

THE RIVER CRABS OF COSTA RICA, AND THE SUBFAMILIES OF THE PSEUDOTHELPHUSIDAE

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ABSTRACT

The Costa Rican river crabs of the family Pseudothelphusidae are reviewed and their gonopods described. Two subfamilies are recognized in the family Pseudothelphusidae; the new subfamily **Epilobocerinae** for *Epilobocera*, and Pseudothelphusinae for the remaining four genera. *Epilobocera fuhrmanni* is a *Pseudothelphusa*. New subgenera proposed for *Pseudothelphusa* are: **Achlidon**, for *P. agrestis*; **Allacanthus**, for *P. pittieri*; **Megathelphusa**, for *P. magna* and *P. richmondi*; **Ptychophallus**, for *P. tristani*, *P. montana*, *P. tumimanus*, *P. exilipes*, and *P. xantusi*. *P. convexa* is relegated to the synonymy of *P. montana*.

I. INTRODUCTION

The American river crabs are an important component of the fauna of tropical fresh waters. There are numerous species, most of which have restricted ranges. Taxonomically, the river crabs have been neglected in spite of the many interesting systematic and zoogeographic problems posed by them. Most of the Pseudothelphusidae were described by Rathbun, who also produced the most recent monograph of the family (Rathbun, 1905). Since that time, studies have been sporadic, usually incidental to other research, or included in faunistic papers. Furthermore, earlier students did not recognize the importance of the male pleopods (gonopods) in classification. Rathbun was inconsistent in the use of gonopod characters. Sometimes she provided good figures, but at other times she ignored the gonopods, even when the description was based on a male.

Rathbun was well aware of the inadequacy of using the carapace for taxonomic distinctions in the genus *Pseudothelphusa*, and also realized the specific distinctiveness of the gonopods, but nevertheless chose to base her keys and descriptions on non-gonopodal features. As a result, many descriptions are based on females, although species of *Pseudothelphusa* should never be described from females alone. Even if a species can be distinguished without using the gonopods, its relationships to other species and genera will remain unknown if this practice is followed.

In this paper, the five genera of the Pseudothelphusidae are divided into two subfamilies and the Costa Rican *Pseudothelphusa* into subgenera on the basis of gonopod structure. In addition, supplementary descriptions are given for the Costa Rican species.

There are types of all the Costa Rican species in the U. S. National Museum.

II. COLLECTION LOCALITIES

Since most of the Pseudothelphusidae have restricted ranges, the localities where they are collected assume considerable importance. All of the Pseudothelphusidae known from Costa Rica were described by Rathbun (1893, 1896, 1898), from specimens provided by various collectors. The locality data supplied by these collectors are inadequate, usually including the name of the nearest village or town and the altitude, but never the province. Since finding the localities where these collections were made

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proved to be a difficult task, the results of my search are listed below. Sr. Don Salvador Jiménez-Canossa was most helpful in resolving difficult problems. The gazetteer by Selander and Vaurie (1962) is very useful, and would have greatly lightened my task had it been available sooner.

Aguabuena. Puntarenas Prov., near the Panamanian border, 8° 44' N, 82° 56' W.

Boruca. Puntarenas Prov., 9° 01' N, 83° 21' W.

Cachí. Cartago Prov., 9° 49' N, 83° 48' W.

Cariblanco. Heredia Prov., 10° 10' N, 84° 10' W.

Chemin de Carrillo. Junction of San José, Cartago, and Limón Provinces, 10° 10' N, 83° 57' W.

El Coronel. Border of San José and Cartago Provinces, on the Rio Sucio, 10° 7' N, 83° 55' W.

Java. Selander and Vaurie list a "Quebrada de Java," Puntarenas Prov., 8° 52' N, 83° 01' W.

La Palma. There are several "La Palmas" in Costa Rica. According to the altitude of 1500 meters, the one cited by Rathbun is probably Alto La Palma, San José Prov., 10° 03' N, 83° 58' W.

Pacaca, Rodeo. Pacaca is an older name for Villa Colon: Rodeo is probably the name for a farm or ranch. San José Prov., 9° 56' N, 84° 16' W.

Palmar. Palmar Norte or Palmar Sur, Puntarenas Prov., 8° 57' N, 83° 27' W.

Pozo Azul. Guanacaste Prov., 10° 12' N, 84° 56' W.

Rio Maria Aguilar. A tributary of the Rio Virilla, probably near the city of San José, San José Prov., 9° 56' N, 84° 05' W.

Rio Torres. Also a tributary of the Rio Virilla, probably near San José (see previous item).

San Carlos. A region, or district, in Alajuela Province, drained by the Rio San Carlos.

Santa Clara Jiménez. Heredia Prov., 10° 13' N, 83° 43' W.

Santa Domingo, Gulf of Dulce. Puntarenas Prov., 8° 32' N, 83° 17' W.

Surubres, near San Mateo, Alajuela Prov., 9° 56' N, 84° 30' W.

La Flor, Torito. Cartago Prov., 9° 53' N, 83° 50' W.

III. KEY TO THE SPECIES OF COSTA RICAN PSEUDOTHELPHUSIDAE

The following key is based principally on gonopod morphology. There are no fundamental differences between the gonopods of *Pseudothelphusa* and *Potamocarcinus*, and the gonopod characteristics of *Potamocarcinus* included in the key should not be considered of generic importance. Terminology follows Smalley (1964).

1. Antero-lateral teeth of carapace large and spiniform; ventral border of front of carapace not visible from above; marginal process of gonopod extending beyond apex.
 - *Potamocarcinus nicaraguensis*
 - Antero-lateral teeth small or minute; ventral margin of front visible from above; marginal process of gonopod, when evident, not extending beyond apex. *Pseudothelphusa* 2
2. Tip of gonopod not folded, apical spines pointing apically; gonopod simple in structure.
 - *Pseudothelphusa (Achlidon) agrestis*
 - Tip of gonopod folded; at least some of the apical spines pointing cephalad 3
3. Patch of well-defined, short, sub-apical spines on cephalic surface of gonopods, in addition to apical spines.
 - *Pseudothelphusa (Allacanthus) pittieri*
 - Apical spines only 4
4. Large mesial tooth near apex of gonopod; shaft without broad lateral process. Subgenus *Megathelphusa* 5
 - Apical part of gonopod broad, joined to rest of gonopod by narrow peduncle; usually with broad lateral processes. Subgenus *Ptychophallus* 6
5. Marginal process of gonopod curving laterad, ending at tip of gonopod.
 - *Pseudothelphusa magna*
 - Marginal process curving mesiad, ending just short of tip of gonopod.
 - *Pseudothelphusa richmondi*
6. Lateral subapical process of gonopod not broad, not exceeding apical process; mesial process subapical.
 - *Pseudothelphusa xantusi*
 - Lateral subapical process broad, exceeding apical process 7
7. Mesial apical process of gonopod broad, hatchet-shaped.
 - *Pseudothelphusa tristani*
 - Mesial apical process narrow, finger-like 8

8. Lateral subapical process of gonopod not bilobed.
 ----- *Pseudothelphusa exilipes*
- Lateral subapical process bilobed ----- 9
9. Mesial apical process of gonopod, seen in marginal view, nearly as long as lateral apical process; proximal lobe of subapical process sub-acute. Small species.
 ----- *Pseudothelphusa montana*
- Mesial subapical process much shorter than lateral process; proximal lobe of subapical process broadly rounded. Large species.
 ----- *Pseudothelphusa tumimanus*

IV. SYSTEMATIC ACCOUNT

Most of the specimens on which this account is based were collected by me in Costa Rica during the summer of 1962, and were identified by comparison with types in the U. S. National Museum. Specimens from the U. S. National Museum are indicated by the initials USNM. The drawings of *Epilobocera cubensis* are from a specimen borrowed from the Museum of Comparative Anatomy, Harvard University. All other specimens are at Tulane University.

Measurements, where given, are for greatest carapace width and median carapace length in millimeters, of the largest male examined. Immature males too small to be identified with certainty are simply included with the large males in the same collection and listed as "imm.". Some question of identity applies to any female *Pseudothelphusa*, and they also are grouped with the identified males. Specimens so small that the pleopods are not developed are designated "imm.". A number of collections did not include any identifiable specimens and are omitted. Figures in parentheses indicate the altitude in meters. Localities are in Costa Rica unless otherwise specified.

Synonymies are given only if the species has been mentioned by anyone other than Rathbun (1896, 1898, 1905), and Young (1900).

Pseudothelphusa tuberculata Rathbun is omitted from this account. There is a female from Boruca, in the U. S. National Museum, determined by Rathbun, but I believe that this is an erroneous identification, and that the range of *P. tuberculata* should be restricted to Guatemala. The same remarks

apply to a female *Pseudothelphusa venezuelensis* Rathbun from La Palma.

In the illustrations of the gonopods, the caudal surface is always oriented so that the margin can be identified as a line extending the length of the gonopod, with a proximal tuft of setae. The cephalic surface is oriented so that at least some of the apical spines point directly toward the observer. In most Costa Rican species, the apical spines are directed cephalad, although this is not the case with many, if not most, *Pseudothelphusidae*. Most gonopods are more or less flattened caudocephalad, but the drawings of the caudal and cephalic surfaces are not necessarily at 180 degrees, so the gonopod may appear broader in one view than in the other. A standard orientation for gonopod drawings is desirable because figures of complex gonopods are difficult to compare if they are drawn from different sides. Best results are obtained if the right gonopod is removed from the crab for examination, and subsequently kept in a small cotton-stoppered vial in the jar with the crab.

The Subfamilies of the Pseudothelphusidae

Bott (1955) divided the old family Potamonidae into the three families Potamonidae, *Pseudothelphusidae*, and *Deckiniidae*, and his arrangement is adopted here, although with some reservations. All the American river crabs, except the genus *Trichodactylus* Latreille, 1825, belong in the family *Pseudothelphusidae*, which is restricted to the New World.

The relationships among the genera of the *Pseudothelphusidae* have undergone various treatments in the past as summarized by Colosi (1920). Gonopod morphology has not been used in previous classifications at the generic level, even though some carcinologists, notably Alcock (1910), Colosi (1920), and Bott (1955), have recognized the importance of the gonopods in distinguishing the *Pseudothelphusidae* from other river crabs. The *Pseudothelphusidae* can be divided into two readily distinguishable subfamilies on the basis of gonopod structure alone.

Pseudothelphusinae Ortmann, 1893

Pseudothelphusidae with gonopods armed at the tip with a group of apical spines, concentrated in a distinct area at the aperture of the sperm channel. Type genus, *Pseudo-*

thelphusa de Saussure, 1857. Other genera; *Potamocarcinus* H. Milne-Edwards, 1853; *Rathbunia* Nobili, 1896, and *Typhlopseudothelphusa* Rioja, 1952.

Epilobocerinae, new subfamily

Pseudothelphusidae with gonopods armed at the tip with both a patch of apical spines at the aperture of the sperm channel, and also with large, scattered spines. Type and only genus, *Epilobocera* Stimpson, 1860.

The difference between the gonopods of the two subfamilies can readily be seen by comparing *Epilobocera cubensis* Stimpson, 1860 (Figs. 16-17) with any *Pseudothelphusa*. Zimmer (1914) described a river crab from Columbia and placed it in *Epilobocera* on the basis of non-gonopodal structures. Fortunately, Zimmer provided good illustrations of the gonopod, which clearly show that *Epilobocera fuhrmanni* Zimmer should be *Pseudothelphusa fuhrmanni* (Zimmer).

Genus *Potamocarcinus* H. Milne-Edwards
1853

Potamocarcinus nicaraguensis Rathbun
Rathbun, 1893, p. 656; Colosi, 1920, p. 17; Smalley, 1964, p. 29.

Specimens examined: Trinidad, Heredia Prov., border between Costa Rica and Nicaragua; 1 May 1960; 2 ♀♀.—Resguardo, Guanacaste Prov., near Nicaraguan border; 7 Feb. 1960; 4 ♂♂.

Margin of gonopod straight; caudal process prominent, extending well beyond apex; a prominent mesial apical tooth; two smaller, spiniform, cephalic teeth placed close together; without lateral setae.

This species can be distinguished in the field from all other Costa Rican Pseudothelphusidae by the prominent spiniform anterolateral teeth of the carapace. If I had only the gonopod before me, I would place this species in *Pseudothelphusa* (*Megathelphusa*). A large species, found in lakes, rivers, and streams in Nicaragua and Costa Rica. Largest female examined by Rathbun, 95 x 60.1; largest Tulane male, 75.1 x 45.1.

Genus *Pseudothelphusa* de Saussure, 1857

Rathbun made two subgeneric divisions of the large genus *Pseudothelphusa*, one based on gonopod structure (1898, p. 513), the other mostly on structure of the carapace, third maxillipeds, and chelae (1905, p. 27

ff.). The two arrangements result in different classifications, but neither was formally proposed, and there are at present no subgenera recognized for *Pseudothelphusa*. Rathbun's grouping according to gonopod structure is, in my opinion, the more satisfactory of the two. A number of changes must be made in Rathbun's gonopod groups, but for the Costa Rican *Pseudothelphusa*, only the following changes are necessary: (1) remove *P. pittieri* from Group 1, and erect for it a monotypic subgenus, (2) add *P. exilipes* to Group 2, and (3) remove *P. agrestis* from Group 6 and erect for it a monotypic subgenus.

The phylogeny, evolution, and zoogeography of *Pseudothelphusa* cannot profitably be studied without a subgeneric classification, for which the most satisfactory criteria are gonopod characters. Subgenera are therefore proposed for the Costa Rican *Pseudothelphusa*. Subgenera can similarly be erected for other species groups of *Pseudothelphusa*, but a large number of unresolved taxonomic problems prevent further extension of the classification at this time.

Achlidon, new subgenus

Gonopod simple in structure, curving mesiad, with expanded apex. Blunt, mesial subapical tooth the only process. Apical spines directed apically, apex without folds. Margin curving mesiad, emerging near cephalic surface. Type and only species, *P. agrestis*. *Achlidon* (masc.)—unornamented.

Pseudothelphusa (*Achlidon*) *agrestis*
Rathbun, 1898

Specimens examined: La Flor, near Torito, Cartago Prov., 1 ♂, 1 ♀, the types (USNM). Illustrated by Rathbun (1898, p. 515). The shape of the gonopod is quite different from the other species in Rathbun's Group 6.

Allacanthos, new subgenus

Gonopod and margin straight, apex folded, sperm channel emerging on cephalic surface. With a blunt, mesial, apical lobe, and a small, sharp, apically directed lateral lobe bearing sparse apical spines. Cephalic and lateral surfaces with well defined area of small regularly spaced spines; row of scattered spines on mesial surface of shaft. Type and only species, *P. pittieri*. *Allacanthos* (fem.)—other spines.

Pseudothelphusa (Allacanthos) pittieri

Rathbun, 1898

(Figs. 1-3)

Specimens examined: Agua Buena, Puntarenas Prov.; 2 ♂♂, 1 ♀, the types (USNM).

A small species (19.1 x 11.9), with the characters of the subgenus. A small tubercle at the base of the moveable finger of the chela is distinctive. Rathbun thought the gonopod of *P. pittieri* to be similar to those of a group of Mexican and West Indian species (Group 1), but in fact it is unique.

Megathelphusa, new subgenus

Gonopod with large mesial tooth, visible in both cephalic and caudal aspects, and two smaller cephalic teeth, varying in position and shape. Marginal process not extending beyond apex, sperm channel emerging from beneath fold of tip of gonopod. Apical spines small, facing partly apically, partly cephalad. Setae prominent, particularly mesial setae. Two tubercles at base of moveable finger of chelae, forming long area which is light-colored in fresh specimens. Type-species, *Pseudothelphusa magna*; other species, *P. richmondi*. *Megathelphusa* (fem.)—large river crab.

Rathbun separated *P. richmondi* and *P. magna* by the characters of the chelae, stating that the tubercle at the base of the fingers is lacking in *P. richmondi*, but in fact the two species have very similar chelae. Both species of *Megathelphusa* are widely distributed, in contrast to most Costa Rican Pseudothelphusidae.

Pseudothelphusa (Megathelphusa) magna

Rathbun, 1896

Holthuis, 1954, p. 33; Bott, 1956, p. 230; Smalley, 1964, p. 29.

Specimens examined: 11.5 mi. NNW Liberia, Guanacaste Prov.; 9 Feb. 1960; 1 ♂, 1 ♀.—Rio Virilla, 2 mi. W San José, San José Prov.; 11 Feb. 1960; 1 ♂.—Same locality; 24 Jan. 1961; 2 ♂♂, 1 ♀, 1 imm. ♂.—Rio Irigaray, on Pan Am Highway, Guanacaste Prov.; 21 Jan. 1961; 1 ♀.—Rio Las Vueltas, E of Nicaraguan border, Guanacaste Prov.; 21 Jan. 1961; 1 ♂, 1 ♀, 1 imm. ♂.—Small stream, E bank Rio Grande de Tárcoles, 3 mi. E Atenas, Alajuela Prov. (580 m); 11 July 1962; 3 ♂♂, 3 ♀♀, 1 imm.—Small stream, 0.3 mi. S above locality; 11 July 1962; 3 ♂♂, 1 ♀, 3 imm. ♂♂.—Rio

Ciruelas, 0.2 mi. S RR crossing at Ciruelas, Alajuela Prov. (800 m); 20 July 1962; 4 ♂♂, 4 ♀♀, 2 imm.

Two cephalic teeth not separate, consisting of two teeth of single medially directed process. Gonopods similar to illustrations by Holthuis and Bott; some variation shown by mesial apical process.

P. magna is one of the largest species of Pseudothelphusidae, although no one has reported another specimen of the heroic size of one of Rathbun's syntypes (135 x 84); the largest Tulane male is 86.5 x 52.3. The specimens from Ciruelas were under large rocks in a nearly dry gully, and were found in pairs, probably copulating. Known from Costa Rica to Guatemala.

Pseudothelphusa (Megathelphusa) richmondi

Rathbun, 1893

(Figs. 4-6)

Nobili, 1897, p. 3 (but the same specimens listed by Colosi, 1920, p. 20, as *P. sp.*); Boone, 1929, p. 567.

Specimens examined: Tributary of Rio Escondido, 50 mi. from Bluefields, Nicaragua (probably near the town of Rama); 1 ♂, the holotype (USNM).—1.1 mi. N Turrialba, Cartago Prov. (600 m); 18 July 1962; 9 ♂♂, 15 ♀♀, 3 imm. ♂♂.

Cephalic teeth uneven in size, proximal twice size of distal, more pointed. Setae prominent, particularly mesial setae. Row of short setae on cephalic surface just below apical spines. Smaller than *P. magna*; holotype, 49 x 32.5; largest Tulane male, 62.7 x 40.6.

The Costa Rican specimens were found in a coffee plantation on a wet hillside. Ditches had been dug to drain seepage from the field, and the crabs were burrowing into the sides of the ditches. *P. richmondi* is known from Nicaragua to Panama.

Ptychophallus, new subgenus

Gonopod with expanded tip connected to shaft by narrow peduncle. Lateral process of apical expansion larger than mesial, bearing apical spines; mesial process either narrow and fingerlike, or broad and hatchet-shaped. Most species with very broad subapical lateral process, usually bilobed. Apical spines directed cephalad. Marginal process folded cephalad, not projecting beyond apex. Without marginal setae; lateral setae usually short, scattered; marginal and caudal setae present.

Type-species, *Pseudothelphusa tristani*. Other species: *P. montana*, *P. tumimanus*, *P. exilipes*, and *P. xantusi*. *Ptychophallus* (masc.)—folded gonopod. *P. tristani* is chosen as the type because it is common, easily recognized, and fairly typical. *Pseudothelphusa colombiana* Rathbun, 1893, from Panama and Mexico, should be placed in this subgenus on the authority of Rathbun (1893). Through an oversight, I did not examine the specimens in the U. S. National Museum on which Rathbun's description was based. The only other record of this subgenus outside of Costa Rica is an erroneous one for *P. xantusi* from La Guayra, Venezuela.

Pseudothelphusa (Ptychophallus) tristani
Rathbun, 1896
(Figs. 7-8)

Specimens examined: La Mina, Rio Torres, San José Prov.; 1 ♂, the holotype (USNM).—1 mi. NW Tabarcia, San José Prov.; 20 June 1962; 2 ♂♂, 5 ♀♀, 3 imm. ♂♂.—same locality; 17 July 1962; 9 ♂♂, 9 ♀♀, 1 imm. ♂, 3 imm.—2 mi. S. Villa Colon, San José Prov.; 29 June 1962; 2 ♂♂, 7 ♀♀.—same locality; 4 July 1962; 1 ♂, 3 ♀♀, 6 imm. ♂♂.—3 mi. E. Atenas, Alajuela Prov. (580 m); 7 July 1962, 4 ♂♂, 5 ♀♀, 1 imm.—0.5 mi. S Cebadilla, Alajuela Prov.; 11 July 1962; 6 ♂♂, 9 ♀♀ (1 ovigerous), 6 imm. ♂♂, 2 imm.—2.7 mi. S El Roble, Heredia Prov. (1200 m); 13 July 1962; 2 ♂♂, 1 ♀.—2.5 mi. NE Santiago Puriscal, San José Prov., 17 July 1962, 26 ♂♂, 16 ♀♀, 4 imm. ♂♂.—0.8 mi. W Piedades, San José Prov.; 26 July 1962; 12 ♂♂, 26 ♂♂, (4 with small crabs on abdomen), 6 imm. ♂♂.

Only *Ptychophallus* with mesial apical lobe broad and hatchet-shaped. Proximal process of subapical lobe small, setae sparse. Fingers of larger chelae gaping in largest males, closed tightly in smaller males.

Abundant in the hills and mountains south of San José. *P. tristani* is more terrestrial than *P. tumimanus* or *P. montana*. Typically, *P. tristani* is found under rocks or logs at the edge of streams, or even some distance from the stream edge. A cavity under the rock or log, filled with water, forms part of the crab's burrow.

Pseudothelphusa (Ptychophallus) montana
Rathbun, 1898
(Figs. 9-10)

P. convexa, Rathbun, 1898.

Specimens examined: Alto La Palma, San José Prov.; 2 ♂♂, 2 ♀♀, the types (USNM).—Palmar, Puntarenas Prov., 1 ♂, holotype of *P. convexa* (USNM).—0.6 mi. S. Alto La Palma, San José Prov.; 9 July 1962; 2 ♂♂, 2 ♀♀, 0.2 mi. S Alto La Palma; 9 July 1962; 2 ♂♂, 3 ♀♀, 2 imm. ♂♂.—Rio Honduras, 3.0 mi. N continental divide, San José Prov.; 9 July 1962; 9 ♂♂.—11 mi. NE Turrialba, Cartago Prov. (770 m); 6 July 1962; 4 ♂♂, 5 ♀♀, 6 imm. ♂♂.—same locality; 21 July 1962; 13 ♂♂, 14 ♀♀, 17 imm. ♂♂.—4 mi. E La Suiza, Cartago Prov.; 18 July 1962; 1 ♂, 2 ♀♀, 1 imm. ♂.

Similar to *P. tumimanus* and *P. exilipes*. Medial process of gonopod long, slender. Subapical lateral process bilobed, proximal lobe acutely angled, caudal surface with distinct depression between lobes. Small species (30.9 x 18.1).

Rathbun (1898) gave a confusing account of *P. montana* and *P. convexa*. The only distinct difference between the types is that the two subapical lateral lobes of *P. montana* are not so distinct, the more proximal lobe not so acute, and the depression between the two lobes on the caudal surface more shallow. However, her figures (1898, p. 516 and p. 526) show the opposite, that is *P. montana* with a deep depression on the caudal surface. Since the gonopods of the material examined by me vary in the shape of the subapical lateral lobes and degree of concavity of the caudal surface, *P. convexa* should be considered a synonym of *P. montana*. The name *P. montana* is chosen in preference to *P. convexa* because the specimens studied and illustrated in this work are from the type locality of *P. montana* and from the surrounding region.

The lack of females from Rio Honduras is due to the mixture of *P. tumimanus* and *P. montana* in the collection, and the difficulty of distinguishing the females. All the females were arbitrarily assigned to the more common *P. tumimanus*.

Found in streams, and under boards at an abandoned sawmill (northeast of Turrialba).

Pseudothelphusa (Ptychophallus) tumimanus
Rathbun, 1898
(Figs. 11-12)

Specimens examined: Cachí, Cartago Prov., 1 ♂, the holotype (USNM).—2 mi. S Cariblanco, Heredia Prov. (1200 m); 25 June 1962; 3 ♂♂, 7 ♀♀, 1 imm.—same locality, 28 June 1962, 4 ♂♂, 5 ♀♀ (2 with juveniles on abdomen), 2 imm. ♂♂.—same locality; 14 July 1962; 10 ♂♂, 5 ♀♀.—Rio Honduras, 3.0 mi. N continental divide, San José Prov.; 9 July 1962; 16 ♂♂, 31 ♀♀, 16 imm. ♂♂, 5 imm.—1.2 mi. SE El Roble, Heredia Prov. (1300 m); 13 July 1962; 1 ♂, 1 imm. ♂.

Lateral subapical process relatively larger than in other species of subgenus, tapering more gradually proximally, with scalloped border, and with short, heavy setae scattered along proximal part of lateral process.

A large species for the subgenus (Tulane, 60.3 x 35.7; holotype, after Rathbun, 70.2 x 42.2). Most specimens, and all the larger ones, were found in streams under rocks, or moving freely on the bottom.

Both *Temnocephala* and *Branchiobdellidae* were found on *P. tumimanus*, but they were mutually exclusive; the *Temnocephala* occurred on the population near Cariblanco, and the *Branchiobdellidae* on the crabs from Rio Honduras. The two populations are separated by about 18 miles of very rugged mountains. Hobbs and Villalobos (1958) report both groups of commensals occurring together on *Pseudothelphusa lamellifrons* Rathbun, 1893.

Pseudothelphusa (Ptychophallus) exilipes
Rathbun, 1898
(Figs. 13-14)

Specimens examined: Santa María de Dota, San José Prov.; 2 ♂♂, 4 ♀♀ (USNM).

Mesial apical lobe of gonopod downturned, more proximal than in *P. montana*; rounded distal lobe formed from margin at apex. Marginal and caudal setae prominent, individual setae long; long, scattered setae on lateral surface proximal to widest part of subapical lobe. Apical spines restricted to distal part of "patch".

The holotype of *P. exilipes* is a female from El Coronel. The present description and illustrations are based on a male from Santa María de Dota, about 51 kilometers from El Coronel, and identified with the

type by Rathbun. Males from the type-locality would be very valuable. Collecting six miles from El Coronel yielded specimens only of *P. tumimanus* and *P. montana*. Similar problems of confirming the identity of female types are common in the *Pseudothelphusidae*.

Pseudothelphusa (Ptychophallus) xantusi
Rathbun, 1893
(Fig. 15)

Nobili, 1897, p. 3; Colosi, 1920, p. 19 (in the synonymy of *P. fossor*).

Specimens examined: Boruca, Puntarenas Prov.; 3 ♂♂, 1 imm. (USNM).

Without mesial apical lobe, the lobe placed subapically instead. Lateral subapical lobes poorly developed.

Although *P. xantusi* is a rather aberrant member of the subgenus, the folded tip bears the apical spines exactly as in other species of *Ptychophallus*, and the lateral subapical lobes are typical in their shape and position, although not nearly as broad as in the other species.

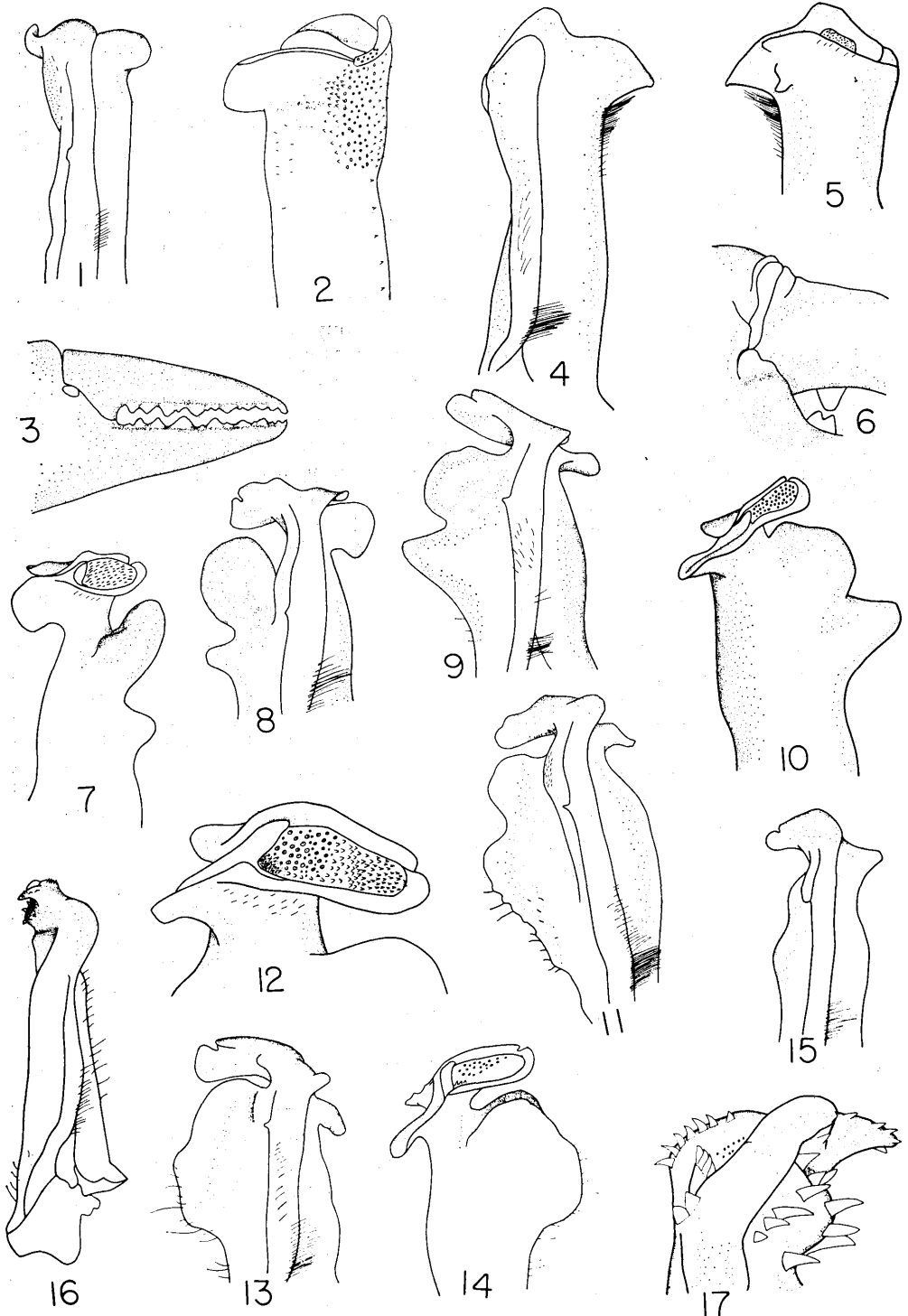
The holotype of *P. xantusi* is a female, locality unknown, but probably from Mexico, and almost certainly not from Costa Rica. In my opinion this species will eventually have to be declared a *species dubia* and a new name assigned to the distinctive species from Boruca. However, judgment should be deferred until the river crabs of Mexico are much better known.

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Explanation of the Figures

Right gonopods (usually distal portion only) and chelae of Costa Rican Pseudothelphusidae. 1-3, *Pseudothelphusa pittieri*; 4-6, *P. richmondi*; 7-8, *P. tristani*; 9-10, *P. montana*; 11-12, *P. tumimanus*; 13-14, *P. exilipes*; 15, *P. xantusi*; 16-17, *Epilobocera cubensis*. Drawn to different scales.

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