAL

Specimens from the Tasmanian seamounts are lodged in the Tasmanian Museum, Launceston, Tasmania, Australia (TM K), the Museum of Victoria, Melbourne, Australia (MV F). The New Zealand specimens are in the National Museum of New Zealand, Wellington, New Zealand (NMNZ); some material designated NNM is in the National Museum of Natural History (Nationaal Natuurhistorisch Museum), Leiden, The Netherlands.

RESULTS AND DISCUSSION

Family CAMPANULINIDAE Hincks, 1868
Genus ***Tripoma*** Hirohito, 1995

Diagnosis. Colony arborescent, stem and branches fascicled. Hydrotheca nearly tubular, pedicellate, operculum of four flaps not demarcated from margin. Gonotheca cocoon-like, sessile, immersed in fascicular tubes of rhizocaulus, orifice terminal, subcircular, operculum membranous.
Type species: *Tripoma arboreum* Hirohito, 1995.

Tripoma arboreum Hirohito, 1995
Figs 1A-D, 2A-J

Tetrapoma fasciculatum Hirohito, 1995: 95, fig. 27a-c, pl. 5, fig. D.
Tripoma arboreum Hirohito, 1995: 98, fig. 28a-e, pl. 6, fig. A.

Material and Records: TM K1708, CSIRO F.R.V. 'Southern Surveyor' Cruise SSO1/97, station 50, 44.21°S 147.04°E to 44.16°S, 147.05°E, 640-700 m, benthic sled, 69.7 km SSE of South East Cape, Tasmania, 29/01/98. Material formalin preserved. Several fertile colonies to 30 mm high on calcareous bryozoan. MV F 83426, 83427, 83428 microslide preparations from these colonies. TM K1709, CSIRO F.R.V. 'Southern Surveyor' Cruise SSO1/97, station 57, 44.18° S, 146.99° E to 44.21°S, 146.95° E, 900-1,100 m, benthic sled, 65.1 km SSE of South East Cape, Tasmania, 29/01/1997. Material formalin preserved. Numerous fertile colonies to 50 mm high on stem of dead bryozoan. Material not well preserved. National Museum of New Zealand, BS 886 (Colln NMNZ 520), 32°35.3'S 167°41.8'E to 32°34.0'S 167°39.39'E, Wanganella bank, Norfolk Ridge, E. Slope, 437-422 m, 29/01/1981, R. V. 'Tangaroa'. Some material as NNM-Coel 27731; two microslide preparations NNM-Coel 2998. Male colony, 60 mm high on sponge. Material alcohol preserved, condition reasonable.

Description

Hydrorhiza a small mass of tubes; hydrocauli erect, stiff, arborescently branched untidily more or less in one plane, branches heavily fascicled to distal region, polysiphonic tubes narrow, parallel to entwining. Distalmost branches monosiphonic, internodes long and slender, nodes a faint constriction in perisarc above apophysis or absent altogether; apophyses of branch distal on internode, moderately long, with a deep transverse distal node. Hydrothecae strictly alternate in monosiphonic branch region, given off in one plane; a hydrotheca in axil of each branch. Hydrotheca borne on a distinct pedicel merging into base of hydrotheca with none to three deep constrictions, hydrotheca deep, perisarc thin (Tasmanian seamount specimens) to moderately thick (Norfolk Ridge specimens), more or less tubular, curved, widening a little from base to about halfway along length, adcauline wall gently convex, abcauline wall slightly concave to straight, a scarcely visible straight or dish-shaped pseudodiaphragm supporting hydranth, often a ring of desmocytes just above. Margin with an operculum of four delicate valves without crease-line.

Gonothecae large, thickly scattered throughout polysiphonic parts of stem and branches, laying along branch or in axil of two branches, cocoon-like, one side adnate to branch. Developing gonotheca flask-shaped, perisarc relatively thin, mature gonotheca cocoon-like, embedded in a meshwork of more or less parallel or entwined fascicular tubes. Empty gonotheca circular to bun-shaped in transverse section with a moderately thick, smooth inter-

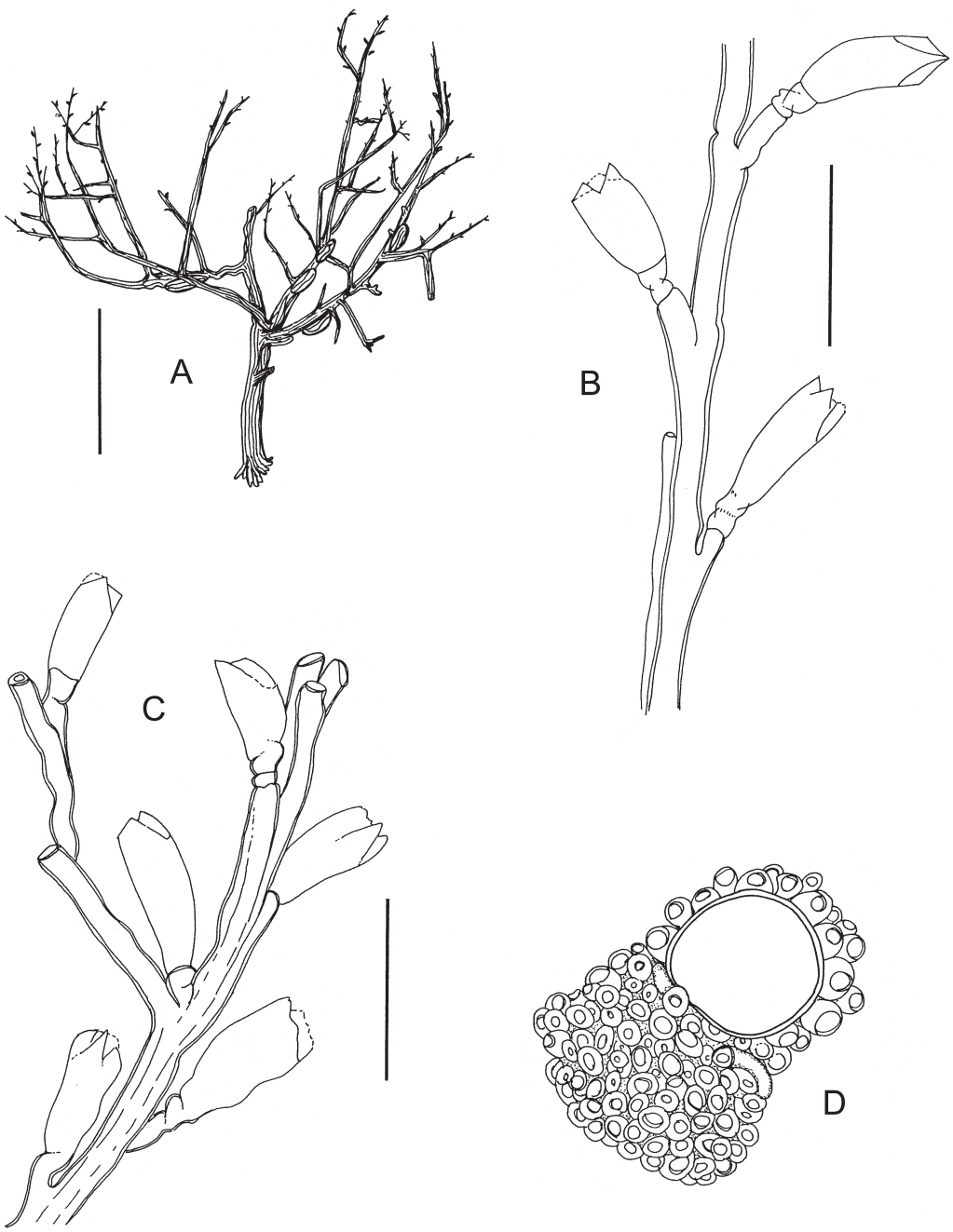

FIG. 1. – A, Colony of *Tripoma arboreum* Hirohito, 1995 (TM K1708) from Tasmanian seamounts. B, Distal end of branch of same colony. C, Distal end of branch of colony from the Norfolk Ridge. D, Transverse section of branch and gonotheca from seamount colony TM K1708. Scale bar:1A, 1 cm; 1B, C, D, 0.5 mm.

nal rind of perisarc surrounded by a tight single or double row fascicular tubes. Orifice terminal, facing outwards or upwards, but frequently obscured, shape variable from subcircular to vaguely quadrangular or scoop-shaped, sometimes surrounded by a short raised collar composed of several perisarcal rings. Operculum a sheet of tissue torn aside at release of contents.

Gonophores eumedusoid but too poorly preserved for detailed description.

Colour

Lower stems buff to yellow-brown, upper stems and monosiphonic branches colourless to transparent, gonophore (preserved) cream coloured.

TABLE 1. – Measurements (μm) of *Tripoma arboreum* Hirohito, 1995.

	Seamount	Norfolk Ridge
Branch, monosiphonic region		
distance between hydrothecal pedicels	530-620	350-450
width at apophysis	80-100	80-120
length of apophysis (adcauline side)	70-180	50-60
width of distal node of apophysis	60-80	80-120
Hydrotheca		
length including pedicel	450-640	580-680
maximum width	180-200	170-220
depth of opercular embayment	140-150	85-110
Gonotheca		
maximum length (estimated)	2500	1430-2060
maximum width	550-900	460-630

Remarks

The opercular valves of the hydrotheca are fragile, most of those of the seamount specimens having collapsed during preservation; the perisarc of the Norfolk Ridge hydrothecae is somewhat thicker and the valves are thus better preserved (Fig. 2C). In some hydrothecae there is an almost imperceptible thickening of the hydrothecal wall at the point of attachment of the very thin, dish-shaped pseudodiaphragm (Fig. 2A). Although Hirohito (1995) reported no diaphragm in his material from Sagami Bay, the same structure together with desmocytes is clearly visible in some hydrothecae in the paratype microslides of *Tetrapoma fasciculatum*.

It is extremely difficult to define the true shape of the gonothecal orifice, most being either damaged in mature specimens, obscured by overgrowth of the fascicular tubes or abraded. The few immature or reasonably intact mature ones suggest a vaguely, subcircular to scoop-shaped rim covered by a very thin operculum fragmented at emergence of the gonophore. There is no evidence in the present material of the four opercular valves described for the gonotheca of *T. fasciculatum* by Hirohito (1995) nor is there any clear evidence of any such structure in Hirohito's specimens.

Quasi-parasitism of Tripoma arboreum

Bale (1915) reported epizootic hydrothecae which he ascribed to the genus *Lafoea* growing on *Acryptolaria arboriformis* (Ritchie, 1911) from Babel Island in Bass Strait, southern Australia. He also (1915) described but did not figure a gonotheca on *Acryptolaria arboriformis* (Ritchie 1911) from deep water off southern Australia, assuming it to be that of *Acryptolaria arboriformis*.

We have examined four microslide preparations labelled "*Cryptolaria arboriformis* Ritchie, off Thouin or Wineglass Bay, near Freycinet Peninsula, Tas. Bale 1915", two microslides labelled "*Cryptolaria arboriformis* Ritchie, Babel Ids, Endeavour, 1915", and one microslide labelled "R.E.Trebilcock, No. 293, *Acryptolaria arboriformis* Ritchie, 7 miles E. of Cape Pillar, Tasmania, 100 fms" in the collection in the Museum of Victoria. Several of the specimens bear Bale's *Lafoea* hydrothecae (Fig. 2I) as well as the cocoon-like gonothecae, typical of *T. arboreum* (Fig. 2H).

We have also examined the holotype specimen of *Acryptolaria arboriformis* (Ritchie 1911) (AM Y257, wet preserved) loaned by the Australian Museum. The much broken colony is about 80 mm high, branching in many directions, both stem and branches being heavily fascicled by thin parallel and entwined tubes. A few of the less heavily fascicled distalmost branches consist of parallel tubes bearing long, tubular *Acryptolaria arboriformis* hydrothecae. The remainder of the colony is almost completely invested in gonothecae of *Tripoma arboreum*. These impart a lumpy appearance to the stems and branches, and together with the surficial meanderings of polysiphonic tubes impart the "frolicsome" appearance of the fasciculations which puzzled Ritchie (1911). The outward-facing, sub-circular orifices of most gonothecae are probably what Ritchie mistook for openings from the polysiphonic tubes to the exterior of the branch. A few small hydrothecae, distinctly those of *T. arboreum,* are also present on the lower regions of several branches. Transverse sections made by us of a branch and gonotheca of the type specimen show that the tubes of *T. arboreum* cannot be distinguished from those of *A. arboriformis* (Fig. 1D). Transverse sections of

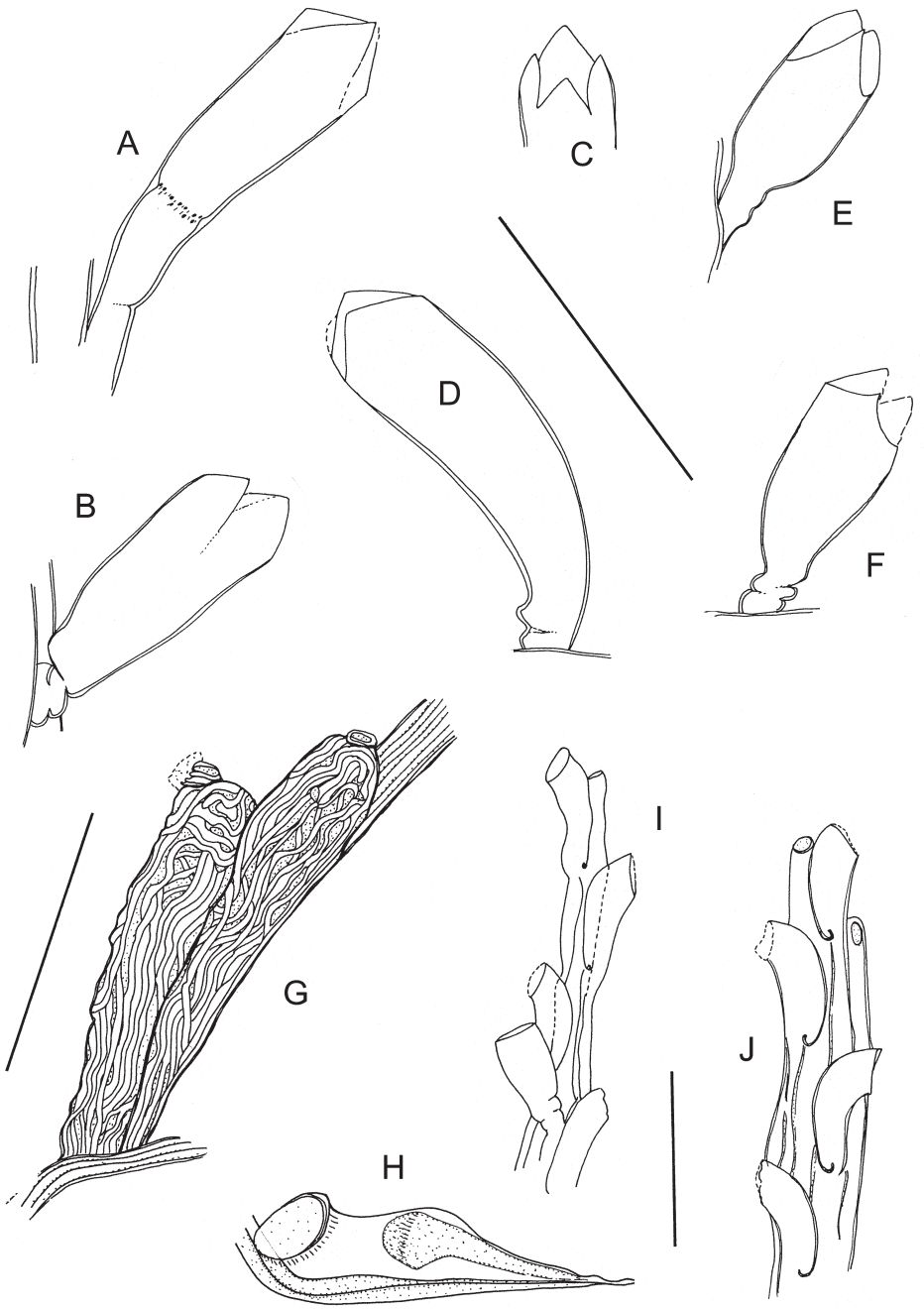

Fig. 2. – A-B, Hydrothecae of *Tripoma arboreum* from Tasmanian seamount colony. C-D, Hydrothecae of *Tripoma arboreum* from colony from Norfolk Ridge. E, Hydrotheca from paratype colony of *Tetrapoma fasciculatum* Hirohito 1995 from Sagami Bay. F, Hydrotheca from holotype colony of *Tripoma arboreum* Hirohito 1995 from Sagami Bay. G, Two adjoined gonothecae from colony of *Tripoma arboreum* from the Norfolk Ridge. H, Young gonotheca of *Tripoma arboreum* without fasciculations from Babel Island, Bass Strait, with *Tripoma* hydrotheca. Slide No 33, Bale hydroid collection, Museum of Victoria. I, Distal part of branch from colony of host colony of *Acrytolaria arboriformis* (Ritchie, 1911) from Babel Island, Bass Strait, with *Tripoma* hydrotheca. Slide No 33, Bale hydroid collection, Museum of Victoria. J, Distal part of branch from holotype colony of *Tripoma arboreum* Hirohito, 1995 from Sagami Bay showing hydrothecae of host colony of *Acrytolaria arboriformis* (Ritchie, 1911). Scale bar: 2A-F, H-J, 0.5 mm; 2G, 2 mm.

branches of the Tasmanian seamount specimens of *T. arboreum* not associated with *A. arboriformis* are indistinguishable from those of the type of *A. arboriformis,* indicating that independent colonies of *T. arboreum* have the same internal structure as the host species of the quasi-parasitic form.

Examination of the less heavily fascicled parts of branches of the preserved holotype colony and microslide specimen of *Tripoma arboreum* Hirohito 1995 reveals biseriate rows of hydrothecae (neither described nor figured by Hirohito) which are clearly those of *Acryptolaria arboriformis* (Ritchie, 1911) (Fig. 2J).

We therefore conclude that *Tripoma arboreum* is capable of adopting two habits of growth: one as independent, arborescent colonies which commence life on invertebrate or inert substrate as in the Tasmanian seamount and Norfolk Ridge colonies. The second, quasi-parasitic habit, seen in the Bass Strait and Sagami Bay *Acryptolaria* colonies is one in which the *Tripoma* stolons become indistinguishably intergrown with the polysiphonic tubes of the host, mimicking its structure and possibly eventually smothering it.

Several examples of epizootism, where juvenile hydroid colonies develop epizootically on colonies of other hydroids then become independently growing, erect colonies are known to us: e.g. colonies of *Halecium delicatulum* Coughtrey, 1876 from the Strait of Gibraltar (Ramil & Vervoort 1992) and the Tasman Sea (W. V. unpub.), and in southern Australia, *Aglaophenia tenuissima* (Bale 1915) on *Gymnangium tubulifer* (Bale, 1915) (see Bale (1915)), *Sertularella pinnata* (Lamouroux, 1816) on *Nemerstesia procumbens* (Spencer, 1891) (see Gordon *et al* 1998) and *Gymnangium longirostre* (Kirchenpauer, 1876) on *Aglaophenia divaricata* (Busk, 1852) (J. E. W. unpub.). Millard (1973) described cases of auto-epizootism in which a species may develop on and within the hydrocaulus of the same species. None of these cases however describe the present situation of quasi-parasitism in which one species invades the hydrocaulus of another species, adopting its structure but without necessarily killing its host.

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