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Revision of *Chone* Krøyer, 1856 (Polychaeta: Sabellidae) from North America and descriptions of four new species

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Abstract

The present study deals with the revision of type and non-type material from 12 species of *Chone* Krøyer, 1856 (Polychaeta: Sabellidae) that have been described from North America: *C. albocincta* Banse, 1972, *C. aurantiaca* (Johnson, 1901), *C. bimaculata* Banse and Nichols, 1968, *C. ecaudata* (Moore, 1923), *C. gracilis* Moore, 1906, *C. magna* (Moore, 1923), *C. minuta* Hartman, 1944, *C. mollis* (Bush in Moore, 1904), *C. picta* (Verrill, 1885), *C. princei* McIntosh, 1916, *C. ungavana* Chamberlin, 1920, and *C. veleronis* Banse, 1972; and the formal description of four new species: *Chone eiffelturris* n. sp., *Chone paramollis* n. sp., *Chone quebecensis* n. sp., and *Chone trilineata* n. sp. *Chone princei* is redescribed and transferred to the genus *Jasmineira* Langerhans, 1880; *C. ungavana* is declared *incertae sedis*; *C. bimaculata* is reinstated; *C. minuta* is synonymized with *C. ecaudata*, and *C. mollis* is recorded for the Pacific coast of Panama.

Keywords: *Chone*, North America, Polychaeta, Sabellidae

Introduction

Fifty-three species have been formally described in *Chone* Krøyer, 1856, a genus of sabellid polychaetes frequently found in soft-bottom marine sediments (Tovar-Hernández and Sosa-Rodríguez 2006). Seventeen of these were described from North America: two from Canada's Atlantic coast (*C. princei* McIntosh, 1916 from the Gulf of Saint Lawrence, Quebec and *C. ungavana* Chamberlin, 1920 from Hudson Strait, North West Territories), five from the US Atlantic coast (*C. americana* Day, 1973, *C. farringtonae* Tovar-Hernández, 2005, *C. perkinsi* Tovar-Hernández, 2005, *C. picta* (Verrill, 1885), and *C. uebelackerae* Tovar-Hernández, 2005) and 10 from the US Pacific coast (*C. albocincta* Banse, 1972, *C. aurantiaca* (Johnson, 1901), *C. bimaculata* Banse and Nichols, 1968, *C. ecaudata* (Moore, 1923), *C. gracilis* Moore, 1906, *C. magna* (Moore, 1923), *C. minuta* Hartman, 1944, *C. mollis* (Bush in Moore, 1904), *C. teres* Bush in Moore, 1904, and *C. veleronis* Banse, 1972) (Table I).

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Table I. Species of *Chone* described from North America.

Species	Type locality
<i>Chone albocincta</i> Banse, 1972	California
<i>Chone americana</i> Day, 1973	Beaufort, North Carolina
<i>Chone aurantiaca</i> (Johnson, 1901)	Port Orchard, Washington
<i>Chone bimaculata</i> Banse and Nichols, 1968 reinstated	Puget Sound, Washington
<i>Chone ecaudata</i> (Moore, 1923)	Santa Cruz Island, California
<i>Chone farringtonae</i> Tovar-Hernández, 2005	Boca Ciega Bay, Florida
<i>Chone gracilis</i> Moore, 1906	Alitak Bay, Alaska
<i>Chone magna</i> (Moore, 1923)	San Miguel Island, California
<i>Chone minuta</i> Hartman, 1944 synonym of <i>C. ecaudata</i>	Dillon Beach, California
<i>Chone mollis</i> (Bush in Moore, 1904)	Pacific Grove, California
<i>Chone perkinsi</i> Tovar-Hernández, 2005	Dumfounding Bay, Florida
<i>Chone picta</i> (Verrill, 1885)	Martha's Vineyard, Massachusetts
<i>Chone princei</i> McIntosh, 1916 transferred to <i>Jasmineira</i>	Gulf of Saint Lawrence, Quebec
<i>Chone teres</i> Bush in Moore, 1904 synonym of <i>C. infundibuliformis</i> fide Banse, 1972	Dutch Harbor, Alaska
<i>Chone uebelackerae</i> Tovar-Hernández, 2005	Hutchingson Island, Florida
<i>Chone ungavana</i> Chamberlin, 1920 <i>incertae sedis</i>	Hudson Strait, North West Territories
<i>Chone veleronis</i> Banse, 1972	California

Banse (1972) synonymized *Chone bimaculata* with *C. dumeri* Malmgren, 1867; *C. minuta* with *C. ecaudata*, and *C. teres* with *C. infundibuliformis* Krøyer, 1856; and described two species from California. Tovar-Hernández (2005) redescribed *C. americana* and described three species from Florida. However, our understanding of *Chone* species in North America remains poor, in part because many of the original descriptions are incomplete and unillustrated, and the drawings used for identifications are seldom the originals or do not correspond to the species of interest. Also comparisons with type material are rarely made. The present study of type and non-type materials of species described from North America redescribes some previously known species, describes four new species, and recognizes two species groups within *Chone*. These data will be used in a future analysis to evaluate the phylogeny of *Chone*.

Methods

Type and non-type material were examined from the following collections: The Natural History Museum, London (BMNH); Canadian Museum of Nature, Ottawa (CMN); The City of San Diego's Marine Biology Laboratory, California (CSD-MBL); El Colegio de la Frontera Sur (ECOSUR); Verónica Rodríguez-Villanueva, Ecología Marina y Análisis Comunitarios del Bentos, Universidad Autónoma de Baja California (EcoMar-UABC); Friday Harbor Laboratories, University of Washington (FHL-UW); Florida Marine Research Institute (FSBC); Los Angeles County Museum of Natural History, Allan Hancock Foundation (LACM-AHF); Los Angeles County Sanitation Districts, Marine Biology Laboratory (LACSD-MBL); Museum of Comparative Zoology, Harvard University (MCZ); National Museum of Wales (NMW); Personal Collection, Rick Rowe (PC-RR); Royal British Columbia Museum, Canada (RBCM); Swedish Museum of Natural History (SMNH); National Museum of Natural History, Smithsonian Institution (USNM); Yale Peabody Museum (YPM); and Zoological Museum of the University of

Copenhagen (ZMUC). The revision of *Chone americana*, *C. farringtonae*, *C. perkinsi*, and *C. uebelackerae* was published recently by Tovar-Hernández (2005); here these species are only included in order to be properly compared with the remaining species described from North America.

Histological sections were made at the Laboratorio de Invertebrados of the Facultad de Ciencias, Universidad Nacional Autónoma de México (UNAM). After paraffin embedding, most serial sections were cut (mostly 7 µm) and stained with haematoxylin–eosin. Drawings were made with a camera lucida. Samples of chaetae and uncini were processed and examined after final dehydration in two changes of 100% ethanol at the Laboratorio de Microscopía Electrónica de Barrido (Facultad de Ciencias, UNAM). CO₂ was used to critical-point dry the specimens, which were then mounted on stubs with platinum tape and coated with gold (200 Å thicknesses) before examination with a Cambridge 250 scanning electron microscope. Some samples were examined at the Laboratorio de Microscopía Electrónica de Barrido (ECOSUR Tapachula).

To standardize and facilitate comparison between species of *Chone*, this study follows the terminology and measurements defined in Tovar-Hernández (2005) and Tovar-Hernández and Sosa-Rodríguez (2006). Unless otherwise stated, every description is based on the available type material and any variation found in additional types is included in parentheses. In all species of *Chone*, the biannulate condition in thoracic segments is given by the presence of distinct intra-notochaetal (*inog*) and intra-neurochaetal grooves (*ineg*), less differentiated than inter-segmental grooves (*isg*); when treated with methyl green all these grooves, faecal groove (*fg*) and noto- and neurochaetal lobes are not coloured (Figure 1A, B), this pattern is omitted in descriptions. The following abbreviations are used in the figures: “a”: gland type a; *ag*, acidophil glands; *apr*, anterior peristomial ring; *aprl*, anterior peristomial ring lobe; *bcs*, basal central skeleton; *bl*, branchial lobe; *bls*, basal lateral skeleton; *bv*, blood vessel; *cm*, circular muscle; *co*, coelom; *col*, collar; *ct*, conjunctive tissue; *cu*, cuticle; *d*, dorsal; *dl*, dorsal lip; *dpa*, dorsal pinnular appendages; *dplm*, dorsal package of longitudinal muscle; *fl*, flange; *g*, gut; *gb*, glandular band; *gce*, glandular, columnar epithelium; *gr*, glandular ridge; *gr2*, glandular ridge on chaetiger 2; *ineg*, intra-neurochaetal groove; *inog*, intra-notochaetal groove; *isg*, inter-segmental groove; *m*, muscle; *mo*, mouth; *n*, nerves; *nc*, nerve cord; *neu*, neurochaetae; *ogs*, oval glandular shields; *oo*, oocyte; *pm*, palmate membrane; *postcl*, post-chaetal lobe; *precl*, pre-chaetal lobe; *rs*, radiolar skeleton; *v*, ventral; *vl*, ventral lip; *vplm*, ventral package of longitudinal muscle; *vra*, ventral radiolar appendages; *y*, yolk.

Results

Systematics

Family SABELLIDAE Latreille, 1825
Subfamily SABELLINAE Latreille, 1825
Chone Krøyer, 1856
Chone albocincta Banse, 1972
 (Figure 1)

Chone albocincta Banse 1972, p 479–481, Figure 8a–j.

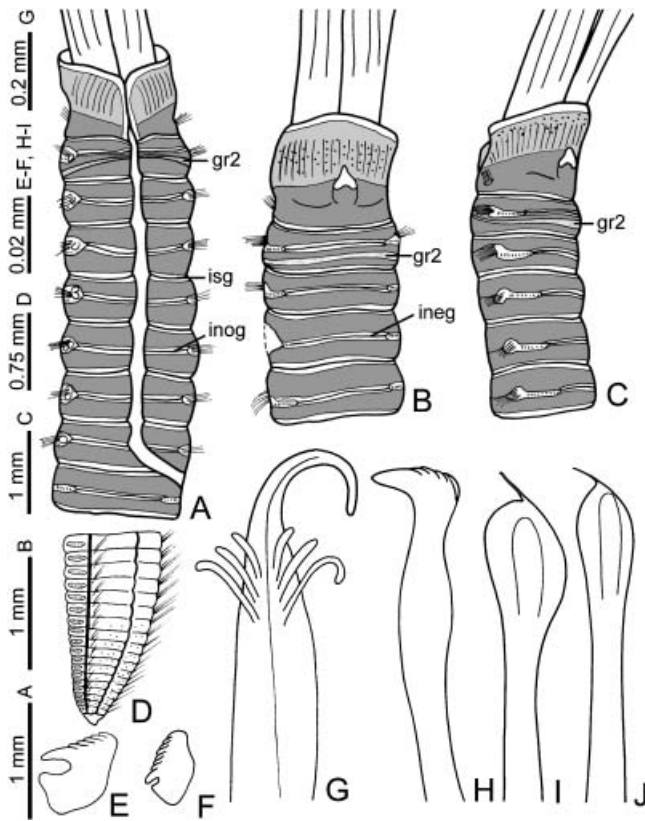


Figure 1. *Chone albocincta*. (A) Anterior end, dorsal view; (B) same, ventral view; (C) same, lateral view; (D) posterior end, latero-dorsal view; (E) anterior abdominal uncinus; (F) posterior abdominal uncinus; (G) radiolar tip; (H) thoracic uncinus; (I, J) paleate chaetae. [LACM-AHF 0455, paratype].

Material examined

Type material. **California** [LACM-AHF POLY 0455, 11 paratypes], Velero, Sta. 6104, 33°39'45"N, 118°06'40"W, 26 m, dark grey silty fine sand, 19 February 1959.

Non-type material. **Oregon** [LACM-AHF], Columbia River, Vessel Cayuse, Cruise 74128, OSU 3009, Sta. 97, coll. MDR, 5 December 1974, 77 m (1). Cruise 7601A, Sta. 1796, coll. MDR, 5 January 1976, 82 m (1). **California** [LACM-AHF], Tomales Bay, 003248, 5745 (1). [LACM-AHF], Goleta, NPDES, Sta. 5, Rep. 1, N 95', 29 October 1985 (2). [CSD-MBL], Point Loma, Sta. A1, 32°39.56'N, 117°15.72'W, 14 January 1986, 18 m (1); Sta. A11, 32°39.98'N, 117°16.27'W, 28 January 1986, 49 m (6); Sta. A12, 32°40.47'N, 117°16.42'W, 30 January 1986, 47 m (1); Sta. A14-4, 32°41.43'N, 117°16.63'W, 16 April 16 1986, 47 m (2). [LACSD-MBL], San Diego, Sta. 0700-10D, 30 m (2); Sta. 0191-00, 30 m (1); Sta. 0794-7D, 30 m (1); Sta. 0701-0D, 30 m (1); Sta. 0100-7D, 30 m (1). [PC-RR], City of San Diego, PLOO Survey, B-1, 1.08 m, 153 (1). MMS Phase II [LACM-AHF], S. Williams CAMP 1-3, Sta. R-8, Rep. 2, Fr 0.5, Sec 0-10 (1); CAMP 2-3, Sta. R-8, Rep. 1, Fr 0.5, Sec 0-10 (1); CAMP 2-3, Sta. R-8, Rep. 2, Fr 0.5, Sec 0-10 (2); CAMP 2-4, Sta. R-8, Rep. 1, Fr 0.5, Sec 0-10 (1); CAMP 2-4, Sta. R-8, Rep. 2, Fr 0.5, Sec 0-10 (1); CAMP 2-5, Sta. R-8, Rep. 3, Fr 0.5, Sec 0-10 (2); CAMP 3-1, Sta. R-8, Rep.

3, Fr 0.5, Sec 0-10 (1). BLM, BFI [LACM-AHF], 22912 (1); 22962 (1); 22979 (1); 2303a (1); 23040 (1); 23045 (1); 23189 (1); 23192 (1); 23192 (2); 23195 (1); 23201 (1); 23202 (1); 23205 (1); 23205 (1); 2912 (1); 80150 (1); 80503 (1); 80504 (1); 80632 (1); 81901 (1); 81905 (1); 81919 (1); 81921 (1); 81922 (1); 81923 (1); 81924 (2); 8272 (1); 83002 (1); 84703 (1). **Western Mexico** [LACM-AHF], F3310, 6179-59 (1).

Additional material. *Chone veleronis* Banse, 1972 [LACM-AHF POLY 0460, paratypes].

Description (based on paratypes, in parentheses variation of specimens from Phase II)

Colour, body shape, and size. Body cream coloured; each thoracic and anterior abdominal segment has two yellow-whitish glandular ridges; glandular ridge in chaetiger 2 brown-orange. Body red-brown in life with whitish glandular rings (Banse 1972). Trunk cylindrical, posterior abdomen depressed dorso-ventrally (Figure 1D). Body length 5–14 mm (2.5–21), width 0.3–1.5 mm (0.25–1.5). Tubes unknown.

Branchial lobes and branchial crown. Insertion of the branchial crown not exposed beyond collar (Figure 1A). Branchial crown length 5–7.5 mm (2–10). Radioles: seven to eight pairs (five to ten). Radioles with median pinnules two times longer than more proximal pinnules. Radiolar tips long. The palmate membrane extends three-quarters the length of the branchial crown (it almost reaches the radiolar tips). Lateral flanges broad (Figure 1G). Dorsal lips triangular, erect, without mid-rib. Ventral lips rounded, about three-quarters the length of the dorsal lips. Ventral radiolar appendages: one pair, as long as branchial crown.

Peristomium. Anterior peristomial ring lobe not exposed beyond collar, distally entire, triangular. Posterior peristomial ring collar: dorsal, ventral and lateral margins entire (Figure 1A–C), ventral margin higher than dorsal (Figure 1C), entire length of mid-dorsal collar margins forms a narrow gap (Figure 1A). Ventral shield of collar rounded, with an anterior, small whitish triangle, and two postero-lateral grooves (Figure 1B, C). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2.5:1.

Thorax. Chaetiger 1: two groups of elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of elongate, narrowly hooded chaetae; one anterior row with bayonet chaetae; two posterior rows with symmetrical; paleate chaetae with medium-sized mucro (Figure 1I, J); neuropodia—one row of acicular uncini per torus, main fang surmounted by four rows of teeth equal in size, occupying half of the main fang length (Figure 1H). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2 (*gr*2): narrow dorsally (Figure 1A), broad ventrally (Figure 1B); in dorsal view it almost reaches the anterior margin of the intra-notochaetal groove (Figure 1A).

Abdomen. Abdominal segments: 31–48 (26–47). Anterior segments: two transverse rows of elongate, narrowly hooded chaetae, chaetae from upper row half as long as chaetae in lower row; uncini with the main fang surmounted by five regular rows of teeth in frontal view, equal in size, occupying one-half the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 1E). Posterior segments: 1–2 very elongate, narrowly hooded chaetae, 25% longer than in anterior segments; modified uncini with the main fang surmounted by six to seven regular vertical rows of teeth equal in size, occupying

three-quarters the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 1F). Pygidium with triangular posterior margin (Figure 1D).

Methyl green staining. The anterior margin of the collar is not coloured; the posterior half of the collar is darker than anterior half; anterior half with grooves and dark spots, the triangle above the ventral shield is not coloured. Thorax and anterior abdomen with epidermis completely glandular, stains uniformly, dorsally (Figure 1A), ventrally (Figure 1B), and laterally (Figure 1C). Posterior end with dark glands (Figure 1D). After 1 day, body stays stained, except the posterior abdomen.

Gametes. Paratypes immature.

Remarks

Chone albocincta, *C. veleronis*, and *C. eiffelturris* n. sp. (see below) are distinguished from other species of the genus by the whitish segmental rings in the thorax and anterior abdomen (Table II). *Chone albocincta* can be distinguished from *C. veleronis* and *C. eiffelturris* n. sp. by the following: the glandular ridge on the second chaetiger is broad ventrally, dorsally it extends to the anterior margin of the intra-notochaetal groove (ventrally greatly broadened extending into the third chaetiger, dorsally narrow in *C. veleronis*; narrow, same width in *C. eiffelturris* n. sp.); the ventral shield of collar is rounded with an anterior whitish triangle and two postero-lateral grooves (ventral shield of collar horseshoe-shaped, three times longer than wide in *C. veleronis*; 2.5 times longer than wide in *C. eiffelturris* n. sp.); short branchial lobes in *C. albocincta* and *C. eiffelturris* n. sp. (long in *C. veleronis*).

Chone aurantiaca (Johnson, 1901)

(Figure 2)

Megachone aurantiaca Johnson 1901, p 431, Plate 18, Figures 186–192; Hartman 1938, p 19; 1959, p 549.

Chone aurantiaca: Banse 1972, p 467–469, Figure 2c–k.

Material examined

Type material. **Washington** [MCZ 1933, holotype], Puget Sound, Port Orchard, coll. A. Robertson, 4 July 1898.

Non-type material. **British Columbia** [RBCM 988-2-45], S end of Fitzhugh Sound, 17-67, opposite the mouth of Rivers In, 51°27'N, 127°49'W, 125 m, coll. P. Lambert et al., 19 January 1988 (2). [CMN 5382], Satellite Channel, 88 m (4). [RBCM 985-403-4], Vancouver Island, Sea Otter Cove, 17-67, East side of Cove, 50°41'N, 128°20.7'W, intertidal, coll. P. Lambert, 4 June 1985, 23 January 1989 (1). **Washington** [USNM 43637], Minnesota Reef, San Juan Island, 48°31.7'N, 122°58'W, 10 July 1968, coll. S. Heller, fine gravel, intertidal (1). [FHL-UW 1700], San Juan Island, 6 July 1953, coll. R. I. Smith, in shell gravel (1). [CMN 3775], Mac Arthur Bank, San Juan Archipelago, 48°24'N, 122°56'W, Sta. 740026, 11 July 1974, 80.46 m, coll. R. M. O. O'Clair (1). [LACM-AHF], West Seattle, Vashon Island, Ferry dock, coll. B. Pernet, 7 May 2004, intertidal (7).

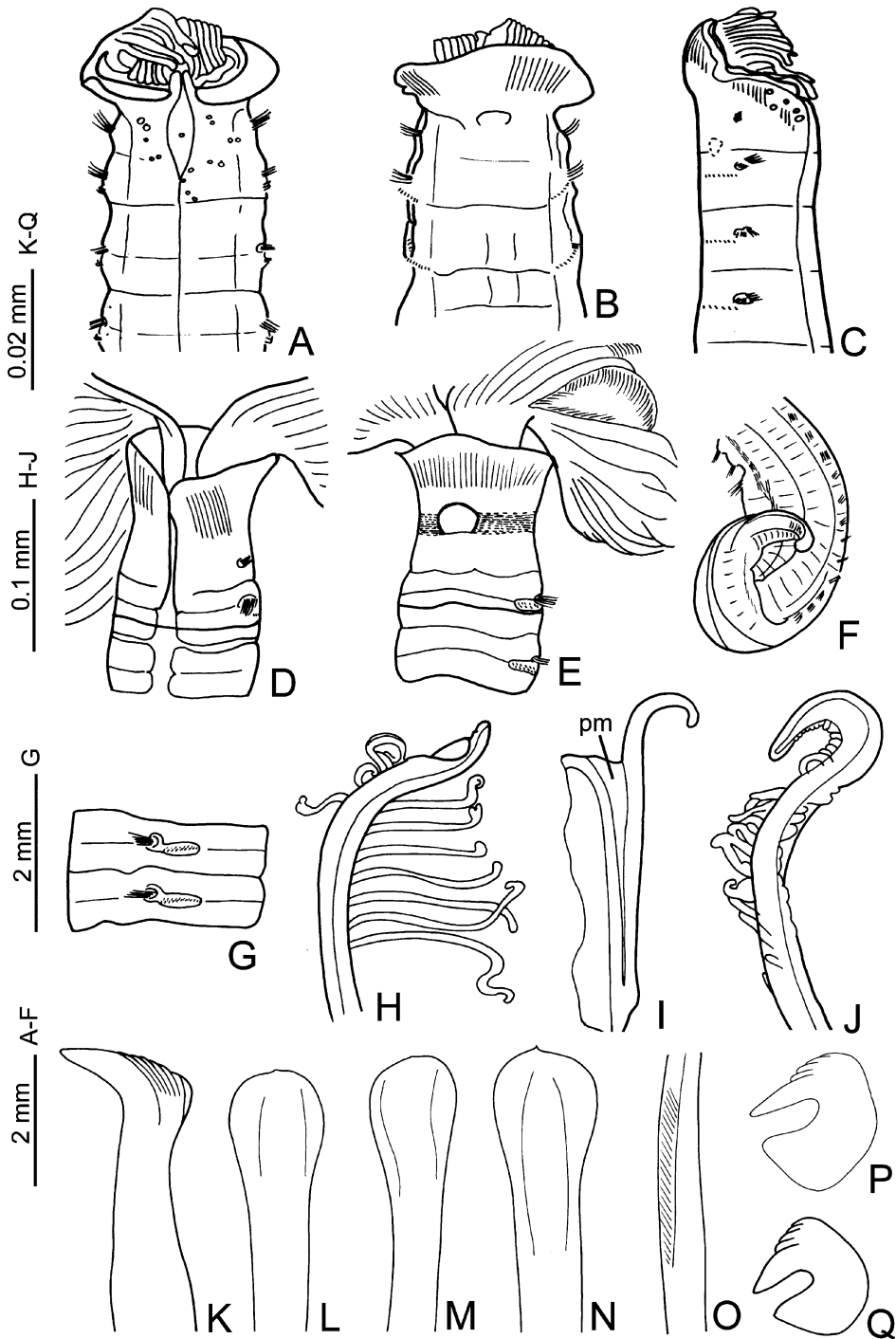


Figure 2. *Chone aurantiaca*. (A, D) Anterior end, dorsal view; (B, E) same, ventral view; (C) same, lateral view; (F) posterior abdomen; (G) thoracic segments; (H, J) radiolar tips; (I) dorsal pinnular appendages; (K) thoracic uncinus from chaetiger 5; (L-N) paleate chaetae; (O) elongate, hooded chaeta, median region; (P) anterior abdominal uncinus; (Q) posterior abdominal uncinus. (A-C, F, J, K, P, Q) [MCZ 1933, holotype]; (D, E, G-I, N, O) [USNM 43637]; (L, M) [FHL 1700].

Additional material. *Chone farringtonae* Tovar-Hernández, 2005 [FSBC I 66733, holotype]. *Chone infundibuliformis* Krøyer, 1856 [ZMUC POL-1749, lectotype; USNM-376, paralectotype; BMNH 82.5.12.33, paralectotype]. *Chone magna* (Moore, 1923) [USNM 17281, holotype]. *Chone mollis* (Bush in Moore, 1904) [YPM 2793, holotype]. *Chone picta* (Verrill, 1885) [YPM 30000, topotype].

Description (based on holotype, in parentheses variation of non-type materials)

Colour, body shape, and size. Holotype partially dehydrated, preserved body brown (bright orange-red when freshly preserved *vide* Johnson 1901), with iridescent, rounded small spots in anterior thoracic segments (Figure 2A, C). Trunk cylindrical (Figure 2C), abruptly enlarged in posterior part of abdomen (Figure 2F). Holotype complete, branchial crown regenerating (Figure 2A, C). Body length 74 (51–85) mm, width 4 (3–8) mm.

Branchial lobes and branchial crown. Insertion of the branchial lobes not exposed beyond collar. Branchial crown length 4 mm (12–17). Radioles: 17 pairs (25–27). Radioles with median pinnules two times longer than proximal pinnules. Radiolar tips short (Figure 2J). The palmate membrane extends about three-quarters the length of branchial crown. Lateral flanges broad (Figure 2H, J). Dorsal lips broadly rounded in frontal view, as long as wide, without mid-rib, resembling the ventral lips, longer than wide in dorso-lateral view. Dorsal pinnular appendages: (two pairs) united by a palmate membrane (*pm*) (Figure 2I). Ventral lips rounded, as long as wide, about one-quarter the length of dorsal lips. Ventral radiolar appendages: (eight short pairs).

Peristomium. Anterior peristomial ring lobe not exposed beyond collar, distally entire, triangular. Posterior peristomial ring collar: antero-dorsal margins entire (Figure 2A, D), forming two well-developed dorsal pockets; entire length of mid-dorsal collar margins forms a narrow gap; faecal groove broad, V-shaped, from segment of collar to segment 2 (Figure 2A); lateral and ventral margins entire (Figure 2B, C, E); ventral margin higher than dorsal. Ventral shield of collar swollen, horseshoe-shaped, as wide as long (Figure 2B, E). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2.5:1 (Figure 2C).

Thorax. Chaetiger 1: two groups of eight elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two rows of elongate, narrowly hooded chaetae (Figure 2O); one anterior row with bayonet chaetae, two posterior rows with symmetrical, paleate chaetae with a very short mucro, sometimes minute or not discernible (Figure 2L–N); neuropodia—two irregular rows of 25 acicular uncini per torus, facing in the same direction, the oldest upper parts of the tori have only one row (one-quarter the length of tori), main fang surmounted by six rows of teeth, second tooth enlarged, located in the midline; dentition covering one-quarter the main fang length (Figure 2K). Glandular ridge on chaetiger 2: narrow.

Abdomen. Abdominal segments: 63 (58–64). Anterior segments: two transverse rows of elongate, narrowly hooded chaetae, chaetae from upper row 50% shorter than chaetae in lower one; uncini with the main fang surmounted by four rows of teeth equal in size, occupying one-half the length of main fang, older (dorsalmost) uncini smaller than younger uncini (ventralmost), main fang not extending beyond breast, breast rectangular

(Figure 2P). Posterior segments: one or two very elongate, narrowly hooded chaetae; uncini similar to those in anterior abdomen (Figure 2Q). Pygidium pointed (Figure 2F).

Gametes. Holotype without gametes; females with oocytes in thorax (RBCM 985-403-4) and abdomen (USNM 43637).

Methyl green staining. The entire body turns uniformly green. The anterior half of the collar is not coloured, posterior end dark. Anterior half of the ventral shield of collar not coloured, posterior half dark.

Remarks

Megachone was synonymized in *Chone* by Banse (1972) by the presence of spatulate chaetae in the type species. Banse (1972) recorded irregular orange-red spots in collar and anterior segments in the holotype. These spots are actually whitish and iridescent.

Chone aurantiaca, *C. gracilis*, *C. magna*, *C. mollis*, *C. picta*, and the type species (*C. infundibuliformis*) constitute a group of species (Group I) that have anterior and posterior abdominal uncini of similar shape (Table III). This is in contrast with a second group (Group II) in which the posterior abdominal uncini are modified (Table II).

Chone aurantiaca, *C. farringtonae*, and *C. magna* have a long posterior peristomial ring collar: in *C. aurantiaca* and *C. farringtonae* it is 2.5 times as long as second chaetiger (three times longer in *C. magna*). *Chone aurantiaca* and *C. magna* have uniform abdominal uncini throughout and narrow glandular ridge on chaetiger 2 (posterior abdominal uncini modified and broad glandular ridge in *C. farringtonae*). *Chone aurantiaca* can be distinguished from *C. magna* by having short radiolar tips (long in *C. magna*), broad radiolar flanges (narrow in *C. magna*), and ventral shield of collar horseshoe-shaped (rounded in *C. magna*).

In the case of *Chone aurantiaca*, *C. mollis* (Figure 19B), and *C. infundibuliformis* the glandular ridge occupies only the external half of the ventral glandular epithelium; whereas dorsally, the glandular ridge occupies only a very small area. For *Chone aurantiaca* and *C. infundibuliformis*, Tovar-Hernández and Sosa-Rodríguez (2006) determined that the glandular ridge is composed of strongly differentiated acidophil glandular cells, tubular-shaped with granulose secretions. From both taxonomic and systematic standpoints, it is recommended that the characterization of the external shape and the extension within the epithelium of the glandular ridge be taken into account as species diagnostic characters.

Chone bimaculata Banse and Nichols, 1968

(Figure 3)

Chone bimaculata Banse and Nichols 1968, p 227–229, Figure 2a–j.

Material examined

Type material. **Washington** [USNM 36280, four paratypes, 36281, one paratype], Puget Sound, 47°10'48"N, 122°50'W, Sta. 5, 22 m, 3 May 1963.

Non-type material. **British Columbia** [RBCM 973-187-21], W coast Vancouver Island, Barkley Sound, Broken Grp, N of Wouwer Islands, Batley Island, 48°52.1'N, 125°21.2'W, 8 m, rock, sand, coll. Peden and Lambert, 29 July 1973 (1).

Table II. Species of *Chone* described from North America with modified, posterior abdominal uncini (Group II).

Species	Radiolar tips	Radiolar flanges	Insertion of branchial lobes	Palmate membrane length: branchial crown length	Anterior peristomial ring lobe	Ventral margin of collar	Ventral shield of collar	Posterior peristomial ring collar length: chaetiger 2, in lateral view	Mucro	Glandular ridge on chaetiger 2	Glandular ridges in thorax and anterior abdomen
<i>C. albocincta</i>	L	Broad	Not exposed	>0.75:1	Not exposed, triangular	Higher than dorsal	Rounded	2.5:1	M	Broad ventrally	Present
<i>C. americana</i>	L	Narrow	Not exposed	0.5:1	Not exposed, triangular	Slightly higher than dorsal	Horseshoe-shaped, 2 times wider than long	1:1	S	Narrow	Absent
<i>C. bimaculata</i>	XL	Narrow	Exposed	0.75:1	Exposed, bilobed	Slightly higher than dorsal	Trapezoid-shaped, 2 times wider than long	1:1	M	Broad	Absent
<i>C. ecaudata</i>	L	Broad	Not exposed	0.75:1	Exposed, digitiform	Slightly higher than dorsal	Horseshoe-shaped, 1.5 times wider than long	2:1	L	Narrow	Absent
<i>C. farringtonae</i>	M	Narrow	Not exposed	0.75:1	Not exposed, triangular	Higher than dorsal	Horseshoe-shaped, 3 times longer than wide	2:1	S	Broad	Absent
<i>C. paramollis</i> n. sp.	L	Narrow	Not exposed	0.75:1	Not exposed, digitiform	Slightly higher than dorsal	Horseshoe-shaped, as wide as long	2:1	Minute or indiscernible	Narrow	Absent
<i>C. perkinsi</i>	M	Narrow	Not exposed	0.75:1	Not exposed, triangular	Slightly higher than dorsal	Horseshoe-shaped, 2 times wider than long	1.5:1	L	Broad dorsally	Absent
<i>C. quebecensis</i> n. sp.	L	Broad	Exposed	0.75:1	Exposed, bilobed	Slightly higher than dorsal	Horseshoe-shaped, 2 times wider than long	2:1	XL	Broad ventrally	Absent

Table II. (Continued).

Species	Radiolar tips	Radiolar flanges	Insertion of branchial lobes	Palmate membrane length: branchial crown length	Anterior peristomial ring lobe	Ventral margin of collar	Ventral shield of collar	Posterior peristomial ring collar length: chaetiger 2, in lateral view	Mucro	Glandular ridge on chaetiger 2	Glandular ridges in thorax and anterior abdomen
<i>C. trilineata</i> n. sp.	L	Narrow	Exposed	0.75:1	Exposed, bilobed	Lower than dorsal	Horseshoe-shaped, as wide as long	1:1	M	Inverted "T"-shaped ventrally	Absent
<i>C. uebelackerae</i>	L	Broad	Not exposed	0.75:1	Not exposed, triangular	Slightly higher than dorsal	Horseshoe-shaped, 2 times wider than long	1.5:1	S	Narrow	Absent
<i>C. veleronis</i>	L	Broad	Exposed	>0.75:1	Not exposed, triangular	Higher than dorsal	Horseshoe-shaped, 3 times longer than wide	2:1	M	Sunglasses-shaped ventrally	Present

Table III. *Chone infundibuliformis* and species of *Chone* described from North America with anterior and posterior abdominal uncini of similar shape (Group I).

Species	Radiolar tips	Radiolar flanges	Insertion of branchial lobes	Palmate membrane length: branchial crown length	Anterior peristomial ring lobe	Ventral margin of collar	Ventral shield of collar	Posterior peristomial ring collar length: chaetiger 2, in lateral view	Mucro	Glandular ridge on chaetiger 2	Distribution of thoracic uncini
<i>C. infundibuliformis</i>	S	Broad	Not exposed	0.75:1	Not exposed, triangular	Slightly higher than dorsal	Horseshoe-shaped, as wide as long	2:1	S	Narrow	Two irregular rows
<i>C. aurantiaca</i>	S	Broad	Not exposed	0.75:1	Not exposed, triangular	Higher than dorsal	Horseshoe-shaped, as wide as long	2.5:1	Minute or indiscernible	Narrow	Two irregular rows
<i>C. gracilis</i>	M	Broad	Not exposed	0.75:1	Not exposed, triangular	Higher than dorsal	Horseshoe-shaped, 2 times wider than long	2:1	S	Narrow	One row in paratype, two irregular rows in holotype
<i>C. magna</i>	L	Narrow	Exposed only when collar is reflexed	0.75:1	Not exposed, triangular	Higher than dorsal	Rounded	3:1	Minute or indiscernible	Narrow	Two irregular rows
<i>C. mollis</i>	L	Broad	Not exposed	0.75:1	Exposed, triangular	Slightly higher than dorsal	Horseshoe-shaped, 2 times wider than long	2:1	Minute or indiscernible	Narrow	One row
<i>C. picta</i>	S	Broad	Not exposed	0.5:1	Not exposed, triangular	Higher than dorsal	Horseshoe-shaped, as wide as long	3:1	Minute or indiscernible	Narrow	One row

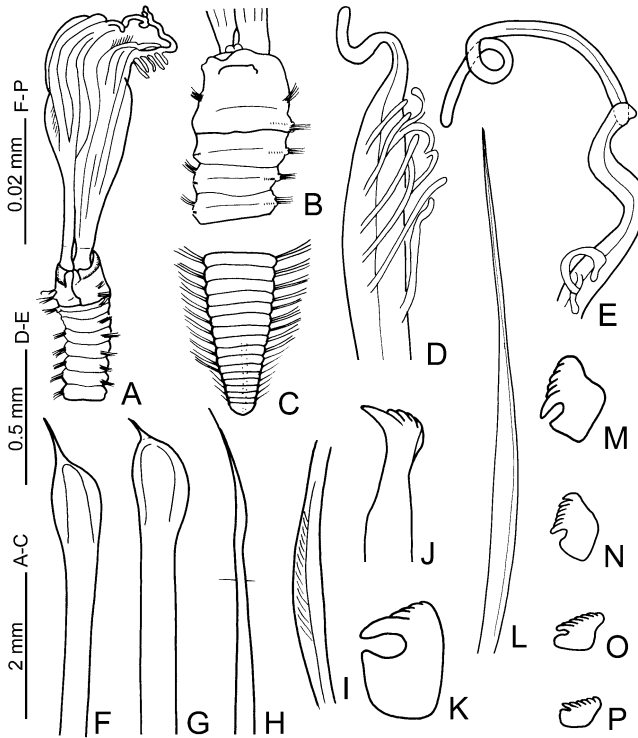


Figure 3. *Chone bimaculata*. (A) Anterior end, dorsal view; (B) same, ventral view; (C) posterior end; (D, E) radiolar tips; (F, G) paleate chaetae; (H) bayonet chaeta; (I) thoracic, elongate, narrowly hooded chaeta; (J) thoracic uncinus; (K) anterior abdominal uncinus; (L) abdominal, elongate, narrowly hooded chaeta; (M-P) posterior abdominal uncini. (A-C, E-P) [USNM 36281, paratype]; (D) [RBCM 973-187-21].

Additional material. *Chone dunei* Malmgren, 1867 [LACM-AHF], Carey, OSU, SMG 1168, 1318]. Norway [ZMUC POL-1755], Bugten avefor rode Ø i Rodr Fjord, 3 Year East Greenland Exp. Sta. 3315, 20 m, 22 August 1933 (54). Scotland [NMW.Z], Calback Ness and Little Roe, Sullom Voe, Shetland Isles: 1998.062.0062, Sta. B48, K, medium sand, 32 m, IOE, April 1988 (12).

Description (based on one complete paratype)

Colour, body shape, and size. Body poorly preserved, cream coloured. Trunk cylindrical, posterior abdomen depressed dorso-ventrally. Body length 9 mm, width 0.75 mm. Tube unknown.

Branchial lobes and branchial crown. Insertion of the branchial lobes exposed beyond collar (Figure 3A). Branchial crown length 5 mm. Radioles: eight pairs. Radioles with median pinnules two times longer than proximal pinnules. Radiolar tips extra long (Figure 3D, E). The palmate membrane extends to three-quarters the length of branchial crown. Lateral flanges broad (Figure 3D, E). Dorsal lips three times longer than wide, without a mid-rib. Dorsal pinnular appendages: two short pairs. Ventral lips rounded, as long as wide, about one-quarter the length of dorsal lips. Ventral radiolar appendages: two short pairs.

Peristomium. Anterior peristomial ring lobe slightly exposed beyond collar dorsally, distally bilobed (Figure 3B). Posterior peristomial ring collar: antero-dorsal margin incised (Figure 3A); entire length of mid-dorsal collar margins forms two prominent lobes, covering a narrow gap; small dorsal pockets (Figure 3A); lateral and ventral margins entire (Figure 3A, B); ventral margin slightly higher than dorsal. Ventral shield of collar trapezoidal, two times wider than long (Figure 3B). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 1:1.

Thorax. Chaetiger 1: two groups of six elongate narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of five elongate, narrowly hooded chaetae (Figure 3I); one anterior row with four bayonet chaetae (Figure 3H), two posterior rows with six symmetrical, paleate chaetae with long and medium-sized mucro (Figure 3F, G); neuropodia—one row of six to eight acicular uncini per torus, main fang surmounted by four rows of teeth, second tooth enlarged, located offset midline, dentition covering three-quarters the length of main fang (Figure 3J). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2: broad.

Abdomen. Abdominal segments: 41. Anterior segments: two rows of five elongate, narrowly hooded chaetae (Figure 3L); uncini with the main fang surmounted by three or four rows of teeth equal in size, second tooth enlarged, dentition occupying one-half the length of main fang; main fang not extending beyond breast, breast rectangular (Figure 3K). Posterior segments: three very elongate, narrowly hooded chaetae, 25% longer than in anterior segments; five to eight modified uncini per torus with the main fang surmounted by six to seven regular rows of teeth equal in size, occupying three-quarters the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 3M–P). Pygidium with rounded posterior margin (Figure 3C).

Gametes. Banse and Nichols (1968) recorded 10 polygonal oocytes per segment in thorax and the anterior two-thirds of the abdomen, each of up to $200\ \mu\text{m} \times 150\ \mu\text{m}$. Paratype [USNM 36280] with oocytes in mid-abdomen.

Methyl green staining. Paratypes with histolysis, when stained, the colour is quickly eliminated. Ventral shield of collar with an anterior whitish line. Two dark rectangles located on lateral sides of anterior peristomial ring collar.

Remarks

The paratypes reviewed have pygidium with rounded posterior margin, not pointed as Banse and Nichols depicted (1968, Figure 2C). Banse (1972, p 466) synonymized *C. bimaculata* Banse and Nichols, 1968 with *Chone duneri* Malmgren, 1867 (described from Spitzbergen). The main reason for describing *C. bimaculata* was the presence of a glandular ridge on chaetiger 2; however, this structure is a diagnostic character for *Chone*.

Chone duneri has been recorded from several latitudes and is considered to be a species with a very wide distribution; however, according to Cochrane (2000) only materials from the Pechora Sea (in the southeastern and northern parts of the Barents Sea) agree with the original description of Malmgren (Spitzbergen) and the redescription of Hofsommer (1913) (Jutland) for *Chone duneri*. She recommended revising the records of *C. duneri* because Spitzbergen is heavily influenced by Atlantic water masses and the subsequent

records contain some discrepancies in the diagnostic characters observed (Madeira by Langerhans 1880 and Mediterranean Sea by Giangrande 1992).

In this study *C. bimaculata* is recognized as a valid species based on unique characters summarized below that separate it from *C. dumeri* (based on additional material from Norway and Scotland) and comparison with records by Cochrane 2000). Both species have the insertion of the branchial lobes and the bilobed anterior peristomial ring lobe exposed beyond the collar as well as radiolar tips extra long (comprising approximately a third of the length of radioles). *Chone bimaculata* differs from *C. dumeri* in that lateral flanges are narrow (broad in *C. dumeri*); the antero-dorsal margin of posterior peristomial ring collar is incised (not incised in *C. dumeri*); the entire length of mid-dorsal collar margins forms two prominent lobes, covering a narrow gap (broad gap in *C. dumeri*); the anterior peristomial ring lobe is partially exposed beyond collar dorsally (completely exposed in *C. dumeri*); the ventral shield of collar is trapezoidal (horseshoe-shaped in *C. dumeri*); modified posterior abdominal uncini (anterior and posterior abdominal uncini similar in *C. dumeri*) and pygidium with rounded posterior margin (triangular in *C. dumeri*).

***Chone ecaudata* (Moore, 1923)**

(Figures 4–6, 19A)

Jasmineira ecaudata Moore 1923, p 246–248.

Chone ecaudata: Hartman 1942a, p 135; 1969, p 663; Berkeley and Berkeley 1950, p 76; 1952, p 124.

Chone minuta Hartman 1944, p 280–281, Plate 23, Figures 50–52, Plate 24, Figures 59, 60; *vide* Banse 1972, p 474.

Material examined

Type material. California [*Chone ecaudata* (Moore, 1923) USNM 17319 (holotype), USNM 58970 (paratype), ANSP 1-21 slide (paratype partially dried), Santa Cruz Island, off Brockway, R/V *Albatross*, Sta. 4431, 61.15–72.41 m, 15 April 1904]. [*Chone minuta* Hartman, 1944, LACM-AHF POLY 0183 (12 paratypes, two removed to *Pseudopotamilla* sp.), Dillon Beach, intertidal, holdfasts of algae and among compound ascidians].

Non-type material. British Columbia [USNM 40722], Vancouver Island, Wreck Bay, 11 August 1921, in roots of eel grass, coll. E. and C. Berkeley (13). [CMN 1980-1743], Vancouver Island, Diana Exp. Kirkby Point Bay, 48°51'N, 125°12'W, rocky shore, sponges, ascidians, 6 August 1975, Sta. P17d (1). [RBCM 988-4-32, 16-77], Burke Channel, 52°12.22'N, 127°22.94'W, 570–590 m, coll. P. Lambert et al., 20 January 1988. **California** [LACM-AHF], Santa Monica Bay, PV, 7.3, Rep. 2, 8 February 1982 (2); 83-60 # 1, 11 May 1979 (3). [CSD-MBL], Mission Bay Jetty, Sta. B2, 32°46.00'N, 117°16.18'W, 14 October 1986, 18 m (1). [CSD-MBL], Point Loma, Sta. A14, 32°41.30'N, 117°16.50'W, 28 January 1986, 47 m (1). [CSD-MBL], off Imperial Beach, Sta. B1, 32°35.00'N, 117°16.18'W, 29 January 1987, 62 m (1). [LACSD-MBL], Sta. 0700-4D, 30 m (1). Sta. 0701-4C, 60 m (1). Sta. 0704-8C, 60 m (1). Sta. 0791-5A, 305 m (1). [LACM-AHF], Coal Oil Point, Intertidal, BLM, H2, 1-77 (1); H3, 8-76 (8); H4, 8-76 (8); H6, 1-77 (2); Lo2, 8-76 (3); N-1, 8-76 (2). [LACM-AHF], Point Conception, M3, 8-76 (3); M4, 8-76 (3); BC-48 (1); LH00-77 (1); LH00-365 (1); LH00-97 (1). [LACM-AHF], NMP-RS LH02, 1205, 8 August 2002 (23). [LACM-AHF], Marina del Rey, MMS Phase I, Help Collections: MDR 2A, 16 June 1978 (10). MDR 3A,

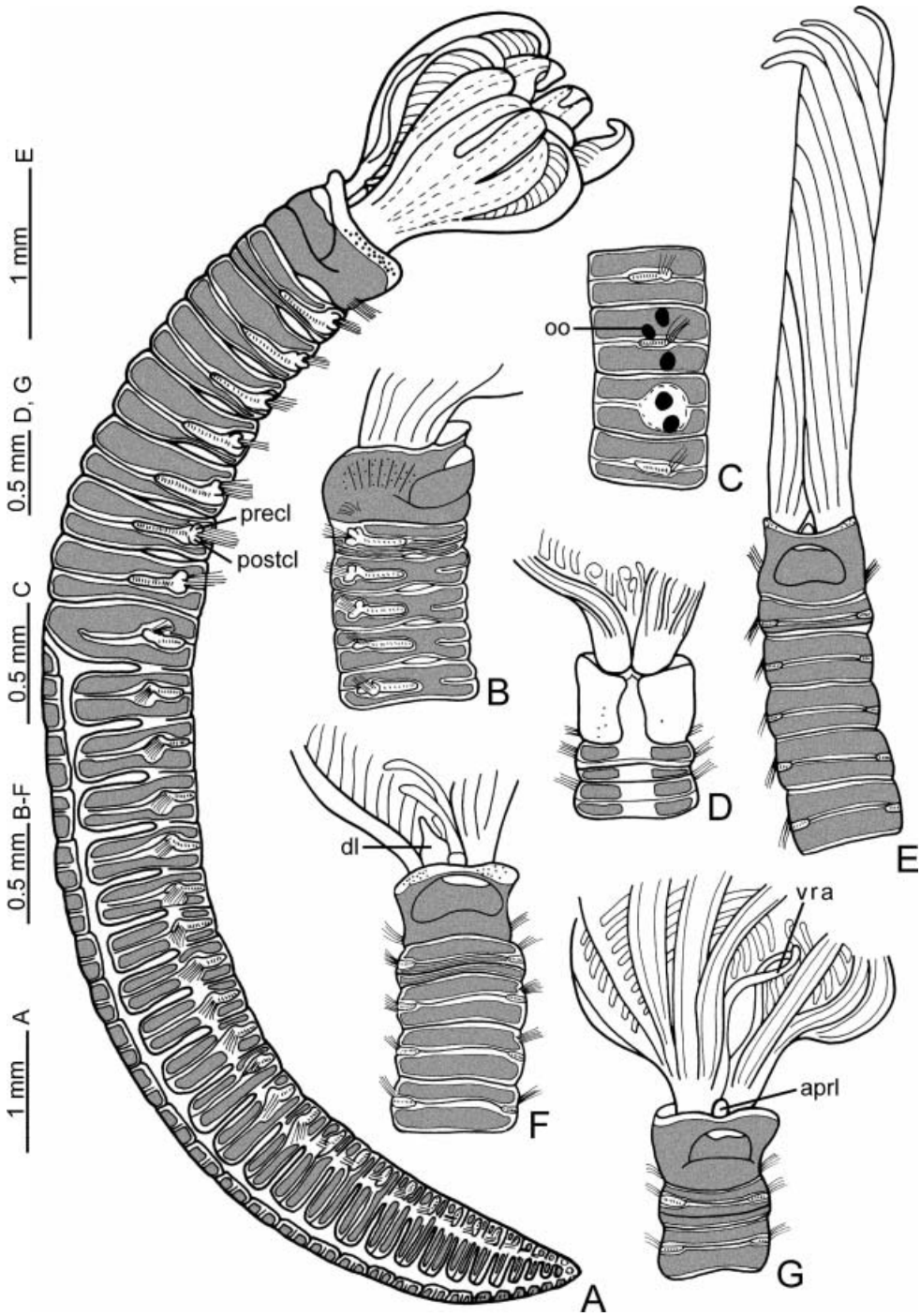


Figure 4. *Chone ecaudata* (with methyl green staining). (A) Whole worm, ventro-lateral view; (B) anterior end, lateral view; (C) posterior thorax, lateral view showing oocytes; (D) anterior end, dorsal view; (E–G) same, ventral view. (A–C, F) [LACM-AHF 0183, paratype *C. minuta*]; (D, G) [USNM 17319, holotype *C. ecaudata*]; (E) [LACM-AHF 2472-53, 003213].

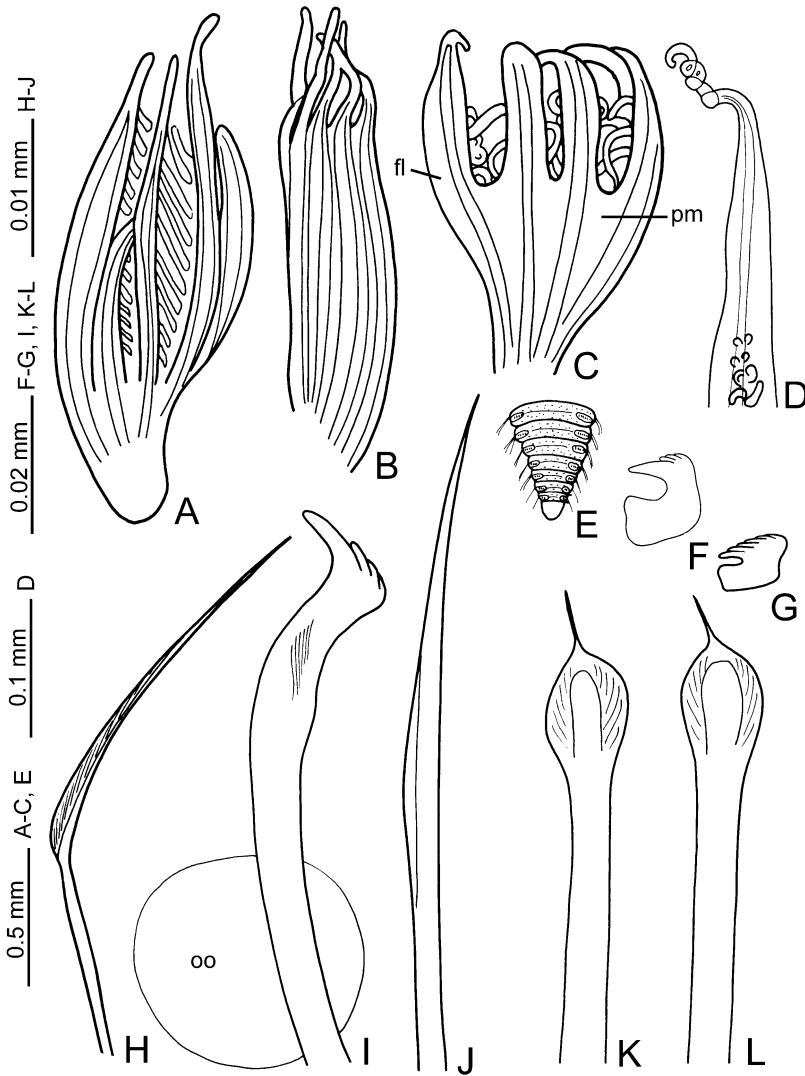


Figure 5. *Chone ecaudata*. (A–C) Branchial crown, different views; (D) radiolar tip; (E) posterior end; (F) anterior abdominal uncinus; (G) posterior abdominal uncinus; (H) bayonet chaeta; (I) thoracic uncinus; (J) thoracic, elongate, narrowly hooded chaeta; (K, L) paleate chaetae. (A–C) [LACM-AHF 2472-53, 003213]; (D, F, G, K, L) [USNM 17319, holotype *C. ecaudata*]; (E, H, J) [LACM-AHF 013, paratype *C. minuta*]; (I) [LACM-AHF, LH02-1205].

21 September 1978 (2). MDR 3A, 28 October 1978 (9). MDR 4A, 23 June 1977 (1). MMS Phase II, 061 B55, 01B (5). [LACM-AHF], BFI, 22962 (2). [LACM-AHF], WLNG, Auriga tow, St. IX, 28 ft, 23 December 1980. POLB RIP RAP, RR2-B3, 23 April 1984 (1). [LACM-AHF], 003208, 2114 (6). [LACM-AHF], 003210, 2128 (8). [LACM-AHF], 003211, 2190 (1). [LACM-AHF], 003212, 2418-53 (5). [LACM-AHF], 003213, Z472-53 (10). [LACM-AHF], 003214, S027-507 (31). [LACM-AHF], 003229 (25). **Western Mexico** [ECOSUR], Bahía de Todos Santos, coll. SISV, 15 October 1982 (13). [LACM-AHF]: LH00-155 (13); LH00-179 (8); LH00-265 (1); LH00-377 (1); LH00-406

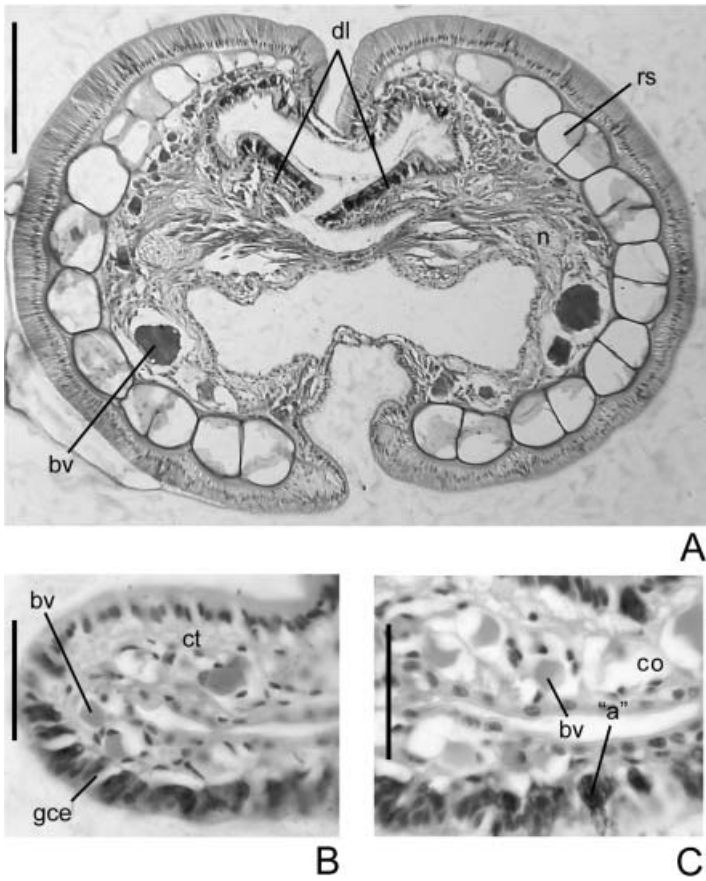


Figure 6. *Chone ecaudata*. (A) Transversal section of the branchial crown base, panoramic view; (B, C) transversal section of dorsal lips. [LACM-AHF, LH02-1205]. Scale bars: 1 mm (A); 100 μ m (B); 165 μ m (C).

(1); LH00-418 (4); LH00-a156 (3); LH01-178 (1); LH01-774 (1); LH01-812 (12); LH01-905 (1); LH01-913 (3); LH01-953 (1); LH03-826 (1); LH03-853 (1); LH04-56 (8).

Additional material. *Chone mollis* (Bush in Moore, 1904) [YPM 2793, holotype].

Description (based on C. ecaudata holotype; in parentheses variation of paratypes of C. ecaudata and C. minuta)

Colour, body shape, and size. Body cream coloured. Trunk cylindrical, posterior abdomen dorso-ventrally flattened. Holotype complete (almost broken in the middle of the body), paratypes incomplete. Body length 3.5 mm (5–9), width 0.75 mm (0.5–0.75). Tubes not preserved in type material, but Moore (1923) recorded that the basal half lacks covering, being thin and transparent, the distal half increasingly coated with a soft, grey, flocculent silt in which minute fragments of shells are scattered. Tubes from MMS Phase II materials flexible, constructed with fragments of shells, algae, and rocks.

Branchial lobes and branchial crown. Insertion of the branchial lobes not exposed beyond collar. Branchial crown length 4 mm (1.5–2.5). Radioles: six pairs (six to nine). Radioles with distal pinnules three times longer than median pinnules. Radiolar tips long (Figures 4E, 5A–D). The palmate membrane (*pm*) extends to three-quarters the length of branchial crown. Lateral flanges (*fl*) broad (Figures 4A, 5C, D). Dorsal lips (*dl*) three times longer than wide, erect, without mid-rib (Figure 4F), triangular in transversal section on the branchial crown base (Figure 6A). Dorsal pinnular appendages: one to three (three to four) short pairs occupying one-quarter of the branchial crown length. Ventral lips rounded, as long as wide, about one-quarter the length of dorsal lips. Ventral radiolar appendages (*vra*): three pairs, the inner and middle ones about one-half the length of branchial crown (Figure 4G), the remainder about one-quarter the length of branchial crown.

Peristomium. Anterior peristomial ring lobe (*lo*) distally entire, triangular with a short, digitiform extension, only this extension is exposed beyond collar (Figure 4E–G). Posterior peristomial ring collar: antero-dorsal margin entire (Figure 4D); lateral and ventral margins entire (Figure 4A, B, E–G); ventral margin slightly higher than dorsal (Figure 4A, B); entire length of mid-dorsal collar margins forms a broad gap (Figure 4D); dorsal pockets well developed. Ventral shield of collar swollen, horseshoe-shaped, 1.5 times wider than long (Figure 4A, B, E–G). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2:1.

Thorax. Chaetiger 1: two groups of eight elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of four to five elongate, narrowly hooded chaetae (Figure 5J); one anterior row with four to five bayonet chaetae (Figure 5H); two posterior rows with five symmetrical, paleate chaetae with long mucro (Figure 5K, L); neuropodia—one row of 10 acicular uncini per torus, main fang surmounted by four rows of teeth equal in size, second tooth enlarged, located offset midline, dentition occupying three-quarters of the main fang length (Figure 5I). Faecal groove broad (Figure 4D). Pre (*precl*) and post-chaetal (*postcl*) lobes well developed (Figure 4A, B). Broad glandular, columnar epithelium (*gce*), swollen in ventral thoracic segments (Figure 19A). Narrow glandular ridge on chaetiger 2 (*gr2*), occupying half of the epithelium in longitudinal section (Figure 19A).

Abdomen. Abdominal segments: 42 (24–26). Anterior segments: two rows of five to six elongate, narrowly hooded chaetae, chaetae from upper row 50% shorter than chaetae in lower one; 10–12 uncini per torus with the main fang surmounted by three regular vertical rows of teeth equal in size, second tooth enlarged, dentition occupying one-half the length of main fang, older (dorsalmost) uncini smaller than younger uncini (ventralmost), main fang not extending beyond breast, breast rectangular (Figure 5F). Posterior segments: one to two very elongate, narrowly hooded chaetae, 25% longer than in anterior segments, making an angle with the shaft at the base of the hood; five to eight modified uncini per torus with the main fang surmounted by six to seven regular vertical rows of teeth equal in size, occupying three-quarters the length of main fang, older (dorsalmost) uncini smaller than younger uncini (ventralmost), main fang not extending beyond breast, breast rectangular (Figure 5G). Pygidium with rounded posterior margin (Figure 5E).

Gametes. Holotype mature female, with oocytes from third thoracic segment to posterior abdomen. Paratype mature female, with oocytes in thorax. Additional females with oocytes (*oo*) in thorax (Figures 4C, 5I) and abdomen (USNM 40722, RBCM 988-4-32).

Histology of dorsal lips. The branchial crown is vascularized by two large blood vessels (*bv*), innervated (*n*) at the base of each branchial lobe, and supported by lateral bars or horns of radiolar skeleton (*rs*) (Figure 6A). The dorsal lips (*dl*) are vascularized by a plexus of small blood vessels (*bv*) that run along the lip as a strongly branched network (Figure 6B, C); each blood vessel is surrounded by coelomic chambers (*co*) (Figure 6C). The dorsal lips have conjunctive tissue (*ct*) extending along the outer margin of the lip, but there is no extension of the branchial skeleton. Two types of simple epithelium are present in dorsal lips: columnar (*gce*) and cubic (Figure 6B). The columnar epithelium covers the external/outer margin of the lips (Figure 6B, C), includes ciliated cells and type “a” glands (Figure 6C), and is covered by a cuticle. The cubic epithelium covers the internal/inner margin of the lip (Figure 6B, C), there are no ciliated cells.

Methyl green staining. The anterior margin of the collar has a granular pattern (Figure 4A, E, F). The ventral shield of the collar stained completely, except for the anterior margin (Figure 4A, B, E–G). Dark areas around the thoracic notopodia are separated by a spotty stained longitudinal band. The epidermis is completely glandular and stains uniformly ventrally in thorax and abdomen (Figure 4A); dorsally colourless in thorax and collar (Figure 4D). The posterior abdomen has a granular pattern. Bodies of specimens fixed inside their tubes have a cross-sectional rectangular appearance after methyl green staining.

Remarks

Moore (1923) described *Chone ecaudata* in the genus *Jasmineira* by the absence of palmate membrane; however, Hartman (1942a, p 135) transferred this species to *Chone*. Banse (1972) synonymized *Chone minuta* Hartman, 1944 and *C. ecaudata*, finding that there are no differences between the diagnostic characters for the two species; this conclusion is confirmed here, since type materials from both species and several additional samples reviewed have no differences in their external general morphology, chaetae and uncini, histology of the dorsal lips, or distribution and size of gametes.

Banse (1972), in his figure 6e, shows well-developed ventral shields of a specimen from British Columbia identified as *C. ecaudata*; however, the shape of the collar and anterior thoracic segments illustrated do not correspond with *C. ecaudata*, and the specimen figured is probably a species of *Euchone*. The ventral thoracic segments in *C. ecaudata* and *C. quebecensis* n. sp. are completely swollen due to the fact that the glandular columnar epithelium (*gce*) is broad or high (Figure 19A, C), in contrast with other species such as *C. aurantiaca*, *C. infundibuliformis* (Tovar-Hernández and Sosa-Rodríguez 2006, Figure 12), and *C. mollis* (Figure 19C), in which the glandular columnar epithelium in ventral thoracic segments is low. In *C. ecaudata* and *C. quebecensis* n. sp. the ventral thoracic segments look like a mat when treated with methyl green, but they cannot be considered ventral shields as in members of *Euchone* or other sabellid genera such as *Demonax* or *Sabellastarte*, in which the shields are well developed and completely distinctive due to their rectangular shape, the presence of intersegmental grooves, and the less coloured glandular epidermis of the lateral sides of the body.

Chone eiffelturris n. sp.

(Figure 7)

Material examined

Type material. **Panama** [LACM-AHF, holotype, 20 paratypes; ECOSUR 0072, three paratypes], Pacific coast of Panama, Causeway, Cage 8, inner sand, coll. H. Lee, 3 June 1977.

Topotype material. **Panama** [LACM-AHF], Causeway, Pacific coast, inner sand, CON-F, Sample C, 31 January 1976 (2); T-F, Sample C, 22 March 1976 (2); P-E-I, Sample C, 19

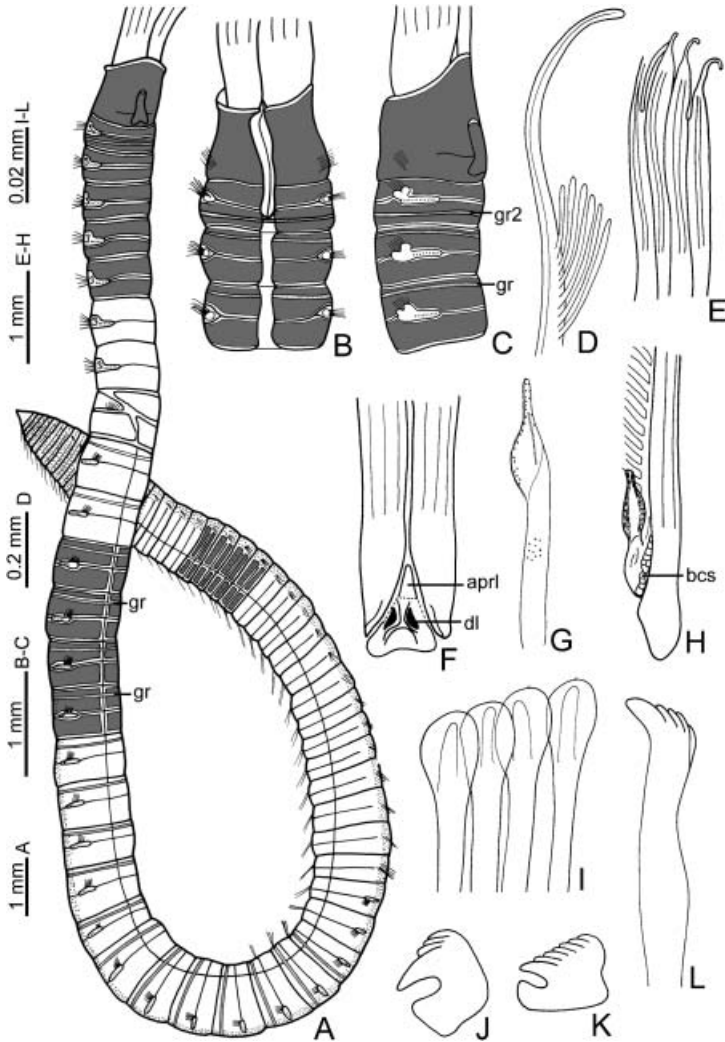


Figure 7. *Chone eiffelturris* n. sp. (A) Body, ventro-lateral view; (B) anterior end, dorsal view; (C) same, lateral view; (D) radiolar tip; (E) radioles; (F) base of the branchial crown; (G) dorsal lip; (H) dorsal lip and dorsal most radiole; (I) paleate chaetae; (J) anterior abdominal uncinus; (K) posterior abdominal uncinus; (L) thoracic acicular uncinus. (A–C) Methyl green staining, in (A) only some segments are coloured. (A–C) [LACM-AHF, holotype]; (D–L) [LACM-AHF, paratype].

March 1976 (1); P-F-1, Sample C, 28 March 1976 (1); T-D, Sample A, 1 April 1976 (2); T-D, Sample B, 4 April 1976 (5); P-O-1, Sample A, 4 April 1976 (2); P-O-1, Sample B, 4 April 1976 (1); CON-D, Sample A, 19 April 1976 (1); P-F-2, Sample A, 24 May 1976 (1); P-F-2, Sample C, 24 May 1976 (1); P-E-I, Sample B, 26 May 1976 (1); T-D, Sample B, 1 June 1976 (2); P-O-2, Sample B, 3 June 1976 (1); CON-F, Sample B, 1 April 1977 (2); CON-F, Sample C, 1 April 1977 (3); Set 1 # 1, 6 April 1977 (7); Set 2 # 3, 6 April 1977 (6); Set 5 # 1, 6 April 1977 (2); Set 1 # 1, 3 May 1977 (10); Set 2 # 3, 3 May 1977 (4); Set 4 # 3, 3 May 1977 (5); Set 5 # 3, 3 May 1977 (7); Control 42, 2 June 1977 (2); Control 45, 2 June 1977 (10); Control 49, 2 June 1977 (6); Cage 42, 2 June 1977 (3); Cage 49, 2 June 1977 (10); Control 8, 3 June 1976 (7); Control 33, 3 June 1977 (4); Control 38, 3 June 1977 (5); Cage 18, 3 June 1977 (11); Cage 33, 3 June 1971 (12); Cage 38, 3 June 1977 (2); No. 8, 3 June 1977 (10); Set 1 # 1, 1 July 1977 (2); No. 2, 1 July 1977 (5); No. 3, 1 July 1977 (1); No. 5, 1 July 1977 (10); No. 8, 1 July 1977 (1); No. 9, 1 July 1977 (3); Freeser, B/6, 6 July 1977 (1); Freeser, 015, 6 July 1977 (1). Causeway, Pacific coast, inner mud, Set 1 # 1, 6 April 1977 (5); Set 2 # 2, 6 April 1977 (3); Set 3 # 1, 6 April 1977 (7); Set 4 # 1, 6 April 1977 (4); Set 5 # 1, 6 April 1977 (2); Set 1 # 3, 3 May 1977 (3); Set 2 # 3, 3 May 1977 (6); Set 3 # 3, 3 May 1977 (10); Set 4 # 3, 3 May 1977 (5); Set 5 # 3, 3 May 1977 (2); Control 5, 2 June 1977 (4); Control 6, 2 June 1977 (5); Control 28, 2 June 1977 (5); Cage 2, 2 June 1977 (9); Cage 5, 2 June 1977 (10); Cage 6, 2 June 1977 (7); Control 18, 3 June 1977 (5); Control 2, coll. H. Lee, 3 June 1977 (13); Control 19, 3 June 1977 (5); Cage 19, 3 June 1977 (2); No. 1, 1 July 1977 (1); No. 3, 1 July 1977 (6); No. 4, 1 July 1977 (6); No. 5, 1 July 1977 (3); No. 10, 1 July 1977 (2).

Non-type material. **California** [LACM-AHF], Tomales Bay, 003249, 6762, inshore (1); 15174, F 3326, K 112 (1). [LACM-AHF], Marina del Rey, MMS Phase I, Help Collections: MDR 3A, 21 September 1978 (3). MDR 2A, 21 September 1978 (1). MDR 3A, 17 March 1978 (1). MDR 4A, 21 September 1978 (3). MDR 4A, 23 June 1977 (3). [LACM-AHF], Dawson, 1-4 # 2 (1). [CSD-MBL], San Diego, Sta. I-35, 7 August 2003, 19 m, RV (1). **Western Mexico** [LACM-AHF], F3297, 2026/51 (1); F3302, 2013-51 (1); F3324, 2624 (8); F3334, N15182, P51-59 (3); F3535, N15183, P51-59 (4); F3357, 6179-5h (2); F3359, M15193, 10870, P5-59 (1); F3364, 2624-54 (30). [CSD-MBL], Tijuana, Sta. TJI-4, 11 August 1997, 0.29 m, KL-C (1). [ECOSUR], Bahía de Todos Santos, 15 October 1981 (3).

Additional material. *Chone aurantiaca* (Johnson, 1901) [MCZ 1933, holotype]. *Chone magna* (Moore, 1923) [USNM 17281, holotype]. *Chone mollis* (Bush in Moore, 1904) [YPM 2793, holotype]. *Chone picta* (Verrill, 1885) [YPM 30000, topotype].

Description (based on holotype, in parentheses variation observed in paratypes)

Colour, body shape, and size. Body cream coloured, with a whitish glandular ridge (*gr*) persegment from third thoracic segment to mid-abdomen (Figure 7A). Trunk cylindrical. Posterior abdomen depressed dorso-ventrally. Body length 38 mm (9.5–25), width 1.2 mm (0.5–1.5). Tube composed of small rocky fragments: black, brown, and terracotta.

Branchial lobes and branchial crown. Insertion of the branchial lobes not exposed beyond collar (Figure 7B). Branchial crown length 8 mm (4–7). Radioles: nine pairs (five to eight).

Median pinnules two times longer than more proximal pinnules. Radiolar tips extremely long (1 mm) (Figure 7D, E). The palmate membrane extends to three-quarters the length of branchial crown (almost reaching the radiolar tips) (Figure 7E). Lateral flanges narrow (Figure 7D, E). Dorsal lips (*dl*) triangular, two times longer than wide, without mid-rib (Figure 7F–H). Dorsal pinnular appendages: one pair (1). Ventral lips rounded, about one-quarter the length of dorsal lips. Ventral radiolar appendages: two short pairs.

Peristomium. Anterior peristomial ring lobe (*lo*) not exposed beyond collar, distally entire, triangular. Posterior peristomial ring collar: antero-dorsal margin forming two well-developed dorsal pockets, entire length of mid-dorsal collar margins forms a narrow gap (Figure 7B); lateral, dorsal, and ventral margins entire (Figure 7A–C); ventral margin higher than dorsal (Figure 7C). Ventral shield of collar Eiffel Tower-shaped, swollen, 2.5 times longer than wide (Figure 7A). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2.5:1.

Thorax. Chaetiger 1: two groups of elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of elongate, narrowly hooded chaetae; one anterior row with bayonet chaetae; two posterior rows with five symmetrical, paleate chaetae with minute mucro (Figure 7I); neuropodia—one row of acicular uncini per torus, main fang surmounted by four rows of teeth equal in size, second tooth enlarged, located offset midline, dentition occupying three-quarters of main fang length (Figure 7L). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2 (*gr2*): narrow. Very narrow glandular ridges (*gr*) in thoracic segments.

Abdomen. Abdominal segments: 53 (43–51). Anterior segments: two transverse rows of elongate, narrowly hooded chaetae, chaetae from upper row half as long as chaetae in lower row; uncini with the main fang surmounted by three regular rows of teeth in frontal view, second tooth enlarged, dentition occupying half the length of main fang (Figure 7J), main fang not extending beyond breast, breast rectangular; single, narrow glandular ridge per segment, more evident than those in thorax. Posterior segments: one or two very elongate, narrowly hooded chaetae, directed upwards, modified uncini with the main fang surmounted by six to seven regular vertical rows of teeth equal in size (Figure 7K), occupying three-quarters the length of main fang, main fang not extending beyond breast, breast rectangular. Pygidium with triangular posterior margin (Figure 7A).

Methyl green staining. Anterior margin of the ventral shield of collar not coloured (Figure 7A, C). Body stains uniformly (Figure 7A–C). Posterior end with a granular pattern (Figure 7A).

Gametes. Paratype and specimen from [LACM-AHF 003249, 6762] females with abundant polygonal oocytes in all thoracic segments and anterior abdomen, diameter 115–150 μm .

Etymology

The specific name refers to the peculiar shape of the ventral shield of the collar, which is Eiffel Tower-shaped. Derived from the Latin *turris*, meaning tower.

Remarks

Chone eiffelturris n. sp., *C. paramollis* n. sp., *C. aurantiaca*, *C. magna*, *C. mollis*, and *C. picta* have paleate chaetae with a minute mucro, not easily discernible (Tables II, III). However, *Chone eiffelturris* n. sp. and *C. paramollis* n. sp. have the modified posterior abdominal uncini typical of Group II, in comparison with *C. aurantiaca*, *C. magna*, *C. mollis*, and *C. picta* the abdominal uncini are of similar shape throughout (Group I). *Chone eiffelturris* n. sp. has extremely long radiolar tips (long in *C. paramollis* n. sp.); the palmate membrane extends more than three-quarters the length of branchial crown, almost reaching radiolar tips (three-quarters in *C. paramollis* n. sp.); ventral shield of collar is Eiffel Tower-shaped (horseshoe-shaped in *C. paramollis* n. sp.) and glandular ridges are present in thorax and anterior abdominal segments (absent in *C. paramollis* n. sp.). *Chone eiffelturris* n. sp. is unique in having extremely long radiolar tips, ventral shield of collar Eiffel Tower-shaped and glandular ridges in thorax and anterior abdomen. Other species with glandular ridges in thorax and anterior abdomen are *Chone albocincta* and *C. veleronis* (see remarks on *C. albocincta*). *Chone mollis* and *Chone eiffelturris* n. sp. are species with wide distribution in California, Western Mexico, and the Pacific coast of Panama.

Chone gracilis Moore, 1906

(Figure 8)

Chone gracilis Moore 1906, p 257–259, Plate 12, Figures 62–66; Berkeley and Berkeley 1952, p 123–124, Figure 254; Hartman 1969, p 665; Fauchald 1972, p 326–327.

Material examined

Type material. **Alaska** [USNM 5513 (holotype), ANSP AD 2208 (one paratype), ANSP 1-24 (one paratype), Alitak Bay, Kodiak Island, Sta. 4274, 1903, 4–56.3 m].

Non-type material. **Alaska** [USNM 40723], Pavlov Bay, Ms. Stranger, coll. E. and C. Berkeley (3). **Oregon** [LACM-AHF], 000002-62, 44°33.5'N, 125°14.6'W, 2000 m, Cruise 6207A, AD6, 6 July 1972 (1); 000009-25 (1); 000007-12 (4).

Description (based on holotype, in parentheses variation observed in paratypes)

Colour, body shape, and size. Body cream coloured (brown in USNM 40723) with an iridescent epicuticle. Trunk cylindrical. Holotype complete, but pygidium and some radioles are broken, branchial crown almost separate from the body. Body length 21 mm (5–12 mm), width 1.5 mm (0.5–1.5). Tube hyaline.

Branchial lobes and branchial crown. Insertion of the branchial lobes partially exposed dorsally beyond collar (Figure 8A). Branchial crown length 11 mm (1.75–3.5). Radioles: nine (seven) pairs. Radioles with median pinnules three times longer than more proximal pinnules. Radiolar tips medium-sized (Figure 8D, H). The palmate membrane extends to three-quarters the length of branchial crown. Lateral flanges broad (Figure 8D–H). Dorsal lips (*dl*) broad basally, triangular towards tip, erect, without mid-rib (Figure 8I). Dorsal pinnular appendages: (six pairs). Ventral lips (*vl*) rounded, small, as long as one-quarter the length of dorsal lips (Figure 8I). Ventral radiolar appendages: (three pairs).

Peristomium. Anterior peristomial ring lobe not exposed beyond collar, distally entire, triangular. Posterior peristomial ring collar: antero-dorsal margin entire (Figure 8A); lateral

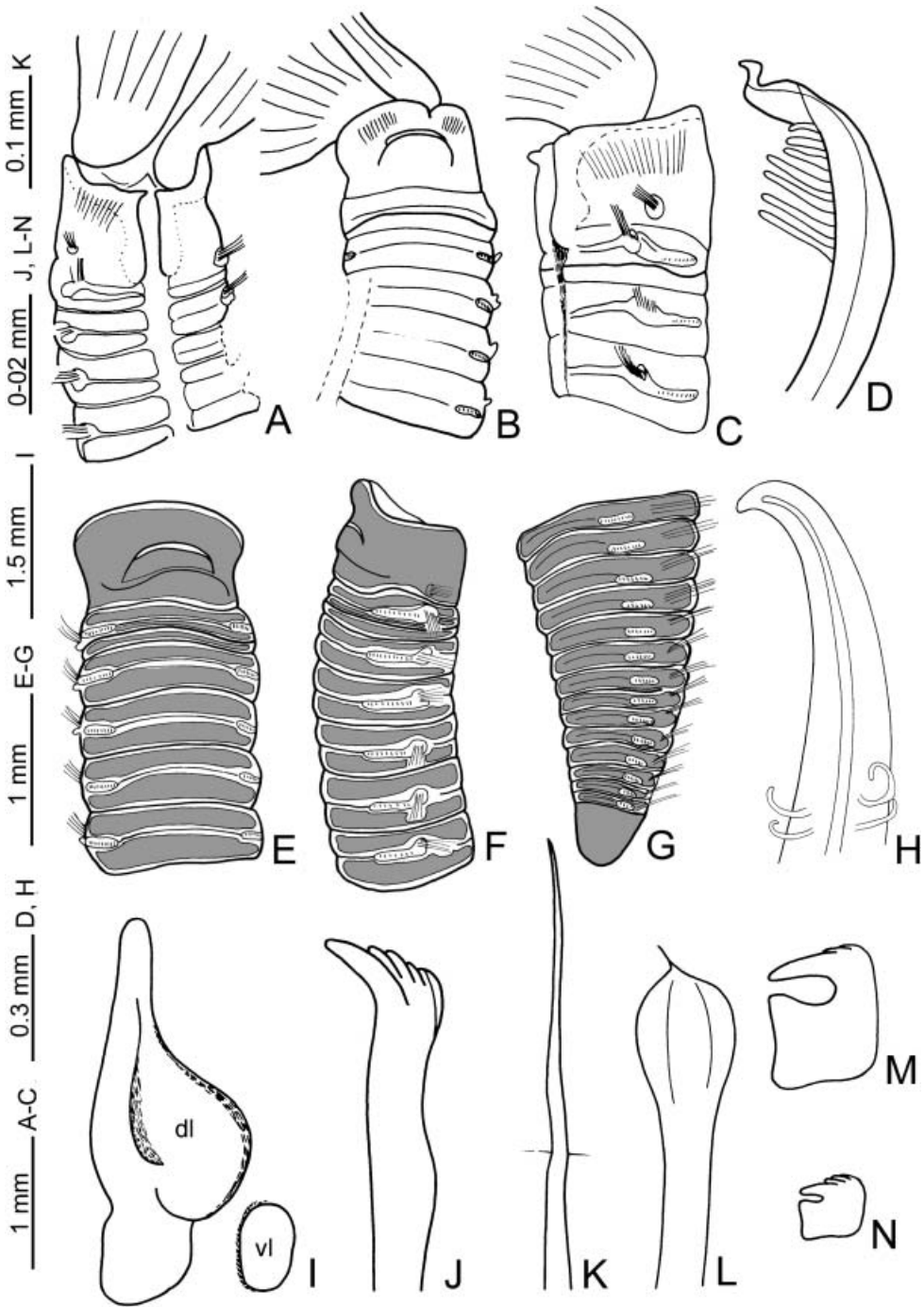


Figure 8. *Chone gracilis*. (A) Anterior end, dorsal view; (B, E) same, ventral view; (C, F) same, lateral view; (D, H) radiolar tip; (G) posterior end; (I) dorsal and ventral lips; (J) thoracic uncinus; (K) bayonet chaeta; (L) paleate chaeta; (M) anterior abdominal uncinus; (N) posterior abdominal uncinus. (E–G) Methyl green staining. (A–D, J–N) [USNM 5513, holotype]; (E–H) [ANSP 2208, paratype].

margins entire (Figure 8C–F); ventral margin incised in holotype (Figure 8B), entire in paratype (Figure 8E) and higher than dorsal (Figure 8C, F); entire length of mid-dorsal collar margins forms a broad gap; broad faecal groove (Figure 8A); dorsal pockets well developed. Ventral shield of collar swollen, horseshoe-shaped, two times wider than long (Figure 8B, E). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2:1.

Thorax. Chaetiger 1: two groups of nine elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two rows of nine elongate, narrowly hooded chaetae; one anterior row with four to five bayonet chaetae (Figure 8K); two posterior rows with five symmetrical, paleate chaetae with short mucro (Figure 8L); neuropodia—two irregular rows (one row) of 19 (13) acicular uncini per torus, facing in the same direction, the oldest upper parts of the tori have only one row (one-quarter of the torus length), main fang surmounted by four rows of teeth, second tooth enlarged, located in the midline, dentition occupying a quarter the length of main fang (Figure 8J). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2: narrow.

Abdomen. Abdominal segments: (24–43). Anterior segments: two transverse rows of very elongate, narrowly hooded chaetae; uncini with the main fang surmounted by three rows of teeth occupying one-half the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 8M). Posterior segments: very elongate, narrowly hooded chaetae; uncini similar to those in anterior abdomen, but larger (Figure 8N). Pygidium with rounded posterior margin (Figure 8G).

Gametes. Holotype female with oocytes in thorax and abdomen; paratype immature.

Methyl green staining. Anterior end of the ventral shield of collar not coloured, posterior end dark (Figure 8A). The epidermis is completely glandular (looks like a mat) and stains uniformly in thorax and abdomen, dorsally and ventrally (Figure 8E–G).

Remarks

Chone gracilis Moore, 1906 and *Chone gracilis* Hofsommer, 1913 described from the Kiel Canal (Baltic Sea) are homonyms. The species of Moore is a senior homonym [according to the Principle of Homonym (Article 52.2) and the Principle of Priority (Article 52.3) from the International Commission on Zoological Nomenclature 2000]. It may be used as a valid name. The holotype of *Chone gracilis* has the ventral margin of the collar incised probably, due to a regeneration process. However, in paratype and additional material it is entire. Deep-water specimens from Oregon have abdominal elongate narrowly hooded chaetae, extremely long. *Chone gracilis* is unique among the species of *Chone* distributed in North American waters in having medium-length radiolar tips. Among species in Group I, *Chone gracilis* and *C. infundibuliformis* have a short mucro; however, the ventral margin of the collar is higher than dorsal margin in *C. gracilis*, and slightly higher in *C. infundibuliformis*.

Chone magna (Moore, 1923)

(Figure 9)

Euchone magna Moore 1923, p 245, Plate 18, Figures 45, 46; Hartman 1961, p 42.

Chone magna: Hartman 1969, p 669; Banse 1972, p 472–474, Figure 5.

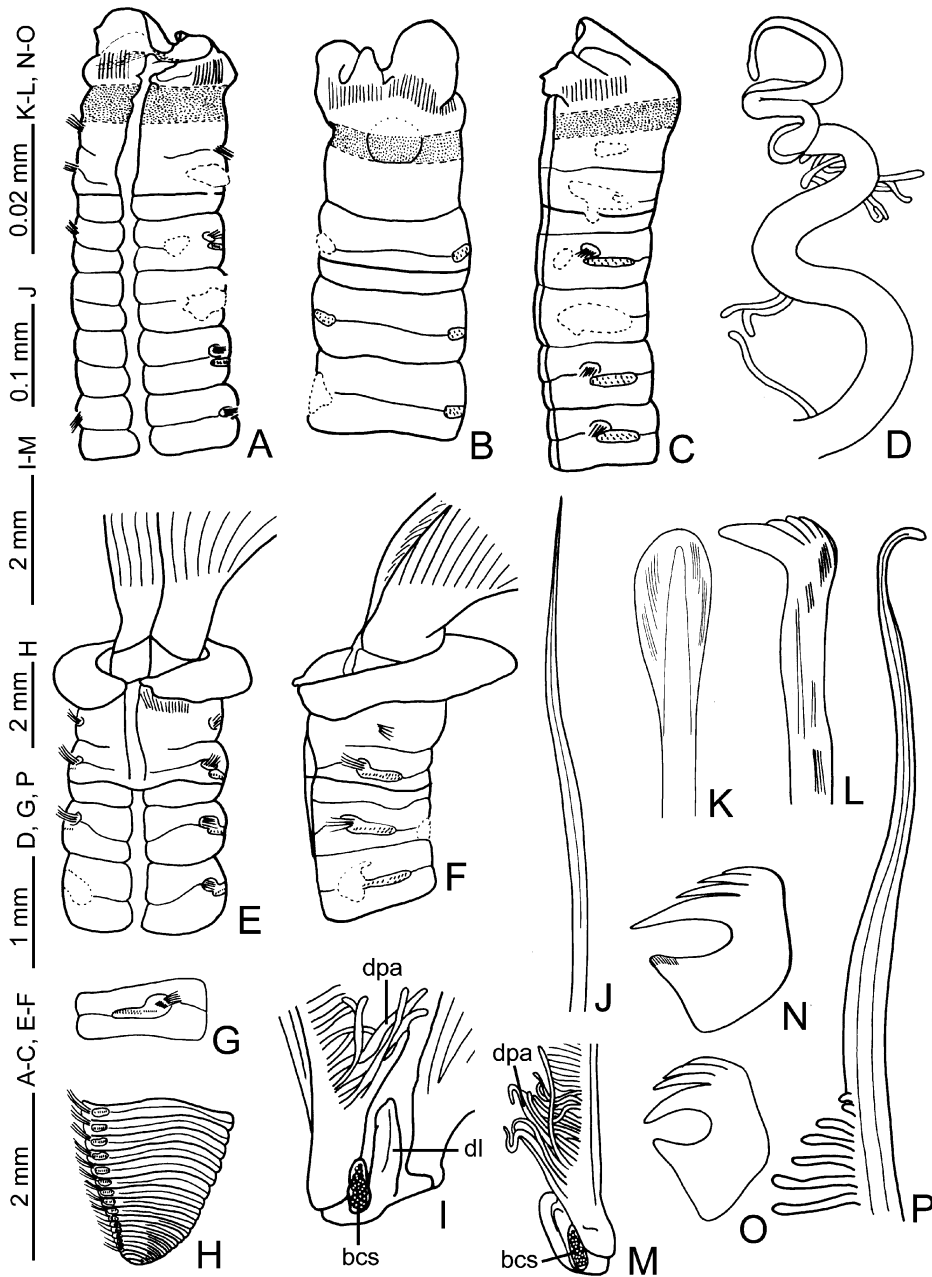


Figure 9. *Chone magna*. (A) Anterior end, dorsal view; (B) same, ventral view; (C) same, lateral view; (D) radiolar tip; (E) anterior end, dorsal view, not reflexed; (F) same, lateral view, not reflexed; (G) thoracic segment, lateral view; (H) posterior abdomen; (I) dorsal lip; (J) thoracic, elongate, narrowly hooded chaeta; (K) paleate chaeta; (L) thoracic uncinus; (M) dorsal most radiole and dorsal lip; (N) anterior abdominal uncinus; (O) posterior abdominal uncinus; (P) radiolar tip. (A–C, L, N, O) [USNM 17281, holotype]; (D, G–I, M) [FHL 293]; (E, F, J, K, P) [USNM 43636].

Material examined

Type material. **California** [USNM 17281 (holotype), ANSP AD 3297 (one paratype), ANSP 1-22, 1-23 (one paratype mounted in slides), San Miguel Island, off Harris, R/V *Albatross*, Sta. 4436, 271 m, 15 April 1904].

Non-type material. **Washington** [USNM 43636], South of Orcas Island, W of Blakeley Island, 48°34.9'N, 122°50.8'W, 13 August 1964 (1). [FHL 293], Lopez Island, San Juan Archipelago, Upright Head, coll. R. P. Dales and G. John, 2 August 1960 (1). [LACM-AHF], Point Loma, Westec, LA5, 430–480 m, 30 March 1983 (1). [LACM-AHF], BLM 2296, BFI (1).

Additional material. *Chone aurantiaca* (Johnson, 1901) [MCZ 1933, holotype]. *Chone farringtonae* Tovar-Hernández, 2005 [FSBC I 66733, holotype]. *Chone mollis* (Bush in Moore, 1904) [YPM 2793, holotype]. *Chone picta* (Verrill, 1885) [YPM 30000, topotype].

Description (based on holotype, number in parentheses correspond to paratypes and non-type material)

Colour, body shape, and size. Body cream coloured, covered by an iridescent layer of epicuticle. Trunk cylindrical (Figure 9C, E, F). Holotype fragmented in three parts (without branchial crown, posterior abdomen damaged as well as a few chaetigers). Body length 8.2 mm (54–71), width 3 mm (2.5–6). Tubes unknown.

Branchial lobes and branchial crown. Insertion of the branchial lobes not exposed beyond collar (exposed only when anterior margins of collar are reflexed). Branchial crown length (16–18 mm). Radioles: (29) pairs. Radioles with median pinnules two times longer than basal ones. Radiolar tips long (3.5 mm) (Figure 9D, P). The palmate membrane extends to three-quarters the length of branchial crown. Lateral flanges narrow (Figure 9P). Dorsal lips (*dl*) broadly rounded, longer than wide, without mid-rib (Figure 9I, M). Dorsal pinnular appendages (*dpa*): (five to six short and median pairs). Ventral lips small, rounded, as long as wide, about one-half length of dorsal lips. Ventral radiolar appendages: one to three pairs, the inner one about three-quarters the length of branchial crown, the remainder about one-quarter the length of branchial crown.

Peristomium. Anterior peristomial ring lobe not exposed above collar, distally entire, triangular. Posterior peristomial ring collar: antero-dorsal margin entire, entire length of mid-dorsal margins forms a broad gap (Figure 9A, E), deep faecal groove, dorsal pockets well developed; lateral and ventral margins entire (Figure 9E, F); ventral margin higher than dorsal (Figure 9B, C, F). Ventral shield of collar swollen, rounded (Figure 9B). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 3:1.

Thorax. Chaetiger 1: two groups of 10 elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two rows of 8–10 elongate, narrowly hooded chaetae (Figure 9J); one anterior row with eight to nine bayonet chaetae; two posterior rows with 11 symmetrical, paleate chaetae without mucro (a very short hair-like mucro in additional material) (Figure 9K); neuropodia—two irregular rows of 26–46 acicular uncini per torus (Figure 9G), facing in the same direction, the oldest upper parts of the tori have only one row (one-quarter the length of tori), main fang surmounted by four rows of teeth, second tooth enlarged, located

in the midline, dentition occupying a quarter the length of main fang (Figure 9L). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2: narrow.

Abdomen. Abdominal segments: 42 (62–72). Anterior segments: two rows of 6–10 elongate, narrowly hooded chaetae, chaetae from upper row half as long as chaetae in lower row; 10–12 uncini per torus with the main fang surmounted by three rows of teeth, occupying half the length of main fang, older (dorsalmost) uncini smaller than younger uncini (ventralmost), main fang not extending beyond breast, breast rectangular with a triangular anterior tip (Figure 9N). Posterior segments: one or two very elongate, narrowly hooded chaetae, 50% longer than in anterior segments; five to eight uncini per torus, similar to those in anterior segments, but smaller (Figure 9O). Pygidium with rounded posterior margin (Figure 9H).

Gametes. Holotype male with sperm in posterior abdomen, spermatozoa nucleus barrel-shaped (1.5 times longer than wide), acrosome sub-triangular and two large, rounded mitochondria.

Methyl green staining. Anterior end of the ventral shield of collar not coloured, posterior end dark. Collar coloured only in the basal half. Body coloured uniformly dorsal and ventrally.

Remarks

Euchone magna was transferred to *Chone* by Hartman (1969), see details in Banse (1972, p 473). *Chone magna* is included in the Group I (species with anterior and posterior abdominal uncini with similar shape; Table III). *Chone magna* and *C. picta* have a long posterior peristomial ring collar, three times longer than second chaetiger; but *C. magna* has long radiolar tips (short in *C. picta*) and narrow radiolar flanges (broad in *C. picta*).

Chone mollis (Bush in Moore, 1904)

(Figures 10, 19B)

Metachone mollis Bush in Moore 1904, p 216, Plate 35, Figures 19, 20, 28.

Chone mollis: Hartman 1942b, p 87, Figures 141–143; 1944, p 279; 1969, p 673; Banse 1972, p 469, Figure 3.

Material examined

Type material. **California** [YPM 2793, holotype], Pacific Grove, Harriman Alaska Expedition, 12, p. 216 W, R. Coe, 1901.

Non-type material. **California** [LACM-AHF], Tomales Bay, 003258, 8 June 1941 (24). 003240, Sta. 6, coll. G. Jones, August 1958 (78). 003244, 1610-48 (8). 003245, 211352 (1). 003246, 4938-57 (14). 003247, 5028-57 (9). 003250 (24). 003251, 1958 (15). 003254 (4). [LACM-AHF], Pitelka, Pelican Point, Sta. 5, 25 June 1941, sand mud, low tide (3). AB pre 372 P (1). [LACM-AHF], Monterey Bay, 003256, coll. G. E. MacGinitie, 2 January 1931 (1). [LACM-AHF], Central California, 003253 (1). 003255 (5). 003257 (8). [LACM-AHF], Marina del Rey, MDR 3A, 29 December 1977 (3). MDR 3A, 16 June 1978 (4). MMS Phase I, Help Collections, MDR 3A, 21 September 1978 (1). [LACM-AHF], Newport, 003242, Sta. 11, January 1951 (1). 003243, Sta. 21, January 1954

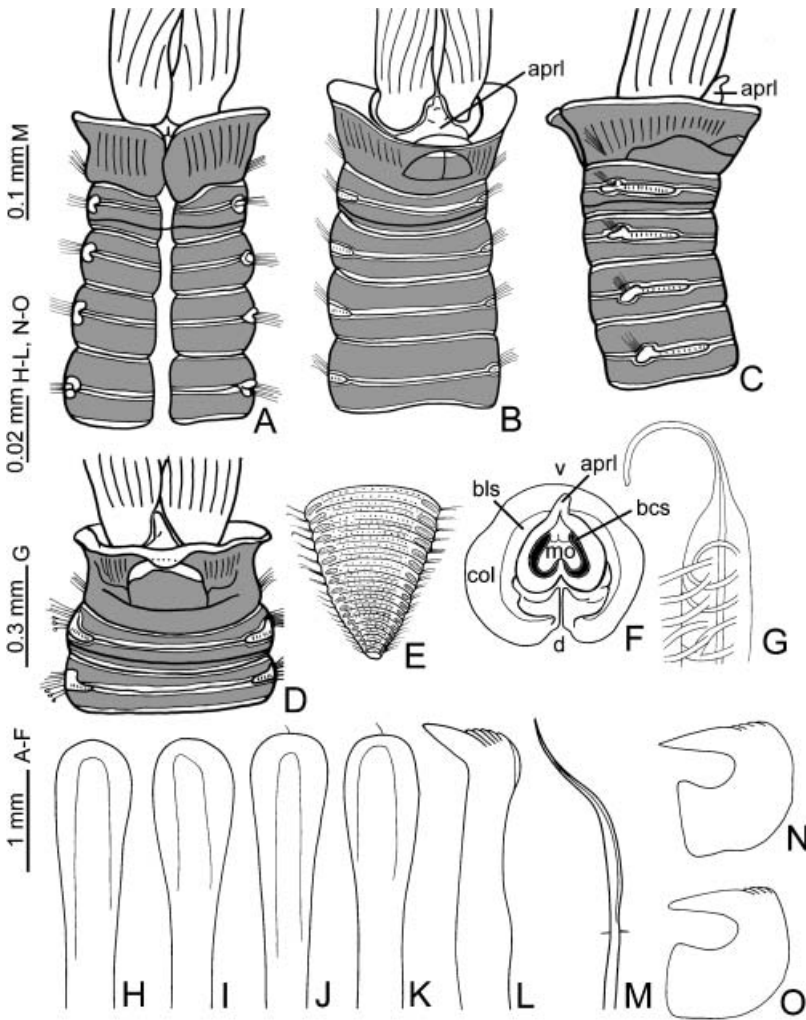


Figure 10. *Chone mollis*. (A) Anterior end, dorsal view; (B) same, ventral view; (C) same, lateral view; (D) ventral shield of collar without longitudinal division; (E) posterior end; (F) peristomium, frontal view; (G) radiolar tip; (H-K) paleate chaetae; (L) thoracic uncinus; (M) bayonet chaeta; (N, O) anterior abdominal uncini. (A-D) Methyl green staining. (A-C, E-G) [LACM-AHF 003258]; (D) [LACM-AHF 003240]; (H-O) [YPM 2793, holotype].

(1). [LACSD-MBL], Sta. 0194-2D, 30 m (3). **Western Mexico** [LACM-AHF], F 3298, 964-39 (2); M15170-F3311 V-2 (1); N 15184-F3336, K-116 (1); N 15174-F3326 K-112 (1); F3345, 1260-41(1); F3330, K-133, M15178 (4). [ECOSUR], Bahía de Todos Santos, coll. SISV, 18 February 1982 (1). **Panama Pacific** [LACM-AHF], coll. H. Lee: CON-D, Sample A, 28 January 1976 (1); 5-F, Sample C, 21 March 1976 (2); P-E-2, Sample C, 27 March 1976 (1); 5-D, Sample A, 5 April 1976 (3); 5-D, Sample B, 5 April 1976 (2); T-D, Sample C, 6 April 1976 (2); CON-F, Sample B, 14 April 1976 (6); CON-D, Sample B, 26 April 1977 (3); PE2 Sample B, 16 May 1976 (2); 5-F, PF1 Sample B, 23 May 1976 (4); PF2 Sample B, 24 May 1976 (1); P-E-2, Sample C, 24 May 1976 (2); Sample A, 25 May 1975 (3); 5-F, Sample C, 26 May 1976 (1); P-E-2, Sample C, 27 May 1976 (1); 5-F, Sample B, 30 May 1976 (3); T-D, Sample A, 1 June 1976 (1); CON-D, Sample B, 28 July

1976 (1); Freeser 0/1, 6 July 1977 (1); Freeser 0/2, 6 July 1977 (5); Freeser 0/3, 6 July 1977 (4); Freeser 0/5, 6 July 1977 (10); Freeser 0/6, 6 July 1977 (8); Freeser 0/7, 6 July 1977 (1); Freeser 0/8, 6 July 1977 (6); Freeser 0/9, 6 July 1977 (15); P-E-2, Sample C, 3 September 1976 (2).

Description (in parentheses variation of specimens LACM-AHF 003259)

Colour in preserved material, body shape, and size. Body brown coloured with an iridescent layer of epicuticle (separated from the body wall). Trunk cylindrical. Holotype incomplete (no posterior end, and only the left half of the branchial crown), with histolysis. Body length 25 mm (34–39), width 2 mm (2.5–4).

Colour in life. Body cream coloured, collar yellow, ventral shield of collar and ventral thoracic segments whitish, glandular ridge on chaetiger 2 white, iridescent epicuticle; ventral and dorsal lips red; radioles with six to eight irregular red-brown coloured, narrow bands [LACM-AHF, Tomales Bay, June 2004, LH04-286-001].

Branchial lobes and branchial crown. Insertion of the branchial lobes not exposed beyond collar. Branchial crown length 8 mm (8–10). Radioles: 17 pairs (13–16). Pinnules from middle region twice as long as more proximal pinnules. Radiolar tips long, elongate (Figure 10G). The palmate membrane extends to three-quarters the length of branchial crown. Lateral flanges broad. Dorsal lips broadly rounded in frontal view, as long as wide, without a mid-rib, resembling the ventral lips. Dorsal pinnular appendages: (five to eight) short pairs united by a palmate membrane. Ventral lips rounded, as long as wide, about one-half of the dorsal lips length. Ventral radiolar appendages (*vra*): one to five pairs, one-quarter to one-half the length of branchial crown (Figure 19B).

Peristomium. Base of the peristomium composed of two lateral horns of basal central skeleton (*bcs*) surrounding the mouth (*mo*); anterior peristomial ring lobe (*lo*) exposed beyond collar, distally triangular, elongate (Figure 10B–D, F). The base of the posterior peristomial ring collar is supported by basal lateral skeleton (*bls*). Antero-dorsal, lateral, and ventral margins of the posterior peristomial ring collar entire (Figure 10A–D); ventral margin slightly higher than dorsal (Figure 10C); entire length of mid-dorsal margins forms a narrow gap; dorsal pockets well developed. Ventral shield of collar swollen, inside and outside of the collar wall (Figure 10B), horseshoe-shaped, two times wider than long (Figure 10B, D), divided by a median-longitudinal line in large specimens (Figure 10B). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2:1.

Thorax. Chaetiger 1: elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two rows of elongate, narrowly hooded chaetae; one anterior row with bayonet chaetae (Figure 10M), two posterior rows with paleate chaetae with minute mucro, not easily discernible (Figure 10H–K); neuropodia—one row of acicular uncini, main fang surmounted by five rows of teeth equal in size, second tooth enlarged, located in the midline, dentition occupying a quarter the length of main fang (Figure 10L). Pre- and post-chaetal lobes well developed. Broad glandular, columnar epithelium (*gce*), swollen in first two ventral thoracic segments, narrow in following thoracic segments (Figure 19B).

Narrow glandular ridge on chaetiger 2, it occupies a quarter of the epithelium in longitudinal section (Figure 19B).

Abdomen. Abdominal segments: 42 (41–43), two transverse rows of five to six elongate, narrowly hooded chaetae, chaetae from upper row half as long as chaetae in lower one; uncini with the main fang surmounted by four regular vertical rows of teeth equal in size, occupying one-half the length of main fang, older (dorsalmost) uncini smaller than younger uncini (ventralmost), main fang not extending beyond breast (Figure 10N), breast rectangular. Posterior segments: one or two very elongate, narrowly hooded chaetae; uncini similar to those in anterior abdomen (Figure 10O). Pygidium with rounded posterior margin (Figure 10E).

Gametes. Holotype and specimens from Pacific Panama females with oocytes (*oo*) in thorax (Figure 19B).

Methyl green staining. The epidermis is completely glandular and stains uniformly in thorax and abdomen, dorsally and ventrally (Figure 10A–C). The ventral shield of collar is not coloured in the anterior margin (Figure 10B, D). Posterior end with granular pattern (Figure 10E).

Remarks

Metachone mollis was established as having thoracic paleate chaetae lacking a mucro; however, Fauvel (1927) transferred this species to *Chone*, arguing that because the size and length of the mucro varies greatly between species it cannot have generic significance. Re-examination of type material confirmed the presence of a very short hair-like mucro in complete chaetae in holotype. *Chone aurantiaca*, *C. magna*, *C. picta*, and *C. mollis* have paleated chaetae with mucro minute or absent (Table III). In *C. mollis*, the ratio of posterior peristomial ring collar length versus chaetiger 2 length is 2:1 (2.5:1 in *C. aurantiaca*, 3:1 in *C. magna* and *C. picta*); the ventral margin of the posterior peristomial ring collar is slightly higher than dorsal (very much higher in *C. aurantiaca*, *C. magna*, and *C. picta*); the radiolar flanges are narrow (broad in *C. aurantiaca*); and the entire length of mid-dorsal margins forms a narrow gap (broad *C. magna* and *C. picta*). Like *Chone eiffelturris* n. sp., *C. mollis* is distributed in California, Western Mexico, and Pacific coast of Panama.

Chone paramollis n. sp.

(Figure 11)

Material examined

Type material. **California** [LACM-AHF 003251, 1958, Tomales Bay, holotype, 80 paratypes; ECOSUR 0073, five paratypes]. Topotypes [LACM-AHF], 003218 (5); 003238, # 2 8-58 (various dozens); 003240, # 6, coll. G. Jones, August 1958 (11); 003246, 4938-57 (4); 003247, 5028-57 (10); 003248, 5745 (1); 003250 (6).

Non-type material. **California** [LACM-AHF], Marina del Rey, MMS Phase I, Help Collections, MDR 2A, 21 September 1978 (12). MDR 4A, 21 September 1978 (3). [LACM-AHF], Santa Monica Bay, Repl. Study, Sta. 83-60 # 1, 62 m, 11 May 1979 (1);

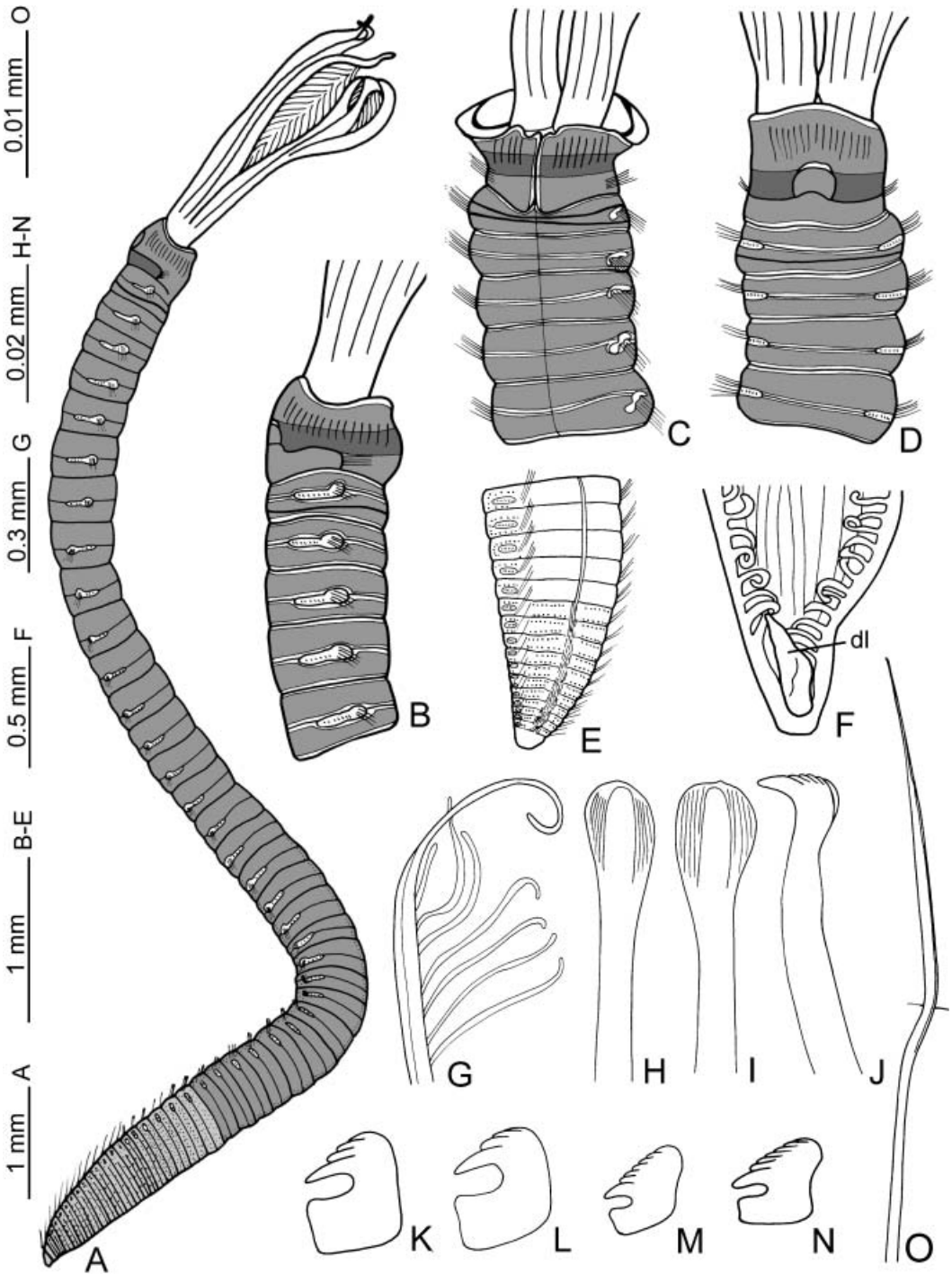


Figure 11. *Chone paramollis* n. sp. (A) Body, lateral view; (B) anterior end, dorsal view; (C) same, ventral view; (D) same, lateral view; (E) posterior end; (F) left branchial lobe; (G) radiolar tip; (H, I) palcate chaetae; (J) thoracic uncini; (K, L) anterior abdominal uncini; (M, N) posterior abdominal uncini; (O) bayonet chaeta. (A–D) Methyl green staining. (A–C, E) [LACM-AHF 003251, holotype]; (D, F, G–O) [LACM-AHF, paratype].

Sta. 83-60 # 3, 62 m, 11 May 1979 (1). [LACM-AHF], Newport, 003241, Sta. 9, January 1954 (1). [CSD-MBL], Point Loma, Sta. A-12, 32°40.47'N, 117°16.42'W, 4 January 1981, 47 m (1); Sta. I-8, 35 m, 13 February 2005 (2). [LACSD-MBL], San Diego, Sta. Y6D, 30 m (10). Sta. 0102-3D, 30 m (1). Sta. 0703-3D, 30 m (2). Sta. 0194-2D, 30 m (1). Sta. 0191-7D, 30 m (1). [PC-RR], City of San Diego, ITP I-2, 32 m, 1 July 2002, RCR DLZ 1089 (1); San Diego Bay, SB03, 10.4 m, 13 April 2004 (2). [LACM-AHF BLM 24242 BFI] (1). [LACM-AHF BFI], BLM 6846-60, 003219 (1). **Western Mexico** [ECOSUR], Bahía La Paz, Calerita, coll. SISV, 12 June 1987 (2).

Additional material. *Chone mollis* (Bush in Moore, 1904) [YPM 2793, holotype].

Description (based on holotype, in parentheses variation of paratypes)

Colour, body shape, and size. Body pink. Trunk depressed dorso-ventrally, posterior abdomen with a dorso-ventral depression (Figure 11E). Body length 20 mm (13–24), width 1 mm (0.9–1). Tubes unknown.

Branchial lobes and branchial crown. Insertion of branchial lobes not exposed beyond collar (Figure 11A, B). Branchial crown length 5 mm (4). Radioles: eight pairs (seven to eight). Radioles with median pinnules twice the length of proximal pinnules. Radiolar tips long (Figure 11G). The palmate membrane extends to three-quarters the length of branchial crown. Lateral flanges narrow. Dorsal lips (*dl*) triangular, elongate, erect, without mid-rib (Figure 11F). Dorsal pinnular appendages: two pairs. Ventral lips rounded, as long as wide, about one-quarter the length of dorsal lips. Ventral radiolar appendages: one pair, occupying one-half the length of branchial crown.

Peristomium. Anterior peristomial ring lobe triangular at their base, then digitiform, not exposed beyond collar. Posterior peristomial ring collar: antero-dorsal margin forming well-developed dorsal pockets, entire length of mid-dorsal collar margins forms a narrow gap (Figure 11C); lateral and ventral margins entire (Figure 11A, B, D); ventral margin slightly higher than dorsal (Figure 11B). Ventral shield of collar horseshoe-shaped, swollen, as wide as long (Figure 11D). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2:1.

Thorax. Chaetiger 1: elongate narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of elongate, narrowly hooded chaetae; one anterior row with bayonet chaetae (Figure 11O); two posterior rows with five symmetrical, paleate chaetae with minute or indiscernible mucro (Figure 11H, I); neuropodia—one row of acicular uncini per torus, main fang surmounted by four rows of teeth equal in size, second tooth enlarged, located offset midline, dentition occupying three-quarters the length of main fang (Figure 11J). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2: narrow.

Abdomen. Abdominal segments: 46 (37–43). Anterior segments: two transverse rows of elongate, narrowly hooded chaetae, chaetae from upper row half as long as chaetae in lower row; uncini with the main fang surmounted by three regular rows of teeth in frontal view, second tooth enlarged, dentition occupying half the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 11K, L). Posterior segments: one or two very elongate, narrowly hooded chaetae, modified uncini with the main fang

surmounted by six to seven regular vertical rows of teeth equal in size, occupying three-quarters the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 11M, N). Pygidium with triangular posterior margin (Figure 11E).

Gametes. Holotype female with oocytes in thorax and mid-abdominal region, different sizes.

Methyl green staining. The epidermis is completely glandular and stains uniformly in thorax and abdomen, dorsally and ventrally, except the anterior margin of collar (Figure 11A–C). The anterior end of the first ventral glandular shield is not coloured, lateral sides of ventral shield of collar dark (Figure 11A–C). Posterior end granular (Figure 11E). After 24 h specimens lost colour; only two glandular rings per segment are visible.

Etymology

Specific name refers to the similarity between this species and *Chone mollis*.

Remarks

The collar segment of *Chone paramollis* n. sp. resembles *Chone mollis*; however, *C. paramollis* n. sp. has modified posterior abdominal uncini (Group II), which are not modified in *C. mollis* (Group I); the ventral shield of collar is as long as wide in *C. paramollis* n. sp. (two times wider than long in *C. mollis*); the anterior peristomial ring lobe not exposed beyond collar (exposed in *C. mollis*); the posterior peristomial ring collar length is two times longer than first chaetiger length (1.5 in *C. mollis*). *Chone paramollis* n. sp. and *C. eiffelturris* n. sp. are unique among species of *Chone* from Group II in having paleate chaetae with a minute or indiscernible mucro: *C. paramollis* n. sp. has long radiolar tips (extremely long in *C. eiffelturris* n. sp.); the palmate membrane extends three-quarters of the branchial crown length (more than three-quarters, almost reaching radiolar tips, in *C. eiffelturris* n. sp.); ventral shield of collar horseshoe-shaped (“A”-shaped in *C. eiffelturris* n. sp.) and lacking glandular ridges in thorax and anterior abdominal segments (present in *C. eiffelturris* n. sp.).

Chone picta (Verrill, 1885) new combination

(Figure 12)

Sabella picta Verrill 1885, p 440.

Material examined

Topotype material. **Massachusetts** [YPM 30000], Martha’s Vineyard, off Gay Head, R/V *A. E. Verrill*, Naturalist Dredge, 126 ft, SEP 1789, coll. V. A. Zullo, T. J. M. Schopf, J. M. Reinhart, and E. P. McReynolds, 6 June 1969 (1). [YPM 30002], Off Gay Head, 2400 m from CC Buoy, 70°51’N, 41°22’W, 90–110 ft, SEP 1155, coll. J. L. Simon and P. E. Schwamb, 22 June 1966 (1).

Non-type material. **Massachusetts** [YPM 34894], 6400 m S of Fishing Ledge, 41°52.7’N, 70°18.5’W, R/V *A. E. Verrill*, Epibenthic Dredge, 105 ft, SEP 1620 Ep, coll. Biotic Census, 19 December 1967 (1). [YPM 30001], Cape Cod Bay, 11,200 m ENE of Manomet Point, 41°56.6’N, 70°29.1’W, R/V *A. E. Verrill*, Smith-McIntyre Grab, 140 ft, SEP 1224 E1, coll.

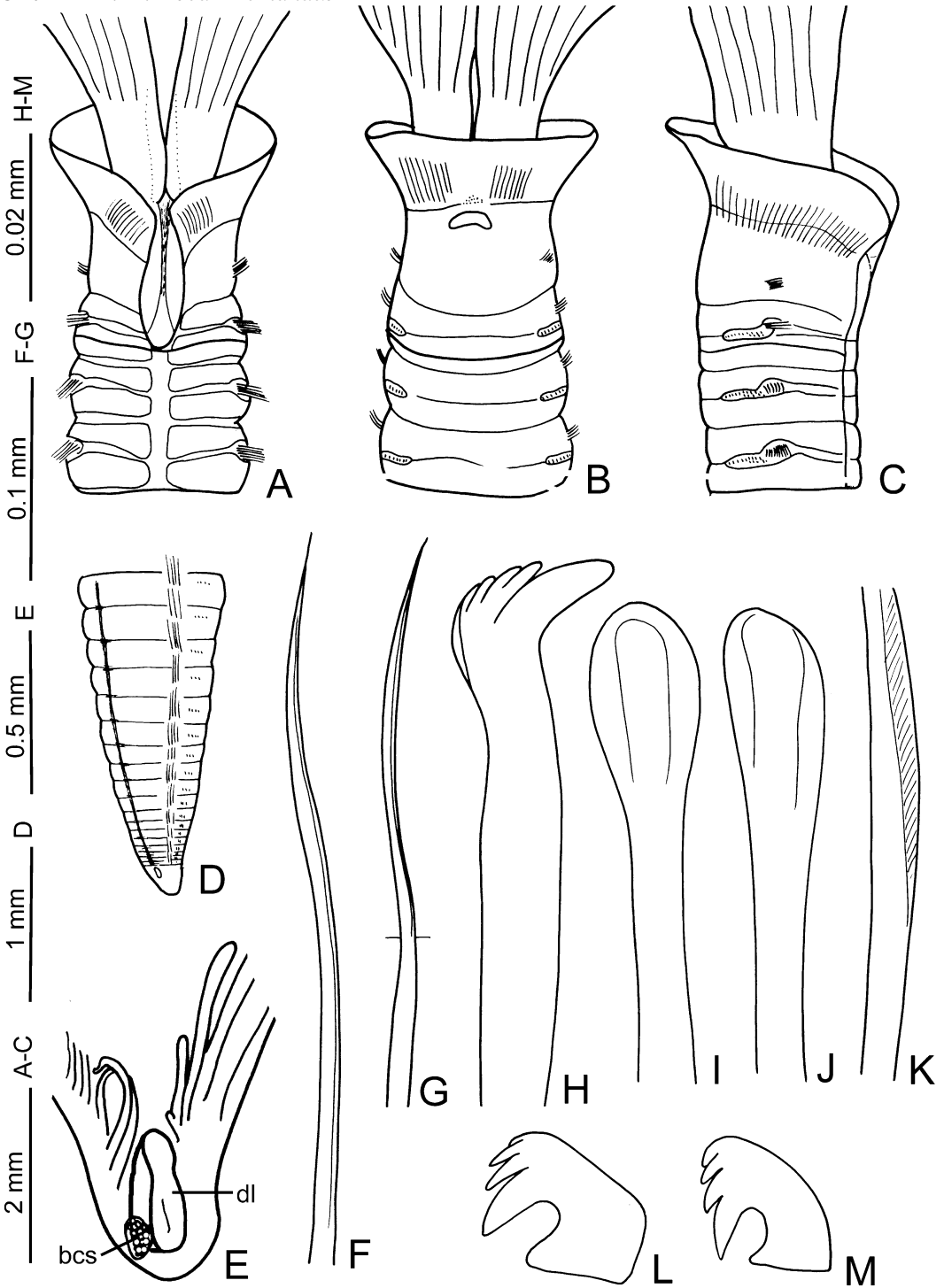


Figure 12. *Chone picta*. (A) Anterior end, dorsal view; (B) same, ventral view; (C) same, lateral view; (D) posterior end, lateral view; (E) branchial lobe; (F) thoracic, elongate, narrowly hooded chaeta; (G) bayonet chaeta; (H) thoracic uncinus; (I, J) paleate chaetae; (K) abdominal, elongate chaeta; (L) anterior abdominal uncinus; (M) posterior abdominal uncinus. [YPM 30002, topotype].

Biotic Census, 3 March 1968 (2). [YPM 34891], 2400 m off Race Point, Provincetown, 42°03.5'N, 70°16.00'W, R/V *A. E. Verrill*, Smith-McIntyre Grab, 188 ft, SEP 0518 E2, coll. Biotic Census, 14 May 1968 (1). [YPM 34895], Off Fishing Ledge, 41°50.5'N, 70°18.5'W, R/V *A. E. Verrill*, scuba, 105 ft, SEP 1220, dive, coll. D. Grant, R. Wilce, C. McKay, and J. Sears, 26 August 1968 (1). [YPM 34896], Off Fishing Ledge, 41°50.5'N, 70°18.5'W, R/V *A. E. Verrill*, scuba, 105 ft, SEP 1220, dive, coll. D. Grant, R. Wilce, C. McKay, and J. Sears, 26 August 1968 (1). [YPM 34906], Fishing Ledge, 41°50.5'N, 70°18.5'W, R/V *A. E. Verrill*, Smith-McIntyre Grab, 94 ft, SEP. 1220 E1, coll. Biotic Census, 26 August 1968 (1). [YPM 34902], 6400 m N of Barnstable Harbor, 41°47.5'N, 70°18.67'W, R/V *A. E. Verrill*, Smith-McIntyre Grab, 66 ft, SEP 2118 ES, coll. Biotic Census, 14 October 1968 (1). [YPM 34905], 4800 m NE of McIntyre, 120 ft, SEP 1028 E4 (1). [YPM 34899], 4800 m NE of east end of Cape Cod Canal, 41°49.2'N, 70°27.7'W, R/V *A. E. Verrill*, Naturalist Dredge, 83–90 ft towed 2 min, 500 ft, SEP 1820N, coll. Biotic Census, 19 November 1968 (1). [YPM 34900], 4800 m NE off east end of Cape Cod Canal, 41°49.2'N, 70°27.7'W, R/V *A. E. Verrill*, Naturalist Dredge, 86 ft, SEP 1926N, coll. Biotic Census, 19 November 1968 (1). [YPM 34893], 11,200 m NE of Manomet Point, 41°58.5'N, 70°24.0'W, R/V *A. E. Verrill*, Smith-McIntyre Grab, 154 ft, SEP 1024 E1, coll. Biotic Census, 19 December 1968 (3). [YPM 34901], 11,200 m NE of Manomet Point, 41°58.5'N, 70°24.0'W, R/V *A. E. Verrill*, Naturalist Dredge, 152 ft, SEP 1024 N, coll. Biotic Census, 19 December 1968 (1). [YPM 34909], Off Barnstable Harbor, 41°46.5'N, 70°18.6'W, R/V *A. E. Verrill*, Smith-McIntyre Grab, 68 ft, SEP 2220 E5, coll. Biotic Census, 7 January 1969 (1).

Redescription

Colour, body shape, and size. Body cream coloured. Verrill (1885): “color of the body greenish, specked with bright red, most so posterior and anteriorly, on the collar the red predominates. Branchiae transparent greenish white, with transverse spots of flake-white and bright red; bases light red”. Trunk cylindrical. Body length 20.7–40.7 mm, width 2–2.5 mm.

Branchial lobes and branchial crown. Insertion of the branchial lobes not exposed beyond collar dorsally (Figure 12A). Branchial crown length 6–11 mm. Radioles: 12–15 pairs. Radioles with median pinnules two times longer than more proximal pinnules. Radiolar tips short. The palmate membrane extends up half the length of branchial crown. Lateral flanges broad. Dorsal lips (*dl*) two times longer than wide, rounded, erect, without mid-rib (Figure 12E). Dorsal pinnular appendages: one to three short pairs. Ventral lips rounded, as long as wide, about one-quarter the length of dorsal lips. Ventral radiolar appendages: one to three pairs, the inner one about three-quarters the length of branchial crown, the remainder about one-quarter the length of branchial crown.

Peristomium. Anterior peristomial ring lobe not exposed beyond collar, distally entire, triangular (Figure 12A). Posterior peristomial ring collar: antero-dorsal (Figure 12A), lateral (Figure 12C) and ventral margins entire (Figure 12B); ventral margin slightly higher than dorsal (Figure 12C); entire length of mid-dorsal collar margins forms a broad gap and a deep faecal groove (Figure 12A); dorsal pockets well developed. Ventral shield of collar swollen, horseshoe-shaped, as long as wide (Figure 12B). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 3:1.

Thorax. Chaetiger 1: two groups of four to six elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two rows of four to five elongate, narrowly hooded chaetae (Figure 12F); inferior group with one row with four to five bayonet chaetae (Figure 12G), two posterior rows with five symmetrical, paleate chaetae without mucro (Figure 12I, J); neuropodia—one row of 8–13 acicular uncini per torus, main fang surmounted by four rows of teeth, second tooth enlarged, located in the midline, dentition occupying a quarter the length of main fang (Figure 12H). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2: narrow.

Abdomen. Abdominal segments: 54–56. Anterior segments: two transverse rows of elongate, narrowly hooded chaetae (Figure 12K), uncini with the main fang surmounted by three rows of teeth equal in size, occupying half the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 12L). Posterior segments: very elongate, narrowly hooded chaetae, uncini similar to those in anterior abdomen (Figure 12M). Pygidium with posterior margin rounded (Figure 12D).

Gametes. Females with oocytes in thorax and middle abdominal region.

Methyl green staining. Basal half of collar dark, distal half not coloured; ventral shield of collar dark on basal half, distal half not coloured. Body coloured uniformly.

Remarks

Bush in Moore (1904, p 216) mentioned that *Sabella picta* Verrill (1885) is a *Metachone*, but provided no details. Hartman (1942a, p 136) synonymized *Sabella picta* Verrill, 1885 with *C. infundibuliformis*; however, *C. picta* is distinguished by a broad faecal groove (narrow in *C. infundibuliformis*), paleate chaetae without mucro (short mucro in *C. infundibuliformis*), dorsal pockets well developed (poorly developed in *C. infundibuliformis*), and posterior peristomial ring collar three times as long as chaetiger 2 (two times in *C. infundibuliformis*) (Table III).

Chone quebecensis n. sp. (Figures 13–15, 19C)

Material examined

Type material. **Quebec** [CMN 1989-0394], holotype, 13 paratypes; [ECOSUR 0074], four paratypes (two covered in gold for SEM): Saint Lawrence estuary, off Point Mitis, Sta. B610-7IL-152D, 37 m, coll. Rafat MASSAD, 9 July 1971. Topotypes [CMN 1989-0384], off Trois Pistols, Sta. B130-70F-11D, 33 m, coll. Rafat MASSAD, 22 June 1970 (6). [CMN 1989-0391], off Grandes Beyoeromes, Sta. B94-15, 70L, 274 m, coll. Rafat MASSAD, 30 July 1970 (6). [CMN 1989-0386], off Trois Pistols, Sta. B167-70P-86D, 165 m, coll. Rafat MASSAD, 21 August 1970 (30). [CMN 1989-0390], off Point au Pire, Sta. B527-71H-57D, 220 m, coll. Rafat MASSAD, 17 June 1971 (12). [CMN 1989-0393], off St. Simon, Sta. B247 71I-81D, 282 m, coll. Rafat MASSAD, 22 June 1971 (3). [CMN 1989-0392], off Grandes Beyoeromes, Sta. B92-7, 71I-83D, 357 m, coll. Rafat MASSAD, 23 June 1971 (2). [CMN 1989-0385, 10], off Trois Pistols, Sta. BI63-7IL-121D, 115 m, coll. Rafat MASSAD, 6 July 1971 (10). [CMN

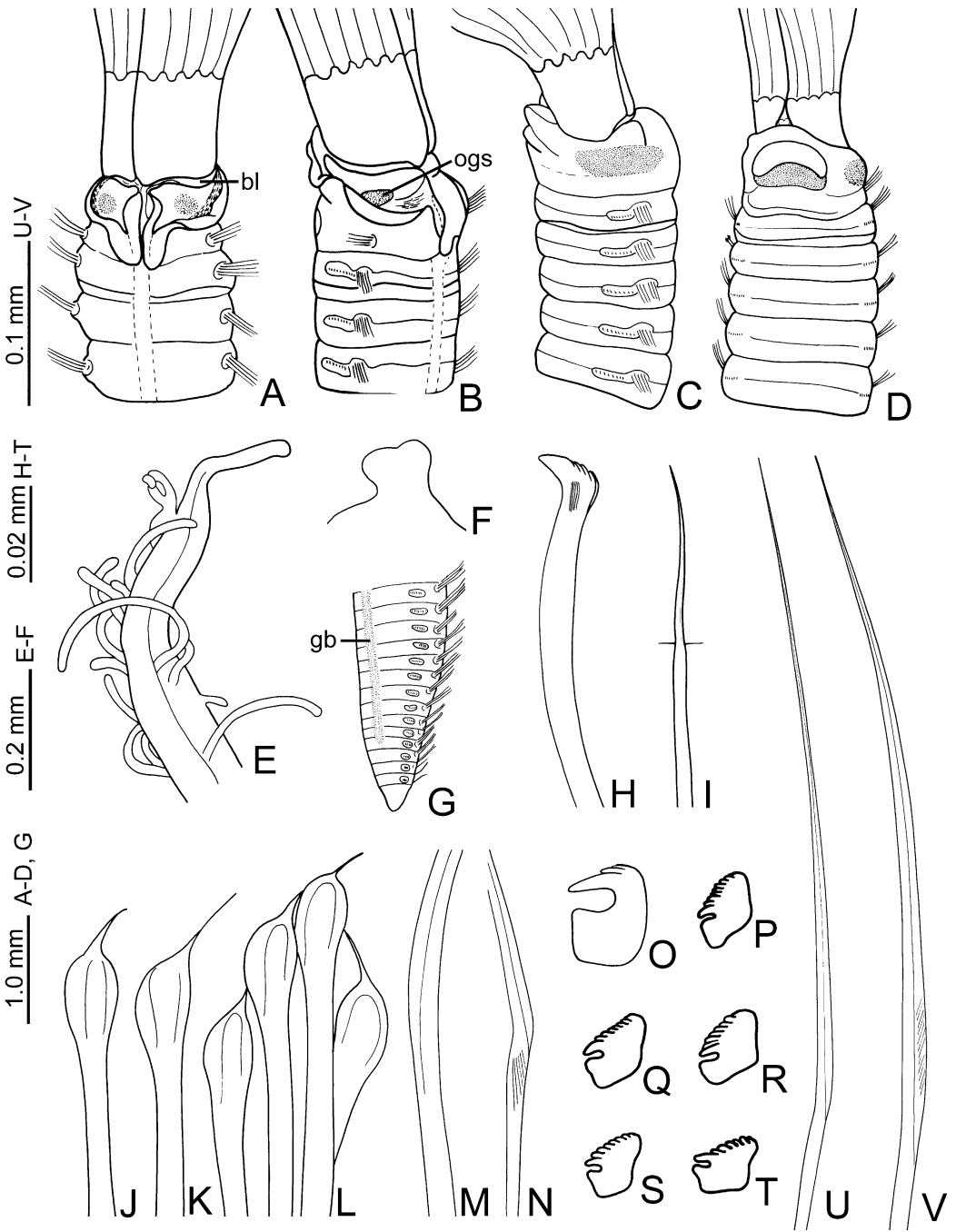


Figure 13. *Chone quebecensis* n. sp. (A) Anterior end, dorsal view; (B) same, lateral view, collar reflexed; (C) same, lateral view, collar not reflexed; (D) same, ventral view; (E) radiolar tip; (F) anterior peristomial ring lobe; (G) posterior abdomen, ventro-lateral view; (H) thoracic uncinus; (I) bayonet chaeta; (J-L) paleate chaetae; (M, V) elongate narrowly hooded chaetae from anterior abdomen; (N, U) modified, elongate narrowly hooded chaetae from posterior abdomen; (O) anterior abdominal uncinus; (P-T) modified, posterior abdominal uncini. (A-B, E-V) [CMN 1989-0304, paratype]; (C, D) [CMN 1989-0394, holotype].

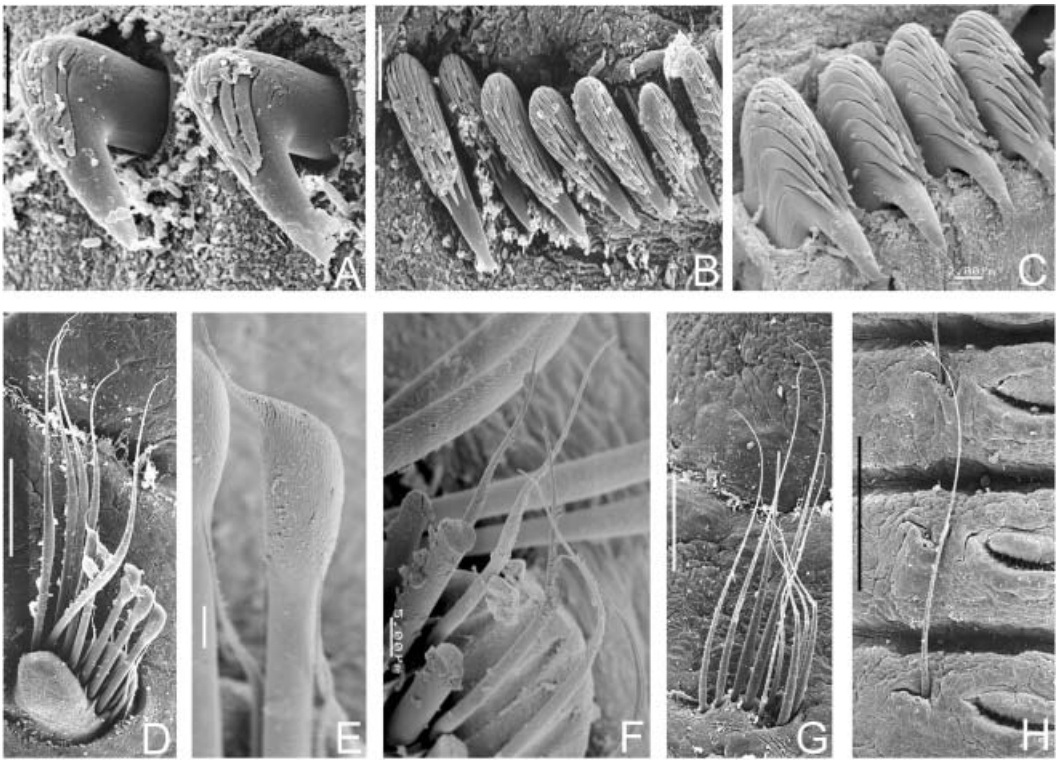


Figure 14. *Chone quebecensis* n. sp. (A) Thoracic uncini; (B) anterior abdominal uncini; (C) posterior abdominal uncini; (D) thoracic chaetiger; (E) paleate chaeta; (F) bayonet chaetae; (G) anterior abdominal chaetiger; (H) posterior abdominal chaetiger. [ECOSUR 0074, paratype]. (A, B, D, G, H) SEM UNAM; (C, E, F) SEM ECOSUR. Scale bars: 5 μm (A, B, E); 50 μm (D, G, H).

1989-0387], off Point au Pire, Sta. B504-71L-164B, 15 m, coll. Rafat MASSAD, 9 July 1971 (2).

Non-type material. **Labrador Sea** [ZMUC-POL-1758], “Ingolf”, Sta. 38., 59°12'N, 51°05'W, 3521 m, 30 July 1895 (1) material cited by Wessenberg-Lund (1950) as *C. infundibuliformis*. **Nova Scotia** [CMN 1983-0165], Cape Breton, Bras d'Or Lake, St. Andrews Channel, Sta. CBNID, 60–120 m, 46°38.5'N, 60°38.5'W, coll. NMNS 121 Expedition, 1 July 1981 (22). [CMN 1983-01], Bras d'Or Lake, Saint Andrews Channel, Sta. CBNID, 60–120 m, 46°35'N, 60°38.5'W, coll. NMNS 121 Expedition, 1 July 1981 (1).

Additional material. *Chone bimaculata* Banse and Nichols, 1968 [USNM 36280, paratypes; 36281, paratype]. *Chone ecaudata* (Moore, 1923) [USNM 17319, holotype, 58970, paratype]. *Chone letterstedti* (Kinberg, 1867) [SMNH 576, holotype]. *Chone perkinsi* Tovar-Hernández, 2005 [FSBC I 66735, holotype].

Description (in parentheses variation observed in paratypes)

Colour, body shape, and size. Body and base of the branchial crown cream coloured. Trunk cylindrical (Figure 13B, C), posterior abdomen depressed

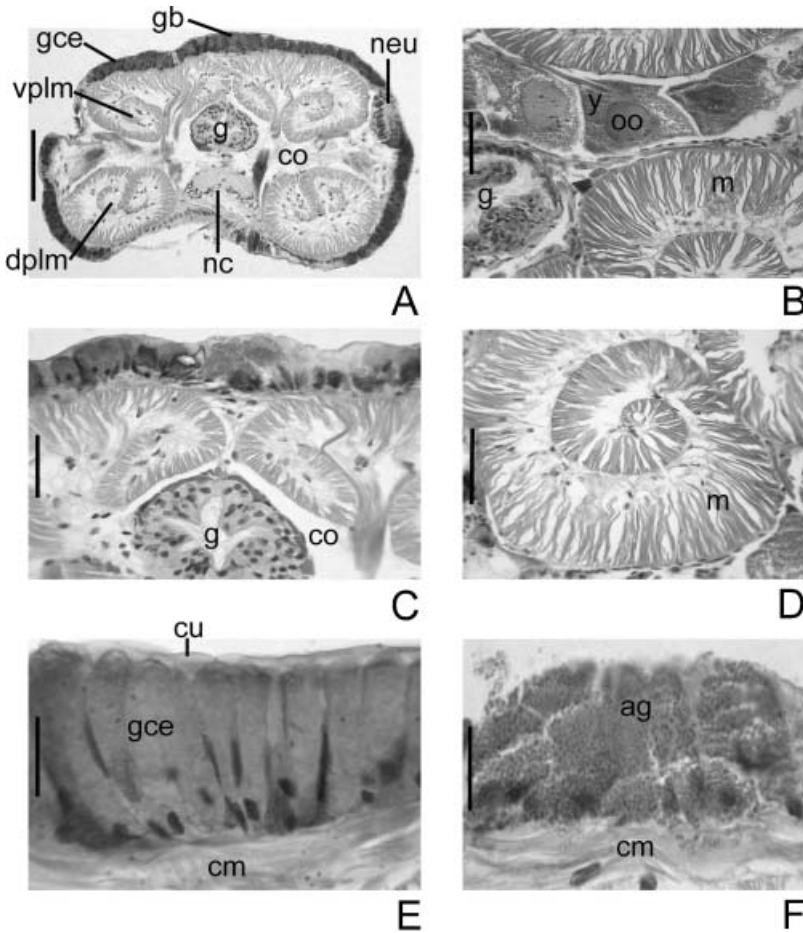


Figure 15. *Chone quebecensis* n. sp., transversal sections from posterior abdomen. (A) Panoramic view; (B) oocytes and yolk; (C) gut and glandular, abdominal band; (D) ventral package of longitudinal muscle; (E) glandular, columnar epithelium; (F) glandular, abdominal band. [CMN 1983-0165, topotype]. Scale bars: 200 μm (A); 50 μm (B); 100 μm (C); 56 μm (D); 12.5 μm (E, F).

latero-ventrally (Figure 13G). Body length 14 mm (4.1–16), width 1.3 mm (0.3–1.2). Tubes unknown.

Branchial lobes and branchial crown. Insertion of the branchial lobes (*bl*) exposed beyond collar (Figure 13A, B). Branchial crown length 7 mm (6–7). Radioles: 10 pairs (8–13). Radioles with median pinnules three times longer than more proximal pinnules. Radiolar tips long (Figure 13E). The palmate membrane extends to three-quarters the length of branchial crown. Lateral flanges broad (Figure 13E). Dorsal lips three times longer than wide, erect, without mid-rib. Dorsal pinnular appendages: one to three short pairs, united by a palmate membrane. Ventral lips rounded, as long as wide, about one-quarter the length of dorsal lips. Ventral radiolar appendages: one to three pairs, the inner one as long as three-quarters the length of branchial crown, the remainder about one-quarter the length of branchial crown.

Peristomium. Anterior peristomial ring lobe exposed beyond collar (Figure 13B–D), distally bilobed (Figure 13D, F). Posterior peristomial ring collar: antero-dorsal margin deeply incised, forming two well-developed dorsal pockets (Figure 13A), two dorsal, oval glandular shields (*ogs*) (Figure 13A, B), entire length of mid-dorsal collar margins forms a narrow gap (Figure 13A); lateral and ventral margins entire (Figure 13C, D); ventral margin slightly higher than dorsal (Figure 13B, C). Ventral shield of collar swollen, horseshoe-shaped, two times wider than long (Figure 13D). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2:1.

Thorax. Chaetiger 1: two groups of four to six elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of four to five elongate, narrowly hooded chaetae; one anterior row with four to five bayonet chaetae (Figures 13I, 14D, F); two posterior rows with five symmetrical, paleate chaetae with long mucro (Figures 13J–L, 14D, E); neuropodia—one row of 8–13 acicular uncini per torus, main fang surmounted by four rows of teeth equal in size, occupying half the length of main fang (Figures 13H, 14A). Pre- and post-chaetal lobes well developed. Broad glandular, columnar epithelium (*gce*), swollen in ventral thoracic segments (Figure 19C). Broad glandular ridge on chaetiger 2, occupying half of the epithelium in longitudinal section (Figure 19C).

Abdomen. Abdominal segments: 46 (42–46). Anterior segments: two transverse rows of five to six elongate, narrowly hooded chaetae (Figure 13M, V), chaetae from upper row half as long as chaetae in lower row (Figure 14G); 10–12 uncini per torus, older (dorsalmost) and younger uncini (ventralmost) with the main fang surmounted by six regular rows of teeth in frontal view, equal in size, occupying three-quarters the length of main fang (Figure 14B), main fang not extending beyond breast (Figure 14O), breast rectangular. Posterior segments: one or two very elongate, narrowly hooded chaetae, 25% longer than in anterior segments (Figure 14H), making a small angle with the shaft at the base of the hood (Figure 13N, U); five to eight modified uncini per torus with the main fang surmounted by six to seven regular vertical rows of teeth equal in size (Figure 14C), occupying three-quarters the length of main fang, older (dorsalmost) uncini smaller than younger uncini (ventralmost), main fang not extending beyond breast, breast rectangular. Ventral, glandular, whitish band on posterior abdomen (*gb*) (Figure 13G). Pygidium with triangular posterior margin (Figure 13G).

Gametes. Females with oocytes polyhedron-shaped in thorax and abdomen (Figure 15B), diameter 37.5–56.25 µm. Sperm in posterior abdominal chaetigers, spermatozoa rectangular nucleus (two times longer than wide), acrosome sucking-shaped (occupying one-quarter the length of nucleus) and two small, rounded mitochondria.

Methyl green staining. Anterior end of the ventral shield of collar not coloured, posterior end dark. Dorsally, there is no colour in collar, chaetigers 1 and 2; then each segment is divided into four dark rectangles by the presence of the faecal groove, inter-segmental and intra-notochaetal and neurochaetal grooves. Ventrally, each segment has a median, longitudinal dark band; lateral sides are coloured uniformly. Laterally, the collar has two large, rectangular spots (Figure 13C). Pygidium stays darker for several days.

Histology. The ventral, posterior abdominal glandular band (*gb*) in *Chone quebecensis* n. sp. is a complete whitish band in preserved material (Figure 13G), pink with

haematoxylin–eosin (Figure 15A). This structure is located in a mid-ventral transition zone on the columnar epithelium (Figure 15A, C, E, F), and composed of strongly differentiated acidophil glandular cells (*ag*), tubular-shaped with granulose secretions (Figure 15F). The glandular columnar epithelium (*gce*) has large, rectangular cells, covered by cuticle (*cu*) (Figure 15E). Abdomen is composed of two ventral (*vplm*) and two dorsal packages of longitudinal muscle (*dplm*) (Figure 15A, D); the coelom is filled with oocytes (*oo*) and yolk (*y*) (Figure 15B).

Remarks

Chone quebecensis n. sp. is unique among *Chone* species in having (1) the ventral margin of anterior peristomial ring lobe distally bilobed; (2) two peristomial, dorsal glandular shields; (3) a ventral, longitudinal glandular band on the posterior part of abdomen; and (4) spermatozoa with rectangular nucleus (two times longer than wide), head sucker-shaped and two small, rounded mitochondria. The bilobed condition of the anterior peristomial ring lobe in *Chone quebecensis* n. sp. is common in species of *Amphicorina* Claparède, 1864 (in which it could be minutely bilobed or trilobed), and also in *C. bimaculata* and *C. sp. 3* Fitzhugh, 2002 (bilobed in both). However, *C. quebecensis* n. sp. is easily distinguished from *C. bimaculata* and *C. sp. 3* by having two peristomial, dorsal glandular shields and a ventral, longitudinal glandular band on the posterior part of abdomen.

Chone quebecensis n. sp., *C. albocincta*, and *C. perkinsi* have the glandular ridge on chaetiger 2 broad on one side: broad ventrally in *C. quebecensis* n. sp. and *C. albocincta*, and broad dorsally in *C. perkinsi*. Paleate chaetae with long mucro in *C. quebecensis* sp. nov. and *C. perkinsi*, with medium-sized mucro in *C. albocincta*. *C. perkinsi* has radioles with five to six dark brown bands, each band constituted by a variable number of bright, brownish spots surrounding the cells of the branchial skeleton; these bands are absent in *C. quebecensis* n. sp. Branchial lobes are exposed beyond the collar in *C. quebecensis* n. sp., and not exposed in *C. perkinsi*.

Chone quebecensis n. sp. and *C. letterstedti* have the antero-dorsal margin of the posterior peristomial ring collar deeply incised. *Chone quebecensis* n. sp. has long radiolar tips (short in *C. letterstedti*); narrow flanges (broad in *C. letterstedti*); posterior abdominal uncini modified (not modified in *C. letterstedti*); and a posterior dorso-ventral abdominal depression (absent in *C. letterstedti*).

Etymology

The specific epithet refers to the collecting and distribution zone.

***Chone teres* Bush in Moore, 1904**

Chone teres Bush in Moore 1904, p 215–216, Plate 30, Figure 1, Plate 37, Figures 16–23.

Remarks

Chone teres Bush in Moore (1904) was described from Dutch Harbor (Alaska), and synonymized with *C. infundibuliformis* Krøyer, 1856 by Banse (1972, p 462). Original drawings of chaetae and uncini by Bush (Plate 37, Figures 16–23) agree with the redescription of *C. infundibuliformis* by Tovar-Hernández and Sosa-Rodríguez (2005);

however, features of branchial crown and peristomium were not detailed or illustrated, and type material of *C. teres* was not available in time to be included in this revision.

Chone trilineata n. sp.
(Figure 16)

Type material. **California** [LACM-AHF (holotype, one paratype) Santa Monica Bay, Sta. 4, 5-1974]. Topotypes [LACM-AHF], SMB, Rep. 5.5-6.0 # 5, 9 May 1979 (1); SMB, Rep. 8.3-6.0 # 6, 61 m, 11 May 1979 (1).

Non-type material. **California** [CSD-MBL], San Diego, Sta. I, 1-1, 0.97 m, 23 July 1997 (1). [PC-RR], City of San Diego, A/0, Sta. B-13, 1 June 1999, 193 m (1). [LACM-AHF], BLM, BFI, 22965 (1); 23153 (1); 80603 (1). [LACM-AHF], ACE, LA-2, BD2-2/I, 8 May 1984 (1). [LACSD-MBL], Sta. 0205-8D, 60 m (1). **Baja California** [EcoMar-UABC], Bahía de Todos Santos, South of Islas Coronado, Sta. E2575-21, 32°29.65'N, 117°20.55'W, coll. V. Rodríguez-Villanueva, 2 September 1998, 65 m (1).

Description (based on holotype and paratype)

Colour, body shape, and size. Body cream coloured. Trunk cylindrical, posterior abdomen depressed dorso-ventrally. Body length 4.8 mm (5.5), width 0.5 mm. Tubes unknown.

Branchial lobes and branchial crown. Insertion of the branchial lobes exposed beyond collar (Figure 16A, B, E). Branchial crown length 2.2 mm (3). Radioles: six pairs. Radioles with distal pinnules three times longer than more proximal pinnules. Radiolar tips long. The palmate membrane extends to three-quarters the length of branchial crown. Lateral flanges narrow. Dorsal lips three times longer than wide, erect, without mid-rib. Dorsal pinnular appendages: one short pair, united by a palmate membrane. Ventral lips rounded, small. Ventral radiolar appendages absent.

Peristomium. Anterior peristomial ring lobe (*apr*) exposed beyond collar, distally bilobed (Figure 16B). Posterior peristomial ring collar: entire length of mid-dorsal collar margins forms a narrow gap (Figure 16C); lateral and ventral margins entire (Figure 16A, B, D, E); dorsal margin slightly higher than ventral (Figure 16C, E). Ventral shield of collar horseshoe-shaped, as long as wide (Figure 16A, B, D). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 1:1.

Thorax. Chaetiger 1: two groups of elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of elongate, narrowly hooded chaetae; one anterior row with bayonet chaetae; two posterior rows with symmetrical, paleate chaetae with medium-sized mucro (Figure 16H–J); neuropodia—one row of acicular uncini per torus, main fang surmounted by four rows of teeth equal in size, occupying half the length of main fang (Figure 16J). Pre- and post-chaetal lobes well developed. Glandular ridge on chaetiger 2 (*gr2*): ventrally with a median, vertical projection, dorsally with two vertical projections, all projections directed towards anterior margin of second segment (Figure 16A–E).

Abdomen. Abdominal segments: 24 (26). Anterior segments: two transverse rows of elongate, narrowly hooded chaetae (Figure 16L). Posterior segments: one or two very elongate, narrowly hooded chaetae; modified uncini with the main fang surmounted by six to seven regular vertical rows of teeth equal in size (Figure 16F, G), occupying three-quarters the length of main fang, main fang not extending beyond breast, breast rectangular. Pygidium with triangular posterior margin (Figure 16A).

Gametes. Female with oocytes (*oo*) from second thoracic segment (Figure 16L) to posterior abdomen (LACM-AHF, SMB).

Methyl green staining. The epidermis is completely glandular and stains uniformly in thorax and abdomen, dorsally and ventrally, except the anterior margin of collar. The anterior end of the first ventral glandular shield and the extensions of the glandular ridge on chaetiger 2 are not coloured (Figure 16A–E).

Etymology

The specific name is Latin, meaning three-lined; and refers to the peculiar shape of the glandular ridge on chaetiger 2.

Remarks

Chone trilineata n. sp. is unique among *Chone* species by having the glandular ridge on chaetiger 2 with one ventral and two dorsal projections directed anteriorly and the ventral margin of collar lower than dorsal (Table II). *Chone trilineata* n. sp., *C. quebecensis* n. sp., *C. bimaculata*, and *C. veleronis* have the insertion of the branchial lobes exposed beyond collar, and modified posterior abdominal uncini (Group II). All these species can be distinguished by the glandular ridge on chaetiger 2: in *C. trilineata* n. sp. the glandular ridge has one ventral and two dorsal projections directed anteriorly; in *C. quebecensis* n. sp. the ridge is broad ventrally; in *C. bimaculata* it is homogeneously broad; and in *C. veleronis* it is sunglasses-shaped ventrally.

Chone veleronis Banse, 1972

(Figure 17)

Chone veleronis Banse 1972, p 477–479, Figure 7.

Material examined

Type material. **California** [LACM-AHF POLY 0460, 46 paratypes, Velero].

Non-type material. **California** [LACM-AHF], Oceanside, A-4 # 3, 11 December 1982 (4). Dawson, T-2-80 # 1 (1). [CSD-MBL], Point Loma, Sta. A10, 32°39.50'N, 117°16.13'W, 14 January 1986, 47 m (2); Sta. A11, 32°39.98'N, 117°16.27'W, 28 January 1986, 49 m (12). [PC-RR], City of San Diego, PLOO Survey, A-10, 0.76 m, 8 July 1986, 113 (2). [LACM-AHF], 003209, 2120-52 (1). [LACM-AHF], 003216, 4845-57 (1). [LACM-AHF], ORCOSAN, NB-30, 57 m, 25 July 1975 (1). [LACM-AHF], BLM, BFI, 22662 (1); 22912 (1); 23039 (1); 23040 (1); 23189 (1); 23189 (1); 23195 (1); 23201 (1); 23205 (1); 23911 (1); 24380 (1); 81504 (1); 81507 (1); 81509 (1); 81514 (1); 81520 (2);

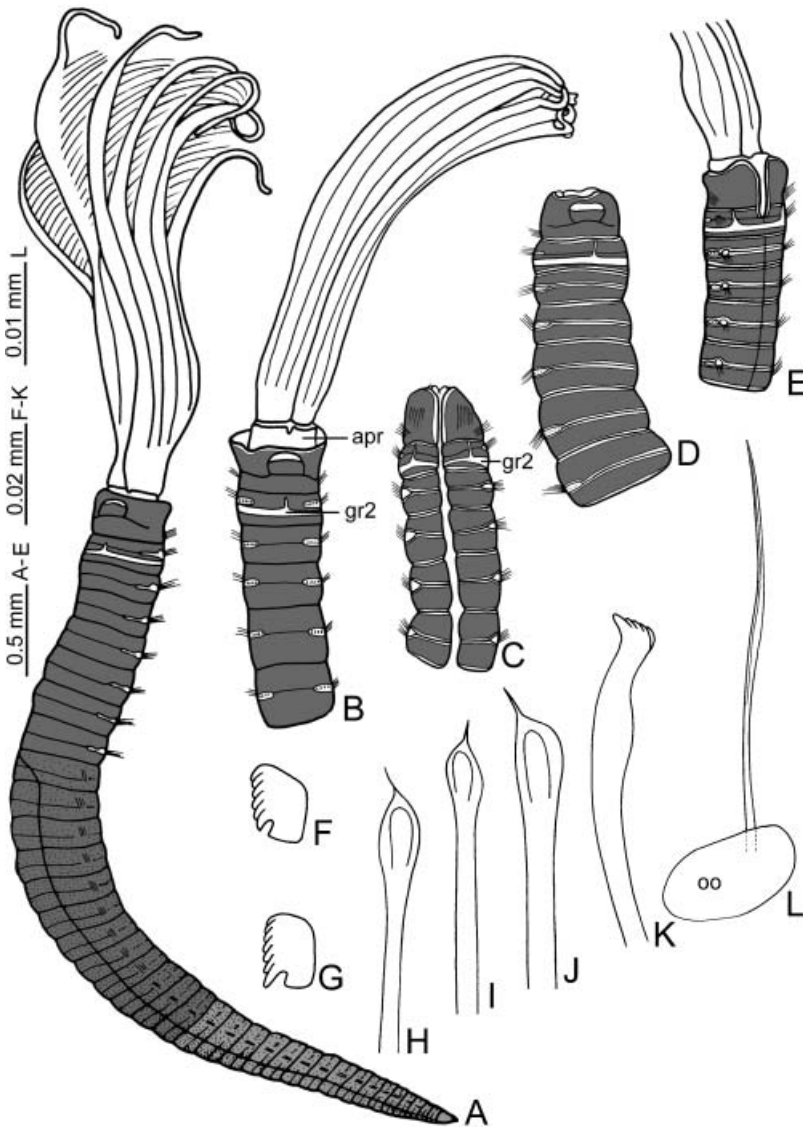


Figure 16. *Chone trilineata* n. sp. (A) Body, lateral view; (B, D) anterior end, ventral view; (C) same, dorsal view; (E) same, dorsolateral view; (F, G) posterior abdominal uncini; (H–J) paleate chaetae; (K) thoracic uncinus; (L) abdominal elongate narrowly hooded chaetae. (A) [PC-RR, Sta. B-13]; (B, C) [LACM-AHF, holotype]; (D–L) [LACM-AHF, paratype].

81521 (1); 81901 (1); 81902 (5); 81903 (4); 81904 (3); 81906 (1); 81908 (1); 81919 (6); 81920 (8); 81921 (2); 81922 (4); 81923a (5); 81923b (5); 81924 (3); 81925 (4); 81927 (1); 81927 (2); 83502 (1); 86201 (1); 86701 (4).

Description (based on paratypes)

Colour in preserved material, body shape, and size. Body and base of the branchial crown cream coloured. Glandular ridge brown or orange. Glandular ridges yellow in segments

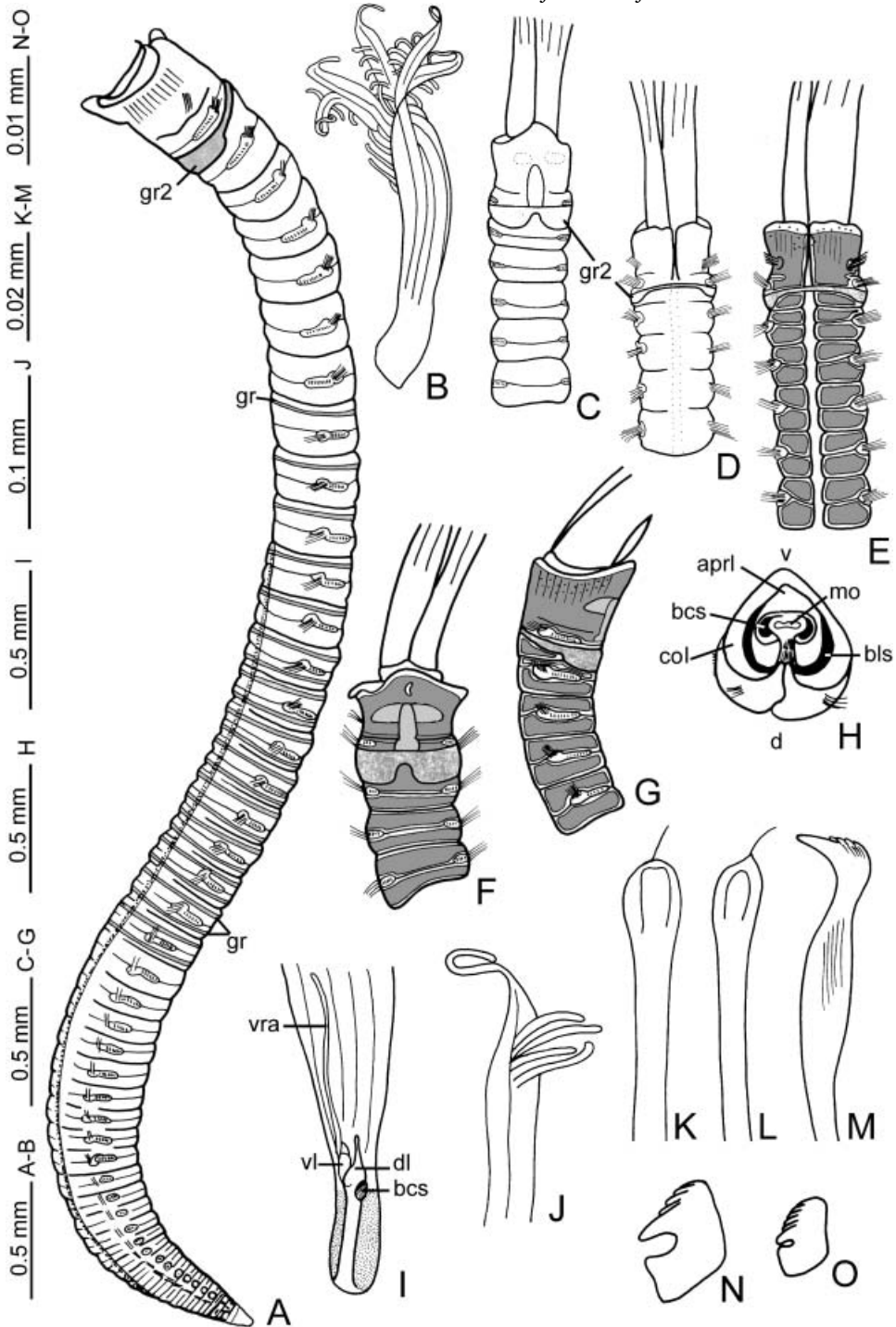


Figure 17. *Chone veleronis*. (A) Body, lateral view; (B) branchial crown; (C, F) anterior end, ventral view; (D, E) same, dorsal view; (G) same, lateral view; (H) peristomium, frontal view; (I) branchial lobe; (J) radiolar tip; (K, L) paleate chaetae; (M) thoracic uncinus; (N) anterior abdominal uncinus; (O) posterior abdominal uncinus. (A, C, D) Unstained worms; (E-G) methyl green staining. [LACM-AHF 0460, paratype].

from anterior part of abdomen (Figure 17A). Body depressed for all its length, with a ventral compression along last 14 abdominal segments. Body length 7–9 mm, width 0.35–0.5 mm. Tubes unknown.

Colour in fresh material. Base of the branchial crown cream coloured. Mid-dorsal collar margins red/orange, colour extending towards the dorsal lips. Radioles cream coloured in the basal half, then two distal red bands occupying the length of three pinnules, colour extending into pinnules. One pair of dorsal pinnular appendages with white spots on the basal half. Flanges and body wall transparent. Orange oocytes in thorax and anterior abdomen. Glandular ridge on chaetiger 2, and anterior abdominal ridges white [LACM, AHF, Santa Monica Bay, SMB-LACSD, Sta. 8D17, LH04-438].

Branchial lobes and branchial crown. Insertion of the branchial lobes exposed beyond collar laterally (Figure 17A, G). Branchial crown length 3–4 mm. Base of the branchial crown long, about one-quarter the length of branchial crown (Figure 17C–F). Radioles: five to six pairs. Radioles with median pinnules twice as long as distal pinnules. Radiolar tips long (Figure 17J). The palmate membrane extends to three-quarters the length of branchial crown (almost reaching the radiolar tips). Lateral flanges broad (Figure 17J). Dorsal lips triangular, elongate, erect, three times longer than wide, without mid-rib (*dl*) (Figure 17I). Ventral lips rounded (*vl*) and about one-half the length of dorsal lips (Figure 17I). Ventral radiolar appendages: one pair occupying one-half the radiole length (*vra*) (Figure 17I). Dorsal pockets not developed.

Peristomium. Base of the peristomium composed of two lateral horns of basal central skeleton (*bcs*) surrounding the mouth (*mo*); anterior peristomial ring lobe (*lo*) not exposed beyond collar, distally entire, triangular (Figure 17H). The base of the posterior peristomial ring collar is supported by basal lateral skeleton (*bls*). Posterior peristomial ring collar: dorsal, ventral, and lateral margins entire (Figure 17A, C–G); ventral margin higher than dorsal (Figure 17A, G); entire length of mid-dorsal collar margins forms a narrow gap (Figure 17D, E). Ventral shield of collar swollen, extending to the second thoracic segment, horseshoe-shaped, three times longer than wide (Figure 17C, F). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2:1.

Thorax. Chaetiger 1: two groups of elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—two irregular rows of elongate, narrowly hooded chaetae; one anterior row with bayonet chaetae; two posterior rows with symmetrical; paleate chaetae with medium-sized mucro (Figure 17K, L); neuropodia—one row of acicular uncini with the main fang surmounted by four rows of teeth equal in size, occupying half the length of main fang (Figure 17M). Glandular ridge on chaetiger 2 (*gr2*): ventrally, the glandular ridge is sunglasses-shaped, extending to the first half of the third segment; dorsally, inverted U-shaped. The ridge is located near to the superior margin of second segment dorsally and ventrally, on the sides it is located near to the inferior margin of the second segment, under noto- and neurochaetae (Figure 17A, C–G).

Abdomen. Abdominal segments: 33–35. Anterior segments: one glandular ridge in most anterior segments, then two ridges per segment (*gr*) (Figure 17A); two transverse rows of elongate, narrowly hooded chaetae; uncini with the main fang surmounted by four regular rows of teeth in frontal view, equal in size, occupying half the length of main fang, main

fang not extending beyond breast, breast rectangular (Figure 17N). Posterior segments: very elongate, narrowly hooded chaetae; modified uncini with the main fang surmounted by six to seven regular vertical rows of teeth equal in size (Figure 17O), occupying three-quarters the length of main fang, main fang not extending beyond breast, breast rectangular. Pygidium with triangular posterior margin (Figure 17A).

Gametes. Oocytes in thorax and anterior abdomen [LACM-AHF, LH04-438].

Methyl green staining. The epidermis is completely glandular and stains uniformly in thorax and abdomen, dorsally and ventrally, except the anterior margin of collar (Figure 17E–G). Posterior end lost colour quickly, but pygidium stayed darker for several days.

Remarks

Chone veleronis is unique among *Chone* species in having a very long base of the branchial crown, and the glandular ridge of chaetiger 2 being sunglasses-shaped ventrally (extending to the first half of the third segment) and inverted U-shaped dorsally.

Jasmineira Langerhans, 1880

Jasmineira princei (McIntosh, 1916) new combination
(Figure 18A–G)

Chone princei McIntosh 1916, p 60–63, Plate 3, Figures 3–8.

Material examined

Type material. **Quebec** [BMNH 1921.5.1.4373 (lectotype, two paralectotypes), Gulf of Saint Lawrence, coll. Dr Whiteaves, 1872].

Additional material. *Euchone analis* Krøyer, 1856 [USNM 333, probable type].

Redescription (in parentheses variation observed in paralectotypes)

Colour, body shape, and size. Body cream coloured. Trunk cylindrical. Body length 23 mm (18–25), width 2 mm (2–2.2). Tube is a smoothly rounded, firm structure of mud which coats the internal chitinous lining.

Branchial lobes and branchial crown. Insertion of the branchial lobes exposed beyond collar. Branchial crown length 15 mm (14–18). Base of the branchial lobes prominent. Radioles: 13 pairs (12). Pinnules long, of similar size along radioles. Radiolar tips short (Figure 18C). Palmate membrane absent. Narrow radiolar flanges. Dorsal lips elongate, triangular, mid-rib present, lateral lamellae broad dorsally. Dorsal pinnular appendages absent. Ventral lips small, rounded. Ventral radiolar appendages: five pairs (three), the inner one about three-quarters the length of branchial crown, the remainder about one-half the length of branchial crown.

Peristomium. Anterior peristomial ring lobe not exposed beyond collar, distally entire. Posterior peristomial ring collar: antero-dorsal margin deeply incised, forming two well-developed dorsal pockets; two dorsal vascular loops; entire length of mid-dorsal collar

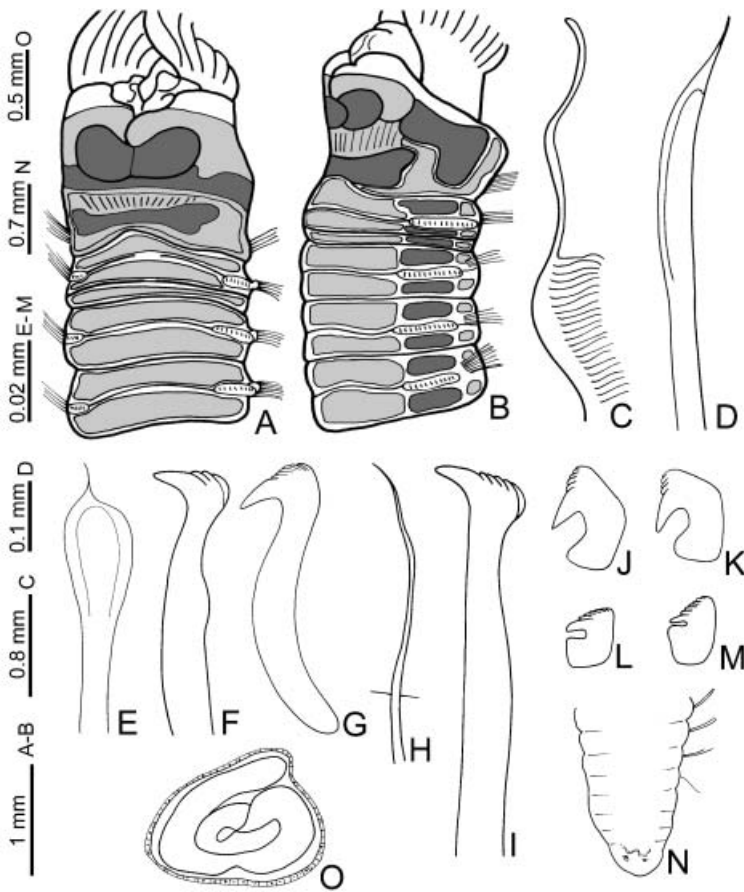


Figure 18. *Jasmineira princei*, *Chone ungavana*, and *Euchone analis*. (A) Anterior end, ventral view; (B) same, lateral view; (C) radiolar tip; (D) bayonet chaeta; (E) paleate chaeta; (F) thoracic uncinus; (G) abdominal uncinus; (H) bayonet chaeta; (I) thoracic uncinus; (J, K) anterior abdominal uncini; (L, M) posterior abdominal uncini; (N) posterior end; (O) vascular loops. (A–G) [BMNH 1921.5.1.4373, lectotype] *Jasmineira princei*; (H–N) [CMN 1900-8369, holotype] *Chone ungavana*; (O) [USNM 333] *Euchone analis*.

margins forms a broad gap; lateral margin entire (Figure 18B); ventral margin incised, forming two trapezoidal-shaped lappets (Figure 18A); ventral margin higher than dorsal (Figure 18B). Ventral shield bean-shaped, two times longer than wide, divided transversely (Figure 18A). Ratio of posterior peristomial ring collar length versus chaetiger 2 length, in lateral view: 2:1 (Figure 18B).

Thorax. Chaetiger 1: elongate, narrowly hooded chaetae. Chaetigers 2–8: notopodia—elongate, narrowly hooded chaetae; one anterior row with bayonet chaetae (Figure 18D); two posterior rows with paleate chaetae, palea long with medium-sized mucro (Figure 18E); neuropodia—one row of acicular uncini with the main fang surmounted by three rows of teeth equal in size, occupying half the length of main fang; hood present (Figure 18F). Glandular ridge on chaetiger 2: narrow (Figure 18A, B).

Abdomen. Abdominal segments: 52 (48). Anterior segments: two transverse rows of elongate, narrowly hooded chaetae; uncini with the main fang surmounted by teeth equal

in size, breast reduced to narrow swelling, handles long (Figure 18G). Posterior segments: very elongate, narrowly hooded chaetae, 25% longer than in anterior segments; uncini similar to those in anterior abdomen. Pygidium with a triangular, posterior margin.

Gametes. Lectotype female with oocytes in anterior abdomen, visible through the body wall. Paralectotype female, oocytes from the second thoracic segment to the last thoracic segment.

Methyl green staining. The anterior margin of collar is not coloured dorsally, ventrally, or laterally. The ventral shield of collar is dark coloured. The posterior and basal-lateral margins of collar are dark. The ventral shield of the first thoracic chaetiger is dark with anterior longitudinal grooves (Figure 18A). Each thoracic segment is uniformly coloured ventrally (Figure 18A); laterally, each segment has a dark rectangle in the upper and lower side of the torus (Figure 18B); dorsally, colourless.

Remarks

In this study, a lectotype and two paralectotypes are designated from syntypes according to Article 74.4, International Commission on Zoological Nomenclature (2000). *Chone princei* is redescribed and transferred to the genus *Jasmineira* due to the fact that the original description lacked some critical details diagnostic for *Jasmineira*. The redescription provided here shows that in *J. princei*: (1) insertion of the branchial lobes is exposed beyond collar; (2) pinnules are similar-sized along radioles; (3) palmate membrane is absent; (4) radiolar flanges are narrow; (5) dorsal lips are elongate, triangular with radiolar appendages; (6) dorsal pinnular appendages are absent; (7) anterior peristomial ring lobe is not exposed beyond collar; (8) dorsal pockets are well developed with vascular loops in the peristomium; (9) abdominal uncini have the main fang covered by teeth of equal size, breast reduced to narrow swelling, and handles long; and (10) oocytes are distributed in thorax and anterior abdomen.

Jasmineira is often confused with *Fabrisabella* Hartman, 1969, because both have abdominal uncini with a reduced narrow breast and long handle; however, they differ in that *Fabrisabella* lacks dorsal pinnular appendages and bayonet chaetae; both are present in *Jasmineira* (Fitzhugh 1989).

McIntosh (1916), in his description of *Chone princei*, referred to a “glandular tubular organ” located at the dorsal peristomium; this structure is called “vascular loops” in the redescription given here. The vascular loops are circular cameras situated dorsally in each side of the peristomium; inside each camera there is an S- or C-shaped vessel; their structure and function has not been studied yet, but it is very probable that they are vascularized by the central blood vessel. The vascular loops have also been recorded in the genus *Fabrisabella* (Fitzhugh 1989), and in some specimens of *Euchone analis* (Figure 18O).

Chone ungavana Chamberlin, 1920 *incertae sedis* (Figure 18H–N)

Chone ungavana Chamberlin 1920, p 26–27, Plate 4, Figures 1–4.

Material examined

Type material. **North West Territories** [CMN 1900-8369 (holotype) Hudson Strait, King George's Sound, 62°N, 73°W, 64.3 m, coll. Low and Wakeham, Diana Expedition, September 1897].

Additional material. *Chone infundibuliformis* Krøyer, 1856 [ZMUC POL-1749, lectotype; USNM-376, paralectotype; BMNH 82.5.12.33, paralectotype].

Description

Holotype dried out, complete but torn in thorax and abdomen. Branchial crown as long as half of the body length. Insertion of the branchial lobes exposed beyond collar, anterior peristomial ring lobe triangular, exposed beyond collar. Ventral margin of collar higher than dorsal. Dorsal margins forming two deep pockets. Radioles with broad flanges, radiolar tips short. Ventral shield of collar swollen. Thoracic uncini distributed as irregular double rows in tori, four rows of teeth above the main fang, hood present (Figure 18I). Bayonet chaetae (Figure 18H). Anterior abdominal uncini with four to five rows of teeth above the main fang, occupying half the length of main fang, main fang not extending beyond breast, breast rectangular (Figure 18J, K), posterior abdominal uncini similar to the

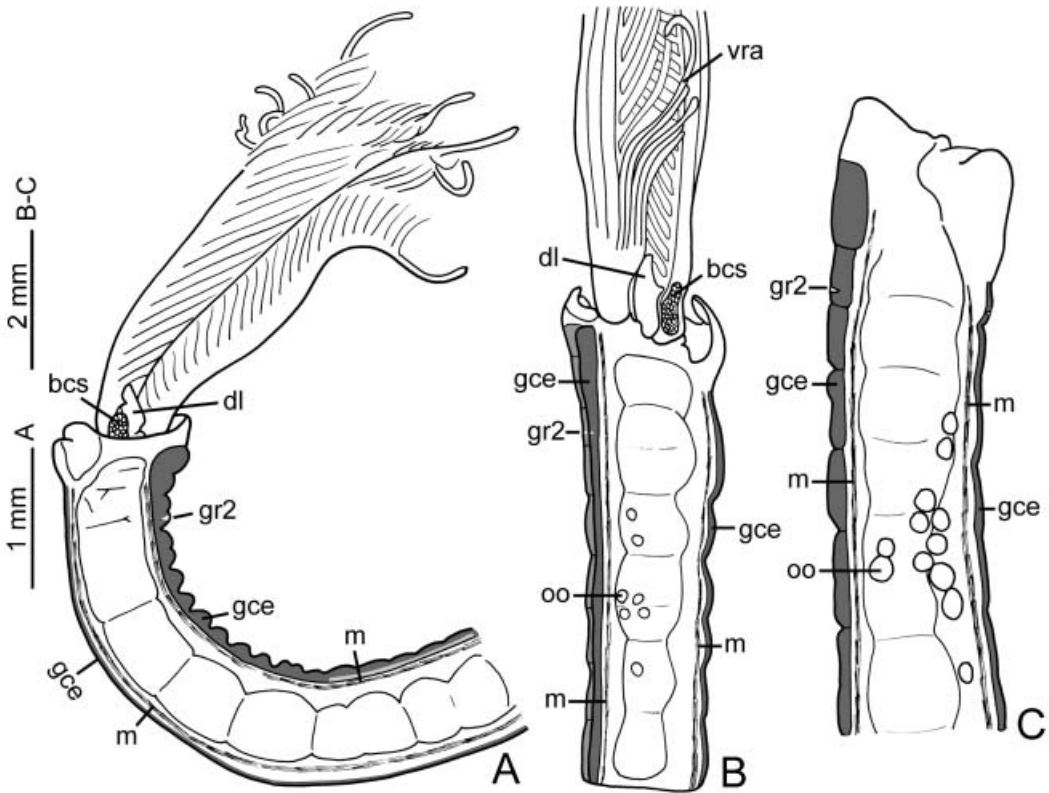


Figure 19. Thoracic transversal sections. (A) *Chone ecaudata*; (B) *Chone mollis*; (C) *Chone quebecensis* n. sp. (A) [LACM-AHF LH02-1205]; (B) [LACM-AHF, Han Lee]; (C) [CMN 1989-0385].

anterior ones, but smaller (Figure 18L, M). Pygidium rounded (Figure 18N). Holotype female with oocytes in thorax.

Remarks

Holotype is dried out, no additional material is available, and there are no new records of this species since its description in 1920. From the holotype, only a few characters were recognized, two of them also being present in *C. infundibuliformis*. *Chone ungavana* and *C. infundibuliformis* have short radiolar tips, broad flanges and thoracic uncini distributed in two irregular rows in each torus. However, in *C. ungavana* the anterior peristomial ring lobe is exposed beyond the collar (not exposed in *C. infundibuliformis*), and branchial lobes exposed beyond the collar (not exposed in *C. infundibuliformis*). At this time it is not possible to recognize the validity of *C. ungavana* due to the dehydration of the only available material.

Discussion

Two groups of the species can be recognized in *Chone* Krøyer, 1856: the first one is a homogeneous group integrated with the type species *C. infundibuliformis* and composed of species with anterior and posterior abdominal uncini of similar shape (*Chone*-type) (Table III). In species of this group, hundreds of small oocytes are distributed in the thorax and abdomen. The dorsal lips are broadly rounded, without mid-rib, vascularized by a plexus of a few small blood vessels, and supported by hyaline cartilage with no extension of the branchial skeleton. The margin of the anterior peristomial ring lobe is triangular and entire. The glandular ridge on chaetiger 2 is homogeneously narrow; and the glandular, columnar epithelium in the ventral thoracic segments is narrow and low (not swollen).

The second group is composed of species with modified, posterior abdominal uncini (as rasp-shaped plates or *Amphicorina*-type) (Table II). This kind of modified uncinus has a main fang surmounted by several regular, vertical rows of small teeth of equal size that occupy at least three-quarters the length of the main fang, and a poorly developed rectangular or sub-rectangular breast, in contrast to an anterior segment uncinus with a few rows of unequal-sized teeth occupying less than half the length of the main fang and a well-developed breast (Tovar-Hernández and Sosa-Rodríguez 2006). In species in this group, a few large oocytes are distributed in the thoracic and abdominal segments. The dorsal lips are triangular, elongate, erect, without mid-rib, vascularized by a plexus of several small blood vessels, and supported by hyaline cartilage with no extension of the branchial skeleton. The anterior peristomial ring lobe can be triangular, digitiform, or bilobed. The glandular ridge on chaetiger 2 varies among species of this group: it can be a complete or an incomplete band; a narrow or broad homogeneous band; broad or narrow dorsally, laterally, or ventrally; with a mid-ventral projection; or ventrally greatly broadened, sunglasses-shaped, and extending to the third chaetiger. Glandular ridges in the thorax and anterior abdomen can be present. The glandular, columnar epithelium in the ventral thoracic segments is broad and high (swollen, but without ventral shields).

According to Rouse and Fitzhugh (1994), intratubular brooders tend to be small-bodied, with few relatively large eggs (as in members of Group II) whereas broadcast spawners are large-bodied with several small eggs (as in members of Group I). Bick and Randel (2005) studied the ontogenetic variations in *Euchone analis*. In their study they argued that

juveniles have fewer teeth above the main fang on abdominal uncini than adult specimens. However, the number of teeth in profile above the main fang of anterior and posterior abdominal uncini in juvenile and mature individuals of *Chone infundibuliformis* (and others species in Group I) is the same. This pattern also occurs in posterior abdominal uncini of juvenile and mature specimens of species in Group II. If the presence/absence of modified, posterior abdominal uncini (*Amphicorina*-type) is a feature that is not due to ontogeny, the modified uncini could be a plesiomorphic character for Group II and such variation could result in splitting the genus. However, the revision of type and non-type materials for all the remainder species of *Chone* is needed in order to place them within this framework of sabellid evolution.

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