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Caprellids (Crustacea: Amphipoda) from the Gulf of Mexico, with observations on *Deutella mayeri*, redescription of *Metaprotella hummelincki*, a taxonomic key and zoogeographical comments

Carlos E. Paz-Ríos^a, José M. Guerra-García^b & Pedro-Luis Ardisson^a

^a Laboratorio de Bentos, Departamento de Recursos del Mar, Cinvestav, Merida, Mexico

^b Laboratorio de Biología Marina, Departamento de Zoología, Facultad de Biología, Universidad de Sevilla, Sevilla, España

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REVIEW ARTICLE

Caprellids (Crustacea: Amphipoda) from the Gulf of Mexico, with observations on *Deutella mayeri*, redescription of *Metaprotella hummelincki*, a taxonomic key and zoogeographical comments

Carlos E. Paz-Ríos^{a*}, José M. Guerra-García^b and Pedro-Luis Ardisson^a

^aLaboratorio de Bentos, Departamento de Recursos del Mar, Cinvestav, Merida, Mexico;

^bLaboratorio de Biología Marina, Departamento de Zoología, Facultad de Biología, Universidad de Sevilla, Sevilla, España

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Seventeen species of caprellid amphipods have been recorded so far in the Gulf of Mexico. New distributional and habitat data are included for 12 species. *Pseudaeginella biscaynensis* has been recorded again in the Gulf of Mexico for the first time since it was originally described 45 years ago. New morphological information based on the development of *Deutella mayeri* and a redescription of *Metaprotella hummelincki* are also provided, along with a key for species identification and zoogeographical comments at the regional and global scales.

Keywords: Caprellidae; species diversity; taxonomy; tropical western Atlantic; Yucatan

Introduction

Members of the family Caprellidae Leach, 1814 are conspicuous because they have an elongated-cylindrical body, which is reflected in their common name, ‘skeleton shrimps’. Caprellids have head and pereonite 1 fused, rudimentary coxae, two or three pairs of gills, oostegites on pereonites 3 and 4, pereopods 3 and 4 absent, reduced or well developed, and abdominal appendages (Ito et al. 2011).

Caprellids inhabit the seabed, clinging to available substrata such as algae, seagrasses, hydroids, bryozoans, gorgonians and mollusc shells (e.g. mussels, oysters) (McCain 1968; Keith 1971; Takeuchi and Hirano 1995; Diaz et al. 2005). They are also found on the carapace of sea turtles (Caine 1986; Aoki and Kikuchi 1995; Pfaller et al. 2008) and more frequently as part of fouling assemblages (Thiel et al. 2003; Frey et al. 2009; Guerra-García et al. 2011).

Biologically, caprellids display four major feeding mechanisms: scavenging, scraping, filter-feeding and predation (Caine 1974, 1977). The most current analysis of digestive contents has revealed that caprellids are mainly detritivores or obligate predators (Guerra-García and Tierno de Figueroa 2009). Caprellids are mostly sedentary because they have a limited ability for swimming, crawling or jumping; cosmopolitan species may possess morphological adaptations and/or life styles that enhance their abilities to drift as plankton or to cling to drifting materials (Caine

*Corresponding author. Email: cpaz@mda.cinvestav.mx

1978; Takeuchi and Hirano 1995; Takeuchi and Sawamoto 1998; Aoki 1999; Ortiz et al. 2002). Caprellids undergo direct development bearing their eggs and juveniles in a marsupium, and some species exhibit parental care (Thiel 1997; Aoki 1999; Johnson et al. 2001). They are a source of food for fish and crustaceans with commercial importance in coastal water ecosystems, therefore the nutritional value of caprellids is being evaluated currently as an alternative food in aquaculture (Woods 2009; Baeza-Rojano et al. 2010). Likewise, taking into account their biological and ecological traits, caprellids are considered indicators of habitat quality (Takeuchi et al. 2001; Guerra-García and Koonjul 2005; Guerra-García et al. 2009).

Currently there is controversy about the phylogeny of the family Caprellidae because of existing evidence that suggests (Takeuchi 1993) and supports (Laubitz 1993) arguments that caprellids are a polyphyletic group. However, the new phylogenetic relationship proposed by Myers and Lowry (2003) and recent genetic analyses (Ito et al. 2008, 2010, 2011) provide evidence suggesting that caprellids are a monophyletic clade.

Taxonomic work on caprellids in the Gulf of Mexico has been documented by Pearse (1908, 1912), Steinberg and Dougherty (1957); McCain (1968); Ortiz et al. (2002); Foster, Heard, et al. (2004); Foster, Thomas, et al. (2004); Winfield, Escobar-Briones, et al. (2007); Paz-Ríos and Ardisson (2013); Rodríguez-Almaras and Ortega-Vidales (2013), and Winfield and Ortiz (2013). An effort to summarize these and other studies by means of checklists of species has been carried out by Steinberg and Dougherty (1957); Ortiz (1979); Escobar-Briones et al. (2002); Foster, Thomas, et al. (2004); Winfield et al. (2006); Winfield, Escobar-Briones, et al. (2007); Winfield (2008); LeCroy et al. (2009), and recently by Winfield and Ortiz (2013).

Although there is information on caprellids in the Gulf of Mexico, there is no current comprehensive taxonomic treatment covering all the Gulf basin and species. Therefore, the aim of the present study is to update existing knowledge of the caprellids in the Gulf of Mexico by providing an annotated checklist, new figures, a key to species identification and zoogeographical comments.

Furthermore, examination of material of *Deutella mayeri* Stebbing, 1895 and *Metaprotella hummelincki* McCain, 1968 provided new characteristics overlooked or lacking in the description by McCain (1968). Thereby comments about morphology are provided for *D. mayeri* on the basis of its development; and for *M. hummelincki* a redescription is provided including the ontogenetic changes during its development.

Materials and methods

The Gulf of Mexico is herein defined as in Felder et al. (2009): the Gulf basin included in the polygon from Cabo Catoche, Mexico, to Cabo de San Antonio, Cuba along this coast until Punta Hicacos, Cuba, and from there through the Florida Strait to Key Largo, USA.

Records of caprellids presented here were derived from a review of literature, in combination with unpublished data for 12 species: 10 obtained during new sampling and two from loaned material. Samples were collected from 31 stations along the north coast of the Yucatan Peninsula, southeast Gulf of Mexico; the loaned material was collected from two stations on the Texas coast, northwest Gulf of Mexico (Table 1, Figure 1). Stations of the Yucatan Peninsula were sampled from the intertidal to the shallow subtidal (≤ 16 m depth) using snorkeling, SCUBA, Birge–Ekman grab sampler, suction sampler device or core sampler, except

Table 1. Summary of sampling stations in the Gulf of Mexico.

Station	Locality	Coordinates (N, W)	Substrate	Depth (m)	Sampling gear	Date (day/month/year)
1	Celestun Lagoon	20°46'18", 90°24'26"	Muddy	1	BE	5/04/95
2	Progreso Beach I	21°15'38", 89°47'20"	Sandy	1	SU	1/05/02
3	Progreso Beach II	21°16'36", 89°42'49"	Sandy	1.5	SU	1/05/02
4	Progreso Beach III	21°17'00", 89°40'33"	Sandy	1.5	SU	15/05/02
5	Progreso Beach IV	21°15'09", 89°49'34"	Sandy	1.5	SU	23/04/03
6	Progreso Beach V	21°14'30", 89°51'54"	Sandy	1.5	SU	3/11/03
7	Progreso Beach VI	21°16'07", 89°45'04"	Sandy	1.5	SU	4/11/03
8	Yucatan Shelf I	22°06'00", 88°59'00"	Sandy	31.4	PP	10/04/04
9	Yucatan Shelf II	22°17'00", 88°00'00"	Sandy	40.9	PP	10/04/04
10*	Celestun Beach	20°48'34", 90°25'06"	Muddy	1	SU, CO	17/09/07, 28/11/10
11	Alacranes Reef I	22°23'00", 89°40'35"	Navigation buoy	-	HA	20/04/10
12	Alacranes Reef II	22°22'36", 89°40'23"	Navigation buoy	-	HA	20/04/10
13	Yalahau Lagoon	21°26'02", 87°20'06"	Wood dock	1.5	HA	14/07/10
14	El Cuyo Beach	21°31'06", 87°40'40"	Wood dock	1	HA	7/08/10
15	Progreso Beach VII	21°17'16", 89°39'56"	Wood dock	Intertidal	HA	24/08/10
16	Yucalpeten Harbor	21°16'41", 89°42'06"	Wood dock	1	HA	24/08/10
17	Dzilam Bravo Beach	21°27'23", 88°41'36"	Seagrass bed	1	HA	25/02/11
18	Dzilam Bravo Harbor	21°23'33", 88°53'45"	Wood dock	1	HA	26/02/11
19	San Felipe Harbor	21°35'50", 88°09'20"	Wood dock	1	HA	5/03/11
20*	Sisal Offshore I	21°21'20", 90°08'36"	Sandy	16.2	CO	20/07/10, 30/08/10
21*	Sisal Offshore II	21°19'00", 90°08'58"	Sandy	12.4	CO	21/05/10, 30/08/10
22*	Sisal Offshore III	21°17'36", 90°03'32"	Sandy	11.4	CO	21/07/10, 28/09/10
23*	Sisal Offshore IV	21°20'31", 90°08'21"	Sandy	12.4	CO	22/05/10, 21/07/10
24*	Celestun Offshore I	20°52'43", 90°45'48"	Sandy	16.7	CO	16/04/10, 18/05/10, 18/06/10
25*	Celestun Offshore II	21°00'57", 90°37'05"	Sandy	14.4	CO	18/06/10, 17/12/10

(Continued)

Table 1. (Continued).

Station	Locality	Coordinates (N, W)	Substrate	Depth (m)	Sampling gear	Date (day/month/year)
26*	Celestun Offshore III	20°53'00", 90°45'15"	Sandy	15.4	CO	19/06/10, 26/07/10
27	Celestun Offshore IV	21°00'56", 90°37'10"	Sandy	13.8	CO	19/06/10
28*	Telchac Offshore	21°25'13", 89°18'24"	Algae	9.7	HA	8/05/13, 8/07/13
29	Cabo Catoche I	21°40'07", 87°06'00"	Oyster reef	8	HA	18/07/13
30	Cabo Catoche II	21°45'06", 87°06'01"	Oyster reef	14	HA	18/07/13
31	Yucatán Shelf III	21°30'06", 91°00'00"	Sandy	30	SM	10/08/13
32	Brazos Santiago Pass	26°05'00", 97°09'00"	Floating debris	–	HA	16/05/05
33	Port Aransas Offshore	27°45'50", 97°01'13"	Oil platform	10	HA	29/05/83

Note: (*) Stations sampled at different times. Sampling gear: (BE) Birge-Ekman grab; (CO) Core sampler; (HA) Hand; (PP) Petite Ponar grab; (SM) Smith-McIntyre grab; (SU) Suction sampler device.

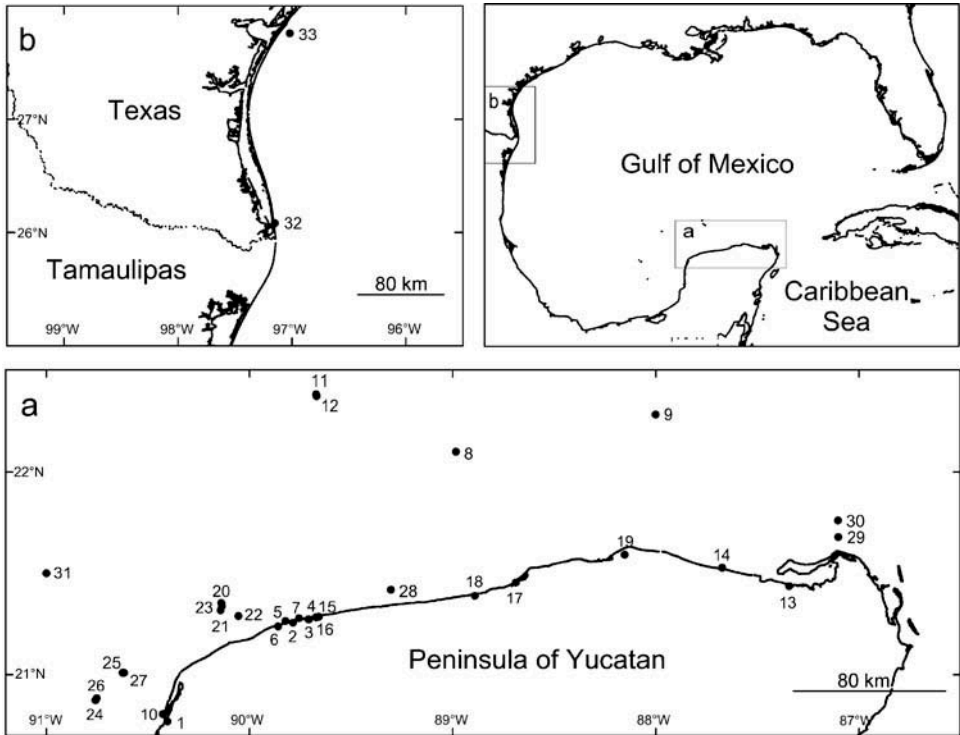


Figure 1. Sampling stations in the Gulf of Mexico.

for sites 8, 9 and 31 where sampling was carried out on the continental shelf (30–40 m depth) using grab samplers. The material was passed through a 0.5-mm sieve, fixed in 4% buffered formalin and stored in 70% alcohol. Specimens were dissected under a stereo-microscope and illustrations were made under a compound microscope with camera lucida. All species examined from the Yucatan Peninsula are deposited in the ‘Colección de Invertebrados Bentónicos de Yucatán (CYMX), Laboratorio de Bentos, Cinvestav’; the actual specimens herein recorded have a catalogue number for the collection. Abbreviations used in figures are: A, antenna; Hd, head; Bd, body; Ab, abdomen; UL, upper lip; LL, lower lip; LMd, left mandible; RMd, right mandible; Mx, maxilla; Mxp, maxilliped; Gn, gnathopod; P, pereopod; Dv, dorsal view; Lv, lateral view. Institutional abbreviations are: BRTC, Biodiversity Research and Teaching Collection of Texas AandM University, Texas, USA; CNCR, Colección Nacional de Crustáceos, Instituto de Biología, Universidad Nacional Autónoma de México, México DF, México; FCB-UANL, Colección Carcinológica de la Facultad de Ciencias Biológicas de la Universidad de Nuevo León, Nuevo León, México.

The present study follows the classification proposed by Myers and Lowry (2003) for caprellids. Synonymies, type locality, distribution, habitat and remarks for all species are presented in the form of an annotated taxonomic checklist. An abbreviated list of the main synonymies was included for each species; a more extensive list of synonyms is found in McCain (1968) and McCain and Steinberg (1970). The Gulf

of Mexico basin is shared by three countries, so for ease of reporting the distribution records in the Gulf basin were displayed by country: Cuba (CUB), Mexico (MEX) and United States of America (USA).

Zoogeographical information on caprellids in the Gulf of Mexico is summarized in two figures. The first reports species numbers from four depth zones in the Gulf basin (modified from Yáñez-Arancibia and Day 2004): shallow coast (0–20 m), continental shelf (21–200 m), continental slope (201–2000) and abyssal plain (\geq 2001 m). The second includes reports on species numbers from four geographical regions in the Gulf basin (based on Felder et al. 2009): northeast (NE), northwest (NW), southwest (SW) and southeast (SE). To explore the faunal affinity among geographic regions, a hierarchical cluster analysis was applied to a species composition matrix of presence/absence. The Sorensen coefficient as similarity index and average linkage clustering was used in the cluster analysis due to differences in collected data (e.g. sample size, sampling effort, sampling method). The statistical software used for this analysis was PRIMER v6 (Clarke and Gorley 2006).

Systematics

The present review provides a systematic account for 17 caprellid species in the Gulf of Mexico; the taxonomic arrangement includes nine genera and two subfamilies within the family Caprellidae.

Family **CAPRELLIDAE** Leach, 1814.

Subfamily **CAPRELLINAE** Leach, 1814.

Caprella andreae Mayer, 1890

Caprella acutifrons f. *Andraeae* Mayer, 1890: 51, 55–56, pl. 2, fig. 38, pl. 4, figs 56, 70, 71. Chevreux and Fage, 1925: 452, fig. 430a.

Caprella andreae McCain, 1968: 19–22, figs 8, 9. McCain and Steinberg, 1970; Cavedini, 1982; Krapp-Schickel, 1993: 777–778, fig. 330. Aoki and Kikuchi, 1995: 54–58, figs 1, 2. Ortiz et al., 2002, fig. 18. Foster, Thomas, et al., 2004: 162, 171, fig. 9.

Type locality

Offshore New Jersey, Atlantic coast of USA (38°10' N, 64°20' W).

Distribution

Northeastern Atlantic; Mediterranean; Western Atlantic; Hawaii; Japan (McCain 1968; Krapp-Schickel 1993; Minchin and Colmes 1993; Spivak and Bass 1999).

Records in the Gulf of Mexico

CUB: La Havana (McCain 1968). USA: Key West (McCain 1968); Padre Island (Shirley 1974).

Habitat

Caprella andreae frequently occurs on floating objects (e.g. buoys, driftwoods) and on the carapace of the sea turtles *Caretta caretta* and *Chelonia mydas* (Shirley 1974; Caine 1986; Aoki and Kikuchi 1995; Pfaller et al. 2008; Sezgin et al. 2009; Cabezas, Navarro-Barranco, et al. 2013), where it seems to be consumed incidentally by turtles (Frick et al. 2009). The depth range reported is 0–2 m (LeCroy et al. 2009).

Remarks

Caprella andreae is similar to *Caprella penantis* Leach, 1814, but readily distinguished from the latter by the inflated peduncle of antenna 1 in males and the palm of pereopods 5–7 convex with medial grasping spines. Recently, Cabezas et al. (2010) have clearly separated *C. andreae* from the populations of *C. penantis* using molecular evidence, supporting the validity of these two species, which, along with *Caprella dilatata* Krøyer, 1843 were formerly considered as one under the ‘acutifrons’ complex.

Although the review of Foster, Thomas, et al. (2004) suggests the presence of this species in the northern region of the Gulf of Mexico, those authors along with LeCroy et al. (2009) overlooked the Texas coast record of Shirley (1974) reporting *C. andreae* found on the carapace of the loggerhead sea turtle *Caretta caretta*. Thus, *C. andreae* has not been recorded in the Gulf of Mexico during the last 39 years.

Caprella danilevskii Czerniavski, 1868

Caprella Danilevskii Czerniavski, 1868: 92, pl. 6, figs 21–34. Mayer, 1890: 58, pl. 5, fig. 44, pl. 7, figs 12, 13.

Caprella Danilevskii Chevreux and Fage, 1925: 454, fig. 432.

Caprella danilevskii McCain, 1968: 22–25, figs 10, 11. McCain and Steinberg, 1970; Cavedini, 1982; Gable and Lazo-Wasem, 1987; Krapp-Schickel, 1993: 779, fig. 531. Guerra-García and Takeuchi, 2002: 683–684, fig. 6. Ortiz et al., 2002, fig. 20. Guerra-García, 2004: 28–30, fig. 24. Guerra-García and Takeuchi, 2004: 1005–1007, figs 28, 29. Diaz et al., 2005: 3–4, 12, fig. 3. Guerra-García, 2006: 442, fig. 41. Winfield, Escobar-Briones, et al., 2007: 44, fig. 13.

Type locality

Black Sea.

Distribution

Mediterranean; South Africa; South Arabia coast; Bermuda; Venezuela; Brazil; Hawaii; northeastern Pacific; Australia (McCain and Steinberg 1970; Krapp-Schickel 1993; Guerra-García 2004; Diaz et al. 2005).

Records in the Gulf of Mexico

MEX: Mexican ridges at southwest (Winfield et al. 2006). USA: Loggerhead Key (McCain 1968).

Habitat

Caprella danilevskii has been found on algae, seagrasses, sponges, tunicates, bryozoans (McCain 1968), clinging on different species of algae along the coast of Ceuta, North Africa with high hydrodynamics (Guerra-García 2001), as well as on algae of the Caribbean coastlines of Venezuela and Colombia (Díaz et al. 2005; Guerra-García, Krapp-Schickel, et al. 2006). The depth range reported is shallow water extending to 2620 m (Winfield et al. 2006; Winfield, Escobar-Briones, et al. 2007; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

According to McCain (1968) and Guerra-García (2006), *C. danilevskii* is easily distinguished from the other species of *Caprella* by its elongate gills with long axis parallel to body, the distinctive male abdomen with a pair of appendages hooked distally, the absence of grasping spine in the pereopods, and the short dactylus on the male ganathopod 2.

Caprella danilevskii has been studied in detail, especially its life history (Takeuchi and Hirano 1991, 1992) and the toxic effects of tributyltin (Takeuchi et al. 2001; Ohji et al. 2004).

***Caprella equilibra* Say, 1818**
(Figure 2)

Caprella equilibra Say, 1818; Steinberg and Dougherty, 1957: 273–274, figs 1, 2.

McCain, 1968: 25–30, figs 12, 13. McCain and Steinberg, 1970; Cavedini, 1982; Lazo-Wasem and Gable, 1987: 335–336, fig. 10. Krapp-Schickel, 1993: 782–783, fig. 533. Serejo, 1998; Ortiz et al., 2002, fig. 21. Foster, Thomas, et al., 2004: 162, 167–168, fig. 7. Díaz et al., 2005: 3–4, fig. 4. Winfield, Escobar-Briones, et al., 2007: 44, fig. 14. Guerra-García and Ros, 2012: 76–78, fig. 2.

Caprella aequilibrata Mayer, 1882: 45, pl. 1, fig. 7, pl. 2, figs 1–11, pl. 4, figs 20–25, pl. 5, figs 16–18. Chevreux and Fage, 1925: 455, fig. 433.

Caprella bermudica Kunkel, 1910: 108–110, fig. 42. Lazo-Wasem and Gable, 1987: 335–336, fig. 10.

Material examined

Station 33, two males, six females, two juveniles (one male and one female from this station used for figures), BRTC 2–9489.

Type locality

Charleston, South Carolina.

Distribution

Cosmopolitan (McCain 1968; Krapp-Schickel 1993).

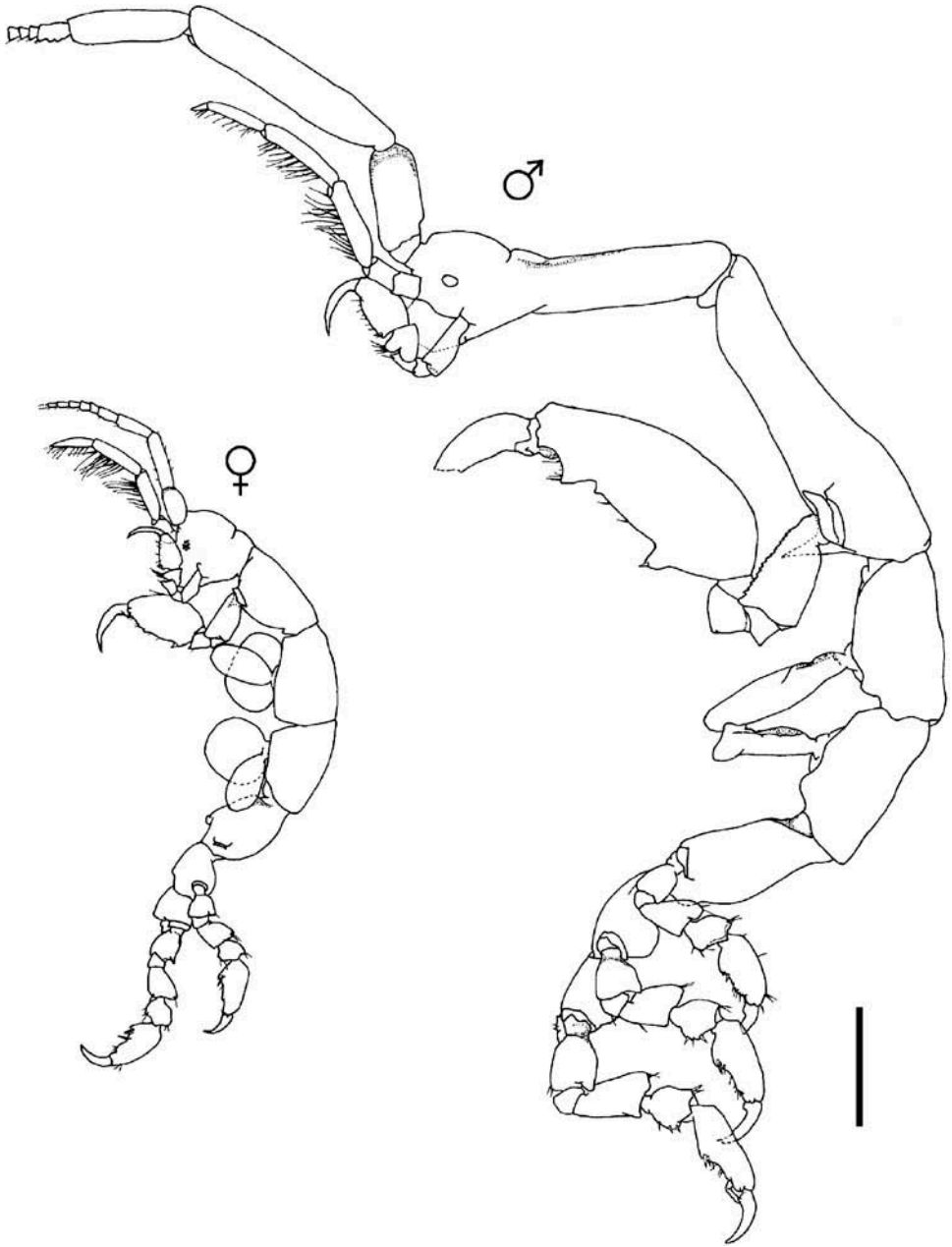


Figure 2. *Caprella equilibra* Say, 1818. Texas, USA; BRTC 2-9489. Scale bar: 1 mm.

Records in the Gulf of Mexico

MEX: Tamaulipas and Veracruz continental shelf (Escobar-Briones and Winfield 2003); Mexican ridges and Sigsbee abyssal plain at southwest (Winfield et al. 2006).
USA: Port Aransas (Steinberg and Dougherty 1957); Port Isabel; Galveston; Grand

Isle; Panama City (McCain 1968); Louisiana Offshore (Lewbel et al. 1987); Coast of Mississippi; St Andrew Bay (Foster, Thomas, et al. 2004); Port Aransas Offshore (present study).

Habitat

Caprella equilibra has been found on seagrasses, green and red algae, sponges, hydroids, alcyonarians, bryozoans, gorgonians, and ascidians (McCain 1968; Gable and Lazo-Wasem 1987; Alarcón-Ortega et al. 2012). It has also been found in plankton samples, artificial substrata (Lewbel et al. 1987; Takeuchi and Sawamoto 1998; present study) and on the carapace of the loggerhead sea turtle *Caretta caretta* (Caine 1986). The depth range reported is shallow water extending to 3700 m (Winfield et al. 2006; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

In the Gulf of Mexico, *C. equilibra* is similar to *C. danilevskii* because both lack a cephalic spine. However, these species can be easily separated because *C. equilibra* has a ventral spine between the bases of the second gnathopod, whereas *C. danilevskii* does not.

A recent morphological study of *C. equilibra* in southern Spain has revealed intraspecific variation in the female abdomen, even within the same population (Guerra-García and Ros 2012). According to the diagnosis of the genus *Caprella* by McCain (1968), the abdomen of males is provided with a pair of uni- or bi-articulate appendages and a pair of lobes; females only have the pair of lobes and lack appendages. However, a few females of *C. equilibra* found in southern Spain were provided with abdominal appendages. The study provided evidence supporting the idea that the abdominal appendage is a polymorphic and symplesiomorphic character in *Caprella* and *Metacaprella* Mayer, 1903 (another genus with the same morphological variation), and that *Metacaprella* is not a valid genus (Guerra-García and Ros 2012).

Caprella penantis Leach, 1814 (Figure 3)

Caprella Penantis Leach, 1814: 404.

Caprella acutifrons Mayer, 1882, 1890: 50, pl. 2, figs 36, 37, 39–41, pl. 4, figs 52, 53, 55, 57–61, 65–69; including the ‘forms’ neglecta, tabida, gibbosa, carolinensis, lusitanica, virginica.

Caprella geometrica Say, 1818; Pearse, 1912; McCain, 1965: 194–196, figs 1e, g, 2a–f.

Caprella carolinensis Steinberg and Dougherty, 1957: 270–273, figs 3–7.

Caprella penantis McCain, 1968: 33–40, figs 15, 16. McCain and Steinberg, 1970; Cavedini, 1982; Krapp-Schickel, 1993; Guerra-García and Takeuchi, 2002: 692–693, fig. 12. Ortiz et al., 2002: fig. 23. Foster, Thomas, et al., 2004: 162, 171–172, fig. 10. Guerra-García, 2004: 30, fig. 26. Guerra-García and Takeuchi, 2004: 1013–1015, fig. 35. Diaz et al., 2005: 3–4, fig. 5. Guerra-García, 2006: 442, fig. 42. Guerra-García, Krapp-Schickel, et al., 2006: 153–157, figs 2–4. Winfield, Escobar-Briones, et al., 2007: 44, fig. 12. Guerra-García and Lowry, 2009: 293–294, fig. 2. Rodríguez-Almaras and Ortega-Vidales, 2013: 990, fig. 3.

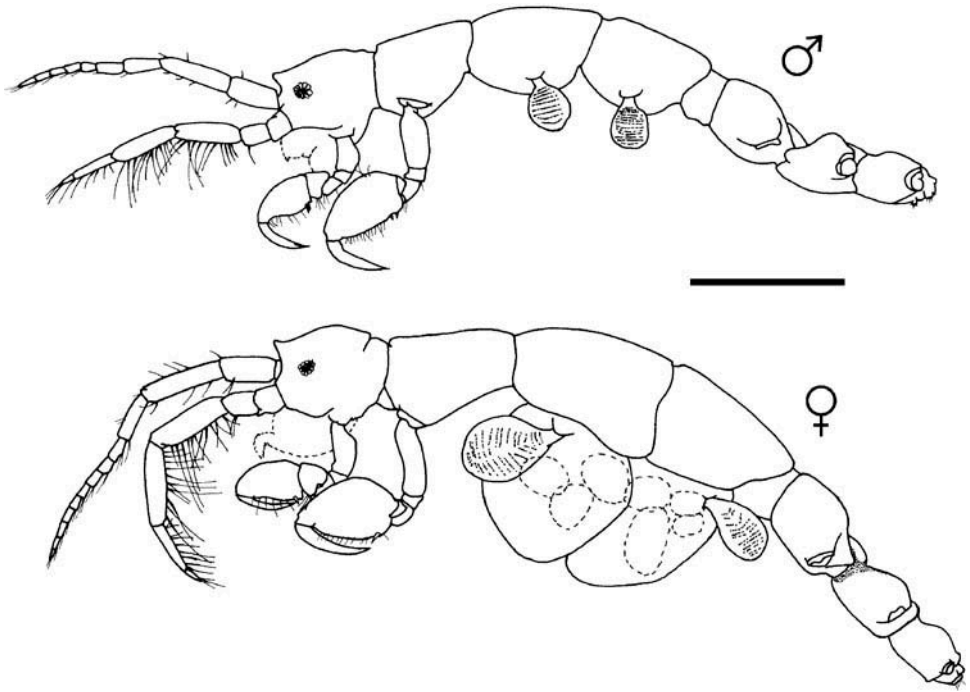


Figure 3. *Caprella penantis* Leach, 1814. Texas, USA; BRTC 2–9108. Scale bar: 1 mm.

Material examined

Station 32, two males, two females (one ovigerous; one male juvenile and one female from this station used for figures), BRTC 2–9108.

Type locality

Devonshire coast, UK.

Distribution

Atlantic Ocean; Indian Ocean; Pacific Ocean; Mediterranean (Guerra-García and Lowry 2009).

Records in the Gulf of Mexico

MEX: Alvarado Lagoon (Cházaro-Olvera et al. 2002); Sigsbee abyssal plain at southwest (Winfield et al. 2006); Laguna Madre (Rodríguez-Almaras and Ortega-Vidales 2013). USA: Strait of Florida (Pearse 1912); Port Isabel; Port Aransas; Alligator Harbor (Steinberg and Dougherty 1957); Galveston; Freeport; Ocean Springs; Destin; Panama City; St Georges; Apalachee Bay; Dunedin; Tampa Bay; Sarasota Bay; Key West (McCain 1968); Brazos Santiago Pass (present study).

Habitat

Caprella penantis obtains its food primarily by filter-feeding and scraping, and detritus is the dominant stomach content in this species (Caine 1974). This species has been found living in a great diversity of substrata, e.g. red and brown algae, seagrasses, sponges, hydroids, tunicates, bryozoans, echinoids (McCain 1968), intertidal exposed areas, highly hydrodynamic areas, clinging on algae (Guerra-García 2001), gorgonaceans, *Caulerpa* sp. beds (Guerra-García 2004), mussels (Diaz et al. 2005), hydroid *Cnidoscypus* sp. (Guerra-García, Krapp-Schickel, et al. 2006), and muddy bottoms (Winfield et al. 2006). The depth range reported is shallow water extending to 3700 m (Winfield et al. 2006; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

Caprella penantis is probably a complex of different species in which it is difficult to understand if the morphological variation is intra- or interspecific (Guerra-García, Redondo-Gómez, et al. 2006). To solve this taxonomic problem, Cabezas et al. (2010) used random amplified polymorphic DNA analysis indicating that the specimens of several populations around the world (Spain, Portugal, Morocco, Japan and Brazil) of *C. penantis* could belong to the same species, in spite of morphological variations. However, molecular analysis based on mitochondrial DNA seems to reveal that it is effectively a complex of cryptic species (Cabezas, Cabezas, et al. 2013).

***Caprella scaura* Templeton, 1836**
(Figure 4)

Caprella scaura Templeton, 1836: 191–192, pl. 20, fig. 6. Mayer, 1890: 70–74, pl. 4, figs 40–51, pl. 6, fig. 41, pl. 7, figs 2, 35, 36. Mayer, 1903: 117–120, pl. 5, figs 13–18, pl. 10, fig. 11. McCain, 1968: 40–44, figs 17, 18. Arimoto, 1976; Ortiz et al., 2002, fig. 24. Guerra-García, 2003c: 4–5, fig. 2. Guerra-García and Takeuchi, 2003: 161–163, fig. 7. Foster, Heard, et al., 2004: 65, 67, figs 1, 2. Foster, Thomas, et al., 2004: 162, 170, fig. 8. Guerra-García, 2004: 31–34, fig. 27. Krapp et al., 2006: 2–4, figs 1–12. Rodríguez-Almaras and Ortega-Vidales, 2013: 989–990, fig. 2.

Caprella nodosa Templeton, 1836: 191–192, pl. 21, fig. 7.

Caprella cornuta Dana, 1853: 816–817.

Caprella attenuata Dana, 1853: 817–819.

Type locality

Rivière Noire, Mauritius.

Distribution

Atlantic Ocean; Indian Ocean; Pacific Ocean; Mediterranean (Guerra-García and Takeuchi 2003; Krapp et al. 2006; Guerra-García et al. 2011).

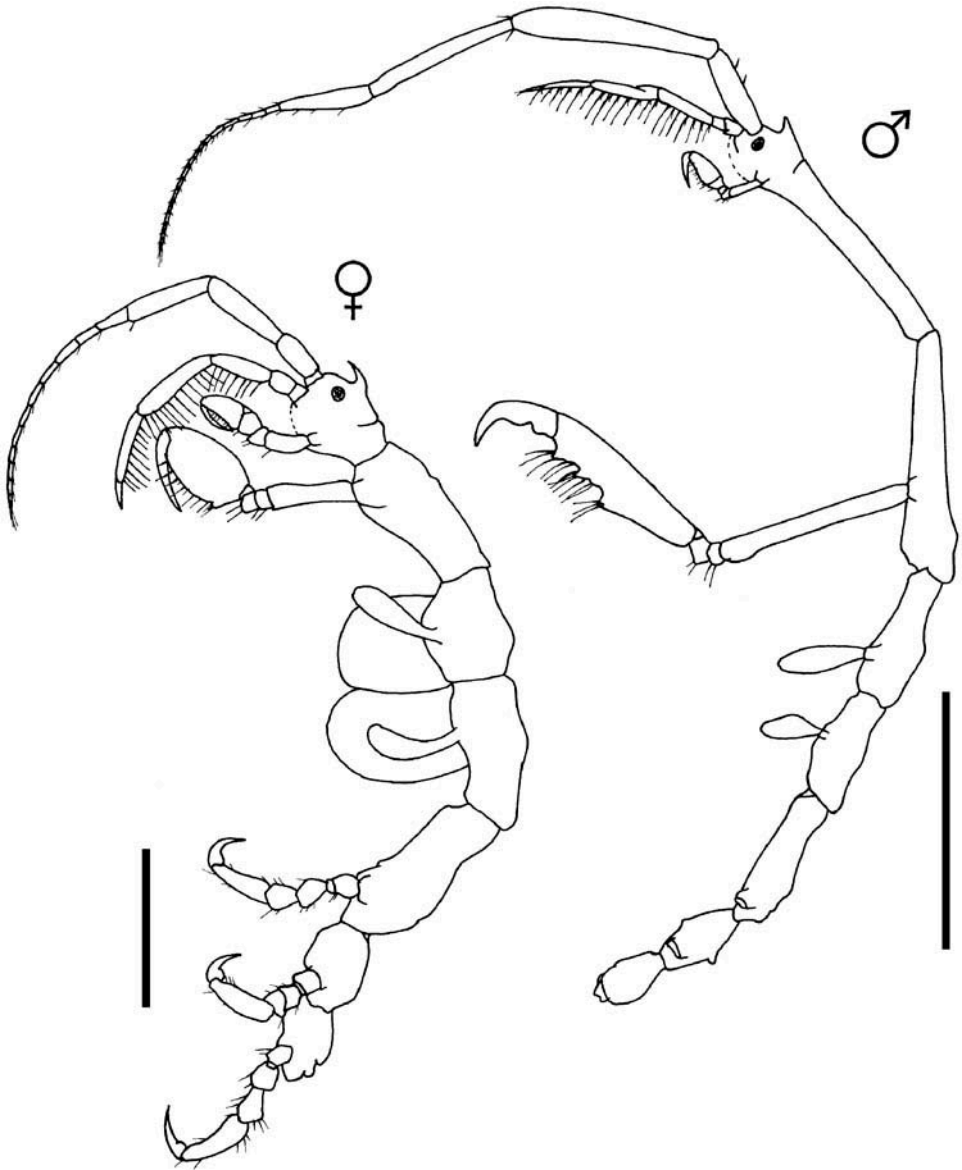


Figure 4. *Caprella scaura* Templeton, 1836. Tamaulipas, Mexico; FCB-UANL C325-06316. Refigured from Rodríguez-Almaras and Ortega-Vidales (2013). Scale bar for male: 2.2 mm; scale bar for female: 1.1 mm.

Records in the Gulf of Mexico

MEX: Laguna Madre (Rodríguez-Almaras and Ortega-Vidales 2013). USA: St. Andrew Bay (Foster, Heard, et al. 2004; Foster, Thomas, et al. 2004); Aransas Bay (Ahrens and Grubbs 2012).

Habitat

Caprella scaura has been recorded from bryozoans, seagrasses (Lim and Alexander 1986; Takeuchi and Hino 1997; Guerra-García and Takeuchi 2003), sponges (Serejo 1998), and seaweeds (Guerra-García and Thiel 2001). In general, this species occurs on a wide variety of substrata indicating no specific habitat selection, see Guerra-García (2003c) and Guerra-García and Takeuchi (2003) for lists of substrata. In the Gulf of Mexico this species has been found on rocks associated with algae, seagrasses, hydroids, bryozoans, barnacles and fouling organisms (Foster, Heard, et al. 2004; Ahrens and Grubbs 2012; Rodríguez-Almaras and Ortega-Vidales 2013). The depth range reported is 0–17 m (LeCroy et al. 2009).

Remarks

This caprellid is a species with complicated taxonomy, which shows wide morphological variation. Krapp et al. (2006) suggested seven subspecies of *C. scaura*; of these subspecies, five lack a ventral spine on pereonite 2 and the remaining two have a ventral spine on pereonite 2. After a detailed description by Takeuchi and Oyamada (2013), one of those subspecies with a ventral spine (*C. scaura scauroides* Mayer 1903) was recently elevated to species category. In the Gulf of Mexico, the acute anteriorly directed cephalic spine of *C. scaura* clearly distinguishes this species from *C. equilibra* and *C. danilevskii*, both of which are without such a spine, and from *C. andreae* and *C. penantis*, both of which possess a triangular cephalic process. To date, the complete mitochondrial genome of *C. scaura* has been determined, which will be useful for explaining the phylogeography of this species (Ito et al. 2010).

The worldwide distribution of *C. scaura* was recently revised by Guerra-García et al. (2011). These authors pointed out that *C. scaura* appears to be a strong invader, able to colonize a wide geographical range. For example, in the Gulf of Mexico there was only one record in the northern region (St Andrew Bay, Florida) by Foster, Heard, et al. (2004), but now this species has been recorded in another northern location (Aransas Bay, Texas) by Ahrens and Grubbs (2012) and in the southern region (Laguna Madre, Tamaulipas) by Rodríguez-Almaras and Ortega-Vidales (2013). These records from the Gulf of Mexico support a model of invasion worldwide.

Deutella californica Mayer, 1890

Deutella californica Mayer, 1890: 27–28, pl. 1, figs 3, 4, pl. 3, figs 15, 16, pl. 5, fig. 18. Dougherty and Steinberg, 1953; Steinberg and Dougherty, 1957: 279–281, figs 15, 21–23, 28. McCain, 1968: 54, fig. 52. McCain and Steinberg, 1970; Laubitz, 1970: 16–18, figs 3, 26. Martin, 1977; Ortiz et al., 2002, fig. 28. Guerra-García, 2003b: 1062, fig. 2. Winfield, Escobar-Briones, et al., 2007: 47, fig. 17.

Type locality

Cape Mendocino, California.

Distribution

Northeastern Pacific (Guerra-García 2003b); Gulf of Mexico (LeCroy et al. 2009).

Records in the Gulf of Mexico

MEX: Tamaulipas continental shelf (Escobar-Briones and Winfield 2003); Laguna Madre (Barba and Sánchez 2005); Bay of Campeche at southwest (Winfield, Escobar-Briones, et al. 2007).

Habitat

Deutella californica has been reported on seagrasses and hydroids with a mainly predatory feeding mode (Caine 1980); on the hydroid *Obelia dichotoma*, on the carapace and legs of the sheep crab *Loxorhynchus grandis*, on algae, bryozoans, compound ascidians, flat fine sand, sandstone, shale bedrock and the tentacular radioles of the polychaete worm *Eudistylia polymorpha* (Martin 1977; Guerra-García 2003b). The depth range reported is shallow water extending to 25 m (Dougherty and Steinberg 1953; LeCroy et al. 2009).

Remarks

According to Guerra-García (2003b) the shape of the gnathopod 2 propodus in males is the best characteristic to differentiate this species from among the remaining species of *Deutella*. It is characterized by having a propodus nearly rectangular, palmar surface with proximal grasping spine, and a medial poison spine separated from the distal portion by a deep cleft; the palmar and distal portion of the propodus bear long hair-like setae (Laubitz 1970).

There was one record for *D. californica* in the Gulf of Mexico (Port Aransas, Texas) by Steinberg and Dougherty (1957), however it was considered doubtful by McCain (1968) and Laubitz (1970). Subsequently, the species was not reported for a long time (46 years) in the Gulf of Mexico. To date this species has only been recorded in the southern region of the Gulf basin. Unfortunately no specimens of this species could be located for comparative purposes. The record in Escobar-Briones and Winfield (2003) is based on one unsexed specimen without illustrations from a bachelor's degree thesis (Borja 1998 cited in Escobar-Briones and Winfield 2003) and the current deposition of this specimen is unknown. Likewise, the deposition of specimens in Barba and Sánchez (2005) is unknown (E Barba, pers. comm.). Finally, the first author has inquired in the CNCR (the place where the material of Winfield, Escobar-Briones, et al. 2007 is housed), but there are no voucher specimens of this species deposited there.

***Deutella incerta* (Mayer 1903)**
(Figure 5)

Luconacia incerta Mayer, 1903: 49–50, pl. 2, figs 11–14, pl. 6, figs 73–75, pl. 9, figs 21, 40, 57. McCain, 1968: 53–54, 68–72, figs 33–35. McCain and Steinberg, 1970: 53. *Protellopsis stebbingii* Pearse, 1908: 30–32, fig. 4; 1912: 379. Kunkel, 1910: 111–113, fig. 43.

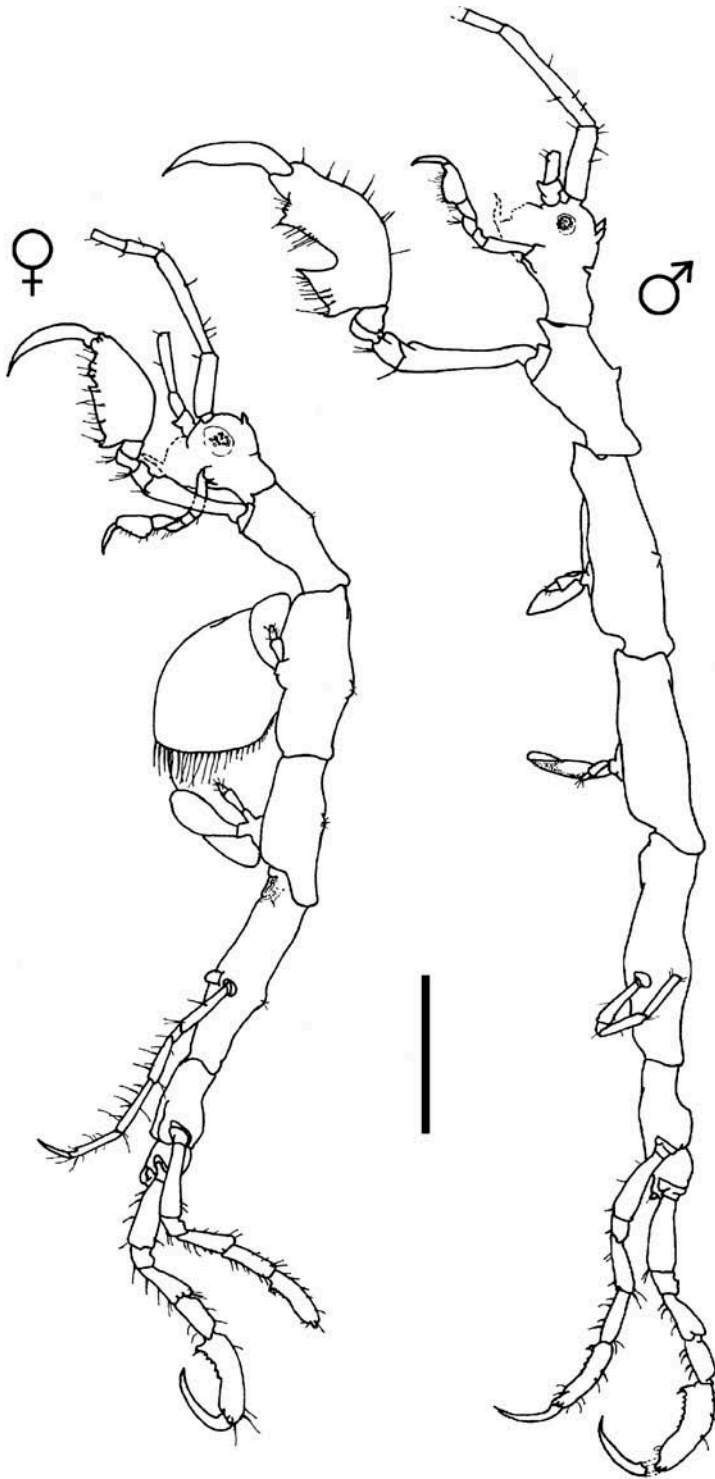


Figure 5. *Deutella incerta* (Mayer 1903). Yucatan, Mexico; CYMX-10-CY. Scale bar: 1 mm.

Deutella incerta Steinberg and Dougherty, 1957; Gable and Lazo-Wasem, 1987: 635–636, fig. 4. Ortiz et al., 2002, fig. 29. Guerra-García, 2003b: 1062–1065, fig. 3. Foster, Thomas, et al., 2004: 162–164, fig. 4. Diaz et al., 2005: 3–5, 15, fig. 6. Guerra-García, Krapp-Schickel, et al., 2006: 164–168, figs 9–11. Winfield, Escobar-Briones, et al., 2007: 47, fig. 18.

Material examined

Station 1, three ovigerous females, CYMX-1-CY. Station 2, one male, one female, CYMX-2-CY. Station 3, three males, one juvenile, CYMX-3-CY. Station 4, two males, three females, CYMX-4-CY. Station 5, two males, two females (one ovigerous), CYMX-5-CY. Station 6, two males, two females (one ovigerous), CYMX-6-CY. Station 7, one ovigerous female, CYMX-7-CY. Station 13, nine males, three ovigerous females, CYMX-8-CY. Station 14, one male, CYMX-9-CY. Station 15, two males, two females (one male and one female from this station used for figures), CYMX-10-CY. Station 10, four males, two ovigerous females, 28 November 2010, CYMX-20-CY. Station 17, two males, two ovigerous females, CYMX-22-CY. Station 19, two ovigerous females, CYMX-23-CY. Station 29, three females, CYMX-49-CY. Station 30, one male, one female, CYMX-50-CY.

Type locality

Off Mobile Bay, Alabama.

Distribution

Northwestern Atlantic; Gulf of Mexico; Caribbean Sea (McCain 1968; Oliva-Rivera 2003; Foster, Thomas, et al. 2004; Diaz et al. 2005; Ortiz and Lalana 2010).

Records in the Gulf of Mexico

MEX: Yalahau Lagoon (Oliva-Rivera and Jiménez-Cueto 1997; present study); Campeche Sound (Winfield et al. 2006); Celestun; Progreso; Dzilam Bravo; Rio Lagartos; El Cuyo; Cabo Catoche (present study). USA: Mississippi-Alabama continental shelf (Mayer 1903); Strait of Florida (Pearse 1908); between Delta of the Mississippi River and Cedar Key (Pearse 1912); Alligator Harbor (Steinberg and Dougherty 1957); Port Isabel; Puerto Aransas; Mobile Bay; Tampa Bay, Key Largo (McCain 1968); St Andrew Bay; St Joseph Bay (Foster, Thomas, et al. 2004).

Habitat

Deutella incerta shows predatory habits to obtain its food; however, detritus is the dominant stomach content reported (Caine 1974). This species is widely distributed in the temperate and tropical areas of the western North Atlantic (McCain 1968), and has been collected on mangrove roots, *Sargassum* sp., *Thalassia* sp., sponges, hydroids, alcyonarians, ascidians, coral rubble, sandy bottom, detritus and it has occasionally been taken in plankton tows (Guerra-García 2003b; Oliva-Rivera 2003; Diaz et al. 2005; Guerra-García, Krapp-Schickel, et al. 2006). The depth range reported is shallow water extending to 1470 m (Winfield et al. 2006; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

Steinberg and Dougherty (1957) synonymized the monotypic *Luconacia* of Mayer (1903) with *Deutella*, transferring *L. incerta* to *Deutella*. McCain (1968) re-established *Luconacia* and claimed several important differences between the genera. Finally Gable and Lazo-Wasem (1987) described a transitional species (*Deutella aspiducha* Gable and Lazo-Wasem 1987) that allowed them to re-unite *Deutella* and *Luconacia*, which was later supported by Guerra-García (2003b).

McCain (1968) did not mention the record of *D. incerta* to Tampa Bay, although it is represented in his map. Thereby it is assumed to be a valid record.

***Deutella mayeri* Stebbing, 1895**
(Figures 6–8)

Deutella mayeri Stebbing, 1895: 400–402, pl. 15a. Mayer, 1903: 44–45. McCain, 1968: 54–57, figs 25, 26, 52. McCain and Steinberg, 1970: 48. Ortiz et al., 2002, fig. 30. Guerra-García, 2003b: 1070–1071, fig. 8. Guerra-García, Krapp-Schickel, et al., 2006: 168–171, figs 12, 13.

Material examined

Station 10, two males (one male from this station used for figures, male A; the other male used for figure Gn2", male B), 17 September 2007, CYMX-11-CY. Station 21, one male, 21 May 2010, CYMX-28-CY. Station 23, one male, two females (1 ovigerous), 22 May 2010, CYMX-29-CY; one male, two females, 21 July 2010, CYMX-39-CY. Station 24, one male, 18 May 2010, CYMX-27-CY; one male, 18 June 2010, CYMX-30-CY. Station 27, one male (gnathopod 2 used for figure Gn2', male C), three females (two ovigerous; one female from this station used for figures), CYMX-34-CY.

Type locality

Antigua, West Indies.

Distribution

Gulf of Mexico; Caribbean Sea (McCain 1968; Ortiz and Lalana 1996, 2010; Guerra-García 2003b; Guerra-García, Krapp-Schickel, et al. 2006).

Records in the Gulf of Mexico

MEX: Celestun; Celestun Offshore; Sisal Offshore (present study). USA: Southwestern Florida (Guerra-García 2003b).

Habitat

This species has been found clinging on *Thalassia* sp., hydroids, algae (Guerra-García, Krapp-Schickel, et al. 2006) and on sandy bottoms from coral reef areas as

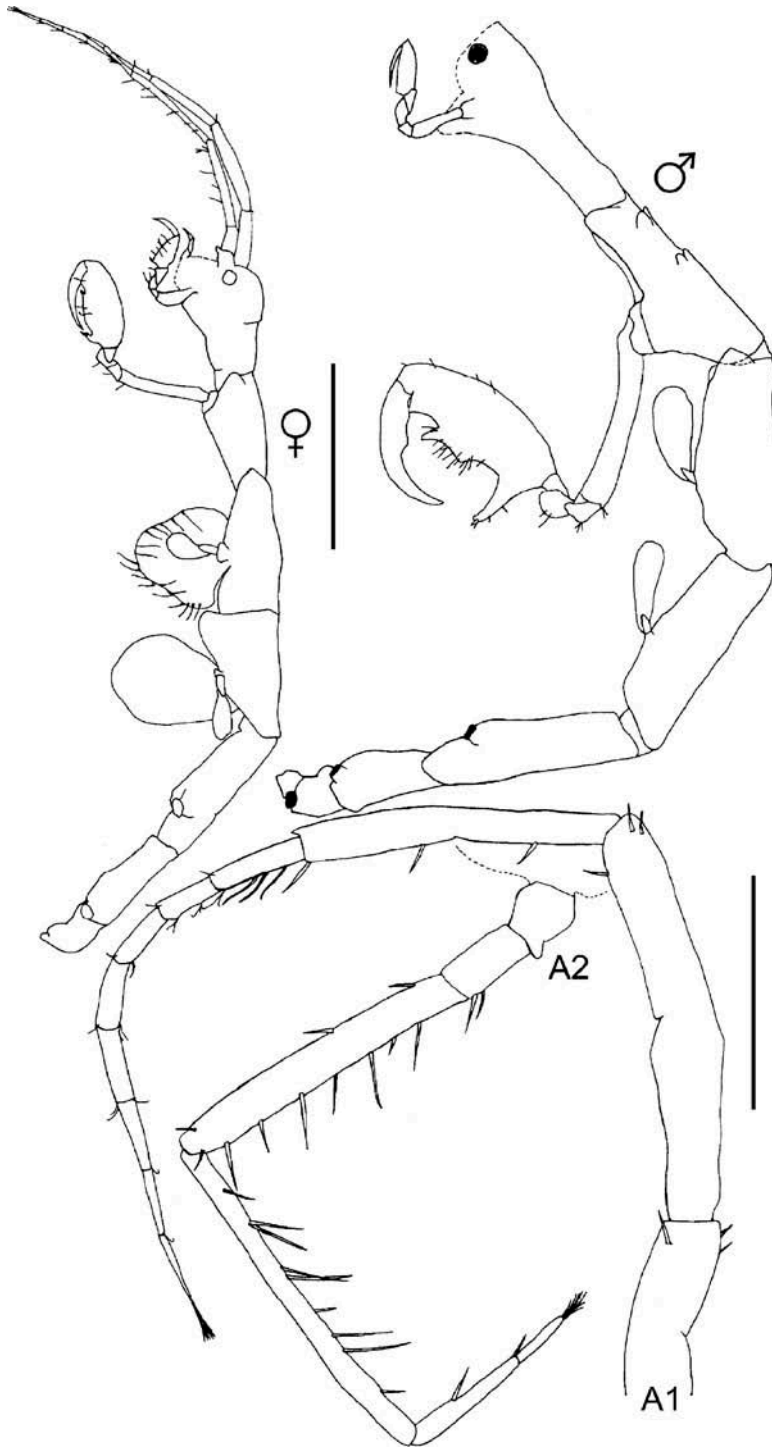


Figure 6. *Deutella mayeri* Stebbing, 1895. Yucatan, Mexico; male A, CYMX-11-CY; female, CYMX-34-CY. Scale bar for A1 and A2: 0.5 mm; scale bar for male A and female: 1 mm.

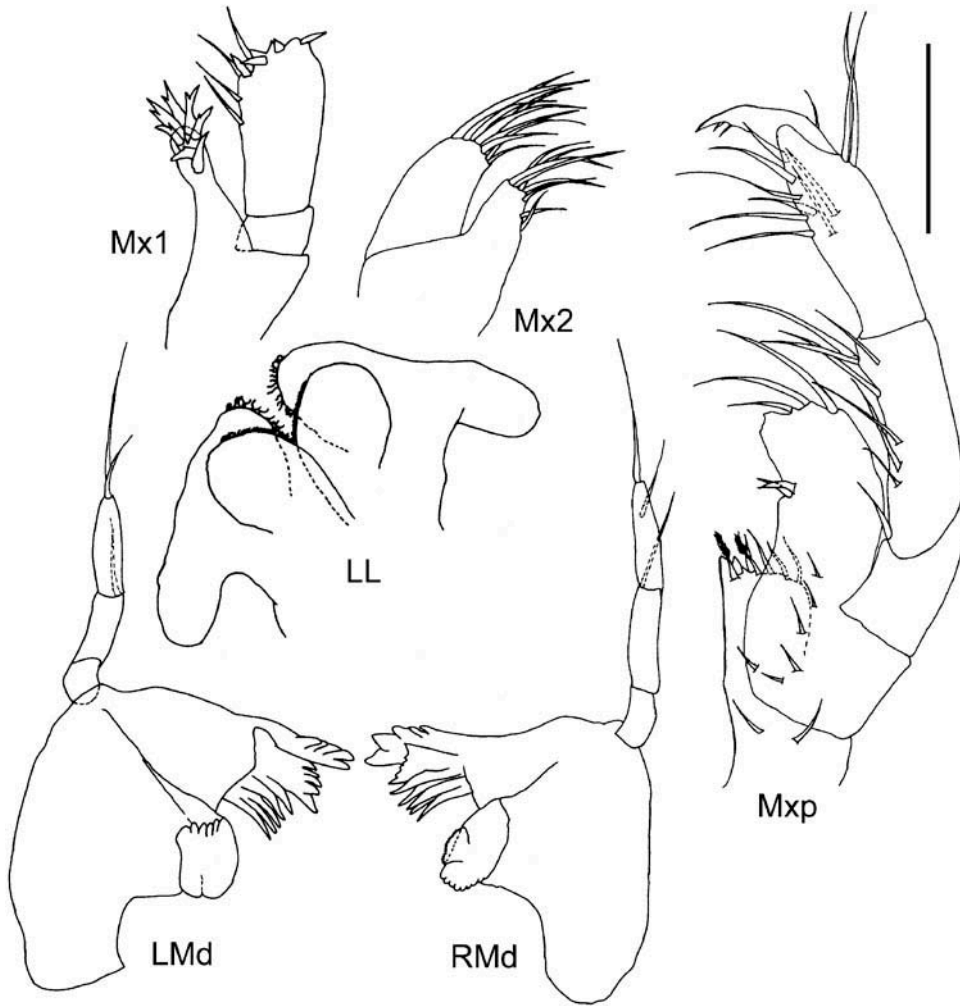


Figure 7. *Deutella mayeri* Stebbing, 1895. Yucatan, Mexico; male A, CYMX-11-CY. Scale bar: 0.1 mm.

well as on muddy sediment from the coast (present study). The depth range is 1–18 m (Guerra-García 2003b; present study).

Ontogenetic development

The main feature to distinguish this species easily from the remaining species of *Deutella* is in the striking propodus of gnathopod 2 in males: it has a triangular elongate process proximally provided with a grasping spine (Guerra-García 2003b). Regarding that, Guerra-García, Krapp-Schickel, et al. (2006) illustrated the morphological variation in the propodus of gnathopod 2 in the male of *D. mayeri* during its development. In the present study, though only a few

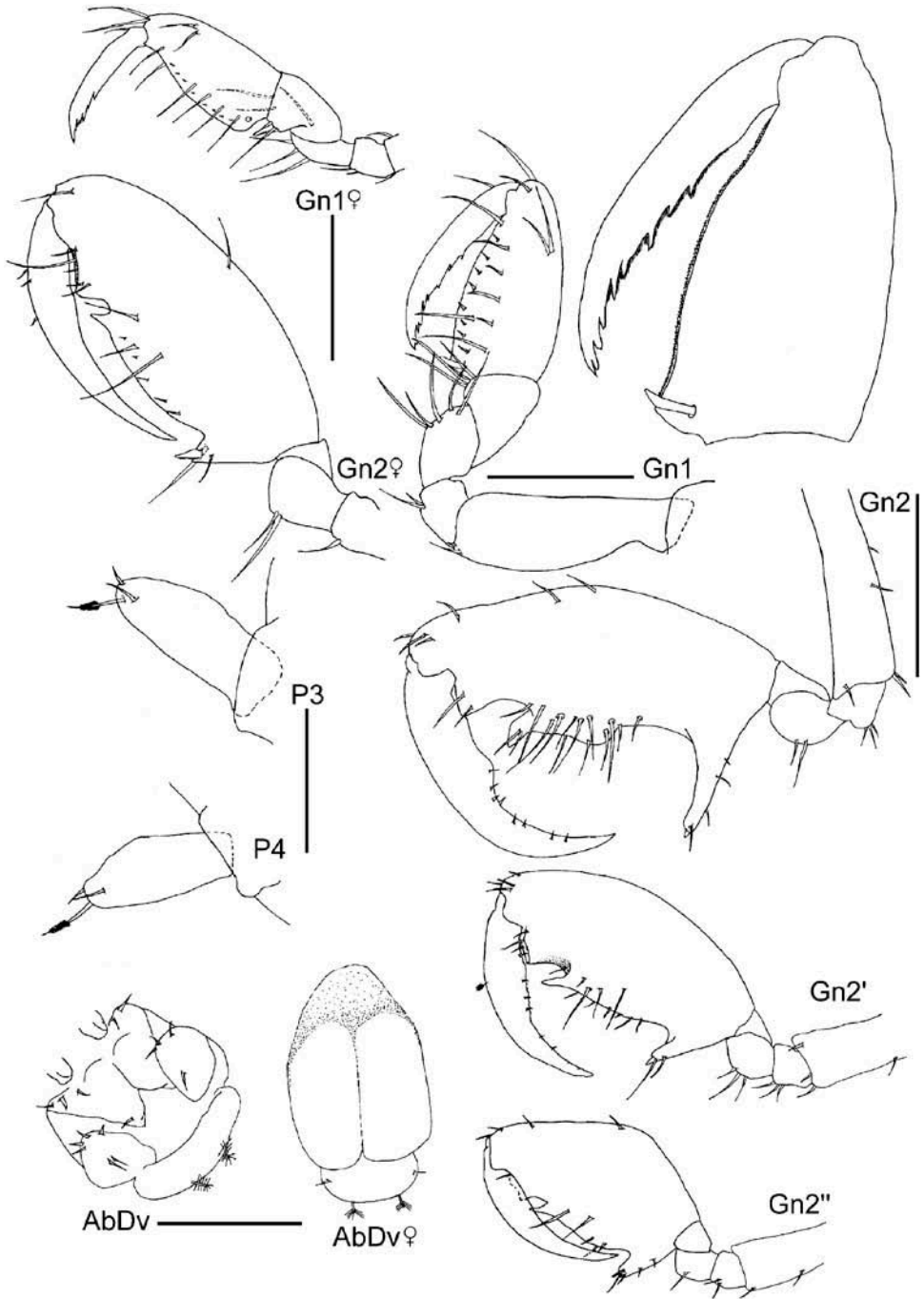


Figure 8. *Deutella mayeri* Stebbing, 1895. Yucatan, Mexico; male A and male B, CYMX-11-CY; male C and female, CYMX-34-CY. Scale bars for P3, P4, AbDv and AbDv of female: 0.1 mm; scale bars for Gn1, Gn1 of female and Gn2 of female: 0.2 mm; scale bar for Gn2 of male A, Gn2' of male C and Gn2'' of male B: 0.5 mm.

specimens were examined, the morphological variation of gnathopod 2 was also observed. In fact, the propodus of the male specimen is stouter and larger than those illustrated by McCain (1968); Guerra-García (2003b) and Guerra-García, Krapp-Schickel, et al. (2006), suggesting a final stage of development, a super-adult. Furthermore, based on the material examined, the morphological variation during the development of *D. mayeri* can also be noticed on the anterolateral projection of pereonites 2 and 3 (rounded when superadult instead of triangular when juvenile or adult), and dorsal surface of pereonite 2 (two pairs of tubercles when superadult instead of smooth when juvenile or adult).

Other morphological characters that also varied with development, and which contrast with the descriptions and observations of McCain (1968) and Guerra-García (2003b) were displayed in the mouthparts, specifically in the maxilla 1–2, and maxilliped. Outer lobe of maxilla 1 bearing seven distal spines (new range: 4–7). Outer lobe of maxilla 2 with nine apical setae (new range: 5–9); inner lobe with eight apical setae (new range: 4–8). Inner plate of maxilliped with 3–7 apical setae of which 1–4 robust and 2–3 plumose, and one robust, short seta like a ‘tooth’.

Remarks

A characteristic observed in the material examined and not reported before for *D. mayeri* was the uni-articulate pereopod 3 and 4. Usually these pereopods have been described and illustrated with two articles, therefore the present material denotes intraspecific variation in *D. mayeri*.

The male of *D. mayeri* is similar to that of *Deutella indica* Guerra-García, 2002c by the shape of gnathopod 2, but differ by the two pairs of dorsal tubercles on pereonite 2, a simple setal formula and the uni-articulate abdominal appendage. Likewise, *D. mayeri* is similar to *Deutella caribensis* Guerra-García, Krapp-Schickel, et al. 2006, *Deutella philippinensis* Guerra-García, 2002d and *Deutella venenosa* Mayer, 1890, the others species of the genus bearing one article on pereopods 3 and 4. *Deutella mayeri* differs from the first species by the head and pereonites 3 and 4 smooth, and mandibles with setal formula simple; it differs from the second species by the mandibles with setal formula simple, dorsal tubercles on pereonite 2 and male abdomen appendages uni-articulate; it differs from the third species by the head and pereonite 1 smooth, and dorsal tubercles on pereonite 2.

Reports on the occurrence of *D. mayeri* in the Gulf of Mexico have been occasional and confusing. Ortiz (1979) based on Steinberg and Dougherty (1957) included this species in a checklist of amphipods for the Gulf of Mexico and Caribbean Sea. After that, Posey et al. (1998) in an ecological study reported this species occurring on sandy sediments of the northwestern continental shelf from Florida. More recently Escobar-Briones et al. (2002) included this species in their checklist of amphipods for Mexico; however, the most recent checklist for Mexico made by Winfield (2008) did not include *D. mayeri*. In a review of the genus *Deutella*, Guerra-García (2003b) confirmed the record of *D. mayeri* in the Gulf of Mexico, which was adopted by Winfield and Ortiz (2013) in their checklist of caprellids for the Gulf of Mexico.

Hemiaegina minuta Mayer, 1890
(Figure 9)

Hemiaegina minuta Mayer, 1890: 40, pl. 1, figs 25–27, pl. 3 figs 32–35, pl. 5, figs 52, 53, pl. 6, figs 13, 33, 34, pl. 7, fig. 4. McCain, 1968: 61–64, figs 29, 30. McCain and Steinberg, 1970: 51. Gable and Lazo-Wasem, 1987: 637. Serejo, 1997: 630–632, fig. 1. Ortiz et al., 2002, fig. 32. Guerra-García, 2003c: 6–7, fig. 3; 2003d: 105–106, fig. 10. Foster, Thomas, et al., 2004: 161, 163, fig. 3. Guerra-García, 2004: 39–40, fig. 32. Diaz et al., 2005: 3, 5–6, 18, fig. 9. Krapp-Schickel and Guerra-García, 2005: 50–51, fig. 3. Guerra-García, 2006: 443, fig. 43. Guerra-García, Krapp-Schickel, et al., 2006: 171–174, figs 14–16. Winfield, Escobar-Briones, et al., 2007: 47, fig. 15. Guerra-García and Lowry, 2009: 295–297, fig. 3. Guerra-García et al., 2010: 303–304, fig. 6.

Hemiaegina quadripunctata Sundara Raj, 1927: 126, pl. 8.

Hemiaegina costai Quitete, 1972: 165–168, pls. 1, 2.

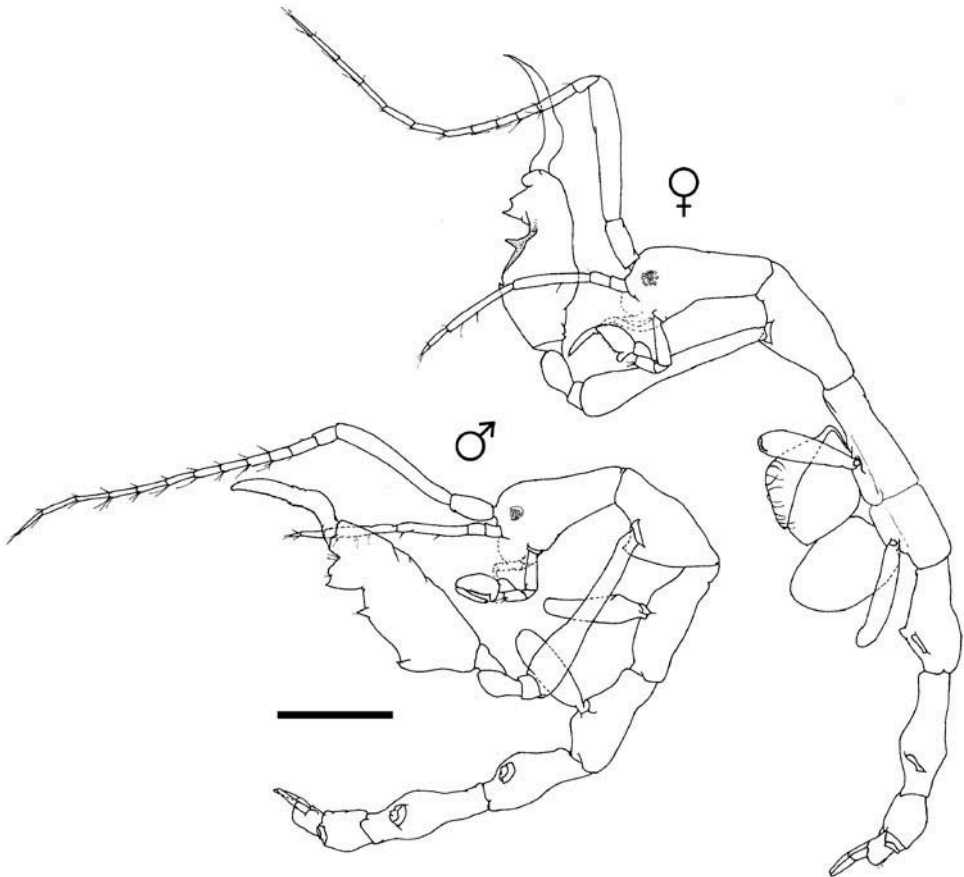


Figure 9. *Hemiaegina minuta* Mayer, 1890. Yucatan, Mexico; male, CYMX-52-CY; female, CYMX-51-CY. Scale bar: 0.5 mm.

Material examined

Station 11, 17 females (13 ovigerous), CYMX-12-CY. Station 12, six females (four ovigerous), CYMX-13-CY. Station 29, two males, four females (one female from this station used for figure), CYMX-51-CY. Station 30, one male, CYMX-52-CY (used for figure).

Type locality

Off Amoy, China.

Distribution

Widely distributed in tropical and temperate waters worldwide (McCain 1968; Guerra-García and Lowry 2009; Guerra-García et al. 2010): Indo-Pacific; West and East Atlantic; Mediterranean.

Records in the Gulf of Mexico

MEX: Campeche Sound (Winfield et al. 2006); Alacranes Reef; Cabo Catoche (present study). USA: Port Aransas (Steinberg and Dougherty 1957); off Pensacola–29°44' N, 88°25.5' W; Loggerhead Key (McCain 1968); Biloxi Bay (Pederson and Peterson 2002); St Joseph Bay (Foster, Thomas, et al. 2004).

Habitat

This species has been found on many different substrata (Guerra-García and Lowry 2009; Guerra-García et al. 2010): pelagic *Sargassum* sp., plankton tows, on the bivalve *Arca zebra*, in green, brown and red algae, sponges, tunicates, hydroids, seagrasses, dead corals encrusted with algal turf, and under small boulders. The depth range reported is shallow water extending to 354 m (Winfield et al. 2006; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

The genus is currently monotypic. *Hemiaegina minuta* is easily identified by the following characteristics: hexagonal outline of the pereonites in dorsal view, third article of antenna 1 short, antenna 2 without swimming setae, gnathopod 1 propodus with a round projection proximally, and abdomen with a distinctive pair of two-articulate appendages (McCain 1968; Guerra-García, Krapp-Schickel, et al. 2006).

***Mayerella redunca* McCain, 1968**
(Figures 10, 11)

Mayerella redunca McCain, 1968: 75–78, figs 37, 38, 50. McCain and Steinberg, 1970: 53. Guerra-García, 2003a: 189, 191, 194, figs 8, 11. Diaz et al., 2005: 3, 6, 19–20, figs 10, 11. Paz-Ríos and Ardisson, 2013: 2, fig. 1.

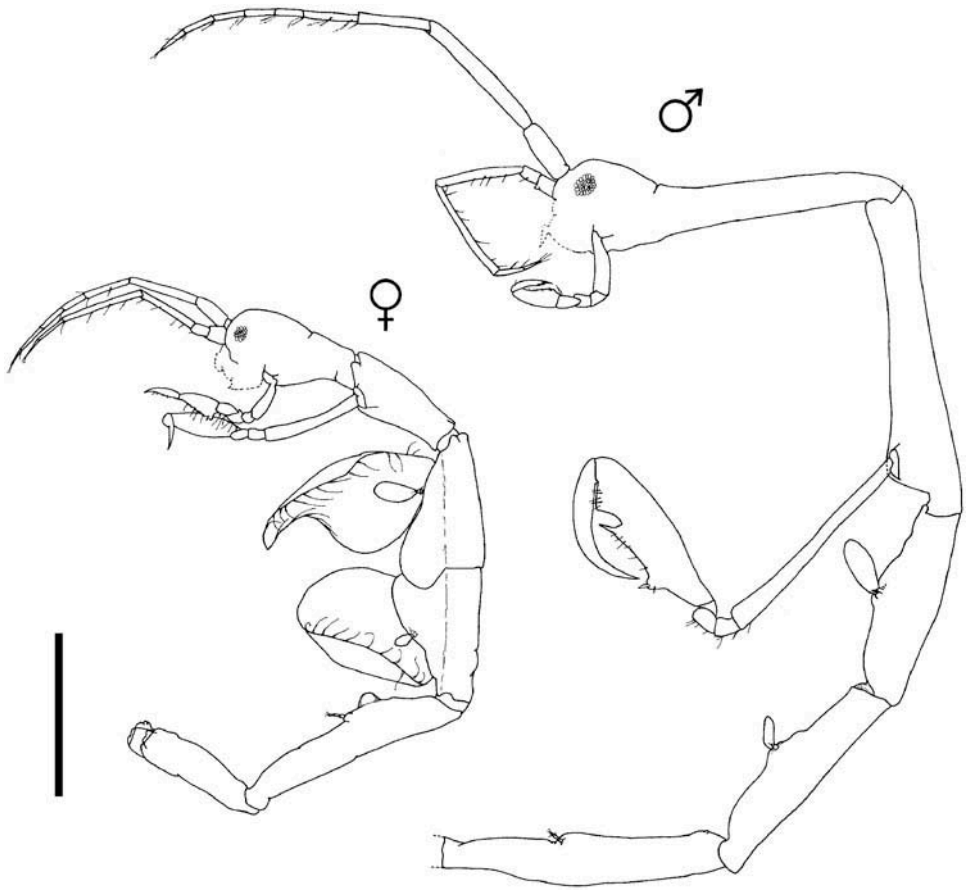


Figure 10. *Mayerella redunca* McCain, 1968. Yucatan, Mexico; male, CYMX-76-PY; female CYMX-75-PY. Scale bar: 0.5 mm.

Material examined

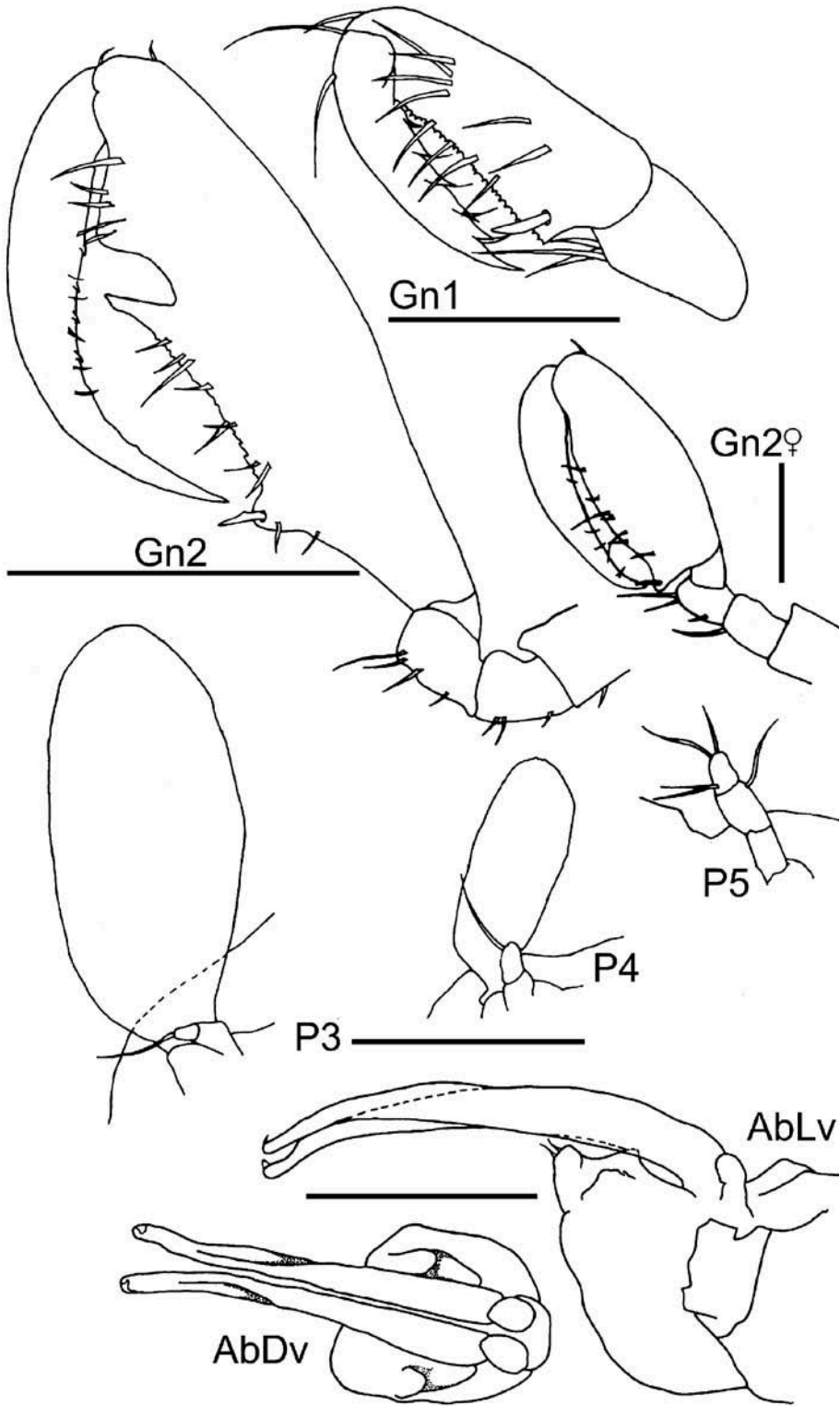
Station 8, one male, one female (female used for figures), CYMX-75-PY. Station 9, two males (one male from this station used for figures), CYMX-76-PY.

Type locality

Coche Island, Venezuela.

Distribution

Gulf of Mexico; Caribbean Sea (McCain 1968; Diaz et al. 2005; Paz-Rios and Ardisson 2013).



Records in the Gulf of Mexico

MEX: Northeastern Yucatan Shelf (Paz-Ríos and Ardisson 2013). USA: off Louisiana (LGL Ecological Research Associates Inc., and Texas AandM University 1986).

Habitat

This species has been collected in plankton samples and on sandy sediments (Diaz et al. 2005; Paz-Ríos and Ardisson 2013). The depth range reported is intertidal zone extending to 320 m (Paz-Ríos and Ardisson 2013).

Remarks

According to a review of the genus *Mayerella* by Guerra-García (2003a), the primary diagnostic characteristics of male *M. reduunca* are: dactylus of gnathopod 2 slightly curved, shorter than propodus, and abdomen with appendages elongated and curved apically.

This species has been collected rarely; only three records from the Gulf of Mexico have been reported since its original description in the Caribbean Sea (Paz-Ríos and Ardisson 2013).

***Metaprotella hummelincki* McCain, 1968**
(Figures 12–15)

Metaprotella spec. Mayer, 1903: 43.

Metaprotella hummelincki McCain, 1968: 78–82, figs 39, 40. Ortiz et al., 2002, fig. 36.

Material examined

Station 10, 29 males (six males from this station used for figures), 52 females (34 ovigerous; one female from this station used for figures), 17 September 2007, CYMX-14-CY. Station 21, one ovigerous female, 30 August 2010, CYMX-44-CY. Station 22, two females, two juveniles, 21 July 2010, CYMX-38-CY; two juveniles, 28 September 2010, CYMX-45-CY. Station 23, one ovigerous female, one juvenile, 21 July 2010, CYMX-40-CY. Station 24, one juvenile, two ovigerous females, 16 April 2010, CYMX-26-CY. Station 26, one ovigerous female, 19 June 2010, CYMX-33-CY; one ovigerous female, 26 July 2010, CYMX-42-CY. Station 27, four males (one male from this station used for figures), five ovigerous females, CYMX-35-CY. Station 28, three males, five females, three juveniles, 8 July 2013, CYMX-48-CY.

Redescription

Mature male, body length 8.5 mm, CYMX-35-CY. Body with tubercles on the head, pereonites 2–4, and the proximal lateral surface of pereonite 5; suture between head

Figure 11. *Mayerella reduunca* McCain, 1968. Yucatan, Mexico; male, CYMX-76-PY; female CYMX-75-PY. Scale bars for Gn1, Gn2 of female, P3, P4, P5, AbDv and AbLv: 0.1 mm; scale bar for Gn2: 0.3 mm.

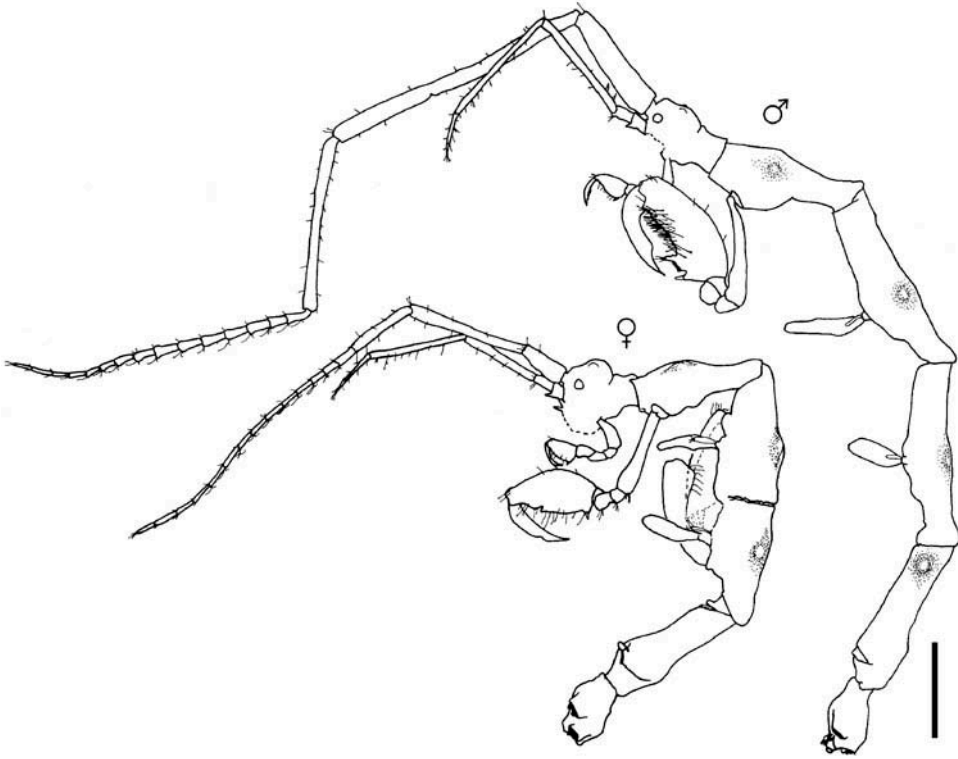


Figure 12. *Metaprotella hummelincki* McCain, 1968. Yucatan, Mexico; male, CYMX-35-CY; female, CYMX-14-CY. Scale bar: 1 mm.

and pereonite 1 present; eye distinctive; gills on pereonite 3 and 4, oval; pereopods 3 and 4 one article approximately one-quarter length of gills.

Antenna 1 longer than total body length, peduncle longer than flagellum by 10%, peduncle article 1 with five dorsal plumose setae, flagellum with 15 articles, longer than antenna 2. Antenna 2 longer than head to end of pereonite 2, peduncle article 2 with two dorsal spines, flagellum with two articles.

Upper lip symmetrically bilobed; each lobe carrying a distal row of dense setulae. Mandibular molar process strong with a large tooth on incisor side; left mandible with incisor and lacinia mobilis divided into five teeth followed by three pectinate setae; right mandible with incisor divided into five teeth followed by a lacinia mobilis toothed but not distinctly 5-toothed, and 3 pectinate setae; palp with three articles, article 3 with 3–4 setae, article 3 with setal formula 1–12–1–1 on left mandible and 1–13–2–1 on right one. Inner lobes of the lower lip well demarcated with many dense setules close to margin; outer lobes extend backwards, dense setules around inner margin. Maxilla 1 outer lobe carrying seven spines (4 bifurcate, two serrate, one smooth); distal article of palp with four spines and six setae. Outer and inner lobes of the maxilla two carrying eight setae, three of these very short and one plumose on the inner lobe. Maxilliped, inner plate rectangular apically truncate, with five plumose and one non-plumose apical setae, and one tooth on mediobasal margin; outer plate

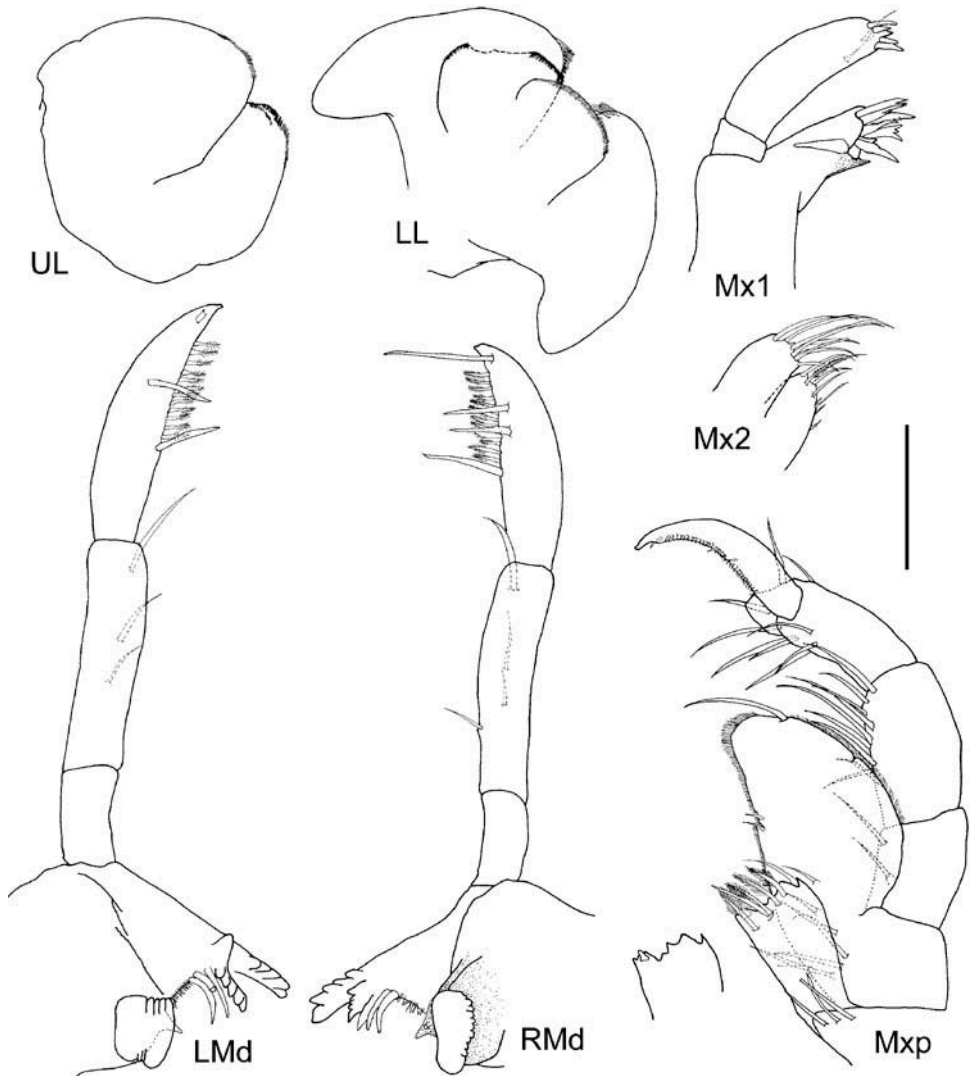


Figure 13. *Metaprotella hummelincki* McCain, 1968. Yucatan, Mexico; male, CYMX-35-CY. Scale bar: 0.1 mm.

with 1 apical seta and two setae in notch at midlength of medial margin, medial and lateral margin setulose; article 3 of the palp distally expanded.

Gnathopod 1, dactylus not quite extended to carpus, with single row of cuticular spines on inferior margin and one on a submarginal ridge, propodus inferior margin with evenly spaced cuticular spines decreasing in size distally, carpus with rounded setose lobe on ventral surface. Gnathopod 2 dactylus decreasing 50% in width medially, 80% as long as propodus; propodus with one proximal grasping spine, inferior margin with 7 small spines, one poison tooth on proximal projection, and one large median excavation; palm densely setose.

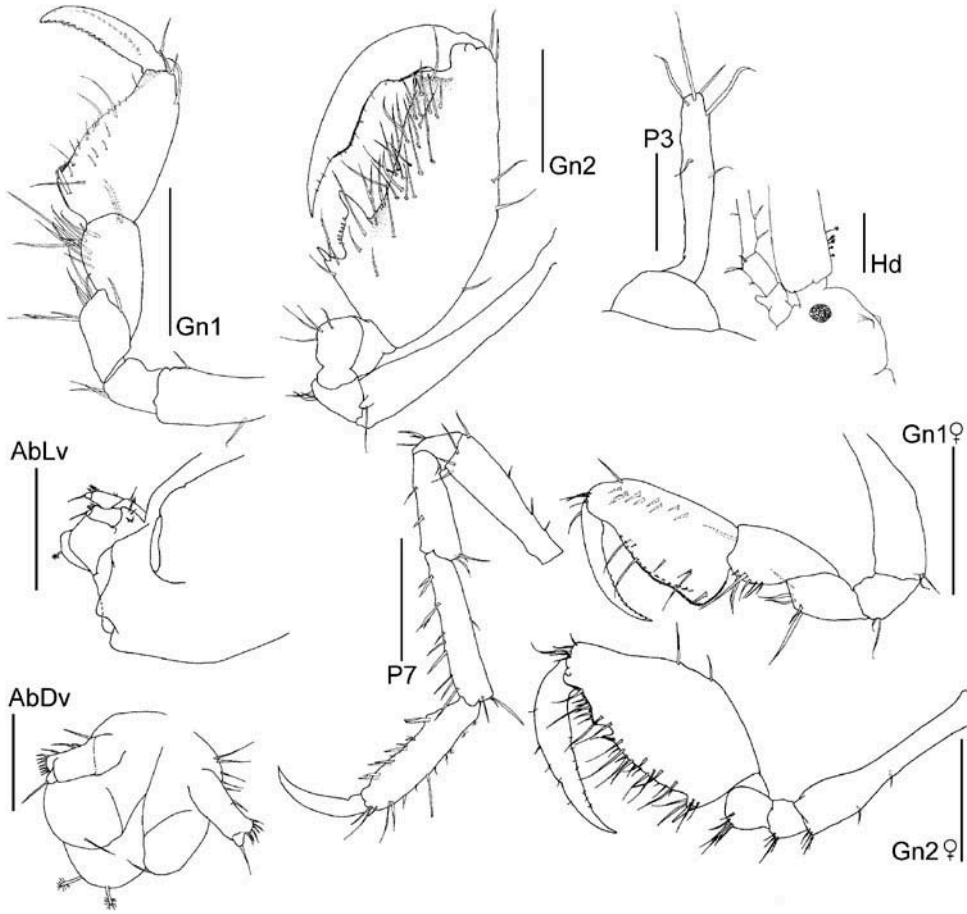


Figure 14. *Metaprotella hummelincki* McCain, 1968. Yucatan, Mexico; male, CYMX-35-CY; female, CYMX-14-CY. Scale bars for P3 and AbDv: 0.1 mm; scale bars for Hd, Gn1 and Gn1 of female: 0.3 mm; scale bars for Gn2, Gn2 of female, P7 and AbLv: 0.5 mm.

Pereopods 3–4 one article with 5–6 apical setae, approximately one-quarter length of gills; pereopods 5–6 absent; pereopod 7 located posteriorly on pereonite 7, 6-articulate, propodus with a pair of proximal grasping spines.

Abdomen with a pair of appendages bearing fringe of setae and papillae at tip and with distinct pair of lobes bearing single seta.

Mature female, body length 6.9 mm, CYMX-14-CY. Body as in male. Antenna 1 longer than 0.77 total body length, peduncle shorter than flagellum, flagellum with 14 articles, longer than antenna 2. Antenna 2 longer than peduncle of antenna 1, longer than head to end of pereonite 2, flagellum with two articles. Mouthparts as male, except by outer lobe of maxilliped with two apical setae. Gnathopod 1 similar to male. Propodus of gnathopod 2 almost as long as basis, with proximal grasping spine, palm with notch. Gills and pereopods as in male. Abdomen with pair of lobes, each with 1 seta.

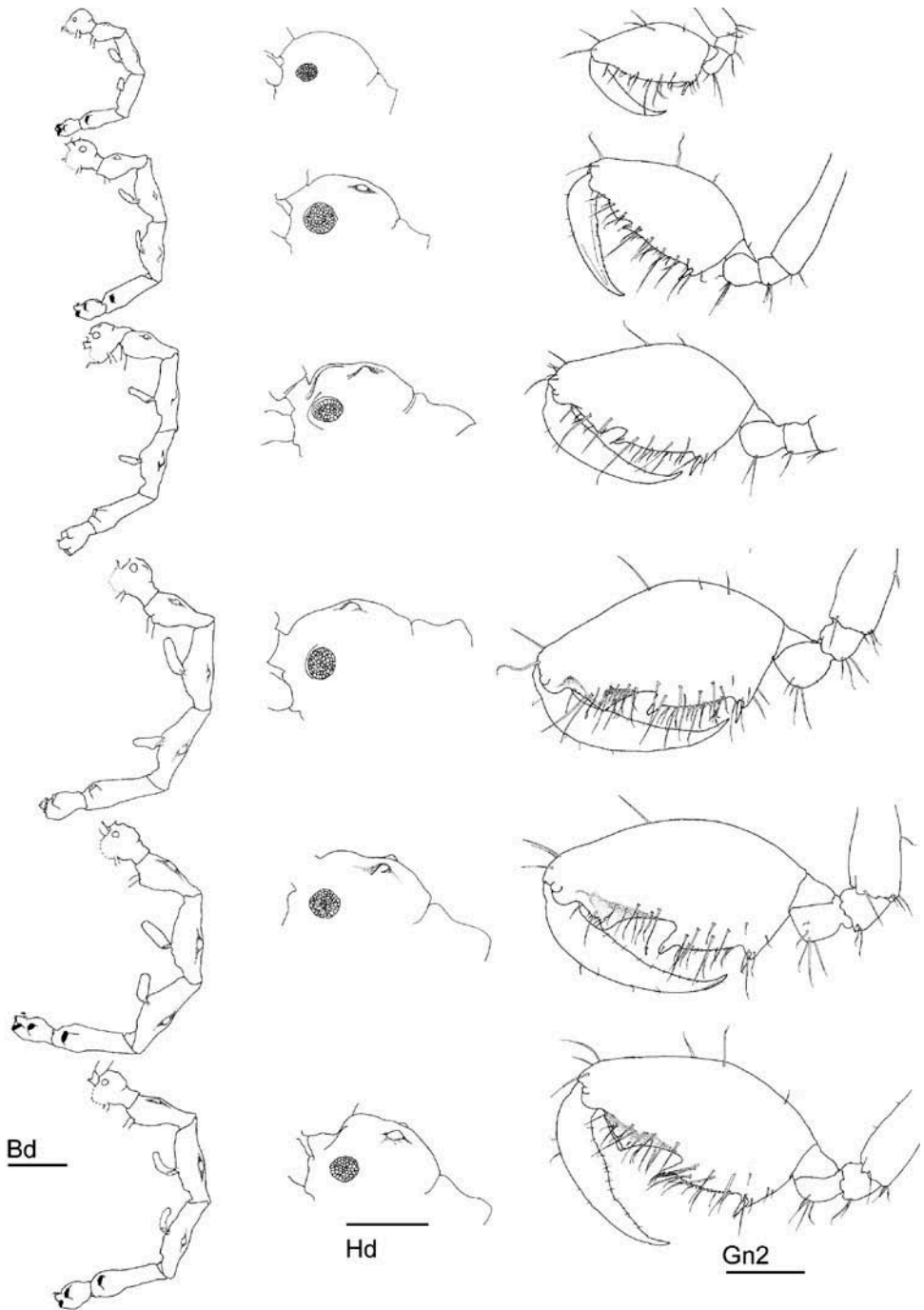


Figure 15. *Metaprotella hummelincki* McCain, 1968. Yucatan, Mexico; males, CYMX-14-CY. Scale bars for Hd and Gn2: 0.3 mm; scale bar for Bd: 1 mm.

Ontogenetic development

The number of articles in the flagellum of antenna 1 (not figured) increases allometrically; it increases from 4 in the first stages of development to 15 in the final stage. Antenna 2 has two articles and this character is constant and consistent for the genus. The tubercle sizes proportionally increase with body length, hence larger specimens bear larger tubercles. Generally tubercles were larger in the female specimens observed than in the males. The aspect of male gnathopod 2 changes considerably during development. Initially, the propodus is wider, scarcely setose, with a shallow distal notch, and a small poison tooth. The distal notch and poison tooth are visible at the same time as several small teeth appear on the proximal margin of the palm. And finally, for very large specimens the propodus becomes elongated (longer than wider), densely setose, with a wide medial notch, and a large poison tooth located at the proximal end of the palm.

Type locality

La Parguera, Puerto Rico.

Distribution

It is the only member of the genus *Metaprotella* occurring in the western Atlantic: Gulf of Mexico (Winfield, Abarca-Arenas, et al. 2007) and Caribbean Sea (McCain 1968; Ortiz et al. 2009).

Records in the Gulf of Mexico

MEX: Veracruz Coral Reef System (Winfield, Abarca-Arenas, et al. 2007); Celestun; Celestun Offshore; Sisal Offshore; Telchac Offshore (present study).

Habitat

This species has been found on *Thalassia* sp. in the Caribbean Sea (McCain 1968), on fouling panels among coral reefs (Winfield, Abarca-Arenas, et al. 2007), on muddy sediment, and sandy bottoms from coral reef areas on southeastern Gulf of Mexico (present study). The depth range reported is 1–29 m (McCain 1968).

Remarks

Metaprotella hummelincki was originally described and illustrated from La Parguera, Puerto Rico by McCain (1968). After description, the species was illustrated in the pictorial guide by Ortiz et al. (2002). In both cases, illustrations resemble immature stages in males and females, lacking traits present in the newly specimens found in this study. Therefore, *M. hummelincki* is redescribed here in detail based on specimens found from the north coast of Yucatan Peninsula, SE Gulf of Mexico. These specimens represent mature stage in males with tubercles on the head, inner plate of maxilliped with 1 tooth on mediodistal margin, gnathopod 2 dactylus decreasing in

width medially, and gnathopod 2 propodus with a large median excavation and a large poison tooth on proximal projection. In females, the mature stage is represented by specimens with tubercles on the head and palm with notch on propodus of gnathopod 2.

All species of the genus *Metaprotella* have spiny bodies or at least a cephalic spine (McCain 1968; Larsen 1997; Guerra-García 2002a, 2003c; Takeuchi and Lowry 2007; Lim and Takeuchi 2012; Momtazi and Sari 2013), with the exception of *Metaprotella problematica* Mayer, 1890 which bears one forward pointing spine laterally on pereonite 3, *Metaprotella mauritiensis* Guerra-García, 2003c with head and body smooth, and *M. hummelincki* with tubercles on the head, at the insertion of gnathopod 2, pereonites 3–4 and at the proximal lateral surface of pereonite 5.

Male specimens of *M. hummelincki* are similar to male specimens of *Metaprotella unguja* Larsen, 1997 by the shape of gnathopod 2, but differ by the tubercles and the abdomen. Female specimens of *M. hummelincki* differ from female specimens of *M. unguja* by the presence of tubercles, instead of paired dorsal spines above the insertion of gnathopod 2 otherwise smooth.

***Paracaprella guerrargarciai* Winfield and Ortiz, 2013**
(Figure 16)

Type locality

Lobos reef, Veracruz.

Distribution

Gulf of Mexico (Winfield and Ortiz 2013).

Records in the Gulf of Mexico

MEX: Lobos reef, Veracruz (Winfield and Ortiz 2013).

Habitat

Coral rubble of *Acropora cervicornis* (Lamarck, 1816), at 16 m depth (Winfield and Ortiz 2013).

Remarks

Paracaprella guerrargarciai can be easily distinguished from all species in the genus *Paracaprella* by the setose dorsal body.

This species is the second caprellid species discovered and described originally from the Gulf of Mexico, since Mayer (1903) discovered *D. incerta* (described as *L. incerta*) in the Mississippi–Alabama continental shelf a century ago.

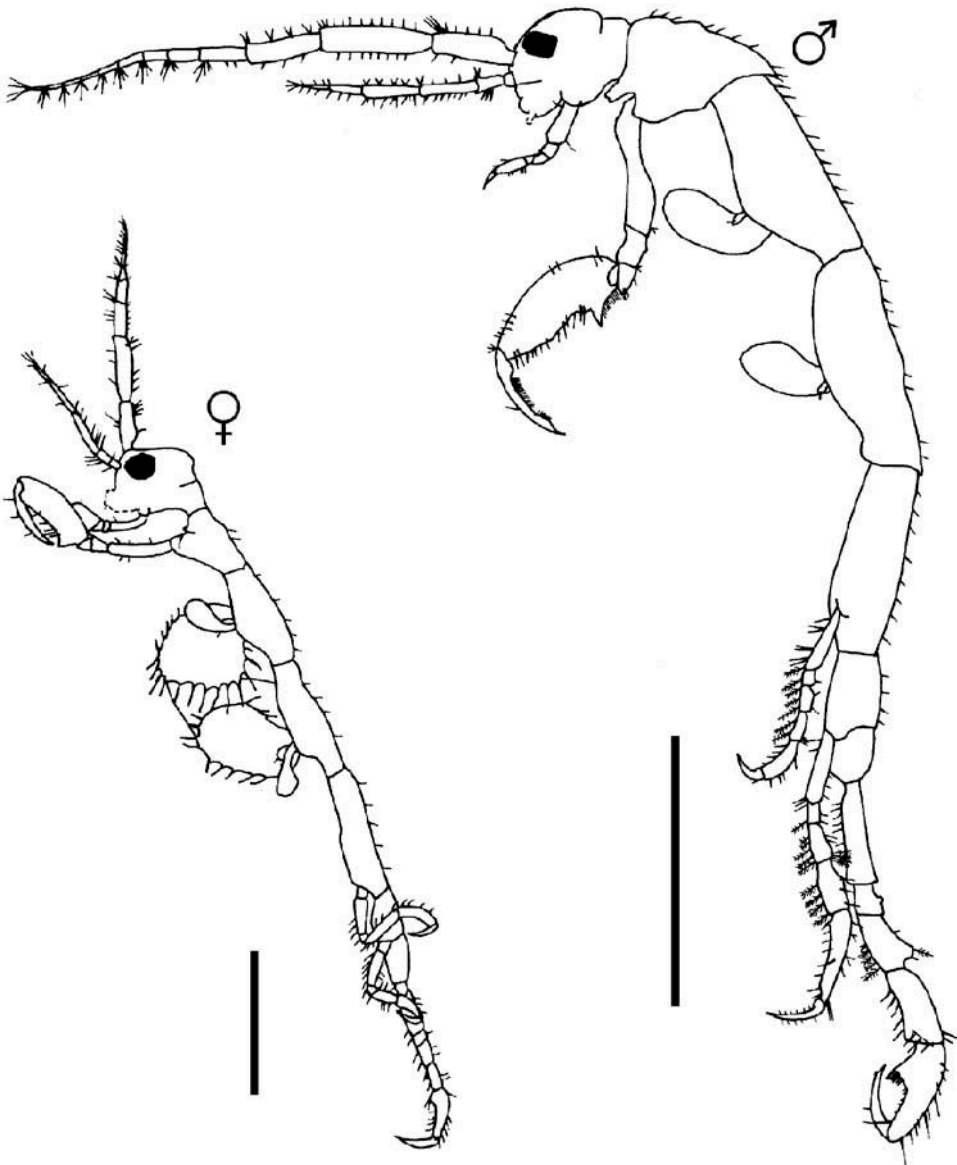


Figure 16. *Paracaprella guerragarciai* Winfield and Ortiz, 2013. Veracruz, Mexico; holotype male, CNCR#26736; paratype female, CNCR#26737. Refigured from Winfield and Ortiz (2013). Scale bar for male: 1 mm; scale bar for female: 0.7 mm.

Paracaprella pusilla Mayer, 1890
(Figure 17)

Paracaprella pusilla Mayer, 1890: 41, pl. 1, figs 28–30; pl. 3, figs 45–47; pl. 5, figs 48, 49; pl. 6, fig. 10; 1903: 67, pl. 2, figs 36, 37; pl. 7, fig. 52. Steinberg and Dougherty, 1957: 283–284, figs 16, 19, 24, 30. McCain, 1968: 82–86, figs 41, 42. Serejo, 1998:

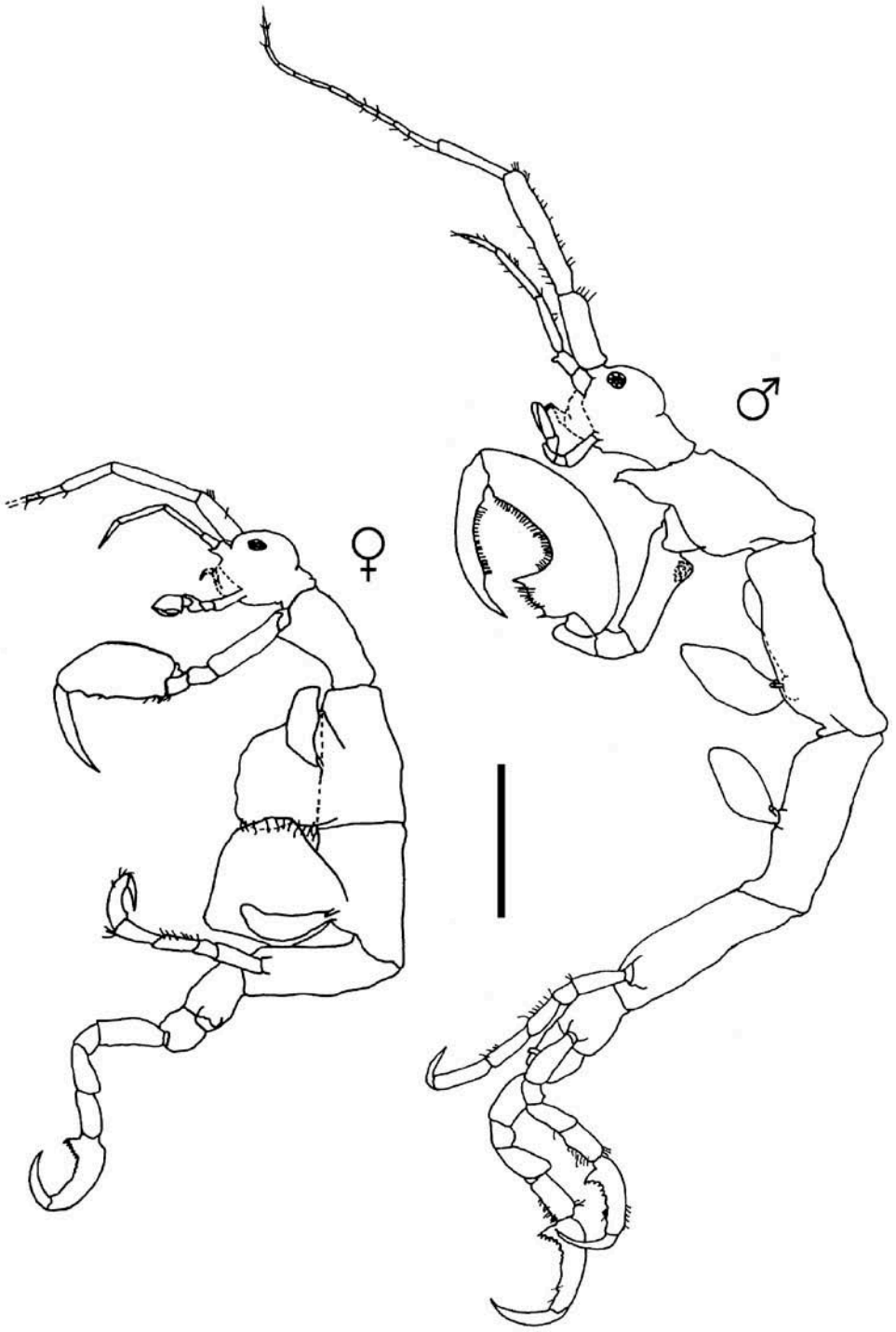


Figure 17. *Paracaprella pusilla* Mayer, 1890. Yucatan, Mexico; CYMX-17-CY. Scale bar: 1 mm.

381, fig. 7j, l. Guerra-García and Thiel, 2001: 880, fig. 8. Ortiz et al., 2002, fig. 37. Foster, Thomas, et al., 2004: 162, 165, fig. 5. Diaz et al., 2005: 3, 6–7, fig. 13. Guerra-García, Krapp-Schickel, et al., 2006: 175–178, figs 17–19. Winfield, Escobar-Briones, et al., 2007: 30, 47, fig. 16. Bhave and Deshmukh, 2009: 111–112, figs 1, 2. Guerra-García et al., 2010: 304–305, fig. 8. *Caprella nigra* Reid, 1951: 283–284, 289, fig. 58.

Material examined

Station 1, one male, eight females (six ovigerous), CYMX-15-CY. Station 3, one male, one ovigerous female, CYMX-16-CY. Station 10, one ovigerous female, 28 November 2010, CYMX-21-CY. Station 13, 54 males, 63 females (26 ovigerous), 12 juveniles (one male and one female from this station used for figures), CYMX-17-CY. Station 14, 16 males, 22 females (16 ovigerous), CYMX-18-CY. Station 16, 11 males, 11 females (six ovigerous), CYMX-19-CY. Station 18, 89 males, 101 females (47 ovigerous), five juveniles, CYMX-24-CY.

Type locality

Rio de Janeiro, Brazil.

Distribution

Western Atlantic; Chile; southern Spain; tropical west Africa; south Africa; Tanzania; Suez Canal; India; Australia; China; Hawaii (Bhave and Deshmukh 2009; Guerra-García et al. 2010; Ros and Guerra-García 2012).

Records in the Gulf of Mexico

MEX: Tamaulipas continental shelf (Escobar-Briones and Winfield 2003); Laguna Madre (Barba and Sánchez 2005); Mexican ridges at southwest (Winfield et al. 2006); Celestun; Progreso; Dzilam Bravo; El Cuyo; Yalahau Lagoon (present study). USA: Port Aransas (Steinberg and Dougherty 1957); Port Isabel; Grand Isle; Panama City; St Petersburg; Sarasota Bay (McCain 1968); Louisiana Offshore (Lewbel et al. 1987); Perdido Key (Rakocinski et al. 1996); Choctawhatchee Bay (Martin and Bortone 1997); Biloxi Bay (Pederson and Peterson 2002); Dog Keys Pass; Horn Island Pass (Foster, Thomas, et al. 2004).

Habitat

Paracaprella pusilla has been collected from mangrove roots, seagrasses, hydroids and ascidians (McCain 1968), sandy beaches (Rakocinski et al. 1996), artificial reefs (Lewbel et al. 1987; Martin and Bortone 1997), sponges (Serejo 1998), gravel bottoms, ropes, mussels, oysters, sabellariid worm rock (Diaz et al. 2005), and muddy bottoms (Winfield et al. 2006). The depth range reported is shallow water extending to 498 m (Winfield et al. 2006; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

Paracaprella pusilla is similar to *Paracaprella tenuis* (Mayer 1903); however, males of *P. pusilla* can be distinguished from those of *P. tenuis* by the large sharp-pointed projection on the anteroventral margin of pereonite 2, the proximal knob on the basis of gnathopod 2 and the presence of setae on the dactylus of gnathopod 2 (McCain 1968).

Recently, Ros and Guerra-García (2012) analysed the worldwide distribution of *P. pusilla*, recording, for the first time, this species in European coastal waters (southern Spain).

Paracaprella tenuis (Mayer 1903)

(Figure 18)

Paracaprella tenuis Mayer, 1903: 68, pl. 2, figs 34, 35, pl. 7, figs 51, 58. McCain, 1968: 86–89, figs 43, 44. McCain and Steinberg, 1970: 59. Laubitz, 1972: 67–68, pl. 18. Arimoto, 1976: 55–58, figs 24, 25. Guerra-García, 2002b: 225–227, figs 9–12. Ortiz et al., 2002, fig. 38. Foster, Thomas, et al., 2004: 162, 166–167, fig. 6.

Deutella abracadabra Steinberg and Dougherty, 1957: 277–279, figs 14, 17, 18, 20, 27.

Material examined

Station 19, 21 males, 66 females (35 ovigerous), 19 juveniles (one male and one female from this station used for figures), CYMX-25-CY.

Type locality

Woods Hole, Massachusetts.

Distribution

Northwestern Atlantic; Gulf of Mexico; Venezuela; Tanzania; Japan (Takeuchi 1999; Díaz and Martín 2001; Guerra-García 2002b).

Records in the Gulf of Mexico

MEX: Laguna Madre (Barba and Sánchez 2005); Rio Lagartos (present study). USA: Ship Island; Alligator Harbor (Steinberg and Dougherty 1957); Port Isabel; Corpus Christi; Galveston Bay; Pensacola Bay; Tampa Bay (McCain 1968); Apalachicola Bay (Sheridan 1979); Choctawhatchee Bay (Martin and Bortone 1997); Biloxi Bay (Pederson and Peterson 2002); St Andrew Bay; St Joseph Bay (Foster, Thomas, et al. 2004); Aransas Bay (Ahrens and Grubbs 2012).

Habitat

Paracaprella tenuis has been collected from various red and brown algae, seagrasses, sponges, hydroids, alcyonarians, bryozoans and from hydroids attached to the

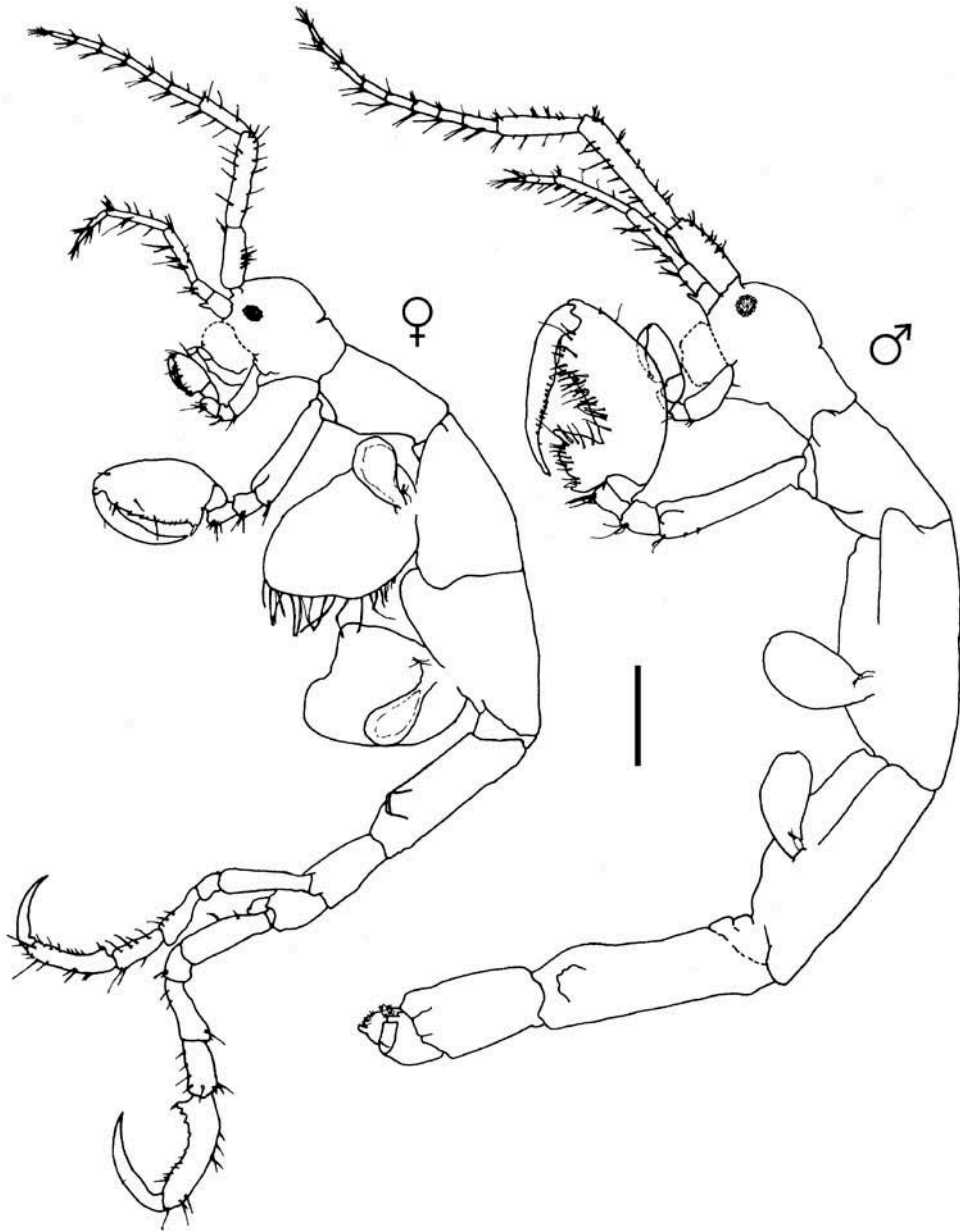


Figure 18. *Paracaprella tenuis* Mayer, 1903. Yucatan, Mexico; CYMX-25-CY. Scale bar: 1 mm.

carapace of the spider crab *Libinia* sp. (McCain 1968). It has also been found in artificial reefs (Martin and Bortone 1997) and on the carapace of the loggerhead sea turtle *Caretta caretta* (Caine 1986). Detritus is the dominant stomach content in this species (Caine 1974). Caine (1998) reported a mutualistic relationship between *P. tenuis* and the hydrozoan *Bougainvillia rugosa*, where the caprellids defended the

hydroid's tentacles in order to obtain a substratum to which they could cling and graze on diatoms. The depth range reported is < 1–11 m (LeCroy et al. 2009).

Remarks

Recently Guerra-García (2002b) redescribed this species from specimens collected from *Syringodium* sp., *Fungia* sp. and other corals from Tanzanian coast but did not include the records of Arimoto (1976) cited by Takeuchi (1999) for Japanese waters. Several morphological differences in the material from Tanzania could indicate that the Tanzanian specimens could belong to an undescribed species of *Paracaprella*, close to *P. tenuis*.

Pseudaeginella biscaynensis (McCain 1968) (Figures 19, 20)

Falotritella biscaynensis McCain, 1968: 57–61, figs 27, 28. McCain and Steinberg, 1970: 51. Gable and Lazo-Wasem, 1987: 637–638. Ortiz et al., 2002, fig. 31. Guerra-García, 2002b: 223–225, figs 5–8.

Pseudaeginella biscaynensis Laubitz, 1995: 88. Guerra-García, 2003d: 107, fig. 12. Guerra-García, 2004: 54, fig. 43. Diaz et al., 2005: 3, 7, 23, fig. 14. Guerra-García, 2006: 448–449, fig. 54. ?Guerra-García and Lowry, 2009: 309–311, fig. 10.

Material examined

Station 28, two male, three females (one male and one female from this station used for figures), 8 May 2013, CYMX-47-CY. Station 29, three males, one female, CYMX-53-CY.

Type locality

Key Biscayne, Florida.

Distribution

Bermuda; Southern Florida; Gulf of Mexico; Barbuda Island; St Lucia Island; Venezuela (McCain 1968; Gable and Lazo-Wasem 1987; Diaz et al. 2005); Tanzania; Papua New Guinea; Australia (Guerra-García 2002b, 2003d, 2006).

Records in the Gulf of Mexico

MEX: Telchac Offshore; Cabo Catoche (present study). USA: Key Largo; Long Key (McCain 1968).

Habitat

Pseudaeginella biscaynensis has been collected from red algae (McCain 1968), the green algae *Avrainvillea* sp. and the seagrass *Thalassia* sp. (Gable and Lazo-Wasem 1987), among coral, sponges, on the seagrasses *Cymodocea* sp. and *Syringodium* sp.,

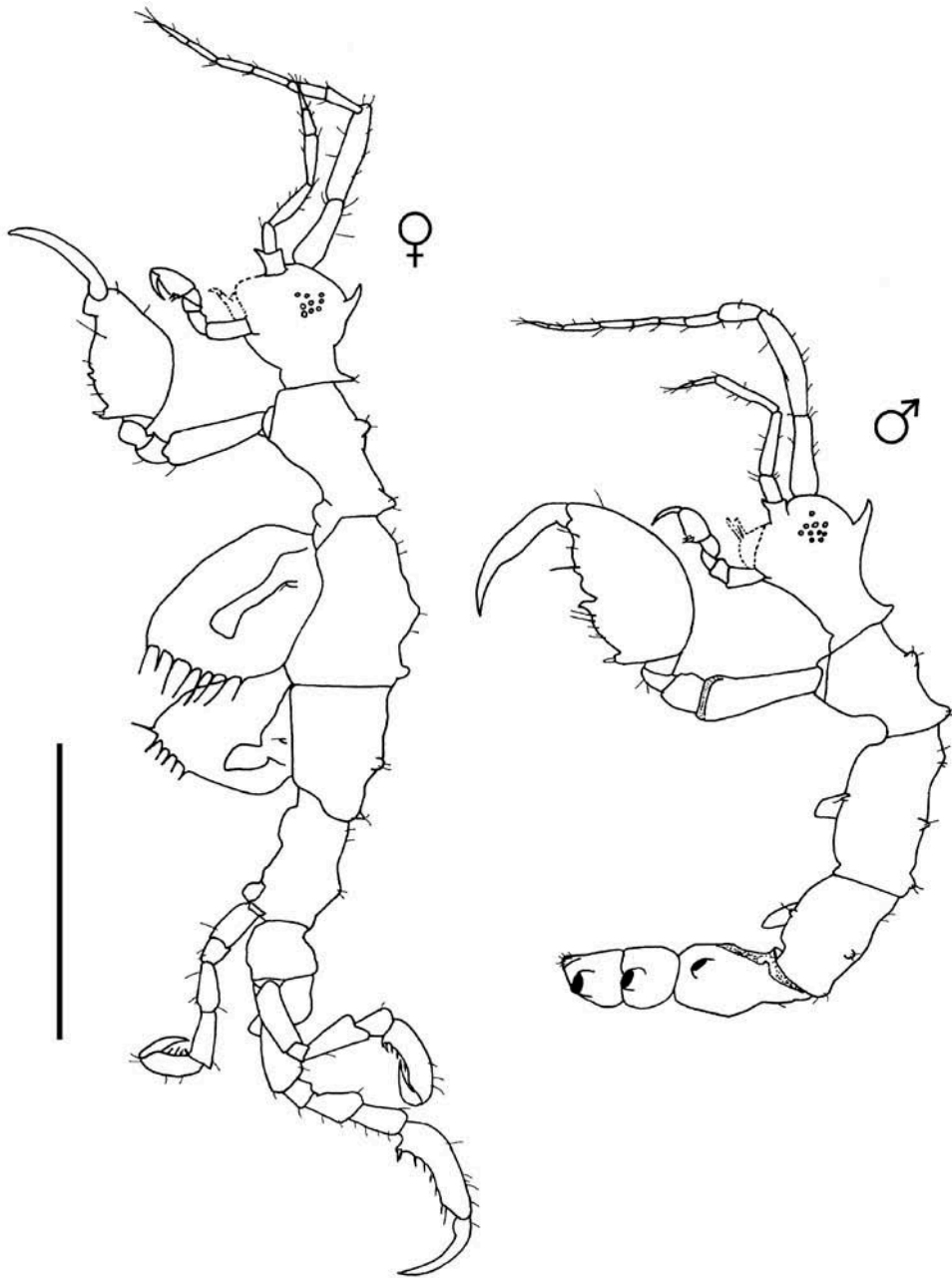


Figure 19. *Pseudaeiginella biscaynensis* (McCain 1968). Yucatan, Mexico; CYMX-47-CY. Scale bar: 1 mm.

on the seaweed *Galaxaura* sp., on the green algae *Halimeda* sp., and calcareous red tubular algae (Guerra-García 2002b, 2003d, 2006; Guerra-García and Lowry 2009). The depth range reported is 1–22 m (LeCroy et al. 2009).

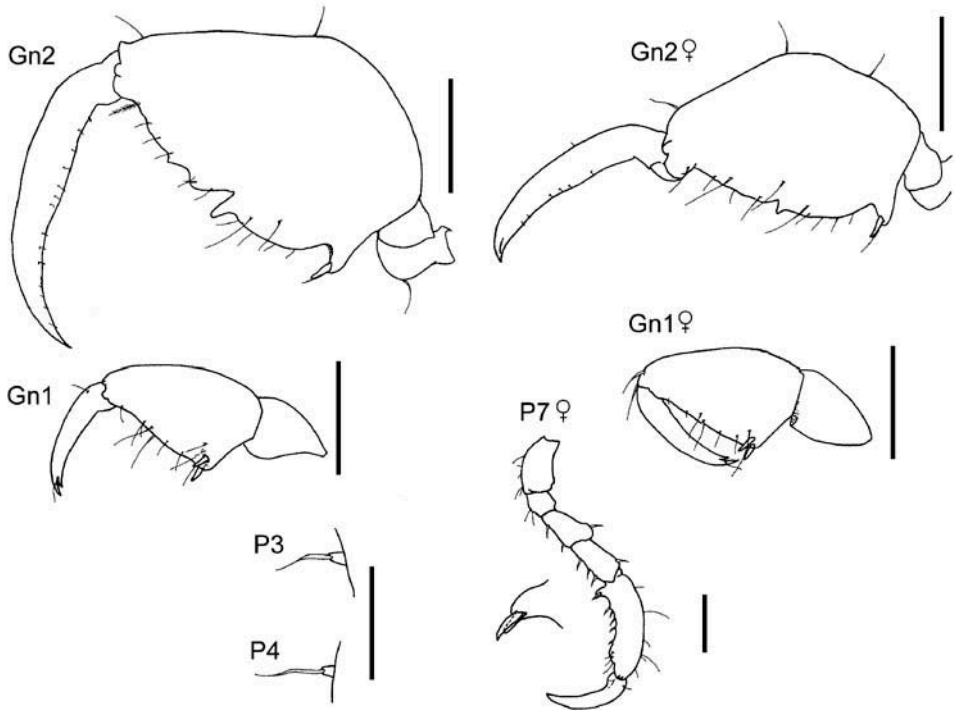


Figure 20. *Pseudaeginella biscaynensis* (McCain 1968). Yucatan, Mexico; CYMX-47-CY. Scale bars for Gn1, P3, P4 and Gn1 of female: 0.1 mm; scale bars for Gn2, Gn2 of female and P7 of female: 0.2 mm.

Remarks

Laubitz (1995) considered the genus *Fallotritella* synonymous with *Pseudaeginella*, based mainly on the presence in both nominal genera of minute pereopods 3 and 4. *Pseudaeginella biscaynensis* was recently redescribed by Guerra-García (2002b) with specimens from the Indian Ocean, with it later recorded in the Pacific Ocean (Guerra-García 2003d, 2006). Hence, this species is probably cosmopolitan but *P. biscaynensis* may prove to be a species complex due to its morphological variation among regions (Guerra-García 2006).

Pseudaeginella biscaynensis is basically identified by its spinose body, head with a single dorsal anteriorly directed acute projection, pereopod 5 inserted posteriorly on pereonite 5, and by its propodus of pereopod 6 and 7 with 2 proximal grasping spines (McCain 1968; Guerra-García 2002b). The material examined in the present study agrees with the description and figures of specimens from Florida (type material), except for pereopod 5 being more robust and with grasping spine on propodus, and female gnathopod 2 with notch medially on propodus.

This species has been scarcely recorded in the western Atlantic region, particularly in the Gulf of Mexico, so demonstrating the poor knowledge of caprellids in that region. The lack of records for this species is probably due to its small size and since it

is usually covered by detritus (McCain 1968; present study). The present record for *P. biscaynensis* in the Gulf of Mexico is the second in the Gulf basin because it was originally described by McCain (1968) 45 years ago.

Subfamily **PHTISICINAE** Vassilenko, 1968.

Hemiproto wigleyi McCain, 1968

(Figure 21)

Hemiproto wigleyi McCain, 1968: 65–68, figs 31, 32c–e. McCain and Steinberg, 1970: 51. Ortiz et al., 2002, fig. 33. Diaz et al., 2005: 3, 7–8, 24, fig. 15. Winfield, Escobar-Briones, et al., 2007: 50, fig. 19.

Material examined

Station 31, one male (used for figures), CYMX-54-PY.

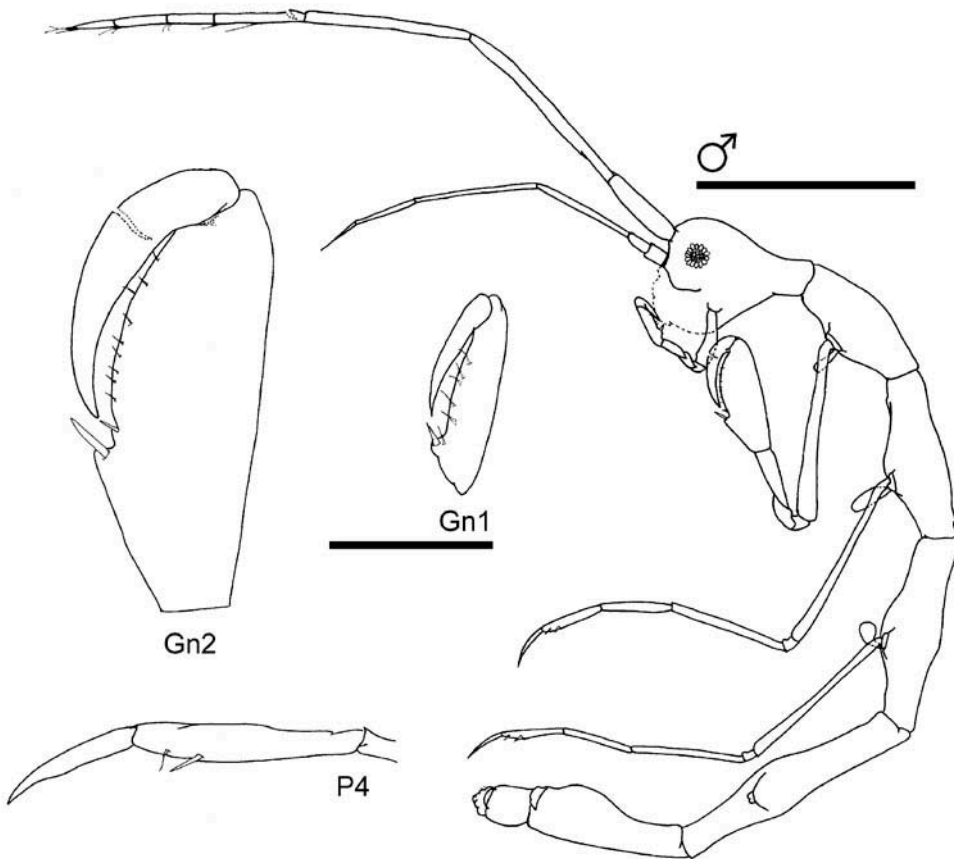


Figure 21. *Hemiproto wigleyi* McCain, 1968. Yucatan, Mexico; CYMX-54-CY. Scale bar for male: 0.5 mm; scale bar for Gn1, Gn2 and P4: 0.1 mm.

Type locality

Coche Island, Venezuela.

Distribution

Southeastern Florida (McCain 1968); California (Watling 1997); Gulf of Mexico (Winfield et al. 2006); Caribbean Sea (McCain 1968; Diaz et al. 2005; Ortiz et al. 2006; Ortiz and Lalana 2010).

Records in the Gulf of Mexico

CUB: La Habana (Ortiz et al. 2006). MEX: Campeche Sound and Veracruz continental shelf (Winfield et al. 2006); Northwestern Yucatan Shelf (present study).

Habitat

Hemiproto wigleyi has been collected from *Thalassia testudinum*, *Halimeda opuntia* (Diaz et al. 2005), washed algae (Ortiz et al. 2006), and soft bottoms (Winfield et al. 2006; present study). The depth range reported is 25–76 m (Winfield et al. 2006; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

Monotypic genus. The main characteristics to identify this species are: molar absent; mandibular palp 3-articulate; pereopods 3 and 4, 6-articulate; pereopod 5, 5-articulate; abdomen of male with two pairs of small 1-articulate appendages, only one pair in females (McCain 1968). The size of the specimen examined in the present study is 2.63 mm, which is roughly three times smaller than the male specimen examined by McCain (1968), with a size of 7.5 mm. That size represents a juvenile because in addition to the small size, the number of articles in antennae and the number of grasping spines on propodus of gnathopod 1 and 2 and propodus of pereopod 3 and 4 are fewer, compared with the description in McCain (1968).

***Phthisica marina* Slabber, 1769**
(Figures 22, 23)

Phthisica marina Slabber, 1769: 77, pl. 10. Chevreux and Fage, 1925: 434–436, fig. 422.

McCain, 1968: 91–97, figs 46, 47. McCain and Steinberg, 1970: 65. Arimoto, 1980: 96–101, fig. 2. Krapp-Schickel, 1993: 806–808, figs 549, 550. Guerra-García and Takeuchi, 2002: 705. Ortiz et al., 2002, fig. 40. Foster, Thomas, et al., 2004: 161–163, fig. 2. Winfield, Escobar-Briones, et al., 2007: 56, fig. 20.

Proto ventricosa Mayer, 1882: 22, pl. 1, fig. 1, pl. 3, figs 16–29, pl. 4, figs 12, 13, pl. 5, figs 1–5. Mayer, 1890: 12, pl. 3, figs 4–6; pl. 5, figs 3–6; pl. 6, fig. 1; pl. 7, fig. 1. Mayer, 1903: 20, pl. 6, fig. 23.

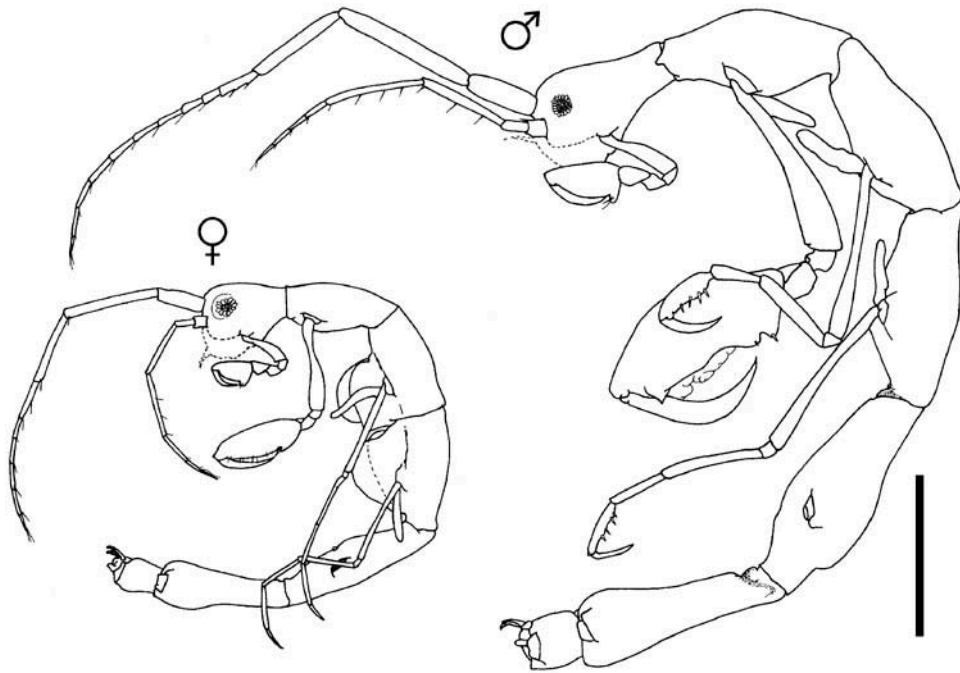


Figure 22. *Phtisica marina* Slabber, 1769. Yucatan, Mexico; CYMX-78-CY. Scale bar: 1 mm.

Material examined

Station 8, one male, two females (one male and one female from this station used for figures), CYMX-78-PY. Station 9, one male, CYMX-77-PY. Station 20, one male, 20 July 2010, CYMX-37-PY; one male, 30 August 2010, CYMX-43-PY. Station 23, three males, 21 July 2010, CYMX-41-PY. Station 24, two juveniles, 18 June 2010, CYMX-31-PY. Station 25, one male, 18 June 2010, CYMX-32-PY; one male, 17 December 2010, CYMX-46-PY. Station 27, one juvenile, CYMX-36-PY.

Type locality

Walcheren, province of Zeeland, the Netherlands.

Distribution

Atlantic Ocean; Pacific Ocean; Mediterranean (McCain 1968; Krapp-Schickel 1993).

Records in the Gulf of Mexico

CUB: Cojimar Bay (Ortiz 2001). MEX: Campeche Sound (Winfield et al. 2006); Veracruz Coral Reef System (Winfield, Abarca-Arenas, et al. 2007); Northeastern Yucatan Shelf (Paz-Ríos and Ardisson 2013); Celestun Offshore; Sisal Offshore (present study). USA: from Panama City to Dry Tortugas (McCain 1968).

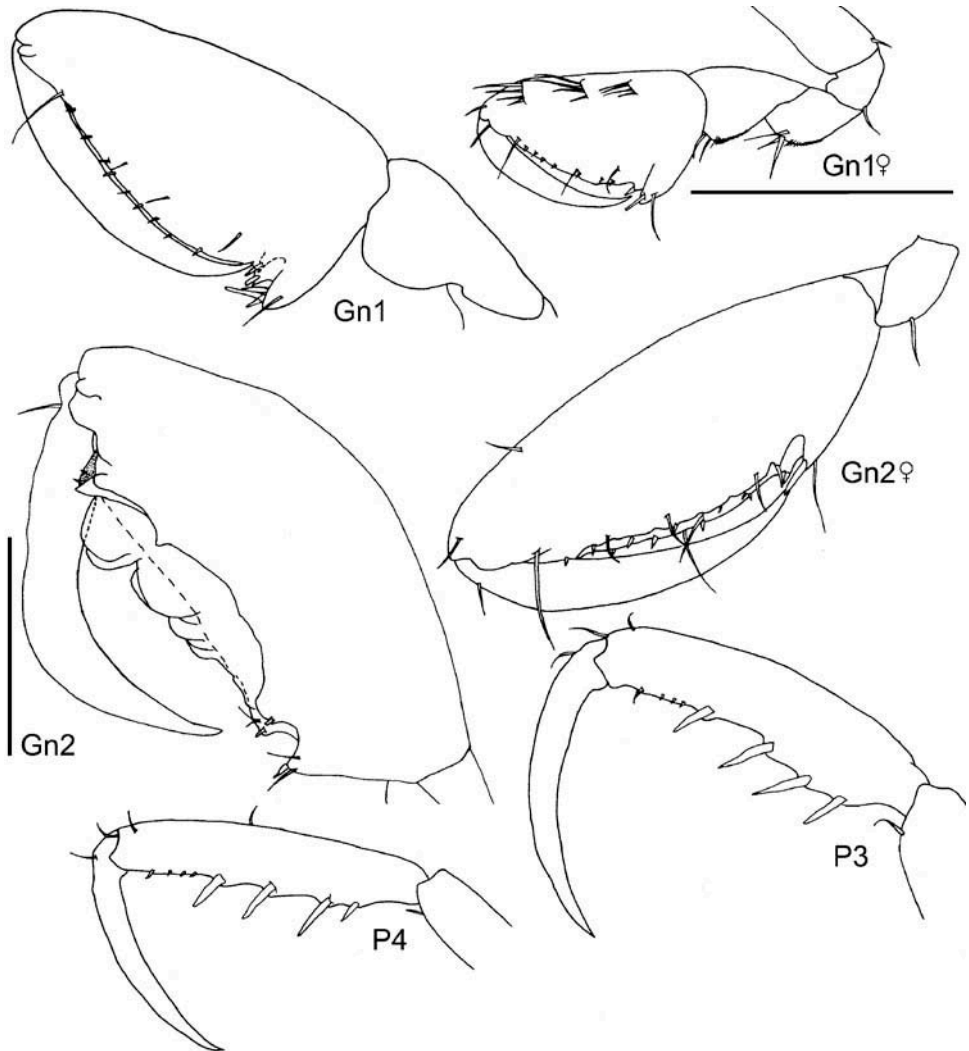


Figure 23. *Phtisica marina* Slabber, 1769. Yucatan, Mexico; CYMX-78-CY. Scale bar for Gn1, Gn1 of female, Gn2 of female, P3 and P4: 0.3 mm; scale bar for Gn2: 0.5 mm.

Habitat

This species has been found on green and brown algae, seagrasses, sponges, hydroids, bryozoans, echinoderms (McCain 1968) and sandy and muddy bottoms (Diaz et al. 2005; Winfield et al. 2006; Paz-Ríos and Ardisson 2013). The depth range reported is shallow water extending to 1470 m (Winfield et al. 2006; Winfield and Escobar-Briones 2008; LeCroy et al. 2009).

Remarks

Phtisica marina is differentiated from *Hemiproto wigleyi* by the abdomen of both sexes, which has two pairs of well-developed bi-articulate appendages. The material

examined is very similar to the Mediterranean species illustrated by Krapp-Schickel (1993); it includes a membranous sac on the male propodus palm of gnathopod 2 and a dactylus that is strongly curved. However, the material examined is different from the descriptions of McCain (1968) and Krapp-Schickel (1993), as well as from the illustrations by Ortiz et al. (2002) and Diaz et al. (2005), by possessing 4 instead of 3 spines on the propodus palm of pereopod 3 and 4.

Key to species of caprellids in the Gulf of Mexico

1. Gills on pereonites 2–4. Pereopods 3–4 well-developed with 6 articles 2
Gills on pereonites 3–4. Pereopods 3–4 reduced (1 or 2 articles) or absent ... 3
2. Abdomen with 2 pairs of small 1-articulated appendages in males, 1 pair in females *Hemiproto wigleyi*
Abdomen with 2 pairs of well-developed 2-articulated appendages in males, 2 pairs in females *Phthisica marina*
3. Pereopod 5 reduced to 3 small articles *Mayerella reduunca*
Pereopod 5 with 6 articles 4
4. Antenna 2 with dense row of long setae ventrally. Pereopods 3–4 absent 5
Antenna 2 with sparse, short, setae ventrally. Pereopods 3–4 reduced to 1 or 2 articles 9
5. Head with sharp, acutely tipped, anterodorsally directed spine
..... *Caprella scaura*
Head smooth, without sharp anterodorsally directed spine 6
6. Head with blunt anterodorsally directed process. Male with gnathopod 2 inserted in middle of pereonite 2 7
Head without blunt anterodorsally directed process. Male with gnathopod 2 inserted in posterior of pereonite 2 8
7. Peduncle of antenna 1 inflated in males. Propodus of pereopods 5–7 convex with medial grasping spines *Caprella andreae*
Peduncle of antenna 1 not inflated in males. Propodus of pereopods 5–7 concave with proximal grasping spines *Caprella penantis*
8. Pereonite 2 with a ventral projection between gnathopod 2. Propodus of pereopods 5–7 with grasping spines *Caprella equilibra*
Pereonite 2 smooth, without a ventral projection between gnathopod 2. Propodus of pereopods 5–7 without grasping spines *Caprella danilevskii*
9. Pereopods 3–4 with 1 article 10
Pereopods 3–4 with 2 articles 12
10. Body spinose. Head with single anterodorsally directed spine. Pereonite 1 with posterior dorsal projection *Pseudaeginella biscaynensis*
Body dorsally smooth or with tubercles 11
11. Body dorsally smooth. Pereonites hexagonal in dorsal view. Mandibular palp absent. Propodus of gnathopod 1 with a round projection proximally.

- Pereonite 2 with acute ventral projection between gnathopod 2. Pereonites 6–7 not fused *Hemiaegina minuta*
 Body with dorsal tubercles. Pereonites not hexagonal in dorsal view. Mandibular palp present (3-segmented). Propodus of gnathopod 1 without a round projection proximally. Pereonite 2 smooth, without acute ventral projection between gnathopod 2. Pereonites 6–7 fused
 *Metaprotella hummelincki*
12. Body with dorsal projections on head and pereonite 2 13
 Body without dorsal projections on head. Pereonite 2 with dorsal tubercles or smooth 14
13. Head bearing a dorsal projection and pereonite 2 with 1 pair of dorsal tubercles. Propodus of gnathopod 2 widened distally, profusely setose
 *Deutella californica*
 Head and pereonite 2 bearing a dorsal pair of projections. Propodus of gnathopod 2 not widened distally, scarcely setose *Deutella incerta*
14. Pereonite 2 with 1 or 2 pairs of dorsal tubercles. Mandibular palp well-developed, 3-segmented. Propodus of gnathopod 2 with an elongate projection proximally in males *Deutella mayeri*
 Pereonite 2 dorsally smooth. Mandibular palp reduced (1–3 small segments) or absent. Propodus of gnathopod 2 with a trapezoidal projection proximally in males 15
15. Body dorsally setose. Gnathopod 2 with a distal very large robust tooth on proximal trapezoid projection of propodus, dactylus with inner margin serrate. Pereopods 5–7 with plumose setae *Paracaprella guerragarciai*
 Body dorsally bare. Gnathopod 2 with a distal short robust tooth on proximal trapezoid projection of propodus, dactylus with inner margin smooth. Pereopods 5–7 without plumose setae 16
16. Mandibular palp absent, represented by single seta. Anterolateral margin of pereonite 2 with large triangular projection in males, projection smaller in females. Basis of male gnathopod 2 with proximal knob on posterior margin *Paracaprella pusilla*
 Mandibular palp absent, without single seta or composed of 1 to 3 minute segments with 1 terminal seta. Anterolateral margin of pereonite 2 with small triangular projection in males, absent in females. Basis of male gnathopod 2 without proximal knob on posterior margin
 *Paracaprella tenuis*

Zoogeographical comments

A summary of species distribution by depth and geographical region in the Gulf of Mexico is provided in Table 2. From deeper zones there is a decrease in species number with increasing depth (Figure 24A). All species (17) are found on the shallow coast, 12 on the continental shelf, eight on the continental slope and three (*C. danilevskii*, *C. equilibra* and *C. penantis*) on the abyssal plain. Geographically, the southern regions hold a higher number of species (17) than the northern regions

Table 2. Checklist and distribution of caprellid species by geographical region and depth in the Gulf of Mexico.

Species	NE	NW	SW	SE	Depth (m)
<i>Caprella andreae</i> (Mayer, 1890)		×		×	0–2
<i>Caprella danilevskii</i> (Czerniavski 1868)			×	×	0–2620
<i>Caprella equilibra</i> (Say 1818)	×	×	×		0–3700
<i>Caprella penantis</i> (Leach, 1814)	×	×	×	×	0–3700
<i>Caprella scaura</i> (Templeton 1836)	×	×	×		0–17
<i>Deutella californica</i> (Mayer 1890)			×		1–25
● <i>Deutella incerta</i> (Mayer 1903)	×	×	×	×	0–1470
● <i>Deutella mayeri</i> (Stebbing 1895)	×			×	1–18
● <i>Hemiaegina minuta</i> (Mayer 1890)	×	×	×	×	0–354
● <i>Hemiproto wigleyi</i> (McCain 1968)			×	×	25–76
● <i>Mayerella redunda</i> (McCain 1968)		×		×	0–320
● <i>Metaprotella hummelinckii</i> (McCain 1968)			×	×	1–29
<i>Paracaprella guerrargarci</i> (Winfield and Ortiz 2013)			×		16
● <i>Paracaprella pusilla</i> (Mayer 1890)	×	×	×	×	0–498
● <i>Paracaprella tenuis</i> (Mayer 1903)	×	×	×	×	0–11
● <i>Phthisica marina</i> (Slabber 1769)	×		×	×	0–1470
● <i>Pseudaeiginella biscaynensis</i> (McCain 1968)				×	1–22

Notes: Recorded species found in the north coast of the Yucatan Peninsula, SE Gulf of Mexico, are indicated by a symbol (●) preceding their name. NE, northeast; NW, northwest; SW, southwest; SE, southeast.

(11) (Figure 24B). The most widely distributed species in the Gulf basin are *C. penantis*, *D. incerta*, *H. minuta*, *P. pusilla* and *P. tenuis*, all of which have been reported from all four regions of the Gulf of Mexico.

From the faunal affinity among regions, two species assemblages are displayed at the 66% similarity level (Figure 25). Geographically, one of them represents the southern sector fauna (SW and SE) at 69% similarity and the other represents the northern sector fauna (NW and NE) at 78% similarity.

Discussion

Caprellids from the Gulf of Mexico

Species richness

Work on caprellids in the Gulf of Mexico has been constant, but remains insufficient. Steinberg and Dougherty (1957) reviewed the early literature for caprellids known from the Gulf of Mexico (mostly from the northern Gulf of Mexico), reporting at that time nine species. After that, McCain (1968) provided a comprehensive taxonomic study of the northwestern Atlantic caprellids, including the fauna of the Gulf of Mexico basin (mostly from the northern Gulf of Mexico), reporting 11 species from this Gulf basin. Ortiz (1979) made a compilation of species for the Gulf of Mexico and Caribbean Sea based on McCain's study, reporting the same species for the Gulf of Mexico, with the exception of *D. californica*, which was excluded. Camp (1998) listed 12 species for Florida, although he did not specify if the species belonged to the

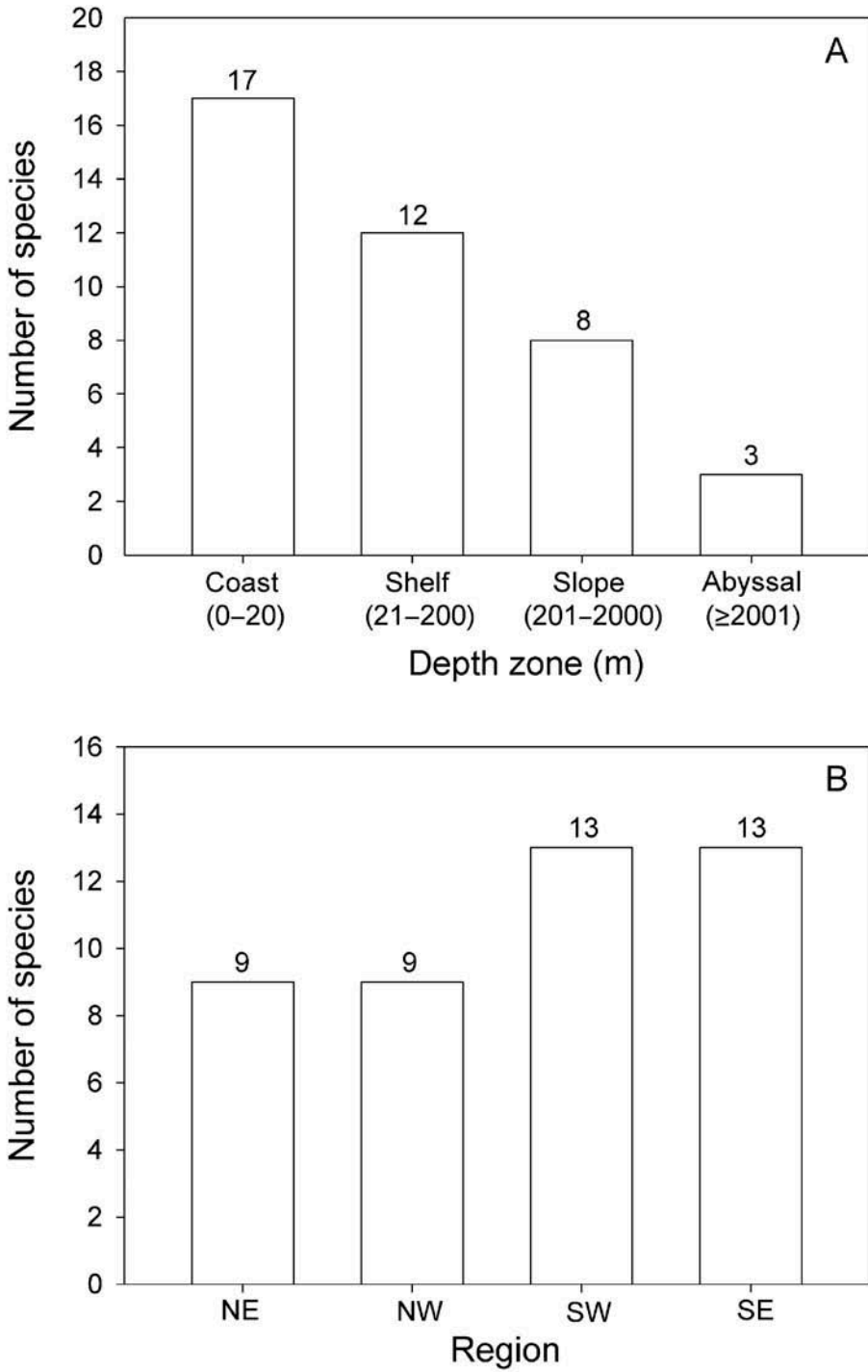


Figure 24. Species number by depth zone (A) and region (B) in the Gulf of Mexico. NW, northwest; NE, northeast; SW, southwest; SE, southeast.

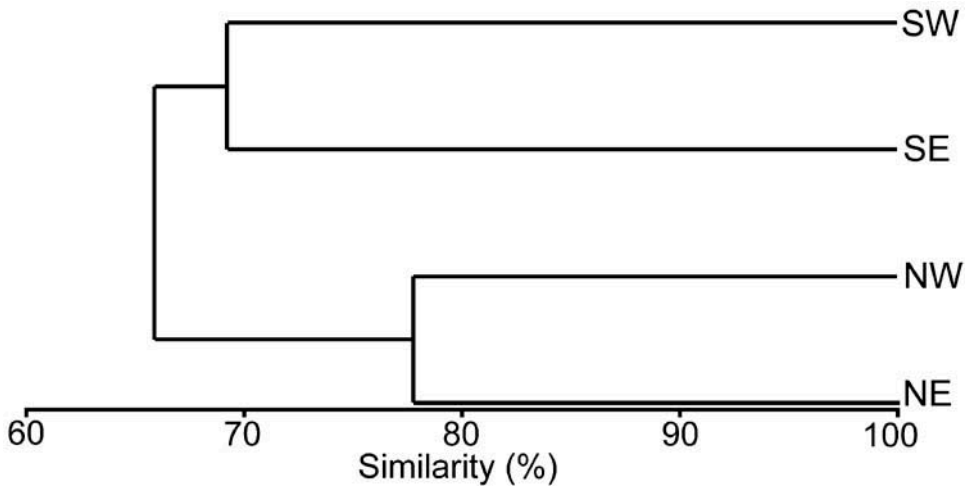


Figure 25. Similarity of the caprellid fauna among regions of the Gulf of Mexico. NE, northeast; NW, northwest; SW, southwest; SE, southeast.

eastern or western coast. Recently, Ortiz et al. (2002) made an illustrated guide to the caprellids in the Gulf of Mexico and Caribbean Sea, although they did not specify the distribution of the species. Escobar-Briones and Winfield (2003) listed three species on the continental shelf from the southwestern Gulf of Mexico. Foster, Thomas, et al. (2004) listed nine caprellid species for the northern Gulf of Mexico, and Winfield et al. (2006) listed eight species for the southwestern Gulf of Mexico continental shelf and slope. Subsequently, Winfield, Escobar-Briones, et al. (2007) pointed out that there are 15 caprellid species recorded in the Gulf of Mexico, although they only listed and made a taxonomic key for nine of them. LeCroy et al. (2009) summarized the published information at that time on the caprellids, listing 13 species in the Gulf of Mexico. Winfield and Ortiz (2013) described a new species in the Gulf of Mexico, including a checklist with 16 species.

In addition to the above studies, there are two checklists of amphipods for Mexico that include caprellids (Escobar-Briones et al. 2002; Winfield 2008). These checklists have been useful for estimating amphipod diversity (including caprellids), nevertheless their scope is limited because neither includes specific records or distribution for species in Mexican waters.

As has been shown above, there is information on the caprellids in the Gulf of Mexico, however, it has been split into northern and southern regions without any current comprehensive taxonomic treatment covering all the Gulf of Mexico basin and species. Therefore, the contribution of the present study is to bring together all the published available information and new data, to update the existing knowledge so far for the caprellids in the Gulf of Mexico, as well as to provide a species identification key.

From McCain (1968) to the present study, the species richness of caprellids in the Gulf of Mexico has been low, from 11 to 17 species. This may be due to the lack of sampling of new habitats, as demonstrated by the new records of Foster, Heard, et al. (2004) from the jetties of St Andrew Bay, Winfield, Abarca-Arenas, et al. (2007) from

the coral reefs of Veracruz, Paz-Ríos and Ardisson (2013) from the northern continental shelf of Yucatan, Rodríguez-Almaras and Ortega-Vidales (2013) from Laguna Madre, and Winfield and Ortiz (2013) from the Tuxpan-Lobos reef system. Also, caprellids have often been overlooked in benthic studies because they are rarely collected (because of their specific habitat or the sampling device used) or when they are, specialists are not always available to make identifications, for instance, *C. andreae* has been mostly found on the carapace of the loggerhead sea turtle and it has not been reported in the Gulf of Mexico for 39 years.

Zoogeographical comments

Zoogeographically, deep water has been considered a barrier for peracarid species dispersal with benthic recruitment (Myers 1997). Caprellideans *sensu lato* undergo direct development and some species provide parental care for their offspring (Thiel 1997), assuming thereby that, as in gammarideans *sensu lato*, shallow-water taxa are constrained by expanses of deep water (Myers 1993). The environmental variability (e.g. hydrodynamics, geomorphology, food availability) in the Gulf of Mexico is different through the depth gradient, which results in a diminishing richness and abundance of benthic fauna with depth (Escobar-Briones et al. 1999; Escobar-Briones and Winfield 2003; Hernández-Arana et al. 2003; Escobar-Briones et al. 2008; Haedrich et al. 2008; Winfield and Escobar-Briones 2008). The diminishing pattern related to depth can be noted in the present study by a remarkable difference in the reported species number from the shallow coast (with 17) to the abyssal plain (with three). The species reported from the abyssal plain were documented for the first time at that depth zone by Winfield et al. (2006) in the southwestern Gulf of Mexico; they explained their occurrence by sediment transport and turbidity currents. Subsequently, Winfield and Escobar-Briones (2008) analysed the bathymetric change of amphipods in southern Gulf of Mexico pointing out that the occurrence of caprellids in the abyssal plain is also a reflection of the available substrata present in the deep-sea, like bryozoans and corals.

Regionally, the higher reported species number in the southern regions can be explained by heterogeneity and availability of habitat as well as by an increase in the study of caprellids. The southern regions form part of the carbonate province in the Gulf of Mexico, which includes the largest area of coral reef (Tunnell et al. 2007). The importance of this ecosystem lies in the wide availability of microhabitat found for amphipod species (Thomas 1993; Escobar-Briones and Jiménez-Guadarrama 2010; Richards et al. 2012). Particularly, caprellids are predominantly associated (clinging) to faunal and vegetal components in coral reefs like algae, bryozoans, hydroids, seagrasses and sponges; they are also collected from sandy bottoms (Escobar-Briones and Winfield 2003; Guerra-García 2006; Guerra-García, Krapp-Schickel, et al. 2006). In the present study, two newly recorded species for the southeastern Gulf of Mexico (*D. mayeri* and *Metaprotella hummelincki*) came mostly from core samples of sand with algae collected on coral reef areas in northern Yucatan and two others newly recorded species (*Paracaprella pusilla* and *Paracaprella tenuis*) came from samples of fouling communities collected on harbours in the same region, exemplifying the heterogeneity and availability of habitat, as well as an increase in the intensity of sampling. After the study of McCain (1968), the present study and two more studies (Ortiz et al. 2006; Paz-Ríos and

Ardisson 2013) have contributed with new reports of caprellid species for the southeast region. McCain (1968) recorded the first seven species (*C. andreae*, *C. danilevskii*, *C. penantis*, *D. incerta*, *Hemiaegina minuta*, *Pseudaeginella biscaynensis* and *Phtisica marina*) in the region from the Florida Keys, USA, after that, there was a gap of information for a long time until Ortiz et al. (2006) documented one new record (*Hemiproto wigleyi*) from La Habana, Cuba and Paz-Ríos and Ardisson (2013) another new record (*Mayerella redunca*) from the northeastern Yucatan Shelf, Mexico. Finally, the present study contributed four new records (*D. mayeri*, *Metaprotella hummelincki*, *Paracaprella pusilla* and *Paracaprella tenuis*) from the Yucatan coast, Mexico, with an account of 13 species for that region. Thereby, because the southern sector includes potential habitats for many species and the increasing study of amphipods, more new records or species are expected in that sector.

From the analysis of faunal affinity, the outcome of similarity among regions resembles the major zoogeographic provinces (based on a temperature regimen) in the Gulf of Mexico documented by Neigel (2009): Carolinian province and Caribbean province. Northern regions (NW and NE) correspond to fauna with Carolinian affinity, characterized by a warm-temperate condition and southern regions (SW and SE) correspond to fauna with Caribbean affinity, characterized by a tropical condition. The approximate boundaries between Carolinian and Caribbean provinces in the Gulf of Mexico are Cabo Rojo (Veracruz) on the southwestern end and Cape Romano (Florida) on the northeastern end. These provinces have been recognized for caprellideans by McCain (1968) and Winfield, Escobar-Briones, et al. (2007). McCain (1968) stated that the northern Gulf of Mexico caprellid fauna receives contributions from both the tropical and temperate areas with no endemic species. On the other hand, from the zoogeographic comments by Winfield, Escobar-Briones, et al. (2007) it is inferred that dominant components of the southern Gulf of Mexico caprellid fauna are also from tropical (Caribbean province) and temperate (Carolinian province) areas with a low number of endemic species. Therefore, temperature is apparently an important factor determining the regional distribution of caprellids in the Gulf of Mexico. In the present study, the higher species numbers were reported in the south sector rather than in the north sector. This latitudinal gradient of species richness coincides with the global distribution pattern of shallow-water caprellid species identified by Laubitz (1970) and Thiel et al. (2003) in the east Pacific coast: the species richness increasing from high latitudes with cooler surface waters to low latitudes with warmer surface waters. This gradient is observed in McCain (1968, Table 3) for caprellids in the northwest Atlantic coast increasing from the Carolinian province (North Carolina to eastern Florida and northern Gulf of Mexico) to the Caribbean province (southern Gulf of Mexico extended to Amazon River). In the present study, this gradient is also observed in the accumulated species richness of caprellids in regions of the Gulf of Mexico in the counter-clockwise direction (Table 2), starting at the northeast region with nine species, followed by the northwest region with 11, the southwest region with 16 and the southeast region with 17.

Zoogeography of caprellideans (as in gammarideans) in the Gulf of Mexico has been poorly explored because the state of our knowledge regarding the distributions of these taxa is limited (LeCroy et al. 2009); nevertheless, the caprellid fauna seemed to vary in the Gulf basin with two major trends in large-scale marine biogeography: bathymetric and latitudinal gradients. Further studies

will be needed before any final statement about the zoogeography of caprellids in the Gulf of Mexico.

Caprellids from the Gulf of Mexico in a world context

On a global scale, when we compare the reported number of species in the Gulf of Mexico (17) with other marine regions around the world, we find a much lower diversity than other marine regions. For example, in Japanese waters (Takeuchi 1999) and the Mediterranean Sea (Sturaro and Guerra-García 2012), 115 and 41 species have been reported, respectively. However, the Gulf basin also exhibits the same or almost the same number of species as the Caribbean coasts from Colombia, Cuba, Mexico, Puerto Rico, Lesser Antilles and Venezuela with 25 species collectively (Oliva-Rivera 1998; Diaz et al. 2005; Guerra-García, Krapp-Schickel, et al. 2006; Ortiz and Lalana 2010; Martín et al. 2013), the Brazilian coasts with 19 species (Lacerda et al. 2011) or Australia's Great Barrier Reef with 17 species (Guerra-García and Lowry 2009). Even, the Gulf basin harbours more species than the Bermuda islands with six species (Gable et al. 2010), the tropical eastern Pacific (extended to Chile) with 11 species (Guerra-García and Thiel 2001; García-Madrigo 2007; González et al. 2008) or the coast of India with 11 species (Guerra-García et al. 2010).

According to the number of species (401) proposed by Ah Yong et al. (2011) for Caprellidae, it can be estimated that the species richness of the Gulf of Mexico represents c.4% of the caprellid fauna around the world. Nevertheless, given the heterogeneity of habitat in the Gulf of Mexico, there is great potential for increasing the caprellid diversity in the Gulf basin by documenting many new records and/or species. This is supported by the description of a new genus and species from the Guanahacabibes Peninsula (northwest Cuba) by Ortiz et al. (2009) in a nearby area to the Gulf of Mexico, and the description of a new species (*Paracaprella guerragarciai*) recently found in the Lobos reef (southwest Gulf of Mexico) by Winfield and Ortiz (2013). Therefore, as Nizinski (2003) pointed out regarding knowledge of the decapod crustaceans in the western Atlantic, which also applies to the amphipods of the Gulf of Mexico, it is not static, and new discoveries, additional collecting, and better understanding of systematic relationships will continue to improve our understanding of regional biodiversity.

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References

- Ahrens NL, Grubbs FP. 2012. A western range extension for *Caprella scaura* (Amphipoda: Caprellidae) in the Aransas Bay Ecosystem, Texas. *Gulf Caribb Res.* 24:7–11.
- Ahyong ST, Lowry J, Alonso M, Bamber RN, Boxshall GA, Castro P, Gerken S, Karaman GS, Goy JW, Jones DS, et al. 2011. Subphylum Crustacea Brünnich, 1772. In: Zhang Z-Q, editor. *Animal biodiversity: an outline of higher-level classification and survey of taxonomic richness*. Auckland: Zootaxa; p. 165–191.
- Alarcón-Ortega LC, Guerra-García JM, Sánchez-Moyano JE, Cupul-Magaña FG. 2012. Feeding habits of caprellids (Crustacea: Amphipoda) from the west coast of Mexico. Do they feed on their hosting substrates? *Zool beatica.* 23:11–20.
- Aoki M. 1999. Morphological characteristics of young, maternal care behaviour and micro-habitat use by caprellid amphipods. *J Mar Biol Ass U K.* 79:629–638.
- Aoki M, Kikuchi T. 1995. Notes on *Caprella andreae* Mayer, 1890 (Crustacea: Amphipoda) from the carapace of Loggerhead Sea Turtles in the East China Sea and in Kyushu, Japan. *Proc Jap Soc Syst Zool.* 53:54–61.
- Arimoto I. 1976. Taxonomic studies of caprellids (Crustacea, Amphipoda, Caprellidae) found in the Japanese and adjacent waters. *Spec Publ Seto Mar Biol Lab. Ser. III:*1–229.
- Arimoto I. 1980. Supplement to the Japanese caprellid fauna. I. Caprellids from the Korea Strait and adjacent waters. *Publ Seto Mar Biol Lab.* 25:95–113.
- Baeza-Rojano E, García S, Garrido D, Guerra-García JM, Domingues P. 2010. Use of Amphipods as alternative prey to culture cuttlefish (*Sepia officinalis*) hatchlings. *Aquaculture.* 300:243–246.
- Barba E, Sánchez AJ. 2005. Peracarid crustaceans of Central Laguna Madre Tamaulipas in the Southwestern Gulf of Mexico. *Gulf Mex Sci.* 23:241–247.
- Bhave BJ, Deshmukh VD. 2009. A record of skeleton shrimp *Paracaprella pusilla* Mayer, 1890 from Mumbai waters. *J Mar Biol Ass India.* 51:111–113.
- Cabezas MP, Cabezas P, Machordom A, Guerra-García JM. 2013. Hidden diversity and cryptic speciation refute cosmopolitan distribution in *Caprella penantis* (Crustacea: Amphipoda: Caprellidae). *J Zool Syst Evol Res.* 51:85–99.
- Cabezas MP, Guerra-García JM, Baeza-Rojano E, Redondo-Gómez S, Figueroa ME, Luque T, García-Gómez JC. 2010. Exploring molecular variation in the cosmopolitan *Caprella penantis* (Crustacea: Amphipoda): results from RAPD analysis. *J Mar Biol Ass U K.* 90:617–622.
- Cabezas MP, Navarro-Barranco C, Ros M, Guerra-García JM. 2013. Long-distance dispersal, low connectivity and molecular evidence of a new cryptic species in the obligate rafter *Caprella andreae* Mayer, 1890 (Crustacea: Amphipoda: Caprellidae). *Helgol Mar Res.* 67:483–497.
- Caine EA. 1974. Comparative functional morphology of feeding in three species of caprellids (Crustacea, Amphipoda) from the Northwestern Florida Gulf Coast. *J Exp Mar Biol Ecol.* 15:81–96.
- Caine EA. 1977. Feeding mechanisms and possible resource partitioning of the Caprellidae (Crustacea: Amphipoda) from Puget Sound, USA. *Mar Biol.* 42:331–336.

- Caine EA. 1978. Habitat adaptations of North American caprellid Amphipoda (Crustacea). Biol Bull. 155:288–296.
- Caine EA. 1980. Ecology of two littoral species of caprellid amphipods (Crustacea) from Washington, USA. Mar Biol. 56:327–335.
- Caine EA. 1986. Carapace epibionts of nesting loggerhead sea turtles: Atlantic coast of USA. J Exp Mar Biol Ecol. 95:15–26.
- Caine EA. 1998. First case of caprellid amphipod-hydrozoan mutualism. J Crustac Biol. 18:317–320.
- Camp DK. 1998. Checklists of selected shallow-water marine invertebrates of Florida. St. Petersburg (FL): Florida Department of Environmental Protection. Checklist of shallow-water marine Malacostracan Crustacea of Florida; p. 123–189.
- Cavedini P. 1982. Contributo alla conoscenza dei Caprellidi del Mediterraneo (Crustacea, Amphipoda). Boll Mus Civ Stor Nat Verona. 8:493–531.
- Cházaro-Olvera S, Winfield I, Ortiz M, Álvarez F. 2002. Peracarid crustaceans from three inlets in the Southwestern Gulf of Mexico: new records and range extensions. Zootaxa. 123:1–16.
- Chevreaux E, Fage L. 1925. Amphipodes. Faune de France. 9:1–488.
- Clarke KR, Gorley RN. 2006. PRIMER v6: user Manual/Tutorial. Plymouth (UK): PRIMER-E.
- Czerniavski V. 1868. Materialia ad zoographiam Ponticam comparatam. Trav Soc Nat St Pétersburg. 1:19–136.
- Dana JD. 1853. Crustacea, Part II. US Expl Exped. 14:689–1618.
- Díaz YJ, Guerra-García JM, Martín A. 2005. Caprellids (Crustacea: Amphipoda: Caprellidae) from shallow waters of the Caribbean coast of Venezuela. Org Div Evol. 5:249–251. Available from: <http://www.senckenberg.de/odes/05-10.htm>
- Díaz YJ, Martín A. 2001. New records of amphipods (Crustacea: Amphipoda) from shallow waters of the Caribbean coast of Venezuela. Rev Biol Trop. 49:1271–1276.
- Dougherty EC, Steinberg JE. 1953. Notes on the skeleton shrimps (Crustacea, Caprellidea) of California. Proc Biol Soc Wash. 66:39–50.
- Escobar Briones E, Estrada-Santillán EL, Legendre P. 2008. Macrofaunal density and biomass in the Campeche Canyon, Southwestern Gulf of Mexico. Deep-Sea Res Pt II. 55:2679–2685.
- Escobar-Briones E, Jiménez-Guadarrama EL. 2010. Macrocrustáceos (Peracarida, Decapoda) de fondos carbonatados del sector occidental del Banco de Campeche en el sur del Golfo de México. Rev Mex Biodi. 81:S63–S72.
- Escobar-Briones E, Signoret M, Hernández D. 1999. Variación de la densidad de la infauna macrobéntica en un gradiente batimétrico: Oeste del Golfo de México. Cienc Mar. 25:193–212.
- Escobar-Briones E, Winfield I. 2003. Checklist of the benthic Gammaridean and Caprellidae (Crustacea: Peracarida: Amphipoda) from the Gulf of México Continental Shelf and Slope. Belg J Zool. 133:37–44.
- Escobar-Briones E, Winfield I, Ortiz M, Gasca R, Suárez E. 2002. Amphipoda. In: Llorente-Bousquets J, Morrone JJ, editors. Biodiversidad, taxonomía y biogeografía de artrópodos de México: hacia una síntesis de su conocimiento. vol. III. Ciudad de México (MX): Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Universidad Nacional Autónoma de México; p. 342–371.
- Felder DL, Camp DK, Tunnell JW. 2009. An introduction to Gulf of Mexico biodiversity assessment. In: Felder DL, Camp DK, editors. Gulf of Mexico origins, waters and biota, vol. I, Biodiversity. Corpus Christi (TX): Texas AandM University Press; p. 1–12.
- Foster JM, Heard RW, Knott DM. 2004. Northern range extensions for *Caprella scaura* Templeton, 1836 (Crustacea: Amphipoda: Caprellidae) on the Florida gulf coast and in South Carolina. Gulf Caribb Res. 16:65–69.

- Foster JM, Thomas BP, Heard RW. 2004. Range extension and review of the caprellid amphipods (Crustacea: Amphipoda: Caprellidae) from the shallow, coastal waters from the Suwannee river, Florida, to port Aransas, Texas, with an illustrated key. *Gulf Caribb Res.* 16:161–175.
- Frey MA, Gartner HN, Murray CC, Therriault TW. 2009. First confirmed records of the non-native amphipod *Caprella mutica* (Schurin 1935) along the coast of British Columbia, Canada, and the potential for secondary spread via hull fouling. *Aquat Invasions.* 4:495–499.
- Frick MG, Williams KL, Bolten AB, Bjorndal KA, Martins HR. 2009. Foraging ecology of oceanic-stage loggerhead turtles *Caretta caretta*. *Endang Species Res.* 9:91–97.
- Gable MF, Lazo-Wasem EA. 1987. The Caprellids (Amphipoda: Caprellida) of Bermuda: a survey of specimens collected from 1876–1987, including cave inhabitants, and the description of *Deutella aspiducha*, new species. *Proc Biol Soc Wash.* 100:629–639.
- Gable MF, Lazo-Wasem EA, Baldinger AJ. 2010. The amphipoda of Bermuda - a century of taxonomy. *Zool beatica.* 21:131–141.
- García-Madriral MS. 2007. Annotated checklist of the amphipods (Peracarida: Amphipoda) from the tropical Eastern Pacific. *Contributions to the Study of East Pacific Crustaceans.* 4:63–195.
- González ER, Haye PA, Balanda M-J, Thiel M. 2008. Lista sistemática de especies de peracaridos de Chile (Crustacea, Eumalacostraca). *Guayana.* 72:157–177.
- Guerra-García JM. 2001. Habitat use of the Caprellidea (Crustacea: Amphipoda) from Ceuta, north Africa. *Ophelia.* 55:27–38.
- Guerra-García JM. 2002a. *Metaprotella tanzaniensis*, a new caprellid (Crustacea: Amphipoda: Protellidae) from Tanzania, with a key to the species of *Metaprotella*. *Bull Mar Sci.* 70:909–918.
- Guerra-García JM. 2002b. Redescription of five rare caprellids (Crustacea: Amphipoda: Caprellidea) collected from Tanzanian coasts. *Helgol Mar Res.* 55:221–231.
- Guerra-García JM. 2002c. Two new species of *Deutella* Mayer, 1890 (Crustacea: Amphipoda: Pariambidae) collected by the R.V. ‘Anton Bruun’ during the International Indian Ocean Expedition 1963–1964. *Zootaxa.* 74:1–18.
- Guerra-García JM. 2002d. Littoral caprellids (Crustacea: Amphipoda: Caprellidae) from Philippines, with the description of a new species. *Raff Bull Zool.* 50:395–406.
- Guerra-García JM. 2003a. Redescription of *Mayerella magellanica* McCain and Gray, 1971 (Crustacea: Amphipoda: Caprellidae) from Chile with a revision of the genus *Mayerella*. *Hydrobiologia.* 490:187–195.
- Guerra-García JM. 2003b. Revision of the genus *Deutella* (Crustacea: Amphipoda: Caprellidea) with description of a new species, redescription of *Deutella venosa* Mayer, 1890 and a key to the species of *Deutella*. *J Nat Hist.* 37:1059–1084.
- Guerra-García JM. 2003c. The Caprellidea (Crustacea: Amphipoda) from Mauritius Island, Western Indian Ocean. *Zootaxa.* 232:1–24.
- Guerra-García JM. 2003d. Caprellids (Crustacea: Amphipoda) from Papua New Guinea, with the description of a new species. *Helgol Mar Res.* 57:100–109.
- Guerra-García JM. 2004. The Caprellidea (Crustacea, Amphipoda) from Western Australia and Northern Territory, Australia. *Hydrobiologia.* 522:1–74.
- Guerra-García JM. 2006. Caprellidae (Crustacea: Amphipoda) from the Great Barrier Reef and adjacent localities. *Rec Aust Mus.* 58:417–458.
- Guerra-García JM, Baeza-Rojano E, Cabezas MP, Díaz-Pavón JJ, Pacios I, García-Gómez JC. 2009. The amphipods *Caprella penantis* and *Hyale schmidtii* as biomonitors of trace metal contamination in intertidal ecosystems of Algeciras Bay, Southern Spain. *Mar Pollut Bull.* 58:783–786.
- Guerra-García JM, Ganesh T, Jaikumar M, Raman AV. 2010. Caprellids (Crustacea: Amphipoda) from India. *Helgol Mar Res.* 64:297–310.

- Guerra-García JM, Koonjul MS. 2005. *Metaprotella sandalensis* (Crustacea: Amphipoda: Caprellidae): a bioindicator of nutrient enrichment on coral reefs? *Environ Monit Assess.* 104:353–367.
- Guerra-García JM, Krapp-Schickel T, Müller HG. 2006. Caprellids from the Caribbean coast of Colombia, with description of three new species and a key for species identification. *Bol Invest Mar Cost.* 35:149–194.
- Guerra-García JM, Lowry JK. 2009. Caprellidae. In: Lowry JK, Myers AA, editors. *Benthic Amphipoda (Crustacea: Peracarida) of the Great Barrier Reef, Australia*. Auckland: Zootaxa; p. 290–327.
- Guerra-García JM, Redondo-Gómez S, Espina ÁG, Castillo JM, Luque T, García-Gómez JC, Figueroa M. 2006. *Caprella penantis* Leach, 1814 and *Caprella dilatata* Kroyer, 1843 (Crustacea: Amphipoda) from the Strait of Gibraltar: a molecular approach to explore intra- and interspecific variation. *Mar Biol Res.* 2:100–108.
- Guerra-García JM, Ros M. 2012. Presence of abdominal appendages in females of *Caprella equilibra* Say, 1818 (Peracarida, Amphipoda): is *Metacaprella* Mayer, 1903 a valid genus? *Crustaceana.* 85:71–79.
- Guerra-García JM, Ros M, Dugo-Cota A, Burgos V, Flores-León AM, Baeza-Rojano E, Cabezas MP, Núñez J. 2011. Geographical expansion of the invader *Caprella scaura* (Crustacea: Amphipoda: Caprellidae) to the East Atlantic coast. *Mar Biol.* 158:2617–2622.
- Guerra-García JM, Takeuchi I. 2002. The Caprellidea (Crustacea: Amphipoda) from Ceuta, North Africa, with the description of three species of *Caprella*, a key to the species of *Caprella*, and biogeographical discussion. *J Nat Hist.* 36:675–713.
- Guerra-García JM, Takeuchi I. 2003. The Caprellidea (Malacostraca: Amphipoda) from Mirs Bay, Hong Kong, with the description of a new genus and two new species. *J Crustac Biol.* 23:154–168.
- Guerra-García JM, Takeuchi I. 2004. The Caprellidea (Crustacea: Amphipoda) from Tasmania. *J Nat Hist.* 38:967–1044.
- Guerra-García JM, Thiel M. 2001. La fauna de caprélidos (Crustacea: Amphipoda: Caprellidea) de la costa de Coquimbo, centro-norte de Chile, con una clave taxonómica para la identificación de las especies. *Rev Chil Hist Nat.* 74:873–883.
- Guerra-García JM, Tierno de Figueroa JM. 2009. What do Caprellids (Crustacea: Amphipoda) feed on? *Mar Biol.* 156:1881–1890.
- Haedrich RL, Devine JA, Kendall VJ. 2008. Predictors of species richness in the deep-benthic fauna of the northern Gulf of Mexico. *Deep-Sea Res Pt II.* 55:2650–2656.
- Hernández-Arana HA, Rowden AA, Attrill MJ, Warwick RM, Gold-Bouchot G. 2003. Large-scale environmental influences on the benthic macroinfauna of the Southern Gulf of Mexico. *Estuar Coast Shelf Sci.* 58:825–841.
- Ito A, Aoki MN, Yahata K, Wada H. 2011. Complicated evolution of the caprellid (Crustacea: Malacostraca: Peracarida: Amphipoda) body plan, reacquisition or multiple losses of the thoracic limbs and pleons. *Dev Genes Evol.* 221:133–140.
- Ito A, Aoki MN, Yokobori S-I, Wada, H. 2010. The complete mitochondrial genome of *Caprella scaura* (Crustacea, Amphipoda, Caprellidea), with emphasis on the unique gene order pattern and duplicated control region. *Mitochondrial DNA.* 21:183–190.
- Ito A, Wada H, Aoki MN. 2008. Phylogenetic analysis of caprellid and corophioid amphipods (Crustacea) based on the 18S rRNA gene, with special emphasis on the phylogenetic position of Phtisicidae. *Biol Bull.* 214:176–183.
- Johnson WS, Stevens M, Watling L. 2001. Reproduction and development of marine peracaridans. *Adv Mar Biol.* 39:105–260.
- Keith DE. 1971. Substrate selection in caprellid amphipods of Southern California, with emphasis on *Caprella californica* Stimpson and *Caprella equilibra* Say (Amphipoda). *Pac Sci.* 25:387–394.

- Krapp T, Lang C, Libertini A, Melzer RR. 2006. *Caprella scaura* Templeton, 1836 sensu lato (Amphipoda: Caprellidae) in the Mediterranean. *Org Div Evol.* 6:77–81. Available from: <http://www.senckenberg.de/odes/06-03.htm>
- Krapp-Schickel G. 1993. Suborder Caprellidea. *Mémoires de l'Institut Océanographique Monaco.* 13:773–809.
- Krapp-Schickel T, Guerra-García JM. 2005. Littoral Caprellidae (Crustacea: Amphipoda) from Indonesia, with the description of a new species. *Boll Mus Civ Stor Nat Verona.* 29:47–62.
- Krøyer H. 1843. Beskrivelse af nogle arter og slægter af Caprellina: med indledende bemaerkninger om Laemodipoda og deres plads i systemet. *Naturhistorisk tidsskrift.* 4:490–518.
- Kunkel BW. 1910. The Amphipoda of Bermuda. *Trans Connect Acad Arts Sci.* 16:106–113.
- Lacerda MB, Takeuchi I, Masunari S. 2011. Redescription of the rare amphipod crustacean *Pseudaeginella montoucheti* (Quitete, 1971) from Brazil. *ZooKeys.* 146:1–17.
- Larsen K. 1997. A new species of *Metaprotella* (Crustacea: Amphipoda: Caprellidae) from East Africa, with key to the genera of Protellidae and discussion of generic characters. *J Nat Hist.* 31:1203–1212.
- Laubitz DR. 1970. Studies on the Caprellidae (Crustacea, Amphipoda) of the American North Pacific. *Publ Biol Oceanogr.* 1:1–89.
- Laubitz DR. 1972. The Caprellidae (Crustacea, Amphipoda) of Atlantic and Arctic Canada. *Publ Biol Oceanogr.* 4:1–82.
- Laubitz DR. 1993. Caprellidea (Crustacea: Amphipoda): towards a new synthesis. *J Nat Hist.* 27:965–976.
- Laubitz DR. 1995. Caprellidea (Crustacea: Amphipoda) from the Southern and Western Indian Ocean. *Mésogée.* 54:81–100.
- Lazo-Wasem EA, Gable MF. 1987. A review of recently discovered type specimens of Bermuda Amphipoda (Crustacea: Peracarida) described by B.W. Kunkel (1882–1969). *Proc Biol Soc Wash.* 100:321–336.
- Leach WE. 1814. Crustaceology. *The Edinburgh Encyclopaedia.* 7:383–437.
- LeCroy S, Gasca R, Winfield I, Ortiz M, Escobar-Briones E. 2009. Amphipoda (Crustacea) of the Gulf of Mexico. In: Felder DL, Camp DK, editors. *Gulf of Mexico origins, waters and biota, vol. I, Biodiversity.* Corpus Christi (TX): Texas AandM University Press; p. 941–972.
- Lewbel GS, Howard RL, Gallaway BJ. 1987. Zonation of dominant fouling organisms on Northern Gulf of Mexico petroleum platforms. *Mar Environ Res.* 21:199–224.
- LGL Ecological Research Associates Inc., Texas AandM University. 1986. *The Gulf of Mexico Continental Slope Study: Appendices. Annual Report: Year 2.* New Orleans (LA): LGL Ecological Research Associates, Inc. (Contract No. 14–12–0001–30212).
- Lim JHC, Takeuchi I. 2012. The distinctive species characteristics of *Metaprotella sandalensis* Mayer, 1898 (Crustacea: Amphipoda), commonly distributed throughout the tropical West Pacific coasts. *Raffles B Zool.* 60:23–34.
- Lim STA, Alexander CG. 1986. Reproductive behaviour of the caprellid amphipod *Caprella scaura* typica Mayer, 1890. *Mar Behav Physiol.* 12:217–230.
- Lowry JK, Myers AA. 2003. A Phylogeny and a new classification of the Corophiidea Leach, 1814 (Amphipoda). *J Crustac Biol.* 23:443–485.
- Martín A, Díaz Y, Miloslavich P, Escobar-Briones E, Guerra-García JM, Ortiz M, Valencia B, Giraldo A, Klein E. 2013. Regional diversity of Amphipoda in the Caribbean Sea. *Rev Biol Trop.* 61:1681–1720.
- Martin DM. 1977. A survey of the family Caprellidae (Crustacea, Amphipoda) from selected sites along the northern California coast. *Bull South Calif Acad Sci.* 76:146–167.
- Martin TR, Bortone SA. 1997. Development of an epifaunal assemblage on an estuarine artificial reef. *Gulf Mex Sci.* 15:55–70.

- Mayer P. 1882. Die Caprelliden des Golfes von Neapel under angrenzenden Meeres-Abschnitte. Eine Monographie. Fauna Flora Golfe Neapel. 6:1–201.
- Mayer P. 1890. Die Caprelliden des Golfes von Neapel under angrenzenden Meeres-Abschnitte. Nachtrag zur Monographie derselben. Fauna Flora Golfe Neapel. 17:1–157.
- Mayer P. 1903. Die Caprellidae der Siboga-Expedition. Siboga Exped. 34:1–160.
- McCain JC. 1965. The Caprellidae (Crustacea: Amphipoda) of Virginia. Chesap Sci. 6:190–196.
- McCain JC. 1968. The Caprellidae (Crustacea: Amphipoda) of the Western North Atlantic. Bull US Natl Mus. 278:1–147.
- McCain JC, Steinberg JE. 1970. Amphipoda I, Caprellidea I, Fam. Caprellidae. Crustaceorum Catalogus. 2:1–78.
- Minchin D, Colmes JMC. 1993. A skeleton shrimp *Caprella andreae* Mayer (Crustacea: Amphipoda) new to Ireland and other strandings in September 1991. Ir Nat J. 24:285.
- Momtazi F, Sari A. 2013. Intertidal caprellids (Crustacea: Amphipoda) of the Persian Gulf and the Gulf of Oman, with description of three new species. Zootaxa. 3717:195–223.
- Myers AA. 1993. Dispersal and endemism in gammaridean Amphipoda. J Nat Hist. 27:901–908.
- Myers AA. 1997. Biogeographic barriers and the development of marine biodiversity. Estuar Coast Shelf Sci. 44:241–248.
- Neigel JE. 2009. Population genetic and biogeography of the Gulf of Mexico. In: Felder DL, Camp DK, editors. Gulf of Mexico origins, waters and biota, vol. I, Biodiversity. Corpus Christi (TX): Texas AandM University Press; p. 1353–1369.
- Nizinski MS. 2003. Annotated checklist of decapod crustaceans of Atlantic coastal and continental shelf waters of the United States. Proc Biol Soc Wash. 116:96–157.
- Ohji M, Arai T, Miyazaki N. 2004. Effects of tributyltin on the survival in the caprellid amphipod *Caprella danilevskii*. J Mar Biol Ass UK. 84:345–349.
- Oliva-Rivera JJ. 1998. Enciclopedia de Quintana Roo. Chetumal (MX): Gobierno del Estado de Quintana Roo. Tomo I A-B, Anfipodos; p. 148–169.
- Oliva-Rivera JJ. 2003. The amphipod fauna of Banco Chinchorro, Quintana Roo, Mexico with ecological notes. Bull. Mar. Sci. 73:77–89.
- Oliva-Rivera JJ, Jiménez-Cueto MS. 1997. Composición, distribución y abundancia de los crustáceos peracáridos de la Laguna de Yalahau, Quintana Roo. AvaCient. 23:26–31.
- Ortiz M. 1979. Lista de especies y bibliografía de los anfipodos (Crustacea: Amphipoda) del Mediterráneo americano. Rev Invest Mar, Serie. 8:1–40.
- Ortiz M. 2001. Lista de invertebrados marinos, estuarinos y semiterrestres de la Playa de Cojimar, en la costa norte de la Provincia de la Habana. Rev Invest Mar. 22:93–102.
- Ortiz M, Álvarez F, Winfield I. 2002. Caprellid amphipods (Amphipoda: Caprellidea): illustrated key for the genera and species from the Gulf of Mexico and the Caribbean Sea. Ciudad de México (MX): Universidad Nacional Autónoma de México.
- Ortiz M, Guerra-García JM, Lalana R. 2009. *Cubadeutella cavernicola*, a new genus and species of Caprellidae (Crustacea: Amphipoda) from Cuba. Zootaxa. 2130:60–68.
- Ortiz M, Lalana R. 1996. Los anfipodos de la primera expedición conjunta Cuba-USA, a bordo del B/I “Ulises”, a las aguas del archipiélago Sabana-Camaguey, Cuba, en 1994. An Inst Biol, Univ Nac Auton Mex Zool. 67:89–101.
- Ortiz M, Lalana R. 2010. Distribución de los anfipodos (Crustacea, Malacostraca, Peracarida) de los subórdenes Gammaridea, Caprellidea e Hyperidea, presentes en el archipiélago cubano. Rev Invest Mar. 31:75–90.
- Ortiz M, Lalana R, Varela C, Arias R, Cabrerías R. 2006. Registros nuevos de anfipodos e isópodos marinos cubanos (Crustacea, Peracarida). Cocuyo. 16:19–20.
- Paz-Ríos CE, Ardisson PL. 2013. A new record of *Mayerella redunca* (Crustacea: Amphipoda: Caprellidae) from the Gulf of Mexico. Mar Biodivers Rec. 6:1–4. Available from: <http://dx.doi.org/10.1017/S1755267212000905>

- Pearse AS. 1908. Descriptions of four new species of amphipodous Crustacea from the Gulf of Mexico. *Proc US Nat Mus.* 34:27–32.
- Pearse AS. 1912. Notes on certain amphipods from the Gulf of Mexico, with descriptions of new genera and new species. *Proc US Nat Mus.* 43:369–379.
- Pederson EJ, Peterson MS. 2002. Bryozoans as ephemeral estuarine habitat and a larval transport mechanism for mobile benthos and young fishes in the north-central Gulf of Mexico. *Mar Biol.* 140:935–947.
- Pfaller JB, Frick MG, Reich KJ, Williams KL, Bjorndal KA. 2008. Carapace epibionts of loggerhead turtles (*Caretta caretta*) nesting at Canaveral National Seashore, Florida. *J Nat Hist.* 42:1095–1102.
- Posey MH, Alphin TD, Banner S, Vose F, Lindberg W. 1998. Temporal variability, diversity and guild structure of a benthic community in the Northeastern Gulf of Mexico. *Bull Mar Sci.* 63:143–155.
- Quitete JMPA. 1972. *Hemiagina costai*, nova espécie de Caprellidae da costa brasileira (Crustacea: Amphipoda). *Atas Soc Biol Rio de Janeiro.* 15:165–168.
- Rakocinski CF, Heard RW, LeCroy SE, McLelland JA, Simons T. 1996. Responses by macrobenthic assemblages to extensive beach restoration at Perdido Key, Florida, USA. *J Coast Res.* 12:326–353.
- Reid DM. 1951. Report on the Amphipoda (Gammaridea and Caprellidea) of the coast of tropical West Africa. *Atlantide Rep.* 2:189–291.
- Richards VP, Stanhope MJ, Shivji MS. 2012. Island endemism, morphological stasis, and possible cryptic speciation in two coral reef, commensal Leucothoid amphipod species throughout Florida and the Caribbean. *Biodivers Conserv.* 21:343–361.
- Rodríguez-Almaras GA, Ortega-Vidales VM. 2013. Primer registro de *Caprella scaura* y *Caprella penantis* (Crustacea: Peracarida: Amphipoda) en la laguna Madre, Tamaulipas, México. *Rev Mex Biodi.* 84:989–993.
- Ros M, Guerra-García JM. 2012. On the occurrence of the tropical caprellid *Paracaprella pusilla* Mayer, 1890 (Crustacea: Amphipoda) in Europe. *Medit Mar Sci.* 13:134–139.
- Say T. 1818. An account of the Crustacea of the United States. *J Acad Nat Sci Phila.* 1:374–401.
- Serejo CS. 1997. *Hemiaegina costai* Quitete, 1972 a synonym of *Hemiaegina minuta* Mayer, 1890 (Amphipoda: Caprellidae). *Crustaceana.* 70:630–632.
- Serejo CS. 1998. Gammaridean and Caprellidean fauna (Crustacea) associated with the sponge *Dysidea fragilis* Johnston at Arraial do Cabo, Rio de Janeiro, Brazil. *Bull Mar Sci.* 63:363–385.
- Sezgin M, Ates AS, Kata T, Katağan T, Bakir K, Yalçın Özdilek S. 2009. Notes on amphipods *Caprella andreae* Mayer, 1890 and *Podocerus chelonophilus* (Chevreux and Guerne, 1888) collected from the loggerhead sea turtle, *Caretta caretta*, off the Mediterranean and the Aegean coasts of Turkey. *Turk J Zool.* 33:433–437.
- Sheridan PF. 1979. Three new species of *Melita* (Crustacea: Amphipoda), with notes on the amphipod fauna of the Apalachicola estuary of Northwest Florida. *Northeast Gulf Sci.* 3:60–73.
- Shirley TC. 1974. *Caprella andreae* Mayer, 1890 (Crustacea: Amphipoda: Caprellidae) from Padre Island, Texas. *Tex J Sci.* 26:621.
- Slabber M. 1769. *Natuurkundige Verlustingen, behelzende microscopise Waarneemingen van in- en uitlandse water- en land-Dieren.* Te Haarlem: J. Bosh.
- Spivak ED, Bass CC. 1999. First finding of the pelagic crab *Planes marinus* (Decapoda: Grapsidae) in the Southwestern Atlantic. *J Crust Biol.* 19:72–76.
- Stebbing TRT. 1895. XLVI.—Two new amphipods from the West Indies. *Ann Mag Nat Hist.* 15:397–403.
- Steinberg JE, Dougherty EC. 1957. The skeleton shrimps (Crustacea: Caprellidae) of the Gulf of Mexico. *Tulane Stud Zool.* 5:267–288.

- Sturaro N, Guerra-García JM. 2012. A new species of *Caprella* (Crustacea: Amphipoda) from the Mediterranean Sea. *Helgol Mar Res.* 66:33–42.
- Sundara Raj B. 1927. Suborder Caprellidea (Laemodipoda). The littoral fauna of Krusada Island in the Gulf of Manaar. *Bull Madras Govt Mus (NSNHS).* 1:125–128.
- Takeuchi I. 1993. Is the Caprellidea a monophyletic group?. *J Nat Hist.* 27:947–964.
- Takeuchi I. 1999. Checklist and bibliography of the Caprellidea (Crustacea: Amphipoda) from Japanese waters. *Otsuchi Mar Sci.* 24:5–17.
- Takeuchi I, Hino A. 1997. Community structure of caprellid amphipods (Crustacea) on seagrasses in Otsuchi Bay, Northeastern Japan, with reference to the association of *Caprella japonica* (Schurin) and *Phyllospadix ivatensis* Makino. *Fish Sci.* 63:327–331.
- Takeuchi I, Hirano R. 1991. Growth and reproduction of *Caprella danilevskii* (Crustacea: Amphipoda) reared in the laboratory. *Mar Biol.* 110:391–397.
- Takeuchi I, Hirano R. 1992. Duration and size of embryos in epifaunal amphipods *Caprella danilevskii* Czerniavski and *C. okadai* Arimoto (Crustacea: Amphipoda: Caprellidea). *J Exp Mar Biol Ecol.* 164:161–169.
- Takeuchi I, Hirano R. 1995. Clinging behavior of the epifaunal caprellids (Amphipoda) inhabiting the *Sargassum* zone on the Pacific coast of Japan, with its evolutionary implications. *J Crustac Biol.* 15:481–492.
- Takeuchi I, Lowry JK. 2007. Description of *Metaprotella haswelliana* (Mayer, 1882) (Crustacea: Amphipoda: Caprellidae) from Western Australia with designation of a neotype. *Zootaxa.* 1466:11–18.
- Takeuchi I, Oyamada A. 2013. Description of two species of *Caprella* (Crustacea: Amphipoda: Caprellidae) from the North Pacific; *C. californica* Stimpson, 1857 and *C. scauroides* Mayer, 1903, with a new appraisal of species ranking for *C. scauroides*. *Helgol Mar Res.* 67:371–381.
- Takeuchi I, Sawamoto S. 1998. Distribution of caprellid amphipods (Crustacea) in the western North Pacific based on the CSK International Zooplankton collection. *Plankton Biol Ecol.* 45:225–230.
- Takeuchi I, Takahashi S, Tanabe S, Miyazaki N. 2001. *Caprella* watch: a new approach for monitoring butyltin residues in the ocean. *Mar Environ Res.* 52:97–113.
- Templeton R. 1836. Descriptions of some undescribed exotic Crustacea. *Trans Entomol Soc Lond.* 1:185–198.
- Thiel M. 1997. Another caprellid amphipod with extended parental care: *Aeginina longicornis*. *J Crust Biol.* 17:275–278.
- Thiel M, Guerra-García JM, Lancellotti DA, Vásquez N. 2003. The distribution of littoral caprellids (Crustacea: Amphipoda: Caprellidea) along the Pacific coast of continental Chile. *Rev Chil Hist Nat.* 76:297–312.
- Thomas JD. 1993. Identification manual for the marine Amphipoda (Gammaridea): I. Common coral reef and rock bottom amphipods of South Florida. Tallahassee (FL): Florida Department of Environmental Protection.
- Tunnell Jr JW, Chavez EA, Withers K. 2007. Coral reefs of the southern Gulf of Mexico. Corpus Christi (TX): Texas AandM University Press.
- Watling L. 1997. Taxonomic atlas of the benthic fauna of the Santa Maria Basin and the western Santa Barbara Channel, vol. 12. Santa Barbara (CA): Santa Barbara Museum of Natural History. Chapter 5, The Suborder Caprellidea; p. 223–240.
- Winfield I. 2008. Catálogo taxonómico de especies de México, Capital natural de México, vol. I, Conocimiento actual de la biodiversidad. Ciudad de México (MX): Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. Anfipodos (Crustáceos); p. 46–63.
- Winfield I, Abarca-Arenas LG, Cházaro-Olvera SI. 2007. Crustacean macrofoulers in the Veracruz coral reef system, SW Gulf of Mexico: checklist, spatial distribution and diversity. *Cah Biol Mar.* 48:287–295.

- Winfield I, Escobar-Briones E. 2008. Composición, dominancia y distribución batimétrica de los anfípodos bentónicos (Caprellidea y Gammaridea) en la porción mexicana del Golfo de México. In: Álvarez F, Rodríguez-Almaraz GA, editors. *Crustáceos de México: estado actual de su conocimiento*. Monterrey (MX): Universidad Autónoma de Nuevo León; p. 17–32.
- Winfield I, Escobar-Briones E, Álvarez F. 2007. Clave para la identificación de los anfípodos bentónicos del Golfo de México y el sector norte del Mar Caribe. Ciudad de México (MX): Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, Comisión Nacional para el Conocimiento y Uso de la Biodiversidad.
- Winfield I, Escobar-Briones E, Morrone JJ. 2006. Update checklist and identification of areas of edemism of benthic amphipods (Caprellidae and Gammaridea) from offshore habitats in the SW Gulf of Mexico. *Sci Mar*. 70:99–108.
- Winfield I, Ortiz M. 2013. The Caprellidea (Crustacea: Peracarida: Amphipoda) from the Gulf of Mexico with a description of a new species of *Paracaprella*. *Sci Mar*. 77:161–168.
- Woods CMC. 2009. Caprellid amphipods: an overlooked marine finfish aquaculture resource? *Aquaculture*. 289:199–211.
- Yáñez-Arancibia A, Day JW. 2004. The Gulf of Mexico: towards an integration of coastal management with large marine ecosystem management. *Ocean Coast Manage*. 47:537–563.