

FRESH-WATER SHRIMPS (CRUSTACEA, DECAPODA, NATANTIA) OF THE ORINOCO BASIN AND THE VENEZUELAN GUAYANA

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ABSTRACT

Shrimps of the families Sergestidae and Palaemonidae collected in the Orinoco basin, the upper Cuyuní River, and the upper and lower Río Negro, are dealt with in this paper. New records and comments are given for *Acetes paraguayensis*, *Macrobrachium amazonicum*, *M. brasiliense*, *M. jelskii*, *M. nattereri*, *M. surinamicum*, and *Palaemonetes carteri*. Two new palaemonids are described: *Macrobrachium cortezi*, a form related to *M. nattereri*, from several localities in the Orinoco River and upper Río Negro, and *M. aracamuni*, from an altitude of 680 m in the Cerro Aracamuni in the drainage area of the upper Río Negro. Another previously undescribed species of *Macrobrachium* is recorded but not named due to the lack of mature males.

The Guayana highland is an ancient land mass extending from the Amazon River to the Atlantic coast of South America and includes the Guianas and parts of Venezuela and Brazil. The Venezuelan Guayana comprises 41,300 km² of territory, mostly above 400 m that separate the Orinoco from the Amazon basin and forms a formidable barrier to the dispersion of the fresh-water fauna of the lowlands. The hydrology of the zone is defined by the Orinoco River that bounds the area to the west and north and its tributaries that generally flow north or northwesterly. A smaller portion to the east is drained by the Cuyuní River. The Orinoco and the Amazon basins are connected through the Brazo Casiquiare, while the inundated savannah of Rupununi allows intermittent connections between the Branco and the Esequibo Rivers (Lowe-McConnell, 1964). There is no fresh-water continuity between the Orinoco and the Cuyuní basins.

The fresh-water fauna of the Venezuelan Guayana has been explored superficially, and only along the courses of the main rivers and the few roads now existing in the area. The fresh-water shrimps of the Orinoco River are practically unknown (Rodríguez, 1980, 1981) except for a record of *Macrobrachium amazonicum* (Heller, 1862) in the lower Orinoco and another record of *M. brasiliense* (Heller, 1862) from Villavicencio, Colombia (Holthuis, 1952). *Euatya sculptilis* Koelbel, 1884, later synonymized under *Atya gabonensis* Giebel, 1875, was described from the Orinoco River basin, but its presence there has never been confirmed, although recently Hobbs (1980) recorded this West African species from Brazil.

MATERIALS AND METHODS

Recently an opportunity was afforded me to study several large collections of fresh-water shrimps from localities in the Venezuelan Guayana and the Orinoco basin, as well as a small collection from the Río Negro near Manaus. The areas studied and the respective localities, as represented in Fig. 1, are as follows:

(a) Upper Cuyuní River.—1, Río Botanamo; 2, Río Venamo; 3, Anacoco Island; 4, Road El Dorado-Santa Elena;

(b) Middle course of the Orinoco and its right hand affluents.—5, Ciudad Bolívar; 6, Río Aro; 7, Río Pao; 8, Río Tauca; 9, Río Tucuragua; 10, Río Uyape; 11, Río Cuchivero; 12, Caicara; 13, Puerto Ayacucho; 14, Cerro Autana, 400 m above sea level;

(c) The Orinoco-Río Negro connection.—15, San Carlos; 16, Cerro Aracamuni, 680 m above sea level;

- (d) Lower Río Negro, Brazil—17, Manaus; 18, Igarapé do Veado;
 (e) The Orinoco delta.—19, Curiapo; 20, Guayo; 21, Bahía de Tobejube;
 (f) The Venezuelan "llanos."—22, Río Morichal Largo; 23, Las Mercedes, 220 m above sea level;
 24, Río Tinaco; 25, El Baúl; 26, Río Masparro; 27, Mantecal; 28, Cabruta; 29, San Fernando de Apure; 30, Ticoporo, 230 m above sea level.

The material is deposited in the reference collection of the Instituto Venezolano de Investigaciones Científicas, Caracas (IVIC), and the Museum of the La Salle Foundation, Caracas (LS). The length of the carapace (CL) as used in this paper is measured from its posterior margin to the tip of the rostrum. Notwithstanding that in the species of *Macrobrachium* the second pereopod is twisted when the appendage is extended, and the dactyl of the chela is situated ventrolaterally, in the following descriptions the margin of the chela bearing the dactyl is referred to as "upper" to preserve a standard practice.

Family Sergestidae

Acetes paraguayensis Hansen, 1919

Material.—Río Orinoco near Ciudad Bolívar, to the west of the city; 18.III.1949; A. Fernández Yépez: 1 ♀ (CL 37.9 mm) (LS).—Río Solimoes, Paraná de Janavaca, South of Manaus, Brazil; 17.II.1978: 30 specimens (IVIC).

The specimens from Río Solimoes have on the inner margin of the coxa of the third pereopods the large, acute tooth that Omori (1975) cited as one of the main characters used to separate this species from his *Acetes marinus*, described from the lower Amazon and Surinam. This tooth, although less developed, is also present in my specimen from the Orinoco. *Acetes paraguayensis* has been previously described from the Paraná and Paraguay Rivers in Paraguay and Argentina (Hansen, 1919; Omori, 1975), and from the upper Amazon in Perú (Aldrich, 1962). The present records extend the range of the species to the Middle Amazon River and the Orinoco basin.

Family Palaemonidae

Macrobrachium amazonicum (Heller, 1862)

Material.—Caicara, Río Orinoco, Bolívar State, in the lagoons surrounding the town; 7.IV.1981; E. Ormeño: 68 specimens, including 12 ovigerous ♀♀ (IVIC).—Río Cuchivero, Bolívar State; 7.IV.1981; E. Ormeño: 5 specimens (IVIC).—Río Tucuragua, near La Culebra, Bolívar State; 7.IV.1981; A. E. Esteves: 2 specimens (IVIC).—Río Aro, Bolívar State; 3.I.1950; A. Maurois.—Río Botanamo, 3 km from Río Cuyuní, Bolívar State; 20.VIII.1979; F. Feo (LS).—Curiapo, lower Orinoco delta; 19.XII.1952; J. Poján (LS).—Guayo, lower Orinoco delta; 22.XII.1952; J. Poján (LS).—Las Mercedes, Guárico State, 220 m above sea level; 12.VII.1971; F. Gómez (LS).—Río Tinaco, Cojedes State; 2.IX.1955; F. Fernández (LS).—Río Pao Viejo, NE of El Baúl, Cojedes State; 25.II.1950; A. Fernández (LS).—Río Masparro, Barinas State; 15.IV.1954; A. Fernández (LS).—Mantecal, Apure State (IVIC).

The species is widely distributed in South America; it is known from Venezuela, the three Guianas; the entire Amazon basin in Brazil, Perú, Ecuador, Bolivia, and the Paraná in southern Brazil and northern Paraguay (Holthuis 1966).

Macrobrachium aracamuni, new species

Fig. 2

Material.—Cerro Aracamuni, a tepuy or flat-top mountain, near the Brazilian border, Territorio Federal Amazonas, 680 m above sea level; 10.II.1981: 16 specimens (CL 10.5–19.3 mm) including 1 ovigerous ♀ (CL 16.2 mm) (IVIC).

Description.—The rostrum is straight and moderately high, the tip being curved somewhat upward. It does not reach beyond the end of the antennular peduncle, and sometimes reaches only to the middle of its last joint. The upper margin bears

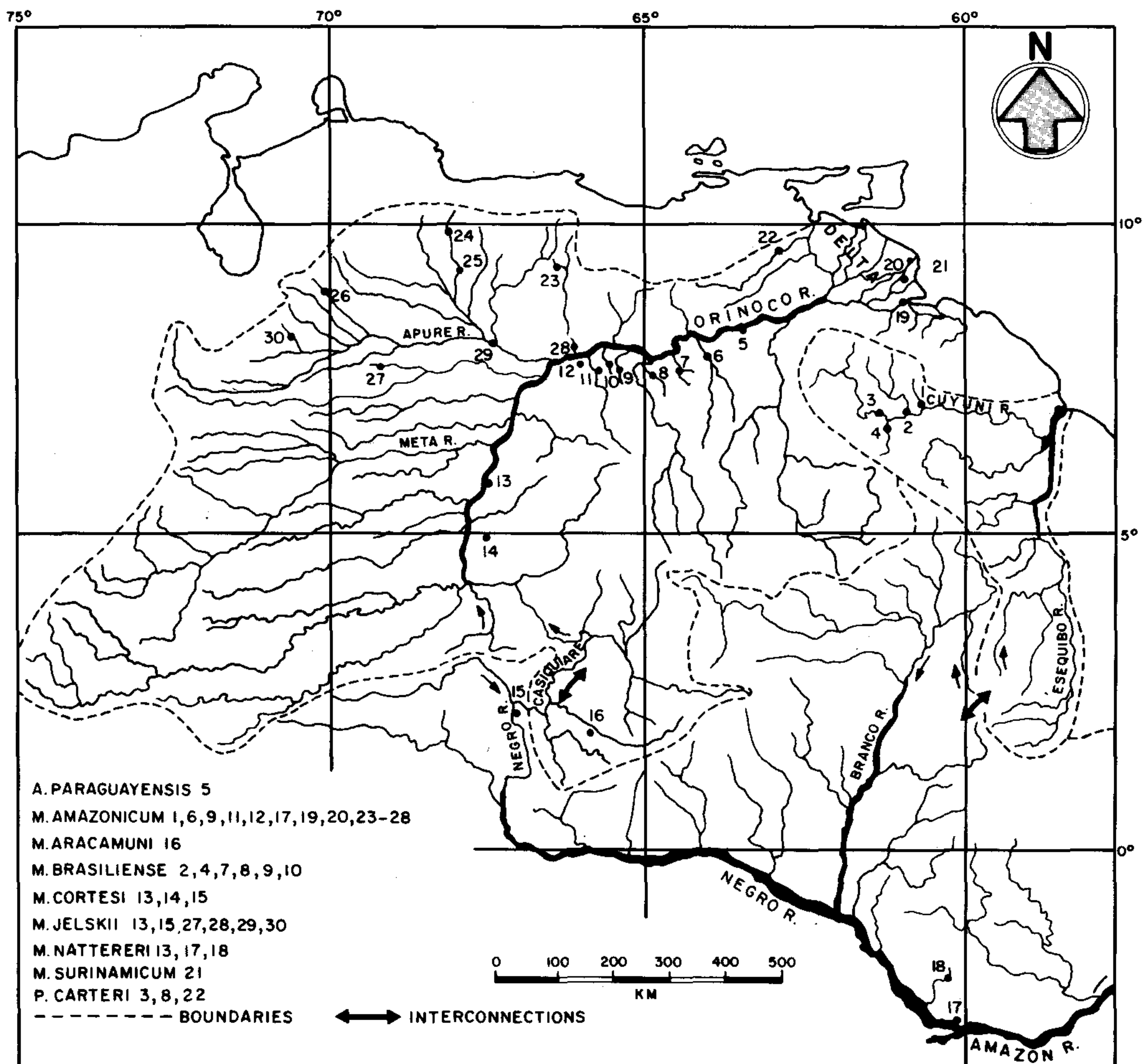


Fig. 1. Map of northern South America, showing the boundaries between the Orinoco, Amazon, and Cuyuni basins, and the locations of the various stations in which fresh-water shrimps were collected.

7-10 teeth, 2 or 3 of which are placed on the carapace behind the orbit. The lower margin bears 2 or 3 teeth. The carapace is smooth.

The abdomen is smooth. The fifth segment ends in an almost rectangular tip. The sixth segment is about 1.5 times as long as the fifth and 0.6 times as long as the telson. The telson is narrow; its ratio of length to width is 3.5:1 (width measured in the middle). The dorsal surface of the telson bears the usual 2 pairs of spines, one at 0.4 and one at 0.7 of its length. The posterior margin is broad and ends in a small median point which is overreached by the inner pair of posterior spines. Numerous feathered setae are present.

The scaphocerite is 2.6 times as long as broad. The outer margin is straight.

The first pereiopods extend with about half the length of the carpus beyond the scaphocerite. The fingers are slightly longer than the palm. The carpus is 1.6 times as long as the chela and 1.3 times as long as the merus. None of the joints of the first legs shows any spine. The second legs are similar in shape but unequal

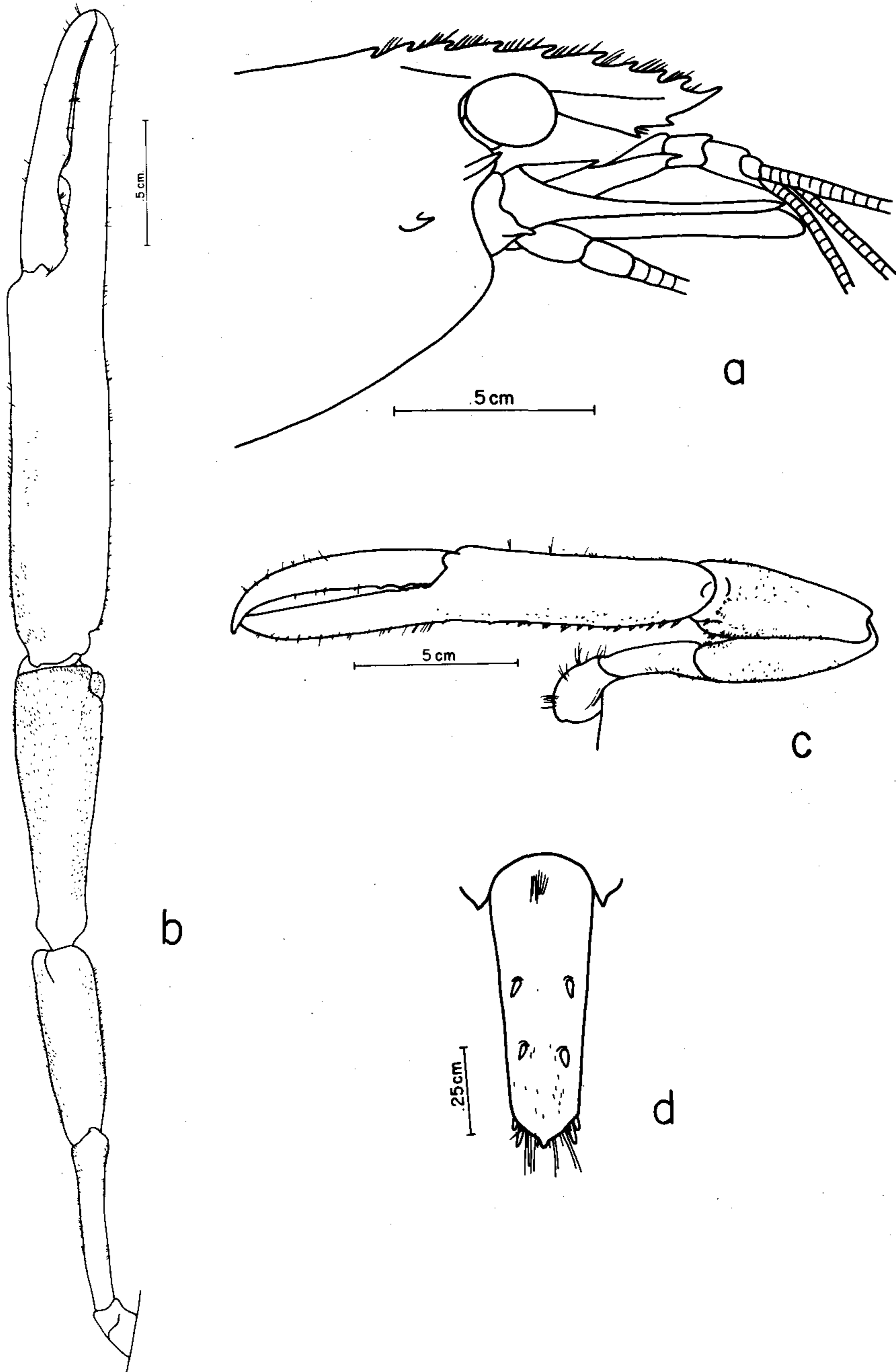


Fig. 2. *Macrobrachium aracamuni*, new species, male holotype, CL 19.3 mm, Cerro Aracamuni, Venezuela: a, anterior part of body, lateral view; b, larger second pereopod; c, smaller second pereopod; d, telson.

in size. The larger extends with part of the merus beyond the scaphocerite. The fingers of the larger chela are about 0.7 the length of the palm. The cutting edge of the dactylus bears 1 large tooth in about the middle; behind this tooth there are 3 or 4 denticles. The fixed finger has the cutting edge provided with 1 large tooth situated at the level behind the large tooth of the dactylus, and 1 smaller tooth proximal to this large one. No tubercles are visible along the cutting edges of the fingers. The palm is slightly compressed and not inflated. The upper and lower margins are subparallel and almost straight. There is no pubescence, and only scattered hairs are visible. The fingers and distal half of the palm are polished and almost devoid of spinulation. The proximal half of the palm has very small spinules. The carpus is 0.7 as long as the palm and 1.5 times as long as the merus. Both merus and carpus bear small spines somewhat larger than those of the palm. The smaller leg extends with the entire carpus beyond the scaphocerite. The fingers are 0.8 as long as the palm. The spinulation is similar to that of the larger leg, but the spines of the lower margin of the palm are larger. The third leg extends with the dactylus beyond the scaphocerite. The propodus is 2.7 times as long as the dactylus, 1.7 times as long as the carpus, and slightly shorter than the merus. The fifth leg fails to reach the end of the scaphocerite. The propodus is 3.3 times as long as the dactylus, 1.6 times as long as the carpus, and somewhat shorter than the merus. No spinules, except those on the posterior margin of the propodus, are present on the last 3 legs.

The pleopods and uropods are normal.

Size.—The carapace length of the largest specimen, an adult male, is 19.3 mm. The carapace length of the only ovigerous female is 16.2 mm. It carried 20 large eggs, measuring 1.6–2.8 mm in diameter.

Types.—The holotype, the largest male of the series, is deposited in the reference collection of the Instituto Venezolano de Investigaciones Científicas, Caracas (IVIC).

Remarks.—*Macrobrachium aracamuni* belongs to the group of inland South American species in which the eggs are large and few. In this group only *M. quelchi* (De Man, 1900), a species known from a locality in the Upper Mazaruni River, possesses such a short rostrum. Both species, however, can be easily separated by the proportions of the larger cheliped and the shape of the chela. The larger cheliped of *M. aracamuni* resembles that of *M. brasiliense* (Heller, 1862) but, at least in the mature male, it is almost devoid of spines.

The material comes from a mountainous area near the Venezuelan-Brazilian border which is not accessible by land. The northern slopes where the collection was made drain to the Brazo Casiquiare.

Macrobrachium brasiliense (Heller, 1862)

Material.—Río Venamo, 5 km upstream from Apanao Rapids, Bolívar State; 18.VIII.1979; D. Taphorn: 2 specimens (CL 14.5, 17.5 mm) (LS).—Road El Dorado-Santa Elena, 88 km from El Dorado, Upper Río Cuyuní basin, Bolívar State; 27.IX.1967: 1 specimen (CL 18.9 mm) (LS).—Same data; 23.II.1980: 2 specimens (CL 24.9, 25.4 mm).—Same data; 91 km from El Dorado; 24.II.1980: 18 specimens (CL 12.9–25.2 mm) including 2 ovigerous ♀♀ (CL 19.9, 20.2 mm).—Same data; 104 kms from El Dorado; 16.IV.1957: 2 specimens (CL 20.5, 23.8 mm).—Río Uyape, near Río Cuchivero, Bolívar State; 7.IV.1981; E. Ormeño: 34 specimens (CL 6.9–22.8 mm) (IVIC).—Río Tucuragua, near La Culebra, Bolívar State; 7.IV.1981; A. Esteves: 14 specimens (CL 5.4–13.4 mm) (IVIC).—Río Tauca, affluent of Río Caura, Bolívar State; 7.V.1981; E. Ormeño: 30 specimens (CL 5.4–15.5 mm) (IVIC).—Río Pao, Bolívar State; 7.IV.1981: 18 specimens (CL 5.4–12.7 mm) (IVIC).

Records of this species are few and scattered over a wide area that covers the upper reaches of the Amazon basin in Ecuador, Perú, and Matto Grosso in Brazil (Holthuis, 1952), the Atlantic drainages of the Guianas: Guyana and Surinam (Holthuis, 1952); Territorio Amapá in Brazil (Gomez Correa, 1977), and the State of Bahia in Brazil. There is a single record in the Orinoco basin in Colombia (Holthuis, 1952).

The material reported here from Río Venamo and the El Dorado road comes from the same basin as the material already known from Guyana. All the specimens from the affluents on the right hand side of the Orinoco (Rivers Uyape, Tucuragua, Tauca, and Pao) are immature (CL 22.6 mm or less) and are therefore referred with doubt to *M. brasiliense*. The rostrum and telson correspond to this species, but the second chelipeds are shorter and more robust than those of *M. brasiliense* of corresponding size, and the spinulation of the lower and upper margin of the chela is more developed, thus resembling the appendages of *M. nattereri*.

Macrobrachium cortezi, new species

Fig. 3

Material.—Gavilán, 30 km SE of Puerto Ayacucho, Río Orinoco; 12.XII.1977: 79 specimens (CL 6.0–23.0 mm), including 5 ovigerous ♀♀ (CL 7.0–14.5 mm) (IVIC).—Same locality; 6.I.1978: 13 specimens (CL 13.0–23.4 mm), including 1 spent ♀.—Carinagua, near Puerto Ayacucho, Río Orinoco; 12.XII.1977: 145 specimens (CL 5.5–20.5 mm) (IVIC).—Same locality; 18.III.1978: 5 specimens (CL 12.5–17.0 mm).—Same locality; 25.IV.1978: 61 specimens (CL 7.0–22.5 mm), including 3 ovigerous ♀♀ (CL 7.5–14.7 mm).—Same locality; 16.V.1978: 19 specimens (CL 9.2–11.5 mm).—Same locality; 3.VIII.1978: 2 specimens (CL 9.5–15.5 mm).—Tobogán, 30 km S of Puerto Ayacucho, Río Orinoco; 17.II.1978: 1 specimen (CL 16.8 mm).—Same locality; 28.IV.1978: 27 specimens (CL 8.5–24.5 mm) including 1 ovigerous ♀.—Same locality; 16.V.1978: 22 specimens (CL 8.2–24.0 mm), including 7 ovigerous ♀♀ (CL 14.0–16.7 mm).—Same locality; 19.IX.1978: 1 specimen (CL 19.0 mm).—Same locality; 6.XI.1978: 2 specimens (CL 24.2–25.4 mm).—Same locality; 15.III.1979: 4 specimens (CL 9.9–15.8 mm).—Culebra, 12 km S of Puerto Ayacucho, Río Orinoco; 17.II.1978: 4 specimens (CL 7.8–14.5 mm).—Raudal Galípero, 45 km N of Puerto Ayacucho, Río Orinoco; 17.II.1978: 5 specimens (CL 15.0–20.2 mm), including 1 ovigerous ♀ (CL 12.5 mm).—Cachama, road from Puerto Ayacucho to Puerto Carreño, Río Orinoco; 20.II.1978: 24 specimens (CL 5.6–16.0 mm).—Orera, road from Puerto Ayacucho to Puerto Carreño; 15.II.1978: 7 specimens (CL 8.8–17.0 mm).—Rueda, 15 km S of Puerto Ayacucho, Río Orinoco; 17.III.1978: 30 specimens (CL 8.0–20.0 mm).—Provincial, 10 km N of Puerto Ayacucho, Río Orinoco; 14.III.1978: 22 specimens (CL 5.5–20.8 mm).—Cerro Autana, 100 km S of Puerto Ayacucho, 400 m above sea level, in a river that discharges to the Orinoco; 11.XI.1977; W. Pérez: 9 specimens (CL 11.4–23.9 mm) including 2 ovigerous ♀♀ (CL 17.5 and 17.7 mm) (LS).—San Carlos de Río Negro, Territorio Federal Amazonas; 131 specimens (CL 4.3–20.7 mm), including 14 ovigerous ♀♀ (CL 9.3–14.4 mm) collected on different occasions through 1979 by Kate Clark (IVIC).

Description.—The moderately high, almost straight rostrum reaches beyond the end of the antennular peduncle, but fails to reach the end of the scaphocerite. The convex upper margin bears 9–11 teeth, regularly placed along the margin, the first 2 or 3 of which are placed behind the posterior orbital margin. The lower margin bears 2 teeth (more rarely 1 or 3). The carapace is smooth. The hepatic spine is less strong than the antennal and is placed obliquely behind it.

The abdomen is smooth. The pleura of the fifth segment have the posterior tip rectangular. The sixth segment is about 1.4 times as long as the fifth and 0.6 times as long as the telson. The telson is short and broad; its ratio of length to width is 2.4:1 (width measured in the middle between the proximal and distal dorsal spines). The dorsal surface of the telson bears the usual 2 pairs of spines. Numerous feathered setae are present.

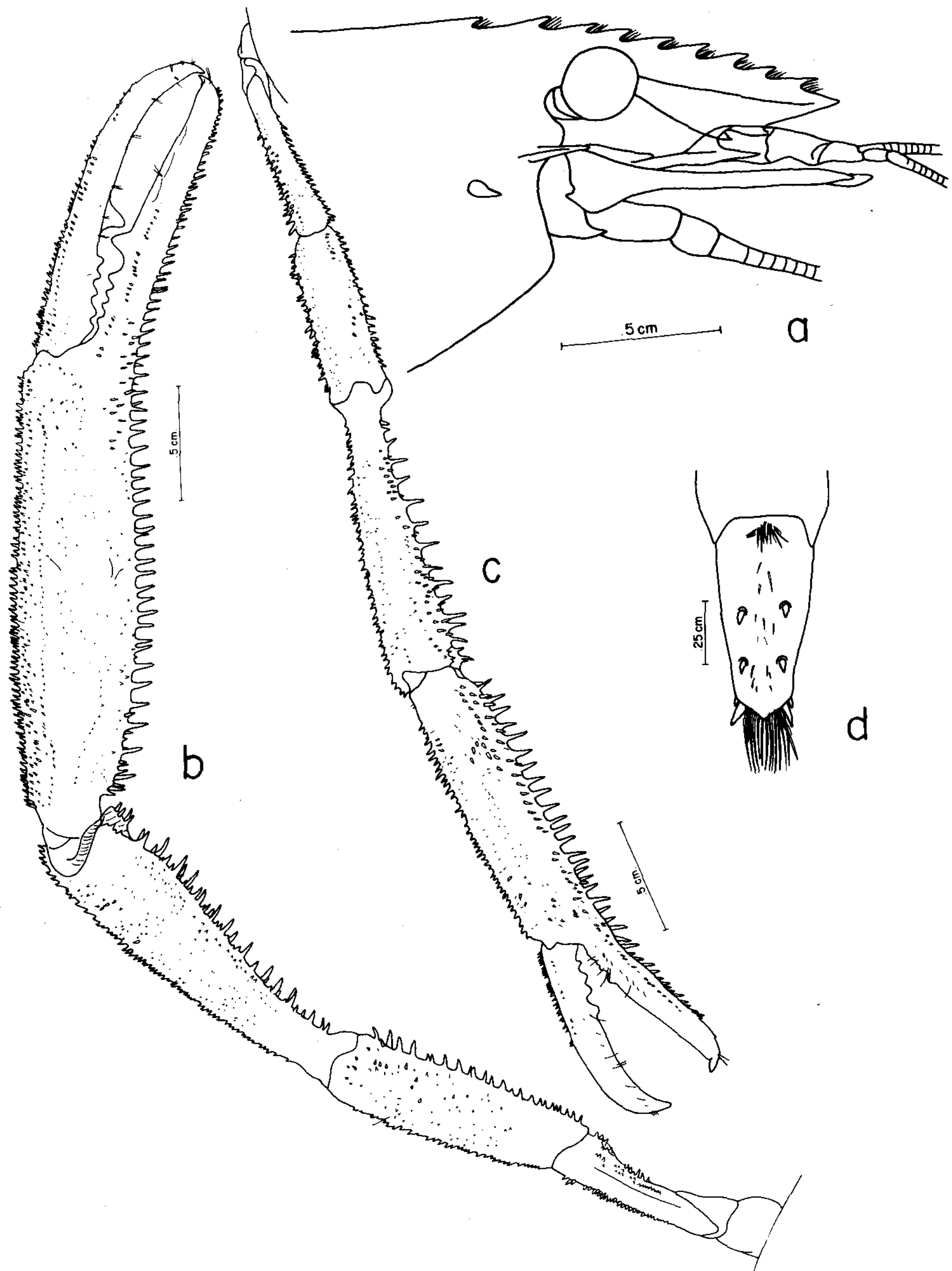


Fig. 3. *Macrobrachium cortezi*, new species, male holotype, CL 24.5 mm, Tobogan, near Puerto Ayacucho, Venezuela: a, anterior part of body, lateral view; b, larger second pereopod; c, smaller second pereopod; d, telson.

The scaphocerite is 2.8 times as long as broad. The outer margin is straight.

The first pereopods extend with about half the length of the carpus beyond the scaphocerite. The fingers are slightly longer than the palm. The carpus is 2.4 times as long as the chela and 1.5 times as long as the merus. None of the joints of the first legs show spinules. The second legs are unequal in size but similar in shape. The larger extends with the entire carpus beyond the scaphocerite. The fingers are about 0.7 times as long as the palm. The fingers in the adult male are slender and curved, gaping thereby. The cutting edge of the dactylus bears a large tooth at about the middle; behind this tooth 2 smaller teeth of equal size are present. The fixed finger has the cutting edge provided with 1 large tooth situated at a level behind the large tooth of the dactylus, and 3 smaller teeth proximal to this larger one. Both fingers have a low longitudinal ridge over the distal half of the cutting edge, ending externally a little before the tips. The upper surface of the dactylus is covered with small spinules; similar spines form an irregular row on the proximal half of the outer surface; only a few scattered spines are visible on the internal surface. The fixed finger bears a row of spines on the lower surface, which are twice as long as those on the upper surface of the dactylus, and scattered spinules on the outer and inner surface. No tubercles are visible along the cutting edges of the fingers. The palm is slightly compressed and not inflated. The upper and lower margins are subparallel and almost straight. There is no pubescence, only scattered hairs are visible. The upper and outer surfaces of the palm are thickly covered with spinules. The lower surface bears a row of larger, regularly spaced spines, about twice as large as those of the upper surface. The inner surface has 4 or 5 obscure rows of spines similar to those of the lower surface. The carpus is 0.7 times as long as the palm and 1.3 times as long as the merus. Both merus and carpus bear small spines on the outer and inner surfaces, and larger spines, obscurely arranged in rows, on the lower surface. The smaller leg extends with part of the carpus beyond the scaphocerite. The fingers are 0.8 times as long as the palm. The cutting edges of both fingers have a larger tooth near the middle followed by 3 or 4 denticles. The spinulation is similar to that of the larger leg. The third leg extends with the dactylus beyond the scaphocerite. The propodus is slightly more than 3 times as long as the dactylus, slightly less than twice as long as the carpus and somewhat shorter than the merus. The fifth leg fails distinctly to reach the end of the scaphocerite. The propodus is 3.5 times as long as the dactylus and 1.8 times as long as the carpus and somewhat shorter than the merus. No spinules, except those on the posterior margin of the propodus, are present on the last 3 legs.

The pleopods and uropods are normal.

In ovigerous females and young specimens the second legs are less strong than those in other mature specimens and have the fingers closing over their entire length. The pair of median teeth is considerably smaller. The spinulation is similar to that of mature specimens, but the rows of larger spines are more clearly defined.

Size.—The carapace length of the largest specimen, an adult male, is 24.5 mm. The carapace length of ovigerous females is 6.0–16.2 mm. The eggs are few (10–20) and large, measuring 2.58–2.83 mm in diameter.

Types.—The holotype is the largest male from Tobogán, near Puerto Ayacucho, Río Orinoco, Venezuela; 28 April 1978. It is deposited in the reference collection of the Instituto Venezolano de Investigaciones Científicas, Caracas (IVIC). Paratypes are deposited at the same collection and at the Museo de Historia Natural La Salle, Caracas.

Remarks.—*Macrobrachium cortezi* belongs to the group of inland South American *Macrobrachium* in which the eggs are large and few. It resembles *M. nattereri* (Heller, 1862), whose geographical area partly overlaps. It differs conspicuously from this latter species in the absence of spinulation on the carapace and in the proportion of the telson. Even the smaller specimens of both species in my collection can be easily separated by the latter character since the ratio of length to width of this segment (width measured in the middle between the proximal and distal dorsal spines) is 2.4:1 in *M. cortezi* and 3.0:1 in *M. nattereri*. The palm of the second legs in adult males is more elongate in *M. cortezi* and the spines of their lower border are relatively larger.

Macrobrachium quelchi (De Man, 1900), a species known only from a locality in the Upper Mazaruni River, also seems related to *M. cortezi*. However, the shape of the rostrum and the proportions of the finger of the larger chela are clearly different.

Macrobrachium jelskii (Miers, 1877)

Material.—Gavilán, 30 km SE of Puerto Ayacucho, Río Orinoco; 12.XII.1977: 27 specimens including 1 ovigerous ♀ (IVIC).—Same locality; 3.V.1978: 35 specimens including 2 ovigerous ♀♀.—Carinagua, near Puerto Ayacucho; 12.XII.1977: 5 specimens (IVIC).—Tobogán, 30 km S of Puerto Ayacucho, Río Orinoco; 16.V.1978: 1 specimen (IVIC).—Raudal Galípero, 45 km N of Puerto Ayacucho, Río Orinoco; 17.II.1978: 4 specimens (IVIC).—Cachama, road from Puerto Ayacucho to Puerto Carreño, Río Orinoco; 20.II.1978: 1 specimen (IVIC).—Provincial, 10 km N of Puerto Ayacucho, Río Orinoco; 14.III.1978: 15 specimens (IVIC).—San Carlos de Río Negro, Territorio Federal Amazonas, 28 specimens collected on different occasions through 1970 by Kate Clark (IVIC).—Mantecal, Apure State; Lagoon, N of Cabruta, Guárico State; 24.I.1970; B. Román.—Caño Biruaca, San Fernando, Apure State; II.1951; A. Fernández.—Río Michaya, Ticoporo, Barinas State, 230 m above sea level; 8.IV.1966; F. Fernández.

The species is known from Venezuela, Trinidad, the three Guianas, Brazil, and Bolivia (Holthuis, 1966).

Macrobrachium nattereri (Heller, 1862)

Fig. 4

Material.—Gavilán, 30 km SE of Puerto Ayacucho, Río Orinoco; 12.XII.1977: 2 specimens (CL 13.5–20.0 mm) (IVIC).—Same locality; 3.V.1978: 11 specimens (CL 4.0–23.0 mm) (IVIC).—Same locality; 25.IV.1978: 85 specimens (CL 7.1–24.0 mm).—Same locality; 3.VIII.1978: 2 specimens (CL 13.6–15.5 mm).—Tobogán, 30 km S of Puerto Ayacucho, Río Orinoco; 25.I.1978: 81 specimens (CL 11.4–37.4 mm) including 1 ovigerous ♀ and 1 spent ♀ (IVIC).—Same locality; 17.II.1978: 10 specimens (CL 22.3–33.0 mm), including 1 ovigerous ♀ (CL 21.8 mm), 1 spent ♀ (CL 23.8 mm).—Same locality; 25.IV.1978: 57 specimens (CL 11.0–35.5 mm), including 1 ovigerous ♀ (CL 25.8 mm).—Same locality; 16.V.1978: 19 specimens (CL 10.1–32.5 mm).—Same locality; 2.VIII.1978: 9 specimens (CL 19.2–34.9 mm).—Same locality; 19.X.1978: 28 specimens (CL 12.4–40.0 mm).—Same locality; 6.XI.1978: 12 specimens (CL 22.8–38.3 mm).—Same locality; 15.III.1979: 38 specimens (CL 10.4–37.7 mm), including 1 ovigerous ♀ (CL 26.8 mm), 2 spent ♂♂ (CL 25.0–25.1 mm) (IVIC).—Culebra, 12 km S of Puerto Ayacucho, Río Orinoco; 17.II.1978: 35 specimens (CL 7.5–23.3 mm).—Raudal Galípero, 45 km N of Puerto Ayacucho, Río Orinoco; 17.II.1978: 33 specimens (CL 9.4–28.5 mm) (IVIC).—Cachama, road from Puerto Ayacucho to Puerto Carreño, Río Orinoco; 20.II.1978: 13 specimens (CL 12.2–22.5 mm) (IVIC).—Provincial, 10 km N of Puerto Ayacucho, Río Orinoco; 14.III.1978: 1 specimen (CL 13.5 mm) (IVIC).—Ducke Reserve, 20 km N of Manaus, Brazil; 23.IV.1980; E. Ormeño: 11 specimens (CL 14.1–27.4 mm).—Igarapé do Veado, road Manaus-Boa Vista, 106 km from Manaus, Río Branco, Brazil; 6.XI.1978: 1 specimen (CL 30.2 mm) (IVIC).

Remarks.—So far the species is known from the Amazon basin (Río Negro, Manaus, and Santarem) and French Guiana (Holthuis, 1966). The material from the Orinoco basin agrees with the description of the species given by Holthuis (1952) based on material from Santarem, and from French Guiana (Holthuis, 1966), except for the following points: The rostrum is higher and bears on the

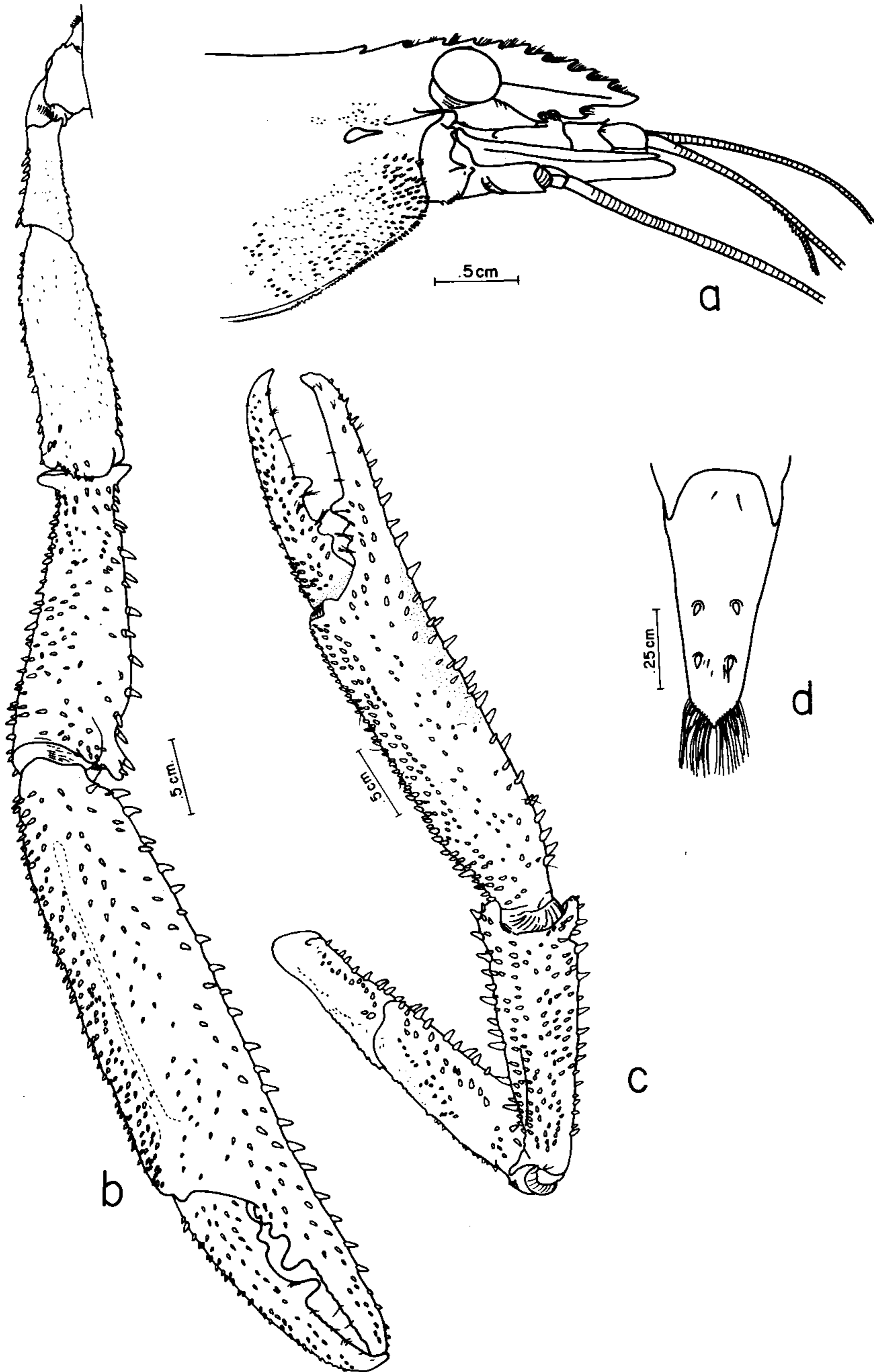


Fig. 4. *Macrobrachium nattereri* (Heller), male, CL 35.0 mm, Puerto Ayacucho, Venezuela: a, anterior part of body, lateral view; b, larger second pereopod; c, smaller second pereopod; d, telson.

upper margin 9–11 teeth, the first 2 (or more rarely 3) of which are placed behind the posterior orbital margin.

The second legs in the full-grown male specimens also differ from the illustration given by Holthuis (1952, pl. 20) as follows: There are only 5–10 isolated tufts of hairs over each finger, the rest of the chela being more naked; the palm has a conspicuous groove on each side; the upper surface between these two grooves is covered by a band of small, closely placed spines that extend to the upper margin of the dactylus; the lower margin has large spines, at least twice as large as those of the upper margin and roughly arranged in 3 longitudinal rows that extend over the internal surface; the external surface has very small spinules, barely visible to the naked eye; the surface of the chela, between the spines, is polished and shiny; the arrangement of the spines is similar, although less distinct, over the carpus and merus; the fingers are more gaping and their central tooth is considerably larger, with the anterior and posterior margins strongly curved, and followed by a row of 3 or 4 denticles.

Specimens smaller than about 15 mm CL are devoid of spinules over the carapace and abdomen. Spinules first appear on the anterior branchial region in specimens larger than 15 mm CL and on the antennal region in specimens larger than about 20 mm CL. Specimens larger than 30 mm CL have spinules also over the orbital region and the abdominal pleura. The largest specimens have a few spinules over the base of the antenna.

The largest specimen of *Macrobrachium nattereri* in my collections is a male (CL 40.0 mm). The carapace length of ovigerous females varies between 16.6 and 26.8 mm. The number of eggs varies between 34 and 150, measuring 2.14–2.58 mm in diameter.

Macrobrachium sp.

Fig. 5

Material.—Río Tauca, affluent of Río Caura, Bolívar State; 8.IV.1981; A. E. Esteves: 1 ♂ (CL 4.7 mm), 9 nonovigerous ♀♀ (CL 5.8–8.0 mm), 6 ovigerous ♀♀ (CL 6.3–9.7 mm) (IVIC).—Same locality; 7.V.1981; E. Ormeño: 6 ovigerous ♀♀ (CL 7.8–9.4 mm) (IVIC).

Twenty-four specimens of an undescribed species of *Macrobrachium* were collected on two different occasions from Río Tauca together with *M. brasiliensis* and *Palaemonetes carteri*. The fact that only a single, probably immature male specimen is available makes it undesirable to assign a specific name to it.

The rostrum is high and straight, the tip being curved somewhat upwards. It reaches to the end of the scaphocerite. There are 7 or 8 teeth placed on the upper margin, 1 (rarely 2) of which is situated behind the orbit. The first tooth is smaller and placed at a lower level than the rest; the distance separating it from the second tooth is larger than that between the other teeth. In some specimens the ultimate one-fifth of the rostrum is devoid of teeth on the upper margin, except for a small subapical tooth. The toothed part of the upper margin is distinctly convex. The lower margin bears 1 tooth. The carapace is smooth.

The abdomen is smooth. The pleuron of the fifth segment ends in a rectangle. The sixth segment is about 1.6 times as long as the fifth. The telson is 1.2 times as long as the sixth segment. The telson is narrow; its ratio of length to width measured in the middle is 4.1:1. The dorsal surface of the telson bears the usual 2 pairs of spines, one at 0.6 and one at 0.7 of its length. The posterior margin ends in a spine which is overreached by the inner pair of posterior spines. Numerous feathered setae are present.

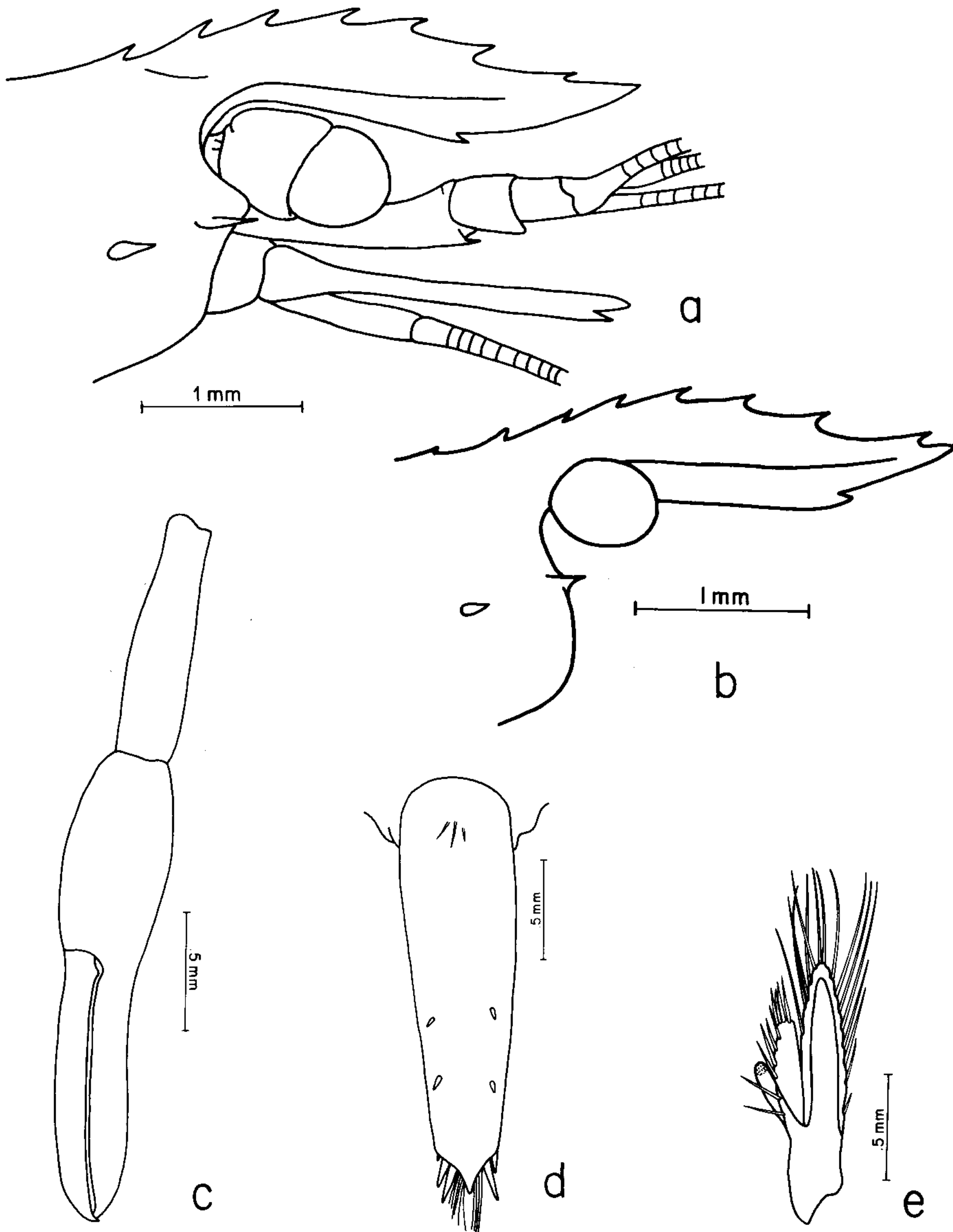


Fig. 5. *Macrobrachium* sp., specimens from Rio Tauca, Venezuela. (a, c-e, male, CL 4.7 mm, b, ovigerous female, CL 7.0 mm), a, anterior part of body, lateral; b, rostrum; c, chela and carpus of largest second pereiopod; d, telson; e, endopod of second pleopod showing *appendix masculina*

The scaphocerite is 3.2 times as long as broad. The outer margin is slightly concave.

The first pereiopod extends with the tip of the chela to the end of the scaphocerite. The fingers are slightly shorter than the palm. The carpus is 1.1 times as long as the chela and 1.1 times as long as the merus. None of the joints of the first leg shows spinules. The second legs of ovigerous females are equal, extending with the whole chela beyond the scaphocerite. They are very slender and entirely

smooth. The fingers of the chela are 0.9 times as long as the palm which is cylindrical. The cutting edges of both fingers bear in the proximal third 1 small tooth. The carpus is 0.5 times as long as the chela and slightly shorter than the merus. The ischium is as long as the carpus. In the only male present in my collections, the fingers are 1.3 times as long as the palm. The palm is slightly swollen and the lower margin of the chela is sinuous. The third leg extends with the tip of the dactylus to the end of the antennular peduncle. The fifth leg fails distinctly to reach the end of the scaphocerite. No spinules except those on the posterior margin of the propodus are present on the last 3 legs.

The pleopods and uropods are normal.

Size.—The species is of very small size since the only male with a developed *appendix masculina* is 4.7 mm CL, and ovigerous females range from 6.3–9.7 mm CL. The number of eggs varies between 10 and 21, measuring 1.1–1.4 mm in diameter.

Macrobrachium surinamicum Holthuis, 1948

Material.—Tobejuba, Orinoco delta; VIII.1954; J. Poján: 12 specimens (CL 8.2–19.6 mm), including 8 ovigerous ♀♀ (CL 12.2–17.3 mm) (LS).—Barra de Quiriquire, Orinoco delta, Monagas State; 14.VIII.1950: 65 specimens (CL 7.2–15.6 mm), including 31 ovigerous ♀♀ (CL 8.7–15.6 mm); 19 specimens with a thoracic bopyrid parasite; no ovigerous female infested (LS).

The species has been recorded from Surinam, Guyana (Holthuis, 1952), and Lake Maracaibo, Venezuela (Díaz-Valbuena, 1976). The specimens from Bogotá, Colombia, recorded by Holthuis (1952), are probably incorrectly labeled. Other records, including the present ones, come from estuarine areas. We have in our collections specimens from Lake Maracaibo, from localities subjected to an annual fluctuation of salinities of 1–3‰.

Palaemonetes carteri Gordon, 1935

Material.—Río Tauca, affluent of the Río Caura, Bolívar State; 7.V.1981; A. Esteves: 23 specimens, including 2 ovigerous ♀♀ (IVIC).—Río Cuyuní, 8 km from Anacoco, Bolívar State; 19.VIII.1979; E. Feo: 13 specimens including 2 ovigerous ♀♀ (LS).—Río Morichal Largo, Monagas State; 10.X.1980; F. Vázquez: 3 specimens (LS).

The species is known from Venezuela, Guyana, Surinam, French Guiana, and the Amazon River near Manaus and near Santarem (Holthuis, 1952).

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