



DISTRIBUTION AND ABUNDANCE OF THE PELAGIC PROCESSID,
PROCESSA PIPPINAE WICKSTEN & MÉNDEZ, 1985 (DECAPODA,
CARIDEA, PROCESSIDAE), COLLECTED DURING THE TALUD XIV
CRUISE IN THE GULF OF CALIFORNIA, MEXICO, AND DESCRIPTION
OF A NEW GENUS

BY

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ABSTRACT

The pelagic processid, *Processa pippinae* Wicksten & Méndez, 1985, has been reported previously as an endemic species in the northern Gulf of California, Mexico. Additional material collected accidentally in a benthic sledge and with a mid-water micronecton net is reported, including a series of small-sized specimens (CL 2.2 mm). The shape of the laterally compressed rostrum of this species varies considerably with size and among adult specimens. Based on several morphological characteristics of *P. pippinae*, a new genus, *Maryprocessa*, is proposed. Several unique characteristics separate *Maryprocessa* new genus from the other five genera of Processidae, including the laterally compressed rostrum overreaching the cornea, unique among the Processidae, the extraordinary long antennal and antennular flagella, the posterior lobe on the dorsal margin of the third abdominal somite, and the long, acute pair of spines on the posterior margin of the sixth abdominal somite.

RÉSUMÉ

La crevette pélagique *Processa pippinae* Wicksten & Méndez, 1985 (Processidae), a été décrite pour le nord du golfe de Californie, Mexique, et est considérée endémique de cette zone. De nouveaux échantillons de cette espèce ont été obtenus de manière accidentelle dans le filet d'un traîneau benthique et à l'aide d'un filet à micronecton, y-compris des exemplaires de très petite taille (CL 2,2 mm). La forme du rostre, comprimé latéralement, varie suivant la taille mais aussi chez les adultes. Sur la base de caractères morphologiques de *P. pippinae*, un nouveau genre, *Maryprocessa*, est proposé. Plusieurs caractères uniques séparent *Maryprocessa* nouveau genre, des cinq autres genres de Processidae: le rostre comprimé latéralement et qui dépasse la cornée, les très longs flagelles des antennes et des antennules, la présence d'un fort lobe postérieur sur le bord dorsal du troisième somite abdominal et d'une paire de longues et aiguës épines postéro-latérales sur le sixième somite abdominal.

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INTRODUCTION

Processids are small to medium-sized shrimps mostly found in tropical and subtropical waters around the world. Most species live on sandy or rocky bottoms. The Processidae contain five genera with a total of 67 species and subspecies: *Ambidexter* Manning & Chace, 1971, three species; *Clytomanningus* Chace, 1997, two species; *Hayashidonus* Chace, 1997, one species; *Nikoides* Paulson, 1875, 10 species; and *Processa* Leach, 1815, 51 species and subspecies (De Grave & Fransen, 2011). In the eastern Pacific only four species of *Processa* have been reported: *Processa aequimana* (Paulson, 1875) (originally from the Indo-West Pacific), *P. hawaiiensis* (Dana, 1852) (originally from Hawaii), *P. peruviana* Wicksten, 1983, and *P. pippinae* Wicksten & Méndez, 1985 (cf. Wicksten & Hendrickx, 2003). *Processa peruviana* has been collected at many localities along the west coast of Mexico and it is considered the most commonly found processid in the Gulf of California (Hendrickx & Wicksten, 2011). *Processa pippinae*, first thought to be a benthic species as all other processids are, was later found abundantly in mid-water trawls in the northern Gulf of California and recognized as a typically pelagic species, endemic to the Cortés Province (Hendrickx & Estrada-Navarrete, 1989a; Hendrickx, 2005). Additional material of this endemic species was collected during the TALUD XIV cruise, and is reported here.

Comparative data related to genera and species of Processidae and terminology used in this contribution were taken from Manning & Chace (1971) and Chace (1997).

MATERIAL AND METHODS

The material was obtained while sampling with the R/V “El Puma” of the Universidad Nacional Autónoma de México in the northern part of the Gulf of California, roughly between 28°10' and 29°10'N. A total of 30 stations were visited, with depth ranging from 148 and 1346 m. Specimens were collected in a 2.35 m wide by 0.95 m high standard benthic sledge equipped with an outer collecting net of ca 5.5 cm (2 1/4") stretch mesh and an inner net of ca 2.0 cm (3/4") stretch mesh, and with a 0.8 m² mouth area mid-water micronecton net (1 mm mesh aperture). Sampling depth of the benthic sledge was estimated with a digital Simrad echo sounder. The mid-water structure was equipped with a Benthos 1500 m range depth and time recorder.

The specimens examined are deposited in the invertebrate collection at the Mazatlán Marine Station, UNAM, in Mazatlán, Mexico (EMU), with their respective catalogue number. Abbreviations used are: CL, carapace length; St., sampling stations; ovig., ovigerous females. Synonymy includes all references known to the author.

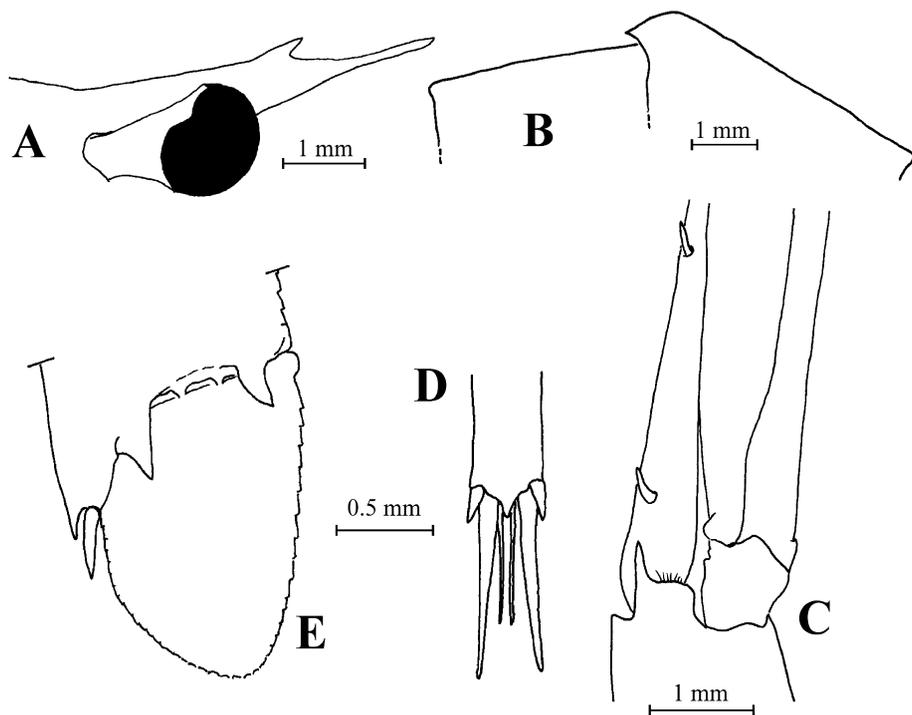


Fig. 1. *Maryprocessa pippinae* (Wicksten & Méndez, 1985) new comb. A, rostrum, lateral view (CL 2.2 mm); B, dorsal part of abdominal somites 3 and 4, lateral view; C, sixth abdominal somite, telson and uropods, lateral view; D, tip of telson, dorsal view; E, tip of uropodal exopod, dorsal view.

TAXONOMIC ACCOUNT

Maryprocessa new genus

Diagnosis. — Rostrum laterally compressed and lamelliform (figs. 1A, 4), long, tip acute, overreaching cornea, with 1-2 dorsal teeth. Antennal flagellum over 6 times as long as carapace; antennular flagella twice as long as carapace. Mandible about 0.5 as wide as minimal length (fig. 3A-C). Third maxilliped with exopod (fig. 3D). Pereopods without exopods. Pereopods of first pair asymmetric, right ending in a chela (fig. 2A), shorter than left, which ends in a single dactylus (fig. 2B). Second pereopods equal in length, merus subdivided into about 5 segments, carpus subdivided into 12-18 segments (fig. 2C). Third abdominal somite with a posterodorsal lobe ending in an acute projection (fig. 1B). Sixth abdominal somite with a pair of long, acute, posterolateral teeth, one on each side (fig. 1C). Telson with distinct, large dorsolateral spines (fig. 1C); tip acute, 2 pairs of terminal spines, inner pair very long, and a pair of long mesial setae (fig. 1D);

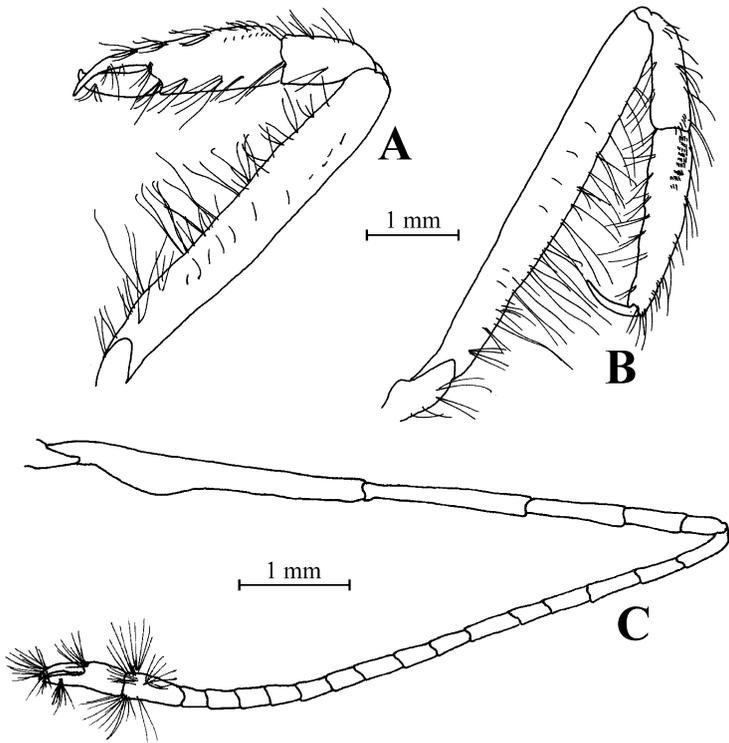


Fig. 2. *Maryprocessa pippinae* (Wicksten & Méndez, 1985) new comb. A, right first pereopod; B, left first pereopod; C, left second pereopod.

uropodal exopod 0.25 to 0.33 longer than endopod. Setae on appendages very long. Mouthparts as illustrated (fig. 3).

Type species. — *Processa pippinae* Wicksten & Méndez, 1985, by monotypy.

Etymology. — The genus is named after Mary K. Wicksten, in recognition of her long and significant work with decapod crustaceans and particularly with Caridea. It is an arbitrary combination of “Mary” and the genus name “*Processa*”. The gender is feminine.

Remarks. — Chace (1997) added two genera to the Processidae and presented a key to the five genera in this family. *Maryprocessa* new genus, is easily distinguished for all of these genera by the laterally compressed rostrum, unique among the Processidae and which clearly overreaches the cornea; by the extraordinary long antennal and antennular flagella; the posterior lobe on the dorsal margin of the third abdominal somite; the long, acute pair of teeth on the posterior margin of the sixth abdominal somite; the proportionally long uropodal exopod; and the presence of long or very long setae on appendages. *Maryprocessa* new genus features asymmetrical second pereopods (left simple, longer than right, which is chelate), while

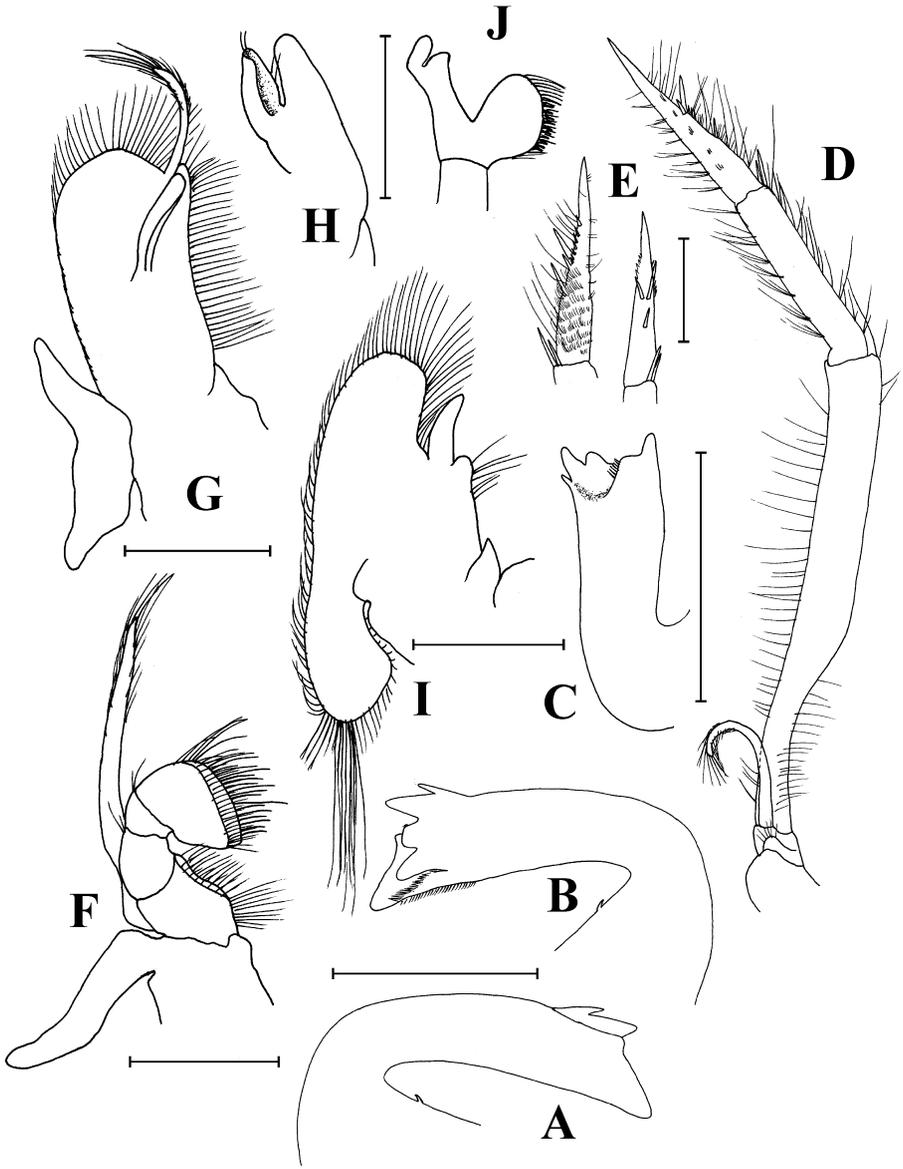


Fig. 3. *Maryprocessa pippinae* (Wicksten & Méndez, 1985) new comb. A, right mandible, ventral view; B, same, dorsal view; C, left mandible, ventral view; D, third maxilliped; E, same, details of ultimate segment; F, second maxilliped; G, first maxilliped; H, same, detail, mesial view; I, second maxilla; J, first maxilla. Scale bar: 1.0 mm.

Ambidexter has symmetrical, chelate first pereopods. The presence of a massive, wide mandibular molar process separates *Clytomanningus* from *Maryprocessa* new genus, in which the molar process is longer than wide. *Hayashidonus* features a telson devoid of dorsolateral spines or with minute spines, whilst *Maryprocessa*

new genus possesses distinct, strong spines. The anterior pereopods of *Nikoides* have an exopod, absent in *Maryprocessa*. Compared to *Processa*, the most speciose genus of the Processidae, the more obvious distinctive characters of *Maryprocessa* new genus are the shape of the rostrum, the length of the flagella, the presence of a dorsal abdominal lobe, and the sharp posterior teeth on the sixth somite. In addition, in *Maryprocessa* new genus the second pereopods are of equal length while in *Processa* these are usually of different length. The telson features an acute tip and 3 pairs of terminal spines, of which the two inner pairs are very long, the longest being about 2.4 the telson width measured at the base of the external spines. The uropodal exopod is considerably longer than the exopod (0.25 to 0.33 longer) and both uropodal rami are provided with very long setae.

As in all species of Processidae, the proximal segments of the outer antennular flagellum of *Maryprocessa pippinae* are much thicker than the distal segments, but these are few in other genera. In *Maryprocessa*, these thick annuli (ca. 35) are about 3 times as thick as the distal annuli, and the latter are much more numerous (ca. 50) compared to other species of Processidae. All pereopods bear long, simple setae. The scaphocerites, pleopods, and uropods (with a very long exopod) are also densely fringed with long setae. All these characters, together with the extremely long antennal flagellum and the soft consistence of the integuments, are obviously related to the pelagic habitat of *M. pippinae*.

The mouthparts of *Maryprocessa pippinae* new comb. were illustrated and described by Wicksten & Méndez (1985). New illustrations are provided herein (fig. 3), noting only a few minor differences with the original description, none of taxonomic value.

***Maryprocessa pippinae* (Wicksten & Méndez, 1985) new combination**
(figs. 1, 2, 3, 4)

Processa pippinae Wicksten & Méndez, 1985: 16, figs. 1-4. — Hendrickx & Estrada-Navarrete, 1989a: 109-112; 1989b: 117; 1996: 138, fig. 86. — Hendrickx, 2005: 169 (list).

Material examined. — TALUD XIV, R/V "El Puma". Benthic sledge. St. 14 (28°36'14"N 112°28'03"W), 1 male (CL 8.1 mm) and 1 ovigerous female (CL 8.9 mm), 8 April 2011, 305-316 m (EMU-9445). St. 20 (28°46'29"N 112°45'40"W), 2 males (CL 8.5, 8.6 mm) and 10 ovig. females (CL 7.9-8.5 mm), 9 April 2011, 410-414 m (EMU-9446A). St. 21 (29°00'53"N 112°51'31"W), 2 males (CL 8.2, 8.5 mm) and 3 females (CL 7.9-8.3 mm), 9 April 2011, 412-415 m (EMU-9449A). St. 22 (29°05'27"N 112°46'44"W), 3 males (CL 8.5-9.9 mm) and 6 females (CL 8.0-8.8 mm), 9 April 2011, 380-390 m (EMU-9447). St. 24 (29°08'06"N 112°58'42"W), 9 males (CL 8.2-9.2 mm), 1 female (CL 8.7 mm), and 3 ovig. females (CL 8.1-8.3 mm), 9 April 2011, 532-594 m (EMU-9446B). St. 26 (29°02'11"N 113°17'12"W), 3 males (CL 8.1-8.6 mm) and 1 female (CL 7.9 mm), 10 April 2011, 1150-1165 m (EMU-9449B). St. 27 (29°08'53"N 113°25'28"W), 2 males (CL 8.5 mm), 10 April 2011, 860-907 m (EMU-9449C). St. 29 (28°36'25"N 112°58'29"W), 1 male (CL 8.1 mm), 11 April 2011, 627-643 m (EMU-9449D). Micronection mid-water trawls. St. 28-1 (28°41'05"N 113°01'14"W), 78 specimens, including 3 ovig. females, surface to 805 m (total

depth 898 m) (EMU-9448B). St. 28-2 (28°40'03''N 113°01'06''W), 70 specimens, including 1 ovig. female, 10/April/2011, surface to 610 m (total depth 749 m) (EMU-9448A).

Distribution. — According to Hendrickx & Estrada-Navarrete (1996), *M. pippinae* new comb. is endemic to the Gulf of California where it is distributed in mid-water roughly between 28° and 30°11'N. The material of the TALUD XIV cruise was collected within this distribution range (fig. 5). Samples containing *M. pippinae* new comb., have been obtained from mid-water nets hauled from a minimum depth of 192 m (Hendrickx & Estrada-Navarrete, 1989a) and a maximum depth of 805 m (this study) to the surface. No further information is available on the bathymetric distribution of this species. Micronecton samples from the TALUD XIV cruise were collected at night.

Remarks. — The material on which the original description of *P. pippinae* is based consisted of one male, one female and one damaged ovigerous female (Wicksten & Méndez, 1985). These authors noted the peculiar shape of the rostrum (lamellar vs. straight in other processids), the presence of a pair of long, acute posterolateral teeth on the sixth abdominal somite (none in other processids), and the long first antennae (vs. short to moderately long in other processids), and the thin carapace (vs. well calcified in other processids). These peculiar characters, together with the presence of a posterior dorsal lobe on the third somite, are considered sufficient to reassign the species to a distinct genus.

The material collected in the micronecton net during the TALUD XIV cruise included very small specimens (minimum CL 2.2 mm). Examination of specimens ranging from 2.2 to 8.6 mm CL shows a wide variation in rostrum shape and length (fig. 4). In small organisms, the dorsal tooth may be present (fig. 4A) or not (fig. 4B). In the largest specimens, the dorsal tooth may be strong or weak and the distance to the tip varies (fig. 4C, D). The height of the rostrum is also quite variable, from narrowly (fig. 4G) to widely lamellar (fig. 4F). In a few specimens, two dorsal teeth are observed instead of one (fig. 4G), and the forepart of the rostrum, beyond the dorsal tooth, is either very acute (fig. 4F) or lamellar (fig. 4H).

In the micronecton samples, *Maryprocessa pippinae* new comb. was collected together with large quantities of another pelagic caridean, *Pasiphaea pacifica* Rathbun, 1902. The area where these samples were taken (Canal de Ballenas) is visited in winter and spring by a permanent resident population of the fin whale *Balaenoptera physalus* (Linnaeus, 1758) (cf. Gallo-Reynoso et al., 2005; Urbán, 2010). Samples were taken in April, thus corresponding to the period when these whales are visiting the area. According to Tershy et al. (1993), *B. physalus* feeds on invertebrates, primarily the euphausiid *Nyctiphanes simplex* Hansen, 1911, a species common and abundant throughout the Gulf of California and reaching a total length of ca. 16 mm (Sánchez-Osuna, 2010). Based on the material collected

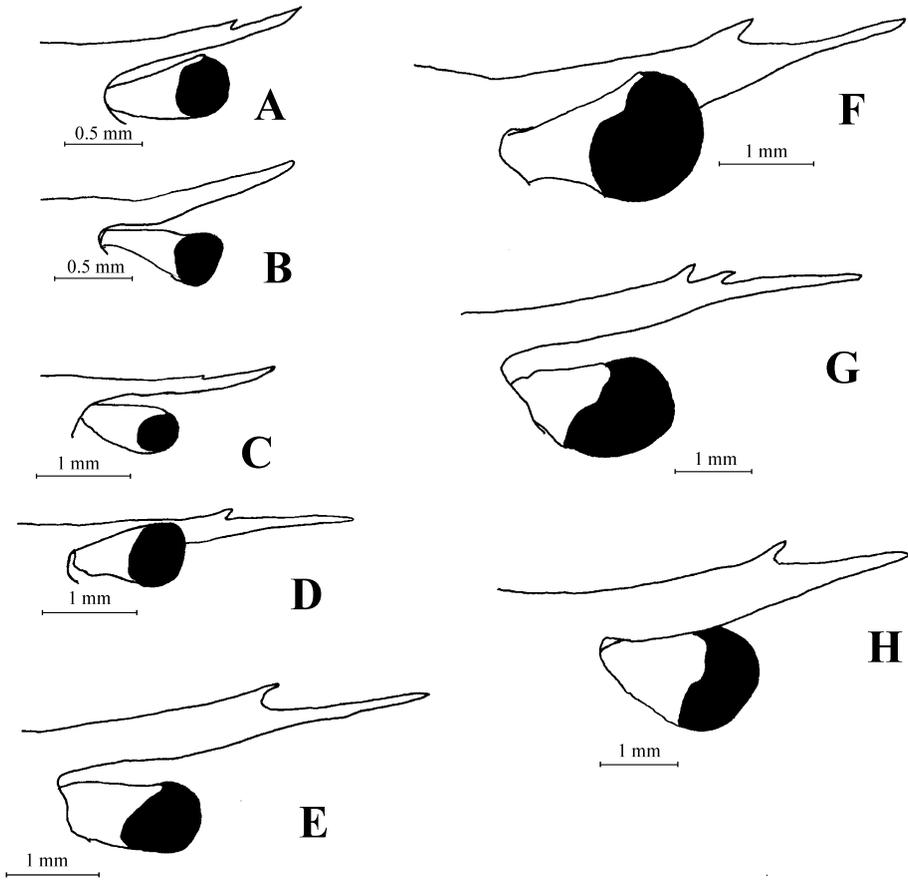


Fig. 4. *Maryprocessa pippinae* (Wicksten & Méndez, 1985) new comb. Lateral view of rostrum. A, CL 2.2 mm; B, CL 2.4 mm; C, CL 3.1 mm; D, CL 4.3 mm; E, CL 6.2 mm; F, CL 7.4 mm; G, CL 8.4 mm; H, CL 8.6 mm.

during the TALUD XIV cruise, juveniles of both *M. pippinae* and *P. pacifica* could also be part of the diet of this species of fin whale.

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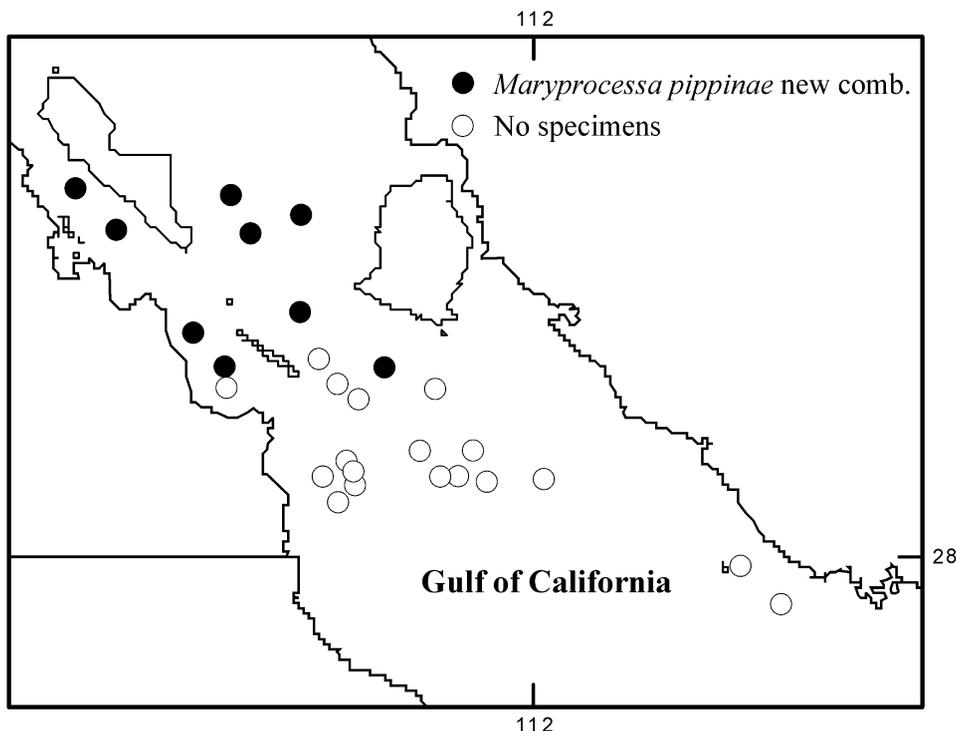


Fig. 5. Localities where specimens of *Maryprocessa pippinae* (Wicksten & Méndez, 1985) new comb. were collected during the TALUD XIV cruise in the Gulf of California, Mexico.

REFERENCES

- CHACE, F. C., JR., 1997. The caridean shrimps (Crustacea: Decapoda) of the Albatross Philippine Expedition, 1907-1910, Part 7: families Atyidae, Eugeonatonotidae, Rhynchocinetidae, Bathypalaemonellidae, Processidae, and Hippolytidae. *Smithson. Contrib. Zool.*, **587**: 1-106.
- DE GRAVE, S. & C. H. J. M. FRANSEN, 2011. Carideorum catalogus: the Recent species of the dendrobranchiate, stenopodidean, procarididean and caridean shrimps (Crustacea: Decapoda). *Zool. Meded., Leiden*, **85**(9): 195-589.
- GALLO-REYNOSO, J.-P., T. L. BEAN, E. PALOMINO, A.-L. FIGUEROA-CARRANZA & L. ORTIZ, 2005. *Mysticetes* on the midriff area of the Gulf of California during the summers of 1995, 1996 and 1997. In: V. SÁNCHEZ-CORDERO & R. A. MEDELLÍN (eds.), *Contribuciones mastozoológicas en homenaje a Bernardo Villa: 205-214*. (Instituto de Biología, UNAM and Instituto de Ecología, UNAM, CONABIO, Mexico).
- HENDRICKX, M. E., 2005. Cap. 14. Crustacea 6. Decapoda: Dendrobranchiata, Caridea, Palinura, Anomura & Brachyura. In: M. E. HENDRICKX, R. C. BRUSCA & L. T. FINDLEY (eds.), *A distributional checklist of the macrofauna of the Gulf of California, Mexico. Part I. Invertebrates: 159-194*. [Listado y distribución de la macrofauna del Golfo de California, México, Parte I. Invertebrados]. (Arizona-Sonora Desert Museum, Tucson, Arizona).
- HENDRICKX, M. E. & F. D. ESTRADA NAVARRETE, 1989a. *Processa pippinae* Wicksten and Méndez, 1985: a pelagic processid shrimp from the Gulf of California. *Rev. Biol. trop.*, **37**(1): 109-112.

- — & — —, 1989b. A checklist of the species of pelagic shrimps (Penaeoidea and Caridea) from the eastern Pacific with notes on their geographic and depth distribution. *CalCofi Rep.*, **30**: 104-121.
- — & — —, 1996. Los camarones pelágicos (Crustacea: Dendrobranchiata y Caridea) del Pacífico mexicano: 1-157. (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad e Instituto de Ciencias del Mar y Limnología, UNAM, Mexico).
- MANNING, R. B. & CHACE, F. A., JR., 1971. Shrimps of the family Processidae from the northwestern Atlantic Ocean (Crustacea: Decapoda: Caridea). *Smithson. Contrib. Zool.*, **89**: 1-41.
- SÁNCHEZ-OSUNA, L., 2010. Abundancia y distribución de los Euphausiacea (Crustacea) del Golfo de California y Pacífico mexicano (1977-1991): 1-206. (M.Sc. Thesis, Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, Mexico City).
- TERSHEY, B. R., A. ACEVEDO-G., D. BREESE & C. S. STRONG, 1993. Diet and feeding behavior of fin and Bryde's whales in the central Gulf of California, Mexico. *Rev. Inv. Cient.*, **1**: 31-37.
- URBÁN, R. J., 2010. Marine mammals of the Gulf of California. In: R. C. BRUSCA (ed.), *The Gulf of California. Biodiversity and conservation*: 188-209. (Arizona-Sonora Desert Museum Studies in Natural History, ASDM Press and University of Arizona Press, Tucson, Arizona).
- WICKSTEN, M. K. & M. E. HENDRICKX, 2003. An updated checklist of benthic marine and brackish water penaeoid and caridean shrimps (Decapoda: Penaeoidea, Stenopodidea, Caridea) from the eastern tropical Pacific. In: M. E. HENDRICKX (ed.), *Contributions to the study of East Pacific crustaceans [Contribuciones al estudio de los Crustáceos del Pacífico Este]*, **2**: 49-76. (Instituto de Ciencias del Mar y Limnología, UNAM, Mexico).
- WICKSTEN, M. K. & M. MÉNDEZ, 1985. *Processa pippinae*, a new species of deep-sea shrimp from the Gulf of California (Decapoda, Caridea). *Crustaceana*, **49**(1): 16-21.