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Pinnotheres orcutti Rathbun, 1918, a new Eastern Tropical Pacific species of *Tumidotheres* Campos, 1989 (Crustacea: Brachyura: Pinnotheridae)

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Abstract

The lack of a protuberance in the basal antennal article in the holotype of *Pinnotheres orcutti* Rathbun, 1918, allows its removal from *Pinnotheres* Bosc, 1802 [type species, *P. pisum* (Linnaeus, 1767)]. The species is instead included in *Tumidotheres* Campos, 1989, because of the presence of a thick, tumid and firm carapace, and its surface covered with a short, dense, and deciduous tomentum; the third maxilliped having a propodus larger than the carpus; and the presence of a subspatulate dactylus of the third maxilliped medially inserted into a notch on the ventral margin of the propodus. *Tumidotheres orcutti* **new combination** can be separated from its sole Pacific Ocean congener, *T. margarita* Smith, 1870, by its unique dentition on the inner margin of the cheliped pollex, which is armed with a blunt proximal lobe and a row of small teeth, the two distal teeth being conspicuously the largest. In contrast, the pollex dentition of *T. margarita* consists of very small teeth, all similar in size.

Key words: Brachyura, Pinnotheridae, *Pinnotheres orcutti*, *Tumidotheres*

Resumen

La ausencia de una protuberancia en el artejo basal de la antena en el holotipo de *Pinnotheres orcutti* Rathbun, 1918, permite remover esta especie de *Pinnotheres* Bosc, 1802 [especie tipo, *P. pisum* (Linnaeus, 1767)]. La especie es en vez incluida en *Tumidotheres* Campos, 1989, debido a la presencia de un caparazón grueso, túmido y firme, y su superficie cubierta con una pubescencia corta, densa y caediza; el tercer maxilipedio con un propodus más largo que el carpus y un dáctilo subespatulado que se inserta medialmente en una escotadura sobre el margen ventral del propodus. *Tumidotheres orcutti*, **nueva combinación**, puede ser separado de su congénere en el Océano Pacifico *T. margarita* Smith, 1870 por su exclusiva dentición del margen interno del dedo fijo de la quela, el cual está armado con un diente romo proximal y una fila de dientes pequeños, siendo los dos más distales conspicuamente los más grandes. En contraste, la dentición del dedo fijo en *T. margarita* consiste en dientes pequeños, todos similares.

Introduction

Ongoing studies on the Tropical Eastern Pacific pinnotherid crabs prompted us to evaluate the generic status of *Pinnotheres orcutti* Rathbun, 1918, a species described on the basis of a dried male that was collected in October 1910 from Manzanillo, Colima, México. Subsequent to the original description, Glassell (1938) described the adult female of this species, extending its distribution to Tenacatita Bay, Jalisco and Tres Marias Island, Nayarit, México. More recently Hendrickx (1995) expanded its distribution northward to the upper Gulf of California.

The morphology of *P. orcutti* was studied herein in detail and compared to all known American genera of Pinnotheridae, as well as with the type species of the *Pinnotheres* Bosc, 1802, *P. pisum* (Linnaeus, 1767) (Fig. 1). In addition, an unidentified pinnotherid collected in Cabo Blanco island, Costa Rica and deposited in the Museum

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of Zoology of the Universidad de Costa Rica agrees well with Glassell´s description of the female of *P. orcutti*. We provide an updated description of the male holotype of *P. orcutti*, and Glassell's female description is complemented with that of the Costa Rican ovigerous female. This allows us to verify the identity of the female on which Hendrickx (1995) based his upper Gulf of California record.

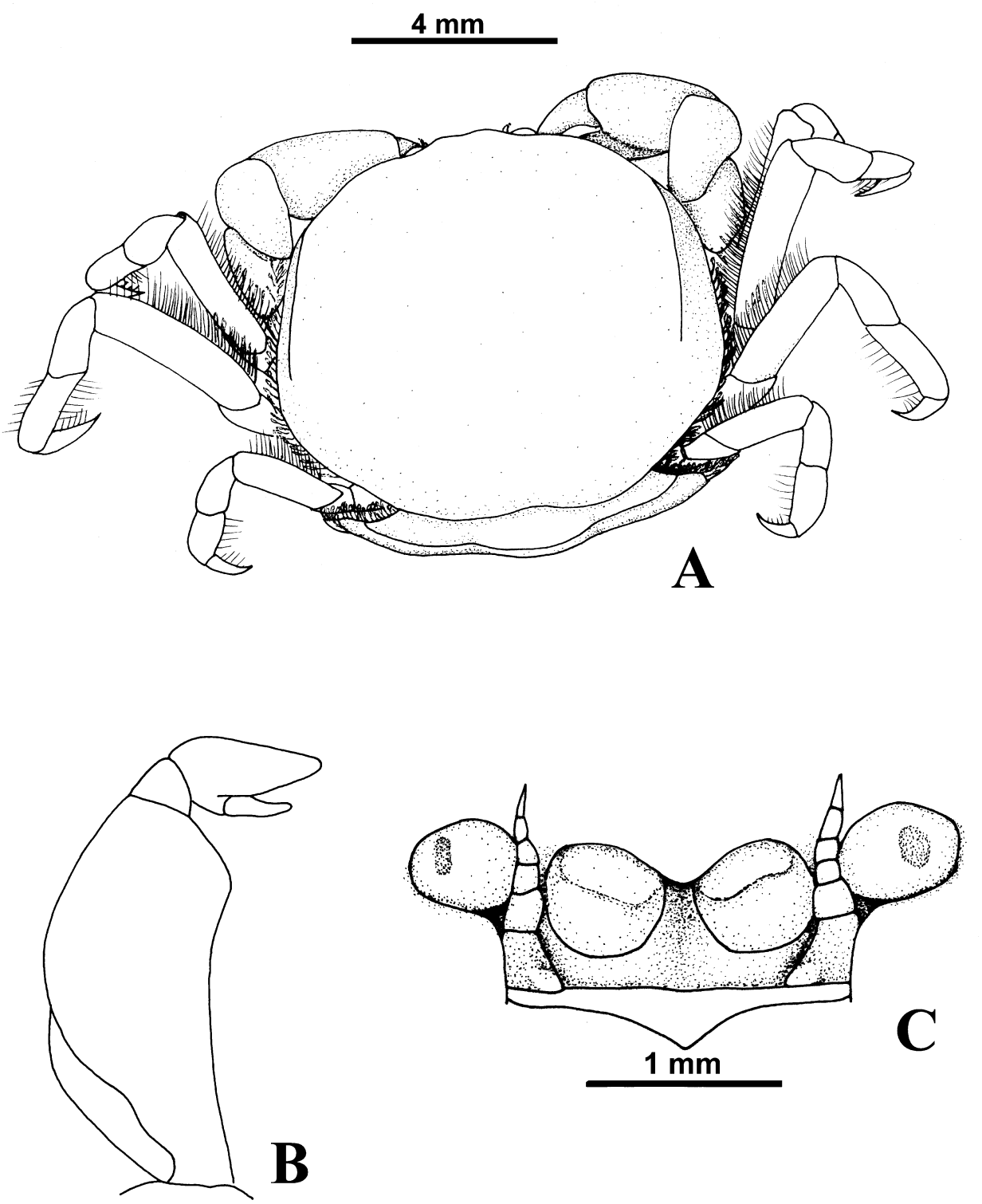

FIGURE 1. *Pinnotheres pisum* (Linnaeus, 1767), from coast of France (UABC), female, A, dorsal view; B, third maxilliped; C, frontal view. Scale: A = 4 mm; B = not to scale; C = 1 mm.

Materials and methods

The studied specimens came from the Crustacean Collection of the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), the Crustacean Collection of the Museum of Zoology, Universidad de Costa Rica (MZ-UCR) and the Macroinvertebrates collection of the Instituto de Ciencias del Mar y Limnología (Estación Mazatlán), Universidad Nacional Autónoma de México, Sinaloa, México (EMU). Additional voucher material of *Tumidotheres margarita* was collected along the Baja California peninsula, which has been deposited in the Laboratorio de Sistemática de Invertebrados of the Facultad de Ciencias, Universidad Autónoma de Baja California (UABC). Drawings were made with the aid of a Leica Camera Lucida attached to a stereoscopic microscope Leica MZ-12. Editing of drawings was performed using the computer programs Adobe Illustrator CS5.1 and Adobe Photoshop CS5.1. For a comparative proposes the present description follows those of Campos (1989, 2009). Abbreviations used include: lc, length of carapace; wc, width of carapace.

Systematics

Order Decapoda Latreille, 1802

Infraorder Brachyura Linnaeus, 1758

Section Eubrachyura de Saint Laurent, 1980

Family Pinnotheridae De Haan, 1833

Tumidotheres Campos, 1989

Type species. By original designation, *Pinnotheres margarita* Smith, 1870. Gender masculine.

Diagnosis. Carapace thick, firm but not hard; surface covered with short, dense, deciduous tomentum. Gastric, cardiac regions separated from branchiohepatic area by depressions, all these regions tumid. Third maxilliped with ischium indistinguishably fused with merus; palp with 3 articles, carpus shorter than subtrapezoidal propodus, about twice as long as wide; dactylus narrowly spatulate, inserted in angular notch in middle of ventral margin of propodus, not extending beyond tip of propodus. Abdomen in both sexes with 7 free somites.

Distribution. Tropical Eastern Pacific region: *T. margarita* (Smith, 1870), Gulf of California and west coast of Baja California Sur at San Ignacio and west coast of Baja California at El Rosario to Bahía de Panamá, Panamá (Schmitt *et al.* 1973; Campos 1989); *T. orcutti* (Rathbun, 1918), Tenacatita Bay, Jalisco and Tres Marias Island, Nayarit, México to Cabo Blanco Island, Costa Rica (Glassell, 1938; present paper). Western Atlantic: *T. maculatus* (Say, 1818), Cape Code, Massachusetts to Texas, U.S.A.; Cuba, Puerto Rico, Jamaica, U.S. Virgin Islands, Brazil, Uruguay, Argentina (Schmitt *et al.* 1973; Campos 1989).

Hosts. Mollusca: Bivalvia, Pectinidae (*Argopecten* Monterosato, 1889, *Hinnites* Defrance, 1821, *Placopecten* Verrill, 1897), Pteridae (*Pinctada* Röding, 1798), Pinnidae (*Pinna* Linnaeus, 1758), Mytilidae (*Modiolus* Lamark, 1799, *Mytilus* Linnaeus, 1758, *Perna* Philipsson, 1788), Anomiidae (*Anomia* Linnaeus, 1758), Chamidae (*Chama* Linnaeus, 1758); Polychaeta, Chaetopteridae (*Chaetopterus* Cuvier, 1830), Arenicolidae (*Arenicola* Lamarck, 1801) (Schmitt *et al.* 1973; Campos 1989).

Tumidotheres orcutti (Rathbun, 1918) new combination

(Figs. 2–5)

Pinnotheres orcutti Rathbun, 1918: 64–66, 98–99.—Glassell 1938: 451–452.—Silas & Alagarswami 1967:1204, 1225 (list).—Ng *et al.* 2008: 250 (list).

Type locality. Manzanillo, Colima, México (Eastern Pacific).

Material examined. 1 male holotype, dried, Manzanillo, Colima, México (USNM 49215); 1 ovigerous female (MZ-UCR 2220-11), northeast side Cabo Blanco I., dredged parallel to the line coast, 30–40 m depth, 16–17 May 1998, Costa Rica, 9°33´26.67” N, 85°07´05.61” W.

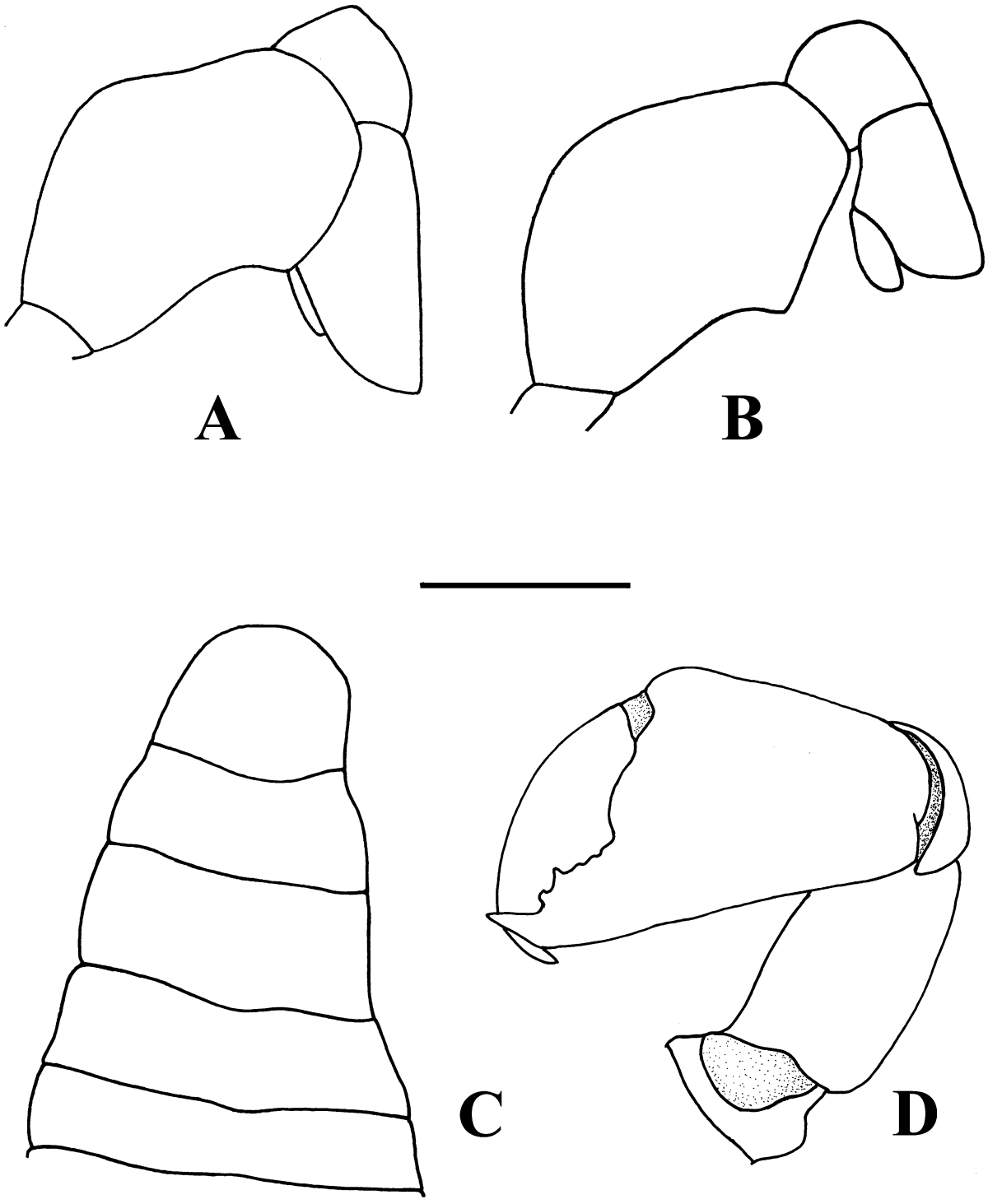

FIGURE 2. *Tumidotheres orcutti* (Rathbun, 1918) from Manzanillo, Colima, México, male holotype (USNM 49215), A-B, third maxilliped; C, abdominal somites 3-6 and telson; C, cheliped, external view. Scale: A-B = 0.38 mm; C = 0.62 mm; D = 1.09 mm.

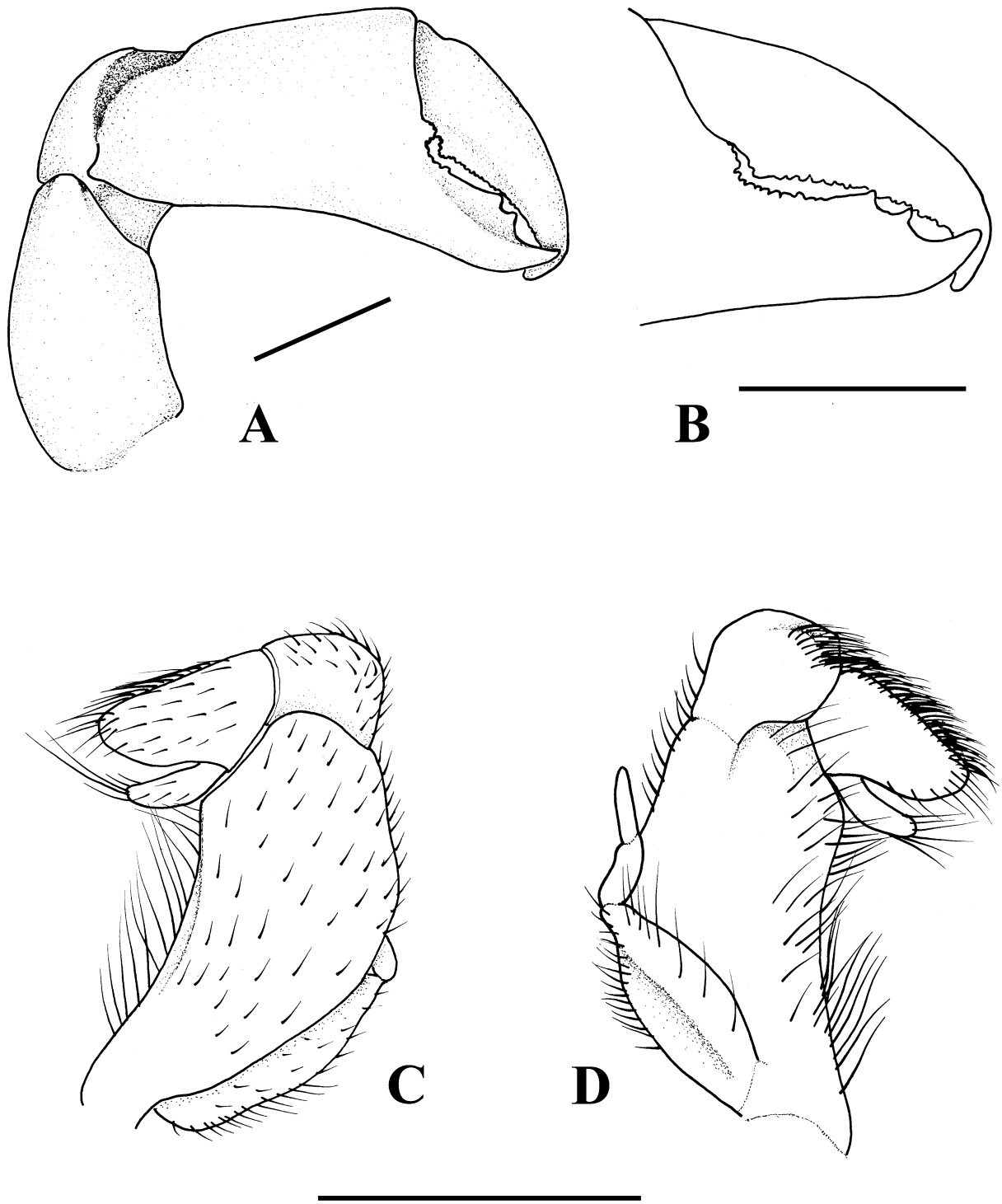

FIGURE 3. *Tumidotheres orcutti* (Rathbun, 1918), from Cabo Blanco Island, Costa Rica, female (MZ-UCR 2220-11): A, cheliped external view; B. tip of cheliped; D-E, internal and external view of the third maxilliped. Scale = 1 mm.

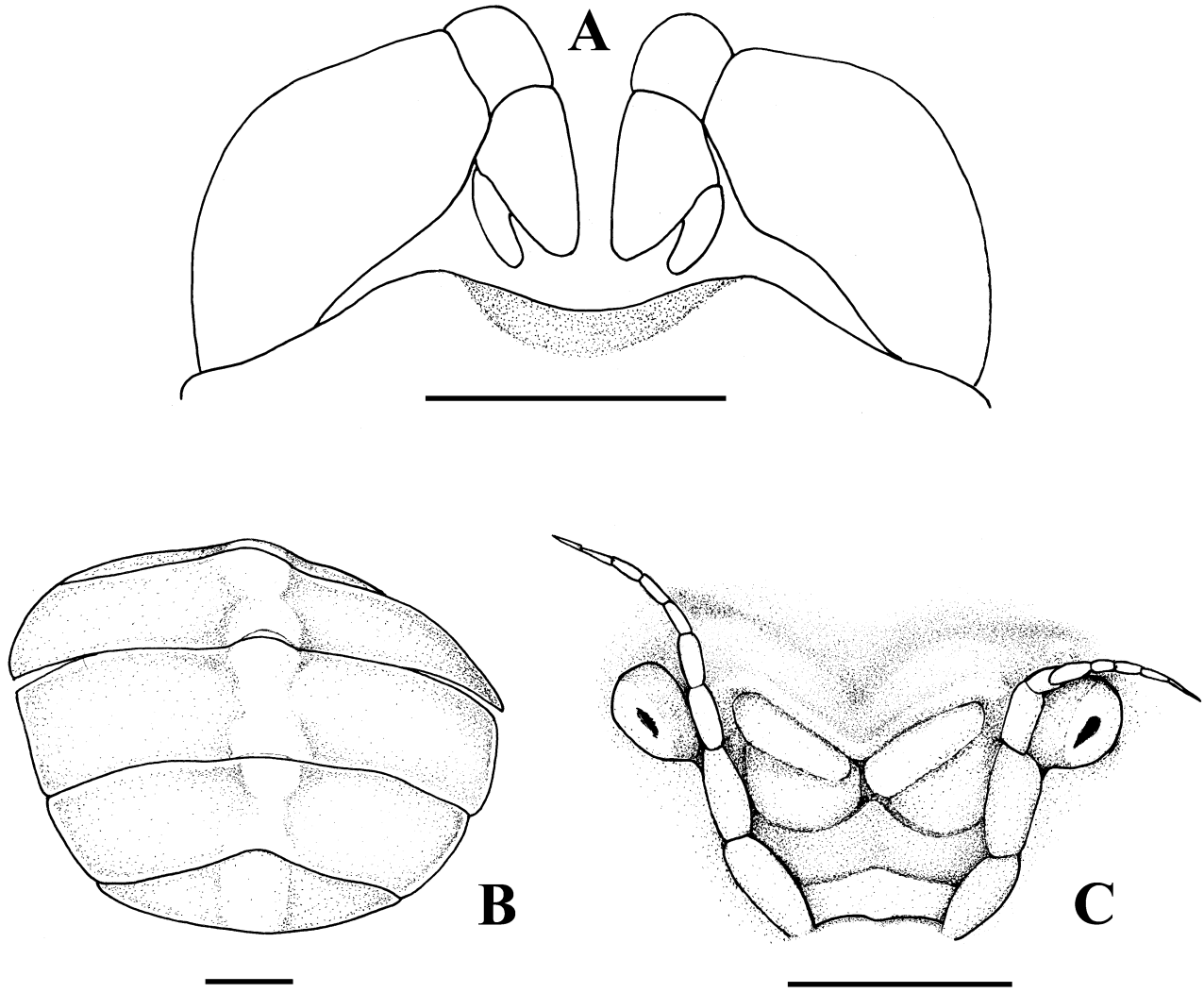

FIGURE 4. *Tumidotheres orcutti* (Rathbun, 1918), from Cabo Blanco Island, Costa Rica, female (MZ-UCR 2220-11): A, third maxilliped; B, abdomen; C, frontal view. Scale = 1 mm.

Measurements. Male holotype, lc = 3.6 mm, wc = 3.1 mm; ovigerous female (MZ-UCR 2220), lc = 5.9 mm, wc = 6.1 mm. Adult female (MZ-UCR 2220-11) lc = 8.5 mm, wc = 8.1 mm (Glassell 1938).

Comparative examined. *Pinnotheres pisum* (UABC), "coast of France"; *Tumidotheres margarita* (UABC) , Gulf of California; Playa Kino Viejo, Sonora, 2 females (1 ovigerous), 24 Jan 1985, J. R. Campoy-Favela coll., from *Argopecten circularis* (Sowerby, 1835). Punta San Pedro, Bahía Concepción, Baja California Sur, 1 ovigerous female, May 1983, P. A. Ramirez coll., host *Pinctada mazatlanica* (Hanley, 1856); 1 female, 18 May 1984, P. A. Ramirez coll., host *P. mazatlanica*; 3 females (2 ovigerous), 4 Nov 1984, J. L. Bello-León coll., host *P. mazatlanica*; *T. margarita* (EMU3747), 1 female, Cortes 3, station 37 (Consag Rock), upper Gulf of California, 4 Aug. 1985, M. Hendrickx coll. West coast of Baja California; Estero El Cardón, Laguna de San Ignacio, Baja California Sur, 4 males and 30 females, 4 Apr 1987, Eulogio López coll., host *Argopecten* (?) *aequisulcatus* (Carpenter, 1864).

Geographic. West coast of México, Maria Madre Island, Tres Marías Islands, Nayarit; Tenacatita Bay, Jalisco and Manzanillo, Colima (Glassell 1938); Cabo Blanco Island, Costa Rica (present paper).

Host. Unknown.

Redescription of male (modified from Rathbun 1918). Carapace subhexagonal-suboctagonal, longer than broad, broadest in posterior half, dorsal surface tumid, uneven, posterolateral portion of branchial region forming

steep triangular facet; dorsal surface densely hairy, bordered by raised rim; cardiac region surrounded by furrow except anteriorly, surmounted by median tubercle near posterior end. Front sub-rectangular truncate, corners rounded, medially emarginate; broad median furrow posterior to front. Lateral margins long, convex; postero-lateral margins short, concave; posterior margin short, straight. Basal segment of antenna elongated, obliquely placed.

Merus of outer maxilliped wide, subangled; propodus broadly subtrapezoidal, digitiform dactylus inserted on proximal portion of oblique distal margin.

Cheliped (left only present) stout, manus short, dorsal margin oblique, increasing greatly in width toward distal end; lower margin of propodus straight except curved upward distal tip; cutting edge of immovable finger with few teeth of which 2 distal the larger, median largest; dactylus wide at base, strongly arched. Tip of propodus, dactylus sharper; curved, overlapping. Legs narrow, length 2 >1= 3> 4, propodi with both margins convex except straight posterior margin of second leg; dactyli slender curved, subequal, with spine-like tips.

Abdomen widest at third segment, narrowing distally, telson subcircular longer than sixth segment; sixth segment with shallow right-angled indentation on either side.

Redescription of female (modified from Glassell 1938). Carapace calcareous, high, convex, suboctagonal, slightly longer than broad, broadest in posterior half, surface uneven, branchial regions with irregular lobes; dorsal surface pubescent, bordered by raised rim; cardiac region surrounded by furrow except anteriorly, no median tubercle near posterior end, as in smaller male. Front emarginated, blunt-pointed lobes separated by wide deep notch, behind which runs broad median furrow. Lateral margin long, angled, convex; postero-lateral margin short; posterior margin convex. Basal segment of antennae elongated, obliquely placed.

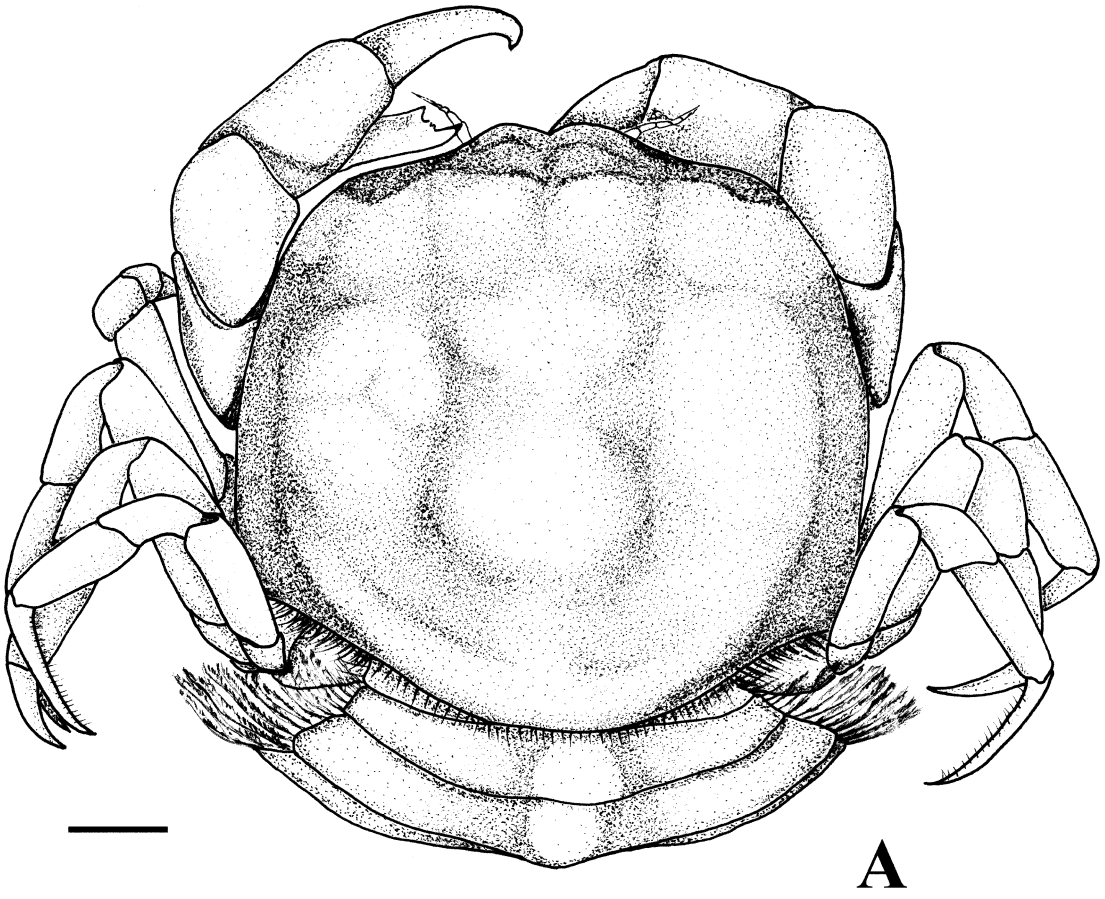

FIGURE 5. *Tumidotheres orcutti* (Rathbun, 1918), from Cabo Blanco Island, Costa Rica, female (MZ-UCR 2220-11), dorsal view, showing the tumid carapace. Scale = 1 mm.

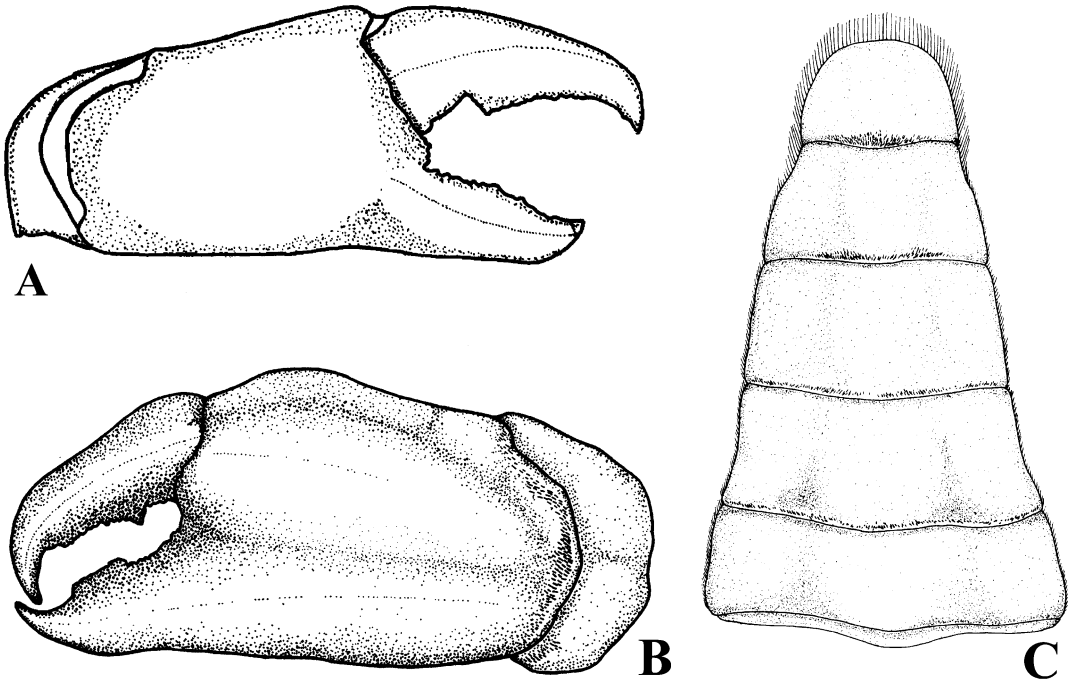

FIGURE 6. *Tumidotheres margarita* (Smith, 1870), from Bahía Concepción, Baja California Sur, México, A-B, cheliped, female and male respectively; C, male abdomen. Not to scale.

Merus of outer maxilliped wide, angled; the propodus gently curved at apex, dactyl extending nearly to extremity of propodus.

Chelipeds similar, stout, manus short, dorsal margin oblique, increasing in width toward distal end; ventral margin concave under gape; pollex sharply, upturned at apex, armed with blunt proximal lobe, row of small teeth, 2 distal larger, median largest; dactylus wide at base, strongly arched with wide, angular tooth anterior to deep proximal notch for reception of proximal lobe of pollex; tips of fingers sharply pointed, crossing each other.

Ambulatory legs narrow; second longest; dactyli of first 3 pairs subequal in length, slightly pubescent with spine-like tips; dactyli of fourth pair nearly 1/3 longer than others, nearly straight, longer than propodus fourth, with fringe of pubescence on lower margins.

Abdomen subspherical; telson within perimeter, posterior margins oblique, tip with slight median emargination.

Color. Male: dorsal surface of dried specimen dark purple except across front and on posterior margin and posterior half of cardiac region (Rathbun 1918: 99). Female: buff, pubescence earthy brown (Glassell 1938: 452).

Remarks. The lack of a subconical protuberance in the basal antennal article in *Pinnotheres orcutti* (see Campos 2009; Fig. 1C) is a distinctive feature that allows to the species to be removed from *Pinnotheres* Bosc, 1802. The following characteristics support the inclusion of *P. orcutti* in *Tumidotheres* Campos, 1989: 1) presence of a thick and firm but not hard carapace, with its uneven surface covered with a short, dense, and deciduous tomentum; 2) third maxilliped with a propodus that is longer than the carpus and 3) a subspatulate dactylus medially inserted into a notch on the ventral margin of the propodus. Species of the genus *Pinnotheres* have an even and soft carapace (Fig 1A) and although they have the propodus of the third maxilliped longer than the carpus, its dactyl is styliform and inserts into the proximal third of the ventral margin of propodus (Fig. 1B). *Tumidotheres orcutti* **new combination** is the third species of this American genus and the second recorded from the Tropical Eastern Pacific region. It can easily be separated from its sole Pacific congener, *T. margarita*, by its unique dentition on the inner margin of the cheliped pollex, which is armed with a blunt proximal lobe and a row of small teeth, the two distal ones being conspicuously the largest (Figs. 2D; 3A–B). The pollex dentition of *T. margarita* consists of very small teeth, all of similar size (Fig. 6A–B).The morphology of the female on which Hendrickx based the upper Gulf of California record of *T. orcutti* concurs with *T. margarita* instead of *T. orcutti*. *Tumidotheres orcutti* species is restricted to Tres Marías Islands, Nayarit, Mexico. Glassell (1938) pointed out

some remarkable variations of the third maxilliped of *T. orcutti* that need to be taken into account during future identifications of this species. In particular, he noted that in one specimen of Tenactatlita Bay, Jalisco, the dactyl of the right and left sides were asymmetrical in length, with that of the right extending considerably past its propodus, whereas that of the left was short of its propodal apex. This appears to be the first record of an asymmetry in the third maxilliped in the Pinnotheridae. It is unknown whether this is a normal variation or a developmental aberration. Some sexual differences in the shape of the male and female propodi were also noticed. In both sexes this article is subtrapezoidal (Figs. 2 A-B; 3 C-D; 4 A), but in the male the distal dorsal margin is subacute instead of gently rounded as in the female. We consider that the subtriagular shape recorded by Glassell (1938) and earlier by Rathbun (1918) for males refers to the distal tip and not the propodus as a whole, which is clearly subtrapezoidal in both sexes. Glassell (1938) also pointed out that the shallow right-angled indentations on either side of the sixth abdominal segment present in the male holotype of *T. orcutti*, as well as in the adult male of *T. margarita* (Fig. 6C), were absent in a male from Maria Madre I. This specimen was unavailable for study, but the lack of abdominal indentation, which is always present in adult males, suggests that this specimen is a subadult male or a female in prehard or hard stage possessing a masculine habitus and can only be distinguished from males by the absence of gonopods (see Campos 1989, 2013).

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