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REVISION OF *HYDROIDES* GUNNERUS, 1768 (POLYCHAETA: SERPULIDAE) FROM THE EASTERN PACIFIC REGION AND HAWAII

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ABSTRACT

A taxonomic revision of the *Hydroides* species (Polychaeta: Serpulidae) from the Eastern Pacific Ocean is presented. Twenty-one taxa are described, of which two are widespread (*H. diramphus* Mörcz, 1863 and *H. elegans* (Haswell, 1883)) and four are Amphiamerican (*H. alatalateralis* (Jones, 1962), *H. gairacensis* Augener, 1934, *H. salazarvallejoi* Bastida-Zavala & Ten Hove, 2003, and *H. sanctaerucis* Krøyer [in] Mörcz, 1863). Three species are new to science: *Hydroides deleoni* n. sp., *H. panamensis* n. sp. and *H. trompi* n. sp. Morphometric comparisons between *H. brachyacanthus* Rioja, 1941, *H. deleoni* n. sp., and *H. similis* (Treadwell, 1929), between *H. chilensis* Hartmann-Schröder, 1962, *H. cruciger* Mörcz, 1863 and *H. panamensis* n. sp., and between *H. recurvispina* Rioja, 1941 and *H. trompi* n. sp. are given. Three specific names are placed into synonymy: *Hydroides californicus* Treadwell, 1929, *H. intereans* (Chamberlin, 1919) and *H. pacificus* Hartman, 1969. A key to all species from the Eastern Pacific Ocean is given.

Key words: Central America, Gulf of California, key, new species, Serpulinae, standard diagnosis

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INTRODUCTION

The genus *Hydroides* Gunnerus, 1768, is the most diverse genus in number of species within the Serpulidae Rafinesque, 1815. A historical review is given in Bastida-Zavala & Ten Hove (2003). The Eastern Pacific is the tropical region with the lowest number of *Hydroides* species. Until now, 14 species were recorded (Salazar-Vallejo, 1989a), 11 being endemic to the region.

The diversity of serpulids in general, and *Hydroides* in particular, is low in the Eastern Pacific as compared to other warm-water areas. One of the reasons, like in the hermatypic corals, may have been massive extinction in the Pleistocene (2-3 MY ago) during the closure of the Isthmus of Panama (cf. Brusca, 1980; Longhurst & Pauly, 1987); on the other hand, the separation of populations after this closure may have produced geminate species as in decapod crustaceans (Abele, 1976; Brusca, 1980). Most *Hydroides* species live on continental shelves (Bastida-Zavala & Ten Hove, 2003). The Gulf of Mexico, Caribbean and Antilles together measure 1.39 million km², while the continental shelf from Mexico to Colombia is only 0.40 million km² (Longhurst & Pauly, 1987), and this could be reflected in a lower number of species (McArthur & Wilson, 1967). A third reason may be that the region still is very large and research efforts have been less intense than in other regions (e.g. Caribbean), with the exceptions of the Californian coast and Gulf of California (cf. Brusca, 1980). This might be corroborated by the fact that the present paper reports 21 taxa, as opposed to the 14 in the last checklist (Salazar-

Vallejo, 1989a).

The aim of this paper is to review the species of *Hydroides* from the Eastern Pacific (from San Francisco (California) to Arica (Chile)), and the Hawaiian Islands (Fig. 1). The latter are included since, apart from one endemic (*H. bannerorum* Bailey-Brock, 1991) and two widespread species (*H. dirampus* Mörcz, 1863 and *H. elegans* (Haswell, 1883)), the remaining two species are common in the Eastern Pacific (*H. brachyacanthus* Rioja, 1941 and *H. cruciger* Mörcz, 1863). The strong North Equatorial current bringing surface water from Western Mexico to Hawaii, combined with ship-transport may be the causes of this faunistic composition (cf. Carlton, 1987; Longhurst & Pauly, 1987). The invasive 'Route 13' of Carlton (1987) includes, at least, seven species of microgastropods, the limpet *Crucibulum spinosum*, tanaid *Parapseudes pedispinus*, isopod *Paracerceis sculpta*, amphipod *Coryphium baconi*, marine dipteran *Ephydria*, and bryozoan *Schizoporella unicornis*, which most likely were transported to Hawaii from the Eastern Pacific American continent (Carlton, 1987, 1999; Coles et al., 1999).

Some species (*H. alatalateralis* Jones, 1962), *H. gairacensis*, Augener, 1934, *H. salazarvallejoi* Bastida-Zavala & Ten Hove, 2003 and *H. sanctaerucis* Krøyer [in] Mörcz, 1863) with a wide Western Atlantic distribution were revised in a previous work (Bastida-Zavala & Ten Hove, 2003); in view of their restricted distributions on the Pacific American coasts, they probably have recently invaded the Pacific of Panama and Colombia rather than being unchanged relicts from before the rise of the Isthmus of Panama. One species was described recently (*H. tenhovei* Bastida-Zavala & De León-González, 2002). For these species, we do not include a diagnosis in the present work; they only are briefly mentioned in the taxonomic account with their Pacific distribution. Although two species have a worldwide distribution (*H. dirampus*, *H. elegans*), the diagnoses given here are based on the Eastern Pacific specimens only.

METHODS

We studied type material that was available to us. Specimens of *Hydroides* were studied in a standardized way, following Ten Hove & Jansen-

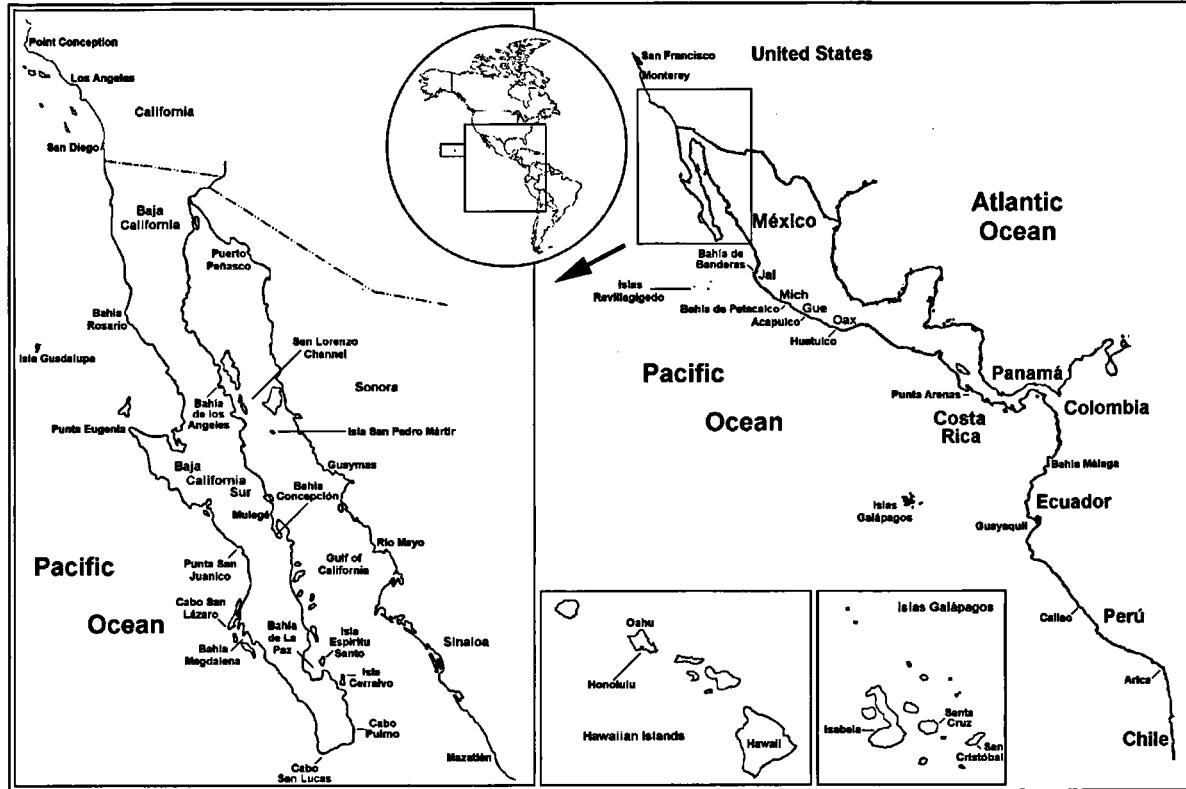


Fig. 1. Study area. The Eastern Pacific region with geographical names mentioned in text. (Abbreviations: Jal=Jalisco, Mich=Michoacán, Gue=Guerrero, Oax=Oaxaca).

Jacobs (1984), Ten Hove (1990) and Bastida-Zavala & Ten Hove (2003). Sometimes specimens were included without a detailed revision, referred to 'as not studied in detail', although without any doubt about the identity, and only for new distribution records. The collecting, fixation, preservation, measuring methods and observation of characters were explained in a previous work (Bastida-Zavala & Ten Hove, 2003). In the paragraphs 'Material', the number of specimens per locality is one, unless otherwise mentioned. When the identity of a literature record or of material revised by us could not be ascertained with absolute certainty this is denoted by a question mark (?) before the synonym or material. To avoid loss of information, the values observed in 'juveniles' have been given in parentheses next to the range. Scales of figures are in millimetres.

The order of the species in the taxonomic account and Table 1 is strictly alphabetical.

The distribution maps (Figs. 9, 14, 20 and 24) only give Eastern Pacific records.

ABBREVIATIONS

The following abbreviations are used in the text:

INSTITUTES

AMNH	American Museum of Natural History, New York
BMNH (ZB)	collection number of the MNH, formerly British Museum of Natural History, London
BPBM	Bernice P. Bishop Museum, Honolulu
BZ-pc	Bastida-Zavala (personal collection)
CAS	California Academy of Sciences, San Francisco
CP-ICML-UNAM	Universidad Nacional Autónoma de México, México City
ECOSUR (Serp)	El Colegio de la Frontera Sur, Chetumal, México (reference collection)
ICZN	International Code of Zoological Nomenclature

Table 1. Checklist of *Hydrodides* from the Eastern Pacific Region and Hawaii.

<i>H. alatalateralis</i> (Jones, 1962)
<i>H. bannerorum</i> Bailey-Brock, 1991
<i>H. brachyacanthus</i> Rioja, 1941
<i>H. chilensis</i> Hartmann-Schröder, 1962
<i>H. cruciger</i> Mörch, 1863
<i>H. deleoni</i> n. sp.
<i>H. diramphus</i> Mörch, 1863
<i>H. elegans</i> (Haswell, 1883)
<i>H. gairacensis</i> Augener, 1934
<i>H. glandifer</i> Rioja, 1941
<i>H. gracilis</i> (Bush, 1905)
<i>H. humilis</i> (Bush, 1905)
<i>H. inermis</i> Monro, 1933
? <i>H. malleophorus</i> Rioja, 1942, see taxonomical remarks in <i>H. diramphus</i>
<i>H. ochoterena</i> Rioja, 1941
<i>H. panamensis</i> n. sp.
<i>H. recurvispina</i> Rioja, 1941
<i>H. salazarvallejoi</i> Bastida-Zavala & ten Hove, 2003
<i>H. sanctaerucis</i> Krøyer [in] Mörch, 1863
<i>H. similis</i> (Treadwell, 1929)
<i>H. tenhovei</i> Bastida-Zavala & De León-González, 2002
<i>H. trompi</i> n. sp.

Names placed into synonymy in the region:

- H. californicus* Treadwell, 1929, junior synonym of *H. cruciger*
H. intereans (Chamberlin, 1919, as *Eupomatus*), junior synonym of *H. gracilis*
H. pacificus Hartman, 1969, junior synonym of *H. elegans*
-

LACM-AHF	Los Angeles County Museum of Natural History, Allan Hancock Foundation	POL RL THL THW TL	Peduncle plus operculum length Radiolar length Thorax length Thorax width Total length of the body
STATISTICAL TERMS			
MNH	Museum of Natural History of London	n	sample size
MNHN	Museum national d'Histoire naturelle, Paris	r	range of data
UANL	Universidad Autónoma de Nuevo León, México	μ	mean
USNM	US National Museum of Natural History, Washington D.C.	±	standard deviation
TEXT (MOSTLY LATIN)			
WLH	Wormlab, University of Hawaii	cf.	confer (compare with)
YPM	Peabody Museum of Natural History, Yale University, New Haven, Connecticut	don.	donated by
ZMA (V.Pol.)	Zoölogisch Museum, Universiteit van Amsterdam (collection)	fide	according to (literally: trusting)
ZMH (V.)	Zoologisches Institut und Zoologisches Museum der Universität Hamburg (collection)	legit	collected by
CHARACTERS			
ED	External diameter of tube	partim	partially, in part
ID	Internal diameter of tube	pers. comm.	personal communication
OD	Opercular diameter	pers. obs.	personal observation
OL	Opercular length	s.n.	sine numero (without number)
		s.str.	sensu stricto (in the strict sense)
		unpubl.	unpublished
		vs.	versus (compared with)
		w/o	without

**KEY TO EASTERN PACIFIC SPECIES OF
HYDROIDES (for terminology see Bastida-Zavala & Ten Hove, 2003).**

- 1 a. Verticil spines with lateral spinules (e.g. Figs. 4A, 5A, 11C, 17B-D) 2
 - b. Verticil spines without lateral spinules (e.g. Figs. 3A-D, 13A-C), distally dilated tips may be present (e.g. Figs. 10A-C) 6
 - 2 (1) a. Verticil spines with one pair of lateral spinules; spines curving inwards (e.g. Figs. 4A, 5A, 18A) 3
 - b. Verticil spines with more than one pair of lateral spinules; spines straight or curving outwards (e.g. Figs. 11B, 17A) 5
 - 3 (2) a. Verticil spines curving inwards strongly, lateral spinules at two-thirds of spine length, gradually changing from two side spinules in lateral position in dorsal spines to one external spinule in ventral spines (e.g. Figs. 18A-C) *H. panamensis* n. sp.
 - b. Verticil spines curving inwards more gradually, lateral spinules almost halfway in all spines (e.g. Figs. 4A, 5A) 4
 - 4 (3) a. Verticil spines with asymmetric arrangement, larger dorsally; with 21-58 short radii (e.g. Figs. 4A-E) *H. chilensis*
 - b. Verticil spines symmetric; with 22-32 long and pointed radii (e.g. Figs. 5A, B, D, E) *H. cruciger*
 - 5 (2) a. Funnel with blunt radii; verticil spines with up to 5 pairs of lateral spinules (e.g. Figs. 11A, C) *H. elegans*
 - b. Funnel with pointed radii; verticil spines with more than six pairs of lateral spinules (e.g. Figs. 17A-D) *H. ochoterena*
 - 6 (1) a. Funnel absent (e.g. Fig. 2A) *H. bannerorum*
 - b. Funnel radii with laterally expanded tip (T-shaped) (e.g. Fig. 22R) *H. gairacensis*
 - c. Funnel radii with pointed tip (e.g. Figs. 7G, 12A, B) 7
 - 7 (6) a. Verticil spines similar in shape and size (e.g. Figs. 10A, B, 13A, B) 8
 - b. Verticil with one or more dorsal spines larger than the others (e.g. Figs. 3A, B, 12A, B) 14
 - 8 (7) a. Verticil spines with flat almost T-shaped tips (e.g. Figs. 10A-C) *H. diramus*
 - b. Verticil spines with pointed tips (e.g. Fig. 19C) .. 9
 - 9 (8) a. Verticil spines with external spinules (e.g. Figs. 19P, Q) *H. sanctaerucis*
 - b. Verticil spines without external spinules (e.g. Figs. 15A, G, I) 10
 - 10 (9) a. Spines straight or slightly curving outwards (e.g. Figs. 15A, G) *H. humilis*
 - b. Spines curving inwards, tips may be twisted clockwise (e.g. Figs. 19A-C, 22B, G) 11
- 11 (10) a. Spines with wings (e.g. Figs. 2H, I) *H. alatalateralis*
 - b. Spines without wings 12
- 12 (11) a. Spines with a pronounced distal knob (e.g. Figs. 19A, C) *H. recurvispina*
 - b. Spines without a knob (e.g. Figs. 22A, F, H) 13
- 13 (12) a. Spines curving inwards, generally with tips twisted clockwise, with internal spinule (e.g. Figs. 22A, F, H) *H. trompi* n. sp.
 - b. Spines curving inwards, not twisted, without internal spinule (e.g. Figs. 13A, F) ... *H. gracilis* (partim)
- 14 (7) a. One dorsal hook in verticil (e.g. Figs. 3A, 12A, B) 15
 - b. Two or more dorsal hooks in verticil (e.g. Figs. 21A, I, F) 20
- 15 (14) a. Hook partially fused to adjacent spines (e.g. Figs. 12A, B, D) 16
 - b. Hook free (e.g. Figs. 3A, B) 18
- 16 (15) a. Ventral spines with internal spinule 17
 - b. Ventral spines without internal spinule (e.g. Figs. 12A-C) *H. glandifer*
- 17 (16) a. Tip of ventral spines blunt (e.g. Fig. 12N) *H. salazarvallejoi*
 - b. Tip of ventral spines pointed (e.g., Fig. 12O) *H. tenhovei*
- 18 (15) a. All verticil spines thick, slightly curved (e.g. Figs. 16A, B) *H. inermis*
 - b. Ventral verticil spines slender (e.g. Figs. 3B, I, J) .. 19
- 19 (18) a. Ventral spines with subapical incurving beak and pronounced knob (e.g. Figs. 3A, C, I) *H. brachyacanthus*
 - b. Ventral spines apically incurving, without knob (e.g. Figs. 7G, I) *H. deleoni* n. sp.
- 20 (14) a. Spines without internal spinule (e.g. Fig. 13G) *H. gracilis* (partim)
 - b. Spines with internal spinule (e.g. Figs. 21C, D) *H. similis*

TAXONOMIC ACCOUNT

Hydroides Gunnerus, 1768

***Hydroides alatalateralis* (Jones, 1962)**
Figs. 2H, I

Eupomatus alatalateralis Jones, 1962: 205-207, figs.

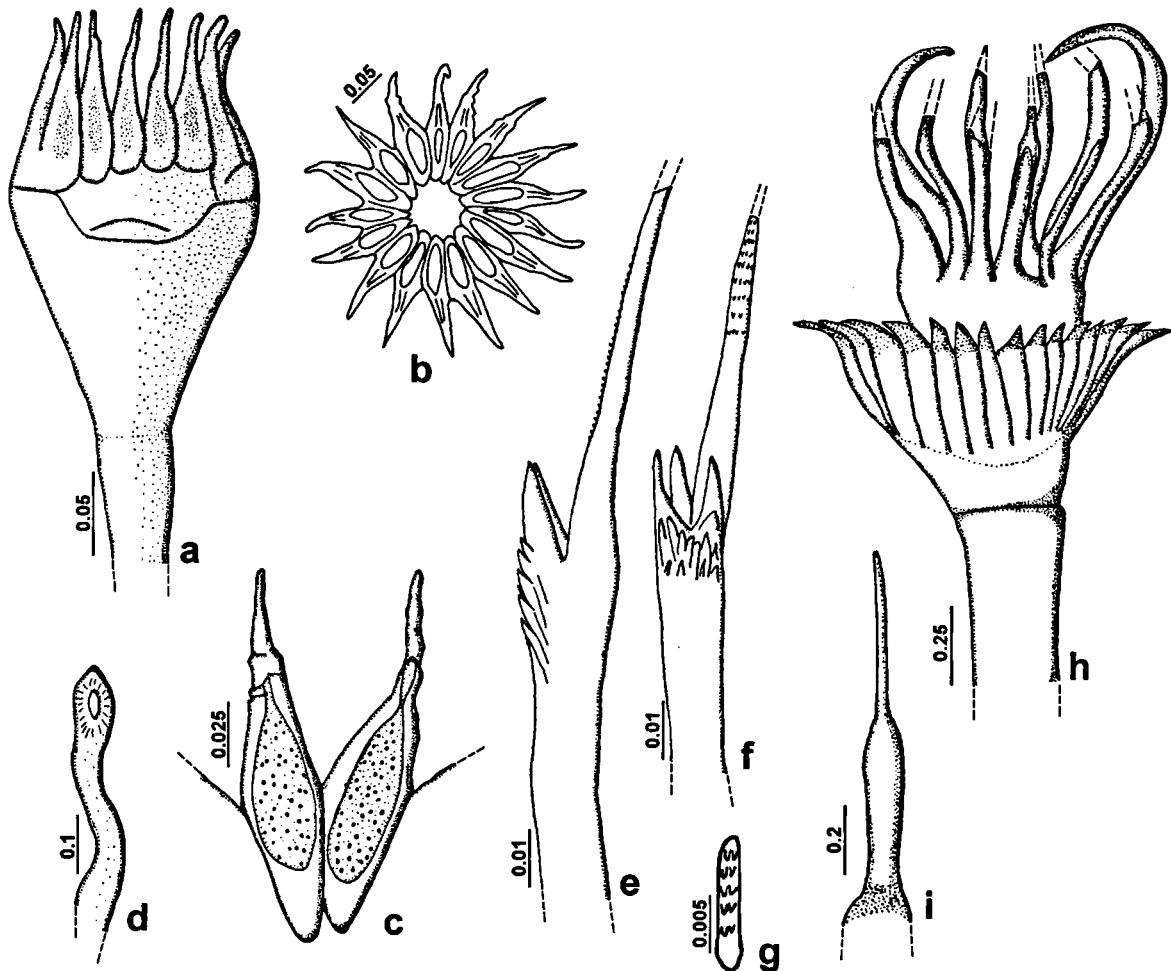


Fig. 2. A-G: *Hydroides bannerorum*, paratype, USNM 136581. A, operculum, lateral view. B, other operculum, apical view. C, detail of vetricil spines. D, pseudoperculum. E-F, bayonet chaetae, lateral and frontal view. G, thoracic uncinus. H-I: *H. alatalateralis*, from Curaçao, ZMA V.Pol. 3403. H, operculum, lateral view. I, vetricil spine, frontal view.

139-146. Type locality: Port Royal, Jamaica.

Hydroides alatalateralis (Jones, 1962); Laverde-Castillo, 1988: 88 (Bahía Málaga, Colombian Pacific); Bastida-Zavala & Ten Hove, 2003: 115-118 (Caribbean, diagnosis).

HABITAT. - No details given by Laverde-Castillo.

DISTRIBUTION. - Amphiamerican. Colombian Pacific (Fig. 9); Caribbean Sea and Gulf of Mexico.

REMARKS. - This Caribbean species (Figs. 2H, I) is recorded only once from Bahía Málaga, Colombian Pacific, by Laverde-Castillo (1988). His diagnosis, drawing and the fact that he had material from the Caribbean for comparison,

leave no doubt about the identity.

***Hydroides bannerorum* Bailey-Brock, 1991**
Figs. 2A-G

Hydroides bannerorum Bailey-Brock, 1991: 199, figs. 1a-r. Type locality: Sand Island and Barbers Point, Oahu, Hawaii, U.S.A.

MATERIAL. - Six 'adult' specimens.

HAWAIIAN ISLANDS: USNM 136581, paratype (Oahu, near Sand Island and Barbers Point sewage outfalls, sta. B1-R2, outside the sewage effluent, 70 m, IX-1986, legit J. Bailey-Brock); BPBM s.n., 5 specimens (Oahu, south shore, Sand Island, I-1986, legit J. Bailey-Brock, sta. 51 B1-R1); ZMA V.Pol. 5020-5024, 14 specimens, not studied in detail (same locality, 21°16'N, 157°51'W, 15-IX-1987, 5-X-1999, 16-19-I-2001, benthic ocean outfall samples SI 9/87, B5R5,

SI 1999, D5R1, D5R3, D6R2, BP 2001, HB1R5 (PO 36),
City and County Oceanographic Team, Environmental
division).

DESCRIPTION. - Tube: white, opaque, very thin, ID=0.2 mm, ED=0.2 mm; with peristomes and transversal ridges; longitudinal ridges lacking.

Colour and size: body pale. TL=3.1 mm (n=2, r:2.3-4.3, $\mu=3.1\pm 1.4$).

Branchial crown: with four radioles (n=6, r:3-5, $\mu=4.3\pm 0.8$) left, and five right (n=6, r:3-6, $\mu=4.6\pm 1.0$). RL=1.1 mm (n=6, r: 0.5-1.5, $\mu=1.1\pm 0.4$). Terminal filament very long in one specimen (17%), long in five (83%).

Peduncle: POL=1.6 mm (n=6, r:1.0-2.2, $\mu=1.6\pm 0.5$). Insertion left (n=5, 83%) or right (n=1, 17%); with ill-defined constriction (Fig. 2A). Pseudoperculum present (Fig. 2D) in five specimens (83%), lacking in one (17%).

Operculum: OL=0.3 mm (n=6, r:0.3-0.5, $\mu=0.3\pm 0.1$), OD=0.2 mm (n=6, r:0.1-0.2, $\mu=0.2\pm 0.03$). Funnel lacking. Verticil with 17 light to dark brown spines (n=6, r:16-19, $\mu=17.0\pm 1.1$), straight. All spines similar in shape and size (Figs. 2A, B), with pointed tip. Spines with one small basal internal spinule (Fig. 2B); without external or lateral spinules, with small and irregular tubercles in middle sections of some spines (Fig. 2C); spines without wings. Verticil without central tooth (Fig. 2B).

Collar chaetae: bayonet chaetae with two or three pointed-elongate teeth and proximal rasp, distal blade denticulate (Figs. 2E, F); hooded (capillary) chaetae present.

Thorax: THL=0.9 mm (n=5, r:0.5-1.3, $\mu=0.9\pm 0.3$), THW=0.2 mm (n=5, r:0.2-0.3, $\mu=0.2\pm 0.1$). Thoracic membranes very tiny. Six (n=1), seven (n=2) or eight (n=1) chaetigers with hooded (limbate) chaetae of two sizes, rasp-shaped uncini (Fig. 2G).

Abdomen: with 16 (n=2, r:12-22, $\mu=16.2\pm 7.1$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae. Posterior chaetigers with 'capillary' chaetae. Anterior and posterior uncini rasp-shaped.

HABITAT. - Depth: 70 m, on sand grains.

DISTRIBUTION. - Only known from Oahu Island,

Hawaiian Islands (Fig. 9).

REMARKS. - Bailey-Brock (1991) did not illustrate a pseudoperculum in the specimens, but a close examination of the branchial crown shows a tiny and slender pseudoperculum (Fig. 2D). Non type specimens, from BPBM, are not from the diffuser (zone of initial dilution in Bailey-Brock, 1991), and *H. bannerorum* is not affected by sewage effluent (Bailey-Brock, pers. comm.).

TAXONOMIC REMARKS. - With a single opercular funnel (Fig. 2A) instead of the two superimposed ones as usual in the genus *Hydroides*, two alternative hypotheses are possible:

1) the verticil is absent (not developed), and the primary funnel has developed into a chitinous barrier against potential invaders of the tube;

2) the verticil is present, and the funnel has been secondarily lost.

Arguments in favour of hypothesis 1 are that the funnel is the primary, the verticil the secondary development in ontogeny (all opercula start as single funnels, e.g. Ten Hove, 1984; Ben-Eliahu & Ten Hove, 1989); secondly, the thoracic uncini are rasp-shaped, most probably a neotenic character. However, the opercular spines have a typical arrangement for the verticil of a secondary operculum in *Hydroides*, with long spines basally fused to each other and with a basal internal spinule. All primary opercula we have seen are different from this pattern in showing short radii, hardly 'spines', only exceptionally with a structure similar to a basal internal spinule. At this moment we, therefore, regard hypothesis 2 as the most likely one.

Hydroides bannerorum is one of the three *Hydroides* species with more than seven thoracic chaetigers, the other two are *H. bisectus* from Japan (Imajima & Ten Hove, 1989) and *Hydroides* sp. 2 from Curaçao (Bastida-Zavala & Ten Hove, 2003), however, these species both have a proximal funnel and distal verticil. In the structure of the operculum *H. bannerorum* is an atypical member of the genus *Hydroides*.

Hydroides brachyacanthus Rioja, 1941
Figs. 3A-M, 7A-F

Hydroides brachyacantha Rioja, 1941a: 169-172, Pl.

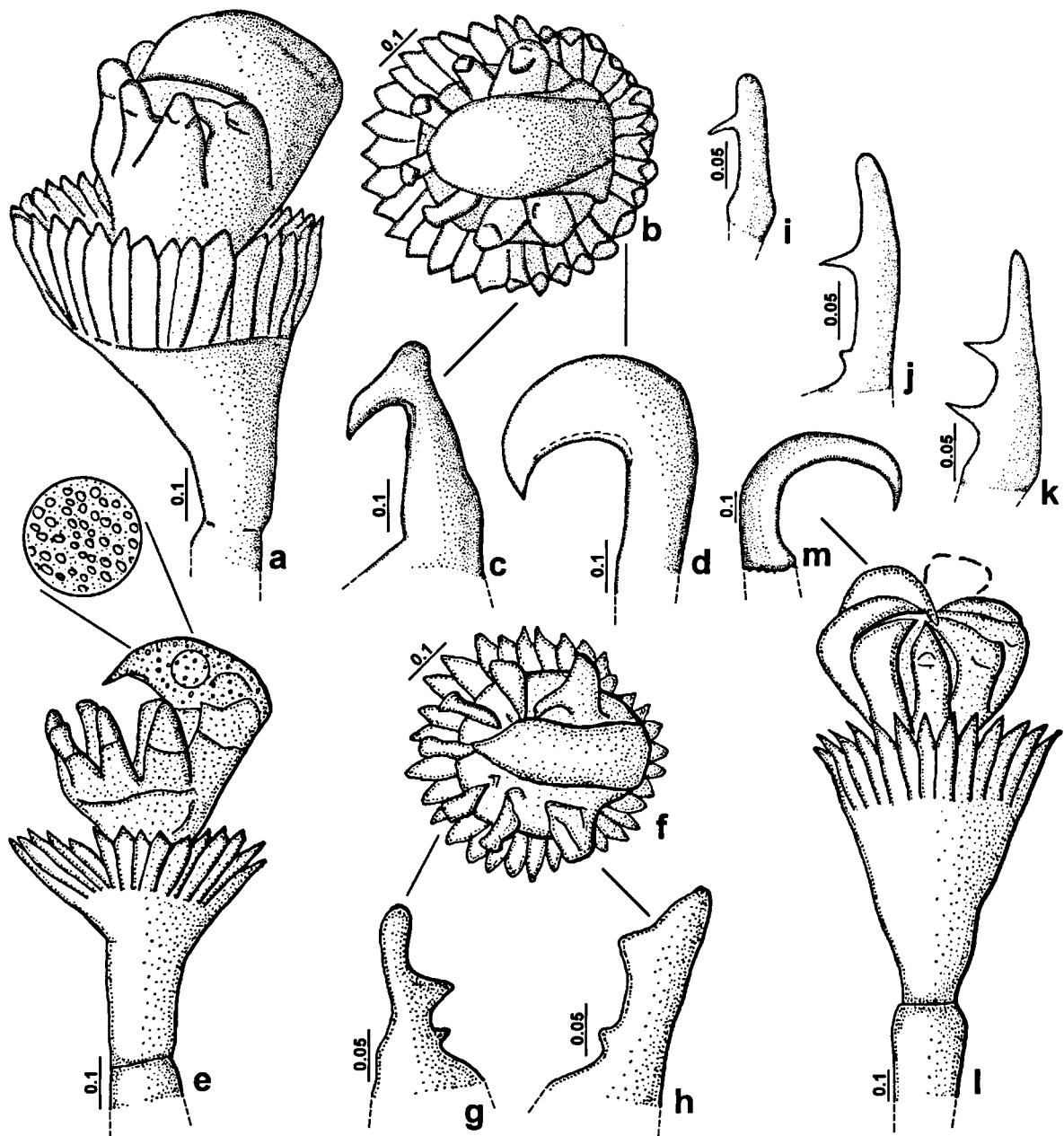


Fig. 3. *Hydroides brachyacanthus*. A-D: from Gulf of California, ZMA V.Pol. 3918. A-B, operculum, lateral and apical view. C-D, verticil spines, lateral view. E-H: from Sonora, CAS 029187. E-F, operculum, lateral and apical view and detail of surface of dorsal hook. G-H, verticil spines, lateral view. I-K: from Ecuador, ZMA V.Pol. 3507, verticil spines, lateral view. L-M: from Hawaii, LACM-AHF s.n., operculum and verticil spine, lateral view.

3, fig. 2, Pl. 4, figs. 1-9. Type locality: Mazatlán (Sinaloa) and Acapulco (Guerrero), Mexico; 1960: 255 (Islas Revillagigedo, on spines of *Eucidaris thouarsii*).

?*Hydroides brachyacantha*; Straughan, 1969: 232 (Oahu, Hawaii); Bailey-Brock, 1987: 419-420 (same).

Not: *Hydroides brachyacantha*; Bastida-Zavala, 1993 (see *H. similis*).

MATERIAL. - 18 'adult' and eight 'juvenile' specimens.

CALIFORNIA: LACM-AHF s.n. (Los Angeles County, Topanga Canyon, 18-XII-1945, Velero, sta. 1503).

BAJA CALIFORNIA: LACM-AHF s.n. (southwest of Isla Guadalupe, western coast of Baja California, 17-VIII-1946,

Velero, sta. 1521-46); ZMA V.Pol. 3918 (Isla San Pedro Martir, Gulf of California, from spondylid oyster in coralline algae rubble field, 23 m, 10-VII-1993, legit K. Kaiser).

SONORA: CAS 029187 (3 miles from San Carlos Bay, Guaymas, Gulf of California, 6-7 m, 2-VIII-1969).

GUERRERO: ECOSUR Serp-1a, 5 specimens not studied in detail (Acapulco, on *Crucibulum* sp., 4-VIII-1988, legit S.I. Salazar-Vallejo); ECOSUR Serp-1b, 4 specimens not studied in detail (Los Cantiles, Acapulco, 26-V-2000, legit A. Medina); ZMA V.Pol. 5027, 2 specimens (La Quebrada, Acapulco, on mollusks, 8-15 m, -25-V-2000, legit A. Medina).

OAXACA: ECOSUR Serp-1c (Playa La Entrega, on coral, VIII-1986, legit L. Mitchell); ECOSUR Serp-1d, 3 specimens not studied in detail (Huatulco, harbor, 22-V-2000, legit S.I. Salazar-Vallejo, P. Salazar-Silva, L. González & J.R. Bastida-Zavala).

COSTA RICA: LACM-AHF s.n., ZMA V.Pol. 3856, 3 specimens and 2 not studied in detail (Dominical, rock pools, 12-XI-1968, legit D. Straughan).

PANAMA: ZMA V.Pol. 3474, 2 specimens, one not studied in detail (Taboguilla, on plexiglas, 10 m, legit Birkeland).

ECUADOR: ZMA V.Pol. 3507, 11 specimens ($2^{\circ}11'28''S$ $80^{\circ}56'31''W$, N of Guayaquil, 8-9 m, 8-V-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 6670).

?HAWAIIAN ISLANDS: LACM-AHF s.n. (Oahu, 8-VII-1972, legit D. Straughan, sta. X2-5); LACM-AHF s.n. (Oahu, 9-VII-1972, legit D. Straughan, sta. X3-2); LACM-AHF s.n., 2 specimens (Oahu, 11-VII-1972, legit D. Straughan, sta. X5-1); LACM-AHF s.n. (Oahu, 17-VII-1972, legit D. Straughan, sta. X14-3).

DESCRIPTION. - Tube: white, ID=0.8 mm (n=14, r:(0.4)0.5-1.2, $\mu=0.8\pm 0.2$), ED=1.1 mm (n=14, r:(0.5)0.7-1.6, $\mu=1.1\pm 0.3$); most tubes fragmentary and/or covered by epibionts, all tubes lack peristomes; eight tubes have transversal ridges, lacking in the rest; one tube shows three longitudinal ridges, five show two, one shows one and five none.

Colour and size: body yellow to light brown. TL=12.9 mm (n=6, r:(3.7)7.3-28.5, $\mu=12.9\pm 7.6$).

Branchial crown: with ten radioles (n=15, r:(4)8-15, $\mu=10.1\pm 2.2$) left, and ten right (n=15, r:(4)6-15, $\mu=9.8\pm 2.6$). RL=1.5 mm (n=17, r:(0.2)0.2-3.6, $\mu=1.5\pm 0.9$). Terminal filament very long in one specimen (6%), long in 11 specimens (69%) and short in four (25%).

Peduncle: POL=2.6 mm (n=18, r:(0.8)1.6-5.2, $\mu=2.6\pm 1.1$). Insertion left (n=7, 41%), right (n=9, 53%), or at both sides (n=1, 6%); with shallow (Figs. 3A, E) to well defined constriction (Fig. 3L). Pseudoperculum present in 16 specimens.

Operculum: OL=1 mm (n=18, r:(0.3)0.7-1.6, $\mu=1.0\pm 0.3$), OD=0.6 mm (n=18, r:(0.2)0.4-1.0, $\mu=0.6\pm 0.2$). Funnel with 30 radii (n=18, r:(14)26-35, $\mu=29.7\pm 2.5$) with pointed tips. Interradial grooves 2/5 of funnel length in four opercula, 1/3 in 12 and 1/4 in two. Verticil with nine yellow to dark brown spines (n=18, r:(7)7-11, $\mu=8.4\pm 1.3$), strongly curving inwards. The dorsal hook bigger than the others (Figs. 3A, B, D-F, L), covering the central disc (Figs. 3B, F); other spines similar in shape and size (Figs. 3A, E), with pointed tip and a knob (Figs. 3C, G-K). Spines with one short basal internal spinule (Figs. 3G-J), sometimes long (Fig. 3K) or lacking (Fig. 3C); without external and lateral spinules and/or wings. Verticil without central tooth.

Collar chaetae: bayonet chaetae with two pointed-elongate (Fig. 7B) or blunt-short teeth (Fig. 7A), distal blade smooth; hooded (capillary) chaetae present (Fig. 7C).

Thorax: THL=2.1 mm (n=16, r:(1.0)1.5-4.0, $\mu=2.1\pm 0.7$), THW=0.6 mm (n=16, r:(0.1)0.5-1.0, $\mu=0.6\pm 0.2$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 7D) of two sizes, saw-shaped uncini.

Abdomen: with 66 (n=7, r:(30)30-107, $\mu=65.9\pm 24.9$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 7E). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Fig. 7F), posterior uncini rasp-shaped.

HABITAT. - Depth: 0-23 m, on mollusks and coral; fouling.

DISTRIBUTION. - Western coast of Baja California Sur, Gulf of California to Ecuador, ?Hawaii (Fig. 9); questionably circum(sub)tropical.

REMARKS. - For reasons given below, the specimens from Hawaii have not been included in our diagnosis.

TAXONOMIC REMARKS. - The original description of *H. brachyacanthus* shows an operculum with one (geniculate) hook, bigger than the other spines, covering the central disc (Rioja, 1941a). This character immediately separates *H. brachyacanthus* from the otherwise similar species *H. similis*,

showing 2-4 hooks. Moreover, *H. brachyacanthus* has 7-11 verticil spines against 11-16 in *H. similis* (Figs. 8C, D).

The specimens from Hawaii have two to three dorsal hooks, slightly bigger than the other spines (Figs. 3L, M), which have a short knob (Fig. 3L), resembling *H. similis*. They are nevertheless included with a ? in *H. brachyacanthus* since the number of spines (7-8) falls within the range of *H. brachyacanthus* (7-11) rather than in that of *H. similis* (11-16, Figs. 8C, D).

The operculum of *Hydroides brachyacanthus* is also similar to that of specimens which we identified as *H. deleoni* n. sp. However, *H. brachyacanthus* has a knob in the spines (Figs. 3C, G), lacking in *H. deleoni* n. sp. (Figs. 7G, L). The number of radii shows differences too: 26-35 vs. 30-43 (Figs. 8B, D).

An extensive discussion on the *brachyacanthus*-complex is given in Imajima & Ten Hove (1984), from which we only will mention here that their material from the tropical Indo-Pacific Region was neither entirely conform to the original description in numbers of verticil spines (5-7) and radii (38-46), nor in the smoothly curving (not geniculate) dorsal hook.

Hydroides chilensis Hartmann-Schröder, 1962 Figs. 4A-O

Hydroides chilensis Hartmann-Schröder, 1962: 165-167, figs. 225-228. Type locality: Arica, Chile.

Hydroides cruciger (non Mörch); Laverde-Castillo, 1988: 88-89 (Bahía Málaga, Pacific of Colombia).

?*Hydroides cruciger* (non Mörch); Knight-Jones & Knight-Jones, 1991: 584 (Lima, Peru).

MATERIAL. - Six 'adult' and three 'juvenile' specimens.

COLOMBIA: ZMA V.Pol. 3603 (Bahía Málaga, 03°56'N 77°21'W, Isla Curichichi, dive, up to 10 m, 25-XII-1985, legit J.J.A. Laverde-Castillo).

ECUADOR: ZMA V.Pol. 3504, 4 specimens (N of Guayaquil, 02°11'28"S 80°56'31"W, 8-9 m, dive, 8-V-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 6670). PERU: ZMA V.Pol. 3503, 4 specimens (Callao, Isla San Lorenzo, naval base near dynamite shacks, 2-6 m, 1965, dive, legit S. Taylor, Program SEPBOP, R/V Anton Bruun, cruise 12, sta. 65211).

CHILE: ZMH V. 15179, 15180 and ZMA V.Pol. 3687, type series of *H. chilensis*, not entirely studied in detail (Arica, 22-

VII-1960, legit G. Hartmann-Schröder).

DESCRIPTION. - Tube: white, ID=1.5 mm (n=3, r:(0.7)1.1-1.7, $\mu=1.5\pm 0.3$), ED=2.2 mm (n=4, r:(1.0)1.5-2.5, $\mu=2.2\pm 0.5$); most tubes fragmentary and/or covered by epibionts; all tubes lack peristomes; four tubes have transversal ridges, lacking in the rest; one tube shows three longitudinal ridges and two show two.

Colour and size: body pale yellow. TL=18 mm (n=5, r:(10.0)15.3-22.0, $\mu=18.0\pm 3.2$).

Branchial crown: with 17 radioles (n=5, r:(9)13-16, $\mu=14.2\pm 1.1$; including data of the typeseries: n=13, r:(9)13-23, $\mu=16.9\pm 3.2$) left, and 17 right (n=5, r:(9)13-18, $\mu=14.5\pm 2.3$; including data of the typeseries: n=12, r:(9)13-24, $\mu=17.0\pm 3.4$). RL=2.2 mm (n=5, r:(1.5)2.0-2.7, $\mu=2.2\pm 0.3$). Terminal filament long in two specimens (40%), short in three (60%).

Peduncle: POL=3.9 mm (n=6, r:(2.2)3.0-5.7, $\mu=3.9\pm 1.0$). Insertion left (n=3, 50%), right (n=2, 23%), or at both sides (n=1, 17%); with shallow defined constriction (Figs. 4A, C, E). Pseudoperculum present in all specimens.

Operculum: OL=1.8 mm (n=6, r:(0.8)1.1-2.8, $\mu=1.8\pm 0.6$), OD=1.2 mm (n=6, r:(0.6)0.7-2.2, $\mu=1.2\pm 0.5$). Funnel with 40 radii (n=12, r:(21)21-58, $\mu=40.2\pm 10.1$) with pointed tips. Interradial grooves 2/5 of funnel length in two opercula and 1/3 in four. Verticil with eight yellow spines (n=12, r:(6)7-11, $\mu=8.4\pm 1.3$), curving inwards; numbers of radii and spines include those of type series. All spines similar in shape (Figs. 4A-C), with pointed tip, dorsal spines tend to be somewhat longer. Spines with one short to long basal internal spinule (Fig. 4B), in one specimen irregularly shaped, wart-like (Fig. 4D); without external spinules; with one pair of well-developed lateral spinules in the middle section of the spines (Figs. 4A, E); without wings. Verticil without central tooth (Fig. 4B).

Collar chaetae: bayonet chaetae with two blunt-elongate teeth (Fig. 4F) or pointed-elongate teeth (Fig. 4G), distal blade smooth (Figs. 4F, G); hooded (capillary) chaetae present (Fig. 4H).

Thorax: THL=3.7 mm (n=6, r:(2.2)2.8-5.5, $\mu=3.7\pm 1.1$), THW=1.6 mm (n=6, r:(0.6)1.1-2.2, $\mu=1.5\pm 0.4$; including data of the typeseries: n=14, r:(0.6)1.1-2.2, $\mu=1.6\pm 0.3$). Thoracic membranes well developed. Six chaetigers with hood-

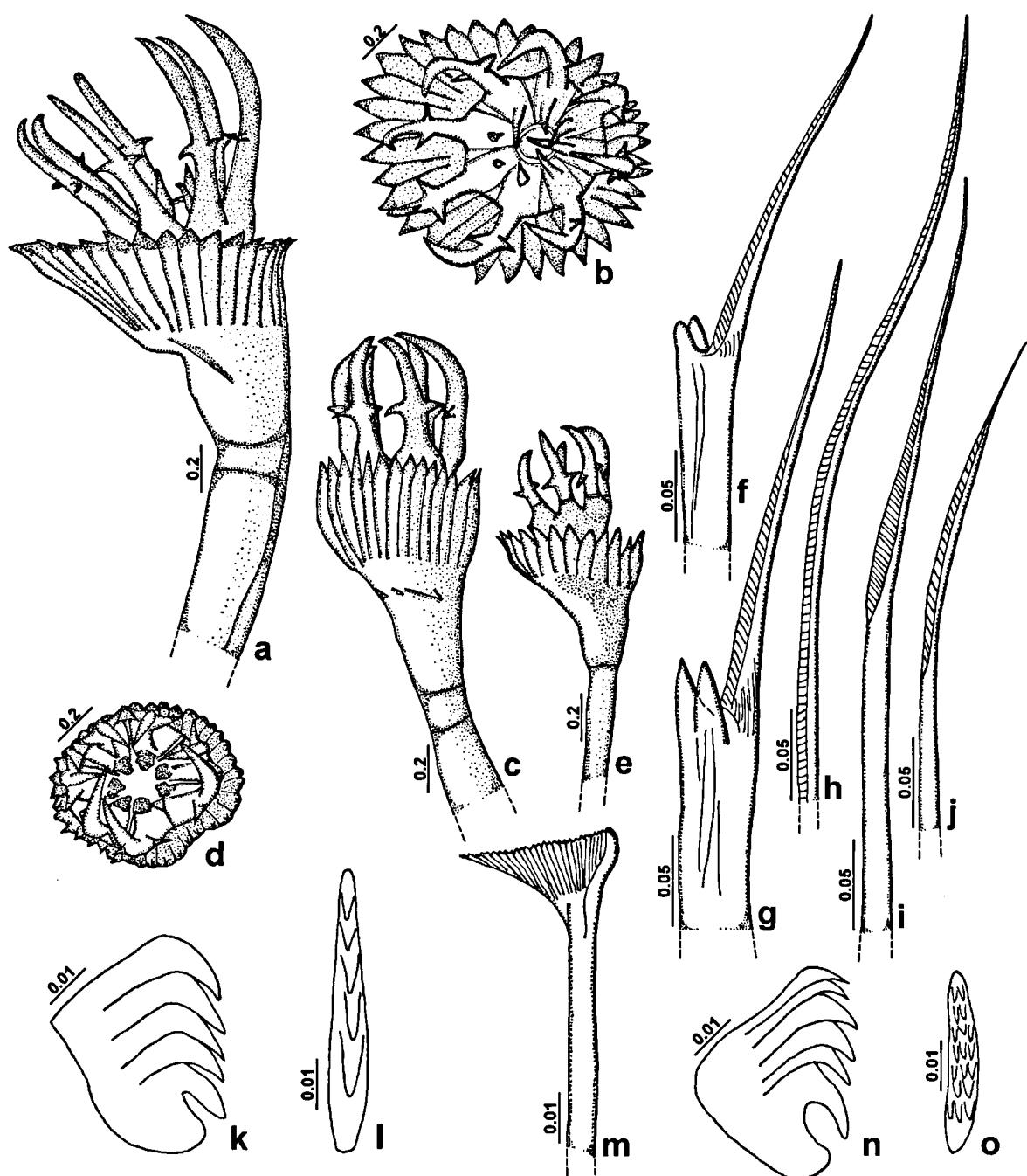


Fig. 4. *Hydroides chilensis*. A-B, from Peru, ZMA V.Pol. 3503, operculum, lateral and apical view. C-E: from Ecuador, ZMA V.Pol. 3504. C-D, left operculum, lateral and apical view. E, right operculum, lateral view. F-O: from Peru, ZMA V.Pol. 3503. F-G, bayonet chaetae. H, hooded (capillary) chaeta. I-J, thoracic hooded (limbate) chaetae. K-L, thoracic uncini. M, anterior or abdominal flat-trumpet chaeta. N-O, anterior and posterior abdominal uncini.

ed (limbate) chaetae of two sizes (Figs. 4I, J), saw-shaped uncini (Figs. 4K, L).

Abdomen: with 91 (n=5, r:(43)66-99, $\mu=79.9 \pm 13.5$; including data of the type series: n=11,

r:(43)66-123, $\mu=91.0 \pm 16.5$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 4M). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped

(Fig. 4N), posterior uncini rasp-shaped (Fig. 4O).

HABITAT. - Depth: 2-10 m. On coral and shells.

DISTRIBUTION - From Colombia to Arica (Chile) (Fig. 9).

TAXONOMIC REMARKS. - Hartmann-Schröder (1962) compared this species with *H. californicus* Treadwell, 1929, a junior synonym of *H. cruciger* Mörch, 1863, and gave as main differences the asymmetric arrangement of the verticil spines (larger dorsally) in *H. chilensis*, as opposed to the radial symmetry in *H. cruciger*. From our description, a few other differences become apparent: *Hydroides chilensis* is larger: 66-123 vs. 50-95 abdominal chaetigers, 13-24 vs. 10-17 radioles, THW= 1.1-2.2 vs. 0.8-1.5 mm (Fig. 6A). Both species can be clearly distinguished by their funnel radii: 40 (21-58) short ones in *H. chilensis* (Figs. 4A-C, E, 6B, D), 26 (22-32) long and pointed ones in *H. cruciger* (Figs. 5A, B, D, E). We therefore are of the opinion that *H. chilensis* is a separate taxon, probably of specific level. *Hydroides chilensis* was placed into the synonymy of *H. cruciger* by Zibrowius (1971: 717), therefore the material of Knight-Jones & Knight-Jones (1991: 584; Lima, Peru) should be checked, because it might belong to *H. chilensis*. The same holds for some material in collections identified as *H. cruciger* by Zibrowius and by Ten Hove.

***Hydroides cruciger* Mörch, 1863**

Figs. 5A-Q

Hydroides (Eucarphus) crucigera Mörch, 1863: 378, Pl. 11, fig. 8. Type locality: Punta Arenas, Western Costa Rica.

Hydroides californicus Treadwell, 1929: 12, figs. 32-33 (Baja California); Rioja 1941a: 161-164 (Acapulco, Guerrero and Mazatlán, Sinaloa).

Hydroides cruciger; Monro, 1933: 1083 (Taboga Island, Panama); Rioja, 1944: 411-414 (Acapulco, Mazatlán, La Paz, Gulf of California); 1947: 215 (La Paz and Topolobampo, Gulf of California); Straughan, 1969: 232-234 (Hawaii); Kudenov, 1975: 228 (Station Beach, Puerto Peñasco, Gulf of California); Bailey-Brock, 1987: 420, fig. 3.II.190 (same as

Straughan); Bastida-Zavala, 1993: 35 (Bahía de La Paz, Gulf of California); 1995: 24 (Cabo Pulmo reef, Gulf of California).

Hydroides crucigerus; De León-González, 1990: 336-337 (western coast of Baja California Sur).

MATERIAL. - Eleven 'adult' and three 'juvenile' specimens. BAJA CALIFORNIA: AMNH 1995, 2 syntypes of *H. californicus* (Baja California, 1911); ECOSUR Serp-2f and ZMA V.Pol. 3694, 250 specimens not studied in detail (29°N 113°30'W, La Gringa, Bahía de Los Angeles, cobbles on sand, scarce coral and sponges, 2-3 m deep at low tide, 13-VIII-1989, legit H.A. Ten Hove).

BAJA CALIFORNIA SUR: BZ-pc (Coromuel beach, Bahía de La Paz, sand and rock bottom, 1 m, 9-XII-1985, legit S.I. Salazar-Vallejo & J.A. De León-González); BZ-pc, 2 specimens, one not studied in detail (Cabo Pulmo reef, Coral Los Frailes, on dead coral *Pocillopora* sp., 4 m, 25-IX-1988, legit P. Hernández, J. Ketchum & J.R. Bastida-Zavala); BZ-pc, not studied in detail (Cabo Pulmo reef, second bar, *Pocillopora* sp., 4 m, 18-IX-1989, legit P. Hernández, J. Ketchum & J.R. Bastida-Zavala); LACM-AHF s.n. (La Paz, 28-I-1955, sta. K-134).

GUERRERO: ECOSUR Serp-2a (La Quebrada, Los Cantiles, Acapulco, on oysters, 8 m, 26-V-2000, legit A. Medina).

OAXACA: ECOSUR Serp-2b (Puerto Angel, on coral, IV-1986, legit C. Rodríguez).

COSTA RICA: LACM-AHF s.n. (Dominical, rock pools, XI-12, 1968, legit D. Straughan).

PANAMA: ECOSUR Serp-2c, 2 specimens not studied in detail (08°56.3'N 79°33.3'W, Balboa Yacht Club, salinity= 25‰, 30-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-2d and LACM-AHF s.n., 14 specimens not studied in detail (08°57.8'N 79°34.2'W, Diablo Spinning Club, salinity= 19‰, 30-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-2e, not studied in detail (08°58.3'N 79°31.7'W, Balboa Yacht Club, salinity=30‰, 01-VI-2002, legit S.I. Salazar-Vallejo). HAWAIIAN ISLANDS: LACM-AHF s.n., 8 specimens (Oahu, 8, 11, 16, 17-VII-1972, legit D. Straughan, sta. X2-1-3, sta. X5-3, X6-1-2, sta. X4-2, sta. X16-3).

DESCRIPTION. - Tube: white, ID=1.1 mm (n=7, r:(0.8)1.0-1.4, $\mu=1.1\pm 0.1$), ED=1.7 mm (n=7, r:(1.2)1.5-2.0, $\mu=1.7\pm 0.2$); most tubes fragmentary and/or covered by epibionts; all tubes lack peristomes; four tubes have transversal ridges, lacking in the rest; four tubes show three longitudinal ridges.

Colour and size: body pale yellow. TL=14.4 mm (n=5, r:(8.5)8.5-22.7, $\mu=14.4\pm 5.8$).

Branchial crown: with 14 radioles (n=11, r:(8)10-17, $\mu=14.0\pm 2.0$) left, and 14 right (n=11, r:(9)10-17, $\mu=13.8\pm 2.0$). RL=2.8 mm (n=11,



Fig. 5. *Hydroides cruciger*. A-C: from Baja California Sur, BZ-pc: A-B, operculum, lateral and apical view. C, verticil spine, lateral view. D-I: from Hawaii, LACM-AHF s.n. D-E, operculum, sub-apical and lateral view. F, bayonet chaeta. G, hooded (capillary) chaeta. H, thoracic hooded (limbate) chaeta. I, thoracic uncinus. J-Q: from Baja California Sur, BZ-pc: J-K, bayonet chaetae. L, hooded (capillary) chaeta. M, thoracic hooded (limbate) chaeta. N, thoracic uncinus. O, anterior abdominal flat-trumpet chaeta. P-Q, anterior abdominal unci.

r:(1.5)2.0-3.5, $\mu=2.8\pm0.5$). Terminal filament long in eight specimens (73%), short in three (27%).

Peduncle: POL=4.0 mm (n=12, r:(2.2)2.5-5.2,

$\mu=4.0\pm0.8$). Insertion left (n=5, 45%), right (n=5, 45%), or at both sides (n=1, 10%); with shallowly defined constriction (Figs. 5A, E). Pseudoperulum present in ten specimens (91%), not found

in one (9%).

Opercum: OL=1.4 mm (n=12, r:(0.8)0.8-1.9, $\mu=1.4\pm 0.3$), OD=0.9 mm (n=12, r:(0.3)0.6-1.2, $\mu=0.9\pm 0.2$). Funnel with 26 radii (n=12, r:(18)22-32, $\mu=25.7\pm 3.2$) with pointed tips. Interradial grooves 1/2 of funnel length in two opercula, 2/5 in two and 1/3 in eight. Verticil with eight yellow spines (n=12, r:(7)7-10, $\mu=8.0\pm 0.9$), curving inwards. All spines similar in shape and size (Figs. 5A, B, D, E), with pointed tip. Spines with one short to long basal internal spinule (Figs. 5B-D); without external spinules; with one pair of well-developed lateral spinules in the middle section of the spines (Figs. 5A, E); without wings. Verticil without central tooth (Fig. 5B).

Collar chaetae: bayonet chaetae with two blunt-short teeth, distal blade smooth (Figs. 5F, J, K); hooded (capillary) chaetae present (Figs. 5G, L).

Thorax: THL=2.6 mm (n=10, r:(2.0)2.0-3.5, $\mu=2.6\pm 0.6$), THW=1.1 mm (n=10, r:(0.7)0.8-1.5, $\mu=1.1\pm 0.2$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Figs. 5H, M) of two sizes, saw-shaped uncini (Figs. 5I, N).

Abdomen: with 69 (n=6, r:(50)50-95, $\mu=69.4\pm 15.8$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 5O). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Figs. 5P, Q), posterior uncini rasp-shaped.

HABITAT. - Depth: 0-8 m, on dead coral, molluscs and in rock pools. Salinity tolerance 19-37‰.

DISTRIBUTION. - From Baja California to Bahía Málaga (Colombia), Hawaii (Fig. 9).

REMARKS. - Freshly collected material from Bahía de Los Angeles showed two colour morphs: one with radioles predominantly banded with purple, the other orange. In two series of ten specimens of those morphs, one of us (HAtH, 1989, unpubl.) could not find differences in either tube or operculum. Many juvenile specimens show a primary operculum, merely consisting of a funnel, with chitinized radii; in some we found both primary and typical secondary operculum. A comparison of morphometrics of three 'popu-

lations' of *H. cruciger* and *H. chilensis* is given in Figs. 6A-C. There are no clear differences between the three populations, but in all cases *H. chilensis* is different.

TAXONOMIC REMARKS. - See taxonomic remarks under *H. chilensis*. Differences between *H. cruciger*, *H. chilensis* and *H. panamensis* n. sp. are given in the taxonomic remarks for the last species.

Hydrodoides deleoni n. sp.

Figs. 7G-T

MATERIAL. - 10 'adult' specimens.

BAJA CALIFORNIA SUR: ZMA V.Pol. 3784, holotype and 20 paratypes, not all studied in detail (Punta San Juanico, 26°13'N 112°13'W, 35 m, 28-IV-1988, legit De León-González).

COSTA RICA: LACM-AHF s.n. and ZMA V.Pol. 3856, 10 specimens, not studied in detail (Dominical, rock pools, 12-XI-1968, legit D. Straughan).

PANAMA: BMNH 1933:7:10:475-479, ZB 1972:49, ZMA V.Pol. 3228, 8 specimens, not studied in detail (Balboa, rock and rock-pools at low tide and from *Astrangia* sp., legit C. Crossland S.Y. St. George Panama & Galapagos cruise, 16-VI-1924); ECOSUR Serp-40a, not studied in detail (08°56.3'N 79°33.3'W, Balboa Yacht Club, salinity=25‰, 30-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-40b and LACM-AHF s.n., 4 specimens not studied in detail (08°58.3'N 79°31.7'W, Balboa Yacht Club, salinity=30‰, 1-VI-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-40c, not studied in detail (08°54.7'N 79°31.8'W, Punta Culebra, Balboa, 30-V-2002, legit S.I. Salazar-Vallejo); USNM 58523, 3 specimens not studied in detail (Isla Venado, SE side, rocky intertidal, 15-IV-1972, legit Byas, Pawson, Dawson, Jones, Turner & Fried, sta. 86-1; J.S. Tromp det. *H. cf. brachyacanthus*).

ECUADOR: ZMA V.Pol. 3508 (N of Guayaquil, 02°11'28"S 80°56'31"W, 8-9 m, dive, 8-V-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 6670).

DESCRIPTION. - Tube: white, ID=0.9 mm (n=5, r:0.8-1.1, $\mu=0.9\pm 0.1$), ED=1.5 mm (n=5, r:1.2-1.7, $\mu=1.5\pm 0.2$); most tubes fragmentary and/or covered by epibionts, all tubes lack peristomes; four tubes have transversal ridges, lacking in the rest; one tube shows two longitudinal ridges and one none.

Colour and size: body pale, each segment with black spots laterally. TL=15.2 mm (n=9, r:9.3-21.0, $\mu=15.2\pm 0.4$).

Branchial crown: with 11 radioles (n=10, r:7-13, $\mu=10.6\pm 1.8$) left, and 11 right (n=9, r:9-13,

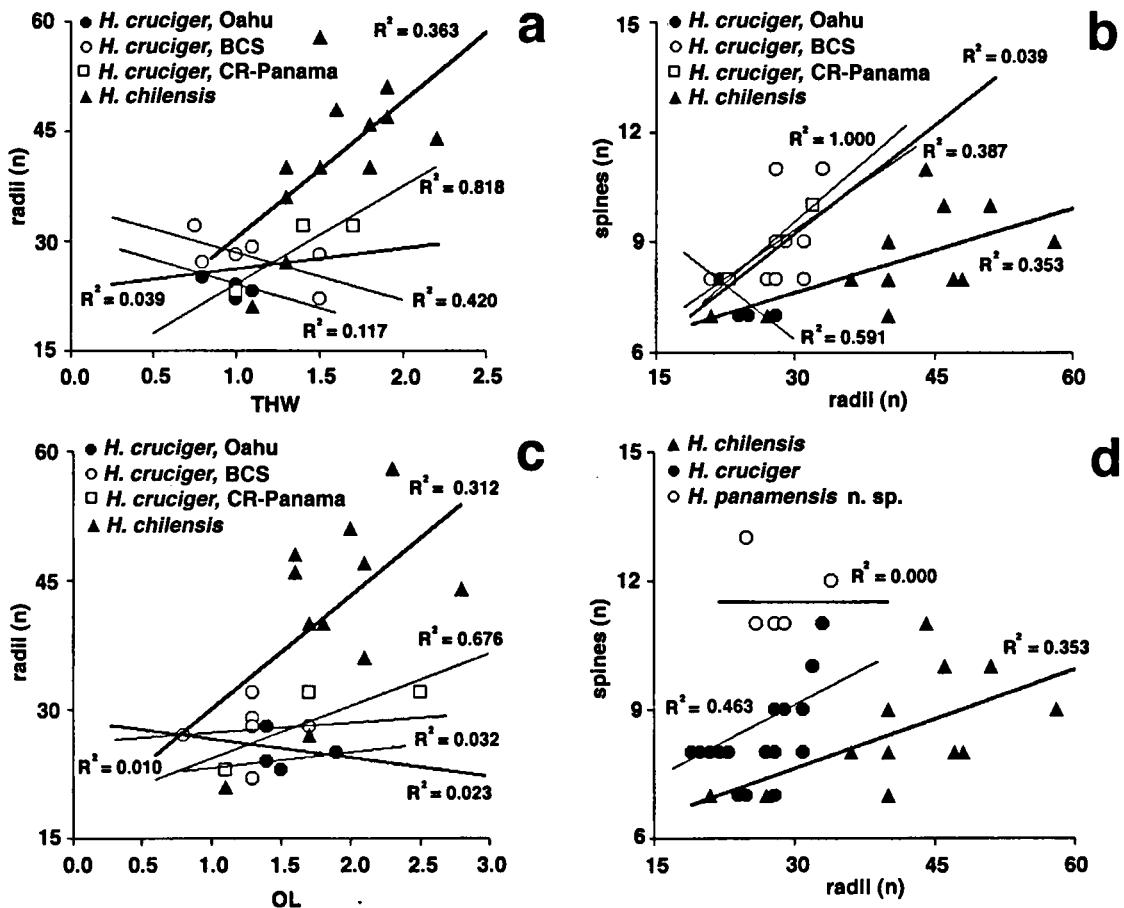


Fig. 6. Morphometric comparisons between different populations of *Hydroides cruciger*, *H. chilensis* and *H. panamensis* n. sp. In Figs. A-C the tendency line of all specimens of *H. cruciger* is marked with a thick line (abbreviations: BCS=Baja California Sur, CR=Costa Rica).

$\mu=10.8\pm1.2$). RL=1.5 mm ($n=17$, $r:(0.2)0.2-3.6$, $\mu=1.5\pm0.9$). Terminal filament long in seven specimens and short in three.

Peduncle: POL=3.3 mm ($n=10$, $r:2.0-4.0$, $\mu=3.3\pm0.6$). Insertion left ($n=4$) or right ($n=6$); with very ill-defined constriction (Figs. 7G, I). Pseudoperculum present in all specimens.

Operculum: OL=1.5 mm ($n=9$, $r:1.0-1.8$, $\mu=1.5\pm0.3$), OD=0.7 mm ($n=10$, $r:0.5-0.8$, $\mu=0.7\pm0.1$). Funnel with 36 radii ($n=10$, $r:30-43$, $\mu=36.3\pm4.1$) with pointed tips. Interradial grooves 2/5 of funnel length in four opercula, 1/3 in six. Verticil with nine yellow spines ($n=10$, $r:7-11$, $\mu=9.1\pm1.1$), tips curving inwards. The most dorsal spine bigger than the others (Figs. 7G-I); other spines similar in shape and size, with pointed tip, lacking knob (Figs. 7G-I). Spines with one short basal internal spinule (Fig. 7H); without

external and lateral spinules and/or wings. Verticil without central tooth (Fig. 7H).

Collar chaetae: bayonet chaetae with two blunt-elongate teeth (Figs. 7J, K), distal blade smooth; hooded (capillary) chaetae present (Fig. 7L).

Thorax: THL=2.6 mm ($n=10$, $r:1.7-3.3$, $\mu=2.6\pm0.5$), THW=0.7 mm ($n=10$, $r:0.6-1.0$, $\mu=0.7\pm0.1$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae of two sizes (Figs. 7M, N), saw-shaped uncini (Figs. 7O, P).

Abdomen: with 80 ($n=9$, $r:39-114$, $\mu=80.4\pm23.6$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 7Q). Posterior chaetigers with 'capillary' chaetae. Anterior and posterior uncini saw-shaped (Figs. 7R-T).

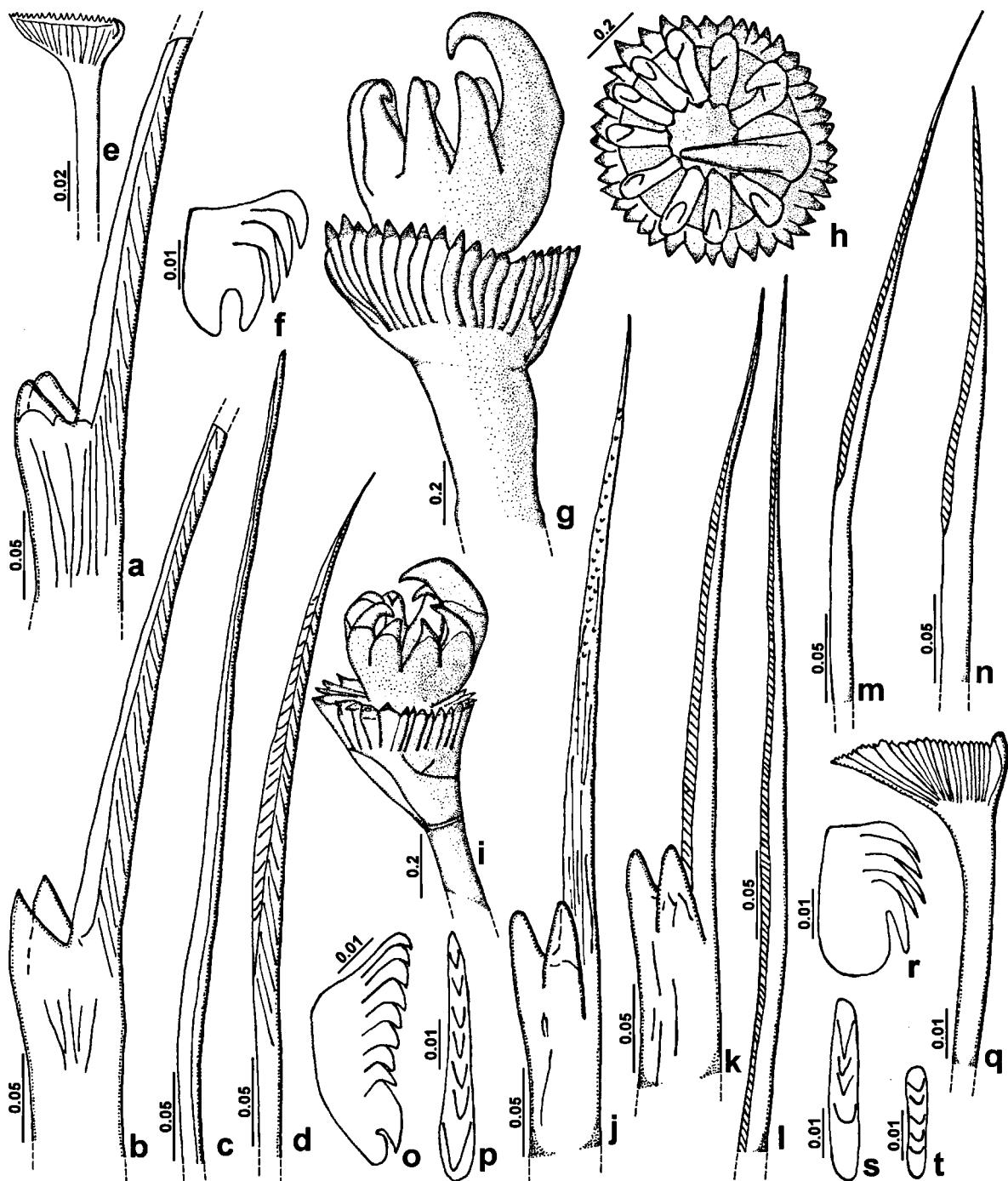


Fig. 7. A-F: *Hydroides brachyacanthus*, from Hawaii, LACM-AHF s.n. A-B, bayonet chaetae. C, hooded (capillary) chaeta. D, thoracic hooded (limbate) chaeta. E, anterior abdominal flat-trumpet chaeta. F, anterior abdominal uncinus. G-H, J-T: *Hydroides deleoni* n. sp., holotype, ZMA V.Pol. 3784. G-H, operculum, lateral and apical view. J-K, bayonet chaetae. L, hooded (capillary) chaeta. M-N, thoracic hooded (limbate) chaetae. O-P, thoracic uncini. Q, anterior abdominal flat-trumpet chaeta. R-S, anterior abdominal uncini. T, posterior abdominal uncinus. I: from Ecuador, ZMA V.Pol. 3508, operculum, lateral view.

HABITAT. - Depth: 0-35 m, rocks, rock-pools and on an ecological island: a flat and hard PVC structure surrounded by soft-bottom. Salinity tol-

erance 25-37%o.

DISTRIBUTION. - Baja California Sur to Ecuador

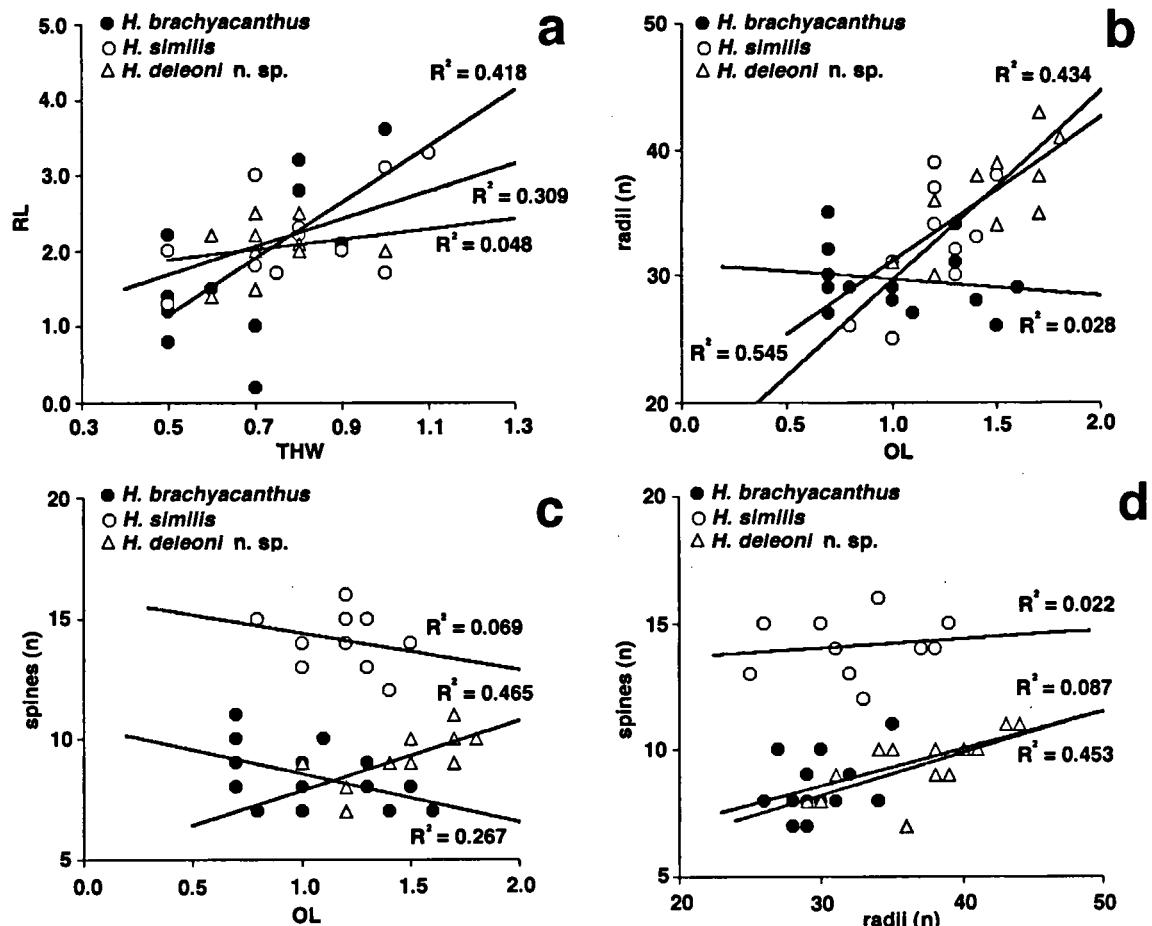


Fig. 8. Morphometric comparisons between *Hydroides brachyacanthus*, *H. deleoni* n. sp. and *H. similis*.

(Fig. 9).

ETYMOLOGY.- Named after Jesús A. De León-González, distinguished polychaete specialist, who first presented us with a good sample of this new species.

TAXONOMIC REMARKS. - *Hydroides deleoni* n. sp. is rather similar to *Hydroides brachyacanthus*, and for about 25 years the species was routinely identified by Ten Hove and students as *H. cf. brachyacanthus*, the 'cf.' indicating that they were aware of the differences with Rioja's description. For characters separating the two species see 'Taxonomic remarks' of *H. brachyacanthus* and Fig. 8.

Hydroides diramphus Mörcz, 1863
Figs. 10A-L

Hydroides (Eucarphus) dirampha Mörcz, 1863: 379, Pl. 11, fig. 10. Type locality: St. Thomas, Lesser Antilles.

Eupomatus lunulifer Claparède, 1870; Hartman 1966: 237 (Honolulu, material studied).

Hydroides dirampha; Zibrowius, 1971: 705-707 (extensive synonymy; widely recorded in temperate and tropical seas of the World); Bailey-Brock, 1987: 420, fig. 3.II.191 (Oahu, Hawaii); Bastida-Zavala & Ten Hove, 2003: 162-164 (diagnosis of Caribbean specimens).

?*Hydroides malleophorus* Rioja, 1942: 126-130, figs. 7-14 (Mazatlán, Gulf of California); Salazar-Vallejo, 1989b: 54.

MATERIAL. - Eight 'adult' specimens.

CALIFORNIA: LACM-AHF s.n., 2 specimens (San Diego County, National City Marine Terminal, pier-inner piling, 24-VI-1999, sta. BB-Rep-3).

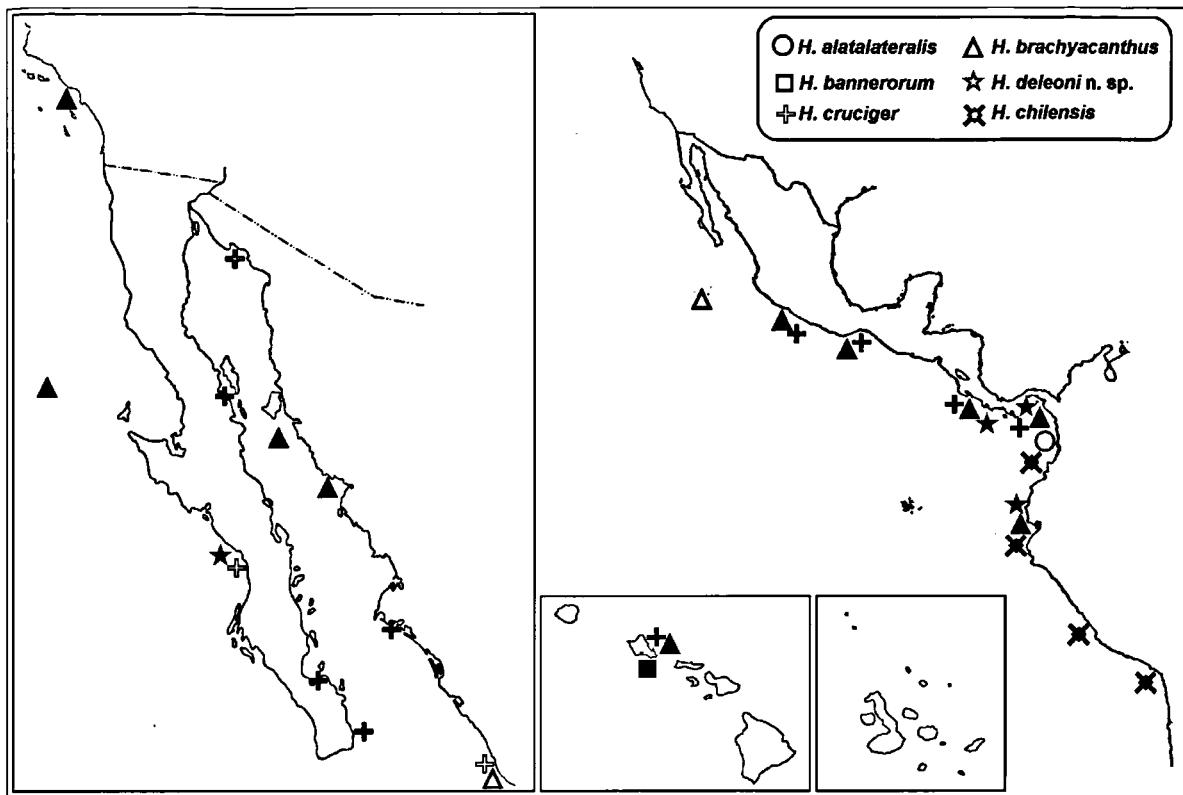


Fig. 9. Distribution of *Hydroides alatalateralis*, *H. bannerorum*, *H. brachyacanthus*, *H. chilensis*, *H. cruciger* and *H. deleoni* n. sp. Closed symbols denote examined material, open symbols literature records.

BAJA CALIFORNIA SUR: BZ-pc (Coromuel beach, Bah'a de La Paz, sand and rock bottom, 1 m, 24-VI-1986, legit S.I. Salazar-Vallejo & J.A. De León-González).

HAWAIIAN ISLANDS: LACM-AHF N5044, 5 specimens (Honolulu, Yacht Harbor, 18-V-1900).

DESCRIPTION. - Tube: white, ID=1.7 mm (n=4, r:1.4-2.1, $\mu=1.7\pm0.3$), ED=2.0 mm (n=4, r:1.7-2.5, $\mu=2.0\pm0.3$); most tubes fragmentary; three tubes have peristomes, lacking in one; three specimens have transversal ridges; one tube has two longitudinal ridges, lacking in three.

Colour and size: body pale yellow. TL=25.6 mm (n=5, r:21.1-34.0, $\mu=25.6\pm4.9$).

Branchial crown: with 15 radioles (n=8, r:12-21, $\mu=15.3\pm3.0$) left, and 16 right (n=8, r:13-20, $\mu=16.5\pm2.1$). RL=4.2 mm (n=8, r:3.0-6.5, $\mu=4.4\pm1.5$). Terminal filament long in five specimens (63%), short in three (37%).

Peduncle: POL=5 mm (n=7, r:4.0-6.0, $\mu=5.0\pm0.9$). Insertion left (n=4) or right (n=4); with well defined constriction (Figs. 10A, C). Pseudopericulum present in all specimens.

Operculum: OL=1.6 mm (n=7, r:1.2-2.0,

$\mu=1.6\pm0.3$), OD=1.2 mm (n=7, r:0.8-1.5, $\mu=1.2\pm0.3$). Funnel with 29 radii (n=8, r:26-31, $\mu=28.8\pm2.1$) with pointed tips. Interradial grooves 2/5 of funnel length in three opercula, 1/3 in four and 1/4 in one. Verticil with 14 yellow spines (n=8, r:12-17, $\mu=14.0\pm1.9$), straight. All spines similar in shape and size (Figs. 10A-C). Tip of spines T-shaped and flattened (Figs. 10A-C). Spines with one basal internal spinule (Fig. 10B); without external and lateral spinules and/or wings. Verticil without central tooth (Fig. 10B).

Collar chaetae: bayonet chaetae with two pointed-elongate (Fig. 10D) to blunt-elongate teeth (Fig. 10E), distal blade smooth; hooded (capillary) chaetae present (Fig. 10F).

Thorax: THL=3.5 mm (n=8, r:3.0-5.0, $\mu=3.5\pm0.7$), THW=1.4 mm (n=8, r:0.9-1.8, $\mu=1.4\pm0.3$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 10G) of two sizes, saw-shaped uncini (Figs. 10H, I).

Abdomen: with 80 (n=3, r:75-90, $\mu=80.1\pm8.4$) chaetigers. Anterior and middle abdominal

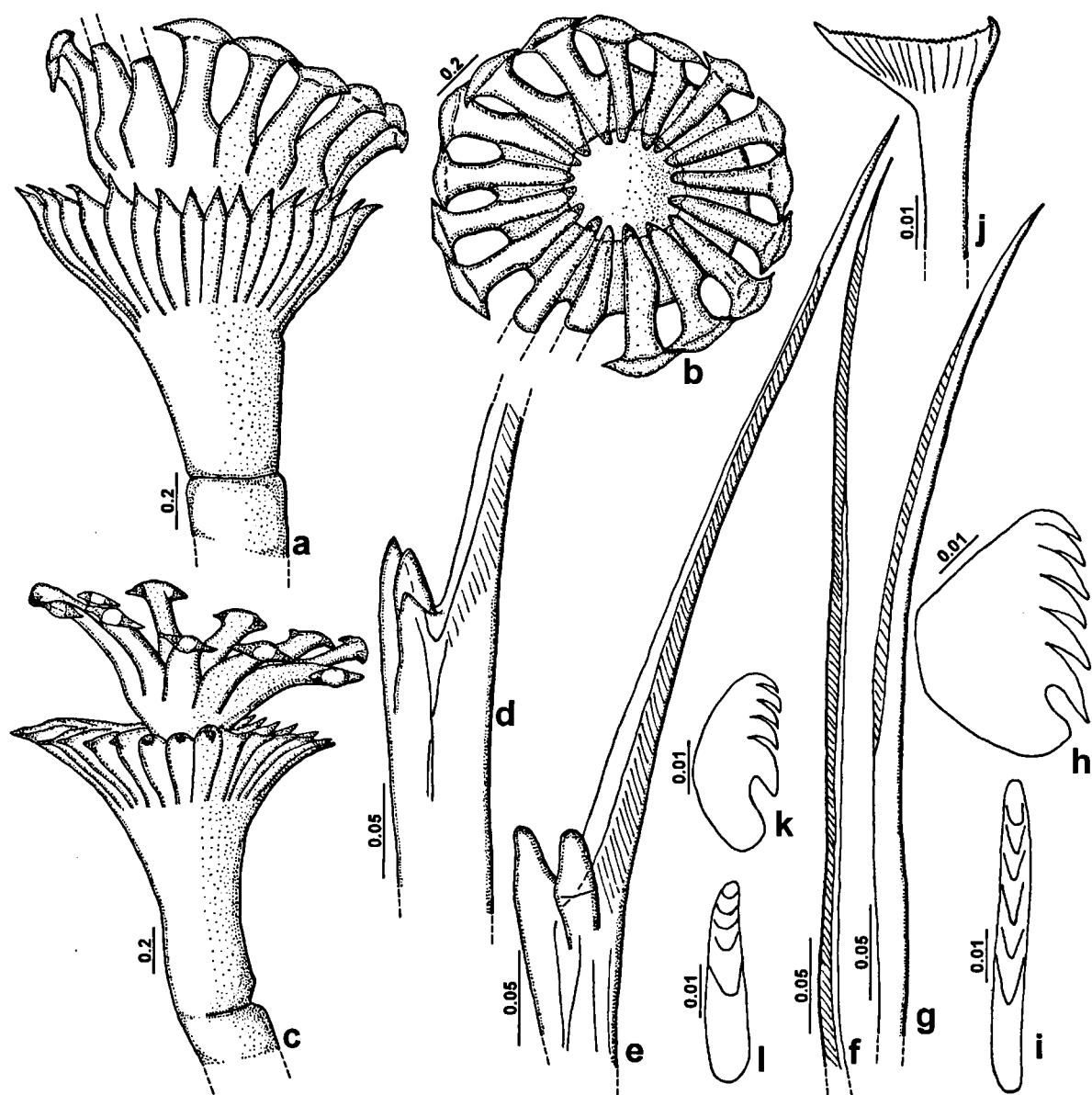


Fig. 10. *Hydroides diramphus*. A-B: from Baja California Sur, BZ-pc, operculum, lateral and apical view. C: from Hawaii, LACM-AHF N5044, operculum, lateral view. D-L: from Baja California Sur, BZ-pc: D-E, bayonet chaetae, lateral and frontolateral view. F, hooded (capillary) chaeta. G, thoracic hooded (limbate) chaeta. H-I, thoracic uncini. J, anterior abdominal flat-trumpet chaeta. K-L, anterior abdominal uncini.

chaetigers with flat-trumpet chaetae (Fig. 10J). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Figs. 10K, L), posterior uncini rasp-shaped.

HABITAT. - Depth: 0-1 m, rocks on sandy bottom; fouling.

DISTRIBUTION. - California to Baja California Sur, Hawaii (Fig. 14). Circum(sub)tropical (e.g.

Zibrowius, 1971).

REMARKS. - Specimens of *H. diramphus* from the Eastern Pacific are not different morphologically from Western Atlantic specimens.

TAXONOMIC REMARKS - Zibrowius (1971) revised material from many localities around the world, in tropical and temperate waters, and synonymized with *H. diramphus* all forms that have

verticil spines with distal laterally expanded tips: *Hydroides cumingii* Mörch, 1863, *H. lunulifer* (Claparède, 1870), *H. serratus* (Bush, 1910), and *H. malleophorus* Rioja, 1942. However, Zibrowius (1971) did not study material of the type locality of *H. malleophorus* (Mazatlán), and description and drawings by Rioja (1942: 126-130, figs. 7-14) indicate some differences with *H. dirampha*: fewer verticil spines, seven vs. (10)12-17, tips with a middle split, and radii apparently larger and fewer (12-15 vs. 26-31) than in *H. diramphus*. The type material of *H. malleophorus* is lost (Salazar-Vallejo, 1989b) and specimens from the type locality are not available to us. Until topotypical material becomes available, we therefore regard *H. malleophorus* as a questionable synonym of *H. dirampha*.

***Hydroides elegans* (Haswell, 1883)**

Figs. 11A-S

Eupomatus elegans Haswell, 1883: 633, Pl. 12, fig. 1; 1885: 660-662, Pl. 31, figs. 1-4, Pl. 32, figs. 11-12, Pl. 33, figs. 1-6. Type locality: Port Jackson, Australia.

Hydroides norvegica (non Gunnerus); Edmondson & Ingram, 1939: 3-16 (Pearl Harbor, material studied); Hartman, 1966: 237-238 (same).

Hydroides elegans; Zibrowius, 1971: 721-725 (extensive discussion); Bailey-Brock, 1987: 420-421, fig. 3.II.192 (Hawaii); Bastida-Zavala & Ten Hove, 2003: 164-167 (diagnosis of Caribbean specimens).

Hydroides pacificus Hartman, 1969: 759-760, figs. 1-5 (South California).

MATERIAL. - 15 'adult' and three 'juvenile' specimens.

CALIFORNIA: CAS 010011, 7 specimens (Marina del Rey, Santa Monica Bay, fouling, 16-IX-1972); LACM-AHF 1454-42, holotype and 3 paratypes of *H. pacificus* (6-VIII-1942, Velero IV sta. 1454-42, from hull of ship); LACM-AHF N1926, 5 specimens (Newport Bay, 11-X-1942, legit T. & E. Burch, among algae and bryozoans; as *Eupomatus gracilis*); LACM-AHF N8796 (Mare Island, San Francisco, U.S. Sub N-1 Narwhal, fouling, 8-12-1929); LACM-AHF s.n. (Long Beach, Downtown Marina, 30-VIII-2000, LH-00-358).

HAWAIIAN ISLANDS: AMNH 2376, not studied in detail (Oahu, Kaneohe Bay, 3-III-1936, det. A.L. Treadwell: *Hydroides norvegicus*).

DESCRIPTION. - Tube: white, ID=1.1 mm (n=14, r:(0.8)0.8-1.4, $\mu=1.1\pm 0.2$), ED=1.3 mm (n=14,

r:(1.0)1.0-1.5, $\mu=1.3\pm 0.1$); some tubes fragmentary and/or covered by epibionts; eight tubes have peristomes, lacking in five; all specimens have transversal ridges; three specimens show two longitudinal ridges, lacking in ten.

Colour and size: body pale yellow. TL=19.0 mm (n=11, r:(14.0)14.0-23.5, $\mu=19.0\pm 2.7$).

Branchial crown: with 12 radioles (n=15, r:(8)8-16, $\mu=11.8\pm 2.2$) left, and 12 right (n=15, r:(6)8-15, $\mu=11.5\pm 2.5$). RL=3.4 mm (n=13, r:(2.3)2.5-4.0, $\mu=3.4\pm 0.5$). Terminal filament long in one specimen (8%), short in 11 (92%).

Peduncle: POL=4.4 mm (n=12, r:(3.2)3.6-5.7, $\mu=4.4\pm 0.6$). Insertion left (n=5, 33%) or right (n=10, 67%); with very ill-defined constriction. Pseudoperculum present in 13 specimens (87%), not found in two (13%).

Operculum: OL=1.3 mm (n=11, r:(1.0)1.0-1.7, $\mu=1.3\pm 0.2$), OD=0.9 mm (n=12, r:(0.7)0.7-1.2, $\mu=0.9\pm 0.1$). Funnel with 27 radii (n=15, r:(21)21-35, $\mu=27.4\pm 4.0$) with blunt tips. Interradial grooves 1/2 of funnel length in four opercula, 2/5 in four and 1/3 in four. Verticil with 13 yellow to hyaline spines (n=14, r:(11-22)11-18, $\mu=13.5\pm 1.9$), straight. All spines similar in shape and size (Figs. 11A, C), with pointed tip (Figs. 11A, C, D). Spines with one to four internal spinules (Figs. 11A-D) and two to five pairs of lateral spinules (Figs. 11A-D); without external spinules or wings. Verticil with central tooth of variable shape and with numerous spinules (Figs. 11A-I).

Collar chaetae: bayonet chaetae with two to four pointed-short teeth and proximal rasp (Figs. 11J, K), distal blade with many denticles; hooded (capillary) chaetae present (Fig. 11L).

Thorax: THL=3.3 mm (n=12, r:(2.5)2.5-4.2, $\mu=3.3\pm 0.6$), THW=0.9 mm (n=12, r:(0.5)0.7-1.3, $\mu=0.9\pm 0.2$). Thoracic membranes small. Six chaetigers with hooded (limbate) chaetae of two sizes (Figs. 11M, N), saw-shaped uncini (Fig. 11O).

Abdomen: with 47 (n=11, r:(42)42-51, $\mu=46.9\pm 3.1$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 11P). Posterior chaetigers with 'capillary' chaetae. Anterior and posterior uncini saw-shaped (Figs. 11Q-S).

HABITAT. - Depth: 0-1 m; fouling on ships and piers.

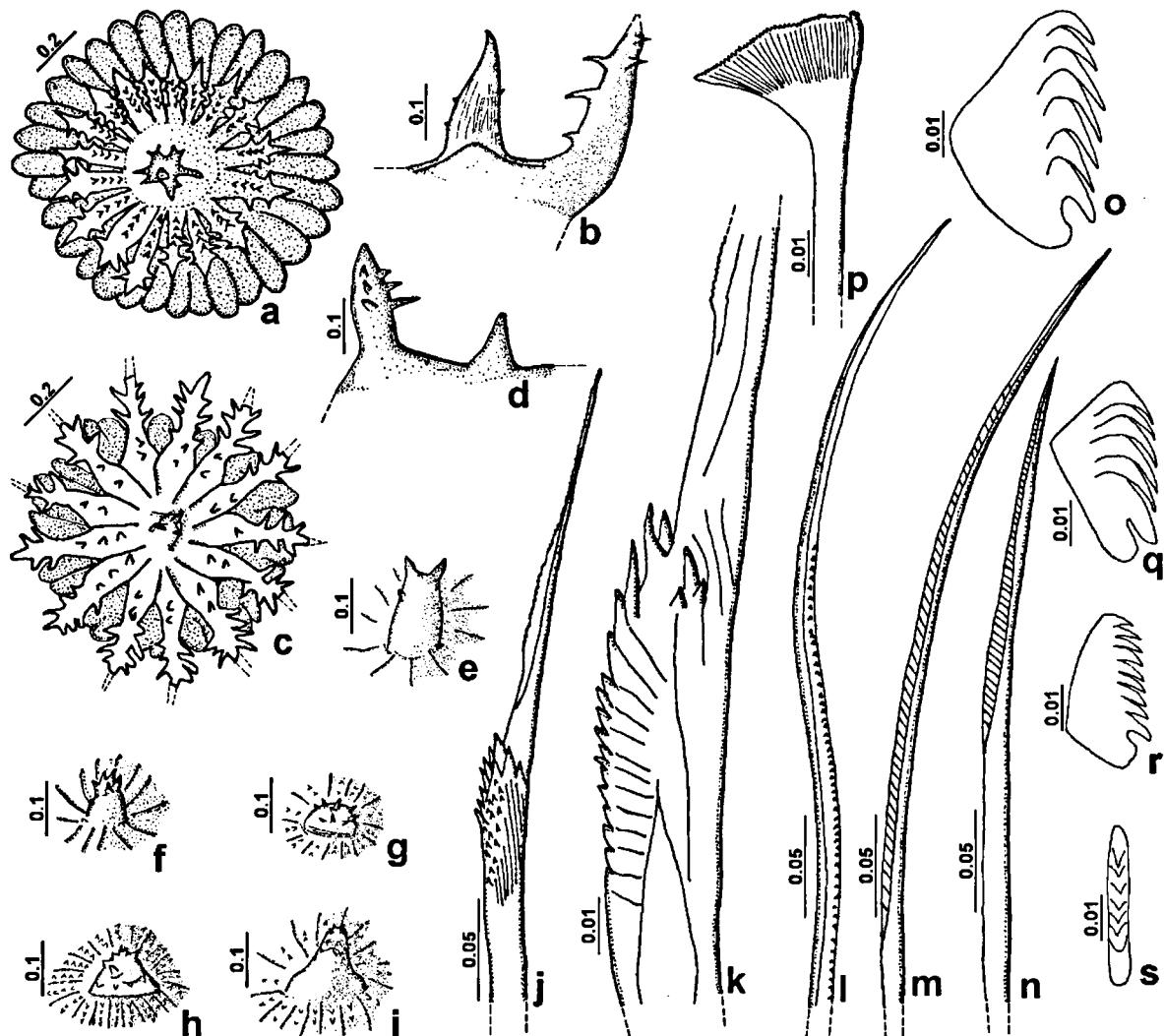


Fig. 11. *Hydroides elegans*, from California, LACM-AHF 145442. A, operculum, apical view. B, central tooth of other specimen, lateral view. CAS 010011: C, operculum, apical view. D-I, central tooth of other specimens. J-K, bayonet chaeta and detail. L, hooded (capillary) chaeta. M-N, thoracic hooded (limbate) chaetae. O, thoracic uncinus. P, anterior abdominal flat-trumpet chaeta. Q, anterior abdominal uncinus. R-S, posterior abdominal uncini.

DISTRIBUTION. - California and Hawaii (Fig. 14). Circum(sub)tropical (e.g. Zibrowius, 1971).

REMARKS. - Specimens of *H. elegans* from the Eastern Pacific are morphologically very similar to those from the Western Atlantic, except for the total length: Californian specimens are twice as large ($n=11$, $r:14.0-23.5$ mm, $\mu=19.0$) than those from the Caribbean and Gulf of Mexico ($n=5$, $r:4.5-13.3$, $\mu=8.5$). All specimens ($n=18$) studied from the Eastern Pacific have a central tooth (Figs. 11A-I), as opposed to only one specimen out of 14 with a central tooth from the Western

Atlantic (Bastida-Zavala & Ten Hove, 2003, Figs. 35D, E).

***Hydroides gairacensis* Augener, 1934**

Hydroides (Eupomatus) gairacensis Augener, 1934: 117, figs. 20a-c. Type locality: Gairaca, Santa Marta, Colombia; material studied.

Hydroides uncinata (non Philippi); Monro, 1933: 1082 (text-fig. 25, Panama).

Hydroides gairacensis; Zibrowius, 1969: 366-376 (revision, Colombia, Mexican Caribbean,

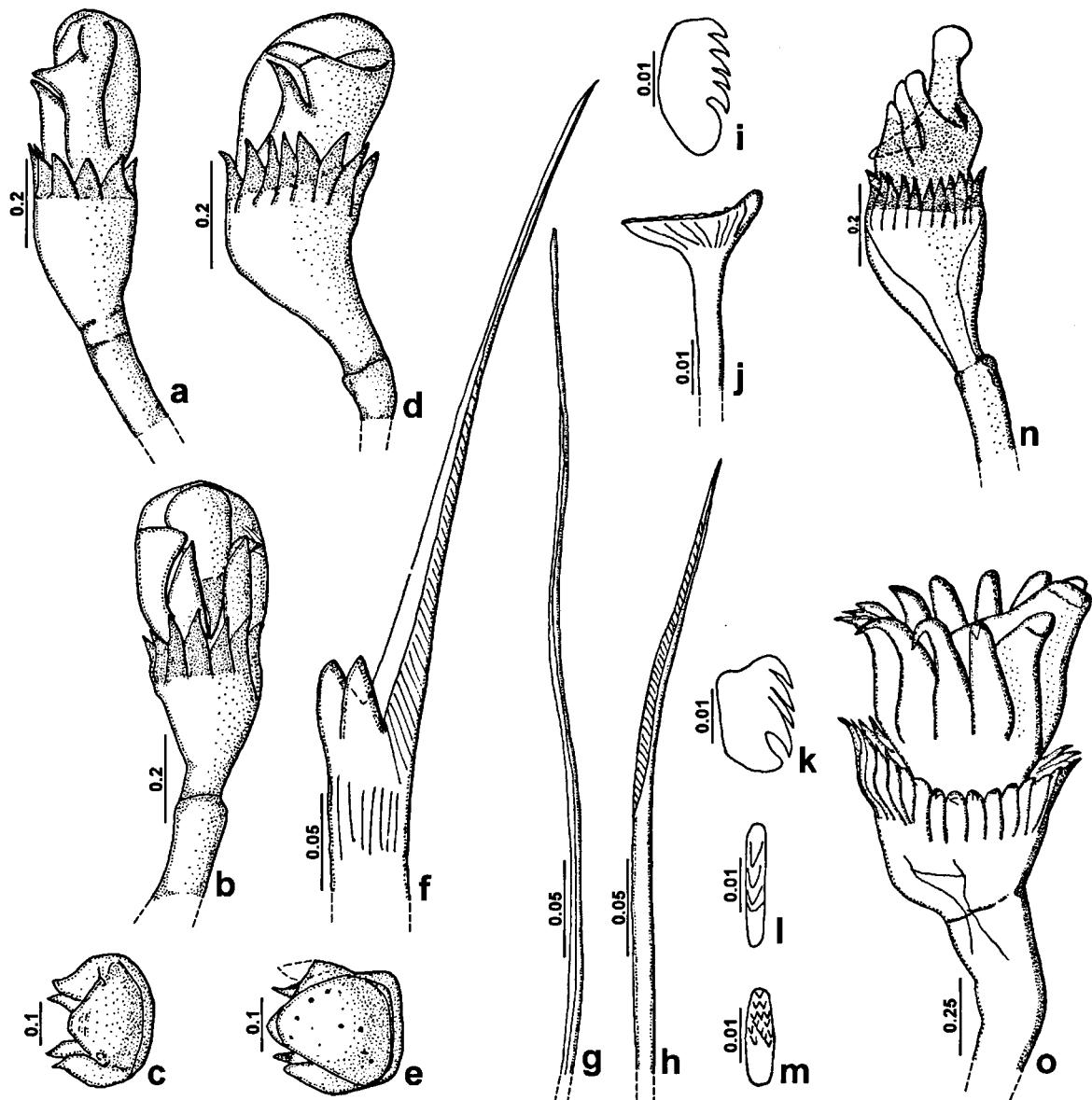


Fig. 12. A-M: *Hydroides glandifer*. A-C: from Jalisco, BZ-pc, operculum, lateral, ventral and apical view. D-M: from Baja California Sur, BZ-pc: D-E, operculum, lateral and apical view. F, bayonet chaeta. G, hooded (capillary) chaeta. H, thoracic hooded (limbate) chaeta. I, thoracic uncinus. J, anterior abdominal flat-trumpet chaeta. K-L, anterior abdominal uncini. M, posterior abdominal uncinus. N: *H. salazarrallejoi*, from the Caribbean, MNHN s.n., operculum, lateral view. O: *H. tenhovei*, from Baja California Sur, ECOSUR Serp-34, operculum, lateral view.

Southern Brazil, Pacific of Panama); Bastida-Zavala & Ten Hove, 2003: 129-132 (diagnosis).

MATERIAL. - ECUADOR: USNM 98401, not studied in detail (N of Guayaquil, 02°11'28"S 80°56'31"W, 8-9 m, dive, 8-V-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 6670).

HABITAT. - Depth: 2-9 m, on dead coral.

DISTRIBUTION. - Amphiamerican. Panama, Ecuador (Fig. 14); Caribbean Sea south to Brazil.

REMARKS. - This species is most probably a Caribbean taxon. The only literature record from Pacific Panama, by Monro (1933, as *H. uncinata*) has been confirmed by Zibrowius (1969). Several years ago one of us (HAtH) identified the speci-

men from Ecuador mentioned above, it had six verticil spines twisted clockwise and 14 radii with typical T-shaped tips. See 'Taxonomic remarks' of *H. trompi* n. sp.

Hydroides glandifer Rioja, 1941

Figs. 12A-M

Hydroides glandiferum Rioja, 1941a: 172-174, Pl. 4, figs. 10-14. Type locality: Acapulco (Guerrero), Mexico.

Olgaharmania glandifera; Rioja, 1941b: 733-734 (new genus); Salazar-Vallejo, 1989b: 55-56.

Olgaharmania sp. Bastida-Zavala, 1995: 25 (Cabo Pulmo reef, Gulf of California).

Hydroides glandifer, Bastida-Zavala & De León-González, 2002: 393-394.

MATERIAL. - Four 'adult' specimens.

BAJA CALIFORNIA SUR: BZ-pc (Cabo Pulmo reef, second bar, on dead coral *Pocillopora* sp., 7 m, 8-V-1989, legit P. Hernández, J. Ketchum & J.R. Bastida-Zavala); BZ-pc (Cabo Pulmo reef, third bar, on dead coral *Pocillopora* sp., 17 m, 18-IX-1989, legit P. Hernández, J. Ketchum & J.R. Bastida-Zavala); BZ-pc (Cabo Palmo reef, second bar, on dead coral *Pocillopora* sp., 4 m, 18-IX-1989, legit P. Hernández, J. Ketchum & J.R. Bastida-Zavala).

JALISCO: BZ-pc (Punta Anita, Bahía Banderas, 15-VII-1990, legit J.C. Pérez-Urbiola).

DESCRIPTION. - Tube: lost.

Colour and size: Body pale yellow. TL=11.8 mm (n=2, r:7.5-18.5, $\mu=11.8\pm7.8$).

Branchial crown: with seven radioles (n=3, r:4-11, $\mu=7.3\pm3.6$) left, and eight right (n=4, r:5-10, $\mu=8.0\pm2.2$). RL=1.5 mm (n=4, r:0.7-2.0, $\mu=1.5\pm0.6$). Terminal filament very long in one specimen (33%) and short in two (67%).

Peduncle: POL=1.8 mm (n=4, r:1.0-2.5, $\mu=1.8\pm0.7$). Insertion right (n=4); with well defined constriction (Figs. 12A, B, D). Pseudoperculum present in all specimens.

Operculum: OL=0.8 mm (n=4, r:0.5-1.0, $\mu=0.8\pm0.2$), OD=0.3 mm (n=4, r:0.2-0.3, $\mu=0.3\pm0.05$). Funnel with 15 radii (n=4, r:12-17, $\mu=15.1\pm2.2$) with pointed tips. Interradial grooves 2/4 of funnel length in two opercula, 1/3 in one and 1/5 in one. Verticil with five black spines (n=4, r:5, $\mu=5.0\pm0.0$). The most dorsal spine bigger than the rest, with a distal section strongly curving inwards (Figs. 12A, B, D); the

rest of spines basally fused to the dorsal most (Figs. 12A, D), with pointed tip (Figs. 12A, B, D). Spines without internal, external, lateral spinules and/or wings. Verticil without central tooth (Figs. 12C, E).

Collar chaetae: bayonet chaetae with two blunt-elongate teeth, distal blade smooth (Fig. 12F); hooded (capillary) chaetae present (Fig. 12G).

Thorax: THL=1.7 mm (n=4, r:1.2-2.5, $\mu=1.7\pm0.6$), THW=0.5 mm (n=4, r:0.4-0.7, $\mu=0.5\pm0.1$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 12H) of two sizes, saw-shaped uncini (Fig. 12I).

Abdomen: with 93 (n=2, r:89-97, $\mu=92.9\pm5.7$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 12J). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Figs. 12K, L), posterior uncini rasp-shaped (Fig. 12M).

HABITAT. - Depth: 4-17 m, on dead coral *Pocillopora* sp.

DISTRIBUTION. - Baja California Sur to Acapulco, Guerrero (Fig. 14).

TAXONOMIC REMARKS. - At first sight *H. glandifer* is similar to *H. salazarvallejoi*. Differences can be found in funnel radii: 12-17 ($\mu=15$) almost black ones in *H. glandifer*, 14-24 ($\mu=18$) yellow to brown ones in *H. salazarvallejoi*. The dorsal hook is convex in the first, concave in the latter; remaining verticil spines lack an internal spinule and have pointed tips in *H. glandifer* (Figs. 12A, B, D), show an internal spinule and are blunt in *H. salazarvallejoi* (Fig. 12N). See comparison between both species in Bastida-Zavala & Ten Hove (2003, table 5).

Hydroides gracilis (Bush, 1905)

Figs. 13A-V

Eupomatus gracilis Bush, 1905: 234-235, Pl. 27, fig. 9, Pl. 34, fig. 25, Pl. 37, figs. 26-27. Type locality: Pacific Grove, California, United States.

Eupomatus intereans Chamberlin, 1919: 23; Zibrowius, 1971: 694 (synonymized).

Hydroides uncinata (non Philippi); Berkeley &

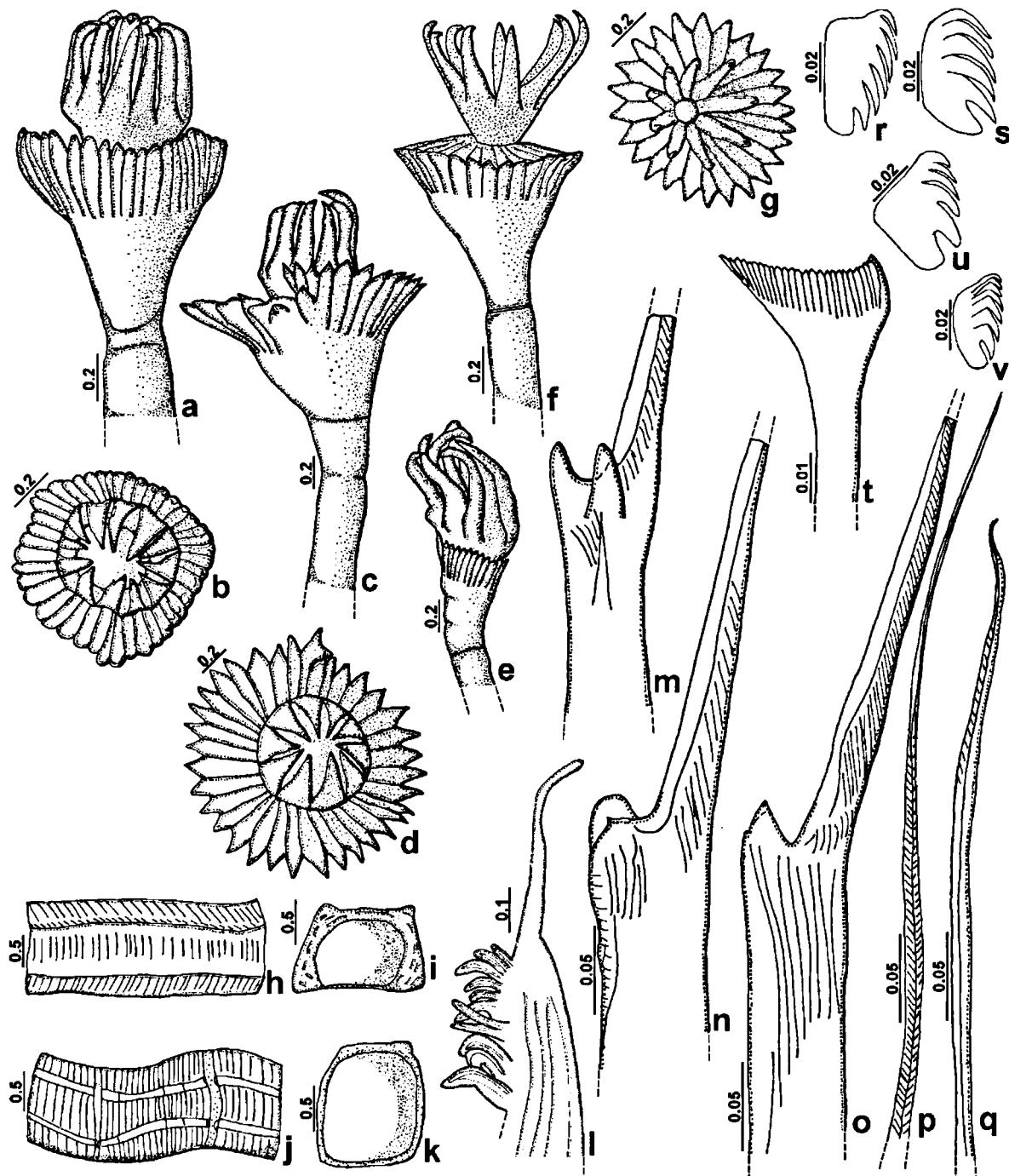


Fig. 13. *Hydroides gracilis*, from California. A-B: LACM-AHF s.n., operculum, lateral and apical view. C-E: LACM-AHF N1874. C-D, left operculum, lateral and apical view. E, right operculum, lateral view. F-V: LACM-AHF N1875. F-G, operculum, lateral and apical view. H-K, tubes, from above and cross-section. L, tip of radiole. M-O, bayonet chaetae, fronto-lateral and lateral view. P, hooded (capillary) chaeta. Q, thoracic hooded (limbate) chaeta. R-S, thoracic uncini. T, anterior abdominal flat-trumpet chaeta. U-V, anterior and posterior abdominal uncini.

Berkeley, 1941: 56 (southern California); 1958: 405 (Bahía Tortugas, Baja California Sur); both records are *H. gracilis* fide Zibrowius, 1971: 695.

Hydroides gracilis (Bush, 1905); Zibrowius, 1971: 694-695 (discussion).

MATERIAL. - Nine 'adult' and nine 'juvenile' specimens.

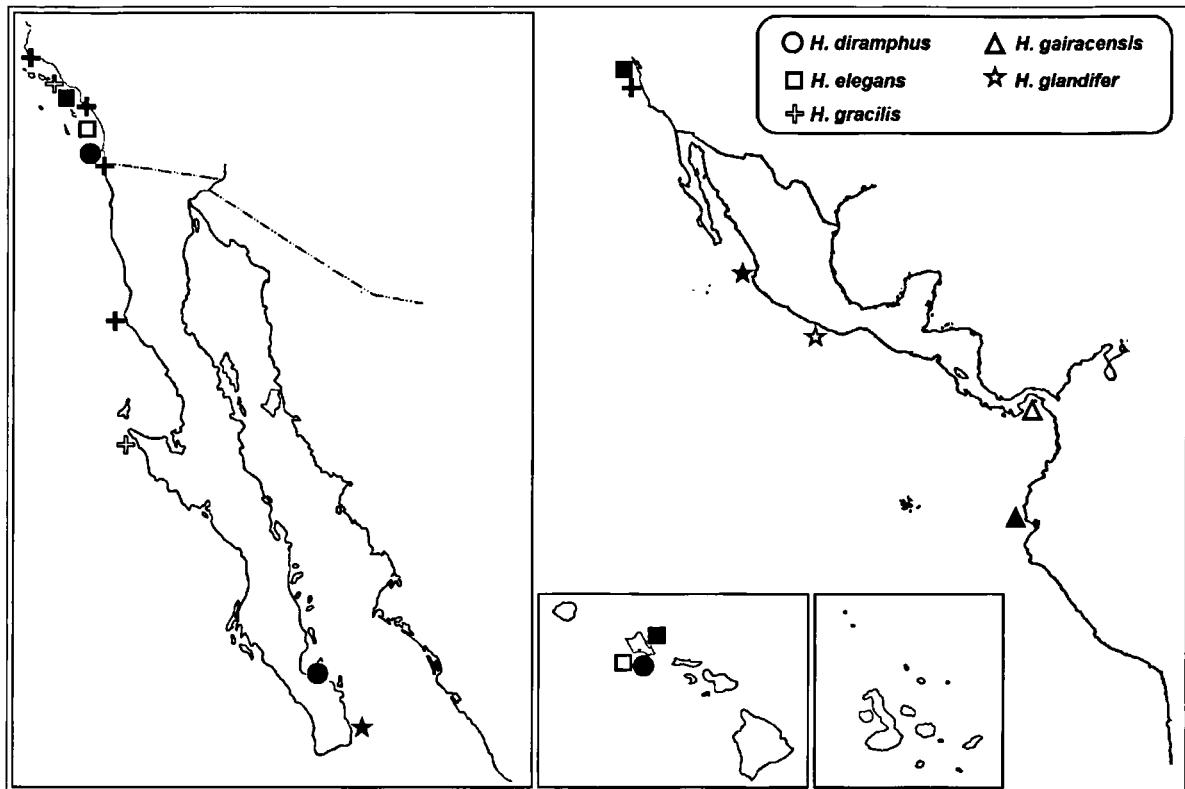


Fig. 14. Distribution of *Hydroides diramphus*, *H. elegans*, *H. gairacensis*, *H. glandifer* and *H. gracilis*. Closed symbols denote examined material, open symbols literature records.

CALIFORNIA: LACM-AHF N1874, 5 specimens (Point Conception, VII-1933); LACM-AHF N1875, 6 specimens (La Jolla, from aquaculture tanks of, 22-V-1938); LACM-AHF 1218-40, 2 specimens (Laguna Beach, 30-XI-1940); LACM-AHF s.n. (San Diego, Scripps Institution of Oceanography, from lead filter, 5-VIII-1941); YPM 2697, 2 syntypes (Pacific Grove, Monterey Bay, VIII-1901, legit W.R. Coe); ZMA V.Pol. 3867 (Laguna Beach, 12-VI-1935, on colony of vermetid *Aletes* sp.).

BAJA CALIFORNIA: ZMA V.Pol. 3701, 2 specimens (Bahía de Rosario, from large Trochidae, brought ashore by fishermen collecting Echinoidea, 14-VIII-1989, legit H.A. Ten Hove).

DESCRIPTION. - Tube: white, ID=1.3 mm (n=3, r:(0.8)1.0-1.8, $\mu=1.3\pm0.4$), ED=1.8 mm (n=3, r:(0.9)1.3-2.5, $\mu=1.8\pm0.6$); most tubes are fragmentary; one tube has peristomes, lacking in two; three specimens have transversal ridges and all show two longitudinal ridges (Figs. 13H, J). The wall of the tube is thick or thin, and the mouth is circular to quadrangular (Figs. 13I, K).

Colour and size: body pale yellow to light brown. TL=18.7 mm (n=6, r:(7.5)13.2-28.5, $\mu=18.7\pm5.7$).

Branchial crown: with 14 radioles (n=9, r:(8)12-18, $\mu=14.1\pm2.2$) left, and 14 right (n=9, r:(8)11-19, $\mu=14.4\pm2.7$). RL=3 mm (n=9, r:(1.2)2.0-4.5, $\mu=3.0\pm1.0$). Terminal filament very long (Fig. 13L) in three specimens (33%) and long in six (67%).

Peduncle: POL=3.8 mm (n=10, r:(2.0)2.0-5.0, $\mu=3.8\pm1.1$). Insertion left (n=4, 44%), right (n=4, 44%), or at both sides (n=1, 12%); with shallow (Figs. 13C, E, F) to well defined constriction (Fig. 13A). Pseudoperculum present in all specimens.

Operculum: OL=1.8 mm (n=10, r:(1.0)1.4-2.3, $\mu=1.8\pm0.3$), OD=1.0 mm (n=10, r:(0.5)0.5-1.5, $\mu=1.0\pm0.3$). Funnel with 30 radii (n=10, r:(16)16-42, $\mu=30.0\pm6.9$) with pointed tips (Figs. 13C, D, F, G), except one specimen with blunt tips (Figs. 13A, B). Interradial grooves 1/2 of funnel length in one operculum, 2/5 in five and 1/3 in four. Verticil with 11 yellow spines (n=10, r:(8)9-12, $\mu=10.7\pm0.9$), curving inwards. All spines similar in shape and size (Figs. 13A, C, F), with pointed tip (Fig. 13F); dorsal spines may be slightly larger. Spines without internal, external or lateral spin-

ules, or wings (Figs. 13A-G). Verticil without central tooth (Figs. 13B, D, G).

Collar chaetae: bayonet chaetae with two blunt-elongate (Fig. 13M), rounded-short (Fig. 13N) or pointed-short (Fig. 13O) teeth, distal blade smooth; hooded (capillary) chaetae present (Fig. 13P).

Thorax: THL=3.5 mm (n=9, r:(1.7)2.5-6.0, $\mu=3.5\pm1.1$), THW=1.3 mm (n=9, r:(0.6)1.0-1.9, $\mu=1.3\pm0.3$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 13Q) of two sizes, saw-shaped uncini (Figs. 13R, S).

Abdomen: with 90 (n=6, r:(51)52-138, $\mu=89.6\pm33.7$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 13T). Posterior chaetigers with ‘capillary’ chaetae. Anterior and posterior uncini saw-shaped (Figs. 13U,V).

HABITAT. - Depth: 0-5 m, on rocks, on gastropod shell and in aquaculture tanks.

DISTRIBUTION. - Monterey Bay, California to Bahía Tortugas, Baja California Sur (Fig. 14).

REMARKS. - One specimen has a clearly damaged left operculum, with a funnel with a split area (Figs. 13C, D), and a soft, irregular and not yet fully grown right operculum (Fig. 13E).

TAXONOMIC REMARKS. - Most *Hydroides gracilis* specimens have verticil spines of the same size, but some specimens have two or three dorsal spines slightly bigger than the others (Figs. 13C, F) like in *H. similis*; however, *H. gracilis* has ventral spines without knob and without basal internal spinule (Figs. 13A, C, F, G), while *H. similis* shows a conspicuous knob in the ventral spines and a basal internal spinule (Figs. 21A-D).

***Hydroides humilis* (Bush, 1905)**

Figs. 15A-I

Eupomatus humilis Bush, 1905: 235-236, Pl. 39, figs. 39-40, Pl. 44, fig. 22. Type locality: Guaymas, Sonora, Gulf of California.

MATERIAL. - Ten ‘adult’ specimens.

?BAJA CALIFORNIA: ZMA V.Pol. 3695, 4 specimens (29°N 113°30'W, La Gringa, Bahía de Los Angeles, cobbles on sand, scarce coral and sponges, 2-3 m deep at low tide, 13-VIII-1989, legit H.A. Ten Hove).

?GUERRERO: ECOSUR Serp-39, 2 specimens (Playa Condesa, Acapulco, on rock oysters, 27-XI-1999, legit S.I. Salazar-Vallejo).

PANAMA: ZMA V.Pol. 3632, 2 specimens (Paitilla Beach, 28-X-1970, legit A.A. Reimer);

PACIFIC: ZMA V.Pol. 5079, 2 specimens (unknown locality, on mangrove oysters, *Ostrea iridescens* Hanley, 1864 and *O. columbiensis* (Hanley, 1864), together with *Pomatoceros minutus* Rioja, 1941 and *Ficopomatus miamicensis* (Treadwell, 1934), presumably from A.A. Reimer’s ‘Panama Pacific Collection’ or D. Straughan’s ‘Costa Rica mangrove swamp’).

DESCRIPTION. - Tube: white, ID=0.4 mm (n=7, r:0.2-0.7, $\mu=0.4\pm0.2$), ED=0.5 mm (n=7, r:0.4-1.0, $\mu=0.5\pm0.2$); most tubes are fragmentary; all tubes lack peristomes; all have transversal ridges; one tube shows three longitudinal ridges, two show two and two none.

Colour and size: body pale yellow to light brown. TL=3.7 mm (n=7, r:2.5-6.5, $\mu=3.7\pm1.7$).

Branchial crown: with five radioles (n=10, r:4-8, $\mu=4.9\pm1.2$) left, and five right (n=10, r:4-7, $\mu=4.9\pm0.7$). RL=0.9 mm (n=9, r:0.6-1.5, $\mu=0.9\pm0.4$). Terminal filament long in six specimens and short in four.

Peduncle: POL=1.0 mm (n=10, r:0.5-1.5, $\mu=1.0\pm0.3$). Insertion left (n=3) or right (n=7); with very ill-defined constriction (Figs. 15A, G, I). Pseudoperculum present in all specimens.

Operculum: OL=0.4 mm (n=10, r:0.3-0.5, $\mu=0.4\pm0.1$), OD=0.2 mm (n=10, r:0.2-0.5, $\mu=0.2\pm0.1$). Funnel with 16 radii (n=10, r:12-20, $\mu=16.2\pm2.2$) with pointed tips (Figs. 15A, B, G). Interradial grooves 1/2 of funnel length in one operculum, 2/5 in one, 1/3 in four and 1/5 in four. Verticil with eight yellow spines (n=10, r:7-10, $\mu=8.4\pm1.0$), curving outwards or straight. All spines similar in shape and size (Figs. 15A, B, G), maybe sometimes with a dorsal hook (Fig. 15I), with pointed (Figs. 15A, B) or maybe blunt tip (Fig. 15G). Spines without internal, external or lateral spinules, or wings (Figs. 15A, B, G, I). Verticil without central tooth (Fig. 15B).

Collar chaetae: bayonet chaetae with two blunt-elongate (Fig. 15C) to pointed-elongate (Fig. 15H) teeth, maybe with proximal rasp (Fig. 15H), distal blade with small denticles (Figs. 15C, H); hooded (capillary) chaetae present.

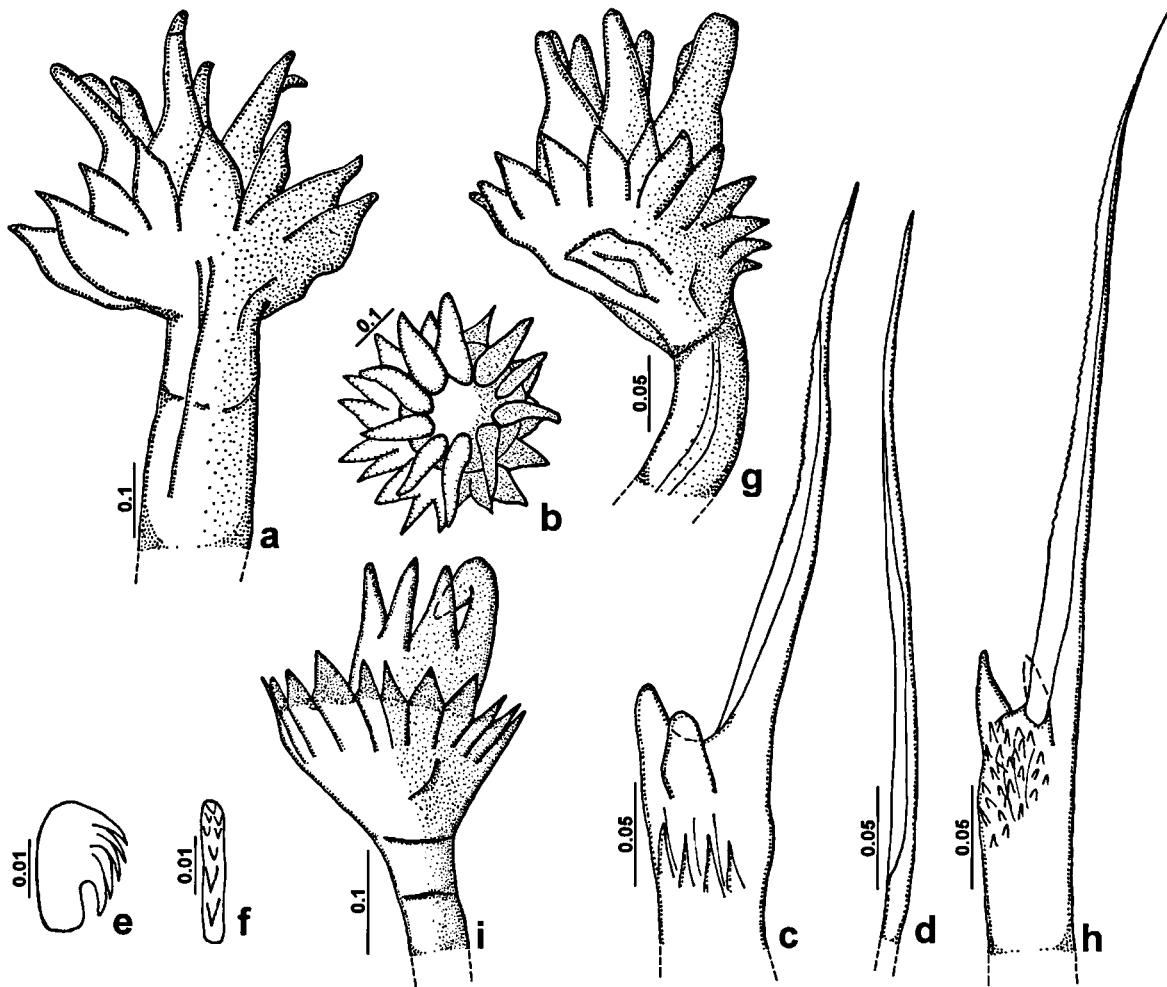


Fig. 15. A-F: *Hydroides humilis*, from Panama, ZMA V.Pol. 3632. A-B, operculum, lateral and apical view. C, bayonet chaeta. D, hooded (capillary) chaeta. E-F, anterior abdominal uncini. G-I: *Hydroides?* *humilis*. from Baja California, ZMA V.Pol. 3695. G, operculum, lateral view. H, bayonet chaeta. I, other operculum, lateral view.

Thorax: THL=0.9 mm ($n=9$, $r:0.7-1.7$, $\mu=0.9 \pm 0.3$), THW=0.2 mm ($n=9$, $r:0.2-0.3$, $\mu=0.2 \pm 0.04$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 15D) of two sizes, saw-shaped uncini (Fig. 15E).

Abdomen: with 27 ($n=6$, $r:23-32$, $\mu=26.8 \pm 3.3$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae. Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped, posterior uncini rasp- to saw-shaped (Fig. 15F).

HABITAT. - Depth: 2-3 m, on mangrove oysters and cobbles on sand.

DISTRIBUTION. - Bahía de los Angeles, Baja

California to Panama (Fig. 20).

TAXONOMIC REMARKS. - The specimens from Baja California (ZMA V.Pol. 3695) have a dorsal spine bigger than the others (Fig. 15G), and in one specimen this dorsal spine has a distal tip curving inwards, as a hook (Fig. 15I), resembling *H. brachyacanthus*. Since the material is very small (THW=0.2-0.3 mm), one cannot entirely exclude the possibility that these specimens are juveniles of *H. brachyacanthus*. Therefore we have included them with a ? in our list of material, and added 'maybe' to the description in those places where this ? material differs from the probably more typical specimens.

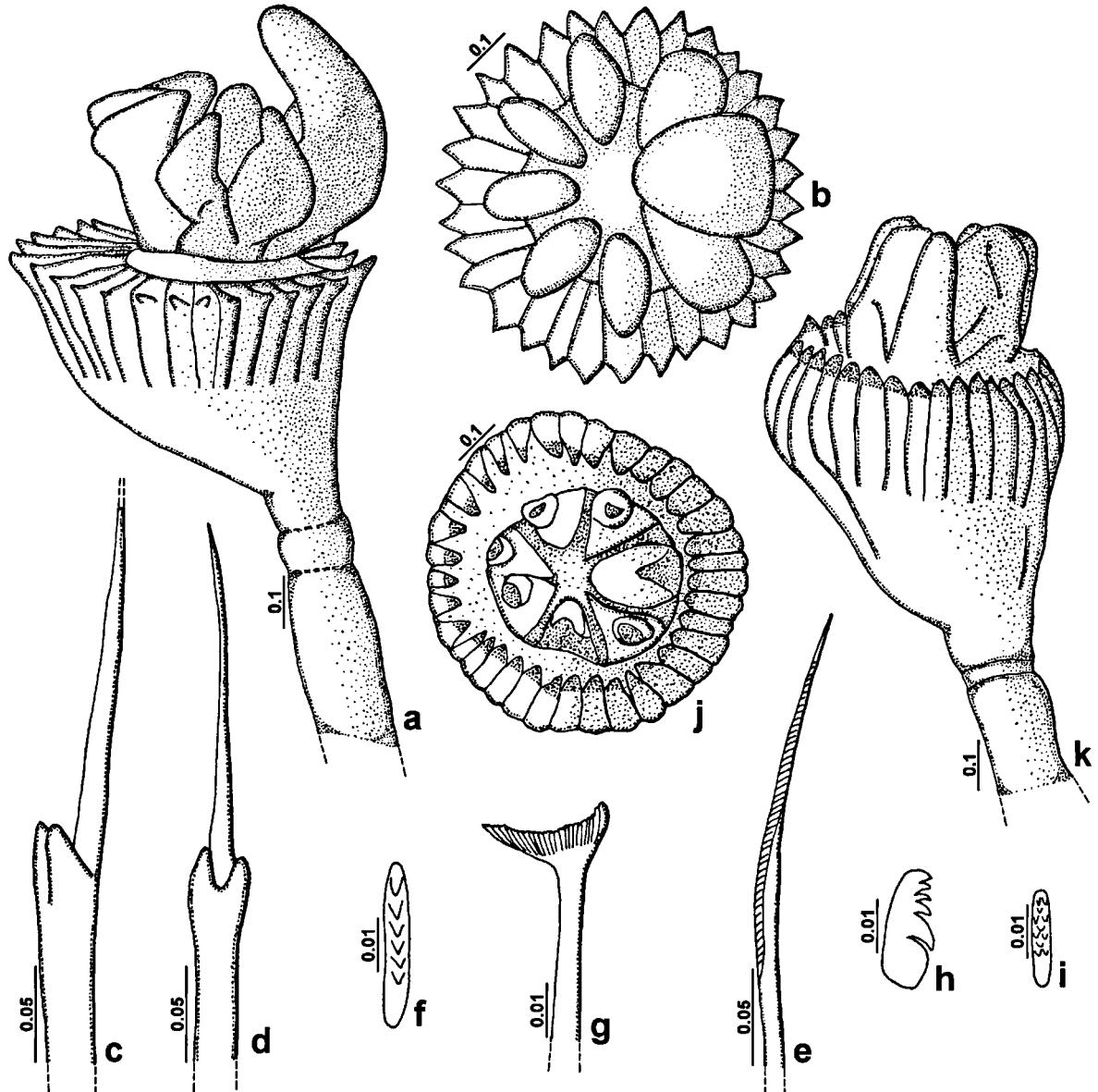


Fig. 16. *Hydroides inermis*, from Galapagos. A-I: ZMA V.Pol. 3087. A-B, operculum, lateral and apical view. C-D, bayonet chaetae, lateral and frontal view. E, thoracic hooded (limbate) chaeta. F, thoracic uncinus. G, anterior abdominal flat-trumpet chaeta. H-I, anterior and posterior abdominal uncinii. J-K: ZMA V.Pol. 3510, operculum, lateral and apical view.

Hydroides inermis Monroe, 1933

Figs. 16A-K

Hydroides inermis Monroe, 1933: 1083-1085, text figs. 27a-e. Type locality: James Bay, James Island, Galapagos.

MATERIAL. - Four 'adult' specimens.

GALAPAGOS: ZMA V.Pol. 3087, syntype (from BMNH 1933.7.10.426-430, James Island, sand and weed, IV/X-1924, 10-12 m, legit C. Crossland, S.Y. St. George); USNM 98404, ZMA V.Pol. 3510, 33 specimens not all studied in

detail (00°15'52"S 91°22'55"W, 1-15 m, 25-V-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 66132); USNM 98402, ZMA V.Pol. 3509, 12 specimens not studied in detail (00°45'11"S 90°18'15"W, 8-10 m, 19-V-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 66112).

PERU: USNM 98407, not studied in detail (04°53'-04°57"S 81°20'-81°23'W, 75-91 m, Otter trawl, 2-VI-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 624-E).

DESCRIPTION. - Tube: white, ID=0.7 mm (n=3, r:0.5-0.8, $\mu=0.7\pm0.2$), ED= 0.8 mm (n=3, r:0.7-

1.0, $\mu=0.8\pm0.2$); all tubes lack peristomes; all have transversal ridges and lack longitudinal ridges.

Colour and size: body pale yellow. TL=11.9 mm (n=4, r:8.2-15.0, $\mu=11.9\pm3.2$).

Branchial crown: with 10 radioles (n=4, r:8-11, $\mu=9.7\pm1.5$) left and 10 right (n=4, r:8-11, $\mu=9.7\pm1.5$). RL=1.9 mm (n=4, r:1.6-2.3, $\mu=1.9\pm0.3$). Terminal filament long in two specimens and short in two.

Peduncle: POL=3.2 mm (n=4, r:2.3-3.6, $\mu=3.2\pm0.6$). Insertion right (n=2) or left (n=2); with well defined constriction (Figs. 16A, K). Pseudoperculum present.

Operculum: OL=0.8 mm (n=4, r:0.7-1.0, $\mu=0.8\pm0.1$), OD=0.6 mm (n=4, r:0.4-0.7, $\mu=0.6\pm0.1$). Funnel with 31 radii (n=4, r:27-35, $\mu=30.9\pm3.4$) with pointed tips. Interradial grooves 2/5 of funnel length in one operculum and 1/3 in three. Verticil with eight yellow spines (n=4, r:7-8, $\mu=7.5\pm0.6$) strongly curving inwards. The most dorsal spine bigger than the others, the rest of the spines similar in shape and size, partially obscuring the central disc (Figs. 16B, J), with blunt tip (Figs. 16A, B, J, K). Internal spinules present in two specimens, absent in the other two; spines without external and lateral spinules and/or wings (Figs. 16A, K). Verticil without central tooth (Figs. 16B, J).

Collar chaetae: bayonet chaetae with two pointed-elongate teeth (Figs. 16C, D), distal blade smooth; hooded (capillary) chaetae present.

Thorax: THL=1.7 mm (n=4, r:1.5-2.0, $\mu=1.7\pm0.2$), THW=0.6 mm (n=4, r:0.5-0.7, $\mu=0.6\pm0.1$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 16E) of two sizes, saw-shaped uncini (Fig. 16F).

Abdomen: with 67 (n=4, r:47-83, $\mu=67.0\pm1.5$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 16G). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Fig. 16H), posterior uncini rasp-shaped (Fig. 16I).

HABITAT. - Depth: 1-91 m.

DISTRIBUTION. - Only known from the Galapagos Islands and N. Peru (Fig. 20).

TAXONOMIC REMARKS. - By its very broad and

blunt, almost valvular, verticil spines *H. inermis* is different from all species from the Eastern Pacific and Atlantic. The operculum superficially resembles *H. brachyacanthus*, but the verticil spines in *H. inermis* have blunt tips (Figs. 16A, K), in *H. brachyacanthus* they are pointed (Figs. 3C, D).

***Hydroides ochoterena* Rioja, 1941**

Figs. 17A-M

Hydroides ochotereana Rioja, 1941a: 164-167, Pl. 2, figs. 1-12, Pl. 3, fig. 1, Pl. 4, fig. 16. Type locality: Acapulco, Guerrero, Mexico.

Hydroides ochotereana; in Zibrowius, 1972: 434-435, 437 (comparison with other species with lateral spinules); Laverde-Castillo, 1988: 89-90 (Bahía Málaga, Pacific Colombia).

MATERIAL - Four 'adult' and four 'juvenile' specimens.

COSTA RICA: LACM-AHF s.n. and ZMA V.Pol. 3857, 4 specimens (Dominical, rock pools, 12-XI-1968, legit D. Straughan).

GALAPAGOS: ZMA V.Pol. 3498, 3 specimens, and 24 spec. USNM, not studied in detail (00°45'11"S 90°18'15"W, 8-10 m, 19-V-1966, Program SEPBOP, R/V Anton Bruun, cruise 16, sta. 66112).

?MEXICAN PACIFIC: ECOSUR Serp-36 (unknown locality, without any data).

DESCRIPTION. - Tube: white, ID=1.1 mm (n=2, r:(0.5)0.8-1.4, $\mu=1.1\pm0.4$), ED=1.7 mm (n=2, r:(0.6)1.2-2.5, $\mu=1.7\pm0.9$); tubes fragmentary; one tube has peristomes, another has transversal ridges, both structures lacking in other tubes; one tube shows three longitudinal ridges, absent in the other tubes.

Colour and size: body pale yellow. TL=12.9 mm (n=3, r:(9.7)9.7-15.3, $\mu=12.9\pm3.0$).

Branchial crown: with nine radioles (n=3, r:(6)8-10, $\mu=9.0\pm1.0$) left, and 10 right (n=3, r:(6)9-10, $\mu=9.7\pm0.6$). RL=2.1 mm (n=3, r:(1.5)2.0-2.2, $\mu=2.1\pm0.1$). Terminal filament long in three specimens.

Peduncle: POL=2.7 mm (n=4, r:(1.7)2.3-3.2, $\mu=2.7\pm0.4$). Insertion left (n=2), or right (n=2); with ill- (Fig. 17A) to shallowly defined constriction (Fig. 17C). Pseudoperculum present in all specimens.

Operculum: OL=1.3 mm (n=4, r:(0.7)1.2-1.5, $\mu=1.3\pm0.1$), OD=0.6 mm (n=4, r:(0.2)0.5-0.7, $\mu=0.6\pm0.1$). Funnel with 29 radii (n=4, r:(15)27-

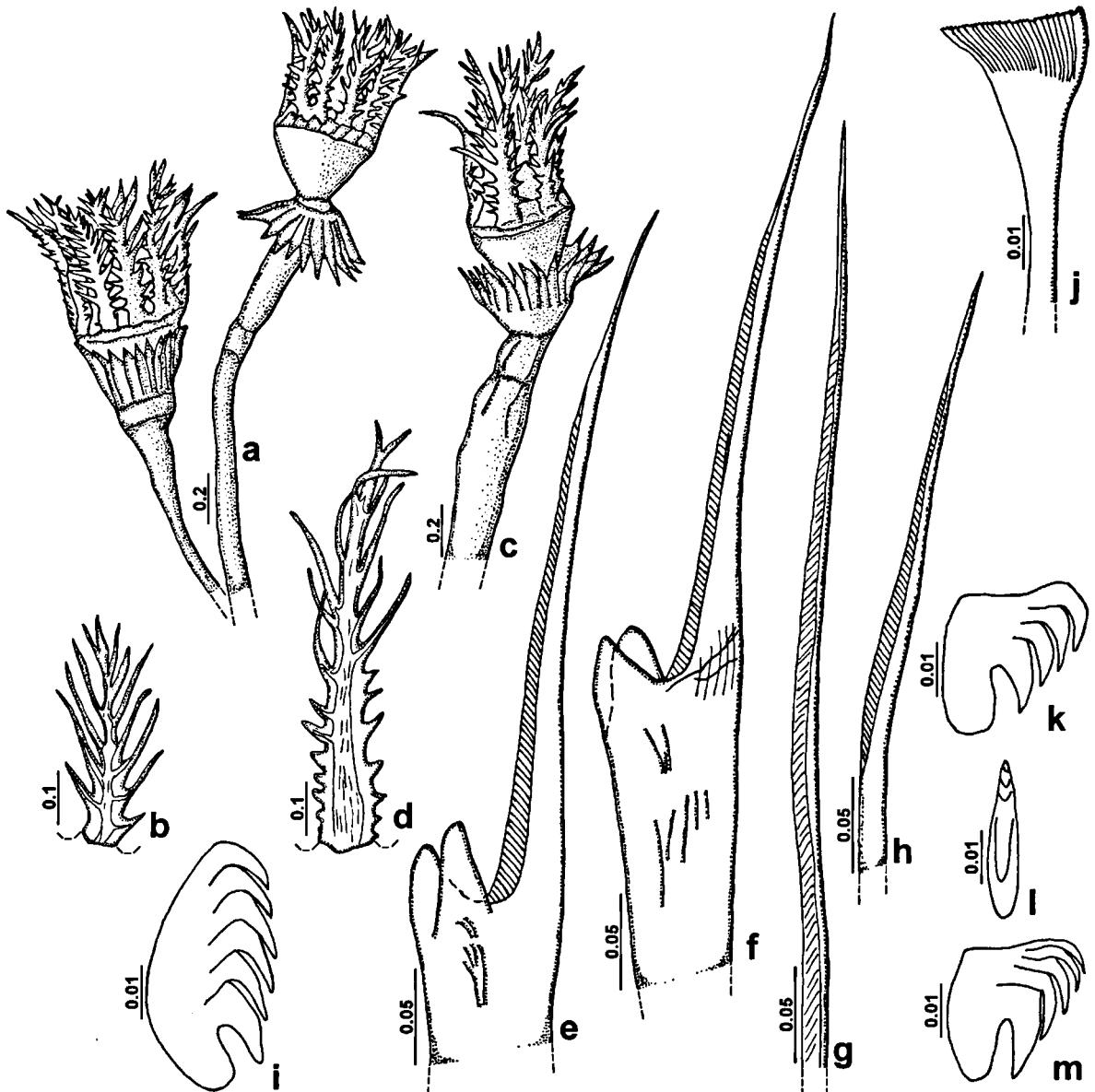


Fig. 17. *Hydroides ochoterena*, from Costa Rica. A-D: LACM-AHF s.n. A-B, opercula, lateral view and detail of spine. C-D, other operculum, lateral view and detail of spine. E-M: ZMA V.Pol. 3857. E-F, bayonet chaetae. G, hooded (capillary) chaeta. H, thoracic hooded (limbate) chaeta. I, thoracic uncinus. J, anterior abdominal flat-trumpet chaeta. K-L, anterior abdominal uncini. M, posterior abdominal uncinus.

32, $\mu=28.9\pm2.4$) with pointed tips. Interradial grooves 1/2 of funnel length in one operculum, 2/5 in two and 1/3 in one. Verticil with 18 yellow spines ($n=4$, $r:(11)16-21$, $\mu=17.9\pm2.2$), straight. All spines similar in shape and size (Figs. 17A, C), with pointed to split tip (Figs. 17A-D). Spines with or without one basal internal spinule (Figs. 17B-D); with 6-20 pairs of lateral spinules (Figs. 17A-D); without external spinules, wings and/or central tooth.

Collar chaetae: bayonet chaetae with two blunt-elongate to blunt-short teeth (Figs. 17E, F), distal blade smooth; hooded (capillary) chaetae present (Fig. 17G).

Thorax: THL=1.8 mm ($n=3$, $r:(1.3)1.5-2.0$, $\mu=1.8\pm0.3$), THW=0.8 mm ($n=3$, $r:(0.3)0.7-0.8$, $\mu=0.8\pm0.1$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 17H) of two sizes, saw-shaped uncini (Fig. 17K).

Abdomen: with 73 (n=4, r:(69)69-81, $\mu=72.9 \pm 5.5$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae. Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Fig. 17L), posterior rasp-shaped uncini (Fig. 17M).

HABITAT. - Depth: 0-10 m, on rocks and shells.

DISTRIBUTION. - Acapulco, Guerrero to Colombia (Fig. 20).

TAXONOMIC REMARKS. - Rioja clearly misspelled the species-group name *ochotereana*, based on the personal name Ochoterena. According to the ICZN art. 32.5 this must be corrected, to *ochoterena*, which is regarded to be a noun in apposition; therefore the gender-ending should remain unchanged (art.31.2.1), although the genus name *Hydroides* is to be treated as masculine (art.30.1.4.4.).

The operculum of *Hydroides ochoterena* cannot be confused with any other described American species. It shows some resemblance to the opercula of *H. azoricus* Zibrowius, 1972 (Atlantic), *H. longispinosus* Imajima, 1976 (including *H. centropinna* Wu & Chen, 1981) and *H. nanhaiensis* Wu & Chen, 1981 (both Indo-Pacific). The latter two taxa have collar chaetae with proximal rasp, absent in *H. ochoterena*. In *H. azoricus* a central spinule and plural internal spinules are present, lacking in *H. ochoterena*, where, moreover, the side spinules are longer than in *H. azoricus*.

Hydroides panamensis n. sp.

Figs. 18A-N

MATERIAL. - Seven 'adult' specimens.

PANAMA: USNM 1013581, 1013582, holotype and 30 paratypes, ZMA V.Pol. 5078, 5 paratypes and ECOSUR 0038, one paratype, not all revised in detail (Paitilla Beach, 28-X-1970, legit A.A. Reimer); ZMA V.Pol. 5086, 14 specimens not studied in detail (Paitilla Beach, *Tetractita* zone, 04-I-1972, legit A.A. Reimer); ECOSUR Serp-37a and LACM-AHF s.n., 4 specimens not studied in detail (08°56.3'N 79°33.3'W, Balboa Yacht Club, salinity=25‰, 30-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-37b and LACM-AHF s.n., 70 specimens not studied in detail (08°58.3'N 79°31.7'W, Club de Yates y Pesca de Panamá, salinity=30‰, 01-VI-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-37c and LACM-AHF s.n., 15 specimens not studied in detail (08°57.8'N 79°34.2'W, Diablo Spinning Club, salini-

ty=19‰, 30-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-37d and LACM-AHF s.n., 7 specimens not studied in detail (08°57.8'N 79°34.5'W, Fuerte Rodman, salinity=24‰, 31-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-37e, 5 specimens (08°54.7'N 79°31.8'W, Punta Culebra, Balboa, 30-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-37f and LACM-AHF s.n., 5 specimens not studied in detail (08°55'N 79°31.9'W, Smithsonian Dock, Naos, salinity=31‰, 01-VI-2002, legit S.I. Salazar-Vallejo); ZMA V.Pol. 3352, not studied in detail (Farfan Beach, sessiles on pipe near channel, 6-IV-1973, legit M.L. Jones, Newman, Dawson & Millard, sta. 134-5); ZMA V.Pol. 3353, not studied in detail (Whore house reef, at low water, 5-IV-1973, legit M.L. Jones, Newman, Dawson & Millard, sta. 133-2); ZMA V.Pol. 3354, not studied in detail (eastern end of Venado Beach, mid-tidal, rocks, 4-XI-1971, legit M.L. Jones, Dawson, Byas & Rosewater, sta. 54-1); ZMA V.Pol. 3355, 4 specimens not studied in detail (Venado Beach, along sand rock spit, 5-XI-1972, legit M.L. Jones, Dawson, Kaufman & Brown, sta. 111-1); ZMA V.Pol. 3356, 3 specimens not studied in detail (Floats at pilot pier, 18-IV-1972, legit M.L. Jones, Byas, Dawson & Pawson, sta. 91); ZMA V.Pol. 3357, 17 specimens, not studied in detail (Farfan, rocky area near shore, 7-XI-1972, legit R. Brown, Dawson, Kaufman & Millard, sta. 113-1).

ECUADOR: ZMA V.Pol. 3505, 2 specimens not studied in detail (2°13'09"S 80°54'38"W, near Guayaquil, 8-9 m, dive 8-V-1966, Program SEPBOB, R/V Anton Bruun, cruise 16, sta. 6670).

DESCRIPTION. - Tube: white, ID=1.2 mm (n=4, r:1.0-1.5, $\mu=1.2 \pm 0.2$), ED=2.1 mm (n=4, r:1.7-2.5, $\mu=2.1 \pm 0.4$); tubes fragmentary; one tube has peristomes, lacking in the rest; all tubes have transversal and two longitudinal ridges.

Colour and size: Body light brown. TL=15.0 mm (n=2, r:12.5-18.0, $\mu=15.0 \pm 3.9$).

Branchial crown: with 16 radioles (n=5, r:12-18, $\mu=15.5 \pm 2.2$) left, and 16 right (n=5, r:12-18, $\mu=15.5 \pm 2.3$). RL=2.9 mm (n=5, r:2.5-3.5, $\mu=2.9 \pm 0.4$). Terminal filament very long in one specimen (20%), long in two specimens (40%), short in two (40%).

Peduncle: POL=3.7 mm (n=5, r:2.8-4.2, $\mu=3.7 \pm 0.5$). Insertion left (n=1, 20%) or right (n=4, 80%); with well defined constriction (Figs. 18A, D). Pseudoperculum present in all specimens.

Operculum: OL=1.5 mm (n=5, r:1.2-1.7, $\mu=1.5 \pm 0.2$), OD=0.9 mm (n=5, r:0.7-1.1, $\mu=0.9 \pm 0.2$). Funnel with 27 radii (n=5, r:25-29, $\mu=26.8 \pm 1.6$) with pointed tips (Figs. 18A, B, D). Interradial grooves 2/5 of funnel length in one operculum, 1/3 in two and 1/4 in two. Verticil with 11 yellow spines (n=5, r:11-13, $\mu=11.4$).

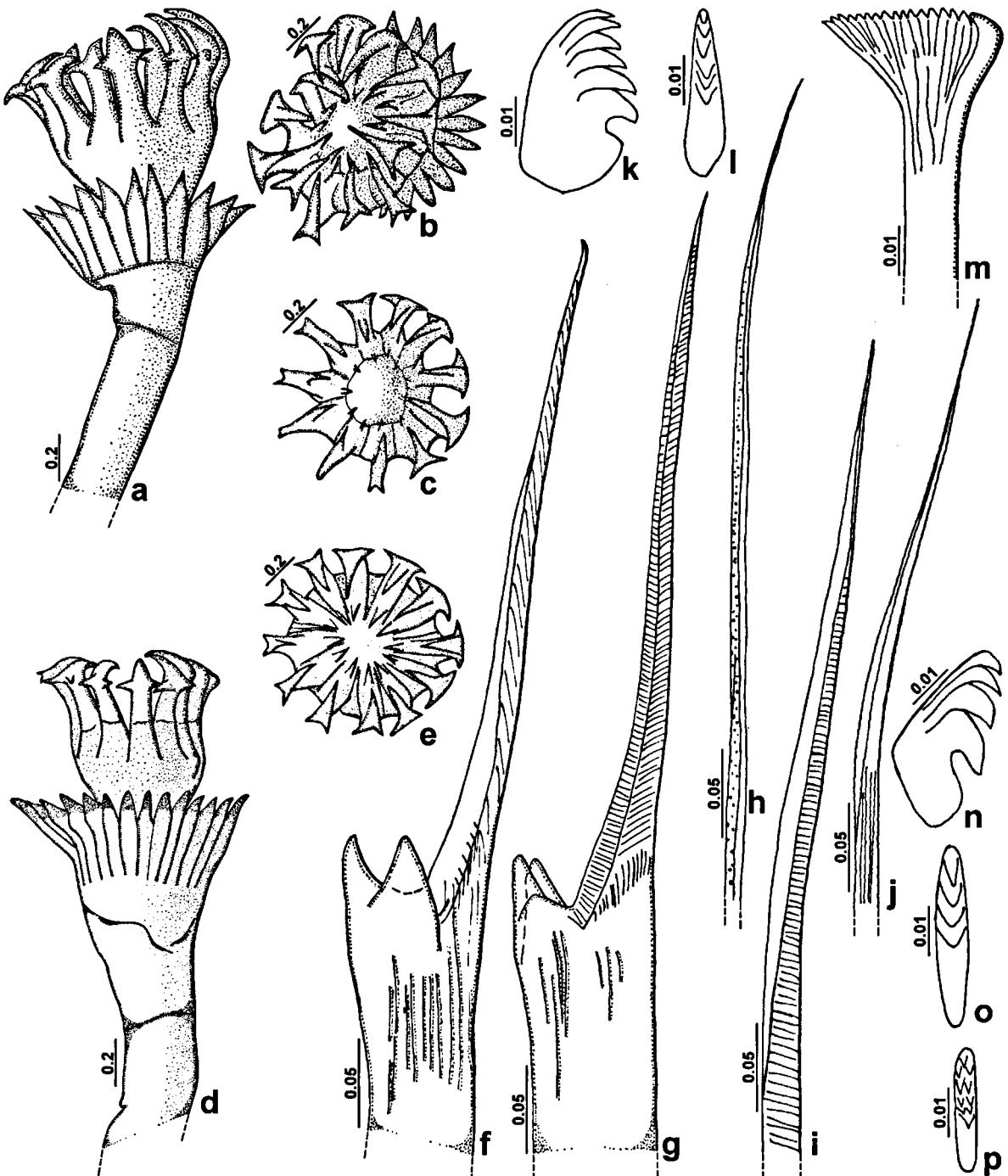


Fig. 18. *Hydroides panamensis* n. sp., from Panama. A-C, F-P: ECOSUR Serp-37. A-B, operculum, lateral and apical view. C, other operculum, apical view. F-G, bayonet chaetae. H, hooded (capillary) chaeta. I-J, thoracic hooded (limbate) chaetae. K-L, thoracic uncini. M, anterior abdominal flat-trumpet chaeta. N-O, anterior abdominal uncini. P, posterior abdominal uncinus. D-E: holotype, USNM 1013581, operculum, lateral and apical view.

± 0.9 , curving inwards. All spines similar in size (Figs. 18A, C, D), though the dorsal ones may be slightly larger, curving inwards strongly, especially the ventral spines, with pointed tip. Spines with basal internal spinule (Figs. 18C, E). One pair of

lateral spinules at two thirds of spine length (Figs. 18A-E), which may gradually change from side spinules in lateral position in dorsal spines to one external spinule in ventral spines (Fig. 18C); spines without wings. Verticil without central

tooth (Figs. 18B, C).

Collar chaetae: bayonet chaetae with two pointed-short teeth, distal blade smooth (Figs. 18F, G); hooded (capillary) chaetae present (Fig. 18H).

Thorax: THL=3.8 mm (n=5, r:2.5-5.0, μ =3.8 \pm 0.8), THW=1.6 mm (n=5, r:1.1-2.2, μ =1.6 \pm 0.3). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae of two sizes (Figs. 18I, J), saw-shaped uncini (Figs. 18K, L).

Abdomen: with 92 (n=9, r:77-120, μ =92.4 \pm 14.1) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 18M). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Figs. 18N, O), posterior uncini rasp-shaped (Fig. 18P).

HABITAT. - Depth: 0-9 m, on rocks; fouling. Salinity tolerance 19-37‰.

DISTRIBUTION. - Pacific of Panama, Ecuador (Fig. 24).

ETYMOLOGY.- Named for its distribution, as far as known yet restricted to the Pacific side of Panama (and adjacent areas).

TAXONOMIC REMARKS. - *Hydroides panamensis* n. sp. might be confused with *H. cruciger*, *H. chilensis* or the Caribbean *H. parvus*, all have incurving verticil spines with one pair of lateral spinules. In *H. cruciger*, *H. chilensis* and *H. parvus* those spinules are always in lateral position (e.g. Figs. 4A, C, E, 5A, B, E), while they shift to a more external position in the ventral spines of *H. panamensis* n. sp., even to the extent that the pair is merging into a single spine (Figs. 18B, C, E). Further, the number of verticil spines is higher in *H. panamensis* n. sp. (11-13, Fig. 6D) than in *H. cruciger* (7-11), *H. chilensis* (8-10) and *H. parvus* (6-10). Another difference between *H. panamensis* n. sp., *H. cruciger* and *H. chilensis* is the curvature of the verticil spines, being almost geniculate in the first, and smooth-straight in *H. cruciger* and *H. chilensis*. *H. parvus* can be distinguished by the pronounced knobs of its verticil spines (Bastida-Zavala & Ten Hove, 2003), missing in the three other taxa.

***Hydroides recurvispina* Rioja, 1941**

Figs. 19A-O

Hydroides recurvispina Rioja, 1941a: 167-169, Pl. 1, figs. 11-15, fig. 1a-c. Type locality: Acapulco (Guerrero), Mexico; 1942: 125-126 (Río Mayo, Gulf of California).

MATERIAL. - Six 'adult' and four 'juvenile' specimens.

BAJA CALIFORNIA: ZMA V.Pol. 3697, 4 specimens (29°N 113°30'W, La Gringa, Bahía de Los Angeles, cobbles on sand, scarce coral and sponges, 2-3 m deep at low tide, 13-VIII-1989, legit H.A. Ten Hove).

GULF OF CALIFORNIA: ZMK s.n., 3 dry specimens (28°11.3'N 111°37.0'W, shell dredge, sand, 61 m, 22-III-1960, legit R.H. Parker, sta.174); LACM-AHF s.n. and ZMA V.Pol. 3865, 4 specimens, 2 not studied in detail (24°21'55"N 110°15'55"W, San Lorenzo Channel, sand, shell and corallines, 12-26 m, 14-II-1940, Velero, sta. 1111-40).

MICHOACÁN/GUERRERO: UANL 3757, 3758, 2 specimens (Bahía de Petacalco, 14-IV-1993, II-1994, legit E. Amador, sta. B4, A1).

PANAMA: LACM-AHF s.n. and ZMA V.Pol. 5077, 14 specimens, not all studied in detail (Taboguilla, plexiglas plates at 12 m, 1-II-1972, legit Birkeland); ZMK s.n., not studied in detail (Taboga, 7-9 m, sand and stones, 8-II-1916, legit Th. Mortensen).

DESCRIPTION. - Tube: white, ID=0.8 mm (n=4, r:(0.5)0.6-1.0, μ =0.8 \pm 0.2), ED=1 mm (n=4, r:(0.7)0.8-1.4, μ =1.0 \pm 0.3); all tubes lack peristomes; all tubes with transversal and three longitudinal ridges.

Colour and size: body pale yellow. TL=9.7 mm (n=2, r:(5.5)8.5-11.0, μ =9.7 \pm 1.8).

Branchial crown: with 10 radioles (n=5, r:(8)8-12, μ =9.7 \pm 1.5) left, and 10 right (n=5, r:(7)8-12, μ =9.5 \pm 1.5). RL=2.3 mm (n=5, r:(1.5)1.7-3.0, μ =2.3 \pm 0.6). Terminal filament long in four specimens (80%) and short in one (20%).

Peduncle: POL=3.1 mm (n=5, r:(2.2)2.5-3.9, μ =3.1 \pm 0.5). Insertion left (n=4, 80%), or right (n=1, 20%); with well defined constriction (Figs. 19A, M). Pseudoperculum present in all specimens.

Operculum: OL=1 mm (n=5, r:(0.7)0.8-1.5, μ =1.0 \pm 0.3), OD=0.6 mm (n=5, r:(0.5)0.5-0.8, μ =0.6 \pm 0.1). Funnel with 24 radii (n=5, r:(19)20-29, μ =23.8 \pm 3.3) with pointed tips. Interradial grooves 2/5 of funnel length in one operculum, 1/3 in two, 1/4 in one and 1/6 in one. Verticil with nine yellow spines (n=5, r:(8)8-10, μ =9.2

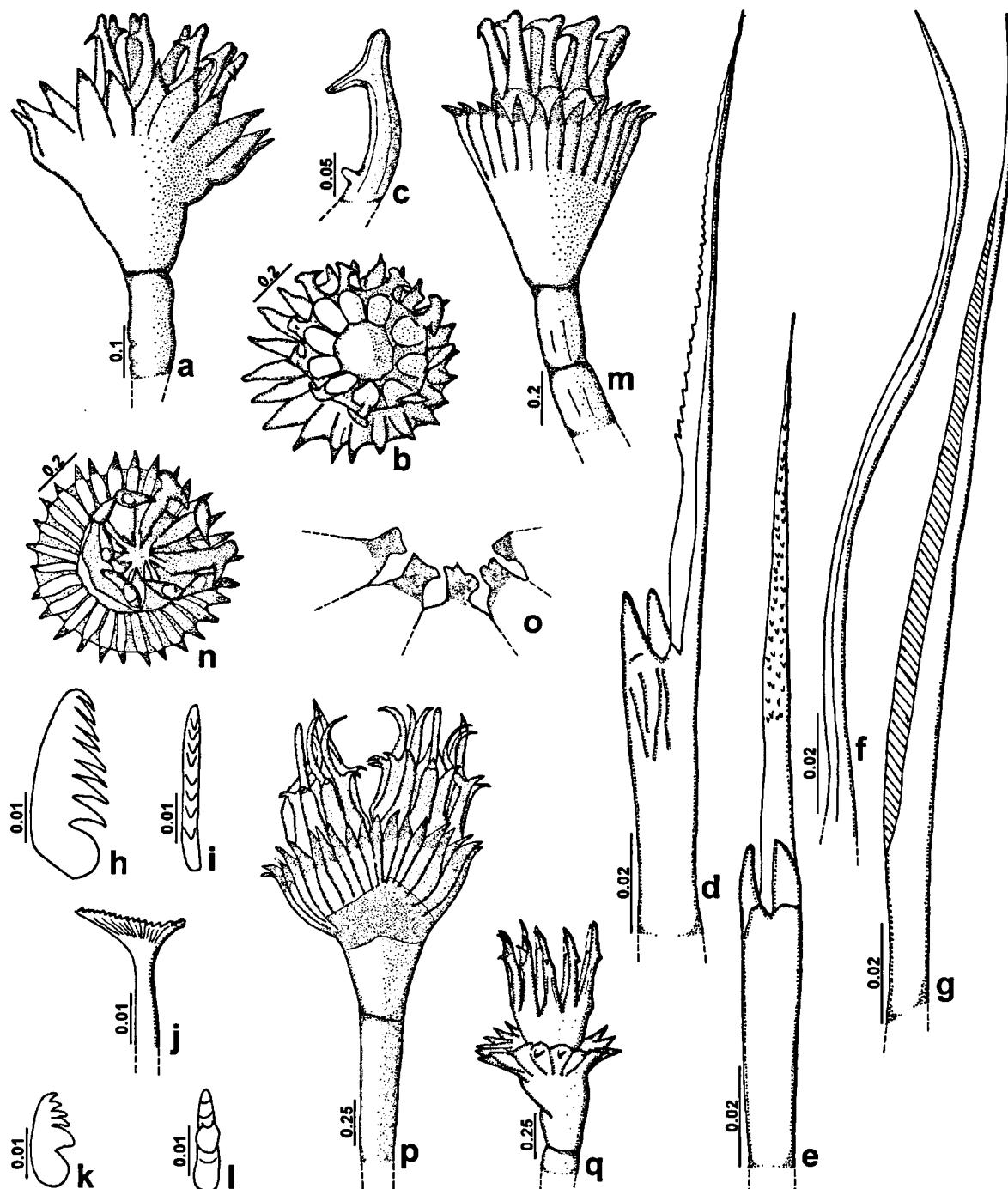


Fig. 19. A-O: *Hydroides recurvispina*. A-O: from Guerrero/Michoacán, UANL 3757. A-B, operculum, lateral and apical view. C, detail of spine. D-E, bayonet chaetae, lateral and frontal view. F, hooded (capillary) chaeta. G, thoracic hooded (limbate) chaeta. H-I, thoracic uncini. J, anterior abdominal flat-trumpet chaeta. K-L, anterior abdominal uncini. M-N: from Gulf of California, ZMA V.Pol. 3865, operculum, lateral and apical view. O: from Panama, ZMA V.Pol. 5077, basal internal spinules, from above. P-Q: *H. sanctaerucis*, from Pacific coast of Panama. P: ECOSUR Serp-38, operculum, lateral view; note two verticils in single funnel. Q: ZMA V.Pol. 3363, operculum, lateral view.

± 0.8), straight, with tips twisted clockwise. All spines similar in shape and size, with an external distal knob (Figs. 19A, C, M), and pointed tip.

Spines with one basal internal spinule with blunt tip (Fig. 19C), in one specimen wart-like (Fig. 19O); without external or lateral spinules or

wings. Verticil without central tooth (Figs. 19B, N).

Collar chaetae: bayonet chaetae with two pointed-elongate teeth, distal blade denticulate (Figs. 19D, E); hooded (capillary) chaetae present (Fig. 19F).

Thorax: THL=2.5 mm (n=5, r:(1.5)2.2-2.7, $\mu=2.5\pm 0.2$), THW=0.7 mm (n=5, r:(0.3)0.5-0.9, $\mu=0.7\pm 0.2$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae (Fig. 19G) of two sizes, saw-shaped uncini (Figs. 19H, I).

Abdomen: with 40 (n=2, r:(32)32-50, $\mu=40.0\pm 12.7$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 19J). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Figs. 19K, L), posterior uncini rasp-shaped.

HABITAT. - Depth: 2-61 m, on rocks and shells on sandy bottom; fouling.

DISTRIBUTION. - Gulf of California to Panama (Fig. 20).

TAXONOMIC REMARKS. - *Hydroides recurvispina* resembles *H. trompi* n. sp. (see below) in the clockwise twist of the tips of verticil spines, and basal internal spinules occasionally may be similar to those in *H. trompi* n. sp. (Figs. 19O, 22C); however, all spines of *H. recurvispina* have a pronounced knob (Figs. 19A, C, M), while those in *H. trompi* n. sp. are smooth (Figs. 22A, F, H). Further, *H. recurvispina* has more radii and spines (20-29, 8-11, Figs. 23C, D) in spite of having smaller size (RL=1.7-3.5 mm, Fig. 23A; THW=0.5-0.9 mm, Fig. 23B) than *H. trompi* n. sp. (16-22, 5-10, RL=2.0-6.0 mm, THW=0.9-1.7 mm). A further difference between *H. recurvispina* and *H. trompi* n. sp. is the greater chitinization of the funnel in the latter.

Hydroides salazarvallejoi Bastida-Zavala & Ten Hove, 2003
Fig. 12N

Hydroides salazarvallejoi Bastida-Zavala & Ten Hove, 2003: 158-162, fig. 32. Type locality: Santa Marta, Colombia.

MATERIAL. - PANAMA: USNM 58608, two specimens not studied in detail, (08°59'08"N, 79°35'78"W, Miraflores Locks, lower chamber, brackish water, 26/27-VIII-1974, legit M.L. Jones, Rosewater & Kaufman, sta.204); USNM 58607, not studied in detail (same, upper east chamber, scrapings bottom of lock, 17-I-1972, legit M.L. Jones & P. W. Glynn, sta. 77-2).

HABITAT. - Depth: 0-1 m, docks and rocks. Brackish and marine water.

DISTRIBUTION. - Amphiamerican. Costa Rica, Panama and Ecuador (Fig. 24); Caribbean Sea (Bastida-Zavala & Ten Hove, 2003)

REMARKS. - We have not been able to find differences between Atlantic (Fig. 12N) and Pacific specimens of this taxon, though the numbers of radii and verticil spines appear to be lower in the Pacific (16-24, 6-8 vs. 10-18, 4-6).

TAXONOMIC REMARKS. - See Bastida-Zavala & Ten Hove, 2003.

Hydroides sanctae-crucis Krøyer [in]

Mörcz, 1863

Figs. 19P, Q

Hydroides (Eucarphus) sanctae-crucis Krøyer [in]
Mörcz, 1863: 378-379, Pl. 11, fig. 12. Type locality: Saint Croix, Lesser Antilles.

Hydroides sanctae-crucis; Bastida-Zavala & Ten Hove, 2003: 148-151 (diagnosis, first record from Pacific Panama).

MATERIAL. - OAXACA: ECOSUR Serp-38a, four specimens not studied in detail (Huatulco, harbor, rocks, intertidal, 22-V-2000, legit S.I. Salazar-Vallejo, P. Salazar-Silva, L. González & J.R. Bastida-Zavala).

PANAMA: ZMA V.Pol. 3363, 5 specimens (floats at pilot pier, 18-IV-1972, legit Jones et al., sta. 91); ECOSUR Serp-38b, 1 specimen not studied in detail (08°56.3'N, 79°33.3'W, Balboa Yacht Club, salinity=25‰, 30-V-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-38c and LACM-AHF s.n., 13 specimens not studied in detail (08°57.8'N, 79°34.2'W, Diablo Spinning Club, salinity=19‰, 30-V-2002 and 5-VI-2002, legit S.I. Salazar-Vallejo); ECOSUR Serp-38d and LACM-AHF s.n., 3 specimens not studied in detail (Fuerte Rodman, salinity=24‰, 31-V-2002, legit S.I. Salazar-Vallejo).

HABITAT. - Depth: 0-1 m, rocks; fouling. Salinity

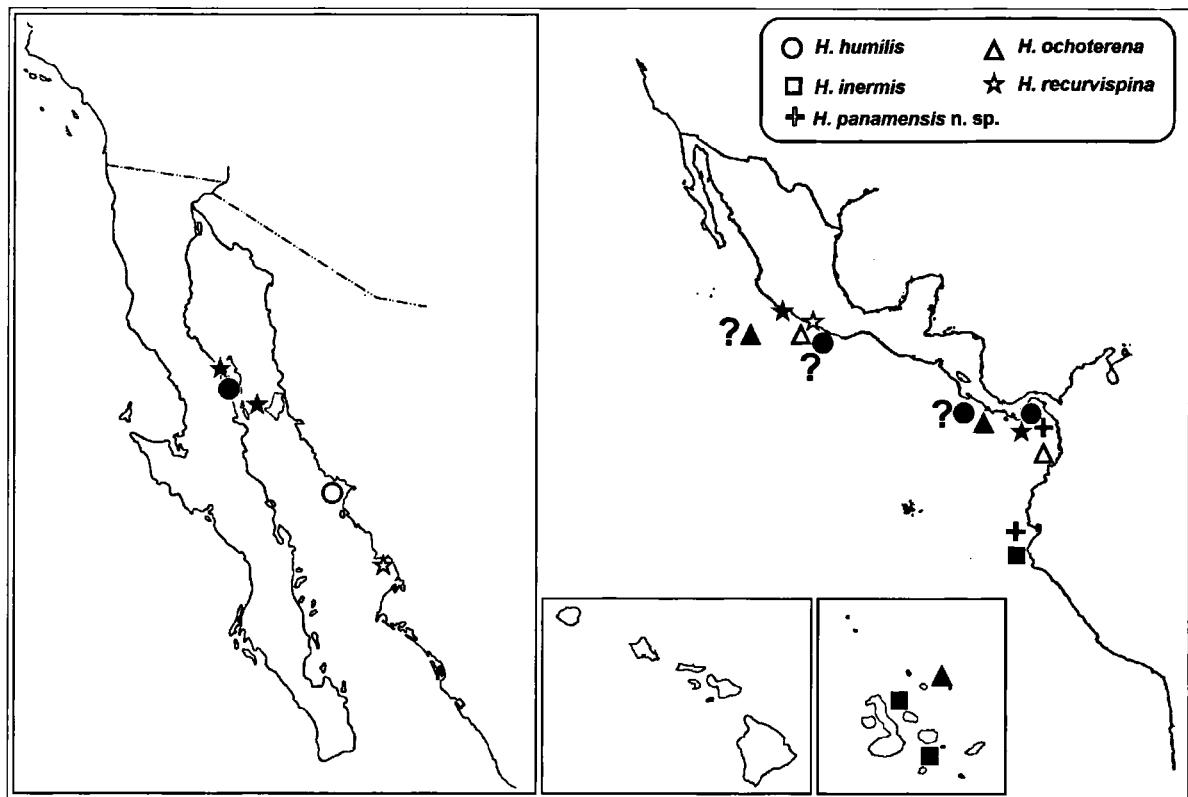


Fig. 20. Distribution of *Hydrocoetes humilis*, *H. inermis*, *H. ochoterena*, *H. panamensis* n. sp. and *H. recurvispina*. Closed symbols denote examined material, open symbols literature records.

tolerance 19-37‰.

DISTRIBUTION. - Amphiamerican. Oaxaca and Panama (Fig. 24); Gulf of Mexico, Eastern U.S.A. and Caribbean Sea.

REMARKS. - This is a common Caribbean species (Figs. 19P, Q). The few records from the Pacific of Panama by Bastida-Zavala & Ten Hove (2003, ZMA V.Pol. 3363, repeated here), near the Pacific entrance to the Panama Canal (with low salinity), and from Huatulco (Oaxaca) harbor, might indicate a comparatively recent case of ship transport.

Recently collected material from the Pacific side of Panama we observed a specimen with a double verticil on a single funnel (Fig. 19P). It is the first time that this aberration is observed.

***Hydrocoetes similis* (Treadwell, 1929)**

Figs. 21A-U

Eupomatus similis Treadwell, 1929: 11-12, fig. 31.

Type locality: Baja California, Western Mexico; Hartman, 1956 (diagnosis of same material).

Hydrocoetes brachyacantha (non Rioja, 1941); Bastida-Zavala, 1993: 35 (Bahía de La Paz, Gulf of California); 1995: 24 (Cabo Pulmo reef, Gulf of California).

MATERIAL. - Nine 'adult' and three 'juvenile' specimens.

BAJA CALIFORNIA: AMNH 1993, 3 syntypes (exact locality unknown, legit C.H. Townsend, 1911); ZMA V.Pol. 3698 (29°N 113°30'W, La Gringa, Bahía de Los Angeles, cobbles on sand, scarce coral and sponges, 2-3 m deep at low tide, 13-VIII-1989, legit H.A. Ten Hove).

BAJA CALIFORNIA SUR: BZ-pc, 4 specimens not studied in detail (Caimancito beach, Bahía de La Paz, sand and rock bottom, on coral, 9-XII-1985, and Coromuel beach, sand and rock bottom, 29-XI-1986, legit S.I. Salazar-Vallejo & J.A. De León-González); BZ-pc, ECOSUR-Serp-44 and ZMA V.Pol. 4988, 3 specimens and 4 not studied in detail (Cabo Pulmo reef, second bar, on dead coral *Pocillopora* sp., 4-7 m, 8-V-1989, 18-IX-1989, legit P. Hernández, J. Ketchum & J.R. Bastida-Zavala); LACM-AHF s.n. (Cabo

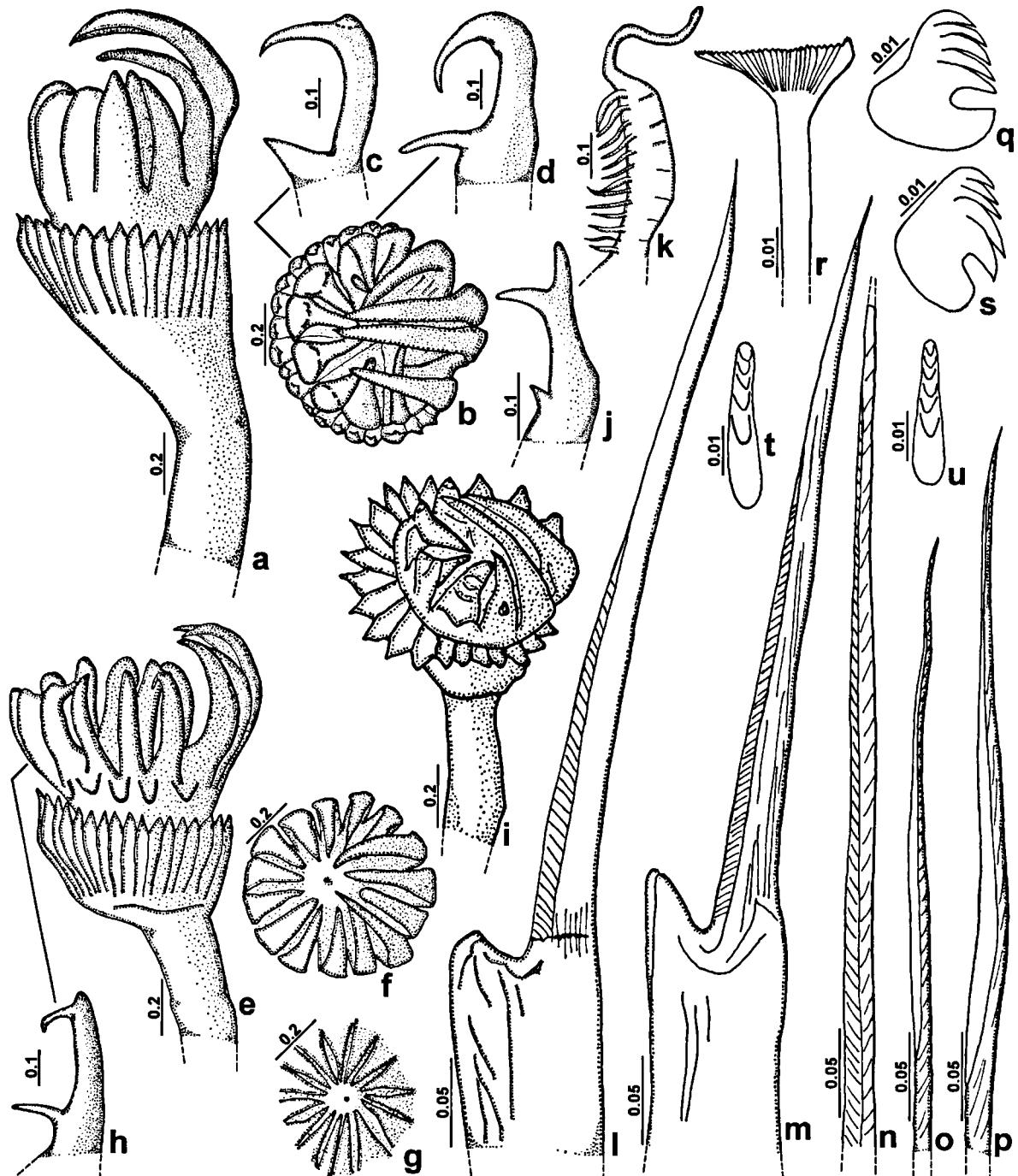


Fig. 21. *Hydroides similis*. A-H: from Baja California Sur, ZMA V.Pol. 4988. A-B, operculum, lateral and apical view. C-D, verticil spines. E-F, other operculum, lateral and apical view. G, detail of central disc. H, verticil spine. I-J: from Costa Rica, LACM-AHF s.n., operculum, apical view and verticil spine. K-U: from Baja California Sur, BZ-pc. K, tip of radiole. L-M, bayonet chaetae. N, hooded (capillary) chaeta. O-P, thoracic hooded (limbate) chaetae. Q, thoracic uncinus. R, anterior abdominal flat-trumpet chaeta. S-T, anterior abdominal uncini. U, posterior abdominal uncinus.

San Lucas, 18-III-1940, Allan Hancock Pacific Expedition
67R, LC18 met 40); UANL 0360 (Bahía Concepción, 27-VII-1985).

ISLAS REVILLAGIGEDO: CP-ICML-UNAM s.n.

(18°43'33"N 110°56'22"W, Bahía Braulia, Socorro Island,
15-17 m, 29-XI-1997, B/O El Puma, campaña SURPA-
CLIP1, sta. 45); CP-ICML-UNAM s.n., 2 specimens
(18°48'40"N 111°02'58"W, Cabo Largo, Socorro Island,

15-18 m, 30-XI-1997, B/O El Puma, campaña SURPA-CLIP1, sta. 65 and 75).

COSTA RICA: LACM-AHF s.n. (Dominical, rock pools, 12-XI-1968, legit D. Straughan).

PANAMA: USNM Acq. 292580 (Isla Venado, SE side, rocky intertidal, 15-IV-1972, legit Byas, Pawson, Dawson, Jones, Turner & Fried, sta. 86-1).

DESCRIPTION. - Tube: white, ID=1.0 mm (n=4, r:(0.5)0.8-1.3, $\mu=1.0\pm0.2$), ED=1.3 mm (n=4, r:(0.7)1.2-1.7, $\mu=1.3\pm0.2$); all tubes lack peristomes but have transversal ridges; two specimens show three longitudinal ridges, one shows two, and one none.

Colour and size: body pale yellow. TL=12.1 mm (n=3, r:(10.5)10.8-14.0, $\mu=12.1\pm1.6$).

Branchial crown: with 12 radioles (n=9, r:(8)9-16, $\mu=11.9\pm2.0$) left, and 10 right (n=9, r:(7)7-12, $\mu=10.4\pm1.7$). RL=2.3 mm (n=9, r:(1.5)1.7-3.3, $\mu=2.3\pm0.6$). Terminal filament very long (Fig. 21K) in two specimens (22%), long in six (67%) and short in one (11%).

Peduncle: POL=3.4 mm (n=10, r:(1.8)2.3-4.5, $\mu=3.4\pm0.6$). Insertion left (n=4), right (n=4) or at both sides (n=1); with ill-defined constriction (Figs. 21A, E, I). Pseudoperculum present in all specimens.

Opercum: OL=1.2 mm (n=10, r:(0.4)0.8-1.5, $\mu=1.2\pm0.2$), OD=0.7 mm (n=10, r:(0.4)0.6-0.9, $\mu=0.7\pm0.1$). Funnel with 32 radii (n=10, r:(24)25-39, $\mu=32.2\pm4.7$) with pointed tips. Interradial grooves 1/2 of funnel length in two opercula, 2/5 in three, 1/3 in three and 1/4 in one. Verticil with 14 yellow to light brown spines (n=10, r:(1)12-16, $\mu=14.1\pm1.2$), strongly curving inwards. Three to four dorsal spines bigger than the others (Figs. 21A, B, E, F, I); other spines similar in shape, with small (Fig. 21C) to pronounced knob (Figs. 21H, J), with pointed tip (Figs. 21C, D, H, J). Spines with one short (Fig. 21J) to long basal internal spinule (Figs. 21C, D, H); without external and lateral spinules and/or wings. Verticil without central tooth (Figs. 21F, G).

Collar chaetae: bayonet chaetae with two blunt-short (Fig. 21L) to pointed-elongate teeth (Fig. 21M), distal blade smooth; hooded (capillary) chaetae present (Fig. 21N).

Thorax: THL=2.6 mm (n=9, r:(1.2)1.2-3.9, $\mu=2.6\pm0.8$), THW=0.9 mm (n=9, r:(0.5)0.7-1.1, $\mu=0.9\pm0.1$). Thoracic membranes well devel-

oped. Six chaetigers with hooded (limbate) chaetae of two sizes (Figs. 21O, P), saw-shaped uncini (Fig. 21Q).

Abdomen: with 67 (n=2, r:(30)59-75, $\mu=66.5\pm11.3$) chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 21R). Posterior chaetigers with 'capillary' chaetae. Anterior (Figs. 21S, T) and posterior uncini saw-shaped (Fig. 21U).

HABITAT. - Depth: 0-18 m, on dead corals, in rock pools.

DISTRIBUTION. - Baja California to Panama (Fig. 24).

TAXONOMIC REMARKS. - *Hydroides similis* shows some resemblance to *H. brachyacanthus* since both have strongly incurving verticil spines, ventral ones with a knob. However, *H. similis* has 2-4 larger dorsal spines (Figs. 21A, B, E, F), while there is only one covering the central disc in *H. brachyacanthus* (Fig. 3A). There are fewer spines in *H. brachyacanthus* (7-11) than in *H. similis* (11-16; Figs. 8C, D).

Specimens of *H. gracilis* with larger dorsal spines (Figs. 13C, F) are somewhat similar to *H. similis*; however, internal spinules are absent in *H. gracilis* (Figs. 13B, D, G), well developed in *H. similis* (Figs. 21C, D, H, J).

Hydroides tenhovei Bastida-Zavala & De León-González, 2002
Figs. 12O

Hydroides tenhovei Bastida-Zavala & De León-González, 2002: 389-394, figs. 2a-m, 3a-h.
Type locality: Cabo San Lázaro, Western coast of Baja California Sur, Mexico.

HABITAT. - Depth: 27-30 m, on an 'ecological island': a flat and hard PVC structure surrounded by soft-bottom.

DISTRIBUTION - Western coast of Baja California Sur, Mexico (Fig. 24).

***Hydroides trompi* n. sp.**
Figs. 22A-Q

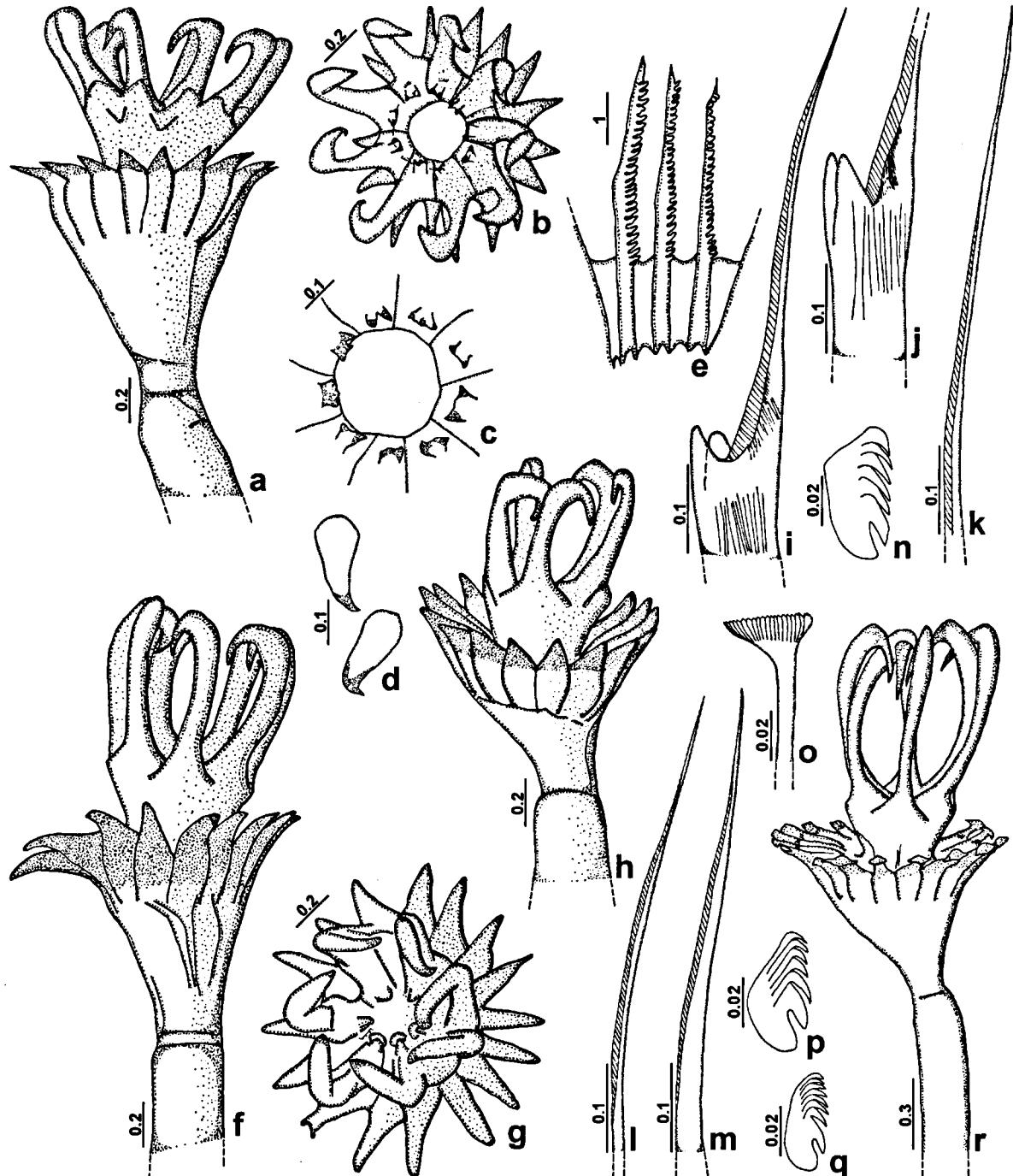


Fig. 22. A-Q: *Hydroides trompi* n. sp. A-E: holotype, USNM 58605. A-B, operculum, lateral and apical view. C, central disc and basal internal spinule, apical view. D, tip of verticil spines, from above. E, inter-radiolar membrane. F-G: from Baja California, ZMA V.Pol. 3696, operculum, lateral and apical view. H-Q: from Baja California Sur, BZ-pc. H, operculum, lateral view. I-J, bayonet chaetae. K, hooded (capillary) chaeta. L-M, thoracic hooded (limbate) chaetae. N, thoracic uncinus. O, anterior abdominal flat-trumpet chaeta. P-Q, anterior and posterior abdominal uncinii. R: *H. gairacensis*, from Quintana Roo, ECOSUR Serp-12c, operculum, lateral view.

?*Eupomatus recurvispina* (non Rioja, 1941); Kudenov, 1975: 228; 1980: 122 (Puerto Peñasco).

?*Eupomatus* sp. Kudenov, 1973: 130, fig. 5.33.

MATERIAL. - Eight 'adult' specimens.

BAJA CALIFORNIA: ZMA V.Pol. 3696 (29°N 113°30'W, La Gringa, Bahía de Los Angeles, cobbles on sand, scarce

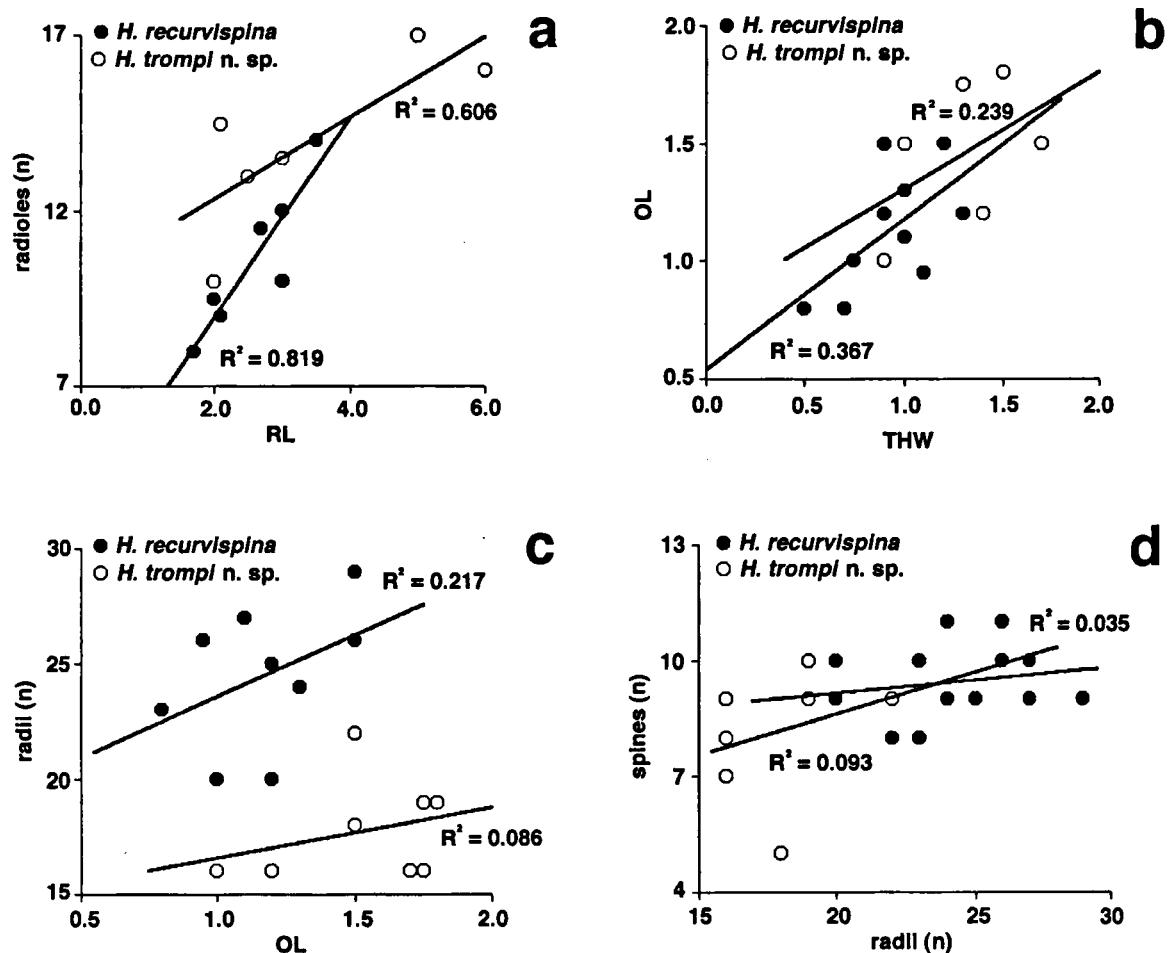


Fig. 23. Morphometric comparisons between *Hydroides recurvispina* and *H. trompi* n. sp.

coral and sponges, 2-3 m deep at low tide, 13-VIII-1989, legit H.A. Ten Hove).

BAJA CALIFORNIA SUR: BZ-pc (Bahía de La Paz, Enfermería mangrove, 8-I-1986, legit S.I. Salazar-Vallejo). PANAMA: USNM 58605, holotype, USNM 1013587, paratype and ZMA V.Pol. 3358, paratype (08°59'08"N 79°35'78"W, Miraflores Locks, lower chamber, 26/27-VIII-1974, legit M.L. Jones, Rosewater & Kaufman, sta. 204); USNM 58602, 2 specimens (same, upper east chamber, scrapings bottom of lock, 17-I-1972, legit M.L. Jones & P.W. Glynn, sta. 77-2); USNM 58603 (Isla Venado, SE side, rocky intertidal, 15-IV-1972, legit Byas, Pawson, Dawson, Jones, Turner & Fried, sta. 86-1).

DESCRIPTION. - Tube: white, ID=1.6 mm ($n=4$, r:1.4-1.8, $\mu=1.6\pm 0.2$), ED=2.1 mm ($n=4$, r:2.0-2.3, $\mu=2.1\pm 0.1$); one tube showed transversal ridges of which the most anterior two were almost like peristomes, the other two tubes lacking peristomes and longitudinal ridges, with

transversal ridges or rugose.

Colour and size: body pale yellow. Only complete specimen, TL= 26 mm, but incomplete specimens already up to 33.5, possibly 50 mm. Branchial crown: with 14 radioles left ($n=6$, r:9-17, $\mu=13.9\pm 2.9$), and 14 right ($n=6$, r:11-17, $\mu=13.7\pm 2.3$). RL=3.1 mm ($n=6$, r:2.0-6.0, $\mu=3.1\pm 1.7$). Radioles of holotype connected by an interradiolar membrane for one third of their length (Fig. 22E), in one paratype for one fifth; in five other specimens absent. Terminal filament short to very long.

Peduncle: POL=3.5 mm ($n=8$, r:2.4-6.0, $\mu=3.5\pm 1.2$). Insertion left ($n=2$) or right ($n=4$); with well defined constriction (Figs. 22A, F, H). Pseudoperulum present.

Operculum: OL=1.5 mm ($n=8$, r:1.0-1.8, $\mu=1.5\pm 0.3$), OD=1.0 mm ($n=8$, r:0.6-1.3, $\mu=1.0\pm 0.3$).

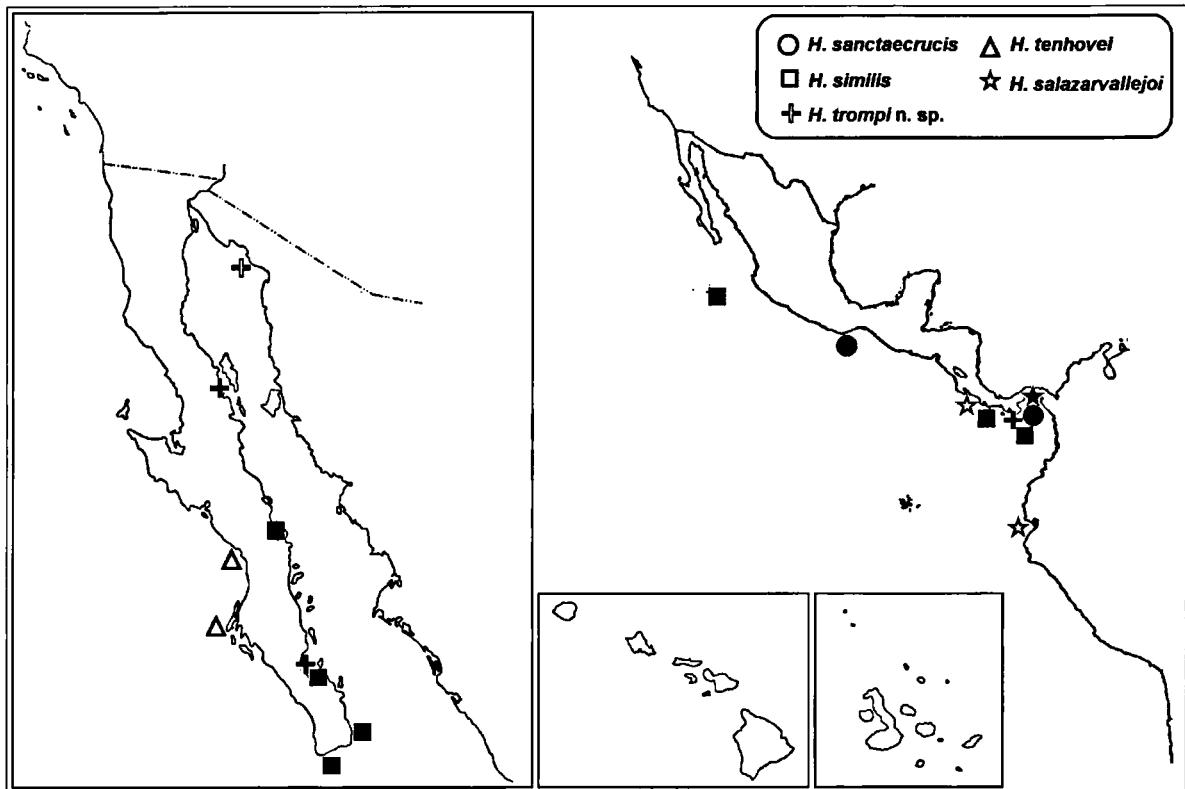


Fig. 24. Distribution of *Hydroides salazarvallejoi*, *H. sanctaecrucis*, *H. similis*, *H. tenhovei* and *H. trompi* n. sp. Closed symbols denote examined material, open symbols literature records.

± 0.3). Funnel with 18 radii ($n=8$, $r:16-22$, $\mu=17.6 \pm 2.2$) with pointed tips (Figs. 22A, B, F-H). Interradial grooves 1/6 of funnel length in one operculum, 1/5 in one and 1/4 in six. Verticil with eight yellow spines ($n=8$, $r:5-10$, $\mu=8.0 \pm 1.6$), curving inwards with tips twisted clockwise (Figs. 22A, B, D, F-H). All spines similar in shape and size, with sharp tip. Spines with wart-like basal internal spinule (Figs. 22B, C, G); without external and/or lateral spinules or wings. Verticil without central tooth (Figs. 22B, C, G).

Collar chaetae: bayonet chaetae with two blunt-elongate (Fig. 22I) or pointed-elongate teeth basally (Fig. 22J), distal blade smooth (Figs. 22I, J); hooded (capillary) chaetae present (Fig. 22K).

Thorax: THL=4.5 mm ($n=6$, $r:3.5-7.0$, $\mu=4.5 \pm 1.5$), THW=1.3 mm ($n=6$, $r:0.9-1.7$, $\mu=1.3 \pm 0.3$). Thoracic membranes well developed. Six chaetigers with hooded (limbate) chaetae of two sizes (Figs. 22L, M), saw-shaped uncini (Fig. 22N).

Abdomen: with up to 118 chaetigers, and if the posterior abdomen found in the tube fragments

with one of the paratypes belongs to that paratype, up to 127 chaetigers. Anterior and middle abdominal chaetigers with flat-trumpet chaetae (Fig. 22O). Posterior chaetigers with 'capillary' chaetae. Anterior uncini saw-shaped (Fig. 22P), posterior uncini rasp-shaped (Fig. 22Q).

HABITAT. - Depth: 0-3 m, on dead corals and on cobbles on sand.

DISTRIBUTION. - Gulf of California and Panama (Fig. 24).

ETYMOLOGY. - Named after Jossy S. Tromp, a student of one of us (HAtH), who first realized that this was a separate taxon, 'nov. spec. ii'.

REMARKS. - The interradiolar membrane, as shown by the holotype and one paratype of *Hydroides trompi* n. sp., is not recorded before in any other *Hydroides* species; maybe this character went unnoticed. The fact that it is missing in other specimens also might indicate that it is a

temporary state.

The specimen from Isla Venado showed sperm attached to the abdomen.

TAXONOMIC REMARKS. - The main difference in verticil spines of *Hydroides trompi* n. sp. and *H. recurvispina* is the presence of a pronounced knob in the latter, absent in the former. There also are differences in numbers of verticil spines (5-10 vs. 8-11) and funnel radii (16-22 vs. 20-29). A wart-like basal internal spinule (Fig. 22C) like that in *H. trompi* n. sp. is present in one specimen of *H. recurvispina* (Fig. 19O). Further discussion in taxonomic remarks of *H. recurvispina* and Fig. 23.

By the low number of verticil spines (7) and funnel radii (18), as well as by the fact that the verticil spines do not show a distal knob, the material mentioned and figured by Kudenov (1973, 1975, 1980) most probably belongs to *H. trompi* n. sp., and not to *H. recurvispina* s.str.

Hydroides trompi n. sp. is similar to *H. gairacensis* in the shape and number of the verticil spines (Figs. 22A, F, H vs. 22R); however, *H. trompi* n. sp. has pointed radii while in *H. gairacensis* these are T-shaped.

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