Zootaxa 5039 (4): 479–494
https://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5039.4.2
http://zoobank.org/urn:lsid:zoobank.org:pub:DD56F2C2-D5F5-4B42-8462-0DAD3A482846

Hyperiids (Amphipoda, Hyperiidea) collected during the TALUD cruises in western Mexico. 5. Family Amphithyridae, with the description of a new species of *Amphithyropsis* Zeidler

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Abstract

In order to complete the information related to the little studied deep-sea planktonic fauna of western Mexico, samples from a wide depth range (surface to 1550 m depth) were obtained using different gear. Six species and 108 individuals of hyperiid amphipods of the family Amphithyridae were collected at 26 localities, including a new species of *Amphithyropsis* Zeidler, 2016, which is herein described based on an adult male and a gravid female. Other species include *Amphithyrus bispinosus* Claus, 1879, the most abundant and frequently collected species (70 specimens at 17 localities), *A. muratus* Volkov, 1982 (11 specimens at 8 localities), *A. sculpturatus* Claus, 1879 (14 specimens at 7 localities), *Paralycaea gracilis* Claus, 1879 (10 specimens from 6 localities), and *P. hoylei* Stebbing, 1888 (one specimen from one locality). Worldwide and regional distributions are provided for each species.

Key words: Pelagic amphipods, eastern Pacific, *Amphithyrus*, *Paralycaea*, *Amphithyropsis* new species

Introduction

Hyperiid amphipods are a polyphyletic group of holoplanktonic crustaceans that branched from different lineages of benthic ancestors (Laval 1980). They colonized the pelagic environment in various ways and times mostly by using gelatinous zooplankters as substrata (Laval 1980, Vinogradov 1999, Lützen 2005). Hyperiids are distributed in all oceans from the surface to abyssal depths; they are chiefly oceanic forms with few but potentially abundant neritic-coastal species (Gasca *et al*. 2012, Lavaniegos 2020). In tropical latitudes hyperiids are more diverse but less abundant than in cold and temperate waters (Vinogradov 1999). At least at some stage of their life cycle, the vast majority if not all hyperiids are symbiotically associated to gelatinous zooplankters mainly during both the reproductive and juvenile stages (Pirlot 1932, Laval 1980, Bellan-Santini 1999). They can behave as parasitoids (i.e., larvae feed and develop in/on host tissues) of the gelatinous zooplankters, and symbionts in different kinds, grade or extent of symbiotic associations including ectoparasitism, endoparasitism, commensalism, or amensalism; they can be frequently observed also as free-swimming zooplankters (Siegel-Causey 1982, Vinogradov *et al*. 1996, Gasca & Haddock 2004, Gasca & Browne 2018).

Our knowledge about these crustaceans, especially in Mexican and deep waters, is still quite limited. Siegel-Causey (1982) analyzed material collected during seven cruises made during 1956–1957 in the epipelagic and mesopelagic zones of the Gulf of California. He found 118 hyperiid species. Gasca *et al*. (2012) studied the hyperiid community sampled in surface waters of the eastern Pacific for 27 months, linked with the 1997-1998 El Niño event; they recorded 80 species in the Mexican tropical Pacific, south of the Gulf of California. Several authors have put together all the available information about the hyperiids recorded in Mexican Pacific waters (i.e., Brusca & Hendrickx 2005, García Madrigal 2007, Gasca 2009).

Accepted by K. Tomikawa: 27 Aug. 2021; published: 17 Sept. 2021

The biological study of deep and midwater hyperiid amphipods of the GoC and adjacent Californian waters has been mainly carried out in this century by the Monterey Aquarium Research Institute (MBARI) together with El Colegio de la Frontera Sur (ECOSUR), and by Instituto de Ciencias del Mar y Limnología (UNAM). Their joint findings have provided unprecedented information on the symbiotic associations of hyperiids with gelatinous zooplankters (Gasca & Haddock 2004, 2016, Gasca *et al*. 2007, 2015), on the distribution of the species (Gasca & Hendrickx, 2020, 2021a, b, c), and have yielded the discovery of new species (Gasca 2005, Gasca & Browne 2018, Gasca & Hendrickx 2020).

In this work we report our findings on the distribution of six species of the hyperiid family Amphithyridae in western Mexico, including the description of a new species of the genus *Amphithyropsis*.

Methods

The material on which this study is based was collected during a series of research cruises by the R/V "El Puma" of the Universidad Nacional Autónoma de México (UNAM), between 1989 and 2014, off the west coast of the Baja California Peninsula, in the Gulf of California, and off SW Mexico (see Hendrickx 2012, 2015). The 17 cruises were part of the TALUD project (Spanish translation of continental slope) aimed at studying the deep-water pelagic and benthic invertebrates and fish fauna of western Mexico. Specimens of Amphithyridae were collected in 26 localities sampled during eight of these 17 cruises: TALUD I, December 1989; TALUD III, August 1991; TALUD IV, August 2000; TALUD V, December 2000; TALUD VI, March 2001; TALUD VII, June 2001 (Gulf of California); TALUD XI, June 2007; TALUD XII, March-April 2008 (off the SW coast of Mexico, from Jalisco to Guerrero). Positional coordinates for each sampling station were obtained using a GPS navigation system. Depth was measured with an EdoWestern analogic recorder (TALUD I–VII) or a SIMRAD digital recorder (TALUD XI and XII). Specimens were captured with: 1) a 60 cm mouth diameter bongo net (BO) (0.550 mm mesh aperture twin-nets) (2 samples in total), operating between surface and 200–1550 m depth; 2) a 0.9 m^2 mouth surface micro-nekton (MN) net (2 mm mesh aperture) (16 samples in total), operating between surface and 900–1440 m depth; 3) a 6-foot Isaacs-Kidd (I-K) midwater sampler (7 samples in total), operating between surface and 200–630 m depth; and 4) in one occasion, specimens were retained in the net of a benthic sledge (BS) during the ascent of the gear (see Material Examined). The material collected during this survey was preserved in a 5% formaldehyde solution, later thoroughly washed with fresh water, and transferred to a 70% ethanol solution for long-term preservation. It is deposited in the Regional Collection of Marine Invertebrates (ICML-EMU) at UNAM in Mazatlán, Mexico, and in the Zooplankton Reference Collection (ECO-CH-Z) held at El Colegio de la Frontera Sur, Chetumal, Mexico. In the laboratory, specimens were examined under an Olympus SZX16 stereomicroscope and an Olympus CX31 biological microscope equipped with a drawing tube. Keys, descriptions, and drawings in Barnard (1930), Hurley (1956), Vinogradov *et al*. (1996), and Zeidler (2016) were used to identify the specimens. A restricted synonymy is provided for each species, including the prime synonym, junior synonyms if any, recent compilations, and contributions dealing with the Mexican Pacific. Other abbreviations used are: F, female; M, male; TD, total depth at sampling station; St., sampling station. This is the 5th contribution dealing with Hyperiidea collected off western Mexico during the TALUD project.

Results

As recently defined (see Zeidler 2016), the family Amphithyridae includes nine species contained in three genera: *Paralycaea* Claus, 1879 (three species), *Amphithyrus* Claus, 1879 (five species), and *Amphithyropsis* Zeidler, 2016 (one species) (Horton *et al*. 2021). During this survey, six species of this family were collected, including five of the previously known species, and a new species of *Amphithyropsis* which is the second known species of this genus.

The three known amphithyriid genera share distinctive characteristics like the morphology of the male antennae, the absence of antenna 2 in females, and the shape and structure of pereopods 5 (long, with a large rectangular basis) and 6 (with an almost operculiform, large basis, lacking a telsonic groove), and coxa 7 fused with the pereonite (Zeidler 2016). A new genus was proposed by Zeidler (2016) to accommodate the nominal species *Amphithyropsis pulchellus* (Barnard, 1930), previously treated as *Tetrathyrus pulchellus* (Barnard 1930). The main characters used to re-assign this species were the presence of a 2-articulated female antennae and the presence of not chelated gnathopods with a distal notch on the propodus of pereiopods 1 and 2. Zeidler (2016) also recognized that the specimen described and illustrated by Hurley (1956) as *Paralycaea gracilis* Hurley, 1955, was in fact a specimen of *A. pulchellus.*

Taxonomic section

Suborder Hyperiidea H. Milne Edwards, 1830

Infraorder Physocephalata Bowman & Gruner, 1973

Superfamily Platysceloidea Bowman & Gruner, 1973

Family Amphithyridae Zeidler, 2016

Genus *Amphithyrus* Claus, 1879

Amphithyrus bispinosus Claus, 1879

Amphithyrus bispinosus Claus, 1879: 15; Siegel-Causey, 1982: 379; Vinogradov *et al*., 1996: 568, fig. 246; Brusca & Hendrickx, 2005: 153 (list); García Madrigal, 2007: 159 (list); Gasca 2009: 90 (list); Lavaniegos & Hereu, 2009: 152 (Appendix); Gasca *et al*., 2012: 126 (tab. 1); Valencia & Giraldo, 2012: 1493 (tab. 1); Valencia *et al*., 2013: 52 (tab. 1); Zeidler, 2016: 32, 33 (key), fig. 9.

Material examined. 19M, 51F from 17 stations (Fig. 1). TALUD I. St. 5 (ca. 23°16' N, 107°31'W), December 11, 1989, 3M, 1F, BO from surface to ca. 200 m (TD > 1500 m) (ICML-EMU-12869-A); St. 6 (23°15'54"N, 107°31'12"W), December 12, 1989, 1M, 9F, BO from surface to ca. 200 m (TD, 1550 m) (ICML-EMU-12869-B). TALUD III, St. 10B (23°43'24"N, 107°39'06"W), August 18, 1991, 1M, I-K from surface to 630 m (TD, ca. 900 m) (ICML-EMU-12870-A); St. 19 (25°12'00"N, 109°07'00"W), August 20, 1991, 1M, 2F, I-K, surface to 410 m (TD, 920 m) (ECO-CH-Z-10540); St. 19B (25°18'24"N, 109°18'36"W), August 20, 1991, 2F, I-K from surface to 600 m (TD, 1890 m) (ICML-EMU-12870-B); St. 25A1 (25°51'00"N, 109°57'00"W), August 21, 1991, 1F, I-K from surface to 200 m (TD, 1280–1360 m) (ICML-EMU-12870-C). TALUD IV, St. 7 (22°00'22"N, 106°49'18"W), August 23, 2000, 2M, 7F, MN from surface to 500 m (TD, 1970 m) (ICML-EMU-12871-A); St. 15 (23°23'30"N, 107°47'48"W), August 24, 2000, 1F, MN from surface to 1500 m (TD, 2350 m) (ICML-EMU-12871-B); St. 22 (24°17'20"N, 108°50'30"W), August 26, 2000, 1F, MN from surface to 1325 m (TD, ca. 1800 m) (ICML-EMU-12871-C). TALUD V. St. 5 (22°00'57"N, 106°40'00"W), December 13, 2000, 1M, 15F, MN from surface to ca. 1400 m (TD >1600 m) (ICML-EMU-12872); St. 29 (25°14'36"N, 109°24'15"W), December 17, 2000, 4M, 1F, MN from surface to 1290 m (TD, 2040 m) (ECO-CH-Z-10541). TALUD VI. St. 7 (22°21'39"N, 107°01'42"W), March 14, 2001, 1M, 5F, MN from surface to 1305 m (TD, 2100 m) (ICML-EMU-12873-A); St. 22 (24°17'34"N, 108°50'25"W), March 15, 2001, 1F, MN from surface to 1410 m (TD, 1760 m) (ICML-EMU-12871-B). TALUD XI. St. 6A (16°58'00"N, 100°57'00"W), June 7, 2007, 1M, 1F, MN from surface to 1400 m (TD, 1960 m) (ICML-EMU-12874-A); St. 19B (17°56'00"N, 103°10'00"W), June 9, 2007, 2M, 1F, MN from surface to 1490 m (TD, 1750 m) (ICML-EMU-12874-B). TALUD XII. St. 4 (16°59'39"N, 100°58'07"W), March 28, 2008, 1M, MN from surface to 1200 m (TD, 1995 m) (ICML-EMU-12875-A); St. 15C (17°27'51"N, 102°10'43"W), March 31, 2008, 1M, 2F, MN from surface to 1530 m (TD, 1880 m) (ICML-EMU-12875-B).

Distribution. Circumoceanic, in warm waters of the Atlantic (south of 43°N), Pacific (South China Sea, Kuroshio Current, tropical eastern Pacific), and Indian (Bay of Bengal) Oceans; Mediterranean Sea; in the 200-300 m layer, often in surface layer (0-50 m) (Siegel-Causey 1982, Vinogradov *et al*. 1996). Off Australia (Zeidler 1998). In the eastern Pacific from off the west coast of Baja California, and from 28°30'N, in the Gulf of California, to off Gorgona Island, Colombia (García Madrigal 2007, Lavaniegos & Hereu 2009, Valencia & Giraldo 2012).

Remarks. Siegel-Causey (1982) reported this species as relatively common in the Gulf of California. In the Mexican tropical Pacific it is relatively frequent and abundant (Gasca *et al*., 2012). It has been reported in association with the siphonophore *Agalma elegans* (Sars, 1846) (Harbison *et al*. 1977).

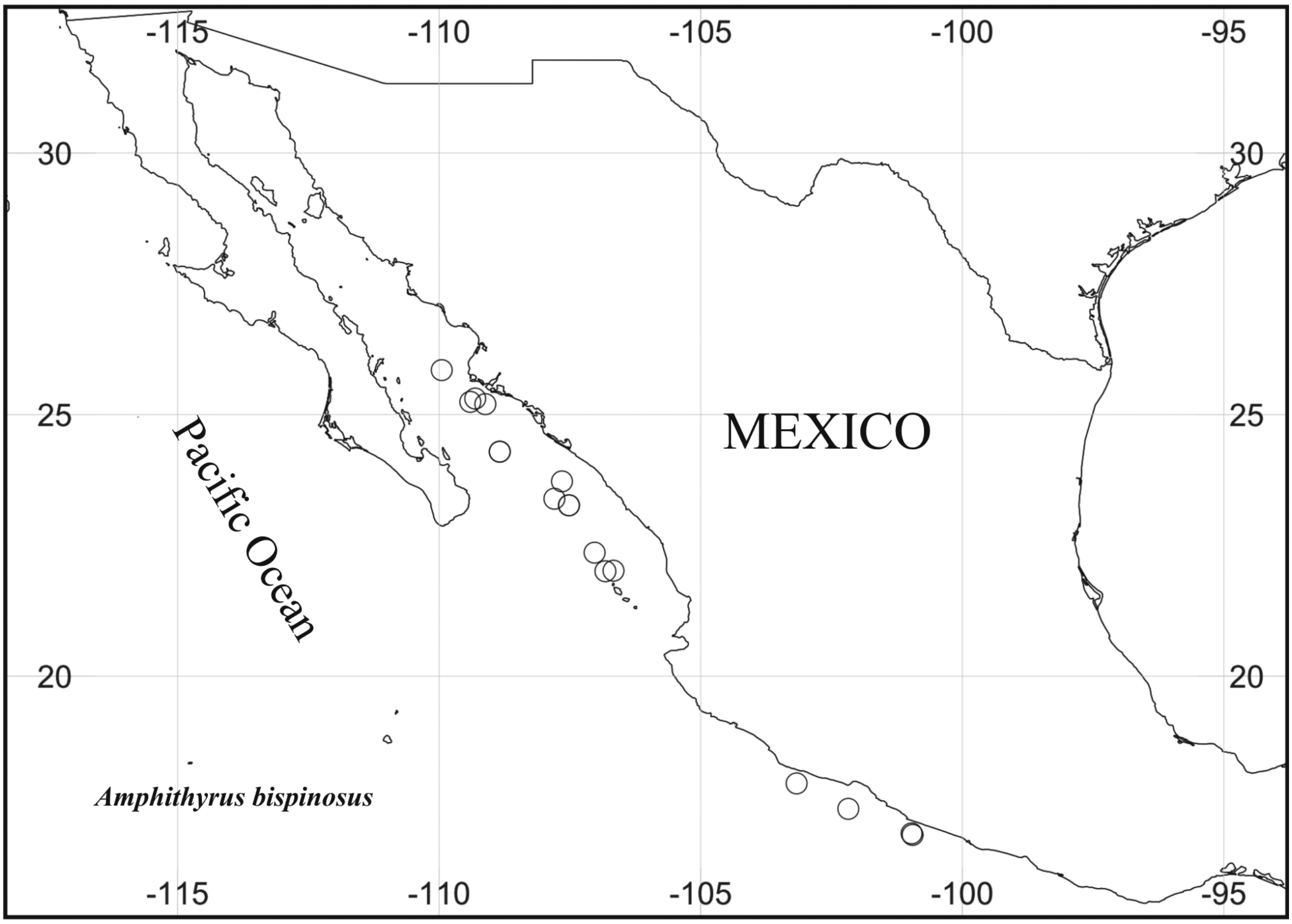

FIGURE 1. Localities where *Amphithyrus bispinosus* was captured during this survey.

Amphithyrus muratus **Volkov, 1982**

Amphithyrus muratus Volkov, 1982 in Vinogradov *et al*., 1982: 464, fig. 248; Vinogradov *et al*., 1996: 571, fig. 248; Gasca, 2009: 90(list), 91; Gasca *et al*., 2012: 126 (tab. 1); Valencia & Giraldo, 2012: 1493 (tab. 1); Zeidler, 2016: 32, 33 (key).

Material examined. 5M, 6F from 8 stations (Fig. 2). TALUD III. St. 3B (22°36'36"N, 106°35'54"W), August 17, 1991, 1M, I-K from surface to 275 m (TD, ca. 650 m) (ICML-EMU-12876). TALUD IV. St. 7 (22°00'22"N, 106°49'18"W), August 23, 2000, 1M, 1F, MN from surface to 500 m (TD, 1970 m) (ECO-CH-Z-10542); St. 15 (23°23'30"N, 107°47'48"W), August 24, 2000, 1F, MN from surface to 1500 m (TD, 2350 m) (ICML-EMU-12877-A); St. 25A2 (24°54'N, 108°59'W), August 26, 2000, 1M, BS from surface to ca. 800 m (ICML-EMU-12877-B). TALUD VI. St. 7 (22°21'39"N, 107°01'42"W), March 14, 2001, 1F, MN from surface to 1305 m (TD, 2100 m) (ICML-EMU-12878-A); St. 22 (24°17'34"N, 108°50'25"W), March 15, 2001, 1M, MN from surface to 1410 m (TD, 1760 m) (ICML-EMU-12878-B); St. 29 (25°16'24"N, 109°24'54"W), March 16, 2001, 2F, MN from surface to 1440 m (TD, 2080 m) (ICML-EMU-12878-C). TALUD VII, St. 36 (25°42'37"N, 110°04'35"W), June 9, 2001, 1M, 1F, MN from surface to 1390 m (TD, 2400 m) (ICML-EMU-12879).

Distribution. Pacific Ocean, in the Kuroshio Current and near Nasca Ridge (Vinogradov *et al*. 1996). In the eastern Pacific from the Gulf of California (north to 25°42'37"N) to off Gorgona Island, Colombia, and in the vicinity of the Nasca Ridge (Vinogradov *et al*. 1996, Valencia & Giraldo 2012, present study).

Remarks. Found at eight localities during this study although always in very low numbers, *A. muratus* had not been reported previously from the Gulf of California or from western Mexico. It features a remarkably wide distribution range, with the original description referring to material from the North Pacific (Kuroshio Current) and off Chile (Nasca Ridge). Considering present records and the material reported by Valencia & Giraldo (2012) off Gorgona Island, about 28 km off the coast of Colombia, *A. muratus* appears to occur consistently in the eastern

Pacific.

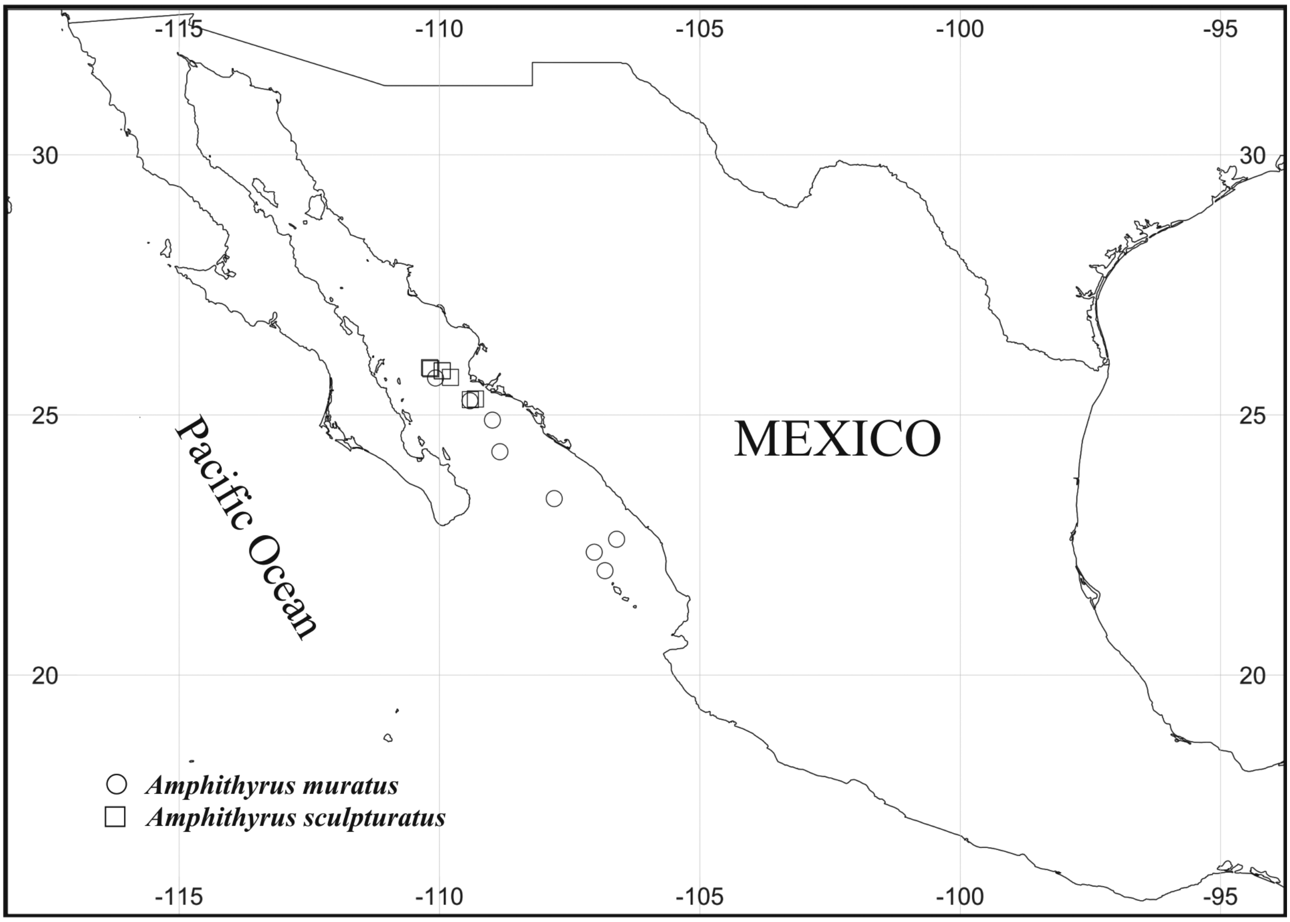

FIGURE 2. Localities where *Amphithyrus muratus* and *A. sculpturatus* were captured during this survey.

Amphithyrus sculpturatus Claus, 1879

Amphithyrus sculpturatus Claus, 1879: 16; Siegel-Causey, 1982: 383; Vinogradov *et al*., 1996: 574, fig. 250; Brusca & Hendrickx, 2005: 153 (list); García Madrigal, 2007: 159 (list); Gasca, 2009: 90 (list); Lavaniegos & Hereu, 2009: 142 (tab. 1), 146 (tab. 2), 152 (Appendix); Gasca *et al*., 2012: 126 (tab. 1), 133 (tab. 4), 134; Lavaniegos, 2014: 5 (tab. 1), 8, 10 (tab. 4); Lavaniegos, 2017: 24; Valencia & Giraldo, 2012: 1493 (tab. 1); Valencia *et al*., 2013: 52 (tab. 1); Zeidler, 2016: 32, 33 (key).

Amphithyrus orientalis Stebbing, 1888: 1485–1488.

Material examined. 10M, 4F in 7 localities (Fig. 2). TALUD III. St. 19B (25°18'24"N, 109°18'36"W), August 20, 1991, 2M, 1F, I-K from surface to 600 m (TD, 1890 m) (ECO-CH-Z-10543); St. 25A1 (25°51'00"N, 109°57'00"W), August 21, 1991, 1M, I-K from surface to 200 m (TD, 1280–1360 m) (ICML-EMU-12880-A); St. 25A2 (25°50'54"N, 109°56'54"W), August 21, 1991, 1M, I-K from surface to 230 m (TD, 1250–1328 m) (ICML-EMU-12880-B); St. 25B (25°43'18"N, 109°47'24"W), August 23, 1991, 1F, I-K from surface to 150 m (TD, ca. 1100 m) (ICML-EMU-12880-C). TALUD V, St. 36 (25°54'30"N, 110°11'24"W), December 17, 2000, 1M, MN from surface to 1340 m (TD, 1990 m) (ICML-EMU-12881). TALUD VI, St. 36 (25°53'15"N, 110°10'06"W), March 17, 2001, 1F, MN from surface to 1360 m (TD, 2000 m) (ICML-EMU-12882). TALUD VII, St. 29 (25°17'31"N, 109°24'30"W), June 8, 2001, 5M, 1F, MN from surface to 1335 m (TD, 2080 m) (ICML-EMU-12883).

Distribution. Atlantic (south of 40°N), Pacific (Kuroshio Current), and eastern Indian Oceans; Mediterranean and Red Seas; in the 0–100 m layer (Vinogradov *et al*. 1996). Off Australia (Zeidler 1998). In the eastern Pacific from off the west coast of Baja California and the Gulf of California (north to 25°54'30"N) to off Gorgona Island, Colombia (García Madrigal 2007, Valencia & Giraldo 2012, present study).

Remarks. The material of station 36 of the TALUD V cruise represents a slight extension of the northernmost distribution limit of *A. sculpturatus* in the Gulf of California. Zeidler (1998) considered this species as uncommon although widely distributed, mainly in tropical waters.

Siegel-Causey (1982) considered both *A. orientalis* Stebbing, 1888, and *A. glaber* Spandl, 1924, as junior synonyms of *A. sculpturatus*. However, *A. glaber* is currently recognized as a valid species (Vinogradov *et al*. 1996), while *A. orientalis* has indeed been synonymized with *A. sculpturatus* by Spandl (1927: 250) (see Shih & Cheng 1995).

Paralycaea gracilis Claus, 1879

Paralycaea gracilis Claus, 1879: 40; Siegel-Causey, 1982: 280; Vinogradov *et al*., 1996: 466, fig. 203; Brusca & Hendrickx, 2005: 153 (list); García Madrigal, 2007: 162 (list); Gasca, 2009: 88 (tab. 1); Lavaniegos & Hereu, 2009: 152 (Appendix 1); Gasca *et al*., 2012: 126 (tab 1), 136; Lavaniegos, 2014: 4 (tab. 1); Valencia & Giraldo, 2012: 1491–1496 (passim), 1492 (tab. 1), 1496 (tab. 3); Valencia *et al*., 2013: 51 (tab. 1); Gómez-Gutiérrez *et al*., 2014: 1019 (tab. 3); Zeidler, 2016: 36, figs. 11–12, 39 (key).

Material examined. 7M, 3F from 6 stations (Fig. 3). TALUD III, St. 19 (25°12'00"N, 109°07'00"W), August 20, 1991, 1M, 1F, I-K, from surface to 410 m (TD, 920 m) (ECO-CH-Z-10544); St. 25A1 (25°51'00"N, 109°57'00"W), August 21, 1991, 2M, I-K from surface to 200 m (TD, 1280–1360 m) (ICML-EMU-12884-A); St. 19B (25°18'24"N, 109°18'36"W), August 20, 1991, 2M, I-K from surface to 600 m (TD, 1890 m) (ICML-EMU-12884-B). TALUD VI. St. 7 (22°21'39"N, 107°01'42"W), March 14, 2001, 1F, MN from surface to 1305 m (TD, 2100 m) (ICML-EMU-12885). TALUD XI. St. 19B (17°56'00"N, 103°10'00"W), June 9, 2007, 1F, MN from surface to 1490 m (TD, 1750 m) (ICML-EMU-12886). TALUD XII. St. 15C (17°27'51"N, 102°10'43"W), March 31, 2008, 2M, MN from surface to 1530 m (TD, 1880 m) (ICML-EMU-12887).

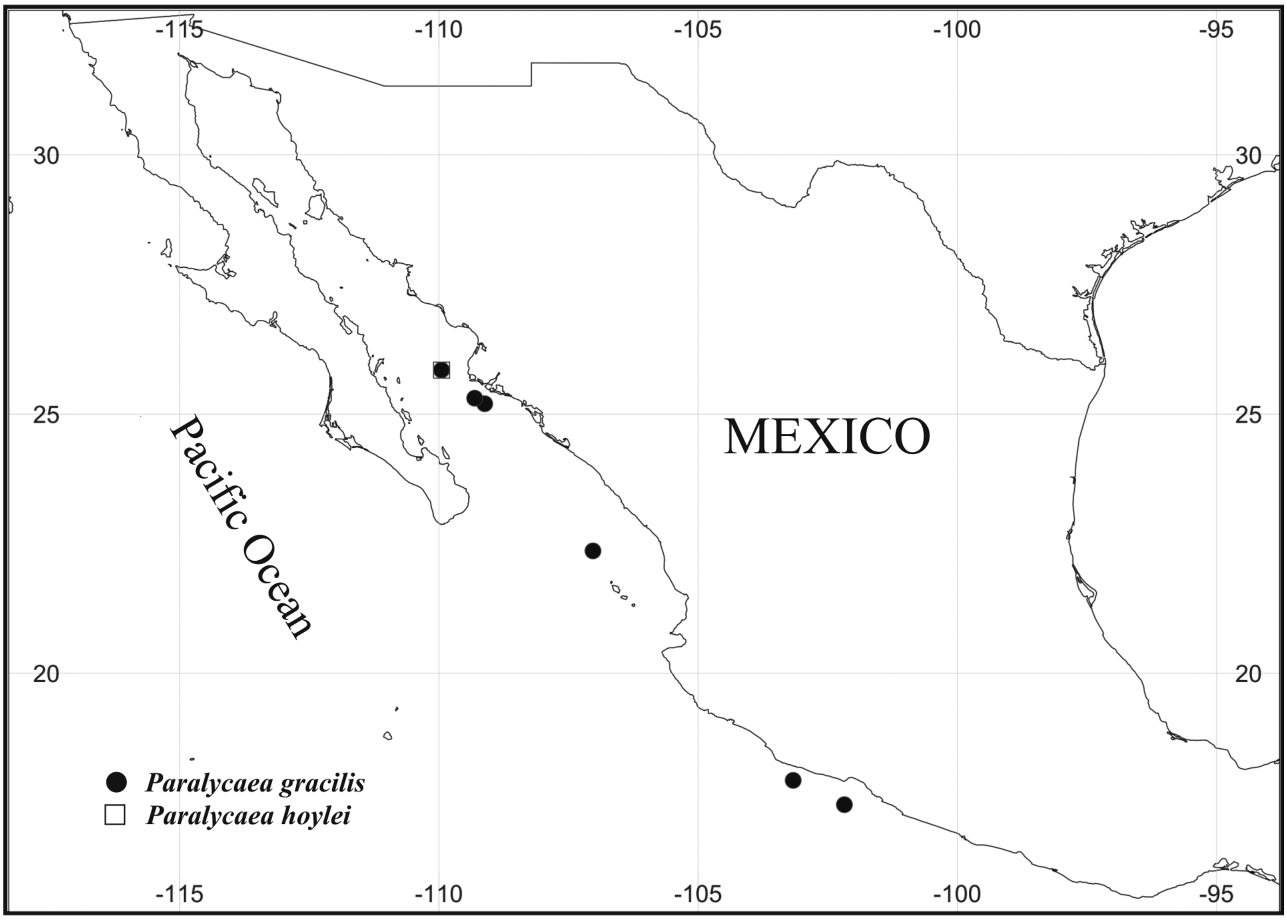

FIGURE 3. Localities where *Paralycaea gracilis* and *P. hoylei* were captured during this survey.

Distribution. Atlantic (south of 59°N), Pacific (Australia and New Zealand), and eastern Indian Oceans; Mediterranean (Vinogradov *et al*. 1996). The genus *Paralycaea* is widely distributed in tropical and temperate regions worldwide, mainly in near-surface waters (Zeidler 2016). In the eastern Pacific from off the west coast of Baja California and the Gulf of California (up to 28°N), north and south of Maria Madre Island, Mexico, and south to off Gorgona Island, Colombia (García Madrigal 2007, Valencia & Giraldo 2012, Gómez-Gutierrez *et al*. 2014).

Remarks. *Paralycaea gracilis*, previously included in the family Pronoidae (see Siegel-Causey 1982, Zeidler 1998), was recently moved to the family Amphithyridae described by Zeidler (2016).

Paralycaea hoylei Stebbing, 1888

Paralycaea hoylei Stebbing, 1888: 1570; Siegel-Causey, 1982: 283; Vinogradov *et al*., 1996: 466 (in synonymy of *P. gracilis*); Gasca, 2009: 88 (tab. 1); Gasca *et al*., 2012: 126 (passim) (tab. 1); Zeidler, 2016: 36, 39 (key).

Material examined. 1M from one station (Fig. 3). TALUD III, St. 25A2 (25°50'54"N, 109°56'54"W), August 21, 1991, 1M, I-K from surface to 230 m (TD, ca. 1400 m) (ICML-EMU-12888).

Distribution. Atlantic, off Africa (type locality), in surface waters (Stebbing, 1888). Central and southern Gulf of California (Siegel-Causey 1982, present study). Registered as "uncommon" in tropical Australian waters (Zeidler 1998). Registered as one of the most common species along the west coast of Mexico under the influence of El Niño (Gasca *et al*. 2012). Its true distribution remains largely unknown because of the taxonomic problems related to this species.

Remarks. *Paralycaea hoylei* is now included in the family Amphithyridae (Zeidler 2016). Vinogradov *et al*. (1996) recognized only one valid species of *Paralycaea*, *P. gracilis*, thus considering both *P. hoylei* and *P. newtoniana* Bovallius, 1887 as junior synonyms of Stebbing' species. Zeidler (1998: 85), however, established the validity of *P. hoylei* based on material collected in Australian waters. The status of *P. newtoniana* was further discussed by Zeidler (2016) (see comments in discussion).

Amphithyropsis shanti sp. nov.
(Figs. 4–8)

Type material. Holotype, 1 male, TALUD III. St. 19B (25°18'24"N, 109°18'36"W), August 20, 1991, I-K from surface to 600 m (TD, 1890 m) (ECO-CH-Z-10545). Allotype, 1 gravid female, TALUD IV, St. 25A2 (24°54'N, 108°59'W), August 26, 2000, BS from surface to ca. 800 m (ECO-CH-Z-10546).

Type locality. Central Gulf of California, SW of Topolobampo, Sinaloa (25°18'24"N, 109°18'36"W).

Distribution. Known only from two localities, in the central Gulf of California, Mexico (Fig. 9).

Etymology. The Sanskrit noun *shanti* means peace. It is feminine as the genus gender, which ending on the suffix *–opsis* is to be treated as feminine (Oren & Schink 2016). In this way, we manifest our wish for world peace.

Description of adult male.

Body. Body (Fig. 4A) robust, weakly curved, total length, 2.66 mm. Surface of whole body sculptured with hexagonal and pentagonal polygons.

Head. Longer than high, hemispheric, representing 0.15 x of total body length (0.40 mm), not notoriously deeper than body. Eyes (Fig. 4B) covering most of head surface except for triangular frontal space in front of head. *Antenna 1* (Fig. 4C, 5A) prominent; peduncle 1-segmented, flagellum with large callynophore armed with transversally arranged rows of aesthetascs crossing the ventral zone, distal segment armed with spines and aesthetascs. *Antenna 2* (Fig. 5B, C) peduncle with dorsally flat and ventrally round first segment, as high as long; succeeding four segments zig-zagged, folded below eyes and thorax; segments with row of setae along anterior margins; terminal segment with setae extending to the tip, directed anteriorly. Segment 3 about 0.75 x length of segments 2, terminal article about 0.83 x the length of precedent.

Mandible (Fig. 5D) about 0.75 x length of first mandibular palp. *Mandibular palp* (Fig. 5E) 3-segmented, middle segment being longest (0.15–0.20 x of segments 1 or 3 length).

Maxilliped (Fig. 5F) fully sculptured, developed inner lobes completely fused, with two spines on the external apical margins (Fig. 5G). *Maxillae* sculptured; *maxilla 1* inner lobe wide and truncated, outer lobe triangular with long apical spines; *maxilla* 2 both lobes pyramidal, about 2 x as long as maxilla 1, with spines both along inner margin and apically (Fig. 5H).

Pereon (Fig. 4A) length about 2 x eyes diameter, all segments distinctly separate. *Pereopods 1 and 2* (Fig. 6A, B) bases longer than combined length of distal segments; carpus sub-rectangular, lacking anterodistal projection; propodus with rounded, thumb-like antero-distal projection. *Pereopod 1* simple (ca. 0.41 mm), with long slender basis, straight anterior margin, and bulging posterior margin; isquium bent to the front, forming the internal part of an elbow (similar in pereopods 1–4); propodus 0.4 x narrower than carpus, thumb-like in posterodistal section; dactylus claw-shaped, ornamented with teeth-like processes and short spines. *Pereopod 2* like pereopod 1, about 1.2 x its length, basis 1.3 x length of basis of pereopod 1; propodus narrower than carpus, with thumb-like process on postero-distal end. *Pereopods 3 and 4* (Fig. 6C, D) (0.7 mm) longer than 1 and 2 (ca. 0.50 mm). *Pereopod 3* approximately 1.6 times as long as pereopod 1. Basis with weakly concave anterior margin and convex posterior margin; 70% wider than the widest portion of pereopod 1 basis. *Pereopod 4* basis with straight anterior margin, posterior margin regularly convex, propodus almost 2 x as long as carpus, dactylus nearly half length of propus, bent backwards, with postero-proximal hump. *Pereopod 5* (Fig. 6E) being the longest leg (about 1 mm), 2 x as long as pereopod 2, basis 2 x as long as wide, with anterodistal lobe overlapping ischium, inserted terminally to basis, bent towards posterior end; carpus and propodus with short spines along anterior margin (seen at 400 magnification); propodus long, slender; dactylus short (0.1 x propodus length). *Pereopod 6* (Fig. 6F) basis longer than wide, with fissure but lacking telsonic groove; isquium inserted in ventral rounded socket of basis; merus dorsal margin approximately 0.5 length of anterior margin, with similar and regularly distributed spines along anterior margin; carpus about 0.5 x as long as merus width; propodus less than 0.5 carpus width; dactylus finger-shaped, 0.3 x propodus length. A strong structural union of isquium to basis appears like a separating segment. *Pereopod 7* (Fig. 6G) basis more than 3.5 x as long as wide, plus one additional crinkled segment, about 0.2 mm total length. *All coxae*, except seventh, separate from thorax, coxae 1–5 rectangular, with rounded margins; coxa 6 posteriorly expanded, with groove and spines on posterior margin.

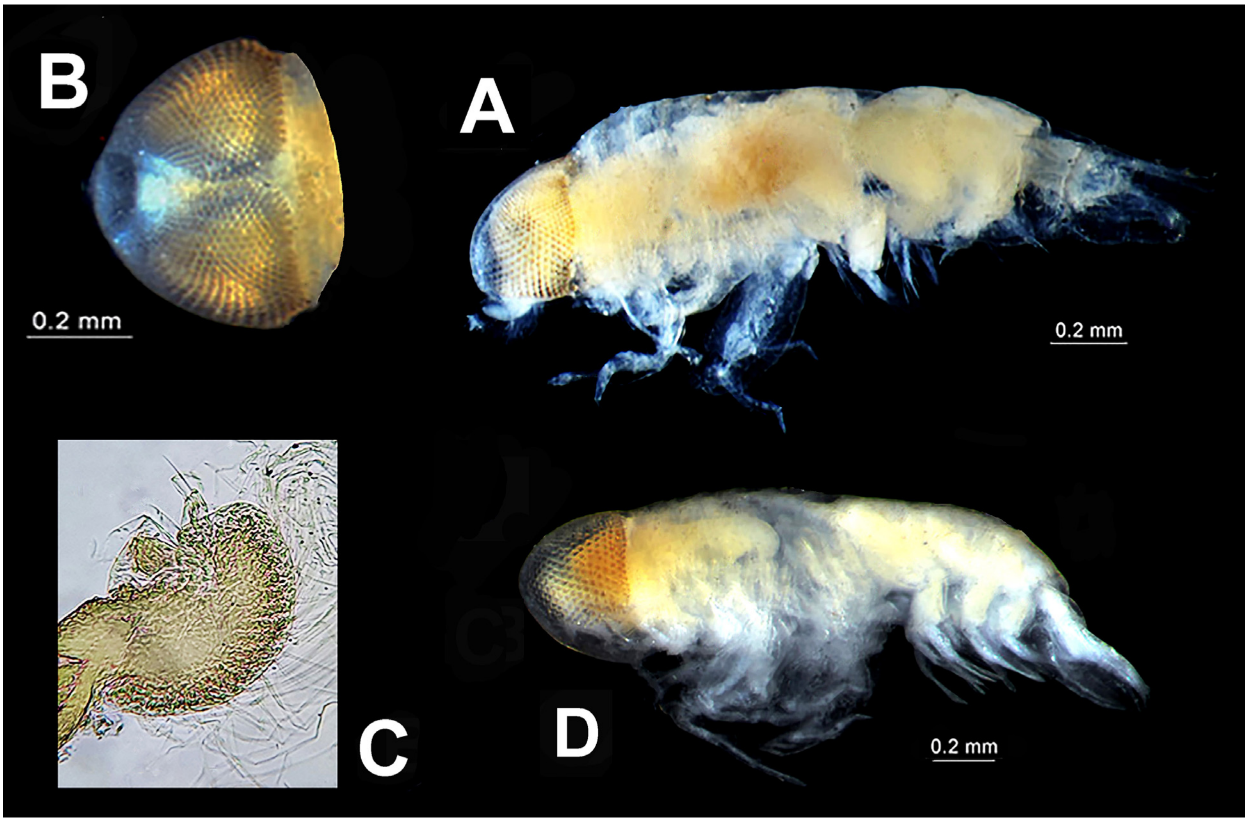

FIGURE 4. *Amphithyropsis shanti* **sp. nov** from the eastern Pacific. Holotype, male (ECO-CH-Z-10545), and allotype, female (ECO-CH-Z-10546). A. habitus, lateral view; B) eyes, dorsal view; C) first antenna; D) habitus, lateral view. Scales as indicated. (photos A, B and D by Humberto Bahena).

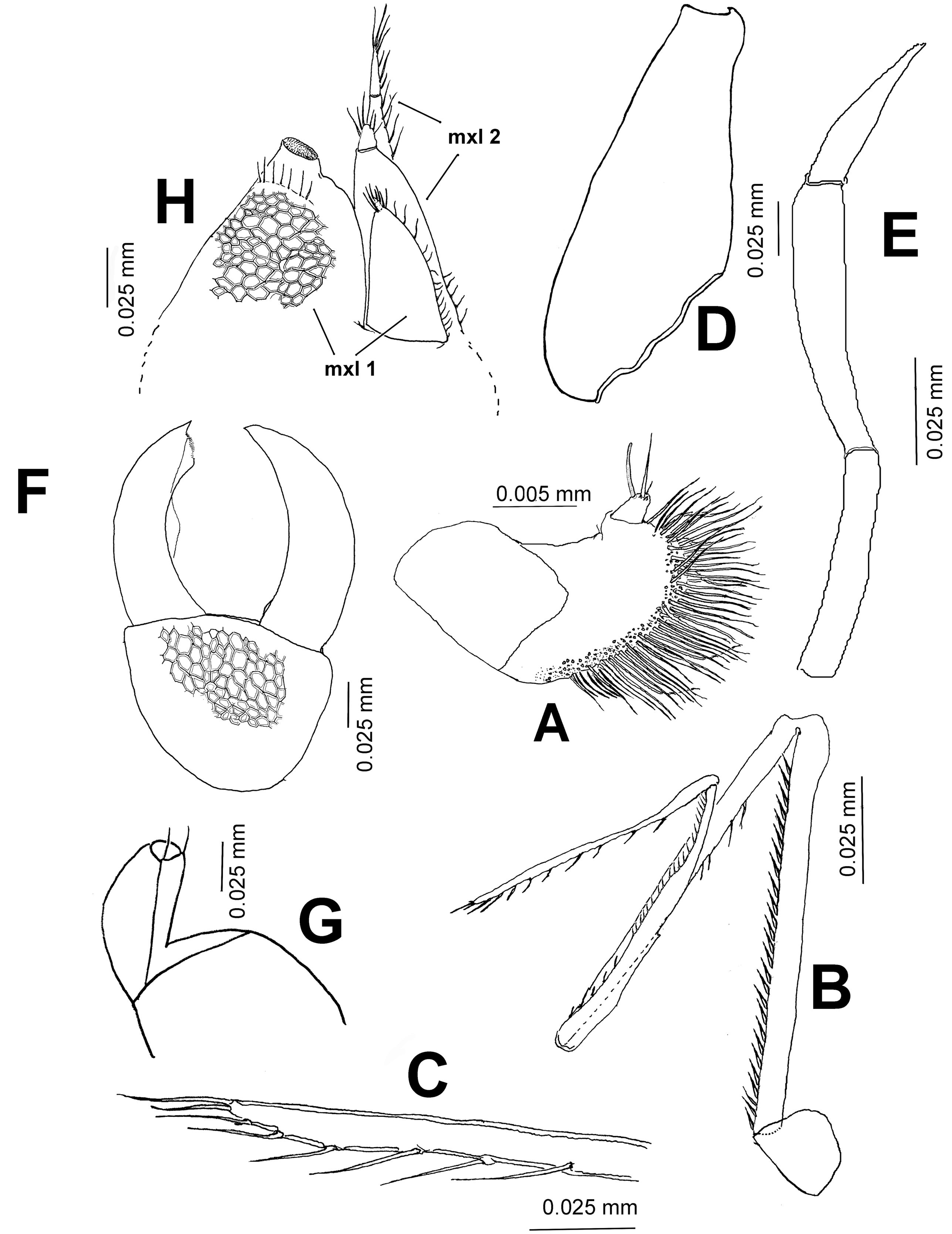

FIGURE 5. *Amphithyropsis shanti* **sp. nov.** Holotype, male (ECO-CH-Z-10545). A) first antenna; B) second antenna; C) distal segment of second antenna; D) mandible; E) mandibular palp; F) maxilliped with outer lobes (sculptures partly represented); G) maxilliped inner lobe; H) mouthparts including first and second maxilla (sculptures partly represented). Scales as indicated.

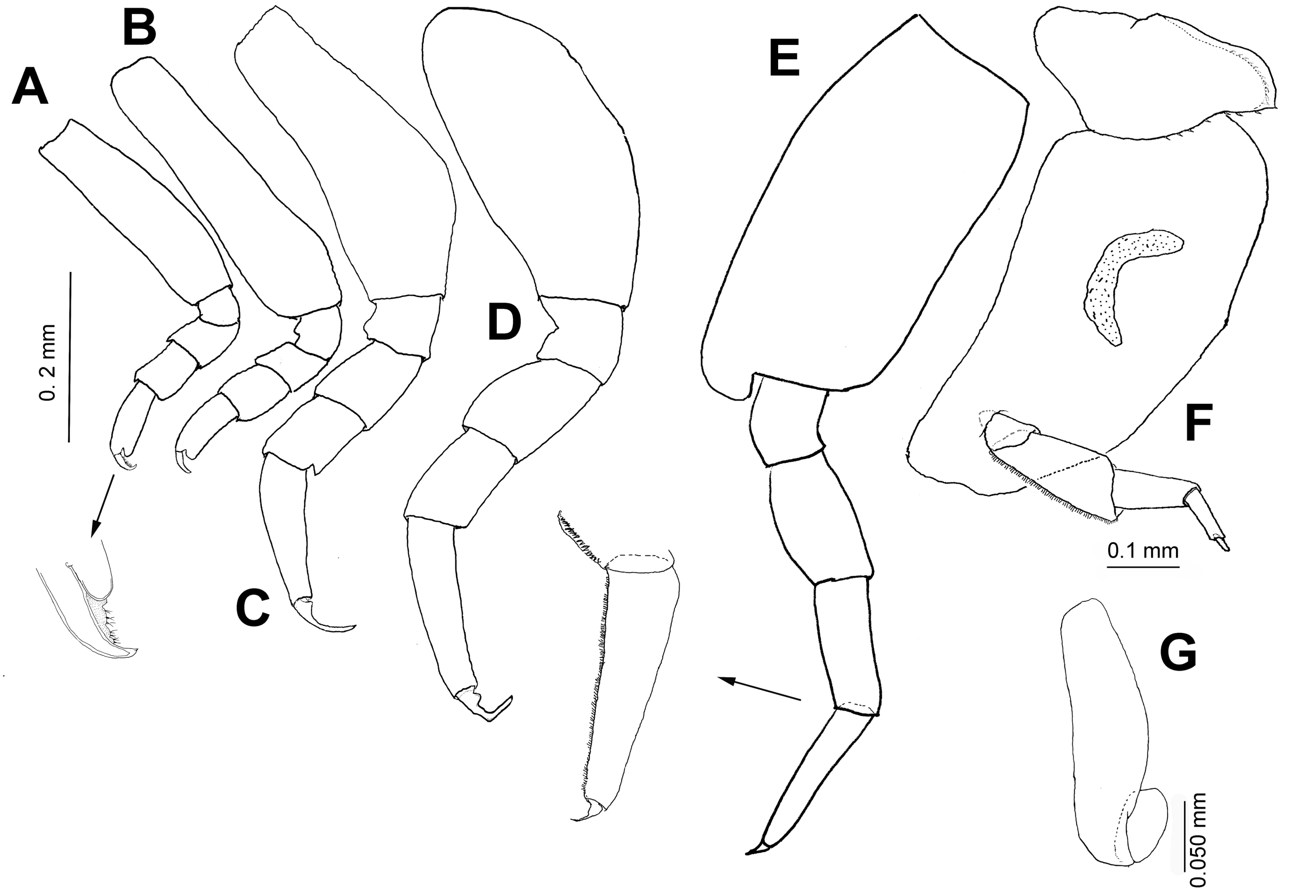

FIGURE 6. *Amphithyropsis shanti* **sp. nov.** Holotype male (ECO-CH-Z-10545). A) pereopod 1 with detail of apical claw (arrow); B) pereopod 2; C) pereopod 3; D) pereopod 4; E) pereopod 5 with detail of distal segment (arrow); F) pereopod 6; G) pereopod 7. Scales as indicated.

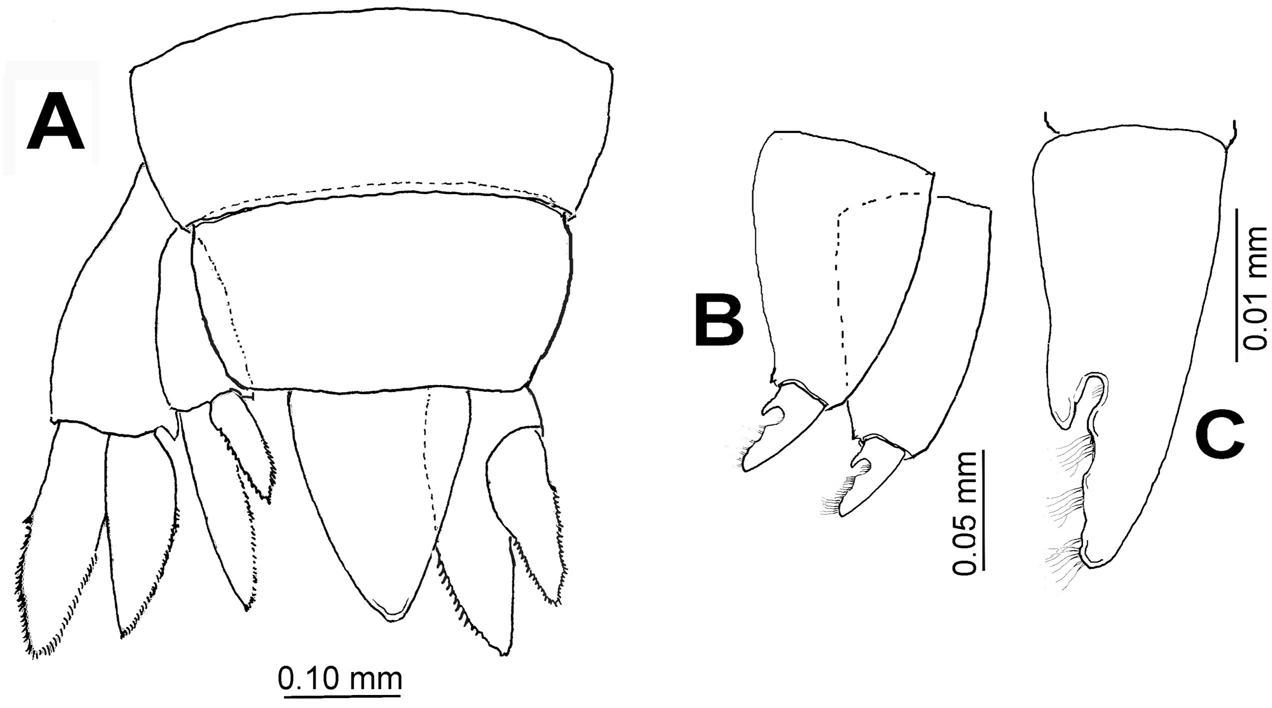

FIGURE 7. *Amphithyropsis shanti* **sp. nov**. Allotype female (ECO-CH-Z-10546). A) urosome and uropods, dorsal view; B) first antennae; C) antenna, detail of distal segment. Scales as indicated.

Pleon. *Pleon* (Fig. 4A) 1.3 x combined length of pereon segments; *epimeral plates* rounded, with slightly elongated distal margin, directed backwards (illustrated for female in Fig. 8G); pleonic segments with height similar to thoracic segments, projected downward. *Third epimeron* with median dorsal and lateral teeth. Pereon and urosome subequal in length (0.70 mm). *Urosome* first segment about as long as fused segments 2 and 3 (0.19 mm), shorter than telson (0.23 mm). *Uropods* maximum length about 1.35 x telson length; margins of uropod endopods and exopods serrate; endopod of *uropod 3* fused with basis; *uropod 1* ca. 0.50 mm long, exopod and basis sub equally long, with serrate margins, exopod 1.25 times as long as endopod, with both margins serrate; *uropod 2* about 0.60 mm long, exopod 0.6 x uropod 2 total length, endopod about 0.5 x as long as exopod, with serrate margins specially on endopod; *uropod 3* about 0.55 x uropod 1 length, endopod length 2/3 of total uropod 3 length (ca. 0.28 mm), inner and outer rami serrate along inner margins, especially apically. *Telson* not fused to urosome.

Description of allotype female (gravid)

Body (Fig. 4D) smaller than male (2.4 mm).

Head. Higher than long (vs. longer than high in male), the longest part in the dorsal portion and not in the middle, head not as rounded as in male. *Antenna 1* (Fig. 7A, B) 2-articulated, directed backwards; callinophore resembling a truncate cone, with several transverse tight rows of aesthetascs; terminal segment about 0.35 x preceding one, with distinctive thumb-like projection forming an incomplete "U", armed with setae. *Antenna 2* absent.

Pereon. Pereopods (Fig. 8) similar to those of male, but with some variations: carpus of pereopod 1 wider proximally in female (Fig 8A); propodus of female pereopod 5 equally wide along segment (Fig 8E).

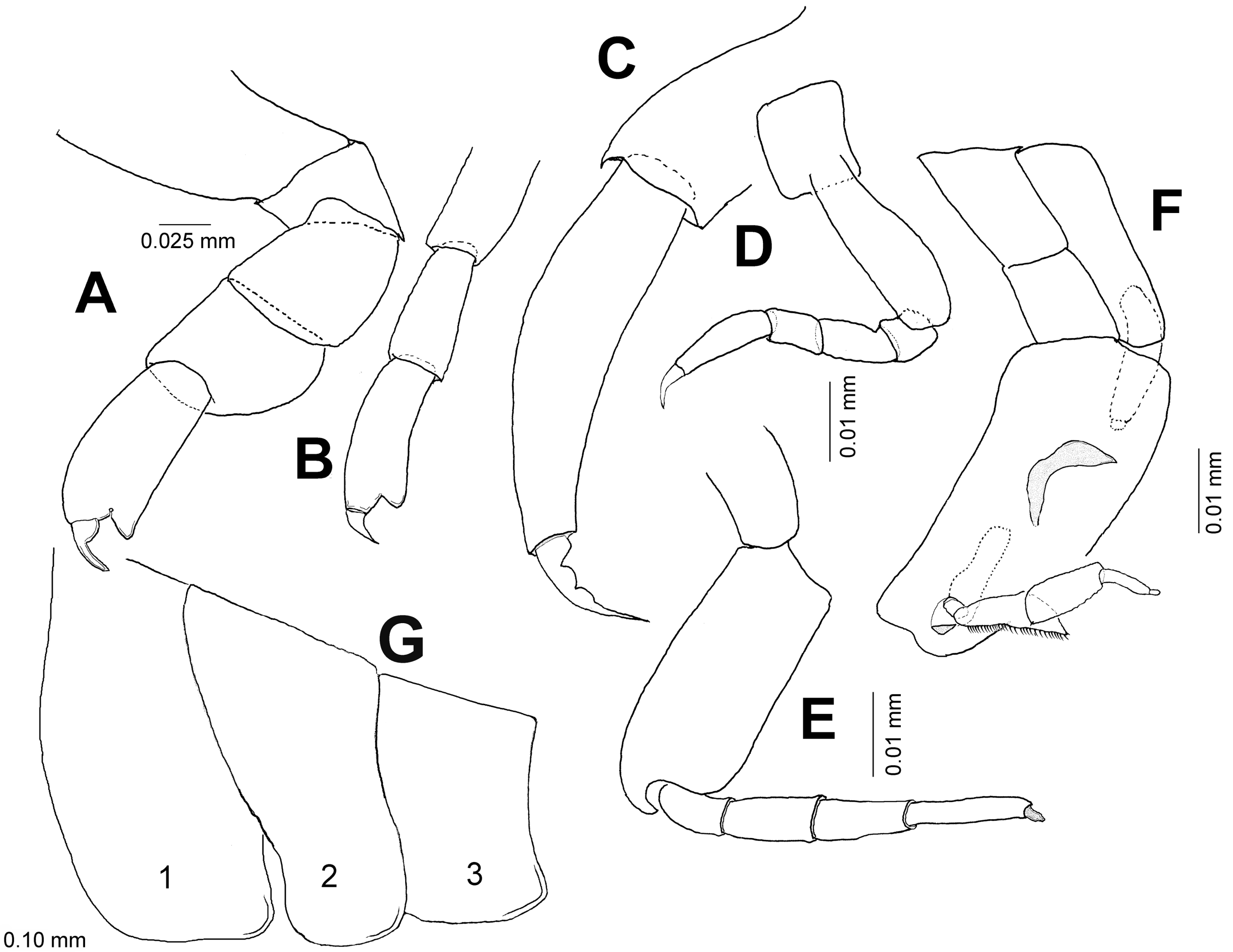

FIGURE 8. *Amphithyropsis shanti* **sp. nov.** Allotype female (ECO-CH-Z-10546). A) pereopod 1; B) pereopod 2; C) pereopod 3; D) pereopod 4; E) pereopod 5; F) pereopods 6 and 7; G) epimerons 1–3. Scales as indicated.

Urosome and uropods (Fig. 7A) as illustrated.

Remarks. Hitherto, the genus *Amphithyropsis* contained a single species, *A. pulchellus*, described from a male found off New Zealand, but it was not described in detail. Barnard (1930) pointed out some of its specific characteristics, like the reticulate cuticular sculpturing, and described and illustrated the 4th segment of pereopod 6, specifying that its structure "… seems to be quite distinctive". *Amphithyropsis pulchellus* had so far been found in the southwestern Pacific, including waters around New Zealand and Australia and, as stated by Zeidler (2016), it also occurs along the southeast coast of Africa, where specimens show the same attributes as those from the Pacific.

The specimens collected in the Gulf of California have the main distinctive generic features of *Amphithyropsis* but cannot be assigned to *A*. *pulchellus* because these specimens possess: 1) different segment proportions in the male antenna 2; 2) a shallower head; 3) pereopods lacking spines; 4) the basis of pereopods 1 and 2 longer than the combined length of distal segments; 5) the middle segment of the male mandibular palp longer than the others; and 6) a female first antenna with a thumb-like projection. All these characters allowed us to distinguish our material from *A*. *pulchellus* and propose a new species.

Amphithyropsis shanti **sp. nov.** most closely resembles *A. sculpturatus* mainly in the body sculpturation, urosome and uropods shape, and in the general structure of pleonite VI. *Amphithyropsis shanti* **sp. nov.**, however, is easily distinguished from this species by having segments 4–6 of pereopods 1 and 2 more rectangular, segment 5 without anterodistal projection, and segment 2 longer than the combined length of distal segments. *Amphithyropsis shanti* **sp. nov.** also has the uropod 2 endopod about 0.5 x the length of the exopod, which is longer than basis, and the pleonite VII lacks segments 3–5. The shape of the female antennae 1 is also a conspicuous distinctive characteristic between the two species.

Discussion

In his pioneer work in the Gulf of California, Siegel-Causey (1982) reported three species of *Amphithyrus*: *A. sculpturatus*, *A. bispinosus*, and *A. similis* Claus, 1879. The same species were later reported by Brusca & Hendrickx (2005). In the present study, we collected the first two species reported by Siegel-Causey (1982), and *A. muratus*. However, we did not find *A. similis*, reported by Siegel-Causey (1982) as rare in the Gulf of California and very close to *A. sculpturatus*. Zeidler (2016) included five valid species in *Amphithyrus* and it is remarkable that four of these have been found in western Mexico. The fifth species, *A. glaber* Spandl, 1924, is known from the Kuroshio Current area and the Red Sea (Vinogradov *et al.* 1996).

Paralycaea seems to be a relatively uncommon but widely distributed genus in tropical and temperate regions of the world's oceans, occurring mainly in near-surface waters (Zeidler 2016). Despite of this, Siegel-Causey (1982) reported three species of *Paralycaea* from the Gulf of California: *P. gracilis*, *P. hoylei*, and *P. newtoniana*. The first two were also collected during our survey. Siegel-Causey (1982) reported one female of *P. newtoniana* from his Gulf samples but noticed that this species had been considered a morphological variant of *P. gracilis*. While reviewing the genus, Zeidler (2016: 36) considered *P. newtoniana* as being closer to *P. hoylei* but, because of the lack of an adequate description and the unavailability of the type material, chose to maintain the status of *P. newtoniana* as uncertain and considered only two valid species within the genus *Paralycaea*: *P. gracilis* and *P. hoylei*. Again, it is remarkable that both species are found among the most abundant species in tropical, surface and neritic-coastal waters in western Mexico and *P. gracilis* being more frequent during "el Niño" period (Gasca *et al*. 2012). The species of *Paralycaea* have been found, when observed in nature, associated with siphonophores like *Agalma elegans*, *Sulculeolari*a *quadrivalvis* de Blainville, 1830*, S. chuni* (Lens & van Riemsdijk, 1908), and *Nanomia bijuga* (Delle Chiaje, 1844) (Harbison *et al*. 1977).

Except for *Amphithyrus bispinosus*, collected at 17 localities during this survey and often recorded in the eastern Pacific (Siegel-Causey 1982, Lavaniegos & Hereu 2009, Valencia & Giraldo 2012, Valencia *et al*. 2013), the other four species of Amphithyridae reported herein were rather rare in our study (collected in 8, 7, 6 and 1 localities only) (Table 1), and this reflects the scarcity of records in the area. *Amphithyrus muratus*, recently reported from the Pacific coast of Colombia by Valencia & Giraldo (2012), was not previously known from the Mexican Pacific, while *A. sculpturatus* had been reported from the Mexican portion of the California Current (Lavaniegos & Hereu 2009, Lavaniegos 2014, 2017) as well as from the west coast of Panama and Colombia (Valencia & Giraldo 2012, Valencia *et al*. 2013), but never abundantly.

Both *Amphithyrus bispinosus* and *A. glab*er have been found in association with the siphonophore *Agalma elegans*, while *Amphithyrus similis* was observed on the upper region of the siphosomal stem of *Chelophyes appendiculata* (Eschscholtz, 1829) (Harbison *et al*. 1977). Laval (1980) mentioned that the families Platyscelidae (where species of *Amphithyrus* were previously accommodated) and Parascelidae appear to use mainly siphonophores as hosts.

Paralycaea gracilis was also rare in our samples (six locations only) and *P. holeyi* was extremely rare (one specimen only) (Table 1). The former has been reported in the California Current, in western Colombia and western Panama (Lavaniegos & Hereu 2009, Lavaniegos 2014, Valencia & Giraldo 2012, Valencia *et al*. 2013) and near the entrance of the Gulf of California (Gómez-Gutiérrez *et al*. 2014). In the case of *P. hoylei*, there is a reasonable possibility that it has been collected in additional locations in the eastern Pacific but was reported as *P. gracilis*, thus following Vinogradov *et al*.'s (1996) opinion expressed in their widely used monograph on hyperiid amphipods (i.e., *P. hoylei* was treated as a junior synonym of *P. gracilis*).

With the discovery of a second species of the genus *Amphithyropsis*, *A. shanti* **sp. nov.**, the number of species of the family Amphithyridae in western Mexico is now set at seven: four species of *Amphithyrus*, two of *Paralycaea*, and one species of *Amphithyropsis*. This local account represents 70% of the currently known species of Amphithyridae worldwide, which is quite remarkable.

Acknowledgements

Ship time aboard the R/V "El Puma" was provided by the Instituto de Ciencias del Mar y Limnología, UNAM (TALUD I and III), and by the Coordinación de la Investigación Científica, UNAM (TALUD IV to XII). The TALUD project has also received laboratory and field work support from CONACyT (Project 31805-N for the TALUD IV to VII cruises), Mexico. The authors thank all scientists, students and crewmembers who took an active part in the TALUD cruises. We thank J.C. Hernández-Payán (SNI research assistant) for sorting the specimens of pelagic amphipods, and Humberto Bahena for taking the photographs of figure 4. We thank Mercedes Cordero Ruiz for preparing figures 1–3 and 9.

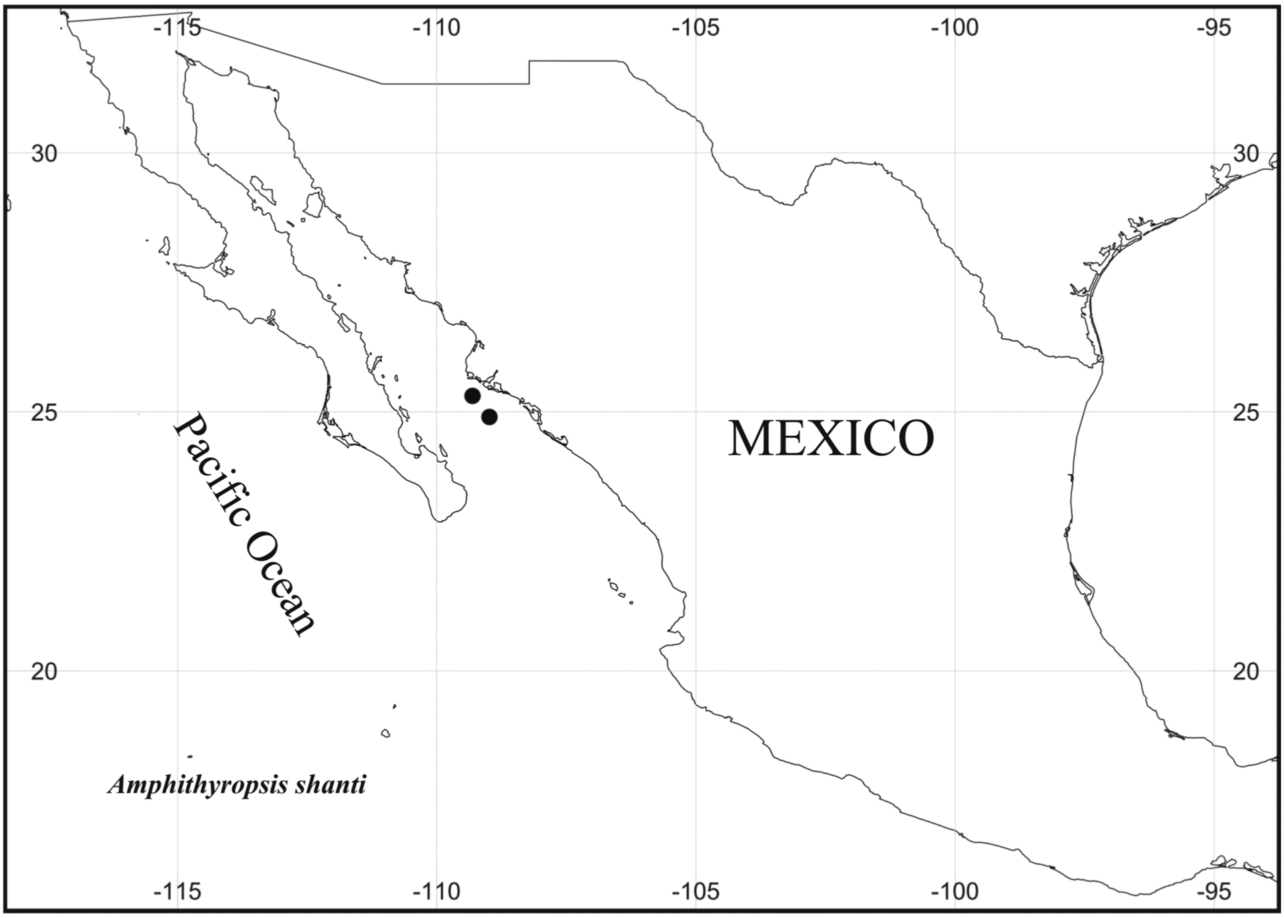

FIGURE 9. Localities where *Amphithyropsis shanti* **sp. nov**. was captured during this survey.

TABLE 1. Numbers of localities (Loc) where each species was collected and number of specimens (Spec).

Species	# Loc	# Spec
Amphithyrus bispinosus	17	19M, 51F
Amphithyrus muratus	8	5M, 6F
Amphithyrus sculpturatus	7	10M, 4F
Paralycaea gracilis	6	7M, 3F
Paralycaea hoylei	1	1M
Amphithyropsis shanti **sp. nov**.	2	1M, 1F
Total	26	**43M, 65F**

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