

**CHITINOPOMA ARNDTI N.SP., AN INCUBATING BATHYAL SERPULID POLYCHAETE FROM SAINT-PAUL ISLAND, SOUTHERN INDIAN OCEAN**

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**Summary.** — Previously two species of serpulid were known for their tubes partially modified into brood chambers: *Chitinopoma serrula* from the Boreal and Arctic Atlantic with paired pouches along the keel, and *Microprotula oviceolata* from Japan with widened peristome rings surrounding the inner tube. The tiny new species from Saint-Paul Island is characterized by single calcareous pouch-like brood chambers added externally to the proper tube as in *C. serrula*. It is part of the epifauna of stylasterine hydrocorals collected by the "Valdivia" in 1899 at a depth of 672 m.

**Résumé.** — *Chitinopoma arndti n.sp.*, *Polychète Serpulidae bathyal incubant de l'île Saint-Paul, Sud de l'Océan Indien.* Jusqu'à présent on connaissait deux espèces de Serpulidae dont le tube était partiellement modifié pour former des chambres incubatrices: *Chitinopoma serrula* de l'Atlantique boréal et arctique possédant des poches paires le long de la carène, et *Microprotula oviceolata* du Japon possédant des péristomes élargis entourant le tube intérieur. La minuscule espèce nouvelle de l'île Saint-Paul est caractérisée par des chambres incubatrices calcaires, en forme de poche et impaires, ajoutées à l'extérieur du tube à proprement parler de la même façon que chez *C. serrula*. L'espèce fait partie de l'épifaune d'Hydrocoralliaires Stylasterina récoltés par la "Valdivia" en 1899 à la profondeur de 672.

Special incubation mechanisms, either in the tube or in the operculum, are characteristic of the coiled tube worm family Spirorbidae (Bailey, 1969; Knight-Jones et al., 1972; Thorp, 1975). On the contrary, incubation is exceptional in the closely related family Serpulidae. As noted by TenHove (1979), embryos have been found in the modified tube of some Filograninae whereas special brood chambers were previously known only from the tubes of *Chitinopoma serrula* (Stimpson, 1854) and *Microprotula oviceolata* Uchida, 1978, the type species of the genera *Chitinopoma* Levinsen, 1883, and *Microprotula* Uchida, 1978, respectively, *Chitinopoma serrula* has a wide distribution throughout the Boreal and Arctic Atlantic Ocean, from New England and Denmark northward to Greenland, Iceland, the Faroes, Scandinavia, the gulf of Kola, Novaya Zemlya and Spitzbergen. It has been described under various names, mostly with reference to the remarkable brood chambers. Information on the species, including synonymy and distribution, has been summarized elsewhere (Zibrowius, 1969). Tubes with the characteristic brood chambers have repeatedly been figured in the literature (for example by Dons, 1931, fig. 3, 1934, fig. 2-3; Brattström & Thorson, 1941, fig. 2 A-G, fig. 4 A, C, D;

Hartmann-Schröder, 1971, fig. 185 1). *Microprotula oviceolata* is known only from Uchida's description who discovered the tiny species in a seawater aquarium in Japan.

A tiny species collected with stylasterine corals by the Deutsche Tiefsee-Expedition ("Valdivia" 1898-1899) from bathyal depths off Saint-Paul Island, southern Indian Ocean, has calcareous brood chambers along the tube. This represents the third species of serpulid with brood chambers. Unfortunately only poor material is available and the resulting description of the worm is incomplete. Nevertheless, it appears that the new species belongs to *Chitinopoma*, previously a monotypic genus recorded from the Boreal and Arctic Atlantic.

*Chitinopoma arndti* new species

**Type material:** Fragments of about 10 tubes, mostly with brood chambers (= syntypes), all from "Valdivia" stat. 165; Zoologisches Museum Berlin, No. 10979. One incomplete worm (accidentally lost) extracted from its damaged tube (the latter destroyed by extracting the worm).



Nine tube fragments (syntypes) of *Chitinopoma arndti* n.sp., most with brood chambers.

**Type locality:** Deutsche Tiefsee-Expedition 1898-1899, "Valdivia" stat. 165 – 3 January 1899: 38°40,0'S 77°38,6'E 672 m (data from label). North-east of Saint-Paul Island.

**Name:** Species named in memory of Walther Arndt, curator of invertebrates at the Berlin museum from 1925 to 1944. During world war II Walther Arndt contributed to saving the zoological collections, including the stylasterine corals on which this new species occurs. A victim of Nazi terror, he was executed on 26 June 1944 (Matthes, 1947; Pax, 1952).

### Description.

Only a very small worm, previously dry, hardened and encrusted by tiny crystals, was available for a preliminary study: unfortunately it was lost during rehydrating and rinsing manipulations (except for the previously detached operculum). Due to the bad preservation, many details of the soft parts and of the setae and uncini remain incompletely known.

Length of worm lacking posterior part of abdomen about 1,8 mm; length of branchial crown 0,6 mm; length of thorax similar. Opercular diameter 0,1 mm. Branchial crown consisting of 5 or 6 (?) filaments on each side. Opercular stalk smooth, without pinnules; its position uncertain (right or left?). Collar not continued into long thoracic membranes. Operculum collapsed, but slight bilateral symmetry probable; distal surface concave with thin, "horny" transparent plate. Thoracic setigerous segments 1 + 4(?); the first showing special setae with a proximal wing somewhat differentiated from the distal limbate zone. Sickle-setae ("Apomatus-setae") present in posterior thoracic segments. Thoracic uncini resembling those of *Chitinopoma serrula* and of *Vermiliopsis* s.str., edge saw-shaped with about 12 (?) teeth, the anterior tooth apparently simple (not bifurcated). Abdominal uncini with rasp-shaped edge. Abdominal setae not observed.

Tube white, thin-walled, up to 5 mm long and about 0,35 to 0,4 mm wide including a pair of projecting lateral keels; somewhat flattened towards the basal attachment and roughly pentagonal in cross-section, with denticulate keels (one situated medianly and two laterally, one on each side). Keels variable in form from low and spiny with long slender teeth to higher and more continuous, sawblade-like, with larger less deeply separated teeth. Tube generally with a few distinct transverse ridges interrupting the keels and representing peristomes or growth stages followed by reprisal of continuous growth. Distal part of adult tube becoming free from substrate, erect, and producing a well-marked flared peristome.

Brood chambers always single, never paired, situated in the more or less erect distal part of the tube and

continuous with the previously attached lower side and opposite to the median keel; vesicular thin-walled pouches, extremely fragile, about twice as long (0,4 to 0,5 mm) as wide (0,2 to 0,3 mm) and narrower than the tube itself with its projecting keels. Brood chambers possess a distinct median keel and open by a distal pore into the tube orifice where it is transformed into a peristome. Tubes may have two or more brood chambers along the free erect distal part; they are normally widely separated and only exceptionally occur close together. Presumably only one at a time has been functional (the distal one).

### Affinities

The types of setae and uncini, as well as the structure of the brood chamber of the new species suggest close affinities with *Chitinopoma serrula*. As far as could be discerned from the single, badly preserved, incomplete worm, setae and uncini appear to be similar to those of *C. serrula*; only the special thoracic setae differ markedly in having the distal limbate zone and the proximal wing less differentiated and less separated than in *C. serrula*. The brood chambers are of the same thin-walled, vesicular, elongate and pouch-like type, external to the proper wall of the tube, and restricted to part of its circumference. Differences exist in both their position and sculpture. In *C. serrula* the brood chambers are smooth and occur in pairs in the attached part of the tube, one on each side of the median keel. In the new species they are keeled and occur singly on the erect, distal part of the tube, opposite to the median keel. The smaller number of thoracic setigerous segments (a total of 5? instead of 7) in the remarkably tiny new species is not considered to be a significant generic character.

In *Microprotula oviceolata*, a non-operculate species with 7 thoracic setigerous segments, different types of setae and uncini, and a smooth tube circular in cross-section, the brood chamber is of a different type. According to Uchida (1978) the brood chamber is formed on the erect part of the tube by upward extension from a circular peristome into a globular structure surrounding the inner continuation of the tube.

The genera *Chitinopoma* Levinsen, 1883, and *Filogranula* Langerhans, 1884, are closely related which has not previously been recognized. Their branchial crown, operculum, setae and uncini are rather similar. The species of *Filogranula* are characterized by peristome structures of varying complexity in the erect part of the tube (Zibrowius, 1968 – under *Omphalopoma*, 1972b, 1973, 1981), whereas the species of *Chitinopoma* possess brood chambers added externally to the proper tube. Both genera share a tendency towards elaborate tube structures. Species with complex tube structures appear to have complex patterns of calcium

carbonate secretion which may be correlated with neuroendocrine activities, and would be an interesting subject for study.

### Ecology

At present *Chitinopoma arndti* n.sp. is known only from one station off Saint-Paul Island at a depth of 672 m ("Valdivia" stat. 165) where tubes were found attached to dead, fan-shaped branches of a white stylasterine coral (*Errina* sp.). The same haul had provided various other species of coral, including two additional species of stylasterines (all previously unstudied) and several species of solitary and colonial scleractinians (Marenzeller, 1904). Among the serpulid epifauna from this station two other species are noteworthy. By its general aspect and structure a very solid tube closely resembles tubes of the Atlantic deep-water *Neovermilia falcigera* (Roule, 1898) which is also known as a Pleistocene fossil from the Mediterranean. Three tubes of *Neomicrorbis* are very similar to those of the Atlantic *N. azoricus* Zibrowius, 1972 (a). The genus *Neomicrorbis*, originally known from a Cretaceous fossil, thus appears to be widespread in the bathyal depths of the Indian Ocean; previous records are from the Comoros (Zibrowius, 1979) and from La Réunion (Zibrowius, unpublished: "Marion Dufresne" cruise MD 32, 1982).

Various substrates, including soleractinians and large bryozoan colonies collected at shallower depths (mainly 40-80 m) at Saint-Paul and Amsterdam Islands (Beurois, 1975; Zibrowius, 1974) have been examined, but *C. arndti* n.sp. has not been found among the serpulid epifauna. It appears to be a typical bathyal species.

The present preliminary study needs to be completed after additional material which can be obtained from Saint-Paul Island. It is hoped that a forthcoming cruise, devoted to biological studies, aboard the French research vessel "Marion Dufrene" to Amsterdam and Saint-Paul Islands (part of Territoire des Terres Australes et Antarctiques Françaises) will provide an opportunity to collect this remarkable species.

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