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Ivanenko V.N. & Defaye D. 2006. Copepoda. In: D. DESBRYERES, M. SEGONZAC & M. BRIGHT (Eds.) Handbook of Deep-Sea Hydrothermal Vent Fauna. Second edition. DENISIA, 18: 318-355

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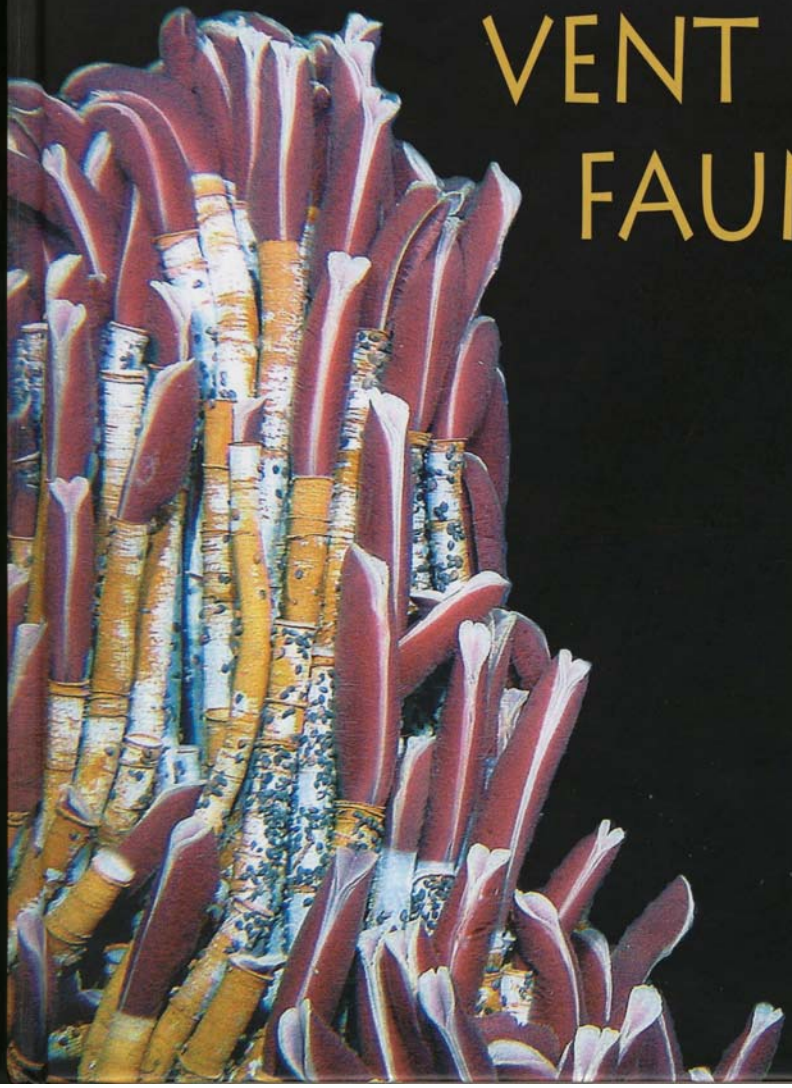
HANDBOOK OF DEEP-SEA HYDROTHERMAL VENT FAUNA



EDITORS: D. DESBRUYÈRES, M. SEGONZAC & M. BRIGHT

Handbook of Deep-Sea Hydrothermal Vent Fauna

D. DESBRYÈRES, M. SEGONZAC & M. BRIGHT (Eds.)

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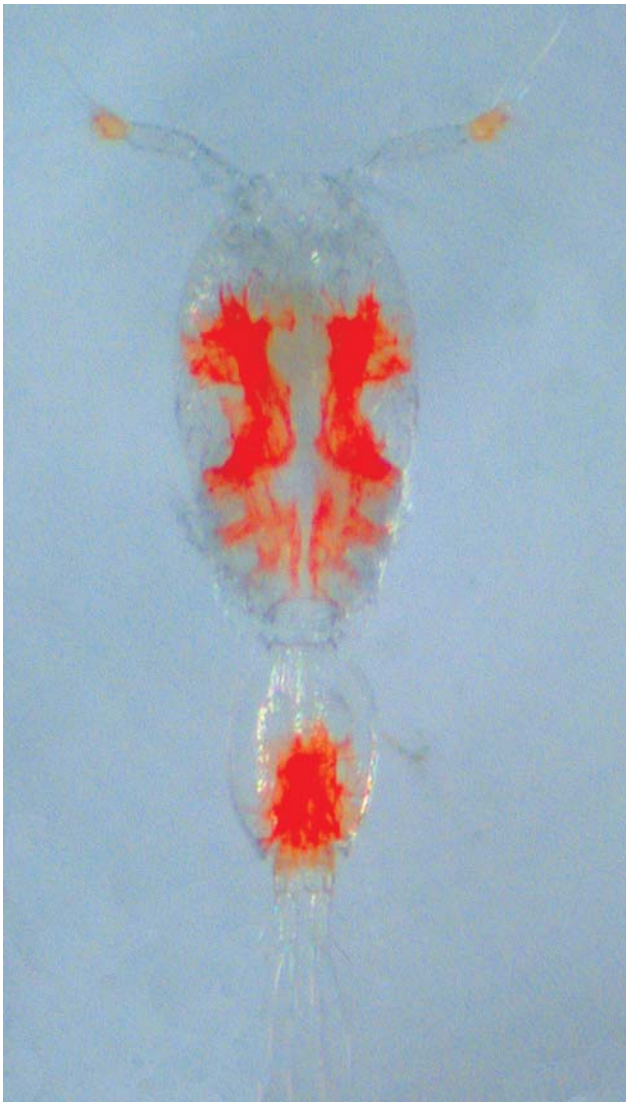
The second extensively expanded edition of the "Handbook of Deep-Sea Hydrothermal Vent Fauna" gives on overview of our current knowledge on the animals living at hydrothermal vents. The discovery of hydrothermal vents and progresses made during almost 30 years are outlined. A brief introduction is given on hydrothermal vent meiofauna and parasites. Geographic maps and a table of mid-ocean ridges and back-arc basins with the major known hydrothermal vent fields, their location and depth range and the most prominent vent sites are provided. Higher taxa are presented individually with information on the current taxonomic and biogeographic status, the number of species described, recommendations for fixation, and schematic drawings, which aim to help non-specialists to identify the animals. 86 authors contributed with their expertise to create a comprehensive database on animals living at hydrothermal vents, which contains information on the morphology, biology, and geographic distribution of more than 500 currently described species belonging to one protist and 12 animal phyla. It comprises also the largest collection of more than 1000 pictures of hydrothermal vent animals taken in situ with submersibles, in vivo after collection, and with various dissection, light, and scanning electron microscopes after fixation and preparations.

Contents

Arthropoda, Crustacea, Copepoda

Almost 80 species of copepods are described from hydrothermal vents. More than half of the copepods species recorded represent copepods of the family Dirivultidae (order Siphonostomatoida) which were exclusively found at different vent sites with exception for the type species of *Dirivultus dentaneus* (Humes & Dojiri 1980; Ivanenko & Ferrari 2003). Additionally, three dirivultid species descriptions from animals of the East Pacific Rise, the West Pacific, and the Mid-Atlantic Ridge are in preparation; and at least two dozens of new species, which are in our disposition, are waiting for thorough descriptions. These are mostly representatives of calanoids, cyclopoids and harpacticoids from different localities of the East Pacific Rise and the Mid-Atlantic Ridge, which came mainly from the samples obtained during in situ colonization experiments and sediment traps. Some of these copepods represent common genera (such as the harpacticoid genus *Tisbe* and the cyclopoid genus *Heptnerina* close to *Cyclopina*) and even common families (the harpacticoid family Tegastidae) known till now only from shallow waters (Ivanenko & Defaye 2004a, b; V. Ivanenko & D. Defaye, unpublished).



1: *Oncaea preclara* from East Pacific Rise: 9°N, Tica; by M. Bright.

Certainly new methods of meiofauna sampling and exploration of new sites will reveal many new copepods representing different taxonomical and ecological groups. Further ecological studies of copepods from different microhabitats, distinct localities, environments surrounding deep-sea hydrothermal vents and cold seeps (see Heptner & Ivanenko 2002; V. Ivanenko, D. Defaye & Cuoc, unpublished), as well as meiofauna associated with whale remnants (to date unknown) will let us better understand the role of the remarkably diverse copepods in structuring and functioning of deep-sea chemosynthetic communities.

For more information about taxonomic composition, distribution, morphological, and biological traits, and the presumed habitat specificity of the copepods from deep-sea chemosynthetic environments we refer to the paper of Heptner & Ivanenko (2002) as an attempt to summarize all data available for that moment.

V.N. Ivanenko

2: *Aphotopontius* sp. from East Pacific Rise: 13°N;
by M. Bright.

References:

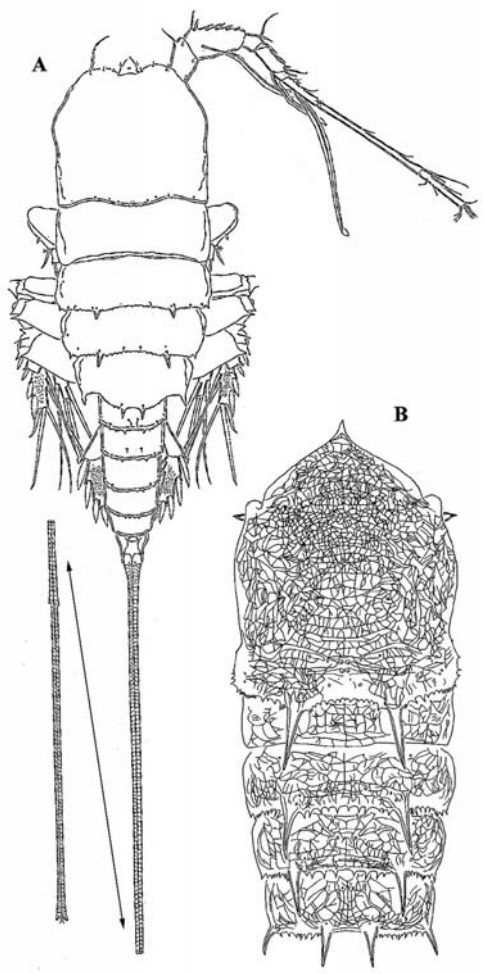
Heptner M.V. & V.N. Ivanenko (2002) Arthropoda Selecta **11**(2): 117-134.
Humes A.G. & M. Dojiri (1980) Pac. Sci. **34**: 143-151.
Ivanenko V.N. & D. Defaye (2004a) Cah. Biol. Mar. **45**(3): 255-268.
Ivanenko V.N. & D. Defaye (2004b) Zoosystema **26**(1): 49-64.
Ivanenko V.N. & F.D. Ferrari (2003) Arthropoda Selecta **11**(3): 177-185.

Andromastax Conroy-Dalton & Huys, 1999

Species	Distribution	Body length in mm
A. cephaloceratus Lee & Huys, 2000	Okinawa Trough	Female 3.05, male 2.85
A. muricatus Conroy-Dalton & Huys, 1999	Galapagos Spreding Center	Female 3.49, male 3.24

Morphology: Body with reticulated integument. Cephalic shield, coxae of legs 2-4 with spinous processes. Caudal rami slightly longer than rest of body. Antennule of female seven-segmented, second segment with two spine-like processes. Antennule of male nine-segmented, segment 8 elongate. Feeding appendages of male reduced.

Biology: Large benthopelagic copepods with non-feeding males. *A. muricatus* has been found in "washing of mussel sample". *A. cephaloceratus* has been collected 0.5-3 m above the bottom.



1: *A. cephaloceratus*; A: Male habitus, dorsal; B: Female cephalosome, dorsal; from Lee & Huys (2000).

References:

Conroy-Dalton S. & R. Huys (1999) J. Crustac. Biol. **19**(2): 408-431.
Lee W. & R. Huys (2000) Zool. J. Linn. Soc. **129**: 1-71.

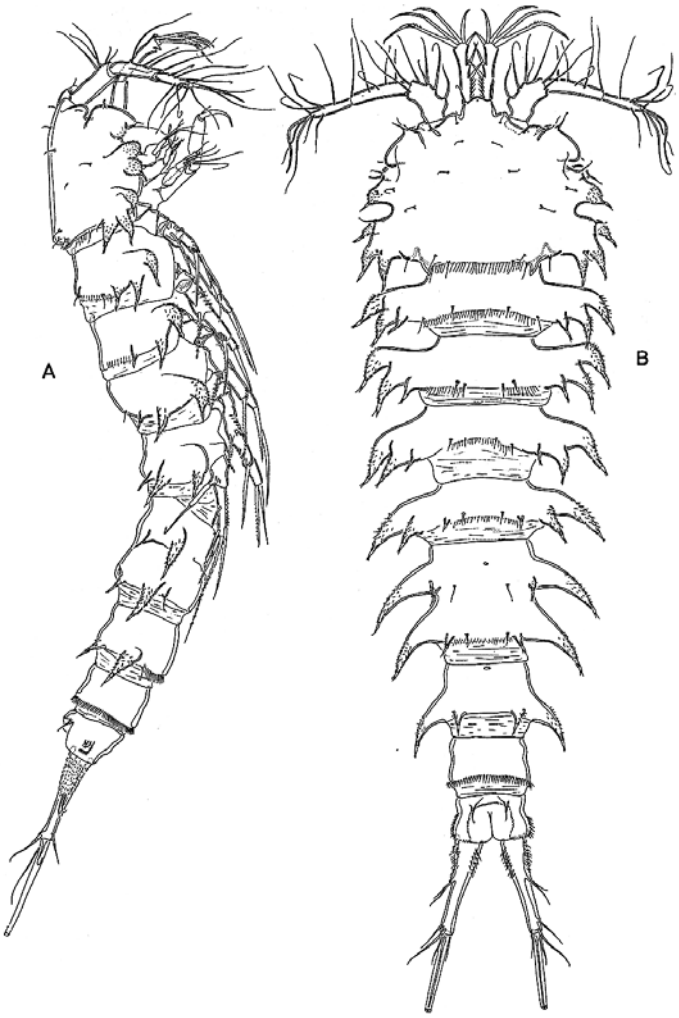
Uptionyx verenae Conroy-Dalton & Huys, 2000

Size: Body length of female 1.11 mm. Male unknown.

Morphology: Body with dorsal and lateral bulbous processes on all somites except last two somites. Rostrum subtriangular prominence. Antennule three-segmented, with aesthetasc on segments 2 and 3. Antenna three-segmented, without exopod. Legs 1-4 biramous; endopods of legs 1-4 and exopod of leg 1 two-segmented, exopod of legs 2-4 three-segmented. Leg 5: long endopod fused with protopod, with four setae; exopod one-segmented, with five setae.

Biology: Two females were found associated with macroinvertebrates. Most ancorabolids inhabit mud sediment.

Distribution: Juan de Fuca Ridge: Middle Valley Segment, Peanut Vent.



1: Female; A: Habitus, dorsal; B: Habitus, lateral; from Conroy-Dalton & Huys (2000).

Reference:

Conroy-Dalton S. & R. Huys (2000) Cah. Biol. Mar. **41**(4): 343-397.

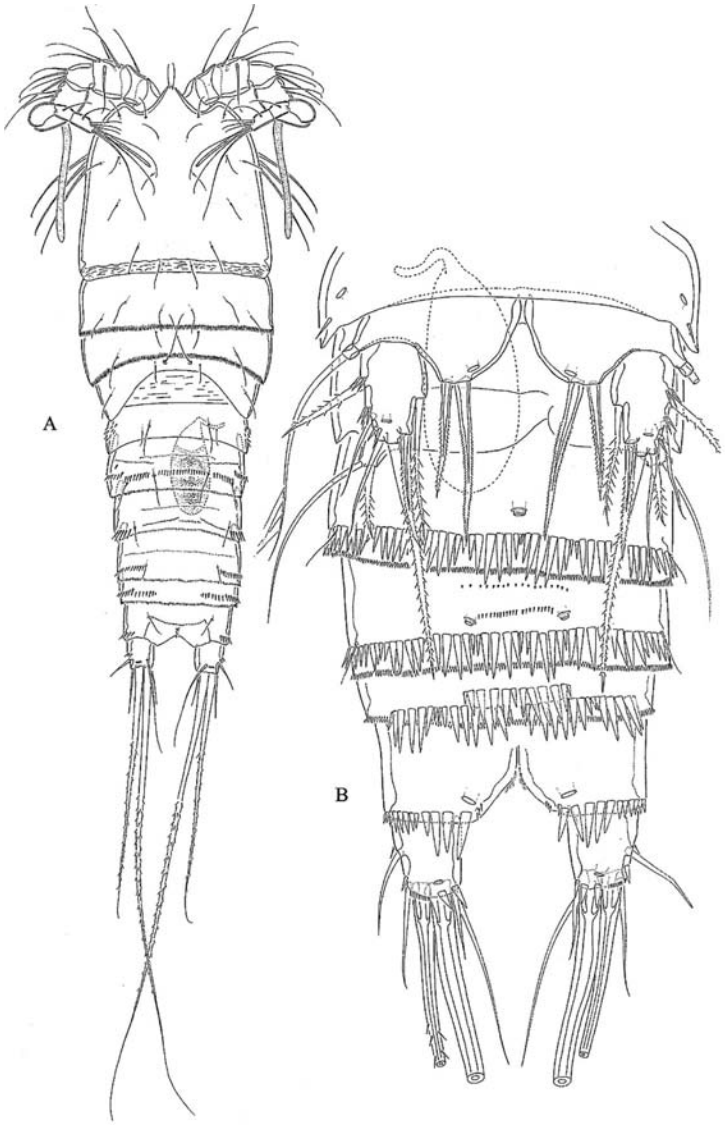
Argestoides prehensilis Huys & Conroy-Dalton, 1997

Size: Body length of male 0.34 mm. Female unknown.

Morphology: Prosome four-segmented; urosome six-segmented. Antennule eleven-segmented, geniculation between segments 8 and 9. Antennary exopod two-segmented, with three setae. Maxilliped subchelate, three-segmented. Legs 1-4 biramous, with three-segmented rami. Endopod of leg 1 prehensile, first segment elongate. Leg 5 two-segmented, baseoendopod with endopodal lobe bearing two spines, exopod with six setae.

Biology: One male has been found in a "fraction of bucket mussel washings", bearing, attached to its shield of cephalothorax and anal somite, two stages of a tantulocarid, an ectoparasitic crustacean.

Distribution: Galapagos Spreading Center.



1: Male; A: Habitus, dorsal; B: Urosome, ventral; from Huys & Conroy-Dalton (1997).

Reference:

Huys R. & Conroy-Dalton S. (1997) Cah. Biol. Mar. **38**: 235-249.

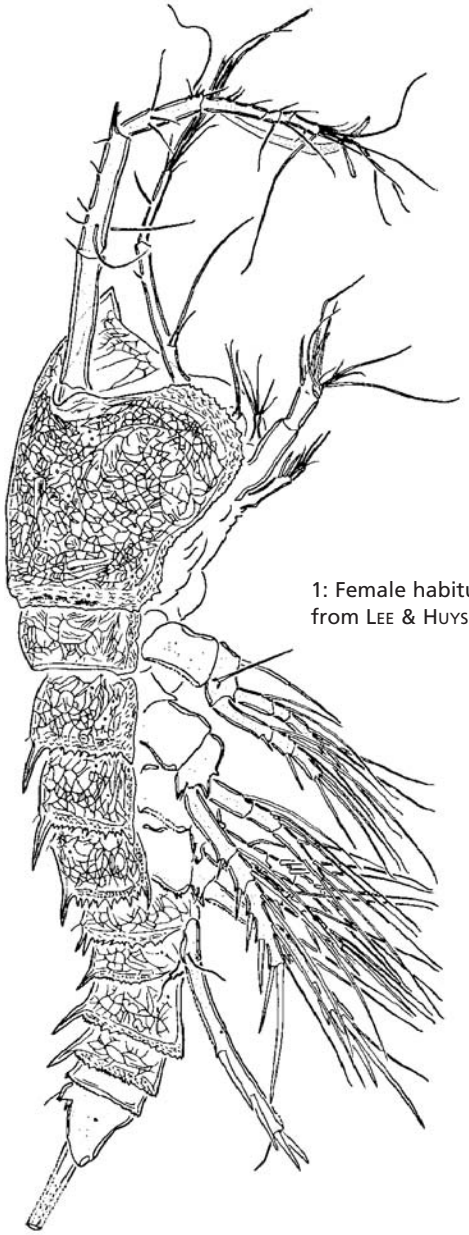
Jamstecia terazakii Lee & Huys, 2000

Size: Body length of female 3.38 mm. Male unknown.

Morphology: Body with reticulated integument and paired spinous processes. Caudal rami 1.5 longer than rest of body. Antennule seven-segmented, first segment elongate. Antenna with two-segmented exopod, one-segmented endopod shorter than allobasis. Leg 5 large, one-segmented.

Biology: Benthopelagic copepod sampled 0.5-3 m above the bottom.

Distribution: Okinawa Trough.



1: Female habitus, lateral; from Lee & Huys (2000).

References:

Lee W. & R. Huys (2000) Zool. J. Linn. Soc. **129**: 1-71.
Lee W. & R. Huys (2001) Zool. J. Linn. Soc. **131**: 249.

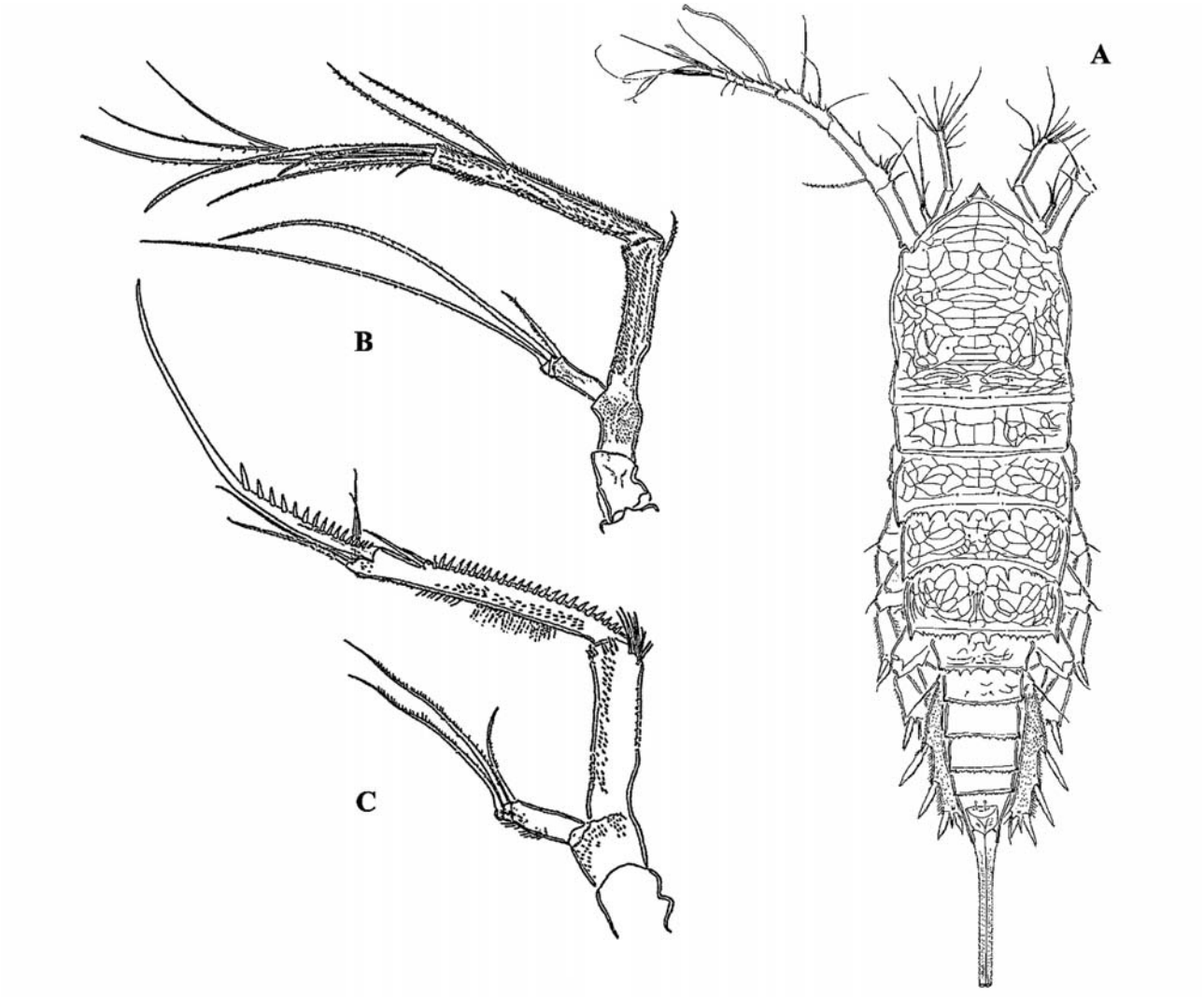
Scabrantenna yooi Lee & Huys, 2000

Size: Body length of female 3.53 mm; male 3.32 mm.

Morphology: Body with reticulated integument. Caudal rami slightly longer than rest of body. Rostrum spiniform, small in female and strongly developed in male. Antennule seven-segmented in female, nine-segmented in male. Antenna with three-segmented exopod, allobasis and endopod sexually dimorphic. Mandible and maxillule reduced in male. Leg 1-4 biramous, with three-segmented rami, excepting one-segmented endopod of leg 1. Leg 5 almost reaching posterior edge of anal somite, one-segmented in female and three-segmented in male.

Biology: Benthopelagic copepod sampled 0.5-3 m above the bottom. Male non-feeding.

Distribution: Okinawa Trough.



1A: Female habitus, dorsal; B: Male antenna; C: Antenna; from Lee & Huys (2000).

Reference:

Lee W. & R. Huys (2000) Zool. J. Linn. Soc. **129**: 1-71.

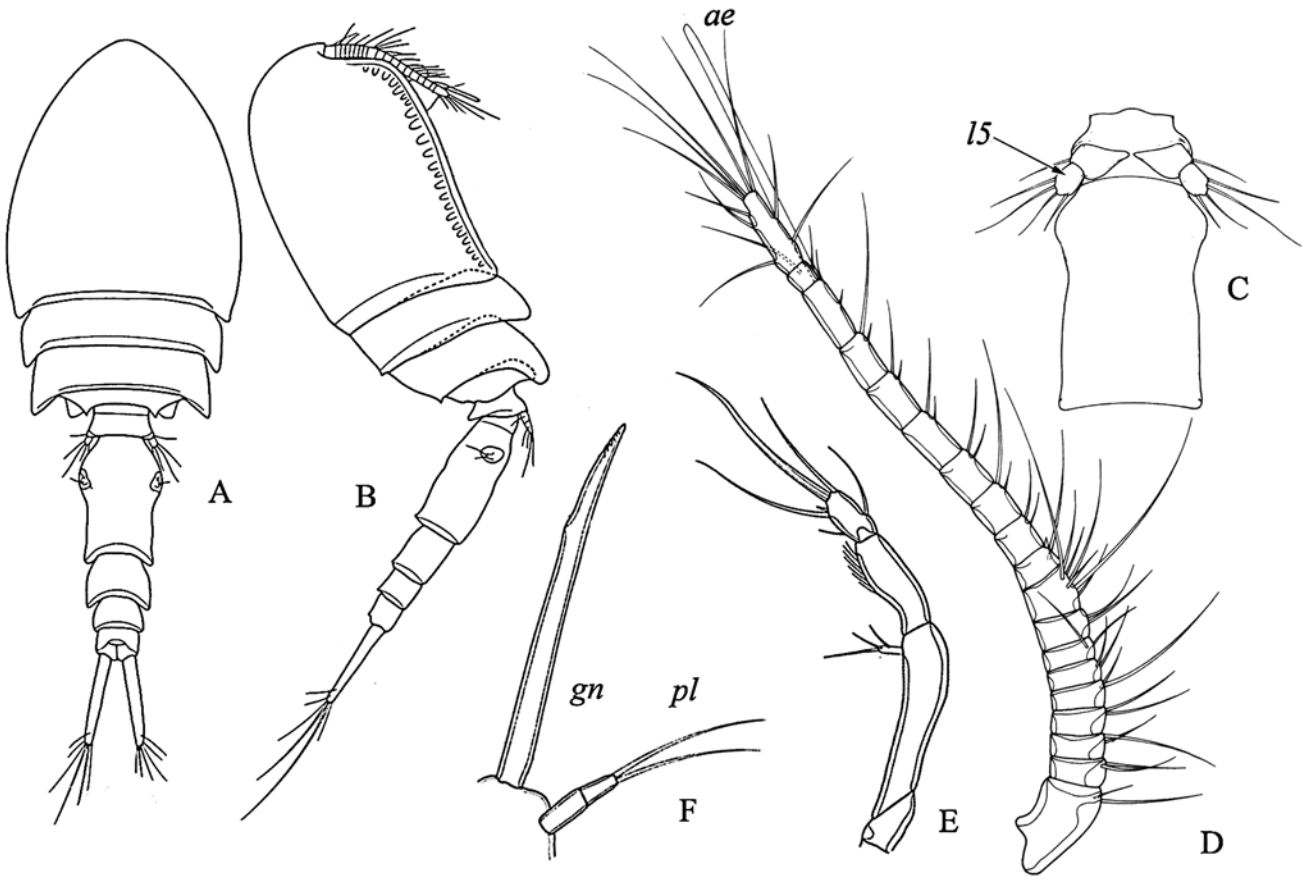
Cheramomyzon abyssale Humes, 1989

Size: Body length of female 2.09-2.27 mm. Male unknown.

Morphology: Prosome four-segmented, tergites of last two somites pointed posteriorly. Urosome five-segmented; first somite with leg 5. Genital double-somite and caudal ramus elongate. Oral cone elongate. Antennule nineteen-segmented; segment 17 with aesthetasc. Antenna with short one-segmented exopod. Mandible with stylet-like gnathobase and two-segmented palp bearing two terminal setae. Maxilla two-segmented, distal segment claw-like. Legs 1-4 biramous, with three-segmented rami. Leg 5 two-segmented, distal segment with four setae.

Remark: Has been found in three samples.

Distribution: East Pacific Rise: 13°N.



1: Female; A: Habitus, dorsal; B: Habitus, lateral; C: Leg 5 and genital double-somite, ventral; D: Antennule; E: Antenna; F: Mandible. ae – aesthetasc; gn – gnathobase of mandible; l5 – leg 5; pl – palp of mandible; from Humes (1989).

Reference:

Humes A.G. (1989) Bull. Mus. Natl. Hist. Nat., Paris, 4e sér. **11**, section A (4): 829-849.

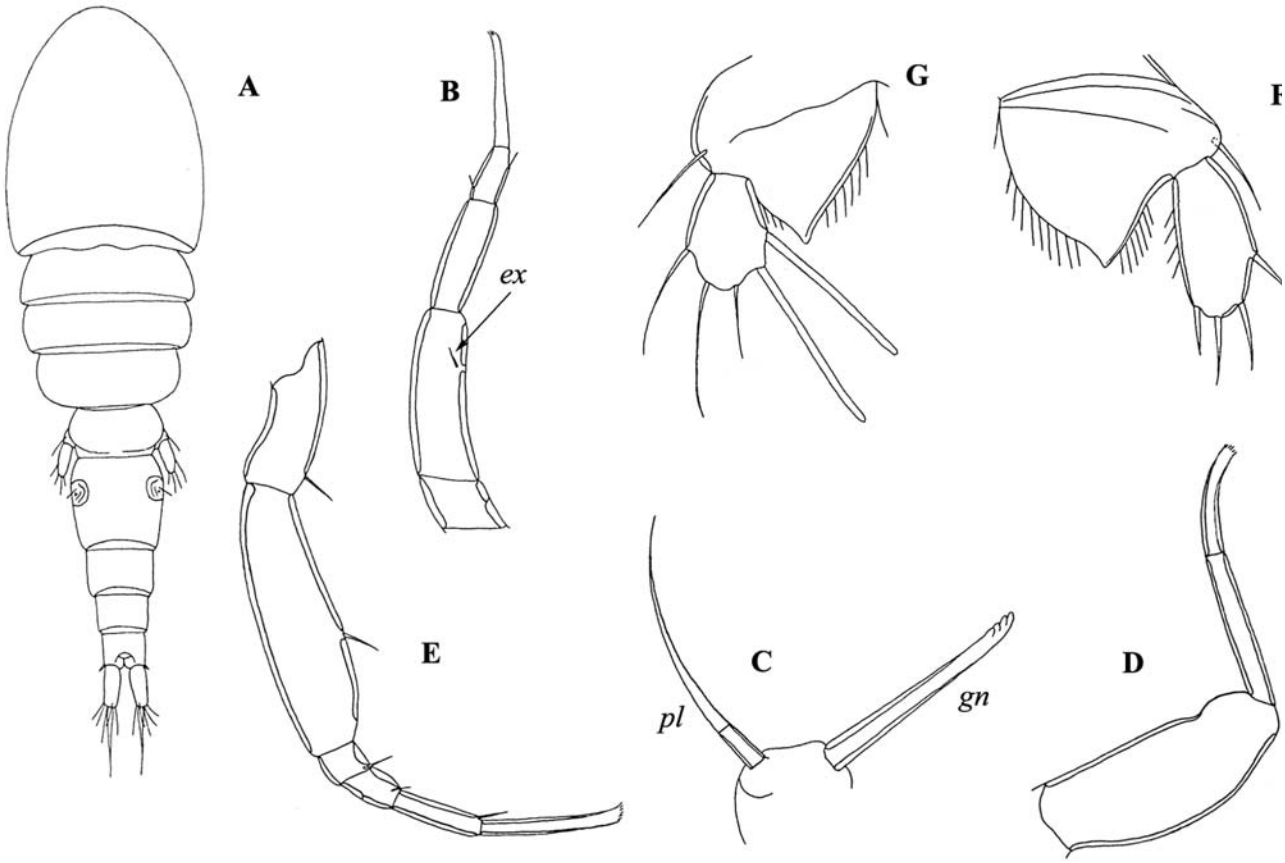
Collocherides brychius HUMES, 1999

Size: Body length of female 0.55-0.58 mm; male 0.50-0.51 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female and six-segmented in male; first somite with leg 5. Longest seta of caudal ramus slightly longer (1.18:1) than ramus. Oral cone short. Antennule of female twenty-segmented, segment 18 with aesthetasc. Antenna with exopod represented by one short seta. Mandible with stylet-like gnathobase and one-segmented palp with one terminal seta. Maxilla three-segmented. Legs 1-4 biramous, with three-segmented rami. Second segment of endopod of legs 1-3 with two inner setae. Leg 5 two-segmented, first segment with outer seta, second segment with four setae in female and five setae in male.

Biology: Females and males have been found in washings of tube worms. All congeners are endosymbionts living in the stomach of shallow-water ophiuroids (HUMES 1993).

Distribution: Juan de Fuca Ridge: Cleft Segment, Marker M of North Field, 2253 m.



1: Female; A: Antennule; B: Antenna; C: Mandible; D: Maxilla; E: Maxilliped; F: Leg 5; G: Male leg 5.
ex – exopod of antenna represented by seta; gn – gnathobase of mandible; pl – palp of mandible; from HUMES (1999).

References:

HUMES A.G.(1993) Bijdr. Dierkd. **63**: 121-127.
HUMES A.G. (1999) Proc. Biol. Soc. Wash. **112**(1): 181-188.

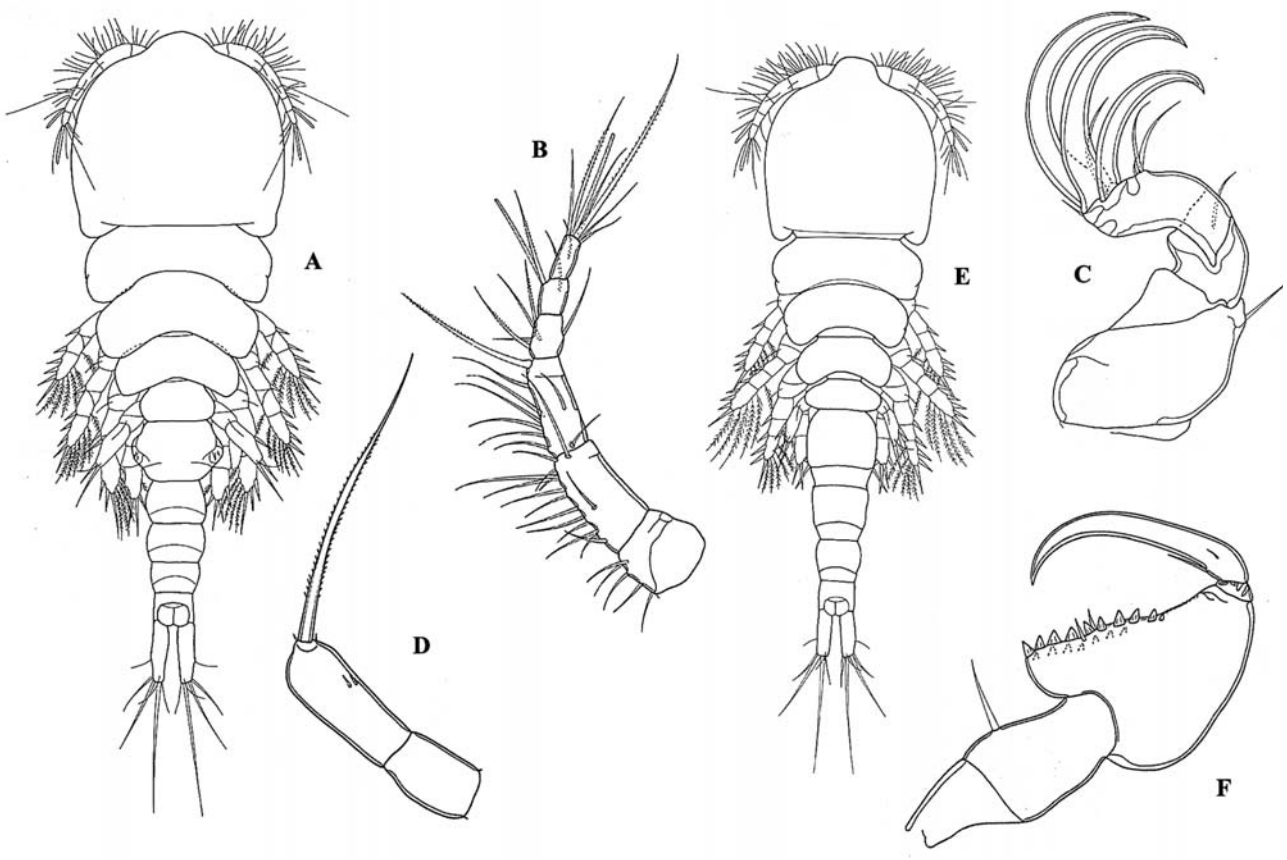
Hyphalion captans Humes, 1987

Size: Body length of female 1.94-2.17 mm; male 1.71-1.82 mm.

Morphology: Body elongate, flattened. Prosome four-segmented. Urosome six-segmented in female, five-segmented in male; first somite with leg 5. Rostrum broad, projecting anterior. Antennule six-segmented in both sexes; male antennules non-geniculate. Antenna three-segmented, without exopod; distal segment with three stout recurved claws. Mandible flexed, gnathobase with three spines and one seta; palp absent. Lobe of maxillule with five setae. Maxilla two-segmented; first segment with one seta; second segment with one seta and three spines. Maxilliped sexually dimorphic; maxilliped of female two-segmented, second segment with long terminal seta; maxilliped of male subchelate, four-segmented, second segment triangular with two rows of spinules, third segment not well defined, fourth segment claw-like. Legs 1-4 biramous with three-segmented rami. Leg 5 two-segmented, first segment with one seta; second segment with three spines and one seta.

Biology: Symbiont of bivalves; type of feeding unclear, may feed on tissues, mucus or utilize host's food.

Distribution: Guaymas Basin.



1: Female; A: Habitus, dorsal; B: Antennule; C: Antenna; D: Maxilliped; E: Male habitus, dorsal; F: Maxilliped; from Humes (1987).

References:

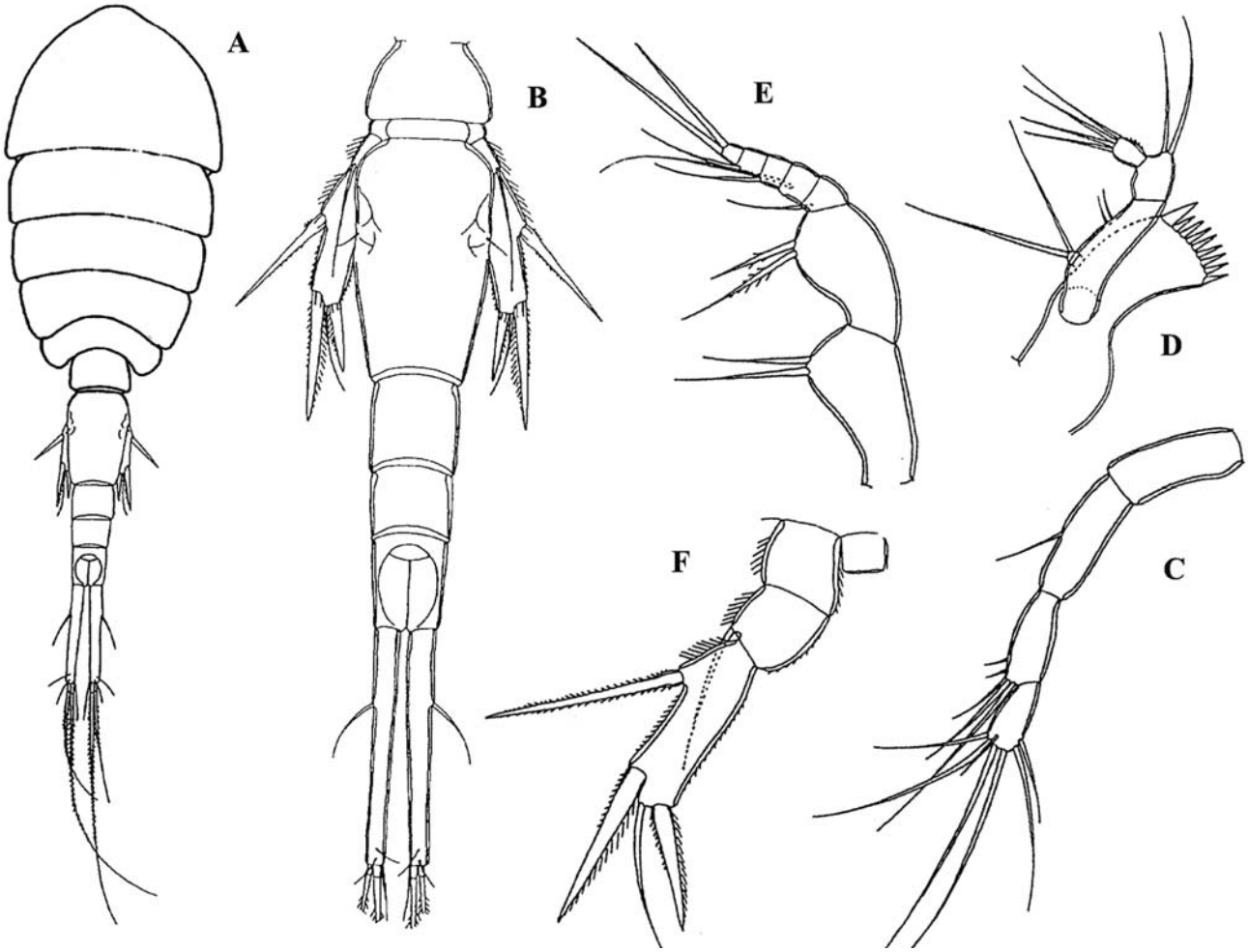
Defaye D. & T. Toda (1994) Bull. Mus. Natl. Hist. Nat., Paris, 4e sér. **16**, section A (1): 87-94.
Humes A.G. (1987) Bull. Mar. Sci. **41**: 645-788.

Barathricola rimensis Humes, 1999

Size: Body length of female 0.67-0.79 mm; male 0.47-0.57 mm.

Morphology: Prosome slender, five-segmented. Urosome five-segmented in female, six-segmented in male, first somite with leg 5. Caudal ramus long, of length/width ratio 11:1. Antennule thirteen-segmented; geniculation of male antennules between segments 11 and 12. Antenna four-segmented, without exopod. Mandible with biramous palp: endopod two-segmented; exopod small, one-segmented, with two terminal setae. Legs 1-4 biramous, with three-segmented rami. Leg 1 with one seta on inner segment. Leg 5 three-segmented with intercoxal sclerite: armature 0-0; 1-0; II, 1, I in female and 0-0; 1-0; II, 1, I, 1 in male.

Distribution: Juan de Fuca Ridge: Coaxial Segment, Flow vent site (Vent HDV).



1: Female; A: Habitus, dorsal; B: Urosome, dorsal; C: Antenna; D: Mandible; E: Maxilliped; F: Leg 5; from Humes (1999).

Reference:

Humes A.G. (1999) J. Nat. Hist. **33**: 961-978.

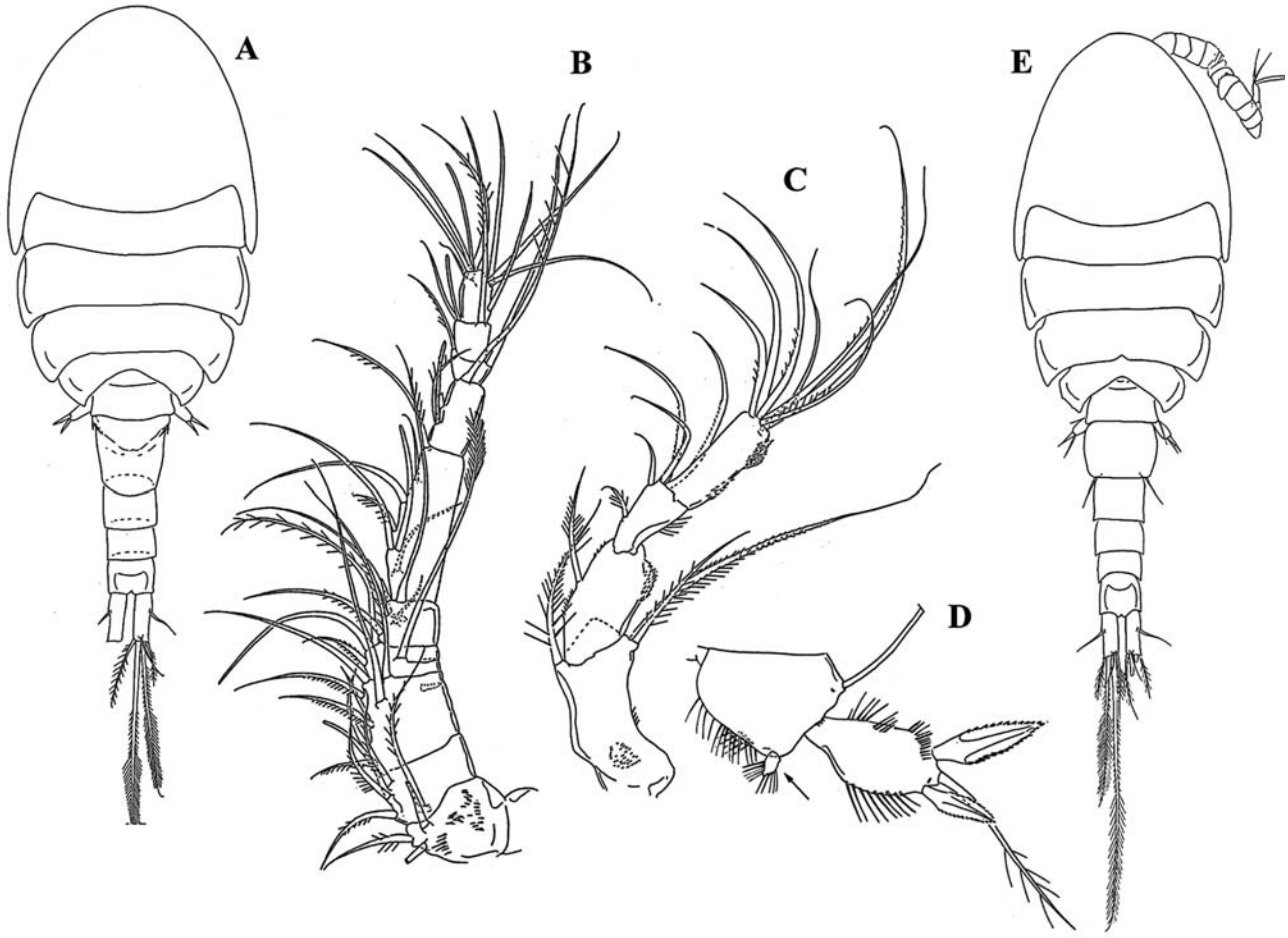
Heptnerina confusa Ivanenko & Defaye, 2004

Size: Body length of female 0.82 mm; male 0.65 mm.

Morphology: Prosome five-segmented; tergite of somite bearing leg 1 covered laterally by shield of cephalosome. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Antennule ten-segmented in female and seventeen-segmented in male. Antenna four-segmented; exopod represented by two setae on first segment. Mandible with biramous palp. Legs 1-4 biramous, with three-segmented rami. Endopod of leg 4 with three robust setae. Leg 5 two-segmented with armature 1-0; I, 1, I in female and 1-0; I, 1, I, 2 in male. First segment of female leg 5 can have stout endopodal element.

Biology: Many adult and subadult copepodid stages of *H. confusa* have been collected during in situ colonization experiments at the base of the active chimney Eiffel Tower covered by a layer of *Bathymodiolus azoricus* (Bivalvia, Mytilidae).

Distribution: Mid-Atlantic Ridge: Lucky Strike, Chimney Eiffel Tower.



1: Female; A: Habitus, dorsal; B: Antennule; C: Antenna; D: Leg 5, endopodal element arrowed; E: Male habitus, dorsal; from Ivanenko & Defaye (2004).

Reference:

Ivanenko V.N. & D. Defaye (2004) Zoosystema **26** (1): 49-64.

Aphotopontius HUMES, 1987

Species	1	2	3	4	5	6	7	8	9	10	11
A. acanthinus HUMES & LUTZ, 1994		+									
A. arcuatus HUMES, 1987	+		+	+							
A. atlanteus HUMES, 1996									+	+	
A. baculigerus HUMES, 1987	+			+							
A. flexispina HUMES, 1987				+							
A. forcipatus HUMES, 1987						+	+	+			+
A. hydronauticus HUMES, 1989			+								
A. limatulus HUMES, 1987	+	+		+							
A. mammillatus HUMES, 1987	+		+	+	+						
A. probolus HUMES, 1990	+										

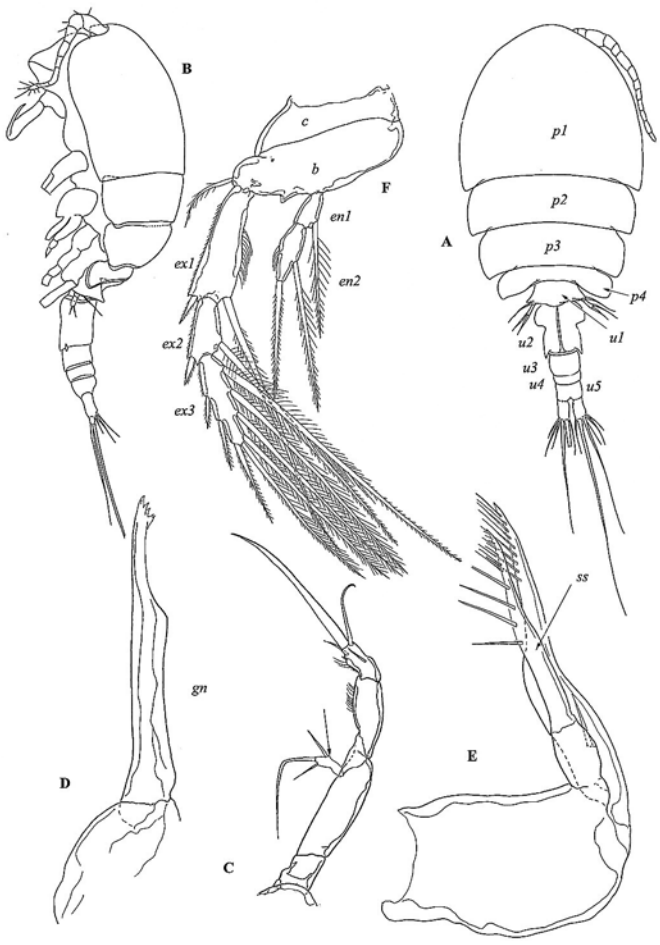
Size: Body length 0.6-1.2 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Oral cone short. Antenna with one-segmented exopod. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Endopod of leg 4 two-segmented; first segment with one inner seta; second segment with two (terminal and inner) setae.

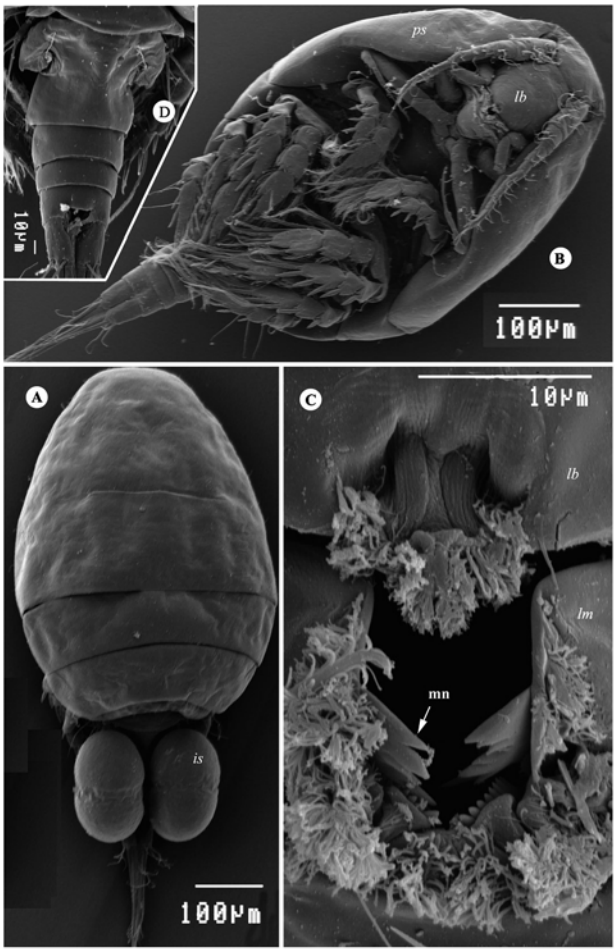
Remarks: *A. rapunculus* HUMES & SEGONZAC, 1998 transferred to *Rhogobius* HUMES, 1987; *A. temperatus* HUMES, 1997 was synonymized with *A. atlanteus*. Only females are known for *A. flexispina* and *A. hydronauticus*.

Biology: All species of *Aphotopontius* have been found free-living or associated with invertebrates. *A. arcuatus*, *A. atlanteus*, *A. flexispina* and *A. probolus* found in association with bivalves; *A. arcuatus*, *A. flexispina* and *A. mammillatus* with vestimentiferans; *A. acanthinus* and *A. forcipatus* with crustaceans. Ecological studies at the Juan de Fuca Ridge showed that *A. forcipatus* is more abundant at new vents appearing after eruption and has female to male ratio 10.6:1 (TSURUMI et al. 2003). Functional analysis suggests that copepods of the genus *Aphotopontius* are swimming and moving over substratum, they can feed on bacterial films and flakes on substratum and in near-bottom water column (HEPTNER & IVANENKO 2002).

Distribution: See the table after Ivanenko & Ferrari, 2003: 1 – Galapagos Rift; 2 – East Pacific Rise at 10°N; 3 – East Pacific Rise at 13°N; 4 – East Pacific Rise at 21°N; 5 – Guaymas Basin, 27°N; 6 – Gorda Ridge, 41°N; 7 – Juan de Fuca Ridge, 46°N; 8 – Explorer Ridge, 49°N; 9 – Mid-Atlantic Ridge at 37°N (Lucky Strike); 10 – Mid-Atlantic Ridge at 37°N (Menez Gwen); 11 – Mid-Atlantic Ridge at 23°N (Snake Pit).



1: Female of *A. mammillatus*; A: Habitus, dorsal; B: Habitus, lateral; C: Antenna; D: Mandible; E: Maxilla; F: Leg 4. b – basis; c – coxa; en1-en2 – endopodal segments; ex1-ex3 – exopodal segments 1-3; gn – gnathobase of mandible; p1-p4 – segments of prosome; ss – sinuous seta of maxilla; u1-u5 – segments of urosome; from Ivanenko & Heptner (1998).



2: Female of *A. atlanteus* (SEM); A: Habitus, dorsal; B: Habitus, ventral; C: Distal part of oral cone; D: Urosome, dorsal. es – egg sac; lb – distal part of labrum of oral cone, oral cone, distal part of labrum; lm – distal part of labium of oral cone ornamented with setiform elements; md – mandible, tip of gnathobase; original.

References:

Heptner M.V. & V.N. Ivanenko (2002) Arthropoda Selecta **11**(2): 117-134.
Humes A.G. (1987) Bull. Mar. Sci. **41**(3): 645-788.
Humes A.G.(1990) Sci. Mar. **54**(2): 145-154.
Humes A.G. & R.A. Lutz (1994) Jour. Crustac. Biol. **14**(2): 337-345.
Humes A.G. & M. Segonzac (1998) Cah. Biol. Mar. **39**: 51-62.
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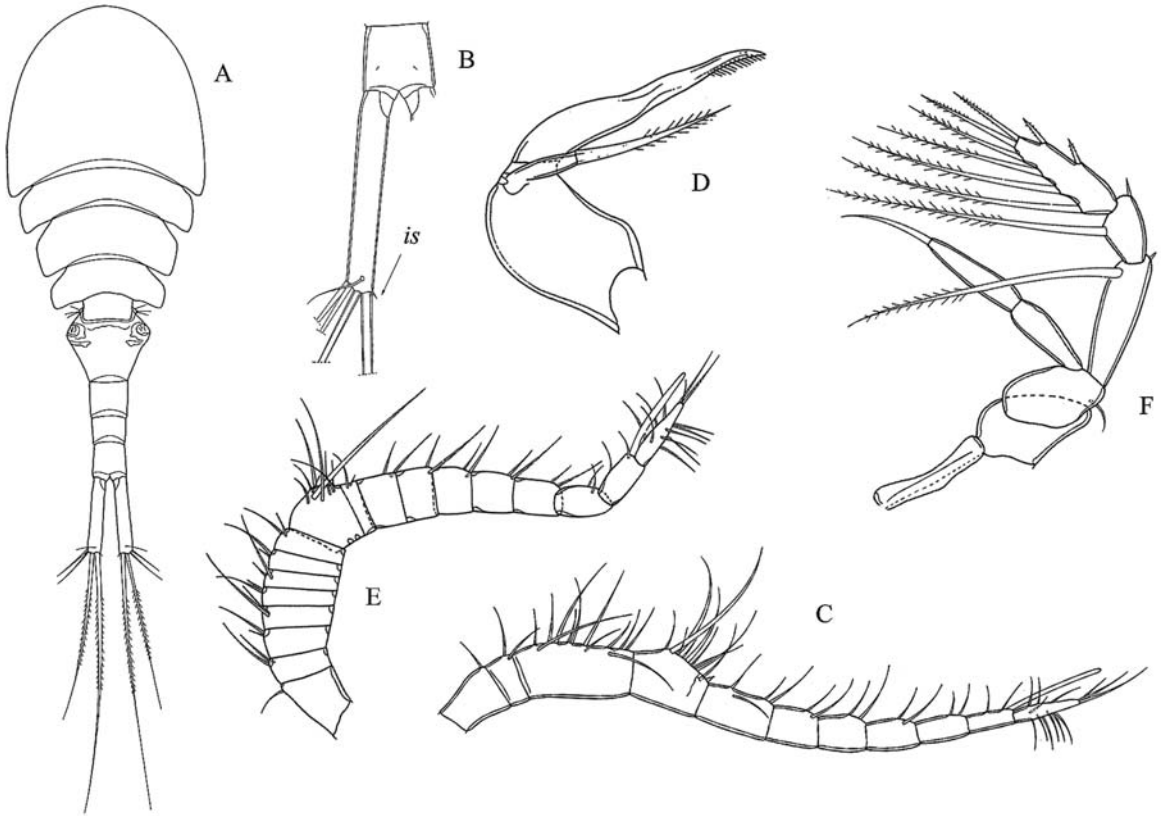
Ivanenko V.N & M.V. Heptner (1998) J. Mar. Syst. **15**: 243-254.
Tsurumi M., de Graaf R.C. & V. Tunnicliffe (2003) J. Mar. Biol. Ass. U.K. **83**(3): 469-478.

Benthoxynus Humes, 1984

Species	Distribution	Body length in mm
B. spiculifer Humes, 1984	Juan de Fuca Ridge: Axial Seamount, Heineken Hollow, Megaplume Site; Gorda Ridge; Explorer Ridge	Female 1.61-1.79; male 0.97-1.09
B. tumidiseta Humes, 1989	East Pacific Rise: 13°N, sites Genesis, Elsa, Totem	Female 1.53-1.76; male unknown

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Caudal ramus elongate; innermost terminal seta minute. Oral cone short. Antenna with one-segmented exopod. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. First exopodal segment of leg 3 lacks inner seta. Leg 4 with two-segmented endopod; first segment unarmed; second segment armed with terminal spine. Leg 5: small lobe with 3 setae in female and two setae in male.

Biology: *B. spiculifer* has been found in debris from vestimentiferan tubes. Ecological studies at the Juan de Fuca Ridge revealed that it is more common at older vents (Tsurumi et al. 2003). The blood of *B. spiculifer* has haemoglobin supporting aerobic respiration in low-oxygen conditions (Hourdez et al. 2000).



1: Female of *B. tumidiseta*; A: Habitus, dorsal; B: Anal somite and elongate caudal ramus with reduced innermost terminal seta, dorsal; C: Antennule; D: Maxilla; female of *B. spiculifer*; E: Antennule; F: Leg 4. is – innermost terminal seta of caudal ramus; from Humes (1989) (A-D) and Humes (1984) (E, F).

References:

Hourdez S., Lamontagne J., Peterson P., Weber R.E. & C.R. Fisher (2000) Biol. Bull. **199**: 95-99.
Humes A.G. (1984) Can. J. Zool. **62**: 2594-2599.
Humes A.G. (1989) Bull. Mus. Natl. Hist. Nat., Paris, 4e sér. **11**, section A, no. 4: 829-849.
Tsurumi M., de Graaf R.C. & V. Tunnicliffe (2003) J. Mar. Biol. Ass. U.K. **83**(3): 469-478.

Ceuthoecetes Humes & Dojiri, 1980

Type species: C. *aliger* Humes & Dojiri, 1980. Other included species: C. *acanthothrix* Humes, 1987; C. *cristatus* Humes, 1987; C. *introversus* Humes, 1987.

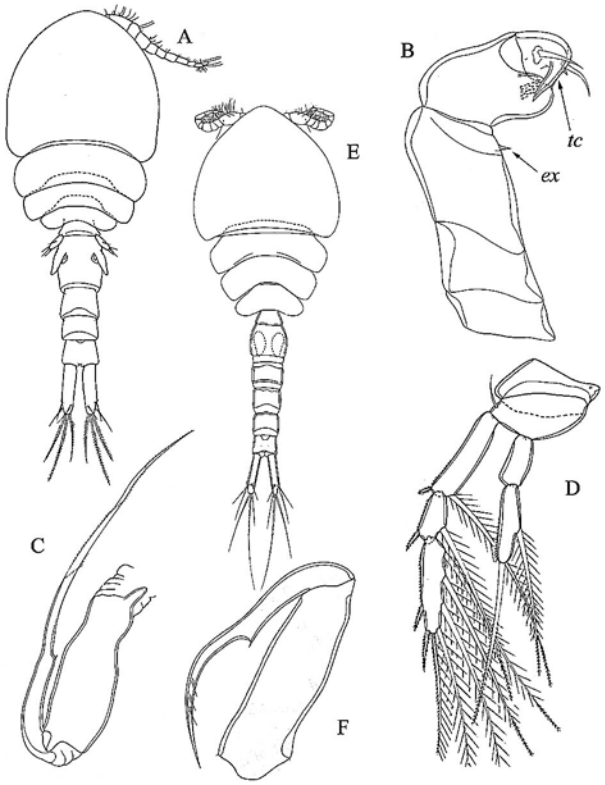
Size: Body length 0.91-1.50 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Oral cone short, with distal disk formed by labium. Antenna with small one-segmented exopod; endopod with curved terminal claw. First segment of maxilla without inner sinuous seta; second segment elongate, with distal setiform part. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod; first segment unarmed; second segment armed with terminal spine and inner seta. Maxilliped of male with stout second segment.

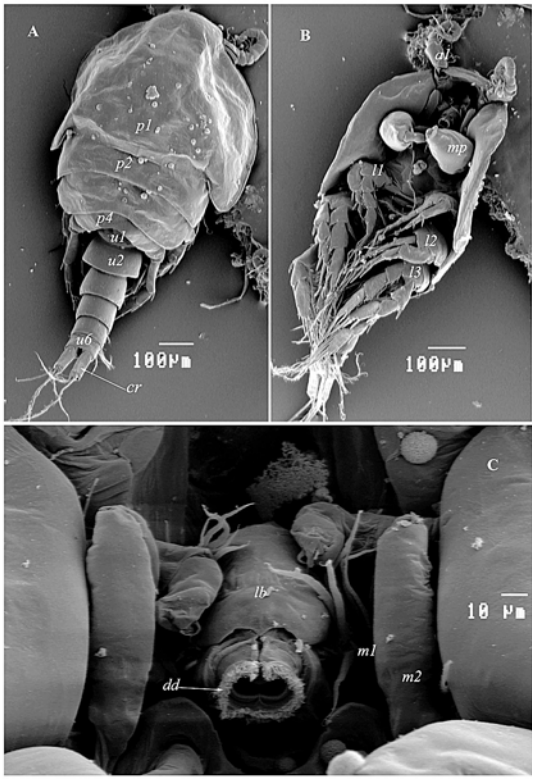
Remarks: Only female was described for C. *aliger*; only males are known for three other species.

Biology: Abundant in washings of vestimentiferans and *Calyptogena*. Type of feeding unclear, may feed on tissues or associated mucus of their hosts. *Ceuthoecetes aliger* was found in washing of tentacular crowns of vestimentiferans.

Distribution: East Pacific Rise, Galapagos Spreading Center.



1: Female of *C. aliger*; A: Habitus, dorsal; B: Antenna; C: Maxilla; D: Leg 4; E: Male of *C. cristatus,* habitus, dorsal; F: Male of *C. introversus*, maxilla.
ex – exopod; tc – terminal claw of endopod; from Humes & Dojiri (1980) (A-D) and Humes (1987) (F).



2: Male of *C. introversus* (SEM). A: Habitus, dorsal; B: Habitus, ventral; C: Oral cone, ventral.
a1 – antennule; cr – caudal ramus; dd – distal disk of oral cone formed by labium; l1-l3 – swimming legs 1-3. lb – labium; m1 – maxillule; m2 – maxilla; mp – maxilliped; p1-p4 – segments of prosome; u1-u6 – somites of urosome; original.

References:

Humes A.G. (1987) Bull. Mar. Sci. **41**(3): 645-788.
Humes A.G. & M. Dojiri (1980) Proc. Biol. Soc. Wash. **93**(3): 697-707.
Humes A.G. & M. Segonzac (1998) Cah.Biol. Mar. **39**: 51-62.
Ivanenko V.N. & F.D. Ferrari (2003) Arthropoda Selecta **11**(3): 177-185.

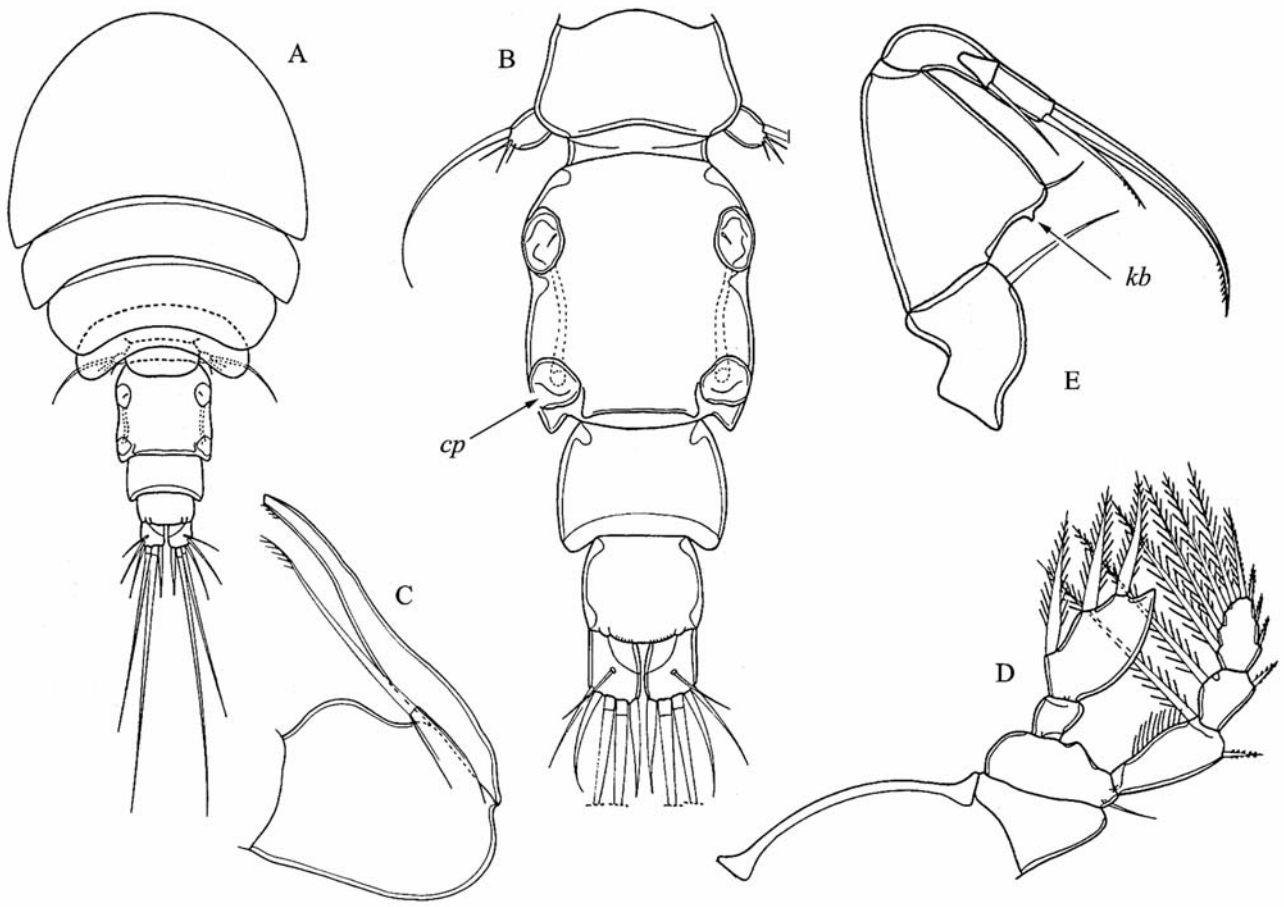
Chasmatopontius thescalus Humes, 1990

Size: Body length of female 1.14-1.39 mm; male 1.06-1.28 mm.

Morphology: Prosome four-segmented. Urosome four-segmented in female, five-segmented in male; first somite with leg 5. Copulatory pores near posterior border of female genital double-somite. Oral cone short. Antenna with one-segmented exopod. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod; first segment unarmed; second segment with three inner setae. Second segment of male maxilliped expanded, with knob on inner edge.

Biology: Abundant. Found in washings of tubes of *Paralvinella hessleri* Desbruyères & Laubier, 1989 in the Mariana Back-Arc Basin.

Distribution: Mariana Back-Arc Basin: Alice Spring, Illium; Lau Back-Arc Basin: Vailili.



1: Female; A: Habitus, dorsal; B: Urosome, dorsal; C: Maxilla; D: Male leg 4, anterior; E: Maxilliped, posterior.
cp – copulatory pore; kb – knob on inner edge of male maxilliped; from Humes (1990).

References:

Humes A.G. (1990) J. Nat. Hist. **24**: 289-304.
Humes A.G. (1991) Bull. Mus. Natl. Hist. Nat., Paris, 4e sér. **13**, section A, nos. 1-2: 121-134.

Dirivultus Humes & Dojiri, 1980

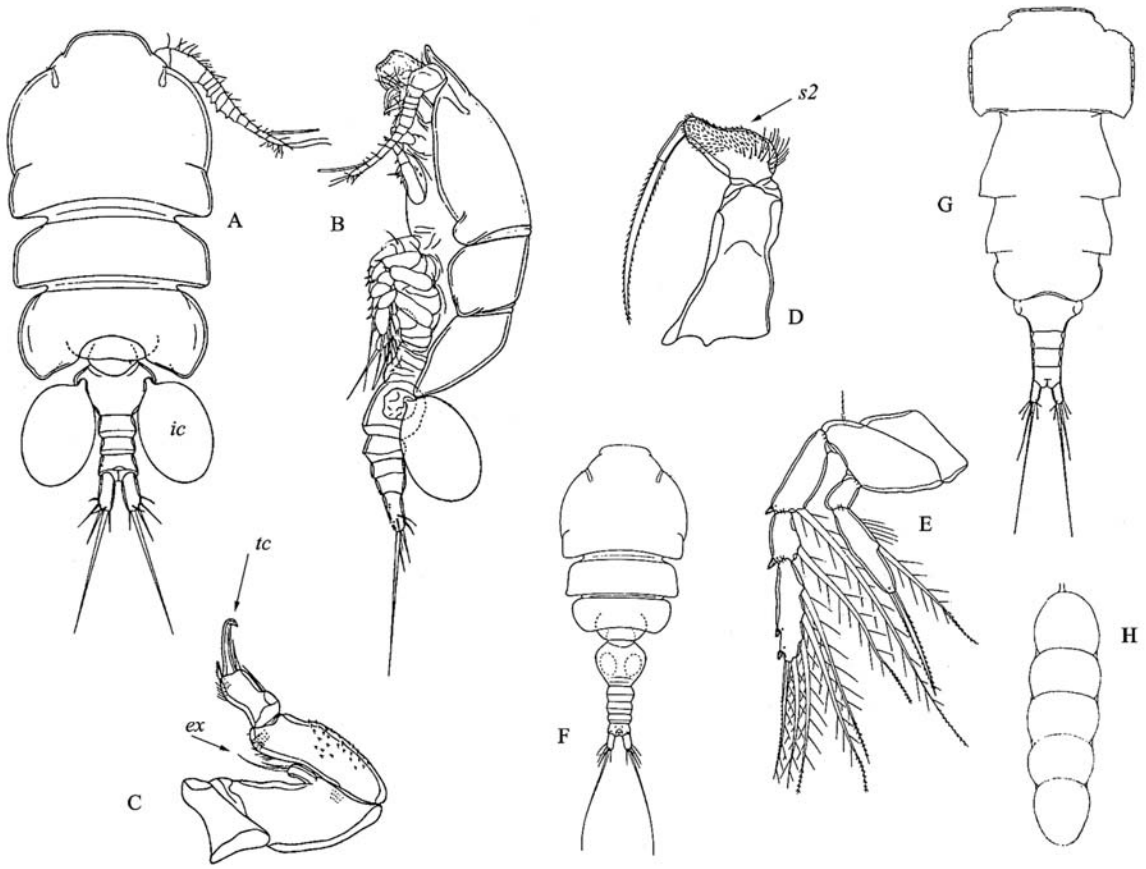
Type species: *D. dentaneus* Humes & Dojiri, 1980; one further species *D. spinigulatus* Humes, 1999.

Size: Body length of female 1.00-1.16 mm; male 0.92-1.09 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Rostral area projecting anteriorly. Oral cone with distal disk formed by labium; labrum with dentiform spines directed posteriorly. Antenna with one-segmented exopod; endopod with curved terminal claw. Mandible with stylet-like gnathobase, without palp. First segment of maxilla without inner sinuous seta. Second segment of maxilla armed with long slender claw and ornamented with long setules. Exopods of legs 1-4 and endopods of legs 2-3 three-segmented; endopods of legs 1 two- or three-segmented. Leg 4 with two-segmented endopod; first segment unarmed; second segment armed with terminal spine and inner seta.

Biology: May "feed on tentacular lamellae or associated mucus" of siboglinids (Humes & Dojiri 1980). The type species *D. dentaneus* Humes & Dojiri, 1980 has been found in tentacular crown of *Lamellibrachia barhami* Webb, 1969 off Southern California.

Distribution: *D. dentaneus* from Southern California (32°19'6"N, 117°19'08"W; 1125 m); *D. spinigulatus* from Tabar-Feni Volcanic Fore-Arc: Edison Seamount.



1A: Female habitus, dorsal; B: Habitus lateral; C: Antenna, posterior; D: Maxilla; E: Leg 4; F: Male habitus, dorsal; G: Female habitus, dorsal; H: Egg sac. ec – egg sac; ex – exopod; s2 – second segment of maxilla ornamented with setules; tc – terminal claw of endopod; from Humes & Dojiri (1980) (A-F *D. dentaneus*) and Humes (1999) (G-H *D. spinigulatus*, female).

References:

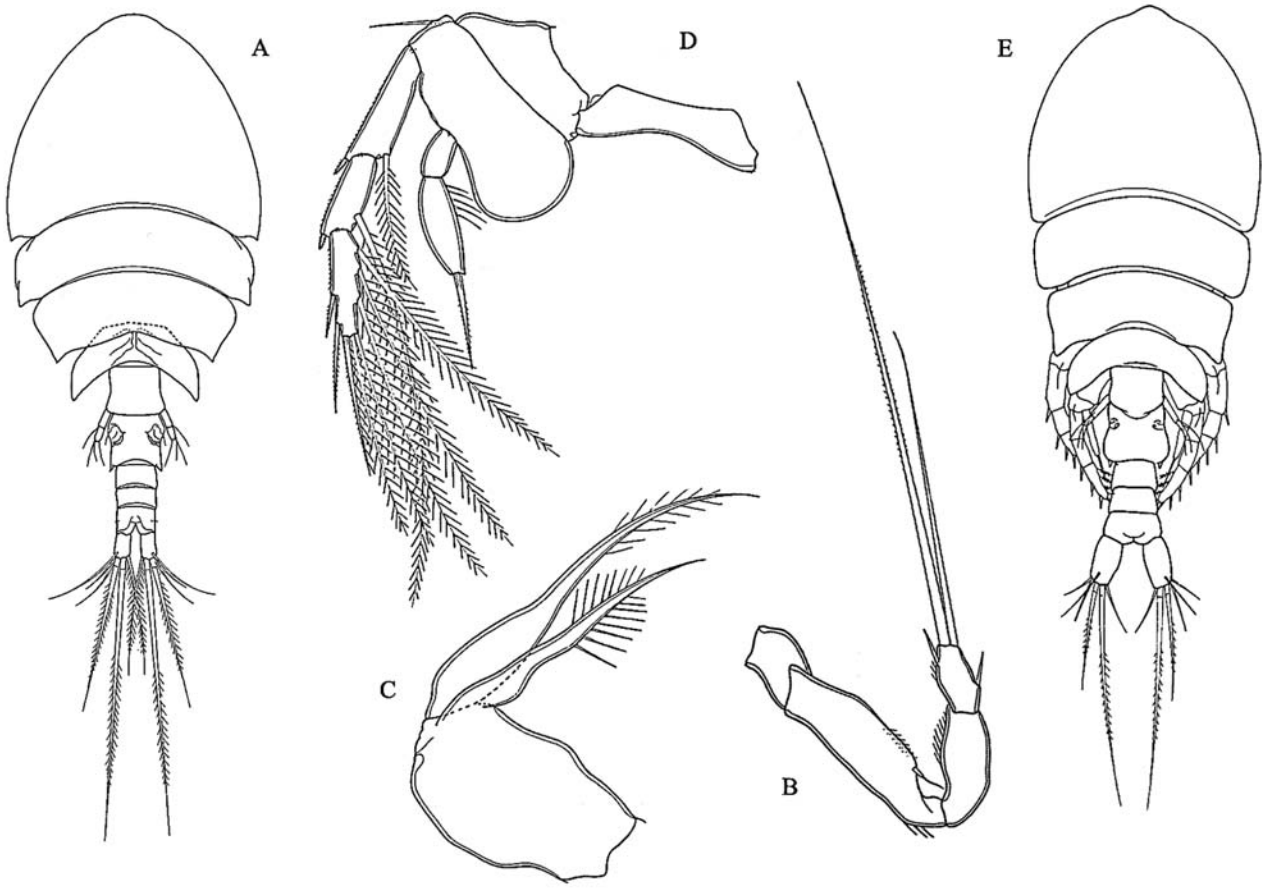
Humes A.G. (1999) J. Mar. Biol. Ass. U.K. **79**: 1053-1060.
Humes A.G. & M. Dojiri (1980) Pac. Sci. **34**: 143-151.

Exrima Humes, 1987

Species	Distribution	Body length in mm
E. dolichopus Humes, 1987	East Pacific Rise: 13°N, Parigo	Female 1.12-1.15; male unknown
E. singular Humes, 1987	East Pacific Rise: 21°N, Clam Acres	Female 0.97-1.07; male unknown

Morphology: Prosome four-segmented. Urosome five-segmented; first somite with leg 5. Oral cone short. Antenna with one-segmented exopod; distal segment of endopod with two long terminal setae. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod; first segment unarmed; second segment armed with terminal spine. Leg 5 two-segmented.

Biology: *E. singula* has been found in washing of vestimentiferans and *Calyptogena*.



1: Female of *E. singula*; A: Habitus, dorsal; B: Antenna; C: Maxilla; D: Leg 4; E: Female of *E. dolichopus*, habitus, dorsal; from Humes (1987).

References:

Humes A.G. (1987) Bull. Mar. Sci. **41**: 645-788.
Humes A.G. (1989) Bull. Mus. Natl. Hist. Nat., Paris, 4e sér. **11**, section A, no. 4: 829-849.

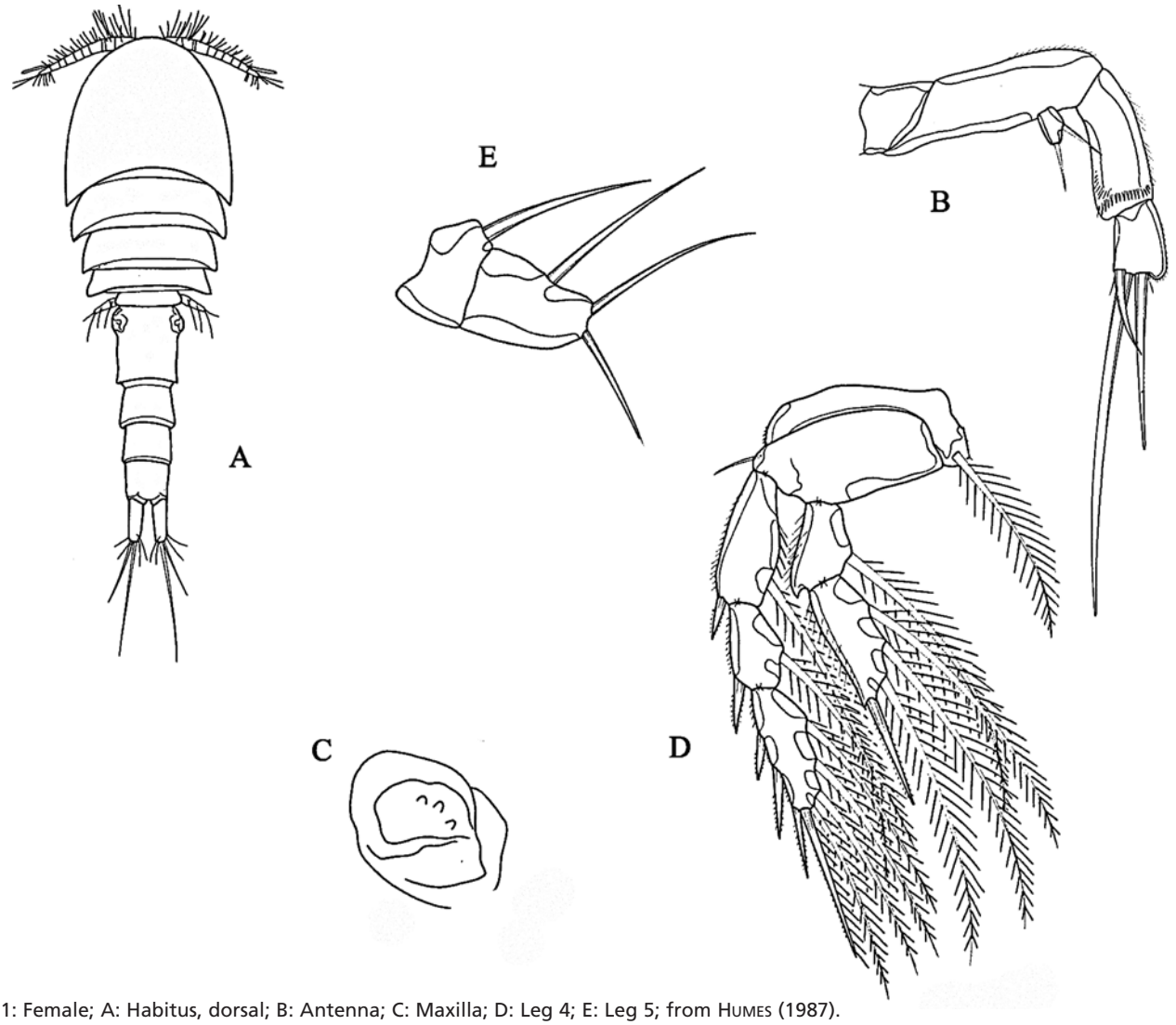
Fissuricola caritus Humes, 1987

Size: Body length of female 1.19-1.34 mm. Male unknown.

Morphology: Prosome four-segmented. Urosome five-segmented; first somite with leg 5. Oral cone short. Antenna with one-segmented exopod. Mandible with stylet-like gnathobase, without palp. Maxilla reduced to small vestige. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod; first segment with inner seta; second segment with one terminal spine and three inner setae.

Remark: The only dirivultid with maxilla reduced to vestige.

Distribution: East Pacific Rise: 21°N, Clam Acres.



1: Female; A: Habitus, dorsal; B: Antenna; C: Maxilla; D: Leg 4; E: Leg 5; from Humes (1987).

References:

Humes A.G. (1987) Bull. Mar. Sc. **41**: 645-788.
Ivanenko V.N. & F.D. Ferrari (2003) Arthropoda Selecta **11** (3): 177-185.

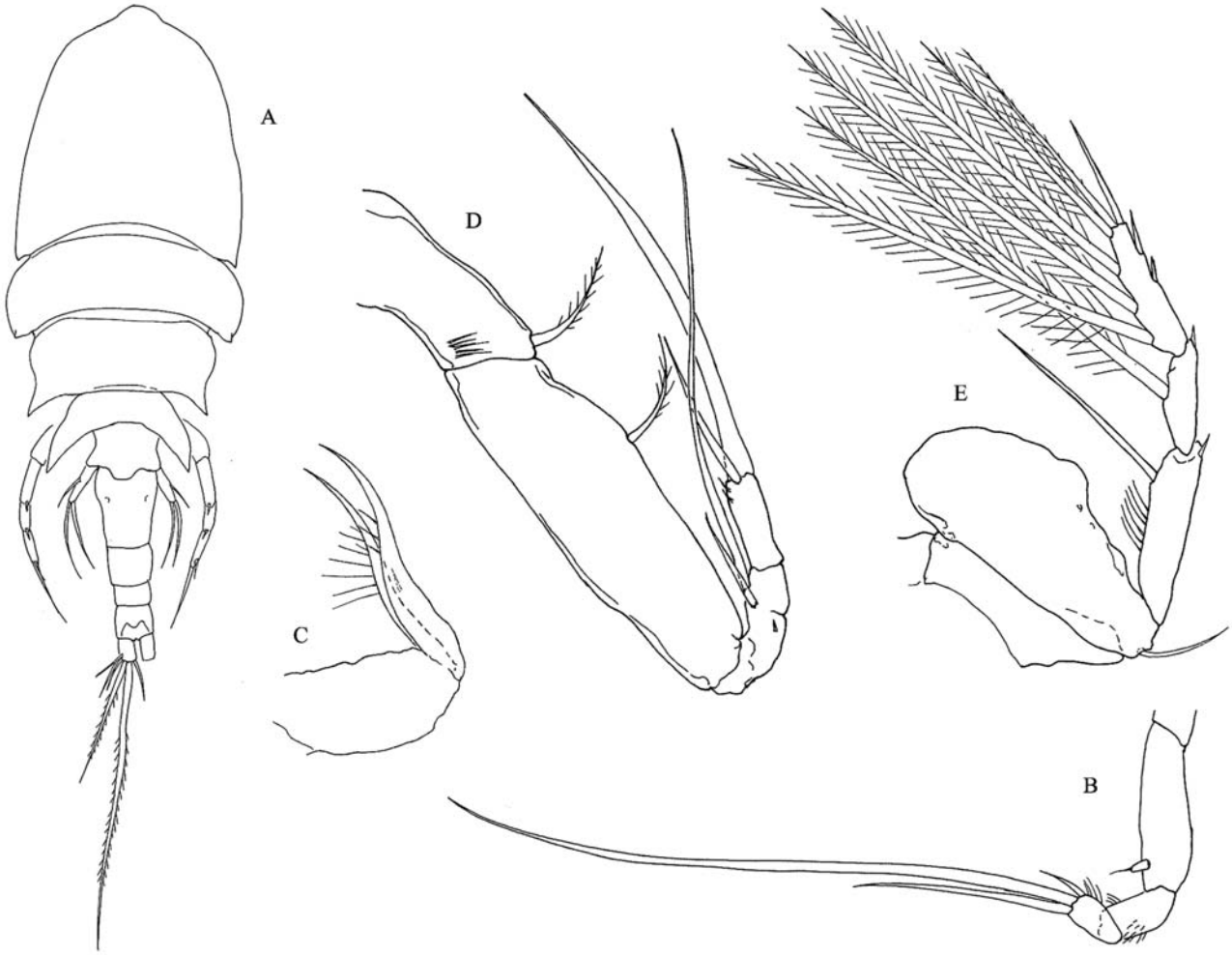
Humesipontius arthuri Ivanenko & Ferrari, 2003

Size: Body length of female 1.8 mm. Male unknown.

Morphology: Body elongate. Prosome four-segmented. Urosome five-segmented; first somite with leg 5. Oral cone short. Antenna with one-segmented exopod; second segment of endopod with elongate terminal seta. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. First segment of maxillipedal endopod with elongate seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 without endopod.

Remark: The only dirivultid missing endopod of leg 4.

Distribution: Juan de Fuca Ridge.



1: Female; A: Habitus, dorsal; B: Antenna; C: Maxilla; D: Maxilliped, posterior; E: Leg 4, anterior; after Ivanenko & Ferrari (2003).

Reference:

Ivanenko V.N. & F.D. Ferrari (2003) Arthropoda Selecta **11**(3): 177-185.

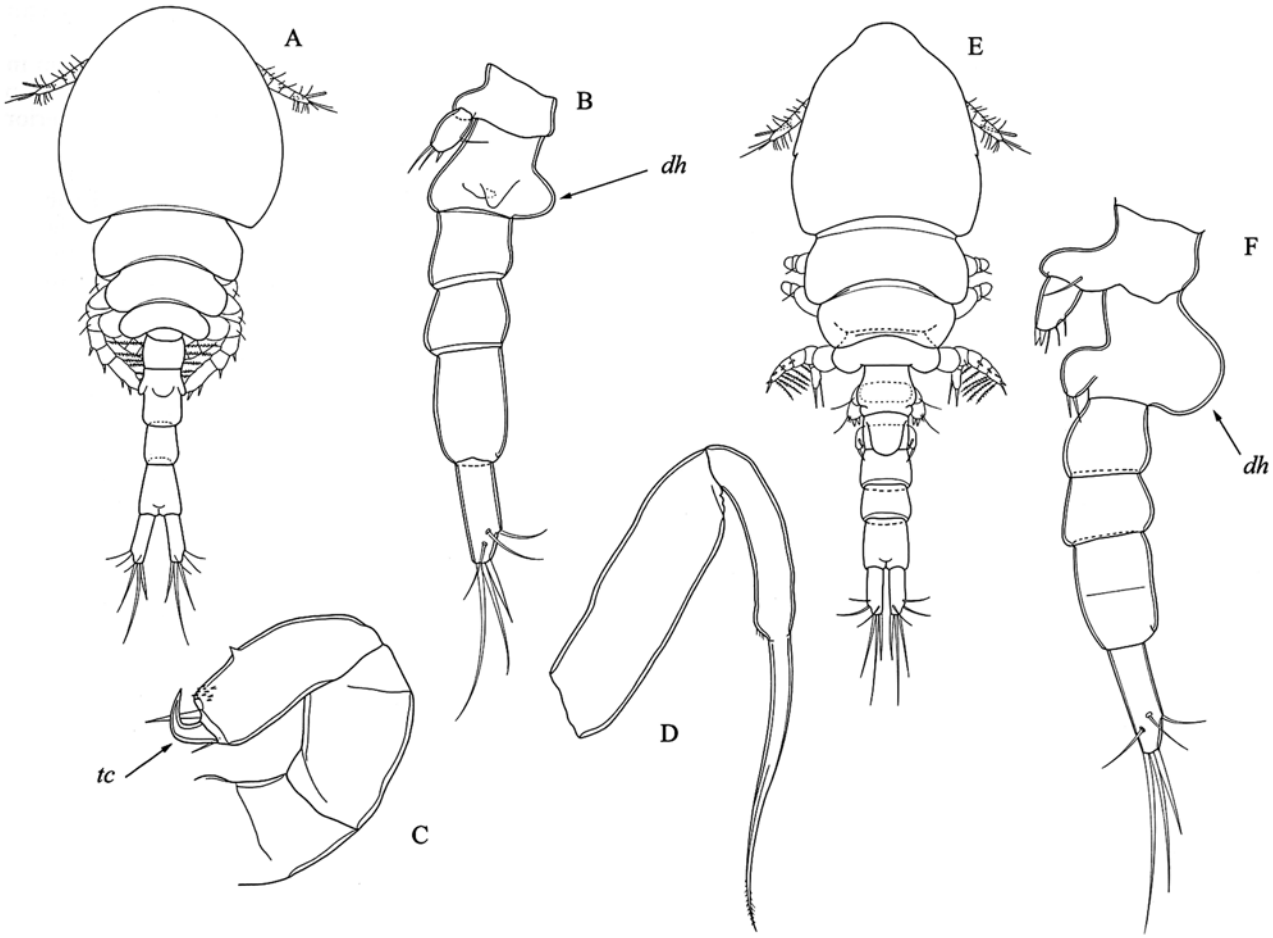
Nilva torifera Humes, 1987

Size: Body length of female 0.67-0.88 mm, male 0.79-0.96 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5; last two somites indistinctly separated. Genital double-somite of female and genital somite of male with dorsal hump. Oral cone short, with distal disk formed by labium. Antenna with small one-segmented exopod; endopod with curved terminal claw. First segment of maxilla without inner sinuous seta; second segment elongate with setiform distal part. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod; first segment unarmed; second segment armed with inner seta and terminal spine.

Biology: Common in washings of vestimentiferans and *Calyptogena*; type of feeding unclear, may feed on tissues or mucus of hosts.

Distribution: Galapagos Spreading Center; East Pacific Rise: 21°N, Clam Acres: 13°N, Parigo, Totem, Genesis.



1: Female; A: Habitus, dorsal; B: Urosome, lateral; C: Antenna; D: Maxilla; E: Male habitus, dorsal; F: Urosome, lateral. dh – dorsal hump; tc – terminal claw of antennal endopod; from Humes (1987).

Reference:

Humes A.G. (1987) Bull. Mar. Sci. **41**: 645-788.

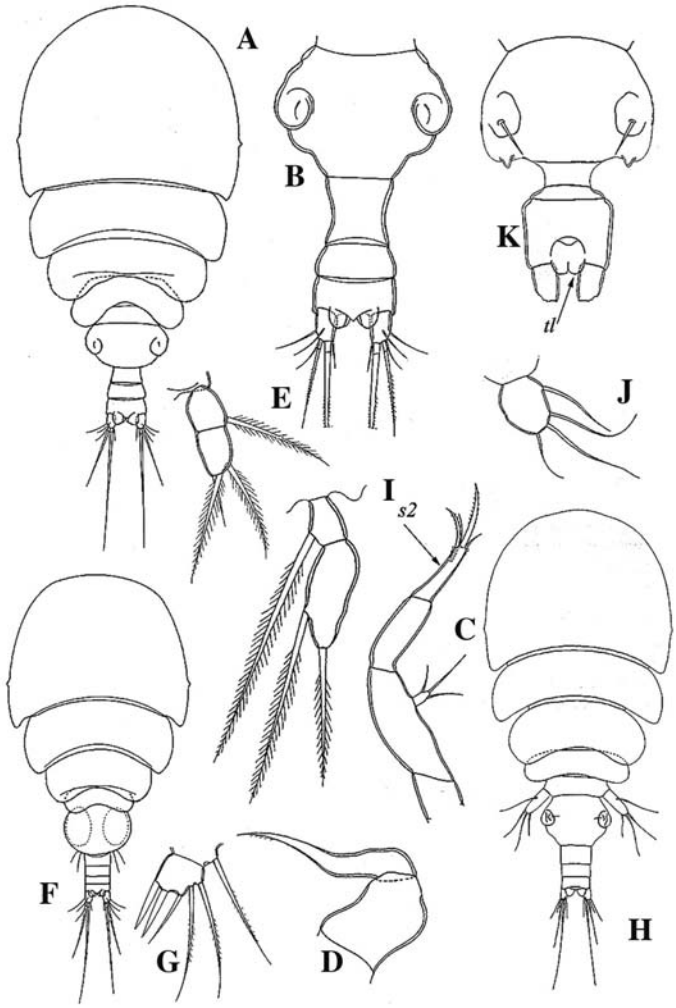
Rhogobius Humes, 1987

Species	Distribution	Body length in mm
R. contractus Humes, 1987	Galapagos Spreading Center; East Pacific Rise: 13°N, 21°	Female 0.7-0.94, male 0.6-0.71
R. pressulus Humes, 1989	Galapagos Spreading Center	Female 0.67-0.78; male unknown
R. rapunculus (Humes & Segonzac, 1998)	East Pacific Rise: 9°N	Female 0.89-0.91; male unknown

Morphology: Body with broad prosome. Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Last abdominal somite with terminal paired lobes. Oral cone short. Antenna with one-segmented exopod; second segment of endopod elongate and slender. Mandible with stylet-like gnathobase, without palp. First segment of maxilla without inner sinuous seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod; first segment with inner seta; second segment with terminal spine and inner seta.

Remark: *R. rapunculus* (Humes & Segonzac, 1998) transferred from *Aphotopontius*.

Biology: *R. contractus* has been found in number of samples (Humes & Segonzac 1998). Only two females of *R. rapunculus* and 10 females of *R. pressulus* have been found until now.



1: Female of *R. contractus*.; A: Habitus, dorsal; B: Genital double-somite, abdominal somites and caudal rami; C: Antenna; D: Maxilla; E: Leg 5, male; F: Habitus, dorsal; G: *R. rapunculus*. Female leg 5; H: Habitus, dorsal; I: Leg 4; J: Female of *R. pressulus,* leg 5; K: Genital double-somite and abdominal somites. s2 – second segment of endopod; tl – terminal lobe on anal somite; from Humes (1987) (A-G), Humes & Segonzac (1998) (H-J) and Humes (1989) (K).

References:

Humes A.G. (1987) Bull. Mar. Sci. **41**: 645-788.
Humes A.G. (1989) Pac. Sci. **43**: 27-31.
Humes A.G. & M. Segonzac (1998) Cah. Biol. Mar. **39**: 51-62.

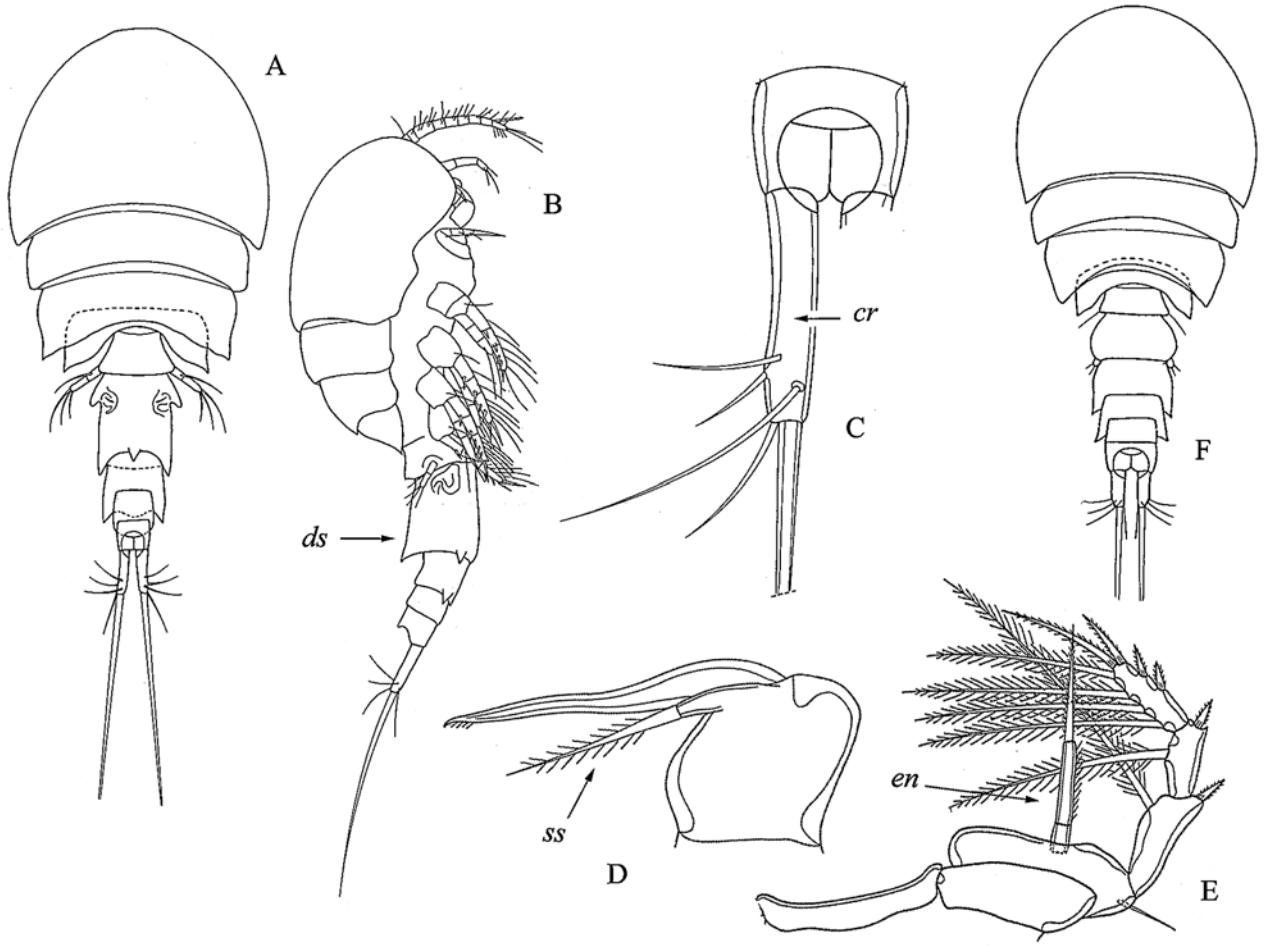
Rimipontius mediospinifer Humes, 1996

Size: Body length of female 0.84-1.01 mm; male 0.57-0.69 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Genital double-somite of female with dorsal longitudinal crest. Caudal rami with 5 setae: innermost terminal seta reduced. Oral cone short. Antenna with one-segmented exopod. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod, first segment unarmed; second segment with terminal spine.

Biology: Found in washing of the decapod *Rimicaris* (Humes 1996) and in plankton 80-300 m over the hydrothermal field among shrimps and other copepods (Ivanenko 1998). It can "feed on the bacteria on the mouthparts of the shrimps, but also, when they are free, perhaps on the bacteria free in the water" (Humes 1996).

Distribution: Mid-Atlantic Ridge: Logatchev, Irina-2; Snake Pit, Broken Spur (80-300 m over Saracen's Head).



1: Female; A: Habitus, dorsal; B: Habitus, lateral; C: Anal somite and caudal ramus, dorsal; D: Maxilla; E: Leg 4; F: Male habitus, dorsal. cr – caudal ramus; ds – dorsal spiniform process of genital double somite; en – endopod of leg 4; ss – sinuous seta of maxilla; from Humes (1996).

References:

Humes A.G. (1996) Bull. Mar. Sci. **58**: 609-653.
Humes A.G. & M. Segonzac (1998) Cah. Biol. Mar. **39**: 51-62.
Ivanenko V.N. (1998) Zool. Zh. **77**(11): 1249-1256.

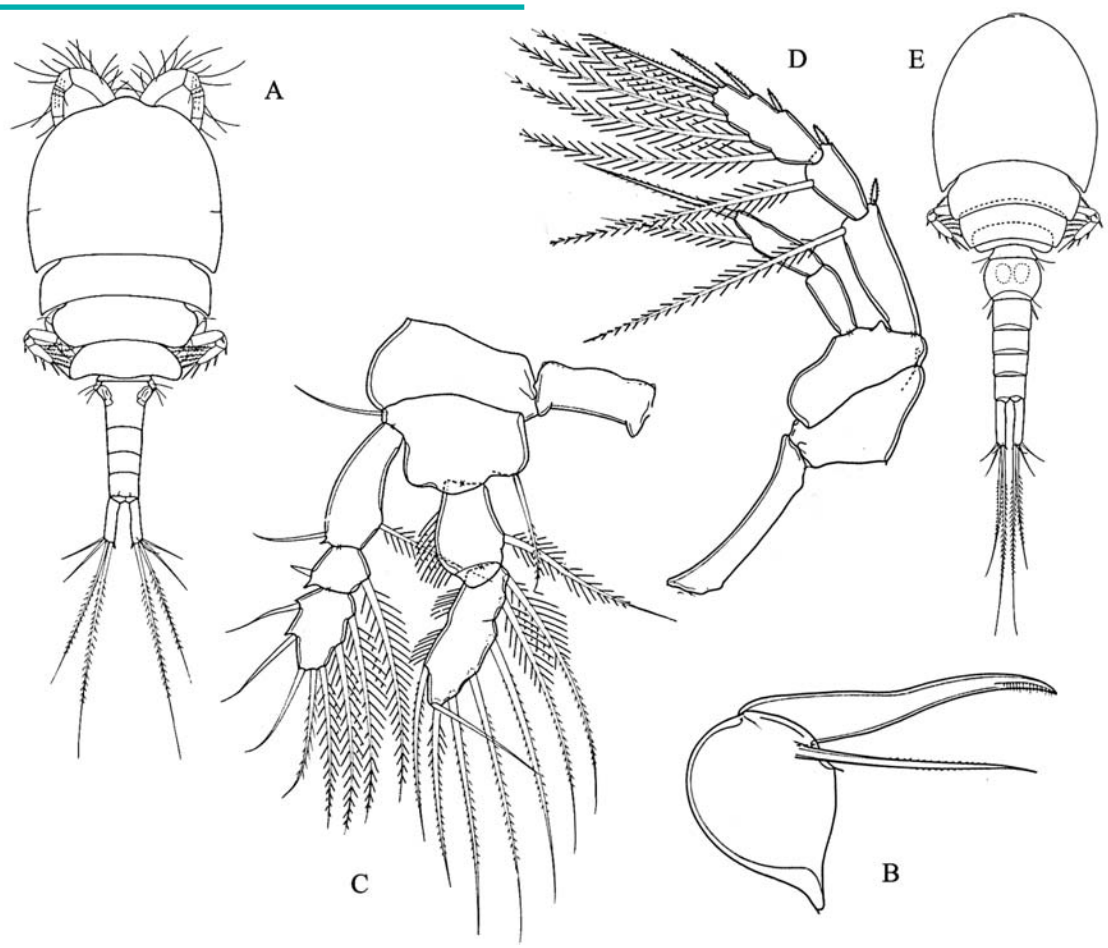
Scotoecetes introrsus HUMES, 1987

Size: Body length of female 1.65-1.79 mm; length of male 1.30-1.42 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Oral cone short. Antenna with one-segmented exopod. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Exopods of legs 1-4 and endopods of legs 2-3 three-segmented. Endopod of leg 1 two-segmented in female and three-segmented in male; distal segment of endopod with outer terminal seta directed inward. Leg 4 with two-segmented endopod; first segment unarmed, second segment with terminal spine and inner seta.

Biology: Abundant, associated with siboglinids, feeding on bacterial flakes; different copepodid stages have been found in washings of vestimentiferans collected at 9°N (unpublished data). The blood of *S. introrsus* as well as that of *Benthoxynus spiculifer* has haemoglobin supporting aerobic respiration in low-oxygen conditions (SELL 2000).

Distribution: East Pacific Rise: 9°N, 13°N.



1: Female; A: Habitus, dorsal; B: Maxilla; C: Leg 1; D: Leg 4; E: Male habitus, dorsal.
lb – labrum of oral cone; a2 – antenna; m1 – maxillule; m2 – maxilla; from HUMES (1987).

References:

HEPTNER M.V. & V.N. IVANENKO (2002) Arthropoda Selecta, **11**(2): 117-134.
HUMES A.G.(1987) Bull. Mar. Sci. **41**: 645-788.
HUMES A.G. & M. SEGONZAC (1998) Cah. Biol. Mar. **39**: 51-62.
SELL A.F. (2000) Proc. R. Soc. London **267**: 2323-2326.

Stygiopontius HUMES, 1987

	1	2	3	4	5	6	7	8	9	10	11	12	13
S. appositus		+	+										
S. brevispina									+				
S. cinctiger	+	+	+										
S. cladarus											+		+
S. flexus	+			+									
S. hispidulus	+	+	+										
S. latulus													+
S. lauensis									+				
S. mirus	+												+
S. mucroniferus	+			+									
S. paxillifer	+		+										
S. pectinatus								+			+	+	+
S. quadrispinosus					+	+	+						
S. regius													+
S. rimivagus										+			
S. sentifer	+	+	+										
S. serratus													+
S. stabilitus		+						+					
S. teres													+
S. verruculatus	+		+										

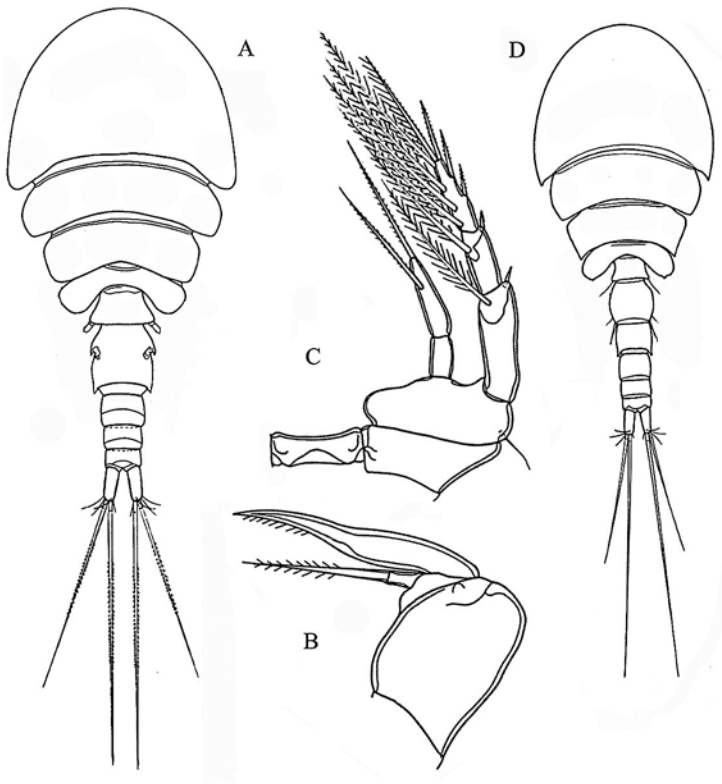
Size: Body length 0.6-1.6 mm.

Morphology: Prosome four-segmented. Urosome five-segmented in female, six-segmented in male; first somite with leg 5. Oral cone short. Antenna with one-segmented exopod. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Exopods of legs 1-4 and endopods of legs 1-3 three-segmented. Leg 4 with two-segmented endopod; first segment unarmed; second segment armed with terminal spine and inner seta.

Remarks: *S. lumiger* HUMES, 1989 and *S. bulbisetiger* HUMES, 1996 were synonymized with *S. sentifer* and *S. pectinatus*, respectively. Only females are known for eight species (*S. cinctiger*, *S. flexus*, *S. hispidulus*, *S. mucroniferus*, *S. pectinatus*, *S. sentifer*, *S. stabilitus*, and *S. teres*), and only males are known for six species (*S. appositus*, *S. latulus*, *S. mirus*, *S. paxillifer*, *S. rimivagus*, and *S. verruculatus*).

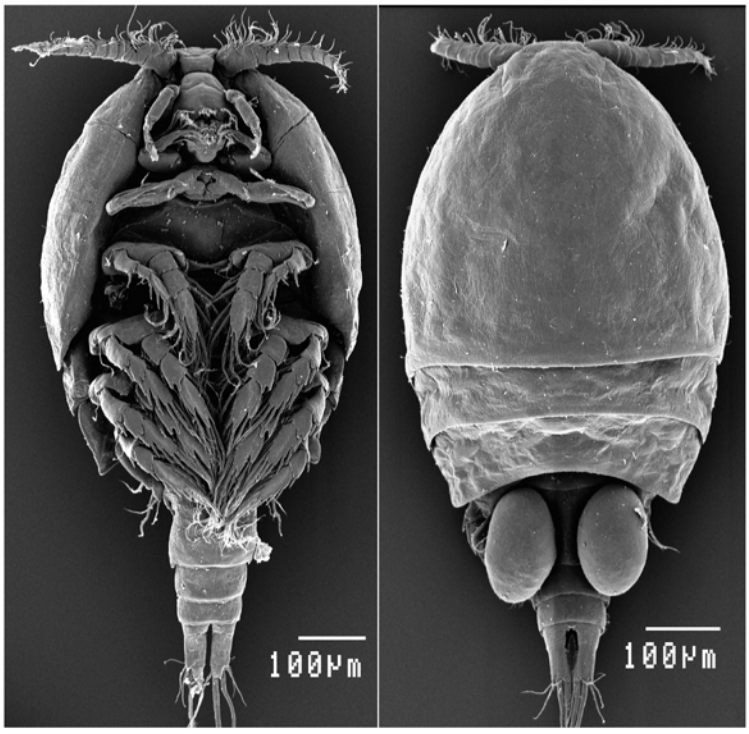
Biology: All species of the genus *Stygiopontius* have been found free-living or associated with invertebrates. *S. hispidulus* and *S. rimivagus* have been found in association with bivalves; *S. hispidulus*, *S. sentifer*, and *S. stabilitus* with polychaetes; *S. flexus* with siboglinids; *S. cladarus* and *S. pectinatus* with crustaceans. *S. sentifer* lives in tubes of polychaete *Alvinella pompejana* DESBRUYÈRES & LAUBIER, 1980. *S. pectinatus* has been found in gill cavity of the shrimps *Rimicaris exoculata* WILLIAMS & RONA, 1986 and *Chorocaris chacei* (WILLIAMS & RONA, 1986) and free-living in plankton over hydrothermal field (IVANENKO 1998). *S. quadrispinosus* is more abundant at high temperature at the Juan de Fuca Ridge and has the ratio of females to males 7.6:1 (TSURUMI et al. 2003).

Distribution: See the table after Ivanenko & Ferrari (2003): 1 – East Pacific Rise at 10°N; 2 – East Pacific Rise at 13°N; 3 – East Pacific Rise at 21°N; 4 – Guaymas Basin, 27°N; 5 – Gorda Ridge, 41°N; 6 – Juan de Fuca Ridge, 46°N; 7 – Explorer Ridge, 49°N. WP – West Pacific: 8 – Mariana Back-Arc Basin, 18°N; 9 – Lau Back-Arc Basin, 23°S; 10 – Mid-Atlantic Ridge at 37°N (Lucky Strike); 11 – Mid-Atlantic Ridge at 29°N (Broken Spur); 12 – Mid-Atlantic Ridge at 26°N (TAG); 13 – Mid-Atlantic Ridge at 23°N (Snake Pit).



1: Female of *S. quadrispinosus*; A: Habitus, dorsal; B: Maxilla; C: Leg 4; D: Male habitus, dorsal; from Humes (1987).

2: *S. pectinatus* ventral view (left) and dorsal view (right); original.



References:

Heptner M.V. & V.N. Ivanenko (2002) Arthropoda Selecta **11**(2):117-134.
Humes A.G. (1987) Bull. Mar. Sci. **41**: 645-788.
Ivanenko V.N. (1998) Zool. Zh. **77** (11): 1249-1256.
Ivanenko V.N. & F.D. Ferrari (2003) Arthropoda Selecta **11** (3): 177-185.
Tsurumi M., de Graaf R.C. & V. Tunnicliffe (2003) J. Mar. Biol. Assoc. U.K. **83**(3): 469-478

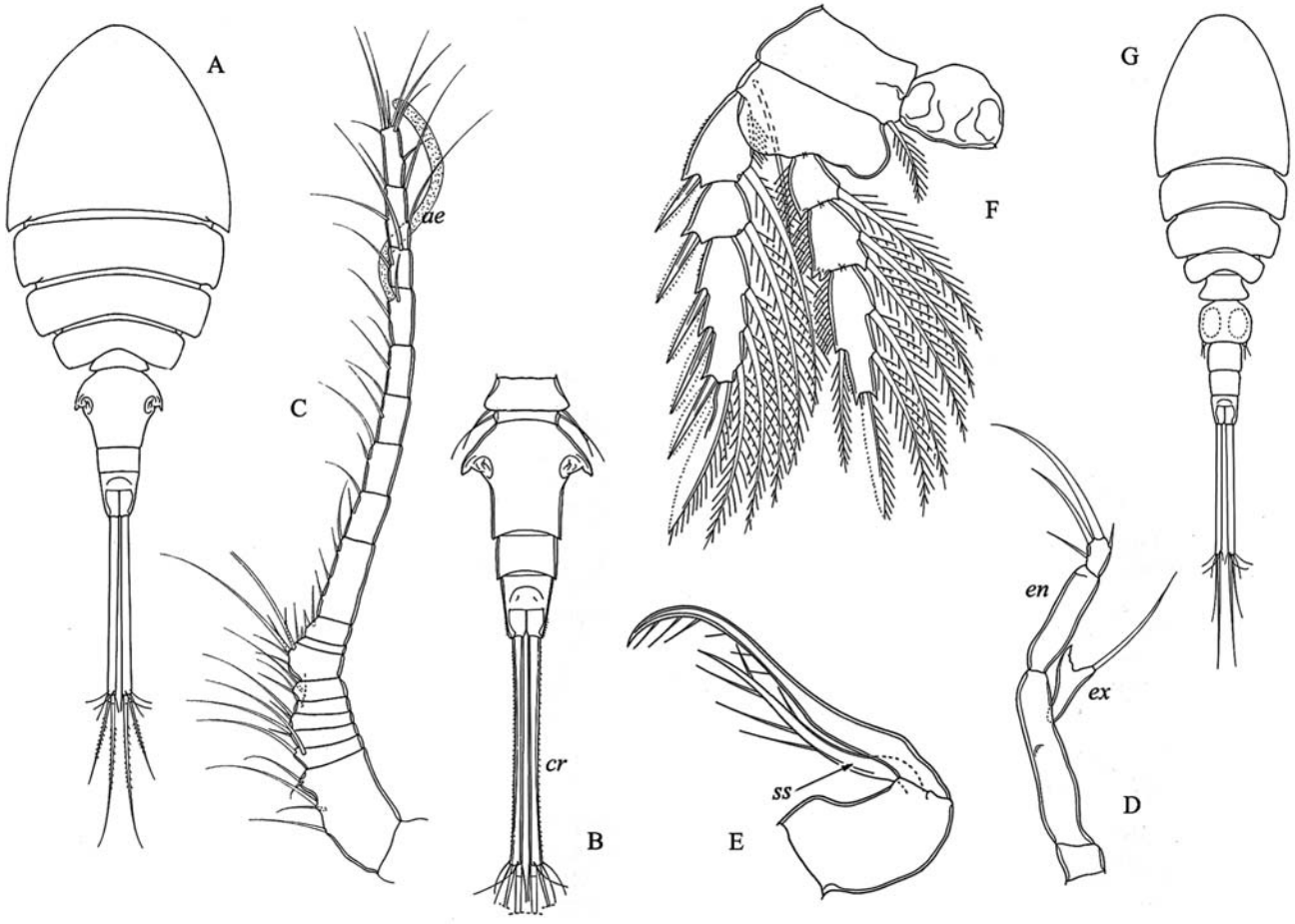
Ecbathyrion prolixicauda HUMES, 1987

Size: Body length of female 1.01-1.11 mm; male 0.77-0.84 mm.

Morphology: Prosome four-segmented. Urosome four-segmented in female and five-segmented in male; first somite with leg 5. Caudal ramus elongate. Oral cone short. Antennule eighteen-segmented in female and seventeen-segmented in male; aesthetasc on segments 15 and 17 in female and male, respectively. Antenna with one-segmented exopod having pointed projection. Mandible with stylet-like gnathobase, without palp. First segment of maxilla with inner sinuous seta. Legs 1-4 biramous, with three-segmented rami. Basis of leg 1 without inner spine or seta. Leg 5: first segment fused with somite and represented with one outer seta; second segment bearing three setae in female, and five setae in male.

Remarks: Found in many samples.

Distribution: Galapagos Rift; East Pacific Rise: 9°N, 13°N, 21°N.



1: Female; A: Habitus, dorsal; B: Urosome, dorsal; C: Antennule; D: Antenna; E: Maxilla; F: Leg 4; G: Male habitus, dorsal.
ae – aesthetasc; cr – caudal ramus; ds – genital double-somite; en – endopod; ex – exopod; ss – sinuous seta; from HUMES (1987).

References:

HUMES A.G. (1987) Bull. Mar. Sci. **41**: 645-788.
HUMES A.G. & M. SEGONZAC (1998) Cah. Biol. Mar. **39**: 51-62.

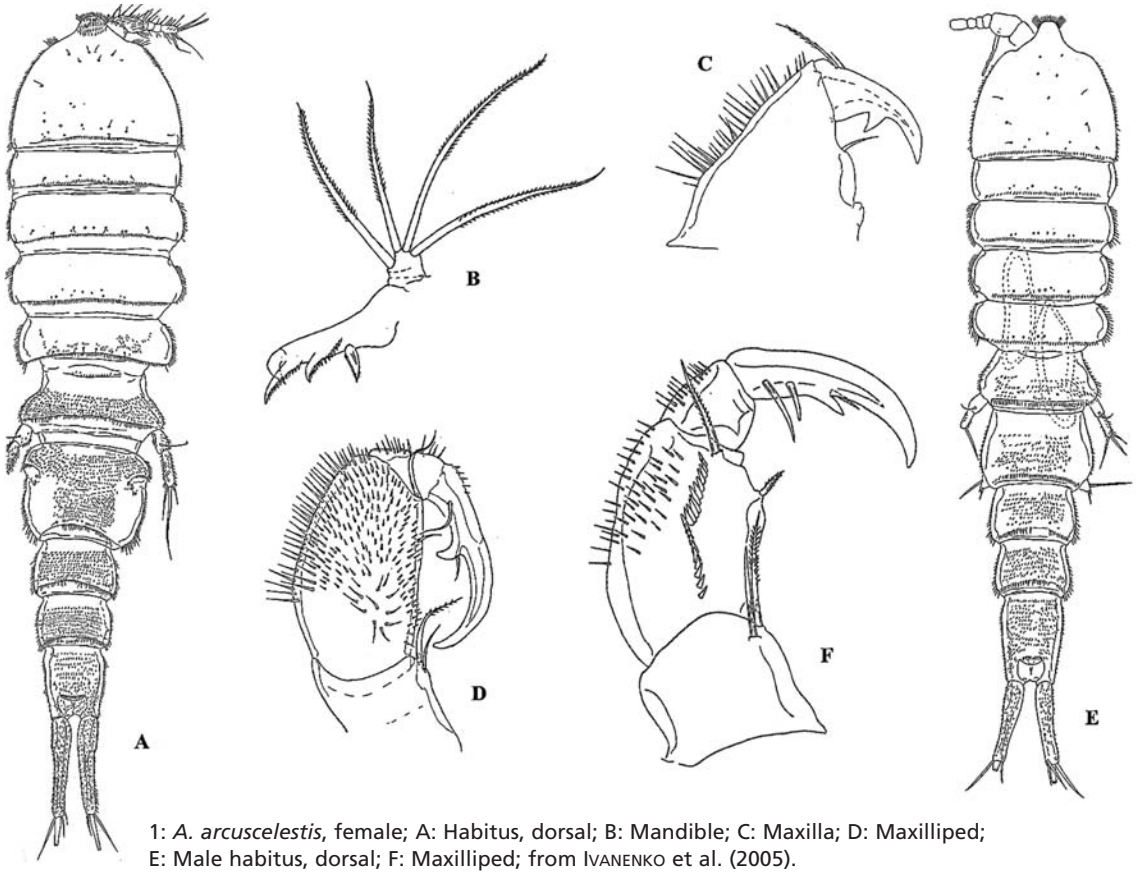
Ambilimbus Ivanenko, Defaye & Huys, 2005

Species	Distribution	Body length in mm
A. altalis (Humes & Huys, 1992)	Juan de Fuca Ridge	Female 2.41-2.46; male 1.98-2.13
A. arcuscelestis Ivanenko, Defaye & Huys, 2005	Mid-Atlantic Ridge: Rainbow	Female 2.35; male 1.65
A. tuerkayi (Martinez-Arbizu, 1999)	Fiji Basin	Female 1.51; male 1.2

Synonym: *Amphicrossus* Huys, 1991

Morphology: Body elongate and flattened, ornamented with spinules. Prosome five-segmented, epimera of somites bearing legs 1-4 rounded. Urosome five-segmented in both sexes; first somite with leg 5; copulatory pore on ventral side of genital double-somite. Rostrum prominent with row of dentiform spinules and long setules. Antennule six-segmented in both sexes. Antenna four-segmented, without exopod. Mandibular gnathobase with four spines, mandibular palp one-segmented with four setae. Maxillule represented by lobe with five setae. Maxilla two-segmented, distal segment claw-like, with inner process. Maxilliped four-segmented, sexually dimorphic, distal segment claw-like, with inner process. Legs 1-4 biramous with three-segmented rami. Leg 5 two-segmented.

Biology: Deep-sea poecilostomatoid cyclopoids found in sediment. Most likely associated with bivalves. Type of feeding unclear; can feed on tissues, mucus or utilize hosts food. *Erebonaster protentipes* Humes, 1987 has been found in mantle cavity and in washings of a *Nuculana*-like protobranch bivalve from cold seeps at Guaymas Basin.



1: *A. arcuscelestis*, female; A: Habitus, dorsal; B: Mandible; C: Maxilla; D: Maxilliped; E: Male habitus, dorsal; F: Maxilliped; from Ivanenko et al. (2005).

References:

Humes A.G. (1987) Bull. Mar. Sci. **41**: 645-788.
Humes A.G. & R. Huys (1992) Can. J. Zool. **70**: 1369-1380.
Ivanenko V.N., Defaye D. & R. Huys (2005) Marine Biology Research **19**: 93-105.

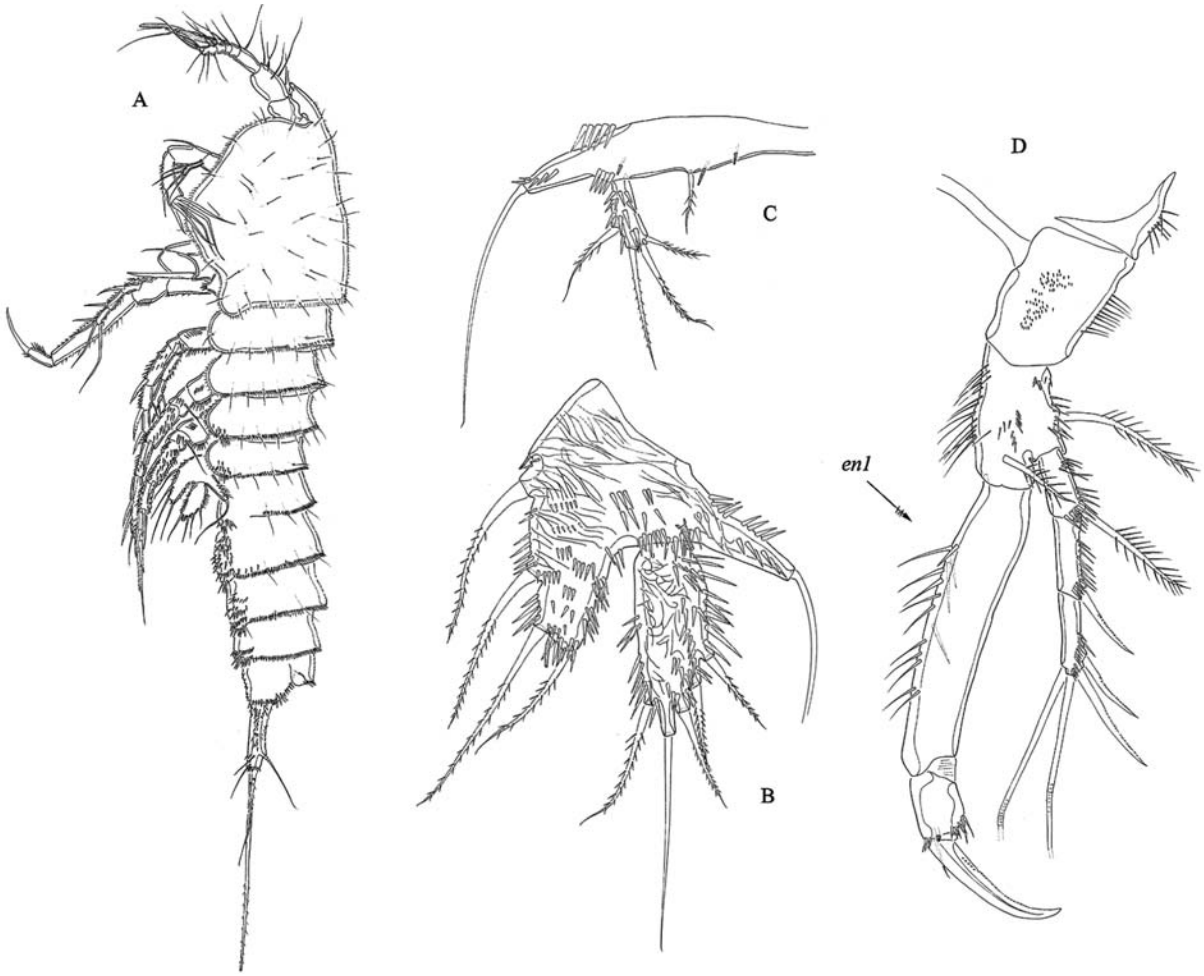
Bathylaophonte Lee & Huys, 1999

Species	Distribution	Body length in mm
B. azorica Lee & Huys, 1999	Mid-Atlantic Ridge: Menez Gwen, Lucky Strike	Female 0.69; male 0.66
B. pacifica Lee & Huys, 1999	East Pacific Rise:17°S north of Easter Island	Female 0.81; male 0.74

Morphology: Body elongate, sub-cylindrical, with reticulated integument and spinules. Prosome four-segmented; urosome five-segmented in female and six-segmented in male; genital double-somite of female subdivided dorsally. Rostrum bell-shaped. Anal operculum well-developed. Antennule seven-segmented in female, eight-segmented in male. Antenna with one-segmented exopod bearing four setae. Maxilliped subchelate, three-segmented. Legs 1-4 biramous, with three-segmented exopods and two-segmented endopods, except male with three-segmented endopod of leg 3. Endopod of leg 1 prehensile, first segment longer than exopod, first segment unarmed, second segment with claw and one seta. Leg 5 two-segmented; endopodal lobe of female well developed, with four setae; endopodal lobe of male reduced, with one seta; exopod with five setae in female and four setae in male.

Biology: Both species were "extracted from the invertebrates living in the hydrothermal fluids".

Distribution: East Pacific Rise: 17°S north of Easter Island.



1: *B. azorica*; A: Female habitus, lateral; B: Leg 5, anterior; C: Male leg 5, anterior; D: Female of *B. pacifica*, leg 1, anterior; en1 – first endopodal segment; from Lee & Huys (1999).

Reference:

Lee W. & R. Huys (1999) Cah. Biol. Mar. **40**: 293-328.

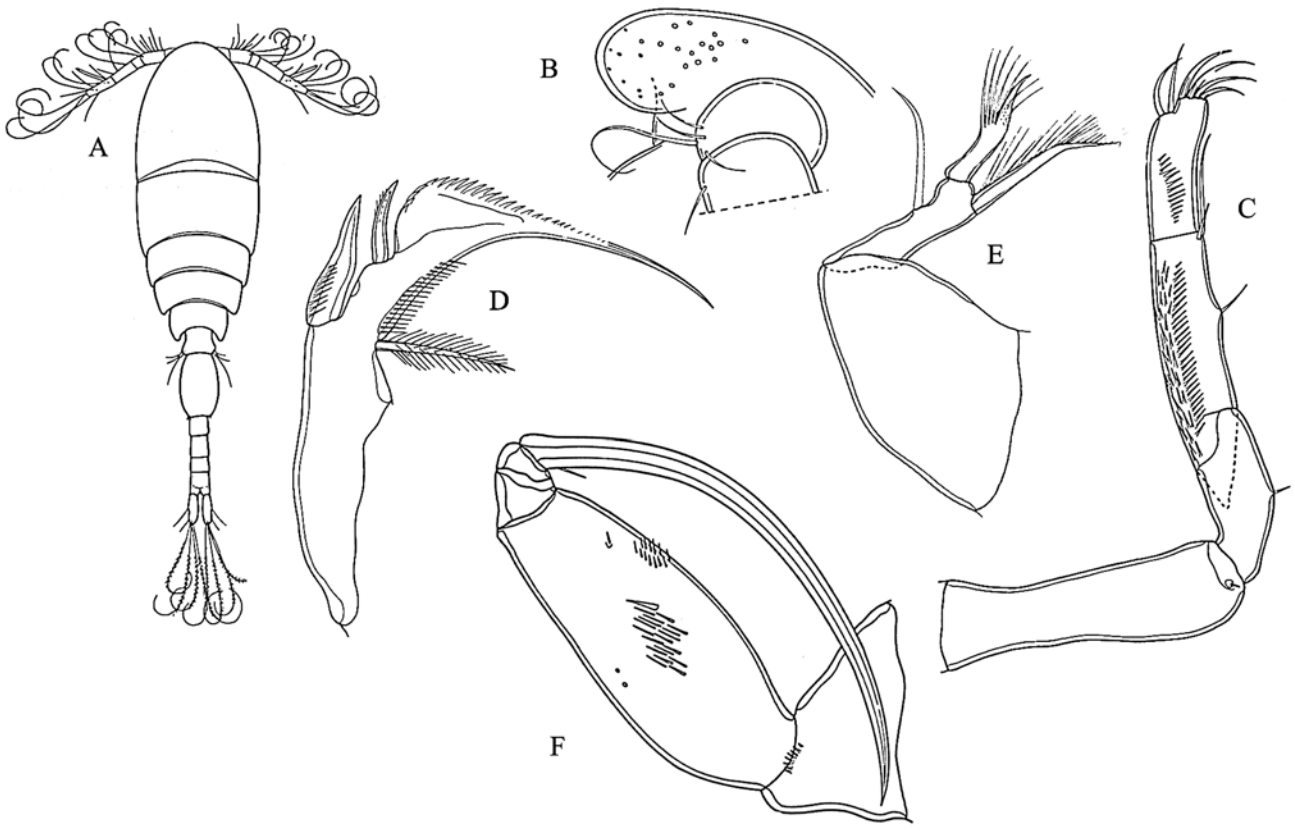
Laitmatobius crinitus HUMES, 1987

Size: Body length of male 1.29-1.38 mm. Female unknown.

Morphology: Body slender. Prosome five-segmented. Urosome six-segmented, first somite with leg 5, second somite elongate. Rostrum rounded lobe in lateral view. Caudal ramus elongate, length/width ratio 2.7:1. Antennule five-segmented. Antenna four-segmented with four terminal setiform claws and two subterminal setae. Mandible elongate, without palp; basal part with two spines and one seta, distal part forming long lash. Maxillule bilobed. Maxilla two-segmented; second segment with one seta and two spines. Maxilliped subchelate, four-segmented. Legs 1-4 biramous, with three-segmented rami; basis of leg 1 with inner spine. Leg 5 represented by small segment bearing two setae and adjacent seta.

Biology: More than 60 males of *L. crinitus* have been found in two samples. Other family members occur in plankton at different depths and probably associated with pelagic invertebrates (HUYS & BÖTTGER-SCHNACK 1997 cited in BOXSHALL & HALSEY 2004).

Distribution: Guaymas Basin.



1: Male; A: Habitus, dorsal; B: Rostrum, lateral; C: Antenna; D: Mandible; E: Maxilla; F: Maxilliped; from HUMES (1987).

References:

BOXSHALL G.A & S.H. HALSEY (2004) An Introduction to Copepod Diversity. Ray Society, London: i-xv, 1-966.
HUMES A.G. (1987) Bull. Mar. Sci. **41**: 645-788.

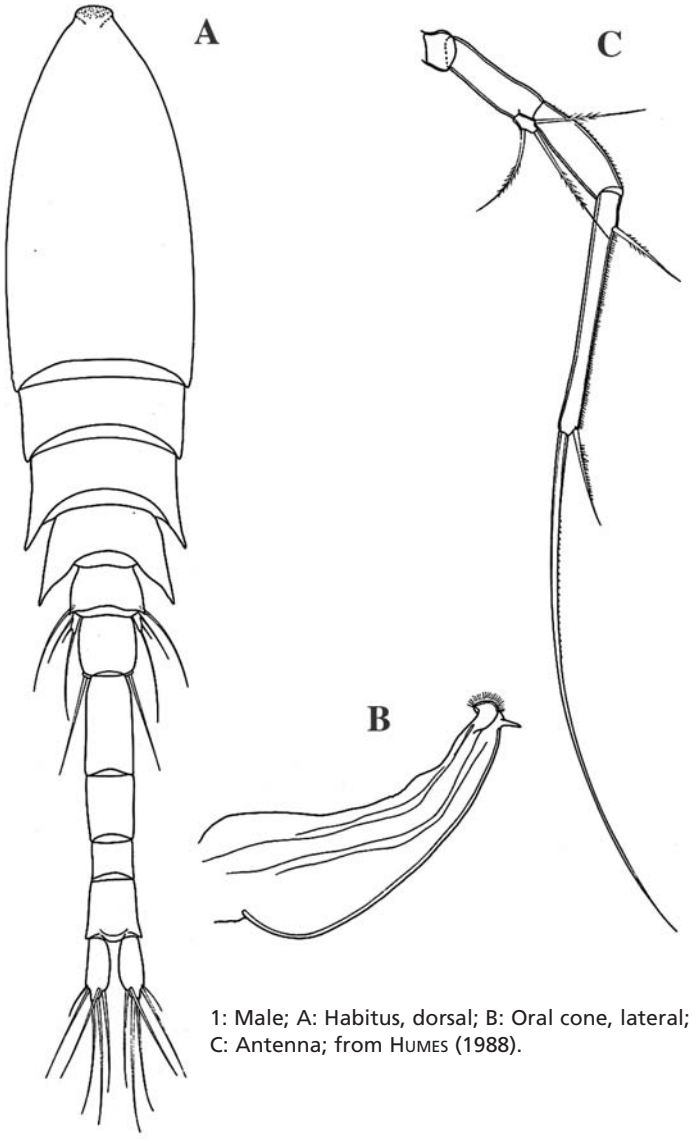
Hyalopontius boxshalli Humes, 1988

Size: Body length of male 4.75-4.86 mm. Female unknown.

Morphology: Body elongate, 5.7 times as long as wide. Prosome four-segmented, epimera pointed posteriorly. Urosome six-segmented, first somite with leg 5. Oral cone elongate. Antennule eleven-segmented. Antenna with short one-segmented exopod bearing three long setae and two-segmented endopod bearing two unequal terminal setae. Mandible with stylet-like gnathobase, without palp. Maxillule with lobe bearing three setae and one adjusted to lobe seta. Maxilla two-segmented. Maxilliped subchelate, three-segmented with long terminal claw. Legs 1-4 biramous, with three-segmented rami. Leg 5 one-segmented, armed with three setae; one outer seta near segment.

Biology: Two males have been found only. Functional analysis suggests that megapontiids suck out blood or soft tissues of unknown hosts (Heptner 1968).

Distribution: Galapagos Spreading Center.



1: Male; A: Habitus, dorsal; B: Oral cone, lateral; C: Antenna; from Humes (1988).

References:

Heptner M.V. (1968) Zool. Zh. **47**(11):1628-1638.
Humes A.G. (1988) Proc. Biol. Soc. Wash. **101**(4): 825-831.

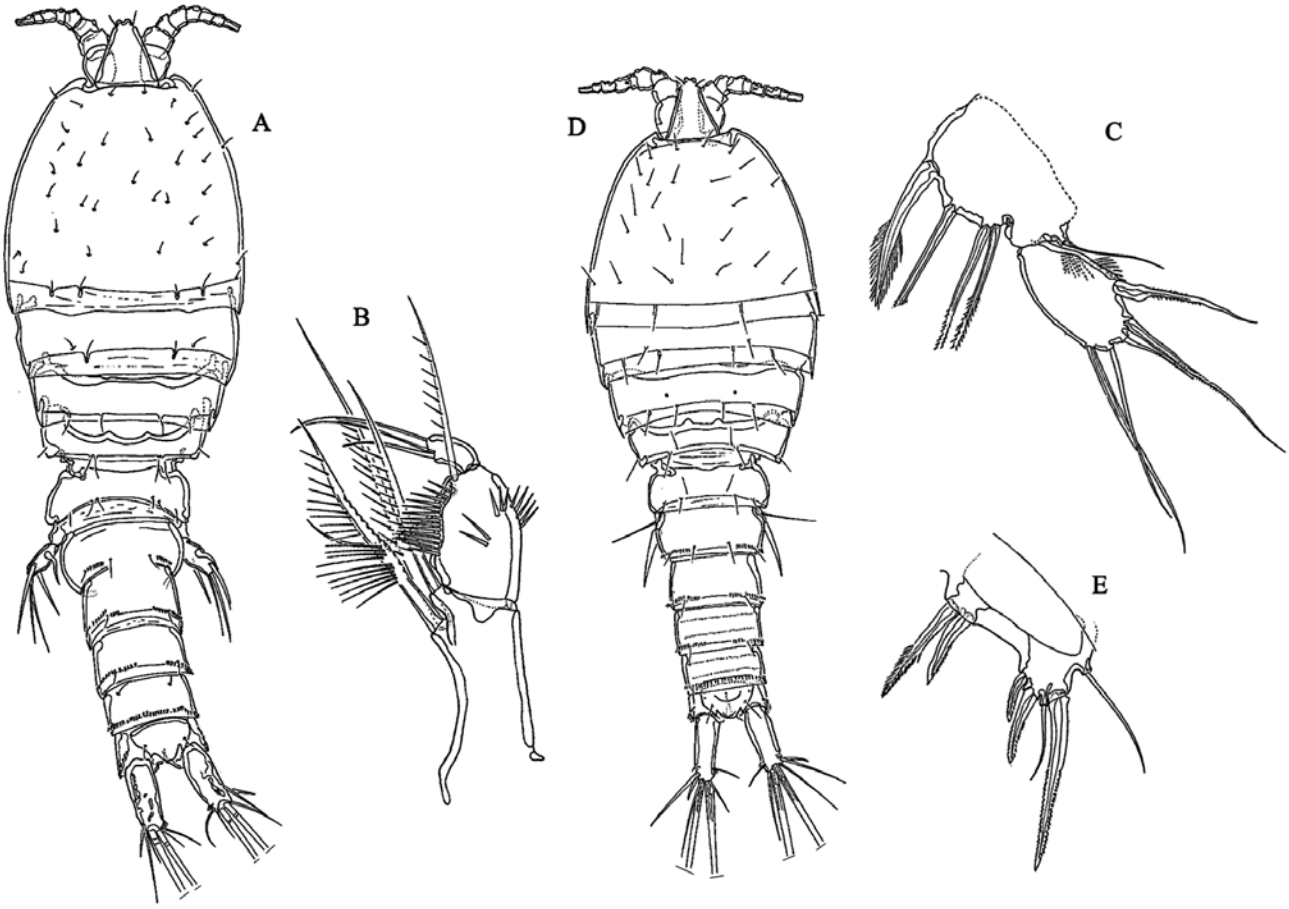
Stenhelia gundulae Willen, 2003

Size: Body length of female 0.89 mm; male 0.81 mm.

Morphology: Body with distinct separation between prosome and urosome. Prosome four-segmented; urosome five-segmented in female and six-segmented in male. Rostrum separated from cephalothorax, triangular, with bifid tip. Anal operculum large and prominent. Caudal rami 2.6 times as long as wide. Antennule short, eight-segmented in female and ten-segmented in male. Antennary exopod three-segmented, with one, one, four setae. Maxilliped three-segmented. Legs 1-4 biramous, with three-segmented rami, except two-segmented endopod of leg 1 in female and of legs 1 and 2 in male. Leg 5 with exopod articulated with baseoendopod in female and fused in male; baseoendopod with one outer and four or two inner setae in female and male, respectively; exopod with five setae in female and four setae in male.

Biology: Found only in "the North and South Clam fields, with a relatively high abundance". The samples with the copepods "contained basaltic pepperite with numerous small xenoliths as well as a great number of vesicomyiid clams and a rich associated fauna indicating hydrothermal activity" (Willen 2003).

Distribution: Tabar-Feni Volcanic Fore-Arc: Edison Seamount, Southern Clam field, North Clam field.



1A: Female habitus, dorsal; B: Maxilliped; C: Leg 5; D: Male habitus, dorsal; E: Leg 5; from Willen (2003).

Reference:

Willen E. (2003) J. Nat. Hist. **37**(14): 1691-1711.

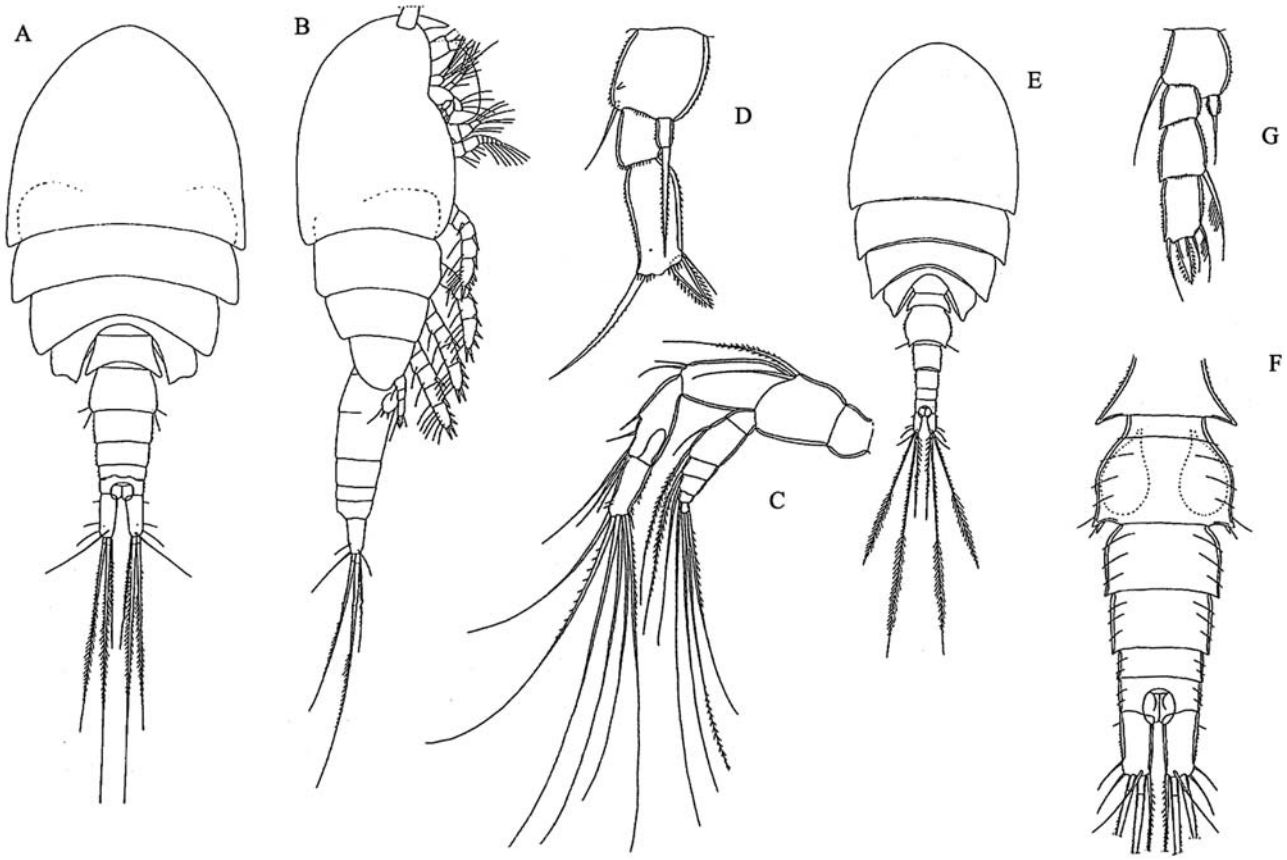
Misophriopsis longicaudata HUMES, 1999

Size: Body length of female 1.80-1.94 mm; male 1.28-1.45 mm.

Morphology: Prosome slender, five-segmented; tergite of somite bearing leg 1 covered by shield of cephalosome. Urosome ornamented with lamellae and setules, five-segmented in female, six-segmented in male; first somite with leg 5, genital double-somite of female subdivided dorsally. Rostrum beak-like in lateral view. Caudal rami longer than wide. Antennule eighteen-segmented in female, thirteen-segmented in male. Antenna with three-segmented endopod and six-segmented exopod. Legs 1-4 biramous, with three-segmented rami. Second endopodal segment of leg 2 with two inner setae. Leg 5 with one-segmented endopod and two- or three-segmented exopod in female and male, respectively.

Remarks: Misophriid copepods inhabit shallow waters, deep-sea hyperbenthos, deep-sea plankton, anchialine caves, and lava tubes. Bathypelagic misophriids of the genus *Benthomisophria* SARS, 1909 "are opportunistic gorgers, feeding on variety of other animals, including copepods and cnidarians" (BOXSHALL 1982). Cave misophriids of the genus *Speleophriopsis* JAUME & BOXSHALL, 1996 (Speleophriidae) have been found in baited traps and can be scavengers (BOXSHALL & HALSEY 2004).

Distribution: Juan de Fuca Ridge: Coaxial Segment, Flow site (Vent HDV).



1A: Female habitus, dorsal; B: Habitus, lateral; C: Antenna; D: Leg 5; E: Male habitus, dorsal; F: Urosome, dorsal; G: Leg 5; from HUMES (1999).

References:

BOXSHALL G.A. (1982) Philos. Trans. R. Soc. Lond. B **297**: 125-181.
BOXSHALL G.A. & S.H. HALSEY (2004) An Introduction to Copepod Diversity. Ray Society, London: i-xv, 1-966.
HUMES A.G. (1999) J. Nat. Hist. **33**: 961-978.

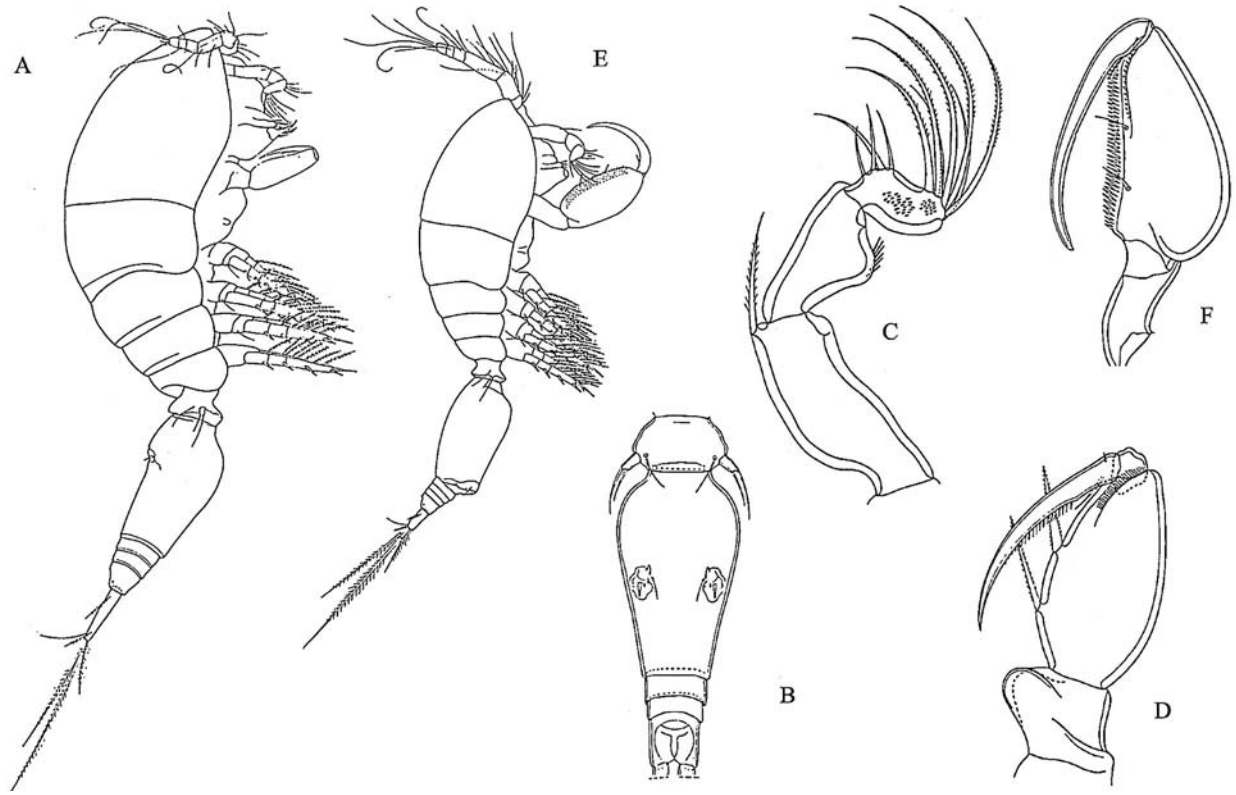
Oncaea praeclara Humes, 1988

Size: Body length of female 1.01-1.30 mm; male 0.91-0.98 mm.

Morphology: Body elongate. Prosome five-segmented. Urosome five-segmented in female and six-segmented in male, first somite with leg 5. Genital double-somite of female and genital somite of male, anteriorly dilated and elongate. Caudal ramus long, length/width ratio 6.7:1 in female and 3.2:1 in male. Antennule six-segmented in both sexes. Antenna three-segmented, without exopod; distal segment with two groups of setae. Mandible with three setae and two broad spines; palp absent. Maxillule lobe with seven setae. Maxilla two-segmented, second segment with one spine and one seta. Maxilliped sexually dimorphic, four-segmented in female and three-segmented in male. Legs 1-4 biramous, with three-segmented rami. Female leg 5 as a small segment bearing two setae and adjacent dorsal seta; male leg 5 represented by three setae.

Biology: Common in the "samples taken in the vicinity of the vents by means of box corers and slurp guns" (Humes 1988). *Oncaea* sp. has been found in plankton over the Mid-Atlantic Ridge among dirivultids and subadult calanoids (Ivanenko 1998). Most of more than 70 species of *Oncaea* occur in the epipelagic zone, several species have been found in the deep bathypelagic zone. Go et al. (1998) recently reported that *Oncaea* feeds on the integuments of various planktonic animals and inflicts especially heavy injuries to chaetognaths; the copepods of this group "must gnaw or cut out pieces of host integument with their mandibles. To do this, they adhere tightly to the host by means of their antennae and maxillipeds" (Heptner & Ivanenko 2002).

Distribution: Galapagos Rift; East Pacific Rise: 9°N, 13°N, 21°N; Guaymas Basin.



1A: Female habitus, lateral; B: Urosome, dorsal; C: Antenna; D: Maxilliped; E: Male habitus, dorsal; F: Maxilliped; from Humes (1987).

References:

Go Y.-B., Oh B.-C. & M.J. Terazaki (1998) J. Mar. Sys. **15**: 474-482.
Heptner M.V. & V.N. Ivanenko (2002) Arthropoda Selecta **11**(2): 117-134.
Humes A.G. (1987) Bull. Mar. Sci. 41: 645-788.
Humes A.G. (1988) J. Plankton Res. **10**: 475-485.
Humes A.G. & M. Segonzac (1998) Zool. Zh. **77**(11): 1249-1256.

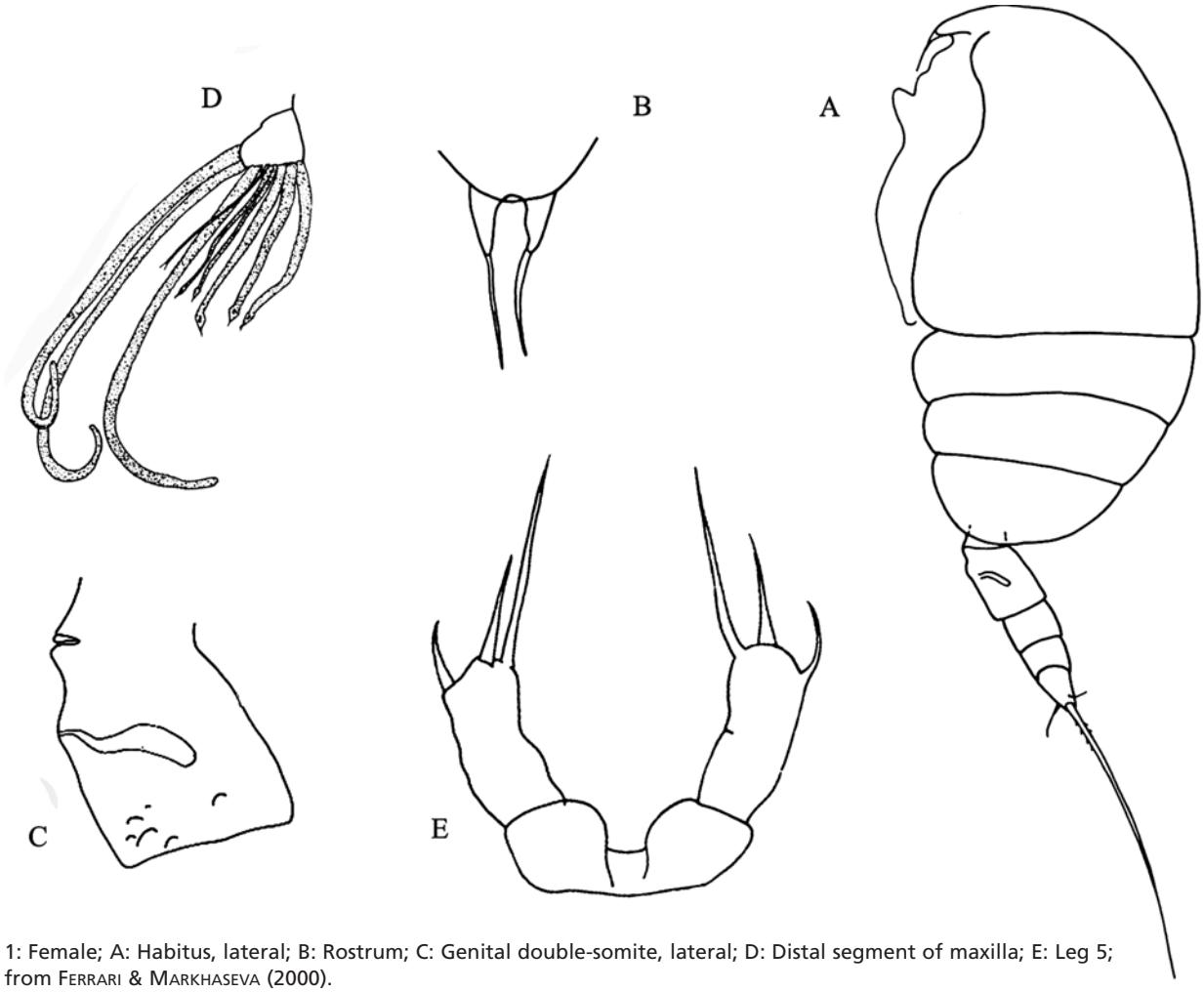
Grievella shanki Ferrari & Markhaseva, 2000

Size: Body length of female 2.1-2.2 mm. Male unknown.

Morphology: Prosome four-segmented; last segment of prosome with leg 5. Urosome three-segmented; first somite is genital double-somite with small integumental bumps. Rostrum bearing two filaments, each on robust base. Antennule twenty four-segmented; segment 22 with ear-like extension. Distal segment of maxilla with nine sensory setae. Exopods of legs 1-4 and endopods of legs 3-4 three-segmented; endopods of leg 1 and leg 2 one- and two-segmented, respectively. Distal exopodal segment of leg 2 with two outer spines. Leg 5 two-segmented, distal segment with three setae.

Biology: One female has been collected in "less than a meter above the surface on the side of a small diffusing vent chimney". The copepods of the family Scolecitrichidae "usually are collected from pelagic and benthopelagic habitats of marine waters below 200 m" (Ferrari & Markhaseva 2000).

Distribution: East Pacific Rise: 21°S, Droopy Vent.



1: Female; A: Habitus, lateral; B: Rostrum; C: Genital double-somite, lateral; D: Distal segment of maxilla; E: Leg 5; from Ferrari & Markhaseva (2000).

Reference:

Ferrari F.D. & E.L. Markhaseva (2000) Proc. Biol. Soc. Wash. **113** (4): 1079-1088.

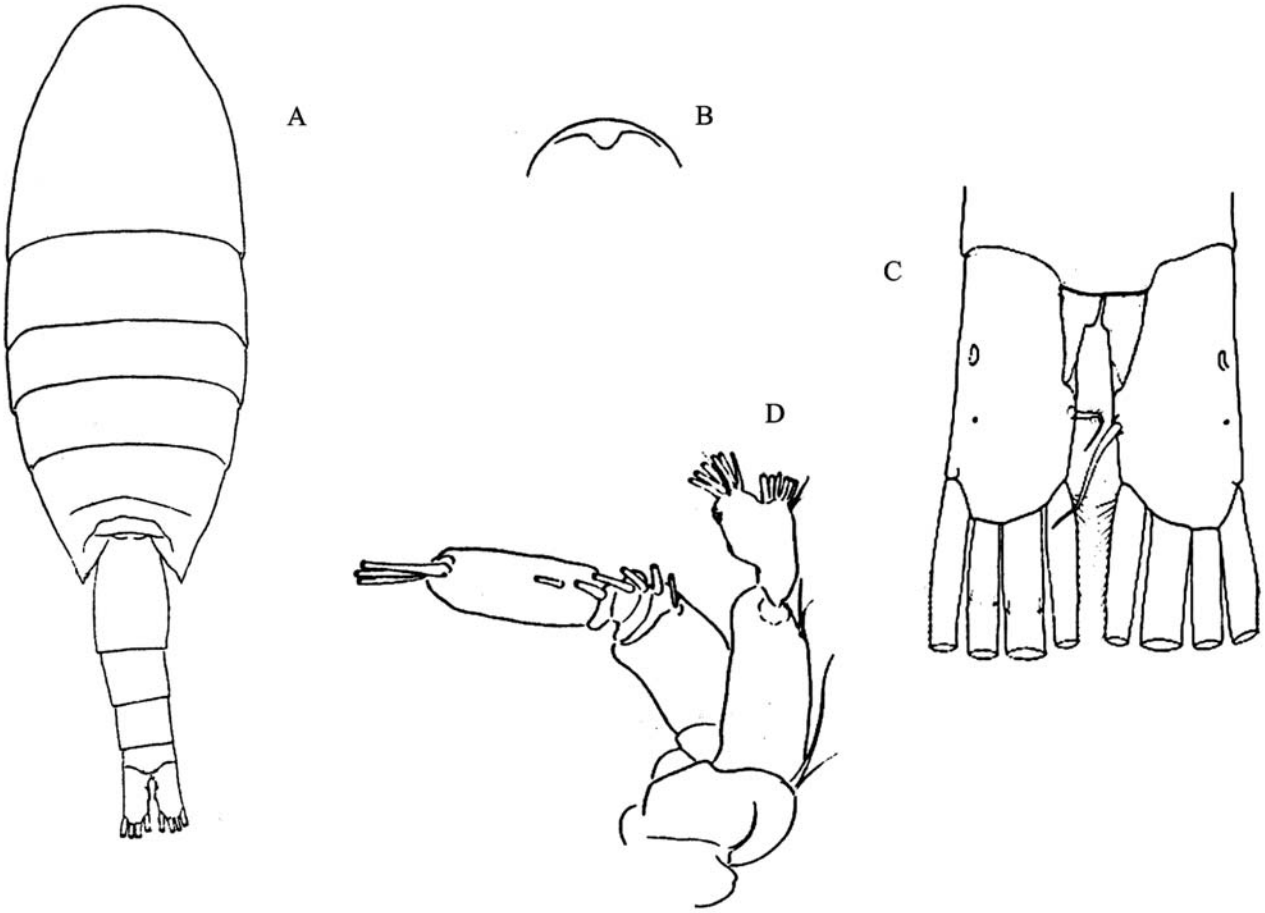
Isaacsicalanus paucisetus Fleminger, 1983

Size: Body length of female 2.44-2.56 mm. Male unknown.

Morphology: Prosome five-segmented; tergites of two proximal somites fused laterally. Urosome four-segmented; first somite is genital double-somite. Rostrum present, not bifurcate. Caudal rami slightly asymmetrical: left inner seta projecting ventrally, right inner seta directed dorsally. Antennule twenty three-segmented. Exopod of antenna longer than endopod. Exopods of legs 1-4 and endopods of legs 3-4 three-segmented; endopods of legs 1-2, 1- and two-segmented, respectively. Leg 1: first segment of exopod without inner seta. Leg 5 absent.

Biology: The copepods have been sampled with the aid of a slurp gun within 1 m of the sea floor. They "were swimming in a tightly clustered swarm of several thousand individuals just about a small depression… formed in collapsed pillow lava" (Fleminger 1983). Water temperatures in the depression range from 5-15°C. The genus belongs to Spinocalanidae, "a common group of small- to medium-sized calanoid copepods found at meso- and bathypelagic depths of all oceans" (Schulz 1996).

Distribution: East Pacific Rise: 21°N.



1: Female; A: Habitus, dorsal; B: Rostrum; C: Caudal rami; D: Antenna; from Fleminger (1983) (A, B, D) and Schulz (1989) (C).

References:

Fleminger A. (1983) Proc. Biol. Soc. Wash. **96** (4): 605-622.
Schulz K. (1989) Mitt. Hamb. Zool. Mus. Inst. **86**: 185-208.
Schulz K. (1996) Polar Biol.**16**: 595-600.

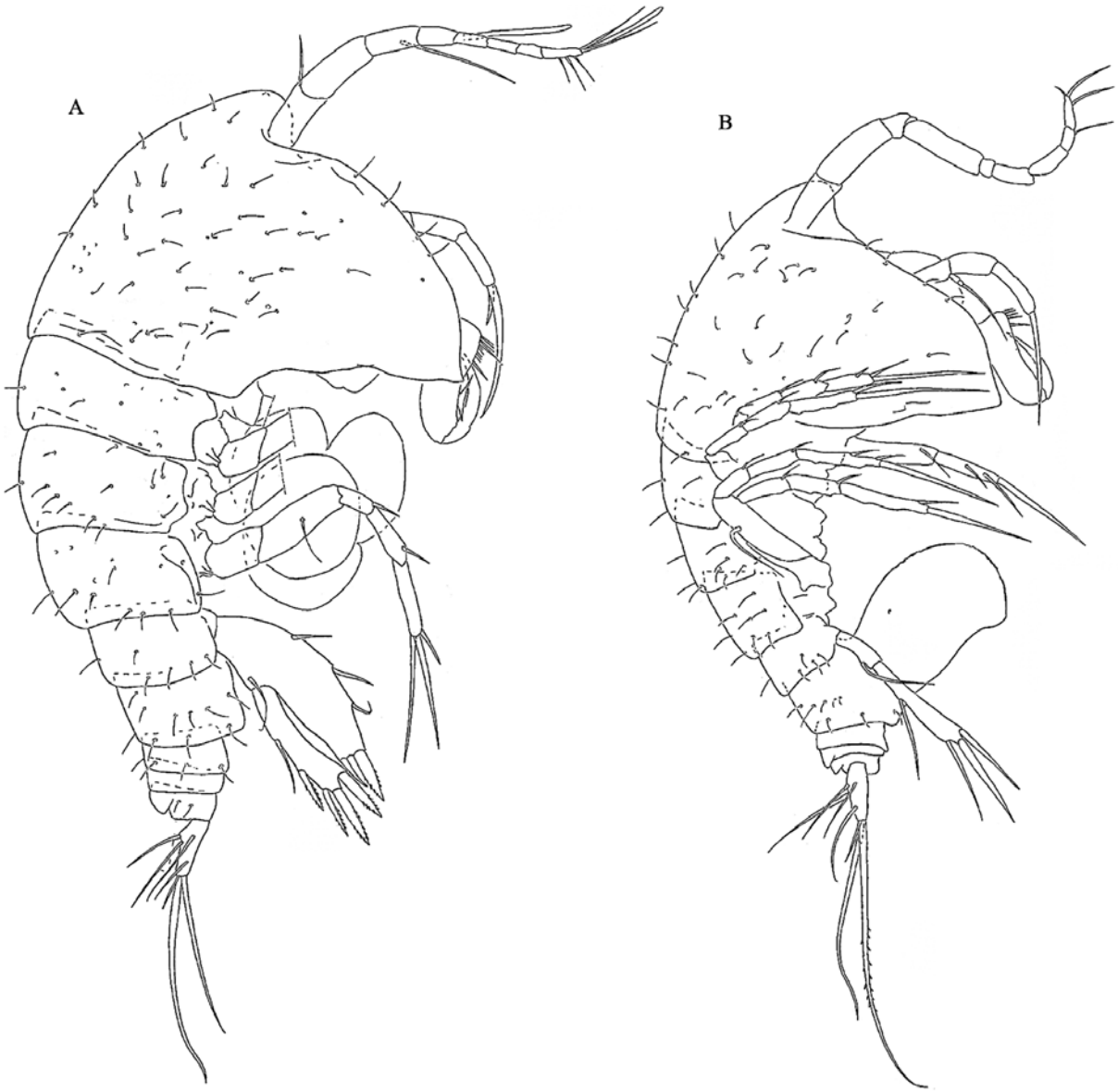
Smacigastes micheli Ivanenko & Defaye, 2004

Size: Body length of female 0.63 mm; male 0.57 mm.

Morphology: Body strongly compressed laterally, shield of cephalothorax produced ventrolaterally, and male genital complex produced ventrally. Legs 1-4 biramous, with three-segmented rami. Elongate caudal rami and ten-segmented antennule of male are the distinctive features of *Smacigastes*.

Biology: Numerous adult and subadult copepodid stages of *S. micheli* have been collected during in situ colonization experiments at the base of the active chimney Eiffel Tower covered by a layer of *Bathymodiolus azoricus* (Bivalvia, Mytilidae).

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1A: Female habitus, lateral; B: Male habitus, lateral; from Ivanenko & Defaye (2004).

Reference:

Ivanenko V.N. & D. Defaye (2004) Cah. Biol. Mar. **45**: 255-268.

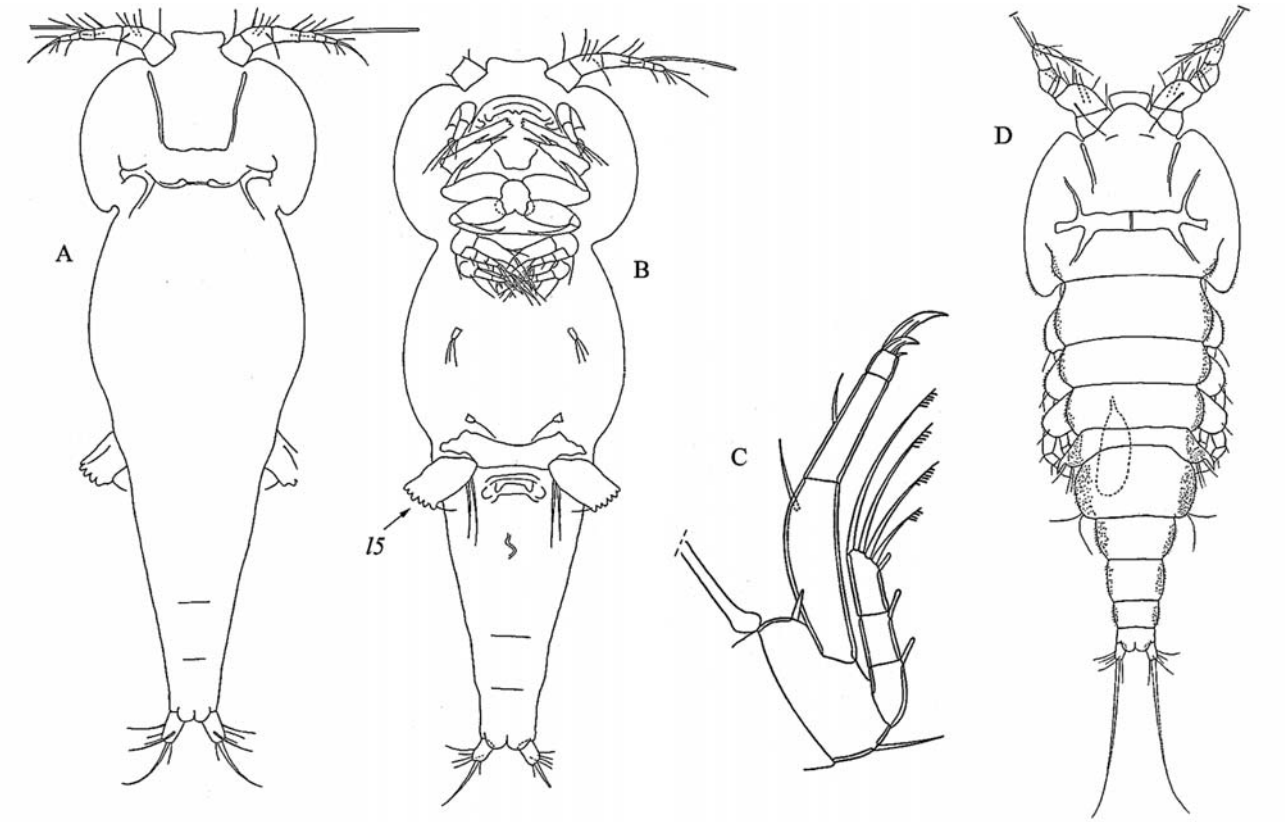
Cholidya polypi Farran, 1914

Size: Body length of female 0.74-0.83 mm; male 0.57-0.62 mm.

Morphology: Body of female with flattened shield-like cephalothorax and swollen metasome, urosome with slight indication of segmentation. Body of male with distinct somites and six-segmented urosome. Rostrum produced anteriorly. Antennule six-segmented in female and seven-segmented in male. Antenna: exopod one-segmented, endopod two-segmented. Mandibular palp three-segmented. Maxillule bilobed, with three and five setae. Maxilla three-segmented, last two segments forming claw. Maxilliped four-segmented, distal segment claw-shaped. Leg 1 biramous with three segmented rami; distal segment of endopod with three claws; distal segment of exopod armed with one spine and four setae ornamented with setules. Leg 2 of female biramous, with two-segmented rami. Legs 3-4 of female represented by small segment with three and one setae, respectively. Legs 2-4 of male with three-segmented exopods and two-segmented endopods. Leg 5 of female one-segmented, with four setae and blunt terminal teeth. Leg 5 of male represented with lateral expansion bearing four setae.

Biology: Widespread ectoparasite living on arms and web of deep-sea octopuses in the Atlantic and Pacific Oceans. One of these octopuses, *Graneledone* sp., sampled at the sediment-laden vent field was described by Juniper et al. (1992). The parasitic tisbids are found on arms, head, and gills of the deep-sea octopuses associated to soft substrates. The redescription of *Cholidya polypi* and the list of species parasitizing octopuses is given in Humes & Voight (1997). Number of free-living tisbids (including *Tisbe* sp. nov.) have been found in the Mid-Atlantic Ridge (Lucky Strike) during in situ colonization experiments (Ivanenko et al., in preparation).

Distribution: Juan de Fuca Ridge: Middle Valley; none vent localities, Pacific and Atlantic Oceans (Humes & Voight 1997).



1A: Female habitus, dorsal; B: Habitus ventral; C: Leg 1; D: Male habitus, dorsal. en – endopod; l5 – leg 5; from Humes & Voight (1997).

References:

Humes A.G. & J.R. Voight (1997) Ophelia **46**(1): 65-81.
Juniper S.K., Tunnicliffe V. & E.C. Southward (1992) Can. J. Zool. **70**: 1792-1809.

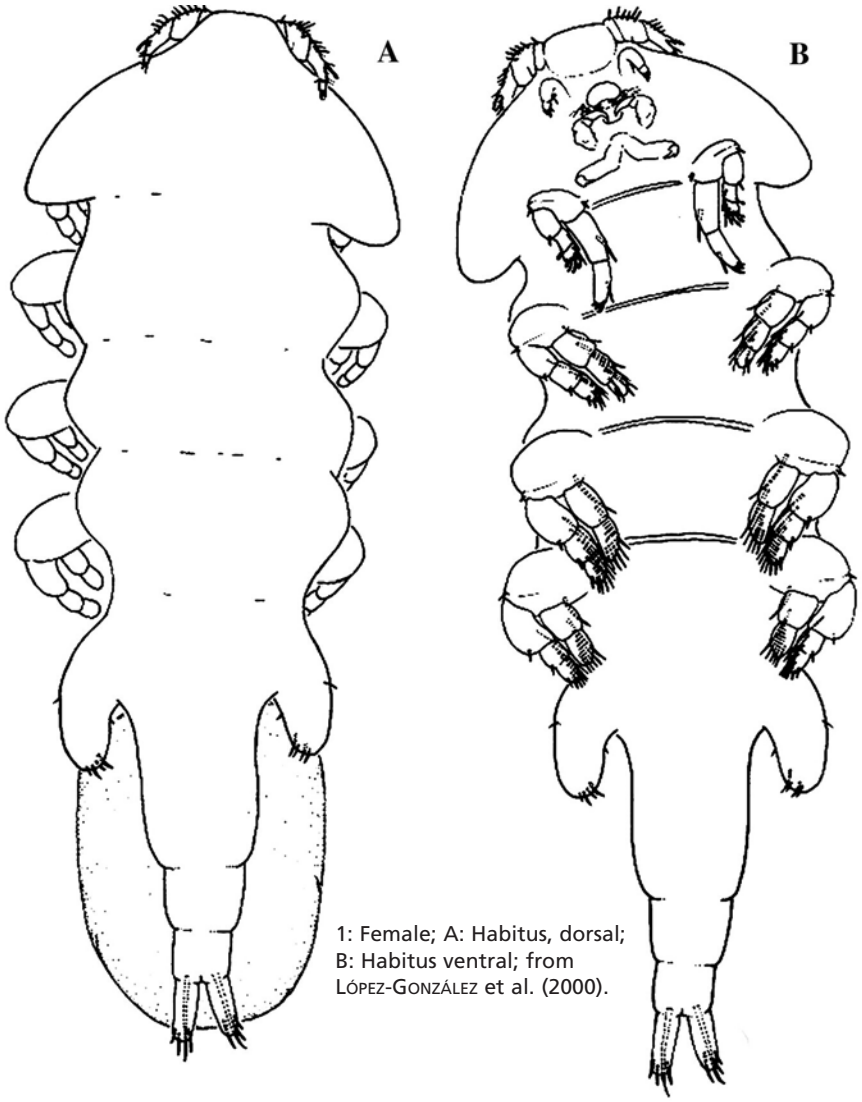
Genesis vulcanoctopusi López-González, Bresciani & Huys, 2000

Size: Body length of female 2.5-2.8 mm. Male unknown.

Morphology: Body indistinctly segmented; prosome laterally expanded with protruding margins. Rostrum produced beyond anterior margin of cephalothorax. Antennule four-segmented. Antenna with one-segmented exopod and two-segmented endopod. Mandibular palp two-segmented. Maxillule bilobed, with eight setae. Maxilla two-segmented, second segment claw-like. Maxilliped three-segmented, distal segment claw-shaped. Leg 1-4 biramous, exopods of legs 1-4 and endopod of leg 2 three-segmented; endopods of legs 1, 3, and 4 two-segmented. Leg 5 represented by lobe fused to body and bearing six setae.

Biology: Females and subadults have been found embedded and encapsulated in the integument of the head and of the mantle of the deep-sea octopus *Vulcanoctopus hydrothermalis* González & Guerra, 1998. It was suggested that the life cycle of *Genesis vulcanoctopusi* would consist of both endoparasitic and ectoparasitic phases.

Distribution: East Pacific Rise: 13°N, near Genesis.



1: Female; A: Habitus, dorsal; B: Habitus ventral; from López-González et al. (2000).

Reference:

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