



A new species of *Callianidea* H. Milne Edwards, 1837 (Decapoda, Axiidea, Callianideidae) from the Pacific coast of Central America, with key to the genus

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Abstract

A new callianideid species, *Callianidea mariamartae* n. sp. is described from the Pacific coast of Costa Rica. The material is compared with the type description of *C. laevicauda* Gill, 1859 and *C. typa* H. Milne Edwards, 1837. Diagnostic features of the new species include a *linea thalassinica* very short, lateral margin of carapace with a distinct hepatic groove, accessory respiratory filaments unsegmented, outer uropodal ramus with strong longitudinal carinae. This is first record of the genus from eastern Pacific of Central America and third report of the family from world. A key for identification of the species belonging to the genus is provided in this document.

Key words: Callianideidae, *Callianidea mariamartae*, new species, intertidal, eastern Pacific, Costa Rica

Resumen

Se describe una nueva especie de la familia Callianideidae, *Callianidea mariamartae* n. sp., para la costa del Pacífico de Costa Rica. El material colectado es comparado con la descripción tipo de *C. laevicauda* Gill, 1859 y *C. typa* H. Milne Edwards, 1837. La nueva especie puede ser distinguida por tener una línea talasínica muy corta, margen lateral del caparazón provisto de una notoria sutura hepática, filamentos respiratorios accesorios no segmentados y la rama externa del urópodo provista de una fuerte carina longitudinal. Este es el primer registro del género para el Pacífico Este de América Central y el tercero de la familia para el mundo. Se provee en este documento una clave para la identificación de las especies pertenecientes a este género.

Palabras claves: Callianideidae, *Callianidea mariamartae*, nueva especie, intermareal, Pacífico Este, Costa Rica

Introduction

The family Callianideidae was initially organized by Kensley & Heard 1991 into seven genera: *Callianidea* H. Milne Edwards, 1837; *Crosniera* Kensley & Heard, 1991; *Marcusiarius* Rodrigues & de Carvalho, 1972; *Meticonaxius* de Man, 1905; *Michelea* Kensley & Heard, 1991; *Mictaxius* Kensley & Heard, 1991; and *Thomassinia* de Saint Laurent, 1979. Posteriorly, genera *Crosniera*, *Mictaxius*, and *Thomassinia* were relocated into Thomassinidae; *Michelea*, *Marcusiarius*, and *Meticonaxius* into Micheleidae; and only genus *Callianidea* stayed in the family Callianideidae (Poore 1997; Appeltans *et al.* 2012). Although, recent molecular evidence has suggested the merging of Thomassinidae into Callianideidae (Robles *et al.* 2009), previous cladistic information has noted that Callianideidae is monophyletic and originates from different clades of the Thalassinidea (Poore 1994).

The family Callianideidae currently comprises two species belonging to the genus *Callianidea* (Appeltans *et al.* 2012). *Callianidea laevicauda* Gill, 1859 distributed in the Caribbean region (Sakai 1992, Vargas & Wehrmann 2009), in Pacific coast of Mexico (Schmitt 1939; Hernández-Aguilera 1998) and in Colombia (Lemaitre & Ramos

1992) and *C. typa* H. Milne Edwards, 1837 from the Indo Pacific region (to details see Sakai 1992) including Bikini Atoll, Saipan, Guam, and Tahiti (Kensley & Heard 1991). Recent surveys in the intertidal zone along the Pacific coast of Costa Rica, Central America, revealed the presence of an additional species of callianideid, described herein as *Callianidea mariamartae* **n. sp.** A morphological description and illustration of this species as well as a detailed differentiation from *C. laevicauda* and *C. typa* is provided.

Material and methods

Nineteen specimens of this new species were hand-collected under stones on sandy bottoms from intertidal zone of Golfo Dulce (N = 16; 08°38–03″N–83°09–51″W), Isla San José, Islas Murciélagos (N = 01; 10°50–59″N–85°55–00″W), and Playa Grande (N = 01; 10°30–04″N–85°48–01″W), all sites located along the Pacific coast of Costa Rica. Materials used in this study were collected during November 2011, February and May 2012.

Specimens were preserved in ethyl alcohol (70–90%) for subsequent laboratory analysis. Drawings were made with the aid of a camera lucida. All specimens were measured (TL, total length; CL, carapace length) under a light stereomicroscope equipped with a calibrated ocular micrometer and camera lucida or using a vernier caliper (0.01 mm). Terminology as well as abbreviations follows those used by Kensley & Heard (1991). Holotype and paratype were deposited in the Museo de Zoología, Escuela de Biología, Universidad de Costa Rica, Costa Rica (Holotype, MZUCR 2928-01; Paratype, MZUCR 2921-09; other material, MZUCR 2920-03, 2928-02, 2929-01, 2930-01, 2931-01, 2932-01).

Description of species

Callianidea H. Milne Edwards, 1837

Included species: *Callianidea typa* H. Milne-Edwards, 1837 (type species by monotypy); *Callianidea laevicauda* Gill, 1859

Callianidea mariamartae, new species

Figs 1A–I, 2A–H.

Type material. Holotype, male (CL: 12.4mm, TL: 50.1mm, Islotes Mogos, Osa, Golfo Dulce (08°38–03″N - 83°09–51″W), southern Pacific coast of Costa Rica, May 13 2012, collected by R. Vargas from intertidal zone, (specimen in excellent condition, not dissected, with both first pereopods attached) (MZUCR 2928-01). Paratype: female (CL: 11.1mm, TL: 42.6mm). Isla San José, Islas Murciélagos (10°50–59″N - 85°55–00″W), 10 Nov 2011, collected by R. Vargas from intertidal zone (MZUCR 2921-09).

Other type material. Seventeen specimens were deposited in the Museo de Zoología, Escuela de Biología, Universidad de Costa Rica (MZUCR: 2920-03, 2928-02, 2929-01, 2930-01, 2931-01, 2932-01). All specimens of *Callianidea mariamartae* **n. sp.** examined were caught in the sand under rocks from intertidal zone along the Pacific coast of Costa Rica.

Etymology. Patronym: gender female, named in honour of María Marta Chavarría, government official of the Santa Rosa National Park in recognition of her many important contributions to conservation and bio-awareness of the unique and biologically diverse protected coastal area of Guanacaste, Costa Rica.

Diagnosis. Carapace strongly compressed laterally, cervical groove located in posterior third of carapace, lateral margin of carapace with hepatic groove, *linea thalassinica* very short. Eyestalks triangular, obtuse apically, slightly separated one from each other apically. Antennular peduncle distinctly shorter than antennal peduncle. Scaphognathite of maxilla with spinulose border and elongated seta on posterior lobe about half length of scaphognathite. Mxp2 with epipod short and foliaceous; palp of endopod with about five acute spines on distal region. P1 unequal and dissimilar; larger cheliped with ventral margin of propodus, merus and ischium dentate; margin ventral of propodus and carpus of smaller cheliped ornamented with long tufts of setae. P5 dactylus twisted, forming a true dentate claw with distal section of propodus, latter armed with teeth which increase in size toward distal end. Plp1 of 2 articles, distal article broadly triangular, with small mesial lobe bearing hooks. Pleopods 2–5

with both rami bearing marginal slender cylindrical accessory respiratory filaments unsegmented. Outer uropodal ramus with strong longitudinal carinae, margin dentate, inner ramus with longitudinal dorsal ridge bearing 2 spines.

Description. Medium in size shrimp, carapace length (CL) = 5.4–12.4mm. Carapace oval in shape, strongly compressed laterally and without cardiac prominence. Cervical groove located in posterior third of carapace, lateral margin of carapace with hepatic groove, *linea thalassinica* very short extending posteriorly from orbit (Fig. 1A). Rostrum conspicuous, triangular shape, pointed downward (Fig. 1B). Eyestalks triangular, obtuse apically, slightly separated one from each other apically; cornea well formed, suboval, small, subterminal (Fig. 1B). Antennular (A1) peduncle distinctly shorter than antennal (A2) peduncle, reaching to distal margin of fourth antennal segment, antennular terminal segment about 1.5 times as long as penultimate; A2 scaphocerite lacking, article 4 slender and elongated about as long as three anterior segments (Fig. 1B), antennal flagellum about 2 times as long as peduncle antennal. Incisor process of mandible with four teeth on the mandible crest, two smaller located on molar base; palp of 3 articles with abundant setae on distal margin and one row of fine spines through lateral margin (Fig. 1C). Maxillule with distal endite thin and long, proximal short and broad, latter with long epipod and setae with dentate tips; palp thin with two long setae on tip (Fig. 1D). Proximal and distal endite of maxilla bilobed, external margin of both densely covered with setae; palp two-segmented; scaphognathite with spinulose border and elongated seta on posterior lobe about half length of scaphognathite (Fig. 1E). Maxilliped 1 with two strong and setose endites; endopod provided with digitiform projection; exopod larger than endopod, epipod elongated and strong (Fig. 1F). Maxilliped 2 with exopod well-developed, flagellum segmented, epipod short and foliaceous; palp of endopod with about five acute spines on distal region, half length of second segment, fourth segment 2.4 times as long as posterior segments (Fig. 1G). Exopod of Mpx3 extending to mesial zone of merus, latter with an acute spine on internal margin close to carpus-merus articulation, epipod reduced; propodus slightly larger than carpus; merus shorter than ischium (Fig. 1H), ischium with *crista* dentate on inner surface, row of teeth increasing in size toward distal end (Fig. 1I).

P1 unequal and dissimilar. Larger cheliped massive; dactylus and fixed finger armed with prominent teeth on internal surface, inner surface of fixed finger with five prominent rounded teeth one very conspicuous and two rows of smaller teeth; palm and dactylus similar in length; ventral margin of propodus with dentate border; carpus conical, half length of merus, armed with a hook on ventral margin; merus subovoid, dentate border on ventral margin of merus and ischium (Fig. 2A). Smaller cheliped slender and less massive than larger cheliped; dactylus armed with one rectangular conspicuous tooth, dactylus similar in length than immobile finger; fixed finger with prominent triangular tooth distally on cutting edge, palm 2.0 times as long as dactylus; insertion carpus-merus subtriangular; merus and carpus similar in length, margin ventral of propodus and carpus ornamented with long tufts of setae (Fig. 2B).

Pereopod 2 chelate; dactylus with setal tufts; movable finger armed with acute spines on distal end; internal edge of fixed finger armed with acute spines, cutting edges straight, long tufts of setae on ventral margin of propodus and carpus; carpus triangular in shape; merus with long setal rows restricted to the ventral margin, ventral margin of merus strongly convex (Fig. 2C). P3 subchelate, palm with notch, dactylus thick and short with two setal rows, propodus laterally flattened with ventral margin covered with dense setal tufts, carpus triangular in shape, both sides of merus convex (Fig. 2D). P4 slightly subchelate; dactylus digitiform; propodus with strong distal spine and rows of setal on dorsal margin; carpus subtriangular in shape, carpus-merus insertion incomplete; merus about 2.0 times as long as carpus (Fig. 2E). P5 dactylus twisted, forming a true dentate claw with distal section of propodus, latter armed with teeth which increase in size toward distal end (Fig. 2F); dactylus and distal section of propodus covered with dense setal tufts; dorsal margin of carpus rounded; merus similar in long than three posterior segments; ischium subtriangular (Fig. 2G).

Abdominal somites smooth, with irregular oblique tufts of setae through abdominal region; abdominal somite 1 with sclerotized anterodorsal lobe, posterior region of lobe articulated in last part of cephalothorax; abdominal somite 1 different in shape from remaining somites (Fig. 1A). Pleopod 1 in male of 1 article, distal article broadly triangular, with small mesial lobe bearing hooks (Fig. 2H). Pleopod 2 with rod-shaped setose appendix masculina and short free appendix interna (Fig. 2I). Pleopods 2–5 with both rami bearing marginal slender cylindrical accessory respiratory filaments unsegmented (Fig. 2I). Uropodal ramus rounded, outer uropodal ramus with strong longitudinal carinae, distal margin dentate, inner ramus with longitudinal dorsal ridge bearing 2 spines; lateral ridge of telson converge distally, slightly wider than longer, ornamented with long tufts of setal (Fig. 2J).

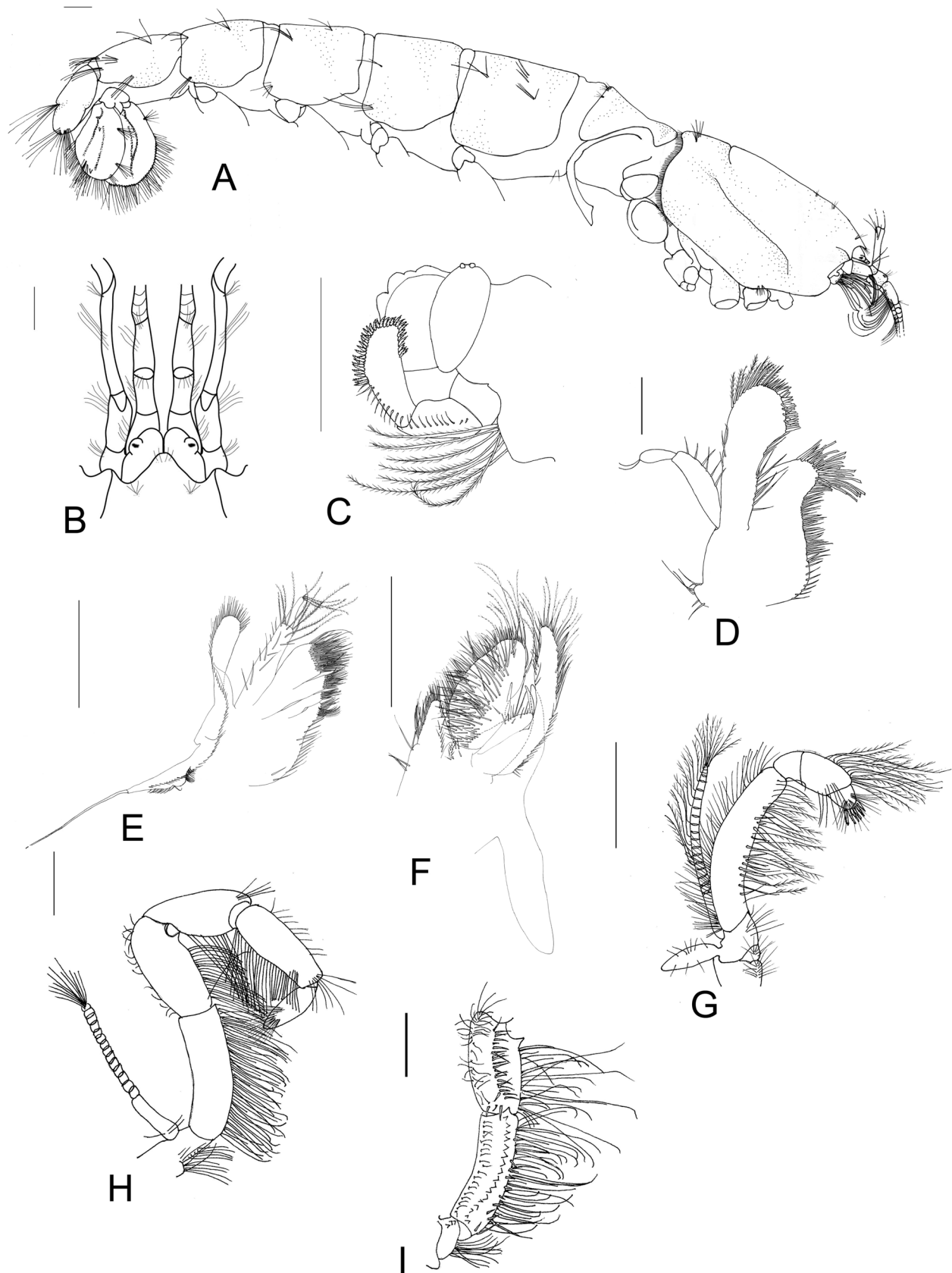


FIGURE 1. *Callianidea mariamartae* n. sp. A, lateral view; B, anterior region of carapace; C, right mandible; D, right maxillule; E, right maxilla; F, right maxilliped 1, G, right maxilliped 2; H, right maxilliped 3; I, crista dentate on inner surface of merus Mxp3. A, B, male holotype; C–H, male paratype. Scale bars equal 1.0mm.

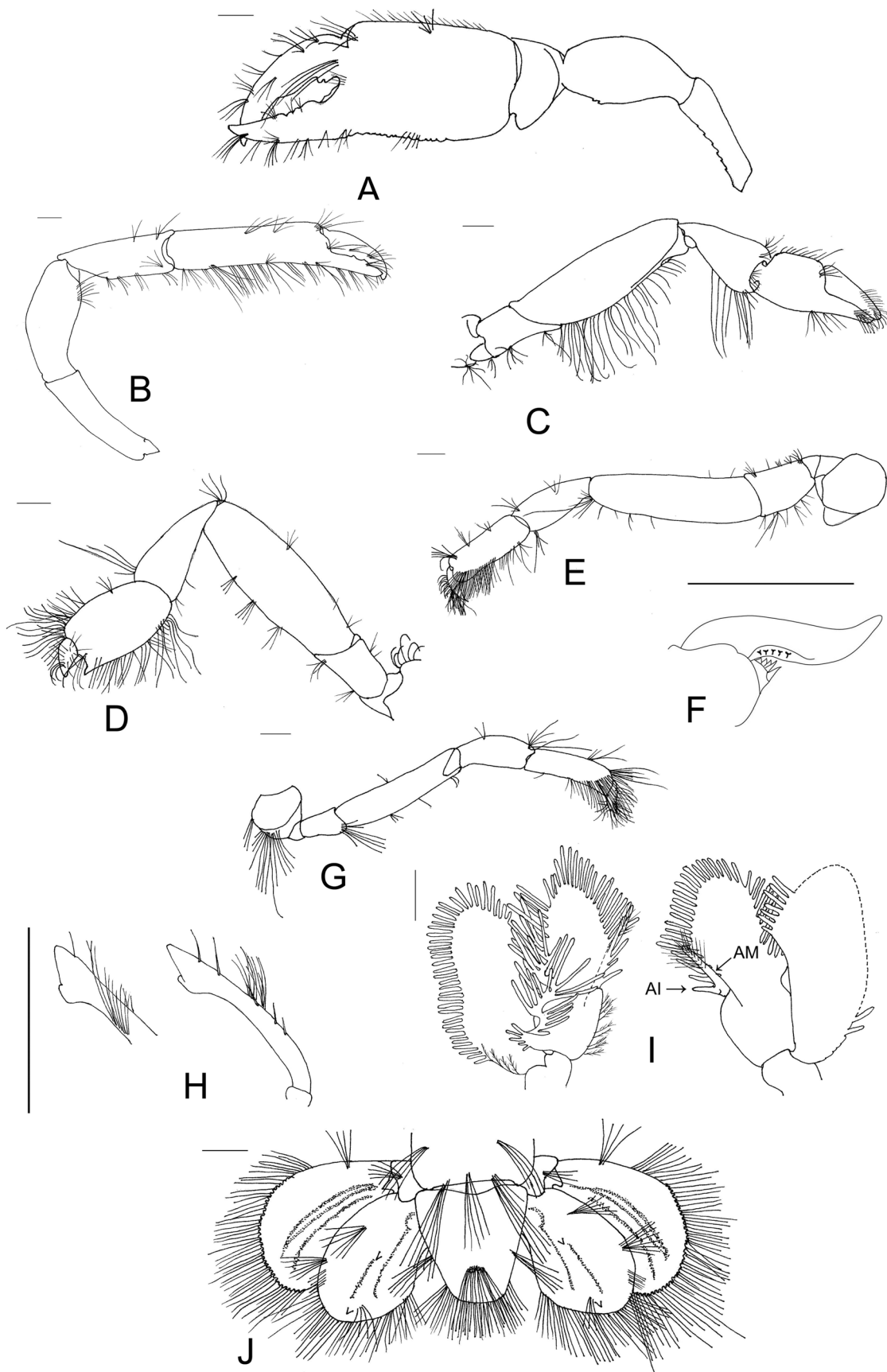


FIGURE 2. *Callianidea mariamartae* n. sp. A, major cheliped; B, minor cheliped; C, pereiopod 2; D, pereiopod 3; E, pereiopod 4; F, detail of dactylus pereiopod 5; G, pereiopod 5; H, pleopod 1 male; I, internal and external view pleopod 2 (AM, appendix masculine; AI, appendix internae); J, telson and uropods. A–F, H, male holotype; G, male paratype. Scale bars equal 1.0mm.

Habitat. The specimens were collected by hand, in the sand under rocks in the intertidal zone.

Colour. Carapace white, cardiac region pale salmon, without any kind of chromatophores. Pereopods 1 and 2 strongly calcified and white. Pereopods 3–5 white, transparent. Abdomen white except for a tint of pale salmon on lateral face. Tail fan and pleopods white.

Type locality. Islotes Mogos, Osa, Golfo Dulce (08°38'03"N - 83°09'51"W), southern Pacific coast of Costa Rica.

Distribution. Presently known only along the Pacific coast of Costa Rica.

Remarks. *Callianidea mariamartae* n. sp., and *C. laevicauda* from Caribbean Sea share some similarities i.e. very short *linea thalassinica* and maxilliped 3 with an acute spine on internal margin of the merus (between others morphological characters). However, the new species differs from *C. laevicauda*, among other aspects, in having (1) lateral margin of carapace with a distinct hepatic groove; (2) anterolateral carapace without vertical row of specialized setae in postantennal area; (3) seta on posterior lobe of maxilla about half length of scaphognathite (4) Mxp2 with acute spines on distal region of palp; (5) accessory respiratory filaments unsegmented; (6) outer uropodal ramus with strong longitudinal carinae (*C. laevicauda* see Kensley & Heard 1991; p. 501–502; Fig. 3A, C; 4A, F, I). *Callianidea mariamartae* n. sp. differs from *C. typa* from Indo Pacific region in having a *linea thalassinica* very short and pleopods filaments unsegmented. *Callianidea typa* is characterized by lacking any sign of a *linea thalassinica* and the presence of cylindrical pleopodal filaments with a constriction near the midpoint (*C. typa* see Sakai 1992; p. 13, 15; Fig. 3A, 5H and Poore 1997; p. 350; Fig. 1A).

Key to the species of the genus *Callianidea*

1. Carapace with *linea thalassinica* lacking *Callianidea typa*
- Carapace with *linea thalassinica* very short 2
2. Lateral margin of carapace with distinct hepatic groove, outer uropodal ramus with strong longitudinal carinae *C. mariamartae* n. sp.
- Lateral margin of carapace lacking hepatic groove, outer uropodal ramus without longitudinal carinae *C. laevicauda*

Discussion

During 2000's, the family Callianideidae (H. Milne Edwards, 1837) was submitted to a keen revision (see Kensley & Heard 1991; Sakai 1992; Poore 1994) that organize it in only one genus, *Callianidea* (Poore 1997; Appeltans *et al.* 2012). Over this lapse of time, Sakai (1992) postulated *Paracallanidea* as a new genus of Callianideidae based on a redescription of *C. laevicauda* from the Caribbean coast of Colombia. However, as pointed out by Poore (1997), the general *habitus* of this species and the morphological differences stated by Sakai (1992) in pleopods 1 and 2, the male appendix interna on pleopod 2, and the pleopodal filaments are not enough to establish a monotypic genus. We, therefore, do not recognize *Paracallanidea* as a valid genus (see also de Grave *et al.* 2009).

Currently, only two species of callianideid (*C. laevicauda* and *C. typa*) have been accepted around the world (Poore 1997; Appeltans *et al.* 2012), even though, others specific names have been given as junior synonyms of *C. typa* (e.g. *C. elongata* H. Milne Edwards, 1837; *C. mucronata* Kossman; *C. planocula* Melin, 1939; *C. segura* Lanchester, 1901; *C. steenstrupii* Boas, 1880) (see Appeltans *et al.* 2012). In the case of *C. laevicauda*, it is interesting to note that presence of this species to both side of American coast has been poorly questioned by carcinologists. Solely Schmitt (1939) proposed that population of *C. laevicauda* from Tres Marias Islands and Socorro (Pacific coast of Mexico) differs from those found in Caribbean Sea. According to this author, specimens of *C. laevicauda* (var = *occidentalis*) from Pacific coast of Mexico and those from Caribbean Sea can be separated by ornamentation that each form have in the lower margin and fixed finger of the large cheliped. Nonetheless, this proposal was not accepted and the subspecies *C. l. occidentalis* was posteriorly synonymized as *C. laevicauda* by Kensley & Heard (1991). According to these authors, separation of Pacific and Atlantic types of this species is based on very thin evidence which is not sufficient to justify the existence of two different forms.

In accordance with Schmitt (1939), *C. l. occidentalis* has margin more or less toothed or tuberculate and ridge on inner side of the fixed finger crenulated. While, *C. laevicauda* from Caribbean Sea has the margin slightly roughened or, at most, obscurely crenulated and the ridge on inner side of the fixed finger is smooth (Kensley &

Heard 1991). *Callianidea mariamartae* **n. sp.**, has ventral margin of propodus clearly dentate and inner surface of fixed finger armed with five prominent rounded teeth, with one very conspicuous and two rows of smaller teeth. According to these findings *C. mariamartae* **n. sp.**, differs from *C. l. occidentalis* from the Pacific coast of Mexico and *C. laevicauda* from Caribbean Sea. Unfortunately, we cannot to make a deeper comparison between our specimens and the description proportioned by Schmitt (1939) because the author has mentioned only two morphological features which are not enough to establish any kind of conclusion conclusive. On the other hand, Lemaitre & Ramos (1992) assigned to *C. laevicauda* some specimens collected in the Pacific coast of Colombia. Under to these authors, *C. laevicauda* from Colombia has a carapace transparent, with red spots dorsally and blue chromatophores near cervical groove; P1, 2 red with white stripes; tip of fingers of chelae (pereopods 1) dark yellow. This coloration pattern differs considerably of *C. mariamartae* **n. sp.** from Costa Rica.

Our study provides strong evidences that indicate important differences between the morphology of *C. mariamartae* **n. sp.** from the Pacific coast of Costa Rica and *C. laevicauda* from Caribbean Sea. For instance, the new species differs from *C. laevicauda* in having lateral margin of carapace with a distinct hepatic groove, accessory respiratory filaments unsegmented and outer uropodal ramus with strong longitudinal carinae. *Callianidea mariamartae* **n.sp.**, shares most characters defined by H. Milne Edwards (1837) in this genus, except the pattern of setal row that is one typical character for all species belonging to *Callianidea* (Kensley & Heard 1991, p. 495, Fig. 2A) and that was not present in neither of examined specimens in this study. These structures may play an important role as support to the respiratory process of *Callianidea*'s species and may be easily observed on carapace, abdominal pleura, and propodus of pereopods 2–4 of *C. laevicauda* (Kensley & Heard 1991; p. 501; Figs. 3A, F–H) and *C. typa* (Poore 1997; p. 350, 351; Figs. 1A, 2D, F, G).

The current distribution of *C. typa* encompasses the Indo Pacific region (to details see Sakai 1992) including Bikini Atoll, Saipan, Guam, and Tahiti (Kensley & Heard 1991), while *C. laevicauda* is distributed in eastern Pacific and western Atlantic (Schmitt 1939; Sakai 1992; Lemaitre & Ramos 1992; Hernández-Aguilera 1998; Vargas & Wehrtmann 2009). Information analyzed in this study suggests that populations assigned to *C. laevicauda* from the Caribbean Sea and Pacific coast of Mexico actually belong to two different species. Accordingly, we believe that geographical distribution of *C. laevicauda* is limited to Caribbean Sea, while populations from the Pacific coast of Colombia, Costa Rica and Mexico belong to different species from *C. laevicauda*. A detailed morphological description of Pacific populations from Colombia and Mexico are needed to determine if these forms are different from *C. mariamartae* **n. sp.** from Costa Rica.

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