Nauplius
The Journal of The Brazilian Crustacean Society

e-ISSN 2358-2936
www.scielo.br/nau
www.crustacea.org.br

Original Article

Neobirsteiniamysis inermis (Willemoes-Suhm, 1874) (Peracarida, Mysida, Mysidae) in western Mexico

José Carlos Hernández-Payán[1,2] orcid.org/0000-0003-1483-1289
Michel E. Hendrickx[1] orcid.org/0000-0001-9187-6080

1 Universidad Nacional Autónoma de México, Unidad Académica Mazatlán Instituto de Ciencias del Mar y Limnología, Laboratorio de Invertebrados Bentónicos. Mazatlán, Sinaloa, 82000, Mexico.
JCH-P E-mail: jose_carlos_11@hotmail.com

2 Universidad Nacional Autónoma de México, Instituto de Ciencias del Mar y Limnología, Programa de Postgrado en Ciencias del Mar y Limnología. Mexico City, Mexico.
MEH E-mail: michel@ola.icmyl.unam.mx

ZOOBANK: http://zoobank.org/urn:lsid:zoobank.org:pub:B308B9F4-7BC3-4AF0-A8E7-CA7135E9F8B6

Abstract

The offshore mysid *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874) is reported for the first time in western Mexico. A large series of specimens (168 specimens: 44 males, 124 females) was obtained from samples taken with a large benthic sled in as many as 28 localities distributed off the west coast of the Baja California Peninsula (15), in the Gulf of California (11), and off SW Mexico (2). Only one ovigerous female was collected. A complete description of the material, based on a mature specimen, is provided, including SEM images of the mandibles, which are described in detail, and of the eyes.

Keywords

Distribution, eastern Pacific, eyes, mandibles, Mysida, Peracarida, redescription

Introduction

Pelagic mysid shrimps (Mysida *s.s.*) have been scarcely studied in the eastern Pacific, with most records related to the area between Alaska and southern California (*e.g.*, W.M. Tattersall, 1951; Banner, 1954a; 1954b; Austin, 1985; Gleye, 1982; Murano and Chess, 1987; Hanamura, 1997; Price, 2004). Records from areas south of California are often limited to the type locality, particularly in deep-water species (*e.g.*, *Hansenomysis tropicalis* Bacescu, 1967; *Mysimenzies hadalis* Bacescu, 1971), and much of the mysid fauna along the Central American coast and further south

Corresponding Author
Michel E. Hendrickx
michel@ola.icmyl.unam.mx

SUBMITTED 13 July 2020
ACCEPTED 8 September 2020
PUBLISHED 20 November 2020

DOI 10.1590/2358-2936e2020043

remains largely unknown (Price, 2004; Price *et al.*, 2009). Some recent compilation of information available for the eastern Pacific (Alaska to Chile) indicated that there is a total of 113 species of Mysida recorded in the entire area (Price, 2004). Of these, 37 species are found exclusively from the southern Mexican border to Chile (Price, 2004). A total of 19 species have now been recorded off western Mexico (Hernández-Payán and Hendrickx, 2020), which is much less that the number of species recorded in the cold-temperate northeast Pacific (45 species; Austin, 1985) but much more than the number of species currently recorded in western Costa Rica (4 species; Price *et al.*, 2009).

The genus *Birsteiniamysis* was originally proposed by Tchindonova (1979) in an oral communication during the XIV USSR Pacific Science Congress in Khabarovsk, USSR, in August 1979. Further details related to this genus were included in two other contributions by Tchindonova (1979; 1981). However, none of these three contributions met the nomenclatural criteria of the International Commission of Zoological Nomenclature (ICZN, 1999) and the genus *Birsteiniamysis* has remained unavailable, although it had been cited in several occasions in species lists or in some contributions following 1981 (*e.g.*, Beliaev, 1989; Fukuoka, 2007: 418; Petryashov, 2009; 2014). It is only very recently that the status of *Birsteiniamysis sensu* Tchindonova, 1979 was reviewed and a new genus, *Neobirsteiniamysis* Hendrickx and Tchindonova, 2020, was proposed as a new name (see Hendrickx *et al.*, 2020; Hendrickx and Tchindonova, 2020).

According to Mees and Meland (2012 onwards), the genus *Birsteiniamysis sensu* Tchindonova (1979) contains only two species: *Birsteiniamysis inermis* (Willemoes-Suhm, 1874), originally described in the genus *Petalophthalmus* Willemoes-Suhm, 1874, and *Birsteiniamysis caeca* (Birstein and Tchindonova, 1958), originally described in the genus *Boreomysis* G.O. Sars, 1869. A third species, *Birsteiniamysis scyphops* (G.O. Sars, 1879), originally described in the genus *Boreomysis*, is a junior synonym of *Petalophthalmus inermis* Willemoes-Suhm, 1875. Both species are now included in *Neobirsteiniamysis* Hendrickx and Tchindonova, 2020, with *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874) designated as the type species of the genus (Hendrickx *et al.*, 2020; Hendrickx and Tchindonova, 2020).

During exploratory cruises in deep water off western Mexico, a large series of specimens of Mysida and Lophogastrida was collected in the pelagic realm (see Hendrickx and Hernández-Payán, 2018; 2020). Among this abundant material, specimens of *N. inermis* were identified in 28 localities and are reported herein. Based on this material, a complete description of this species is provided, including detailed illustrations of the mandible and the eyes.

Material and Methods

The material used in this study was collected during a deep-water sampling program off western Mexico (the TALUD project). Samples of *N. inermis* were collected by the R/V "El Puma" of the Universidad Nacional Autónoma de México (UNAM), between 2000 and 2014 during the following cruises: off the west coast of the Baja California Peninsula (TALUD XV, July 2012; TALUD XVI–B, 24–31 May 2014); in the Gulf of California (TALUD IV, August 2000; TALUD V, December 2000; TALUD VI, March, 2001; TALUD VII, 6–8 June 2001; TALUD VIII, April 2005; TALUD IX, 12–13 November 2005; TALUD X, 10–12 February 2007), and off the SW coast of Mexico, from Jalisco to Guerrero (TALUD XII, 29–30 March 2009). During these cruises, samples were obtained from 734 to 2125 m depth with a benthic sled. Positional coordinates for each sampling station were obtained using a GPS navigation system. Depth was measured with an EdoWestern analogic recorder (TALUD IV–VIII) or a digital recorder (TALUD IX–XVI-B). All the specimens were captured with a benthic sled (2.35 m width, 0.9 m high) equipped with a modified shrimp net (approximately 5.5 cm stretched mesh size) with an approximately 2.0 cm (3/4") internal lining net (see Material examined). The material collected during this survey is deposited in the Regional Collection of Marine Invertebrates (ICML-EMU and catalogue number), at UNAM in Mazatlán, Mexico. Size (carapace length) was measured to the nearest 0.01 mm with a digital caliper. Abbreviations are St., sampling station; M, male; F, female; OF, ovigerous female; CL, carapace postorbital length; BS, benthic sled. Scanning Electron Microscopy (SEM) was available for selected structures in addition to line drawings (camera lucida).

Systematics

Order Mysida Boas, 1883

Family Mysidae Haworth, 1825

Neobirsteiniamysis inermis
(Willemoes-Suhm, 1874)
(Figs. 1-10)

Petalophthalmus inermis Willemoes-Suhm, 1874: 575. — Willemoes-Suhm, 1876b: 588.

Petalophthalmus armiger — Willemoes-Suhm, 1875: 41 (only female), pl. 7, fig. 1, 3–14. — E. Perrier, 1893: 1026.

Boreomysis scyphops G.O. Sars, 1879: 428. — G.O. Sars, 1884: 34; 1885b: 56. — G.O. Sars, 1885c: 178, pl. XXXII, figs. 10–20. — G.O. Sars, 1886: 14. — Filhol, 1885: 1 (passim). — Norman, 1886: 9. — Norman, 1905: 10. — Stebbing, 1893: 268. — Calman, 1901: 23. — Calman, 1909: 171 (passim). — Gerstaecker and Ortmann, 1901: 602 (passim). — Ohlin, 1901b: 71. — Zimmer, 1904: 433. — Zimmer, 1905: 149 (passim). — Zimmer, 1909: 57. — Hansen, 1908: 99, fig. 1–8. — Hansen, 1921: 71. — Linko, 1908: 41. — Stephensen, 1918: 65. — Illig, 1930: 559. — Nouvel, 1943: 46. — Nouvel, 1950: 4. — Zenkewitch, 1954: 82. — Brattegard and Meland, 1997: 78.

Boreomysis suhmi Faxon, 1893: 218 (foot note).

Boreomysis distinguenda Hansen, 1908: 100, fig. 2a, b. — W.M. Tattersall, 1913: 869. — Zimmer, 1927: 623. — Illig, 1930: 559.

Boreomysis inermis — W.M. Tattersall, 1951: 46. — O.S. Tattersall, 1955: 75. — Gordan, 1957: 342 (catalogue). — Birstein and Tchindonova, 1958: 282, fig. 9. — Birstein and Tchindonova, 1962: 62. — Ii, 1964: 19. — Mauchline and Murano, 1977: 49 (list). — Kathman *et al.*, 1986: 108, 109, figs. a-e. — Laubitz, 1986: 15. — Ledoyer, 1990: 40. — 1995: 603. — Müller, 1993: 25. — Castellani *et al.*, 2017: 479, figs. O–R.

Birsteiniamysis inermis Tchindonova, 1981: 28, 29 (passim). — Tchindonova, 1993: 153-155 (passim). — Fukuoka, 2007: 418. — Petryashov, 2009: 67, pl. II, fig. 1, pl. III, figs. 7, 8. — Petryashov, 2014: 187.

Birsteiniamysis scyphops — Tchindonova, 1981: 28, 29 (passim).

Neobirsteiniamysis inermis — Hendrickx *et al.*, 2020: 21 (genus *nomen nudum*) . — Hendrickx and Tchindonova, 2020: 2 (genus *nomen novum*).

Material examined. 168 specimens: 44 males, 123 females, 1 ovigerous female. TALUD IV. St. 26 (24°56’24”N 109°05’36”W), August 26, 2000, 1 male (CL 13.56 mm) and 3 females (CL 13.13–18.08 mm), BS operated at 1200–1274 m (ICML-EMU-12581). TALUD V. St. 26 (24°56’18”N 109°11’48”W), December 16, 2000, 1 female (CL 14.88 mm), BS operated at 1280–1310 m (ICML-EMU-12582). TALUD VI. St. 18 (24°14’56”N 108°16’17”W), March 15, 2001, 1 male (CL 8.24 mm), BS operated at 850–890 m (ICML-EMU-12583). TALUD VII. St. 13 (23°30’18”N 107°44’00”W), June 6, 2001, 1 female (CL 9.14 mm), BS operated at 1400–1450 m (ICML-EMU-12584-A); St. 18 (24°14’30”N 108°16’24”W), June 7, 2001, 4 males (CL 9.00–9.82 mm), 51 females (CL 6.19–12.05 mm) and 1 ovigerous female (CL 11.55 mm), BS operated at 950–1010 m (ICML-EMU-12584-B); St. 25 (24°52’48”N 108°58’00”W), June 8, 2001, 1 male (CL 10.18 mm) and 14 females (CL 6.57–10.98 mm), BS operated at 780–850 m (ICML-EMU-12585). TALUD VIII. St. 20 (25°56’56”N 110°43’00”W), April 19, 2005, 7 males (CL 6.73–12.04 mm) and 2 females (CL 8.08–10.15 mm), BS operated at 1140–1150 m (ICML-EMU-12586). TALUD IX. St. 10 (24°56’24”N 110°16’42”W), November 12, 2005, 1 female (CL 11.41 mm), BS operated at 969–1225 m (ICML-EMU-12587-A); St. 16 (25°23’48”N 110°36’42”W), November 13, 2005, 3 females (CL 11.04 – 11.81 mm), BS operated at 997–1021 m (ICML-EMU-12587-B).

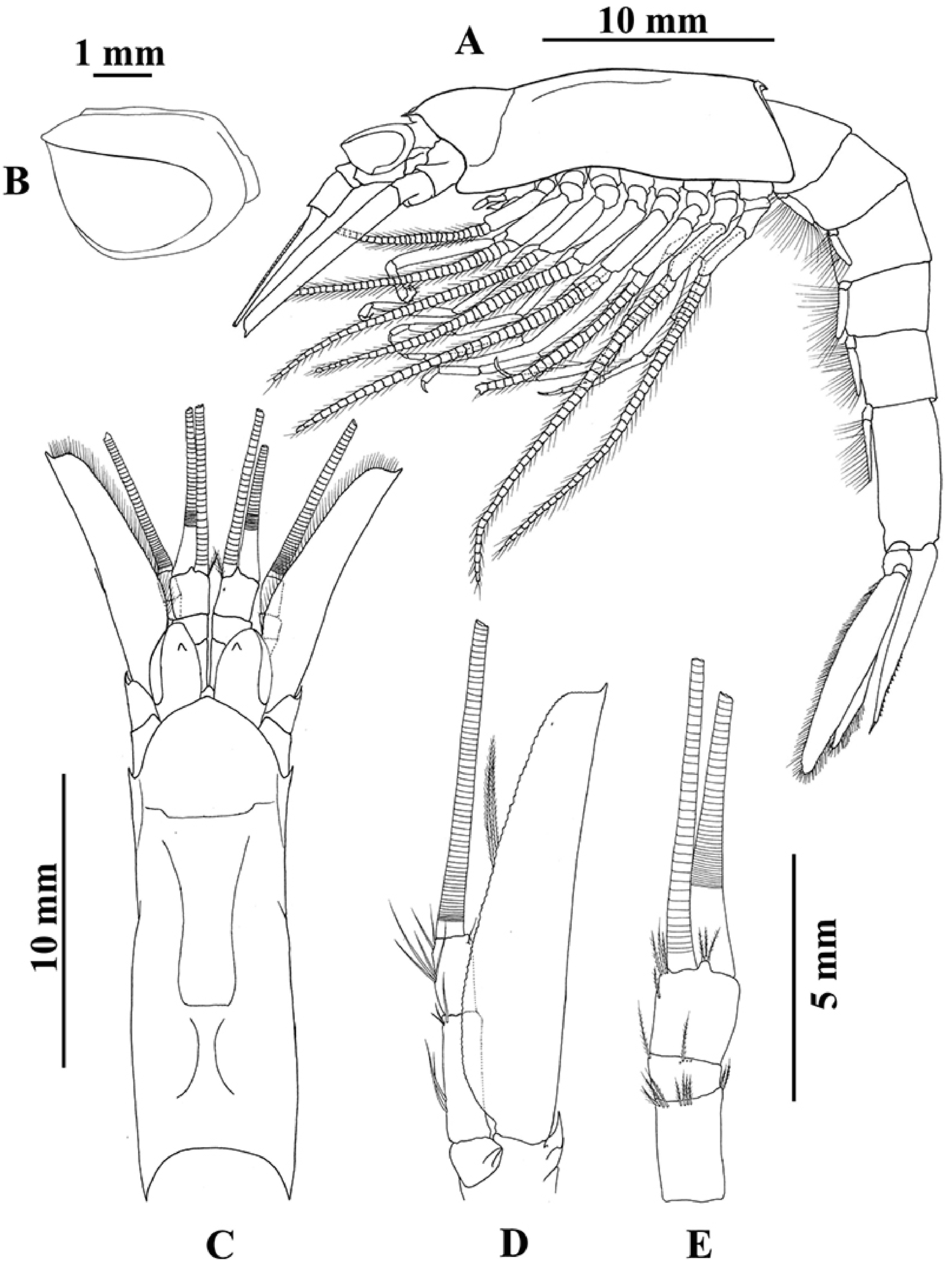

Figure 1. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female, CL 15.01 (ICML-EMU-12590-C). **A**, lateral view; **B**, lateral view of the eyes; **C**, dorsal view of the carapace; **D**, antennal peduncle and scale; **E**, antennular peduncle.

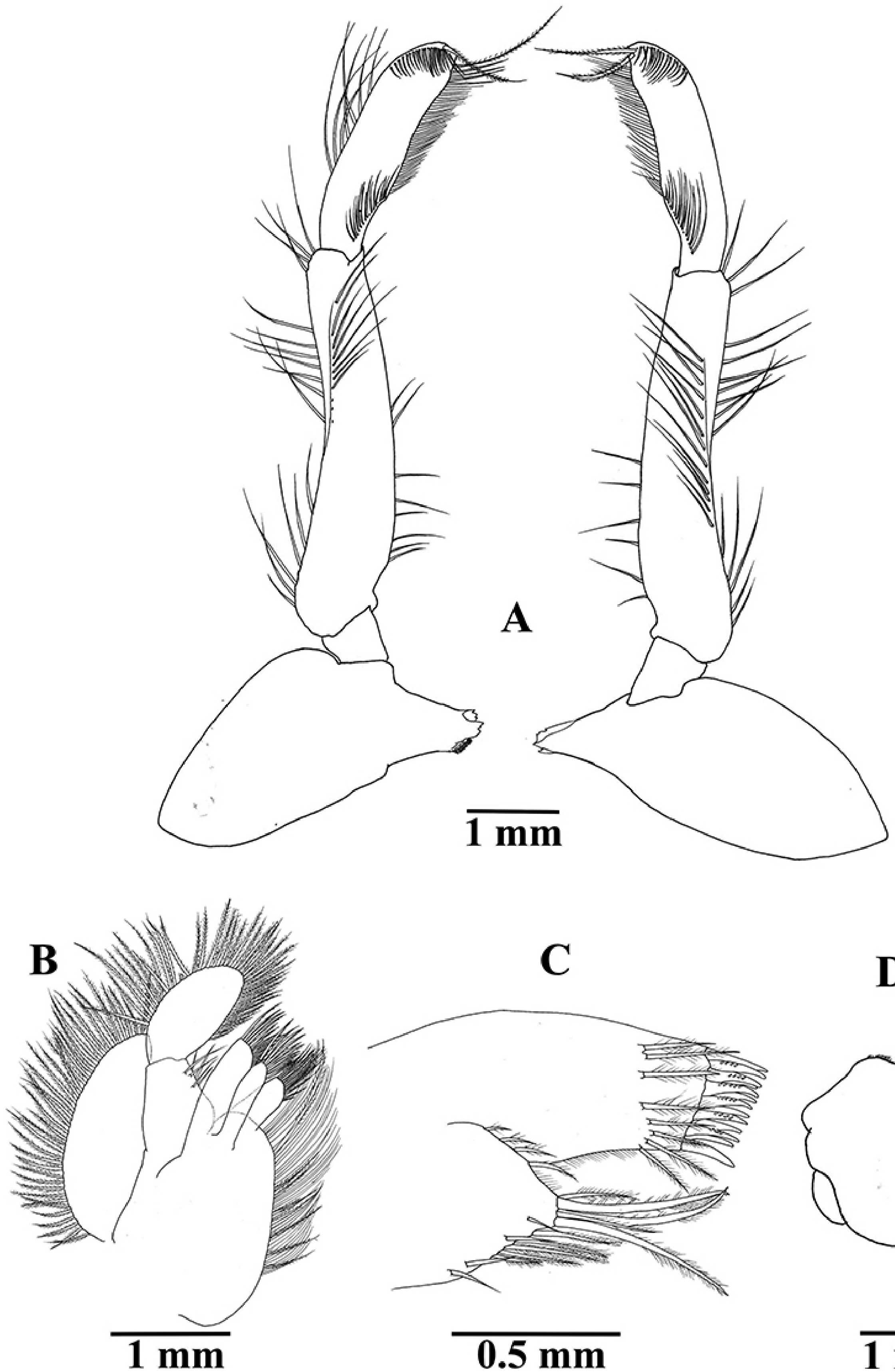

Figure 2. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female, CL 15.01 (ICML-EMU-12590-C). **A**, left and right mandibles and mandibular palp; **B**, maxilla; **C**, maxillula; **D**, labrum.

TALUD X. St. 10 (27°48'30"N 112°17'12"W), February 10, 2007, 2 females (CL 11.29–15.44 mm), BS operated at 1396–1422 m (ICML-EMU-12588-A); St. 18 (27°09'06"N 111°46'54"W), February 12, 2007, 1 female (CL 17.19 mm), BS operated at 1526 m (ICML-EMU-12588-B). TALUD XII. St. 9 (17°10'26"N 101°37'37"W), March 29, 2008, 4 males (CL 13.88–16.36 mm) and 4 females (CL 11.72–18.55 mm), BS operated at 1392–1420 m (ICML-EMU-12598-A); St. 15 (17°25'33"N 102°07'20"W), March 30, 2008, 1 female (CL 20.14 mm), BS operated at 2080–2125 m (ICML-EMU-12589-B). TALUD XV. St. 8 (24°25'48"N 112°38'06"W), July 30, 2012, 2 females (CL 15.03–15.92 mm), BS operated at 1212–1235 m (ICML-EMU-12590-A); St. 9 (24°25'12"N 112°52'48"W), July 30, 2012, 1 female (CL 13.23 mm), BS operated at 1425–1494 m (ICML-EMU-12590-B); St. 13 (25°02'12"N 112°54'06"W), July 30, 2012, 1 male (CL 14.35 mm) and 3 females (CL 14.24–18.32 mm), BS operated at 1210–1245 m (ICML-EMU-12590-C). TALUD XVI-B. St. 5 (28°48"N 115°24.1"W), May 24, 2014, 4 males (CL 8.05–10.12 mm) and 3 females (CL 10.14–11.72 mm), BS operated at 772–776 m (ICML-EMU-12591-A); St. 7 (29°21.2"N 115°39.14"W), May 31, 2014, 1 male (CL 8.77 mm) and 5 females (CL 10.74–12.87 mm), BS operated at 710–750 m (ICML-EMU-12591-B); St. 8 (29°23.8"N 115°45.2"W), May 24, 2014, 1 female (CL 12.76 mm), BS operated at 1416–1480 m (ICML-EMU-12591-C); St. 9 (29°20.89"N 115°51"W), May 31, 2014, 1 male (CL 14.49 mm) and 1 female (CL 15.65 mm), BS operated at 1848–1860 m (ICML-EMU-12592-A); St. 17 (29°54.3"N 116°01.5"W), May 27, 2014, 12 males (CL 7.73–11.35 mm) and 14 females (CL 8.10–12.21 mm), BS operated at 734–774 m (ICML-EMU-12592-B); St. 18 (30°39.3"N 116°25.9"W), May 26, 2014, 2 males (CL 10.00–10.66 mm) and 2 females (CL 11.84–12.61 mm), BS operated at 740–785 m (ICML-EMU-12592-C); St. 19 (30°38"N 115°31.67"W), May 25, 2014, 2 females (CL 16.84–18.34 mm), BS operated at 1385–1433 m (ICML-EMU-12593-A); St. 20 (30°51.26"N 116°42.18"W), May 26, 2014, 1 male (CL 15.50 mm), BS operated at 2075–2090 m (ICML-EMU-12593-B); St. 21 (30°49.4"N 116°47.8"W), May 28, 2014, 1 male (CL 16.22 mm) and 1 female (CL 15.04 mm), BS operated at 2018–2093 m (ICML-EMU-12593-C); St. 23 (30°56.04"N 116°40.92"W), May 27, 2014, 1 male (CL 16.20 mm) and 3 females (CL 12.69–15.92 mm), BS operated at 1296–1340 m (ICML-EMU-12594-A); St. 26 (31°46.1"N 116°58.35"W), May 26, 2014, 2 males (CL 9.84–10.67 mm), BS operated at 982–989 m (ICML-EMU-12594-B); St. 27 (31°42.6"N 117°13"W), May 27, 2014, 1 female (CL 15.80 mm), BS operated at 1394–1397 m (ICML-EMU-12594-C).

Description. Carapace (Fig. 1A, C) elongated, slightly produced forward as small triangular process, occasionally acute; antero-lateral margins slightly produced; cervical groove well marked anteriorly and laterally.

Eyes (Fig. 1B) large, elongated, outer surface concave, oblong in lateral view, without pigmentation, one small dorsal papilla.

Antennular peduncle (Fig. 1E) short, 3-articulate; first rectangular, as long as combined length of second and third, 3 short plumose setae on outer margin, inner margin with 2 short, plumose setae, ventral surface with 4 short, plumose setae; second article smaller than other two, one short, plumose setae on outer margin, 3 short, plumose setae on ventral surface; third article almost as wide as long, 4 short, plumose setae on outer margin, a small bump in middle of distal margin bearing small setae.

Antennal peduncle (Fig. 1D) little more than 1/2 scale length; first article short, with prominent spine near inner margin; second article long, 2 slender, simple setae in middle of outer margin, 3 setae on outer distal edge; third article slightly more than 1/2 length of second article, approximately 1/6 scale length, with 4 long setae in middle of outer margin, 2 setae on outer distal edge, 1 setae on inner margin. Antennal scale (Fig. 1D) extended well beyond distal edge of antennal peduncle, approximately 4.5 times as long as broad, wider near its base, straight outer margin without setae, ending in one strong spine, apex truncated, all margins setose.

Mandibles (Fig. 2A) palp 3-articulated; first article short, without spines; second longer than third, both margins setose, almost same width throughout its length; third article approximately 3 times as long as broad, short comb-shaped setae on distal 2/3 of inner margin, one series of short, sub-marginal setae on proximal 1/3, apical border with 2 long, plumose setae, one series of short, sub-marginal setae on distal 1/4, outer margin with 7 thin setae. Right mandible (Fig. 2A) well developed, incisor process small, composed of one chitinous ridge with four teeth; lacinia mobilis small, located between incisor and pars centralis, represented by one row of thick, long apical setae and one series of small, thin setae covering both base of molar process and outer margins (Fig. 7A–C); molar process sub-rectangular, with one series of parallel lamellae on crushing surface formed by strong sharp spines attached at base, one series of small pores at edge of molar process. Left mandible (Fig. 7D-F) with strong incisive process, consisting of one chitinous ridge with 4 teeth; lacinia mobilis present, well developed, consisting of 5 teeth, one bifid, two small, and one large, well marked at extremity; par centralis represented by one series of 6 flattened elements, composed of one row of long setae, united at their base; molar process similar to the right mandible.

Maxilla (Fig. 2B) exopod wide, extending to proximal 1/3 of endopod distal article, 38 long, plumose, marginal setae; distal segment of endopod oval, densely setose on both margins, setae long, plumose; 3 sub-rectangular, elongated endites armed with numerous long, distal setae.

Maxillula (Fig. 2C) external lobe armed with 13 strong, indented, apical setae, 8 long plumose setae on ventral surface; inner lobe with 3 long, stout and 2 thin apical setae, all plumose, 4 small plumose setae on inner margin, 5 slender, plumose setae on outer margin, 4 small, simple setae on ventral surface. Labrum (Fig. 2D) symmetric, bilobed anterior margin with simple short setae.

First thoracopod (Fig. 3A,B) small, thin; gnathobase with elongate lobe, well developed, covered with one series of long, plumose setae on outer margin, 14 short, simple setae on ventral surface; pre-ischium with 10 plumose setae; ischium with 9 long, plumose setae on inner margin, 4 single setae on outer margin, several single setae on ventral surface; merus elongated, with 17 long, plumose setae on inner margin, several single setae on outer margin and on ventral surface; carpopropodus with one long setae, serrated on inner margin; short, triangular dactyl with several long thin setae on inner and outer margins; exopodite almost 3 times longer than endopodite, 29-articulated, each article with long plumose setae; epipod well developed.

Second thoracopod (Fig. 3C, D) longer than first, shorter than combined length of thoracopods 3, 4; endopod elongated, without distal subchela; short pre-ischium, with few short, ventral, simple setae; ischium with long, simple seta on inner margin; merus and carpus approximately of same size, armed with one series of long, simple setae on inner margin and on distal part of external margin; dactyl covered with simple setae, one series of short, serrated spines on inner margin; exopod much longer than endopod, 36-articulated, each article with long, plumose setae.

Thoracopod 3–8 (Figs. 3E, F, 4A–F) with long, thin endopods; ischium armed with long, simple setae on inner margin; merus armed with simple setae on inner margin; carpus with one series of tufts of short setae, distally hook-shaped, few long, plumose setae on inner margin; propodus longer than dactyl, 1–3 long setae on distal end of outer margin; dactyl fused with nail, forming long claw; exopod longer than endopod, 34–40 articles, each with long, plumose setae. Penis (Fig. 4F) at base of male's eighth thoracopod, elongated, with one series of tiny spines on ventral surface, short setae on inner margin. Marsupium of females made of 7 pairs of oostegites.

Abdominal somites 1–6 without spines. Male pleopods (Fig. 5A–F) biramous, well developed, all endopods with proximal lobe armed with short, simple setae; endopod of first pair (Fig. 5A) covered with long, thin setae on inner margin, exopod approximately twice as long as endopod, covered with long, plumose setae on both margins; endopod of second pair of pleopods (Fig. 5B) approximately 1/2 length of exopod, both covered with long, plumose setae on both margins; exopod of third pair of pleopods (Fig. 5C) considerably longer than exopod of other pleopods, endopod approximately twice as long as exopod, both covered with long, plumose setae on both margins, distal joints with shorter, stout, spiniform setae (Fig. 5D); fourth pair of exopod (Fig. 5E) slightly longer than endopod, both armed with long, plumose setae on both margins; endopod and exopod of fifth pair (Fig. 5F) almost of same size, long, plumose setae on both margins. Female pleopods (Fig. 5G–K) uniramous, well developed, increasing in size posteriorly, covered with long, plumose setae on inner margin, one series of short, simple setae on proximal part of both margins.

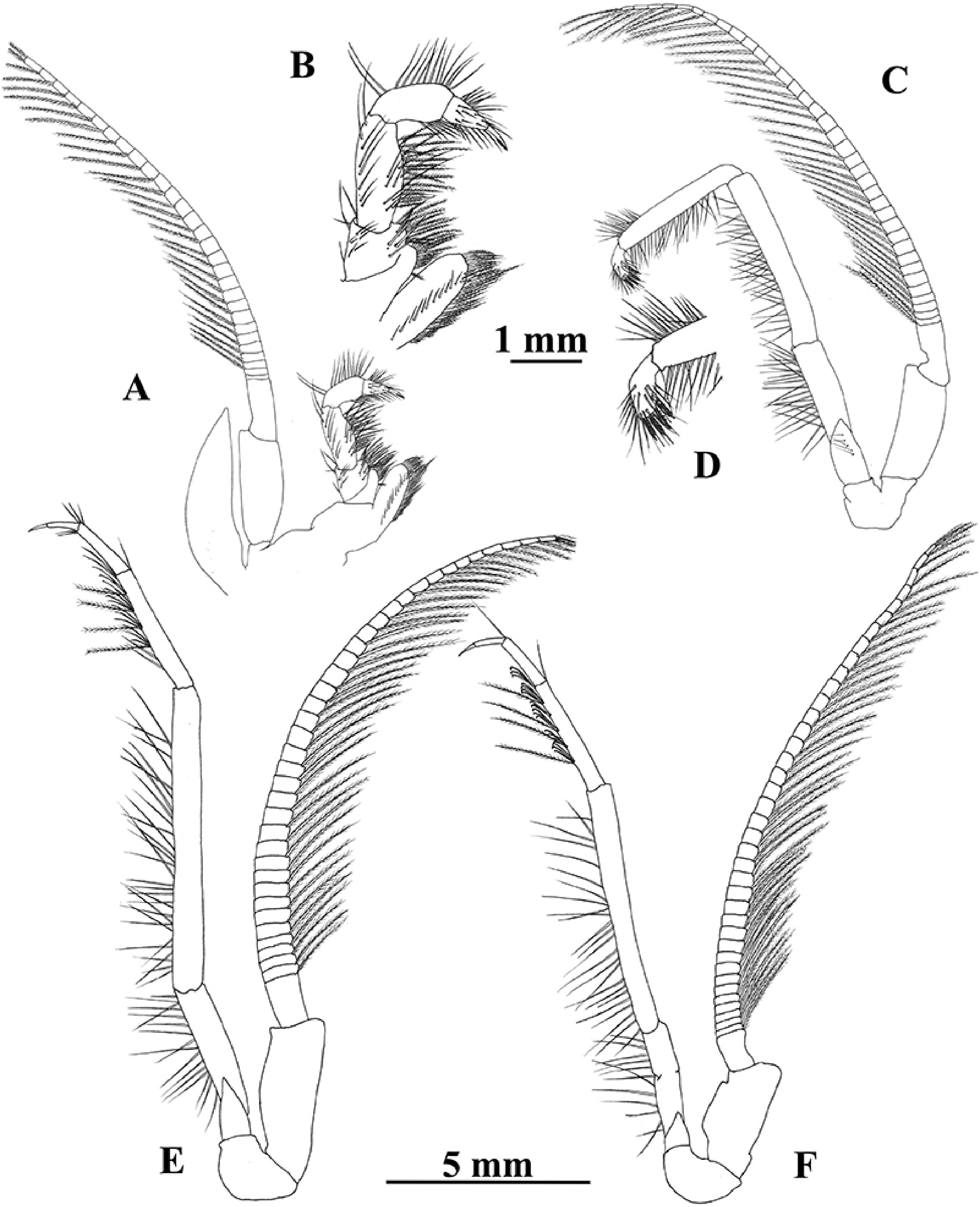

Figure 3. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female CL 15.01 (ICML-EMU-12590-C). **A**, thoracopod 1; **B**, same, endopodite detail; **C,** thoracopod 2; **D**, same, detail of the last 2 articles; **E**, thoracopod 3; **F**, thoracopod 4.

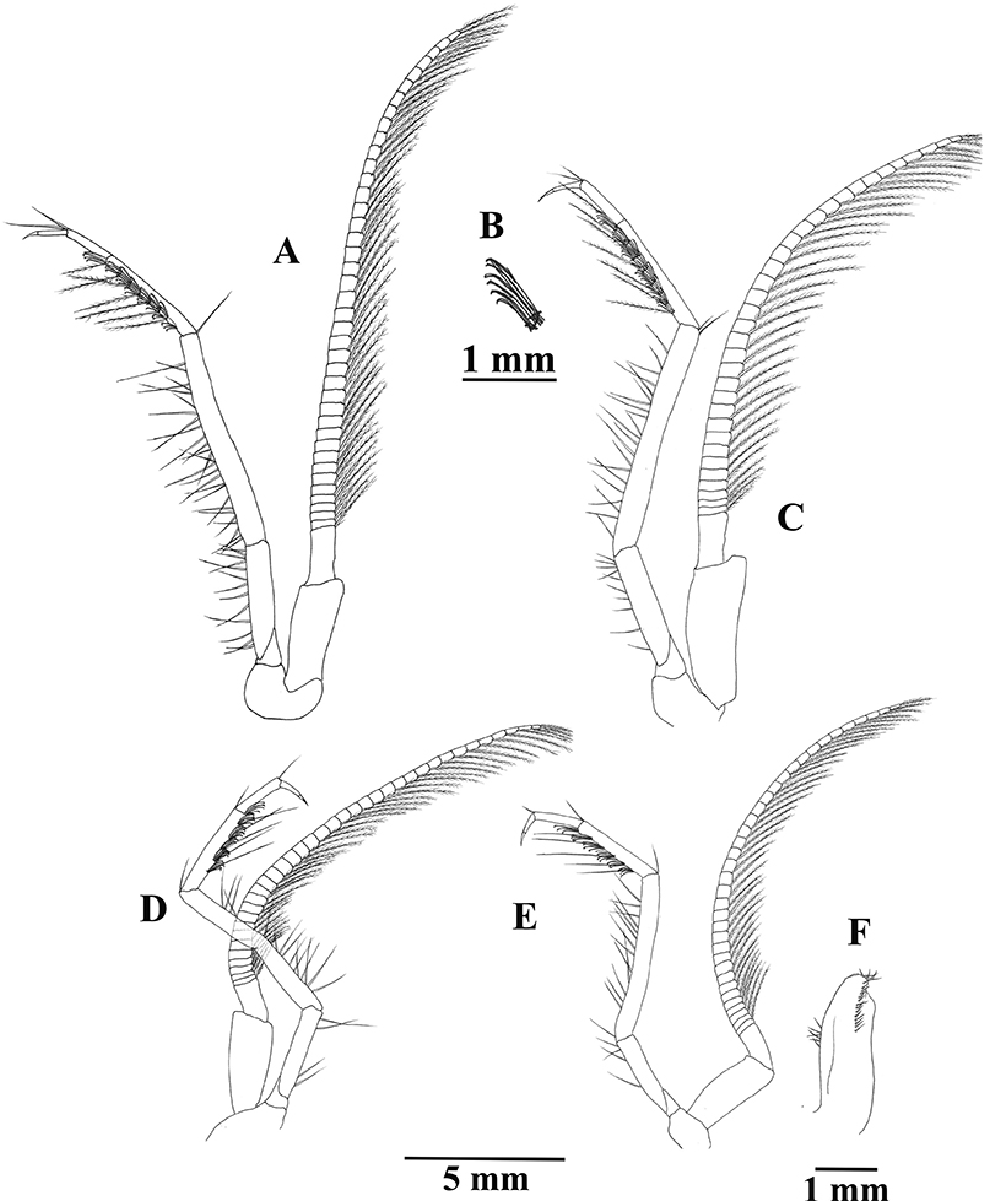

Figure 4. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female, CL 15.01 (ICML-EMU-12590-C). **A**, thoracopod 5; **B**, detail of the tuft of hook-shaped setae in the carpus; **C**, thoracopod 6; **D**, thoracopod 7; **E**, thoracopod 8; **F**, penis.

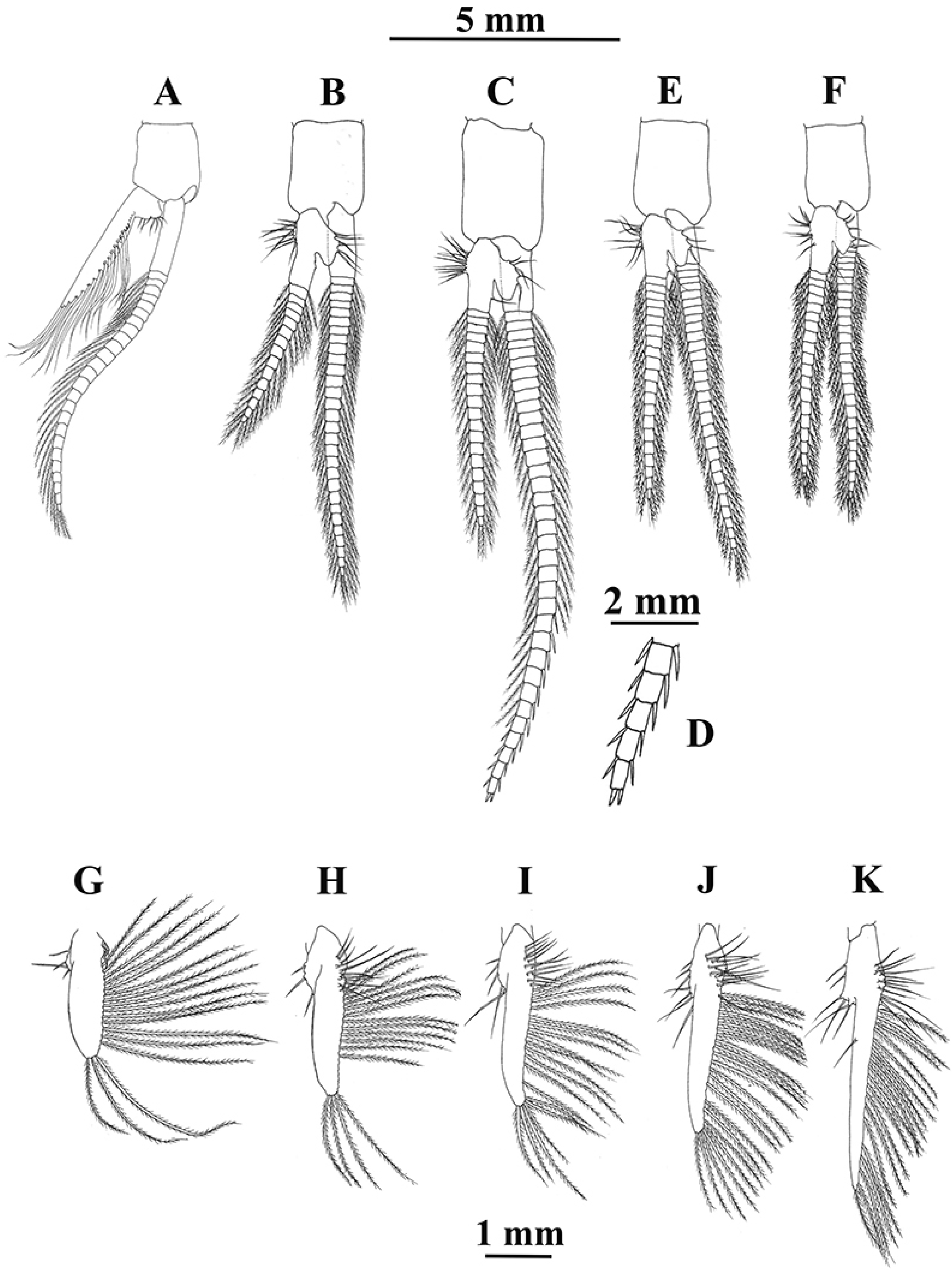

Figure 5. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female, CL 15.01 mm and male, CL 16.20 mm (ICML-EMU-12590-C and 12594-A). **A–F**, pleopods 1–5 of male; **G–K**, pleopods 1–5 of female.

Uropods (Fig. 6A) long, robust; exopod about 1.3 times as long as telson, about 4 times as long as wide, outer margin armed with 2 proximal spine-like setae, inner about twice as long as the other; endopod shorter than exopod, one statocyst at base, 2-3 spine-like setae on proximal 1/3 of inner margin.

Telson (Fig. 6B) wide, approximately 2.7 times as long as wide, distal half with convex sides, proximal 1/3 of lateral margins unarmed, remaining 2/3 armed with about 37 spine-like setae, distal 1/3 with series of 3–5 short spine-like setae between slightly larger one, spines reducing in size towards posterior margin, the latter with moderately deep cleft, V-shaped, approximately 1/9 of total telson length, posterior lobes sub-triangular, 1 strong, terminal, long spine-like seta in each lobe, cleft armed with numerous small teeth, 2 long, plumose setae at basal edge of cleft.

Size. Males, CL 6.73–16.36 mm; females, CL 6.19–20.14 mm; ovigerous female (1 specimen) CL 11.55 mm.

Geographic distribution (previous records as *Boreomysis inermis* or *Birsteiniamysis inermis*). South Atlantic, Antarctic, and Pacific (W.M. Tattersall, 1951; Tchindonova, 1958; Ii, 1964). Registered by G.O. Sars (1885) at three locations in the South Pacific and by W.M. Tattersall (1913) in the Weddell Sea. W.M. Tattersall (1951) reported this species in Pacific deep water, from the Bering and Okhotsk Seas to the southeast coast of California. Off Japan (Fukuoka, 2007). North Atlantic and Norwegian Sea (Castellani *et al*., 2017). Off western Mexico (Fig. 8) (this study).

New records in Mexico. *Neobirsteiniamysis inermis* is recorded for the first time in the Mexican Pacific, in 28 localities (Fig. 8). It occurs both in the central and southern Gulf of California (11 localities), off the west coast of the Baja California Peninsula (15 localities), and off SW Mexico (two localities), thus indicating it is a widespread and rather frequent species in the region.

Bathymetric distribution. Because stratified (discrete) samples were not available during our study, the material examined herein was collected at unknown depths during sampling operations within the water column, from surface to 710–2125 m. Tchindonova (1958), Ii (1964), and W.M. Tattersall (1951) report a bathymetric range of 900–3800 m. However, unless automatic opening-closing gear was used, which is apparently not the case, the depth range at which specimens of *N. inermis* have been captured in the past remains imprecise. Brattegard and Meland (1997: 78) referred to *B. scyphops* as a probably benthopelagic species, occurring in 980–3570 m depth.

The rarity of previous records for western Mexico could be linked to the fact that most zooplankton and micronekton samples previously taken in the area have been obtained between surface and about 200 m depth (see Hendrickx and Estrada-Navarrete, 1996; Durán-Campos *et al*., 2020; Diaz *et al*., 2020). Although precise level of residence of *N. inermis* is still imprecise, it would seem that it is mainly a deep-water species, occurring well offshore, beyond the limit of neritic waters. A total of 166 specimens were examined during this study, a very large proportion (78 %) in stations with depth comprised between 780–1450 m and 710–2093 m (Tab. 1). The maximum number of specimens in a single locality was 56 (TALUD VII, St. 18; maximum sampling depth, 950–1010 m), the unique locality where an ovigerous female was found. Second to this is St. 17 of TALUD XVI-B cruise, with maximum sampling depth of 734–774 m, with 26.

Remarks. In her characterization of "*Birsteiniamysis*", Tchindonova (1993) emphasized the structure of the eyes, stating: "Concave surface with microfibrous microstructure. Visual elements located inside proximal part of eye stalk. Degree of development of ocular rudimentary papilla and its location on stem species-specific" (translation available in Hendrickx *et al*., 2020). While examining the material collected during this study, is was possible to review in detail these characteristics. The ocular globe is indeed deeply concave on its lateral face (Fig. 9A, B), with the upper and lower margin next to the concavity wide or narrow depending upon the angle at which the eye is illustrated (compared Fig. 9A, B). The "microfiber microstructures" described by Tchindonova (1993) correspond to a microscopically rippled bottom of the ocular concavity, showing rather regular undulations without apparent visual elements (Fig. 9C). The position of the ocular papilla in our material was quite consistent, but there was a considerable variation of its size, from a proportionally very small structure (Fig. 10C, I) to a much larger protuberance (Fig. 10A, E, G). No clear relationship was observed between the size of the papilla and either the sex or the size of the specimens examined.

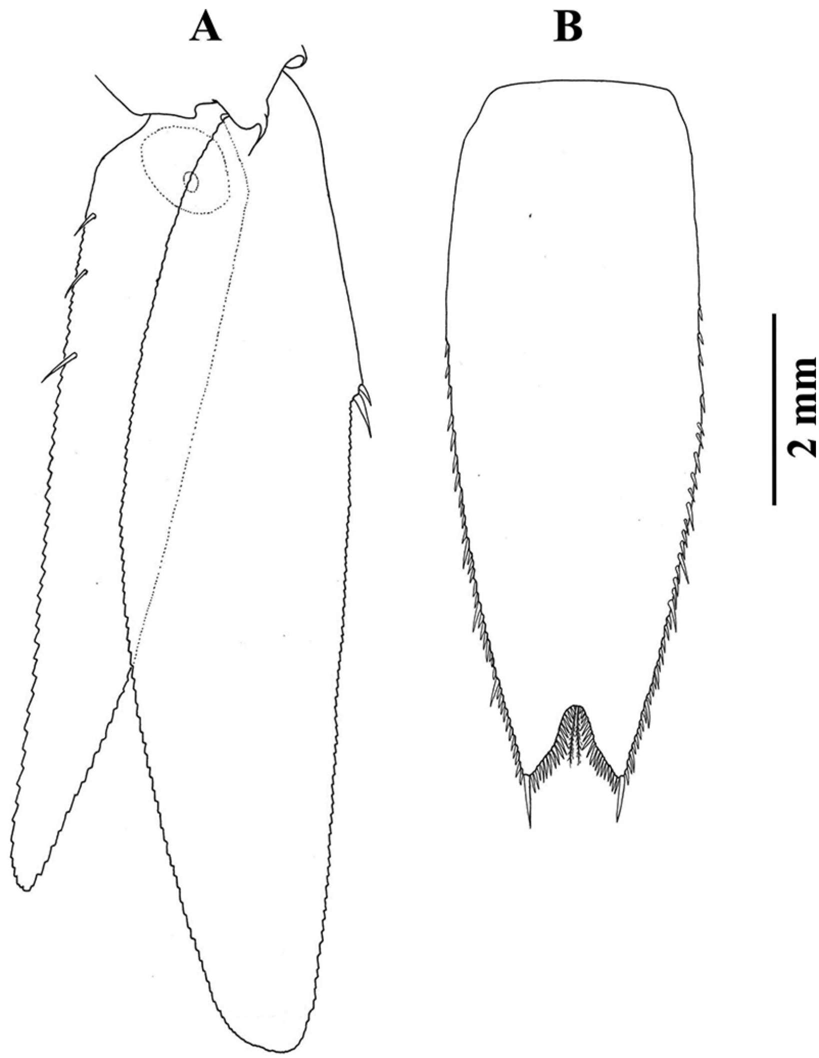

Figure 6. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female, CL 15.01 mm (ICML-EMU-12590-C). **A**, uropods, dorsal view; **B**, telson, dorsal view.

A slightly produced anterior margin of the carapace, forming a small triangular process, occasionally acute, was observed in the material examined (Fig. 10). In this case, all three males examined (Fig. 10B, D, F) featured a rather sharp terminal process, which seems to be sex-related; indeed, the females featured an obtusely triangular projection (Fig. 10H, J).

The number of ovigerous females captured for this species is notably low, and only one out of 124 females collected during the survey was carrying embryos inside the marsupium. There are very few records of large numbers of offshore mysids available and comparison with other oceanic species is rather difficult. In the case of *Petalophthalmus armiger* Willemoes-Suhm, 1875, collected during the same survey in similar conditions, a total of 38 specimens was obtained, six males and 32 females, without a single ovigerous female (Hendrickx and Hernández-Payán, 2018). In other studies, some covering longer periods of time or in shallower water, the number of ovigerous females collected has been reported as significantly higher. For example, in *Boreomysis oparva* Saltzman and Bowman, 1993, up to 7 % of females collected between surface and 3400 m depth carried larvae, but values were highly variable according to depth. In the case of *Metamysidopsis neritica* Bond-Buckup and Tavares, 1992, Calil and Borzone (2008) reported about 10 % of ovigerous females among the specimens (including juveniles), and 66 % of adult females were ovigerous. In *Schistomysis assimilis* (G.O. Sars, 1877), the percentage of brooding females varied from 1.0 to 15.4 % according to the period of the year (San Vicente and Sorbe, 2003).

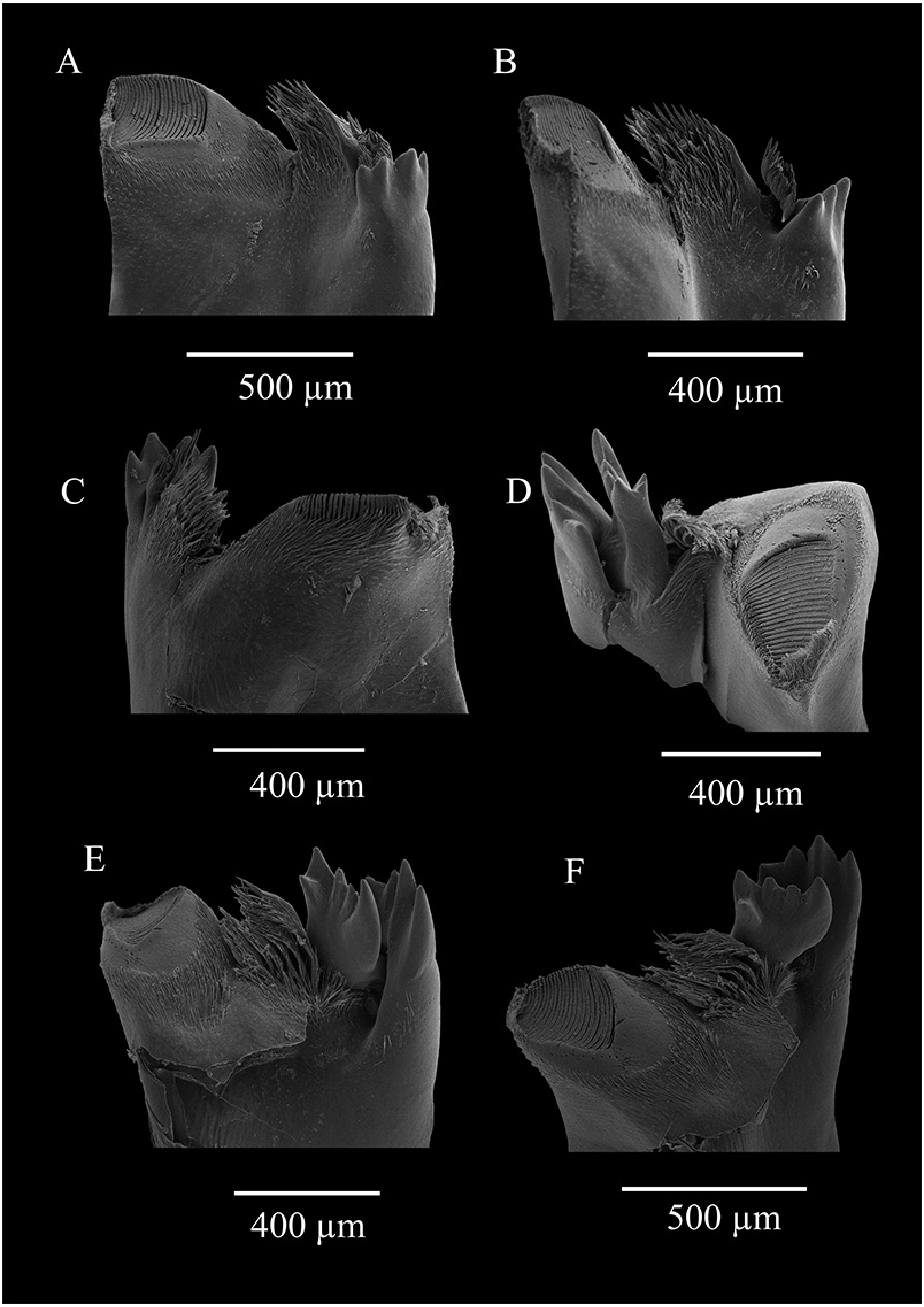

Figure 7. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female, CL 18.08 mm (ICML-EMU-12581). SEM photographs. **A–C**, right mandible; **D–F**, left mandible.

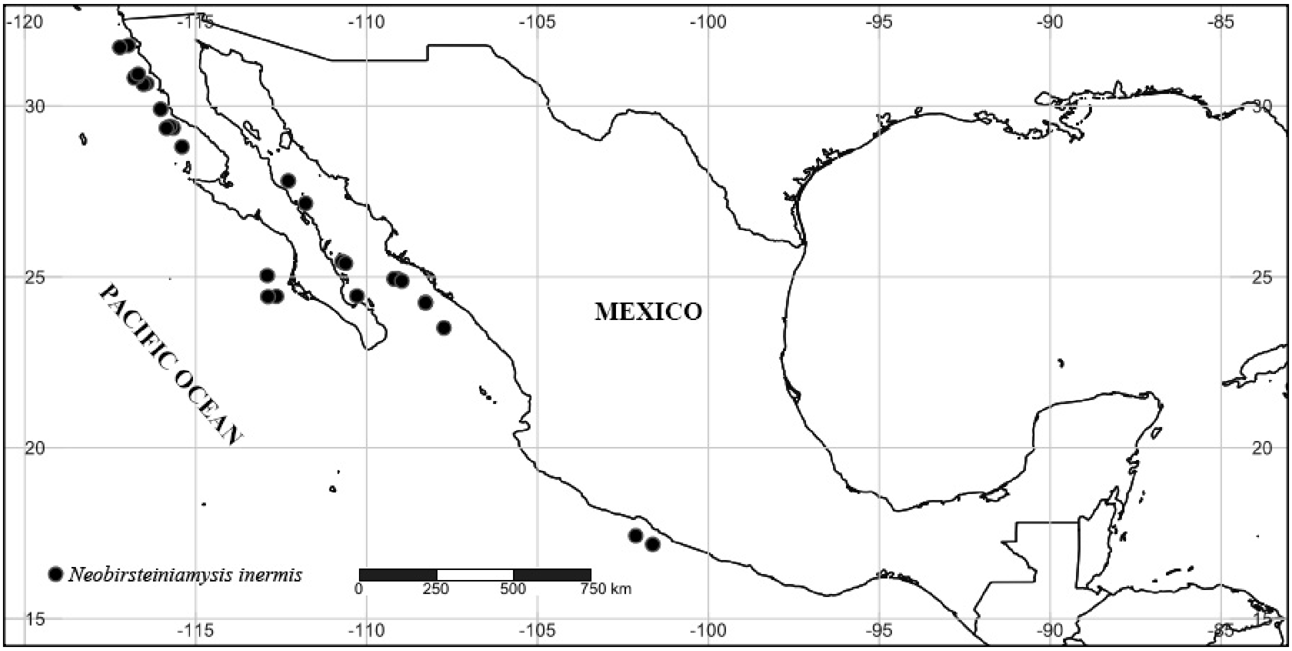

Figure 8. Localities off western Mexico where specimens of *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874) were collected.

Table 1. Total depth (depth range) recorded at localities where specimens of *Neobirsteiniamysis inermis* (Willemos-Suhm, 1874) were collected during this study.

Cruises	Localities	Number of specimens	Depth range
Gulf California			
TALUD IV	1	4	1200–1274 m
TALUD V	1	1	1280–1310 m
TALUD VI	1	1	1280–1310 m
TALUD VII	3	72	780–1450 m
TALUD VIII	1	9	1140–1150 m
TALUD IX	2	4	969–1225 m
TALUD X	2	3	1396–1526 m
Western Baja			
TALUD XV	3	7	1210–1494 m
TALUD XVI-B	12	58	710–2093 m
SW Mexico			
TALUD XII	2	9	1392–2125 m
Total	28	168	710–2125 m

The very low incidence of ovigerous females in our sample might be related to variation in the depth range at which ovigerous females reside compared to males and non-ovigerous females, or to the period of the year when samples were obtained. However, samples analyzed herein were collected from February to July, in November and in December, thus covering most of the year. Unfortunately, for the time being, there is no clear explanation for the absence of a larger proportion of ovigerous females in our samples.

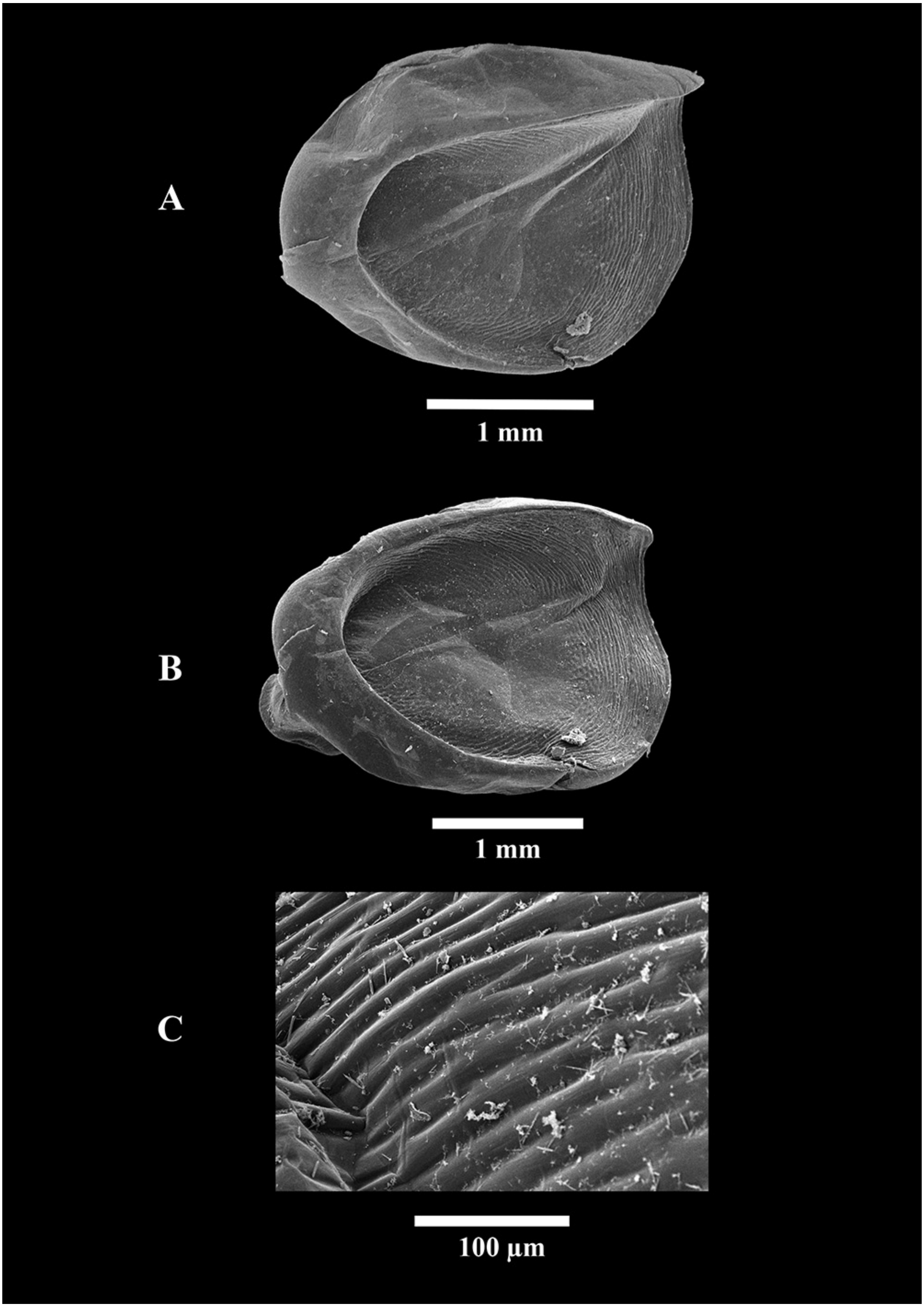

Figure 9. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Female, CL 18.08 (ICML-EMU-12581). SEM photographs. **A**, lateral view of the eye; **B**, same, different angle; **C**, fibrous microstructures in the concave surface.

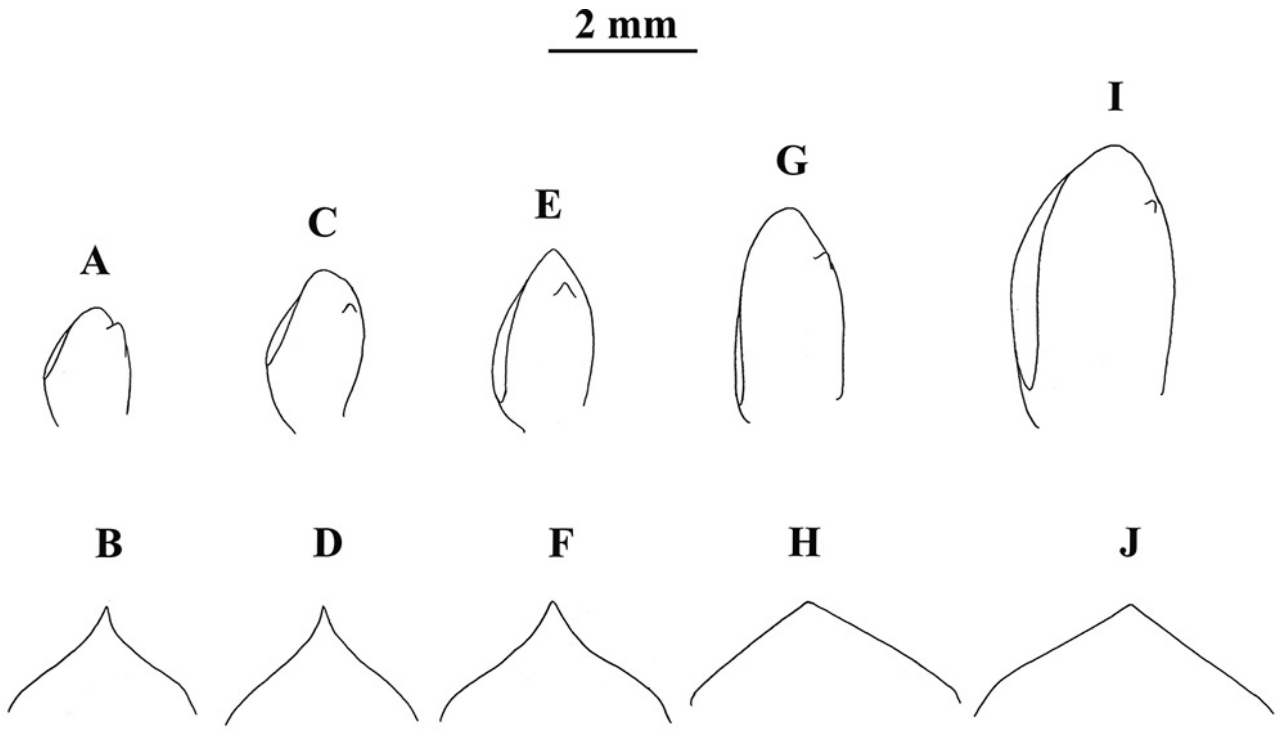

Figure 10. *Neobirsteiniamysis inermis* (Willemoes-Suhm, 1874). Variation in size and location of the ocular papilla (A, C, E, G, I), and of the rostrum shape (B, D, F, H, J). **A, B**, male, CL 9.54 mm (ICML-EMU-12591-A); **C, D**, male, CL 11.03 mm (ICML-EMU-12586); **E, F**, male, CL 10.55 (ICML-EMU-12584-B); **G, H**, female, CL 14.88 (ICML-EMU-12582); **I, J**, female, CL 18.08 (ICML-EMU-12581).

Acknowledgements

Ship time aboard the R/V "El Puma" was provided by the Coordinación de la Investigación Científica, UNAM, and partly supported by CONACyT (project 179467). The TALUD project has also received laboratory and field work support from CONACyT (Project 31805- N for the TALUD IV to VII cruises; project 179467 for the TALUD XV and XVI–B cruises, Mexico). The authors thank all scientists, students and crew members who took an active part in the TALUD cruises. Special thanks to M.B. Mendoza Garfias, Instituto de Biología, UNAM, for preparing samples and taking the SEM photographs for figures 7 and 9, and to Ana Luna for her help with these tasks. A recipient of a Master Grant (ref. 629343; 2017-2019) JCHP acknowledges CONACyT Mexico for support during his studies.

References

Austin, W.C. 1985. Mysidacea. p. 559–563 In: An Annotated checklist of marine invertebrates in the cold temperate northeast Pacific. Vol. 3. Khoyatan Marine Laboratory, Vorino, Canada.

Banner, A.H. 1954a. New records of Mysidacea and Euphausiacea from the northeastern Pacific and adjacent areas. *Pacific Science*, 8: 125–139.

Banner, A.H. 1954b. Some "Schizopod" crustaceans from the deeper water off California. *Allan Hancock Foundation Publications, Occasional Papers*, 13: 1–48.

Beliaev, G.M. 1989. Deep-sea ocean trenches and their fauna. Moscow, Nauka Publishing House, 225p. [In Russian with English abstract].

Birstein, J.A. and Tchindonova, J.G. 1958. The deep sea mysids of the northwest Pacific Ocean. *Trudy Instituta Okeanologi*, 27: 258–355. [In Russian].

Birstein, J.A. and Tchindonova, J.G. 1962. Mysidacea collected by the Soviet Antarctic Expedition on the M/V 'Ob'. *Biological Report of the Soviet Antarctic Expedition*, 1: 58–68.

Bond-Buckup, G. and Tavares, L.M.G. 1992. *Metamysidopsis neritica* a new peracarid from the coastal waters of south Brazil (Crustacea, Mysidacea). *Atlântica*, 4: 65–71.

Brattegard, T. and Meland, K. 1997. Mysidacea (Crustacea) in the Faroe area. *Föroya Fróðskaparrit* (Annales Societatis Scientarium Færoensis), 45: 69–95.

Calman, W.T. 1901. A catalogue of Crustacea and of Pycnogonida contained in the Museum of the University College, Dundee. Dundee, University of St. Andrews, 56p.

Calman, W.T. 1909. The Mysidacea. p. 171-182. In: E.R. Lankaster (ed), A Treatise on Zoology, pt. 7, Appendiculata, fasc. 3, Crustacea. London, A. and Ch. Black.

Calil, P. and Borzone, C.A. 2008. Population structure and reproductive biology of *Metamysidopsis neritica* (Crustacea: Mysidacea) in a sand beach in south Brazil. *Revista Brasileira de Zoologia*, 25: 403–412.

Castellani, C.; Lehtiniemi, M. and Meland, K. 2017. Crustacea: Lophogastrida and Mysida. p. 471–489. In: Claudia Castellani and M. Edwards (eds), Marine Plankton: A practical guide to ecology, methodology, and taxonomy. Oxford, Oxford University Press.

Diaz, F.A.R.; Gómez, M.A.M.; Monter, E.C.; De Leon, D.A.S. and Campos, E.D. 2020. Seasonal variability in copepod biomass in a cyclonic eddy system in the Bay of La Paz, southern Gulf of California, Mexico. *bioRxiv,* 2020: 1–7.

Durán-Campos, E.; Monreal-Gómez, M.A.; De León, D.A.S. and Coria-Monter, E. 2019. Zooplankton functional groups in a dipole eddy in a coastal region of the southern Gulf of California. *Regional Studies in Marine Science*, 28: 100588.

Faxon W. 1893. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of México, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U.S. Fish Commission Steamer "*Albatross*" during 1891. VI. Preliminary descriptions of new species of Crustacea. *Bulletin of the Museum of Comparative Zoology*, 24: 149–220.

Filhol, H. 1885. La vie au fond des mers. Paris, G. Masson, vii+301p., 96 figs., 8 pls.

Gerstaecker, A. and Ortmann, A.E. 1901. Malacostraca. In: Bronn, H.G. (ed), Klassen und Ordnungen des Tierreichs. Leipzig, C.F. *Winter'sche Verlagshandlung*, 5: 602–686.

Gleye L.G. 1982. Two new species of Leptomysinid mysids (Crustacea, Mysidacea) from southern California. *Proceedings of the Biological Society of Washington*, 95: 319-324.

Gordan, J. 1957. A bibliography of the order Mysidacea. *Bulletin of the American Museum of Natural History*, 112: 283–393.

Hanamura, Y. 1997. Review of the taxonomy and biogeography of shallow-water mysids of the genus *Archaeomysis* (Crustacea: Mysidacea) in the North Pacific Ocean. *Journal of Natural History*, 31: 669–711.

Hansen, H.J. 1908. Crustacea Malacostraca. I. *Copenhagen, The Danish Ingolf Expedition*, 3: 1–120.

Hansen, H.J. 1921. Studies on Arthropoda. I. *Copenhagen, Gyldendalske Boghandel*, 80p, 4 pls.

Hendrickx M.E.; Sidorov D. and Tchindonova, J.G. 2020. Replacement for the nomenclaturally unavailable name *Birsteiniamysis* Tchindonova (Crustacea, Mysida). *Geomare Zoologica*, 2: 19–23.

Hendrickx, M.E. and Estrada-Navarrete, F.D. 1996. Los camarones Pelágicos (Crustacea: Dendrobranchiata y Caridea) del Pacífico mexicano. México, Comisión Nacional para el Conocimiento y uso de la Biodiversidad e Instituto de Ciencias del Mar y Limnologia, UNAM. 157p.

Hendrickx, M.E. and Hernández-Payán, J.C. 2018. Redescription of the mysid *Petalophthalmus armiger* Willemoes-Suhm, 1875 (Crustacea: Mysida: Petalophthalmidae) and distribution off western Mexico. *Zootaxa*, 4444: 283–298.

Hendrickx, M.E. and Hernández-Payán, J.C. 2020. Rediscovery of *Hansenomysis lucifugus* (Faxon, 1893) (Crustacea, Mysida, Petalophthalmidae) in the eastern Pacific. *Zootaxa*, 4729: 416–428.

Hendrickx, M.E. and Tchindonova, J.G. 2020. Validation of *Neobirsteiniamysis* Hendrickx & Tchindonova as a replacement name for the unavailable genus name *Birsteiniamysis* (Crustacea, Mysida). *Nauplius*, 28: e2020040, 2 p.

Ii, N. 1964. Fauna Japonica, Mysidae. Tokyo, Biogeogreographic Society of Japan, p. 1–15 [General remarks on Mysidae from Japanese waters], p. 15–16 [key to subfamilies].

Illig, G. 1930. Die Schizopoden der Deutschen Tiefsee Expedition. p. 399-625. In: C. Chun (ed), Wissenschaftliche Ergebnisse Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899. Vol. 22. Jena, Gustav Fischer.

Kathman, R.D.; Austin, W.C.; Saltman, J.C. and Fulton, J.D. 1986. Identification manual to the Mysidacea and Euphausiacea of the northeast Pacific. *Canadian Special Publication of Fisheries and Aquatic Sciences*, 93: 11–141.

Laubitz, D.R. 1986. Bibliographia invertebratorum aquaticorum Canadensium. *Synopsis speciorum*, 8: 1-61.

Ledoyer, M. 1990. Mysidacea (Crustacea) de la campagne «EPOS 3» en mer de Weddell, Antarctique. *Mésogée,* 50: 37–44.

Ledoyer, M. 1995. Mysidacés (Crustacea) de Kerguelen, Crozet et Bouvet (Océan Austral) récoltés par la Japonaise, le Marion-Dufresne (1972–82) et dans des contenus stomacaux d'oiseaux. *Journal of Natural History*, 29: 601–618.

Linko, A. 1908. Schizopoda of the Russian Northern Sea. *Mémoires de l'Académie Impériale des Sciences de Saint Petersbourg*, 18 (8): 1–76. [In Russian].

Mauchline, J. and Murano, M. 1977. World list of the Mysidacea, Crustacea. *Journal of the Tokyo University of Fisheries*, 64: 39-88.

Müller, H.G. 1993. *World Catalogue and Bibliography of the Recent Mysidacea.* Wetzlar, Germany, Wissenschaftler Verlag, Tropical Products Trading Center, 491p.

Mees, J. and Meland, K. (eds) (2012 onwards). World List of Lophogastrida, Stygiomysida and Mysida. *Birsteiniamysis* Tchindonova, 1981. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=422824. Accessed on (January through June 2020).

Murano, M. and Chess, J.R. 1987. Four new mysids from Californian coastal waters. *Journal of Crustacean Biology*, 7: 182–197.

Norman, A.M. 1886. *Museum Normanianum, III. Crustacea*. Printed for private distribution, 26p. (Second edition published in 1905).

Norman, A.M. 1905. Museum Normanianum, or a catalogue of the Invertebrata of the Arctic and north Atlantic temperate ocean and Palaearctic region. III. Crustacea. Second edition. Durham, publ. by the author, 47p.

Nouvel, H. 1943. Mysidacés provenant des campagnes du Prince Albert Ier de Monaco. p. 1–128. In: J. Richard (ed), Résultats des campagnes scientifiques accomplies sur son yacht par Albert Ier, Monaco, fasc. 105.

Nouvel, H. 1950. Mysidacea. In: P. Jespersen and F.S. Russell (eds), Fiches d'identification du zooplankton. Copenhagen, Conseil Permanent International pour l'Exploration de la Mer, 18, p. 1–6; 19, p. 1–; 20, p. 1–4; 21, p. 1–4; 22, p. 1–4; 23, p. 1–4; 24, p. 1–4; 25, p. 1–4; 26, p. 1–3; 27, p. 1–4.

Ohlin, A. 1901. Arctic Crustacea collected during the Swedish Arctic expeditions 1898, 1899 and 1900 under the direction of A. G. Nathorst and G. Kolthoff. II. Decapoda, Schizopoda. *Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlingar*, 27(4): 1–91.

Perrier, E. 1893. Mysidae. p. 1026–1027. In: *Traité de Zoologie*. Paris, G. Masson.

Petryashov, V.V. 2009. Order Mysidacea. p. 65–83. In: S.V. Vassilenko and V.V. Petryashov (eds), Illustrated keys to free-living invertebrates of Eurasian Arctic seas and adjacent deep waters, Vol. 1. Rotifera, Pycnogonida, Cirripedia, Leptostraca, Mysidacea, Hyperiidea, Caprellidea, Euphausiasea, Dendrobranchiata, Pleocyemata, Anomura, and Brachyura. Fairbanks, Alaska Sea Grant, University of Alaska.

Petryashov, V.V. 2014. Deep-sea fauna of European seas: An annotated species check-list of benthic invertebrates living deeper than 2000 m in the seas bordering Europe. Mysida, Lophogastrida. *Invertebrate Zoology*, 11: 183–191.

Price, W.W. 2004. An annotated checklist for the order Mysida (Crustacea: Malacostraca: Peracarida) from the Pacific coasts of the Americas (Alaska to Chile). p. 53–77. In: M.E. Hendrickx (ed), Contributions to the Study of East Pacific Crustaceans, vol. 3. Mexico D.F., ICML, UNAM.

Price, W.W.; Heard, R.W. and Vargas, R. 2009. Shallow water mysids. p. 229–236. In: I. Wehrtmann and J. Cortés (eds), Marine Biodiversity of Costa Rica, Central America. Springer, Dordrecht.

Saltzman, J. and Bowman, T.E. 1993. *Boreomysis oparva*, a new possum shrimp (Crustacea: Mysidacea) from an eastern tropical Pacific seamount. *Proceedings of the Biological Society of Washington*, 106: 325–331.

San Vicente, C. and J.-C. Sorbe 2003. Biology of the suprabenthic mysid "*Schistomysis assimilis*" (Sars, 1877) on Creixell beach, Tarragona (northwestern Mediterranean). *Boletin del Instituto Español de Oceanografía*, 19: 391–406.

Sars, G.O. 1877. Nye bidrag til Kundskaben om Middlehavets vets Invertebrat-fauna. I. Middlehavets Mysider. *Archiv for Mathematik og Naturvidenskab*, 2: 10–119.

Sars, G.O. 1879. Crustacea et Pycnogonida nova in itinere 2do et 3tio expeditionis Norvegicae anno 1877, 1878 collecta. *Archiv for Mathematik og Naturvidenskab, Christiania*, 4: 427–476.

Sars, G.O. 1884. Preliminary notices on Schizopoda of H.M.S. "*Challenger*" Expedition. *Forhandlinger i Videnskabs-Selkabet i Christiania*, 7: 1–43.

Sars, G.O. 1885a. Report on the Schizopoda collected by H.M.S. "*Challenger*" during the years 1873-1876. *Reports of the scientific Results of the Voyage of H.M.S. Challenger Zoology*, 13(37): 1–128.

Sars, G.O. 1885b. Crustacea I. In: Den Norske Nordhavs-Expedition, 1876-78. *Christiania*, vol. 14, Zoology, 280p., 21 pls., 1 map.

Sars, G.O. 1885c. Report on the Schizopoda, collected by H.M.S. Challenger during the years 1873-1876. In: Murray, J. (ed.), Zoology. Report on the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873–76 Under the Command of Captain George S. Nares, R.N., F.R.S. and the Late Captain Frank Tourle Thomson, R.N. Wyville Thomson, C. and J. Murray (series eds.) Vol. 13. Edinburgh, Neill and Company, 225p.

Stebbing, T.R.R. 1893. A history of Crustacea. Recent Malacostraca. New York, Appleton and Co., pp. xvii-xvii, 1–466.

Stephensen, K. 1918. Grønlands Krebsdyr og Pycnogonider. *Meddelelser om Grønland*, 22: 1–479.

Tattersall, O.S. 1955. Mysidacea. *Discovery Reports*, 28: 1–190, 46 figs.

Tattersall, W.M. 1913. The Schizopoda, Stomatopoda, and non-Antarctic Isopoda of the Scottish National Antarctic Expedition. *Transactions of the Royal Society of Edinburgh*, 49: 865–894.

Tattersall, W.M. 1951. A review of the Mysidacea of the United States National Museum. *Bulletin of the United States National Museum*, 201: 1–292.

Tchindonova, J.G. 1979. The distribution of deep-sea bottom and near-bottom mysids (Mysidacea, Crustacea) in the World Ocean. Abstract of papers of the 14th Pacific Science Congress, USSR, Khabarovsk, August, 1979: 101–102.

Tchindonova, J.G. 1981. New data on systematic position of some deep-sea mysids (Mysidacea, Crustacea) and their distribution in the world ocean. *Proceedings of the XIV Pacific Science Congress*, 14: 24–33. [In Russian with English abstract]

Tchindonova, J.G. 1993. The distribution of the deep-sea near-bottom pelagical Mysidacea (Crustacea) in the World Ocean and the relationship between high taxons in this group of animals. p. 147–158. In: N.G. Vinogradov (ed), The deep-sea bottom fauna in the southern part of the Atlantic Ocean. *Trudy Instituta Okeanologii Imeni P.P. Shirshova* (Transactions of the P.P. Shirshov Institute of Oceanology, 127) [in Russian].

Willemoes-Suhm, R. von 1874. Von der Challenger expedition: Briefean C. Th. E. v. Siebold, II. *Zeitschrift für Wissenschaftliche Zoologie*, 24: ix-xxiii.

Willemoes-Suhm, R. von 1875. On some Atlantic Crustacea from the "*Challenger*" Expedition. *Transactions of the Linnean Society of London*, 1: 23–59.

Willemoes-Suhm, R. von 1876. Preliminary report to Professor Wyville Thomson, on Crustacea observed during the cruise of H.M.S. "*Challenger*" in the southern seas. *Proceedings of the Royal Society of London*, 24: 585–592.

Zenkewitch, L.A. 1954. Erforschungen der Tiefseefauna im nordwestlichen Teil des Stillen Ozeans. In: On the distribution and origin of the deep sea bottom fauna. *Publications of the International Union of Biological Sciences*, ser. B, 16: 72–85.

Zimmer, C. 1904. Die Arktischen Schizopoden. p. 415–492. In: F. Römer and F. Schaudinn (eds), Fauna Arctica, vol. 3. Jena, Gustav Fischer.

Zimmer, C. 1905. Biologische Notizen uber Schizopoden. *Verhandlungen der Deutschen Zoologischen Gesellschaft,* 15: 149–153.

Zimmer, C. 1909. Die nordischen Schizopoden (inkl. Nachtrag zu *Mysis oculata* (Fabr.). p. 1–179. In: K. Brandt and C. Apstein (eds), Nordisches Plankton, vol. 12. Kiel and Leipzig, Lipsius und Tischer.

Zimmer, C. 1927. Mysidacea. p. 607–650. In: W. Kuikenthal (ed), Handbuch der Zoologie, vol. 3. Berlin and Leipzig, Walter de Gruyter.