

Serpulid Polychaetes (Annelida) from the Northern Mariana Islands, Micronesia

Eijiroh Nishi and Akira Asakura

Natural History Museum and Institute, Chiba
955-2 Aoba-cho, Chuo-ku, Chiba 260, Japan

Abstract Eight serpulid polychaetes of 6 genera, *Spirobranchus corniculatus* (Grube, 1862)-complex, *Spirobranchus paumotanus* (Chamberlin, 1919), *Vermiliopsis* sp., *Serpula vittata* Augener, 1914, *Serpula hartmanae* Reish, 1968, *Protula* sp., *Salmacina* sp., and *Pomatoleios kraussii* Baird, 1865, are recorded from coral and rocks in the shallow waters of the Northern Mariana Islands. The variation of opercular morphology of *S. corniculatus* and *S. paumotanus* is documented, and the zoogeographical distribution of serpulid polychaetes is commented.

Key words: Serpulid polychaete, operculum, Mariana, coral reef.

In May and June 1992, the Natural History Museum and Institute, Chiba, (NHMIC) conducted an expedition to the northern Mariana Islands, Micronesia, in cooperation with the Department of Natural Resources (the Commonwealth of the Northern Mariana Islands) and the University of Guam Marine Laboratory. During the expedition, a considerable number of polychaetes were collected from rocky intertidal and subtidal areas of the islands, and those results were preliminarily reported (Sato-Okoshi and Yokouchi, 1994). Their list was incomplete and comprised 5 serpulid taxa, of which only one was identified to species level. We thus selected the Serpulidae for a more detailed study. We scraped additional material from coral colonies and rocks collected during the expedition. Altogether 29 worms were found, of which 22 were able to be identified to 8 taxa, and 5 specimens were damaged and unidentifiable.

Information on tropical polychaete fauna is generally poor, in particular, with regard to the northern Marianas. We compare our results with records from related areas.

Material and Methods

Collections were made on Maug East, Maug West, and Maug North Islands of the northern Marianas (see Asakura *et al.*, 1994, for a detailed map and location of sampling stations). The specimens were collected by

Akira Asakura and Taiji Kurozumi of the Natural History Museum and Institute, Chiba, and are deposited at the Museum.

Spirobranchus paumotanus

(Chamberlin, 1919)

(Figs. 1A–H, 2A–F)

Material examined. CBM-ZW-1, Maug East, st-B, underside of coral *Pocillopora* sp.; CBM-ZW-3, Maug East, st-A, underside of *Pocillopora* sp.; CBM-ZW-4, Maug East, st-B, underside of *Pocillopora* sp.; CBM-ZW-5, Maug West, st-E, underside of *Pocillopora* sp.; CBM-ZW-6, Maug West, st-E, underside of *Pocillopora* sp.; CBM-ZW-7, Maug West, st-E, underside of *Pocillopora* sp.; CBM-ZW-8, Maug North, st-F, underside of *Pocillopora* sp.; CBM-ZW-17, Maug East, st-C, underside of *Pocillopora* sp.

Description. The body including operculum measures 4 to 10 mm (N=8). The calcareous opercular plate white, and the worms usually pale brown. The opercular disc circular, generally with three simple horns without side-spines, arising from a elevated broad base. The fringe of the disc and the tips of the spines pale pink, and the spines and the surface of the opercular plate with many scattered pinkish points. The morphology of the opercular spines highly variable. Generally the latero-dorsal spines simple, like ox-horns (Fig. 1A–G), and rarely the spines with a dorsal tine and side-spines reminiscent of but

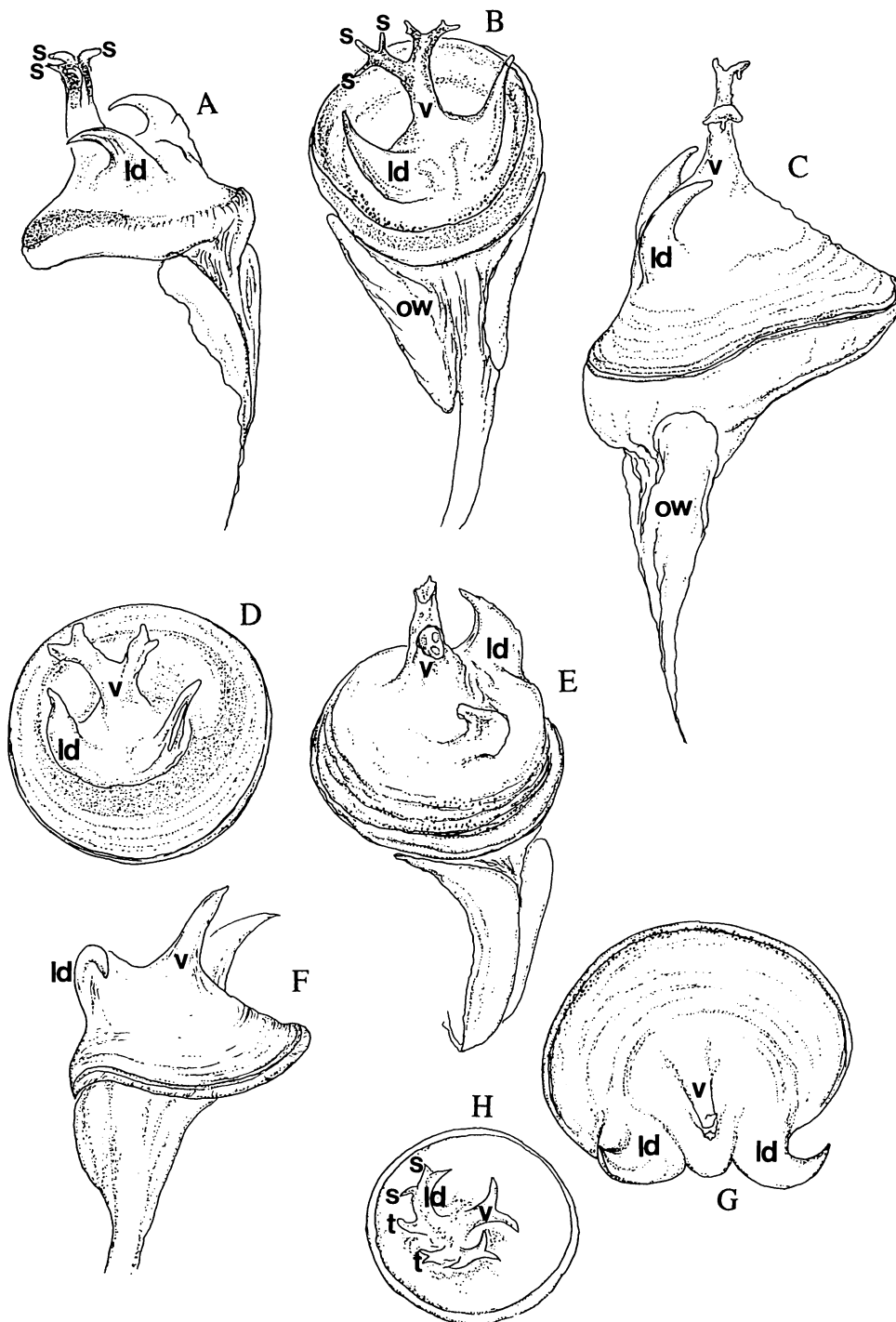


Fig. 1. *Spirobranchus paumotanus* (Chamberlin). A-H: operculum ld, latero-dorsal spine; s, secondary spine; t, dorsal tine of latero-dorsal spine; v, ventral spine.

less elaborate than those in the Carribean *Spirobranchus giganteus* Pallas (Fig. 1H, compare with figs 36, 43 of ten Hove, 1970). The

ventral spine simple (Fig. 1F, G), but more often bifurcated with side-spines (Fig. 1A-E, H). The peduncular wing small and not so

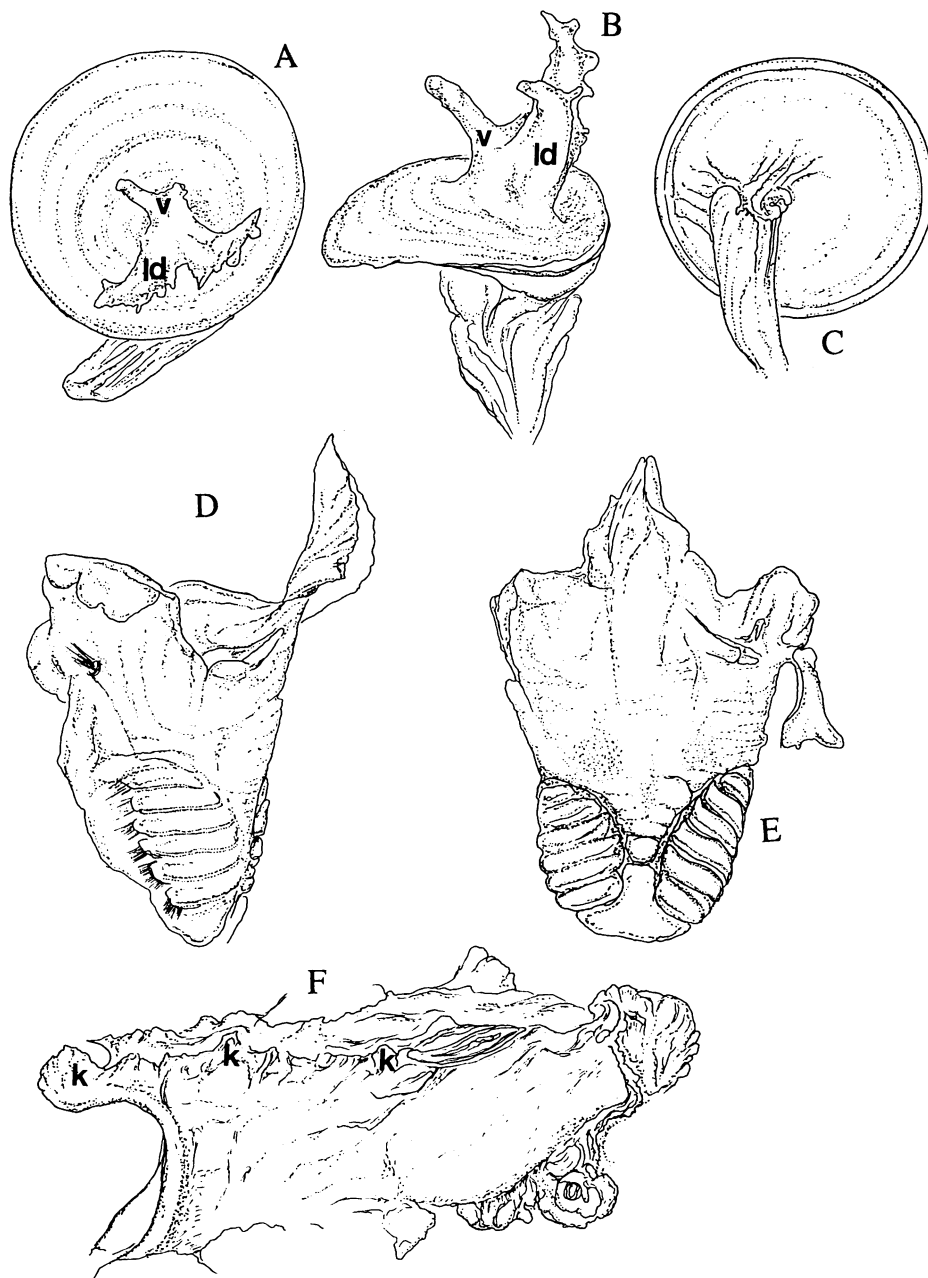


Fig. 2. *Spirobranchus paumotanus* (Chamberlin). Operculum (A–C), thoracic membrane (D and E), and anterior part of tube. k, keel; ld, latero-dorsal spine; v, ventral spine.

broad than that of *Spirobranchus corniculatus* (Grube). The collar trilobed, with a pointed medio-ventral part, and two rounded latero-dorsal parts encircling branchial lobes (Fig. 2D, E). Tonguelets between the ventral and latero-dorsal collar folds (Fig. 2D). Seven thoracic segments, 6 of which are uncinigerous (Fig. 2D, E). Collar setae of the

Spirobranchus type, deeply embedded in the base of the collar segment. The collar continuous with the thoracic membranes, forming a narrow apron across anterior abdominal segments. The tube triangular in cross-section, with a strong median keel, which is sinuous and forms a well developed tooth over the mouth (Fig. 2F). The tube is pale blue, most

pronounced in the keel in the bleached condition of specimens. Inner surface of the tube white, partly pale blue. The surface of the tube marked by small punctuations, giving a foraminous appearance to the sides and lateral fringes. Tubes often covered by coralline algae and bryozoans.

Spirobranchus corniculatus
(Grube, 1862)-complex
(Fig. 3A–C)

Material examined. CBM-ZW-9, Maug East, st-B, 3 m deep, on coral *Pocillopora* sp.; CBM-ZW-10, Maug East, st-B, on *Pocillopora* sp.; CBM-ZW-11, Maug East, st-B, on *Pocillopora* sp.; CBM-ZW-13, Maug North, st-F, on *Pocillopora* sp.; CBM-ZW-18, Maug East, st-C, on *Pocillopora* sp.; CBM-ZW-20, Maug East, st-C, on *Pocillopora* sp. (6 specimens)

Description. Ten to 20 mm in length from

the tip of the opercular spines to the posterior end of the abdomen. The opercular plate, 1–4 mm in diameter, ovoid and concave. A group of spines arising near the dorsal margin, from a short common stem consisting of a pair of latero-dorsal spines, while a simple medio-ventral spine broken in the specimen examined. The latero-dorsal spines also broken in most parts, but in the examined parts with a truncated dorsal tine each, of variable size, and one or two side-spines in addition. The opercular plate white, except for some dots of pale pink around the margin. The opercular peduncle somewhat flattened with lateral wings extending about half to two-thirds the length of the peduncle (Fig. 3C). These wings with an entire edges and lack a crenulation. The collar continuous with the thoracic membranes, forming a narrow apron across anterior abdominal seg-

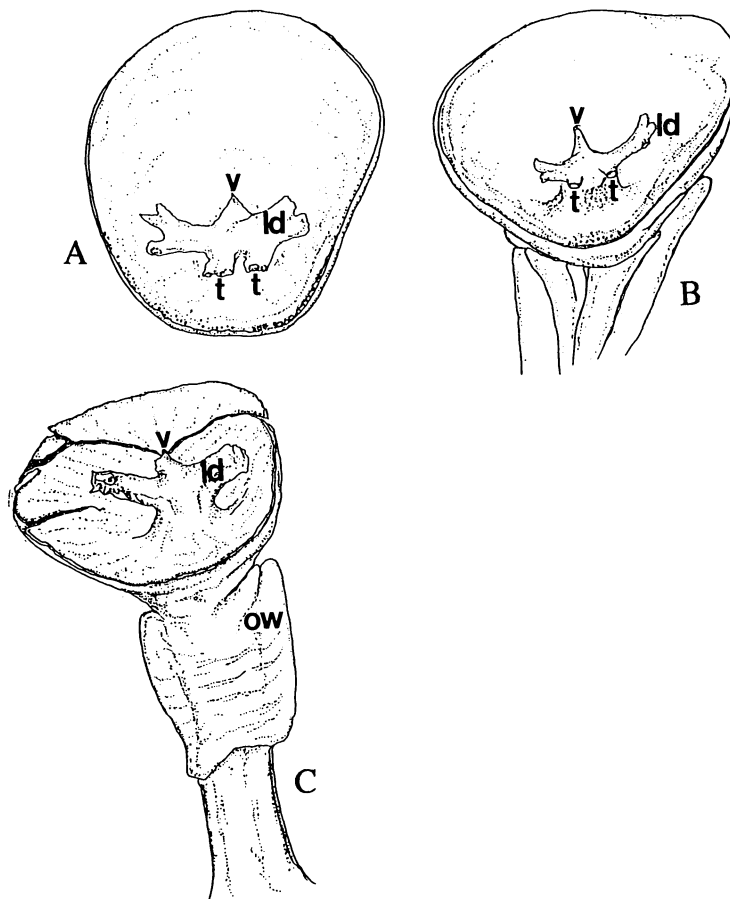


Fig. 3. *Spirobranchus corniculatus* (Grube). A and B: opercular plate, C: opercular plate and peduncle. ld, latero-dorsal spine; ow, opercular wing; t, dorsal tine of latero-dorsal spine; v, ventral spine.

ments. Thoracic segments 7, 6 of which are uncinigerous. Collar setae deeply embedded in the base of the collar.

Description of tube. The tube nearly triangular in cross-section, with a string median keel forming a well developed firm tooth over the mouth. All the tubes embedded in the skeletons of the coral *Pocillopora* sp. Two worms apparently occur beneath a coral

head, but their tubes are partly embedded within living coral tissues.

Remarks. The Mariana's specimens of the *Spirobranchus corniculatus* complex are smaller than those recorded from Fiji (Bailey-Brock, 1985), of similar size as those from Okinawa (Nishi, unpublished) and Celebes, Indonesia (ten Hove, 1970). The opercular morphology and other characters fit well to

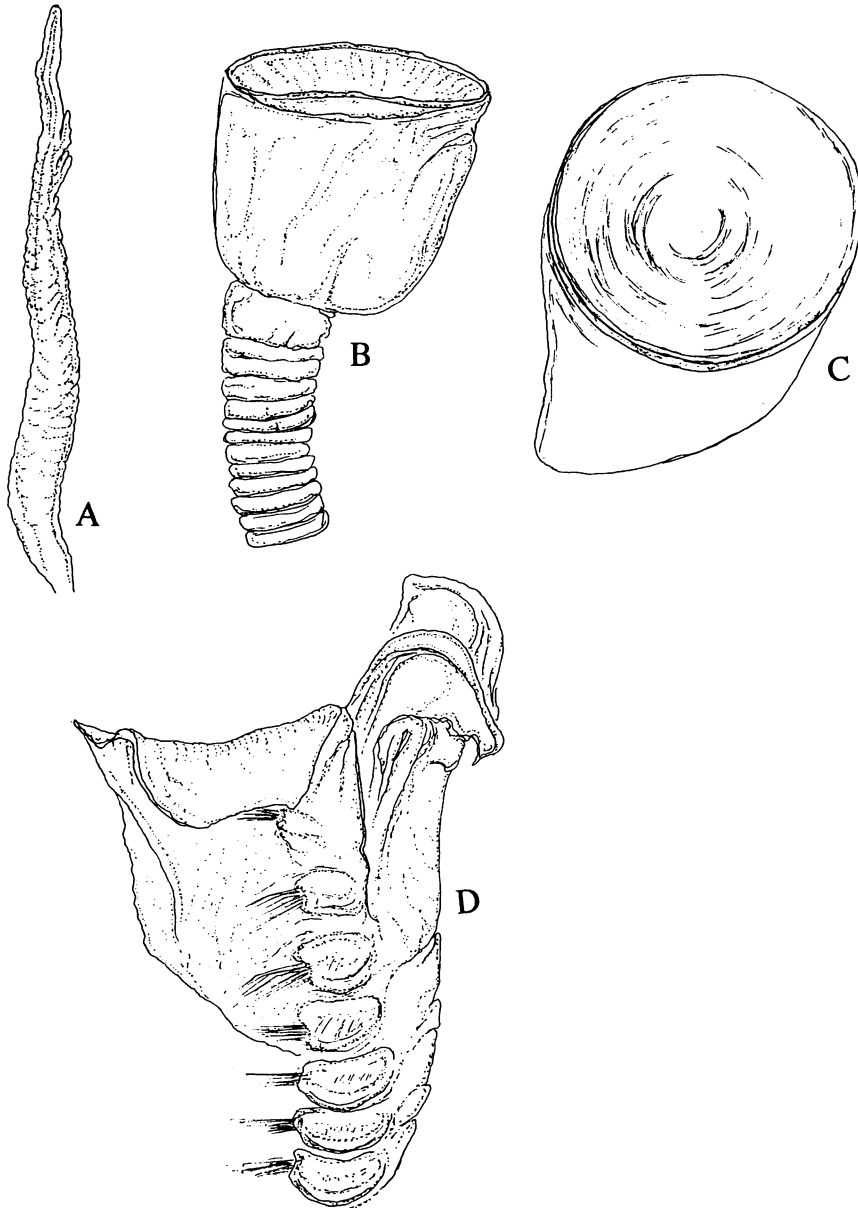


Fig. 4. *Vermiliopsis* sp. A: radiole, dorsal view, B and C: operculum, D: thorax showing ending of thoracic membrane.

the description of *S. corniculatus* by ten Hove (1970).

***Vermiliopsis* sp.**

Material examined. CBM-ZW-14, Maug East, st-A, underside of coral *Pocillopora* sp.; CBM-ZW-15, Maug West, st-E, underside of *Pocillopora* sp. (2 worms)

Description. Tiny serpulid worms, measuring about 5 mm including branchiae. The branchial crown circular with 15 pairs of radioles with slightly swollen tips. Stylodes absent.

The operculum cup-shaped, with a white fleshy bulbous part and a horny slightly concave, black plate terminally (Fig. 4B, C). The upper surface of the opercular plate with many rings, and its margin smooth (Fig. 4C). The opercular peduncle with white or semi-transparent, and regularly annulated (Fig. 4 B). The peduncle inserted to the right side at the base of the branchial crown. The collar with an entire margin, continuous with the thoracic membranes, which end just posterior to the third row of uncini or setiger 4. The thorax composed of 7 segments, 6 of which are uncinigerous. The abdomen with 28 segments, the posterior 18 with long geniculate setae. A ventral shield present in the posterior abdomen. The tube white, circular in cross-section, with some encircling flaring peristomes.

Remarks. The systematic confusion in *Vermiliopsis* is large (ten Hove and Wolf, 1986; ten Hove, 1994), and further informations, such as detailed structure of various setae and tube morphology, unnoted in the present study, are needed for a correct identification. Our specimens are similar to *V. monodiscus* Zibrowius, 1969 in opercular morphology, however, the latter species has a different bathymetric and geographic range. Other species of *Vermiliopsis* are characterized by a different shape of operculum.

***Serpula vittata* Augener, 1914**

Material examined. CBM-ZW-16, Maug East, st-B, rocky intertidal, underside of coral colony.

Description. A small specimen, 10 mm including branchiae, total number of segments 60. The branchiae with 10 radioles on either

side, ended in slender non-pinnulate tips. A branchial membrane absent. The opercular peduncle cylindrical and arising from the left branchial lobe just below the first normal filament. The opercular funnel shallow, with 16 blunt marginal teeth. A constriction present near the basal part of the funnel (Fig. 5A, B). The collar continuous with the thoracic membranes, ending at the last thoracic setiger, and not forming an apron on the ventral side.

The thorax composed of 7 segments, 6 of which are uncinigerous. The collar setae of two types, bayonet and slender capillary. The remaining thoracic setae of limbate capillary-type. The abdominal setae flat trumpet-shaped, capillary setae present at the posterior segments.

***Serpula hartmanae* Reish, 1968**

Material examined. CBM-ZW-12, Maug East, St-B, 3 m deep, underside of coral *Pocillopora* sp.

Description. Twenty mm in length including branchiae, with a total number of segments of 60. Fifteen pairs of gill radioles, operculum inserted at the left side. The opercular funnel shallow and shaped like an inverted bell with 10 blunt marginal teeth (Fig. 5C, D). A constriction present between the basal part of the funnel and the peduncle (Fig. 5A). The thorax composed of 7 segments, 6 of which are uncinigerous.

Description of tube. The tube white, thick walled, with a granular surface, irregularly coiled and lacking longitudinal ridges.

Remarks. The species of genus *Serpula* in the West Pacific are also in need of revision as stated by Imajima and ten Hove (1984) and ten Hove (1994). The identification of *Serpula vittata* and *S. hartmanae* in this paper are tentative only.

***Protula* sp.**

Material examined. CBM-ZW-21, Maug East, St-B, 3 m deep, underside of coral *Pocillopora* sp. (one specimen and two empty tubes).

Description. Only one worm without posterior abdomen, measuring 8 mm including branchiae.

Description of tube. The tube white, thin

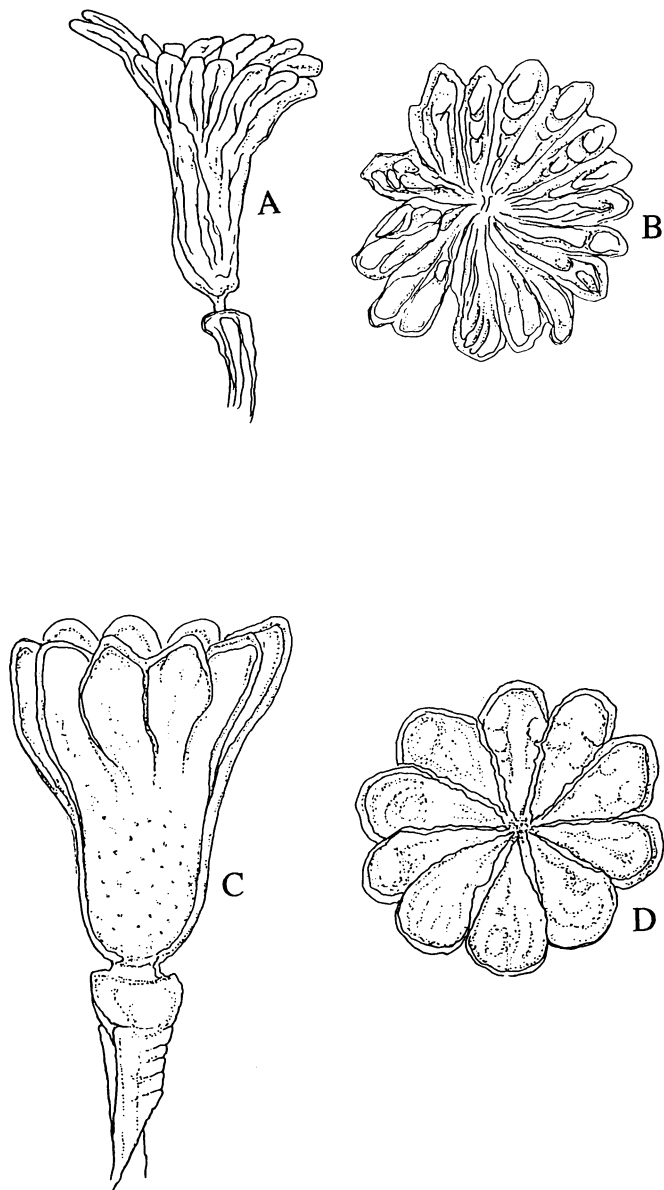


Fig. 5. *Serpula*. spp. A and B; operculum of *Serpula vittata* Augener, C and D: operculum of *Serpula hartmanae* Reish.

walled, not ornamented with tube.

***Salmacina* sp.**

Material examined. CBM-ZW-24, Maug East, St-B, 3 m deep, underside of coral *Pocillopora* sp. (2 incomplete worms and some tubes).

***Pomatoleios kraussii* Baird, 1865**

Material examined. CBM-ZW-2, Maug

West, St-E, intertidal, on rock (two empty tubes)

Description of tube. The tubes are stout, pale blue, and have a longitudinal median keel, projecting in a tooth over the mouth.

Discussion

Eight serpulid taxa have been here reproted from the northern Marianas. This is a low number if compared with other collections

from the Indo-Pacific, mentioning up to 40 species (e.g., Straughan, 1967; Imajima, 1977; Uchida, 1978; Imajima and ten Hove, 1984; Bailey-Brock, 1985, 1987), and certainly low in number in contrast to the estimate of total number of Indo-Pacific serpulid taxa (excluding spirorbids) of 60–80 (ten Hove, pers. com.). This low number almost certainly reflects incomplete sampling, notably the lack of dredging and specialist collecting.

In the specimens examined by Sato-Okoshi and Yokouchi (1994), Tropical Christmas tree worm *Spirobranchus corniculatus* was found, and we also collected this species from Northern Mariana. As this species is widely distributed in Indo-Pacific area including Japan, it was not surprising that this species is here reported from Mariana, too. The other 4 taxa identified to species level all also have wide Indo-Pacific distributions.

Acknowledgments

We thank Dr. H. A. ten Hove, Zoologische Museum, University of Amsterdam, for his critical reading, and Dr. S. Naomi, Natural History Museum and Institute, Chiba, for his useful comments on this paper. This work is a part of the results of a cooperative expedition to the Northern Mariana Islands supported by the Natural History Museum and Institute, Chiba, and the Division of Fish and Wildlife, Department of Natural Resources of the Commonwealth of the Northern Mariana Islands. Special acknowledgments are extended to the Government of the Commonwealth of the Northern Mariana Islands.

References

- Asakura, A., T. Ohba, S. Miyano, T. Furuiki, T. Kurozumi, and H. Harada. 1994. Outline of the biological expedition to the Northern Mariana Islands, Micronesia. Nat. Hist. Res., Spec. Issue (1): 1–11.
- Bailey-Brock, J. H. 1985. Polychaetes from Fijian coral reefs. Pac. Sci. 39: 195–220.
- Bailey-Brock, J. H. 1987. Polychaetes of Fanga'uta lagoon and the coral reefs of Tongatapu, Tonga, with discussion of the Serpulidae and Spirorbidae. Proc. Biol. Soc. Washington 7: 280–294.
- ten Hove, H. A. 1970. Serpulidae (Polychaeta) from the Caribbean. I. The genus *Spirobranchus*. Stud. Fauna Curacao 32: 1–57.
- ten Hove, H. A. 1994. Serpulidae (Annelida, Poly-

- chaeta) from the Seychelles and Amirante Islands. In J. van der Land (ed.), Oceanic reefs of the Seychelles. Cruise Reports Neth. Indian Ocean Program, II, pp.107–116. Nat. Hist. Mus., Leiden.
- ten Hove, H. A. and P. S. Wolf. 1986. Family Serpulidae. In Uebelacker J. (ed.), Taxonomic guide to the polychaetes of the Northern Gulf of Mexico, pp. 55, 1–55, 34, B. A. Vittor & Ass. Inc., Louisiana.
- Imajima, M. 1977. Serpulidae (Annelida, Polychaeta) collected around Chichi-jima (Ogasawara Islands). Mem. Natn. Sci. Mus., Tokyo 10: 89–111.
- Imajima, M. 1978. Serpulidae (Annelida, Polychaeta) collected around Nii-jima and O-shima, Izu Islands. Mem. Natn. Sci. Mus., Tokyo 11: 49–72.
- Imajima, M. and ten Hove, H. A. 1984. Serpulidae (Annelida, Polychaeta) from the Truk Islands, Ponape and Majuro Atoll, with some other new Indo-Pacific records. Proc. Jap. Soc. Syst. Zool. 27: 35–66.
- Imajima, M. and ten Hove, H. A. 1986. Serpulidae (Annelida, Polychaeta) from Nauru, the Gilbert Islands (Kiribati) and the Solomon Islands. Proc. Jap. Soc. Syst. Zool. 32: 1–16.
- Sato-Okoshi, W. and M. Yokouchi. 1984. A preliminary list of polychaetes (Annelida) collected by the biological expedition to the Northern Mariana Islands, Micronesia. Nat. Hist. Res. Special Issue (1): 169–171.
- Straughan, D. 1967. Marine Serpulidae (Annelida, Polychaeta) of Eastern Queensland and New South Wales. Aust. J. Zool. 15: 201–261.
- Uchida, H. 1978. Serpulid tube worms (Polychaeta, Sedentaria) from Japan with the systematic review of the group. Bull. Mar. Park Res. St. 2: 1–98.

(Accepted on 17 October 1995)

北マリアナ諸島から採集された カンザシゴカイ科多毛類 について

西 栄二郎・朝倉 彰

千葉県立中央博物館
〒260 千葉市中央区青葉町 955-2

北マリアナ諸島モーグ島の潮間帯から水深3メートルまでの岩礁域から6属8種のカンザシゴカイ科多毛類（環形動物門）、*Spirobranchus corniculatus* (Grube), *S. paumotanus* (Chamberlin), *Serpula vitata* Augener, *Serpula hartmanae* Reish, *Protula* sp., *Salmacina* sp., *Pomatoleios kraussii* Baird を記録した。イバラカンザシ属の2種の殻蓋の形態変異について述べ、その生物地理について簡単に論じた。