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DESCRIPTION OF *HYDROIDES BULBOSUS* SP. NOV. (POLYCHAETA, SERPULIDAE), FROM THE IRANIAN GULF, WITH A TERMINOLOGY FOR OPERCULA OF *HYDROIDES*.

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ABSTRACT

A description of *Hydroides bulbosus* sp. nov. (Polychaeta, Serpulidae), from the Gulf of Iran, may serve as a standard for future descriptions in the genus. A comparison with probably related species, *H. albiceps*, *H. steinitzi* and *H. trivesiculosus*, is given. A standard terminology for opercular structures in the genus is proposed.

INTRODUCTION

Species of the genus *Hydroides* (Polychaeta, Serpulidae) are distinguished mainly by their opercula. Nevertheless, recent descriptions and diagnoses of various species given by workers, such as Straughan (1967), Pillai (1972), Ben-Eliahu (1972, 1976), Zibrowius (1973), Imajima (1976, 1978), Imajima & ten Hove (1986, 1989), are not completely comparable. This is caused partly by the fact that parts of the descriptive attributes have been taken for granted and left out. In this paper, an attempt has been made to base the description on a standard, ticking off the attributes one by one either in the positive or negative sense. Moreover, a lack of a consistent terminology becomes evident, especially in the operculum. One may find for instance the terms hook, process, projection, spine, spinule and tooth describing one and the same structure. The verticil has been referred to as opercular crown, distal funnel, corona, to name just the more common ones. On the other hand, the term spine has been used for ontogenetically completely different structures. During revisionary work on the genus from Australia (ten Hove, in prep.) and from the Gulf of Mexico (ten Hove & Perkins, in prep.), the present author studied most of the ca 80 species recognized to date. It became apparent that not all "spines" are homologous, and that the terminology should acknowledge differences in ontogeny.

The following abbreviations have been used in the text, in connection with the deposition of material:

AM:	Australian Museum, Sydney;
BMNH:	British Museum (Natural History), London; renamed Natural History Museum;
tH:	temporary collection number in ZMA;

USNM: United States National Museum of Natural History, Washington DC;
ZMA: Zoölogisch Museum, Instituut voor Taxonomische Zoölogie, Amsterdam.

TERMINOLOGY

A terminology is proposed in Fig. 1, as far as possible in line with the above mentioned authors. Since not all possible permutations of the infra-specific nor the intra-specific variation can be covered, a choice has been made for terms, covering the average situation in the average operculum. For instance, a "spine" is according to my dictionary "a stiff sharp-pointed process... thorn-like". However, not all vertical spines are sharp-pointed processes, in many cases verticil spines actually are blunt valvular and not thorn-like at all. Similarly a tubercle is defined in the dictionary as "a small wart-like swelling". However, a basal tubercle may in fact be a spinule, or even a curving spine longer than the verticil spine, absolutely not wart-like. Even in this case, the term tubercle still should be applied to facilitate comparison of descriptions. Generally the term should thus be followed by a description of the actual situation. For instance, in *Hydroides longispinosa* Imajima, 1976 there is a central tooth, which is longer than the verticil spines and which has accessory denticles. In *H. elegans* (Haswell, 1883) a central tooth is generally present, short, exceptionally with accessory denticles.

DESCRIPTIVE PART

Hydroides bulbosus sp. nov. (Figs. 2-9, 19)

Material studied

Oman, N, Khor Ghubb Ali, on shells and stones in sheltered bay with sandy bottom and limestone headlands, 18 m, 18.XII.1971 (Holotype, BMNH ZB 1972.42; 4 paratypes, BMNH ZB 1980.548, ZMA tH704, AM W 19862, USNM 123384); off Bukha, 26°10′N, 56°10′E, from dead coral fragments, 26.XI.1971 (3 paratypes, BMNH 1972.41, 1980.550/1); al Quwai, on mainland side (E) of strait running N-S, 18-36 m (1 paratype, BMNH 1972.43); all legit P. F. S. Cornelius, det. H. Zibrowius as *H. albiceps*.

Distribution

Tropical: Indo-West Pacific, Gulf of Iran.
Type locality: N. Oman, Khor Ghubb Ali.

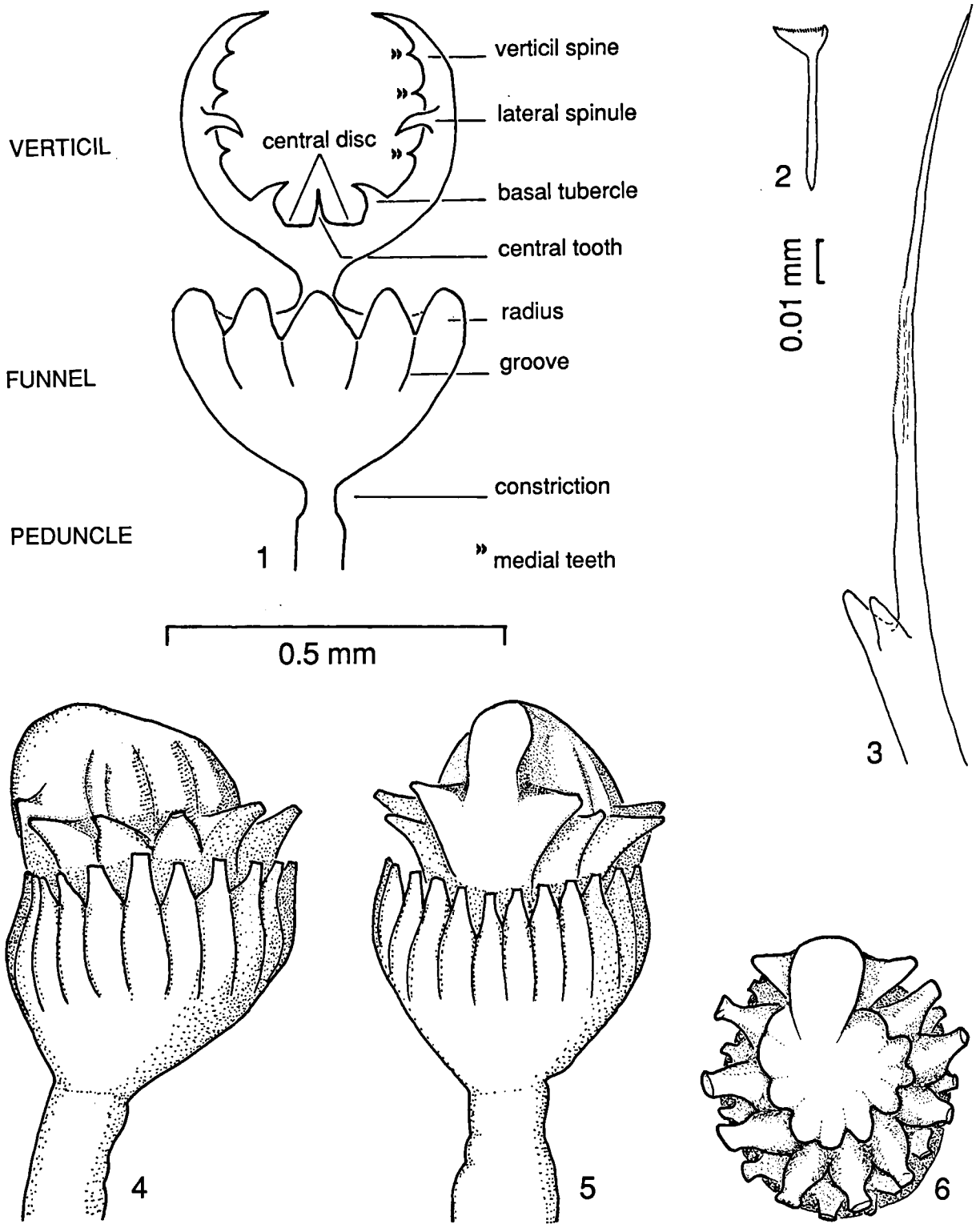
Diagnosis

TUBE: white, about 1.4 (up to 2.0) mm wide with lumen of about 0.5 mm. Subtrapezoidal in cross section, with faint irregular growth rings and slightly dilated mouth, but without wide flaring collar-like rings. There are two pronounced, thick longitudinal ridges. Innermost part of tube hyaline, opaque middle layer, and outermost hyaline layer.

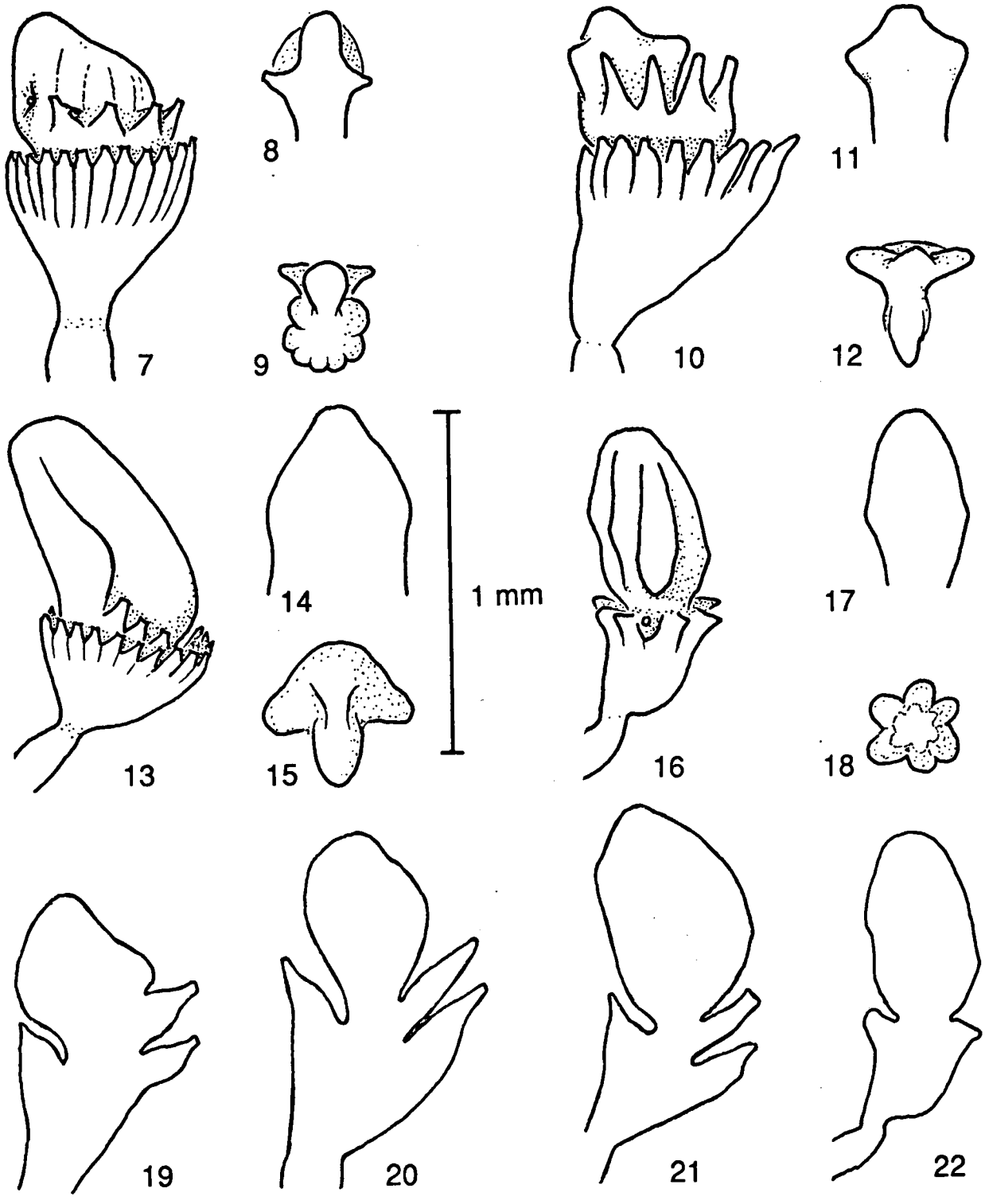
BRANCHIAE: each lobe with up to 8 radioles (holotype 6, generally 7) arranged in semicircles, without branchial membrane. Pinnules along radiole subequal in length; terminal filament sometimes slightly swollen, up to twice size of nearest pinnules. Branchial eyes not observed.

PEDUNCLE: smooth, subtriangular to circular in cross section, inserted just below first and second normal radiole; with clear constriction at base of funnel (Figs. 5, 7). Pseudoperculum 0.5-1.0 mm long, elongated.

OPERCULUM: with distal verticil inserted without stalk into proximal oblique funnel. Verticil with large dorsal vesicular spine and 7-14 shorter spines (holotype 9, $\times = 9$, SD = 2, n = 9), curved outwards, with blunt to slightly laterally extended tips, but without accessory spinules, tubercles or teeth (Figs. 4, 6). Dorsal spine consisting of bulbous median part, and two latero-dorsal processes, triangular in dorsal view (Fig. 5). Median bulb with 7-14 longitudinal grooves, with corresponding number of verticil spines inserted at base, although sometimes appearing more numerous. Funnel chitinized to and including constriction, with 20-29 (holotype 24, $\times = 22.7$,



Figs. 1-6. Fig. 1, schematic operculum of *Hydroides* with terminology; verticil in longitudinal section, funnel in lateral view. Fig. 2, abdominal seta. Fig. 3, bayonet seta. Figs. 4-6, operculum of *H. bulbosus* sp. nov.: 4, paratype, lateral view; 5, same, dorsal view; 6, holotype, apical view. 2-6, all from type locality.



Figs. 7-22. Comparison of characteristic opercula of similar species. 7, 10, 13, 16, lateral views; 8, 11, 14, 17, dorsal views of vesicular verticil spine; 9, 12, 15, 18, apical views of vesicular spine; 19-22, longitudinal sections. *Hydroides bulbosus* sp. nov., 7-9, ZMA tH704, 19, BMNH 1972.41. *H. albiceps*, 10-12, Red Sea, Egypt, legit T. G. Pillai 22.IV.1982, BMNH ZB 1989.259; 20, Australia, N.T., Channel Island near Darwin, stn. 13, legit H. A. ten Hove 24.II.1986. *H. trivesiculosus*, 13-15, holotype, Australia, Queensland, Heron Island, legit B. Dew, 1956, AM W 4111; 21, locality as 20. *H. steinitzi*, 16-18, 22, Gulf of Suez, from tube of *Spirobranchus tetraceros*, legit J. H. Lord, BMNH 1870.12.23.62.

SD = 2.8, n = 9) blunt to rectangular-tipped, chitinized marginal radii. Grooves separating radii extending 1/3-1/2 of funnel length (Fig. 5). Length of operculum about 0.7 (holotype 0.55, up to 0.9) mm, width about 0.45 mm.

COLLAR and thoracic membranes: collar high, 1/3 to entire length of radioles, with undulating margin; continuous with thoracic membranes, which form apron across anterior abdominal setiger. Pairs of small, wartlike protuberances of collar setiger present; tonguelets between ventral and lateral collar parts absent.

THORAX: with collar setiger, and 6 uncinigerous setigers. Collar setae of two types: bayonet and hooded (limbate). Bayonet setae with two heavy basal teeth below long, smooth notch and very faintly serrated distal blade (Fig. 3). Subsequent setae hooded (limbate), of two sizes. *Apomatus*-setae absent. Uncini along entire thorax saw-shaped, with pointed fang and 7 curved teeth. Pair of pigmented spots, presumably prostomial eyes, present in base of branchial lobes.

ABDOMEN: abdominal setigers usually numbering about 55 (holotype 55, up to 70). Uncini saw-shaped anteriorly, with fang and 4 teeth; posterior uncini rasp-shaped with 5 rows of teeth, fang and 7 teeth in profile view. Setae flat trumpet-shaped, with slightly enlarged proximal tooth (Fig. 2). Capillary setae present in posterior ca. 14 setigers.

SIZE: length to 16.5 (holotype 8) mm, branchiae and operculum accounting for 1/6 of entire length. Width of thorax 0.4-0.6 mm (holotype 0.4, x = 0.47, SD = 0.07, n = 9).

Remarks

In both verticil spines and funnel radii, the shape of the tips may vary according to angle of view, between individuals, or within one individual. Tips range from bluntly rounded to rectangular and even may be extended laterally. In one of the paratypes four of the dorsal interradial grooves of the funnel bear a small projection, like an accessory denticle or even an additional radius, presumably a teratological variation.

TAXONOMICAL REMARKS

The fact that the material had been identified as *Hydroides albiceps* (Grube, 1870) by Zibrowius (in 1973) is indicative of the similarity to this species, with its wide Indo-West Pacific distribution (from Zanzibar to Red Sea, Polynesia to Queensland). Therefore, the operculum of *H. bulbosus* has been compared with ample material of *H. albiceps*, but also with *H. trivesiculosus* Straughan, 1967 (also with a wide Indo-West Pacific distribution, from Tanzania and Red Sea to Australia) and with *H. steinitzi* Ben-Eliahu, 1972 (Suez Canal, Philippines). Only details of figured specimens are given in the legend.

Although the bulbous median part of the dorsal spine in *Hydroides albiceps* is very variable in shape and development, as contrasted with *H. bulbosus* it is always smoothly rounded and without furrows. Moreover, its base is constricted, joining the bases of the remaining verticil spines (Figs. 10-12). In *H. bulbosus* the other verticil spines are inserted to the median bulb at 1/3rd of its length (Fig. 19). *H. trivesiculosus* likewise never shows longitudinal furrows in the median bulb; the latero-dorsal processes in *H. trivesiculosus* are swollen and rounded (Figs. 13-15), and not triangular as in *H. bulbosus*.

The trend of reduction in length and number of verticil spines other than the bulbous dorsal one, evident in *Hydroides trivesiculosus* (8 to 2 rudiments), culminates in *H. steinitzi*, where they are entirely lacking (Figs. 16-18). The latter species has only one (dorsal) vesicular spine remaining (Fig. 22), without latero-dorsal processes, but with 6-7 longitudinal grooves. In both *H. bulbosus* and *H. trivesiculosus*, verticil spines tend to be shorter than those of *H. albiceps* (Figs. 19-21).

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