Zootaxa 3669 (3): 367–383
www.mapress.com/zootaxa/

Article

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

http://dx.doi.org/10.11646/zootaxa.3669.3.10
http://zoobank.org/urn:lsid:zoobank.org:pub:B9C2D423-6E86-4B42-8689-0A3107846AC4

Crangonidae and Glyphocrangonidae (Decapoda; Caridea) of the Southern Gulf of Mexico

ANA ROSA VÁZQUEZ-BADER[1] & ADOLFO GRACIA[2]

[1]Laboratorio de Ecología Pesquera de Crustáceos. Instituto de Ciencias del Mar y Limnología, UNAM, Av. Universidad # 3000, Universidad Nacional Autónoma de México, CU, Distrito Federal, 04510. México. E mail: [1]ana-rosav@hotmail.com, [2]gracia@unam.mx

Abstract

Distribution and abundance of species of Crangonidae and Glyphocrangonidae in the Mexican deep-waters of the Gulf of Mexico were analyzed through six research cruises onboard of the R/V *Justo Sierra* of the Universidad Nacional Autónoma de México using an otter trawl in a depth range of 300–1200 m. We collected two and five species of the Crangonidae and Glyphocrangonidae families, respectively. We provide information about its depth and geographic distribution, abundance, frequency of occurrence and size structure. *Glyphocrangon*, composed of five species (*G. aculeata*, *G. alispina*, *G. haematonotus*, G. *longleyi* and *G. spinicauda*), was the most common and abundant component during the benthic trawls with a total of 1125 individuals. The family Crangonidae recorded only one genus and two species (*Parapontocaris caribbaea* and *P. vicina*) with 21 individuals. A taxonomic key for these crangonid and glyphocrangonid shrimps of the Gulf of Mexico is also provided.

Key words: Crangonidae, Glyphocrangonidae, Gulf of Mexico, sizes, depth, distribution

Introduction

Deep-water decapod megacrustaceans of the SW and SE Gulf of Mexico in front of Tamaulipas to Quintana Roo Mexican states are poorly known, mainly due to scarce studies developed in the southern part of the Gulf of Mexico comparatively to the north area. Wicksten & Packard (2005) reported near 396 collection sites in the northern part, in comparison to only 28 located in the southern counterpart in the Mexican waters. Most of the available information about deep-water crustacean fauna in the south of the Gulf of Mexico is referred mainly to records by foreign expeditions (e.g. R/V *Alaminos*, *Oregon*, and *Pillsbury)*. Few studies have been developed in Mexican deep-waters, some of them in the Mexican Ridge System and Sigsbee Canyon (Gaytán 2005; Escobar-Briones *et al*. 2008). But none of these expeditions made extensive and/or intensive collections throughout the Mexican continental slope. Since 1998, the Laboratorio de Ecología Pesquera de Crustáceos, ICML, UNAM, has been conducting a research program in deep-waters of Mexican Gulf of Mexico, with the purpose to analyze the biodiversity of megacrustaceans and explore potential fishery resources in the upper continental slope. As a result of these investigations, we present information of the caridean families, Crangonidae and Glyphocrangonidae of the south Gulf of Mexico obtained during the projects BATO (Biota de los arrecifes de la plataforma y del talud continental en el noroeste del Banco de Campeche); BIOREPES (Biodiversidad y Recursos Pesqueros del Golfo de México); and COBERPES (Comunidades bentónicas y recursos pesqueros potenciales del mar profundo del Golfo de México), which were carried out between 1998 and 2011.

The family Glyphocrangonidae represented only by *Glyphocrangon* A. Milne-Edwards 1881, has nowadays, a total of 89 species around the world (De Grave & Fransen 2011; Komai 2011), which inhabit from continental shelf to abyssal basins (200 to 6500 m) (Holthuis 1971; Gore 1985; Kensley *et al*. 1987; Komai 2004b, 2006, 2007, 2011). Eight species were recorded in the western Atlantic (Pequegnat 1970; Holthuis 1971; Dardaeu & Heard 1983; Chace 1984; Cardoso & Serejo 2007; Campos *et al*. 2005; Komai 2004a), while Felder *et al*. (2009) registered 7 species for the entire Gulf of Mexico, and only 3 in the Mexican portion of the Gulf of Mexico. On the

Accepted by Joseph Goy: 30 Apr. 2013; published: 7 Jun. 2013

other hand, Crangonidae has been reviewed by some authors with the object to resolve the phylogenetic (Christoffersen 1988) and taxonomic relationships (Chace 1984). Many new species have been described in the recent years, and nowadays the family has approximately 23 genera and 219 species around the world (Kim and Hayashi 2003; De Grave & Fransen 2011) distributing from littoral to around 5852 meters depth (Chace 1984). In the Western Atlantic 8 genera and about 70 species have been registered (Dardaeu & Heard 1983; Cruz *et al.* 2002; Komai 2008a; Cardoso 2009), while Felder *et al*. (2009) mentioned 7 genera and 9 species for the Gulf of Mexico. Four genera and 7 species of these had been registered for the Caribbean and southern Gulf of Mexico.

In this paper we present information about specific composition, depth and geographic species distribution, frequency of occurrence and abundance of Crangonidae and Glyphocrangonidae species found in the Mexican waters of the Gulf of Mexico with a key for them.

Material and methods

We conducted six research cruises onboard of the R/V *Justo Sierra* of the Universidad Nacional Autónoma de México in the upper continental slope (between 300–1200 m depth) of the entire Mexican Gulf of México, from the Mexican border of the United States of America to the Mexican Caribbean Sea (Fig. 1a). Samples were obtained with an otter trawl (18 m mouth aperture, 4.5 cm stretched mesh, 1.5 cm stretched mesh cod-end). Each tow lasted 30 min at a speed of 2.5 to 3.0 knots. A total of 186 trawls were performed during six cruises: BATO (spring 1998), BIOREPES1 (summer 2005), BIOREPES2 (spring 2007), BIOREPES3 (autumn 2008), COBERPES (summer 2009), and COBERPES 2011 (spring 2011).

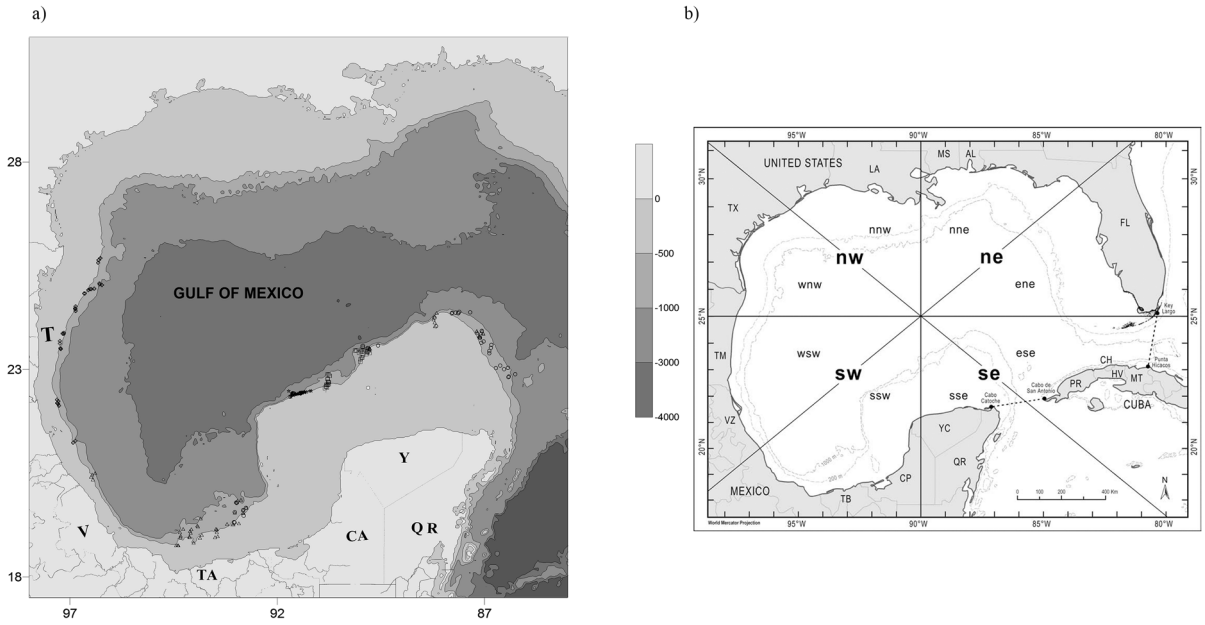

FIGURE 1. a) Study area in the south of the Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo. b) The Gulf of Mexico geographic boundaries. Abbreviations: Fl= Florida, AL=Alabama, M= Mississippi, LA= Louisiana, TX= Texas, TM= Tamaulipas, TB= Tabasco, CP= Campeche, YC= Yucatán, QR= Quintana Roo From, PR= Pinar del Río, CH= ciudad de la Habana, MT= Matanzas (after Felder *et al.* 2009).

The catch from each haul was sorted by species and quantified. All material collected was preserved in ethanol and kept in the Crustacean Reference Collection of the Laboratorio de Ecología Pesquera de Crustáceos (LEPC, ICML, UNAM). Individual crustacean were measured to the nearest 0.1 mm with vernier calipers from the posterior orbital margin to posterodorsal margin of the carapace (CL; mm). For each specimen information of restricted synonymies (taken from Holthuis 1971; Dardaeu 1980, Dardaeu & Heard 1983; Chace 1984; Christoffersen 1988; Komai 2004a; Kim & Hayashi 2005; Komai 2006, 2008a,b), geographical and bathymetrical

distribution (overall and regional), total number of specimens, and sex ratio was included. Analysis of occurrence and abundance patterns, were done in a 100 m depth strata basis. Comparisons of size and sex by depth strata were made for all cruises with a one-way analysis of variance (ANOVA). Significance of variation was tested using post-hoc Tukey hypothesis of pairwise comparisons (Sokal & Rohlf 1995). The distribution within the Gulf of Mexico was analysed using the arbitrary 8 sectors of the Gulf of Mexico proposed by Felder *et al*. (2009) (Fig. 1b).

Results

Along the scientific cruises, we collected a total of 24 individuals which belonged to two species of Crangonidae and 1126 individuals belonging to 5 species of the Glyphocrangonidae.

Family Crangonidae

Parapontocaris caribbaea (Boone, 1927)

(Fig. 2)

Aegeon caribbaeus Boone 1927, pp.125–131, fig. 28.—Chace 1956, 13 (in part).
Parapontocaris caribbea—Chace 1984: 30 (in key).—Campos *et al*. 2005, 86, fig. 50.—Felder *et al*. 2009, 1060.

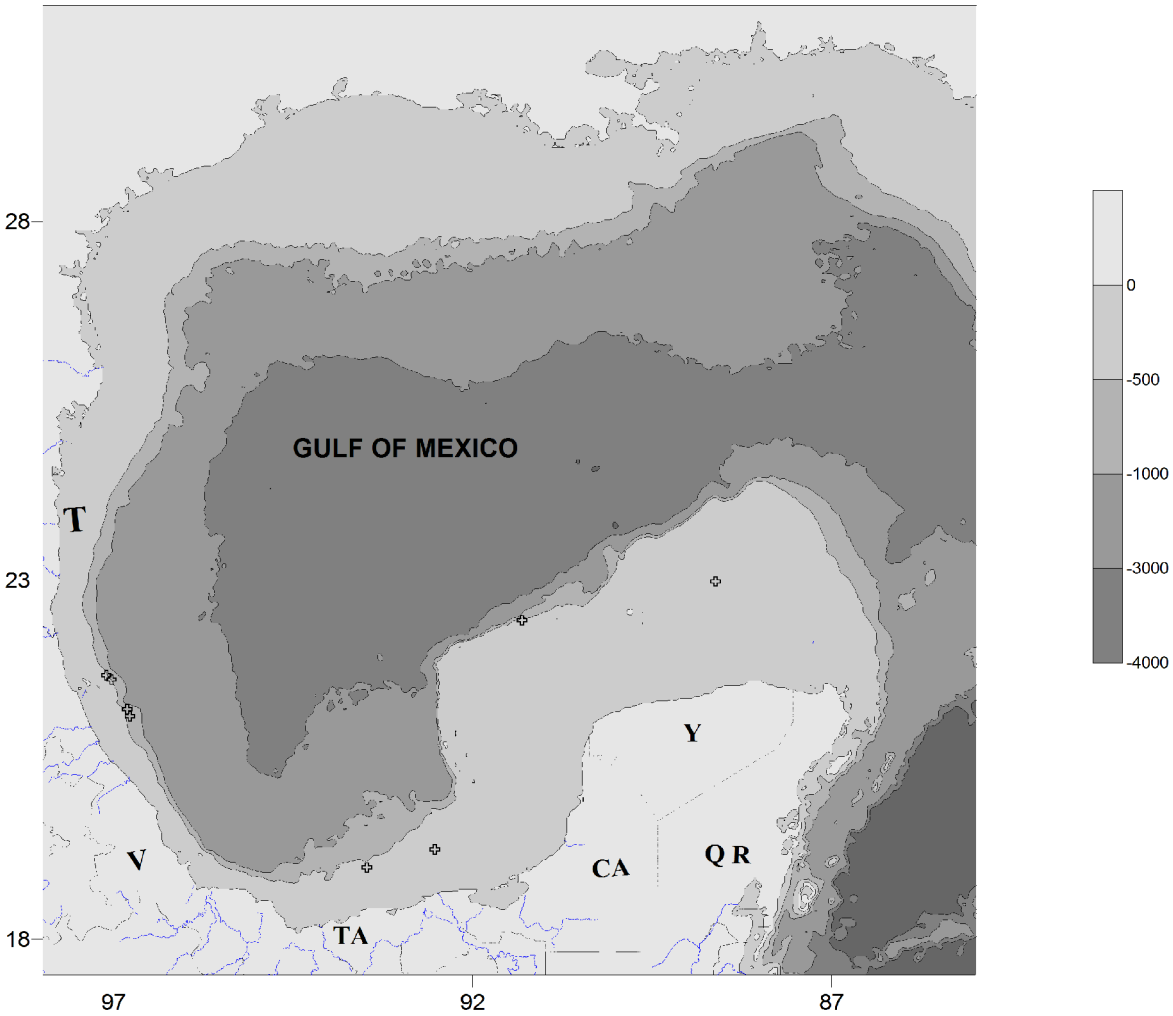

FIGURE 2. Map of distribution of *P. caribbaea* in the southern Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo.

Material examined. BATO stn 32, ovigerous ♀ 1. **COBERPES** stn B2, ♀ 1. **COBERPES3** stn B2, ♀ 1. Supplemental specimens.- **SIGSBEE9** stn A4, ♀ 1; stn A7, ovigerous ♀ 1; stn A9, ♀ 3. **SIGSBEE10** stn B, ovigerous ♀ 1; stn D, ♀ 1stn E, ♀ 2

Overall Geographic and Bathymetric Distribution. Western Atlantic, Bahamas Islands (Bullis & Thompson 1965) and Straits of Florida (Chace 1956); northwestern Gulf of Mexico, off Galveston Bay (Chace 1956), sectors of the Gulf of Mexico: NNE, WNW, and ESE, from 311–815 m (Felder *et al*. 2009); Caribbean Sea, off Honduras (Boone 1927; Bullis & Thompson 1965); and Colombia in a depth range of 366 to 549 m (Cruz *et al*. 2002; Campos *et al.* 2005).

Distribution in the Southwestern and Southeastern Gulf of Mexico. Veracruz: off Tuxpan river (WSW); Tabasco: west Carmen y Machona Lagoons (SSW); Yucatán: east Celestún, (SSW), and in front of Ría Lagartos (SSE) from 299 to 428 m depth on muddy and shell sediment (Fig. 2).

Remarks. This species is recorded for the first time in the southwestern Gulf of Mexico (WSW, SSW, and SSE). *P. caribbaea* was few frequent and scarce, we collected only 12 individuals. Length distribution by sex showed females being smaller than ovigerous females. The females range was 13.5–20.8 mm CL; and ovigerous female size range was 16.6–18.5 mm CL. The ovigerous females were present in spring and summer at 340 m depth.

Parapontocaris vicina (Dardeau & Heard, 1983)

(Fig. 3)

Aegeon caribbaeus Chace, 1956, 13 [in part].
Parapontocaris vicina—Chace 1984: 30 (in key).—Campos *et al*. 2005: 87, fig. 51.—Felder *et al*. 2009: 1061.

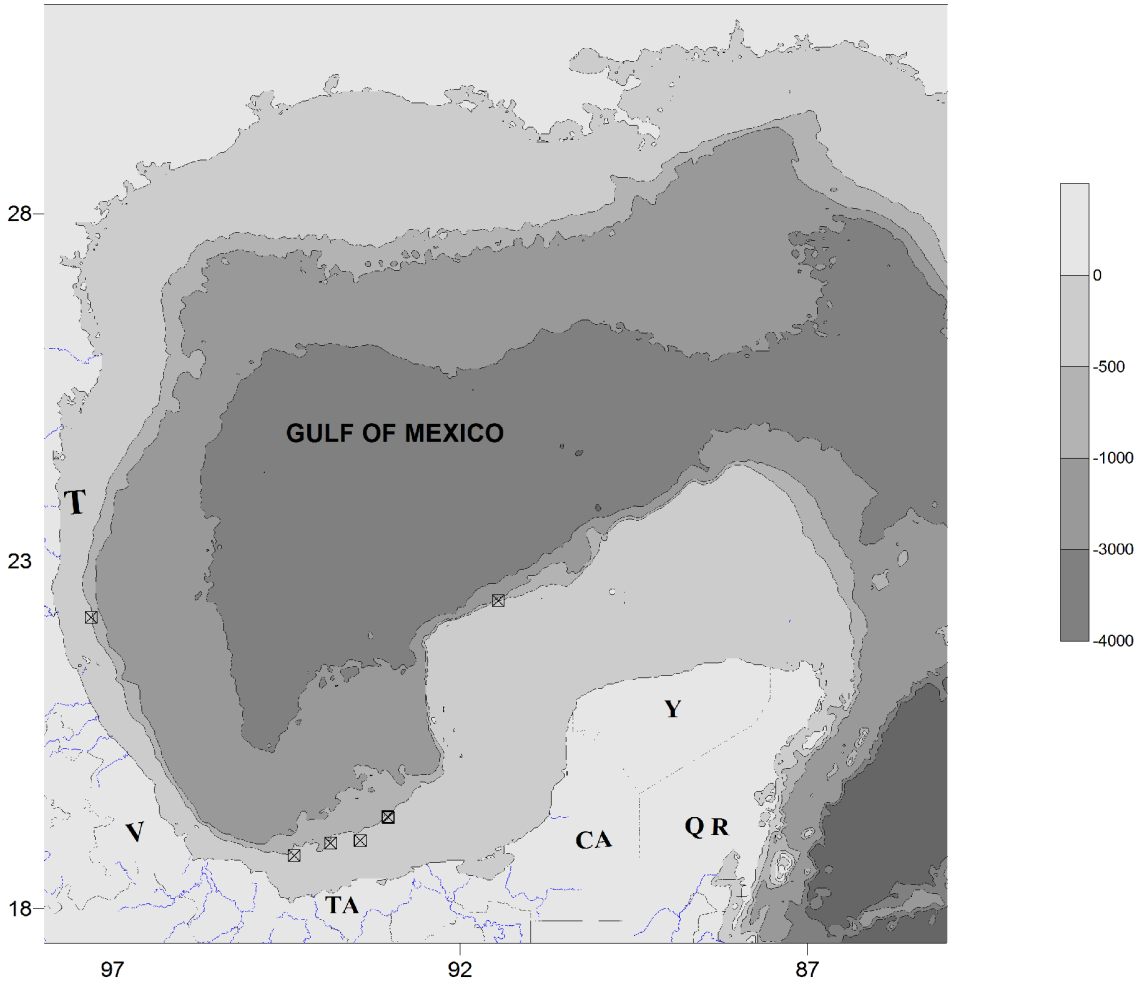

FIGURE 3. Map of distribution of *P. vicina* in the southern Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo.

Material examined. BIOREPES3 stn. C5, ♀ 1, ovigerous ♀ 1. **COBERPES** stn A 10, ovigerous ♀ 2; stn B3, ♀ 2, ovigerous ♀ 2; stn B15, ♀ 1. **COBERPES3** stn B10, ♀ 1; B15, ♀ 1; α6, ovigerous ♀ 1; α7♀ 1.

Overall Geographic and Bathymetric Distribution. This species was recorded in Western Atlantic, from Bahamas Islands; North central Gulf of Mexico, off Mississippi River Delta (Chace 1956); Straits of Florida; sectors of the Gulf of Mexico: NNE, and ESE, from 366–612 m (Felder *et al*. 2009); Caribbean Sea, off Honduras and Nicaragua (Bullis & Thompson 1965), and Colombia, from 366 to 549 m depth (Cruz *et al*. 2002).

Distribution in the Southwestern and Southeastern Gulf of Mexico. We collected *P. vicina* in front of Pánuco River, Veracruz (sector WSW), and in front of Carmen and Machona Lagoons, Tabasco (SSW), from 325 to 513 m depth, on muddy sediments (Fig. 3).

Remarks. This species like *P. caribbaea* was few abundant during trawls and it is the first time that *P. vicina* is registered in the WSW and SSW sectors of the Gulf of Mexico. The size range for the females was 16.0–21.7 mm CL; and 19.7–22.8 for ovigerous females. The 6 ovigerous females occurred in autumn and summer. As Dardaeu & Heard (1983) pointed out, the two species of *Parapontocaris* never occurred together in the same haul, although they were collected in successive trawl hauls.

Family Glyphocrangonidae

Glyphocrangon aculeata A. Milne Edwards, 1881

(Figs. 4, 5)

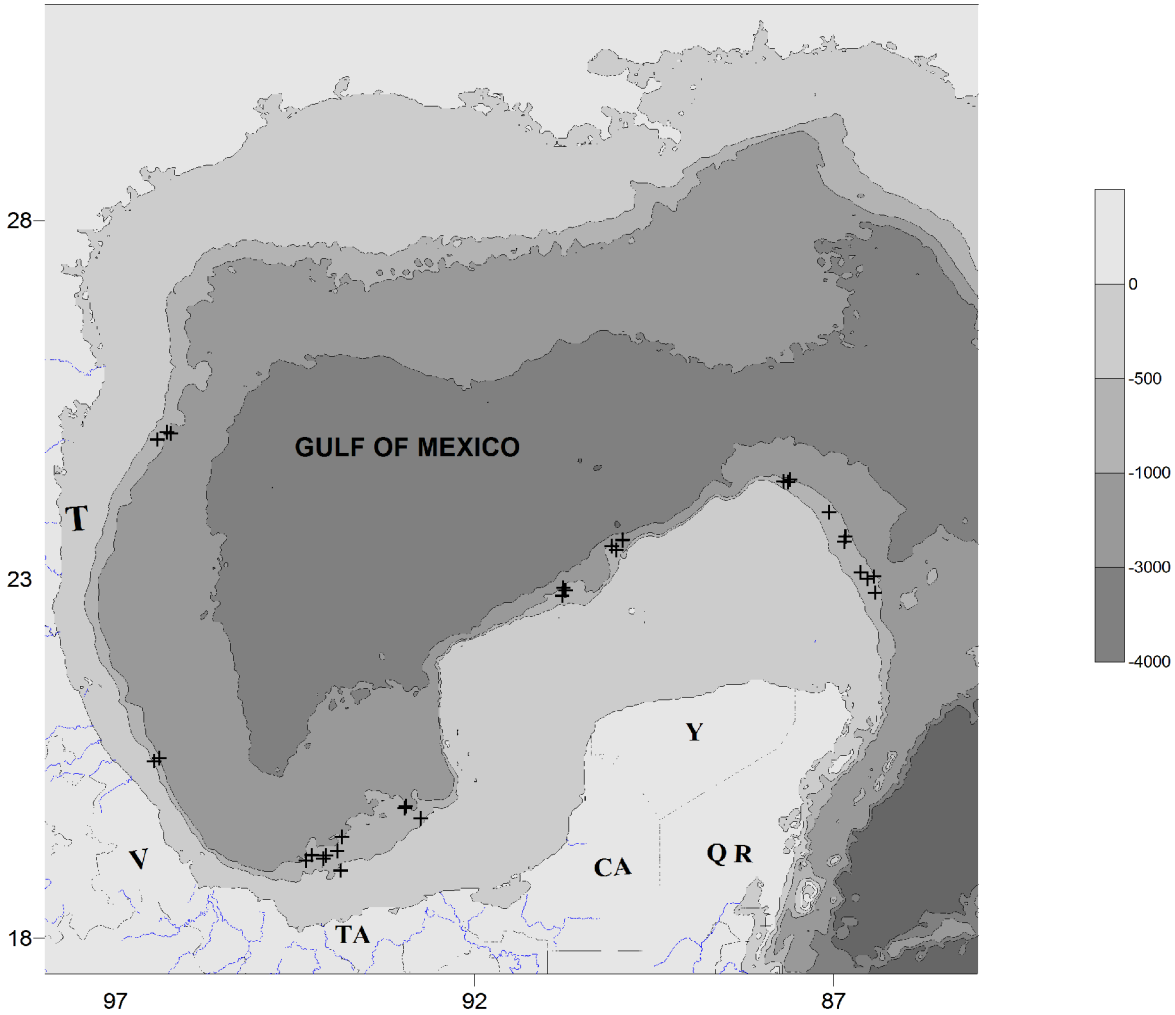

FIGURE 4. Map of distribution of *G. aculeata* in the southern Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo.

Glyphocrangon aculeatum A. Milne Edwards, 1881: 5 (type locality: off St. Vincent, West Indies, 1030 m).
Glyphocrangon aculeata—Bate 1888: 521, pl. 94, fig. 1.—Moreira, 1901: 15.—Pequegnat, 1970: 104.—Holthuis 1971: 323, fig. 10.—Coelho & Ramos 1972: 156.—Boschi 1973: 234, fig. 1b.—Forest & Holthuis 1997: 56.—Ramos-Porto & Coelho 1998: 342.—Komai 2004a: 32, fig. 1A, B.—Wicksten & Packard 2005: 1757.—Felder *et al*. 2009: 1061.

Material examined. BIOREPES2 stn 5, ♀ 2, ovigerous ♀ 6; stn 6, ♀ 1, ovigerous ♀ 1; stn 7, ♂ 1, ♀ 4; stn 8, ♂ 1, ♀ 2, ovigerous ♀ 1; stn 14, ♀ 4, ovigerous ♀ 5; stn 27, ♂ 4, ♀ 11, ovigerous ♀ 10; stn 28b, ♂ 4, ♀ 2, ovigerous ♀ 1; stn 35, ♀ 2; stn 36, ♀ 1, ovigerous ♀ 3. **BIOREPES3** stn A15, ovigerous ♀ 13; stn A16, ♂ 3, ♀ 7, ovigerous ♀ 1; stn A17, ♂ 1, ♀ 4; stn A18, ♂ 3, ♀ 3. **COBERPES** stn A2, ovigerous ♀ 7; stn A5, ovigerous ♀ 1; stn A6, ♂ 1, ♀ 2; stn B6, ♂ 3, ♀ 4, ovigerous ♀ 7; stn B8, ♂ 1, ♀ 8, ovigerous f6; stn B9, m4, f6, ovigerous f8; stn B10, m2, f13, ovigerous f16; stn E1, m1, ovigerous ♀ 1; stn E2, ♂ 1; stn Ω8, ovigerous ♀ 1; stn Ω9, ♂ 3, f4, ovigerous ♀ 1; stn Ω10, ♂ 2, ♀ 1; stn Ω13, ♂ 1, ♀ 2, ovigerous ♀ 6. **COBERPES 2011** stn B1, ♂ 2; stn B2, ♀ 2, ovigerous ♀ 2; stn B3, ovigerous ♀ 1; stn B4, ♂ 1; stn B7; ovigerous ♀ 1; stn B9, ♂ 1; stn C4, ovigerous ♀ 1; stn C5, ovigerous ♀ 4; stn D1, ovigerous ♀ 2; stn D6, ovigerous ♀ 4; stn D7, ♂ 4, ovigerous ♀ 3; stn D9, ovigerous ♀ 1.

Overall Geographic and Bathymetric Distribution. This species has been recorded off Cape Hatteras (North Carolina, U.S.A.) to off Recife (NE Brazil), the entire Gulf of Mexico (NW; NE; SW; SE) and Caribbean Sea; at a 707–1760 m depth range (Holthuis, 1971; Felder *et al*. 2009).

Distribution in the Southwestern and Southeastern Gulf of Mexico. We collected this species in Tamaulipas: Laguna Madre (WNW); in front of Veracruz: Nautla and Coatzacoalcos rivers (WSW); Tabasco: Carmen-Machona Lagoons, Grijalva-Usumacinta rivers (SSW); Campeche: San Pedro-San Pablo rivers, Términos Lagoon (SSW); Yucatán: N of Alacranes reef (ESE); at a depth range of 443.8 to 1144 m. It was found inhabiting clay and shell sediment (Fig. 4).

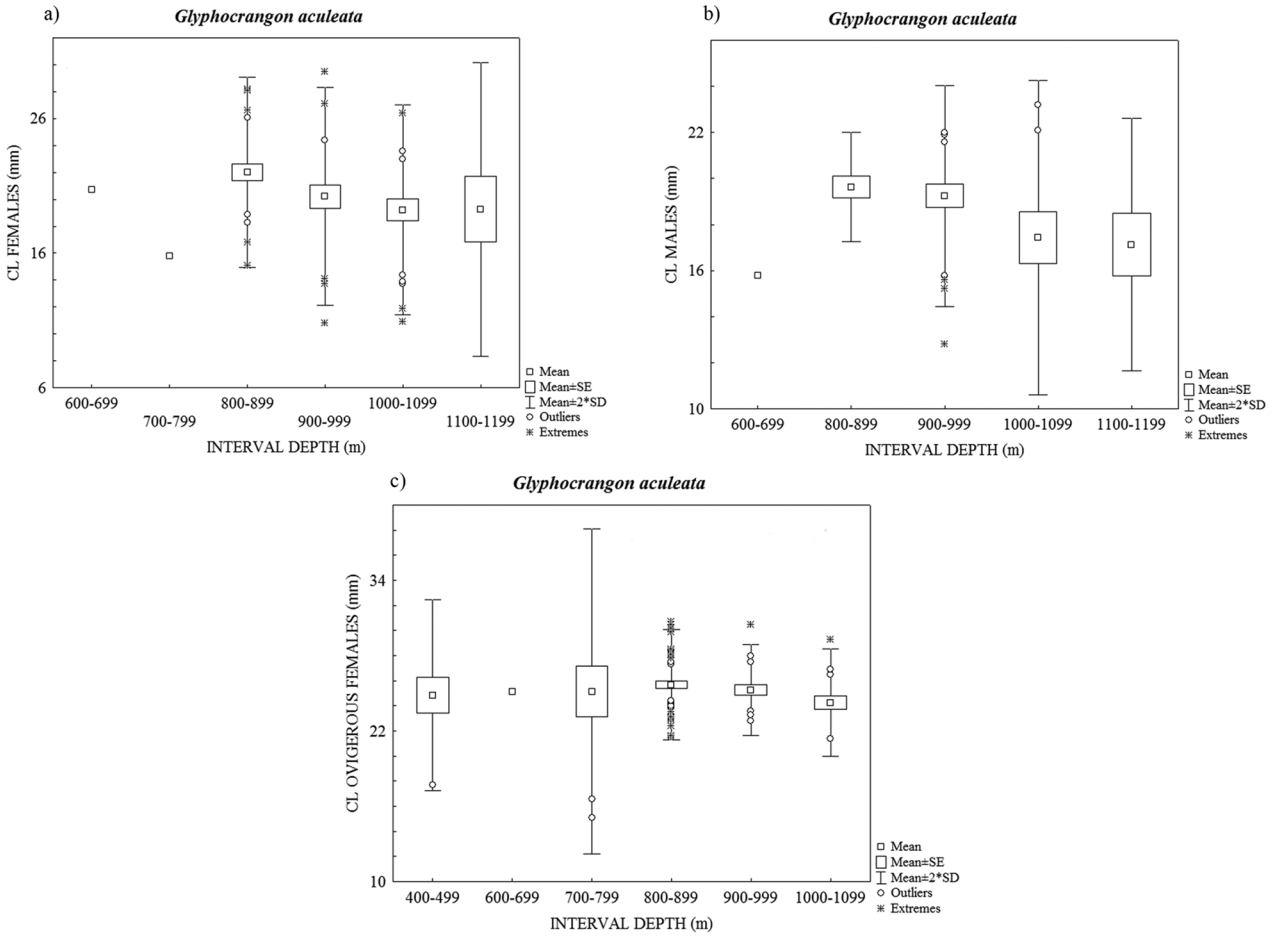

FIGURE 5. Size distribution by sex and depth interval of *G. aculeata*, a) females; b) males; c) ovigerous females.

Remarks. A total of 242 individuals of *G. aculeata* was collected in all cruises. Although this species occur in the entire Gulf of Mexico, we obtained the highest abundances in the sectors SSW and ESE, stations located in front of Coatzacoalcos River (867 m depth) and W of Alacranes reef, Yucatán (828.9 m depth). Sex ratio was 4.6 females to 1 male; ovigerous females accounting 57.3 % of the total females. Length carapace distribution showed that males were smaller than females. Ovigerous female size range was 15.1–32.0 mm (mean 25.32 ± SD) whereas females varied between 10.8–30.7 mm CL (mean 20.53 ± 3.99 SD), and males size range was 12.8–23.2 mm CL (mean 18.7 ± 2.62 SD) (Fig.5a, b, c).

The widest depth distribution range was observed in the ovigerous females (443.8–1047 m) compared to the non-ovigerous females and males depth distribution range (681.6–1044.0 and 620.0–1144 m, respectively). The ovigerous females occurred in spring, summer and autumn at depths between 800–899 m; but the maximum number was registered in summer (COBERPES 2009) off the Coatzacoalcos River. Although we observed a tendency of minor sizes to be present at deepest intervals, the ANOVA did not show a significant difference (males: F= 1.706, p= 0.1686; females: F= 1.9583, p= 0.0937; ovigerous females: F= 6721, p= 0.6454).

Glyphocrangon alispina Chace, 1939

(Figs. 6, 7)

Glyphocrangon alispina Chace, 1939: 39 (type locality: north of Matanzas Province, Cuba, 23°24'N, 81°00.5'W).—Pequegnat 1970: 105.—Holthuis 1971: 347, fig. 15.—Komai 2004a: 3, fig. 1C, D.

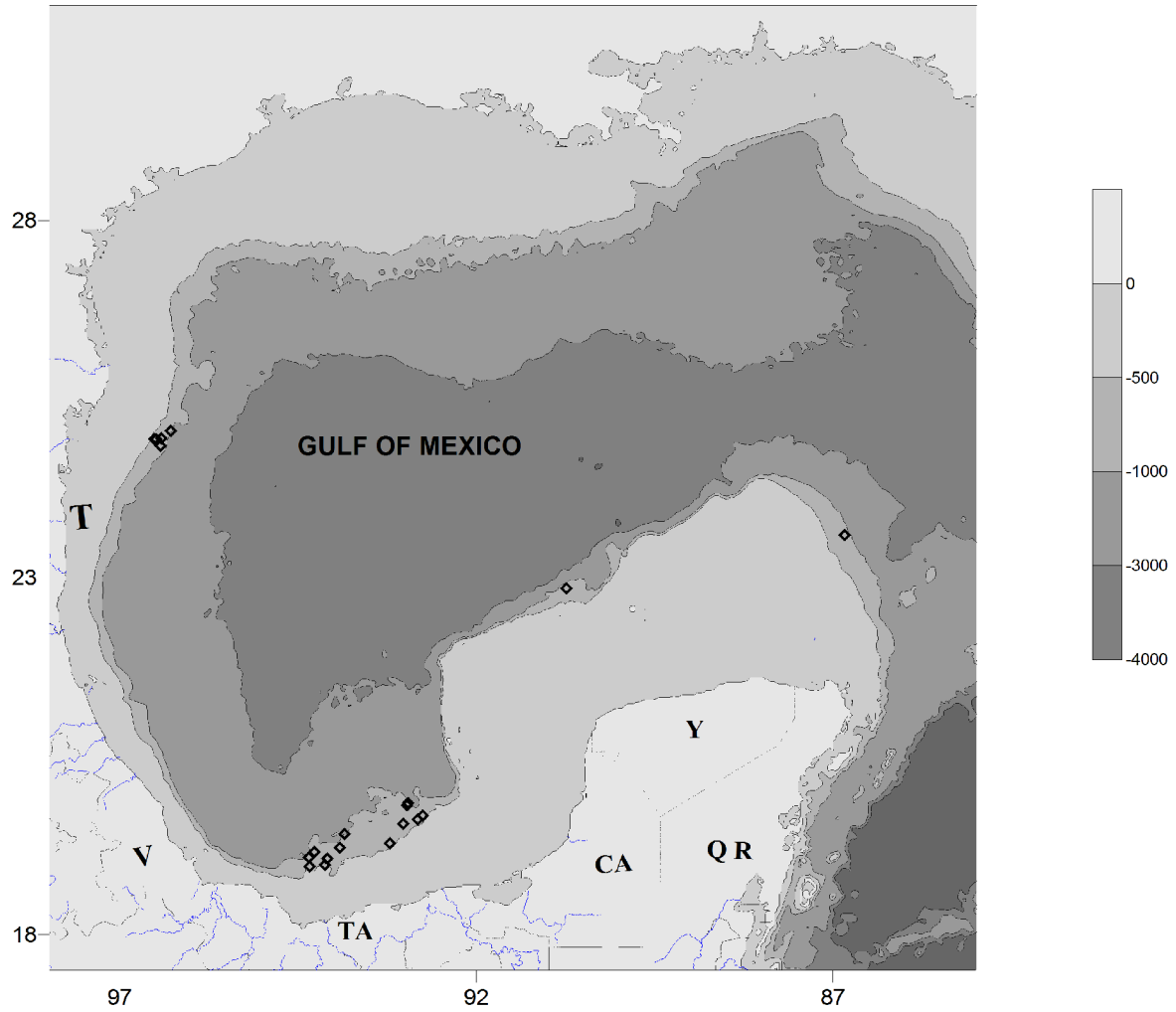

FIGURE 6. Map of distribution of *G. alispina* in the southern Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo.

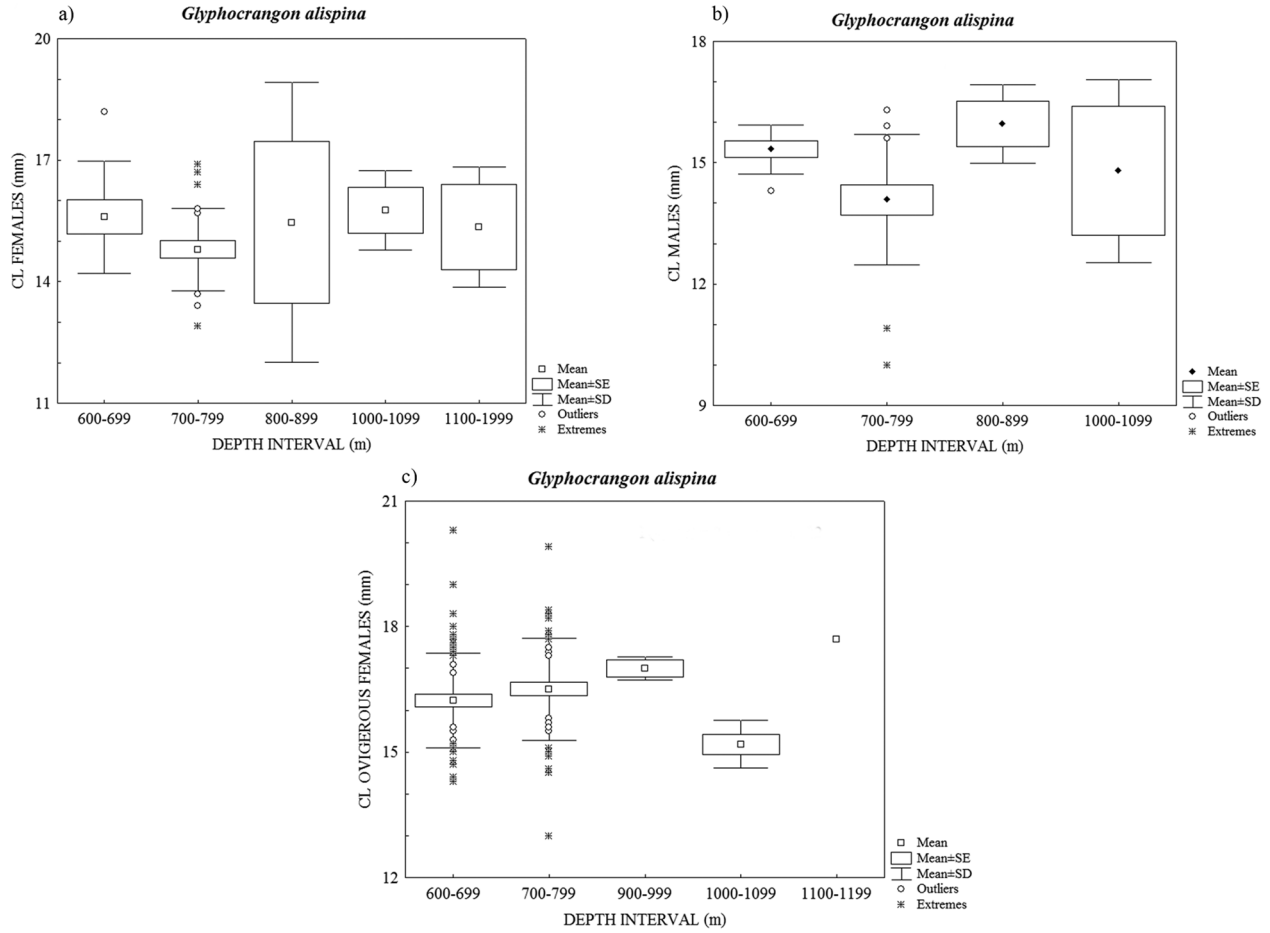

FIGURE 7. Size distribution by sex and depth interval of *G. alispina*, a) females; b) males; c) ovigerous females.

Material examined. BIOREPES2 stn 27, ♀ 1; stn 36, ♂ 1, ♀ 1, ovigerous ♀ 3. **BIOREPES3** stn A9, ♀ 1; stn A13, ♂ 9, ♀ 11, ovigerous ♀ 28; stn A14, ♂ 4, ♀ 10, ovigerous ♀ 9; stn A15, ♂ 1; stn A17, ovigerous ♀ 1. **COBERPES** stn A5b, ovigerous ♀ 4; stn A6, ♀ 2, ovigerous ♀ 1; stn B4, ovigerous ♀ 6; stn B6, ovigerous ♀ 1; stn B8, ♀ 1, ovigerous ♀ 1; stn B11, ♀ 1; stn B12, ♂ 1, ♀ 3, ovigerous ♀ 11; stn Ω1, ♂ 1, ♀ 1, ovigerous ♀ 1; stn Ω5, ♂ 3, ovigerous ♀ 25; stn Ω7, ♀ 3, ovigerous ♀ 11; stn Ω8, ♂ 10, ♀ 3, ovigerous ♀ 16; stn Ω9, ♂ 1, ♀ 2, ovigerous ♀ 2; stn Ω10, ovigerous ♀ 1. **COBERPES 2011** stn C5, ♂ 2, ♀ 1, juvenile 1.

Overall Geographic and Bathymetric Distribution. This species has been recorded in the entire Caribbean Sea, including the Gulf of Mexico (NW; NE; SW; SE), from the Florida Straits to British Guiana; at a 548–1865 m depth range (Holthuis, 1971, Felder *et al.* 2009).

Distribution in the Southwestern and Southeastern Gulf of Mexico. Within study area we collected *G. alispina* in Tamaulipas: Laguna Madre (WSW); Veracruz: Coatzacoalcos and Tonalá rivers (SSW); Tabasco: Carmen-Machona, and Mecoacán Lagoons, Grijalva-Usumacinta rivers (SSW); Yucatán: N of Alacranes reef (SSE); from 671.9 to 1144.0 m depth on clay and muddy shell sediment (Fig. 6).

Remarks. We caught 195 individuals in all research cruises. The maximum abundance was found during autumn 2009 in front of Laguna Madre at 699 m depth. Male mean size was small (14.64 ± 1.50 SD), compared to females (15.16 ± 1.37 SD), and ovigerous females (16.33 ± 1.18 SD). Sex ratio favoured females 4.97: 1 male, the ovigerous females counting 74.7% of the total females. Females (non-ovigerous and ovigerous) were found in a wider depth range (671.9 to 1144 m depth), than males (699 to 1047.9 m depth). Size depth distribution showed that the smallest size for females (12.4 mm CL) and males (10.0 mm CL) occurred at the depth interval of 700–799, while the ovigerous females (13.0 mm CL) were collected deeper (1000–1099 m depth) (Fig.7a, b, c). In spite of this apparent size distribution pattern, ANOVA results by size and depth did not show significant differences (males: F= 2.6354, p= 0.0685; females: F= 0.8502, p= 0.05029; ovigerous females: F= 2.42, p= 0.0522 (Fig. 7a, b,

c). Ovigerous females were more abundant in autumn and summer. They were mainly found in front of Laguna Madre and Grijalva-Usumacinta rivers accounting 75% of the total number of females.

Glyphocrangon haematonotus Holthuis, 1971
(Fig. 8)

Glyphocrangon haematonotus Holthuis, 1971: 315, figs. 6, 7.—Felder *et al*. 2009: 1061.

Material examined. BIOREPES2 stn 12, ovigerous ♀ 3. **COBERPES 2011** stn D5, ♀ 1.

Overall Geographic and Bathymetric Distribution. South Carolina; southeastern Gulf of Mexico (ESE), and Caribbean Sea, from 247 to 966 m depth (Felder *et al*. 2009).

Distribution in the Southwestern and Southeastern Gulf of Mexico. This species was collected in the North zone of Alacranes Reef (Yucatán area; ESE) at 626–650 m depth on muddy shell sediment (Fig. 8).

Remarks. This is the first record for *G. haematonotus* in the SSE of the Gulf of Mexico. This species was few abundant. We collected only 4 individuals; 3 ovigerous females were found during spring at 626 m depth.

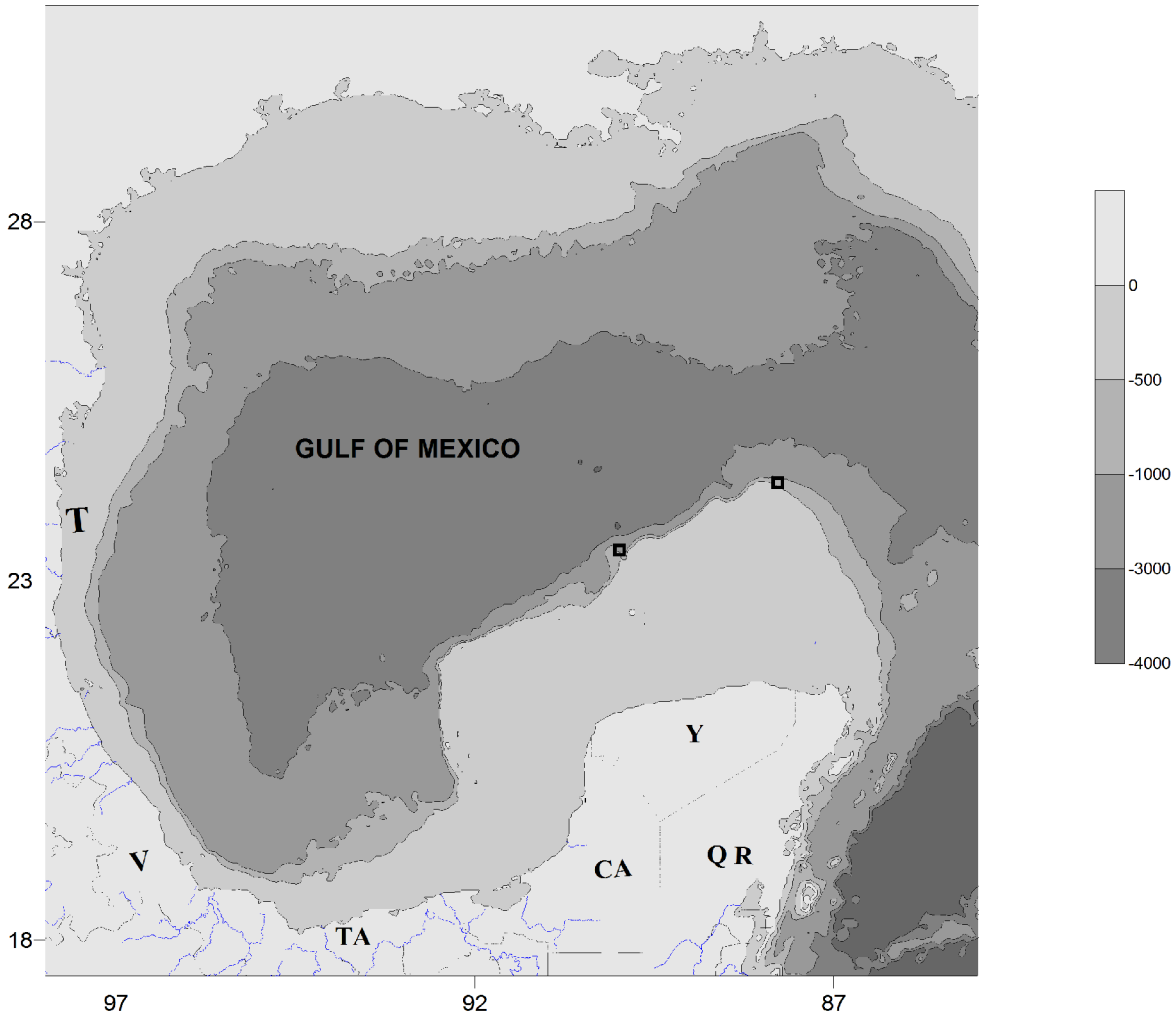

FIGURE 8. Map of distribution of *G. haematonotus* in the southern Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo.

***Glyphocrangon longleyi* Schmitt, 1931**
(Figs. 9, 10)

Glyphocrangon longleyi Schmitt, 1931: 393.—Bullis 1956: 10.—Felder *et al*. 2009: 1061.

Material examined. BATO stn 6, ♂ 4, ♀ 1, ovigerous ♀ 1; stn10, ♂ 2, ♀ 3, ovigerous ♀ 1; stn 15, ♀ 1; stn 34, ♂ 1; stn 35, ♂ 1, ♀ 3; stn 48, ♂ 1, ♀ 1; stn 49, ♀ 1; stn 53, ♂ 7, ♀ 6, ovigerous ♀ 4, stn 54, ♀ 1; stn 65, ♂ 8, ♀ 1, ovigerous ♀ 1. **BIOREPES1** stn 47, ♂ 5, ♀ 4, ovigerous ♀ 3. **BIOREPES2** stn 10, ♀ 2; stn 11, ♀ 2; stn 12, ♂ 1; stn 15, ♀ 1; stn 23, ♂ 2; stn 24, ♂ 3, ♀ 5, ovigerous ♀ 1; stn 25, ♂ 1, ♀ 5; stn 32, ♀ 2, ovigerous ♀ 3; stn 32b, ♂ 1, ♀ 1, ovigerous ♀ 1; stn 37, ♂ 1, ♀ 1; stn 38, ♂ 9, ♀ 10, ovigerous ♀ 2. **BIOREPES3** stn A2, ♀ 1, ovigerous ♀ 3; stn A11, ♀ 10, ovigerous ♀ 7, stn A12, ♂ 4, ♀ 1; stn A24, ♀ 1; stn A25, ♂ 1, ♀ 5, ovigerous ♀ 5; stn B1, ♂ 5, ♀ 8, ovigerous ♀ 1; stn B2, ♀ 1, ovigerous ♀ 3; stn B4, ♂ 3, ♀ 2, ovigerous ♀ 1; stn B5, ♂ 1, ♀ 1, ovigerous ♀ 1; stn B6, ovigerous ♀ 2; stn C1, ♂, ♀ 5, ♀ 6, ovigerous ♀ 5; stn C5, ♀ 1; stn C6, ♂ 9, ovigerous ♀ 13; stn C7, ♂ 1, ♀ 1; stn D1, ♀ 5, ovigerous ♀ 6. **COBERPES** stn A2, ♂ 49, ♀ 79, ovigerous ♀ 39 (measured 10 individuals of each sex); stn A3, ♂ 23, ♀ 22, ovigerous ♀ 6; stn A11, ♂ 6, ♀ 1; stn B2, ♂ 14, ♀ 38, ovigerous ♀ 7; stn B3, ♂ 6, ♀ 8, ovigerous ♀ 2; stn B13, ♂ 5, ♀ 2; stn Ω2, ovigerous ♀ 5; stn Ω3, ♂ 24; stn Ω6, ♂ 1, ovigerous ♀ 2. **COBERPES 2011** stn B3, ♂ 1, ♀ 1, ovigerous ♀ 1; stn B4, ♂ 2, ♀ 1, ovigerous ♀ 2; stn C3, ♀ 2, ovigerous ♀ 1; stn D5, ♀ 1; stn D10, ♂ 3, ovigerous ♀ 1; stn D11, ♂ 4.

Overall Geographic and Bathymetric Distribution. East of Florida; Gulf of Mexico (NW, NE, SW, SE); Caribbean Sea; from 300 to 867 m depth (Felder *et al.* 2009).

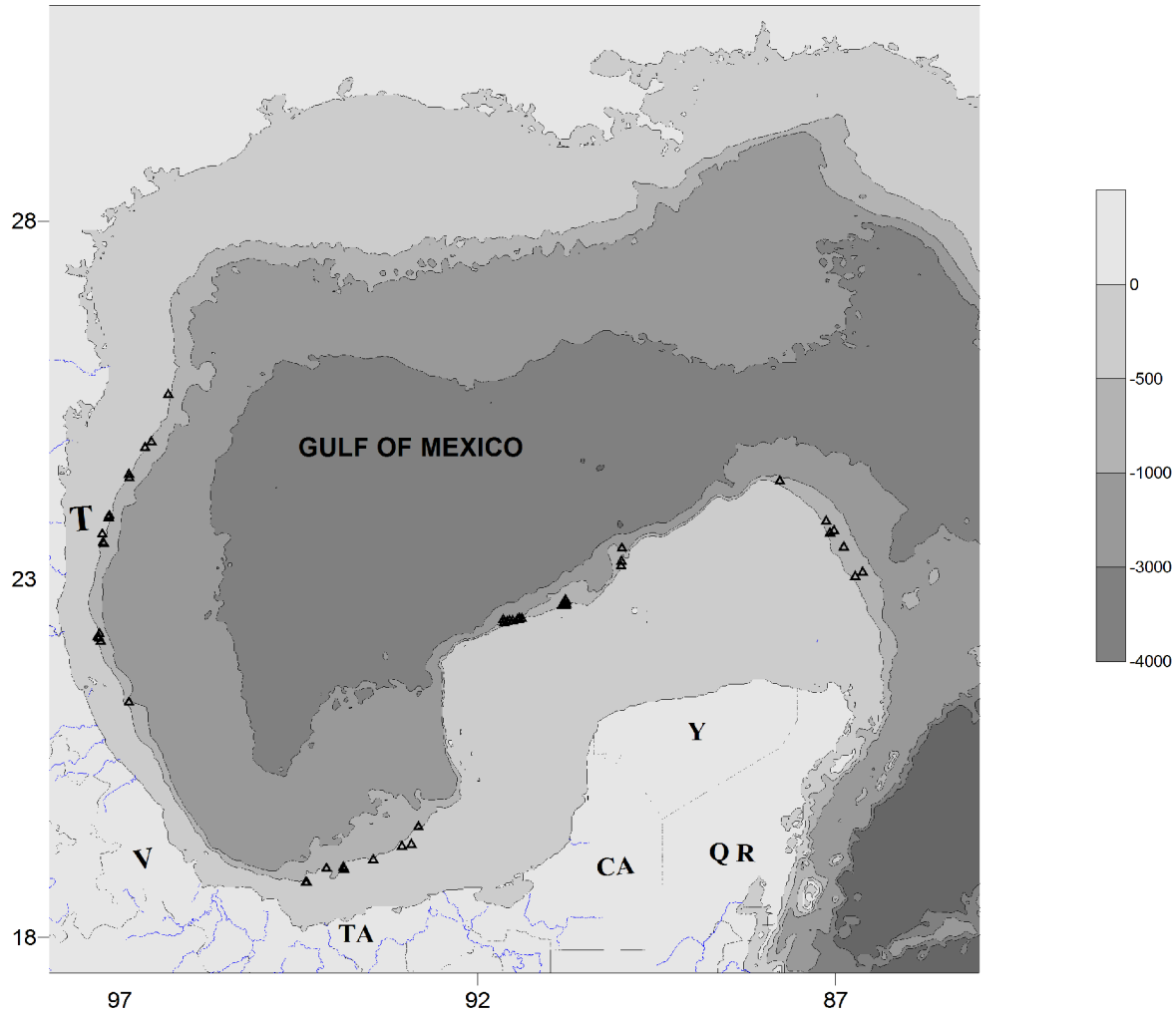

FIGURE 9. Map of distribution of *G. longleyi* in the southern Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo.

Distribution in Southwestern and Southeastern Gulf of Mexico. *G. longleyi* was collected in: Tamaulipas, off Bravo, San Fernando and Soto La Marina rivers, and off Laguna Madre (WSW); in Veracruz, off the Pánuco and Coatzacoalcos rivers; in Tabasco, in front of Grijalva-Usumacinta rivers (SSW); in Yucatán, off the area of Alacranes reef, and Laguna Rosada; and in Quintana Roo, off Ría Lagartos (SSE); from 671.9 to 1144.0 m depth on clay and shell sediment (Fig. 9).

Remarks. *G. longleyi* was the most abundant species of the Glyphocrangonidae with a total of 602 individuals. The maximum abundance occurred during the summer in the area off Coatzacoalcos and Tonalá rivers, and Veracruz between 359.0 and 443.8 m depth. There was a high ratio of females to males (1.81:1), and the ovigerous females represented 33.5% of the total f number. The male size range was 12.7–27.8 mm CL (mean 21.0±3.068 SD). They exhibited a wide range depth distribution from 293.4 to 711.8 m. Nevertheless, more than 50% of males were found between 506–577 m depth. There were no significant differences of male size among depth strata (F= 1.686, p > 0.1405). Female size range recorded was 12.4 –34.7 mm CL (mean 23.2 ± 4.30 SD). Females were collected in a wide depth range 359.0–711.8 m. ANOVA test revealed that there was a significant difference in the female mean size between depth intervals 400–499 and 600–699 m (F = 2.4989, p < 0.0440). The ovigerous female size ranged from 30.6– 34.0 mm CL (mean 27.2 ± 2.74 SD) at a depth between 359.0 to 711.8 m. ANOVA results showed differences among the shallow and deeper strata (F= 6.9175, p < 0.00006) (Fig. 10a, b, c). Ovigerous females occurred during spring, summer and autumn and were found in a narrower depth range (800 to 1200 m), compared to the non-ovigerous female's distribution range that was from 400 to 1200 m depth.

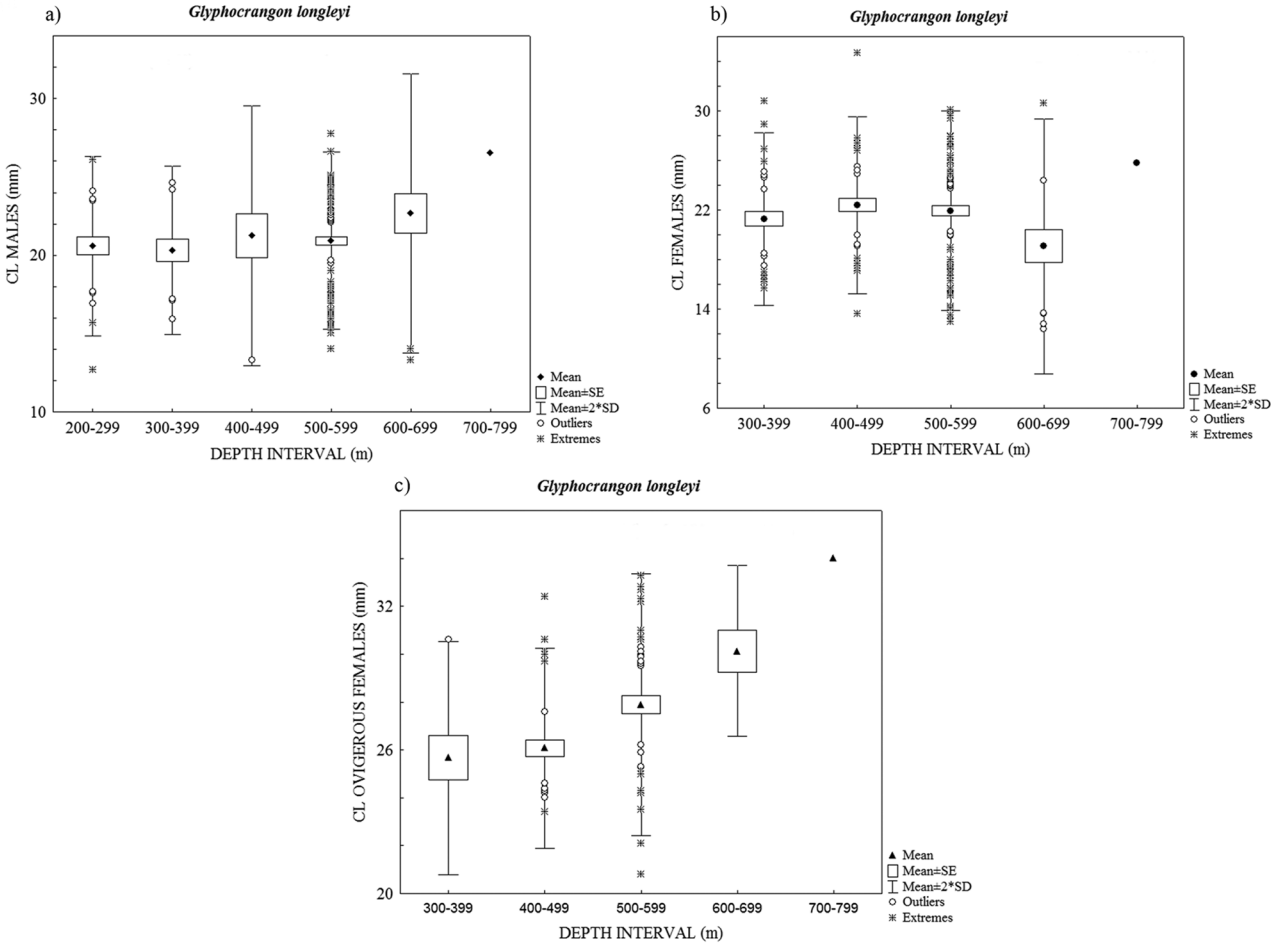

FIGURE 10. Size distribution by sex and depth interval of *G. longleyi* a) males; b) females; c) ovigerous females.

***Glyphocrangon spinicauda* A. Milne-Edwards, 1881**
(Figs. 11, 12)

Glyphocrangon spinicauda A. Milne Edwards, 1881: 3 (type locality: off St. Christopher, West Indies, 17°19.27'S, 62°50.30'W, 450 m).—Pequegnat 1970: 110.—Holthuis 1971: 295, figs 6, 7.—Coelho & Ramos 1972: 157.—Ramos-Porto & Coelho 1998: 342.—Ramos-Porto & Silva 2004: 40.—Forest & Holthuis 1997: 56, pl. 40, fig. 1, 1a.—Komai 2004a: 40, fig. 4C, D.—Felder *et al*. 2009: 1061.

Material examined. BIOREPES2 stn 10, ♂ 1; stn 11, ♀ 5, ovigerous ♀ 4. **COBERPES 2011** stn E4, ♂ 2, ovigerous ♀ 6; stn E7, ♀ 1, ovigerous ♀ 64.

Overall Geographic and Bathymetric Distribution. Recorded in the East and South Florida; Gulf of Mexico (NW, NE, SW); Caribbean Sea; Brazil; from 256 to 692 m depth (Felder et *al*. 2009).

Distribution in the Southwestern and Southeastern Gulf of Mexico. In Mexican deep-waters, this species was found on muddy bottom on the west of Cabo Catoche and Celestún, Yucatán (SSW), at a depth range of 422.0 to 536.0 m (Fig. 11).

Remarks. *G. spinicauda* was not a frequent species found in the trawls. We collected this species in only two cruises. The total abundance was 83 individuals. The maximum number of individuals was collected in front of Cabo Catoche at 423.9 m depth, during the spring of 2011. The ovigerous females represented 92.2% of the total females, and varied in size from 19.0 to 25.7 mm CL (mean 1.06154 ± 0.24 SD). ANOVA test showed a significant difference in size distribution between 400–499 and 500–599 m depth strata ($F = 14.0075$, $p < 0.0004$) (Fig.12).

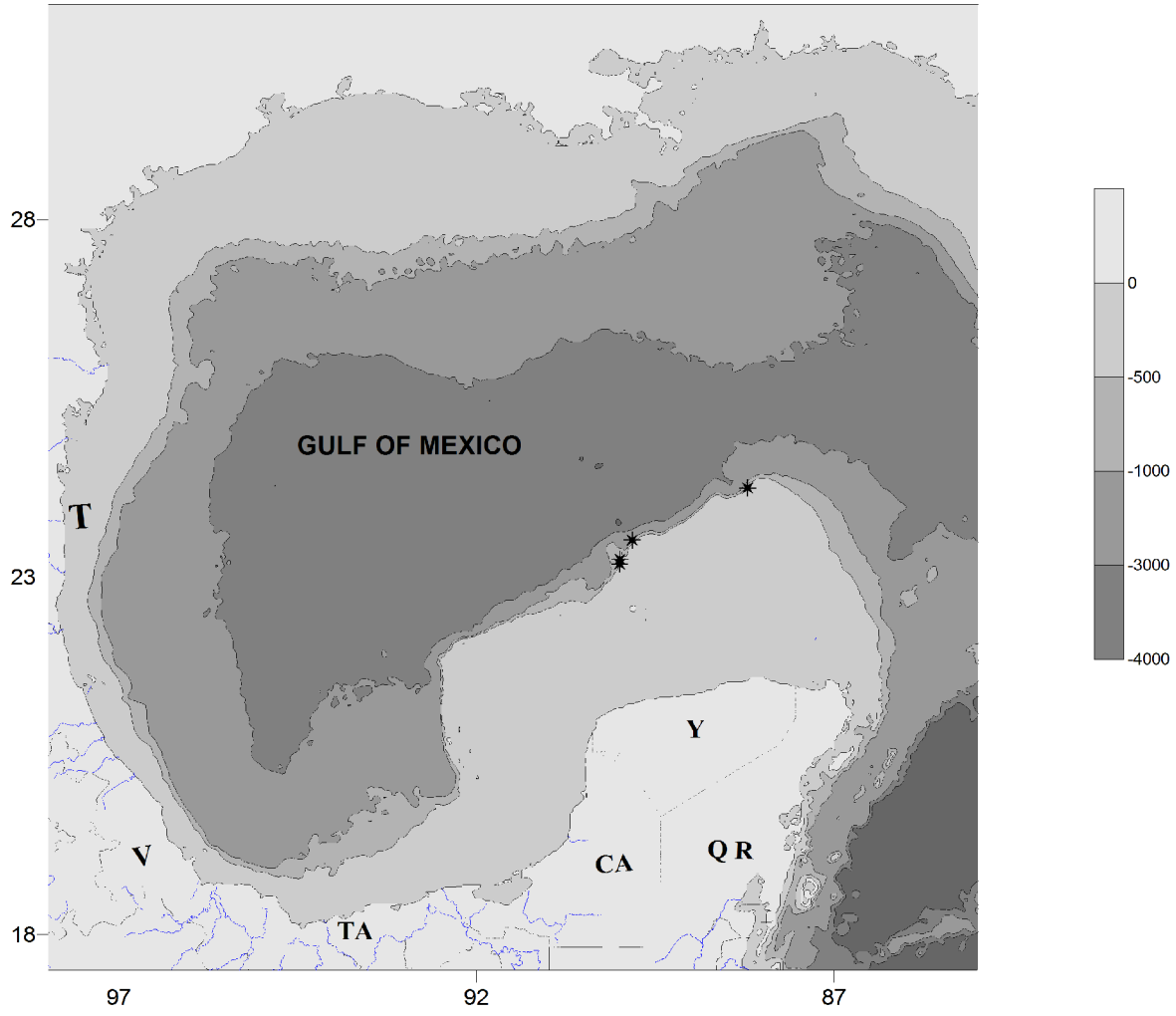

FIGURE 11. Map of distribution of *G. spinicauda* in the southern Gulf of Mexico. Abbreviations: T= Tamaulipas, V= Veracruz, TA= Tabasco, CA= Campeche, Y= Yucatán, QR= Quintana Roo.

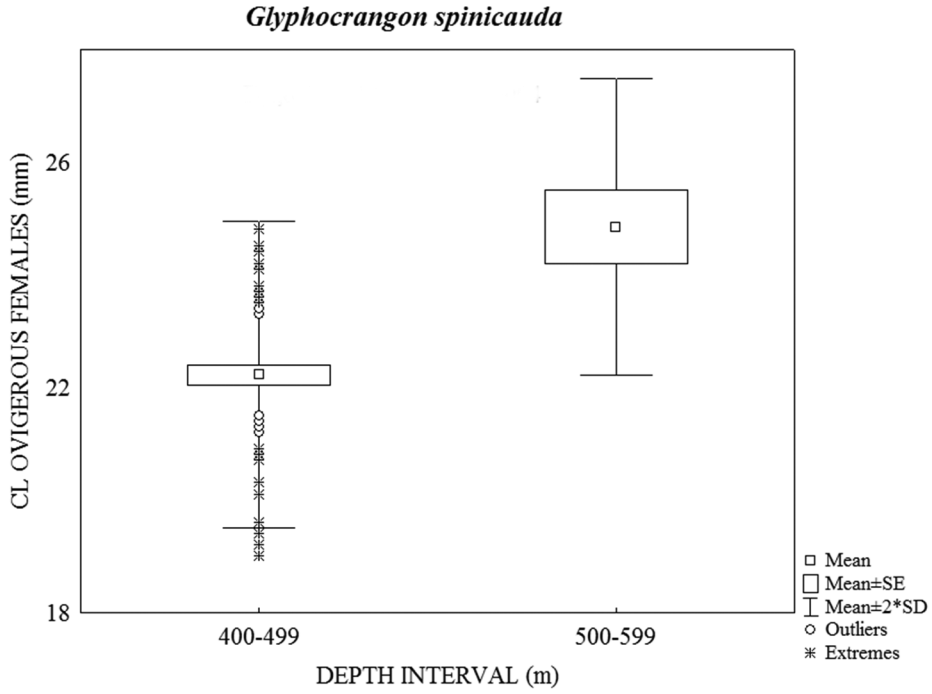

FIGURE 12. Size distribution by sex and depth interval of ovigerous females of *G. spinicauda*.

Discussion

The material collected in the southern part of the Gulf of Mexico revealed that *Glyphocrangon*, was one of the most common and abundant component during the benthic trawls particularly in the areas off rivers and lagoons. We collected it at 61.8% of the total trawls. We found five of seven species of Glyphocrangonidae reported for the Gulf of Mexico: *G. aculeata*, *G. alispina*, *G. haematonotus*, G. *longleyi*, and *G. spinicauda*,

G. haematonotus and *G. spinicauda* are reported for the first time in the SSE sector. Also we extend the bathymetrical distribution of *G. aculeata* to shallow depths, as it was previously registered between 707–1760 m depth in the sectors defined for the Gulf of Mexico (Felder *et al.* 2009). In this study we collected this species at depth range between 443.8 to 1144 m.

The Crangonidae was less abundant and frequent. In the Gulf of Mexico 7 genera and 9 species have been registered, but we only found one genus and two species: *Parapontocaris caribbaea* and *P. vicina*. The first one was registered for the first time in the WSW, SSW and SSE sectors. The size and depth ranges in both species of *Parapontocaris* were different. In *P. caribbaea* the size range was from 13.5 to 18.5 mm, in a depth interval of 299–428 m, whereas in *P. vicina* the size range was 16.0 to 22.8 mm, at 325 to 513 meters depth. As Dardaeu & Heard (1983) pointed out, ovigerous females in this last species were much larger (19.7–22.8) than in *P. caribbaea* (16.6–18.5 mm). We observed that both species were present in the sectors SSW and WSW, but *P. vicina* was absent in the trawls of the sector SSE.

All the glyphocrangonid species were distributed along the entire south Gulf of Mexico, but G. *longleyi*, *G. aculeata* and *G. alispina* were more abundant and frequent throughout all cruises, although its abundance varied geographically. On the other hand, *G. longleyi* and *G. aculeata* presented its highest density mainly in the Campeche Bay and Campeche Bank. Meanwhile, *G. alispina* showed its highest abundance spots in the continental slope of Tamaulipas.

Species depth distribution pattern did not show any marked seasonal differences. All species were found in a wide bathymetric range in all the cruises corresponding to different seasons. Nonetheless, we observed an apparent differential depth and size species distribution pattern, as highest catches of *G. longleyi* for males and females were more frequent in the 500–599 m stratum, and in the 400–499 m stratum for ovigerous females. Size structure by

sex in this depth showed ample variability as males presented the major abundance at a mean CL size of 21.06 mm, females 21.72 mm and ovigerous females at 27.22 mm. Only the non-ovigerous and ovigerous females showed statistically differences among the bathymetrical strata: non-ovigerous females among the strata 400–499 and 500–599, 600–699 and 700–799 m; while the ovigerous females showed statistically differences among 300–399 m and 700–799 m strata. *G. aculeata* mean size depth distribution by strata was small compared with *G. longleyi* (males 18.67 mm, females 20.53 mm and ovigerous 25.32 mm CL). In this study the highest abundance was observed at 900–999 m stratum for females, and ovigerous females.

G. alispina presented the smallest mean size (males 14.67 mm, females 15.25 mm and ovigerous 14.67 mm CL). Highest abundances were registered for ovigerous females at 600–699 m stratum, whereas the non-ovigerous were recorded at 700–799 m stratum, but we do not found statistical differences among strata.

All of the species of *Glyphocrangon* collected in the slope of the Gulf of Mexico were mostly represented by females (73.9%), of which ovigerous females accounted the 34.35%. It must be noted that we found ovigerous females of the five species of *Glyphocrangon* in all cruises. Although percentage differences were relatively small among cruises, we registered higher ovigerous percentage during summer (spring 32.2%, summer 42.4%, and autumn 26.4 %). As a matter of fact the only species that presented the maximum ovigerous females in autumn was *G. longleyi*.

The occurrence of high percentages of ovigerous glyphocrangonid female shrimps suggests that reproduction may occur along the year peaking in summer. It must also be remarked that non ovigerous and ovigerous females of the three more abundant glyphocrangonid species showed larger sizes than males. A depth size segregation pattern was apparent. Females and ovigerous females in *G. aculeata*, were most abundant at depth interval 900–999 m (CL 20–22 mm in both); whereas in *G. alispina* maximum abundance was found at 600–699 m depth interval (CL, 14.5–16.5 mm). However, these differences were only significant for non-ovigerous and ovigerous females of *G. longleyi* (females at 500–599 m, CL 21–23 mm; ovigerous females at 400–499 m, CL 24–26 mm). We collected a great number of ovigerous females of *G. spinicauda*, most of them had a size range between 22–24 mm CL, and the major sizes were found at 500–599 m depth stratum.

Although we have carried out an extensive study in the Gulf of Mexico with more than 180 hauls, the knowledge of the deep-water decapods crustaceans in the southern part of the Gulf of Mexico is still far from complete. We expect that further and deeper investigations may eventually reveal the existence of more species off the Mexican coast.

Key to the Gulf of Mexico species of Crangonidae

1.	Second pereiopod chelate	2
-	Second pereiopod simple	7
2.	Six or 7 gills in each gill chamber, each with ventral apex directed posteriorly	3
-	Eight gills in each gill chamber, each with ventral apex directed anteriorly	6
3.	Rostrum without lateral teeth in posterior half; carapace without longitudinal suture extending from orbital margin to branchial region; with single spine behind rostrum; merus of 1st pereiopod with strong spine on flexor margin	*Philocheras gorei*
-	Rostrum armed with 1 or 2 pairs of lateral teeth in posterior half	4
4.	Carapace with one middorsal tooth posterior to the level of midlength, 2 teeth on the lateral face	*Parapontophilus...* 5
-	Carapace with two middorsal tooth, more than 3 or 4 teeth on lateral face (including a hepatic tooth and 2 or 3 epibranchial), small spine above orbital cleft	*Pontophilus brevirostris*
5.	1 rudimentary anterior epigastric tooth on the carapace; cornea well pigmented and faceted	*Parapontophilus gracilis*
-	1 anterior epigastric tooth; cornea opaque and no faceted	*Parapontophilus talismani*
6.	Rostrum simple, not cleft apically, with 2 pairs of lateral teeth; carapace with 4 or 5 teeth on 1st lateral carina; abdominal sterna unarmed	*Parapontocaris...*7
-	Rostrum short, spiniform or with distinct lateral teeth (1 to three pairs)	8
7.	Dorsal midline of carapace with four distinct spines	*Parapontocaris caribbaea*
-	Dorsal midline of carapace with five distinct spines	*Parapontocaris vicina*
8.	Second pereiopod reduced in size failing to reach end of merus of first pereopods	9
-	Second pereiopod strong, overreaching merus of preceding pair; eye without cornea; interlocking mechanism between telson and uropods; telson truncated armed with 2 pairs of long spines	*Prionocrangon pectinata*
9.	Carapace with three pairs of strongly denticulate carinae; orbit with cleft; abdomen with median or submedian carinae on the1st to 6th somites	*Sabinea hyxtrix*
-	Carapace without denticulate lateral carinae on the carapace, three teeth on dorsal midline; orbit smooth; abdomen dorsally rounded	*Lissosabinea tridentata*

Key to the Western Atlantic and Gulf of Mexico species of *Glyphocrangon* (after Holthuis 1971)

1. Anterior lateral carina of carapace with 2 distinct teeth behind the branchiostegal spine 2
- Anterior lateral carina of carapace with one tooth or without teeth behind branchiostegal spine 8
2. Pleuron of fifth abdominal somite ending in 3 distinct teeth . . . . . *G. sculpta*
- Pleuron of fifth abdominal somite ending in 2 distinct teeth 3
3. Rostrum with 3 lateral teeth on each side; dactylus of fifth pereiopod, at least in females, broad and bifid . . . . . *G. rimapes*
- Rostrum with 2 lateral teeth on each side; dactylus of fifth pereiopod oval, not bifid 4
4. Anterior antennal carina formed of row of tubercles; first abdominal somite with transverse rows of tubercles between intermediate carinae. 5
- Anterior antennal carina absent; first abdominal somite usually with only single transverse row of tubercles, viz., along posterior margin. 6
5. Eyes with -cornea white; body naked or with very inconspicuous pubescence; margins of rostrum and basal part of carinae on telson serrated or crenulated; posterior antennal carina distinctly serrated, between it and posterior lateral carina many tubercles; basal part of outer margin of scaphocerite without fringe of setae. . . . . *G. atlantica*
- Eyes with cornea pigmented; body with short, but dense pubescence; margins of the rostrum (apart from 2 pairs of rostral teeth) not serrated; posterior antennal carinae (apart from 2 blunt posterior teeth) straight, not serrated; between it and posterior lateral carina surface of carapace smooth; outer margin of scaphocerite ciliated for its entire length . . . . . *G. spinicauda**
6. Posterior antennal carina usually rounded anteriorly, not ending in spine; antennal spine directed strongly outward, far more strongly diverging than branchiostegal spine . . . . . *G. aurantiaca*
- Posterior antennal carina usually ending anteriorly in spine or sharp angle; antennal spine not more strongly diverging than branchiostegal spine 7
7. Anterior intermediate carina not ending in spine; posterior antennal and posterior lateral carinae bearing several blunt tubercles or teeth; anterior of 2 teeth on anterior lateral carina behind pterygostomian spine reaching to or beyond orbital margin . . . . . *G. longleyi**
- Anterior intermediate carina ending in sharp spine; posterior antennal and posterior lateral carinae straight, without tubercles or teeth; anterior tooth of anterior lateral carina not reaching level of posterior margin of orbit . . . . . *G. haematonotus**
8. Anterior antennal carina strong, forming with antennal spine single sharply pointed winglike expansion; anterior lateral carina ending in branchiostegal spine . . . . . *G. neglecta*
- Anterior antennal carina absent or at most indicated by few small tubercles; antennal spine isolated on anterior margin of carapace, not winglike expanded posteriorly; lateral ridge ending between antennal and branchiostegal spines. 9
9. Posterior antennal carina ending anteriorly in large winglike expanded spine; tooth at anterior end of anterior lateral carina large and winglike, much wider than antennal spine . . . . . *G. aculeata**
- Posterior antennal carina anteriorly blunt or ending in small spinule, which not at all winglike; tooth at anterior end of anterior lateral carina, although distinct, much shorter and less wide than antennal spine 10
10. Upper surface of rostrum corrugated at either side of median carina . . . . . *G. longirostris**
- Upper surface of rostrum at either side of median carina smooth 11
11. Antennal spine hardly more divergent than branchiostegal spine; posterior antennal carina ending anteriorly in low right angle . . . . . *G. nobilis*
- Antennal spine usually far more strongly diverging than branchiostegal spine; Posterior antennal carina ending in distinct spine . . . . . G. *alispina**

* Species recorded for the SSW and SSE Gulf of Mexico

Acknowledgments

We thank the crew of R/V *Justo Sierra*, as well as scientific staff of the different cruises for their collaboration and support. To Dr. Elva Escobar, for facilitating the material of glyphocrangonids from the SIGSBEE expeditions. We are very grateful to M. en C. Magaly Galván Palmerín for her assistant in the data registered and to Lic. Com. Adolfo Gracia Vázquez for his support in preparing illustrations. We thank comments of Dr. Jung Nyum Kim and one anonymous reviewer that clearly enhanced the manuscript content. We also thank the Dirección General de Asuntos del Personal Académico de la Universidad Nacional Autónoma de México for supporting the research project Biodiversidad y recursos pesqueros potenciales del mar profundo del Golfo de México PAPIIT IN223109-3.

References

Bate, C.S. (1888) Report on the Crustacea Macrura collected by H. M. S. *Challenger* during the years 1873–76. *Report on the Scientific Results of the Voyage Challenger, Zoology*, 24, i–xc, 1–942.

Boone, L. (1927) Crustacea from tropical east American seas. Scientific results of the first oceanographic expedition of the *Pawnee. Bulletin of the Bingham Oceanographic Collection*, 1, 1–147.

Boschi, E.E. (1973) Aportes al conocimiento de tres especies de camarones de aguas profundas del Atlántico sur (Crustacea, Caridea). *Physis*, Section A, Buenos Aires, 32, 85, 233–244.

Bullis, H.R. (1956) Preliminary results of deep-water exploration for shrimp in the Gulf of Mexico by the M/V *Oregon* (1950–1956). *Commercial Fisheries Review*, 18, 12, 1–12.

Bullis, H. R. & Thompson, J.R. (1965) Collections by the exploratory fishing vessels *Oregon*, *SilverBay*, *Combat* and *Pelican* made during 1956 to 1960 in the southwestern North Atlantic. *U.S. Fish & Wildlife Service, Special Scientific Report*, 510, 1–130.

Campos, N.H., Navas, G.R., Bermúdez, A. & Cruz, N. (2005) Los crustáceos decápodos de la franja superior del talud continental (300–500 m) del mar Caribe colombiano. (*Monografía 2 de la Fauna de Colombia). Bogotá: Instituto Nacional de Ciencias Naturales.* Universidad Nacional de Colombia, 272 pp.

Cardoso, I.A. (2009) First record of *Parapontophilus longirostris* Komai, 2008 (Caridea, Crangonidae) on Brazilian waters. *Nauplius* 17, 1, 29–35.

Cardoso, I.A. & Serejo, C.S. (2007) Deep sea Caridea (Crustacea, Decapoda) from Campos Basin, RJ, Brazil. *Brazilian Journal of Oceanography*, 55, 39–50.
http://dx.doi.org/10.1590/S1679-87592007000100005

Chace, F.A., Jr. (1939) Preliminary descriptions of one new genus and seventeen new species of decapod and stomatopod Crustacea. Reports on the scientific results of the first *Atlantis* Expedition to the West Indies, under the joint auspices of the University of Havana and Harvard University. *Memorias de la Sociedad Cubana de Historia Natural*, 13, 31–54.

Chace, F.A., Jr. (1956) Collections by the *Oregon* in the Gulf of Mexico. *In*: Springer, S. & Bullis, H. (Eds). *United States Bureau of Commerce Fisheries, Special Science Report Fisheries* 196, 5–23.

Chace, F.A., Jr. (1984) The caridean shrimps (Crustacea: Decapoda) of the *Albatross Philippine* Expedition, 1907–1910, part 2: families Glyphocrangonidae and Crangonidae. *Smithsonian Contributions to Zoology*, 397, 1–63.

Christoffersen, M.L. (1988) Genealogy and phylogenetic classification of the world Crangonidae (Crustacea, Caridea), with a new species and new records for the south western Atlantic. *Revista Nordestina de Biologia*, 6, 1, 43–59.

Coelho, P.A. & Ramos, M.A. (1972) A constituição e a distribuição da fauna de decápodos do litoral leste da América do Sul entre as latitude de 50°N e 39°S. *Trabalhos Oceanográficos da Universidade Federal de Pernambuco, Recife*, 13, 133–236.

Cruz, N., Bermudéz, A.N., Hernando, C. & Navas, G. (2002) Los camarones de la familia Crangonidae de la franja superior del talud continental del mar Caribe Colombiano. *Boletín de Investigaciones Marinas Costeras*, 31, 83–203.

Dardeau, M.R. (1980) A new species of *Pontophilus* (Crustacea: Natantia: Crangonidae) from the Gulf of Mexico and the Western Atlantic. *Proceedings of the Biological Society of Washington*, 93, 3, 563–572.

Dardeau, M.R. & Heard, R.W.J. (1983) Crangonid shrimps (Crustacea: Caridea), with a description of a new species of *Pontocaris*. *Memoirs of the Hourglass Cruises*, 6, 1–39.

De Grave, S. & Fransen, C.H.J.M. (2011) Carideorum Catalogus: The Recent Species of the Dendrobranchiate, Stenopodidean, Procaridideanand Caridean Shrimps (Crustacea: Decapoda). *Zoologische Mededelingen*, Leiden, 89, 195–589.

Escobar-Briones, E., Gaytán, A. & Legendre, P. (2008) Epibenthic megacrustaceans from the continental margin, slope and abyssal plain of the southwestern Gulf of Mexico: Factors responsible for variability in species composition and diversity. *Deep-Sea Research II*, 55, 2667–2678.
http://dx.doi.org/10.1016/j.dsr2.2008.07.016

Felder, D.L., Álvarez, F., Goy, J.W. & Lemaitre, R. (2009) Decapoda (Crustacea) of the Gulf of Mexico, with comments on the Amphionidacea. *In*: Felder, D.L. & Camp, D.K. (Eds). *Gulf of Mexico Origin, Waters, and Biota Volume 1, Biodiversity.* Texas A&M University Press, College Station, Texas, pp. 1019–1104.

Forest, J. & Holthuis, L.B. (1997) A. Milne-Edwards Recueil de figures de Crustacés nouveaux ou peu connus, 1883. *New facsimile edition with comments and annotations***.** Backhuys Publishers, Leiden, 128 pp.

Gaytán, A. (2005) Estructura Comunitaria de los megacrustáceos (Lophogastrida, Isopoda y Decapoda) del sur del Golfo de México. *Tesis Biología, Facultad de Ciencias*, UNAM, 121 pp.

Gore, R.H. (1985) Some rare species of abyssobenthic shrimp (families Crangonidae, Glyphocrangonidae and Nematocarcinidae) from the Venezuela Basin, Caribbean Sea (Decapoda, Caridea). *Crustaceana*, 48, 269–285.
http://dx.doi.org/10.1163/156854085X00981

Holthuis, L.B. (1971) The Atlantic shrimps of the deep-sea genus *Glyphocrangon* A. Milne Edwards, 1881. Biological results of the University of Miami deep-sea expeditions. 75. *Bulletin of Marine Science*, 21, 267–373.

Kensley, B., Tranter, H.A, & Griffin, D.J.G. (1987) Deep-water decapod Crustacea from eastern Australia (Penaeidea and Caridea). *Records of the Australian Museum*, 39, 263–33l.
http://dx.doi.org/10.3853/j.0067-1975.39.1987.171

Kim, J.N. & Hayashi, K.I. (2003) *Syncrangon*, a new crangonid genus with redescriptions of *S. angusticauda* (De Haan) and *S. dentate* (Balss) (Crustacea, Decapoda, Caridea) from East Asian waters. *Zoological Science*, 20, 669–682.
http://dx.doi.org/10.2108/zsj.20.669

Kim, J.N. & Hayashi, K.I. (2005) A revision of the genus *Prionocrangon* (Crustacea: Decapoda: Caridea: Crangonidae). *Journal of Natural History*, 39, 19, 1597–1625.
http://dx.doi.org/10.1080/00222930400016788

Komai, T. (2004a) Deep-sea shrimps of the genus *Glyphocrangon* A. Milne-Edwards (Crustacea, Decapoda, Caridea, Glyphocrangonidae) from off southeastern coast of Brazil collected during the *REVIZEE* Program. *Arquivos do Museu Nacional, Rio de Janeiro,* 62, 31–44.

Komai, T. (2004b) A review of the Indo-West Pacific species of the genus *Glyphocrangon* A. Milne Edwards, 1881 (excluding the *G. caeca* Wood-Mason, 1891 species group) (Crustacea: Decapoda: Caridea: Glyphocrangonidae). *In*: Marshall, B. & Richer de Forges, B. (Eds.), Tropical Deep Sea Benthos Vol. 23. *Memoires du Museum national d'Histoire naturelle*, Paris 191, 375–610.

Komai, T. (2006) Revision of the *Glyphocrangon caeca* species group (Crustacea, Decapoda, Glyphocrangonidae), *In*: Richer de Forges B. & Justine, J. (Eds.), Tropical deep-sea benthos, volume 24. *Mémoires du Muséum national d'Histoire Naturelle*, 193, 243–264.

Komai, T. (2007) A new species of *Glyphocrangon* (Crustacea, Decapoda, Caridea, Glyphocrangonidae) from the Austral Islands, French Polynesia. *Zoosystema*, 29, 565–573.

Komai, T. (2008a) A world-wide review of species of the deep-water crangonid genus *Parapontophilus* Christoffersen, 1988 (Crustacea: Decapoda: Caridea), with descriptions of ten new species. *Zoosystema*, 30, 261–332.

Komai, T. (2008b) A new species of *Philocheras* (Crustacea, Decapoda, Caridea, Crangonidae) from southwestern Australia. *Zoosystema* 30, 2, 387–398.

Komai, T. (2011) A new species of the deep-sea shrimp genus *Glyphocrangon* A. Milne-Edwards (Crustacea: Decapoda: Caridea: Glyphocrangonidae) from the southeastern Atlantic off southern Africa. *African Natural History,* 6, 83–90.

Milne Edwards, A. (1881) Description de quelques crustacés macroures provenant des grandes profondeurs de la Mer des Antilles. *Annales des Sciences Naturelles*, *6e série*, 11, 1–15.

Moreira, C. (1901) Crustaceos do Brazil. Contribuições para o conhecimento da fauna Brazileira. *Archos do Museu Nacional do Rio de Janeiro*, 11, 1–151, i–iv, pls 1–4.

Pequegnat, L.H. (1970) Deep-sea caridean shrimps with descriptions of six new species. *In*: Pequegnat, W.E. & Chace, F.A. (Eds.). *Contributions on the Biology of the Gulf of Mexico.* Texas A&M University Oceanographic Studies. Gulf Publishing, Houston, 1, 125–170.

Ramos-Porto, M. & Coelho, P.A. (1998) Malacostraca - Eucarida. Caridea (Alpheoidea excluded). *In*: Young, P.S. (Ed.) Catalogue of Crustacea of Brazil, Rio de Janeiro: *Museu Nacional, Série Livros, 6*, 325–350.

Ramos-Porto, M. & Silva, K.C.A. (2004) Camarões de profundidade coletados na costa norte do Brasil (Crustacea: Penaeidea e Caridea). Congreso Brasileiro de Zoologia, 22., Recife. *Resumos, Recife, Universidade Federal de Pernambuco*, 101 pp.

Schmitt, W.L. (1931) Some carcinological results of the deeper water trawlings of the Anton Dohrn, including description of two new species of Crustacea. *Year book, Carnegie Institution of Washington*, 30, 389–394.

Sokal, R.R. & Rohlf, F.J. (1995) *Biometry.* W.A. Freeman & Co, San Francisco, 776 pp.

Wicksten, M.K. & Packard, J.M. (2005) A qualitative zoogeographic analysis of decapod crustaceans of the continental slopes and abyssal plain of the Gulf of Mexico. *Deep-Sea Research I*, 52, 1745–1765. http://dx.doi.org/10.1016/j.dsr.2005.04.006