

Taxonomy and systematics

First records of non-hyperiid planktonic amphipods (Amphilochidea and Senticaudata) from deep waters of southwestern Gulf of Mexico, with an identification key

Primeros registros de anfípodos planctónicos no hiperídeos (Amphilochidea y Senticaudata) de aguas profundas del suroeste del golfo de México, con una clave de identificación

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Abstract

Within the planktonic Amphipoda, the non-hyperiid species have been scarcely studied in the southern Gulf of Mexico. Zooplankton samples were obtained over a grid of 25 oceanographic stations in the southwestern area of the gulf using a stratified opening-closing plankton net system in epi- and mesopelagic zones (0-1,000 m depth). Sixty-nine individuals of non-hyperiid planktonic amphipods were obtained. Their taxonomic identification indicate the presence of 3 species of Amphilochidea, *Cyphocaris anonyx* Boeck, 1871, *C. challenger* Stebbing, 1888, *Eusiropsis riisei* Stebbing, 1897, and 1 species of Senticaudata, *Stenopleura atlantica* Stebbing, 1888, representing the first records of these species in the region. A taxonomic account and information on their horizontal and vertical distribution in the studied area are provided. The presence of eyes in *E. riisei* is for the first time reported. An identification key for 7 species of Amphilochidea and Senticaudata recorded in the Gulf of Mexico is provided.

Keywords: Mesopelagic zone; Pelagic amphipods; *Stenopleura atlantica*; Stratified sampling; Vertical distribution; Western Atlantic Ocean

Resumen

Entre los Amphipoda planctónicos, las especies no hiperídeas del sur del golfo de México han sido escasamente estudiadas. Se obtuvieron muestras de zooplancton sobre una red de 25 estaciones oceanográficas ubicadas en el suroeste del golfo utilizando un sistema de redes planctónicas estratificadas de apertura y cierre en zonas epi- y mesopelágicas (0-1,000 m de profundidad). Se obtuvieron 69 individuos de anfipodos planctónicos no hiperídeos. Los resultados de su identificación taxonómica indican la presencia de 3 especies de Amphilochidea, *Cyphocaris anonyx* Boeck, 1871, *C. challengerii* Stebbing, 1888, *Eusiropsis riisei* Stebbing, 1897, y 1 especie de Senticaudata, *Stenopleura atlantica* Stebbing, 1888, lo cual representa sus primeros registros en la región. Se presenta un reporte taxonómico de las especies y se proporciona información sobre su distribución horizontal y vertical en el área de estudio. Se reporta por primera vez la presencia de ojos en *E. riisei*. Se proporciona una clave de identificación de 7 especies de Amphilochidea y Senticaudata registradas en el golfo de México.

Palabras clave: Zona mesopelágica; Anfipodos pelágicos; *Stenopleura atlantica*; Muestreo estratificado; Distribución vertical; Océano Atlántico occidental

Introduction

Among the peracarid crustaceans, the order Amphipoda Latreille, 1816 is the most abundant and has the greatest species richness (LeCroy et al., 2009); this order includes 6 suborders (Lowry & Myers, 2017). The amphipods inhabit mainly benthic systems and have been mostly studied in epicontinental aquatic ponds and in coral reefs, coastal lagoons, mangroves, interacting with other benthic or pelagic organisms (Bowman, 1955; LeCroy et al., 2009; Lowry & Stoddart, 1997; Marrón-Becerra et al., 2018; Thomas & Barnard, 1992; Violante-Huerta, 2018). In planktonic systems, amphipods can be free-living or associated with gelatinous organisms. Some species have been recognized as active predators of other zooplankters (Vinogradov et al., 1996).

Within the planktonic Amphipoda, the non-hyperiid species have been scarcely studied because most of them inhabit deep waters. Generally, they show a broad distribution in the water column. Some species inhabit the epi- and mesopelagic zones, and others are exclusively found in the bathypelagic or hadal zones (Hughes & Lowry, 2015; Lowry & Stoddart, 1997; Thurston, 1976; Vinogradov, 1999). Knowledge of the vertical distribution of non-hyperiid planktonic amphipods is scarce. In the Atlantic Ocean, the last study was published by Thurston (1976) upon stratified samples analyzing the diel vertical migration and distribution of 8 non-hyperiid species down to 950 m depth.

In the Gulf of Mexico, studies concerning planktonic amphipods are mainly referred to surface waters (Barnard, 1972; Barnard & Thomas, 1989; Gasca, 2003, 2004; Gasca et al., 2009), with few studies in deep waters (Lowry & Stoddart, 1997; Shoemaker, 1956). In this gulf, 2 suborders of planktonic Amphipoda have been recorded: Amphilochidea Boeck, 1871 with 3 families and 3 species, the Cyphocarididae with *Cyphocaris*

tunicola Lowry & Stoddart, 1997, the Eurytheneidae with *Eurythenes obesus* (Chevreux, 1905), and the Synopiidae with *Synopia ultramarina* Dana, 1853, and Hyperiidea H. Milne Edwards, 1830 with about 100 species (Barnard, 1972; Barnard & Thomas, 1989; LeCroy et al., 2009; Lowry & Stoddart, 1997; Shoemaker, 1956). However, there are no studies on non-hyperiid planktonic amphipods addressing the mesopelagic zone in Mexico. In this work we report the first records of 4 species of non-hyperiid planktonic amphipods of the suborders Amphilochidea and Senticaudata Lowry & Myers, 2013 from the southwestern Gulf of Mexico and provide information on their horizontal and vertical distribution using stratified samples collected up to 1,000 m depth. An identification key for 7 species of Amphilochidea and Senticaudata recorded in the Gulf of Mexico is provided.

Materials and methods

Zooplankton samples were collected in the southwestern Gulf of Mexico from January 23 to February 3, 2013 during the oceanographic campaign “Zooplankton de la capa mesopelágica del sur del Golfo de México” (ZOOMEP-1) with the Research Vessel “Justo Sierra”. Samples were obtained over a grid of 25 oceanographic stations (Fig. 1, Table 1) covering oceanic waters, using a stratified opening-closing plankton net system (nets with 75 cm mouth and 505 µm mesh) with a flowmeter at the mouth of each net to estimate the volume of filtered water. At each station, 2 sets of stratified sampling nets were made: the first set with 3 nets to sample the waters between 0-600 m depth, and the second set with 2 nets to sample the waters between 600-1,000 m depth. This effort was carried out at most at 5 levels of the water column, depending on bottom depth (Table 1): level 1: 0-200 m, level 2: 200-400 m, level 3: 400-600 m, level 4: 600-800 m, and level 5: 800-1,000 m. Thus, a total of 104 samples

were obtained. The samples were fixed in 4% formalin and preserved in 70% ethanol. In the laboratory, amphipods were sorted, dissected, and body parts mounted on semi-permanent slides. The taxonomic identification was made following the publications of Hughes and Lowry (2015), LeCroy (2000), Lowry and Stoddart (1997), Stebbing (1888, 1897), and Vinogradov (1999). One individual of each species was deposited in the Colección Nacional de Crustáceos (CNCR), Instituto de Biología, Universidad Nacional Autónoma de México, and the rest of examined individuals are deposited in the zooplankton collection of the Laboratorio de Ecología de Sistemas Pelágicos, Instituto de Ciencias del Mar y Limnología (ICML-LESP), Universidad Nacional Autónoma de México.

For the species account we follow the taxonomic classification of Horton et al. (2019). The diagnoses of the species are mainly based on publications of several authors, which are indicated in the correspondent species account. In addition, mean density (ind/1,000 m³) value of each species was calculated by the following formula:

$$\text{Mean density} = ((\sum^N ((n_i \times 1000)/V(i)))/N)$$

n_i = number of individuals at sampling station i ; $V(i)$ = volume of filtered water at sampling station i ; N = number of sampling stations

Descriptions

Order Amphipoda Latreille, 1816

Suborder Amphilocheia Boeck, 1871

Infraorder Lysianassida Dana, 1849

Parvorder Lysianassidira Dana, 1849

Superfamily Lysianassoidea Dana, 1849

Family Cyphocarididae Lowry & Stoddart, 1997

Cyphocaris Boeck, 1871

Cyphocaris anonyx Boeck, 1871

(Fig. 2)

Diagnosis. Slender and smooth body, total length 3-15 mm, antenna 1 shorter than antenna 2, extending beyond pereonite 6. Head narrow, deeper than longer; rostrum absent. Eyes present, rounded. Pereonite 1 conspicuously produced anterodorsally. Coxae of pereopods 1-3 smaller than the following coxae. Gnathopods 1-2 weakly subchelate. Pereopods 3-4 with an expanded distal end of the propodus. Pereopod 3 coxa not anteriorly produced. Pereopod 4 coxa anterior margin subacute. Pereopod 5 coxa smaller than coxa 4, basis posterior margin spur with margins serrate, almost reaching the length of merus, not reaching beyond pleonite 1; basis posterior margins of pereopods 5-7 dentate. Telson relatively short, not reaching the end of uropod 3. Sources: Hughes and Lowry (2015), Lowry and Stoddart (1997), and Vinogradov (1999).

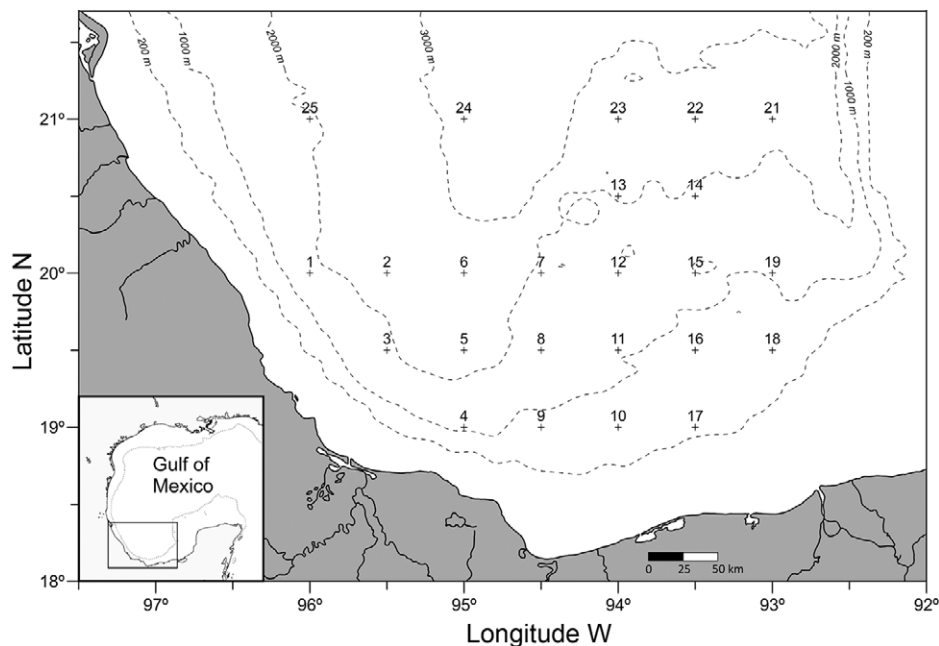


Figure 1. Geographical location of the sampling stations in the southwestern Gulf of Mexico during the oceanographic cruise ZOOME-1 in winter, from January 23 to February 3, 2013.

Taxonomic summary

Type locality. Greenland, North Atlantic Ocean (Hughes & Lowry, 2015).

Depth range. 0 - 2,523 m (Hughes & Lowry, 2015).

Geographical distribution. North Atlantic: Greenland, central north Atlantic, New York-USA, Bermuda, Caribbean Sea, Iceland, Norway, Ireland, west Bay of Biscay; Gulf of Mexico; South Atlantic: oceanic waters between America and Africa, Brazil, Gulf of Guinea, south Africa; North Pacific: Bering Sea, Gulf of Alaska, Punta Rompiente-Mexico; South Pacific: Solomon Sea, New Caledonia, oceanic waters off Peru and Chile; Western Indian Ocean: next to Madagascar; Australia: north-east and south oceanic waters; Sub-Antarctic Ocean: south-east of Campbell Island (Bellan-Santini & Costello, 2001; GBIF.org, 2019; Hughes & Lowry, 2015; Hurley, 1963; Lalana et al., 2005; Miloslavich et al., 2010; OBIS, 2019; Thurston, 1976; Vinogradov, 1999, 2004; this study).

Table 1

Geographical coordinates, depth, and sampled levels of sampling stations in the southwestern Gulf of Mexico.

Station	Latitude N	Longitude W	Depth (m)	Sampled levels
1	20	96	0 - 1,000	1-5
2	20	95.5	0 - 1,000	1-5
3	19.5	95.5	0 - 1,000	1-5
4	19	95	0 - 1,000	1-5
5	19.5	95	0 - 1,000	1-5
6	20	95	0 - 1,000	1-5
7	20	94.5	0 - 1,000	1-5
8	19.5	94.5	0 - 1,000	1-5
9	19	94.5	0 - 600	1-3
10	19	94	0 - 400	1-2
11	19.5	94	0 - 800	1-4
12	20	94	0 - 1,000	1-5
13	20.5	94	0 - 1,000	1-5
14	20.5	93.5	0 - 1,000	1-5
15	20	93.5	0 - 600	1-3
16	19.5	93.5	0 - 400	1-2
17	19	93.5	0 - 400	1-2
18	19.5	93	0 - 600	1-3
19	20	93	0 - 1,000	1-5
21	21	93	0 - 1,000	1-5
22	21	93.5	0 - 1,000	1-5
23	21	94	0 - 1,000	1-5
24	21	95	0 - 1,000	1-5
25	21	96	0 - 1,000	1-5

Material examined. Seven adults ♀♀ and 3 juveniles collected from: station 1, level 2, 1 ♀ ICML-LESP 0001; station 5, level 4, 1 juvenile ♀ CNCR 35502 and 1 juvenile ICML-LESP 0002; station 7, level 4, 1 ♀ ICML-LESP 0003; station 11, level 2, 1 ♀ ICML-LESP 0004; station 19, level 3, 1 ♀ ICML-LESP 0005; station 22, level 3, 1 juvenile ICML-LESP 0006; station 24, level 3, 2 ♀♀ ICML-LESP 0007; station 25, level 3, 1 ♀ ICML-LESP 0008.

Remarks

Cyphocaris anonyx and *C. ananke* Hughes & Lowry, 2015 are morphologically very similar. *C. anonyx* has the shape of the pereopod 4 coxa anterior margin subacute and the length of the telson shorter than the uropod 3 length, whilst in *C. ananke* the pereopod 4 coxa anterior margin is broadly rounded and the telson is as long as the uropod 3 (Hughes & Lowry, 2015). All the *C. anonyx* studied individuals have translucent rounded eyes as reported by Hughes and Lowry (2015), who annotated that this character was previously ignored possibly due to the bleaching effect of alcohol. The color of the examined individuals preserved in alcohol is yellowish. The mean density of this species was 0.15 ind/1,000 m³.

Cyphocaris challenger Stebbing, 1888
(Fig. 3)

Diagnosis. Slender and smooth body with 2.7 to 5.7 mm of total length, antennae long; antenna 1 shorter than antenna 2. Head narrow, deeper than longer; rostrum absent. Eyes present, reniform. Pereopod 1 produced anteriorly, overlapping head. Coxae of pereopods 1-3 smaller than the following coxae. Gnathopods 1-2 weakly subchelate. Pereopod 4 coxa anterior margin rounded, with a strongly convex anterior margin covering coxae of pereopods 1-3. Pereopod 5 basis proximal posterior margin serrate and the distal posterior margin spur smooth, exceeding length of merus and not reaching beyond pleonite 1; basis posterior margins of pereopods 5-7 dentate. Telson relatively short, not reaching the end of uropod 3. Sources: Hughes and Lowry (2015), Lowry and Stoddart (1997), Stebbing (1888), and Vinogradov (1999).

Taxonomic summary

Type locality. Hawaiian Islands, North Pacific Ocean (Hughes & Lowry, 2015).

Depth range. 0 - 5,987 m depth (Hughes & Lowry, 2015).

Geographical distribution. North Atlantic: oceanic waters of New York-USA, Bermuda, oceanic waters in front of Ireland, Canary Islands; Gulf of Mexico; South Atlantic: oceanic waters between America and Africa, Brazil, south Africa; North Pacific: Japan, Hawaiian

Islands, Bering Sea, Gulf of Alaska, Canada, USA; South Pacific: Solomon Sea; Indian Ocean: Arabian Sea, southernmost Indian Ocean next to Madagascar; Southern Australia Basin (GBIF.org, 2019; Hughes & Lowry, 2015; OBIS, 2019; Thurston, 1976; Vinogradov, 1999, 2004; Yamada & Ikeda, 2000; this study).

Material examined. Station 3, level 2, 1 adult ♀, CNCR 35503; station 22, level 5, 1 juvenile, ICML-LESP 0009.

Remarks

Cyphocaris challenger is similar to *C. bouvieri* Chevreux, 1916 in the shape of the pereopod 5 basis, but the main difference is the spur that exceeds the length of merus in *C. challenger* but not in *C. bouvieri* (Hughes & Lowry, 2015). *C. challenger* differs from *C. tunicola* (the only cyphocarid species reported in the Gulf before

the present study) by having the dorsal margin of the spur of pereopod 5 basis smooth, and a shorter length of spur, whilst in *C. tunicola* the posterior margin of the spur is entirely serrated and the length of spur much longer (Hughes & Lowry, 2015; Lowry & Stoddart, 1997). The color of the examined individuals preserved in alcohol is yellowish. The mean density of this species was 0.04 ind/1,000 m³.

Infraorder Amphilochida Boeck, 1871
 Parvorder Eusiridira Stebbing, 1888
 Superfamily Eusiroidea Stebbing, 1888
 Family Eusiridae Stebbing, 1888
Eusiropsis Stebbing, 1897
Eusiropsis riisei Stebbing, 1897
 (Fig. 4)

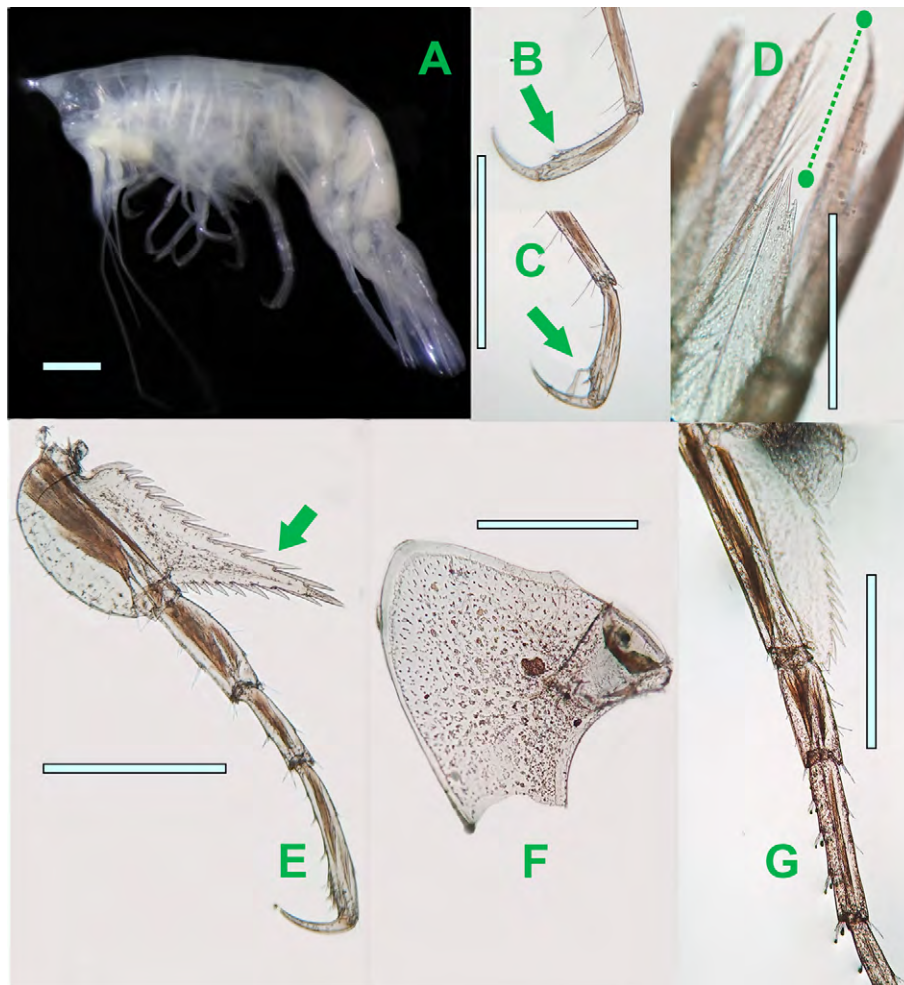


Figure 2. Female of *Cyphocaris anonyx* Boek, 1871 (10.5 mm total length) from southwestern Gulf of Mexico. A, Habitus in left lateral view; B, pereopod 3 with extended distal end of propodus; C, pereopod 4 with extended distal end of propodus; D, telson with tip not reaching the end of uropods 3; E, pereopod 5 spur with serrated margins; F, pereopod 4 coxa subacute; G, pereopod 7 with basis posterior margin serrated. Scale bars = 1 mm.

Diagnosis. Body slender, smooth, total length 7 mm, without mucronations on dorsal surface of pleonites. Eyes present, translucent, reniform. Head with triangular rostrum longer than broad. Antenna 1 and antenna 2 subequal in length, lower margin with some calceoli in antenna 1, calceoli in upper margin in antenna 2. Gnathopods 1-2 subchelate, subequal with eusirid form. Gnathopods 1-2 merus with posterior lobe, carpus lacking posterior lobe, propodus with a spinigerous process on posteriodistal edge. Pereopods 3-7 elongate and simple, the inferior margin setose, with dactylus simple. Basis of pereopods 5-7 with serrations in the posterior margin. Dorsal surface of all segments of the pleon smooth. Telson elongate, narrow, apically incised with the end margin with 4 very long plumose setae. Sources: Stebbing (1897), Vinogradov (1999), and this study.

Taxonomic summary

Type locality. Tropical Atlantic (Stebbing, 1897).

Depth range. 0 - 500 m (Vinogradov, 1999).

Geographical distribution. North Atlantic: Canary Islands; Gulf of Mexico; South Atlantic: Brazil; South Pacific: central part, Indonesia; North Indian Ocean: Arabian Sea (GBIF.org, 2019; OBIS, 2019; Thurston, 1976; Vinogradov, 1999; this study).

Material examined. Station 10, level 2, 1 adult ♀, CNCR 35504.

Remarks

There are only 2 species in the genus *Eusiropsis* and *E. riisei* is the type species (Horton et al., 2019). *E. riisei* differs from the other species *E. spinidorsalis* Gamo, 1981 by the lack of the conspicuous transverse rows of spinules on the dorsum surface of the pleon segments (Gamo, 1981). This characteristic is the most important and easily distinguishable morphologic feature among the 2 species, since *E. riisei* has the dorsal surface smooth in all segments (Stebbing, 1897). Previous studies indicated the absence

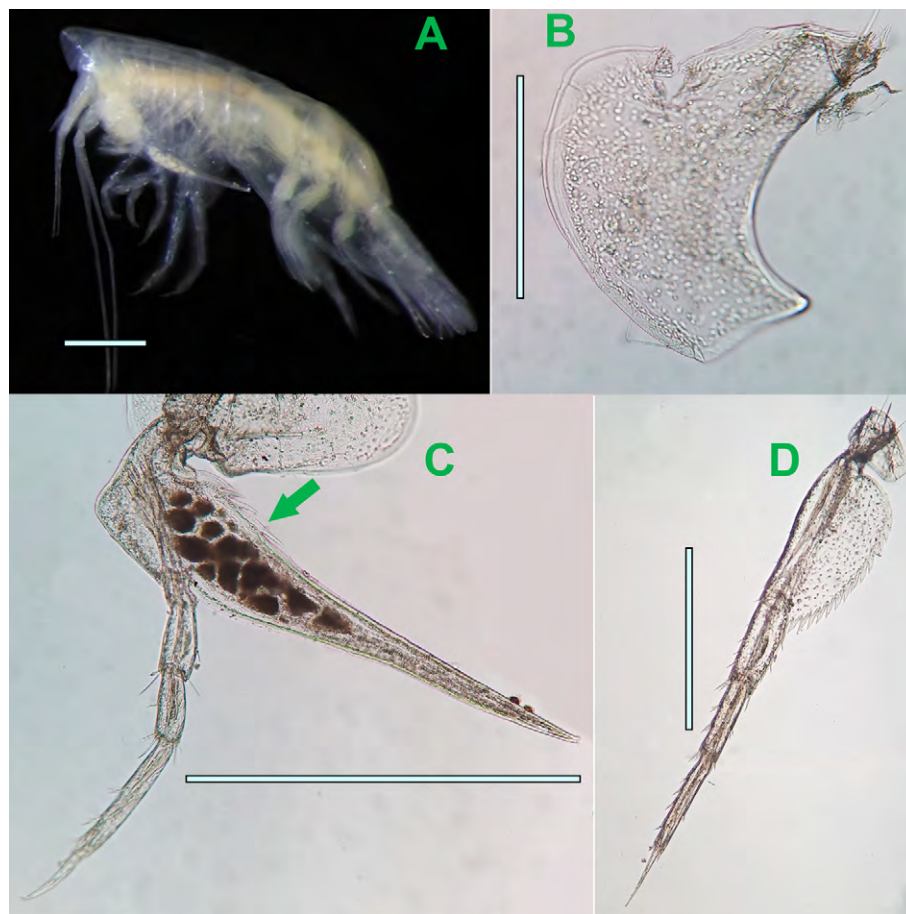


Figure 3. Female of *Cyphocaris challengerii* Stebbing, 1888 (5.7 mm total length) from southwestern Gulf of Mexico. A, Habitus in left lateral view; B, pereopod 4 coxa rounded; C, pereopod 5 spur with serrated proximal posterior margin and anterior and distal posterior margins smooth; D, pereopod 7 with basis posterior margin serrated. Scale bars in A, C, D = 1 mm; B = 0.5 mm.

of eyes in *E. riisei* (Stebbing, 1897; Vinogradov, 1999), but in the studied individual we observed translucent reniform ommatidia in each side of the head (Fig. 4B). According to Gamo (1981), *E. spinidorsalis* has a pair of distinct reddish eyes. The distribution range of *E. spinidorsalis* is restricted to the northwestern Pacific Ocean, only recorded in Japan (Gamo, 1981; GBIF.org, 2019). The color of the examined specimen preserved in alcohol is yellowish. The mean density of this species was 0.02 ind/1,000 m³.

Suborder Senticaudata Lowry & Myers, 2013
 Infraorder Hadziida S. Karaman, 1943
 Parvorder Hadziidira S. Karaman, 1932
 Superfamily Calliopoidea G.O. Sars, 1895
 Family Calliopiidae G.O. Sars, 1893
Stenopleura Stebbing, 1888
Stenopleura atlantica Stebbing, 1888
 (Fig. 5)

Diagnosis. Body slender, smooth, total length 2.5-4.7 mm. Antenna 1 peduncle short, second article much shorter

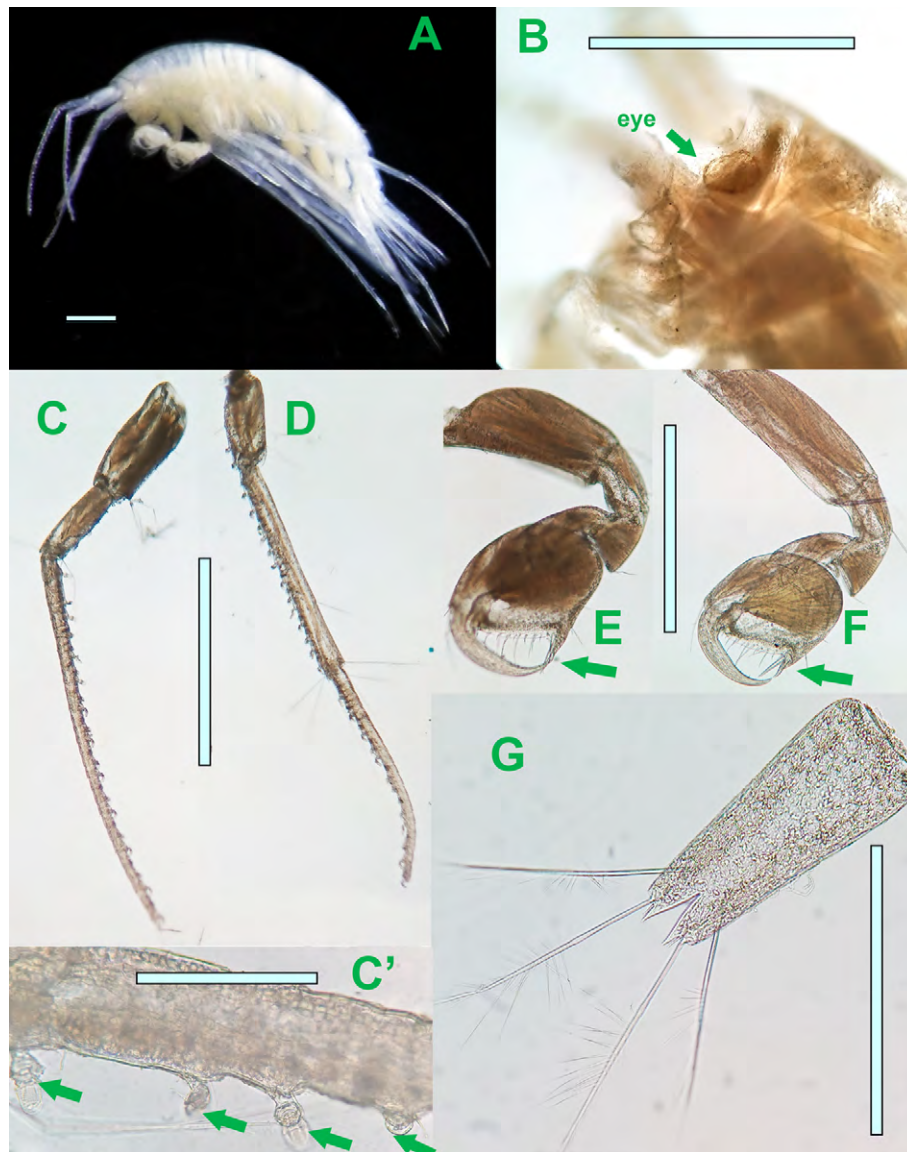


Figure 4. Female of *Eusiropsis riisei* Stebbing, 1897 (7 mm total length) from southwestern Gulf of Mexico. A, Habitus in left lateral view; B, eyes clearly demarcated reniform; C, first antenna; C', calceoli of antenna 1; D, second antenna; E, gnathopod 1 with spinigerous process on posteriodistal edge of propodus; F, gnathopod 2 with spinigerous process on posteriodistal edge of propodus; G, telson with incised tip and 4 long plumose setae. Scale bars in A-F = 1 mm; G = 0.7 mm; C' = 0.5 mm.

than article 1; antenna 1 slightly longer than antenna 2. Eyes clearly defined, reniform, pigmented in red. Short coxae. Gnathopods 1 and 2 with large posterior lobe in merus, smaller than pereopods; gnathopod 1 prehensile and gnathopod 2 elongate and slender subchelate. Pereopods 3-7 elongate and simple; pereopod 7 with broad basis as long as merus. Uropods armed with lateral spines. Telson entire relatively short, as broad as long, apically incised. Sources: Stebbing (1888), Vinogradov (1999), this study.

Taxonomic summary

Type locality. Mid Atlantic Ocean 1°47' N, 24°26' W (Stebbing, 1888).

Depth range. 0 - 800 m, mainly at surface waters (Thurston, 1976).

Geographical distribution. North Atlantic: Cuba, Ireland, Canary Islands; Gulf of Mexico; South Atlantic: oceanic waters between America and Africa, Brazil, Gulf of Guinea, South Africa; South Pacific: New Zealand; Eastern Tropical Pacific: coast of Panama; North Indian Ocean: Arabian Sea; Antarctic: Davis Sea (Bellan-Santini & Costello, 2001; De Broyer et al., 2007; GBIF.org, 2019; Lalana et al., 2005; Miloslavich et al., 2010; OBIS, 2019; Vinogradov, 1999; this study).

Material examined. Forty-seven adult ♀♀, 9 ovigerous ♀♀ collected from: station 1, level 1, 1 ♀, CNCR 35505,

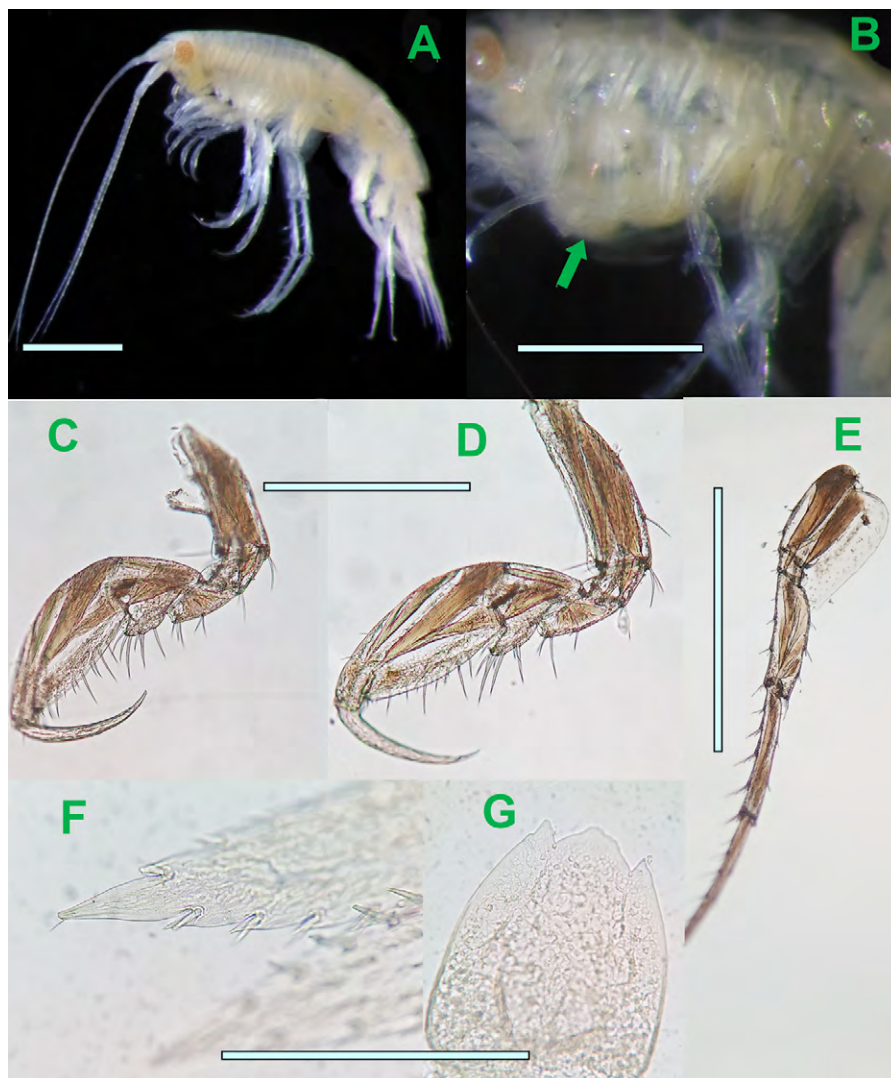


Figure 5. Female of *Stenopleura atlantica* Stebbing, 1888 (4 mm total length) from the southwestern Gulf of Mexico. A, Habitus in left lateral view; B, ovigerous female; C, gnathopod 1 prehensile with large posterior lobe in merus; D, gnathopod 2 elongate and slender subchelate with large posterior lobe in merus; E, pereopod 7 with the broad basis as long as merus; F, tip of uropod 3 with lateral margins armed with spines; G, telson with incised apical margin. Scale bars A, B, E = 1 mm; C, D = 0.5 mm; F, G = 0.3 mm.

9 ♀♀ and 1 ovigerous ♀ ICML-LESP 0010; station 1, level 2, 1 ♀ ICML-LESP 0011; station 1, level 5, 3 ♀♀, ICML-LESP 0012; station 2, level 1, 1 ♀ and 1 ovigerous ♀, ICML-LESP 0013; station 2, level 2, 1 ♀, ICML-LESP 0014; station 2, level 5, 1 ♀, ICML-LESP 0015; station 3, level 1, 1 ♀, ICML-LESP 0016; station 3, level 2, 1 ♀, ICML-LESP 0017; station 4, level 2, 1 ♀ and 1 ovigerous ♀, ICML-LESP 0018; station 4, level 3, 2 ♀♀, ICML-LESP 0019; station 4, level 4, 1 ♀, ICML-LESP 0020; station 4, level 5, 1 ♀, ICML-LESP 0021; station 5, level 1, 5 ♀♀, ICML-LESP 0022; station 5, level 2, 1 ♀, ICML-LESP 0023; station 5, level 3, 1 ♀, ICML-LESP 0024; station 5, level 4, 1 ♀, ICML-LESP 0025; station 7, level 1, 2 ♀♀, ICML-LESP 0026; station 7, level 4, 1 ♀, ICML-LESP 0027; station 8, level 1, 1 ♀, ICML-LESP 0028; station 8, level 3, 2 ♀♀, ICML-LESP 0029; station 11, level 1, 2 ovigerous ♀♀, ICML-LESP 0030; station 12, level 3, 1 ♀, ICML-LESP 0031; station 12, level 4, 1 ♀, ICML-LESP 0032; station 12, level 5, 2 ovigerous ♀♀, ICML-LESP 0033; station 13, level 1, 1 ♀, ICML-LESP 0034; station 13, level 3, 1 ♀, ICML-LESP 0035; station 14, level 4, 1 ♀, ICML-LESP 0036; station 16, level 1, 1 ovigerous ♀, ICML-LESP 0037; station 19, level 3, 1 ♀, ICML-LESP 0038; station 21, level 3, 1 ovigerous ♀, ICML-LESP 0039; station 22, level 2, 1 ♀, ICML-LESP 0040; station 23, level 3, 1 ♀, ICML-LESP 0041; station 25, level 2, 1 ♀, ICML-LESP 0042.

Remarks

Stebbing (1888) noted that the genus *Stenopleura* is morphologically intermediate between the Atylidae G. O. Sars, 1882 and the Eusiridae Stebbing, 1888 due to its shape of mouth parts, and gnathopods 1-2 with an apparent eusirid form, but with important differences in the rest of pereopods, uropods and telson in comparison to the genus *Eusirus* Krøyer, 1845, so, finally the author established the new monotypic genus *Stenopleura* in the family Atylidae. Later, this species was reassigned by Sars (1895) in the family Calliopiidae. *Stenopleura*, currently considered as a monotypic genus differs from *Calliopi* Lilljeborg, 1865 by the shape of the distal margin of telson, in *Calliopi* is rounded, and in *Stenopleura*, the distal margin of telson is incised (Barnard, 1964). In this study, all individuals collected were adult females. The number of ovigerous females (Fig. 5B) were highest with 5 specimens at level 1, in contrast with 1 specimen in level 2 and level 3 each, and 2 in level 5. In level 4 ovigerous females were absent. The color of the examined specimens preserved in alcohol is yellowish. The mean density of this species was 1.13 ind/1,000 m³.

Discussion

This is the first attempt to study the deep-water (by stratified sampling) non-hyperiid planktonic amphipods (up to 1,000 m depth) in the southwestern Gulf of Mexico (Fig. 1). Four species of non-hyperiid planktonic amphipods are recorded for the first time in this area: *Cyphocaris anonyx*, *C. challenger*, *Eusiropsis riisei*, and *Stenopleura atlantica*. All of them were observed as free-living forms, not associated with gelatinous organisms. With these new records, the species richness of non-hyperiid planktonic amphipods in the Gulf of Mexico rises to 7 (Table 2). In the western Atlantic Ocean, the 4 species here encountered had been mainly recorded at temperate latitudes (GBIF.org, 2019; OBIS, 2019; Vinogradov, 1999). Our records in the Gulf of Mexico extend their geographical range in the Atlantic (Table 2), indicating their affinity to tropical waters in the western Atlantic. Only *C. anonyx* and *S. atlantica* have previous records in the Caribbean Sea (Lalana et al., 2005; Miloslavich et al., 2010). In the northeastern Gulf of Mexico, near Florida, the species *C. tunicola* was recorded in association with pelagic tunicates between 200 to 500 m depth (Lowry & Stoddart, 1997). The vertical distribution of *S. atlantica* is extended up to 1,000 m depth; previously, Thurston (1976) recorded this species up to 800 m depth, referring as the greatest depth where the species inhabits in the north Atlantic Ocean.

Regarding the abundance, we consider that *C. challenger* and *E. riisei* are rare species in the study area, since only 1 or 2 individuals are represented in our samplings. In contrast, *S. atlantica* was found in 17 (from 25) oceanographic stations at all sampling levels (Table 2), with its highest density at surface waters (0 - 200 m). Thurston (1976) found this species in the third abundance position of the non-hyperiid planktonic amphipods at surface waters (40 - 85 m depth) in the North Atlantic. The occurrence of ovigerous females of *S. atlantica* more frequently at level 1 (0 - 200 m depth) in our study suggests that the species mostly reproduces in the epipelagic zone, in concordance with the findings of Thurston (1976), where *S. atlantica* juveniles were present only in surface waters, however, further studies are needed to determine the environmental factors affecting the reproduction of the species.

The presence of eyes is an important morphological characteristic in the taxonomy of the non-hyperiid species. In a key to Lysianassoid taxa from western Atlantic Ocean published by Lowry and Stoddart (1997), the species *C. anonyx* was distinguished by the absence of eyes.

However, Hughes and Lowry (2015) re-described this species with eyes and discussed that this character was previously ignored possibly due to the bleaching effect of alcohol. All the examined specimens of the 4 species of non-hyperiid amphipods reported in this work have eyes. The *C. anonyx* specimens have translucent rounded eyes as previously reported by Hughes and Lowry (2015), and *C. challenger* specimens have reniform eyes as reported by Vinogradov (1999). The studied specimen of *Eusiropsis riisei* has translucent reniform eyes. In the original description of this species, Stebbing (1897) reported the absence of eyes, and even Vinogradov (1999) extended this absence as a character for the diagnosis of the genus

Eusiropsis. Therefore, the presence of eyes in *E. riisei* is for the first time here reported (Fig. 4B). The specimens of *S. atlantica* have reniform eyes as reported by Stebbing (1988) and Vinogradov (1999), the eyes are red in the present material.

Finally, in the Gulf of Mexico and the Caribbean Sea, new records of planktonic amphipods (hyperiid and non-hyperiid) are still being found in the region (Gasca, 2003, 2009; Lowry & Stoddart, 1997; Miloslavich et al., 2010). Previous studies and our results indicate the need for more taxonomic studies addressing the diversity of planktonic amphipods in Mexican waters, specially mesopelagic ones.

Table 2

Summary of records of non-hyperiid amphipods in the Gulf of Mexico, and their general geographical distribution.

Taxon	Depth (m)		Geographical distribution	References
	Previous records	Current observation		
Suborder Amphilochidea Family Cyphocarididae <i>Cyphocaris anonyx</i>	0 - 2,500	200 - 800	North and south Atlantic; Gulf of Mexico, Caribbean Sea; north and south Pacific; Indian Ocean; Australia; Antarctic.	Bellan-Santini & Costello (2001); GBIF.org (2019); Hughes & Lowry (2015); Hurley (1963); Lalana et al. (2005); Miloslavich et al. (2010); OBIS (2019); Thurston (1976); Vinogradov (1999, 2004); this study.
<i>Cyphocaris challenger</i>	0 - 5,987	200 - 1,000	North and south Atlantic; Gulf of Mexico, north and south Pacific; north Indian Ocean; Australia.	GBIF.org (2019); Hughes & Lowry (2015); OBIS (2019); Thurston (1976); Vinogradov (1999, 2004); Yamada & Ikeda (2000); this study.
<i>Cyphocaris tunicola</i>	200-500	-	Gulf of Mexico (endemic).	Lowry & Stoddart (1997); LeCroy et al. (2009); OBIS (2019).
Family Eurytheniidae <i>Eurythenes obesus</i>	1,518-1,700	-	North and south Atlantic; Gulf of Mexico; south Pacific; Indian Ocean; Australia; Antarctic.	Shoemaker (1956); LeCroy et al. (2009); OBIS (2019).
Family Synopiidae <i>Synopia ultramarina</i>	0-219	-	North and south Atlantic; Gulf of Mexico; north and south Pacific; Indian Ocean; Australia.	Barnard (1972); Barnard & Thomas (1989); LeCroy et al. (2009); OBIS (2019).
Family Eusiridae <i>Eusiropsis riisei</i>	0 - 500	200 - 400	North and south Atlantic; Gulf of Mexico, south Pacific; Indian Ocean.	GBIF.org (2019); OBIS (2019); Thurston (1976); Vinogradov (1999); this study.
Suborder Senticaudata Family Calliopidae <i>Stenopleura atlantica</i>	0 - 800	0 - 1,000	North and south Atlantic; Gulf of Mexico, Caribbean Sea; east tropical and south western Pacific; Indian Ocean; Antarctic.	Bellan-Santini & Costello (2001); De Broyer et al. (2007); GBIF.org (2019); Lalana et al. (2005); Miloslavich et al. (2010); OBIS (2019); Vinogradov (1999); this study.

Key to species of non-hyperiid planktonic amphipods from the Gulf of Mexico.

Adapted from Barnard and Thomas (1989), Hughes (2009), Hughes and Lowry (2015), Lowry and Stoddart (1997), Stebbing (1888, 1897), and Stoddart and Lowry (2004).

1. Gnathopod 1 simple, weakly subchelate or parachelate. Gnathopod 2 simple or minute subchelate. Merus and carpus without posterior lobe 2

- Gnathopod 1-2 subchelate with the propodus much wider than basis or eusirid like very similar shape and size. Merus or carpus with posterior lobe 6
- 2. Coxae 1-2 very reduced or vestigial, coxa 3 smaller than coxa 4. Gnathopod 1 simple, weakly subchelate or parachelate, Gnathopod 2 minute subchelate 3
 - Coxae 1-2 smaller than coxa 3, coxa 3 very large enfolding coxa 4. Gnathopod 1 weakly subchelate. Gnathopod 2 simple. (Synopiidae) *Synopia ultramarina* Dana, 1853
- 3. Gnathopod 1 simple or weakly subchelate. Coxae 1-3 small. Pereopod 5 basis posterior margin with spur. Pereopod 5-7 merus not expanded (Cyphocarididae: *Cyphocaris*) 4
 - Gnathopod 1 parachelate, dactylus over-reaching palm. Pereopod 5 basis posterior margin without spur. Pereopods 5-7 merus expanded posteriorly. (Eurytheneidae) *Eurythenes obesus* (Chevreux, 1905)
- 4. Pereopod 5 posterior margin spur not reaching beyond pleonite 1. Eye present and small. Pereonite 1 without a large, narrow process. 5
 - Pereopod 5 posterior margin spur extremely elongate, reaching beyond pleonite 1. Eye conspicuous greatly enlarged, length at least 3 times as long as wide. Pereonite 1 forming long, narrow, slightly down-turned process *C. tunicola* Lowry & Stoddart, 1997
- 5. Pereopod 5 basis posterior spur margins serrate, not extending more than merus. Pereopod 4 coxa anterior margin is subacute. Telson short not reaching the end of uropod 3. *C. anonyx* Boeck, 1871 (Fig. 2)
 - Pereopod 5 basis posterior margin serrate but spur distal margins smooth, exceeding merus length. Pereopod 4 coxa anterior margin rounded. Telson short not reaching the end of uropod 3 *C. challengerii* Stebbing, 1888 (Fig. 3)
- 6. Antennae 1-2 with calceoli. Gnathopods 1-2 subchelate, subequal with eusirid form, propodus with a spinigerous pocket on posterior edge. Telson very large, apically incised, with 4 very long plumose setae. (Eusiridae) *Eusiropsis riisei* Stebbing, 1897 (Fig. 4)
 - Antenna 1-2 without calceoli. Gnathopod 1-2 subchelate, subequal without eusirid form, propodus without a spinigerous pocket on posterior edge. Telson entire relative short, as broad as long, apically incised, without long setae (Calliopidae) *Stenopleura atlantica* Stebbing, 1888 (Fig. 5)

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