A GENERAL REVISION OF THE PALAEMONIDAE (CRUSTACEA DECAPODA NATANTIA) OF THE AMERICAS.

II. THE SUBFAMILY PALAEMONINAE

(PLATES 1-55)

By LIPKE B. HOLTHUIS

ADDENDA ET CORRIGENDA

Allan Hancock Foundation Publications, Occasional Paper Number 12, Holthuis,

A General Revision of the Palaemonidae of the Americas. Part II.

p. 8, line 21, read: St. Thomas!
p. 14, bottom of page, add: wards. Distal part of upper margin naked. Only one tooth
p. 22, line 22, read: 1879!
p. 37, delete line 8 from bottom
p. 45, 52, 138, 254, read: Cunningham, 1871 (for 1870)
p. 80, between lines 15 and 16 insert: tween these spines
p. 81, between lines 1 and 2 from bottom, insert: at 120 km S. of Paramaribo, Bigidjompo, Lolobroki and Mispel
p. 88, line 5 from bottom; p. 90, lines 1 and 2; p. 115, line 21; p. 137, line 14 from bottom, read: Palemon
p. 89, line 18; p. 96, line 13 from bottom, read: faustinus
p. 90, line 4, read: p. p. ?M. J. Rathbun, 1919, Rapp. Visscherij
p. 95, lines 14 and 16 from bottom, read: Palaemon
p. 97, lines 11 and 17, read: olfersi
p. 107, line 9, read: palm
p. 114, line 10, read: Potipema Marcgraf
line 11, read: Astacus fluviatilis major, chelis aculeatis
p. 115, line 7, read: Palaemon jamaicensis Desmarest, 1823,
line 22, read: Palaemon jamaicensis White, 1847,
p. 117, lines 6 from bottom, read: jamaïcensis
p. 119, line 17, read: Macrobranchium
p. 124, line 9 from bottom, read: (Marc-
line 4 from bottom, read: (Moreira, 1901)
between lines 2 and 3 from bottom, insert: (Von Ihering, 1897; Luederwaldt, 1919, 1929; Sawaya, 1946), Rio
p. 128, line 10, delete: was
p. 136, line 9 from bottom, read: no (for numerous)
p. 137, line 14 from bottom, read: Gibbes, 1850a
p. 142, line 3 from bottom, read: (covered eyes)
p. 146, line 2 from bottom, read: eigenmani
p. 155, line 4 from bottom, read: Tilesius, 1819
p. 158, line 8, read: Calvet
p. 162, line 13, read: Chace
p. 167, line 3, read: instance
line 5, delete: scale
line 10 from bottom, delete: known
p. 168, line 3, read: schmitti
p. 173, line 18 from bottom, read: Schmitt, 1924b
p. 178, line 5, read: Schmitt, 1924b
p. 187, line 12 from bottom, read: Kingsley, 1878a
p. 207, line 15 from bottom, read: Gibbes, 1848
p. 212, line 17 from bottom, read: Kingsley, 1878a
p. 220, last line, read: segments
p. 228, line 5 from bottom, read: S. California!
p. 234, line 10, read: ?Palaemon Vulgaris
p. 239, line 10, read: Valdés
p. 242, line 6 from bottom, read: is like in the female

p. 254, Dana, 1885, read: 1855
p. 255, Duncker, 1900, line 1, read: Palaemonetes
p. 256, Faxon, 1879, line 1, read: Palaemonetes
Filhol, 1885, line 2, read: Bibl. École haut Étud.
p. 258, read: Guérin Méneville, F. E. In line 2 of 1857 entry, read: pp. i-lxxxvii.
p. 261, Johanson, F., read: Johansen, F.
p. 263, Linnaeus, 1745, read: 1754.
p. 267, Nobili, 1900, delete entire item
p. 273, Steinbeck & Rickets, read: Ricketts
p. 274, Sumner, F. B., Osburn, R. C., and Cole, H. J., read: Cole, L. J.
p. 275, Valdés Ragués, 1910, delete entire item.
p. 276, Wheeler, J. F. G., read: Wheeler, J. F. G. and Brown, F. A.
p. 284, line 2, read: Macrobrachium jelskii (Miers)
p. 286, last line should read: De Man, 1900.
p. 336, add to last line: (after Hedgpeth, 1947).
p. 389, read: biunguiculatus, Calmania
p. 390, read: Calmania biunguiculatus
dionyx, Leander
p. 392, read: Macrobrachium vollenhoveni
zariquieyi
delete: Marcgraf, Potipema, 114
p. 394, read: Palaemon schmitti
p. 395, read: Potipema, 114
p. 396, read: vollenhoveni, Macrobrachium
zariquieyi, Macrobrachium

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A GENERAL REVISION OF THE PALAEMONIDAE (CRUSTACEA DECAPODA NATANTIA) OF THE AMERICAS. II. THE SUBFAMILY PALAEMONINAE

By LIPKE B. HOLTHUIS

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The first part of the present paper (Holthuis, 1951) dealt with the subfamilies Euryrhynchinae and Pontoniinae. Here the third and last American Palaemonid subfamily, that of the Palaemoninae, is treated. This subfamily is represented in the American waters by 9 genera, which may be distinguished as follows:

1. Hepatic spine present, branchiostegal spine absent. . . . 2
   1¹. Hepatic spine absent, branchiostegal spine present or absent. 4
2. Dactylus of last 3 legs biunguiculate. Mandible with 3-articulated palp. Marine. . . . . *Brachycarpus*
   2¹. Dactylus of last 3 legs simple. Fresh, sometimes brackish, water. 3
3. Mandible with three-jointed palp. . . . *Macrobrachium*
   3¹. Mandible without palp. . . . . *Pseudopalaemon*
4. Branchiostegal spine absent. Fresh water. 5
   4¹. Branchiostegal spine present. 6
5. Mandible with three-jointed palp. Rostrum compressed, toothed. Eyes with pigment. Second legs heavy, tuberculated. Western. . . . . *Cryphiops*
   5¹. Mandible without palp. Rostrum compressed, with or without teeth. Second legs rather slender, smooth. Eyes without pigment. Eastern. . . . . *Troglocubanus*
6. Mandible without palp. . . . . *Palaemonetes*
   a. Eyes with pigment. Second legs much stronger than first. Outer margin of uropodal exopod ending in a tooth and a movable spine. . . . . subgen. *Palaemonetes* s.s.
   a¹. Eyes without pigment. Second legs about as strong as first. Outer margin of uropodal exopod ending in a tooth, no movable spine present. . . . . subgen. *Alaocaris*
   6¹. Mandible with a two- or three-jointed palp. 7

7. Eyes without pigment, cornea reduced. Anterior margin of basal segment of antennular peduncle concave, gradually merging in the strong anterolateral spine. No branchiostegal groove. Propodus of fifth pereiopod with transverse rows of hairs in distal part of posterior margin. Mandibular palp 2-jointed. *Creaseria*

7¹. Eyes distinctly pigmented, cornea well developed. Anterior margin of basal segment of antennular peduncle rounded, anterolateral spine small. 8

8. First pleopod of male with appendix interna. Mandible with a two-jointed palp. Branchiostegal groove absent. No transverse rows of hairs on posterior margin of propodus of fifth pereiopod. . . . . *Leander*

8¹. First pleopod of male without appendix interna. Mandible with a two- or a three-jointed palp. Branchiostegal groove generally distinct. Propodus of fifth pereiopod with transverse rows of hairs in distal part of posterior margin. . . . . *Palaemon*

a. Rostrum with a distinct basal crest of teeth. No branchiostegal groove. Dactylus of last three legs excessively long, longer than propodus and carpus combined. . . . . subgenus *Nematopalaemon*

a¹. Rostrum without a basal crest. A distinct branchiostegal groove present. Dactylus of last three legs always less than half the length of propodus . . . . . b

b. Mandible with a three-jointed palp. [One (sometimes two) teeth of the rostrum behind orbit.] subgenus *Palaemon* s.s.

b¹. Mandible with a two-jointed palp. [Three teeth of the rostrum behind orbit.] . . . subgenus *Palaeander*

Genus **BRACHYCARPUS** Bate, 1888

Definition: The rostrum is well developed, compressed and provided with teeth. The carapace is armed with antennal and hepatic spines. No branchiostegal groove is observed.

The telson bears two pairs of dorsal and two pairs of posterior spines. The posterior margin of the telson bears several hairs.

The eyes have the cornea well developed and pigmented.

The mandible possesses a three-jointed palp. All maxillipeds are provided with exopods. Pleurobranchs are present on the third maxilliped and all pereiopods.

The dactyli of the last three pereiopods are biunguiculate. The propodus of the fifth leg bears only one row of hairs on its posterior margin, namely at the distal end.

The first pleopod of the male bears a distinct appendix interna.

Type species: *Brachycarpus savignyi* Bate, 1888, a species at present considered identical with *B. biunguiculatus* (Lucas).

The genus consists of one species:

Brachycarpus biunguiculatus (Lucas)

Pl. 1, figs. a-q

Palaemon biunguiculatus Lucas, 1849, Expl. sci. Algérie, Crust., p. 45, pl. 4, fig. 4.

Brachycarpus savignyi Bate, 1888, Rep. Voy. Challenger, vol. 24, p. 795, pl. 129, fig. 4.

Brachycarpus neapolitanus Cano, 1890, Boll. Soc. Nat. Napoli, ser. 1, vol. 4, p. 38, pl. 4, fig. 1.

Palaemon savignyi Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 727.

Palaemon biunguiculatus Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 6.

Palaemon savignyi Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 13.

Palaemon Montezumae Nobili, 1898, Boll. Mus. Zool. Anat. Comp. Torino, vol. 13, n. 314, p. 2 (non De Saussure, 1857).

Palaemon savignyi Rankin, 1898, Ann. New York Acad. Sci., vol. 11, p. 224.

Palaemon Savignyi Verrill, 1900, Trans. Conn. Acad. Arts Sci., vol. 10, p. 579.

Brachycarpus savignyi Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 490.

Bithynis savignyi M. J. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 124.

Brachycarpus biunguiculatus Nobili, 1905a, Boll. Mus. Zool. Anat. comp. Torino, vol. 20, n. 502, p. 2.

Brachycarpus advena Nobili, 1905, Bull. Mus. Hist. nat. Paris, vol. 11, p. 395.

Bithynis savignyi Pearson, 1905, Rep. Ceylon Pearl Oyster Fish., vol. 4, p. 78.

Brachycarpus advena Nobili, 1906, Ann. Sci. nat. Zool., ser. 9, vol. 4, p. 75, pl. 4, fig. 1.

Brachycarpus Savignyi Nobili, 1906, Ann. Sci. nat. Zool., ser. 9, vol. 4, p. 77.

Brachycarpus biunguiculatus Nobili, 1906, Ann. Sci. nat. Zool., ser. 9, vol. 4, p. 77.

Palaemonella orientalis M. J. Rathbun, 1906, Bull. U. S. Fish Comm., vol. 23, pt. 3, p. 925, (non Dana, 1852).

Calmania biunguiculatus Nobili, 1907, Ann. Mus. Zool., Univ. Napoli, n. ser., vol. 2, no. 21, p. 3, pl. 2.

Palaemonella rathbunensis Borradaile, 1917, Trans. Linn. Soc. Lond. Zool., ser. 2, vol. 17, p. 358.

Macrobrachium savignyi M. J. Rathbun, 1919, Boeke's Rapp. Onderz. Visscherij Curaçao, vol. 2, p. 324.

Palaemon savignyi Verrill, 1922, Trans. Conn. Acad. Arts Sci., vol. 26, p. 145, fig. 11.

Macrobrachium savignyi Schmitt, 1924a, Bijdr. Dierk., vol. 23, p. 72; Schmitt, 1924c, Univ. Iowa Stud. nat. Hist., vol. 10, pt. 4, p. 83.

Palaemonella rathbunensis Edmondson, 1925, Bull. Bishop Mus. Horolulu, vol. 27, p. 8.

Brachycarpus biunguiculatus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 312; Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 157, fig. 24.

Bithynis savignyi Gurney, 1936, Proc. Zool. Soc. Lond., 1936, p. 619.

Brachycarpus savignyi Gurney, 1938, Sci. Rep. Great Barrier Reef Exped., vol. 6, p. 8, figs. 32-38.

Brachycarpus biunguiculatus Lunz, 1939a, Journ. Elisha Mitchell Sci. Soc., vol. 55, p. 335; Schmitt, 1939, Smithson. Misc. Coll., vol. 98, n. 6, p. 13, fig. 1; Gurney and Lebour, 1941, Journ. Linn. Soc. Lond. Zool., vol. 41, p. 138, figs. 14, 15; Gurney, 1943, Ann. Mag. nat. Hist., ser. 11, vol. 10, p. 502; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 12; Holthuis, 1951a, Atlantide Rep., vol. 2, p. 143.

Description: The rostrum is well developed and reaches about to the end of the scaphocerite. It is rather high and directed straight forwards. The upper margin bears generally 7 (seldom 8), the lower 3 (seldom 2 or 4) teeth. The first 2 teeth of the upper margin are placed on the carapace behind the orbit, the first tooth is placed in about the middle of the length of the carapace, or even somewhat behind it. The carapace is smooth and provided with antennal and hepatic spines.

The abdomen is smooth, the pleura of the fifth segment is pointed. The telson bears 2 pairs of dorsal and two pairs of posterior spines. Between the 2 inner posterior spines numerous setae are present.

The eyes are well developed and well pigmented.

The anterolateral spine of the basal segment of the antennular peduncle is very strong and reaches beyond the second segment of that peduncle. The inner antennular flagellum has the 2 rami fused for 8 to 23 joints, the free part of the shorter ramus being about as long as or slightly longer than the fused portion.

The scaphocerite is about thrice as long as broad. The final tooth overreaches the anterior margin of the lamella. The outer margin is concave.

The mandible is provided with a three-jointed palp. Exopods are present on all maxillipeds. Pleurobranchs may be found on the third maxilliped and all pereiopods.

The first legs are slender. The fingers are longer than the palm and the carpus is slightly longer than the chela. The second legs are much stronger than the first. They are smooth and reach with part of the carpus beyond the scaphocerite. The fingers are slightly shorter than the palm; in adult males, however, they sometimes only are half as long as the palm. The cutting edge of the dactylus bears 2 to 4, that of the fixed finger 2 small teeth in the proximal part. In the adult male the fingers gape strongly, the gap then being filled with hairs. The carpus is very short and cupshaped, it is about half as long as the merus. The last three legs are slender. The dactylus is biunguiculate. Spines only are present on the posterior margin of the propodus. The propodus of the fifth leg bears a row of hairs at the posterior part of the distal margin.

The first pleopod of the male is provided with an appendix interna. The uropods are normal in shape.

Size: The specimens of the Allan Hancock Expeditions vary in size between 16 and 47 mm. The ovigerous females measure 21 to 47 mm. According to Kemp (1925) full grown specimens may attain a length of 65 mm. The eggs are numerous and small, being 0.5 to 0.7 mm in diameter.

Colour: According to notes made by the collectors during the Allan Hancock Expeditions the body is dark blue green, mottled with whitish. The palm of the chela is uniform blue green, the fingers are barred. The fringes of the tail fan, of the scaphocerite, the antennulae and the antennae are close to Chinese orange. Another specimen was stated to be colourless, whitish with slight tawny tinged spots. In the spirit specimens, which are evenly pale brownish yellow, the tips of the fingers generally are coloured brownish red, while behind these coloured tips and separated from them by a colourless band, a band of much

fainter brownish red is visible. The antennular flagella are red, with white rings at the articulations between the joints. This colour pattern of the spirit specimens of the Allan Hancock Expeditions from the Pacific closely agrees with that of spirit specimens from the Atlantic.

Material examined: The Allan Hancock Expeditions 1933, 1934, 1935, 1938, 1939, and 1940 brought home a large collection (totalling about 100 specimens) of this species. The material was collected at the following localities:

Atlantic:

Venezuela: 4 miles N. of Tortuga Island. 21-22 fms, dead coral, April 21, 1939, Sta. A 44-39.

Pacific:

Gulf of California, Mexico: Espíritu Santo Island, San Gabriel Bay. Shoal, coral, Feb. 14, 1940, Sta. 1110-40.

Revillagigedo Islands, Mexico: Socorro Island. Shallow water, *Pocillopora* coral, Jan. 3, 1934, Sta. 131-34. In fish (roach) trap, January 4, 1934. Clarion Island, Sulphur Bay. Shallow water, coral, January 5, 1934, Sta. 140-34. Shore, rock, tidepools, June 10, 1934, Sta. 298-34.

Costa Rica: Parker Bay. Shallow water, coral, February 9, 1935, Sta. 473-35. Playa Blancas. Shore, shale beach between beach and rocky reef, Feb. 8, 1935, Sta. 465-35.

Panama: Secas Islands. Shore, tideflats, coral, Feb. 6, 1935, Sta. 454-35. Shallow water, coral, Mar. 2, 1938, Sta. 867-38. Piñas Bay. Mainland opposite anchorage, shallow water, coral, Jan. 28, 1935, Sta. 437-35. Mainland side of S. Bay, 2-4 fms, coral, Jan. 29, 1935, Sta. 444-35.

Colombia: Octavia Bay. Off point between it and anchorage, coral, Jan. 28, 1935, Sta. 435-35. Port Utria. Reef at inner side of outer island, shore, coral, Feb. 14, 1934, Sta. 232-34. West side of terminal island, 20 fms, sand, Feb. 14, 1934, Sta. 234-34. Reef at inner side of outer island, shore, Feb. 15, 1934, Sta. 239-34. Inner side of outer island, under rocks, Feb. 15, 1934, Sta. 239a-34. Lee beach of island, shore, rock, Jan. 23, 1935, Sta. 413-35. Coral from island beach, 2 fms, Jan. 24, 1935, Sta. 419-35.

Gorgona Island. Off coconut beach, shallow water, *Pocillopora* coral, Jan. 22, 1935, Sta. 411-35. Shallow water, *Pavonia* coral, Jan. 22, 1935, Sta. 412-35.

Cocos Island (Costa Rica): Chatham Bay. Roach trap, Mar. 3, 1933.

Galapagos Islands (Ecuador): Tower Island, Darwin Bay, Seal Beach no. 1. Shallow water, coral, Feb. 22, 1933, Sta. 94-33. Shore, under rocks, Feb. 24, 1933, Sta. 96-33. Shallow water, coral (coral from Sta. 96-33), Feb. 24, 1933, Sta. 97-33. Shore, rock, Feb. 25, 1933, Sta. 98-33. Shore, rock, Feb. 26, 1933, Sta. 101-33. Shallow water, coral clumps, Feb. 26, 1933, Sta. 101a-33.

Albemarle Island, Cartago Bay. North beach, last large beach to north, at about the end of the bay proper, rock, sand, mangroves, Feb. 13, 1933, Sta. 73-33. Northern sandy shore, off dead trees of first beach in big bay, rocks, *Epizoanthus,* Feb. 14, 1933, Sta. 76-33. North shore, rocks, dead trees, Jan. 22, 1938, Sta. 800-38.

Albemarle Island, Tagus Cove. Collected with electric light, Dec. 9, 1934.

James Island, Sullivan Bay, Bartholomew Island. Shallow water, from *Pavonia* coral, Dec. 12, 1934, Sta. 344-35.

South Seymour Island. Shore, from roach trap attached to lobster trap, Feb. 18, 1933. West shore, rock, Jan. 19, 1938, Sta. 789-38.

Duncan Island. Shallow water, *Porites* coral, Feb. 15, 1933, Sta. 80-33.

Barrington Island. Diving in bay, 3 fms, Feb. 2, 1933, Sta. 47-33.

Charles Island, Post Office Bay. From fish trap (tin tube trap), Feb. 5, 1933, Sta. 57-33.

Hood Island, Gardner Bay, Osborn Island. Shore, rock, Jan. 26, 1933, Sta. 30-33.

Furthermore I was able to examine material of this species in the U.S. National Museum, originating from the following localities:

Atlantic:

Bermudas (north side of Mullet Bay, St. Georges Island), Florida (Fort Pierce; Lake Worth Inlet), Bahama Islands (San Salvador), between Jamaica and Haiti, Cuba (off Havana), Porto Rico (Ensenada Honda, Culebra; Ponce; Arroyo), Barbados (Needham's Point), Curaçao (Spanish Water), Old Providence Island.

Pacific:

Revillagigedo Islands (Clarion Island; Socorro Island), Clipperton Island, Cocos Island, Galapagos Islands (James Bay on James Island; Indefatigable Island; Chatham Island; Charles Island).

In the American Museum of Natural History specimens of this species are present from Bahama Islands (Andros Island) and Cuba. In the Rijksmuseum van Natuurlijke Historie at Leiden and the Zoological

Museum at Amsterdam I examined specimens from Aruba, Curaçao and Bonaire. A specimen from St. Thomas was studied by me in the Instituto e Museo di Zoologia della Università in Turin, Italy.

Distribution: The species has a very large distribution, it is known from the Mediterranean, W. Africa, and the E. and W. American coasts, it also is reported from the indo-westpacific region. The records in literature are:

Mediterranean: Oran and Bône, Algeria (Lucas, 1849), Gulf of Napels (Cano, 1890; Kemp, 1925), Messina, Sicily (Kemp, 1925), Catania, Sicily, (Nobili, 1905a).

W. Africa: off Marshall, Liberia !(Holthuis, 1951).

East American waters: Bermuda (Bate, 1888; Verrill, 1900, 1922; Kemp, 1925; Gurney, 1936, 1938, 1943; Gurney and Lebour, 1941), Frying Pan Shoal off Cape Fear, North Carolina (Lunz, 1939a), near Cape Canaveral, Florida (Lunz, 1939a), near Ft. Pierce Inlet, Florida (Lunz, 1939a), West Indies (Kemp, 1925), Nassau, Bahamas (Rankin, 1898), between Jamaica and Haiti![1] (M. J. Rathbun, 1902a), off Havana, Cuba! (M. J. Rathbun, 1902a), Ponce!, Arroyo! and Ensenada Honda!, Porto Rico (M. J. Rathbun, 1902a), Guanica Harbor and off Cana Gorda Island near Guanica, Porto Rico (Schmitt, 1935), St. Thomas! (Nobili, 1898), Needham's Point, Barbados! (Schmitt, 1924c), Bonaire! (M. J. Rathbun, 1919), Curaçao! (M. J. Rathbun, 1902a!; Schmitt, 1924a!).

West Africa: off Marshall, Liberia !(Holthuis, 1951).

West American waters: Clipperton Island! (Schmitt, 1939).

Indo-westpacific region: Red Sea (Nobili, 1905, 1906), Muttuvaratu Paar, Ceylon (Pearson, 1905), Oahu and Molokai, Hawaiian Islands!; (M. J. Rathbun, 1906), Wake Island (Edmondson, 1925).

Type: The type localities are Oran and Bône in Algeria.

Remarks: As Schmitt (1939) already pointed out, no characters can be found to distinguish the West American specimens of the present species from the East American. The large amount of West American material convinced me of the correctness of Dr. Schmitt's view. The only possible character to distinguish the two forms might, according to Schmitt, be found in the number of the fused joints of the two rami of the inner antennular flagellum. This number in the West Indian form

[1] If specimens mentioned in literature have been examined by me, the record is provided with an exclamation point (!). If the locality is mentioned by more authors, the exclamation point also is placed behind the name of the author(s) whose material is examined.

was found to be 15 to 23 in specimens larger than 40 mm and 8 to 10 in specimens smaller than 40 mm. In Schmitt's specimen (20.3 mm in length) this number is 7. In my material the number of fused joints in specimens larger than 40 mm is 10 to 14, in those smaller than 40 mm 6 to 11. Though the fused portion of the 2 rami of the antennular flagellum generally consists of a smaller number of joints in the West American specimens, this difference is too small to base a separate variety upon, the more as specimens of more than 47 mm length have not yet been studied from the west coast.

The secondary sexual differences in the shape of the chela, found in east coast specimens also are observed in the Allan Hancock material.

The first pleopods of the male have the endopod provided with a distinct appendix interna, which is missing in the females. This character, which hitherto was not observed in *Brachycarpus,* is present in the Atlantic as well as in the Pacific material. The only other Palaemonid genera in which this feature is known to be present are *Leander, Leandrites* and *Anchistioides.*

Up till now the occurrence of the present genus in the indo-westpacific region was considered doubtful. Nobili (1906) reported a new species *Brachycarpus advena* from the Red Sea, but he was not fully certain of the correctness of this locality indication. Kemp (1925) made it probable that *Brachycarpus advena* is not different from *B. biunguiculatus.* Furthermore, Pearson (1905) reports *Bithynis savignyi* from Ceylon and states that he cannot find differences with Bate's description and figure. The collection of the U. S. National Museum possesses a specimen of *Brachycarpus,* labelled *B. advena* Nobili, from Pukoo, Molokai, reef at low tide. I have not been able to find differences between this specimen (which, however, is damaged and misses both second legs and part of the telson) and the other *Brachycarpus* specimens at my disposal. Finally, when examining the specimens from the Hawaiian Islands, mentioned by Miss Rathbun in her 1906 paper on the Hawaiian Decapods as *Palaemonella orientalis* Dana, I found them to belong to *Brachycarpus.* Here also no differences between the Atlantic and West American specimens could be detected. These Hawaiian specimens, however, are quite small and not full grown. Though the indo-westpacific material of *Brachycarpus* seen by me is either young or imperfect, and thus no definite conclusion can be made as to their identity with the Atlantic and West American specimens, all evidence points to those three forms all belonging to one species.

The specimen reported by Nobili (1898) from St. Thomas under the name *Palaemon Montezumae* is still preserved in the collection of the Zoological Museum in Turin, Italy, where it was examined by me. It proved to belong to *Brachycarpus biunguiculatus* (Lucas).

Genus MACROBRACHIUM Bate, 1868

Definition: Palaemonid shrimps with the rostrum well developed, compressed and toothed. Carapace armed with antennal and hepatic spines; branchiostegal groove present. Telson with 2 pairs of dorsal and 2 pairs of posterior spines. Mandible with a three-jointed palp. Exopods on all maxillipeds. Pleurobranchs on the third maxilliped and all pereiopods. Last three legs with the dactylus simple. Propodus of fifth leg with numerous transverse rows of setae in the distal part of the posterior margin. First pleopod of male without appendix interna.

Type species: Macrobrachium americanum Bate, 1868.

Of this genus at present 26 species are known from America. All of them inhabit fresh water, though some species sometimes go down the rivers in brackish water. There exist strong indications that of a number of species the eggs are hatched in water of relatively high salinity, there remains however much research work to be done about this question.

Many of the species have a fairly wide distribution, which perhaps may be explained by the fact that these species are not restricted to fresh water during their entire development. Furthermore some of the forms at least seem to be able to travel considerable distances out of the water. Important in this respect are the notes made by Dr. Waldo L. Schmitt during his 1925 visit to S. America. In them he tells how a specimen of *Macrobrachium heterochirus* (Wiegm.) climbed out of a bottle over a wooden table, over a wooden floor out in the open and over a granite flag walk in the hot sun, over a distance of 1.5 meters. In a humid surrounding it of course can displace itself over much larger distances. These two points perhaps are the main reasons that various species are not restricted to small areas defined by watersheds of little importance. There is however a good distinction between the species inhabiting the fresh waters which lead to the Atlantic Ocean and those of the water systems emptying in the Pacific. Most of the western species are closely related to eastern forms; there being only a small number of differences between them. Such species are:

Eastern	Western
M. amazonicum (Heller)	*M. panamense* Rathbun
M. acanthurus (Wiegmann)	*M. tenellum* (Smith)
M. surinamicum Holthuis	*M. transandicum* Holthuis
M. heterochirus (Wiegmann)	*M. occidentale* Holthuis
M. olfersi (Wiegmann)	*M. digueti* (Bouvier)
M. crenulatum Holthuis	*M. hancocki* Holthuis
M. carcinus (L.)	*M. americanum* Bate

At present there are only 2 species known from the Western part of America which are not directly comparable to eastern forms, while there are 10 eastern forms not directly related to west coast species. *M. acanthurus, M. heterochirus, M. olfersi, M. crenulatum,* and *M. carcinus* moreover are represented by closely related forms in the rivers of West Africa.

The study of the present genus is made very difficult by various factors:

1. Only a restricted number of characters is available for identification. The general shape of the animal and many features are common to all species. The best characters are afforded by the shape of the rostrum and that of the second legs. Most of the other parts of the body show, if at all, very small differences, which are sometimes variable and difficult to define.
2. Most of the characters are very variable within the species, especially during the growth of the animal. The rostrum generally becomes relatively shorter with age. The relation between the length of the joints of the second legs changes strongly during the growth, while at a late stage these second legs often develop in the male to an enormous size. According to Ortmann (1891, p. 694) and Henderson and Matthai (1910, p. 278) the relations between the joints of the second legs change during the growth of the animals according to a fixed scheme, which is the same in all species: in the young animals the fingers are longer in comparison with the palm, the palm is shorter when compared with the carpus, the relation between the carpus and the merus is constant during the growth, while the merus in the young specimen is shorter when compared with the ischium. Though in some indo-westpacific species exceptions are found, this rule is as far as I could control generally followed by the American species. Very young postlarval stages of *Macrobrachium carcinus* (L.), *Macrobrachium americanum* Bate and *Macrobrachium ohione* (Smith) have been found.

3. The females, even if adult, often differ strongly from the male, especially in the shape of the second legs, resembling young specimens.
4. Specimens may become sexually mature, before having all the parts of the body fully developed. So for instance females with juvenile characters may already bear eggs. Sometimes males may be found, which are as large as males with fully developed second legs, but in which these legs are still shaped like in the females and juveniles. Such males are termed by Coutière (1901a), "mâles feminisés."

These are the reasons, that, though fully developed males generally may be recognized easily, it is often very difficult or almost impossible to separate females of 2 related species. Generally here the shape of the rostrum is very helpful.

In literature often new species of *Macrobrachium* have been described, which afterwards proved to be young specimens of already known species. As, however, the identity of the species described after juvenile specimens generally cannot be made out with certainty, it is of the largest importance that the description of new species be based on material containing fully developed males.

The American species of *Macrobrachium* may be distinguished as follows:

1. Carpus of second legs as long as or longer than merus . . . 2
   1^1. Carpus of second legs distinctly shorter than merus. . . 27
2. Telson gradually tapering towards a slender tip, which overreaches posterior spines of telson. 3
   2^1. Telson with a distinct posterior margin, which generally bears a median point. This point is overreached by inner pair of posterior spines of telson. 4
3. Lower margin of rostrum with 8-12 teeth. Carpus of second leg in adult male as long as or longer than chela. Eastern. . . . . *amazonicum*
   3^1. Lower margin of rostrum with 5-7 teeth. Carpus of second leg in adult male distinctly shorter than the chela. Western. . . . . *panamense*
4. Second chelae of adult male equal or subequal in shape, sometimes unequal in size. Smaller of the 2 chelae, if one is smaller than the other, never with the fingers gaping. 5
   4^1. Second chelae of adult male very unequal in size and shape. Smaller chela with the fingers strongly gaping and provided with stiff hairs along cutting edges, which fill the gap. Carapace in adult males smooth. 24

5. No tubercles along cutting edges of fingers of second chelae in adult males. Carapace in adult males generally smooth, sometimes hairy. 6

5¹. Along both sides, or only along inner side of cutting edges of fingers of second chelae in adult males, a row of tubercles is present. Carapace distinctly scabrous in adult males, especially in the anterolateral part. 21

6. Cutting edges of fingers of large chela in adult male with 1 or 2 fairly large proximal teeth. Some smaller denticles may be present between these teeth and the base of the fingers, the cutting edge distally of the large teeth, however, is entire. . 7

6¹. Cutting edges of fingers of large chela in adult male with numerous denticles of about equal size up to apex (in not full grown specimens this row of denticles may stop some distance before the tip). If some larger teeth are present, then these always are proximal teeth. 16

7. Second legs of adult male without velvety pubescence (there may be tufts of hairs on the fingers, but these never form a velvety cover). Eggs large and few. 8

7¹. Second legs of adult male with a distinct velvety pubescence on some or all joints. Eggs numerous and small. . . . 10

8. Rostrum distinctly longer than scaphocerite, its tip curved upwards. Lower margin of rostrum with 5 or 6 teeth. Second legs of adult male without spinules. Eastern. . . . . *jelskii*

8¹. Rostrum distinctly shorter or about as long as scaphocerite, straight. Lower margin of rostrum with 1 to 3 teeth. Second legs of adult male with spinules. 9

9. Carpus of second leg in adult male elongate, distinctly longer than palm. Chelae slender. Eastern. . . . . *borellii*

9¹. Carpus of second leg in adult male robust, distinctly shorter than palm. Chelae heavily built. Eastern. . . *quelchi*

10. Rostrum with styliform apex: there are no teeth on distal part of either upper or lower margin. Rest of upper margin provided with numerous teeth. Rostrum high. Eastern. . . *ohione*

10¹. Rostrum with teeth up to apex; if there is a naked portion in distal part of upper margin, then there always is a subapical tooth placed close to apex. 11

11. Rostrum shorter than antennular peduncle. Second legs of the adult male heavy, merus swollen and with lower surface thickly pubescent. Carpus and chela of second leg pubescent too, but

much less distinctly so than merus, fingers not more pubescent than palm. 12

11¹. Rostrum generally slender and reaching beyond antennular peduncle. Second legs of adult male slender, merus not swollen, but elongate. Only fingers of second legs velvety pubescent, other joints naked or with some scattered hairs. 13

12. Carapace of adult male smooth and naked. First three or four teeth of rostrum erect and more widely separated than the other teeth. Rostrum shallow. Teeth on cutting edges of fingers of large chela in adult male of equal size, or with the ultimate slightly higher and broader than rest. Lower margin of fixed finger of that chela without a continuous row of larger spinules. 20

12¹. Carapace in adult males hairy, especially in the anterolateral region. Rostrum rather high, with upper teeth regularly divided over its length. Distal teeth of cutting edges of fingers of large chela in adult male distinctly larger than proximals. Lower margin of fixed finger of that chela with spinules which are larger than the other spinules on the fingers and which form an almost continuous longitudinal row. Western. . . . . *inca*

13. Fingers of second chela in adult male 0.5 to 0.6 times as long as palm. Palm provided with spinules. Rostrum about straight, with 9 or 10 upper and 3 to 5 (seldom 6) lower teeth. Western. . . . . *rathbunae*

13¹. Fingers of second chela in adult male 0.8 times to quite as long as palm. 14

14. Rostrum short, straight, with 7 to 9 upper and 1 to 3 lower teeth. Palm of second chela in male without spinules. Eastern. . . . . *praecox*

14¹. Rostrum elongate, sometimes curved upwards, with 9 to 11 dorsal and 4 to 7 ventral teeth. Palm of second chela of male with spinules. 15

15. Rostrum in adult males almost straight, with the teeth regularly divided over upper margin. Generally 2 teeth of upper margin of rostrum behind orbit. Carpus of large chela in adult males 6-8 (seldom 10) times as long as broad. Eastern. . . . . *acanthurus*

15¹. Rostrum in adult males with proximal part of upper margin somewhat convex, distal part straight and directed upwards, Distal part of upper margin naked. Only one tooth

of upper margin of rostrum behind orbit. Carpus of large chela in adult males generally 13-15 times as long as broad. Western. . . . . *tenellum*

16. Large chela of adult male without feltlike pubescence, or only with a narrow strip of pubescence along cutting edges of fingers. Rostrum with teeth up to apex. 17

16¹. Large chela of adult male with a distinct pubescence on lower surface of palm and on fingers. 18

17. 3 or 4 teeth of rostrum placed behind orbit. Lower margin of rostrum with 4-6 teeth. Carpus of second leg about as long as merus. Eastern. . . . . *surinamicum*

17¹. 5 or 6 teeth of rostrum placed behind orbit. Lower margin of rostrum with 3 (seldom 4) teeth. Carpus of second leg distinctly longer than merus. Western. . *transandicum*

18. Rostrum high with a distinct unarmed region in ultimate half of upper margin. Dorsal teeth of rostrum all of the same shape, the proximals forming a distinct convex crest. 19

18¹. Rostrum shallow, toothed up to apex. The 2-4 proximal teeth of dorsal margin broader and more erect than the other teeth, and with wider interspaces between them. . . 20

19. Rostrum ending in a single sharp point, without subapical teeth. Palm of second legs of adult specimens velvety pubescent, especially in the lower part. Anteroventral part of merus also pubescent. Fingers with some scattered stiff hairs and a narrow strip of pubescence close along cutting edges. Eastern. . *ohione*

19¹. Rostrum with two (seldom one) subapical teeth dorsally. Fingers of second legs of adult specimens entirely pubescent; palm and other joints naked except for some scattered stiff setae. Western. . . . . *gallus*

20. Chelae of second legs of adult male rather elongate, carpus more than thrice as long as broad. Pubescence of second chelae generally not strongly pronounced. Proximal dorsal teeth of rostrum occupying $\frac{2}{5}$ of length of carapace. Eastern. . . . . *heterochirus*

20¹. Chelae of second legs of adult male robust and thickset, carpus more or less cup-shaped, less than thrice as long as broad. Pubescence of second chelae usually very distinct. Proximal dorsal teeth of rostrum occupying less than $\frac{1}{3}$ of length of carapace. Western. . . . *occidentale*

21. Fingers of large chela of adult male as long as or longer than palm, gaping. At each side of cutting edges of fingers of large chela in adult male a row of about 20 tubercles is present. Upper margin of rostrum with 5-10 teeth. Eastern. . . *potiuna*

21[1]. Fingers of large chela of adult male distinctly shorter than palm, closing over the whole length. Generally less than 15 tubercles at each side of cutting edges of fingers of that chela. 22

22. Fingers very short, being about half as long as palm. Only few tubercles (about 4 to 11 in adult males) at each side of cutting edge. Cutting edge of dactylus of large chela in adult males with 2 large teeth in proximal part, between which sometimes a much smaller denticle is visible. Rostrum with 8-11 dorsal teeth. Eastern. . . . . *brasiliense*

22[1]. Fingers of second legs in adult male ⅔ to ¾ as long as palm. Tubercles along cutting edge only distinct at inner side, about 10-13 in number. Cutting edge of dactylus with 1 large tooth, behind which a few smaller denticles are present. 23

23. Rostrum with 12-14 dorsal teeth. Chelae slender, palm not swollen, upper and lower margins of palm about parellel, lower margin sometimes slightly concave. Eastern. . . *nattereri*

23[1]. Rostrum with 6-9 dorsal teeth. Chelae robust, palm swollen, upper and lower margin both convex. Eastern. . . . . *iheringi*

24. Spines at lower margin of large chela of the adult male strongest at base of fingers, strongly diminishing in size and strength proximally, those in middle of palm being very small or even absent. Near base of palm the spines become larger again. Lower margin of palm of large chela of male straight or slightly concave. Large chela itself elongate. Fingers of large chela of adult male with distinctly separated small teeth on the cutting edges up to the apex. Carpus of large chela longer than merus. Eastern. . . . . *faustinum*

24[1]. Spines of lower margin of large chela of adult male strong throughout length of palm, those in middle of palm being as strong as or stronger than those near base of fingers. Carpus of large chela in adult male as long as or shorter than merus. Large chela very robust. 25

25. Distal small teeth of cutting edges of fingers of large chela in adult male distinct and separated by rather large interspaces. Carpus as long as merus. 26

25¹. Cutting edges of fingers of large chela in adult male except for the large teeth at base, crenulate, without distinctly separated teeth. Carpus shorter than merus. . . . 28

26. Palm of large chela of adult males swollen, with lower margin distinctly convex. Hairs on the outer side of the palm numerous. Eastern. . . . . *olfersi*

26¹. Palm of large chela of adult males compressed, lower margin about straight, or only slightly convex. Hairs on outer side of palm relatively few. Western. . . . *digueti*

27. Adult male with chelae of second legs very unequal in shape and size. Smaller leg with fingers gaping, the gap being filled by stiff hairs, which are implanted on the cutting edges. . . 28

27¹. Adult male with chelae of second legs equal in shape, sometimes slightly unequal in size. 29

28. Palm of large chela of adult male more or less convex. Haired space on outer surface of palm not sharply defined, not flat. Fixed fingers with numerous irregularly placed spinules at outer surface. Eastern. . . . . *crenulatum*

28¹. Palm of large chela of adult male compressed. Haired space on outer surface of palm sharply defined, flat. Fixed finger with 1 or 2 rows of spinules at outer surface. Western. . . . . *hancocki*

29. Small species, adult males up to 105 mm long. Fingers of large chela of adult male short, being at most ⅔ as long as palm and closing throughout their length. Second legs of adult male always distinctly different in shape. Carpus of large chela only slightly shorter than merus. Ventral surface of merus, carpus and palm with a thick pubescence; merus swollen. Western. . . . . *inca*

29¹. Larger species, adult males up to 233 mm in length. Second chelae as a rule equal in size. Fingers of large chelae of adult male almost as long as palm, generally gaping. Carpus distinctly shorter than merus, merus not swollen. Ventral surface of merus, carpus and palm slightly if at all pubescent. 30

30. Carpus of second chelae of adult male more than twice as long as wide. Fixed finger of large chela of adult male distinctly pubescent. Fingers slender with tips crossing and reaching far

beyond outer margin of opposite finger. Teeth and spinules very strong. Eastern. . . . . *carcinus*

30[1]. Carpus of second chelae of adult male twice or less than twice as long as wide. Fixed finger of large chelae with a conspicuous pubescence along the cutting edge only. When fingers of large chelae of adult male are closed, then the crossing tips generally do not reach beyond the other finger. Teeth and spinules less strong than in previous species. Western. . . . . *americanum*

The following list gives the specific and varietal names used in combination with the generic names *Astacus, Macrobrachium* or *Palaemon* for American species of the present genus, which proved either to be identical with one of the species mentioned in the key or to be species incertae; if possible the identification is given.

appuni	=*heterochirus*	lamarrei	=*amazonicum*
aztecus	=*carcinus*	laminatus	=*carcinus*
brachy-		longidigitum	=*acanthurus*
dactylus	=*carcinus*	longipes	=*tenellum*
brevicarpus	=*carcinus*	mexicanum	=*acanthurus*
consobrinus	=*olfersi*	montezumae	=?*carcinus*
cubanus	=*faustinum*	ornatus	=*carcinus*
dasydactylus	=*acanthurus*	potieté	=*acanthurus*
desaussuri	=*olfersi*	potiporanga	=*olfersi*
dieperinkii	=*amazonicum*	punctatus	=*carcinus*
ensiculus	=*amazonicum*	sallei	=*ohione*
equatorialis	=*brasiliense*	serratus	=*olfersi*
fluvialis	=species incerta, vid. p. 132	sexdentatus	=*acanthurus*
		spinimanus	=*p. p. olfersi, p. p. faustinum*
forceps	=*acanthurus*		
jamaicense	=*carcinus*	swainsonii	=*acanthurus*

Macrobrachium amazonicum (Heller)

Pl. 2, figs. a-h

Palaemon Lamarrei ? White, 1847, List Crust. Brit. Mus., p. 78. (non H. Milne Edwards, 1837).

Palemon Lamarrei De Haan, 1849, Fauna Japonica, Crust., p. 171.

Palaemon amazonicus Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45, pt. 1, p. 418, pl. 2, fig. 45.

Palaemon ensiculus Smith, 1869, Trans. Conn. Acad. Arts Sci., vol. 2, pp. 26, 40, pl. 1, fig. 2.

"*Palaemon Lamarrei*?" Smith, 1869, Trans. Conn. Acad. Arts Sci., vol. 2, p. 40.

Palaemon Lamarrei De Man, 1879, Notes Leyden Mus., vol. 1, p. 166.

Palaemon Dieperinkii (De Haan MSS) De Man, 1879, Notes Leyden Mus., vol. 1, p. 167.

Palaemon lamarrei Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 701, pl. 47, fig. 2.

Palaemon amazonicus Thallwitz, 1892, Abh. Ber. zool.-anthrop. Mus. Dresden, 1890-1891, pt. 3, pp. 6, 14, 49.

Palaemon lamarrei Ortmann, 1893, Ergebn. Plankton-Exped., vol. 2Gb, p. 48.

Palaemon Amazonicus Nobili, 1896a, Boll. Mus. Zool. Anat. comp. Torino, vol. 11, n. 222, p. 3.

Palaemon lamarrei De Man, 1897, Zool. Jb. Syst., vol. 9, p. 767.

non *Palaemon Lamarrei* Nobili, 1897, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, n. 280, p. 5.

Palaemon amazonicus Ortmann, 1897, Rev. Mus. Paul., vol. 2, p. 204.

Bithynis lamarrei Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 487.

Bithynis ensiculus Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 488.

Palaemon amazonicus Moreira, 1901, Arch. Mus. Nac. Rio de Jan., vol. 11, p. 12.

non *Palaemon* (*Eupalaemon*) *Amazonicus* Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, p. 5.

Palaemon lamarrei p. p. Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.

Bithynis amazonicus Moreira, 1912, Mém. Soc. zool. France, vol. 25, p. 149; Moreira, 1913, Comm. Linhas Telegr. Amazon., Ann. 5, Hist. nat., Zool., p. 15.

Palaemon amazonicus Sunier, 1925, Tijdschr. Nederl. dierk. Ver., ser. 2, vol. 19, p. cxv.

non *Palaemon amazonicus* Pesta, 1931, Ann. naturh. Mus. Wien, vol. 45, p. 174, fig. 1.

Palaemon amazonicus Gordon, 1935a, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 323.

non *Macrobrachium amazonicus* Schmitt, 1936, Zool. Jb. Syst., vol. 67, p. 373.

Macrobrachium amazonicum Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 12; Holthuis, 1950b, Zool. Meded., vol. 31, p. 29.

Description: The rostrum is long and slender, it reaches, even in full grown specimens, distinctly (with 2/5 or even more, in young specimens with a third of its length) beyond the scaphocerite.[2] The anterior half is directed obliquely upwards. The upper margin bears 9 to 12 teeth, the first of which is placed on the carapace behind the orbit. The first seven teeth are placed close together on a basal crest in the proximal half of the rostrum, the ultimate teeth are more widely spaced, often a distinct naked space is present between the penultimate and the antepenultimate dorsal tooth, the last tooth is placed close to the apex. The ventral margin bears 8 to 10 teeth, the distal of which, too, are more widely spaced than the proximals. The carapace is smooth.

The abdomen is smooth. The tip of the pleura of the fifth segment bears a small but distinct tooth. The sixth abdominal segment is about 1.5 times as long as the fifth. The telson is about 1.5 times as long as the sixth abdominal segment. The dorsal surface of the telson bears two pairs of spinules, which are placed in the middle and at 3/4 of the length of the telson. The posterior margin of the telson ends in a sharp median point. Two pairs of spines are placed on the posterior margin. The inner spines do not overreach the apex of the telson. In young specimens the anterior and exterior pair of spines is distinctly smaller than the posterior and inner pair, in the adults the two pairs of spines are subequal in length. The tip of the telson in older specimens reaches farther beyond the inner pair of spines than in younger specimens. In young specimens two feathered setae are present between the inner spines, these generally are wanting in the adults.

The scaphocerite is 2.5 times as long as broad. The outer margin is straight or slightly convex in the proximal, slightly concave in the distal part.

The first pereiopods are slender, they reach to or slightly beyond the end of the scaphocerite; in young specimens, however, they fail to reach so far. The fingers are slightly longer than the palm. The carpus is 2.5 times as long as the chela and 4/3 as long as the merus. The second leg in the adult male is rather strong, it reaches with almost the entire carpus beyond the scaphocerite. The chela is slender, the fingers are about 3/4 of the length of the palm. Both dactylus and fixed finger of the adult male are covered with a thick coat of brown hairs, the extreme tips, however, are naked. The cutting edges of both fingers are provided in the proximal part with one tooth, behind which some smaller teeth

[2] In some Venezuelan specimens the rostrum is somewhat shorter than in the Brazilian and Guiana specimens, reaching less far beyond the scaphocerite.

are visible. The palm is elongate and provided with rather numerous small scattered spinules. The carpus in the adult male is about as long as or slightly longer than the chela, it widens distally and too is provided with numerous small spinules. The merus measures ⅔ of the length of the carpus, it too is provided with spinules, which, however, are less numerous than in the carpus. The merus is 1.5 times as long as the ischium. In an old female (125 mm) the second leg is much less strong, it reaches with about half the carpus or less beyond the scaphocerite. The fingers are almost as long as the palm, they bear no thick coat of hairs, though some scattered tufts of setae are present. Their cutting edges show the same teeth as in the male. The carpus is distinctly longer than the chela. The merus is ⅔ as long as the carpus. The ischium is slightly shorter than the merus. Spinules are present on the palm, carpus and merus, those of the palm and carpus are most distinct but still much smaller than the spinules in the leg of the male. In young specimens the second legs are relatively shorter, the fingers are relatively longer, and the carpus, when compared with the chela, is longer, moreover the spinulation is less distinct or even absent. The last 3 pereiopods are slender, the third reaches about to the end of the scaphocerite or even with the entire dactylus beyond it, the fifth leg reaches with the dactylus sometimes also with a part of the propodus beyond that scale. The propodus of the third leg is almost thrice as long as the dactylus. The carpus is somewhat less than half as long as the propodus, the merus is about as long as or slightly longer than the propodus. The fifth leg is much more slender, the propodus is about 4 times as long as the dactylus, the carpus is about half as long as the propodus, which is somewhat longer than the merus. In the adult males the merus, carpus and propodus are covered with short spinules which are placed close together, between these spinules some hairs are scattered. In the females, the spinules are absent and the leg is naked except for some few longer hairs.

The pleopods and uropods are of the normal shape.

Size: The largest specimen seen by me measured 150 mm. Ovigerous females measured 50 to 110 mm. The eggs are numerous and small, being 0.6 to 0.8 mm in diameter.

Colour: In life the animals are colourless, transparent, (Holthuis 1950b, p. 29).

Material examined: In the United States National Museum specimens of this species are present from: Venezuela (Lake Maracaibo off Pueblo Viejo; Rio Apon, 135 km S.W. of Maracaibo; Rio Ma-

chango, S. of Lagunillas; San Mateo, S. of Barcelona; Lower Orinoco), British Guiana (Cuyuni River near the old Stelling; Kartabo), N.E. Peru (Upper Marañon River; Shansho Caño and Ampijacu River near Pebas; Zapote Cocha), Brazil (between Manáos and Pará; Santarem; Pará; Paraguay River near Descalvados), Bolivia (Rosario). In the American Museum of Natural History at New York, specimens of this species are preserved from British Guiana (Kartabo and Cuyuwimi River). The Rijksmuseum van Natuurlijke Historie at Leiden possesses a large number of specimens from Surinam: Saramacca River near Groningen, Surinam River near Paramaribo and near Kabelstation at about 100 km S. of Paramaribo, and Langaman kondre at the mouth of the Marowijne River. In the Zoological Museum at Amsterdam I examined a specimen from Essequibo, British Guiana.

In the Instituto e Museo di Zoologia della Università in Turin, Italy, 13 juvenile specimens of this species are present originating from Colonia Risso, Rio Apa, Alto Paraguay (1893, A. Borelli coll.).

Distribution: The species lives in fresh water of South American rivers, which empty in the Atlantic Ocean. It is known from the Amazon and Paraguay River basins and from the rivers between these basins, while it also is known from rivers north of the Amazon. The records in literature are: British Guiana (Gordon, 1935a), Surinam! (De Man, 1879! Thompson, 1901), Saramacca River near Groningen! (Holthuis, 1950b), Surinam River near Paramaribo and near Kabelstation at about 100 km S. of Paramaribo! (Holthuis, 1950b), Langamankondre at mouth of Marowijne River, Surinam! (Holthuis, 1950b), Rio Paute, Ecuador (Ortmann, 1891), Rio Huallaga, N. Peru (Thallwitz, 1892), Tabantinga, W. Brazil (Moreira, 1912, 1913), Gurupa, mouth of Amazon River (Pesta, 1931), Amazon River (Heller, 1862), Pará, Brazil (Smith, 1869; Ortmann, 1893), Pernambuco, Brazil (White, 1847), Caceres on Rio Paraguay, S. Brazil (Moreira, 1912, 1913), Colonia Risso, N. Paraguay! (Nobili, 1896a).

Type: The type locality is "Amazon River." The type if extant is preserved in the Naturhistorisches Museum in Vienna, Austria.

Remarks: In literature the present species often is named *Macrobrachium* (or *Palaemon*) *lamarrei. Palemon Lamarrei* was described by H. Milne Edwards (1837, p. 397) from the Bengal coast, and at present is recognized as a species quite distinct from the present form. White (1847) is the first to mention, though with some doubt, Milne Edwards' species from Brazil. The confusion was enlarged when De Haan described *Palemon Lamarrei* from Japan. His specimens namely,

which at present are preserved in the collection of the Leiden Museum, indeed are identical with the present form, as is already pointed out by De Man(1879). These specimens must by some error or other have been mixed with the Japanese material sent to De Haan for examination. This is further confirmed by the fact that De Haan's specimen of *Palemon Lamarrei* was infested by a Bopyrid parasite, which proved to be *Probopyrus floridensis* Rich. var. *gigas* Nierstrasz and Brender à Brandis (=*Probopyrus bithynis* Rich.) a species parasiting on various South and Central American Palaemonids and up till now not known from Japan (vid. Nierstrasz and Brender à Brandis, 1925, and Sunier, 1925). Moreover the fact that *Palaemon brevicarpus* De Haan (1849) is identical with *Macrobrachium carcinus* (L.) (=*Palaemon jamaicensis* (Herbst)), also points to the fact that some American material was mixed with De Haan's Japanese Crustacea.

Ortmann (1891) considered *Palaemon jelskii* Miers (1877) to be described after juvenile specimens of this species. It is, however, a good species (vid. p. 26).

Nobili (1897) mentions *Palaemon Lamarrei* from Rio Lara, Darien, S. Panama, a river which empties in the Pacific Ocean. In the collection of the U. S. National Museum one of Nobili's specimens, which long ago was presented to this institution by the Turin Museum, was examined by me. As was already found by Dr. Waldo L. Schmitt, the specimen does not belong to *Macrobrachium* at all, but is a *Palaemon,* namely *Palaemon gracilis* (Smith).

The specimens recorded by Nobili (1901) as *Palaemon* (*Eupalaemon*) *Amazonicus* from Vinces, Guayaquil and Rio Daule, all 3 localities in W. Ecuador, were examined by me in the Turin Museum. The Vinces specimens belong to *Macrobrachium gallus* new species, the other material to *Macrobrachium panamense* Rathbun. Also Pesta's (1931) specimens from Costa Rica, which he identified as *Palaemon amazonicus,* actually are *Macrobrachium panamense.*

Schmitt's (1936) specimens from Venezuela identified as *M. amazonicus* proved to belong to *M. jelskii.*

Macrobrachium panamense Rathbun

Pl. 3, figs. a-e

Palaemon mexicanus p. p. Nobili, 1897, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, n. 280, p. 5.

Palaemon lamarrei Doflein, 1899, S. B. Bayer. Akad. Wiss., vol. 29, p. 185 (non H. Milne Edwards, 1837).

Palaemon (*Eupalaemon*) *Amazonicus* p. p. Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, p. 5 (non Heller, 1862).

Palaemon lamarrei p. p. Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.

Macrobrachium acanthurus panamense M. J. Rathbun, 1912a, Smithson. Misc. Coll., vol. 59, n. 13, p. 1.

Palaemon amazonicus Pesta, 1931, Ann. naturh. Mus. Wien, vol. 45, p. 174, fig. 1.

Macrobrachium acanthurus Hildebrand, 1939, Zoologica, New York, vol. 24, pp. 23, 24, (non *Palaemon acanthurus* Wiegmann, 1836).

Macrobrachium panamense Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 17.

Description: The present species agrees in almost all characters with *M. amazonicum,* with which species it often has been identified. The differences between the two forms are:

1. The rostrum in *M. amazonicum* bears 8 to 12 (seldom 7) lower teeth, in *M. panamense* this number varies between 5 and 7.

2. The rostrum of the west coast species seems to be shorter than that of the eastern form.

3. Only 1 tooth of the rostrum stands behind the orbit in *Macrobrachium amazonicum,* while there are two in *M. panamense.*

4. The adult males of *M. amazonicum* have the carpus of the second chela longer than or as long as the chela, while in the adult males of *M. panamense* the carpus is distinctly shorter than the chela.

The females and the young differ from the males by having the second legs less developed, smooth, often with the palm somewhat inflated; the fingers are longer and not hairy. The last three legs are smooth. These specimens are difficult to distinguish from young specimens of *M. tenellum.* They may be recognized, however, by having 2 instead of 1 tooth of the rostrum behind the orbit, by having the fifth abdominal segment with the apex of the pleura rectangular and not acute and by having the tip of the telson differently shaped. Furthermore the palm of the chela is never inflated in young specimens of *M. tenellum.*

Colour: Doflein (1894, p. 185) gives the following account of the colour of the living animal: "The animal is white, the second legs are reddish with a blue spot."

Size: The Allan Hancock material of this species is juvenile, the specimens measure 28 to 64 mm. The largest specimen seen by me measures 134 mm.

Material examined: The Allan Hancock Expeditions 1933, and 1934 collected 5 specimens of this species:

Costa Rica: Puerto Culebra. Shore collecting along south slough with dipnet, Mar. 12, 1933, Sta. 115-33.

Ecuador: Guayas River, dipped from plants. Feb. 6, 1934.

In the United States National Museum I studied material of this species from: Honduras (head of Rio Pedregal), Nicaragua (Realejo), Panama (Chamé Point; Farfan Beach; Miraflores; Pedro Miguel and Miraflores Locks in Panama Canal; Corozal; near Panama; Rio Juan Diaz; Rio Mamoni near El Capitan; Rio Calabre, Darien), W. Colombia (Rio Rosario) and Ecuador (Guayaquil). In the American Museum of Natural History at New York specimens of this species are present from Real de Santa Maria, Darien, S.E. Panama.

In the Istituto e Museo di Zoologia della Università in Turin, Italy, I studied material of the present species from Rio Tuyra and Rio Lara, Darien, S. Panama (1895, E. Festa coll.) and from Rio Daule and Guayaquil, Ecuador (E. Festa coll.). From the latter locality a specimen of this species was examined in the Amsterdam Museum.

Distribution: The species is known from fresh water from Honduras to Ecuador, on the Pacific slope. It is recorded in literature from: Bebedoro, Guanacaste, Rio Tenorio, Costa Rica (Pesta, 1931), Pedro Miguel and Miraflores Locks, Canal Zone! (Hildebrand, 1939), Rio Calabre, Panama! (M. J. Rathbun, 1912a), Rio Tuyra and Rio Lara, S. Panama! (Nobili, 1897), Guayaquil, Ecuador! (Doflein, 1899; Nobili, 1901!; Thompson, 1901), Rio Daule, Ecuador! (Nobili, 1901).

Type: The type locality is Rio Calabre, Panama. The type specimens of *Macrobrachium acanthurus panamense* Rathbun are preserved in the U. S. National Museum (Cat. No. 43656).

Remarks: One of the specimens reported by Nobili (1897) under the name *Palaemon mexicanus* from Darien (either from Rio Tuyra or or from Rio Lara) is present in the collections of the U. S. National Museum. The other material from Rio Lara and Rio Tuyra reported upon by Nobili (1897) under the name *Palaemon mexicanus* is preserved in the Turin Museum and was there examined by me. All of these specimens proved to belong to *Macrobrachium panamense* Rathbun. To this latter species also belongs the material from Rio Daule and Rio Guayaquil, which was identified by Nobili (1901) as *Palaemon* (*Eupalaemon*) *Amazonicus*. The larger part of this Ecuador material is preserved in the Turin Museum, while one specimen from Guayaquil is

the property of the Amsterdam Museum. As already pointed out, the specimens from Vinces, Ecuador, which were included by Nobili (1901) in *Palaemon* (*Eupalaemon*) *Amazonicus* also, actually belong in *Macrobrachium gallus* new species.

Hildebrand's (1939) specimens from Pedro Miguel and Miraflores Locks, Canal Zone mentioned by him as *M. acanthurus,* were examined by me and proved to belong to *M. panamense.*

Extensive measurements of the species are given by Nobili (1901) and Pesta (1931), the latter paper is provided with figures of it.

Macrobrachium jelskii (Miers)

Pl. 4, figs. a-d

Palaemon jelskii Miers, 1877, Proc. Zool. Soc. Lond., 1877, p. 661, pl. 67, fig. 1; Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 9.

Bithynis jelskii Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 489.

Macrobrachium amazonicus Schmitt, 1936, Zool. Jb. Syst., vol. 67, p. 373.

Macrobrachium jelskii Chace & Holthuis, 1948, Hummelinck's Stud. Fauna Curaçao, vol. 3, p. 23; Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 1111.

Macrobrachium jelskii Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 15; Holthuis, 1950b, Zool. Meded., vol. 31, p. 30.

Description: The rostrum is slender with the tip curved upwards, it reaches beyond the scaphocerite. The upper margin bears 6 or 7 (seldom 5 or 8) teeth (the subapical teeth excluded), the first of which is situated behind the orbit, the second just above or slightly before the posterior orbital margin. The other teeth are regularly divided over the proximal half of the upper margin of the rostrum. The distal half of the rostrum is unarmed but for two small subapical teeth. The length of this unarmed portion sometimes is much less than half the length of the rostrum, the proximal teeth occupying then more than half the rostrum, but the naked portion always is very distinct. The lower margin bears 5 or 6 teeth. The carapace is smooth.

The abdomen is smooth and normal in shape. The pleura of the fifth segment ends in an acute point. The sixth abdominal segment is almost twice as long as the fifth. The telson is less than 1.5 times as long as the 6th abdominal segment. It bears the usual 2 pairs of spines at its middle and at ¾ of its length. The posterior margin ends in a sharp median tooth, which at both sides is flanked by a long inner and

a shorter outer spine. The slender and straight inner spines distinctly overreach the median point of the posterior margin. There are some 4 feathered setae between the larger inner spines.

The scaphocerite is about 3.5 times as long as broad. It is of about the same breadth throughout its length. The outer margin is straight or slightly concave.

The first pereiopod reaches just to the end of the scaphocerite. The chela is rather broad in the middle, narrowing towards both ends. The fingers are slightly longer than the palm and have the tips pointed. The carpus is 2.5 times as long as the chela and 1.25 times as long as the merus. The second legs are equal, they reach with the larger part of the chela beyond the scaphocerite. They are very slender and entirely smooth. The chela has the fingers ¾ as long as the palm, which is cylindrical. The cutting edges of both fingers bear in the proximal third one small tooth, distally of this tooth the edge is entire, proximally it shows a small gap, at the margin of which some very indistinct teeth or crenulations may be seen. The carpus is slender, it is 1.2 to 1.5 times as long as the chela. The merus is about as long as, or somewhat shorter than the chela, while the ischium is somewhat shorter than the merus. In the males the second legs are of the same shape as in the females, only the teeth on the cutting edges are more distinct. The 3rd pereiopod distinctly fails to reach the end of the scaphocerite. The propodus is slightly more than twice as long as the dactylus. The carpus is half as long as the propodus, while the merus is somewhat longer than the latter joint. The fifth leg reaches with part of the dactylus beyond the scaphocerite, here the propodus is about thrice as long as the dactylus and slightly more than twice as long as the carpus, while the merus is somewhat shorter than the propodus. All joints of the last three pereiopods are smooth, except for a few small and scattered short hairs and the usual row of spines on the posterior margin of the propodus.

Size: The specimens are up to 56 mm long. Ovigerous females of 28 mm and larger have been examined. The eggs are few and large, being 1.3 to 2.3 mm in diameter.

Material examined: In the U. S. National Museum this species is represented by material from La Ceiba, Venezuela and from Paramaribo, Surinam.

In the Rijksmuseum van Natuurlijke Historie at Leiden I studied a series of more than 500 specimens of this species from Paramaribo, and other localities in Surinam, while also some specimens are present there from Chuaico, Trinidad. In the Zoological Museum at Amsterdam, 16 specimens are present from Paramaribo.

Distribution: This species is known from fresh waters of the north-coast of S. America from Venezuela to French Guiana. In literature it is recorded from La Ceiba, Venezuela! (Schmitt, 1936; Chace & Holthuis, 1948), Nannikreek near Nickerie, N.W. Surinam! (Holthuis, 1948), between Coronie and Paramaribo!, Paramaribo!, Republiek at 40 km S. of Paramaribo!, and Galibi at the mouth of the Marowijne River!, Surinam (Holthuis, 1950b), and Oyapock, French Guiana (Miers, 1877).

Type: The type locality is Oyapock, French Guiana. One of the type specimens, a rather damaged spirit specimen, is still preserved in the British Museum (Reg. No. 79.21).

Remarks: Material of the present species is recorded here for the first time under the name *jelskii* since Miers' original description. This is the more astonishing as according to the abundant material examined it certainly is not rare. Probably the species has been confused up till now with *M. amazonicum.*[3] Ortmann (1891) namely in his revision of the present genus, though naming some differences between *M. jelskii* and *M. amazonicum,* thought them nevertheless to belong to one species, the differences being due to age only. This certainly is not correct, as my specimens, which may be considered to be adult show so many constant differences with *M. amazonicum* that specific separation is fully justified. These differences are:

1. The rostrum in *M. amazonicum* bears 9 to 12 upper and 8 to 10 lower teeth, in *M. jelskii* these numbers respectively are 5 to 8 and 5 to 6. Furthermore the rostrum in *M. jelskii* is relatively shorter and less curved upwards than in *M. amazonicum,* also no distinct basal crest is present above the eye.

2. The telson in *M. jelskii* has the inner posterior spines much longer than the apex, while about 4 feathered setae are present at the posterior margin. In *M. amazonicum* the apex of the telson far overreaches the inner spines and there are at most 2 feathered setae.

3. The legs in *M. jelskii* are more slender than in *M. amazonicum* and the relations between the lengths of the joints is different. Furthermore the second legs in *M. jelskii* never have the joints spinulate or pubescent and also the last 3 legs never are scabrous.

4. The eggs of *M. jelskii* are large and few, in *M. amazonicum* they are numerous and small.

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[3] The specimens from the Amsterdam Museum for instance, were provided with a label in the handwriting of the late Dr. J. G. De Man with the indication "*Palaemon* (*Eupalaemon*) *amazonicus* Heller, jonge exemplaren [juvenile specimens]." While Schmitt, 1936, also brought his specimens from La Ceiba, which I examined, to that species.

Macrobrachium borellii (Nobili)

Pl. 4, figs. e-h

Palaemon Borellii p. p. Nobili, 1896, Boll. Mus. Zool. Anat. Comp. Torino, vol. 11, n. 265, p. 2.

Palaemon brasiliensis (?) Nobili, 1896a, Bull. Mus. Zool. Anat. Comp. Torino, vol. 11, n. 222, p. 3 (non Heller, 1862).

Palaemon Borellii Von Ihering, 1897, Rev. Mus. Paul. vol. 2, p. 424.

Palaemon borellii Moreira, 1901, Arch. Mus. Nac. Rio de J., vol. 11, p. 13.

Palaemon Borellii p. p. Nobili, 1901b, Boll. Mus. Zool. Anat. Comp. Torino, vol. 16, n. 402, p. 4.

Palaemon Borellii Sollaud, 1923, Bull. Biol. France Belg., vol. 57, p. 581, fig. 22.

Macrobrachium borellii Ringuelet, 1949, Notas Mus. La Plata, vol. 14, Zool. n. 119, p. 93, textfig. 2, pl. 4, pl. 5, figs. 2, 3; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 13.

Description: The rostrum is almost straight, only the tip being curved slightly upwards; it reaches to, or slightly beyond the end of the scaphocerite. The upper margin bears 6 to 9 teeth, the first of which is situated behind the posterior limit of the orbit. The teeth are placed over the entire length of the upper rostral margin, the distance between the distal teeth often is slightly larger than that between the proximals. A very small subapical tooth is present. The lower margin bears 2 to 4 teeth. The carapace is smooth.

The abdomen is smooth, it is normal in shape. The fifth segment has the apex of the pleurae rounded. The sixth segment is about 1.5 times as long as the fifth. The telson is about 1.5 times as long as the 6th abdominal segment. It bears the usual two pairs of dorsal spinules, the anterior of which is situated in the middle of the telson, the posterior being placed a little closer to the anterior pair than to the posterior margin of the telson. The telson ends in an acute triangular point, which is distinctly overreached by the inner of the two posterior pairs of spines. Numerous feathered setae are present on the posterior margin.

The scaphocerite is about three times as long as broad. It only slightly narrows anteriorly. The outer margin is straight or somewhat concave.

The first pereiopods reach with part of or with the entire fingers beyond the scaphocerite. The fingers are pointed and are as long as the palm. The carpus is fully twice as long as the chela and about 5/4 as long as the merus. The second legs of the adult male are equal in shape and slender. They reach with the carpus and the chela beyond the scapho-

cerite. The fingers are about ½ to ⅔ of the length of the palm. The cutting edge of the dactylus bears in the proximal half two distinct teeth, between which 1 to 3 smaller teeth are present. The cutting edge of the fixed finger bears 1 tooth, which is placed between the two teeth of the dactylus, behind this tooth 2 to 4 small denticles are present on the edge. The fingers bear no spinules and are covered with numerous long setae, which, however, are distinctly separated from each other and never form a velvety cover on the fingers as for instance in *M. acanthurus*. The palm is cylindrical and covered with numerous small spinules, furthermore some scattered hairs are present. The carpus is distinctly (almost 1.5 times) longer than the palm, but shorter than the entire chela. It is about 6 times as long as its largest breadth. The merus is only slightly (0.8 to 0.9 times) shorter than the carpus and about 1.7 times as long as the ischium. The carpus, merus, and ischium are, like the palm, covered with small spinules and some scattered hairs. In the old female there are 2 or 3 inconspicuous teeth on the cutting edges of the fingers; the relation between the length of the fingers and the palm is about the same as in the male (the fingers may be slightly longer than in the male), but the carpus is longer than the entire chela. Juvenile specimens resemble the female, the younger they are, the larger are the differences with the males. The third leg reaches with the ultimate tip of the dactylus beyond the scaphocerite. The dactylus is long and slender. The propodus is about 2.5 times as long as the dactylus and almost twice as long as the carpus. The merus is longer than the propodus. The fifth leg reaches with the entire dactylus beyond the scaphocerite. The dactylus is somewhat less than half as long as the propodus. The carpus is somewhat more than half as long as the propodus, while the merus is as long as the latter joint. The legs are smooth, except for the spinules along the posterior margin of the propodi. Numerous short hairs are present on the last three legs of the male.

The pleopods and uropods are normal in shape.

In the females and the young the legs reach less far forward than in the male. In the old females the second legs reach only with part of the carpus beyond the scaphocerite, while the third legs overreach the scaphocerite with the tips of the dactylus only, the fifth leg reaching slightly farther.

Ovigerous females were collected in the Rio de las Conchas in Argentina in January.

Size: The specimens seen by me measured 44 to 55 mm. I examined ovigerous females of 37 to 54 mm. The eggs are large and few, having a diameter of 1.1 to 2.0 mm.

Material examined: In the collection of the U.S. National Museum specimens of this species are present from: Uruguay (Cerro Largo Department; Maestre Campo, Durazno Department; San Juan, Colonia Department; Rio Santa Lucia, and Arroyo Canelon Grande, Canelones Department), and Argentina (Rio de las Conchas, Buenos Aires Province; Doc Sur, Buenos Aires; El Riachuelo (=Rio de Matanza), Buenos Aires; furthermore the localities Delta, Norte de Bernal and Arroyo Barca Grande, which I could not find on any map). The Rijksmuseum van Natuurlijke Historie at Leiden possesses three specimens from La Plata River, Argentina.

In the Istituto e Muso di Zoologia della Università in Turin, Italy, I examined the types of the present species from San Lorenzo, Jujuy Province and from San Luis Province, Argentina. Furthermore the Turin Museum possesses three specimens (in a very poor condition) from La Plata, Argentina and three specimens from Colonia Risso, Rio Apa, N. Paraguay. In the Museo Civico di Storia Naturale in Genoa, Italy, I examined 9 specimens of this species from La Plata (1885, C. Spegazzini coll.).

Distribution: The species up till now only is known from fresh water in Paraguay, Argentina and Uruguay. The records in literature are: Colonia Risso, Rio Apa, N. Paraguay! (Nobili, 1896a), San Lorenzo, Jujuy Province, Argentina! (Nobili, 1896), Rio Bartel, Goya Department, Corrientes Province (Ringuelet, 1949), Rio Parana Mini, Reconquista Department, Santa Fé Province (Ringuelet, 1949), San Luis Province! (Nobili, 1896), La Plata, Argentina! (Nobili, 1901b), Uruguay (Sollaud, 1923).

Type: The type localities are San Lorenzo (Jujuy Province) and San Luis Province, Argentina. The type material is preserved in the Turin Museum. The San Lorenzo material consists of four specimens, which unfortunately are desiccated. The San Luis specimens number three; one of them, a specimen of 29 mm, proves to belong to *Palaemonetes argentinus* Nobili and not to *Macrobrachium borellii.* The largest specimen from San Luis Province, measuring 50 mm, has been selected the lectotype of *Palaemon Borellii* Nobili.

Remarks: The specimens from Colonia Risso identified by Nobili (1896a) with some doubt as *Palaemon brasiliensis* Heller, still are present in the collection of the Turin Museum and on examination proved to belong to *M. borellii.* The material from La Plata mentioned by Nobili (1901) as *Palaemon Borellii* could be examined in the Isti-

tuto e Museo di Zoologia della Università in Turin and in the Museo Civico di Storia Naturale in Genoa, Italy. The 3 specimens of the Turin Museum indeed belong to the present species, but of the 30 specimens in the Genoa Museum only 9 are *M. borellii,* the rest belong in *Palaemonetes argentinus* Nobili.

Furthermore Ortmann's opinion (vid. Von Ihering, 1897) that *Macrobrachium borellii* is only a juvenile stage of *M. acanthurus* is incorrect, as is immediately shown by the fact that the eggs in *M. borellii* are few and large, while they are numerous and small in *M. acanthurus;* there also are differences in the shape of the rostrum and the second legs.

Juvenile and female specimens of *M. borellii* show a close resemblance to juvenile and female specimens of *M. potiuna.* They may however be recognized by the following characters:

1. In *M. borellii* only 1 tooth of the rostrum is placed on the carapace, in *M. potiuna* generally 2.

2. In *M. borellii* the rostrum generally reaches to, or beyond the scaphocerite, in *M. potiuna* it usually falls short of that scale.

3. The pleura of the fifth abdominal segment in *M. borellii* has the apex broadly rounded, in *M. potiuna* it is rectangular or slightly acute.

4. The carpus of the first legs in *M. borellii* is fully twice as long as the chela, in *M. potiuna* it is shorter.

5. The carpus of the second legs in females and juveniles of *M. borellii* is as long as the chela, it is shorter than the chela in *M. potiuna.*

6. The dactylus of the fifth leg in *M. borellii* is about $\frac{2}{5}$ as long as the propodus, it is $\frac{1}{3}$ as long as that segment in *M. potiuna.*

Macrobrachium quelchi (De Man)

Pl. 5, figs. a-h

Palaemon (*Macrobrachium*) *Quelchi* De Man, 1900, Trans. Linn. Soc. Lond. Zool., ser. 2, vol. 8, p. 57, pl. 6, figs. 1-8.

Macrobrachium quelchi Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 18.

Description: De Man (1900) gives the following description of the present species: "*Palaemon Quelchi* belongs to the species of *small* size, the adult individuals measuring only 55 millim. from tip of rostrum to the extremity of the telson. Examined under a rather strong lens the cephalothorax presents a fine and rare punctation, on which one

observes a short pubescence, for the rest it appears smooth. The rostrum, vertically moderately deep, is rather short, reaching only the end of the antennulary peduncles or even only the middle of their terminal joint, so that it does not extend to the end of the antennal scales. The upper margin, usually very slightly convex above the eyes, gradually descends downwards and carries seven, eight, or nine low, rather equidistant teeth, the first two of which commonly stand on the cephalothorax, but often only one tooth stands on it, the second being placed above the orbital margin. The lower margin is usually armed with two teeth, often, however, with one only. The formulae for 34 specimens are the following:—

$$5 \text{ specimens } \frac{9}{2}\text{; } 4 \text{ specimens } \frac{9}{1}\text{; } 9 \text{ specimens } \frac{8}{2}\text{;}$$
$$5 \text{ specimens } \frac{8}{1}\text{; } 5 \text{ specimens } \frac{7}{2}\text{; } 5 \text{ specimens } \frac{7}{1}\text{;}$$
$$1 \text{ specimen } \frac{6}{2}.$$

"The hepatic spine is small and placed below and posterior to the somewhat larger antennal one. The apex of the telson, as usual shorter than the lateral appendages and the flattened upper surface of which bears the two ordinary pairs of small spinules, is triangular with a quite short median spine; the inner spinules are somewhat longer than the median point and considerably longer than the outer ones.

"The free end of the antennal scales is obtusely angulated internally and reaches a little further forward than the short spine at the extremity of the external margin. The shortest of the three antennular flagella is distinctly serrate and exceeds the free end of the antennal scales by its whole length. The external maxillipedes project with their terminal joint beyond the peduncles of the outer antennae.

"The first pair of legs exceed, in the full-grown male, the antennal scales by two fifth parts of their carpus; the latter is once and two-thirds as long as the hand, the fingers very slightly longer than the palm.

"The second legs are considerably stouter and longer than the first and somewhat unequal. In the largest male, which is 54 millim. long, both legs are slightly longer than the body and both exceed the antennal scales by the whole length of the carpus. The cylindrical merus widens slightly towards its distal end. The carpus of both legs appears at first sight just as long as the merus, but measured exactly it appears always

very slightly longer than it. The carpus, quite narrow at base and here much narrower than the distal end of the preceding joint, regularly widens towards its distal extremity, so that it has a conical shape and its diameter at the distal end is a little broader than that of the merus. The carpus appears, therefore, two and a half to three times as long as thick at its distal extremity. The chela is two and a half times as long as the carpus, and in both legs the palm measures almost two-thirds the length of the whole hand. The palm of the larger chela is distinctly broader than the widened distal end of the carpus, being a little more than once and a half as broad; the palm is about three times as long as broad, and its width measures almost one-fourth the length of the whole hand. The palmar portion of the hand appears slightly broader than thick, the proportion being as 6:5; it is everywhere rounded both on the upper and lower surface and on the sides. When the chela is looked at from above, the outer margin of the palm appears straight, but the inner slightly convex, and the inner border of the chela is a little concave at the base of the fingers. The pointed fingers leave, when closed, a narrow interspace between them, in the middle about as broad as the fingers themselves; the latter are almost cylindrical. The immobile finger is nearly straight and tapers but very slightly towards the tip; the dactylus, however, is somewhat curved and tapers more regularly. Each finger is armed with a strong conical tooth; that of the index is placed just in the middle of the finger, that of the dactylus a little beyond it; three much smaller obtuse teeth are observed between each conical tooth and the articulation, and the third of these small teeth is double. On each finger a sharp cutting-edge runs between the conical tooth and the tip.

"The smaller chela bears a close resemblance to the other, but the difference between its width and its height or thickness is still smaller, so that the palm appears almost cylindrical and but slightly broader than the carpus. The fingers are regularly tapering, the dactylus is less curved, and the interspace between both is small, only half as broad in the middle as the fingers. The toothing is about the same, but the dactylus bears six small obtuse teeth between the large conical tooth and the articulation.

"In the younger individuals the fingers are comparatively longer, so in a young male, long. 36 mm, the palm is 4½ mm, the fingers 4 mm. long; the former, 1⅖ mm. broad, is three times broader than long and 1 mm thick.

"The second legs are on all their joints roughened by small thorny points, that are crowded and numerous on their outer margin, less numerous on the rest of the surface, and those of the lower surface and of the inner margin are distinctly somewhat longer; these legs are glabrous, devoid of hair, except a rare short pubescence, only perceptible under a lens.

"The ambulatory legs of the third pair project with a third of their propodites beyond the antennal scales, their carpopodites reaching as far forward as the peduncles of the outer antennae; the legs of the fifth pair finally extend as far forward as the external maxillipeds, but do not reach the free end of the antennal scales. The ambulatory legs are rather slender. So are the meropodites of the third pair of the largest male 8 mm long, 1.25 mm thick, the propodites 7.9 mm long and 0.84 mm thick, so that the former are little more than six, the latter nine to ten times as long as broad; for the meropodites of the fifth legs these numbers are 7.5 mm and 1 mm, for the propodites 7.9 mm and 0.7 mm, so that the meropodites are seven to eight, the propodites eleven times as long as broad. The dactylopodites are short, measuring about one-fourth the length of the propodites. The posterior margin of the propodites bears two rows of spinules, so that in the third legs there are nine or ten spinules in the outer and six or seven in the inner row. The ambulatory legs are a little hairy, but for the rest quite smooth: the hairs are very short and fine, and arranged partly two and two in longitudinal rows; so that one row runs along the posterior margin of the meropodites."

De Man furthermore gives the following details of an ovigerous female: "The rostrum reaches to the middle of the terminal joint of the antennulary peduncles; the upper margin that descends obliquely downward bears seven teeth, the second of which is placed above the orbital margin; the lower border is armed with two teeth, the interspaces are as usual ciliated. The external maxillipeds exceed the antennal peduncle only by half their terminal joint. The first legs project only with the hands beyond the free end of the antennal scales; the hands measure just two-thirds the length of the carpus. The legs of the third pair reach to the end of the antennal scales, those of the fifth to the end of the antennal peduncles. The meropodites of the third pair are 4¼ mm long and ¾ mm broad; the propodites are 4 mm long and ½ mm broad."

Size: The largest specimen of this species known so far is 55 mm long. An ovigerous female is 38 mm in length. The eggs are large and few, their diameter is 2.5 mm.

Material examined: Some of the syntypes (5 specimens measuring 35 to 54 mm in length) present in the collection of the Zoological Museum at Amsterdam, have been seen by me.

Distribution: The species up till now only is known from the Upper Mazaruni River, British Guiana at an altitude of 2500 feet above sea level.

Type: Twelve syntypes are preserved in the British Museum, London Reg. No. 99.7.20; 5 syntypes are in the collection of the Zoological Museum at Amsterdam.

Macrobrachium inca Holthuis

Pl. 6, figs. a-e

Macrobrachium jamaicense M. J. Rathbun, 1910, Proc. U. S. Nat. Mus., vol. 38, p. 561 (non pl. 51, fig. 1). (non *Cancer* (*Astacus*) *Jamaicensis* Herbst, 1792.)

Macrobrachium inca Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 93.

Macrobrachium inca Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 15.

Description: The rostrum is straight. It reaches about to the end of the antennular peduncle. The upper margin bears 10 to 14, generally 11 or 12 teeth, which are regularly divided over the upper margin. The first 2 or 3 teeth are placed behind the orbit. The lower margin bears 2-4 teeth. The carapace is smooth, it is, however, entirely covered by short erect hairs, which are longest and densest in the anterolateral part.

The abdomen is smooth; no tubercles are present. The top of the pleura of the 5th segment is rectangular with a rather sharp tip. The sixth segment is somewhat longer than the fifth. The telson is 1.5 times as long as the 6th segment. The dorsal spinules are placed in the middle and at ¾ of the length of the telson. The posterior margin of the telson ends in a sharp median point (in old specimens this point is truncated) which is flanked by 2 pairs of spinules, the inner of which overreach the tip of the telson. Numerous feathered setae are present.

The scaphocerite is almost thrice as long as broad. The outer margin is straight or somewhat convex.

The first leg reaches with the chela and a small part of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is about 1.5 times as long as the chela, and only slightly longer than the merus. Both ischium and merus are pubescent, but bear no spinules; the carpus and chela are naked, or bear some few scattered hairs. The second legs are distinctly unequal in size, but about of the same shape.

The larger leg reaches with part of the merus beyond the scaphocerite. The fingers are about 3/5 to 4/5 of the length of the palm, they close over their whole length and have the tips curved inwards. The cutting edge of the dactylus is provided with a large tooth in about the middle of its length. Between this tooth and the base of the fingers some 2 to 4 small denticles are present. The cutting edge bears along its inner side some 8 to 10 deep pits, which sometimes are partly confluent with the edge, giving it a more or less crenulate appearance. The fixed finger has a large tooth, which is situated slightly proximal of the large tooth of the dactylus, here too about 4 small denticles are placed between the base of the finger and the large tooth. The distal part of the cutting edge, however, is straight from the large tooth to the tip. Along the inner margin of the cutting edge about 10-12 pits are present. The rest of the surface of the fingers is beset with longitudinal rows of club-shaped spinules. The palm is elongate and very slightly compressed, it generally is more than twice as long as high. There are various longitudinal rows of club-shaped spinules. These rows are densest dorsally and are much more spaced ventrally, sometimes being absent from the larger part of the ventral surface. The palm and the basal part of the fingers are densely pubescent, also a thick layer of soft hairs is present along the cutting edges of the fingers, obscuring the teeth. The extreme dorsal part of the palm is naked. The carpus is about 7/9 as long as the palm, and is about thrice as long as broad. The merus is swollen, it is about as long as the carpus, being sometimes a little longer, sometimes a little shorter. Both carpus and merus are pubescent and are provided with similarly arranged spinules as are present on the palm. The smaller leg reaches with part of the carpus or with the chela only beyond the scaphocerite. It is shaped almost exactly like the larger leg only the pits along the cutting edge are very inconspicuous or absent. Fingers, palm, merus and carpus are of about equal length. The third leg reaches about to the end of the scaphocerite. The propodus is less than 1.5 times as long as the dactylus, distinctly less than twice the length of the carpus and somewhat shorter than the merus. The fifth leg reaches about to the middle of the scaphocerite. The propodus is 2.5 times as long as the dactylus, somewhat more than 1.5 times as long as the carpus and as long as the merus. Small spinules are present on all the joints of the last 3 legs, those on the posterior margin of propodus and merus being most distinct.

The pleopods and uropods are normal.

Young specimens and females have the carapace naked. The second legs are much smaller and more slender, being almost equal and resembling the smaller second leg of the male. The teeth are feebly indicated and the spinules are smaller or even absent, while only some scattered hairs are present. The third legs reach less far, the fifth farther than in the adult specimens, no spinules, except those on the posterior margin of the propodus are present. Ovigerous females show somewhat more resemblance to the adult males than the young specimens do.

Size: My material ranges between 17 and 105 mm in length. The only three ovigerous females at my disposal are 60 to 88 mm long. The eggs are numerous and small, being 0.45 to 0.70 mm in diameter.

Colour: Dr. Waldo L. Schmitt collected a large number of specimens of this species at Rio Mochè, near Salaverry, N. Peru, October 20, 1926. He made the following note about the colour of living specimens: "The color of the body is dark bluish with reddish markings."

Material examined: The Allan Hancock Expedition, 1938, collected two ovigerous females of this species:

Ecuador: San Francisco Bay. Fresh-water stream near Cape San Francisco, February 23, 1938, Sta. 849-38.

In the U.S. National Museum a large amount of material of this species was studied; for the larger part it originated from N. Peru. The localities are: Parinas River, N. Peru (June 1, 1939, L. and H. E. Frizzell coll.), Sullana, on the Rio Chira, N. Peru (C. H. Eigenmann coll.), Piura on Rio Piura, N. Peru (January 11, 1919, C. H. Eigenmann coll.), Cultambo on the Jequetepeque River near Pacasmayo, Peru (January 12, 1919, C. H. Eigenmann coll.), stream at Pacasmayo, Peru (March 12, 1907, R. E. Coker coll.), Pacasmayo, Peru (April, 1912, Osgood and Anderson coll.), Rio Mochè near Salaverry, Peru (October 20 and 23, 1926, W. L. Schmitt coll.), market at Salaverry (October 24, 1926, W. L. Schmitt coll.), Chile (1919, C. H. Eigenmann coll.[4]).

Type: Holotype (U.S.N.M. Cat. No. 84086) is the largest male from Rio Mochè (October 23, 1926, W. L. Schmitt coll.). All type material is deposited in the U. S. National Museum, the Hancock material, however, is preserved in the collection of the Hancock Foundation, Los Angeles, Calif.

[4] The label carrying the indication "Chile," is not very trustworthy, and I am much in doubt about the occurrence of this species in Chile.

Remarks: The present species shows no direct relation to any of the known American species of *Macrobrachium*. It perhaps is most closely related with *M. carcinus* and *M. americanum*. From these two species it may be distinguished at once by its smaller size, by the shorter fingers of the second legs, by the pubescence and by the swollen merus of that leg.

M. J. Rathbun (1910) mentions specimens of *Macrobrachium jamaicense* from Pacasmayo, Peru, collected by R. E. Coker. These specimens were examined by me (vid. above list of material) and proved to belong to the present species. The figure (pl. 51, fig. 1) given by Rathbun is a copy of Bate's (1868) figure of *Macrobrachium americanum*.

Macrobrachium praecox (J. Roux)

Pl. 9, figs. c-f

Palaemon (*Eupalaemon*) *praecox* J. Roux, 1928, Rev. suisse Zool., vol. 35, p. 43.

Macrobrachium praecox Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 18.

Description: The rostrum is about as long as the scaphocerite. The tip is slightly directed upwards, while the upper margin is slightly convex in the proximal part. The upper margin bears 7 to 9 (seldom 10) teeth, the first of which is placed behind the orbit. The proximal teeth are placed closer together than the distals. The lower margin of the rostrum bears 2 or 3 teeth. The carapace is smooth. The abdomen is smooth and of the usual shape. The pleura of the fifth segment ends in an acute point. The sixth segment is 1.5 times as long as the fifth and 0.8 times as long as the telson. The dorsal spines of the telson lie in about the middle and ¾ of the length of the telson. The posterior margin of the telson is distinct and ends in a rather large median point, which is flanked by the usual two pairs of spines, the inner of which outreaches the median point.

The scaphocerite is thrice as long as broad, it narrows only slightly anteriorly. The external margin is straight or slightly concave.

The first leg reaches with the tips of the fingers beyond the scaphocerite. The fingers are slightly longer than the palm. The carpus is about 2.5 times as long as the chela (in young specimens only twice), it is distinctly longer than the merus. As none of my male specimens is so well developed as that described by Roux (1928) I will give here a translation of Roux's description: "The second legs are of equal length,

and are shorter than the body. They reach beyond the scaphocerite with ¼ of the length of the carpus and with the whole length of the chela. They are a little stronger than the following pairs of legs. The merus is cylindrical and is always a little shorter than the carpus and than the chela. The carpus becomes broader anteriorly. It is shorter than the entire chela in the male, but a little longer than the chela in the females. As for the chela, which is slightly oval in transverse section, it possesses a palmar portion, which is longer than the fingers. The latter are provided with faint teeth at their cutting edges. The dactylus has a small tooth in its proximal third; between this tooth and the base of the finger, two small rounded and very faintly indicated denticles may be seen. The fixed finger possesses one small tooth, which is placed at about the proximal quarter of the finger. The rest of the cutting edge of the fingers is occupied by a low, little developed ridge. The fingers are covered with small asperities and tufts of long hairs, to which in the adult male a thick and short pubescence is added. On the joints of the second leg, and especially on the carpus, principally on the lateral parts, one may observe spinules, which are arranged more or less distinctly in two or three longitudinal rows, which apart from the long and supple hairs are isolated. On the palm the spinules are so to say absent, and one only observes small hairs." In my largest males the second legs are smooth and without spinules at all, there are only some short scattered hairs. The palm is 1.2 times as long as the fingers. The cutting edges of both dactylus and fixed finger bear three extremely small denticles in the proximal third. The carpus is 1.2 times as long as the chela. The merus is about as long as the chela. The legs reach as far forward as in Roux's specimens. It is obvious that though my specimens are larger than Roux's male, they have the second legs less developed, a feature often observed in species of *Macrobrachium*. A female of 41 mm length has the second legs more like in Roux's male than any of my male specimens: the fingers are 5/7 of the length of the palm and the carpus is as long as the chela. The young specimens seen by me have the second chelae not much different from that of my males, only the carpus is relatively longer (1.3 to 1.4 times as long as the chela). The third leg reaches to the tip of the final tooth of the scaphocerite. The propodus is 2.5 times as long as the dactylus, slightly less than twice as long as the carpus and shorter than the merus. The fifth leg overreaches the scaphocerite with the dactylus. The propodus is fully thrice as long as the dactylus, twice as long as the carpus and distinctly longer than the merus. In younger specimens the legs reach less far forward.

The pleopods and uropods are normal in shape.

Size: My largest male measures 43 mm, the largest female 47 mm. Roux (1928) mentions females of up to 50 mm. Roux's ovigerous female measures 32 mm. No ovigerous females are present in the material seen by me. According to Roux the eggs are not very numerous, and rather small, they measure 0.65 to 0.90 mm.

Material examined: In the U.S. National Museum material of this species is present from the Zulia Province of Venezuela: Rio Gé, 0.5 km S. of El Rosario; Rio San Juan, 12 km S. of El Rosario; Rio Apón, 35 km S. of El Rosario and 135 km S. W. of Maracaibo; Rio Machango, S. of Lagunillas.

Distribution: The species is known from fresh water of N. Colombia and W. Venezuela. The records in literature, all from J. Roux (1928) are: Santander, N. Colombia; El Mene, and El Pozon, both in Falcon Province, Venezuela.

Type: The type material, a holotype is not indicated, is preserved in the Naturhistorisches Museum at Basel, Switzerland.

Remarks: The species is at once characterized by the shape of the second legs and the rostrum, even in the young specimens. In all probability the fully developed male has not yet been found. Even Roux's male specimen, though better developed than any of my males, seems not to have reached its full size and development. A description of such a fully developed male is highly desirable.

The collection of the American Museum of Natural History in New York contains 12 specimens of a species of *Macrobrachium* from Arroyo Shunantonich, Benque Viejo, Cayo District, British Honduras (April 2, 1949). These specimens are brought by me with a considerable amount of doubt to the present species. The largest male specimen (38 mm) has the second leg rather well developed, but the specimen in all probability has not yet attained its full size. The smallest specimen measures 26 mm. In these specimens from British Honduras the rostrum reaches slightly beyond the scaphocerite and the rostral formula is $\frac{2)\ 8\ -\ 10}{3\text{-}4}$ (one of the specimens has 13 teeth on the upper margin of the rostrum, while another possesses 5 lower teeth). The second legs reach with almost the whole carpus beyond the scaphocerite. There is no pubescence on the fingers, while small spinules are visible on the carpus and palm. The fingers of the second legs of the larger male are slightly shorter than the palm. The carpus is distinctly shorter than the chela and longer than the merus. It is possible that the British Honduras

specimens represent a species distinct from *M. praecox*. The material of both forms examined by me, however, is rather small and moreover, probably does not contain adult males, so that no definite conclusion can be reached.

Macrobrachium rathbunae Holthuis

Pl. 7, figs. a-f

Macrobrachium rathbunae Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 94; 1950a, Siboga Exped., mon. 39a9, p. 18.

Description: The rostrum is straight and rather high, it reaches slightly beyond the end of the antennular peduncle, but fails to reach the end of the scaphocerite. The upper margin bears 9 or 10 teeth, 1 or 2 of which are placed behind the orbit. The lower margin bears 3 to 5 (seldom 6) teeth. The teeth of the upper margin are regularly divided over the entire length of the rostrum, sometimes the distance between the antepenultimate and ultimate teeth is larger than between the other teeth. The carapace is smooth, but in adult males covered with short hairs, which are most distinct in the anterolateral region. The hepatic spine is distinctly smaller than the antennal.

The abdomen is smooth; in adult males the pleurae are covered with hairs similar to those on the carapace. The pleura of the fifth segment is rather acutely pointed. The sixth segment is 1.5 times as long as the fifth. The telson is about 1.5 times as long as the sixth segment. The dorsal surface of the telson bears a pair of spinules in the middle and one at ¾ of its length. The posterior margin ends in a median acute point, which is distinctly overreached by the inner of the posterior pairs of spines. Numerous feathered setae are present.

The scaphocerite is almost thrice as long as broad. The outer margin is straight or slightly convex.

The first legs reach with the chela beyond the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela and ⅔ as long as the merus. The merus is smooth and almost naked, only some scattered hairs are present. The second legs are equal in shape and only slightly unequal in size. They reach with almost the entire carpus beyond the scaphocerite. The fingers measure about ½ to ⅔ of the length of the palm, they close over their entire length. In young specimens the fingers are relatively longer. The dactylus bears at ⅖ of the length of its cutting edge a large tooth; between the base

of the edge and the large tooth some 4 small denticles are present; distally of the large tooth the edge is entire. The fixed finger has the cutting edge similarly armed, its large tooth is situated somewhat proximal of the large tooth of the dactylus. Both fingers bear some small spinules and are entirely covered by a thick pubescence. The palm is elongate and cylindrical, it is about 5 to 6 times as long as high; longitudinal rows of spinules, but no pubescence, are present. The carpus is distinctly longer than the palm, though being shorter than the entire chela, it is about 6 times as long as broad, and narrows gradually posteriorly. The merus is ¾ to ⅘ as long as the carpus and less than twice as long as the ischium. The carpus and merus bear several longitudinal rows of spinules, but no pubescence is present. The third leg reaches with the tip of the dactylus beyond the scaphocerite. The propodus is more than 2.5 times as long as the dactylus, twice as long as the carpus and slightly shorter than the merus. The fifth leg reaches somewhat beyond the middle of the scaphocerite, but fails to reach the end of it. The propodus is almost 4 times as long as the dactylus, twice as long as the carpus and as long as the merus. All the joints are densely covered with very small spinules.

Pleopods and uropods are normal in shape.

Young specimens and females differ from the adult males by having the second legs less strongly developed. A female specimen of 64 mm barely reaches with the fingertips of the first leg beyond the scaphocerite, the second legs overreach that scale with a small part of the carpus. The second legs are similar in size. The pubescence and spinulation is very inconspicuous. The fingers are only slightly shorter than the palm. The carpus is almost as long as the entire chela and about ⅔ as long as the merus. The ischium is ¾ as long as the merus. The third leg fails to reach the end of the scaphocerite, the fifth just reaches with the tip of the dactylus beyond it. The relation between the joints is the same as in the male.

Size: The largest male specimen is 105 mm long. The smallest specimen seen by me measures 38 mm. Ovigerous females measure 68 to 87 mm. The eggs are numerous and small being 0.5 to 0.7 mm in diameter.

Material examined: The 1933 and 1938 Allan Hancock Expeditions collected 3 specimens:

Panama: Bahia Honda. Shore, near village behind point, in drinking hole, March 9, 1933, Sta. 111-33.

Ecuador: San Francisco Bay. Fresh water stream, February 23, 1938, Sta. 849-38.

Furthermore I examined the following material of the U. S. National Museum: Chorrera, S. Panama (April 9, 1911, S. E. Meek and S. F. Hildebrand coll.), Taboga Island, Gulf of Panama (May 11-15, 1911, S. E. Meek and S. F. Hildebrand coll., and June, 1914, J. Zetek coll.), several streams (Hog Creek, Survey Camp stream, Rio Marina and tributaries) at San José Island, Archipielago de las Perlas, Gulf of Panama (February 12 to September 17, 1944, J. P. E. Morrison coll.), Rio Morte Arnode near Panama City, Panama (March 26, 1912, S. E. Meek and S. F. Hildebrand coll.), Yavisa, S. E. Panama (February 16, 1924, L. Baer coll.), Cituro and Boca de Cupe, Rio Cupe, Darien, S. E. Panama (February 24 and 26, 1912, S. E. Meek and S. F. Hildebrand coll.), Istmina, Upper San Juan River, W. Colombia (C. H. Eigenmann coll.), Rio Dagua near Cordova, 12 miles from Buenaventura, W. Colombia, altitude 120 feet (C. H. Eigenmann coll.), Buenaventura, Mouth of Rio Dagua, W. Colombia (C. H. Eigenmann coll.), San Lorenzo, Rio Telembi, S. W. Colombia (January 14, 1913, C. H. Eigenmann coll.). I am not quite certain about the identification of the Yavisa and the Buenaventura specimens, the former being very much damaged, the latter are young. All specimens, as far as is known, were collected in fresh water.

Type: Holotype (U.S.N.M. Cat. No. 84168) is the largest male specimen from Hog Creek Valley, San José Island, Archipielago de las Perlas, Gulf of Panama, September 12, 1944, J. P. E. Morrison n. R. 3073. All types are deposited in the U. S. National Museum, except the specimen from Allan Hancock Sta. 849-38, which is inserted in the collection of the Hancock Foundation, Los Angeles, Calif.

Remarks: I take pleasure in dedicating this species to the late Dr. Mary J. Rathbun, who was the first to recognize the difference between this species and *M. acanthurus* (Wiegmann). The specimens of the Meek and Hildebrand collection (from Chorrera and Taboga Island) were identified by her as *Macrobrachium acanthurus,* but bear on their labels the remark "Var. with short rostrum" in Miss Rathbun's handwriting.

The species is closely related to *M. acanthurus* and *M. tenellum.* From both these species, however, it immediately may be distinguished, by the short rostrum, which bears less ventral teeth, and by the second legs, which have the fingers relatively much shorter and the carpus and merus not differing so strongly in length.

Macrobrachium acanthurus (Wiegm.)

Pl. 8; pl. 9, figs. a, b

Palaemon acanthurus Wiegmann, 1836, Arch. Naturgesch., vol. 2, pt. 1, p. 150.

Palemon forceps H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 397.

Palaemon forceps White, 1847, List Crust. Brit. Mus., p. 78.

Palaemon Swainsonii (Leach MSS) White, 1847, List Crust. Brit. Mus., p. 78.

Palaemon forceps Lucas, 1857, Castelnau's Anim. nouv. ou rares Amér. Sud, Crust., p. 12.

Palaemon mexicanus De Saussure, 1857, Rev. Mag. Zool., ser. 2, vol. 9, p. 504.

Palaemon forceps De Saussure, 1858, Mém. Soc. phys. Genève, vol. 14, p. 467.

Palaemon mexicanus De Saussure, 1858, Mém. Soc. phys. Genève, vol. 14, p. 468, pl. 4, fig. 27.

Macrobrachium longidigitum Bate, 1868, Proc. Zool. Soc. Lond., 1868, p. 365, pl. 31, fig. 2; Semper, 1868, Proc. Zool. Soc. Lond., 1868, p. 586.

Palaemon forceps p. p. Von Martens, 1869, Arch. Naturgesch., vol. 35, pt. 1, p. 28, pl. 2, fig. 4.

Palaemon forceps Smith, 1869, Trans. Conn. Acad. Arts Sci., vol. 2, pp. 24, 40.

Palaemon acanthurus Smith, 1869, Trans. Conn. Acad. Arts Sci., vol. 2, p. 40.

Palaemon forceps Cunningham, 1870, Trans. Linn. Soc. Lond., vol. 27, p. 497.

Palaemon dasydactylus Streets, 1871, Proc. Acad. Nat. Sci. Phila., 1871, p. 225, pl. 2, fig. 3.

Palaemon sexdentatus Streets, 1871, Proc. Acad. Nat. Sci. Phila., 1871, p. 226, pl. 2, fig. 4.

Palaemon Mexicanus Von Martens, 1872, Arch. Naturgesch., vol. 38, pt. 1, p. 138.

non *Palaemon forceps*? Von Martens, 1876, Preuss. Exped. Ost-Asien, Zool., vol. 1, p. 315.

Palaemon forceps Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

Palaemon mexicanus Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

Palaemon sexdentatus Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

non *Palaemon acanthurus* Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 108.

Palaemon forceps Gundlach, 1887, An. Soc. Esp. Hist. nat., vol. 16, p. 132.

Palaemon mexicanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 711.

Palaemon acanthurus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 720, pl. 47, fig. 5.

Palaemon longidigitum Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 726.

Palaemon Potieté Müller, 1892, Arch. Mus. nac. Rio de J., vol. 8, p. 181.

Palaemon forceps Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 8.

Palaemon longidigitus Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 10.

Palaemon mexicanus Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 10.

Palaemon sexdentatus Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 13.

Palaemon acanthurus p. p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 121.

Palaemon mexicanus Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 123.

non *Palemon forceps* Bouvier, 1895, Bull. Mus. Hist. nat. Paris, vol. 1, p. 160.

Palaemon acanthurus Von Ihering, 1897, Rev. Mus. Paulista, vol. 2, p. 422.

Palaemon mexicanus p. p. Nobili, 1897, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, n. 280, p. 5.

Palaemon acanthurus Ortmann, 1897, Rev. Mus. paul., vol. 2, p. 205.

Palaemon mexicanus Ortmann, 1897, Rev. Mus. paul., vol. 2, p. 206.

Palaemon lamarrei Doflein, 1899, S. B. Bayer. Akad. Wiss., vol. 29, p. 177. (non H. Milne Edwards, 1837.)

Palaemon acanthurus Doflein, 1900, S. B. Bayer. Akad. Wiss., vol. 30, p. 128.

Bithynis acanthurus M. J. Rathbun, 1900a, Proc. Wash. Acad. Sci., vol. 2, p. 154.

Bithynis forceps Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 487.

Palaemon acanthurus Moreira, 1901, Arch. Mus. nac. Rio de J., vol. 11, p. 12.

non *Palaemon* (*Eupalaemon*) *acanthurus* var. Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, p. 6.

Bithynis acanthurus M. J. Rathbun, 1902a, Bull. U.S. Fish Comm., vol. 20, pt. 2, p. 123; Hay, 1903, Proc. U.S. Nat. Mus., vol. 26, p. 434.

Palaemon acanthurus Moreira, 1903, Arch. Mus. nac. Rio de J., vol. 12, p. 120.

Bithynis acanthurus Coulon, 1907, Bull. Soc. Étud. Sci. nat. Elbeuf, vol. 25, p. 191.

Palaemon mexicanus Valdés Ragués, 1909, Mis Trabajos Acad., p. 182.

Palaemon forceps Valdés Ragués, 1909, Mis Trabajos Acad., p. 183.

Macrobrachium acanthurus Pearse, 1911, Rep. Mich. Acad. Sci. Ann Arbor, vol. 13, p. 111.

Palaemon (*Eupalaemon*) *acanthurus* De Man, 1912, Ann. Soc. Roy. Zool. Malac. Belg., vol. 46, p. 243.

Macrobrachium acanthurus Pearse, 1915, Proc. U.S. Nat. Mus., vol. 49, p. 550.

Palemon forceps Torralbas, 1917, An. Acad. Habana, vol. 53, p. 615, fig. 55 (non 54).

Macrobrachium acanthurus Luederwaldt, 1919, Rev. Mus. paul., vol. 11, p. 430.

Palaemon acanthurus Luederwaldt, 1919a, Rev. Mus. paul., vol. 11, p. 387.

Macrobrachium acanthurus Pearse, 1921, Proc. U.S. Nat. Mus., vol. 59, p. 462.

non *Macrobrachium mexicanum* Schmitt, 1924, Proc. Calif. Acad. Sci., ser. 4, vol. 13, p. 386.

Macrobrachium acanthurus Leuderwaldt, 1929, Rev. Mus. paul., vol. 16, p. 53; Boone, 1930, Bull. Vanderbilt Mar. Mus. Huntington, vol. 3, p. 140, pl. 49.

Macrobrachium acanthurus p. p. Schmitt, 1933, J. Wash. Acad. Sci., vol. 23, p. 312.

Macrobrachium acanthurus Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 158; Hildebrand, 1939, Zoologica, New York, vol. 24, p. 22; Reed, 1941, Marine Life Texas, p. 46.

non *Macrobranchium acanthurus* Coventry, 1944, Monogr. Acad. Nat. Sci. Phila., vol. 6, p. 536.

Macrobrachium Hedgpeth, 1946, Texas Game and Fish, vol. 4, n. 12, p. 31, fig. on p. 18.

Macrobrachium acanthurus Sawaya, 1946, Zoologia, São Paulo, vol. 11, p. 405, pl. 1, fig. 14, pl. 2, fig. 15, pl. 3, figs. 16, 17; Hedgpeth, 1947, Texas Game and Fish, vol. 5, pt. 8, p. 14, figs; Hedgpeth, 1947a, Progr. Fish Cult., Oct. 1947, p. 181, figs.

Macrobrachium acanthurus? Chace & Holthuis, 1948, Hummelinck's Stud. Fauna Curaçao, vol. 3, p. 22.

Macrobrachium acanthurus Hedgpeth, 1949, Texas Journ. Sci., vol. 1, p. 30, figs. 1a, 2, 5; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 12; 1950b, Zool. Meded., vol. 31, p. 35.

Description: The rostrum is about straight and reaches slightly beyond the scaphocerite. The upper margin bears 9 to 11 teeth, which are divided regularly over the rostrum, the proximals being placed closer together than the distals. The first two teeth are placed on the carapace behind the orbit, sometimes the second tooth is placed partly over the posterior margin of the orbit. The first tooth generally is separated from the second by a distance which is larger than the distances between the other proximal teeth. The upper margin generally is slightly arched in its basal part. The lower margin bears four to seven (generally six) teeth, which proximally are placed closer together than distally. The carapace is smooth, it only bears short hairs, especially in the anterolateral region.

The abdomen is smooth. The pleura of the fifth segment ends in an acute point. The sixth segment is 1.5 times as long as the fifth. The telson is 1.5 times as long as the 6th abdominal segment. The dorsal spinules are placed in the middle and at ¾ of the length of the telson. The posterior margin ends in a sharp median point, which is flanked by the usual 2 pairs of spinules, the inner of which is longest and overreaches the median point of the telson. Numerous feathered setae are present between these inner spines.

The scaphocerite is about thrice as long as broad and has the outer margin straight or slightly convex.

The first legs reach with the chela, and sometimes with a very small part of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela and ⅔ as long as the merus. The merus is smooth and almost naked. The second legs are equal, they reach with the carpus or with a small part of the merus beyond the scaphocerite. The fingers are slender, close over their whole length and are only slightly shorter than the palm. Their cutting edges bear in the proximal quarter of their length a distinct tooth (the tooth of the dactylus being placed slightly before that of the fixed finger).

Behind this tooth a row of about 4 small denticles extends towards the base of the fingers. The fingers are thickly pubescent throughout their length. The palm is elongate and cylindrical, it is 4.5 to 5.5 times as long as high. It bears several longitudinal rows of spinules, which are largest and placed widest apart in the inner and lower regions; no pubescence is present on the palm. The carpus is slightly shorter than the length of the palm and half the length of the fingers combined, it is 5 to 8 (seldom 10) times as long as broad, and is about 1.5 times as long as the merus. The spinulation of carpus and merus is like that of the palm. Both carpus and merus are naked or show only some scattered hairs. The ischium is half as long as the merus. The third leg reaches with the dactylus and a small part of the propodus beyond the scaphocerite. The propodus is almost 2.5 times as long as the dactylus, about twice as long as the carpus and slightly shorter than the merus. The fifth leg reaches about to the end of the scaphocerite. The propodus is almost thrice as long as the dactylus, twice or almost twice as long as the carpus and as long as the merus. All joints of the last three legs are covered with very numerous densely placed small spinules.

The pleopods and uropods are normal in shape.

Adult females have the 2nd legs more slender and shorter than in the adult males. They reach with about half the carpus beyond the scaphocerite. The relations between the joints are about as they are in the adult male only the ischium is almost as long as the merus. The spinulation and pubescence is like that in the male, only it is less distinct. The third leg reaches only with the tip of the dactylus beyond the scaphocerite. The fifth leg too reaches with part of the dactylus beyond that scale. Young males strongly resemble the adult females. Very young specimens (54 mm long) have the rostrum slender and curved upwards at the end. Here the first three legs reach even less far forwards than in the adult females. The carpus of the second leg may become longer than the chela. The fifth leg reaches with the entire dactylus beyond the antennal scale.

Size: The largest male seen by me measures 166 mm. Ovigerous females range between 36 and 110 mm in length. The eggs are numerous and small, they are 0.47 to 0.65 mm in diameter.

Colour: According to notes made by Dr. Waldo L. Schmitt on his 1925 expedition to S. America, living specimens of this species observed by him at Villa Bella, Ilha São Sebastiao, were coloured as follows: "The general colour is pale wax yellow, with distinct red speckles. The midrib of the rostrum is reddish. The carapace bears at each side

3 vertical irregular maroon red bands. The anterior of these bands is bent forwards at right angles in the upper part, sometimes this anterior line gives off an anteriorly directed side branch, which is placed under and runs parallel with the forwardly curved part of the anterior band: the anterior band being thereby more or less F-shaped. The two other vertical bands have the tips curved more or less abruptly backwards. The abdominal pleurae are provided with oblique red stripes. A red spot is present on the eyestalk. The inner margin of the antennular peduncle is blue. A line of blue dots is visible on the scaphocerite, forming a continuation of the blue line of the antennular peduncle. The chelipeds are pale pea greenish, becoming china bluish distally. The articulation of the fingers is orange ochraceous, just like the distal part of the palm and the base of the fingers. The eggs are pea green." Hedgpeth (1947) gives the following account of the colouration of Texan specimens of the species: "*Macrobrachium acanthurus* . . . . . is greenish in color with a dirty orange stripe down the middle of the back. The claws of this shrimp are not so highly colored, and in fact are usually covered with mud." Hedgpeth's (1949) colour description of the species is very similar.

Material examined: The Allan Hancock Foundation possesses 2 specimens of this species from:

Florida: Boca Raton, Palm Beach Co., fresh-water canal, June, 1944.

In the U.S. National Museum a large number of this species is present. It originates from the following localities: Georgia (St. Simon Sound and Brunswick, Glynn Co.; Cumberland River), Florida (St. Augustine, St. Johns Co.; Daytona Beach, Volusia Co.; Sebastian, Indian River Co.; Fort Pierce, St. Lucie Co.; Boca Raton, Palm Beach Co.; Miami, Dade Co.), Mississippi (Ocean Springs, Jackson Co.; Biloxi, Harrison Co.), Louisiana (Lockport, Lafourche Parish; near Grand Isle, Jefferson Parish), Texas (Palacios, Matagorda Co.; Espiritu Santo Bay, Calhoun Co.; Aransas Pass, San Patricio Co.; Corpus Christi, Nueces Co.; mouth of Rio Grande), Mexico (Vera Cruz; Chiapas River near Gutierrez), Nicaragua (Escondido River near Bluefields), Panama (Puerto Pilon and Toro Point near Colon; Colon; Mindi; Gatun; Frijoles; Porto Bello), Colombia (Sabanilla= Puerto Colombia), Venezuela (near Sinamaica; Lake Tulé W. of Maracaibo; Rio Cocuiga W. of El Mene, Falcon Province; Rio Cumboto near Ocumare; lagoon near Barcelona; stream near Carupano; Rio Amana near Maturin; lower Orinoco), Brazil (Pernambuco;

Maceio; Bahia; San Joao de Barra; São Sebastiao; Santos; Cubatao; Itajahy), Bahamas (Stafford Creek, Andros Island), Cuba (Almendares River near Havana), Jamaica (Montego Bay; Rio Cobre near Kingston Harbour), Haiti (Port-ou-Prince), Santo Domingo, Porto Rico (Añasco; Arecibo; Manati; Rio Bayamon; Carolina Viejo; Canovanilla; Trujillo Alto; Vieques), Virgin Islands (St. Croix). In the Museum of the Academy of Natural Sciences at Philadelphia material of this species is present from Mexico (Coatzacoalcos River, types of *Palaemon dasydactylus* Streets), Porto Rico (Guanica Lake), Santo Domingo and St. Martin.

I furthermore examined material in the American Museum of Natural History in New York from the following localities: Florida (St. Augustine), Texas (Sioux Plantation, 97 miles up the Rio Grande), Vera Cruz State, Mexico (various localities in the drainages of the Rio Coatzacoalcos, Rio Jamapa, and the Rio Tonala), British Honduras (Belize), British Guiana (Georgetown), Santo Domingo, Porto Rico (Playa; Guanica; between San Juan and Guayama; Fajardo).

In the Rijksmuseum van Natuurlijke Historie at Leiden, Holland, I examined material from Venezuela (Laguanta) and Surinam (Coppename River). In the Zoological Museum at Amsterdam several young specimens from Santa Marta, N. Colombia are preserved.

The Turin Museum possesses material of this species from Ponce, Porto Rico (1903, coll. Dr. Bartoldi) and from Bahia, Brazil (1898, coll. Dr. H. von Ihéring).

Distribution: The species lives in fresh, sometimes in brackish water. It is known to occur in the eastern part of America from Georgia (U.S.A.) to S. Brazil and the West Indies. It generally is not found far inland. The records in literature are: St. Simon Sound, Georgia! (Hedgpeth, 1949), St. Augustine!, Miami River! and Coconut Grove, Florida (Schmitt, 1933), Ocean Springs, Mississippi! (Schmitt, 1933), Biloxi, Mississippi! (Hedgpeth, 1949), Lockport, Louisiana! (Schmitt, 1933), near Grand Isle, Louisiana! (Hedgpeth, 1949), Texas (Reed, 1941; Hedgpeth, 1946), Palacios, Texas! (Hedgpeth, 1949), Rockport, and Aransas Bay, Texas (Hedgpeth, 1949), Aransas River, Texas (Hedgpeth, 1947), Rio Grande, Texas! (M. J. Rathbun, 1902a), Sioux Plantation, Rio Grande, Texas! (Hedgpeth, 1949), Mexico (De Saussure, 1857, 1858), Vera Cruz, Mexico (De Saussure, 1858), Hueyapam River at Cuatotolapam, Mexico (Pearse, 1911), Coatzacoalcos River, Mexico! (Streets, 1871; Sharp, 1893), Escondido River, Nicaragua! (M. J. Rathbun, 1902a), Panama, eastcoast (Doflein, 1900), Colon, Panama

(Nobili, 1897), Gatun Locks, Panama! (Hildebrand, 1939), Sabanilla, Colombia! (M. J. Rathbun, 1902a), Fundacion near Santa Marta, Colombia (Pearse, 1915), Rio Bue, Venezuela (Pearse, 1921), Surinam! (De Man, 1912; Holthuis, 1950b), Coppename River, Surinam! (Holthuis, 1950b), Brazil (Wiegmann, 1836; White, 1847; Lucas, 1857; Von Martens, 1869; Ortmann, 1891; Doflein, 1900), mouth of Pará River, N. Brazil (Smith, 1869), Pernambuco, Brazil! (White, 1847; M. J. Rathbun, 1900a!; Moreira, 1901), Maceio! (M. J. Rathbun, 1900a), Bahia (Von Ihéring, 1897; Sawaya, 1946), Rio de Janeiro (H. Milne Edwards, 1837; Cunningham, 1870), Ubatuba, São Paulo State (Luederwaldt, 1919; Sawaya, 1946), São Sebastiao (Von Ihéring, 1897; Luederwaldt, 1919, 1929; Sawaya, 1946), São Paulo, Villa Olympia (Luederwaldt, 1919), Rio Itapurucáia, Piassaguera (Sawaya, 1946), Santos and Iguapé, São Paulo State (Luederwaldt, 1919; Sawaya, 1946), Cubatao near Santos (Von Ihéring, 1897), São Francisco do Sul, Santa Catherina State (Moreira, 1903), Blumenau (Sawaya, 1946), Itajahy River, Santa Catherina State (Von Ihéring, 1897), Sao Lourenço, Rio Grande do Sul (Ortmann, 1891; Von Ihéring, 1897), Itaqui, Rio Grande do Sul State (Sawaya, 1946), West Indies! (White, 1847; M. J. Rathbun, 1902a!), Cuba (Von Martens, 1872; Gundlach, 1887; Valdés Ragués, 1909), Havana, Cuba (Boone, 1930), San Juan, Cuba (Hay, 1903), Haiti (Ortmann, 1891), Santo Domingo! (Sharp, 1893), various localities in Porto Rico! (Gundlach, 1887; M. J. Rathbun, 1902a!; Coulon, 1907; Schmitt, 1935), Vieques! (M. J. Rathbun, 1902a), St. Martin! (Sharp, 1893), Martinique (Doflein, 1899, 1900). The species has been recorded with some doubt from Rio Chuspa, Venezuela! (Chace & Holthuis, 1948).

Type: The type locality is "Brazilian coast." The type, if still extant, is preserved in the Zoological Museum at Berlin. Von Martens (1869), mentions the type specimen to be still present in the collection of the Berlin Museum, bearing the number 1914.

Remarks: Many authors used the specific name *forceps* for the present species, but the name *acanthurus* was published one year before the name *forceps,* it has priority and must be used.

Palaemon mexicanus De Saussure is considered here to be identical with *M. acanthurus,* as the two forms resemble each other in most respects, while the differences mentioned by various authors prove to be due to age, to fall within the range of variation of *M. acanthurus* or to be erroneous. According to De Saussure (1858, p. 465) *Palaemon forceps* (=*M. acanthurus*) should differ from *P. mexicanus* by having the carpus shorter than the chela, while it is longer than the chela in

P. mexicanus. In the figure given by De Saussure, however, the second leg of *P. mexicanus* has the carpus shorter than the chela and longer than the palm, just like in *M. acanthurus.* Ortmann (1891, p. 698, 699) in his key to the species of his division *Eupalaemon* of the present genus distinguishes the two forms on the shape of the rostrum. In *Palaemon mexicanus* the rostrum should be longer than the scaphocerite and strongly curved upwards at the apex. In the description of *Palaemon acanthurus* (p. 721) the variability of the rostrum is pointed at by him: it may be longer than, as long or shorter than the scaphocerite, furthermore it may be straight or more or less curved upwards. Also Smith (1871) points to the variability in the shape of the rostrum: In young specimens the rostum has the apex distinctly more upturned than in older specimens, in females more than in males. This too is shown by my material, though exceptions occur. Various not fullgrown specimens show perfect resemblance to De Saussure's figure and description of *Palaemon mexicanus.* It is therefore almost certain that De Saussure's specimen is either a female or a not fullgrown male of *Macrobrachium acanthurus.*

Palaemon dasydactylus and *P. sexdentatus* Streets (1871), too, are identical with the present species. Streets himself already pointed to the close resemblance of both his species with *P. mexicanus,* with which species they subsequently were identified by Ortmann (1891). Kingsley (1878) identifying *P. dasydactylus* with *P. forceps,* thought *P. sexdentatus* a variety of *P. mexicanus.* The types of *P. dasydactylus* were examined by me, they are present in the Museum of the Academy of Natural Sciences at Philadelphia and are in good condition.

Macrobrachium longidigitum Bate, from an unknown locality is identical with the present species, as is distinctly shown by Bate's description and figure. The specimens described as *Palaemon* (or *Macrobrachium,* or *Bithynis*) *acanthurus* (or *forceps*) from West Africa belong to the closely related *Macrobrachium macrobrachion* (Herklots), while the West American specimens referred to the present species (Von Martens, 1869, p. p.; Kingsley, 1882; Sharp, 1893, p. p.; Bouvier, 1895; Schmitt, 1924; Schmitt, 1933, p. p.; Coventry, 1944) belong to *Macrobrachium tenellum* (Smith). These specimens from Darien identified by Nobili (1897) as *Palaemon mexicanus,* in reality belong to *Macrobrachium panamense* (p. 23). The specimens from Rio Peripa, Ecuador reported upon by Nobili (1901) under the name *Palaemon* (*Eupalaemon*) *acanthurus* var. were examined by me in the Turin Museum. They proved to belong to a new species *Macrobrachium gallus* (p. 67).

Macrobrachium tenellum (Smith)

Pl. 10; pl. 11, figs. a, b

Palaemon forceps p.p. Von Martens, 1869, Arch. Naturgesch., vol. 35, pt. 1, p. 28.

Palaemon tenellus Smith, 1871, Rep. Peabody Acad. Sci., 1869, p. 98; Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

Palaemon longipes Lockington, 1878, Bull. Essex Inst., vol. 10, p. 161 (non *Palaemon longipes* Olivier, 1811).

Palaemon acanthurus Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 108 (non *Palaemon acanthurus* Wiegmann, 1836).

Palaemon tenellus Thallwitz, 1892, Abh. Ber. zool.-anthrop. Mus. Dresden, 1890-91, pt. 3, p. 14.

Palaemon acanthurus p.p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 121.

Palemon forceps Bouvier, 1895, Bull. Mus. Hist. Nat. Paris, vol. 1, p. 160. (non H. Milne Edwards, 1837.)

Macrobrachium mexicanum Schmitt, 1924, Proc. Calif. Acad. Sci., ser. 4, vol. 13, p. 386. (non *Palaemon mexicanus* De Saussure, 1857.)

Macrobrachium acanthurus p. p. Schmitt, 1933, J. Wash. Acad. Sci., vol. 23, p. 312.

Macrobranchium acanthurus Coventry, 1944, Monogr. Acad. Nat. Sci. Phila., vol. 6, p. 536.

Macrobrachium tenellum Holthuis, 1950a, Siboga Exped. mon. 39a9, p. 18.

Description: The present species is so closely related to *M. acanthurus* that I will content myself by giving here only the differences between the 2 species:

1. In adult males of *Macrobrachium tenellum* the rostrum is more curved upwards and has the upper margin divided into a proximal convex and dentate, and a distal unarmed and straight or concave portion. In the adult males of *M. acanthurus* the rostrum is almost straight and has the teeth divided more or less regularly over the upper margin.
2. In *M. tenellum* always only one of the upper teeth of the rostrum is placed behind the posterior margin of the orbit, in *M. acanthurus* there are generally two teeth there.
3. The second legs of *M. tenellum* are more slender, which especially is distinct in the adult male. Here the carpus is 13-15 times as long as its greatest breadth. In adult males of *M. acanthurus* this relation varies between 6 and 10, generally between 6 and 8.

The differences between this species and *M. panamense* have already been dealt with under the latter species (vid. p. 24).

Size: The specimens collected by the Allan Hancock Expeditions measure 22 to 84 mm. The largest male examined by me is 116 mm long. Ovigerous females vary in length from 74 to 112 mm. The eggs are numerous and small and are 0.5 to 0.6 mm in diameter.

Material examined: Specimens of this species were collected during the 1933 Allan Hancock Expedition from the following localities:

Oaxaca, Mexico: Tangola Tangola Bay. Fresh water, March 16, 1933, 119-33.

Costa Rica: Port Culebra. Shore collecting along slough, March 12, 1933, Sta. 115-33. Seining at mouth of slough, March 13, 1933, Sta. 117-33.

In the collections of the Allan Hancock Foundation moreover specimens are present from:

Guerrero, Mexico: Laguna Pie de la Cuesta (=Laguna Coyuca) near Acapulco, Zaca Expedition. September 9, 1946, Sta. 1556-46 (= H.46-238), and September 16, 1946, Sta. 1567-46 (=H.46-250).

The U.S. National Museum possesses material of this species from: Mexico (Mulege and La Paz, Lower California; Mazatlan and Rosario, Sinaloa), Guatemala (Rio Naranjo, E. of Pajapita; Rio Ocosito at Caballo Blanco, W. of Retalhuleu; 40 km S. of Tiquisate, S. E. of Santa Ana Mixtan; Rio Maria Linda near Ixtapa, S. of Escuintla; Rio Aguacapa between Escuintla and Chiquimulilla; Chiquimulilla; Rio de los Esclavos between Chiquimulilla and Cerritos), San Salvador (Rio Lempa; Chagal; Chacalin), Honduras (Choluteca and Pedregal Rivers), Panama (Rio Chamé; Chorrera; Paraiso; Pedro Miguel; Corozal; Panama; between Campana and La Venta near Panama; Rio Morte Arnode near Panama; Rio Juan Diaz; El Capitan; Rio Calabre), Colombia (Puerto Negria on San Juan River near Buenaventura; between Magdalena and Cartagena; Rio Telembi near San Lorenzo, S. W. Colombia), Ecuador (Chone and Portoviejo), N. W. Peru (Sullana on the Rio Chira).

Furthermore I examined 18 specimens from Panama in the collection of the Museum of the Academy of Natural Sciences in Philadelphia, Pa. These specimens were already mentioned by Sharp (1893) as *P. acanthurus.*

Distribution: The species lives in fresh water. It is known from Lower California to N. Peru. The records in literature are: Mulege River, Lower California, Mexico (Lockington, 1878; Bouvier, 1895;

Schmitt, 1924), Mazatlan, Sinaloa, Mexico! (Schmitt, 1933), W. Nicaragua (Kingsley, 1882), Polvon, W. Nicaragua (Smith, 1871), Panama! (Sharp, 1893), Mt. Sapo, Piñas Bay, Panama (Coventry, 1944), Guayaquil, Ecuador (Von Martens, 1869). It is possible, however, that some of the records are based on specimens of *M. panamense.*

Type: The type locality is Polvon, W. Nicaragua. It is not known to me where the type is preserved and if it still is extant (vid. also the remarks p. 185).

Remarks: This species, which may be considered to represent *M. acanthurus* in the fresh waters of W. America was first described by Smith (1871). In 1878 Lockington described it as new for a second time under the name *Palaemon longipes,* which name is preoccupied by the name *Palaemon longipes* Olivier (1811), one of the synonyms of *Stenopus hispidus* (Olivier).

Sometimes specimens of the present species occur together with specimens of *Macrobrachium rathbunae.* The latter species may be distinguished from *Macrobrachium tenellum,* even in the females and young, by the shorter rostrum, which bears less teeth, by the shorter fingers of the second legs and the smaller difference between the lengths of merus and carpus of that leg. Furthermore the pleura of the fifth abdominal segment in *M. rathbunae* never is produced posteriorly in an acute point, while this in *M. tenellum* very often is the case. This posteriorly produced and acutely narrowed tip of the pleura of the fifth abdominal segment generally is very distinct in specimens of the present species, but the character is not constant, sometimes the tip of the pleura only ends in a small acute point and is not produced posteriorly. Smith (1871) already mentions the pointed fifth pleura.

In the collection of the U.S. National Museum a lot of three specimens of Palaemonid prawns is present, which originate from the J. S. Kingsley collection and bear the label "*Palaemon tenellus* Smith, Realijo, Nicaragua, J. A. McNiel, from type lot." The indication "from type lot" obviously is incorrect, as two of the three specimens are *Macrobrachium panamense* Rathbun, while the third belongs to *Palaemon gracilis* (Smith); also the locality given, namely "Realijo" is not the type locality of *Palaemon tenellus* Smith, as Smith reports his material from Polvon, Nicaragua. Realejo, however, is the type locality of Smith's *Leander gracilis,* described by that author in the same paper as his *Palaemon tenellus.* It is therefore possible that the specimen of *Palaemon gracilis* contained in the above mentioned lot is a type specimen of *Leander gracilis* Smith, but we even have no certainty about this.

Macrobrachium surinamicum Holthuis

Pl. 12, figs. a-h

?*Macrobrachium* sp. Chace & Holthuis, 1948, Hummelinck's Stud. Fauna Curaçao, vol. 3, p. 24.

Macrobrachium surinamicum Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 1112; 1950a, Siboga Exped., mon. 39a9, p. 18; 1950b, Zool. Meded., vol. 31, p. 35.

Description: The rostrum is straight, with the ultimate tip slightly curved upwards, it reaches to the end of the scaphocerite. The upper margin bears 13 to 16 (generally 14 or 15) teeth, the first four (sometimes 3) of which are placed on the carapace behind the orbital margin; the fourth tooth reaches sometimes with its tip beyond that margin. The proximal teeth are placed more closely together than the distals. The second tooth is distinctly more remote from the first than from the 3rd. The lower margin bears 4 to 6 (generally 4 or 5) teeth. The carapace (also in adult males) is smooth.

The abdomen is smooth. The pleura of the fifth abdominal segment ends in an acute point. The sixth segment is 1.5 times as long as the fifth and has the usual shape. The telson is ⅔ of the length of the 6th abdominal segment. The anterior of the 2 dorsal pairs of spinules is situated in the middle of the telson, the posterior pair is placed halfway between the anterior pair and the posterior margin of the telson. The posterior margin ends in a distinct sharp median tooth; at each side of this tooth 2 spines are present, the outer of which are very short, the inner are longer and reach with half their length or more beyond the tip of the telson. Between the longer spines numerous setae are present.

The scaphocerite is broadest some distance above the base, and narrows somewhat anteriorly. It is thrice as long as broad. The outer margin is straight or somewhat concave.

The first pereiopods reach in adult specimens with the entire chela sometimes even with a part of the carpus beyond the scaphocerite. In young specimens only a part of the chela reaches beyond the scaphocerite. The fingers are about as long as the palm. The carpus is about twice as long as the chela. The merus is ⅘ of the length of the carpus. The shape of the second pereiopod varies largely with age. In the adult male the second pereiopods are very strong. They are longer than the body and reach with the entire carpus beyond the scaphocerite. The left and right legs are equal in shape, sometimes slightly unequal in size. The fingers in the adult male are about ⅘ of the length of the palm. The dactylus bears in the proximal part of the cutting edge 2 rather strong

teeth, while some 2 smaller teeth are placed behind the posterior large tooth, between the anterior large tooth and the apex of the finger, numerous (about 12) small blunt teeth are present, which diminish in size distally. The fixed finger has the cutting edge armed in the same way as the dactylus, there is only one large tooth, which fits between the 2 large teeth of the dactylus. Some small appressed spinules and some long hairs are present on the fingers, while moreover some short velvety hairs are implanted on each side of the cutting edge, obscuring thereby the teeth. The palm is elongate cylindrical, it is more than 5 times as long as broad and is thickly covered with small anteriorly directed blunt spines, which are pressed against the surface; more slender and more erect spines are present along the lower margin of both palm and fixed finger. The carpus is about half as long as the chela; like the chela it is covered with small and blunt spinules, here, too, slender, erect spinules are present along the lower margin. The merus is slightly shorter than the carpus, it too widens distally, and is covered with spinules as in the carpus and the palm. The ischium measures ⅔ of the length of the merus and too, is covered with spinules. No pubescence is present on the chela, but the lower surface of the carpus and merus bear a layer of short velvety hairs. The last three pairs of pereiopods are slender both the 3rd and 5th pair reach with the dactylus beyond the scaphocerite. The propodus of the third leg is 2.5 times as long as the dactylus, twice as long as the carpus and slightly shorter than the merus. The fifth leg has the propodus more than thrice as long as the dactylus, somewhat less than twice as long as the carpus and distinctly longer than the merus.

Pleopods and uropods are normal in shape.

In younger specimens and in females the relation of the length of the joints of the second leg is different from that in the old males. The fingers and the carpus are longer in relation to the length of the palm. The second legs furthermore are less strong, the spinules are absent or only feebly developed.

Size: The largest male measures 55 mm. Ovigerous females are 28 to 41 mm long. The eggs are numerous and small, being 0.3 to 0.5 mm in diameter.

Material examined: The U. S. National Museum possesses some 6 specimens of this species from the neighbourhood of Bogotà, Colombia (M. Gonzales coll., C. H. Eigenmann don.), and numerous specimens from the Old Stelling, Cuyuni River, British Guiana, from a trap which was placed at a depth of 12 feet at low tide and 18 feet at high tide

(July 17 to August 7, 1926, S. W. Brooks coll.). The collections of the American Museum of Natural History at New York have specimens of this species from British Guiana (Kartabo). In the Rijksmuseum van Natuurlijke Historie at Leiden, Holland, a large collection (232 specimens) of this species is preserved. All the specimens are collected near Paramaribo, Surinam (1907, M. D. Horst coll.; July and October, 1911, W. C. van Heurn coll.; March 23, 1939, H. W. Cossee coll.; July 5, 1944, D. C. Geijskes coll.). Ovigerous females are present in the lots of July and October.

Distribution: The species has been recorded in literature from the mouth of the Surinam River and from near Paramaribo! (Holthuis, 1948), in the same paper the occurrence of the species in Colombia, and British Guiana has been mentioned. The juvenile specimen from Rio Chuspa, Venezuela, recorded by Chace & Holthuis (1948) under the name *Macrobrachium* sp., probably belongs to the present form. The species is known from fresh water of Colombia, Venezuela (?), British and Dutch Guiana.

Type: Holotype is the largest male from Plantation "Geyersvlijt," Paramaribo, Surinam; July, 1911; W. C. van Heurn coll. The types are deposited in the Leiden Museum.

Remarks: The species is characterized by the shape of the chelae and is closely related to the following species. The differences between the two forms will be pointed out under *M. transandicum.*

Macrobrachium transandicum Holthuis

Pl. 13, figs. a-e

Macrobrachium transandicum Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 94; 1950a, Siboga Exped., mon. 39a9, p. 18.

Description: The rostrum is straight, high, and sometimes with the extreme tip curved slightly upwards. It reaches to or somewhat beyond the end of the antennular peduncle, but fails to reach the end of the scaphocerite. The upper margin is slightly convex and is provided with 13 to 16 (generally 15) teeth, which are regularly divided over the upper margin. The first 5 to 7 of these teeth are placed behind the orbital margin, they occupy the anterior $\frac{2}{5}$ of the carapace. The proximal 3 or 4 teeth often are placed wider apart than the following, resembling in this respect more or less *M. occidentale.* The lower margin bears 3 (seldom 4) teeth. The carapace is smooth and pitted. The abdomen is smooth and pitted too. The 5th abdominal segment ends in a

rectangular apex. The sixth segment is slightly more than 1.5 times as long as the fifth. The telson is about 1.5 times as long as the 6th abdominal segment. The dorsal spinules are situated in the middle and at ¾ of the length of the telson. The posterior margin of the telson is distinct and ends in a sharp median point, which is overreached by the inner of the 2 pairs of posterior spines of the telson. Numerous feathered setae are present between these spines.

The eyes are broad.

The scaphocerite is almost thrice as long as broad. The outer margin is straight or slightly concave.

The first legs reach with a small part of the carpus beyond the scaphocerite. The fingers are as long as or slightly longer than the palm. The carpus is fully twice as long as the chela and 1.3 times as long as the merus. The merus and ischium are smooth. The second legs are about equal in shape, but unequal in strength. The larger of the two legs in the adult male reaches with the entire carpus beyond the scaphocerite. The fingers are about 0.7 times as long as the palm. The dactylus bears 1 large tooth slightly proximally of the middle of its length. Behind this tooth there are 3 to 6 smaller teeth, of different size. Anteriorly of the larger tooth the cutting edge bears about 12 to 20 small denticles up to the apex. The fixed finger is similarly armed, the larger tooth, however, is placed closer to the base of the finger. The fingers are naked except for a dense row of pubescence along each side of the cutting edges. The rest of the fingers bears numerous sharp spinules. The palm is elongate, slightly compressed and of about the same height throughout its length. It is about 4 times as long as high, and is covered with numerous small spinules; some rows of longer spinules are present along the lower margin of the palm and the fixed finger. The palm shows no pubescence. The carpus in the adult males is slightly shorter than the palm. It is cylindrical, being about three times as long as broad (in young specimens it is more elongate), it gradually narrows posteriorly. The merus is about ¾ as long as the carpus, it is a little swollen in the middle. Both carpus and merus have a spinulation similar to that of the palm, furthermore they are distinctly pubescent underneath. The ischium is half as long as the merus. The smaller second leg reaches with about half the carpus beyond the scaphocerite, it resembles in the spinulation and the pubescence closely the larger leg, being, however, more slender in shape, having the fingers almost as long as the palm and without the distal denticles on the cutting edge. The carpus is longer than the palm. The third leg reaches with the tip of the dactylus to the end of the scapho-

cerite. The propodus is 2.5 to 3.5 times as long as the dactylus, slightly more than 1.5 times to twice as long as the carpus and somewhat shorter than the merus. The fifth leg fails to reach to the end of the scaphocerite. The propodus is thrice as long as the dactylus, slightly less than twice as long as the carpus, and as long as the merus. All the joints of the last three legs bear numerous small spinules, apart from the usual large spinules at the posterior margin of the propodus. A distinct row of fairly large spinules is present at the posterior margin of the merus of the last 3 legs in the adult male.

Pleopods and uropods are normal in shape.

Ovigerous females have the second legs less developed than in the males. Unfortunately none of the ovigerous females at my disposal have both legs attached, so that it can not be ascertained if they are equal or unequal in size. The denticulation of the cutting edge, and the spinulation and pubescence of the joints is less distinct than in the male. Also the spinulation of the last 3 legs is much less distinct.

Size: My largest male measures 62 mm. My ovigerous females range between 33 and 48 mm. The eggs are numerous and small, they are 0.4 to 0.5 mm in diameter.

Material examined: The material of the U.S. National Museum consists of 1 adult male from Puerto Negria, a station at the head of the stream navigation on the Rio San Juan, north of Buenaventura, W. Colombia (C. H. Eigenmann coll.), about 40 specimens, including numerous adult males and 1 ovigerous female from Cisnero (=Juntas) on the Rio Dagua, 33 miles inland from Buenaventura, W. Colombia, elevation 1046 feet (C. H. Eigenmann coll.), and 33 specimens, 18 of which being ovigerous females, from Rio Telembi, a tributary of Rio Patia, near San Lorenzo, S. W. Colombia (January 14, 1913, C. H. Eigenmann coll.).

Type: The largest male of the Rio Telembi lot is chosen to be the holotype (U.S.N.M. Cat. No. 84115). All the type material is present in the U.S. National Museum.

Remarks: The species is most closely related to *M. surinamicum* new species from which it, however, at once may be distinguished by the features of the rostrum and second legs mentioned in the key. From *M. heterochirus* and *M. occidentale* it differs by having the palm of the chelae of the 2nd legs in the adult male naked and by the elongate carpus of that leg, furthermore it has the rostrum much higher and not so strongly arched over the eye.

Macrobrachium ohione (Smith)

Pl. 14, figs. a, b

Palaemon Ohionis Smith, 1874, Rep. U. S. Fish Comm., vol. 2, p. 640.

Palaemon ohionis Forbes, 1876, Bull. Illinois Mus. Nat. Hist., vol. 1, p. 5; Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67; Hay, 1882, Amer. Nat., vol. 16, p. 143; Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 108.

Palaemon sallei (Guerin MSS) Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 108.

Palaemon Ohionis R. Rathbun, 1883, Bull. U. S. Fish Comm., vol. 2, p. 144.

Palaemon ohionis R. Rathbun, 1884, Fish. Fish Industr. U. S., vol. 1, p. 819; Herrick, 1887, Mem. Denison Sci. Assoc., vol. 1, pt. 1, p. 45; Underwood, 1887, Bull. Illinois Lab. Nat. Hist., vol. 2, p. 374; Hay, 1891, Proc. Indiana Acad. Sci., 1891, p. 149; Evermann, 1892, Bull. U.S. Fish Comm., vol. 11, p. 90; Thallwitz, 1892, Abh. Ber. Zool. Anthrop. Mus. Dresden, 1890-91, pt. 3, p. 11.

Palaemon ohioensis Sharp, 1893, Proc. Acad. Nat. Sci. Phila. 1893, p. 123.

Palaemon ohionis Kingsley, 1899, Amer. Nat., vol. 33, p. 718.

Bithynis ohionis Cary and Spaulding, 1909, Contr. Mar. Fauna Louisiana Coast, p. 10.

Palaemon ohionis Fowler, 1912, Ann. Rep. New Jersey State Mus., 1911, p. 558.

Bythynis ohionis Tulian, 1916, Rep. Conserv. Comm. Louisiana, 1914-1916, p. 115, fig. (on pl. opposite p. 104).

Palaemon ohionis Ortmann, 1918, Ward and Whipple's Freshwater Biology, p. 845; Stiles and Hassall, 1927, Hygienic Lab. Bull., no. 148, p. 215.

Macrobrachium ohionis McCormick, 1933, Abstr. Doctor's Disserts. Ohio State Univ., n. 11, p. 47; McCormick, 1933a, Proc. Indiana Acad. Sci., vol. 43, p. 218, figs. 1-3; Geiser, 1933a, Abstr. Pap. Ann. Meeting N. Texas biol. Soc., April 22, 1933, p. 7; Johnson & Lindner, 1934 ,Invest. Rep. U.S. Bur. Fish., vol. 21, p. 4; Schmitt, 1933, Wash. Acad. Sci., vol. 23, p. 315; Gunter, 1937, Amer. Midl. Nat. Notre Dame, vol. 18, p. 1038, figs. 1-3; Coker, 1938, Elisha Mitchell Sci. Soc. Chapel Hill, vol. 54, p. 84; Lunz, 1939a, Elisha Mitchell Sci. Soc. Chapel Hill, vol. 55, p. 336.

non *Macrobrachium ohionis* Reed, 1941, Marine Life, Texas, pp. 36, 46, 73, fig. on p. 36.

Macrobrachium ohionis Gunter, 1945, Publ. Inst. Mar. Sci. Texas, vol. 1, pt. 1, p. 108; Hedgpeth, 1947, Texas Game and Fish, vol. 5, pt. 8, p. 15, figs.; Hedgpeth, 1947a, Progress. Fish Cult., Oct. 1947, p. 183, figs.

Macrobrachium ohione Hedgpeth, 1949, Texas Journ. Sci., vol. 1, p. 33, figs. 1c, 4, 5; Hedgpeth, 1950, Publ. Inst. Mar. Sci. Texas, vol. 1, n. 2, p. 113; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 17.

Description: The rostrum is high and straight, the tip being curved somewhat upwards. It reaches somewhat beyond the antennular peduncle, but fails to reach the end of the scaphocerite. There are 9 to 13 teeth placed on the upper margin, 3 or 4 of which are situated behind the orbit. The distances separating the first 3 teeth are larger than those between the other teeth. The ultimate $\frac{2}{5}$ of the rostrum is devoid of teeth on the upper, as well as on the lower margin. The toothed part of the upper margin is distinctly convex. The lower margin bears 1 to 3 teeth. The carapace is smooth. The antennal spine slightly remote from the anterior margin of the carapace. The hepatic spine lies below and behind the antennal.

The abdomen is smooth. The fifth abdominal segment ends in an acute point. The 6th segment is slightly less than 1.5 times as long as the fifth. The telson is slightly more than 1.5 times as long as the 6th segment. The 2 pairs of dorsal spines are placed in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson ends in a distinct acute tip, which is overreached by the inner posterior spines.

The eyes and antennulae are normal in shape.

The scaphocerite is about 2.5 times as long as broad. The outer margin is about straight or slightly concave.

The first legs reach with $\frac{1}{3}$ of the carpus beyond the scaphocerite. The chela is slender, the fingers being about as long as the palm. The carpus is twice as long as the chela. The merus measures $\frac{4}{5}$ of the length of the carpus. The second legs in the adult female are strong, though much more slender than in most species of *Macrobrachium*, and equal; they reach with the carpus and the chela beyond the scaphocerite. The fingers are elongate, they are somewhat shorter than the palm. In the adult female the proximal half of the cutting edges of the dactylus and the fixed fingers bear 4 to 8 small denticles, which are of equal size.

The palm is elongate, and cylindrical. Longitudinal rows of small spinules are present on the palm and the fingers. The fingers are pubescent along the cutting edges, the rest of the surface of the fingers only bears scattered tufts of stiff hairs. The palm is entirely pubescent in adult females, this pubescence being longest and therefore most conspicuous in the lower part of the palm. The carpus is as long as the palm and as long as the merus. All these joints are provided with longitudinal rows of spinules. The carpus like the palm is pubescent. The hairs are longest and most dense in the anteroventral part, diminishing in size and density proximally and dorsally, the extreme proximal part of the carpus being naked. The merus shows some pubescence in the anteroventral part. The ischium is ¾ to ⅘ of the length of the merus. The third leg reaches just with the tip of the dactylus beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus and slightly less than twice as long as the carpus. The merus is somewhat longer than the propodus. The ischium is half as long as the merus. The fifth leg too reaches with part of the dactylus beyond the scaphocerite. The propodus is thrice as long as the dactylus, twice as long as the carpus and as long as the merus. The ischium is half as long as the merus.

Pleopods and uropods are normal.

Juvenile specimens (10 to 13 mm long) which belong to the present species were collected in a tidal pool at the east end of Grand Isle, La. In these specimens the rostrum shows the typical shape with the unarmed tip. The number of teeth is the same as in the adults, but the number behind the orbit is much smaller, being generally 1. The hepatic spine is placed very close to the anterior margin of the carapace, being very similar in position to a branchiostegal spine. A trace of a supraorbital spine may be seen in a rather faint elevation of the carapace obliquely above the orbit. The mandible possesses a very small badly developed palp, which consists of one bud-like joint. The second legs are very similar to those of the young postlarval stages of *Macrobrachium carcinus* and *M. americanum,* only the carpus is slightly longer. The third leg has the dactylus very long, being half as long as the propodus. This stage very well agrees with the already mentioned young postlarval stages of *Macrobrachium carcinus* and *Macrobrachium americanum*, it probably must be considered a similar stage of *Macrobrachium ohione*. Here, like in the two other species, the young live in water of a much higher salinity than the adult forms as a rule do.

Size: The adult females become distinctly larger than the adult males. Gunter (1937) noted his largest female to have a length of 93 mm, his largest male being 68 mm long. The males seen by me had the second legs much less developed than the females. The largest female seen by me is 102 mm long. Ovigerous females were observed by McCormick (1933) to be 34 to 90 mm long. The eggs are numerous and small, in my material they are 0.35 to 0.50 mm in diameter.

Colour: According to Hedgpeth (1947) the present species is "a uniform pale gray color with light blue spots and a blue tail." Hedgpeth's (1949) colour description is very similar.

Material examined: In the U.S. National Museum I examined material of this species from the following localities: North Carolina (Avoca, Bertie Co.; Newport River, Carteret Co.), South Carolina (Eastbranch of Cooper River; Edisto River below Dawho River), Georgia (Savannah, Chatham Co.; entrance to Altamaha River; Satilla River; Umbrella Creek), Florida (St. Johns River[5]), Missouri (Hillcrest, Jefferson Co.), Mississippi (Greenville, Washington Co.; near Millikens Bend and Vicksburg, Warren Co.; Pascagoula, Jackson Co.; Baldwin Lodge, Hancock Co.), Arkansas (Fort Smith, Sebastian Co.; Red River), Louisiana (Delta, Madison Parish; Lake Pontchartrain; New Orleans, Orleans Parish; Amesville, Jefferson Parish; Pilottown, Plaquemines Parish; Bayou St. Denis, Barataria Bay; Lake Salvador, St. Charles Parish; Lake Lapourde near Morgan City, St. Mary Parish; Calcasieu Pass, Calcasieu Parish), Oklahoma (Clear Lake, McCurtain Co.), Texas (Trinity River near Magnolia Point, 10 miles S.W. of Palestine, Anderson Co.; Long Lake near Palestine, Anderson Co.; Big White Oak Bayou near Houston, Harris Co.).

Distribution: Macrobrachium ohione is known from the fresh waters of the south-eastern, southern and central United States. The records in literature are: Avoca, N. Carolina! (Schmitt, 1933!; Lunz, 1939a), Newport River, N. Carolina! (Hedgpeth, 1949), Cooper River above Charleston, S. Carolina (Lunz, 1939a), Edisto River from Pine Landing to Hart's Bluff, S. Carolina (Lunz, 1939a), Savannah, Georgia! (Schmitt, 1933), Altamaha River, Georgia! (Schmitt, 1933), Satilla River and Umbrella Creek, Georgia! (Hedgpeth, 1949), Pinto Island, Mobile Bay, Alabama (Hedgpeth, 1949), Greenville and Pasca-

[5] These Florida specimens have not been examined by me. Dr. Fenner A. Chace Jr., curator of Marine Invertebrates of the U. S. National Museum, was so kind to provide me with this record.

goula, Mississippi! (Hedgpeth, 1949), Milliken's Bend, Mississippi (Kingsley, 1882), Vicksburg, Mississippi (Hay, 1882; Kingsley, 1882; Sharp, 1893), Baldwin Lodge, S.W. Mississippi! (Schmitt, 1933), Fort Smith and Red River, Arkansas! (Hedgpeth, 1949), Delta!, Grand Isle!, Pilottown!, Bayou St. Denis!, Lake Salvador!, Atchafalaya River at Morgan City, Louisiana (Hedgpeth, 1949), Lake Pontchartrain, and Lake Lapourde near Morgan City, Louisiana! (Schmitt, 1933), New Orleans, Louisiana! (Forbes, 1876; McCormick, 1933; Schmitt, 1933!), Calcasieu Pass, Louisiana! (Cary and Spaulding, 1909; Schmitt, 1933!), Port Allen, Louisiana (Gunter, 1937), Ohio River at mouth of Great Miami River, Hamilton Co.; mouth of White Oak Creek, Brown Co.; Scioto River, Scioto Co.; Perry Tp., Lawrence Co.; White River below mouth of Mishingum River, Washington Co., Ohio (Hedgpeth, 1949), Cairo, Illinois (Forbes, 1876), Grand Tower, Illinois (Forbes, 1876), Chester, Illinois (McCormick, 1933), Shawneetown, Illinois (Hedgpeth, 1949), Lower Kaskaskia River, Illinois (Luce, 1933), St. Louis, Missouri (Forbes, 1876), Hillcrest, Missouri! (Hedgpeth, 1949), Cannelton, Indiana (Smith, 1874), Lawrenceburgh, Indiana (Hay, 1891), Clear Lake, Oklahoma! (Hedgpeth, 1949), Magnolia Point, Trinity River, Texas! (Evermann, 1892; Geiser, 1933a; Schmitt, 1933), Long Lake near Palestine, Texas! (Evermann, 1892; Geiser, 1933a), Big White Oak Bayou near Houston, Texas! (Evermann, 1892; Geiser, 1933a; Schmitt, 1933), Colorado River near Austin, Texas (Hedgpeth, 1949), Onion Creek 10 miles west of Austin, Texas (Hedgpeth, 1949), Lavaca River, Texas (Geiser, 1933a; Schmitt, 1933), Mesquite Bay, Copano Bay, and Aransas Bay as far south as Harbor Island, Texas (Hedgpeth, 1949), Aransas River, Texas (Hedgpeth, 1947), Aransas Bay, Texas (Hedgpeth, 1950). A map showing the distribution of this and the other species of *Macrobrachium* within the United States has been given by Hedgpeth (1949).

Type: The type locality is Ohio River at Cannelton, Indiana. The whereabouts of the type material is not known to me.

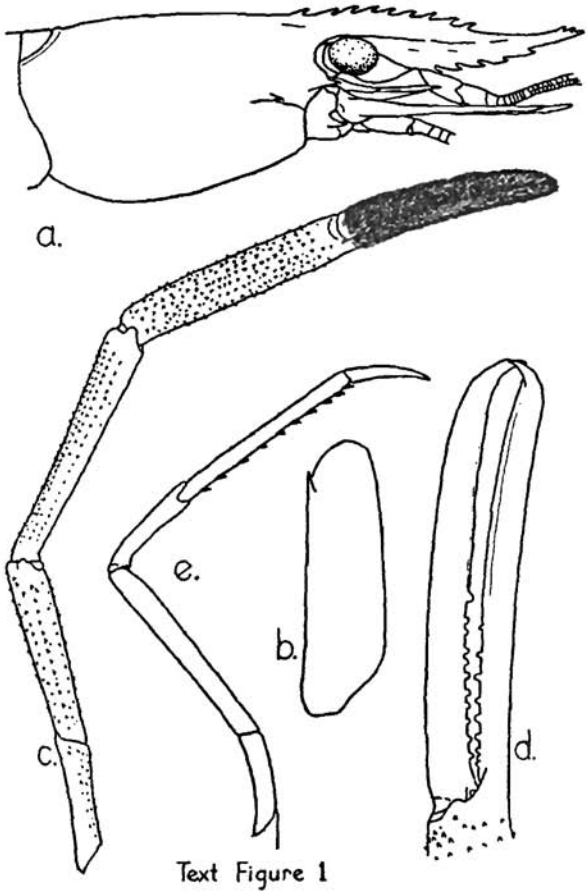
Remarks: The measurements given by Smith (1874) for the female in his original description obviously are, though perhaps partly, incorrect. The species is of economic importance at many places.

As the figure given by Reed (1941, p. 36) distinctly shows, the species named by him *Macrobrachium ohionis,* is in reality *Macrobrachium carcinus* (L.).

Macrobrachium gallus, new species

Palaemon (*Eupalaemon*) *Amazonicus* p.p. Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, p. 5.

Palaemon (*Eupalaemon*) *acanthurus* var. Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, p. 6.



Text Figure 1

Macrobrachium gallus new species, a, anterior part of body in lateral view; b, scaphocerite; c, second leg of large male; d, fingers of second leg of large male (hairs removed); e, third pereiopod. a, c, x1.2; b, e, x2; d, x2.25.

The rostrum is high and straight. The tip is curved somewhat upwards. It reaches slightly beyond the scaphocerite. The upper margin bears 10 to 12 teeth, one or two of which are placed behind the orbit. The first 8 to 10 teeth are placed on an elevated crest in the basal part of the rostrum. The ultimate half or 2/5 of the upper margin of the rostrum is entire except for two (seldom 1) subapical teeth, which are placed close to the tip. In one of the specimens seen by me the posterior subapical tooth is placed about halfway the unarmed portion of the dorsal margin. The lower margin bears 5 or 6 teeth. The carapace is smooth, even in the large males. The antennal spine is placed on the anterior margin of the carapace. The hepatic spine lies slightly below and behind the antennal.

The abdomen is smooth. The pleurae of the fifth segment end in an acute point. The sixth segment is about 1.5 times as long as the fifth. The telson is somewhat less than 1.5 times as long as the sixth abdominal segment. The two pairs of dorsal spines are placed in the middle and at 3/4 of the length of the telson. The posterior margin is distinct and ends in an acute median tip, which is far outreached by the inner posterior spines. Between these inner spines there are 2 feathered setae in juvenile, 4 or more in adult specimens.

The eyes and antennulae are normal in shape.

The scaphocerite is less than three times as long as broad. The outer margin is about straight.

The first legs reach with the chela or with a small part of the carpus beyond the scaphocerite. In juveniles the fingers only reach beyond this scale. The chela has the fingers somewhat longer than the palm. The carpus is fully twice as long as the chela. The merus measures about 3/4 of the length of the carpus. The second legs are equal in shape, though one generally is longer and stronger than the other. They reach with the whole carpus or only a part of it beyond the scaphocerite. The fingers are elongate, they are practically as long as the palm. The cutting edge of all my specimens, even the smallest, bears 9 to 13 rounded teeth of equal size in the proximal half of both fingers. In the distal half the edges are entire. Probably the whole of the edge is denticulate in still larger specimens. The palm is narrowly cylindrical. Longitudinal rows of minute spinules are present on the palm. Both fingers are entirely covered by a velvety cover of soft hairs, the palm is naked but for some scattered stiff hairs. In juveniles the fingers only bear some scattered tufts of hairs. The carpus is about as long as the palm, 5/4 of the length of the merus, and twice as long as the ischium. In juveniles the carpus

is relatively longer and in the very young specimens it is even longer than the entire chela. The carpus and merus are provided with longitudinal rows of spinules as also are present on the palm; there is no pubescence except for some scattered stiff hairs. The third leg reaches with part of the dactylus beyond the scaphocerite. The propodus is almost 2.5 times (in juveniles twice) as long as the dactylus and twice as long as the carpus. The merus is slightly longer than the propodus. The ischium is slightly less than half as long as the merus. The fifth leg reaches about to the end of the scaphocerite. The propodus is 2.5 times as long as the dactylus, twice as long as the carpus and about as long as the merus. The ischium is less than half as long as the merus.

The pleopods and uropods are normal.

Size: The largest male seen by me is 104 mm, the largest female 102 mm long. The smallest specimen was a female of 49 mm. None of the females was ovigerous.

Material examined: During a visit to the Istituto e Museo di Zollogia della Università di Torino, Turin, Italy, in May, 1950, I examined the specimens from Vinces, Ecuador named by Nobili (1901) *Palaemon* (*Eupalaemon*) *Amazonicus* and those from Rio Peripa, Ecuador named by the same author (Nobili, 1901) *Palaemon* (*Eupalaemon*) *acanthurus* var. All these specimens were collected in 1897 by Dr. Enrico Festa. The 5 specimens from Vinces were in a poor condition, but showed to belong undoubtedly to the same species as the Rio Peripa material. The latter material consists of 23 specimens, 14 of which I was allowed to take with me on loan to Leiden for a closer examination. The above description is based on these 14 specimens. Four specimens were donated by the Turin Museum to the Leiden Museum.

Type: Holotype is the large male from Rio Peripa, Ecuador. It is deposited in the Turin Museum.

Remarks: The species shows a close resemblance to *Macrobrachium panamense,* but may be differentiated immediately by the shape of the posterior margin of the telson. Also the evenly denticulated cutting edge of the fingers of the large chela is a very characteristic feature of this new form.

Macrobrachium heterochirus (Wiegm.)

Pl. 15, figs. a, b; pl. 16, figs. a-c

Palaemon heterochirus Wiegmann, 1836, Arch. Naturgesch., vol. 2 pt. 1, p. 149; Stimpson, 1857, Boston Journ. Nat. Hist., vol. 6, p. 503; Von Martens, 1869, Arch. Naturgesch., vol. 35 pt. 1, p. 30.

Palaemon Appuni Von Martens, 1869, Arch. Naturgesch., vol. 35 pt. 1, p. 31, pl. 2, fig. 5.

Palaemon heterocheirus Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 68.

?*Bithynis appuni* Pocock, 1889, Ann. Mag. Nat. Hist., ser. 6, vol. 3, p. 10, pl. 2, fig. 2.

Palaemon appuni Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 722.

Palaemon heterochirus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 736.

Palaemon appuni Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91 pt. 3, p. 6.

Palaemon heterochirus Thallwitz, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91 pt. 3, p. 9.

Palaemon appuni Pocock, 1893, J. Linn. Soc. Lond. Zool., vol. 24, p. 408; Ortmann, 1897, Rev. Mus. paul, vol. 2, p. 207.

Bithynis jamaicensis p. p. M. J. Rathbun, 1902a, Bull. U.S. Fish Comm., vol. 20, pt. 2, p. 123.

Macrobrachium heterochirus Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 14.

Description: The rostrum is narrow and straight, it reaches to the base or to the end of the third joint of the antennular peduncle. The upper margin bears 10 to 12 teeth, 4 or 5 of which are placed behind the orbit. The first is situated at $\frac{2}{5}$ of the length of the carapace. The first 3 or 4 are more erect and are placed wider apart than the others, which are regularly divided over the rest of the rostrum. The upper margin of the rostrum is arched over the eye; the extreme tip is curved slightly upwards. The lower margin bears 2 to 4 teeth. The carapace is smooth.

The abdomen is smooth. The pleura of the fifth segment has the apex rectangular, or slightly acute; the extreme tip generally is rounded. The sixth abdominal segment is only slightly longer than the fifth. The telson is about 1.5 times as long as the 6th abdominal segment. The dorsal spines are placed in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin ends in a spine, which in old specimens is truncate. The inner pair of posterior spines reaches beyond the end of the telson. In very old specimens, however, they are so much worn, that they sometimes fail to reach that far; the telson of such specimens may, however, immediately be recognized from that of *M. amazonicum* by the broad truncate tip, which is provided with numerous setae.

The eyes and antennulae are normal in shape.

The scaphocerite is slightly more than twice as long as broad. The outer margin is straight or slightly convex.

The first leg reaches with almost the entire carpus beyond the scaphocerite. The fingers are slightly shorter than the palm. The carpus is somewhat less than twice as long as the chela. The merus is 4/5 of the length of the carpus. The second legs are equal in shape, though unequal in size in the adult males. They reach with part of the merus beyond the scaphocerite. The fingers are 2/3 of the length of the palm, being sometimes somewhat shorter. The cutting edges bear a row of small teeth of equal size. In my largest male specimen this row extends from the base of the finger to slightly beyond the middle (containing 8 denticles). The last of these denticles generally is broader and slightly higher than the proximals. On the lower margin of the fixed finger there are various scattered spinules; never, however, are the spinules in the median part larger than the rest and they never form a rather high crest-like row. The palm is elongate, being about thrice as long as high and only little compressed. Both palm and fingers are provided with distinct spinules. Close along the cutting edges both fingers are pubescent, the rest of the fingers is naked. The palm is pubescent, along the lower margin this pubescence is most distinct. The carpus is about 3/4 of the length of the palm and as long as or somewhat longer than the merus; it is more than twice as long as high. The carpus, merus and ischium are pubescent at their lower surface. This pubescence gradually becomes indistinct dorsally. The pubescence of the carpus is less distinct than that of the merus. The ischium measures 2/3 of the length of the merus. The smaller leg has the fingers almost as long as to 2/3 as long as the palm. The carpus is as long as the palm or slightly shorter. The last three legs are rather robust. The third leg reaches with the dactylus only, or with 1/3 of the propodus beyond the scaphocerite. The propodus is twice to thrice as long as the dactylus, and slightly more than 1.5 times as long as the carpus. The merus is somewhat longer than the propodus and twice as long as the ischium. The fifth leg reaches about to the middle of the scaphocerite. The propodus is slightly more than twice as long as the dactylus, 1.5 times as long as the carpus and as long as the merus. All joints of the last three legs are covered with minute spinules. The spinules on the lower margin of the merus are not larger than the others. There is some pubescence on the lower surface of the merus.

The pleopods and uropods are normal in shape.

Young specimens (39 mm) have the rostrum relatively higher, their first legs do not reach so far beyond the scaphocerite, their second legs are equal in size, and have the fingers as long as the palm or even longer.

The carpus is longer than the palm, the ischium is about as long as the merus. The last three legs are smooth. The third fails to reach the end of the scaphocerite, the fifth reaches beyond the middle of that scale.

An ovigerous female (73 mm) has the 2nd chelae of about equal size, reaching with the larger part of the carpus beyond the scaphocerite. The relations between the joints of the legs are as in the smaller leg of the male. Otherwise it is just like the adult male, only the spinulation of the last 3 legs is less strong, and there is no pubescence on the merus of these legs.

Size: The largest male at my disposal measures 135 mm. An ovigerous female is 73 mm long. The eggs are numerous and small being 0.35 to 0.50 mm in diameter.

Colour: Notes on the colour of living specimens of this species are made by Dr. Waldo L. Schmitt from material from Ilha São Sebastiao, S. Brazil during his 1925 expedition to S. America. There are two strongly different kind of colour types in this species. One form has the body very dark brown (black brown) on the back, tinged with clearer brown elsewhere. There are longitudinal lemon yellow stripes on the body. One of these stripes runs just along the bases of the upper teeth of the rostrum, the teeth themselves being brown. The carapace is decorated with 1 median and at each side with 3 lateral stripes. The median line ends posteriorly in a cross-like figure. Of the 3 lateral stripes the 2 upper start from the same point on the posterior margin of the carapace, the upper extending towards the posterior margin of the orbit, the other to the antennal spine. The lower (third) yellow band is separated from the lower margin of the carapace by a transparent hazel-coloured region. The abdomen has a median and at both sides a submedian stripe of yellow. A yellow spot moreover is present at the base of the telson, an elongate oblique spot on the uropodal endopods and a small spot near the base of the final tooth of the exopods. The lower lateral stripe of the carapace and the submedian stripes of the abdomen are bright yellow, all other stripes are of a fainter colour and marked with dark spots. The tailfan is dark dragon's blood red, darker at the base, but transparent. The scaphocerite has the spine clear, with a violet line along the inner side, ending maroon purple; the rest of the lamella is coloured wine purple. The flagella are colourless. The legs are dragon's blood red, and the large chela probably purple.

The other type has the body translucent light pea green with black blue-green line markings. The hairs between the rostral spines are orange ochraceous. The carapace has tracings of the blue black green. Further-

more black blue-green lines are present along the anterior margin of the first, both margins of the second and the posterior margins of the third to sixth abdominal somites. The edges of the tailfan and the telson are margined too with black blue-green. The tips of the fingers and the articulating margins of the joints of the chelipeds are orange ochraceous. The spines on the chelipeds are blackish burnt umber giving them a darker appearance than the ground colour.

Dying brown specimens get blue. The correct relation between the two colour types is not known. Dr. W. L. Schmitt thought it probable that the dark brown specimens have recently shed, while the blue-greenish ones are ready to shed.

Material examined: In the United States National Museum material of this species is present from the following localities: Mexico (Zacatlan, Puebla State; Rio Armeria near Colima, Tabasco State), Guatemala (Rio Motagua at El Rancho, and Rio Platana, southeast of Sanarate between Guatemala City and El Progreso in Rio Motagua basin), Venezuela (Rio Mamo, W. of La Guaira; La Guaira), Brazil (Rio Taguanduba at Ilha São Sebastiao), Jamaica (Clyde and Yallahs Rivers), Haiti, Santo Domingo (San Francisco Mts.), Porto Rico (Maricao; Rio Comerio; San Juan), Guadeloupe (La Situ), Dominica, Grenada (Mt. Pleasant). In the Museum of the Academy of Natural Sciences at Philadelphia I examined a specimen from Porto Rico (Arecibo River at Utuado and below). The American Museum of Natural History at New York possesses material of this species from Santo Domingo (Barahona).

Distribution: The species is known from fresh water of eastern Central and South America from Mexico to S. Brazil and from the West Indies. The records in literature are: East coast of Mexico (Wiegmann, 1836), Porto Cabello, Venezuela (Von Martens, 1869), San Juan, Porto Rico! (M. J. Rathbun, 1902a), Cumberland and Fitz Hughes Rivers, St. Vincent (Pocock, 1893), Laiou, Dominica (Pocock, 1889). The species is closely related to the West-African *Macrobrachium chevalieri* (J. Roux).

Type: The type locality is the "east coast of Mexico." The type specimen, which should be preserved in the Berlin Zoological Museum, is probably no longer extant. In 1869 Von Martens (p. 30) already remarked: "Unfortunately I could not yet find again Wiegmann's *Pal. heterochirus* from Mexico, l. c. p. 149, in the Berlin Museum."

Remarks: *Palaemon heterochirus* Wiegmann up till now has been considered a species incerta. Von Martens (1869) points to its resemblance to *P. grandimanus,* but comes to the conclusion that it is different from that species. Ortmann (1891, p. 736) is inclined to consider *Palaemon heterochirus* and *P. grandimanus* synonyms; on p. 743, he indeed identifies the two forms; the difference in locality should be explained by a possible incorrect labelling. When, however, we compare Wiegmann's description of *P. heterochirus* with specimens of *Palaemon appuni* it becomes evident that they are the same, Wiegmann's description fits in all details. Von Martens, in the same paper in which he states *P. heterochirus* to be unidentifiable described this species as *P. appuni,* his description and figure are sufficient to identify the species. Pocock (1889) refers some specimens with doubt to *Bithynis appuni,* his figure shows that his identification is correct. The species seems to be more common than one should conclude from the data presented in literature. It probably often is confused with *M. carcinus* as did M. J. Rathbun (1902). The material from San Juan market, Porto Rico brought by her to *Bithynis jamaicensis* proved on examination to be in reality *M. heterochirus.*

The shape of the rostrum is one of the easiest characters to separate this species from the other East American forms.

Macrobrachium occidentale Holthuis

Pl. 17, figs. a-e

Macrobrachium occidentale Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 95; 1950a, Siboga Exped., mon. 39a9, p. 17.

Description: This species is very closely related to *Macrobrachium heterochirus.* Here the differences between the two forms, which differences are very distinct and constant, are given. In all other characters there is the closest resemblance.

1. There are generally 5 or 6 teeth of the rostrum behind the orbit. These teeth are placed not so widely apart as in *M. heterochirus* occupying less than ⅓ of the dorsal length of the carapace.

2. The first legs have the carpus distinctly less than twice as long as the chela.

3. The left and right second legs are much more different in shape than in *M. heterochirus* and they are less elongate than in that species. The fingers of the larger second leg in the adult male of *M. occidentale* are ⅔ as long as the palm and are gaping, the gap between the fingers

being filled with rather long and stiff hairs, which are implanted alongside the cutting edges and obscure the denticles on the cutting edges. These denticles, 5 to 8 in number in adult males, are placed almost up to the tip of the fingers and there is no distinct constant difference in the size of these denticles. The palm is elongate and somewhat compressed, slightly more so than in *M. heterochirus*. There is a pubescence on the whole chela; this pubescence becomes much longer and more distinct in the ventral region of the inner side of the palm, especially in the distal part of this region. The spinules on the chela are distinct, those on the outer surface are longer and stronger than those on the inner side. The carpus is distinctly shorter than the palm, it is much more robust than in *M. heterochirus,* being about twice as long as high and rather suddenly constricted proximally. Like the chela, the carpus too is provided with spinules and a short pubescence, which at the lower surface becomes somewhat longer. The merus is about as long as the carpus and too is twice as long as high. The pubescence on the merus is like that on the carpus, but the pubescence on the ventral surface of the merus is far more pronounced than that on the carpus. The spinulation of the merus is like that of the carpus and the palm.

4. The shorter leg of the adult male in *M. occidentale* is much more slender than the larger. The fingers are closing. In the proximal part of the cutting edge of the fingers there are up to 5 small denticles, the distal half of the edge is entire. The fingers are about as long as the palm, as long as the carpus and as long as the merus. The pubescence and spinulation of the smaller leg are like those of the larger. The smaller leg is less elongate than that of *M. heterochirus,* but the differences are small.

Size: The largest male in the collection is 90 mm long. The smallest is 52 mm. No ovigerous females are present. In total 20 specimens were studied.

Colour: The holotype male, which was collected in 1946 still shows some traces of colouration: on the large chela namely, the spines on the outer surface are coloured blue, those on the inner surface brownish yellow, the reddish colour of the chela may have been caused by the action of the alcohol.

Material examined: In the U.S. National Museum material of this species is present from the following localities: Rio Naranjo, E. of Pajapita, S. W. Guatemala (March 28, 1947, A. D. Holloway and J. Midence coll.), Rio Guacalate near Masagua, S. of Escuintla, Guatemala (1947, R. R. Miller, A. D. Holloway and J. Midence coll.), Rio

de los Esclavos, just S. of Cuilapa, Guatemala (March 13, 1946, R. R. Miller coll.), Rio del Desague near Giuja, San Salvador (January 24, 1924, S. F. Hildebrand and A. O. Foster coll.), Rio Lempa at Suchitoto, San Salvador (February 5 and 9, 1924, S. F. Hildebrand and A. O. Foster coll.), Boca de Pavarando, Sambu Valley, S. Darien, S. E. Panama (February, 1912, H. Pittier coll.).

Type: Holotype (U.S.N.M. Cat. No. 84151) is the largest male from Rio de los Esclavos, Guatemala. All types are preserved in the U.S. National Museum.

Macrobrachium potiuna (Müller)

Pl. 18, figs. a-d

Palaemon Potiuna Müller, 1880, Zool. Anz. Leipzig, vol. 3, p. 152; Faxon, 1882, Mem. Mus. Comp. Zoöl. Harv., vol. 9, pt. 1, pl. 11, fig. 21; Müller, 1892, Arch. Mus. nac. Rio de J., vol. 8, p. 179, pls. 11-13; Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 12.

Palaemon potiuna Von Ihering, 1897, Rev. Mus. Paul., vol. 2, p. 423; Ortmann, 1897, Rev. Mus. Paul., vol. 2, p. 209, pl. 1, fig. 9; Moreira, 1901, Arch. Mus. nac. Rio de J., vol. 11, p. 14.

Macrobrachium potinua Luederwaldt, 1919, Rev. Mus. Paul., vol. 11, p. 430.

?*Macrobrachium nattereri* Luederwaldt, 1919, Rev. Mus. Paul., vol. 11, p. 430.

Palaemon potinua Luederwaldt, 1919a, Rev. Mus. Paul., vol. 11, p. 387.

?*Palaemon nattereri* Luederwaldt, 1919a, Rev. Mus. Paul., vol. 11, p. 387.

Palaemon potiuna Sollaud, 1923, Bull. Biol. France-Belg., vol. 57, p. 586; Brooks, 1931, Ann. Carnegie Mus., vol. 20, p. 166.

Macrobrachium potiuna Sawaya, 1946, Zoologia, São Paulo, vol. 11, pp. 401, 402; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 18.

Description: The rostrum is straight and rather high, it reaches slightly beyond the end of the antennular peduncle. The upper margin is provided with 7 to 10 equidistant teeth, the first 2 of which are placed behind the orbit. The upper margin is almost straight. The lower margin bears 2 to 3 teeth. In adult males the carapace is roughened in the antero-lateral parts by numerous small spinules. The hepatic spine is somewhat smaller than the antennal and is placed obliquely behind it.

The abdomen is smooth. The pleura of the fifth segment has the tip rectangular or somewhat acute. The 6th segment is 1.5 times as long as the fifth. The telson is 1.5 times as long as the 6th abdominal segment. Of the 2 dorsal pairs of spinules the anterior is situated in or slightly behind the middle, the other generally is placed closer to the anterior pair than to the posterior margin. The posterior margin ends in a median point, which is overreached by the inner pair of the posterior spines. Numerous feathered setae are present between the inner posterior spines.

The eyes and antennulae are normal in shape.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight or slightly convex.

The first leg reaches with ¼ of the length of the carpus or less beyond the scaphocerite. The fingers are about as long as the palm. The carpus is slightly less than twice as long as the chela. The merus measures ⅘ of the length of the carpus. The adult male has the second legs equal in shape, though more or less unequal in size. They reach with the carpus beyond the scaphocerite. The fingers in the adult male are elongate and slender, being somewhat longer than the palm. They are slightly curved, gaping thereby. In the proximal part of the cutting edge, the dactylus is provided with 2 large teeth, the fixed finger bears 1 large tooth, which is situated between the two teeth of the dactylus. Some smaller teeth are present between the large tooth and the base of the fixed finger. The rest of the cutting edge is entire and is very inconspicuous. The edges of both fingers are flanked throughout their length at each side with a row of about 20 tubercles. The surface of the fingers is provided with spinules. The palm is elongate and only slightly compressed; it too bears numerous small spinules. Both fingers and palm are naked, with the exception of a few scattered hairs. The carpus measures ⅔ to ¾ of the length of the palm, it is as long as the merus. Both carpus and merus are densely covered with spinules, but show no trace of pubescence. The ischium measures ⅔ to ¾ of the length of the merus. The third leg reaches with the dactylus beyond or just reaches to the end of the scaphocerite. The propodus is 2.5 times as long as the dactylus, twice as long as the carpus, and slightly shorter than the merus. The fifth leg reaches to the end of the scaphocerite or fails to reach so far. The propodus is thrice as long as the dactylus, twice or slightly more than twice as long as the carpus and as long as the merus. The last 3 legs are smooth, without additional spinules.

The pleopods and uropods are normal in shape.

In young specimens the 2nd legs are equal and smooth, they are much less strong than in the males and have the fingers relatively shorter and closing over their entire length. No tubercles are visible along the cutting edges of the fingers. The carpus of the 2nd leg is as long as the palm. The ovigerous females too have the 2nd legs equal and smooth, reaching only with a small part of the carpus beyond the scaphocerite. The fingers are shorter than the palm and close over their entire length. Just like in the juveniles no tubercles are present along the cutting edges.

Size: My specimens range between 22 and 60 mm of length. Ovigerous females are 31 to 42 mm long. The eggs are few and large, being 1.1 to 1.9 mm in diameter.

Colour: Dr. Waldo L. Schmitt on his 1925 expedition to S. America noted living specimens, obtained by him at São Francisco do Sul, Brazil, to be coloured as follows: Some specimens are dark of Prout's brown or dark burnt umber over the whole body and the claws, other specimens showed the colour of *M. olfersi* (vid. p. 100).

Material examined: In the United States National Museum material of this species is present from the following localities, all situated in S. E. Brazil; São Paulo State (Cubatao near Santos; Cachoeira), Santa Catherina State (Joinville; Ribeira de Vananal near São Francisco do Sul; Rio Hercilio; Hammonia; Blumenau), Rio Grande do Sul State (River between Lagoa Itapeva and Lagoa Quadros). The Turin Museum possesses 3 specimens from Blumenau, Santa Catherina State, Brazil (coll. F. Müller).

Distribution: The species is known from fresh water of the S.E. Brazilian States: Rio de Janeiro to Rio Grande do Sul. The records in literature are: Rio de Janeiro, Jacarépaguá, Casal, Ponte Nova and Mauá, Rio de Janeiro State (Moreira, 1901), Santos, São Paulo State (Luederwaldt, 1919, 1919a), ?Itapura, ?Jaboticabal, ?São Paulo, ?Raiz da Serra, and Alto da Serra, Santos, São Paulo State (Luederwaldt, 1919), Joinville, Santa Catherina State (Von Ihering, 1897), basin of Itajahy River near Blumenau, Santa Catherina State (Müller, 1880, 1892; Faxon, 1882; Ortmann, 1897; Brooks, 1931).

Type: The type locality of this species is Itajahy River, near Blumenau, Santa Catherina State, S.E. Brazil.

Remarks: There exists much confusion in literature about the species referred to *Macrobrachium potiuna, M. iheringi, M. nattereri* and *M. brasiliense,* of which all are closely related. Luederwaldt's records of *Macrobrachium nattereri* are not trustworthy and probably his

material is, partly at least, *M. potiuna*. The material from Cubatão and Joinville in the U. S. National Museum which was received from the Museo Paulista under the name *Macrobrachium nattereri,* namely proves to belong to the present form. The differences between juvenile specimens of *M. potiuna* and *M. borellii* have already been pointed out (p. 32).

Macrobrachium brasiliense (Heller)

Pl. 19, figs. a-e

Palaemon brasiliensis Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45, pt. 1, p. 419, pl. 2, fig. 46.

non *Palaemon brasiliensis* Miers, 1877, Proc. Zool. Soc. Lond., 1877, p. 660.

Palaemon nattereri p.p. Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 711. (non Heller, 1862.)

non *Palaemon brasiliensis* (?) Nobili, 1896a, Boll. Mus. Zool. Anat. comp. Torino, vol. 11, n. 222, p. 3.

Palaemon appuni var. *aequatorialis* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 723, pl. 47, fig. 6.

Palaemon brasiliensis Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 6.

Palaemon Nattereri Nobili, 1897a, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, no. 275, p. 5.

Palaemon nattereri p.p. Ortmann, 1897, Rev. Mus. Paul, vol. 2, p. 207.

non *Bithynis brasiliensis* Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 486.

Palaemon nattereri p. p. Moreira, 1901, Arch. Mus. Nac. Rio de J., vol. 11, p. 13.

Palaemon (*Eupalaemon*) *Nattereri* Nobili, 1901, Boll. Mus., Zool. Anat. comp. Torino, vol. 16, no. 415, p. 5; Nobili, 1901b, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, no. 402, p. 3.

? *Palaemon braziliensis* Gordon, 1935a, Journ. Linn. Soc. Lond., Zool., vol. 39, p. 323.

Macrobrachium brasiliense Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 1111; 1950a, Siboga Exped., mon. 39a9, p. 13; 1950b, Zool. Meded., vol. 31, p. 30.

Description: The rostrum is straight and rather high, it reaches slightly beyond the antennular peduncle, but fails to reach or just reaches the end of the scaphocerite. The upper margin bears 8 to 11 teeth, which are regularly divided over the margin. The first 2 teeth are behind the

orbit, the third stands just over the orbit. The upper margin is slightly convex, the tip is directed somewhat upwards. The lower margin bears 2 or 3 teeth. The carapace is roughened by the presence of numerous spinules which are most distinct anterolaterally. The hepatic spine is less strong than the antennal and is placed obliquely behind it.
tween these spines.

The eyes and antennulae,are normal in shape.

Like the carapace, the abdomen and telson are roughened by spinules. These are most conspicuous at the pleurae. The pleura of the fifth segment ends in an acute point. The sixth segment is somewhat less than 1.5 times as long as the fifth. The telson is 1.5 times as long as the 6th abdominal segment. The dorsal spines are placed in the middle and at ¾ of the length of the telson. The posterior margin ends in a small acute point, which is overreached by the inner of the 2 pairs of spines of the posterior margin of the telson. Numerous feathered setae are present be-
tween these spines.

The scaphocerite is 2.5 times as long as broad. The outer margin is straight or slightly concave.

The first pereiopod reaches with almost half the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is slightly less than twice as long as the chela. The merus is ⅘ of the length of the carpus. The ischium and merus are roughened by the presence of numerous small spinules. The carpus and chela are smooth. The second chelae are similar in shape, but differ in size. The large chela reaches with the entire carpus beyond the scaphocerite. The fingers of the larger chela generally are slightly longer than half the length of the palm. The dactylus bears 2 large teeth on the cutting edge, one in the middle of the edge and one about halfway between the first tooth and the base of the edge. Between these 2 teeth a usually much smaller tooth may be observed. The fixed finger bears one large tooth, which is situated just behind the distal tooth of the dactylus. A row of 3 to 5 small equal and sometimes 1 or 2 larger teeth is present proximally of the large tooth. Along the inner margin of the distal part of the cutting edge of the fixed finger a row of 4 to 11 blunt tubercles is present, about four to six smaller, more acute tubercles are present at the same place in the dactylus, while some 3 or 4 very inconspicuous tubercles are placed at the outside of the cutting edges. The palm is only slightly compressed being almost cylindrical, the lower margin is almost straight or slightly concave. The palm is covered with numerous small spinules which are arranged in more or less distinct longitudinal rows, the spinules at the lower inner surface are largest and placed widest apart, these spinules continue on the fingers. The carpus is about ⅔ as long as the palm and

⅔ as long as the merus, the spinules on the carpus and merus are similarly arranged as those on the palm. The ischium is somewhat more than half as long as the merus. All joints are naked, but for some scattered stiff hairs. The smaller leg reaches only with part of the carpus beyond the scaphocerite. The third leg reaches with the tip of the dactylus beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus, less than twice as long as the carpus, and slightly shorter than the merus. The ischium is half as long as the merus. The fifth leg reaches slightly beyond the middle of the scaphocerite. The propodus is almost thrice as long as the dactylus, less than twice as long as the carpus, and as long as the merus. All joints of the last three legs are covered with numerous minute spinules.

Pleopods and uropods normal.

Young specimens have the chelae smaller, reaching only with part of the carpus beyond the scaphocerite. They have the palm relatively shorter. My ovigerous female has the 2nd leg similar to that of the male only smaller, reaching only with part of the carpus beyond the scaphocerite. The armament and shape of the chela is the same, only the tubercles are more distinct, there are about 6 or 7 at each side of the cutting edge of the fixed finger and 3 or 4 at both sides of the cutting edge of the dactylus.

Size: The largest specimen (♂) seen by me is 85 mm in length. The only ovigerous female measures 47 mm. The eggs are few and large, measuring 1.8 to 2.2 mm in diameter.

Colour: Old specimens of this species are coloured brick red to brownish red when living. They often have the dorsal region very dark brown to almost blackish. Younger specimens are of a much paler red, while juveniles are practically colourless. (Holthuis, 1950b, p. 31).

Material examined: The U. S. National Museum possesses specimens of this species from E. Colombia (Villavicenzio), E. Ecuador (Gualaquiza) and N.E. Peru (mouth of Ampijacu River and Shansho Caño, both localities near Pebas). Villavicenzio lies in the Orinoco Basin, the other localities in the Amazon Basin. In the collections of the American Museum of Natural History at New York specimens of this species are present from W. Brazil, close near the Colombian Border (Rio Uaupes near Caruru) and from British Guiana (Kaieteur Falls). The Rijksmuseum van Natuurlijke Historie at Leiden, Holland possesses a large amount of material of this species from Surinam (Coppename River in Emma Mountains, Saramacca River Basin near Brownsberg creeks at 121 km S. of Paramaribo, Moengotapoe in N. E. Surinam and

at 120 km S. of Paramaribo, Bigidjompo, Lolobroki and Wiagall

the Nassau Mountains in E. Surinam). In the Turin Museum I examined material of this species from Ecuador (Gualaquiza, Rio Zamora, and Rio Santiago; 1896, coll. E. Festa) and from S. Brazil (Cuyaba in Matto Grosso; 1900, coll. F. Silvestri).

Distribution: Due to our poor knowledge of the various species of *Macrobrachium* of the fresh waters of central South America, and the variation of their characters, the records in literature for the larger part are more or less doubtful. The records are: ?British Guiana (Gordon, 1935a), Right Coppename River in Emma Mountains, Central Surinam! (Holthuis, 1948), Brownsberg, Saramacca River Basin, 120 km S. of Paramaribo, Surinam! (Holthuis, 1948), Bididjompo, Lolobroki and Mispel creeks, 121 km. S. of Paramaribo! (Holthuis, 1950b), Moengotapoe, N. E. Surinam! (Holthuis, 1950b), Nassau Mountains near Marowijne River, E. Surinam! (Holthuis, 1950b), Brazil (Heller, 1862), Cuyabà, Matto Grosso region, S.W. Brazil (Nobili, 1901b), Gualaquiza!, Rio Zamora and Rio Santiago, E. Ecuador (Nobili, 1897a, 1901).

Type: The type locality is indicated by Heller as being "a brook at Camaroes, Brazil." As already pointed out by Ortmann (1891, p. 711 footnote) Heller probably made an error in thinking the name Camaroes to be a village, it is more probably the native name of the prawns. The type, if still extant, is deposited in the Naturhistorisches Museum in Vienna, Austria.

Remarks: The specimens mentioned by Miers (1877) as *Palaemon brasiliensis,* obviously are young specimens of the species he refers to *P. nattereri,* it certainly is no *M. brasiliense* as is already shown by the shape of the rostrum. An ovigerous female from Gualaquiza, forming part of the material reported upon by Nobili (1897a and 1901) was presented by the Turin Museum to the U. S. National Museum and was examined by me. In the Turin Museum itself I examined the specimens reported upon by Nobili (1897, 1901, and 1901a) under the name *Palaemon Nattereri.* All the specimens proved to belong to the present species. The specimens reported upon by Nobili (1896) as *Palaemon brasiliensis* (?) on examination proved to be *M. borellii.* I can find no differences whatever to distinguish Ortmann's *Palaemon appuni* var. *aequatorialis* from the present species and therefore consider the 2 forms to be identical. Examination of Ortmann's type, however, remains desirable to settle this question finally.

Macrobrachium nattereri (Heller)

Pl. 20, figs. a-d

Palaemon Nattereri Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45, pt. 1, p. 414, pl. 2, figs. 36, 37.

Palaemon nattereri Miers, 1877, Proc. Zool. Soc. Lond., 1877, p. 660.

Palaemon brasiliensis Miers, 1877, Proc. Zool. Soc. Lond., 1877, p. 660. (non Heller, 1862.)

Palaemon nattereri p. p. Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 710.

Palaemon nattereri Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 11.

non *Palaemon Nattereri* Nobili, 1897a, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, no. 275, p. 5.

Palaemon nattereri p. p. Ortmann, 1897, Rev. Mus. paul, vol. 2, p. 207.

Bithynis brasiliensis Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 486.

Bithynis nattereri Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 486.

Palaemon nattereri p. p. Moreira, 1901, Arch. Mus. nac. Rio de J., vol. 11, p. 13.

non *Palaemon* (*Eupalaemon*) *Nattereri* Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, no. 415, p. 5.

non *Palaemon* (*Eupalaemon*) *Nattereri* Nobili, 1901b, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, no. 402, p. 3.

? *Macrobrachium nattereri* Luederwaldt, 1919, Rev. Mus. paul, vol. 11, p. 430.

? *Palaemon nattereri* Luederwaldt, 1919a, Rev. Mus. paul, vol. 11, p. 387.

Macrobrachium nattereri Sawaya, 1946, Zoologia, São Paulo, vol. 11, pp. 401, 402; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 17.

Description: The rostrum is about straight, the upper margin is somewhat arched. The tip reaches slightly beyond the end of the antennular peduncle, but fails to reach the end of the scaphocerite. The upper margin bears 11 to 14 teeth, 3 of which are placed behind the posterior margin of the orbit. The teeth are regularly divided over the rostrum. The lower margin bears 2 or 3 teeth. The carapace is roughened by numerous small spinules, which are most distinct in the anterolateral part.

The abdomen bears similar small spinules as the carapace, these are especially distinct on the pleurae. The fifth segment ends in an almost rectangular tip. The 6th segment is about $\frac{4}{5}$ as long as the fifth and $\frac{2}{3}$ as long as the telson. The dorsal surface of the telson bears the usual

2 pairs of spines, 1 on the middle and 1 at ¾ of its length. The posterior margin of the telson 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 2.5 times as long as broad. The outer margin is slightly concave.

The first legs reach with more than half the length of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela, and 5/4 as long as the merus. None of the joints of the 1st legs shows any spinules. The second legs are unequal in size, but about equal in shape. The larger reaches with the larger part of the carpus beyond the scaphocerite. The fingers are about 0.6 times as long as the palm. The cutting edge of the dactylus bears a large tooth in about the middle; behind this tooth 2 smaller teeth are present, the proximal being somewhat smaller than the distal. The fixed finger has the cutting edge provided with 1 large tooth, situated at a level behind the large tooth of the dactylus, and some 1 to 3 smaller teeth proximal of this larger one. The fingers are covered with small spinules and scattered hairs, which form no thick pubescence. Along the inner margin of the cutting edge of the fixed finger, distally of the large tooth, a row of 12 tubercles is present, at the inner side of the cutting edge of the dactylus a row of 8 smaller tubercles may be seen. No tubercles are visible in my specimens at the outside of the edge. The palm is only slightly compressed and not inflated. The upper and lower margin are almost straight. There is no pubescence, only scattered hairs are visible. The palm is thickly covered with spinules, the upper are small and placed close together, the lower are longer and placed wider apart. The carpus is ⅔ to 6/7 as long as the palm, and 1.2 to 1.5 times as long as the merus. Both merus and carpus are spinulated like the palm. The smaller leg reaches with a small part of the carpus beyond the scaphocerite. The fingers are ¾ as long as the palm. The dentition of the cutting edge is like in the large chela, also the tubercles along the inner side of the cutting edges are present, though being less distinct than those in the larger leg. The palm is shaped like in the larger leg. The carpus is 0.9 times as long as the palm and ⅞ as long as the merus. Spinulation as in larger leg. The third leg reaches with the dactylus beyond the scaphocerite. The propodus is 2.5 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 thrice as long as the dactylus, about twice as long as the carpus and as long as the merus. No spinules, except those on the posterior margin of the propodus are present on the last three legs.

The pleopods and uropods are normal.

Size: My largest adult male measures 60 mm. No ovigerous females are at my disposal.

Material examined: In the collection of the U. S. National Museum 3 specimens of this species are present from Santarem, at the Amazon River, Estado de Parà, Brazil.

Distribution: The species up till now is known only from the Rio Negro, Brazil (Heller, 1862), Santarem, Parà State, Brazil (present specimens) and St. Laurent, French Guiana (Miers, 1877). The other records, as pointed out below, are incorrect or doubtful.

Type: The type locality is Rio Negro, Brazil. The type specimen, if still extant, is preserved in the Naturhistorisches Museum in Vienna, Austria.

Remarks: The various records in literature of this species must be considered with great reserve. The specimens mentioned by Nobili (1897, 1901, 1901a) as belonging to the present species were examined and proved to belong in *M. brasiliense.* Luederwaldt (1919) only gives a list of localities in which this species was found; his identifications likewise need confirmation. All the specimens namely which the U. S. National Museum obtained from the Museo Paulista as *Palaemon nattereri* prove to belong in reality to *M. potiuna.*

Mier's (1877) specimens from French Guiana, identified by him as *Palaemon brasiliensis,* too, are all probably nothing else than juvenile specimens of the present species, which, moreover, too, is recorded by him from the same locality under the name *Palaemon nattereri.* Young (1900) distinguishes the 2 species on the characters mentioned by Miers, his *Bithynis brasiliensis* thus also must be considered to be *M. nattereri.*

Macrobrachium iheringi (Ortmann)

Pl. 21, figs. a-d

Palaemon iheringi Ortmann, 1897, Rev. Mus. Paul. ,vol. 2, p. 211, pl. 1, figs. 7, 8.

Palaemon Iheringi Von Ihering, 1897, Rev. Mus. Paul., vol. 2, p. 423.

Palaemon iheringi Moreira, 1901, Arch. Mus. Nac. Rio de J., vol. 11, p. 15.

Macrobrachium iheringi Luederwaldt, 1919, Rev. Mus. Paul., vol. 11, p. 430.

Palaemon iheringi Luederwaldt, 1919a, Rev. Mus. Paul., vol. 11, p. 387.

Palaemon Iheringi Sollaud, 1923, Bull. Biol. France Belg., vol. 57, p. 589.

Palaemon iheringi Brooks, 1931, Ann. Carnegie Mus., vol. 20, p. 166.

Macrobrachium iheringi Sawaya, 1946, Zoologia, São Paulo, vol. 11, p. 406, pl. 1, fig. 1, pl. 2, fig. 2; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 15.

Description: The rostrum is rather high and almost straight, the tip only being slightly turned upwards, it reaches beyond the antennular peduncle, but fails to reach the end of the scaphocerite. The upper margin is somewhat convex, it bears 6 to 9 teeth, the first or first two of which are placed behind the posterior orbital margin. The lower margin of the rostrum bears 1 to 3 teeth. The carapace is roughened, especially in the anterolateral parts, by the presence of numerous small spinules. Also the abdomen bears such spinules which are most distinct on the pleurae. The pleura of the fifth segment ends in a distinct small point. The 6th segment is 1.5 times as long as the 5th and 0.6 times as long as the telson. The first dorsal pair of spines of the telson lies slightly behind the middle of the telson, the 2nd pair lies somewhat closer to the anterior pair than to the posterior margin. This posterior margin is distinct and ends in a sharp point, which is slightly overreached by the inner posterior spines. Numerous feathered setae are present between the inner spines.

The scaphocerite is 2.5 times as long as broad. The outer margin is straight or slightly convex.

The first legs reach with about half the length of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is 1.5 times as long as the chela and 5/4 times as long as the merus. The second legs are similar in shape, but differ in size. The larger reaches with the larger part of the carpus beyond the scaphocerite. The fingers are only slightly shorter (0.73 to 0.79) than the palm. The cutting edge of the dactylus bears, in about the middle of its length, a rather large tooth, behind which a row of about 3 smaller denticles, which are of about equal size, are present. The cutting edge of the fixed finger bears 1 large tooth which is placed behind the large tooth of the dactylus. Between the base of the fixed finger and the median large tooth a row of about 4 smaller denticles is present. The fingers bear numerous small spinules and a few scattered hairs. A row of about 11 to 13 tubercles, each of which ends in a horny tip, is present along the inner side of the distal

part of the cutting edge of the fixed finger. The inner side of the cutting edge of the dactylus bears about 10 to 12 similar, but smaller tubercles. No tubercles are present along the outer side of the cutting edges, or they are not distinguishable from the spinules on the rest of the surface. The palm is somewhat compressed, especially in the upper part, the rest is more or less swollen; the lower margin is distinctly convex. The whole surface of the palm is covered with small spinules, which ventrally are somewhat larger than dorsally (the difference however being extremely slight). The carpus is about 5/7 as long as the palm, it is swollen and strongly constricted near the base. The merus is as long as the carpus and swollen too. The ischium is 2/3 as long as the merus. Spinulation of ischium, merus and carpus is just like that of the palm. The smaller 2nd leg reaches with about half the carpus beyond the scaphocerite. The fingers are as long as the palm. In other respects the smaller leg resembles the larger. The third leg reaches with part of the dactylus beyond the scaphocerite. The propodus is twice as long as the dactylus, somewhat less than twice as long as the carpus and shorter than the merus. The fifth leg reaches about to the middle of the scaphocerite. The propodus is 2.5 times as long as the dactylus, twice as long as the carpus and as long as the merus. Except for scattered stiff hairs and a row of spinules along the posterior margin of the propodus, the last three legs are smooth.

The pleopods and uropods are normal in shape.

Young specimens lack the tuberculation of the carapace. The first legs do not reach so far forwards (sometimes reaching with the chela only beyond the scaphocerite). The second legs are equal in size, with the teeth of the chela much smaller, the spinulation more feeble and the tubercles along the cutting edges absent. The carpus is about as long as the palm. The third leg reaches less far, the fourth farther than in the adults.

Size: Males with adult characters, seen by me measure 64 to 75 mm. No ovigerous females were seen by me. Sollaud (1923), reports the eggs to have the same dimensions as those of *M. potiuna* (1.5 to 2 mm).

Material examined: Both types of the species, present in the Carnegie Museum at Pittsburgh, were studied by me, the larger specimen (lectotype) came from Rio Tieté, São Paulo State, Brazil, the smaller specimen (paratype) from Alto da Serra, São Paulo State, Brazil. Furthermore I examined specimens of this species present in the U. S. National Museum from Theresiopolis, Rio de Janeiro State, Brazil; Ypiranga, Alto da Serra, Santos, and Rio Pirajussara near Butantan,

São Paulo State, Brazil. I also refer, though with some doubt, several young specimens from Rio de Janeiro, Covanco near Jacarépaguá, Rio de Janeiro State and Belem, São Paulo State, to the present species, the material is too young, however, to make certain identification possible.

In the Turin Museum I examined 3 specimens of this species from São Paulo, Brazil and 4 specimens (labelled as type) from Os Perús, Brazil (1898, coll. H. Von Ihering).

Distribution: The species up till now is known only from fresh water of Rio de Janeiro and São Paulo States, Brazil. The records in literature, all from São Paulo State, are: Alto da Serra! (Ortmann, 1897!; Von Ihering, 1897!; Luederwaldt, 1919; Sawaya, 1946), Raiz da Serra (Von Ihering, 1897), Campo Grande (Von Ihering, 1897; Sawaya, 1946), São Paulo (Luederwaldt, 1919), Tieté River! (Ortmann, 1897!; Von Ihering, 1897!; Brooks, 1931!; Sawaya, 1946), Perús (Von Ihering, 1897; Luederwaldt, 1919; Sawaya, 1946), Piquete (Von Ihering, 1897), Belém (Moreira, 1901; Luederwaldt, 1919), Sorocaba (Luederwaldt, 1919), Rio Pirajussara and Rio Cabassú (Sawaya, 1946). The exact position of many of these localities is not known to me.

Type: The type locality is Rio Tieté, São Paulo State, Brazil. The lecto- and paratype both are preserved in the collections of the Carnegie Museum at Pittsburgh, Pa.

Remarks: Ortmann (1897) describes his type material to consist of a male and a female, the male being smaller than the female. Examination of the types disclosed, however, that both of them are males.

Though adult males of the present species and of *Macrobrachium potiuna* may be distinguished very easily, it is almost impossible to separate the juveniles of both forms.

Macrobrachium faustinum (De Saussure)

Pl. 22; pl. 23, figs. a-c

Palaemon spinimanus p. p. H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 399 (non *Palaemon spinimanus* Latreille, 1818).

Palaemon spinimanus Gibbes, 1850, Proc. Acad. Nat. Sci. Phila., 1850, p. 29.

Palaemon spinimanus Gibbes, 1850a, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198.

Palaemon Faustinus De Saussure, 1857, Rev. Mag. Zool., ser. 2, vol. 9, p. 505; De Saussure, 1858, Mém. Soc. Phys. Hist. nat. Genève, vol. 14, p. 469, pl. 4, fig. 30.

Palaemon (*Macrobrachion*) *Faustinus* Von Martens, 1872, Arch. Naturgesch., vol. 38, pt. 1, p. 137.

Palaemon spinimanus p. p. Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

Palaemon faustinus Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

Palaemon jamaicensis p. p. Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 107.

Palaemon Faustinus Gundlach, 1887, An. Soc. Esp. Hist. nat., vol. 16, p. 132.

Bithynis spinimanus Pocock, 1889, Ann. Mag. Nat. Hist., ser. 6, vol. 3, p. 10.

Palaemon faustinus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 734; Benedict, 1892, Johns Hopkins Univ. Circ., vol. 11, p. 77; Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 8.

Palaemon Olfersii Pocock, 1893, Journ. Linn. Soc. Lond. Zool., vol. 24, p. 408. (non Wiegmann, 1836.)

Palaemon Faustinus Pocock, 1893, Journ. Linn. Soc. Lond. Zool., vol. 24, p. 408.

non *Palaemon faustinus* Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 122.

Palaemon jamaicensis p. p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 123.

Palaemon olfersii p. p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 122.

Palaemon cubanus (Guérin MSS.) Sharp, 1893, Proc. Acad. Nat. Sci. Philad., 1893, p. 124.

Palaemon faustinus Ortmann, 1897, Rev. Mus. paul, vol. 2, p. 213.

Bithynis faustinus M. J. Rathbun, 1897, Ann. Inst. Jamaica, vol. 1, p. 45.

Bithynis spinimanus Young, 1900, Stalk-eyed Crust. Brit. Guiana, p. 489.

Bithynis olfersii p. p. M. J. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 124.

Bithynis olfersii Hay, 1903, Proc. U. S. Nat. Mus., vol. 26, pp. 430, 434.

Palaemon Faustinus Valdés Ragués, 1909, Mis Trabajos Acad., p. 182.

Macrobrachium olfersii M. J. Rathbun, 1912, Bull. Mus. Comp. Zoöl. Harv., vol. 54, p. 454.

Palæmon spinimanus Torralbas, 1917, An. Acad. Habana, vol. 53, p. 614, figs. 53 (as *Palemon Faustinus*) and 54 (as *Palæmon forceps*).

Macrobrachium olfersii p. p. ? M. J. Rathbun, 1919, Rapp. Visscherij Curaçao, vol. 2, p. 324.

Macrobrachium olfersii p. p. Schmitt, 1933, J. Wash. Acad. Sci., vol. 23, p. 315.

Macrobrachium olfersii Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 158, fig. 25.

? *Macrobrachium olfersii* Schmitt, 1936, Zool. Jb. Syst., vol. 67, p. 372.

Macrobrachium faustinum Chace & Holthuis, 1948, Hummelinck's Stud. Fauna Curaçao, vol. 3, p. 23.

? *Macrobrachium* sp. (near *M. faustinum*) Chace & Holthuis, 1948, Hummelinck's Stud. Fauna Curaçao, vol. 3, p. 23.

Macrobrachium faustinum Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 14.

Description: The rostrum is straight and rather high, it reaches to the end of the antennular peduncle or just fails to reach it. The upper margin is slightly arched and is provided with 13 to 15 small teeth of equal size, 5 or 6 of which are placed behind the orbital margin. The first tooth is situated at about ⅓ of the length of the carapace from the orbit. The teeth are regularly divided over the entire length of the upper margin. The lower margin bears 2 or 3 teeth. The carapace is smooth. The hepatic spine is slightly smaller than the antennal and placed obliquely behind it.

The abdomen, too, is smooth. The pleura of the fifth segment ends in a rather acute point. The sixth segment is somewhat longer than the fifth. The telson is 1.5 times (or slightly less) as long as the 6th segment. The two dorsal pairs of spinules are placed in the middle and at ¾ of the length of the telson. The posterior margin ends in an acute point, which is overreached by the inner of the 2 pairs of posterior spines. Numerous feathered setae are present between those spines.

The eyes and antennulae are normal in shape.

The scaphocerite is thrice, or slightly less than thrice, as long as broad. The outer margin is straight or slightly concave.

The first leg reaches with ⅓ of the carpus or only with the chela beyond the scaphocerite. The fingers are as long as the palm. The carpus generally is slightly less than twice as long as the chela and 5/4 as long as the merus. The merus and ischium in the adult male are smooth, though being more hairy than the carpus and chela. The second legs in the adult

male are strongly unequal in shape and size. The larger reaches with the entire carpus and even a small part of the merus beyond the scaphocerite. The fingers are longer than the palm and are gaping. Their cutting edges each are provided in the proximal part with a rather large tooth, behind which 2 smaller ones are present, the rest of the cutting edge bears some 10 to 17 distinctly separated denticles over the entire length. The fingers bear several longitudinal rows of small spinules over their surface. Along the cutting edges long, stiff, inwardly directed hairs are present. The rest of the fingers is naked. The palm is elongate, being 2 to 2.5 times as long as high, it is rather strongly compressed. A velvety pubescence is present on the inner as well as on the outer and lower surface of the palm, the upper side is naked. Longitidinal rows of spinules are present here too; those in the upper part are smaller and placed closer together than those in the lower parts of the palm. Along the lower margin of the fixed finger a row of strong spines is present, which increase in size posteriorly up to the anterior part of the palm, there they strongly decrease in size becoming again more distinct in the posterior (proximal) part of the palm. The carpus is elongate, it is as long as or slightly longer than the palm (in young specimens shorter) and distinctly longer than the merus, it is 3.5 times as long as broad. It at first gradually narrows posteriorly, close to the base it narrows more rapidly. The merus is somewhat less than twice as long as the ischium. Both carpus and merus are provided with longitudinal rows of spinules, which dorsally, are smaller and placed closer together, than they are ventrally. No pubescence is present. The smaller leg reaches only with half the carpus beyond the scaphocerite. The fingers are longer than the palm, they gape. The cutting edges bear one tooth in the extreme proximal part, while between these teeth and the base some smaller denticles are present, the rest of the edge is entire. Long and stiff and inwardly directed hairs are placed along the cutting edges, filling the gap between the fingers. Both fingers and palm bear longitudinal rows of spinules and some scattered hairs but show no pubescence. The palm is slightly more than twice as long as high. The carpus is distinctly longer than the palm. The merus is distinctly shorter than the carpus, the ischium is ⅔ as long as the merus. Merus, carpus and palm are armed with spinules similar to the carpus and merus of the large leg. No pubescence is present. The third leg reaches to the end of the scaphocerite. The propodus is 2.5 times as long as the dactylus, it is less than twice as long as the carpus and a little shorter than the merus. The fifth leg reaches about to the middle of the scaphocerite. The propodus is thrice

as long as the dactylus, less than twice as long as the carpus and as long as the merus. All joints of the last three legs are smooth, except for some long hairs, and the usual spinules along the posterior margin of the propodus.

Pleopods and uropods are normal.

The ovigerous females (35 to 63 mm long) have the second chelae much less strong than in the adult males. Here too the legs are unequal in shape and size. Both legs reach with part of the carpus beyond the scaphocerite. The fingers of the large chela close over their entire length, they show an armament similar to that of the large chela of the adult male, only the distal denticles are much less distinct or even absent. The fingers are as long as the palm. The carpus is as long as the palm and somewhat longer than the merus. The spinulation and pubescence of the leg is just like that in the adult male. The smaller leg has the fingers closing too. The fingers are as long as the palm, their cutting edges are armed just like in the adult male. The carpus is slightly longer than the palm and longer too than the merus. Spinulation as in the adult male. Small specimens (of about 18 mm) have only 3 or 4 teeth of the rostrum behind the orbit. The first legs reach with only part of the chela beyond the scaphocerite. The second legs are equal in shape and size. They reach with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm or slightly shorter. The cutting edge of the dactylus is provided with 3, that of the fixed finger with 2 very small denticles in the proximal part. The rest of the edge is entire. The carpus is as long as the palm and half the length of the fingers combined it is somewhat longer than the merus. The ischium is slightly shorter than the merus. The third legs reach with the entire or with part of the carpus beyond the scaphocerite. The fifth leg almost reaches the end of that scale.

Colour: Young (1900, p. 490) gives the following note concerning the colouration of the present species: "The colour is red, with the tips of the fingers green."

Size: Specimens seen by me ranged from 18 to 78 mm in length. The largest ovigerous female measured 63 mm, the smallest 35 mm. Some males of 49 mm are already provided with the large chela, while some larger males still show juvenile characters. The eggs are numerous and small, being 0.4 to 0.6 mm in diameter.

Material examined: In the U. S. National Museum material of this species is present from: Bahamas (Andros), Cuba (Rio Pan de Azucar; Almendares River near Culabazan; Havana; Arimao River;

Santiago de Cuba; Guantanamo; Baracoa), Jamaica (Flint, Yallahs, Fresh, Runaway and Ferry Rivers), Haiti (Port-au-Prince; Fund-des-Nègres; Thorland; Miragoane), Santo Domingo (Rio San Juan), Porto Rico (Añasco and surroundings; Mayaguez; Maricao; Juana Diaz; Rio Comerio; Rio Bayamon; Rio Piedras; Arroyo; Rio Caguitas; Trujillo Alto; Canovanilla), Virgin Islands (St. Thomas; St. Croix: Bethlehem, Concordia, Altona, Love and Caledonia Streams, Envy Spring, Mount Welcome and Liaka Swamps), Santa Lucia (Port Castries), N. E. Grenada, Bonaire (Kralendijk). In the Museum of the Academy of Natural Sciences at Philadelphia I examined specimens of this species from the following localities: Cuba (type of *Palaemon cubanus* (Guérin MSS) Sharp), Porto Rico (Arecibo River at Utuado and below), and Santo Domingo. The American Museum of Natural History at New York possesses material of this species from the following localities: Cuba (Santiago de Cuba), Jamaica (Montego Bay), Santo Domingo (Lago Rincon; Point Macao; Cabral; Biran River), Porto Rico (San Juan; Guanica), Dominica (Roseau). The Rijksmuseum van Natuurlijke Historie at Leiden, Holland possesses some specimens from Bonaire (Tanki Kerkhof).

Distribution: The species is known from fresh water of the West Indian Islands. The records in literature are: Antilles (H. Milne Edwards, 1837), Cuba! (Gibbes, 1850a; Von Martens, 1872; Kingsley, 1883!; Gundlach, 1887; Sharp, 1893!; Hay, 1903; Valdés Ragués, 1909; M. J. Rathbun, 1912; Torralbas, 1917), Jamaica! (Benedict, 1892; Sharp, 1893!; M. J. Rathbun, 1897; M. J. Rathbun, 1902a!), Haiti (De Saussure, 1857, 1858; Ortmann, 1891), Santo Domingo! (Kingsley, 1883!; Sharp, 1893!; M. J. Rathbun, 1902a!), Porto Rico! (Gundlach, 1887; M. J. Rathbun, 1902a!; Schmitt, 1935), Santa Lucia! (M. J. Rathbun, 1902a), Laiou, Dominica (Pocock, 1889), Cumberland, Chateaubilair and Fitz Hughes Rivers, St. Vincent (Pocock, 1893), Barbados (Young, 1900), Tobago (M. J. Rathbun, 1902a), Bonaire! (Chace & Holthuis, 1948), Curaçao! (M. J. Rathbun, 1919).

Type: The type locality is a river near Jacmel, Haiti. The type, if extant, is preserved in the Musee d'Histoire Naturelle at Geneva, Switzerland.

Remarks: Up till now *Macrobrachium olfersi* and *Macrobrachium faustinum* were considered by most authors to be identical. Examination of the large amount of material of these forms in the United States National Museum showed, however, that the east American forms con-

sidered to be *Macrobrachium olfersi* in reality belong to 3 species with very distinct and constant differences. Two of these species being *Macrobrachium olfersi* and *M. faustinum*. The latter seems to be confined to the West Indian Islands, where *M. olfersi* is totally lacking. *M. olfersi* on the other hand is known from the continent of Central and South America, from Mexico to Brazil and from Florida (it probably is introduced in the latter locality).

Palaemon spinimanus H. Milne Edwards was partly based on *M. olfersi* and partly on *M. faustinum*. His name, however, may not be used as it is preoccupied by *Palaemon spinimanus* Latreille (1818), who figured in the Tableau encyclopédique et méthodique des trois règnes de la nature, vol. 24, p. 5, pl. 319, fig. 1, a species of *Macrobrachium* which is not identical with any of the American species, but the identity of which is unknown to me (unfortunately Latreille gives no details as to the size, locality, etc., of his species, which must be considered a species incerta).

The material mentioned by Sharp (1893) in his list of the Crustacea in the Museum of the Academy of Natural Sciences at Philadelphia for the larger part was examined by me in that Museum. Sharp made some errors: the material brought by him to *Palaemon faustinus* belongs to *Macrobrachium olfersi,* while material of the present species is inserted by him under *Palaemon jamaicensis* (namely his no. 94, San Domingo, coll. W. M. Gabb and no. 1001, Kingston, Jamaica, coll. W. J. Fox, 1891) and under *Palaemon olfersii* (namely no. 182, Cuba Guérin collection, Guérin's MSS type of *Palaemon cubanus*). The specimens from Santo Domingo and Cuba of the collection of the Philadelphia Academy were identified by Kingsley (1882) as *Palaemon jamaicensis.*

The specimens from Puerto Cabello, reported upon by Nobili (1897) under the name *Palaemon faustinus,* proved to belong to *Macrobrachium olfersi.*

The specimens from Bonaire reported upon by M. J. Rathbun (1919) and Schmitt (1936) under the name *Macrobrachium olfersii,* and those mentioned by Chace & Holthuis (1948) as *Macrobrachium* sp. (near *M. faustinum*) in all probability belong to a new species. I have compared the material studied by Rathbun and Schmitt with other material from Bonaire (Pos Caranja and Pos Calbas near Lima, in wells, March 31 and April 1, 1937, P. W. Hummelinck coll.) of the same species, and with material from Kralendijk, Bonaire, which distinctly belongs to the genuine *Macrobrachium faustinum.* The differ-

ences between the two forms are very distinct. As already pointed out by Dr. Waldo L. Schmitt (1936), who also doubted the identity of the two forms, the rostrum is much longer than in *M. faustinum,* with the ultimate teeth placed much wider apart, while also the legs are more slender; furthermore the legs in all the material seen by me are equal in shape and almost equal in size. As none of the specimens examined seems to be fully adult, I refrain from describing this species as new. The material is inserted in the collection of the United States National Museum labelled "*Macrobrachium* aff. *faustinum* (De Sauss.) prob. *nov. spec.*"

Macrobrachium olfersi (Wiegmann)

Pl. 24; pl. 25, figs. a, b

Astacus 987 Gronovius, 1764, Zoophyl. Gronov., p. 231, pl. 17, fig. 1.

Astacus Serratus Meuschen, 1781, Index Zoophyl. Gronov., (p. 9) (non *Astacus serratus* Pennant, 1777).

Palaemon Olfersii Wiegmann, 1836, Arch. Naturgesch, vol. 2, pt. 1, p. 150.

Palemon spinimanus p. p. H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 399.

Palaemon spinimanus? White, 1847, List Crust. Brit. Mus., p. 79.

Palaemon spinimanus Gibbes, 1850, Proc. Acad. Nat. Sci. Philad., 1850, p. 29; Lucas, 1857, Castelnau's Anim. nouv. ou rares Amér. Sud, Crust., p. 13.

Palæmon consobrinus De Saussure, 1857, Rev. Mag. Zool., ser. 2, vol. 9, p. 504.

Palæmon consobrinus De Saussure, 1858, Mém. Soc. Phys. Hist. nat. Genève, vol. 14, p. 469.

Palaemon Desausuri Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45, pt. 1, p. 420, pl. 2, fig. 47.

Palaemon spinimanus Von Martens, 1869, Arch. Naturgesch, vol. 35, pt. 1, p. 26, pl. 2, fig. 3; p. p. Smith, 1869, Trans. Conn. Acad. Arts Sci., vol. 2, p. 40.

Palaemon Olfersii Smith, 1869, Trans. Conn. Acad. Arts Sci., vol. 2, p. 40.

Palaemon consobrinus Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

Palaemon spinimanus p. p. Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 67.

Palaemon jamaicensis Huxley, 1879, The Crayfish, p. 269, figs. 71, 79; (non *Cancer* (*Astacus*) *Jamaicensis* Herbst, 1792.)

Palaemon jamaicensis Huxley, 1880, L'Écrevisse, p. 197, figs. 71, 79.
Palaemon Potiporanga Müller, 1880, Zool. Anz. Leipzig, vol. 3, p. 152.
Palaemon jamaicensis Huxley, 1881, Der Krebs, p. 226, figs. 71, 79.
Palaemon desaussuri Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 720.
Palaemon consobrinus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 722.
Palaemon olfersii Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 733, pl. 47, fig. 8.
Palaemon Potiporanga Müller, 1892, Arch. Mus. nac. Rio de J., vol. 8, p. 181.
Palaemon consobrinus Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 7.
Palaemon desaussuri Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 7.
Palaemon potiporanga Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 12.
Palaemon spinimanus Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, pp. 13, 49.
non *Palaemon Olfersii* Pocock, 1893, Journ. Linn. Soc. Lond. Zool., vol. 24, p. 408.
Palaemon faustinus Sharp, 1893, Proc. Acad. Nat. Sci. Philad., 1893, p. 122. (non De Saussure, 1857.)
non *Palaemon olfersii* Sharp, 1893, Proc. Acad. Nat. Sci. Philad., 1893, p. 123.
Palaemon Olfersi Ihering, 1897, Rev. Mus. paul., vol. 2, p. 423.
non *Palaemon Olfersii* p. p. Nobili, 1897, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, n. 280, p. 6.
Palaemon Faustinus Nobili, 1897, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, n. 280, p. 6.
Palaemon olfersi Ortmann, 1897, Rev. Mus. paul., vol. 2, p. 212, pl. 1 figs. 10, 11.
Palaemon olfersii p. p. Doflein, 1900, S. B. Bayer. Akad. Wiss., vol. 30, p. 128.
Palaemon olfersi Moreira, 1901, Arch. Mus. nac Rio de J., vol. 11, p. 15.
Bithynis olfersii p. p. M. J. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 124. non *Bithynis olfersii* Hay, 1903, Proc. U. S. Nat. Mus., vol. 26, pp. 430, 434.
Macrobrachium olfersii Pearse, 1911, Rep. Michigan Acad. Arts Sci., vol. 13, p. 111.

non *Macrobrachium olfersii* M. J. Rathbun, 1912, Bull. Mus. Comp. Zool. Harvard, vol. 54, p. 454.

Macrobrachium olfersii Pearse, 1915, Proc. U. S. Nat. Mus., vol. 49, p. 550.

Macrobrachium olfersi Luederwaldt, 1919, Rev. Mus. Paul., vol. 11, p. 430.

Palaemon olfersi Luederwaldt, 1919a, Rev. Mus. paul., vol. 11, p. 387.

non *Macrobrachium olfersi* Beebe, 1926, Arcturus Adventure, p. 435; Belanske, 1927, In Vanderbilt's To Galapagos on the Ara, p. 148, pl. 29.

Macrobrachium olfersii Luederwaldt, 1929, Rev. Mus. paul., vol. 16, p. 53.

non *Macrobrachium olfersii* Boone, 1930, Bull. Vanderbilt Mar. Mus., vol. 3, p. 142, pl. 50.

Macrobrachium olfersii p. p. Schmitt, 1933, J. Wash. Acad. Sci., vol. 23, p. 315.

Palaemon (*Macrobrachium*) *olfersii*? Gordon, 1935a, J. Linn. Soc. Lond. Zool., vol. 39, p. 323.

Macrobrachium olfersii Hildebrand, 1939, Zoologica, New York, vol. 24, p. 22.

non *Macrobrachium olfersii* Meredith, 1939, Voyages Velero III, p. 104, fig.; Schmitt, 1939, Smithson. Misc. Coll., vol. 98, n. 6, p. 28.

non *Macrobrachium olfersii* Coventry, 1944, Monogr. Acad. Nat. Sci. Phila., vol. 6, p. 535.

Macrobrachium olfersii Sawaya, 1946, Zoologia, São Paulo, vol. 11, p. 404, pl. 2, figs. 12, 13.

Macrobrachium olfersii Hedgpeth, 1947, Texas Game and Fish, vol. 5, pt. 8, p. 15, figs; Hedgpeth, 1947a, Progr. Fish Cult., Oct. 1947, p. 183, figs.

Macrobrachium olfersii ? Chace & Holthuis, 1948, Hummelinck's Stud. Fauna Curaçao, vol. 3, p. 23.

Macrobrachium olfersii ? Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 1112.

Macrobrachium olfersii Hedgpeth, 1949, Texas Journ. Sci., vol. 1, p. 35, figs. 1d, 4, 5; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 17.

Description: The rostrum is straight or bent slightly downwards, it reaches about to the end of the antennular peduncle, and sometimes is rather narrow. The upper margin bears 12 to 15 teeth, 4 or 5 of which are placed on the carapace behind the orbit. The distance between the

first tooth and the posterior limit of the orbit is somewhat less than ⅓ of the total length of the carapace (rostrum excluded). The teeth are divided regularly over the rostrum. The lower margin bears 3, seldom 4, teeth. The carapace is smooth. The hepatic spine is smaller than the antennal.

The abdomen is smooth. The pleura of the fifth segment has the top rectangular or slightly acute. The 6th segment is slightly longer than the fifth. The telson is 1.5 times as long as the 6th abdominal segment. The telson has the spinulation and hairs like in the previous species.

The eyes and antennulae are normal.

The scaphocerite is somewhat less than thrice as long as broad. The outer margin is about straight, sometimes slightly concave or convex.

The first legs reach, with ⅓ of the carpus beyond the scaphocerite. The fingers are as long as, or slightly shorter than the palm. The carpus is twice as long as the chela. The merus is ⅘ of the length of the carpus. All joints are smooth, though hairs are present. The second legs are very unequal. The larger reaches with the entire carpus and a small part of the merus beyond the scaphocerite. The fingers (especially the dactylus) are curved, gaping thereby. The armament of the cutting edges is just like in *M. faustinum,* they too show the same arrangement of the long, stiff hairs. The palm is slightly compressed and somewhat swollen, both upper and lower margin are distinctly convex. The palm is 1.5 times to almost twice as long as high and about as long as the fingers. Except for scattered stiff hairs it shows a dense pubescence on the inner, outer and lower surfaces, the upper part being devoid of pubescence. The palm and the fingers bear longitudinal rows of spinules, these spinules are smallest and placed very close together in the upper part, becoming larger and widely separated in the ventral region. Along the entire lower margin of the chela a longitudinal row of strong spines is present, these spines are strongest in the region of the palm, diminishing in strength towards the fingers. The carpus is strongly swollen anteriorly, being constricted near the base. It is slightly shorter than the palm and about as long as the merus. The latter is swollen in the median region. Like the palm, both carpus and merus are provided with longitudinal rows of spinules, which are smallest and densest dorsally, becoming larger and placed wider apart ventrally. The carpus is about twice as long as broad, the merus is somewhat more elongate relatively. The ischium is half as long as the merus. The smaller leg reaches with part of the carpus only beyond the scaphocerite. The fingers are 1.5 times as long as the palm,

they are curved and gape. Like in the previous species the cutting edges bear 1 tooth in the proximal part, having the rest of the edge entire. Numerous long and stiff inwardly directed setae are placed at both sides of the cutting edges, filling thereby the gap between the fingers. The palm is slightly compressed and is 1.5 times as long as high. Longitudinal rows of spinules are present on the palm and the fingers, the lower spines are the larger and the less crowded. The carpus is slightly longer than the palm and about as long as the merus. It is somewhat swollen, just like the merus, and both are provided with spinules like in the palm. The ischium measures ¾ of the length of the merus. The third leg almost reaches to the end of the scaphocerite. The propodus is 2.5 times as long as the dactylus, somewhat less than twice as long as the carpus and distinctly shorter than the merus. The legs are smooth, but for the usual spines at the posterior margin of the propodus, furthermore, a row of spinules is present along the posterior margin of the merus, while some scattered minute spinules may be seen on the outer surface of the merus. The fifth leg reaches almost to the middle of the scaphocerite. The propodus is thrice as long as the dactylus distinctly less than twice as long as the carpus and as long as the merus. The spinulation of the merus is much less distinct than that of the 3rd leg.

The pleopods and uropods are normal in shape.

Ovigerous females have generally less teeth (4) behind the orbit. The first legs reach with the chela only beyond the scaphocerite. The second legs are less strong and less unequal than in the adult males. Of the larger leg the fingers are not gaping, but close over their whole length; the cutting edge distally of the large teeth is entire or shows some indications of denticles. The pubescence and spinulation resemble that in the large leg of the adult male, though they are less distinct. The palm is slightly longer than the fingers, both are narrow. The carpus is of the same length as the palm and as the merus. All these joints are slender, when compared with those of the adult male, the palm is about 2.5 times as long as broad, the carpus is about thrice as long as broad. The spinulation is as in the adult male but less dense. The smaller leg too has the fingers closing. These fingers are slightly shorter than the palm, both are slender. The palm is almost thrice as long as high. No pubescence is present. The carpus is somewhat longer than the palm, and about as long as the merus, it is slightly more than thrice as long as high. The third leg reaches to the end of the antennal scale, the fifth reaches not so far but distinctly overreaches the middle of the scaphocerite. No spinules are present on the meri of the last three legs. The young specimens have still less teeth of the rostrum on the carapace,

generally 3. The first leg reaches only with part of the chela beyond the scaphocerite. In very young specimens (about 20 mm) the chelae are symmetrical. The 2nd legs reach with the chela only beyond the scaphocerite. The fingers are as long as the palm. The carpus is as long as the palm and half the fingers, it is about as long as the merus. The ischium is somewhat shorter than the carpus. The last 3 legs are similar to those in the adult female.

Size: The largest male seen by me is 90 mm long. The ovigerous females are 30 to 65 mm in length. The eggs are numerous and small, measuring 0.4 to 0.6 mm.

Colour: Dr. Waldo L. Schmitt made the following colour notes of living specimens from Ilha São Sebastiao, S. Brazil, during his 1925 S. America expedition: Male. The general colour is Vandyke brown. Some specimens being overlaid with bistre or olive, others being speckled with muddy brown. On the carapace there are hazy lines of a clay to cream buff, making the carapace appear a little streaky, especially on the lateral parts. Such streaks also are visible on the sides of the first and third abdominal somites, extending down almost to the topline of the epimerae. The bistre specimens had a bluish, dark green large cheliped. The muddy speckled specimens had the hand of the large chela black brown, the rest black, while the smaller chela was Vandyke brown. The walking legs of both are more or less transparent, those of the first type having faint bands of blue spots, those of the second type have them speckled with Prout's brown.

Female. The female is more russet in colour. It is marked like the males. The walking legs are almost white, with a few dark mottlings of brown on the anterior side. The larger chela is faint pea green mottled with rather large patches of light marine blue on the inner and outer margins and on the fingers. The first and third abdominal segments have in the posterior part a dark, blackish area which is much darker than the rest of the body.

Habits: Dr. Schmitt notes that this species is a good jumper, it can move itself about a foot through the air. It walks as well as a 4-footed animal.

Material examined: The U. S. National Museum possesses specimens from the following localities: Florida (St. Augustine, St. Johns Co.: Davenport Park, Alcazar Pool and Old Waterworks Pool; Silver Glen Springs, St. Johns River drainage system, Marion Co.[6]), Mexico

[6] These specimens have not actually been seen by me. Dr. Fenner A. Chace Jr., curator of Marine Invertebrates of the U. S. National Museum, kindly provided me with this record.

(Tamazunchale; Vera Cruz), Guatemala (Rio Dulce, which is an outlet of LakeYsobal at San Felipe), Panama (Toro Point near Colon; Gatun River and Locks; Rio Frijoles; Gorgona; Porto Bello), British Guiana (Cuyuni River), Brazil (Ilheos south of Bahia; Ilha São Sebastiao; Cubatâo near Santos; São Francisco do Sul). The American Museum of Natural History possesses specimens of this species from British Guiana (Kartabo). A specimen from that Museum labelled "Zacapa River, Guatemala" shows much resemblance to *M. faustinum*. In the Turin Museum I examined numerous specimens from Rio de Paso Real, Puerto Cabello, Venezuela (1895, coll. E. Festa) and 3 specimens from Santa Catharina, Brazil (coll. H. von Ihering).

Distribution: The species is known only from fresh water of Florida, and the continent of Central and South America from Mexico to S. Brazil. The records in literature are: St. Augustine, Florida! (Schmitt, 1933), Hueyapam River at Cuatotolapam, Vera Cruz State, Mexico (Pearse, 1911), Vera Cruz, Mexico! (De Saussure, 1857, 1858; Sharp, 1893!), Guatemala (Thallwitz, 1892), Escondido River, Nicaragua (M. J. Rathbun, 1902a), Gatun Locks, Canal Zone! (Hildebrand, 1939), Chagres River, Panama (Doflein, 1900), Colombia (Heller, 1862), near Santa Marta, Colombia (Pearse, 1915), La Goajira, N. E. Colombia?! (Chace & Holthuis, 1948), Puerto Cabello, Venezuela! (Nobili, 1897!; Doflein, 1900), Rio Chuspa and Rio Guanta, N. E. Venezuela?! (Chace and Holthuis, 1948), British Guiana? (Gordon, 1935a), Wilhelmina Mts., Central Surinam?! (Holthuis, 1948), Marowijne River E. Surinam?! (Holthuis, 1948), Brazil (Wiegmann, 1836; H. Milne Edwards, 1837; White, 1847; Lucas, 1857; Von Martens, 1869; Ortmann, 1891), Bahia (Von Ihering, 1897), Rio Doce, Espírito Santo State (Sawaya, 1946), Rio de Janeiro (Von Martens, 1869; Moreira, 1901), Serra da Bica, Cascadura and Jacarépaguá near Rio de Janeiro (Moreira, 1901), São Sebastiao (Von Ihering, 1897; Luederwaldt, 1919, 1929; Sawaya, 1946), Rio Itapurucáia (Sawaya, 1946), Santos (Von Ihering, 1897; Luederwaldt, 1919, 1919a; Sawaya, 1946), Sorocaba (Luederwaldt, 1919; Sawaya, 1946), Iguapé, São Paulo State (Luederwaldt, 1919), Itajahy River, Santa Catherina State (Von Ihering, 1897; Sawaya, 1946), "American Ocean near the Antilles" (Gronovius, 1764).

Type: The type locality is the "Brazilian Coast." The type specimen, if still extant, is preserved in the Zoological Museum at Berlin, Germany, where it was still present in 1869, according to Von Martens (1869).

Remarks: As already pointed out under *M. faustinum,* that and the present species often are synonymized and therefore some of the records in literature must be taken with reserve, while they furthermore may refer to *M. crenulatum* new species. The specimens from the west coast of America recorded as *M. olfersii* are either *M. hancocki* or *M. digueti,* those from the West African coast are either *Macrobrachium chevalieri* (J. Roux) or belong to, *M. felicinum* Holthuis or *M. zariquieyi* Holthuis. The material mentioned by Sharp (1893) as *Palaemon olfersii* is present in the Museum of the Academy of Natural Sciences at Philadelphia, and was examined by me. The specimen listed by Sharp as "121. (1a) No locality. No donor's name" was provided in the collection with a label "Panama?" and proved to belong to *M. crenulatum.* The second specimen, no. 182, the type of *Palaemon cubanus* (Guerin MSS) Sharp, from Cuba is *M. faustinum.* The third specimen, (no. 354) which is preserved dry (the other 2 specimens are preserved in spirit), and which originates from Brazil proves to be *M. carcinus* (L.). The specimen (no. 122) from Vera Cruz, identified by Sharp as *Palaemon faustinus* belongs to the present species.

The specimens mentioned by Nobili in his 1897 paper as *Palaemon Olfersii* and *P. faustinus* were examined by me in the Turin Museum. The specimens of *P. Olfersii* from Macuto near La Guayra proved to belong to *M. crenulatum,* those from Rio Sabana probably are *M. hancocki* but on account of the poor condition of the material this could not be made out with certainty. The *P. faustinus* specimens from Paso Real, Puerto Cabello belong to *M. olfersi.*

The specimen mentioned by Schmitt (1938) from Old Providence Island proves to be *Macrobrachium hancocki* new species.

Gronovius's (1764) specimen, as is shown by his figure belongs to the present species. The first binominal name given to this species is *Astacus serratus* Meuschen (1781), which was published by Meuschen in the Index to Gronovius's work. The name *Astacus serratus* Meuschen (1781) is invalid for two reasons: in the first place it is a junior homonym of *Astacus serratus* Pennant (1777), while secondly, during the Thirteenth International Congress of Zoology held in Paris in 1948, the International Commission on Zoological Nomenclature has decided that Meuschen's (1781) work is not available nomenclatorially (cf. Bull. zool. Nomencl., vol. 4 (1950), p. 573).

Palaemon consobrinus de Saussure (1857) and *Palaemon Desausuri* Heller (1862) in all probability are nothing but juvenile specimens of *Macrobrachium olfersi,* as is shown by the descriptions of both authors

and by Heller's figure. De Saussure in his 1858 description, however, states in the definition of *Palaemon consobrinus* that the carpus of the second leg is very long ("carpi longissimi"); in his French description, however, he describes the carpus to be shorter than the chela, though longer than the palm and furthermore says that it is not very cylindrical, but much broader near the chela than at its base. Unfortunately he does not give a comparison of the lengths of the carpus and the merus. In Heller's figure the carpus is drawn much longer than the merus, but this obviously is an error as in his description Heller states the carpus and merus to be about the same length ("Carpus und Brachium sind fast gleich lang (2 Lin.)."). As the other characters given for these two species agree well with juvenile specimens of *Macrobrachium olfersi,* I consider, provisionally at least, *Palaemon consobrinus* and *Palaemon Desausuri* to be synonyms of *Macrobrachium olfersi.*

The status of the specimens from Central America referred to this species is not quite certain. They differ from the typical *Macrobrachium olfersi* by having the carpus of the second leg longer and show more resemblance to *M. faustinum.* As I have insufficient material (especially adult males) from that region at my disposal, I provisionally place them in the present species.

Macrobrachium digueti (Bouvier)

Pl. 26, figs. a-e

Palaemon Digueti Bouvier, 1895, Bull. Mus. Hist. nat. Paris, vol. 1, p. 159, fig. 2.

Bithynis olfersii p. p. M. J. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 124.

Palaemon Digueti Nouvel, 1932, Bull. Mus. Hist. nat. Paris, ser. 2, vol. 4, pp. 408, 409.

Macrobrachium digueti Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 13.

Description: The rostrum is rather shallow and reaches almost to the end of the antennular peduncle. The upper margin bears 13 to 18 teeth, 4 to 7 of which stand behind the orbit. The teeth are regularly divided over the whole length of the rostrum. The proximal rostral teeth extend over the anterior third of the length of the carapace or over a slightly larger part of it. The lower margin bears 2 to 4, generally 3, teeth. The carapace, even in adult males is smooth.

The abdomen is smooth. The pleura of the fifth segment has the tip acute. The sixth segment is 1.5 times as long as the fifth and ⅔ as long as the telson. The telson is of the usual shape, with the two dorsal pairs of spinules placed in the middle and at ¾ of its length. The posterior margin of the telson ends in an acute median point and bears the usual two pairs of spines, the inner of which overreaches the median point of the telson. Numerous setae are present at the posterior margin.

The scaphocerite is about thrice as long as broad. The outer margin is straight or slightly concave. The final tooth is strong and reaches almost to the end of the lamella.

The first leg reaches with the chela and a small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is somewhat less than twice as long as the chela and about 1.2 times as long as the merus. Spinules are present on the ischium, scattered hairs may be found on all joints. The second legs are very unequal in shape and size in the adult male. The larger leg reaches with part of the merus beyond the scaphocerite. The fingers are as long as the palm, they are curved and gape. The cutting edges of both fingers bear in the extreme proximal part one large tooth, behind which 1 or 2 much smaller teeth are placed. The cutting edges distally of the large teeth are provided with teeth 9 to 12 in number, which are placed up to the tips of the fingers. These teeth are placed distinctly apart, like in *Macrobrachium olfersi.* Tufts of hairs are implanted along the cutting edges. The rest of the fingers is naked and is densely covered with spinules. The palm is strongly compressed, it is 1.7 times as long as high. It has a distinct, large, thickly pubescent area at each of the lateral surfaces. The velvety areas occupy almost the whole of the lateral surfaces, only in the anterior, posterior and upper part of the palm there are narrow naked regions. The spinules of the palm are generally only visible in the naked areas, and along the lower margin. In some specimens there are large spinules in the velvety region, but usually there the spinules are very small and obscured from view by the pubescence. The spinules on the naked regions of the palm are larger than those of the fingers. The spinules of the row along the lower margin of the palm, however, are larger than any of the other spinules of the palm. These ventral spinules are strong throughout the length of the palm, resembling thereby those of *Macrobrachium olfersi.* The carpus is shorter than the palm, it is circular in transverse section, and narrows rapidly near its base, the anterior part is somewhat swollen. No pubescence is present on the carpus, only some long scattered hairs may be seen. The spinules of the

carpus are most crowded and smallest in the dorsal region, while ventrally they become larger and more widely spaced. The carpus is somewhat more than twice as long as broad. The merus is slightly shorter than the carpus or as long as that joint, it is slightly swollen in the middle. The spinulation of the merus closely resembles that of the carpus, here too only scattered long hairs are present. The ischium is less than half as long as the merus. The smaller second leg of the male reaches only with half the carpus beyond the scaphocerite. The fingers are almost ⅔ as long as the palm, they are curved and gape. The cutting edges bear 2 or 3 small teeth in the proximal part, the rest of the edges is entire. There are numerous long and stiff, inwardly directed tufts of setae at each side of the cutting edges of the fingers. These tufts completely fill the gap between the fingers. The palm is almost twice as long as high. There is no pubescence on the chela, only some long hairs. Small spinules are present on the palm and the fingers, while a row of stronger spinules runs along the lower margin of the palm. The carpus is 1.2 times as long as the palm and slightly longer than the merus. The spinulation of the carpus and merus is similar to that of the carpus and the merus of the larger leg, only it is less strong. The third leg distinctly fails to reach the end of the scaphocerite. The propodus is about 2.5 times as long as the dactylus, almost twice as long as the carpus and shorter than the merus. The fifth leg reaches slightly beyond the middle of the scaphocerite. The propodus is thrice as long as the dactylus, 1.5 times as long as the carpus and longer than the merus. The last three legs bear some scattered long hairs, furthermore a row of distinct spinules is present on the posterior margin of the propodus of all, and the merus of the third and fourth legs; very small scattered spinules may be seen on some of the joints.

The pleopods and uropods are normal in shape.

Ovigerous females have the rostrum somewhat higher than in the males. The second legs are much less different in shape and size. The larger leg reaches with part of the carpus beyond the scaphocerite. The chela is much more elongate than in the adult male. The fingers are about as long as the palm, and close over their whole length; the cutting edges bear 2 or 3 proximal teeth, the rest of the edge is entire, though indications of the denticulation of the distal part may be seen. The spinulation and pubescence are as in the male, but the spinules are much smaller and the pubescence is confined to the lower half of the palm. The carpus is as long as the palm and slightly longer than the merus. The spinulation of the merus and carpus is as in the smaller leg of the

adult male. The smaller second leg of the female has the chela of the same shape as the larger; no pubescence is present, however. The carpus is about 1.1 times as long as the palm and 1.2 times as long as the merus. The last three legs reach slightly less far forwards than in the adult male, no spinules are present on the merus. Juvenile males resemble the female. The slender chela of the female, and the relatively longer carpus give it an aspect, quite different from that of the adult male. In very juvenile specimens the second legs are equal, reach only with part of the chelae beyond the scaphocerite and have the chelae still more slender than in the female, furthermore the rostrum bears less teeth behind the orbit and these teeth consequently occupy a smaller part of the carapace. The last three legs reach about as far forwards as in the adult female.

Size: The type specimen described by Bouvier had a carapace length of 39 mm, which corresponds with a total body length of about 90 mm. The largest specimen seen by me is 72 mm long, though males of about 40 mm long have already well developed second chelae. Ovigerous females measure 33 to 58 mm. The eggs are numerous and small, they are 0.4 to 0.6 mm in diameter.

Material examined: In the U. S. National Museum specimens of this species are present from: Mexico (Mulege, La Paz and Cape San Lucas, Lower California; Acapulco, Guerrero State), Guatemala (Rio Camaya, tributary of Rio Tulate, 5 miles W. of Mazatenango; Rio Matapa, tributary of Rio Michatoya, between Escuintla and Chiquimulilla), Panama (Rio Chamé; Chorrera; Araijan; Pedro Miguel Locks; Rio Mamoni near El Capitan; Upper Trinidad River; Rio Chucunaque below Yavisa, Darien; Rio Yape; Rio Cupe near Boca de Cupe), San José (S. W. Colombia?), Ecuador (Portoviejo, Manabi Province).

Distribution: The species is known from fresh water of the Pacific drainage, from Lower California to Ecuador. The records in literature are: Mulege River, Lower California! (Bouvier, 1895), La Paz and Cape San Lucas, Lower California! (M. J. Rathbun, 1902a).

Type: The type locality is Mulege River, Lower California. The type material is preserved in the Muséum d'Histoire naturelle in Paris, France, while a female syntype is present in the collection of the U. S. National Museum (Cat. No. 79940).

Remarks: The specimen of which Bouvier figured the second cheliped must be an exceptionally large male. It exceeds all my material in length. The carpus of the second leg of Bouvier's male seems to be

shorter in relation to the merus than in my males, in which the merus moreover is less swollen than figured by Bouvier. The pubescence of the second legs in my males is more distinct than in Bouvier's specimen.

The species is most closely related to *Macrobrachium olfersi,* from which it differs in the following points:

1. The distance between the first upper rostral tooth and the posterior margin of the orbit usually is larger than ⅓ of the length of the carapace (rostrum excluded). In *M. olfersi* it generally is less than ⅓.

2. The palm of the large chela of the adult male is distinctly compressed, never swollen as in *M. olfersi.*

3. The lower margin of the palm of that chela never is strongly convex, but about straight, showing a shallow concave curve near the base of the fingers. The long stiff hairs on the large chela are much less numerous in *M. digueti* than in *M. olfersi* and the velvety pubescence reaches less far dorsally.

4. Also the smaller second leg is more elongate, its palm being only slightly shorter than the fingers and about twice as long as high.

The differences between the species thus are very small, but seem to be constant. Examination of more material of this species, however, is very desirable.

The young specimens from Acapulco are referred with some doubt to the present species as they have the carpus distinctly shorter than the merus, and moreover have the first rostral teeth placed less far on the carapace than in most juveniles of the present species.

Macrobrachium crenulatum Holthuis

Pl. 27, figs. a-d; pl. 28.

Palaemon olfersii p. p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 123.

Palaemon Olfersii p. p. Nobili, 1897, Boll. Mus. Zool. Anat. Comp. Torino, vol. 12, n. 280, p. 6.

Bithynis olfersii p. p. M. J. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 124.

Macrobrachium olfersii p. p. Schmitt, 1933, J. Wash. Acad. Sci., vol. 23, p. 315.

Macrobrachium crenulatum Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 95; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 13.

Description: The rostrum is straight, it reaches about to the end of the antennular peduncle. The upper margin bears 11 to 14 teeth, 4 to 6 of which are placed on the carapace behind the orbit. The first tooth is situated at about ⅓ of the length of the carapace from the posterior margin of the orbit. The upper teeth are small and divided regularly over the rostrum. The lower margin bears 3 or 4 teeth. The carapace is smooth. The hepatic spine is somewhat smaller than the antennal.

The abdomen is smooth. The apex of the fifth somite is almost rectangular and has the tip rounded. The sixth segment is somewhat longer than the 5th: The telson is 1.5 times as long as the 6th segment. The 2 pairs of dorsal spinules are placed in the middle and at ¾ of the length of the telson. The posterior margin bears a median acute point, which in the adults is truncated and 2 pairs of spinules, the inner of which reach beyond the apex of the telson, numerous setae are present between these inner spines.

The eyes and antennulae are normal in shape.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight.

The first legs reach with ⅓ of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is about twice as long as the chela, and ⅝ as long as the merus. The second legs in the adult male are strongly unequal in shape and size. The larger leg reaches with the entire carpus and part of the merus beyond the scaphocerite. The fingers are about as long as the palm, sometimes being slightly longer, sometimes slightly shorter. The fingers, especially the dactylus, are curved and gape. Their cutting edges bear in their proximal part one large tooth, behind which some much smaller teeth may be present. The cutting edge distally of the large teeth bears no such distinctly separated teeth as in the 3 previous species but is crenulated. Both surfaces of the fingers are densely covered with spinules, which are not placed in distinct longitudinal rows. Along the cutting edge numerous tufts of setae are arranged so as to fill up the gap between the fingers. The palm is distinctly compressed, though the lateral surfaces are rounded. It is about twice as long as high. It is highest distally and narrows proximally. Strong spines are arranged in longitudinal rows at the outer surface and lower margin of the palm. Generally there is an ill-defined smooth region on the outer surface of the palm in which no spines are present. The row of spinules along the ventral margin of the palm is very distinct throughout its course, strongly diminishing in size at the base of the fingers. The inner surface of the palm bears longitudinal rows of

very small spinules, which are most conspicuous in the dorsal part. The pubescence of the outer surface is inconspicuous, the hairs are rather short and few. The inner surface is, especially in the ventral part, conspicuously pubescent by the presence of long and dense hairs. The carpus is more or less cupshaped, it is about circular in transverse section. It is twice as long as high and narrows rather suddenly near the base. It is shorter than the palm and than the merus. The merus is slightly thickened in the middle. Both carpus and merus bear spinules, which are arranged in more or less distinct longitudinal rows. The spinules of the lower surface are largest and placed widest apart. The ischium is about half as long as the merus. No pubescence is present on the carpus, merus and ischium. The smaller leg reaches with the larger part of the carpus beyond the scaphocerite. The fingers are curved and gaping, they are almost 1.5 times as long as the palm. The cutting edges bear 1 large tooth in the proximal part, behind this tooth there are several small denticles, distally of the tooth the edges are entire. Numerous tufts of stiff hairs at both sides of the cutting edges fill the gap between the fingers. The fingers are closely beset with spinules. The palm is somewhat compressed. Longitudinal rows of spinules are present on the palm, sometimes leaving an ill defined smooth region in the middle of the outer surface. The spines along the lower margin are strongest, those on the inner surface smallest, no pubescence is present, though some scattered long hairs may be seen especially at the inner surface. The carpus is longer than the palm, which is 1.5 times as long as high, and shorter than the merus. The spinulation is as in the large leg. The third leg reaches with the dactylus and a very small part of the propodus, sometimes only with part of the dactylus, beyond the scaphocerite. The propodus is about 2.5 times to thrice as long as the dactylus, less than twice as long as the carpus and shorter than the merus. The leg, except for the usual row of spines on the posterior margin of the propodus and a row on the posterior margin of the merus is smooth and bears only stiff hairs. The fifth leg reaches about to the middle of the scaphocerite, sometimes a little beyond. The propodus is thrice as long as the dactylus, almost twice as long as the carpus and as long as the merus. There are no spinules on the merus.

Pleopods and uropods are normal.

Ovigerous females differ from the adult males by having the second legs much smaller. The right and left legs differ less in size and resemble each other strongly, though there are differences. In the larger leg the cutting edges of the fingers are crenulated in the distal part, in the smaller leg they are entire, the armament of the cutting edges being much