

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, Bigidjampo, 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: jamaicensis
- 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 & Ricketts, 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: biungiculatus, Calmania
- p. 390, read: Calmania biungiculatus
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

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

The dactyli of the last three pereopods 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. Honolulu, 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, Smithsonian 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 pereopods.

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: Espiritu 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 Haiti¹ (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-west-pacific 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 pereopods. 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* (Wiegman) 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
<i>M. amazonicum</i> (Heller)	<i>M. panamense</i> Rathbun
<i>M. acanthurus</i> (Wiegmann)	<i>M. tenellum</i> (Smith)
<i>M. surinamicum</i> Holthuis	<i>M. transandicum</i> Holthuis
<i>M. heterochirus</i> (Wiegmann)	<i>M. occidentale</i> Holthuis
<i>M. olfersi</i> (Wiegmann)	<i>M. digueti</i> (Bouvier)
<i>M. crenulatum</i> Holthuis	<i>M. hancocki</i> Holthuis
<i>M. carcinus</i> (L.)	<i>M. americanum</i> 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 féminisés."

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
 - 1¹. Carpus of second legs distinctly shorter than merus. . . 27
2. Telson gradually tapering towards a slender tip, which overreaches posterior spines of telson. 3
 - 2¹. 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*
 - 3¹. 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
 - 4¹. 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 sub-apical 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*
 21¹. 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*
 22¹. Fingers of second legs in adult male $\frac{2}{3}$ to $\frac{3}{4}$ 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 parallel, lower margin sometimes slightly concave. Eastern. . . . *nattereri*
 23¹. 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*
 24¹. 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 $\frac{2}{3}$ 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*
 30¹. 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	= <i>heterochirus</i>	lamarrei	= <i>amazonicum</i>
aztecus	= <i>carcinus</i>	laminatus	= <i>carcinus</i>
brachy-		longidigitum	= <i>acanthurus</i>
dactylus	= <i>carcinus</i>	longipes	= <i>tenellum</i>
brevicarpus	= <i>carcinus</i>	mexicanum	= <i>acanthurus</i>
consobrinus	= <i>olfersi</i>	montezumae	= <i>?carcinus</i>
cubanus	= <i>faustinum</i>	ornatus	= <i>carcinus</i>
dasydactylus	= <i>acanthurus</i>	potieté	= <i>acanthurus</i>
desaussuri	= <i>olfersi</i>	potiporanga	= <i>olfersi</i>
dieperinkii	= <i>amazonicum</i>	punctatus	= <i>carcinus</i>
ensiculus	= <i>amazonicum</i>	sallei	= <i>ohione</i>
equatorialis	= <i>brasiliense</i>	serratus	= <i>olfersi</i>
fluvialis	= <i>species incerta</i> , vid. p. 132	sexdentatus	= <i>acanthurus</i>
forceps	= <i>acanthurus</i>	spinimanus	= <i>p. p. olfersi</i> , <i>p. p. faustinum</i>
jamaicense	= <i>carcinus</i>	swainsonii	= <i>acanthurus</i>

Macrobrachium amazonicum (Heller)

Pl. 2, figs. a-h

- Palaemon Lamarrei* ? White, 1847, List Crust. Brit. Mus., p. 78.
 (non H. Milne Edwards, 1837).
Palaemon 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 $\frac{2}{5}$ 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 $\frac{3}{4}$ 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 pereopods 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 $\frac{4}{3}$ 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 $\frac{3}{4}$ 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 $\frac{2}{3}$ 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 $\frac{2}{3}$ 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 pereopods 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 Manãos 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), Tabatinga, 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*. *Palaemon 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 *Palaemon 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 *Palaemon 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* (*Eupalae-mon*) *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, Smithsonian 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 $\frac{3}{4}$ 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 pereopod 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 $\frac{3}{4}$ 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 pereopod 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 pereopods 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 Ortman (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.

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 pereopods 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 $\frac{5}{4}$ 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 $\frac{1}{2}$ to $\frac{2}{3}$ 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 Museo 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 Riso, 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 Riso, 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 Riso 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 antennular 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:—

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

“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 tothing 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 $4\frac{1}{2}$ mm, the fingers 4 mm. long; the former, $1\frac{2}{5}$ 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 antennular 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 $4\frac{1}{4}$ mm long and $\frac{3}{4}$ mm broad; the propodites are 4 mm long and $\frac{1}{2}$ 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 $\frac{3}{4}$ 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 $\frac{3}{5}$ to $\frac{4}{5}$ 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 $\frac{7}{9}$ 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 ~~end of the scaphocerite. The propodus is less than 2.5 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. Oviparous 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 oviparous 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 oviparous 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 $\frac{3}{4}$ 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 $\frac{3}{4}$ 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 $\frac{5}{7}$ 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 $\frac{2}{3-4}$ 8 - 10 (one of the specimens has 13 teeth on the upper margin of

$\frac{2}{3-4}$

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 $\frac{3}{4}$ 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 $\frac{4}{3}$ 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 $\frac{1}{2}$ to $\frac{3}{4}$ of the length of the palm, they close over their entire length. In young specimens the fingers are relatively longer. The dactylus bears at $\frac{2}{5}$ 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 $\frac{3}{4}$ to $\frac{4}{5}$ 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 $\frac{4}{8}$ as long as the merus. The ischium is $\frac{3}{4}$ 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: Bahía 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, Archipelago 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, Archipelago 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 (Wieg.)

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

- Palaemon acanthurus* Wiegmann, 1836, Arch. Naturgesch., vol. 2, pt. 1, p. 150.
- Palaemon 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, Castelnaud'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, 1870⁷¹, 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 *Palaemon 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.
- Palaemon 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 *Macrobrachium 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 $\frac{3}{4}$ 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 $\frac{4}{5}$ 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 Cum-boto 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 Tonalá), 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 (Copename 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 (Dofflein, 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), Itaquí, 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 rostrum 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.
- Palaemon 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.
- Macrobrachium 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 $\frac{4}{3}$ 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 pereopods 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 $\frac{4}{5}$ of the length of the carpus. The shape of the second pereopod varies largely with age. In the adult male the second pereopods 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 $\frac{4}{7}$ 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 $\frac{2}{3}$ 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 pereopods 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 Bogotá, 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 $\frac{3}{4}$ 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 $\frac{3}{4}$ 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. Anthropol. 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 $\frac{3}{4}$ to $\frac{4}{5}$ 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 River⁵), 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 Mishington 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.

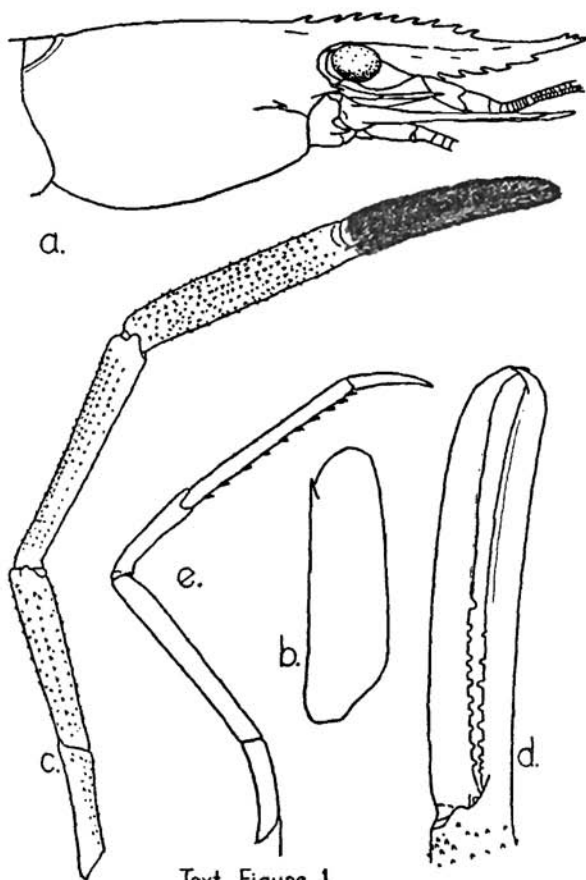
Remarks: The measurements given by Smith (1874) for the female in his original description obviously are, though perhaps partly, incorrect. The species is of economic importance at many places.

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 pereopod. 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 $\frac{2}{5}$ 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 $\frac{3}{4}$ 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 $\frac{3}{4}$ 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, $\frac{5}{4}$ 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 Zoologia 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 (Wiegmann)

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 heterochirus* 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 $\frac{4}{5}$ 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 $\frac{2}{3}$ 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 $\frac{3}{4}$ 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 $\frac{2}{3}$ of the length of the merus. The smaller leg has the fingers almost as long as to $\frac{2}{3}$ 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 $\frac{1}{3}$ 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 $\frac{1}{3}$ 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 $\frac{2}{3}$ 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. Zool. 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 anterolateral 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 $\frac{1}{4}$ 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 $\frac{4}{5}$ 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 $\frac{2}{3}$ to $\frac{3}{4}$ 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 $\frac{2}{3}$ to $\frac{3}{4}$ 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 $\frac{3}{4}$ 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 pereopod 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 $\frac{4}{5}$ 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 $\frac{2}{3}$ as long as the palm and

$\frac{4}{5}$ 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 (σ) 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, Bigidjampo, Lolo-braki and Miszell

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), Bididjampo, 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 $\frac{4}{3}$ 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 $\frac{3}{4}$ 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 $\frac{5}{4}$ 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 $\frac{2}{3}$ to $\frac{6}{7}$ 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 $\frac{3}{4}$ 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 $\frac{9}{8}$ 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 $\frac{5}{4}$ 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 $\frac{5}{7}$ 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 $\frac{2}{3}$ 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 Teresiopolis, 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), Perú (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. V. 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 $\frac{1}{3}$ 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 $\frac{3}{4}$ 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 $\frac{1}{3}$ 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 $\frac{5}{4}$ 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. Longitudinal 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 $\frac{2}{3}$ 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, Envoy 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 Musée 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.

Palaemon 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.

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

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Palaemon 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, Smithsonian 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 $\frac{1}{3}$ 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 $\frac{1}{3}$ 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 $\frac{4}{5}$ 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 $\frac{3}{4}$ 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 Lake Ysobal 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; Cubatão 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 Catharina 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. xariquieyi* 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 Diguetei 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 Diguetei 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 $\frac{2}{3}$ 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 $\frac{3}{4}$ 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 $\frac{4}{3}$ 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; Araján; Pedro Miguel Locks; Rio Mamoni near El Capitan; Upper Trinidad River; Rio Chucunague 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 $\frac{1}{3}$ of the length of the carapace (rostrum excluded). In *M. olfersi* it generally is less than $\frac{1}{3}$.

2. The palms 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 $\frac{1}{3}$ 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 $\frac{3}{4}$ 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 $\frac{1}{3}$ 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 $\frac{5}{4}$ 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

like those in the male. The fingers of both legs are closing over their entire length. The chelae are similar in shape; their spinulation is like that in the adult male, while also traces of the pubescence of the palm in the larger leg are visible. In both legs the fingers are about as long as the palm. The carpus is as long as the palm and shorter than the merus. The spinules on the merus of the 3rd and 4th leg are absent.

Size: Males with fully developed legs range in my material from 58 to 90 mm in length. My ovigerous females are 59 to 70 mm long. The eggs are numerous and small, they are 0.5 to 0.63 mm in diameter.

Material examined: In the U. S. National Museum the following material of this species is present: In shallow stream emptying into Pejebobo River, Panama (February 25, 1906, R. E. B. McKenney coll.), Upper Reservoir Creek, Toro Point, W. of Colon, Canal Zone (January 25, 1912, S. E. Meek and S. F. Hildebrand coll.), La Guayra, Venezuela (June 25, 1895, W. Robinson coll.), fresh water of rocky brook, Macuto, Venezuela (August 1, 1900, Lyon and W. Robinson coll.), Flint River near Sandy Beach, Jamaica (August 13, 1910, E. A. Andrews coll.), Spring in streamlet, Montego Bay, Jamaica (July 5, 1910, E. A. Andrews coll.), fresh water of Waterworks Pond, St. Croix, Virgin Islands (W. A. Beatty coll.), La Situ, Guadeloupe (L. Guesde coll.), Mount Pleasant, N. E. Grenada (March 19, 1942, G. S. Miller Jr. coll.), Trinidad (W. O. Crosby coll.). In the Museum of the Academy of Natural Sciences at Philadelphia I examined a specimen of this species, which probably came from Panama. The American Museum of Natural History possesses juvenile specimens, probably referable to this species from Panama (Rio Chagres) and from Santo Domingo (Barahona). The Turin Museum possesses this species from Macuto near La Guayra, Venezuela.

Type: Holotype (U.S.N.M. Cat. No. 39446) is the specimen (adult male) from Pejebobo River, Panama. The type material is preserved in the U. S. National Museum.

Remarks: In literature the species has been mentioned four times as belonging to *Bithynis*, or *Palaemon olfersii*. Sharp's (1893) specimen n. 121, which probably originates from Panama proved to belong in the present species. Nobili's (1897) specimens from Macuto near La Guayra on examination also showed to belong to *M. crenulatum*. The specimens from La Guayra and Guadeloupe, present in the U. S. National Museum, were identified by Miss Rathbun (1902a) as *Bithynis olfersii*. Schmitt (1933) reports on Rathbun's Guadeloupe specimen as *M. olfersii*. In 1950 a preliminary description of this species was published.

Macrobrachium hancocki Holthuis

Pl. 29, figs. a-e

? *Palaemon Olfersii* p. p. Nobili, 1897, Boll. Mus. Zool. Anat. comp. Torino, vol. 12, no. 280, p. 6.

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

Macrobrachium olfersii Beebe, 1926, Arcturus Adventure, p. 435; Belanske, 1927, In Vanderbilt's To Galápagos on the Ara, p. 148, pl. 29. (non *Palaemon Olfersii* Wiegmann, 1836.)

Macrobrachium olfersii Boone, 1930, Bull. Vanderbilt Mar. Mus. vol. 3, p. 142, pl. 50; Meredith, 1939, Voyages Veleró III, p. 104, fig.; Schmitt, 1939, Smithson. Misc. Coll., vol. 98, no. 6, p. 28.

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

Macrobrachium hancocki Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 96; 1950a, Siboga Exped., mon. 39a9, p. 14.

Description: This species is very closely related to the preceding, resembling it in almost every respect. Therefore only the difference between the two forms will be mentioned here.

1. The rostrum generally is shorter, never reaching beyond the end of the antennular peduncle, and usually reaching to the middle of its last joint. The first rostral tooth is placed in the anterior quarter of the carapace. The distance to the orbit being less than $\frac{1}{4}$ of the length of the carapace (rostrum excluded).

2. The carpus of the first leg is distinctly less than twice as long as the chela.

3. The second legs resemble strongly those of *M. crenulatum*, but differ in having only few spinules arranged in 2 or 3 rows on the outer surface of the fixed finger and by having the region without spines, on the outer surface of the palm, flat or even slightly concave and large, well defined. The pubescence of the outer surface of the palm is restricted to this spinuleless area and is not found outside it. In *M. crenulatum* this area, if present is small and ill defined, the pubescence occurring in, as well as outside of it. The row of spinules of the outer surface of the palm, which runs just above the ventral row, generally is straight and runs parallel to the lower row, at last converging with it. In *M. crenulatum* this upper row is somewhat irregular, diverging from the ventral row distally. On the palm of the smaller leg too the naked area is more conspicuous and the number of spinules on the fixed finger is smaller.

4. The ovigerous females differ in the same characters as the males do, only the 2nd legs in my largest specimen are of equal shape, resembling the smaller leg of the female of *M. crenulatum*.

Size: Males with well developed chelae are 44 to 87 mm long. Ovigerous females are 42 to 44 mm in length. The eggs are numerous and small, being 0.45 to 0.60 mm in diameter.

Colour: The specimen from Cubita Bay, Colombia, an adult male of 52 mm was accompanied by the following collector's note: "Chelipeds cobalt blue, large hand tending towards a black blue (= marine blue). Abdomen same, becoming darker posteriorly. At articulation of movable finger of large hand bright Chinese orange, an especially large spot on left side of finger. Articulation of small finger dull, not more than brownish." Meredith (1939) gives a photograph of the anterior part of the body of the large male (56 mm) of Chatham Island (Allan Hancock Expedition, 1933), and states it to be "a blue shrimp." Furthermore Boone (1930), remarks that "the pair of large chelipeds are deep gentian blue with a purplish cast; the body and other appendages are mottled reddish brown, the tips of the antennae and pleopods being yellowish." Belanske (1927) gives a coloured plate of the specimen described by Boone (1930). The blue colour of the large cheliped thus seems to be very constant.

Material examined: The species was collected in fairly large numbers (about 120 specimens in total) by the Allan Hancock Expeditions 1933, 1934, 1935, and 1938 from the following localities:

Panama: Bahia Honda. Shore, in drinking hole, March 9, 1933, Sta. 111-33. Fresh-water pool, March 9, 1933, Sta. 112-33. Habitat unknown, purchased together with specimens of *Macrobrachium americanum* Bate from an old lady for a cake of soap, March 10, 1935.

Secas Islands. Fresh-water stream and pools, February 5, 1935, Sta. 452-35.

Colombia: Cubita Bay. In stream at watering place, February 13, 1934. Gorgona Island, Watering Bay. Fresh-water stream, February 24, 1938, Sta. 852-38.

Cocos Island (Costa Rica): Chatham Bay. Fresh-water stream, February 28, 1933, Sta. 103-33. Fresh water stream, March 3, 1933, Sta. 109-33. Wafer Bay. Fresh water, March 2, 1933, Sta. 107-33.

Galapagos Islands (Ecuador): Chatham Island, Fresh-water Bay. Upstream $\frac{1}{2}$ mile, seined with 40 ft. special seine, February 1, 1933, Sta. 44-33.

In the collection of the United States National Museum specimens of this species are represented from: Gulf of Nicoya, Costa Rica, fresh water (November 15, 1906, J. F. Tristan coll.), Esparta, Rio Barranca, Costa Rica (June 25, 1928, M. Valerio coll.), Rio Platanales, Golfo Dulce, Costa Rica (April, 1896, H. Pittier coll.), Rio Marino, Hog Creek, and some unnamed streams and pools, San José Island, Archipiélago de las Perlas, Gulf of Panama (February 12 to September 27, 1944, J. P. E. Morrison coll.), Cocos Island, Costa Rica (June 6, 1929, W. K. Fisher coll., Pinchot Expedition), Old Providence Island, Colombia, or Cocos Island, Costa Rica (1938, W. L. Schmitt coll., Franklin D. Roosevelt Presidential Cruise). The American Museum of Natural History at New York possesses specimens of this species from San José Island, Archipiélago de las Perlas, Gulf of Panama, and from Cocos Island (fresh-water brook emptying in Wafer Bay).

The specimens recorded by Nobili (1897) under the name *Palaemon Olfersii* from Rio Sabana, S. Panama, were examined by me in the Turin Museum. The specimens in all probability belong in the present species, but since in both the second legs are lacking, the identity could not be made fully certain.

Distribution: This species lives in fresh water of W. America, from Costa Rica to Colombia, Cocos Island and the Galapagos Archipelago. It is recorded in literature from: Golfo Dulce, Costa Rica! (M. J. Rathbun, 1902a), Esparta, Costa Rica! (Holthuis, 1950), ? Sabana River, Darien! (Nobili, 1897), Mt. Sapó, Piñas Bay, Panama (Coventry, 1944), Cocos Island (Beebe, 1926), Chatham Bay, Cocos Island (Belanske, 1927; Boone, 1930), Chatham Island, Galapagos Archipelago! (Meredith, 1939), Old Providence Island, Colombia! (Schmitt, 1939). (See under remarks.)

Type: Holotype (U.S.N.M. Cat. No. 62218) is the largest male of the collection, namely the specimen from Esparta, Rio Barranca, Costa Rica. Part of the Hancock paratype material is preserved in the collection of the Allan Hancock Foundation at Los Angeles. All other material is deposited in the United States National Museum.

Remarks: The specimen recorded by Schmitt (1939) as *Macrobrachium olfersii* from Old Providence Island, is present in the collection of the U. S. National Museum and was examined by me. It proves to be a typical *Macrobrachium hancocki*, which is the more surprising as Old Providence Island is situated in the Caribbean Sea. The jar in which the specimen is kept, contains, however, a label with the inscription in Dr. Schmitt's handwriting: "Cocos? Old Providence?" Another

label states: "My recollection is that this is an Old Providence specimen." The locality thus is by no means certain and it may be very well possible (and according to the identity of the specimen it seems very probable) that the specimen was collected at Cocos Island.

It is a great pleasure to me to name this beautiful and brilliantly coloured species for Captain Allan Hancock, the leader of the Allan Hancock Expeditions.

Macrobrachium carcinus (L.)

Pl. 30; pl. 31, a-c

- Potipema Marcgraf*, 1648, Hist. Rer. nat. Bras., p. 187.
- Astacus fluviatilis major, chelis aculeatis* Sloane, 1725, Nat. Hist. Jamaica, vol. 2, p. 271, pl. 245, fig. 2.
- Cancer Carcinus* Linnaeus, 1758, Syst. Nat., ed. 10, p. 631.
- Cancer* 44 Linnaeus, 1759, Anim. Spec., p. 203.
- Cancer Carcinus* Linnaeus, 1760, Syst. Nat., ed. 11, p. 631.
- Squilla, Crangon, Americana major* Seba, 1761, Thesaur., vol. 3, p. 54, pl. 21, fig. 4.
- Astacus minor chelis denticulatis* Gronovius, 1764, Zooph. Gronov., p. 231.
- Cancer Carcinus* Linnaeus, 1767, Syst. Nat., ed. 12, p. 1051; Linnaeus, 1767a, Syst. Nat., ed. 13, p. 1051; Houttuyn, 1769, Nat. Hist., vol. 1, pt. 13, p. 406.
- Cancer carcinus* Forster, 1771, Catal. Anim. N. America, p. 33.
- Astacus carcinus* Fabricius, 1775, Syst. Ent., p. 414.
- Cancer carcinus* Müller, 1775, Linn. Natursyst., vol. 5, pt. 2, p. 1124.
- Astacus carcinus* Fabricius, 1781, Spec. Ins., vol. 1, p. 510; Fabricius, 1787, Mant. Ins., vol. 1, p. 332.
- Camaròn de Agua dulce Parra, 1787, Descript. dif. Piezas Hist. nat., p. 157, pl. 55, fig. 2.
- Astacus* 2 Browne, 1789, Nat. Hist. Jamaica, p. 424.
- Cancer Carcinus* Gmelin, 1789, Linn. Syst. Nat., ed. 13, vol. 1, p. 2986.
- Astacus Carcinus* Olivier, 1791, Encycl. méth. Hist. nat., vol. 6, p. 344.
- Cancer (Astacus) Jamaicensis* Herbst, 1792, Vers. Naturgesch. Krabb. Krebse, vol. 2, p. 57, pl. 27, fig. 2.
- non *Cancer (Astacus) Carcinus* Herbst, 1792, Vers. Naturgesch. Krabb. Krebse, vol. 2, p. 58, pl. 28, fig. 1.
- Astacus carcinus* Fabricius, 1793, Ent. Syst., vol. 2, p. 479.
- Palaemon carcinus* Weber, 1795, Nomencl. Ent., p. 94.
- non *Palaemon carcinus* Fabricius, 1798, Suppl. Ent. Syst., p. 402.

- Palaemon jamaicensis* Olivier, 1811, Encycl. méth. Hist. nat., vol. 8, p. 659.
- Palaemon carcinus* Leach, 1815, Zool. Miscell., vol. 2, p. 92, pl. 92; Latreille, 1818, Tabl. encycl. méthod., vol. 24, p. 6, pl. 327, fig. 1.
- Palaemon Jamaicensis* Lamarck, 1818, Hist. nat. Anim. s. Vert., vol. 5, p. 207; Desmarest, 1823, Dict. Sci. nat., vol. 23, p. 330; Desmarest, 1825, Consid. gén. Class. Crust., p. 237.
- Palaemon Carcinus* Guilding, 1825, Trans. Linn. Soc. Lond., vol. 14, p. 338.
- Astacus (Palaemon) jamaicensis* Voigt, 1836, Cuvier's Thierreich, ed. 2, vol. 4, p. 184.
- Palaemon brachydactylus* Wiegmann, 1836, Arch. Naturgesch., vol. 2, pt. 1, p. 148.
- Palaemon Jamaicensis* H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 398.
- Palaemon Jamaicensis* H. Milne Edwards, 1838, Lamarck's Hist. nat. Anim. s. Vert., ed. 2, vol. 5, p. 366.
- Palaemon punctatus* Randall, 1839, J. Acad. Nat. Sci. Phila., vol. 8, p. 146.
- Palaemon jamaicensis* Gibbes, 1845, Proc. Boston Soc. Nat. Hist., vol. 2, p. 70; White, 1847, List Crust. Brit. Mus., p. 78.
- Palaemon brevicarpus* De Haan, 1849, Fauna Japonica, Crust., p. 172.
- Palaemon punctatus* Gibbes, 1850, Proc. Acad. Nat. Sci. Phila., 1850, p. 25.
- Palaemon Jamaicensis* Gibbes, 1850, Proc. Acad. Nat. Sci. Phila., 1850, p. 29.
- Palaemon jamaicensis* Gibbes, 1850a, Proc. Amer. Assoc. Adv. Sci., vol. 3, p. 198.
- Palaemon punctatus* Gibbes, 1850a, Proc. Amer. Assoc. Adv. Sci., vol. 3, p. 198.
- Palaemon jamaicensis* Guérin, 1856, Sagra's Historia de Cuba, Crust., p. xx.
- Palaemon jamaicensis* Guérin, 1857, Sagra's Histoire de Cuba, Crust., p. liv.
- Palaemon aztecus* De Saussure, 1857, Rev. Mag. Zool., ser. 2, vol. 9, p. 504.
- ? *Palaemon Montezumae* De Saussure, 1857, Rev. Mag. Zool., ser. 2 vol. 9, p. 504.

- Palaemon brachydactylus* Stimpson, 1857, Boston J. Nat. Hist., vol. 6, p. 502.
- Palaemon jamaicensis* De Saussure, 1858, Mém. Soc. Phys. Hist. nat. Genève, vol. 14, p. 465.
- Palaemon aztecus* De Saussure, 1858, Mém. Soc. Phys. Hist. nat. Genève, vol. 14, p. 466, pl. 4, fig. 29.
- ? *Palaemon Montezumae* De Saussure, 1858, Mém. Soc. Phys. Hist. nat. Genève, vol. 14, p. 467, pl. 4, fig. 28.
- Palaemon Jamaicensis* Von Martens, 1858, Ann. Mag. Nat. Hist., ser. 3, vol. 1, p. 51.
- Palaemon jamaicensis* p. p. Semper, 1868, Proc. Zool. Soc. Lond., 1868, p. 585.
- Palaemon Jamaicensis* Von Martens, 1869, Arch. Naturgesch., vol. 35, pt. 1, p. 22.
- Palaemon laminatus* (Gollmer MSS.) Von Martens, 1869, Arch. Naturgesch., vol. 35, pt. 1, p. 24.
- Palaemon Jamaicensis* Smith, 1869, Trans. Conn. Acad. Arts Sci., vol. 2, pp. 23, 40.
- Palaemon (Macrobrachion) Jamaicensis* Von Martens, 1872, Arch. Naturgesch., vol. 38, pt. 1, p. 137.
- Palaemon Jamaicensis* Streets, 1872, Proc. Acad. Nat. Sci. Phila., 1872, p. 134.
- Palaemon jamaicensis* Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 68.
- Palaemon brachydactylus* Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 68.
- Palaemon aztecus* Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 68.
- ? *Palaemon montezumae* Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 68.
- Palaemon Jamaicensis* Neumann, 1878, Syst. Uebers. Gatt. Oxyrh., p. 37.
- non *Palaemon jamaicensis* Huxley, 1879, The Crayfish, p. 269, figs. 71, 79.
- Palaemon brevicarpus* De Man, 1879, Notes Leyden Mus., vol. 1, p. 179.
- non *Palaemon jamaicensis* Huxley, 1880, L'écrevisse, p. 197, figs. 71, 79.
- non *Palaemon jamaicensis* Huxley, 1881, Der Krebs, p. 226, figs. 71, 79.
- Palaemon jamaicensis* p. p. Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 107.
- Palaemon jamaicensis* Gundlach, 1887, An. Soc. Esp. Hist. nat., vol. 16, p. 132.

- Bithynis jamaicensis* Pocock, 1889, Ann. Mag. Nat. Hist., ser. 6, vol. 3, p. 10.
- ? *Palaemon montezumae* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 728.
- Palaemon jamaicensis* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 729, pl. 47, fig. 7.
- Palaemon brevicarpus* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 731.
- Palaemon Jamaicensis* Andrews, 1892, Johns Hopkins Univ. Circ., vol. 11, p. 75.
- Palaemon aztecus* Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 6.
- Palaemon brevicarpus* Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 7.
- Palaemon jamaicensis* Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, pp. 9, 49.
- Palaemon laminatus* Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 9.
- Palaemon montezumae* Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 11.
- Palaemon jamaicensis* Verrill, 1892, Trans. Conn. Acad. Arts Sci., vol. 8, p. 353.
- Palaemon jamaicensis*? p. p. Benedict, 1893, Proc. U. S. Nat. Mus., vol. 16, p. 540.
- Palaemon jamaicensis* Pocock, 1893, Journ. Linn. Soc. Lond. Zool., vol. 24, p. 407.
- Palaemon jamaicensis* p. p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 122.
- Palaemon olfersii* p. p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 123.
- Palaemon jamaicensis* Von Ihering, 1897, Rev. Mus. paul., vol. 2, p. 423; Von Ihering, 1897a, Rev. Mus. paul., vol. 2, p. 156; Ortmann, 1897, Rev. Mus. paul., vol. 2, p. 208.
- Bithynis jamaicensis* M. J. Rathbun, 1897, Ann. Jamaica Inst., vol. 1, p. 44.
- non *Palaemon Montezumae* Nobili, 1898, Boll. Mus. Zool. Anat. comp. Torino, vol. 13, no. 314, p. 2.
- Palaemon jamäicensis* Doflein, 1900, S. B. Bayer Akad. Wiss., vol. 30, p. 128.
- Palaemon aztecus* Doflein, 1900, S. B. Bayer. Akad. Wiss., vol. 30, p. 128.
- Bithynis jamaicensis* Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 485.

- Bithynis aztecus* Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 486.
? *Bithynis montezumae* Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 486.
- Palaemon jamaicensis* Moreira, 1901, Arch. Mus. nac. Rio de J., vol. 11, p. 13.
- Bithynis jamaicensis* M. J. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 123.
- Bithynis Jamaicensis* Coulon, 1907, Bull. Soc. Étud. Sci. Nat. Elbeuf, vol. 25, p. 191.
- Palaemon Jamaicensis* Valdés Ragués, 1909, Mis Trabajos Acad., p. 182.
- Macrobrachium jamaicense* Pearse, 1915, Proc. U. S. Nat. Mus., vol. 49, p. 551.
- Palaemon jamaicensis* Tesch, 1914-1917, Encycl. Nederl. West Indië, p. 250.
- Palaemon ornatus* (Forns MSS.) Torralbas, 1917, An. Acad. Habana, vol. 53, p. 616, figs. 56, 57. (non Olivier, 1811.)
- Palaemon jamaicensis* Torralbas, 1917, An. Acad. Habana, vol. 53, p. 617.
- Macrobrachium jamaicense* Luederwaldt, 1919, Rev. Mus. paul., vol. 11, p. 430.
- Palaemon jamaicensis* Luederwaldt, 1919a, Rev. Mus. paul., vol. 11, p. 387.
- Macrobrachium jamaicense* Pearse, 1921, Proc. U. S. Nat. Mus., vol. 59, p. 462; Beebe, 1924, Galapagos, p. 431; Schmitt, 1924b, Zoologica, New York, vol. 5, p. 169; Schmitt, 1924c, Univ. Iowa Stud. nat. Hist., vol. 10, pt. 4, p. 83.
- Palaemon (Macroterochelir) jamaicensis* De Man, 1925, Ann. Mus. Congo Belg., Zool., ser. 3, sect. 3, pt. 1, fasc. 1, p. 51, fig. 13.
- Palaemon carcinus* Sunier, 1925, Tijdschr. Nederl. dierk. Ver., ser. 2, vol. 19, p. cxvii.
- Palaemon jamaicensis* Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, pt. 2, p. 112.
- Macrobrachium jamaicense* Luederwaldt, 1929, Rev. Mus. paul., vol. 16, p. 53.
- Macrobrachium jamaicense* Boone, 1931, Bull. Amer. Mus. Nat. Hist., vol. 63, p. 179, fig. 19.
- Palaemon jamaicensis aztecus* Pesta, 1931, Ann. naturh. Mus. Wien, vol. 45, p. 177.

- Macrobrachium jamaicense* Geiser, 1933, Field and Lab., vol. 2, p. 31; Geiser, 1933a, Abstr. Pap. ann. Meet. N. Texas biol. Soc., April 22, 1933, p. 7; Schmitt, 1933, J. Wash. Acad. Sci., vol. 23, p. 314.
- Periclimenes portoricensis* Schmitt, 1933a, Amer. Mus. Novit., vol. 662, p. 3, fig. 2.
- Palaemon jamaicensis* Gordon, 1935a, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 323.
- Macrobrachium jamaicense* Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 158.
- Periclimenes portoricensis* Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 165, fig. 28.
- ? *Macrobrachium jamaicense* Hildebrand, 1939, Zoologica, New York, vol. 24, pp. 23, 24.
- Macrobrachium ohionis* Reed, 1941, Marine Life Texas, pp. 36, 46, 73, fig. (non *Palaemon ohionis* Smith, 1874.)
- Macrobrachium jamaicense* p. p. Coventry, 1944, Monogr. Acad. Nat. Sci. Phila., vol. 6, p. 535.
- Macrobrachium jamaicense* Sawaya, 1946, Zoologica, São Paulo, vol. 11, p. 402, pl. 1, fig. 9, pl. 3, figs. 10, 11; Hedgpeth, 1947, Texas Game and Fish, vol. 5, pt. 8, p. 14, figs.; Hedgpeth, 1947a, Progr. Fish Cult., Oct. 1947, p. 182, figs.; Chace & Holthuis, 1948, Hummelinck's Stud. Fauna Curaçao, vol. 3, p. 24.
- Macrobrachium carcinus* Hedgpeth, 1949, Texas J. Sci., vol. 1, p. 31, figs. 1b, 3, 5; Holthuis, 1950a, Siboga Exped., mon. 39a9, pp. 13, 117, figs. 23, 24; 1950b, Zool. Meded., vol. 31, p. 31.

Description: The rostrum reaches to or slightly beyond the end of the antennular peduncle, it is rather narrow. The tip is somewhat curved upwards. The upper margin, which is a little arched over the eyes, bears 11 to 14 (in young specimens up to 16) teeth, which are regularly divided over the margin, sometimes the ultimate teeth are placed a little wider apart than the proximals. The first 4 to 6 teeth are placed on the carapace behind the orbit, they occupy about $\frac{1}{3}$ of the length of the carapace (rostrum excluded). The lower margin bears 3 or 4 teeth. The carapace is smooth, in old males the lateral parts show coarse pits.

The abdomen, too, is smooth. The pleura of the fifth segment ends in a rectangle, with the tip rounded. The sixth segment is less than 1.5 times as long as the fifth. The telson is slightly more than 1.5 times as long as the 6th abdominal segment. The 2 dorsal pairs of spinules are

placed in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson ends in an acute point, which in old specimens becomes truncate. The inner of the 2 posterior pairs of spinules is the longer and in young specimens it reaches distinctly beyond the tip of the telson, in old specimens it is much reduced and fails to reach even to the end of the truncated tip of the telson. Numerous feathered setae are present.

The eyes and antennular peduncles are normal in shape.

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

The first legs reach with about half of 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 $\frac{5}{4}$ as long as the merus. Merus and ischium are roughened by the presence of spinules. Carpus and chela are smooth. The second pereopods are strong and far more heavy than the other legs. The left and right leg are equal in shape and size. They reach with part of the merus beyond the scaphocerite. The fingers are slender, and are only slightly shorter than the palm. They distinctly gape in the proximal part. The fingers cross so that the tip of the dactylus reaches far beyond the lower margin of the fixed finger and the tip of the fixed finger reaches distinctly beyond the upper margin of the dactylus. Each finger has the cutting edge provided with one large tooth; that of the dactylus is situated in the middle of the length of the cutting edge, that of the fixed finger lies distinctly proximally of the upper tooth. Between these large teeth and the base of the finger, the cutting edge bears some 2 to 4 smaller denticles. The rest of the edge is entire. Along the cutting edges a distinct brown pubescence is visible. Furthermore the fixed finger is provided with a brown pubescence on its inner surface and on the basal part of its outer surface. The palm is elongate and only slightly compressed, it is almost 4 times as long as high and is, like the fingers, covered with many spinules which are smallest and placed closest together in the upper part, being larger and placed wider apart in the lower region. A feeble pubescence is sometimes visible on the lower surface of the palm being most distinct anteriorly. The carpus is about half as long as the palm, it is about circular in transverse section and gradually narrows posteriorly. It is 2.5 times as long as high. The merus is about $\frac{4}{5}$ as long as the carpus. The ischium is slightly less than $\frac{1}{2}$ as long as the merus. Ischium, merus and carpus show a spinulation similar to that of the palm, here, too, traces of a pubescence are sometimes visible on the ventral surface. The third leg reaches with about

the dactylus beyond the scaphocerite. The propodus is somewhat more than twice as long as the dactylus, about 1.7 times as long as the carpus and distinctly shorter than the merus. The fifth leg reaches about to the middle of the scaphocerite. The propodus is about 2.5 times as long as the dactylus, slightly less than twice as long as the carpus and about as long as the merus. All the joints of the last 3 legs are thickly covered with minute spinules.

Pleopods and uropods are normal in shape.

Ovigerous females differ from the adult males mainly by having the 2nd chelae less strong. They reach with a part of the carpus only beyond the scaphocerite. The fingers close over their entire length, the tip of each finger does not reach beyond the outer margin of the opposing finger. The teeth of the cutting edge are distributed like in the male, but they are much weaker. The pubescence, too, is less developed than in the male. The whole chela is more slender. The fingers are even longer than the palm. The carpus is slightly more than half as long as the palm.

Young specimens have less teeth of the rostrum situated behind the orbit. The first legs reach less far forwards, generally overreaching the scaphocerite with the chela only. The carpus is less than twice as long as the chela. The second legs show much resemblance to those of the female except that the fingers are about as long as or slightly shorter than the palm. The carpus is longer in relation to the merus. Of the last three legs the third is relatively shorter, the fifth somewhat longer than in the larger specimens. Furthermore the spinulation of these legs is much less strong, in very young specimens it often is entirely absent. It is very difficult, sometimes almost impossible, to tell young specimens of this species apart from juveniles of the *M. olfersi* group.

Size: The largest specimen, an adult male, examined by me is 233 mm long. Ovigerous females are 130 to 170 mm in length. The eggs are numerous and small being 0.44 to 0.67 mm in diameter.

Colour: In the first published description of the present species, namely that of Marcgraf (1648), also a description of the colour of Brazilian specimens is given: "Color totius testae pallidus, crassis striis cinereis secundum longitudinem variegatus: brachia sunt inferius cinerea, superius obsoleti coloris instar ligni querni veteris. Oculi nigri; cirrhi albi." With brachia the large second legs are meant, with cirrhi the antennal and antennular flagella. About three centuries later for the second time notes on the colour of the species are given, when Hedgpeth (1947) shortly described the colour of Texas specimens. In 1949 the

same author gives the following more extensive account of the colour of Texas prawns of the present species: "The general dorsal color is dark brown with rich opaque cream mottling on the sides, shading into a light olive green on the edges of the pleura and the legs. The large chelipeds are greenish, with brown-black tubercles and pale orange articulations. The outer uropods are dark, almost black-green, the inner are opaque cream. The telson is dark green but not as dark as the outer uropods." Colour notes of the living animals were made also by Dr. Waldo L. Schmitt in Villa Bella, São Sebastiao, Brazil on his 1925 expedition to South America, and were kindly placed at my disposal. The species is described as follows: The body is greenish blue (marine blue x French green), with broad longitudinal stripes of olive buff to olive yellow tinged with Nile blue. The carapace shows a median stripe, which, however, does not reach the base of the rostrum, neither the posterior margin of the carapace. Furthermore the carapace shows at both sides 3 longitudinal stripes, the upper starting from the posterior margin of the carapace and ending in the rostrum, the upper and lower margin of which, however, are coloured greenish blue; the second stripe also begins at the posterior margin of the carapace (where it merges with the basal part of the upper stripe) and ends in the antennal spine, the third runs along the lower margin of the carapace. The abdomen possesses 2 stripes over the entire length of each half, one along the lower margin and the other over the middle of the lateral surface. The caudal fan is bluish green, with 2 light spots at the base of the telson and fairly large muddy brown spots at the distal part of the uropodal endo- and exopods. The chelipeds are marine blue, with blackish spines, and a flush of French blue at the articulations. The last three legs have the dactyli, propodi and carpi dark china blue above, lighter below; the meri and ischii are much paler, nearly whitish. Another specimen was described as being marine blue black-bottle green, striped with buff lines. The lower lateral surface of the carapace being bright yellow. The legs are china blue, the smaller chela prune purple, with the basal half of the fixed and the tips of both fingers whitish, while a white spot is present at the inside of the distal end of the carpus and a smaller one at the proximal end. The large chela is marine blue, which is worked out to whitish on the inner lower margin of the palm and carpus. A spot is present on the distal end of the merus. Mr. Frederick M. Bayer, assistant curator of the division, Marine Invertebrates of the U.S. National Museum, kindly provided me with the following colour description of specimens from Miami, Fla.: The body "has a rich brown color,

with two lighter brown longitudinal bands along the sides of the abdomen. The sides of the carapace are likewise light, and there are lighter spots on the dorsal part as well. The articulation of the carpus and propodus has a brilliant blue spot, and a smaller spot is present on the articulation of propodus and dactylus."

Material examined: The Allan Hancock Expeditions 1933 and 1939 collected juvenile specimens of this species from:

Panama: Canal Zone, Barro Colorado Island, Biological Station. Freshwater stream, March 6, 1933, Sta. 110-33.

Colombia: Barranquilla near Terminal. Dipnet over ship's side, April 6, 1939.

Venezuela: Cubagua Island. 2-5 fms, sand and algae, April 14, 1939, Sta. A24-39.

The U. S. National Museum possesses material of this species from the following localities: Florida (St. Augustine, St. Johns Co.; Silver Glen Springs, Marion Co.; Miami River, Dade Co.; Big Pine Key, Monroe Co.), Texas (Matagorda and Palacios Bays, Matagorda Co.; Colorado River near Austin, Travis Co.; San Marcos River near San Marcos, Hays Co.; Guadeloupe River, Victoria Co.; San Antonio, Bexar Co.; Devils River, Valverde Co.; Las Moras Creek, Kinney Co.; Brownsville, Cameron Co.), Mexico (Tamazunchale; Zacatlan in N. E. Puebla State; Santa Maria near Vera Cruz), Nicaragua (Greytown), N. Costa Rica (Rio Frio), Panama (Gorgona; Rio Chagres; Frijoles; Miraflores; Gatun; Mindi; Empire), Colombia (Sabanilla; Loma Larga in Santa Marta Mts.), Venezuela (Ocumare; La Guayra; Macuto), British Guiana (Cuyuni River; Kartabo), Brazil (Ilha São Sebastiao; Sacco São Francisco), Cuba (Havana; Calabazar; Guantanamo; Baracoa), Jamaica (Lucea), Santo Domingo (Rio San Juan), Porto Rico (San Sebastian; Juana Diaz; Arroyo; Carolina Viejo; Trujillo Alto; Caguas), Virgin Islands (St. Thomas; St. Croix), Guadeloupe, St. Lucia (Port Castries), Barbados (Bathsheba), Grenada, Curaçao (Pos Europa), Aruba (Bron di Rooi Bringamosa), Old Providence Island. The American Museum of Natural History possesses material of this species from Florida (West Palm Beach), Mexico (Axtla River in San Luis Potosi Province), Panama (Barro Colorado Island in Gatun Lake), Venezuela (La Brea), British Guiana, Cuba (Santiago de Cuba), Santo Domingo, Virgin Islands (St. Croix). Furthermore, I examined in the Rijksmuseum van Natuurlijke Historie at Leiden, Holland, some specimens from Surinam, and from Bonaire (Tanki Kerkhof).

Distribution: This species lives in fresh, and also in brackish, waters of eastern America from Florida to S. Brazil and in the West Indies. The records in literature are:

America (Linnaeus, 1758, 1760, 1767, 1767a; Fabricius, 1775, 1781, 1793; Müller, 1775; Gmelin, 1789), South America (Olivier, 1791, 1811; Lamarck, 1818; Desmarest, 1823, 1825; H. Milne Edwards, 1838; Coulon, 1909), St. Augustine and Silver Springs, Florida! (Schmitt, 1933), Miami and Big Pine Key, Florida! (Hedgpeth, 1949), Matagorda Bay!, Aransas Bay, Colorado River near Austin!, San Marcos River near San Marcos!, Texas (Hedgpeth, 1949), San Marcos and New Braunfels, Texas (Geiser, 1933), San Antonio, Texas! (M. J. Rathbun, 1899!; Geiser, 1933; Reed, 1941), Comal, Texas (Geiser, 1933), Lake Corpus Christi, Texas (Hedgpeth, 1949), Nueces River and Rio Grande (Hedgpeth, 1947), Devils River, Texas! (Geiser, 1933; Schmitt, 1933!), Las Moras Creek and Brownsville, Texas! (M. J. Rathbun, 1899!; Geiser, 1933), Mexico (Wiegmann, 1836), Rio Tampico, Mexico (De Saussure, 1857, 1858), Amixtlan and Zacatlan, Puebla State, Mexico! (M. J. Rathbun, 1899), Vera Cruz, Mexico (De Saussure, 1858), Guatemala! (Kingsley, 1882!; Sharp, 1893!), Nicaragua (Benedict, 1893), Escondido River, Nicaragua (M. J. Rathbun, 1899), Rio Pacuare, Puerto Limon, Costa Rica (Pesta, 1931), Rio Chagres, Panama (Doflein, 1900), Barro Colorado Island, Canal Zone (Boone, 1931), Colon, Panama (Beebe, 1924; Schmitt, 1924b), Old Providence Island off the coast of Nicaragua, Colombia (Benedict, 1893; Coventry, 1944), La Rosa near Santa Marta, Colombia (Pearse, 1915), Rio Tuy, El Concejo, near Lake Valencia, Venezuela (Pearse, 1921), Caracas, Venezuela (Von Martens, 1869), British Guiana (Semper, 1868; Gordon, 1935a), Surinam! (Semper 1868; De Man, 1925!; Holthuis, 1950b), Surinam River near Paramaribo, Surinam! (Tesch, 1914-1917; Holthuis, 1950b!), Rio Paute, Amazon basin, Ecuador (Ortmann, 1891), Napo and Marañon Rivers in Amazon basin, Peru (Kingsley, 1878), Brazil! Marcgraf, 1648; White, 1847; Semper, 1868; Kingsley, 1882!; Sharp, 1893!), Pernambuco (White, 1847), Penedo (Smith, 1869), Bahia (Semper, 1868; Ortmann, 1891), Rio de Janeiro (Von Martens, 1869; Ortmann, 1897), Piauhy and Jacarépaguá near Rio de Janeiro (Moreira, 1901) Ubatuba, São Paulo State (Luederwaldt, 1919; Sawaya, 1946), Perús (Luederwaldt, 1919), Ilha São Sebastiao Tieté near São Paulo (Sawaya, 1946), Santos (Luederwaldt, 1919, 1919a; Sawaya, 1946), Conceição de Itanhaem (Luederwaldt, 1919),

Xiririca, Rio Ribeira de Iguapé (Sawaya, 1946), Iguapé, São Paulo State (Von Ihering, 1897; Sawaya, 1946), Itajahy River, St. Catherine State, Brazil (Von Ihering, 1897), West Indies (Gronovius, 1764; Houttuyn, 1769; Olivier, 1811; Lamarck, 1818; Desmarest, 1823, 1825; Voigt, 1836; H. Milne Edwards, 1837, 1838; Randall, 1839; Semper, 1868; Von Martens, 1869; Thallwitz, 1892), Cuba! (Parra, 1787; Gibbes, 1850a; Guérin, 1856, 1857; Von Martens, 1869, 1872; Gundlach, 1887; Sharp, 1893!; Hay, 1903; Valdés Ragués, 1909; Torralbas, 1917; Boone, 1927), Jamaica (Sloane, 1725; Browne, 1789; Herbst, 1792; Leach, 1825; White, 1847; Gundlach, 1887; Andrews, 1892; M. J. Rathbun, 1897), Haiti (Ortmann, 1891), Porto Rico! (Gundlach, 1887; M. J. Rathbun, 1902a!; Schmitt, 1933a, 1935), St. Thomas (Nobili, 1898), St. Martin! (Streets, 1872!; Kingsley, 1882; Sharp, 1893!), Dominica (Pocock, 1889; Verrill, 1892), Port Castries, St. Lucia! (M. J. Rathbun, 1899), St. Vincent (Guilding, 1825), Cumberland and Chateaubilair Rivers, St. Vincent (Pocock, 1893), Barbados (Young, 1900; Schmitt, 1924a), Port of Spain, Trinidad (De Man, 1925), Kralendijk, Bonaire! (Chace & Holthuis, 1948), Pos Europa, Curaçao! (Chace & Holthuis, 1948), Bron di Rooi Bringamosa, Aruba! (Chace & Holthuis, 1948).

Type: Linnaeus (1758) gives as locality "*in Americae fluviiis.*" As Linnaeus species probably only is based on the description and figure given by Sloane (1725) of his *Astacus fluviatilis major*, and not on actual specimens, we may consider Jamaica to be the type locality and Sloane's material the type material. If Sloane's specimens still are extant, then they are preserved in the British Museum, London.

Remarks: In the tenth edition of his *Systema Naturae*, Linnaeus gave the following account of his *Cancer carcinus*: "C.[ancer] macrourus, thorace laevi, manibus teretiusculis: brachiis hispidulo-aculeatis. *Sloane. iam. 2. p. 271. t. 245. f. 2. Astacus fluviatilis maior, chelis aculeatis. Habitat in Americae fluviiis.*" This makes it certain that his *Cancer Carcinus* is the same species as is generally named at present *Macrobrachium jamaicense* and is distinctly different from the indo-westpacific species generally named *Palaemon carcinus* Fabr. That the name *carcinus* generally is applied to the wrong species probably is due to Herbst, who was the first to separate the indo-westpacific and east American forms, which by former authors had been considered to be one species namely *Cancer* (or *Astacus*) *carcinus*. Unfortunately Herbst gave the name *carcinus* to the indo-westpacific species, while the real *carcinus* was named *jamaicensis* by him. Most of the subsequent authors followed Herbst in

this error. Sunier (1925) already pointed to this, but his communication, being written in Dutch and published in the proceedings of the sessions of the Nederlandsche Dierkundige Vereeniging (Netherlands Zoological Society), certainly must have been overlooked.

Palaemon brachydactylus Wiegmann (1836) distinctly belongs to the present species, as is already shown by Ortmann (1891), who also pointed to the fact that *P. aztecus* only is a juvenile specimen of *P. jamaicensis*. The identity of *P. punctatus* with the present species was shown by Kingsley (1882), moreover I examined the type specimen of Randall's species, which is present in the Museum of the Academy of Natural Sciences at Philadelphia and entirely agree with Kingsley's conclusion.

Palaemon montezumae De Saussure resembles in all respects *M. carcinus* but for the shape of the rostrum. In juvenile specimens (and De Saussure's specimens are juvenile, being only 50 mm long), the rostrum often is variable in shape, though I never found them with the large number of ventral teeth on the lower margin as figured by De Saussure; this may be an abnormality. The status of the species, however, remains uncertain and until more data are available I provisionally consider it identical with *M. carcinus*. Nobili's (1898) specimen brought by him to *Palaemon Montezumae* preserved in the Zoological Museum in Turin, Italy, and on examination proved to be *Brachycarpus biunguiculatus* (Lucas).

In the Crustacea part of Siebold's Fauna Japonica, De Haan (1849) described a species as *Palemon brevicarpus* new species from Japan. This species later never has been recorded in literature⁷), and its status generally was considered dubious. In the collection of the Leiden Museum, the type specimens of De Haan's species still are preserved. Examination of these specimens showed them to be females of *M. carcinus* (L.). Probably some American Palaemonid material has been intermixed with De Haan's Japanese material, to which also points the discovery that De Haan's "*Palemon lamarrei*" from Japan is nothing else than *M. amazonicum* (vid. p. 18). De Haan himself already noted the close resemblance of his *Palemon brevicarpus* with *P. jamaicensis*.

The material mentioned by Sharp (1893) in his list of Crustacea in the Museum of the Academy of Natural Sciences at Philadelphia as *Palaemon jamaicensis* was examined by me. Most of his identifications

⁷ In 1936 Yu (Bull. Fan Mem. Inst. Biol., vol. 6, p. 305, figs. 1, 2), however, described a new variety of De Haan's species. Yu's form proves to belong to a distinct species *Macrobrachium yui* Holthuis (1950a).

were correct only the numbers 94 (San Domingo, W. M. Gabb coll.) and 1001 (Kingston, Jamaica, W. J. Fox coll., 1891) proved to belong to *Macrobrachium faustinum*, while his no. 357 (no locality) in all probability is a *Macrobrachium vollenhoveni* (Herklots). Furthermore Sharp's no. 354 (Brazil) listed by him under *Palaemon olfersii*, does not belong there but distinctly is a *Macrobrachium carcinus* (L.). Kingsley (1882) mentions some specimens of the Philadelphia Academy as *Palaemon jamaicensis*; his material from Santo Domingo and Cuba, however, in reality belongs to *Macrobrachium faustinum*.

The figure given by Huxley (1879, 1880, 1881) of his *Palaemon jamaicensis* show not that species, but *Macrobrachium olfersi*.

The West African specimens mentioned in literature under the name *Palaemon jamaicensis* do not belong to the present species, but are *Macrobrachium vollenhoveni* (Herklots).

The specimens mentioned in Hildebrand's (1939) paper as *Macrobrachium jamaicense* were examined by me. As both specimens lack the 2nd pereopods it is not possible to state with certainty whether these specimens are *M. carcinus* or *M. americanum*.

In a paper entitled "Contribución al estudio de los Crustaceos de Cuba" Dr. F. Torralbas (1917, An. Acad. Ci. méd. fis. nat. Habana, vol. 53) published manuscript notes of Dr. J. Gundlach, which were compiled and completed by Dr. J. I. Torralbas. It seems that both Dr. J. I. Torralbas and Dr. F. Torralbas are not carcinologists, so that the great confusion in the work is nothing to be surprised about. The large number of errors, wrong transcription of names and inaccuracies throughout the work, make it almost worthless. So, for instance, in the description of "Alphous Gundlach" a species is mentioned as "*P. sprinienamus*," which probably means *Palaemon spinimanus*. A new species is described, viz., "*Palaemon ornatus* Forns mss." of which figures are given. It distinctly is the common *Macrobrachium carcinus*. The "new" species not only is not new, but the name used is preoccupied (by *Palaemon ornatus* Olivier, 1811) and the generic name is incorrectly spelled. On one of the plates three figures are shown, two of *Macrobrachium carcinus* (L.), and one of *Justitia longimana* (H. Milne Edwards). The explanation only states "fig. 56 and 57 *Palaemon ornatus* Forns." Either the figure of the Palinurid is only used to fill a blank space, or it also is considered to be *Palaemon ornatus*. The latter supposition is improbable, however, as the same species is twice figured in almost the same position in figs. 47 and 48 under the (correct) name *Palinurus longimanus*. A similar case is found in figs.

53-55. Figs. 53 and 54 give a *Macrobrachium faustinum*, the specimen of fig. 55 belongs to *M. acanthurus*. Fig. 53 bears the "correct" inscription *Palaemon Faustinum*, while figs. 54 and 55 are placed on 1 plate and both are named *Palaemon forceps*. Also outside of the Palaemonids such grave errors and inaccuracies may be found. The publication of this paper, though done with the best intentions, in no way will further our knowledge of the group and only will confuse those who try to use this article.

In 1933 Schmitt described a new Pontonid prawn, which he named *Periclimenes portoricensis*, ~~was~~ collected at Porto Rico (exact locality unknown). An examination of the description and figure reveals that the specimen in question certainly is no Pontonid but a Palaemonid prawn, as the telson bears 2 pairs of spines with 2 feathered hairs between them. These hairs, it is true, are rather strong, but certainly cannot be compared with the inner spines of *Periclimenes* (nothing is said of the branchiae of the specimen). Comparing this description and the figures with young specimens of *Macrobrachium carcinus* and *M. americanum* at my disposal, I found an extremely close resemblance. The shape of the rostrum, the place of the hepatic spine, the armature of the tip of the telson, the shape of the scaphocerite and the legs, all show perfect resemblance to Schmitt's figure. Only the young of *M. carcinus* and *M. americanum* had the mandible provided with a three-articulated palp, while such a palp is missing in all species of *Periclimenes* and is not (or at least not distinctly) figured in Schmitt's article. I, however, do not hesitate to identify *Periclimenes portoricensis* as a juvenile stage of *Macrobrachium carcinus*. The very young stages of *Macrobrachium* species often give rise to confusion. Nobili (1905) once described a juvenile stage of the common indo-westpacific *Macrobrachium lar* (Fabr.) as *Leander dionyx*, while Kemp (1925, p. 285) was inclined to place Nobili's species in a new genus. De Man (1915) described a juvenile specimen of *Macrobrachium australe* (Guérin) as *Leander lepidus*.

Macrobrachium americanum Bate

Pl. 31, figs. d, e

Macrobrachium americanum Bate, 1868, Proc. Zool. Soc. Lond., 1868, p. 363, pl. 30.

Palaemon jamaicensis p.p. Semper, 1868, Proc. Zool. Soc. Lond., 1868, p. 585.

Palaemon jamaicensis Smith, 1871, Rep. Peabody Acad. Sci., 1869, p. 97.

(non *Cancer (Astacus) Jamaicensis* Herbst, 1792.)

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

Palaemon Jamaicensis p.p. Miers, 1891, Whymper's Travels Great Andes suppl., p. 124.

Palaemon americanus Thallwitz, 1892, Abh. Ber. Zool. Anthropol. Mus. Dresden, 1890-91, pt. 3, p. 6.

Palaemon jamaicensis Bouvier, 1895, Bull. Mus. Hist. nat. Paris, vol. 1, p. 160.

Palaemon jamaicensis Faxon, 1895, Mem. Mus. Comp. Zool. Harvard, vol. 18, p. 148.

Bithynis jamaicensis M. J. Rathbun, 1899, North Amer. Fauna, vol. 14, p. 74.

Palaemon (Brachycarpus) jamaicensis Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, p. 7.

Bithynis jamaicensis Meek, 1908, Publ. Field Mus. Zool., vol. 7, p. 202.

Macrobrachium jamaicense M. J. Rathbun, 1910, Proc. U. S. Nat. Mus., vol. 38, pl. 51, fig. 1 (non p. 561); Beebe, 1924, Galapagos World's End, p. 432; Schmitt, 1924, Proc. Calif. Acad. Sci., ser. 4, vol. 13, p. 386; Beebe, 1926, *Arcturus* Adventure, p. 435; Boone, 1930, Bull. Vanderbilt Mar. Mus., vol. 3, p. 146, pl. 51; Sivertsen, 1934, Nyt Mag. Naturv., vol. 74, p. 5; Hult, 1938, Ark. Zool., vol. 30A, pt. 5, p. 5; Steinbeck and Ricketts, 1941, Sea of Cortez, p. 445.

Macrobrachium jamaicense p.p. Coventry, 1944, Monogr. Acad. Nat. Sci. Phila., vol. 6, p. 535.

Macrobrachium americanum Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 12.

Description: *Macrobrachium americanum* and *M. carcinus* are so closely related, that up till now they generally have been considered to form only one species. They agree in almost all respects. Their differences are:

1. The rostrum in adult males of *M. americanum* generally is shorter and higher than in *M. carcinus*, with the arching over the eye and the upward curve of the tip more pronounced.

2. The first tooth of the upper margin of the rostrum in *M. americanum* is placed more anteriorly, its distance to the posterior margin of the orbit is less than $\frac{1}{4}$ of the length of the carapace, in *M. carcinus* this distance mostly is $\frac{1}{3}$ to $\frac{2}{7}$ of the length of the carapace.

3. The second legs in adult males of *M. americanum* are smaller than in adult males of the same size of *M. carcinus*. They are more thickset. The carpus is about twice as long as wide (in *M. carcinus* about 2.5 times). The palm is about thrice as long as high. The pubescence on the fingers is much less pronounced than in *M. carcinus*. When the chelae are closed, the fingertips never reach so far beyond the exterior margin of the opposing finger as in *M. carcinus*. Also the spinulation of the legs is less strong.

It is very difficult or almost impossible to distinguish between the females and young males of *M. carcinus* and *M. americanum*. It perhaps should be better to regard *M. americanum* a subspecies of *M. carcinus* only.

Size: Males with the chelae well developed range in size from 98 to 235 mm. Ovigerous females are 67 to 193 mm in length. The eggs are numerous and small, they are 0.36 to 0.50 mm in diameter.

Material examined: The Allan Hancock Expeditions 1933, 1934, and 1935 collected a large amount of material (about 500 specimens) of this species from:

Mexico: Petatlan Bay, Guerrero State. Shore, collecting inside Morro de Petatlan, between it and lagoon, March 17, 1933, Sta. 120-33 (juveniles, therefore identification not fully certain).

Panama: Secas Islands. Fresh water seepage, February 5, 1935, Sta. 452-35.

Bahia Honda. Freshwater pool, March 9, 1933, Sta. 112-33. Habitat unknown, purchased together with specimens of *Macrobrachium hancocki* new species, from an old lady for a cake of soap, March 10, 1933.

Colombia: Port Utria. February 15, 1934 (juveniles, identification not certain).

Gorgona Island. Habitat unknown, purchased from natives, January 22, 1935.

Cocos Island (Costa Rica): Chatham Bay. Fresh-water stream entering bay, March 3, 1933, Sta. 109-33.

Wafer Bay. Fresh-water, March 2, 1933, Sta. 107-33 (juvenile, identification not certain).

Galapagos Islands (Ecuador): Indefatigable Island, Academy Bay. From drinking water pool, January 20, 1934.

Chatham Island, Freshwater Bay. Upstream $\frac{1}{2}$ mile, seined with 40 ft. special seine, February 1, 1933, Sta. 44-33.

Furthermore I examined in the U. S. National Museum specimens from the following localities: Mexico (Cape San Lucas and La Paz, Lower California; Guaymas, Sonora State; Quelite and Presidio Rivers, and Mazatlan, Sinaloa State; Maria Magdalena and Maria Cleofas, Tres Marias Islands; Santiago River and Ameca, Jalisco State; Armeria River, Colima State), Guatemala (Rio Aguacapa tributary S. of Guatemala City; Rio de los Esclavos near Cuilapa; Rio Paz tributary near Jutiapa), San Salvador (Escarara; Rio Santo Tomás), Honduras (Rio Cobre near San Antonio), Nicaragua (Polvon; Realejo; Fonseca), Costa Rica (Quebrada Chavarria-Golfito and Rio Platanales, Golfo Dulce), Panama (David; Chiriqui; Rio Capiro; Chorrera; Araijan; Culebra; Paraiso; Pedro Miguel; Corozal; Cardenas; Panama; Rio Morte Arnode; Rio Abaco; Rio Pacora; Rio Mamoni near Chepo; Rio Jaqué and tributaries; Taboga Island; San José Island; Rio Chucunaque, Darien), Cocos Island, Colombia (near Buenaventura), Ecuador (Guayaquil), N. Peru (Pariñas River; Quebrada near Mancora). In the American Museum of Natural History at New York specimens of *M. americanum* are present from: Mexico (Rio Rosario in Sinaloa Province), Panama (San José Island, Archipelago de las Perlas; Rio Chico, Darien; Atenanga del Rio Balsas, Darien), Cocos Island.

The specimen recorded by Nobili (1901) as *Palaemon (Brachycarpus) jamaicensis* from Rio Daule, Balzar, Ecuador is still present in the Turin Museum. It was examined there by me and proved to belong to *M. americanum*.

Distribution: The species lives in fresh-water of western America between Lower California and N. Peru, and of the Cocos and Galapagos Islands. The records in literature are: Mulege River, Lower California (Bouvier, 1895), La Paz, Lower California! (M. J. Rathbun, 1899), Cape St. Lucas, Lower California (Faxon, 1895), Guamuchi Ranch, Sierra Laguna Mts., Cape Region, Lower California (Schmitt, 1924), Guaymas, Sonora State, Mexico! (Steinbeck and Ricketts, 1941), Rio Presidio, Sinaloa State, Mexico! (M. J. Rathbun, 1899), Rio de Alica,⁸ Tepic State, Mexico (M. J. Rathbun, 1899), Barranca Ibarra, Santiago River, Jalisco State, Mexico! (M. J. Rathbun, 1899), Maria Magdalena and Maria Cleofas, Tres Marias Islands! (M. J. Rathbun, 1899), Armeria River, Colima State, Mexico! (M. J. Rathbun, 1899), Lake Amatitlan, Guatemala (Bate, 1868; Meek, 1908), Polvon, W. Nicaragua (Smith, 1871; Kingsley, 1883), Rio

⁸I could not find Alica material in the U. S. National Museum and the name Alica does not occur on any of the maps consulted by me.

de los Platanales and Quebrada Chavarria Golfito, Costa Rica! (M. J. Rathbun, 1899), Panama (Faxon, 1895), David River, Chiriqui, Panama! (M. J. Rathbun, 1899), Mt. Sapo, Piñas Bay, Panama (Coventry, 1944), Guayaquil, Ecuador! (M. J. Rathbun, 1899), Rio Daule, Balzar, Ecuador! (Nobili, 1901), Tanti, Ecuador (Miers, 1891), Chatham Bay, Cocos Island (Boone, 1930), Indefatigable Island (= Sañta Cruz), Galapagos Islands (Sivertsen, 1934; Hult, 1938), Chatham Island, Galapagos Islands (Hult, 1938).

Type: The type locality is Lake Amatitlan, Guatemala. The type is preserved in the British Museum, London, as a dry specimen (Reg. No. 68, 41).

Remarks: The specimens described by M. J. Rathbun (1910) as *Macrobrachium jamaicense* from Peru in reality are *M. inca*, her figure (pl. 51, fig. 1) is a copy of Bate's (1868, pl. 30) figure of *M. americanum*.

"*Palaemon fluvialis* Streets"

Pl. 31, figs. f, g

Palaemon fluvialis Streets, 1871, Proc. Acad. Nat. Sci. Phila., 1871, p. 227, pl. 2, fig. 5; Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 68; Ortmann, 1891, Zool. Jo. Syst., vol. 5, p. 710; Thallwitz, 1892, Abh. Ber. Zool. Anthropol. Mus. Dresden, 1890-91, pt. 3, p. 8.

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

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

Streets gives the following description of this species: "Rostrum short, lanceolate, somewhat arched above; not as long as the lamelliform appendages of the external antennae, reaching to the end of the second joint of the antennae; superior margin armed with seven teeth, the inferior margin with two, situated near the point of the rostrum. One specimen of this species had but four teeth above and one below. Two flagella of the internal antennae united for a very short distance; spines on the lateral portion of the carapax very small; first pair of legs slender; hand more than half the length of the carpus; hand of the second pair stout; carpus shorter than the palmar portion of the hand, gradually enlarged toward the hand; fingers cylindrical and straight, shorter than half of the hand, the same length as the carpus, beset with a few stiff hairs; legs smooth. Length 1.3 inches."

The type specimens are still present in the collection of the Museum of the Academy of Natural Sciences at Philadelphia. They are very young and in a very poor condition. I am unable to identify them with certainty with any of the species of *Macrobrachium* at present known from America. They may prove to be juveniles of a species, which has not yet been discovered in adult stage. This question, however, can only be settled after the carcinological fauna of Mexico is better known. After Streets' record the species seems not to have been found again.

The species is recorded by Streets from fresh-water of a tributary of Coatzacoalcos River, Mexico.

Genus PSEUDOPALAEMON Sollaud, 1911

Definition: The rostrum is well developed, compressed and provided with teeth. The carapace is armed with antennal and hepatic spines.

The telson bears two pairs of dorsal and two pairs of posterior spines. Feathered hairs are present on the posterior margin.

The eyes have the cornea well developed and pigmented.

The mandible lacks the palp. Exopods are present on all maxillipeds. Pleurobranchs are found at the bases of the third maxilliped and all pereopods.

The dactyli of the last three pereopods are simple. The propodus of the fifth leg bears numerous transverse rows of hairs in the distal part of its posterior margin.

The endopod of the first pleopod of the male bears no appendix interna.

Type species: *Pseudopalaemon bouvieri* Sollaud, 1911.

This genus consists only of 1 species

Pseudopalaemon bouvieri Sollaud

Pl. 32, figs. a-i

Pseudopalaemon Bouvieri Sollaud, 1911, Bull. Mus. Hist. Nat. Paris, vol. 17, p. 12, figs. 1, 2.

Pseudopalaemon Iheringi Sollaud, 1911a, Bull. Mus. Hist. Nat. Paris, vol. 17, p. 285, fig. 1.

Pseudopalaemon Bouvieri Sollaud, 1923, Bull. Biol. France Belg., vol. 57, p. 579, fig. 21.

Pseudopalaemon bouvieri Cordero and Vaz-Ferreira, 1938, Ann. Acad. Bras., Sci., vol. 10, p. 383, text figs. 1-3, pls. 1, 2; Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 11.

Description: The rostrum is elongate and slender, it reaches about to the end of the scaphocerite. The upper margin bears 5 to 10, generally 7, teeth, the first of which is placed above the posterior margin of the orbit, sometimes just before, sometimes just behind it. The lower margin bears 2 to 5, in my specimens 3 or 4, teeth. The teeth are rather regularly divided over the rostrum, the distals, however, generally being separated by larger interspaces than the proximals. The carapace is smooth and provided with antennal and hepatic spines.

The abdomen is smooth. The pleura of the fifth segment has the apex broadly rounded. The sixth segment is more than twice as long as the fifth. The telson in my specimens has the posterior of the two pairs of spinules placed much closer to the anterior pair than to the posterior margin of the telson. This posterior margin ends in a sharp median point, which is flanked by two pairs of spinules, the inner of which is much longer than the outer. Between these spinules feathered setae are present.

The eyes are well developed. The stalk is longer than the cornea. An ocellus is present.

The antennules have the anterior margin of the first segment convex. The anterolateral spine just slightly reaches beyond that margin. The inner flagellum has the two rami fused for 8 to 9 joints. This fused portion is much shorter than the free part which in my specimens consists of 12 to 16 joints. The scaphocerite is thrice as long as broad. The outer margin is concave.

The mandible bears no palp, but otherwise exactly resembles that of *Macrobrachium*. Exopods are present on all maxillipeds, while pleurobranchs are found on the third maxilliped and all pereopods.

The first legs are not very slender and distinctly fail to reach the end of the scaphocerite. The chela is oval in shape and has the fingers about as long as the palm. The carpus is twice as long as the chela and slightly longer than the merus. The right and left second chelae are equal in shape, and in size. There is, however, a large difference in the shape of these chelae in the two sexes. In the male the second legs reach with slightly less than half the carpus beyond the scaphocerite. The fingers are very long and slender, being 1.5 times as long as the palm. There are no teeth on the cutting edges. The palm is narrow and cylindrical. The carpus is slightly longer than the chela (about 1.1 times) and about 1.2 times as long as the merus. The ischium is half as long as the carpus. No spinulation or pubescence is present on these legs. In the females the second legs are shorter, reaching with the chela only beyond the scaphocerite. The fingers are as long as the palm. The

carpus is 1.5 times as long as the chela, 1.2 times as long as the merus, and about twice as long as the ischium. The last three legs are slender. The dactylus is simple. The third leg reaches about as far forwards as the first. 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 beyond the third, but still fails to reach the end of the scaphocerite. The propodus is fully thrice as long as the dactylus, slightly more than twice as long as the carpus and longer than the merus. The last three legs are smooth, but for a row of spinules along the posterior margin of the propodi, while in the fifth leg numerous transverse rows of setae are present in the distal part of the posterior margin. At the inner side of the base of the fifth leg in the male a large copulatory papilla is present, which bears a triangular flap at the apex.

The second to fifth pleopods are provided with an appendix interna on the endopod. This appendix is absent from the endopod of the first pleopod. The endopod of the second pleopod of the male is provided with an appendix masculina, which is much larger than the appendix interna.

The uropods are very elongate. The outer margin of the exopod ends in a strong tooth, which at its inner margin bears a movable spine.

Size: The specimens seen by me range in size between 15 and 36 mm. My largest males, measuring 26 to 29 mm, have the second chelae with long slender fingers as described above. Males of 17 to 19 mm have the chelae as in the females. My females are up to 36 mm long. According to Sollaud (1911), the eggs are few and large, measuring 1.03 to 1.45 mm in diameter.

Material examined: In the U. S. National Museum material of this species is present from Uruguay (Arroyo Maestre Campo, Durazno Department; Paso de la Arena, Montevideo Department; 14 km N.E. of San Carlos, Maldonado Department) and from Argentina (Arroyo Mandisovi near Concordia, Entre Rios Province).

Distribution: The species inhabits fresh-waters of eastern S. America. It is recorded in literature from: Arroyo del Bellaco, Brazil⁹ (Sollaud, 1911a), Uruguay (Sollaud, 1923), Montevideo, Uruguay (Sollaud, 1911), Las Piedras rivulet and San José river near Montevideo, Uruguay (Cordero and Vaz-Ferreira, 1938).

⁹ Cordero and Vaz-Ferreira point out that the locality Arroyo del Bellaco to all probability is situated not in Brazil but in Uruguay, as many rivulets of this name are known from Uruguay. Moreover the name is given in Spanish, while it should have been written in Portuguese, when the locality is situated in Brazil.

Type: The type locality is: Neighborhood of Montevideo, Uruguay. The two syntypes are preserved in the Museum d'Histoire naturelle at Paris, France.

Remarks: Sollaud (1911, 1911a) thought his material belonged to two different species, *Pseudopalaemon bouvieri* and *P. iheringi*, which should differ in the shape of the rostrum, of the telson, in the oral parts and in the shape of the first legs. As Cordero and Vaz-Ferreira (1938) pointed out, the specimens seen by Sollaud belong to one variable species. The specimens examined by me support this supposition.

Sollaud based his new species, *Pseudopalaemon Bouvieri* on two specimens, which, according to him, are a male of 32 mm and an ovigerous female of 34 mm. His description of the second leg of his male specimen, however, closely resembles that of my female specimens, and does not show the peculiar form of the male specimens in my material. As his "male" is much larger than any of my males, and therefore the shape of the second leg certainly is not due to the juvenile age of the specimen, I am inclined to believe Sollaud's "male" to be either abnormal or to be a female.

Genus **CRYPHIOPS** Dana, 1852

Definition: The rostrum is well developed, compressed and provided with teeth; it is rather short. The carapace is armed with antennal spines only, no hepatic or branchiostegal spines are present. There is a distinct branchiostegal groove.

The telson bears two dorsal and two posterior pairs of spinules. Numerous hairs are present on the posterior margin of the telson.

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 pereopods.

The dactyli of the last three pairs of legs are simple. The propodus of the fifth leg bears ~~numerous~~^{no} transverse rows of hairs in the distal part of its posterior margin.

The first pleopod of the male bears no appendix interna at the endopod.

Type species: *Cryphiops spinulosomanus* Dana, 1852, a species at present considered identical with *Cryphiops caementarius* (Molina).

This genus differs from *Macrobrachium*, with which it often is united, mainly by the absence of the hepatic spine on the carapace. Only one species is known of this genus:

Cryphiops caementarius (Molina)

Pl. 33; pl. 34, figs. a, b; pl. 35, figs. a-g

- Cancer caementarius* Molina, 1782, Saggio Stor. nat. Chili, p. 208; Molina, 1786, Versuch Naturgesch. Chili, p. 183.
- Cancer Caementarioius* Molina, 1786, Versuch Naturgesch. Chili, p. 308.
- Cancer caementarius* Gmelin, 1789, Linn. Syst. Nat., ed. 13, vol. 1, p. 2986; Molina, 1789, Essai Hist. nat. Chili, pp. 184, 328; Molina, 1788-95, Compend. Hist. geogr. nat. civ. Chili, vol. 1, p.
- Cancer cementarius* Molina, 1808, Geogr. nat. civ. Hist. Chili, vol. 1, p. 144.
- Cancer Cementarius* Molina, 1808, Geogr. nat. civ. Hist. Chili, vol. 1, p. 243.
- Astacus caementarius* Molina, 1810, Saggio Stor. nat. Chili, ed. 2, p. 188.
- Cancer caementarius* Poepig, 1835, Reise Chile, Peru, vol. 1, p. 314.
- Palaemon caementarius* Poepig, 1836, Arch. Naturgesch., vol. 2, pt. 1, p. 143.
- Palaemon Gaudichaudii* H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 400.
- Palaemon Gaudichaudii* H. Milne Edwards & Lucas, 1843, d'Orbigny's Voy. Amér. mérid., vol. 6, pt. 1, p. 37, pl. 17, fig. 2; Nicolet, 1849, Gay's Hist. fis. Chile, Zool., p. 218.
- Palaemon caementarius* Nicolet, 1849, Gay's Hist. fis. Chile, Zool., p. 219.
- Palaemon Gaudichaudii* Gibbes, 1850, Proc. Acad. Nat. Sci. Phila., 1850, pp. 25, 28.
- Palaemon gaudichaudii* Gibbes, 1850,^a_^ Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198.
- Cryphiops spinuloso-manus* Dana, 1852, Proc. Acad. Nat. Sci. Phila., 1852, p. 26.
- Palaemon Gaudichaudii* Dana, 1852, U. S. Explor. Exped., vol. 13, p. 592.
- Cryphiops spinuloso-manus* Dana, 1852, U. S. Explor. Exped., vol. 13, p. 595.
- Cryphiops spinulosomanus* Weitenweber, 1854, Lotos, Praha, vol. 4, p. 62.
- Cryphiops spinulosi-manus* Dana, 1855, U. S. Explor. Exped., vol. 13, atlas, p. 12, pl. 39, fig. 4.
- Cryphiops spinulosomanus* Von Martens, 1858, Ann. Mag. Nat. Hist., ser. 3, vol. 1, p. 51.

- Bithynis longimana* Philippi, 1860, Arch. Naturgesch., vol. 26, pt. 1, p. 164.
- Palaemon caementarius* Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45, pt. 1, p. 414.
- Macrobrachium africanum* Bate, 1868, Proc. Zool. Soc. Lond., 1868, p. 366, pl. 31, fig. 3.
- Palaemon Gaudichaudii* Von Martens, 1868, Arch. Naturgesch., vol. 34, pt. 1, p. 65.
- Palaemon gaudichaudii* Semper, 1868, Proc. Zool. Soc. Lond., 1868, p. 586.
- Palaemon caementarius* Cunningham, 1870⁷¹, Trans. Linn. Soc. Lond., vol. 27, p. 497; Cunningham, 1871a, Notes Nat. Hist. Strait Magellan, p. 415.
- Palaemon gaudichaudii* Miers, 1877, Proc. Zool. Soc. Lond., 1877, p. 661.
- Palaemon gaudichaudii* var. *caementarius* Miers, 1877, Proc. Zool. Soc. Lond., 1877, p. 662.
- Bithynis gaudichaudii* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 748.
- Palaemon africanus* Thallwitz, 1892, Abh. Ber. Zool. Anthropol. Mus. Dresden, 1890-91, pt. 3, p. 6.
- Palaemon (Bithynis) gaudichaudii* Thallwitz, 1892, Abh. Ber. Zool. Anthropol. Mus. Dresden, 1890-91, pt. 3, p. 8.
- Bithynis gaudichaudii* Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 119.
- Palaemon caementarius* Philippi, 1894, Zool. Anz., vol. 17, p. 266; Philippi, 1894, An. Univ. Chile, vol. 87, p. 375.
- Bithynis caementaria* Ortmann, 1897, Rev. Mus. Paulista, vol. 2, p. 214.
- Bithynis Gaudichaudii* Doflein, 1899, S. B. Bayer. Akad. Wiss., vol. 29, p. 186.
- Bithynis gaudichaudii* Lenz, 1902, Zool. Jb. Suppl., vol. 5, p. 735.
- Bithynis Gaudichaudii* Porter, 1903, Rev. Chil. Hist. Nat., vol. 7, p. 152.
- Bithynis caementarius gaudichaudii* M. J. Rathbun, 1910, Proc. U. S. Nat. Mus., vol. 38, pp. 560, 604, pl. 54, fig. 1.
- Bithynis caementarius* M. J. Rathbun, 1910, Proc. U. S. Nat. Mus., vol. 38, p. 604.
- Cryphiops spinulosomanus* M. J. Rathbun, 1910, Proc. U. S. Nat. Mus., vol. 38, p. 605.
- Palaemon gaudichaudii* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 285.
- Cryphiops* Kemp, 1925, Rec. Indian Mus., vol. 27, pp. 285, 286.
- Cryphiops* Gordon, 1935a, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 327.

Palaeman caementarius Boone, 1938, Bull. Vanderbilt mar. Mus., vol. 7, p. 255, pl. 102.

Cryphiops caementarius Holthuis, 1950a, Siboga Exped., mon. 39a9, pp. 11, 98.

Description: The rostrum is straight and very short, reaching to or slightly beyond the end of the first segment of the antennular peduncle. It is rather high. The upper margin bears 6 to 8 teeth, 1 or 2 of which are placed behind the orbit. All the teeth are divided regularly over the upper margin. The lower margin bears 0 to 4 teeth. The carapace is smooth, but is provided with short erect hairs, which especially are distinct in the anterolateral parts. The antennal spine is present, the hepatic is missing. A branchiostegal groove is present.

The abdomen is smooth and a little hairy too. The pleura of the fifth segment is bluntly angled, the segment is a little shorter than the sixth. The telson bears 2 pairs of dorsal spines, one in its middle and one at $\frac{3}{4}$ of its length. The posterior margin is rounded or truncate in old specimens, only in very young specimens a median point is visible. The two posterior pairs of spinules are short. Numerous setae are placed between the inner spines.

The eyes and antennulae do not differ from those of *Macrobrachium*.

The scaphocerite is twice as long as broad. The outer margin is convex at base, straight or somewhat concave in the distal part.

The oral parts strongly resemble those of *Macrobrachium* and the branchial formula is like in that species.

The first pereopods are slender, they reach with the larger part of the carpus beyond the scaphocerite. The fingers, which are slightly longer than the palm have their cutting edges directed somewhat outwards, so that when they are closed the inner surface of the fingers forms a hollow concavity, while the outside is slightly convex. The carpus is somewhat less than twice as long as the chela. The merus and ischium are distinctly spinulated, the carpus and chela are smooth. The second legs are strongly unequal in the adult male. The larger reaches with half the merus beyond the scaphocerite. The fingers are slightly shorter than, to $\frac{3}{4}$ as long as, the palm, they are gaping a little. The cutting edges each are provided with 5 to 7 distinct blunt teeth of equal size. The palm is somewhat compressed. It is elongate, being twice as long as high and having the lower margin somewhat convex. The fingers and the palm are covered with strong spinules. No pubescence, apart from some scattered hairs, is present. The carpus is short, being about half as long as the palm; it is strongly constricted near the base. The merus is longer

than the carpus. The ischium is more than half as long as the merus. Ischium, merus and carpus are covered with spinules similar to, but smaller than, those of the chela. No pubescence is present on these joints. The smaller leg reaches with the chela, sometimes with the carpus, beyond the scaphocerite. The fingers are distinctly longer than the palm; they close over their entire length. There are 4 or 5 small denticles in the proximal part of their cutting edges. The palm is somewhat swollen, being broader than both fingers together. Small spinules are present on both palm and fingers. The carpus is about as long as the palm and is strongly constricted near the base. The merus is longer than the carpus. The spinulation of the ischium, merus and carpus is like that of the chela. The third leg reaches with the dactylus, sometimes even with part of the propodus beyond the scaphocerite, but in some cases it fails to reach the end of that scale. The dactylus is simple. The propodus is less than twice as long as the dactylus, 1.5 times as long as the carpus and $\frac{2}{3}$ to $\frac{3}{4}$ as long as the merus. The fifth leg reaches about to the middle of the scaphocerite, but sometimes fails to reach the base of it. The propodus is almost twice as long as the dactylus, somewhat more than 1.5 times as long as the carpus and slightly shorter than the merus. All joints of the last three legs are covered with numerous spinules. No transverse rows of hairs are present in the distal part of the posterior margin of the propodus of the fifth leg.

The pleopods and uropods are similar to those in *Macrobrachium*.

Ovigerous females have the first legs relatively shorter, they reach with only half the carpus beyond the scaphocerite. The second legs are equal in shape and size, they strongly resemble the smaller second leg of the adult male. The tips of the fingers, however, do not end in sharp conical points as in the adult male, but are hoofshaped. In young males the tips of the smaller second leg sometimes still show traces of a hoof-shape. The rostrum in juvenile specimens reaches farther forward than in adult specimens, the second legs are equal, they resemble those of the female, but in very young specimens they are smooth.

Colour: Doflein (1894, p. 185) gives the following account of the colour of the living animal: "Yellowish green with yellowish brown spots on the back. Joints of the first [probably second is meant] leg reddish, chelae greenish blue."

Size: My specimens range between 21 and 185 mm in length. The ovigerous females are 28 to 102 mm long. The eggs are numerous and small, being 0.43 to 0.57 mm in diameter. Ovigerous females were collected in the months November, January and April.

Material examined: During the 1935 Allan Hancock Expedition 28 specimens of this species were purchased at the railroad station at Chosica, 25 miles from Lima, Peru, 2800 ft. elevation, January 8, 1935. In the U. S. National Museum I examined material from Peru (Rio Moche near Salavery, Rimac River near Lima, Callao, Vitor River, Mollendo), Chile (Arica, La Serena and Rio Aconcagua near Culera). The American Museum of Natural History at New York possesses material of this species from Mollendo, Peru.

Distribution: *Cryphiops caementarius* is the common fresh-water prawn of the west coast of S. America, it is known from Peru and Chile. The records in literature are: Peru (Von Martens, 1868; Sharp, 1893), Pacasmayo, Peru, (M. J. Rathbun, 1910), Chancay (M. J. Rathbun, 1910), Ancon, Peru¹⁰ (Ortmann, 1891, 1897), Rio Chillan (Doflein, 1899), Callao (Boone, 1938), Rimac River near Villegas (M. J. Rathbun, 1910), Lima (Miers, 1877; M. J. Rathbun, 1910), Arequipa (M. J. Rathbun, 1910), Mollendo (M. J. Rathbun, 1910), Rio Tambo near Mollendo (Doflein, 1899), Rio Tambo, Peru (Bate, 1868), Chile (Molina, 1782, 1786, 1788-1795, 1789, 1808, 1810; Gmelin, 1789; H. Milne Edwards, 1837; H. Milne Edwards & Lucas, 1843; Nicolet, 1849; Dana, 1852, 1852a; Von Martens, 1868; Miers, 1877; Sharp, 1893), N. Chile (Poeppig, 1835), Coquimbo (Nicolet, 1849), La Serena, Coquimbo (Ortmann, 1891), marshes near La Serena (Cunningham, 1871, 1871a), Rio Coquimbo near La Serena (Lenz, 1902), Rio Coquimbo (Porter, 1903), Rio de La Ligua, Aconcagua (Philippi, 1860, 1894), Rio Aconcagua, Valparaiso (Poeppig, 1836; Philippi, 1894), Valparaiso (Dana, 1852a). Heller (1862) remarks that the species originates from Brazil, this obviously is incorrect.

Type: Type locality is Chile. Type specimens probably are not extant.

Remarks: In 1852 Dana described a curious prawn from fresh-water of Chile, which he named *Cryphiops spinuloso-manus*; this species was remarkable by having the eyes deeply concealed beneath the carapace: "They are much more deeply covered than in *Alpheus*" (Dana, 1852, p. 594). An examination of Dana's figure of this remarkable specimen shows that the position of the eyes with regard to that of the antennulae and antennae is quite normal, and that these appendices too have their basal region covered by the carapace. This situation is so entirely abnormal and improbable, that I think it impossible that this is a natural

¹⁰ In his 1891 article Ortmann states Ancon to be situated in Ecuador, in his 1897 paper, however, he rectifies this and pointed out that this locality lies in Peru.

position for these appendages. In my opinion the entire anterior portion of the head has been pressed backwards below the carapace by some exterior force. As I observed in my material, this is very easily done in this species. In accordance with this supposition is the fact that the eyes are quite normal and are provided with dark pigment and that the antennae and antennulae too are entirely normal in shape. When comparing Dana's description and figure of his only specimen of *Cryphiops spinuloso-manus*, which is a female, with females of *Bithynis caementarius* not one difference of any importance can be found, if we do not consider the position of the eyes, the antennulae and antennae. Also the locality, where *Cryphiops spinuloso-manus* is collected lies in the range of distribution of *Bithynis caementarius*, in fact no other Palaemonid prawn is known from fresh waters of Chile. I am therefore convinced that *Cryphiops spinuloso-manus* is nothing but a mutilated specimen of *Bithynis caementarius*. The genus *Cryphiops* was described in 1852 for the first time, while Philippi erected his genus, *Bithynis*, as late as 1860. The name, *Cryphiops*, therefore has priority over *Bithynis* and has to be used for the present genus, notwithstanding the fact that the name indicates a feature, which is not present in normal specimens of the genus.

Kemp (1925) in his key to the genera of Palaemoninae states *Cryphiops* to have the mandible without a palp. As Gordon (1935, p. 327) already remarked, this is a slip of the pen, as in Dana's description as well as in his figure the presence of a three-jointed palp is distinctly shown.

There are no grounds for considering the forms with and without lower rostral teeth (vars. *gaudichaudii* and *caementarius*) separate varieties. There are all transitions between an entire lower margin and a denticulate one, while no other differences between the two forms are known.

Molina's (1782) original description of this species agrees well with the present form; he is mistaken, however, in considering the species to be building chimneys. As Faxon (1898, p. 690) and Philippi (1899, p. 375) point out Molina apparently confused here the present species and a chimney building crayfish.

The rules of zoological nomenclature force the present species to have the most inappropriate name possible, the generic name *Cryphiops*, indicating a character (~~the~~ covered eyes), which it does not possess, the specific name *caementarius*, (= mason), indicating an ability which it does not have either.

Genus *TROGLOCUBANUS* Holthuis, 1949

Definition: Rostrum present, little or well developed, with or without dorsal, and without ventral teeth. Carapace smooth, with antennal spine, which sometimes is very poorly developed or even absent, without branchiostegal or hepatic spines. Branchiostegal groove present.

Abdomen smooth, with the pleura tips rounded. Telson with two pairs of dorsal and two pairs of posterior spinules. Between the posterior spinules numerous feathered setae are present.

Eyes strongly reduced, bullet-shaped, without a trace of pigment.

Antennula like in *Palaemon*. Upper antennular flagellum with two rami, which are fused at the base.

Scaphocerite like in *Palaemon*. Antennal peduncle provided with an external spine at base of scaphocerite.

Mandible without mandibular palp, consisting of molar and incisor process. The other oral parts not differing from those of *Palaemon*.

The first legs slender and chelate. Second legs stronger, fingers long. Last three legs slender, with simple dactyli. Propodus of fifth leg with transverse rows of setae in the distal part of the posterior margin.

First pleopod with the endopod small and devoid of an appendix interna. All other pleopods with an appendix interna on the endopod. Male moreover with an appendix masculina at the endopod of the second pleopod.

Uropods normal. The final tooth of the external margin of the exopod is provided at its inner side with a movable spine, which at its inner side sometimes is provided again with an immovable tooth.

Type species: *Palaemonetes eigenmanni* Hay, 1903.

The genus consists of four species, all of which formerly were inserted in *Palaemonetes*. This position, however, proved to be untenable and a new genus had to be erected.

The most important difference between *Troglocubanus* and *Palaemonetes* is that the branchiostegal spine, which is very distinct in the latter genus is entirely absent in the former.

All four species of *Troglocubanus* are blind cave dwellers, which up till now only have been recorded from Cuba. They may be distinguished by the following characters:¹¹

1. Rostrum without teeth or with a very small tooth near apex.
 Antennal spine absent *inermis*
- Rostrum with dorsal teeth. Antennal spine present 2

¹¹ This key is adapted from Chace (1943, p. 31).

2. Rostrum with only one dorsal tooth, which is placed behind orbit. Lower margin of rostrum straight or concave . . . *calcis*
 — Rostrum with at least two dorsal teeth, which partly are placed before posterior margin of orbit. Lower margin of rostrum convex 3
3. Two or three dorsal teeth on rostrum. Rostrum not reaching beyond end of antennular peduncle *gibarensis*
 — Six to eight dorsal teeth on rostrum. Rostrum reaching beyond antennular peduncle *eigenmanni*

Troglocubanus calcis (Rathbun)

Pl. 36, figs. a-j

Palaemonetes calcis p.p. M. J. Rathbun, 1912, Bull. Mus. Comp. Zool. Harv., vol. 54, p. 451, pl. 1, figs. 1, 2, 3, 5.

Palaemonetes calcis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 317; Spandl, 1926, Speläol. Monogr., vol. 11, p. 90; Chappuis, 1927, Die Binnengewässer, vol. 3, p. 87; Wolf, 1934, Anim. Cavern. Catal., vol. 3, p. 103; Chace, 1943, Proc. New Engl. Zool. Cl., vol. 22, p. 34, pl. 5; Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 91.

Troglocubanus calcis Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 11.

Description: The rostrum is slender and straight, it reaches beyond the antennular peduncle, but fails to reach the end of the scaphocerite. There is one tooth placed on the upper margin of the rostrum, this tooth stands on the carapace slightly behind the orbit. The upper margin of the rostrum proper, as well as the lower margin is unarmed. The rostrum regularly tapers towards the tip, the lower margin is straight. The carapace is smooth, it is provided with antennal spines only. The antennal spine stands on the anterior margin of the carapace, some distance below the rounded lower orbital angle. A distinct branchiostegal groove is present.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower. The fifth pleura ends in a minute point. The sixth segment is somewhat longer than the fifth and about $\frac{2}{3}$ of the length of the telson. The telson has the anterior pair of dorsal spinules placed slightly behind its middle. The posterior dorsal spinules are situated closer to the anterior pair than to the posterior margin. The posterior margin is rounded and bears the usual two pairs of spinules; between the inner (= longer) spinules several hairs are present.

The eyes are ovate, but they end in a small acute tip. The cornea is strongly degenerated and possesses no pigment.

The stylocerite is short and blunt, it is pressed against the basal segment of the antennular peduncle and therefore difficult to see. The outer margin of the basal segment ends in a strong tooth, which overreaches the second segment of the peduncle. The anterior margin of the basal segment regularly slopes down from the anterolateral spine to the base of the second segment. The second segment is somewhat broader and much shorter than the third. The upper antennular flagellum has the fused part of the two rami consisting of 5 or 6 joints, the free part of the shorter ramus is composed of 15 or 16 joints and it is more than four times as long as the fused part.

The scaphocerite is broadly ovate, being about twice as long as broad. The outer margin is convex, the apex is broadly rounded and overreaches the final tooth. The antennal peduncle fails to reach the middle of the scaphocerite, a strong external tooth is present near the base of the scaphocerite.

The mandible has the incisor process heavy, ending in three teeth, the molar process ends in some blunt knobs. The maxillula has both laciniae slender, the palp is distinctly bilobed. The maxilla has the inner lacinia deeply bilobed, the two lobes are very elongate and slender, the palp and scaphognathite are normal in shape. The first maxilliped has the endites of coxa and basis separated by a distinct notch, the caridean lobe is well developed and rounded, the epipod is large and rounded. The second maxilliped has the usual shape, the epipod is provided with a large podobranch. The third maxilliped reaches about to the end of the scaphocerite. The last joint is slightly shorter than the penultimate, it is broadest at the base and tapers towards the apex. The penultimate segment is rather broad and is narrowed near the base. The antepenultimate segment is slightly less than twice as long as the ultimate, it is distinctly broadened near the apex. The exopod slightly overreaches the antepenultimate segment.

The first legs are slender, they reach with the chela beyond the scaphocerite. The fingers are almost 1.5 times as long as the palm. The carpus is 1.6 times as long as the chela and is about as long as the merus. The second legs are equal, they reach with the larger part of the carpus beyond the scaphocerite. The fingers are very long and slender, being 1.5 times as long as the palm. The cutting edge of the dactylus bears a small tooth in the extreme proximal part, no teeth are visible on the cutting edge of the fixed finger. The palm is swollen. The carpus is

slightly longer than the fingers, while the merus is about as long as the fingers. The ischium is as long as the palm. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is short and simple. The propodus is four times as long as the dactylus, it bears several minute spinules on the posterior margin. The carpus measures $\frac{2}{3}$ of the length of the propodus, while the merus is about as long as the latter joint. The ischium is almost half as long as the merus. The fifth leg is similar to the third, but is more slender: the propodus is more than five times as long as the dactylus, it possesses numerous transverse rows of setae in the distal part of the posterior margin.

The first pleopod of the male has the endopod elongate, without appendix interna. The second pleopod of the male has the appendix interna and appendix masculina of about the same size.

The uropods are normal in shape. The outer margin of the exopod ends in an immovable tooth, at the inner side of which there is a movable spine.

Size: The longest specimen known is 36.8 mm in length. I have seen no ovigerous females.

Colour: According to M. J. Rathbun the colour is whitish, but she did not state if this is the colour of the living animal.

Material examined: In the U. S. National Museum three cotypes of the present species are present.

Distribution: Up till now the species is known only from a pool in a cave between Madruga and Aguacate, Havana Province, Cuba.

Type: The type locality is mentioned above. The holotype and some cotypes are preserved in the Museum of Comparative Zoölogy at Harvard College, some other cotypes (including the specimen figured by M. J. Rathbun) in the U. S. National Museum.

Remarks: As Chace (1943) pointed out, the type material of *Palaemonetes calcis* Rathbun in the Museum of Comparative Zoölogy at Harvard is not homogeneous, but contains specimens of another species: *Troglocubanus inermis* (Chace). The same is true for the type material of *P. calcis* in the U. S. National Museum. Rathbun's description, however, is entirely based on specimens of the present species.

***Troglocubanus eigenmanni* (Hay)**

Pl. 37, figs. a-f

Palaemonetes eigenmanni Hay, 1903, Proc. U. S. Nat. Mus., vol. 26, p. 431, fig. 2.

Palaemonetes eigenmanni Pike, 1906, Biol. Bull. Woods Hole, vol. 11, p. 267, figs. 1-7.

- Palaemonetes eigenmanni* Eigenmann, 1909, Publ. Carnegie Inst., vol. 104, p. 202; M. J. Rathbun, 1912, Bull. Mus. Comp. Zool. Harvard, vol. 54, p. 453; Kemp, 1925, Rec. Indian Mus., vol. 27, p. 317; Spandl, 1926, Speläol. Monogr., vol. 11, p. 90.
- Palaemonetes Eigenmanni* Chappuis, 1927, Die Binnengewasser, vol. 3, p. 87.
- Palaemonetes eigenmanni* Wolf, 1934, Anim. Cavern. Catal., vol. 3, p. 103; Chace, 1943, Proc. New Engl. Zool. Cl., vol. 22, p. 34; Barbour, 1945, Naturalist Cuba, p. 192; Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 91.
- Troglocubanus eigenmanni* Holthuis, 1950a, Siboga Exped., mon., 39a9, p. 11.

Description: The rostrum is slender and turned upwards at the apex, it reaches to or slightly beyond the scaphocerite. The upper margin bears 6 to 8 teeth, the first three of which are placed on the carapace behind the orbit. The distal teeth are much wider spaced than the proximals. The lower margin is convex and entirely without teeth. The carapace is smooth and provided with antennal spines only. These spines stand some distance below the rounded lower angle of the orbit and differ from those of *T. calcis* by being removed from the anterior margin of the carapace, reaching with the apex just to this margin. The branchiostegal groove is distinct.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower and more triangular, their tips, however, are rounded too. The fifth segment is about $\frac{2}{3}$ as long as the sixth and half as long as the telson. The telson has the two pairs of dorsal spinules placed in about the middle and at $\frac{3}{4}$ of its length. The posterior margin of the telson is rounded, there are about four hairs between the inner of the two pairs of posterior spines.

The eyes are like in *T. calcis*.

The antennular peduncle, too, shows the same characters as in that species. The upper antennular flagellum has the fused part of the two rami consisting of 4 or 5 joints, the free part of the shorter ramus consists of 12 to 17 joints and is more than four times as long as the fused part.

The scaphocerite is broad, it is about 2.5 times as long as its greatest breadth. The outer margin is about straight and ends in a small final tooth, which is distinctly overreached by the rounded anterior margin.

The antennal peduncle fails to reach the middle of the scaphocerite. A distinct spine is present near the external side of the base of the scaphocerite.

The mouthparts show no appreciable differences from those of *T. calcis*.

The first leg reaches with part of the carpus beyond the scaphocerite. The fingers are about 1.5 times as long as the palm. The carpus is 1.5 times as long as the chela, it is longer than the merus. The second legs are equal, they are stronger than the first pair and reach with the larger part of the carpus beyond the scaphocerite. Here too the fingers are 1.5 times as long as the palm. A small tooth is present in the proximal part of the cutting edge of the dactylus. The carpus is about as long as the chela, and about 1.2 times as long as the merus. The ischium is $\frac{3}{4}$ of the length of the merus. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is simple and slender. The propodus is about 3.5 times as long as the dactylus and it bears several spinules on the posterior margin. The carpus is somewhat shorter than the propodus. The merus is 1.3 times as long as the carpus. The fifth leg is longer and more slender than the third.

The pleopods and uropods are as in *T. calcis*.

Size: The largest specimen of this species seen by me measures 30 mm, Rathbun (1912) mentions a specimen of 32 mm. There are no ovigerous females in the present material.

Material examined: In the U. S. National Museum material of this species is present from: Ashton (three specimens) and San Cristobal (one specimen) both localities lying in Pinar del Rio Province, and a specimen from Güira de Melena in Havana Province. Both provinces are situated in Cuba.

Distribution: The species only is known from caves in W. Cuba. The records in literature are: Ashton!, Modesta, Jaiguan and San Isidro, all near Cañas, Pinar del Rio Province, Cuba (Hay, 1903), Cañas (Pike, 1906), Güira de Melena, Havana Province, Cuba (M. J. Rathbun, 1912), Alacranes, Matanzas Province (Chace, 1943).

Type: The type locality is Ashton near Cañas, Pinar del Rio Province, Cuba. The holotype and some of the paratypes are preserved in the U. S. National Museum (Cat. No. 26349), the other paratypes are in the collection of the University of Indiana.

Troglocubanus gibarensis (Chace)

Pl. 38, figs. a-i

Palaemonetes gibarensis Chace, 1943, Proc. New Engl. Zool. Cl., vol. 22, p. 28, pl. 7; Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 91.

Troglocubanus gibarensis Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 11.

Description: Chace (1943) gives the following description of the species: "Carapace armed with a small antennal spine below the orbit, but without a branchiostegal spine. There is the usual faint, arched supra-branchial furrow and an oblique furrow running backward and downward from a point on the anterior margin below the antennal spine [= branchiostegal groove]. Rostrum reaching nearly as far as the end of the antennular peduncle, with subparallel margins proximally and tapering to a point distally, armed with two or three teeth above, one of which is behind the level of the hind margin of the orbit, and unarmed below; it is strengthened by a lateral keel on each side running from the posterior orbital margin to the tip. Abdomen smoothly rounded. The sixth somite is somewhat longer than high and at least one-half again as long as the fifth. Telson nearly one-half again as long as the sixth somite, armed with two pairs of dorsal spinules and two or three pairs of terminal spines, between which are six plumose setae; the anterior pair of dorsal spinules is placed about halfway from the base to the tip of the telson, and the posterior pair midway between the first pair and the tip.

"Eyes entirely without pigment, rounded distally and provided with a minute tubercle, just discernible in dorsal view at the outer distal angle. Inner antennular flagellum about as long as the carapace and half of the abdomen; outer flagellum fused for four segments, the free portion of the inner ramus made up of about fifteen segments, the outer branch about one and two-thirds times the length of the prawn. Antennal scale convex externally and evenly rounded distally; the outer spine protrudes but little beyond the outline of the scale. Antennal flagellum more than twice as long as the body of the animal. Third maxillipeds extend as far as the end of the antennal scale. Carpus of first pereopods slightly longer than the merus and nearly half again as long as the chela. Second pereopods long, extending beyond the antennal scale by the length of the chela and most of the carpus; carpus slightly longer than merus, but not more than two-thirds as long as the chela; palm slightly more than half as long as the slightly curved fingers. Last three pairs

of legs increasing in length from third to fifth; the dactyls are subparallel basally, then taper rather abruptly to a sharp point, thus forming an obtuse angle at about the mid-point of the outer margin as in *P. calcis*."

Size: The largest specimen in the collection studied by Dr. Chace is 25 mm long.

Distribution: No material of this species has been seen by me. The only record in literature is that of Chace (1943): Barrio de Cupeysillo, Termino de Gibara, Oriente Province, E. Cuba. The species was found in a deep well, entering an underground stream.

Type: The above cited locality is the type locality. The types (one holo- and 2 paratypes) are deposited in the Museum of Comparative Zoölogy at Harvard College, Cambridge, Mass.

Troglocubanus inermis (Chace)

Pl. 39, figs. a-i

Palaemonetes calcis p.p. M. J. Rathbun, 1912, Bull. Mus. Comp. Zoöl. Harvard, vol. 54, p. 451, pl. 1, fig. 4.

Palaemonetes inermis Chace, 1943, Proc. New Engl. Zool. Cl., vol. 22, p. 26, pl. 6; Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 91.

Troglocubanus inermis Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 11.

Description: The rostrum is rather high and short, reaching about to the end of the antennular peduncle. There are no teeth on the rostrum generally, though some specimens (in my material two of the four specimens) have a small tooth on the dorsal edge near the tip of the rostrum. Both upper and lower margin of the rostrum are convex. The carapace is smooth, it bears no spines at all, the antennal as well as the branchiostegal spines are absent. The lower angle of the orbit is rounded, or more or less truncate. A distinct branchiostegal groove is present.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower, but they have the tips rounded too. The sixth segment is about 1.5 times as long as the fifth, it is somewhat shorter than the telson. The two pairs of dorsal spinules of the telson are very small and placed close together in the posterior half of the telson; the distance between the spines is distinctly smaller than the distance between the posterior pair of spines and the posterior margin of the telson. The posterior margin is rounded, and provided at each corner with a long and a short spinule. Between the inner (longer) posterior spinules numerous (8 to 13) hairs are present.

The eyes are oval in shape, they end in a narrow and sharp point. The cornea is strongly reduced and possesses no pigment at all.

The stylocerite is short and blunt, it is pressed against the antennular peduncle. The anterolateral spine of the basal segment of the antennular peduncle is well developed and reaches to the anterior margin of the second segment. The anterior margin of the first segment gradually slopes down from the end of the anterolateral spine to the base of the second segment. The third segment is longer and more slender than the second. The fused part of the two rami of the upper antennular flagellum consists of four or five segments, the free part of the shorter ramus is composed of about 12 to 17 joints and is much longer than the fused part.

The scaphocerite is broad, it is less than twice as long as broad. The outer margin is convex. The final tooth is distinctly overreached by the rounded anterior margin of the lamella. The antennal peduncle reaches almost to the middle of the scaphocerite. A distinct external spine is visible near the base of that scale.

The mandible has the incisor process much more slender than in *Troglocubanus calcis*. The inner lacinia of the maxillula is strongly broadened, while the upper lacinia too is larger than in *T. calcis*. The maxilla is very similar to that of *T. calcis*, but the lobes of the endite are shorter. The first and second maxillipeds are like those of the type species, only the last two joints of the second maxilliped are less slender there. The third maxilliped reaches about to the end of the antennal peduncle or even to the end of the scaphocerite. The last joint is as long as or slightly longer than the penultimate, which is about half as long as the antepenultimate joint. The antepenultimate joint is of the same breadth throughout its length. The exopod reaches slightly beyond the end of the antepenultimate segment.

The first legs reach with the chela beyond the scaphocerite. The chela is oval in shape. The fingers are nearly 1.5 times as long as the palm, their inner side is hollowed, so that the cutting edge lies more to the outside. The carpus is almost twice as long as the chela, and somewhat longer than the merus. The second legs are equal, they reach only with part of the fingers beyond the scaphocerite. The fingers are about thrice as long as the almost quadrangular palm, they are hollowed at the inner surface just like the first leg, furthermore they are curved. There are no teeth on the cutting edges. The carpus is about as long as the fingers and half the palm together. The merus is of about the same length as the carpus. The ischium is slightly shorter than the

merus. The third leg reaches about to the end of the scaphocerite. The propodus is slightly more than thrice as long as the dactylus, it bears some spinules on the posterior margin. The carpus is somewhat more than half as long as the propodus, while the merus is distinctly longer than the latter joint. The fifth leg is far more slender than the third and reaches beyond the scaphocerite. The propodus is almost five times as long as the dactylus.

The pleopods are normal in shape. The appendix masculina is longer than the appendix interna of the second pleopod of the male.

The uropods are normal, except for the fact that the movable spine, which is placed at the inner side of the final tooth of the outer margin of the exopod, at its inner side is flanked by an immovable tooth. In this respect the species differs from both *T. calcis* and *T. eigenmanni*, which have this movable spine without the immovable tooth at its inner side.

Size: The total length of my largest specimen is 22 mm. None of the specimens examined by me bears ova.

Material examined: Among the cotype material of *Palaeomonetes calcis* Rathbun present in the U. S. National Museum, 4 specimens of the present species were found, they originated from a pool in a cave between Madruga and Aguacate, Havana Province, Cuba.

Distribution: The species is known only from the just cited locality, which is the type locality. It is recorded in literature from there by M. J. Rathbun (1912) and Chace (1943).

Type: The type locality is mentioned above. The holo- and paratypes are preserved in the Museum of Comparative Zoölogy at Harvard College.

Genus CREASERIA Holthuis, 1950a

Definition: Rostrum well developed, compressed. Upper and lower margin with teeth. Carapace smooth, provided with antennal and branchiostegal spines. Branchiostegal spine on anterior margin of carapace. Branchiostegal groove absent.

Telson with 2 pairs of dorsal and 2 pairs of posterior teeth. Setae present between the posterior teeth.

Eyes poorly developed, without pigment.

Mandible with a two-jointed palp. All maxillipeds with exopods. Pleurobranchs on third maxilliped and all pereopods.

First leg slender. Fingers longer than the palm. Second legs slightly more robust, equal, smooth. Last three legs, smooth, slender, dactylus

simple. Propodus of fifth leg with numerous transverse rows of setae in the distal part of the posterior margin.

Pleopods of the female normal, as in *Palaemon*. I unfortunately could not examine male specimens.

Uropods as in *Macrobrachium*.

Type: Palaemon morleyi Creaser, 1936.

The genus is closely related to *Palaemon*, but shows some very important differences, which have been pointed out in the key.

The type and only species is

***Creaseria morleyi* (Creaser)**

Pl. 40, figs. a-f

Palaemon morleyi Creaser, 1936, Publ. Carnegie Inst., n. 457, p. 126, figs. 25-30, tab. 1; Creaser, 1938, Publ. Carnegie Inst., n. 491, p. 163; Chace, 1943, Proc. New Engl. Zool. Cl., vol. 22, p. 33.

Creaseria morleyi Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 6.

Description: The rostrum is straight and reaches to the end of the scaphocerite. The upper margin bears 7 to 10 teeth, 1 or 2 of which are placed behind the orbit. The lower margin bears 1 to 3 teeth. All teeth are little pronounced. The carapace is somewhat swollen and smooth.

The abdomen too is smooth. The pleura of the fifth segment ends in a distinct sharp tooth. The 6th segment is only slightly longer than the fifth. The telson bears 2 pairs of dorsal spines which are placed in about the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin is rounded and ends in a minute sharp tooth. There are 2 pairs of posterior spinules, the inner of which overreaches the tip of the telson. Numerous setae are present between the inner spines.

The eyes are strongly reduced and possess no pigment, they are bullet-shaped.

The antennulae have the basal segment broad, with a strong and pointed stylocerite, which reaches distinctly beyond the middle of the basal segment. The anterolateral spine is very strong, reaching beyond the second segment of the peduncle. The anterior margin of the segment gradually merges into the anterolateral spine. The third segment is somewhat longer than the 2nd. The inner antennular flagellum has the two rami fused for 6 joints. The free part of the shorter ramus is much longer than the fused part and consists of 25 joints.

The scaphocerite is broad, being twice as long as broad. The outer margin is convex. The final tooth just fails to reach the end of the lamella.

The first legs reach with the chela beyond the scaphocerite. The fingers are 1.5 times as long as the palm. The carpus is somewhat longer than the chela and about as long as the merus. All joints are smooth. The second legs are slender, though more robust than the first, they too are smooth. The fingers are about 1.5 times as long as the palm. The merus is shorter than the chela, but longer than the carpus. The fixed finger possesses a serrate tubercle in the proximal part of the cutting edge, the dactylus possesses there a distinct indentation (in juvenile specimens this tubercle and indentation are absent). The third leg reaches with part of the propodus beyond the scaphocerite. The propodus is more than thrice as long as the dactylus, twice as long as the carpus and as long as the merus. The fifth leg reaches with about half the propodus beyond the scaphocerite. The propodus is about 5 times as long as the dactylus, somewhat less than twice as long as the carpus and somewhat longer than the merus.

Size: According to Creaser (1936) the type is 33.5 mm long. The specimen in the U.S. National Museum measures 42 mm.

Material examined: In the U.S. National Museum a female paratype is present from Amil Cave, Yucatan, while I also examined the paratypes from the Amil and Balaam Canche Caves, which are deposited in the Museum of Zoology of the University of Michigan.

Distribution: The species is only known from caves in Yucatan, Mexico. The records in literature are: San Bulha Cave at Motul (Creaser, 1936), San Isidro and Amil! Caves near Merida, Balaam Canche Cave! near Chichen Itza (Creaser, 1936, 1938), Chac Mol Cave near Tohil, Hochtun Cave at Hochtun, Yunchen Cave at Libre Union, Gongora Cave at Oxkutzcab and Spukil Cave at Calcehtok (Creaser, 1938).

Genus LEANDER E. Desmarest, 1849

Definition: The rostrum is well developed, compressed and provided with teeth. The carapace is armed with antennal and branchiostegal spines, the latter are placed some distance behind the anterior margin of the carapace. No branchiostegal groove is present.

The telson bears two dorsal and two posterior pairs of spines. Two very strong feathered setae are placed on the posterior margin between the inner spines.

The eyes have the cornea well developed and pigmented.

The mandible bears a two-jointed palp. All maxillipeds are provided with exopods. Pleurobranchs are present on the third maxilliped and all pereopods.

The dactyli of the last three pereopods are simple. No transverse rows of short hairs are present in the distal part of the posterior margin of the propodus of the fifth legs.

The first pleopod of the male has the endopod provided with a distinct appendix interna.

Type species: Leander erraticus E. Desmarest, 1849, a species considered at present identical with *Leander tenuicornis* (Say).

This genus is represented in American waters only by one species, namely the type of the genus:

Leander tenuicornis (Say)

Pl. 41, figs. a-g; pl. 42, figs a-f

Astacus locusta Fabricius, 1781, Spec. Ins., vol. 1, p. 513 (non Pennant, 1777); Fabricius, 1787, Mant. Ins., vol. 1, p. 333.

Cancer pennaceus p.p. Gmelin, 1789, Linn. Syst. Nat., ed. 13, vol. 1, p. 2988.

Astacus Locusta Olivier, 1791, Encycl. méth. Hist. nat., vol. 6, p. 348; Petagna, 1792, Inst. Entom., p. 417.

Astacus locusta Fabricius, 1793, Ent. Syst., vol. 2, p. 486.

Astacus Locusta Weber, 1795, Nomencl. Ent., p. viii.

Palaemon locusta Fabricius, 1798, Suppl. Ent. Syst., p. 404.

? *Penaeus punctatissimus* Bosc, 1801, Hist. nat. Crust., vol. 2, p. 109, pl. 14, fig. 3.

? *Palaemon locusta* Bosc, 1801, Hist. nat. Crust., vol. 2, p. 105.

? *Penaeus punctatissimus* Latreille, 1802, Hist. nat. Crust. Ins., vol. 6, p. 248, pl. 54, fig. 1.

non *Palaemon locusta* Latreille, 1802, Hist. nat. Crust. Ins., vol. 6, p. 256.

? Without name Krusenstern, 1814, Atlas Reise um die Welt, pl. 22, fig. 1.

Palaemon tenuicornis Say, 1818, Journ. Acad. Nat. Sci. Phila., vol. 1, p. 249.

? *Penaeus adspersus* Tilesius, 1818, Ann. Wetterau. Ges. Naturk., vol. 4, p. 4, pl. 21a, fig. 1.

? *Penée ponctué* A. G. Desmarest, 1830, Bosc's Man. Hist. nat. Crust., ed. 2, vol. 2, pl. 14, fig. 3.

- Palaemon natator* H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 393.
- Palémon tenuirostre* H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 395.
- Palaemon latirostris* De Haan, 1841, Fauna Japonica, Crust., atlas, pl. 45, fig. 12.
- Palaemon natator* Krauss, 1843, Südafr. Crust., p. 55.
- Palaemon tenuicornis* De Kay, 1844, Nat. Hist. New York, Crust., p. 30.
- Palaemon locusta* Gibbes, 1845, Proc. Boston Soc. Nat. Hist., vol. 2, p. 70.
- Palaemon natator* Goodsir, 1845, Ann. Mag. Nat. Hist., vol. 15, p. 74, pl. 7, fig. 3; White, 1847, List Crust. Brit. Mus., p. 77.
- Palaemon tenuicornis* White, 1847, List Crust. Brit. Mus., p. 78.
- Leander erraticus* E. Desmarest, 1849, Ann. Soc. entom. France, ser. 2, vol. 7, p. 92, fig.
- Palaemon latirostris* De Haan, 1849, Fauna Japonica, Crust., p. 170.
- Palaemon locusta* Gibbes, 1850a, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198.
- Palaemon Locusta* Hope, 1851, Catal. Crust. Ital., p. 17.
- Palaemon natator* Dana, 1852, U.S. Explor. Exped., vol. 13, p. 588; Dana, 1855, U.S. Explor. Exped., vol. 13, atlas, p. 12, pl. 38, fig. 11.
- Leander natator* Stimpson, 1860, Proc. Acad. Nat. Sci. Phila., 1860, p. 40.
- Palaemon natator* A. Milne Edwards, 1862, Maillard's Ile Réunion, Ann. F, p. 16; Heller, 1863, Crust. südl. Europ., p. 268, pl. 9, figs. 11, 12; Grube, 1864, Jber. Schles. Ges. vaterl. Cult., vol. 41, p. 62; Barcelo y Combis, 1875, An. Soc. Esp. Hist. nat., vol. 4, p. 65.
- Palaemon torensis* Paulson, 1875, Invest. Crust. Red Sea, p. 116, pl. 17, fig. 3.
- Leander natator* Miers, 1876, Catal. Crust. New Zeal., p. 86.
- Leander tenuicornis* Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 66; Smith, 1879, Trans. Connect. Acad. Arts Sci., vol. 5, p. 122.
- Palaemon natator* De Folin & Périer, 1881?, Les Fonds de la Mer, vol. 4, p. 172.
- Leander natator* De Man, 1881, Notes Leyden Mus., vol. 3, p. 143; Haswell, 1882, Catal. Aust. Crust., p. 195.
- Palaemon tenuirostris* Carus, 1885, Prodr. Faun. Medit., vol. 1, p. 474.
- Leander natator* Filhol, 1885, Bibl. Éc. haute Étud., vol. 30, pt. 2, p. 52; Filhol, 1886, Miss. Ile Campbell, Zool., vol. 3, pt. 2, p. 434.

- Leander tenuicornis* Perrier, 1886, Explor. sous-mar., p. 81.
? *Hippolyte tenuirostris* Perrier, 1886, Explor. sous-mar., p. 81, fig. 32.
Palaemon natator Buen, 1887, An. Soc. Esp. Hist. nat., vol. 16, p. 420.
Leander natator De Man, 1888, Arch. Naturgesch., vol. 53, pt. 1, p. 563.
Palaemon natator Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 784, pl. 128, figs. 6, 7.
Leander natator Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 525.
Palaemon natator Bolivar, 1892, Act. Soc. Esp. Hist. nat., vol. 21, p. 131.
Palaemon (Leander) erraticus Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 8.
Palaemon (Leander) latirostris Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 10.
Palaemon (Leander) natator Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 11.
Leander tenuicornis Ortmann, 1893, Ergebn. Plankton Exped., vol. 2Gb, p. 48.
Leander natator Sharp, 1893, Proc. Acad. Nat. Sci. Phila., p. 120.
Palaemon natator Nutting, 1895, Bull. Lab. nat. Hist. State Univ. Iowa, vol. 3, p. 29.
Leander paulensis Ihering, 1897, Rev. Mus. Paulista, vol. 2, p. 422; Ortmann, 1897, Rev. Mus. Paulista, vol. 2, p. 192, pl. 1, fig. 14.
Palaemon (Leander) tenuicomis Kingsley, 1899, Amer. Nat., vol. 33, p. 718.
Periclimenes parasiticus Nobili, 1899, Ann. Mus. Stor. Nat. Genova, vol. 40, p. 235.
Periclimenes tenuipes p. p. Nobili, 1899, Ann. Mus. Stor. Nat. Genova, vol. 40, p. 235.
Leander natator Rankin, 1900, Ann. New York Acad. Sci., vol. 12, p. 538.
Pandalus tenuicornus Rankin, 1900, Ann. New York Acad. Sci., vol. 12, p. 544.
Palaemon natator Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 482.
non *Leander paulensis* Moreira, 1901, Arch. Mus. Nac. Rio de Jan., vol. 11, p. 11.
Palaemon (Leander) natator Nobili, 1901a, Ann. Mus. zool. Univ. Napoli, n. ser., vol. 1, pt. 3, p. 6.
Leander natator Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Palaemon affinis p. p. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 125.
Palaemon paulensis M. J. Rathbun, 1902a, Bull. U.S. Fish Comm., vol. 20, pt. 2, p. 125.

- Palaemon natator* Thomson, 1903, Trans. Linn. Soc. Lond. Zool., ser. 2, vol. 8, p. 450.
- Palaemon tenuirostris* Calvet, 1905, Trav. Inst. zool. Montpellier, ser. 2, vol. 15, p. 61.
- Leander natator* Nobili, 1906, Ann. Sci. nat. Zool., ser. 9, vol. 4, p. 74.
- Palaemon tenuicornis* Cary & Spaulding, 1909, Contrib. Fauna Louisiana coast, p. 10.
- Palaemon tenuirostris* Calvet, 1910, Trav. Inst. zool. Montpellier, ser. 2, vol. 20, pt. 4, pp. 12, 19.
- Palaemon tenuicornis* Fowler, 1912, Ann. Rep. New Jersey State Mus., 1911, p. 558.
- Palaemon natator* Murray & Hjort, 1912, Depths of the Ocean, p. 671.
- Palaemon tenuicornis* Sumner, Osburn & Cole, 1913, Bull. U.S. Bur. Fish., vol. 31, pp. 137, 663.
- Leander tenuicornis* Lenz & Strunck, 1914, Deutsche Süd-Polar Exped., vol. 15, p. 323; Stebbing, 1914, Trans. Roy. Soc. Edinb., vol. 50, p. 288.
- Leander natator* Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 31; Bolivar, 1916, Bol. Soc. Esp. Hist. nat., vol. 16, p. 251; Buen, 1916, Bol. Soc. Esp. Hist. nat., vol. 16, p. 362.
- Palaemon tenuicornis* Hay & Shore, 1918, Bull. U.S. Bur. Fish., vol. 35, p. 392, pl. 27, fig. 6.
- Palaemon paulensis* Luederwaldt, 1919, Rev. Mus. Paulista, vol. 11, p. 430.
- Palaemon tenuicornis* M. J. Rathbun, 1919, Boeke's Rapp. Visscherij Curaçao, vol. 2, p. 323.
- Leander tenuicornis* Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 392; Verrill, 1922, Trans. Connect. Acad. Arts Sci., vol. 26, p. 143, pl. 43, fig. 4.
- Palaemon tenuicornis* Beebe, 1924, Galapagos, p. 431.
- Palaemon paulensis* Schmitt, 1924a, Bijdr. Dierk., vol. 23, p. 72.
- Palaemon tenuicornis* Schmitt, 1924a, Bijdr. Dierk., vol. 23, p. 72; Schmitt, 1924b, Zoologica, New York, vol. 5, p. 168.
- Leander tenuicornis* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 302, fig. 11.
- Palaemon paulensis* Luederwaldt, 1929, Rev. Mus. Paulista, vol. 16, p. 53.
- Leander tenuicornis* Boone, 1930, Bull. Vanderbilt mar. Mus., vol. 3, p. 137, pl. 47.
- Palaemon tenuicornis* Cowles, 1930, Bull. U.S. Fish Comm., vol. 46, pp. 356, 358.

- Palaemon natator* Nouvel, 1932, Bull. Mus. Hist. nat. Paris, ser. 2, vol. 4, p. 409.
- Palaemon paulensis* Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 160.
- Palaemon tenuicornis* Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 161, fig. 26.
- Leander tenuicornis* Gurney, 1936, Proc. Zool. Soc. Lond., 1936, p. 619; Gurney, 1938, Sci. Rep. Great Barrier Reef Exped., vol. 6, p. 4, figs. 8-16; Gurney, 1939, Ann. Mag. Nat. Hist., ser. 11, vol. 3, p. 120, figs. 1, 2a.
- Leander natator* Maccagno, 1939, Boll. Mus. Zool. Anat. Comp. Torino, vol. 47, p. 439.
- Palaemon tenuicornis* Schmitt, 1939, Smithson. Misc. Coll., vol. 98, pt. 6, p. 28.
- Leander tenuicornis* Gurney & Lebour, 1941, Journ. Linn. Soc. Lond. Zool., vol. 41, p. 145.
- Palaemon tenuicornis* Anonymus, 1942, Annot. List Fauna Grand Isle Region, p. 6; Coventry, 1944, Monogr. Acad. Nat. Sci. Phila., vol. 6, p. 536.
- Leander tenuicornis* Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 26, figs. 1, 2; Holthuis, 1950c, Fauna van Nederland, vol. 15, p. 64.

Description: The rostrum is well developed, it is high in the female, more slender in the male. It reaches about to the end of the scaphocerite. The upper margin is provided with 8 to 14 teeth, which are regularly divided over the entire rostrum, the first two of these teeth are placed behind the posterior limit of the orbit. The lower margin bears 5 to 7 teeth. Like in some other species of Palaemonidae a double row of setae is implanted along the lower margin of the rostrum, thereby concealing the lower teeth. The carapace is smooth, it is provided with antennal and branchiostegal spines. The branchiostegal spine is placed some distance behind the anterior margin of the carapace. No branchiostegal groove is present.

The abdomen is smooth. The first three pairs of pleurae are broadly rounded, the pleurae of the fourth and fifth abdominal segment are narrower and both end in a minute acute tooth. The sixth abdominal segment is slightly longer than the fifth and about $\frac{2}{3}$ of the length of the telson. The telson is provided with two pairs of dorsal and two pairs of posterior spines. The dorsal spines are placed in about the middle and $\frac{3}{4}$ of the length of the telson. The inner of the two pairs of posterior spines is the longer and distinctly overreaches the acute tip of the telson. Between these inner spines a pair of strong feathered setae is present.

The eyes have the cornea well developed and rounded. There are two dark coloured bands visible on the cornea, especially in fresh material.

The basal segment of the antennula has the stylocerite large and pointed, it reaches distinctly beyond the middle of the basal segment. The anterolateral spine of this segment is very strong too, it reaches almost to the end of the second segment of the peduncle. The anterior margin of the basal segment between the anterolateral spine and the second segment is straight or only slightly convex. The second and third segments are shorter and narrower than the first. The upper flagellum has the fused portion of the two rami much shorter than the free part of the shorter ramus.

The scaphocerite is three to five times as long as broad. The outer margin is straight or slightly convex. The final tooth is strong and reaches about to the end of the lamella. The antennal peduncle fails to reach the middle of the scaphocerite. A strong external spine is present near the base of the scaphocerite.

The mandible has the incisor process ending in three large teeth, the molar process ends in some blunt knobs, a two-jointed palp is present. The maxillulla has both laciniae not very broad, the palp is distinctly bilobed. The maxilla has the inner lacinia deeply cleft in two narrow lobes, the palp is well developed, the scaphognathite is large and slender. All the maxillipeds are provided with well developed exopods. The first maxilliped has the basis and coxa separated by a distinct notch, the palp is slender, a distinct caridean lobe is present, the epipod is large and bilobed. The second maxilliped is of the usual shape, the epipod bears a large podobranch. The third maxilliped fails to reach the end of the scaphocerite. The last segment is somewhat more than half as long as the penultimate segment. The antepenultimate segment is slightly longer than the penultimate. The exopod reaches almost to the end of the antepenultimate segment. An arthrobranch and a pleurobranch are present.

A pleurobranch is present at the bases of all pereopods. The first legs are slender, they reach about to the end of the scaphocerite. The fingers are distinctly longer than the palm. The second legs are more robust than the first, they are equal in size and shape. The fingers are longer than the palm, the latter is somewhat swollen. The cutting edge of the fingers is entire except for a small basal tooth in the males. The carpus is distinctly shorter than the chela, and about as long as the merus. The ischium is somewhat shorter than the merus. The second

legs reach with the chela beyond the scaphocerite. The last three legs are slender. The third leg fails to reach the end of the scaphocerite. The dactylus is simple and slender. The propodus is 2.5 times as long as the dactylus, it bears spines on its posterior margin. The carpus is about half as long as the propodus, while the merus has the same length as the latter joint. The fifth leg is distinctly more slender than the third. The propodus is thrice as long as the dactylus, it too bears posterior spinules. There are no transverse rows of hairs in the distal part of the posterior margin of the propodus.

The first pleopod of the male bears a well developed appendix interna on the endopod. Appendices internae furthermore are present on the second to fifth pleopods of both male and female, like in most other Palaemonidae. The second pleopod of the male bears an appendix masculina which is almost as long as the appendix interna.

The uropods are shaped as in *Macrobrachium* and *Palaemon*.

Females differ from the males by having the rostrum much higher, generally the males are smaller than the females.

Size: The species may attain a length of 47 mm. Ovigerous females of 26 mm have been reported (Kemp, 1925). The eggs are numerous and small, measuring 0.5 to 0.8 mm in diameter.

Colour: According to notes made by Dr. Waldo L. Schmitt on Tortugas, specimens of the present species collected near Tortugas were coloured "Bice green and oilgreen, or tawny olive and olive, with opaque spots." Kemp (1925, p. 304) gives the following account of the colour of living specimens from India: "In life the species is closely mottled with umber, sienna or rich red brown, the mottling tending towards an arrangement in longitudinal streaks. Sometimes there is an ill-defined pale mid-dorsal stripe. The second legs are often rather conspicuously banded with brown and pure white; the palm is dark brown, sometimes with a sprinkling of red chromatophores. The other appendages are banded with brown, with occasional touches of white. The eggs also are brown."

Material examined: The Allan Hancock Expedition 1939 collected material of this species from:

Panama (Atlantic coast): Caledonia Bay. 1-5 fms, hard sand, April 4, 1939, Sta. A7-39, 7-12 fms, mud, April 26, 1939, Sta. A53-39.

In the U.S. National Museum material of this species is present from off Massachusetts (Cape Cod, Woods Hole, Nantucket, Martha's Vineyard), off Virginia, Beaufort (North Carolina), off North and South Carolina, off Florida (St. Augustine, Cape Canaveral, Jupiter

Inlet, Miami, Cape Florida, Cutler Flats, Newfound Harbor Key, Marquesas Key, Key West, Tortugas, Marco Pass, Punta Rassa, Hog Island Key), Louisiana (Grand Isle, Cameron, Calcasieu Pass); Texas (Pass Cabello), Gulf of Mexico, Panama (Fox Bay near Colon), Colombia (Sabanilla, Santa Marta), Bermuda, Georges Bank, Bahamas (Abaco, Exuma Sound, off Nassau, between Cat and Eleuthera Islands, Samana Cay), E. and S. of Cuba, Jamaica (Montego Bay), N. of Porto Rico, N. of Culebra, St. Thomas, Curaçao, and various localities in the Atlantic Ocean off the Antilles. A jar with numerous specimens of this species is labelled "Galapagos Islands?" this, however, probably is incorrect; this is the more probable, since the lot in question also contained specimens of the Atlantic gulfweed crab *Planes minutus* (L.) (see Chase, 1951, p. 78).

In the Museum of the Academy of Natural Sciences at Philadelphia, Pa., 2 dry specimens of the present species are preserved as "*Palaemon Mexicanus* Guérin." They originate from Mexico and are from the Guérin collection. Guérin's name is a manuscript name, as far as I can ascertain it never was published. I also examined the (likewise dry preserved) specimens mentioned under Nos. 345 and 346 in Sharp's (1893, p. 120) list, under the name *Leander natator*.

The Rijksmuseum van Natuurlijke Historie, Leiden, Holland, possesses, apart from material of this species from the Malay Archipelago and Japan, specimens from Curaçao (Rifwater), the Sargassum Sea and the northern Atlantic Ocean (29°N, 38°W; 27°N, 42°10'W; 23°N, 35°W). The Zoological Museum in Amsterdam too possesses material from the Malay Archipelago, the Sargassum Sea and the northern Atlantic Ocean (30°N, 70°W; 26°32'N, 73°W); furthermore its collections contain specimens of this species from Gairaca, Santa Marta (Colombia) and from Curaçao (Spaansche Haven and Spaansche Water).

Distribution: The species is known from tropical and subtropical seas all over the world, except for the American west coast. It lives in floating *Sargassum*, but also occurs in shallow water near the seashore between seaweeds. The records in literature are:

Atlantic: Atlantic Ocean (? Bosc, 1801; Goodsir, 1845; White, 1847; Dana, 1852; Stimpson, 1860; Kingsley, 1878; Bate, 1888; Ortmann, 1890; Sharp, 1893), Sargassum Sea (De Folin & Périer, 1881; De Man, 1881; Ortmann, 1893), Gulf Stream (Smith, 1879; Nutting, 1895; Fowler, 1912), Florida Stream (Ortmann, 1893), Newfoundland Bank (Say, 1818; White, 1847), 41°25'N, 66°20'W (Smith,

1879), Vineyard Sound, Massachusetts (Sumner, Osburn & Cole, 1913), Menemsha Bight, Martha's Vineyard Island, Massachusetts (Sumner, Osburn & Cole, 1913), Bermuda (Smith, 1879; Rankin, 1900; Verrill, 1922; Gurney, 1939; Gurney & Lebour, 1941), Mouth of Chesapeake Bay (Cowles, 1930), Beaufort, N. Carolina (Hay & Shore, 1918), 30 miles E. of Palm Beach, Florida (Coventry, 1944), Punta Rassa and Marco, Florida (M. J. Rathbun, 1902a), Turtle Harbor, Florida (Boone, 1930), Grand Isle, Louisiana (Anonymous, 1942), Cameron, Louisiana (Cary & Spaulding, 1909), Stirrup Key, Bahamas (Coventry, 1944), Three Hogsty Key, San Salvador (Boone, 1930), 30 miles N.W. of Little Inagua Island and 50 miles N.W. of Great Inagua Island, Bahamas (Coventry, 1944), Antilles (Sharp, 1893), off Cuba (Schmitt, 1924b, Beebe, 1924; Boone, 1930), Porto Rico (M. J. Rathbun, 1902a; Schmitt, 1935), St. Thomas, Virgin Islands (Schmitt, 1935), Guadeloupe (E. Desmarest, 1849), Old Providence Island, Colombia (Schmitt, 1939), Curaçao (M. J. Rathbun, 1919; Schmitt, 1924a), Ilha São Sebastião near São Paulo, Brazil (Ihering, 1897; Ortmann, 1897; Luederwaldt, 1919, 1929), Falkland Islands (Kemp, 1925), Genoa, Italy (Heller, 1863; Carus, 1885), Corsica, France (Heller, 1863; Carus, 1885), Cette, France (Calvet, 1905, 1910), Baleares, Spain (Barcelo y Combis, 1875; Buen, 1887, 1916; Bolivar, 1916), Ras-el-Zur, Tripolitania (Maccagno, 1939), ? Algiers (Ortmann, 1890), South of the Azores (Lenz & Strunck, 1914), Central Atlantic Ocean: 33°53'N, 32°27'W, 32°11'N, 34°10'W, and 29°54'N, 34°10'W (Stebbing, 1914), 27-30°N 35-40°W (Krauss, 1843), 24°26'N, 34°32'W, and 23°53'N, 53°06'W (Sharp, 1893), 23°N, 35°W (De Man, 1881).

Indo-westpacific: Indian Ocean (H. Milne Edwards, 1837), Red Sea (Paulson, 1875), Ain Musa and Tor, Gulf of Suez (Kemp, 1925), Ghardaqa, Gulf of Suez (Gurney, 1938), Mersa Wadi Lehama (Tattersall, 1921), Jidda, Arabia (Balss, 1915), Eritrea (Nobili, 1901a, 1906), Kamaran (Balss, 1915), Perim (Nobili, 1906; Balss, 1915), Jibuti (Nobili, 1906), Aden (Nobili, 1906), Réunion (A. Milne Edwards, 1862), Kilakarai, Apa Island, and Pamban, both in the Gulf of Manaar, S. India (Kemp, 1925), Ross Channel and North Bay, Andaman Islands (Kemp, 1925), Octavia Pt., Nancowry Harbour and Camorta Island, Nicobar Islands (Kemp, 1925), Japan! (De Haan, 1849; De Man, 1881), Kochi, Japan (Ortmann, 1890), Noordwachter Island, Java! (De Man, 1888), Waigeo, near N.W. New Guinea! (De Man, 1881), Australia (Haswell, 1882), New Zealand (Miers,

1876; Filhol, 1885; Thompson, 1903), South Island, New Zealand (Filhol, 1886). (For additional records on distribution see Holthuis, 1950a.)

Type: The type locality is Newfoundland Banks. The type specimens are preserved in the collection of the Academy of Natural Sciences at Philadelphia, Pa. (vid. Coventry, 1944). White (1847) lists in the catalogue of the Crustacea of the British Museum two specimens of "*Palaemon tenuicornis*" from Banks of Newfoundland, "Presented by Thomas Say, Esq." These specimens probably are syntypes.

Remarks: The fact that the present species has the mandibular palp two-jointed has already been observed by Tattersall (1921) and Gurney (1938). Dana's (1855) and Paulson's (1875) figures of a three-jointed palp in all probability are incorrect; this error probably is due to the fact that the last joint of the palp is very long.

Schmitt (1935) pointed to the close resemblance between *Leander tenuicornis* and *L. paulensis*, but nevertheless considered them to be distinct species. The differences which were used to separate the two forms are:

1. In *Leander tenuicornis* the fingers of the second legs are longer and the palm is much swollen, while in *L. paulensis* the fingers are of about the same length as the palm, which is thick but not swollen.
2. The final tooth of the scaphocerite in *L. tenuicornis* fails to reach the end of the lamella, in *L. paulensis* it overreaches the lamella.
3. The rostrum in *L. tenuicornis* bears 8 to 11, in *L. paulensis* 11 to 13 dorsal teeth.

In the specimens examined by me the length of the fingers of the second legs is rather variable, as is stated also by Kemp (1925) for his material; the palm of that leg, moreover, is more swollen in some specimens than in others. The relation between the length of the final tooth of the scaphocerite and that of the lamella equally proved to be too variable to be used for specific distinction in this case. The number of teeth of the upper margin of the rostrum in my material varies between 8 and 14, and there is no indication that a large number of teeth is connected with any of the other characters mentioned above. After examination of material in the U. S. National Museum, and in the Zoological Museum at Amsterdam, Holland, which was identified as *Palaemon paulensis*, and after comparing it with the large material of *Leander tenuicornis* at my disposal, I came to the conclusion that it is impossible to consider the two forms to be distinct species, or even varieties. *Palaemon paulensis* thus is synonymized here with *Leander*

tenuicornis. Schmitt (1935, p. 162) himself remarks also that in his material of *L. tenuicornis* some specimens were present, which "vary toward *P. paulensis* and in some degree are intermediate between that species and *P. tenuicornis*."

The specimens referred by Moreira (1901) to *Leander paulensis*, certainly do not belong to the present species as is shown by the rostral formulae of Moreira's material and by the fact that the fingers of the second chelae are stated by Moreira to be much shorter than the palm. There can be little doubt that Moreira's specimens in reality belong to *Palaemon northropi*.

The specimen from Arroyo, Porto Rico, identified by M. J. Rathbun (1902a) as *Palaemon affinis*, on examination proved to belong in the present species.

The present species was described for the first time by Fabricius (1781) under the name *Astacus locusta*. Fabricius's description runs as follows: "A[stacus] antennis posticis trifidis, thorace laeui, rostro porrecto supra serrato, subtus laeui, digitis elongatis filiformibus. Habitat — Mus. Dom. Banks. Statura praecedentis [*Astacus squilla*], at minor. Rostrum elongatum, supra serratum, subtus laeue. Thorax laeuis margine vtrinque videntato. Pedes antici elongati, filiformes. Manus ouatae, breues digitis elongatis, linearibus, acutis." In 1787 Fabricius identified the species with *Cancer pennaceus* of Linnaeus (1758), without, however, changing the name. *Cancer pennaceus* L. is no Palaemonid, but a Penaeid prawn, as is distinctly shown by Linnaeus's (1754) description in the Museum Adolphi Friderici, p. 87: "*Cancer macrourus, thorace cylindrico, rostro ensiformi margine superiore serrato. Testa cylindrica, laevis, magnitudine astaci: Rostro ensiformi, compresso, margine superiore serrato. Os pinna utrinque pennacea, recurva. Pedum paria 5, teretia, cylindrica. Chelae tribus primis paribus angustae, aequales, laeves, parum uniformes, nec manus distinctae chelis majoribus. Cauda articulis 7, quorum postici supra carinati; ultimus subulatus, carina sulco excavata."*

That *Cancer pennaceus* is not identical with *Astacus locusta* is at once clear when one compares the statement of Linnaeus that his animal is as large as the crayfish and that of Fabricius that *A. locusta* is smaller than the prawn. In a later description of *Astacus locusta*, which is virtually the same as that of 1781, Fabricius (1793) gives the locality in which the species was collected: "Habitat in Oceano. Mus. Dom. Banks." Fabricius's description and also the locality he gives fits entirely for the present species. The only difference is the fact that in *Leander tenuicornis* the lower margin of the rostrum

bears several teeth, while Fabricius states that the margin is entire in his *A. locusta*. This difference, however, may be explained by that the hairs in the lower half of the rostrum entirely cover the lower rostral teeth. This was already found by Kemp (1925, p. 302) who remarks that the hairs "overlie the teeth and render them almost invisible, with the result that the species has more than once been described as having the lower border unarmed." Fabricius's name *locusta*, though being the first ever given to the present species, may not be used as it is invalid: *Astacus locusta* Fabricius (1781) namely is preoccupied by *Astacus locusta* Pennant (1777), a name given by the English author to *Cancer locusta* Linnaeus (1758), a species of Amphipoda, known at present as *Gammarus locusta* (L.).

Bosc (1801) gives a figure and a description of a prawn, which he names Pénéé très-ponctué (*Penaeus punctatissimus*) and which he abundantly found "dans sa traversée d'Europe en Amérique - - - - - sur les fucus nageans." The figure is very poor, but makes it clear that we have not to do here with a Penaeid prawn. It is most probable in my opinion that the species in reality belongs to *Leander tenuicornis*, in favour of which supposition is the fact that the palms of the chelipeds are swollen and that the fingers are elongate. In Atlantic *Sargassum* three species of prawns are abundant: *Leander tenuicornis*, *Hippolyte coerulescens*, and *Latreutes fucorum*. The shape of the rostrum as figured by Bosc is totally different from that of the two latter species and shows most resemblance to that of *L. tenuicornis*, though differences may be observed. It is possible, however, that these differences are due to incorrectnesses in the figure. Bosc's description, at least with regard to the shape of the rostrum, that of the antenna and the situation of the eyes, probably is made after the figure, so that it is of no great help for the identification. Summarizing we may conclude that *Penaeus punctatissimus* differs strongly from all macruran Crustacea living on *Sargassum*, except for *Leander tenuicornis*, and that the differences shown may be due to errors in Bosc's figure. The poorness of Bosc's description and figure make certain identification not possible, so that it is better to disregard Bosc's name, which should be the oldest valid name for the present species, and to use the well known name of Say.

Tilesius (1818) figures a species, which he names *Penaeus adspersus* and which was found on high sea. The figure, which also is inserted in Krusenstern's (1814) Atlas without, however, being explained there, shows a remarkable resemblance to Bosc's figure of *Penaeus punctatissimus*. This resemblance is so strong, that it does not seem improbable

that Tilesius's figure is made after that of Bosc, the more as Tilesius gives *Panaeus punctatissimus* as a synonym for his species. Tilesius, however, corrected Bosc's figure in several points; so for instance the lower margin of the rostrum is figured serrate in the 1818 figure, while moreover there are shown three pairs of walking legs behind the large ~~scute~~ chelae instead of two.

Examination of the Pontoniinae described by Nobili (1899) showed that the specimen identified by him with *Periclimenes parasiticus* Borr., and part of the material brought by him to *Periclimenes tenuipes* Borr. actually are *Leander tenuicornis*. This material, which is preserved in the Museo Civico di Storia Naturale in Genoa, Italy, originates from Beagle Bay, Papua.

Genus PALAEMON Weber, 1795

Definition: Rostrum well developed, toothed. Carapace smooth, with antennal and branchiostegal spines. Branchiostegal groove present.

Abdomen smooth. Telson with 2 pairs of dorsal and 2 pairs of posterior spines. Posterior margin of telson pointed. Two feathered setae between the inner posterior spines.

The mandible possesses a 2 or 3 jointed palp. The other oral parts and branchial formula as in *Macrobrachium*.

First pereopods slender, smooth. Second legs equal, somewhat stronger than first, smooth. Last 3 legs slender. Dactylus simple. Generally a row of spines along the posterior margin of the propodus. Propodus of fifth leg with numerous transverse rows of hair in the distal part of its posterior margin.

Type species: *Cancer Squilla* Linnaeus, 1758, a species from the eastern Atlantic.

Pleopods and uropods as in *Macrobrachium*.

In the American fauna this genus is represented by the three ~~known~~ subgenera, namely *Palaemon* s.s., *Palaeander* and *Nematopalaemon*. The differences between these subgenera have already been given in the key (p. 2).

Nine species of the genus are known at present from American waters, five of these inhabit the west coast, four are found on the east coast.

The species may be distinguished as follows:

1. Rostrum with an elevated basal crest on dorsal margin. This crest formed by 3 to 5 teeth. No branchiostegal groove. Dactyli

- of last three legs very elongate and slender, being longer than propodus and carpus combined. Subgenus *Nematopalaemon*. Only species *Schmitti* (L.S.)
- Rostrum without an elevated basal crest. A distinct branchio-tegal groove present. Dactyli of last three legs never more than about half as long as propodus 2
 - 2. Mandible with a 3-jointed palp. Only 1 tooth of upper margin of rostrum (seldom 2) placed behind posterior margin or orbit Subgenus *Palaemon* s.s. 3
 - Mandibular palp 2-jointed. Three teeth of upper margin of rostrum placed behind posterior margin of orbit (3rd tooth sometimes just over that margin). Apex of rostrum with subapical tooth. Lower margin with 3 to 7 teeth. Carpus of second leg about as long as chela. Eastern . . . Subgenus *Palaeander* 8
 - 3. Rostrum ending in a sharp point, without subapical teeth. Lower margin of rostrum with 2 to 4 teeth. Western 4
 - Rostrum with 1 or more subapical teeth. Lower margin with 5 to 16 teeth 6
 - 4. Carpus of second leg shorter than palm. Upper margin of rostrum about straight, never convex. Tip of rostrum not conspicuously sword-like lengthened *ritteri*
 - Carpus of second leg longer than palm 5
 - 5. Upper margin of rostrum convex. Rostrum rather short, tip not conspicuously lengthened. Second legs reaching distinctly beyond scaphocerite *peruanus*
 - Upper margin of rostrum about straight. Rostrum slender, ending in an elongate sword-like untoothed apex. Second legs at most reaching to end of scaphocerite *gladiator*
 - 6. Telson gradually tapering towards a sharp point posteriorly, no distinct posterior margin present. Posterior spines of telson far overreached by the tip. Western 7
 - Telson ending in a distinct posterior margin, which in the middle is provided with a small sharp point. This point is overreached by the middle pair of posterior spines. Eastern. *pandaliformis*
 - 7. Lower margin of rostrum with 9 to 12 teeth. Last joint of third maxilliped as long as penultimate joint. Second legs less slender than first, with fingers as long as palm, and carpus distinctly less than twice as long as chela. *gracilis*
 - Lower margin of rostrum with 12 to 16 (seldom 11) teeth. Last joint of third maxilliped 0.7 times as long as penultimate. Second legs as slender as first, fingers shorter than palm, carpus twice as long as chela. *hancocki*

8. Rostrum high, lower margin with 3 or 4 teeth. Fingers of second legs $2/3$ of length of palm or shorter. *northropi*
 — Rostrum slender, lower margin with 5 to 7 teeth. Fingers of second legs more than $2/3$ of length of palm. *floridanus*

NEMATOPALAEMON Holthuis, 1950a

This new subgenus of which only one species is represented in American waters, is characterized by the following characteristics:

1. The rostrum is very long and slender, and has the basal dorsal teeth placed on an elevated basal crest.
2. No branchiostegal groove is present on the carapace.
3. The pleurae of the fourth and fifth abdominal segments have the tips produced posteriorly and broadly rounded.
4. The mandibular palp is three-jointed.
5. The dactyli of the last three pairs of legs are excessively long and thin, being longer than the propodus and carpus combined.
6. The pleopods are much elongated.

The type of this subgenus is *Leander tenuipes* Henderson, 1893, from the indo-westpacific region.

The subgenus contains three species: *Palaemon tenuipes* (Henderson) from the indo-westpacific region, *Palaemon hastatus* Aurivillius from West Africa and the present form.

Palaemon (*Nematopalaemon*) *schmitti* Holthuis

Pl. 43, figs. a-1

Palaemon schmitti Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 97.

Palaemon (*Nematopalaemon*) *schmitti* Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 9.

Palaemon schmitti Holthuis, 1950b, Zool. Meded., vol. 31, p. 36.

Description: The rostrum is very long and slender, it is distinctly longer than the carapace. The ultimate part of the rostrum is directed somewhat upwards. A basal crest of three or four (generally four and seldom five) teeth is present on the dorsal margin. Of these teeth one or two are placed behind the orbit, while a small notch is visible some distance behind the first tooth. The rest of the upper margin is unarmed, except for a small subapical tooth. The lower margin bears seven to nine, generally eight teeth, which are rather small and are regularly divided over the ultimate $2/3$ of the lower margin. The carapace is

smooth and is provided with antennal and branchiostegal spines. No branchiostegal groove is present. A short carina extends backwards from the branchiostegal spine. The abdomen is smooth. The pleurae of the first four segments are truncated and have the distal margin slightly emarginate. The fifth segment has the pleurae posteriorly produced into an elongate lobe, which has the apex rounded. The sixth segment has the pleurae small and pointed, also the posterolateral angles are pointed. The sixth segment is somewhat less than twice as long as the fifth. The telson is a little longer than the sixth segment. The dorsal surface of the telson bears two pairs of spinules. These spinules are very small; the anterior pair is placed in about the middle of the telson, the posterior pair is situated halfway between the anterior pair and the posterior margin of the telson. The posterior margin of the telson ends in a median point and bears at each side of this point two spines and a seta: the outer spines are very small the inner are larger.

The eyes are well developed.

The basal segment of the antennular peduncle is large. The stylocerite is slender and pointed, it reaches about to the middle of the basal segment. On the upper surface the stylocerite bears a carina, which dorsally forms a large anteriorly pointed tooth. The anterolateral angle of the basal segment bears a distinct spine, which overreaches the anterior margin of the segment. The second segment is very short, being distinctly shorter and narrower than the third. The upper antennular flagellum has the two rami fused for about five joints. The shorter ramus has the free part consisting of about eight indistinct joints, it is longer than the fused portion.

The scaphocerite is slender, it reaches distinctly beyond the antennular peduncle, but fails by far to attain the end of the rostrum. It is four times as long as broad. The outer margin is about straight and ends in a distinct final tooth, which is overreached by the lamella. The antennular peduncle by far fails to reach the middle of the scaphocerite. An external spine is present near the base of the scaphocerite.

The mandible has a well developed three-jointed palp, the incisor process ends in some teeth, the molar process in some blunt knobs. The maxillula has the inner lacinia slender, the palp is distinctly bifid. The maxilla has the endite deeply cleft, the scaphognathite is well developed and not very broad. Exopods are present on all maxillipeds. The first maxilliped has the coxa and basis separated by a distinct notch, the palp is well developed, the exopod has the caridean lobe rather broad, the epipod is indistinctly bilobed. The second maxilliped is nor-

mal in shape, a podobranch is present on the epipod. The third maxilliped fails to reach the end of the scaphocerite. It is very slender. The last joint is slightly shorter than the penultimate and about 0.7 times as long as the antepenultimate. The exopod fails by far to reach the end of the antepenultimate segment.

The first pereopod reaches with the tips of the fingers beyond the scaphocerite. The fingers are 1.5 times as long as the palm. The palm is $\frac{4}{3}$ as long as the chela and slightly shorter than the merus. The ischium is about $\frac{3}{5}$ of the length of the merus. The second legs are stronger than the first, they are equal and reach with the chela, sometimes with the carpus, beyond the scaphocerite. The fingers are long and slender, being twice to almost twice as long as the palm, their tips are crossing. No teeth are visible on the cutting edges. The palm is slightly swollen. The carpus measures $\frac{2}{3}$ of the length of the palm. The merus is about thrice as long as the carpus, it is swollen in the proximal part. The ischium is almost half as long as the merus. The last three legs are extremely long and slender. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is enormously long and slender, being at least as long as propodus and carpus combined (as in none of my specimens the dactylus is undamaged, I am not able to give the exact length of this joint). The propodus is twice as long as the carpus and slightly shorter than the merus. The fourth and fifth legs are still more slender than the third. The carpus, merus and ischium are about of the same size as in the third leg, but the propodus and the dactylus are much longer. Transverse rows of short hairs are visible in the distal part of the posterior margin of the fifth legs. No spinules are visible on any of the propodi of the last three legs.

The endopod of the first pleopod of the male is ovate, with the inner margin about straight. No appendix interna is present. The second pleopods of the male have the appendix masculina slightly shorter than the appendix interna. The first pleopods, when extended anteriorly, reach about to the posterior limit of the orbits.

The uropods are elongate ovate. The outer margin of the exopod is concave and ends in a strong tooth, which at its inner side is provided with a slender movable spinule.

Size: My specimens vary in length between 40 and 70 mm. Oviparous females are 55 to 70 mm long. The eggs are numerous and small, measuring 0.4 to 0.6 mm in diameter.

Material examined: In the Rijksmuseum van Natuurlijke Historie at Leiden, Holland, material of this species is present from: Shrimp traps in the mouth of the Surinam River near Resolutie, Surinam (December 22, 1942, D. C. Geijskes coll.), mouth of Warappa Creek near Matappica, north bank of Commewijne River, just E. of Paramaribo, Surinam (December 11, 1942, D. C. Geijskes coll.), shore of the Surinam River near Paramaribo, Surinam (December, 1949, D. C. Geijskes coll.). Specimens from the first mentioned lot have been presented by the Leiden Museum to the U. S. National Museum, Washington, D. C.

Type: Holotype is a specimen from the first mentioned lot (Surinam River near Resolutie). It is preserved in the Leiden Museum, where also the larger part of the paratypes is stored. The rest of the paratypes is in the possession of the U. S. National Museum.

Remarks: The present species is most closely related to *Palaemon* (*Nematopalaemon*) *tenuipes* (Henderson) from India and *Palaemon* (*Nematopalaemon*) *hastatus* Aurivillius from West Africa. The three species are characterized by the enormous prolongation of the dactyli of the last three legs, and differ in that respect from all other species of *Palaemon*. *Palaemon* (*Nematopalaemon*) *schmitti* differs from *P. tenuipes* by having the rostrum longer, with less dorsal and more ventral teeth. The rostral formula of *P. schmitti* is $\frac{3-4 + 1}{7-9}$ of *P. tenuipes* it

is $\frac{4-6 + 1}{2-6}$ (Kemp gives 5 to 7 teeth for the basal crest, as he includes the little notch behind the first tooth as a regular tooth). Furthermore, the last joint of the third maxilliped in *P. tenuipes* is relatively shorter than that in *P. schmitti*. Also the sixth abdominal segment in *P. schmitti* is longer than that in *P. tenuipes*, being more than $\frac{2}{3}$ of the length of the carapace. *Palaemon schmitti* differs from the West African *P. hastatus* in the rostral formula too. This formula in *P. hastatus* namely is $\frac{7-11 + 1}{3-6}$. The carpus of the second legs in *P. hastatus* furthermore is relatively longer than in the American species.

Subgenus PALAEMON Weber, 1795

The characters in which this subgenus differs from the other subgenera of the genus *Palaemon* are:

1. The rostrum never is provided with an elevated basal crest of dorsal teeth.
2. The branchiostegal groove always is distinct.

3. The pleurae of the fifth abdominal segment generally end in a small tooth or sharp point.
4. The mandible is provided with a three-jointed palp.
5. The dactyli of the last three pairs of legs never are excessively long, always being less than half as long as the propodus.
6. The pleopods never are conspicuously elongated.

Palaemon (Palaemon) ritteri Holmes

Pl. 44, figs. a-g

- Palaemon Ritteri* Holmes, 1895, Proc. Calif. Acad. Sci., ser. 2, vol. 4, p. 579, pl. 21, figs. 29-35.
- Palaemon ritteri* Kingsley, 1899, Amer. Nat., vol. 33, p. 37.
- Palaemon Ritteri* Holmes, 1900, Occ. Pap. Calif. Acad. Sci., vol. 7, p. 216.
- Leander Ritteri* Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, p. 4.
- Palaemon ritteri* M. J. Rathbun, 1904, Harriman Alaska Exped., vol. 10, p. 29.
- non *Palaemon ritteri* ? M. J. Rathbun, 1910, Proc. U. S. Nat. Mus., vol. 38, p. 561, pl. 53, fig. 1.
- Palaemon ritteri* Schmitt, 1921, Univ. Calif. Publ. Zool., vol. 23, p. 35, fig. 21; Schmitt, 1924, Proc. Calif. Acad. Sci., ser. 4, vol. 13, p. 386.
- Palaemon ritteri* p.p. Schmitt, 1924, ^bZoologica, New York, vol. 5, p. 168.
- Palaemon ritteri* Sivertsen, 1934, ^bNyt. Mag. Naturvid., vol. 74, p. 4; Chace, 1937, Zoologica, New York, vol. 22, p. 131; Hult, 1938, Ark. Zool., vol. 30A, pt. 5, p. 6.
- non *Palaemon ritteri* Schmitt, 1939, Smithson. Misc. Coll., vol. 98, n. 6, p. 25.
- Palaemon ritteri* Steinbeck and Ricketts, 1941, Sea of Cortez, p. 446.
- Palaemon (Palaemon) ritteri* Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 8.

Description: The rostrum is rather high, it reaches to or beyond the scaphocerite. The upper margin is straight and bears 8 to 10 (generally 8 or 9) teeth, the first or first 2 of which are placed on the carapace, the 3rd being placed generally over the orbital margin. The other teeth are divided regularly over the rostrum, except for a distinct unarmed space before the apex. The lower margin bears 3 teeth (seldom 4), here, too, the distal part is unarmed. The tip of the rostrum is sharp and pointed, without subapical spines. The branchiostegal spine is placed on the anterior margin of the carapace.

The 6th abdominal segment is somewhat more than 1.5 times as long as the fifth, and almost as long as the telson. The dorsal spines of the telson are placed at $\frac{1}{2}$ and $\frac{3}{4}$ of its length. Of the 2 pairs of posterior spines the inner are longest and overreach the median point of the posterior margin of the telson, 2 feathered setae are placed between the inner spines.

The eyes have 2 bands of dark pigment over the cornea.

The basal segment of the anténnula has the anterior margin convex. The anterolateral tooth is distinct, failing to reach beyond the middle of the 2nd segment, but overreaching the anterior margin of the basal segment. The 2 rami of the inner flagellum are fused for about 4 to 6 joints. The free part of the shorter ramus consists of 15 to 26 joints and is much more than twice as long as the fused part.

The scaphocerite is about thrice as long as broad. The lamella distinctly overreaches the final tooth.

The first legs distinctly fail to reach the end of the scaphocerite. The fingers are about as long as the palm. The carpus is 1.5 times as long as the chela and slightly longer than the merus. The second legs reach about to the end of the scaphocerite. The fingers measure about $\frac{3}{5}$ to $\frac{4}{5}$ of the length of the palm. The dactylus bears in the proximal part of its cutting edge 2 very small teeth, the cutting edge of the fixed finger bears one similar tooth, which is situated between the 2 upper teeth. The carpus is about as long as the fingers and about $\frac{3}{5}$ of the length of the merus. The third leg reaches to or just beyond the end of the scaphocerite, in younger specimens it is relatively shorter, failing to reach the end of that scale. The propodus is 2.5 to almost 3 times as long as the dactylus, twice as long as the carpus and almost as long as the merus. The fifth leg reaches about almost to the end of the scaphocerite, in young specimens to the middle of this scale. The propodus is fully thrice as long as the dactylus, about twice as long as the carpus and slightly longer than the merus.

The pleopods and uropods are normal in shape.

Size: The largest specimen seen by me is 40 mm long. A late larva, which to all probability has to be assigned to the present species is 14 mm long. Ovigerous females are 24 to 37 mm long in my material. The eggs are numerous and small, being 0.4 to 0.7 mm in diameter.

Colour: The colour notes made of a specimen of 40 mm from Charles Island, Galapagos (Allan Hancock Expedition, 1934) runs as follows: "Body with somewhat oblique dark bars of brownish on each somite, almost in the same straight line, these bars are placed rather close together."

Material examined: The Allan Hancock Expeditions 1933 to 1937 and 1940 collected more than 500 specimens of this species. The localities are:

Gulf of California, Mexico: Angel de la Guardia Island, Puerto Refugio. Shore, rock, Mar. 20, 1937, Sta. 707-37; Turner's Island, S. of Tiburon Island. Shore, rocky reef, Jan. 24, 1940, Sta. 1042-40; Mangles Anchorage. Shore, rock, Feb. 28, 1936, Sta. 527-36; Agua Verde Bay, San Marcial Reef. Shore, Mar. 10, 1937, Sta. 659-37; San Francisco Island, North Bay. Shore, rock, sand, Feb. 25, 1936, Sta. 518-36. Channel N. of Island, coral, 22 fms, Mar. 8, 1937, Sta. 647-37; Cabeza Ballena, E. of Cape San Lucas. Shore, rock, tidepools, Mar. 4, 1937, Sta. 623-37.

Sonora, Mexico: Tepoca Bay. Shore, rock, reef, Feb. 3, 1940, Sta. 1076-40. Shore, rock, reef, Feb. 4, 1940, Sta. 1077-40.

Panama: Secas Islands. Shore, rock, coral cove, Feb. 4, 1935, Sta. 446b-35. Shore, tide flats, coral, Feb. 6, 1935, Sta. 454-35. 5-20 fms, mud, sand, Feb. 6, 1935, Sta. 458-35.

Colombia: Cupica Bay. Shore, rock, Jan. 26, 1935, Sta. 427-35.

Ecuador: Santa Elena Bay. S. of La Libertad, shore, rock, Jan. 20, 1933, Sta. 16-33. Near south shore, 5-7 fms, rock, shells, gorgonids, Feb. 9, 1934, Sta. 210-34; S. of Santa Elena Point. Shore, rock, Jan. 18, 1933, Sta. 10-33. Manta Bay. Shore, rock, sand, Jan. 19, 1935, Sta. 400-35. W. of Manta, reef with breakers, Jan. 20, 1935, Sta. 403-35.

Cocos Island (Costa Rica): Wafer Bay. Off Treasure Camp Flat, shore, rock, Mar. 1, 1933, Sta. 105-33. Shore, rock, Mar. 2, 1933, Sta. 107-33.

Galapagos Islands (Ecuador): Tower Island, Darwin Bay, Seal Beach No. 1. Shallow water, rock, Feb. 24, 1933, Sta. 96-33. Shore, rock, Feb. 26, 1933, Sta. 101-33; Tower Island, Darwin Bay, Lagoon Beach. Shore, Feb. 22, 1933, Sta. 93-33; Albemarle Island, Cartago Bay. Anchorage, collected with electric light, Feb. 12, 1933, Sta. 72-33. North Beach, last large beach to north, at about the end of the bay proper, rock, sand, mangroves, Feb. 13, 1933, Sta. 73-33; James Island, James Bay. Shore, rock, sand, under and about large boulders, Feb. 12, 1933, Sta. 71-33. James Island, Sullivan Bay. Shore, rock, Dec. 12, 1934, Sta. 343-35; South Seymour Island, Iguana Beach, west shore. Rock, sand, fiddler crabs, Feb. 19, 1933, Sta. 88-33. Rock, sand, Jan. 22, 1934, Sta. 174-34; Indefatigable Island, Conway Bay, small island

in bay. Shore, rock, Feb. 17, 1933, Sta. 82-33; Indefatigable Island, Academy Bay. From up estuary near dam, where mullets were caught, and from shallow waters around rocks near cannery, Feb. 3, 1933, Sta. 49-33; Charles Island, Black Beach. Shore, rock, Jan. 27, 1933; Sta. 33-33. Shore, rock, Jan. 19, 1934, Sta. 166-34.

In the United States National Museum material of this species is present from: Lower California, Mexico (San Bartolomé Bay, Magdalena Bay, La Paz Harbour, Carmen Island, Puerto Refugio on Angel de la Guardia Island, San Felipe, S. end of Tiburon Island), Panama (Chamé Point; Balboa; Panama City; Taboga Island), Ecuador (Salinas), Peru (Paita), Cocos Island, Galapagos Islands (James Island; S. Seymour Island; Indefatigable Island; Eden Island near Indefatigable Island; Chatham Island; Charles Island; Hood Island). Furthermore specimens of this species are present, which bear the labels: Colon Reef, Colon, Panama (Mar. 12, 1912, S. E. Meek & S. F. Hildebrand coll.), and Jacuque Point, Gulf of Venezuela (Jan. 26, 1925). If these labels are correct, then the species occurs also on the Atlantic coast of Central and South America.

In the Turin Museum I examined the specimens reported by Nobili (1901) from Santa Elena Bay, Ecuador.

Distribution: The present species is found along the shores of W. America from San Diego (California) to Paita (Peru) and the Cocos and Galapagos Islands. The records in literature are: San Diego, California (Holmes, 1895, 1900), San Bartolomé Bay, west coast of Lower California! (M. J. Rathbun, 1904), Magdalena Bay, west coast of Lower California! (M. J. Rathbun, 1904! Chace, 1937), La Paz Harbour, Gulf of California! (M. J. Rathbun, 1904), Carmen Island, Gulf of California! (M. J. Rathbun, 1904! Schmitt, 1924), Santa Inez Bay, Gulf of California (Chace, 1939), Puerto Refugio, Angel de la Guardia Island, Gulf of California! (Steinbeck and Ricketts, 1941), S. end of Tiburon Island, Gulf of California! (Steinbeck and Ricketts, 1941), Santa Elena Bay, Ecuador! (Nobili, 1901), Galapagos (Hult, 1938), Tower Island, S. Seymour Island! and Eden Island! Galapagos (Schmitt, 1924b), Post Office Bay, Charles Island, Galapagos (Sivertsen, 1934).

Type: Type locality is San Diego. The type specimen in all probability is no longer extant.

Remarks: The species is most closely related to the next. The differences will be pointed out there. The specimens mentioned by Schmitt

(1939) as belonging to this species proved to be a separate, though closely related form. Also the specimen reported upon by Miss Rathbun (1910) as being probably *Palaemon ritteri* certainly does not belong to this species.

Larval stages: The larvae at my disposal show a striking resemblance to the fifth stage *Palaemon longirostris* as figured by Gurney (1924, fig. 6). The rostrum is higher, with the more sharply upturned top rapidly narrowing in a sharp point. The 3 teeth on the carapace are placed different: the posterior, which is the smallest, stands much closer to the posterior margin of the carapace, the second is placed in or slightly behind the middle, it is larger than the first and smaller than the third tooth, which stands just over the posterior orbital margin. The fourth leg is provided with an exopod. My specimens agree with all other characters mentioned by Gurney for "*Leander longirostris*." The 2 rami of the inner antennular flagellum are already distinctly visible. In some of the specimens traces of the final denticulation of the rostrum already are visible before the anterior tooth.

Size: 16 mm.

The 10 specimens at my disposal were collected by the Allan Hancock Expeditions, 1933, 1934, and 1935, at the following localities:

N. Colombia: Cupica Bay. Anchorage, caught with electric light, Jan. 26, 1935, Sta. 428-35.

Ecuador: Off La Libertad. Anchorage, caught with electric light, Jan. 17, 1933, Sta. 8-33. Anchorage, caught with electric light, Jan. 20, 1933, Sta. 17-33.

Cocos Island (Costa Rica): Chatham Bay. Taken with dipnet from log over ship's side, together with *Plagusia* specimens and young fish, Feb. 28, 1933.

Galapagos Islands (Ecuador): Albemarle Island, Tagus Cove. Anchorage, caught with electric light, Jan. 13, 1934, Sta. 151-34.

Another *Palaemon* larva was collected together with the previous form at Cupica Bay, N. Colombia. It differs from the previous in the following characters: The rostrum is shorter, higher and straighter. It largely fails to reach the end of the scaphocerite. There are only 2 teeth on the dorsal margin of the carapace, a very small one placed in the middle of the carapace and a larger somewhat before the posterior orbital margin. Length 15 mm.

In all probability the first mentioned form is one of the stages of *Palaemon ritteri* Holmes, the identity of the 2nd form is not known.

***Palaemon (Palaemon) gladiator* Holthuis**

Pl. 44, figs. h-1

Palaemon sp. M. J. Rathbun, 1902, Proc. Wash. Acad. Sci., vol. 4, p. 291.

Palaemon ritteri p.p. Schmitt, 1924^b, Zoologica, New York, vol. 5, p. 168.

Palaemon ritteri Schmitt, 1939, Smithson. Misc. Coll., vol. 98, n. 6, p. 25 (non Holmes, 1895).

Palaemon gladiator Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 96.

Palaemon (Palaemon) gladiator Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 7.

Description: The rostrum is slender, reaching slightly beyond the scaphocerite. The basal part is straight, the tip is directed upwards. The upper margin bears 8 or 9 teeth (seldom 7), the first 2 of which are placed behind the orbital margin, the third standing over the orbit. The extreme $\frac{1}{2}$ to $\frac{1}{3}$ of the length of the rostrum is devoid of teeth, on the upper as well as on the lower margin, the apex thereby being sword-like in shape. The lower margin bears three (seldom 2 or 4) teeth, the anterior of which is placed slightly before the anterior tooth of the upper margin. The rostrum shows some resemblance to that of the indo-westpacific *Palaemon semmelinki* (De Man). The carapace is smooth, provided with antennal and branchiostegal spines and a branchiostegal groove. The branchiostegal spine is placed on the anterior margin of the carapace.

The abdomen is smooth. The fifth segment has the pleura ending in a rather indistinct angle. The sixth segment is almost twice as long as the fifth, and slightly longer than the telson. The dorsal surface of the telson bears 2 pairs of spinules, one in the middle and one at $\frac{3}{4}$ of its length. The posterior margin ends in an acute median point, which at each side is flanked by 2 spines, the inner of which overreaches the tip. Between these inner spines 2 feathered setae are present.

The eyes are well developed. None of my specimens bears 2 bands of pigment over the cornea, as is the case in many of my specimens of *P. ritteri*.

The stylocerite reaches about to the middle of the length of the basal segment at the antennular peduncle. The anterior margin of this segment is rounded and overreaches slightly, or reaches as far forward as, the anterolateral spine. The third segment is longer and narrower than the second. The fused part of the 2 rami of the inner antennular fla-

gellum consists of 6 to 10 joints, the free part, which is 1.5 times to almost twice as long as the fused part, consists of 13-19 joints.

The scaphocerite is 3 to 3.5 times as long as broad, the outer margin is slightly concave. The final tooth is distinctly overreached by the lamella.

The oral parts are normal. The mandible bears a three-jointed palp.

The first legs reach slightly beyond the antennular peduncle, but fail to reach to the end of the scaphocerite. The fingers are as long as the palm. The carpus is somewhat less than twice as long as the chela and slightly longer than the merus. The second legs are only very little stronger than the first legs and reach almost to the tip of the final tooth of the scaphocerite in the female, in the male they even reach less far forwards. The fingers measure about $\frac{2}{3}$ to $\frac{3}{4}$ of the length of the palm. Only faint teeth are visible on the cutting edges. The palm is cylindrical, not swollen. The carpus is elongate being slightly shorter than the chela, but longer than the palm and half the length of the fingers combined. The merus is about as long as the carpus and somewhat longer than the ischium. The third legs reach to the end of the antennular peduncle. The propodus is about thrice as long as the dactylus, about twice as long as the carpus and somewhat shorter than the merus. The ischium is half as long as the merus. The fifth pereopod reaches about as far forwards as the third. The propodus is about four times as long as the dactylus, twice as long as the carpus, as long as the merus and twice as long as the ischium. Spinules are present along the posterior margin of the propodus of all last three legs, while the fifth leg has the usual transverse rows of setae in the distal part of that margin. In the male the legs reach less far forwards.

Pleopods and uropods are normal.

The above description is made after an ovigerous female, while the differences with the males are mentioned. Juvenile specimens have the 6th abdominal segment relatively longer, the fused part of the 2 rami of the inner antennular flagellum is distinctly longer than the free part. Furthermore the legs reach less far forwards.

Size: The largest male specimen seen by me measures 30 mm. Ovigerous females are 27 to 35 mm long. The eggs are numerous and small and measure 0.5 to 0.7 mm.

Material examined: The Allan Hancock Expeditions 1933 and 1934 collected 28 specimens of this species in the following localities:

Galapagos Islands (Ecuador): Tower Island, Darwin Bay, Seal Beach No. 1. Shallow water, coral, Feb. 22, 1933, Sta. 94-33, 1 speci-

men; Narborough Island, N.E. point opposite Tagus Cove on Albemarle Island. Shore, mangroves, Jan. 14, 1934, Sta. 153-34, 17 specimens; Indefatigable Island, Academy Bay. Shore, rock, from up estuary near dam where mullets were caught, Feb. 3, 1933, Sta. 49-33, 10 specimens (5 ovigerous females).

Furthermore the collection of the Allan Hancock Foundation possesses the following material of this species:

Narborough Island, Galapagos, dipnet from deck, May 28, 1932, *Zaca* Expedition, 1 specimen; Academy Bay, Indefatigable Island, Galapagos, May 11, 1932, *Zaca* Expedition, 29 specimens (6 ovigerous females).

In the collections of the U. S. National Museum specimens of this new species are present from:

Clipperton Island, Lagoon, Nov. 23, 1898, Hopkins Stanford Galapagos Expedition, 1898-1899. 1 specimen.

Narborough Island, Galapagos, shore, east side, opposite Tagus Cove on Albemarle Island, July 25, 1938, W. L. Schmitt coll., Franklin D. Roosevelt Presidential Cruise, 1938, 4 specimens.

Distribution: The species seems to be confined to the Galapagos Islands and Clipperton Island. On the former group it was collected together with *Palaemon ritteri*, while it was lacking in all *ritteri* material from the mainland seen by me.

Type: Holotype (U.S.N.M. Cat. No. 90964) is the largest ovigerous female from Indefatigable Island (Allan Hancock Expedition, 1933). All type material is deposited in the U. S. National Museum, except part of the Allan Hancock material which is preserved in the collection of the Allan Hancock Foundation, Los Angeles.

Remarks: The species is closely related to *Palaemon ritteri*, but may be distinguished from that form by having the rostrum more slender and ending in a long unarmed sword-like apex, furthermore the sixth abdominal segment is much longer, the anterolateral spine of the basal segment of the antennular peduncle is much smaller, the free portion of the shorter ramus of the antennular flagellum is less than twice as long as the fused portion (in *Palaemon ritteri* it is much more than twice as long), the carpus of the second leg is much longer than the palm (in *P. ritteri* it is distinctly shorter than the palm), and the last three legs are more slender. These differences prove to be constant in my material and even juvenile specimens may be readily recognized. The species first was mentioned in literature by M. J. Rathbun (1902) as *Palaemon* sp. from Clipperton Island. Rathbun mentions some of the differences be-

tween the present species and *P. ritteri*. I examined the specimen, which at present is preserved in the U. S. National Museum and found it identical with the present new species. Schmitt (1924), discusses Rathbun's specimen; he thought the strange shape of the rostrum to be an abnormality, and the other differences to be only due to variation. In 1939 Schmitt in his enumeration of the Crustacea Decapoda collected during the 1938 Presidential Cruise mentions 4 specimens of *Palaemon ritteri* from Narborough Island, Galapagos, which on examination (the material is preserved in the U. S. National Museum) showed to belong to *Palaemon gladiator* n. sp. The fact that both Rathbun and Schmitt did not recognize their material to belong to a species different from *Palaemon ritteri*, in all probability is due to the small number of specimens of this new form at their disposal. By the large amount of material collected by the Allan Hancock Expedition in addition to which I studied the material of the U. S. National Museum made it possible for me to distinguish these 2 forms as distinct species.

***Palaemon (Palaemon) peruanus* Holthuis**

Pl. 45, figs. a-e

Palaemon ritteri? M. J. Rathbun, 1910, Proc. U. S. Nat. Mus., vol. 38, p. 561, pl. 53, fig. 1.

Palaemon ritteri p.p. Schmitt, 1924, Zoologica, New York, vol. 5, p. 169.

Palaemon peruanus Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 97.

Palaemon (Palaemon) peruanus Holthuis, 1950a, Siboga Exped., mon., 39a9, p. 8.

Description: The rostrum is rather high and straight, reaching almost to the end of the scaphocerite. The upper margin is convex and bears 9 teeth, which are rather regularly divided over the upper margin, the first 2 are placed on the carapace behind the orbit. The apex of the rostrum is sharp and simple, it bears no subapical teeth. The lower margin bears 2 teeth.¹² The carapace is smooth and is provided with antennal and branchiostegal spines and a branchiostegal groove. The branchiostegal spine is placed on the anterior margin of the carapace.

The abdomen is smooth. The pleura of the fifth segment ends in an indistinct angle. The sixth segment is 1.5 times as long as the fifth, and as long as the telson. The spines on the telson are similarly arranged as in the previous species.

¹² Rathbun (1910) erroneously states the specimen to have 3 ventral teeth.

The eyes are well developed.

The stylocerite reaches almost to the middle of the basal segment of the antennular peduncle. The anterolateral spine is distinct, but is far overreached by the strongly convex anterior margin of the basal segment. The third segment is somewhat longer and slightly narrower than the second. The inner antennular flagellum has the two rami fused for 7 joints, the free portion consists of 20 joints, which, however, are rather indistinct in my material.* The free part is much more than twice as long as the fused portion.

The scaphocerite is about thrice as long as broad. The final tooth is distinct and is far overreached by the lamella, the outer margin is somewhat concave.

The first legs reach to the end of the scaphocerite. The fingers are as long as the palm, the carpus is $7/6$ as long as the chela. The merus is almost as long as the carpus. The second legs reach with the chela beyond the scaphocerite. The fingers are $4/5$ as long as the palm, their cutting edges are provided with 2 small teeth in the proximal part. The palm is slightly swollen. The carpus is slightly longer than the palm and half the length of the fingers combined. The merus is as long as the carpus. The ischium is somewhat shorter than the carpus. The third leg reaches with a small part of the propodus beyond the scaphocerite. The propodus is somewhat less than thrice as long as the dactylus, less than twice as long as the carpus and somewhat shorter than the merus. The fifth leg reaches as far forwards as the third, the relations between the lengths of the joints are not essentially different from those in the third leg.

The pleopods and uropods of my only male specimen are normal.

Size: The only specimen measures 23 mm.

Material examined: The specimen seen by me comes from salt creeks at La Palisada near Tumbes, N. Peru (Feb. 12, 1908; R. E. Coker coll.), and is preserved in the U. S. National Museum (Cat. No. 40504).

Remarks: The specimen has been reported upon and figured by M. J. Rathbun (1910) who referred it with some doubt to *Palaemon ritteri*. Schmitt (1924) gives some additional details of the specimen.

The specimen certainly is closely related to *Palaemon ritteri*, but nevertheless it is different, as is shown by the elongate carpus of the second legs. The specimen in some ways is intermediate between *P. ritteri* and *P. gladiator*. The rostrum shows most resemblance to that of *P. ritteri*, though it is shorter and has the upper margin convex, the teeth moreover are placed closer to the tip. The 6th abdominal segment is just like

in *P. ritteri*. It has the anterior margin of the basal segment of the antennular peduncle produced much farther forwards than in either *P. ritteri* or *P. gladiator*, resembling however in this respect most *P. gladiator*. The antennular flagellum looks most like that in *P. ritteri*. The fingers of the 2nd legs are distinctly longer than in either of the 2 other species, the carpus resembling that in *P. gladiator*. The legs of the present specimen reach much farther forwards than in either *P. ritteri* or *gladiator*.

This evidence makes it pretty sure that the present specimen represents a new species. Though I hesitate to found a new species on a single specimen I think it the best way to do it here, as the specimen has twice been mentioned in literature and moreover has been figured.

Palaemon (Palaemon) gracilis (Smith)

Pl. 45, figs. f-l

Leander gracilis Smith, 1871, Rep. Peabody Acad. Sci., 1869, p. 97; Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 66.

Palaemon (Leander) gracilis Thallwitz, 1892, Abh. Ber. zool. anthrop. Mus. Dresden, 1890-91, pt. 3, p. 8.

Palaemon Lamarrei Nobili, 1897, Boll. Mus. Zool. Anat. Comp. Torino, vol. 12, n. 280, p. 5. (non H. Milne Edwards, 1837.)

Leander gracilis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 290.

Palaemon (Palaemon) gracilis Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 7.

Description: The rostrum is very long and slender, it reaches far beyond the scaphocerite and has the ultimate half curved upwards. The upper margin bears 5 to 7 (generally 6) teeth in the proximal half, the ultimate half, except for two or three subapical teeth is entire. The first of the dorsal teeth is placed behind the orbit on the carapace proper, the second is placed over the orbit. The lower margin of the rostrum is provided with 9-12 teeth which give the lower margin an evenly serrate appearance, the distance between the ultimate tooth and the apex of the rostrum being somewhat larger than that between the teeth themselves. The carapace is smooth. The branchiostegal spine is placed on the anterior margin.

The abdomen is smooth. The pleura of the fifth segment is produced posteriorly and ends in a rounded top. The sixth segment is about twice as long as the fifth and as long as the telson. The telson has the anterior pair of dorsal spinules placed some distance behind the middle of its length. The posterior pair of spinules lies slightly closer to the an-

terior pair than to the posterior point of the telson. The telson gradually tapers in a sharp tip, there is no distinct posterior margin. The posterior spines only may be seen as small prickles in the posterior part of the lateral margin, they are far overreached by the apex of the telson.

The eyes are normal in shape. No pigment bands are visible in my material.

The stylocerite is very small, it fails to reach the middle of the basal segment of the antennular peduncle. On its dorsal surface it bears a high and rounded crest. The anterior margin of this segment is strongly produced forward and reaches almost to the end of the second segment of the peduncle, and far overreaches the anterolateral spine. The second and third segments of the peduncle are of about the same breadth, but the third is longer than the second. The 2 rami of the inner antennular flagellum are fused for 6 to 10 joints, the free portion is composed of 28 to 44 joints and is at least thrice as long as the fused part.

The scaphocerite is thrice as long as broad. The lamella distinctly overreaches the final tooth. The outer margin is straight.

The mandible bears a 3 jointed palp.

The third maxilliped reaches about to the end of the antennular peduncle. The ultimate joint is as long as the penultimate and $4/5$ to $5/8$ of the length of the antepenultimate.

The first leg fails to reach to the end of the final tooth of the scaphocerite. The fingers are slightly longer than the palm, they are rather high and compressed. The carpus is about 2.5 to 2.6 times as long as the chela. The merus is $4/5$ of the length of the carpus. The second legs reach with part of the chela beyond the scaphocerite, they are a little more robust than the first pair. The fingers are as long as the palm. No teeth are present on the cutting edges. The fingers are hollowed on the inner surface. The carpus is long and slender being 1.8 times as long as the chela. The merus is 0.6 times as long as the carpus and about as long as the ischium. I found no difference in the shape and development of the 2nd legs in the males and females. The third legs reach with the dactylus to the end of the scaphocerite. The propodus is twice as long as the dactylus, 1.5 times as long as the carpus and somewhat shorter than the merus. The fourth and fifth legs are much more slender, and reach with part of the propodus beyond the scaphocerite. The fifth legs overreach the scaphocerite with somewhat less than half the propodus. The propodus of the fifth leg is almost four times as long as the dactylus, slightly less than twice as long as the carpus and somewhat longer than the merus.

The pleopods and uropods are of the usual shape. The uropods are elongate, especially the posterior part being conspicuously long. The outer margin of the exopod of the uropods ends in a distinct tooth, which at its inner side bears an extremely small movable spine.

Size: The largest male seen by me is 55 mm long. The only ovigerous female in my material is 40 mm long. Smith states his ovigerous female to be 43.2 mm in length.

Material examined: In the collection of the U. S. National Museum material from the following localities is represented: Nicaragua (Realejo), Panama (Rio Chorrera near Chorrera; Miraflores; stream between Campana and La Venta; Rio Juan Diaz; El Capitan; Rio Culebra; Rio Calabre; Rio Lara, Darien).

Distribution: The species is known to inhabit fresh waters of western America from Nicaragua to S. Panama. The records in literature are: Estero at Realejo, W. Nicaragua (Smith, 1871), Rio Lara, Darien, S. Panama! (Nobili, 1897).

Type: The type locality is "Estero at Realejo, W. Nicaragua." The type was preserved in the Peabody Museum. (Vid. also the remark on p. 56).

Remarks: Two specimens of the material described by Nobili (1897) under the name *Palaemon Lamarrei* H. Milne Edwards from Darien were presented by the Turin Museum to the U. S. National Museum, where I examined them. As already indicated by a label in the jar by Dr. Waldo L. Schmitt the specimens do not belong to *P. Lamarrei* (= *M. amazonicum*) but to *Palaemon gracilis*.

The species is very closely related to the next, the differences between the 2 forms will be dealt with there. Furthermore *Palaemon gracilis* shows some resemblance to *Palaemon pandaliformis* from the West Indies, but may at once be distinguished by the shape of the telson and by the higher number of ventral rostral teeth.

***Palaemon (Palaemon) hancocki* Holthuis**

Pl. 46, figs. a-f

Palaemon hancocki Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 97.

Palaemon (Palaemon) hancocki Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 7.

Description: Like in *P. gracilis* the rostrum is very long and slender, reaching distinctly beyond the scaphocerite and having the ultimate half curved upwards. The proximal half of the upper margin of the rostrum

is provided with 5 to 7, generally 6, teeth, the first of which is placed slightly behind the orbit. The teeth generally are placed wider apart than in *P. gracilis*. The ultimate half of the upper margin is entire, save for 2 or 3 subapical spines. The lower margin is provided with about 12 to 16 (seldom 11) teeth which are placed close together. The distance between the last tooth and the apex of the rostrum is distinctly larger than that between the teeth themselves. The carapace, abdomen and telson are just the same as in *P. gracilis*.

The eyes, antennulae and antennae too show no appreciable differences with the previous species. The mandible is provided with a 3-jointed palp. The third maxilliped has the last joint much shorter than the penultimate, measuring about 0.7 of its length. The antepenultimate joint is almost twice as long as the ultimate.

The first legs reach almost to the end of the scaphocerite. They are similar to those of *P. gracilis*. The second legs are extremely slender, and reach with the entire chela, sometimes even with a part of the carpus, beyond the scaphocerite. They are as slender as the first legs. The fingers are 0.7 times as long as the palm. The inner surface of the fingers is hollowed, but in the present species it is not so distinct as in *P. gracilis*. No teeth are visible on the cutting edges. The carpus is very long and slender, it is twice as long as the chela and 1.8 times as long as the merus. The last three legs have the relations between the joints almost like in *P. gracilis*, and they reach as far forwards; the dactyli, however, are relatively shorter, the propodus of the third leg being more than twice, that of the fifth leg more than 4 times as long as the dactylus.

The pleopods and uropods show no appreciable differences with those of *Palaemon gracilis*.

Size: The specimens at my disposal are 36 to 67 mm long. The ovigerous females measure 60 to 65 mm. The eggs are numerous and small, being 0.6 to 0.8 mm in diameter.

Material examined: The Allan Hancock 1934 Expedition collected a large ovigerous female from:

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

The United States National Museum possesses about 40 specimens of this species, which originate from:

Colombia: Buenaventura, Nov. 18, 1934, R. Mensing coll.

Ecuador: Exact locality unknown, J. N. Rose coll. Part of the material bears the label "Camotes, J. N. Rose coll." I could not find this locality, which presumably is situated in W. South America.

Distribution: The species is a fresh-water form, like *P. gracilis*. Its range, however, seems to be more southern than that species as it is known only from Colombia and Ecuador.

Type: Holotype (U.S.N.M. Cat. No. 90965) is the ovigerous female from Guayas, collected by the Allan Hancock Expedition. The other specimens are paratypes. All are deposited in the U. S. National Museum.

Remarks: The species is closely related to *Palaemon gracilis*, showing in many characteristics a surprising resemblance to that species. The two forms may, however, easily be distinguished by the following characters:

1. *P. gracilis* possesses 9 to 12 ventral teeth on the rostrum, *P. hancocki* 12 to 16 (seldom 11).

2. The last joint of the third maxilliped in *P. hancocki* is shorter than that in *P. gracilis*.

3. The second legs in *P. hancocki* are much more slender than in *P. gracilis*, they reach farther anteriorly, the fingers are shorter than the palm, and the carpus is longer, being twice as long as the chela.

4. *Palaemon hancocki* gets much larger than *P. gracilis*.

These differences prove to be constant in my material, which consists of about 40 specimens of *P. hancocki*, and more than 50 specimens of *P. gracilis*.

It is a great pleasure to me to name this species for Captain Allan Hancock.

***Palaemon (Palaemon) pandaliformis* (Stimpson)**

Pl. 46, figs. g-1

Leander pandaliformis Stimpson, 1871, Ann. Lyc. New York, vol. 10, p. 130; Kingsley, 1878, Bull. Essex Inst., vol. 10, p. 66.

Leander Potitinga Müller, 1880, Zool. Anz., vol. 3, p. 153 (nom. nud.); Müller, 1892, Arch. Mus. Nac. Rio de Jan., vol. 8, p. 181.

Palaemon (Leander) pandaliformis Thallwitz, 1892, Abh. Ber. Zool. Anthrop. Mus. Dresden, 1890-91, pt. 3, p. 12.

Palaemon (Leander) potitinga Thallwitz, 1892, Abh. Ber. Zool. Anthrop. Mus. Dresden, 1890-91, pt. 3, p. 12.

Leander potitinga Ortmann, 1897, Rev. Mus. Paulista, vol. 2, p. 193, pl. 1, fig. 13; Von Ihering, 1897, Rev. Mus. Paulista, vol. 2, p. 422.

Leander petitinga Rankin, 1898, Ann. New York Acad. Sci., vol. 11, p. 246.

- Leander potitinga* Moreira, 1901, Arch. Mus. Nac. Rio de Jan., vol. 11, p. 12.
- Palaemonetes cubensis* Hay, 1903, Proc. U. S. Nat. Mus., vol. 26, p. 433, fig. 3; M. J. Rathbun, 1912, Bull. Mus. Comp. Zoöl. Harvard, vol. 54, p. 454.
- Palaemon potitinga* Luederwaldt, 1919, Rev. Mus. Paulista, vol. 11, p. 430.
- Leander potitinga* Luederwaldt, 1919a, Rev. Mus. Paulista, vol. 11, pp. 386, 387.
- Leander potitinga* Sollaud, 1923, Bull. Biol. France Belg., vol. 57, p. 545, fig. 10.
- non *Palaemonetes cubensis* Sollaud, 1923, Bull. Biol. France Belg., vol. 57, p. 577, fig. 20.
- Leander pandaliformis* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 290.
- Leander potitinga* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 290.
- Leander cubensis* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 291.
- Leander potitinga* Roux, 1928, Rev. Suisse Zool., vol. 35, p. 46; Brooks, 1931, Ann. Carnegie Mus., vol. 20, p. 166.
- Palaemon cubensis* Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 160.
- Palaemon potitinga* Sawaya, 1946, Zoologia, São Paulo, vol. 11, p. 397, pl. 1, fig. 5; pl. 3, fig. 6.
- Palaemon (Palaemon) pandaliformis* Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 7.

Description: The rostrum is slender, reaching distinctly beyond the saphocerite, and having the ultimate part slightly directed upwards. It bears 5 to 7 (seldom 8) teeth in the proximal $\frac{3}{5}$ of its length. The first of these teeth is placed behind the orbit, it is smaller than the other teeth. The ultimate $\frac{2}{5}$ of the upper margin is entire save for 1 or 2 (seldom 3) subapical teeth. The lower margin bears 5 to 8 (generally 6, seldom 9, and only in young specimens 4) teeth. The carapace has the branchiostegal spine placed on the anterior margin.

The pleurae of the fifth abdominal segment are rather narrowly produced posteriorly and end in a rounded top. The sixth segment is almost twice as long as the fifth and as long as the telson. The anterior pair of dorsal spines is placed somewhat behind the middle of the telson. The posterior pair sometimes is situated midway between the posterior margin of the telson and the anterior pair, sometimes it is closer to the anterior pair or closer to the posterior margin. The posterior margin

of the telson is distinct, ending in a sharp median point, which is flanked by the usual 2 pairs of spines and 1 pair of feathered setae. The inner spines distinctly overreach the median point of the telson.

The eyes are well developed. In my material the cornea bears no dark pigment bands.

The stylocerite is short and fails to reach the middle of the basal segment of the antennular peduncle, it bears a dorsal carina, which is not much pronounced. The anterior margin of the basal segment is strongly convex and reaches almost to the base of the third segment of the antennular peduncle. The anterolateral tooth of the basal segment is small, and far overreached by the anterior margin. The second and third segments are of about the same length, the second being a little broader than the third. The inner flagellum has the 2 rami fused for 8 to 10 joints. The free portion of the shorter ramus consists of about 26 to 30 joints and is more than thrice as long as the fused portion.

The scaphocerite is about thrice as long as broad. The outer margin is straight. The lamella distinctly overreaches the final tooth.

The mandible bears a three-jointed palp. The third maxilliped fails to reach to the end of the antennular peduncle. The last joint is 0.7 times as long as the penultimate.

The first leg reaches almost to the end of the scaphocerite. The fingers are slightly longer than the palm, they are compressed and rather high. The carpus is 2 to 2.3 times as long as the chela and 1.3 times as long as the merus. The second legs reach with half the carpus or less beyond the scaphocerite. They are very slender, being only slightly less slender than the first pair. The fingers are $\frac{2}{3}$ to $\frac{3}{5}$ of the length of the palm. The cutting edge of the dactylus bears 1 small tooth in its proximal third, the cutting edge of the fixed finger is entire. The inner surface of the fingers is hollowed. The carpus is 1.8 times to twice as long as the chela. The merus is about 0.6 times as long as the carpus and $\frac{5}{6}$ as long as the ischium. The third legs reach to the end of the scaphocerite or slightly beyond it. The propodus is more than twice as long as the dactylus, 1.3 to 1.6 times as long as the carpus and distinctly shorter than the merus. The fifth leg reaches with about $\frac{1}{3}$ of the propodus or less beyond the scaphocerite. The propodus is about 3.5 times as long as the dactylus, twice as long as the carpus and somewhat longer than the merus.

The pleopods and uropods are normal in shape.

In juvenile specimens the legs generally reach less far forwards. The rostrum is relatively shorter and bears less ventral teeth (4 or 5 only), while the carpus of the second legs is not so strongly lengthened, being only 1.5 times as long as the chela.

Size: The largest male seen by me measures 33 mm. Sawaya (1946) mentions a male of 38 mm. Ovigerous females seen by me range between 33 and 42 mm in length (in Sawaya's material between 30 and 43 mm). The eggs are numerous and small being 0.6 to 0.9 mm in diameter. Ovigerous females were found in the months January, February and June (Porto Rico).

Material examined: The Allan Hancock 1939 Expedition collected the present species from:

British West Indies: Trinidad, West Manzanilla. Shore, estuary behind sand bar, April 18, 1939, Sta. A36-39.

In the U. S. National Museum a large material of this species is present from the following localities: Guatemala (Lake Ysobal), Nicaragua (Escondido River near Bluefields), Panama (Barro Colorado Island in Gatun Lake), Venezuela (near Barcelona), Brazil (Espírito Santo State: Lagoa nova at Rio Doce; São Paulo State: Ilha São Sebastião, Santos and Cubatão), Cuba (Palacio, Zaza del Medio), Porto Rico (Guanica, Rio la Plata, Rio Piedras, East Luquillo), Virgin Islands (St. Croix), Barbados (Hastings). I examined material of this species in the American Museum of Natural History at New York, it originated from Santo Domingo (Cabral and Lago Rincon).

Distribution: This species is known from fresh and brackish water of the West Indies and from the mainland of Central and South America from Guatemala to S.E. Brazil. The records in literature are: Tacaniqua Lake, El Mene, Falcon Province, Venezuela (Roux, 1928), ?Northern Brazil (Moreira, 1901), Lagoa Juparana, Espírito Santo State, Brazil (Sawaya, 1946), Mauá, Bahia do Rio de Janeiro, Rio de Janeiro State (Moreira, 1901), Ilha Grande, Rio de Janeiro State (Sawaya, 1946), São Sebastião, São Paulo State (Sawaya, 1946), Santos (Luederwaldt, 1919, 1919a; Sawaya, 1946), Rio Ribeira de Iguapé, São Paulo State (Sawaya, 1946), Blumenau, Santa Catharina State, Brazil (Müller, 1880, 1892; Ortmann, 1897; Von Ihering, 1897; Brooks, 1931), Palacio, Cuba! (Hay, 1903), Arroyo de la Cruz, Pinar del Rio Province and Laguna Los Cañas, Marti, Matanzas Province, Cuba (M. J. Rathbun, 1912), Guanica, Porto Rico! (Schmitt, 1935), Barbados or Trinidad (Stimpson, 1871).

Type: The type locality is Barbados or Trinidad. The type specimens could not be found in the collection of the U. S. National Museum, they probably have been destroyed in the 1871 fire of Chicago, when all the material and manuscripts of Dr. Stimpson, the director of the Chicago Academy of Sciences at that time were lost. The types of *Leander potitinga* are preserved in the Museu Paulista at São Paulo and in the Carnegie Museum in Pittsburgh. Those of *Palaemonetes cubensis* are in the U. S. National Museum (Cat. No. 26350).

Remarks: Kemp (1925) in his key to the species of "*Leander*" distinguished *L. pandaliformis*, *L. potitinga* and *L. cubensis* as 3 distinct species, as is done by most other authors. Schmitt, 1935, already pointed out that Kemp's remark that no dorsal spinules are present on the telson of *P. cubensis* is incorrect, and that there are in reality 2 pairs, just like in other species of *Palaemon*. This character was used by Kemp to distinguish *P. cubensis* from the other 2 forms mentioned above. Schmitt further pointed to some inaccuracies in Hay's figure namely that the branchiostegal spine is placed on the anterior margin of the carapace. Hay described the species as a *Palaemonetes*, overlooking the mandibular palp. Kemp, examined a type specimen of Hay's species and found a palp, which according to him was 2-jointed. I also reexamined Hay's type material and found the palp 3-jointed, though in some specimens it was poorly developed. In the other Cuban and Porto Rican material as well as in that of Panama and Brazil, the palp also is distinctly three-jointed. Comparing the Cuban and Porto Rican specimens, which were inserted in the collection of the U. S. National Museum under the name *P. cubensis*, with specimens of *P. potitinga* from Brazil, not the least difference could be found. Some of the Panama specimens had the number of lower rostral teeth rather high, 6 to 8 (seldom 9), but these numbers were sometimes also observed in specimens from other localities. Kemp (1925) separated *Leander pandaliformis* Stimpson from *L. potitinga* on account of the longer carpus of the second legs in Stimpson's species. This character, however, proves to be variable in the present species, as is shown in a large amount of material from one locality seen by me, in which the length of the carpus varies between being 1.8 times and twice as long as the chela. The number of dorsal and ventral teeth of the rostrum in Stimpson's specimens is rather high, but it also is found in numerous specimens which distinctly belong to the present species. As Stimpson's form in all other respects closely agrees with the present material I have no hesitation in considering it to be identical with *P. potitinga* and *Palaemon cubensis*.

The specimens brought by Sollaud (1923) to *Palaemonetes cubensis*, are true *Palaemonetes* and doubtless belong to *P. carteri* Gordon (vid. p. 218).

The present species shows some resemblance to *Palaemon gracilis* from the American West coast, but may immediately be recognized by the shape of the tip of the telson.

Subgenus PALAEANDER Holthuis, 1950a

This new subgenus is very close to *Palaemon* s.s. In fact the only constant difference is the fact that the mandible bears a two-jointed palp. This character, however, is very constant and therefore considered here to be of subgeneric value. The American representatives may furthermore be separated from the species of the subgenus *Palaemon* s.s. by having three (seldom two) teeth of the rostrum behind the orbit.

Type: Type of this subgenus is *Palaemon elegans* Rathke, 1837, a species from the eastern Atlantic.

Palaemon (*Palaeander*) *northropi* (Rankin)

Pl. 47, figs. a-l

Palaemon vulgaris Jones, 1859, The Naturalist in Bermuda, p. 129.

(non Say, 1818.)

Palaemon affinis Heilprin, 1888, Proc. Acad. Nat. Sci. Phila., 1888, p. 322; (non H. Milne Edwards, 1837); Heilprin, 1889, Bermuda Isl., p. 151.

Leander affinis Ortmann, 1893, Ergebn. Plankton Exped., vol. 2Gb, p. 47.

Leander northropi Rankin, 1898, Ann. New York Acad. Sci., vol. 11, p. 245, pl. 30, fig. 4.

Leander affinis Rankin, 1900, Ann. New York Acad. Sci., vol. 12, p. 539.

Palaemon brachylabis M. J. Rathbun, 1900a, Proc. Wash. Acad. Sci., vol. 2, p. 154, pl. 8, fig. 10.

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

Palaemon affinis p.p. M. J. Rathbun, 1902a, Bull. U. S. Fish Comm., vol. 20, pt. 2, p. 125.

Leander affinis Verrill, 1922, Trans. Conn. Acad. Arts Sci., vol. 26, p. 142, pl. 48, fig. 4 (non pl. 43, fig. 3 and pl. 47, fig. 7).

Palaemon affinis Schmitt, 1924a, Bijdr. Dierk., vol. 23, p. 72.

Leander northropi Kemp, 1925, Rec. Indian Mus., vol. 27, p. 292.

Leander affinis Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, pt. 2, p. 113.

Palaemon affinis Schmitt, 1935, Sci. Surv. Porto Rico, Virgin Isl., vol. 15, p. 160.

Leander affinis Gurney, 1936, Proc. Zool. Soc. Lond., 1936, p. 619; Gurney and Lebour, 1941, Journ. Linn. Soc. Lond. Zool., vol. 41, p. 146.

Palaemon brachylabis Sawaya, 1946, Zoologia, São Paulo, vol. 11, p. 398, pl. 2, figs. 7, 8.

Palaemon (Palaander) northropi Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 9.

Description: The rostrum is rather high in the middle and slender in the ultimate portion; it is curved upward and reaches distinctly beyond the scaphocerite. The upper margin is provided with 7 to 10, mostly with 9 teeth, the first three of which are situated behind the posterior margin of the orbit (sometimes the third tooth is placed just over the orbital margin). The first six teeth are placed rather close together, the following are separated by much larger intervals. The last tooth is placed close to the apex, giving it thereby a bifid appearance. The upper margin of the rostrum is entire for a rather long distance before the bifid apex. The lower margin of the rostrum is provided with three or four strong teeth. The carapace is smooth. An antennal and a branchiostegal spine are present. The antennal spine is strong and is placed some distance below the rounded lower angle of the orbit. The branchiostegal spine is almost as strong as the antennal, it is placed on the anterior margin of the carapace, which is curved backwards at the level of the branchiostegal spine.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth are narrower. The pleura of the fourth segment ends in a blunt angle, that of the fifth in a minute sharp tooth. The sixth abdominal segment is somewhat more than 1.5 times as long as the fifth. The telson is somewhat longer than the sixth abdominal segment, it is elongate triangular in shape and possesses two dorsal pairs of spinules, which are situated in the middle and at $\frac{3}{4}$ of its length. The posterior margin bears two pairs of spines, the inner of which is the longer and far overreaches the median point of the posterior margin. Two feathered setae are placed between the inner spines.

The eyes are well developed.

The basal segment of the antennular peduncle is broad. The stylocerite is slender and pointed, it reaches about to the middle of the basal segment. The outer margin of the basal segment is straight or slightly

convex and ends in a distinct anterolateral spine. This anterolateral spine reaches about to the middle of the second segment of the peduncle; the anterior margin of the basal segment is convex, but does not reach beyond the anterolateral spine. The third segment of the peduncle is longer and more slender than the second. The upper antennular flagellum has the two rami fused for 10 to 14 joints, the free part of the shorter ramus consists of 11 to 14 joints. The free portion generally is somewhat shorter than the fused, sometimes as long as, or even slightly longer than it.

The scaphocerite is about thrice as long as broad, the outer margin is about straight or somewhat convex, the final tooth is strong and directed slightly outwards, it almost reaches the end of the lamella. The antero-internal angle of the lamella is rather acute.

The oral parts show the typical shape of the genus *Palaemon*, subgenus *Palaeander*. The mandible bearing a two-jointed palp. The third maxilliped reaches somewhat beyond the end of the antennal peduncle, it has the last joint distinctly shorter than the penultimate.

The first pereopod almost reaches the end of the scaphocerite. The fingers are about as long as the palm. The carpus is 1.7 times to twice as long as the chela. The merus is slightly shorter than the carpus. The second pereopod reaches with the entire chela beyond the tip of the scaphocerite (in one specimen, a female of 36 mm, both second legs fail to reach the end of the scaphocerite). The fingers measure $\frac{2}{3}$ to almost $\frac{1}{2}$ of the length of the palm. The cutting edge of the dactylus bears a small tooth in the proximal part, the rest of the cutting edges is entire; the cutting edge of the fixed finger shows no teeth at all. The carpus is slender, it is about as long as the chela. The merus measures about $\frac{3}{4}$ to $\frac{7}{8}$ of the length of the carpus, the ischium is $\frac{2}{3}$ as long as the merus. The following three pereopods are slender and of about similar shape. The third pereopod reaches about to the end of the scaphocerite, sometimes reaching slightly beyond, sometimes failing to reach so far. The propodus is 2.7 to 3 times as long as the dactylus, its posterior margin is provided with about four scattered spines. The carpus is slightly more than half as long as the propodus. The merus is somewhat longer and broader than the propodus. The ischium is half as long as the merus. The fifth pereopod reaches about as far forwards as the third. Here the propodus is thrice as long as the dactylus, its posterior margin is provided with some very small scattered spines. The carpus is half as long as the propodus. The merus is as long as the propodus and 2.5 times as long as the ischium.

The pleopods and uropods are normal in shape.

The juveniles have the legs shorter. The fingers of the second leg are longer in relation to the palm than in the adults, the carpus too is relatively longer.

Colour: The specimen of the Allan Hancock Expedition 1939 is accompanied with the following note about its colour in life: The body is translucent white, with a few transverse bands of dark brown or black markings on the edges of the abdominal somites. A few oblique-vertical lines of the same colour are on each side of the carapace. A specimen from Fort Jefferson, Tortugas, had the colour in life noted as follows: The body is quite transparent. The carapace is obliquely and longitudinally lined with narrow lines of seal brown. The abdomen is crossbanded with similarly coloured narrow lines. The shorter free part of the upper antennular flagellum is closely speckled with orange ochraceous, just like the distal margins of the joints of the pereopods, including the distal margin of the palm of the second leg near the base of the fixed finger. The stalks of the pleopods have a spot of seal brown colour near the distal end. A spot of orange ochraceous is present at the base of the uropods and last pleopods, while the sixth abdominal segment near the base of the uropods also shows this colour. The eggs are sage green; they in reality are pea green, but the black eyes give them a much darker appearance at a little distance.

Size: The largest male seen by me measures 33 mm. Ovigerous females observed were of a length of 29 to 38 mm. The eggs are numerous and small, being 0.6 to 0.8 mm in diameter.

Material examined: The Allan Hancock 1939 Expedition collected this species from:

Venezuela: Cubagua Island. Shore, coral rock, April 14, 1939, Sta. A25-39. In the collection of the U. S. National Museum material of this species is present from the following localities: Bermudas, Florida (Fort Pierce, St. Lucie Co.; Jupiter Inlet, Palm Beach Co.; Miami Beach, Biscayne Bay, Dade Co.; Key Largo and Tortugas, Monroe Co.), Cuba (off Cape San Antonio, Los Arroyos), Jamaica (Montego Bay), Haiti (Miragoâne), San Domingo (Samaná), Porto Rico (Boqueron Bay, Hucars, Fajardo), Virgin Islands (St. Croix), Curaçao (Spaansche Water), Panama (Coco Solo near Colon), Parahyba State, Brazil (Rio Parahyba do Norte), Rio de Janeiro State (Ilha Pinheiro and Porto da Inhauma, both in Rio de Janeiro Bay), Santa Catherina State, S.E. Brazil (Itajahy, and Florianopolis), Uruguay (Piriapolis). Furthermore I examined a specimen from Caracas Bay, Curaçao in the collection of the Zoological Museum at Amsterdam.

Distribution: This littoral marine species is known from the E. American littoral region between Bermuda and Uruguay. The records in literature are: Bermudas (Jones, 1859; Heilprin, 1888, 1889; Ortmann, 1893; Verrill, 1922; Gurney, 1936; Gurney and Lebour, 1941), Castle Harbor, Bermudas (Rankin, 1900), Nassau, New Providence, Bahama Islands (Rankin, 1898), Glover Reef off British Honduras (Boone, 1927), San Juan, Porto Rico (Schmitt, 1935), Boqueron Bay! Hucares! and Fajardo! Porto Rico (M. J. Rathbun, 1902a), Spaansch Water! and Caracas Bay! Curaçao (Schmitt, 1924a), Rio Parahyba do Norte, N. Brazil! (M. J. Rathbun, 1900a), Mamanguape, Parahyba State, Brazil (M. J. Rathbun, 1900a), Boa Viagem, Rio de Janeiro State (Moreira, 1901), Ilha Grande, Rio de Janeiro State (Sawaya, 1946), S. Vincente, São Paulo State, Brazil (Sawaya, 1946).

Type: The type locality is Nassau, New Providence, Bahama Islands.

Remarks: Jones (1859) mentions *Palaemon vulgaris* from Bermuda, but as already pointed out by Rankin (1900), his specimens belong to the present species. Heilprin (1888) was the second to record the present species. He could not find any differences with *P. affinis* and therefore he identified it with that species. Up to the present time the name *affinis* has generally been used for the present form. In the meantime, however, the species twice has been described as new, namely in 1898 by Rankin as *Leander northropi* and in 1900 by M. J. Rathbun as *Palaemon brachylabis*. Examination of material (among which Rathbun's types) convinced me that both *Leander northropi* and *Palaemon brachylabis* are identical with *P. affinis* Heilprin (non H. M. Edwards). *Palaemon northropi* as the present form has to be named is quite distinct from *P. affinis*, which inhabits the coasts of New Zealand. The differences are:

1. The rostrum of *P. northropi* is longer and more slender. The unarmed distal portion is relatively longer than in *P. affinis*.

2. The free part of the shorter ramus of the upper antennular flagellum in *P. northropi* generally is shorter than the fused part, in *P. affinis* it is longer than the fused part.

3. The mandibular palp in *P. northropi* is two-, that of *P. affinis* three-jointed.

4. *P. northropi* is smaller and more slender than *P. affinis*.

5. *P. northropi* is a form of the American east coast, *P. affinis* is a species of New Zealand waters.

Moreira (1901) gives some remarks on specimens, which he identified with *Palaemon paulensis*, a species considered here to be identical with *Leander tenuicornis*. Considering the fact that Moreira's specimens

have the fingers of the second legs much shorter than the palm, and that the rostrum has much less teeth than in any known specimen of *Leander tenuicornis*, it is certain that his material does not belong to that species. There is very little doubt that the specimens in reality belong to *Palaemon northropi*.

The specimen recorded by M. J. Rathbun (1902a) from Arroyo proved on examination to be *Leander tenuicornis*. The specimen from Puerto Real is so small that it could not be identified with certainty.

Palaemon (Palaeander) floridanus Chace

Pl. 48, figs. a-j

Palaemon floridanus Chace, 1942, Proc. New Engl. Zool. Cl., vol. 19, p. 80, pl. 23.

Palaemon (Palaeander) floridanus Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 8.

Description: The rostrum is slender and strongly curved upwards. It reaches distinctly beyond the end of the scaphocerite. The upper margin bears 7 to 9 teeth in the proximal part and 2 or 3 subapical teeth. There generally is a distinct unarmed region behind the subapical teeth. The posterior teeth in the proximal region are placed somewhat closer together than the anterior. The first three teeth of the upper margin of the rostrum are placed behind the orbit, the third sometimes is placed over the posterior margin of the orbit. The lower margin of the rostrum is provided with 5 to 9 teeth, which are about equally divided over that margin. On the whole the rostrum is distinctly more slender than in *Palaemon northropi* and is less deep, it furthermore narrows more gradually towards the top. The carapace is like that in *P. northropi*, the branchiostegal spine is placed on the anterior margin of the carapace.

The abdomen is smooth. The pleura of the fifth segment ends in a distinct small spine. The sixth segment is almost twice as long as the fifth and is 0.7 times as long as the telson. The telson bears two dorsal pairs of spines, one in its middle and one at $\frac{3}{4}$ of its length. The posterior margin of the telson is distinct and ends in a sharp median point. The usual two pairs of spinules are present. The inner of these pairs overreaches the tip of the telson. Two feathered setae are present between the inner spines.

The eyes are well developed.

The peduncle of the antennula is similar in shape to that of *Palaemon northropi*. The upper antennular flagellum has two rami fused for 9 to 11 joints. The free part of the shorter ramus consists of 13 to 15 joints and is 1.2 to 1.7 times as long as the fused portion.

The scaphocerite is about 3.5 times as long as broad. The outer margin is straight and ends in the strong final tooth, which reaches almost to the end of the lamella. The antero-internal angle of the lamella is rather sharp.

The oral parts are as in the previous species. The mandibular palp is two-jointed.

The first legs reach to the end of the scaphocerite. The fingers are about as long as the palm. The carpus is twice as long as the chela and about $7/6$ of the length of the merus. The second legs are much stronger than the first, they are equal in shape and reach with the chela and a small part of the carpus beyond the scaphocerite. The fingers are long and slender, being 0.7 to 0.9 times as long as the palm. The cutting edges of the fingers bear each one small denticle in the extreme proximal part; the denticle of the dactylus is placed slightly in advance of that of the fixed finger. The palm is slightly inflated. The carpus is as long as the length of the palm and half the length of the fingers combined, it is $9/8$ of the length of the merus. The ischium is somewhat more than half as long as the merus. The third leg reaches to the end of the scaphocerite. The propodus is about 2.5 to 2.7 times as long as the dactylus, twice as long as the carpus and shorter than the merus. The fifth leg reaches with part of the dactylus beyond the scaphocerite. The propodus is slightly more than thrice as long as the dactylus, twice as long as the carpus, and somewhat longer than the merus.

The pleopods and uropods are normal in shape. The movable spine at the inner side of the final tooth of the outer margin of the uropodal exopod is well developed.

In young specimens the legs reach less far forwards than in the older ones.

Size: The largest male seen by me is 31 mm long. Females may attain a size of 50 mm, ovigerous females of 31 to 35 mm long are present in my material. The eggs are numerous and small, they are 0.4 to 0.7 mm in diameter.

Colour: Rather fresh specimens from Cedar Keys still showed traces of the original colouration. Some 5 longitudinal lines of pigment are visible in the anterior part of the carapace; in the posterolateral region of the carapace some oblique lines are present. The abdominal segments show transverse lines of pigment. The first segment has three such lines, the first and last of which reach almost to the tip of the pleura. The second and third segment each have 4 or 5 lines, the last of which, running along the posterior margin is much longer than the

others. The fourth and fifth segment each have a line along the posterior margin, while a short second line may be seen in the middle of the segment. Most of the articulations between the joints of the thoracic legs are coloured yellow in my material. The above lines are coloured orange red in my spirit material, but in the living animal they probably are brown or black.

Material examined: In the U. S. National Museum specimens of this species are present from: Fort Pierce, St. Lucie Co.; Big Gasparilla, Charlotte Co.; Lemon and Sarasota Bays, Sarasota Co.; Clearwater Harbor and Tarpon Springs, Pinellas Co.; Cedar Keys, Levy Co. All localities in Florida. Except for the specimen from Fort Pierce, which was found in a vial containing two specimens of *Palaemon northropi*, all material seen by me originates from the west coast of Florida.

Distribution: The species occurs in seawater along the west coast of Florida (with one record from the east coast, vid. above). The only record in literature is that of Chace (1942) from: Captiva Island, Lee Co., W. Florida.

Type: The type locality is Captiva Island, W. Florida. The types are present in the Museum of Comparative Zoölogy at Cambridge, Mass.

Remarks: This curious form was described for the first time as late as 1942. It is closely related to *Palaemon northropi*, from which species it differs, as is already pointed out by Chace, by the shape of the rostrum, which is more slender and which bears more ventral teeth, by the second legs, which have the fingers distinctly longer, and by the more slender and longer dactyli of the third pereiopods. The differences in the mandible pointed out by Chace proved on examination of my relatively large amount of material to be not constant. In my material of *Palaemon floridanus* the last joint of the palp is as straight as in *Palaemon northropi*, while I also could find no differences in the relation between the length of the two joints in both species. Also the character mentioned by Chace that the fifth pereiopod in *P. floridanus* should not reach beyond the scaphocerite showed to be not constant in my material: in old specimens the fifth leg reaches with part of the dactylus beyond the scaphocerite, just like in *Palaemon northropi*.

Genus PALAEMONETES Heller, 1869

Definition: The rostrum is well developed, and provided with teeth. The carapace is smooth, with the antennal and branchiostegal spines well developed. A branchiostegal groove is present.

The abdomen is smooth, the pleurae of the first four segments are rounded at the tip. The telson bears 2 pairs of dorsal and 2 pairs of posterior spines. Between the inner posterior spines 2 or more hairs are present.

The eyes are well developed or have the cornea strongly reduced.

The antennular peduncle has the basal joint broad, provided with a stylocerite and an anterolateral spine, the anterior margin is rounded. The 2nd and 3rd segments are shorter than the first. The upper antennular flagellum consists of 2 rami, which in the basal part are fused for a shorter or longer distance.

The antenna has the scaphocerite well developed, the outer margin ends in a distinct tooth. A spine is present at the outside of the antennal peduncle near the base of the scaphocerite.

The mandible consists of an incisor and a molar process. No palp is present. The other oral parts are not essentially different from those of *Palaemon*.

The first pereopods are slender, with chelae. The second pereopods are chelate, equal, slender, but generally stronger than the first pair. The last 3 pereopods are slender. The dactylus is simple. The propodus bears posterior spines, in the fifth leg moreover it is provided in the distal part of its posterior margin with transverse rows of setae, which are placed close together.

The first pleopods have the endopod without an appendix interna. This appendix occurs in all other pleopods, while the second pleopods of the male moreover are provided with an appendix masculina, which is stronger than the appendix interna.

The uropods have the same shape as in *Palaemon* and *Macrobrachium*.

The type species is *Palaemon varians* Leach, 1814, from the Eastern Atlantic.

The genus shows very close resemblance to *Palaemon*, in fact the only difference of importance is that in *Palaemon* the mandible possesses a palp, while this palp is absent in *Palaemonetes*.

At present 11 species of *Palaemonetes* are known from America, only two of which are Western species. One of the species is so aberrant, that it was thought necessary to create a new subgenus for it.

The American species may be distinguished as follows:

1. Eyes without pigment, cornea degenerated. First and second pairs of pereopods not very different in shape and size. Exopod of uropods with outer margin ending in a tooth, which bears no movable spine at its inner side. Subterranean fresh-water. Texas. Subgenus *Alaocaris*. Only species . . . *antrorum*

- Eyes with dark pigment, cornea well developed, globular. Second pereopods much stronger and longer than first pair. Exopod of uropods with outer margin ending in a tooth, which at its inner side is provided with a movable spine. Subgenus *Palaemonetes* s.s. 2
- 2. Fused part of the two rami of upper antennular flagellum distinctly longer than free part 3
- Fused part of the two rami of upper antennular flagellum shorter than or as long as free part 4
- 3. Branchiostegal spine situated on anterior margin of carapace, just below branchiostegal groove. Posterior pair of dorsal spines of telson placed midway between the anterior pair and posterior margin of telson. Fresh-water. Eastern U. S. A. *paludosus*
- Branchiostegal spine distinctly removed from anterior margin of carapace and situated some distance below branchiostegal groove. Posterior pair of dorsal spines of telson placed very close to posterior margin, and more close to that margin than to anterior pair of spines, often lying in one row with posterior spines. Fresh-water. Central U. S. A., central Canada, N. E. Mexico *kadiakensis*
- 4. Carpus of second legs longer than chela. Eggs often large and few 5
- Carpus of second legs shorter than chela. Eggs numerous and small 7
- 5. Lower margin of rostrum with 2 or 3 teeth. Rostrum rather high and straight 6
- Lower margin of rostrum with 4 to 7 teeth. Rostrum slender, often curved upwards. Branchiostegal spine removed a small distance from anterior margin of carapace. Fresh-water. Venezuela; British, Dutch and French Guiana . . . *carteri*
- 6. Branchiostegal spine removed a considerable distance from anterior margin of carapace, even failing to reach with its tip beyond that margin. Fresh-water. Bolivia . . . *ivonicus*
- Branchiostegal spine placed on anterior margin of carapace. Fresh-water. S. Brazil, Uruguay, Argentina . . . *argentinus*
- 7. Anterior margin of basal segment of antennula strongly produced forwards and far overreaching the anterolateral spine. Western *hiltoni*

- Anterior margin of basal segment of the antennula, though being convex not reaching so far forwards, and not over-reaching anterolateral spine. 8
- 8. Carpus of second leg in adult female shorter than palm, in males only very slightly (1.1 times) longer or shorter than palm. Dactylus of second leg with 2, fixed finger with 1 tooth on cutting edge. Rostrum with first 2 teeth of dorsal margin behind orbit. Dorsal rostral teeth reaching up to apex. Lower margin with 3 to 5 teeth 9
- Carpus of second chela in adult female much longer than palm (1.3 to 1.5 times), in males carpus is almost as long as whole chela. Dactylus of second leg with one or no teeth, fixed finger without teeth on cutting edge. Rostrum with only one dorsal tooth situated behind the orbit. Eastern 10
- 9. Rostrum with 11-13 dorsal teeth. Upper margin straight, though midrib curved. Rostrum very deep. Third leg reaching with part of propodus beyond scaphocerite. Western *schmitti*
- Rostrum with 8-11 dorsal teeth. Upper margin concave, tip of rostrum gradually curved upwards. Rostrum less deep than in *P. schmitti*. Third leg just reaching to or failing to reach the end of the scaphocerite. Eastern *vulgaris*
- 10. Dorsal teeth of rostrum reaching up to apex, which often is bifid. Lower margin with 4 or 5, seldom 3, teeth. Dactylus of second leg with one distinct tooth on cutting edge, cutting edge of fixed finger entire *intermedius*
- Dorsal margin of rostrum with an unarmed stretch before tip; tip thereby dagger shaped. Lower margin of rostrum with 2 to 4, generally 3 teeth, ultimate part unarmed like upper margin. Dactylus as well as fixed finger of second leg without teeth on the cutting edge *pugio*

Subgenus **ALAOCARIS** Holthuis, 1949

The present new subgenus is erected for *Palaemonetes antrorum* Benedict and is characterized by the following features:

The rostrum is compressed, serrate on the upper margin. The carapace bears an antennal and a branchiostegal spine, a branchiostegal groove is present. The telson bears 2 dorsal and 2 posterior pairs of spines, between the latter 2 feathered setae are present.

The eyes are strongly degenerated and contain no pigment.

The mandible bears no palp, also the other mouth parts are like in *Palaemonetes* s.s., just like the branchial formula.

The first and second pereopods are very similar in shape and size. The last three legs have a shape similar to those of the species of *Palaemonetes* s.s.

The pleopods, except the first pair are provided with an appendix interna, while in the male, moreover an appendix masculina is present. The uropods differ from those of *Palaemonetes* s.s. by missing the movable spine at the inner side of the final tooth of the external margin of the exopod.

Type: The type and only species is *Palaemonetes antrorum* Benedict.

***Palaemonetes (Alaocaris) antrorum* Benedict**

Pl. 49, figs. a-m; pl. 50, figs. a-h; pl. 51, figs. a-d

Palaemonetes antrorum Benedict, 1896, Proc. U. S. Nat. Mus., vol. 18, p. 615; Kingsley, 1899, Amer. Nat., vol. 33, p. 718; Eigenmann, 1900, Proc. Amer. Ass. Adv. Sci., vol. 49, pp. 228, 230; Neher, 1902, Proc. Indiana Acad. Sci., 1902, p. 96, figs. 2-7; Ulrich, 1902, Trans. Amer. Micr. Soc., vol. 23, p. 93, pl. 17; Kemp, 1925, Rec. Indian Mus., vol. 27, p. 317; Spandl, 1926, Speläol. Monogr., vol. 11, p. 90; Chappuis, 1927, Die Binnengew., vol. 3, p. 87; Chace, 1943, Proc. New Engl. Zool. Cl., vol. 22, p. 34.

Palaemonetes (Alaocaris) antrorum Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 89, fig. 1a-e; 1950a, Siboga Exped., mon. 39a9, p. 11.

Description: The rostrum is compressed and rather high. It is short, and reaches to or slightly beyond the base of the third segment of the antennular peduncle, ending abruptly in a sharp point. The upper margin bears 8 to 12, rather irregularly placed small teeth, 3 of which are placed behind the orbit. The lower margin bears no teeth at all, only some hairs are present there. The antennal spine is small, but slender, needle-shaped and distinct. The branchiostegal spine is removed a considerable distance from the anterior margin of the carapace, and lies somewhat below the distinct branchiostegal groove. The integument of the carapace is rather soft.

The abdomen is normal in shape, though the pleurae are relatively short. The sixth segment is twice as long as the fifth and slightly longer than the telson. The anterior of the 2 dorsal pairs of spinules is placed

distinctly behind the middle of the telson, while the posterior pair is situated very close to the posterior margin of the telson, often reaching with the tip over the base of the outer posterior spinules. The posterior margin of the telson bears the usual 2 pairs of spinules, between which 2 feathered setae are present.

The eyes are bullet-shaped, the cornea is entirely degenerated, and shows no pigment.

The antennular peduncle has the stylocerite slender and sharp. The anterolateral spine of the basal segment is small and reaches about to the rounded anterior margin of the segment. The upper antennular flagellum has the 2 rami united for about 4 to 6 joints. The free portion of the shorter ramus consists of 12 to 17 joints and is about 3 to 4 times as long as the fused part.

The scaphocerite is somewhat about 2.5 times as long as broad. The outer margin is straight. The final tooth is far overreached by the lamella.

The oral parts are typical.

The first leg reaches with the fingers beyond the scaphocerite. The chela is rather plump, in some specimens it is more elongate than in others. The fingers are twice to more than twice as long as the very short palm. The cutting edges close over their whole length and are entire; they are seemingly pectinate, however, by the presence of a row of very short hairs just below the edge at the outer side. The inner surface of the fingers is hollowed, so that the cutting edge is removed to the outside. The palm is somewhat swollen, it is higher than long. The carpus is about 1.6 times as long as the chela. The merus is 0.9 times as long as the carpus and the ischium is half as long as the carpus. The second leg reaches to the end of the scaphocerite or reaches with the chela beyond it. It differs extremely little from the first legs, being only slightly longer. The chela is slightly larger and has the fingers relatively a little longer than in the first legs, but the shape is the same. The carpus is 1.5 times as long as the chela and 1.6 times as long as the merus. The ischium is almost as long as the merus. The third leg reaches with part of the propodus beyond the scaphocerite. The propodus is somewhat less than 4 times as long as the dactylus, 1.3 times as long as the carpus and slightly shorter than the merus. The fifth leg reaches with about half the length of the propodus beyond the scaphocerite. The propodus is 6 times as long as the dactylus, 1.6 times as long as the carpus, and 1.2 times as long as the merus.

The pleopods and uropods are normal in shape. The endopod of the first pleopod, both in my male as well as in my female specimens is more or less twisted. Furthermore the external margin of the uropodal exopod has the final tooth without a movable spinule at its inner side.

Size: The largest specimens seen by me measure up to 18 mm. No ovigerous females were among the material examined.

Material examined: The United States National Museum possesses a large amount of material of this species from an artesian well at San Marcos, Texas (collected February and March, 1896 and March, 1902), furthermore 1 specimen is present from Ezell's Cave, San Marcos, Texas (collected March, 1937).

Distribution: The species is only known from subterranean waters at San Marcos, Texas. The only original records in literature are Benedict (1896), Eigenmann (1900), Neher (1902) and Ulrich (1902).

Type: The type locality is the artesian well at San Marcos, Texas. The type specimens are preserved in the collection of the U. S. National Museum (Cat. No. 19326), and were examined by me.

Remarks: The species in many respects is so different from other species of *Palaemonetes* especially in the shape of the eyes, the first 2 legs and the uropods, that I hesitated at first to place it in the present genus. It was thought necessary to place it in a new subgenus as the differences in my opinion are not sufficient to erect a new genus for it. So *Palaemonetes antrorum* is the only blind species of the genus, since the 4 other blind species (*P. calcis*, *P. eigenmanni*, *P. gibarensis* and *P. inermis*) formerly placed in *Palaemonetes* are now removed to a separate genus *Troglocubanus*. *P. antrorum* differs from the 4 *Troglocubanus* species, among other characters, by possessing a distinct branchiostegal spine.

The fact that no ovigerous females could be found in the very extensive material of this species, which is present in the U. S. National Museum, probably is due to the fact that all this material was collected in the early spring (February, March). Neher (1902) reports on material collected in September; his material contained young specimens of about 5 mm length. The species thus possibly is breeding in summer or late spring.

With a considerable amount of doubt I assign two specimens from Ezell's Cave, San Marcos, Texas (April 2, 1933, C. S. Smith coll.) to the present species. The specimens, which are 16 and 18 mm long, show numerous differences with all other specimens of *Palaemonetes antrorum*

seen by me. The rostrum is shorter and bears less teeth (in one specimen there are four, in the other about 7 teeth), the first of which stands on the carapace behind the orbit. The antennal spine is absent in one of the specimens, in the other it is visible as a minute sharp spine. The telson is quite different and has the shape of that of a larval *Palaemonid*: the posterior margin is widened and bears 5 pairs of spines, the external of which are short, the following pair is long and the three inner pairs are of intermediate size. There are two pairs of dorsal spinules, placed on the lateral margins of the telson. The eyes, antennulae, and antennae show no important difference with those of *Palaemonetes antrorum*. The mouth parts, however, are totally aberrant. The mandible resembles that of *P. antrorum* in the absence of a palp and in the shape of the molar process, the incisor process, however, is reduced to a short and blunt triangular structure at the dorsal side of the molar process. The maxillula has the inner lacinia enormously broadened, while the upper lacinia too is larger than that of the typical form. The maxilla shows no essential differences with that of *P. antrorum*. The first maxilliped is very large and has the endites enormously enlarged and produced forwards. The second maxilliped too is excessively large and has the last two joints very elongate. The third maxilliped and all the legs are much more slender than in *P. antrorum*. The third maxilliped reaches to the end of the scaphocerite, the relation between the lengths of the various joints is about as in *P. antrorum*. Both the first and second pereopods reach with the chela beyond the end of the scaphocerite. These two legs are much alike; all the joints are more slender than in *P. antrorum*. The fingers of both these legs are somewhat less than twice as long as the palm, the carpus is almost twice as long as the chela. The third leg reaches with part of the propodus, the fifth even with half the carpus beyond the scaphocerite. The second pleopods have no appendix masculina.

Considering the fact that the telson shows juvenile characters, I do not feel justified in describing the present two specimens as belonging to a new species, as they may not be full grown specimens of *Palaemonetes antrorum*. Against the latter supposition, however, pleads the fact that the specimens are as large as the largest specimens of *Palaemonetes antrorum* seen by me. Furthermore the maxillula, the first and second maxillipeds are much larger than those of the adult specimens of *P. antrorum*, while the third maxillipeds and all the legs are much longer. I have, however, too little material at my disposal to be able to form a definite opinion about the systematic and ontogenetic status of these two specimens. Dr. C. S. Smith, professor of Biology, Southwest Texas State

Teachers College, San Marcos, Texas, who collected this very interesting material in 1933, was so kind to inform me, that at present it is not possible to get material from Ezell's Cave any more, the locality from where the specimens were obtained, because this cave is falling in and is too dangerous to be entered. A specimen of *Palaemonetes* collected in Ezell's Cave on March 25, 1937 (O. Sanders coll.) proved to be perfectly identical with the adult specimens of *Palaemonetes antrorum* from the artesian well at San Marcos. A thorough investigation of the life history of *Palaemonetes antrorum* will be of great value.

Subgenus PALAEMONETES Heller

This subgenus, containing all known species except *Palaemonetes (Alaocaris) antrorum*, differs from the subgenus *Alaocaris* by having:

1. The eyes well developed, with the cornea globular and pigmented.
2. The lower margin of the rostrum provided with teeth.
3. The second legs much stronger than the first.
4. The outer margin of the uropodal exopod ending in a tooth, which at its inner side is provided with a movable spine.

Ten species are known at present from American waters.

Palaemonetes (Palaemonetes) paludosus (Gibbes)¹³

Pl. 51, figs. e-j

Hippolyte caroliniana Gibbes, 1948, Tuomey's Rep. Geol. S. Carolina, App., p. xvi (nom. nud.)²⁸

Hippolyte paludosa Gibbes, 1850a, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 197.

Palaemonetes exilipes Stimpson, 1871, Ann. Lyc. New York, vol. 10, p. 130.

Palaemonopsis exilipes Stimpson, 1871, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 130.

Palaemonetes exilipes p.p. Smith, 1874, Rep. U. S. Fish Comm., vol. 2, p. 641 (non pl. 1, fig. 1).

Palaemonetes paludosa p.p. Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 65.

Palaemonetes paludosa p.p. Kingsley, 1878b, Proc. Acad. Nat. Sci. Phila., 1878, p. 97.

Hippolysmata paludosa Howard, 1883, South Carolina, p. 294.

¹³ Many specimens referred in literature to the present species belong in reality to the next (vid. p. 212).

- Palaemonetes exilipes* p.p. R. Rathbun, 1883, Bull. U. S. Fish Comm., vol. 2, p. 144; R. Rathbun, 1884, Fish. Fish. Industr. U. S., vol. 1, p. 819.
- Palaemonetes exilipes* Ives, 1891, Proc. Acad. Nat. Sci. Phila., 1891, p. 194.
- Palaemon (Palaemonetes) exilipes* Thallwitz, 1892, Abh. Ber. Zool. Anthrop. Mus. Dresden, 1890-91, pt. 3, p. 8.
- Palaemon (Palaemonetes) paludosus* Thallwitz, 1892, Abh. Ber. Zool. Anthrop. Mus. Dresden, 1890-91, pt. 3, p. 12.
- Palaemonetes paludosa* p.p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 124; Kingsley, 1899, Amer. Nat., vol. 33, p. 718 (non fig. 56).
- Palaemonetes exilipes* Coulon, 1907, Bull. Soc. Étud. Sci. Nat. Elbeuf, 1907, p. 191; Worth, 1908, Bull. U. S. Bur. Fish., vol. 28, p. 853; Hay & Shore, 1918, Bull. U. S. Bur. Fish. vol. 35, p. 393, pl. 27, fig. 3.
- Palaemonetes exilipes* p.p. Ortmann, 1918, Ward & Whipple's Fresh Water Biology, p. 845 (non fig. 1312); Kendall, 1923, Rep. U. S. Fish Comm., 1922, pt. 2, p. 14 (non fig. 9); Kemp, 1925, Rec. Indian Mus., vol. 27, p. 316.
- Palaemonetes exilipes* Stiles & Hassall, 1927, Hygienic Lab. Bull., n. 148, p. 216.
- Palaemonetes paludosa* Stiles & Hassall, 1927, Hygienic Lab. Bull., n. 148, p. 216.
- Palaemonetes exilipes* p.p. Creaser, 1931, Pap. Michigan Acad. Sci., vol. 13, p. 272, fig. 39.
- Palaemonetes exilipes* p.p. Creaser, 1933, Aquarium, Phila., vol. 1, p. 261.
- Palaemonetes exilipes* Pearse, 1936, Journ. Elisha Mitchell Sci. Soc., vol. 52, p. 195; Coker, 1938, Journ. Elisha Mitchell Sci. Soc., vol. 54, p. 83; Lunz, 1939, Science, N. Y., n. ser., vol. 81, p. 436; Burkenroad, 1947, Amer. Nat., vol. 81, p. 397.
- Palaemonetes (Palaemonetes) paludosus* Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 91, fig. 1 f-i; 1950a, Siboga Exped. mon. 39a9, p. 10.

Description: The rostrum is rather slender, reaching about to or somewhat beyond the end of the scaphocerite. The upper margin is somewhat concave and the tip is directed upwards. There are 6 to 8 teeth on the upper margin, seldom 5 or 9. The first of these teeth, seldom the first 2, are placed behind the orbit. The distal teeth are more widely spaced than the proximals. The lower margin bears 3 or 4, seldom 1

or 2, teeth. The branchiostegal spine is placed on the anterior margin of the carapace, just below the point where the branchiostegal groove reaches the anterior margin. In all Florida specimens there is no space between the base of the spine and the margin of the carapace, while in specimens from New Jersey to Georgia the spine is slightly removed from the margin, pointing, however, with more than half its length beyond it. These specimens moreover can immediately be separated from *P. kadiakensis* by having the branchiostegal spine placed just below the branchiostegal groove and not quite a distance below it as in the latter species.

The 6th abdominal segment is somewhat less than twice as long as the fifth and is slightly shorter than the telson. The anterior pair of dorsal spines lies in or somewhat behind the middle of the telson, the posterior pair lies about midway between the anterior pair and the posterior margin of the telson. The posterior margin as usual ends in a distinct median point, and is provided with 2 pairs of spines and 2 feathered setae.

The eyes are well developed. The cornea is globular and well pigmented.

The basal segment of the antennular peduncle has the stylocerite small and slender, it reaches to, or just fails to reach the middle of the segment. The anterolateral spine of the basal segment is strong, but nevertheless is somewhat overreached by the strongly forwards produced anterior margin of the segment. The last 2 segments of the peduncle are rather slender, are of about equal length and together they are about as long as the basal segment. The upper flagellum has the 2 rami fused for 16 to 29 joints, the free part consists of 4 to 9 joints, being less than $\frac{1}{3}$ as long as the fused part.

The scaphocerite is about thrice as long as broad, it is of about the same breadth over its entire length. The lamella distinctly overreaches the final tooth.

The first legs just fail to reach the end of the scaphocerite, sometimes they fall largely short of it. The fingers are about as long as the palm. The carpus is $2\frac{1}{2}$ times as long as the chela and $\frac{5}{4}$ times as long as the merus. The second legs are distinctly larger and stronger than the first. They reach with the whole or part of the chela beyond the scaphocerite. The fingers measure $\frac{3}{4}$ of the length of the palm. The cutting edges of the fingers are unarmed, but the fingers are slightly gaping at the base. The carpus is about $1\frac{1}{2}$ times as long as the chela and $1\frac{1}{2}$ to $1\frac{3}{4}$ as long as the merus. The ischium is as long as the merus. The

third pereopod just falls short of the tip of the final tooth of the scaphocerite. The propodus is slightly more than twice as long as the slender dactylus, twice as long as the carpus and slightly shorter than the merus. The fifth leg reaches with part of the dactylus beyond the scaphocerite. The propodus is about thrice as long as the dactylus, twice as long as the carpus and distinctly longer than the merus.

The pleopods and uropods are normal in shape. The outer margin of the uropodal exopod ends in an immovable tooth, which at its inner side is provided with a movable spine.

Size: The largest specimen seen by me measured 46 mm. Ovigerous females measured 30 to 44 mm. The eggs are rather few and large, they are 0.9 to 1.4 mm in diameter.

Colour: In life the animals are nearly transparent (Hay & Shore, 1918).

Material examined: In the collection of the Allan Hancock Foundation at Los Angeles specimens of this species are present from:

Florida: Large Balancing Canal, W. of Boca Raton, June, 1943.

In the United States National Museum material of this species is present from the following localities: New Jersey (Newton Creek, Gloucester, Camden Co.), Maryland (near Gayton, Caroline Co.; Patuxent River at Arundel, Prince George Co.; Laplata, Waldorf and near Bryantown, Charles Co.; St. George Island, St. Mary Co.; Girdle-tree, Worcester Co.), District of Columbia (Shaw Ponds at Kenilworth), Virginia (Dogue Creek, Fairfax Co.; Newport News, Warwick Co.; near Richmond; Taylor Millpond, Greensville Co.; Saunders, Nansemond Co.), North Carolina (Halifax and Hales Point, Halifax Co.; Edenton, Chowan Co.; Mattamuskeet Lake, Hyde Co.; Lakeview, Moore Co.; Beaufort and Morehead City, Carteret Co.; Wilmington, New Hanover Co.; Salmon Creek), South Carolina (between Bayboro and Homewood, Horry Co.; Hopkins, Richland Co.; Summerton, Clarendon Co.; Santee River, Williamsburg Co.; Orangeburg, Whitehouse Church and Fourhole Swamp, Orangeburg Co.), Georgia (Augusta, Richmond Co.; Buckhead Creek near Millen, Screven Co.; Okefenokee Swamp, Charlton Co.), Florida (Silver Lake, Calhoun Co.; Wakulla, Wakulla Co.; Withlacoochee River; Gainesville, Alachua Co.; Palatka, Satsuma and Crescent City, Putnam Co.; Manatee Springs, Levy Co.; McIntosh and Silver Springs, near Lake George, Marion Co.; Homosassa Springs, Citrus Co.; Eustis, Lake Co.; Sanford, Lake Jessup, near Orlando, Lake Butler and Englewood, Orange Co.; Knights, Hillsborough Co.; near Lake Kissimee, Osceola Co.; Indian River; Georgi-

ana, Brevard Co.; Myakka River, Sarasota Co.; Felda, Hendry Co.; near Miami, Dade Co.; Everglades), Mississippi (Grand Plains Bayou), Louisiana (Morgan City, St. Mary Parish; Lake Salvador, St. Charles Parish; Amesville, Jefferson Parish; New Orleans, Orleans Parish; Chalmette, St. Bernard Parish), Oklahoma (Clear Lake, McCurtain Co.), Texas (San Marcos, Hays Co.; Wallace Lake, Chambers Co.).

Distribution: The species is common in fresh-waters E. of the Alleghenies, from New Jersey to Florida. It seems to have been introduced in some localities west of this mountain range. The records in literature are: Maryland (Creaser, 1931), District of Columbia (Creaser, 1931), Virginia (Creaser, 1931), near Chapel Hill, Orange Co., North Carolina (Coker, 1938), Northampton Co., N. C. (Worth, 1908), Halifax, Halifax Co., N. C.! (Coker, 1938), Hales Point, Halifax Co., N. C.! (Hay & Shore, 1918; Coker, 1938!), Edenton, Chowan Co., N. C.! (Hay & Shore, 1918; Coker, 1938!), Lake Mattamuskeet, Hyde Co., N. C.! (Hay & Shore, 1918; Coker, 1938!), near Beaufort, Carteret Co., N. C.! (Pearse, 1936), Lakeview, Moore Co., N. C.! (Coker, 1938), Sampson Co., N. C. (Worth, 1908), Whitelake, Bladen Co., N. C. (Coker, 1938), Wilmington, New Hanover Co., N. C.! (Coker, 1938), Salmon Creek, North Carolina! (Coker, 1938), South Carolina (Gibbes, 1848; Howard, 1883), Summerton, Clarendon Co., S. C.! (Coker, 1938), Orangeburg, Orangeburg Co., S. C.! (Coker, 1938), Summerville, Berkeley Co., S. C. (Stimpson, 1871), St. Andrews, Charleston Co., South Carolina (Gibbes, 1850a), Ohopee River, Emanuel Co., Georgia (Creaser, 1931), Florida (Smith, 1874), Lake Okeechobee, Fla. (Ives, 1891; Sharp, 1893), Lake Hicpochee, De Soto Co., Fla. (Ives, 1891; Sharp, 1893), Caloosahatchie River, Lee Co., Fla. (Ives, 1891; Sharp, 1893).

Type: The type locality of this species is St. Andrews, Charleston Co., South Carolina. The type specimens were preserved in the collection of Dr. Gibbes. Their existence at present is very doubtful, inasmuch as they in 1850 "were not quite perfect, having lost some of their feet and antennae." (Gibbes, 1850a, p. 197.)

Remarks: The present species very often is named *Palaemonetes exilipes* Stimpson. The specimens described by Stimpson (1871) under this name from Somerville, S. C., certainly belong to the present species, but the name *exilipes* may not be used, because Gibbes's (1850a) name is older. Gibbes's specimens which were collected in fresh-water near Charleston, S. C., were more or less damaged, but the description,

though short, is such that it is not possible that his specimens are something else than *Palaemonetes exilipes*. That he brought the species to *Hippolyte*, probably is due to the loss of several legs in his material. As *Palaemonetes* is masculine, the name *paludosa* must be changed in *paludosus*.

The fresh-water species of *Palaemonetes* occurring west of the Alleghanies a long time has been considered conspecific with *P. paludosus*. It is, however, distinct as is pointed out on p. 217.

The records of the present species from Louisiana, Texas and Oklahoma (in the latter locality the species was found together with *P. kadiakensis*), probably is due to shipment of the species from east to west, as it is considered an important fish food. Worth (1908) mentions a large and successful shipment of living *Palaemonetes* from Halifax, N. C., to Neosho, Mo.

***Palaemonetes* (*Palaemonetes*) *kadiakensis* M. J. Rathbun**

Pl. 51, figs. k-n; pl. 52, figs. a, b

Palaemonetes exilipes p.p. Smith, 1874, Rep. U. S. Fish Comm., vol. 2, p. 641, pl. 1, fig. 1.

Palaemonetes exilipes Forbes, 1876, Bull. Illinois Mus. Nat. Hist., vol. 1, p. 5. (non Stimpson, 1871.)

Palaemonetes paludosa p.p. Kingsley, 1878, Proc. Acad. Nat. Sci. Phila., 1878, p. 97; Kingsley, 1878, Bull. Essex Inst., vol. 10, p. 65.

Palaemonetes exilipes Hay, 1882, Amer. Nat., vol. 16, p. 144.

Palaemonetes exilipes p.p. R. Rathbun, 1883, Bull. U. S. Fish Comm., vol. 2, p. 144; R. Rathbun, 1884, Fish. Fish Industr. U. S., vol. 1, p. 819.

Palaemonetes paludosa Underwood, 1886, Bull. Illinois Lab. Nat. Hist., vol. 2, p. 374; Herrick, 1887, Mem. Denison Sci. Ass., vol. 1, pt. 1, p. 46, pl. 5, fig. 5. (non *Hippolyte paludosa* Gibbes, 1850.)

Palaemonetes exilipes Evermann, 1892, Bull. U. S. Fish Comm., vol. 11, p. 90.

Palaemonetes paludosa p.p. Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 124; Kingsley, 1899, Amer. Nat., vol. 33, p. 718, fig. 56.

Palaemonetes exilipes Neher, 1902, Proc. Indiana Acad. Sci., 1901, p. 98, fig. 1.

Palaemonetes kadiakensis M. J. Rathbun, 1902b, Proc. U. S. Nat. Mus., vol. 24, p. 93; M. J. Rathbun, 1904, Harriman Alaska Exped., vol. 10, p. 30, fig. 9.

- Palaemonetes exilipes* Herms, 1907, Ohio Nat., vol. 7, p. 73, figs. 1, 2; Pearse, 1910, Rep. Michigan Acad. Sci., vol. 12, p. 74; Forbes & Richardson, 1913, Bull. Illinois Lab. Nat. Hist., vol. 9, pp. 531, 536, 543; Pearse, 1913, Occ. Pap. Mus. Zool. Univ. Michigan, n. 1, p. 4.
- Palaemonetes paludosus* Shelford, 1913, Bull. Geog. Soc. Chicago, vol. 5, p. 129, fig. 78.
- Palaemonetes paludosa* Huntsman, 1915, contr. Canad. Biol., 1911-1914, pt. 2, p. 154, fig. 7.
- Palaemonetes kadiakensis* Williamson, 1915, Nord. Plankt., vol. 18, p. 409.
- Palaemonetes exilipes* p.p. Ortmann, 1918, Ward and Whipple's Fresh Water Biology, p. 845, fig. 1312; Kendall, 1923, Rep. U. S. Fish Comm., 1922, pt. 2, p. 14, fig. 9; Kemp, 1925, Rec. Indian Mus., vol. 27, p. 316.
- Palaemonetes kadiakensis* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 316.
- Palaemonetes exilipes* Richardson, 1925, Bull. Nat. Hist. Surv. Illinois, vol. 15, p. 420.
- Palaemonetes paludosa* Johansen, 1929, Canad. Field Nat., vol. 43, p. 104.
- Palaemonetes exilipes* p.p. Creaser, 1931, Pap. Michigan Acad. Sci., vol. 13, p. 272, fig. 39.
- Palaemonetes exilipes* Creaser, 1932, Trans. Wisc. Acad. Sci. Arts Lett., vol. 27, p. 333, fig. 13.
- Palaemonetes exilipes* p.p. Creaser, 1933, Aquarium, Phila., vol. 1, p. 261, fig.
- Palaemonetes exilipes* Creaser and Ortenburger, 1933, Pub. Univ. Oklahoma Biol. Surv., vol. 5, p. 45, fig. 19.
- Palaemonetes exilipes* Geiser, 1933, Field Lab., vol. 2, p. 30; Geiser, 1933a, Abstr. Pap. Ann. Meeting N. Texas Biol. Soc., April 22, 1933, p. 7.
- Palaemonetes paludosa* Meehan, 1936, Trans. Amer. Micr. Soc., vol. 55, p. 433, text fig. 7, pls. 54, 55; Meehan, 1936a, Proc. Louisiana Acad. Sci., vol. 3, p. 47.
- Palaemon exilipes* Anonymous, 1942, Annot. List Fauna Grand Isle Region, p. 6.
- Palaemonetes exilipes* Reeves, 1942, Journ. Alabama Acad. Sci., vol. 14, p. 57.
- Palaemonetes paludosa* Hoff, 1944, Rep. Reelfoot Lake Biol. Sta., vol. 8, p. 26.

Palaemonetes (Palaemonetes) kadiakensis Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 92, fig. 1 j-1; 1950a, Siboga Exped., mon. 39a9, p. 10.

Description: The rostrum is straight, rather high in specimens from northern localities, generally more slender in southern specimens. It reaches about to the end of the scaphocerite, reaching sometimes slightly beyond that scale and falling sometimes slightly short of it. The upper margin is somewhat convex and bears 6 to 8, generally 7, teeth (in abnormal specimens 5, 9 or 10 may be found. The first of these teeth is placed behind the orbit on the carapace proper. The teeth are separated by equal distances, only the distance between the last tooth and the tip of the rostrum generally is larger than that between the teeth themselves. The lower surface bears generally 2, sometimes 3 (in southern forms 3 teeth more often are observed than in the northern) teeth (in abnormal specimens none, 1 or 4 lower teeth may occur). The carapace is provided with antennal and branchiostegal spines. The branchiostegal spine lies a distinct distance below the branchiostegal groove and is distinctly removed from the anterior margin of the carapace, generally reaching with the tip to, or slightly beyond that margin.

The abdominal segments are as in *P. paludosus*. The telson has the anterior pair of dorsal spines placed distinctly behind the middle of its length, while the posterior pair is placed very close to the posterior margin, generally so close that it looks as if there are 3 pairs of posterior spines. The 2 posterior spines are as in *P. paludosus*, and 2 feathered setae are present between the inner spines.

The eyes and antennulae as in *P. paludosus*. The anterior margin of the basal segment of the antennula sometimes (most often in southern specimens) is strongly produced anteriorly, overreaching thereby the middle of the 2nd segment, but all transitions to the normal shape occur. Like in *P. paludosus* the shorter of the 2 rami of the upper flagellum has the fused part more (often much more) than thrice as long as the free part. The number of fused joints varies between 11 and 23, that of the free joints between 3 and 8, the higher numbers generally being found in specimens from the southern part of the range of distribution of the species.

The scaphocerite does not differ essentially from that of the preceding species.

The oral parts have the typical form.

The pereopods do not differ essentially from those of *Palaemonetes paludosus*. Also the pleopods and uropods are of the usual shape.

Size: Meehan (1936) states his largest specimen to be 53 mm in length, though generally the specimens are smaller. Ovigerous females were found to be 23 to 49 mm long.

Material examined: In the U. S. National Museum material of this species is present from: New York (Tonawanda, Erie Co.; Brad-dock Bay, Monroe Co.; Sodus Bay, Wayne Co.), Ohio (Perrysburg, Wood Co.; Maumee Basin; Put-in-Bay, Ottawa Co.; Fremont, Sandusky Co.; Sandusky Bay; Flat Creek, N. of Delphos, Camp Creek and Spencerville, Allen Co.; Wabash River and 12 Mile Creek, Mercer Co.; 12 Mile Creek, Lake St. Marys and Auglaize River near Wapakoneta, Auglaize Co.; De Haven Pond, Shelby Co.; Brush Creek, Scioto Co.), Indiana (Shelby, Lake Co.; Lake Maxinkuckee, Marshall Co.; Tippecanoe River; Little River, W. of Aboite, Huntington Co.; Pigeon Creek near Evansville, Vanderburgh Co.), Michigan (Lake Superior; Lake Huron; Mouth of St. Joseph River, Berrien Co.; Port Huron, St. Clair Co.; Detroit and Ecorse, Wayne Co.), Illinois (Kankakee, Kankakee Co.; Quincy, Adams Co.; Horseshoe Lake near Moellenbrocks near Collinsville, Madison Co.; Olney, Richland Co.; Mt. Carmel, Wabash Co.; Bottoms, Union Co.; Cairo, Alexander Co.), Iowa (Keokuk, Lee Co.), Kentucky (Clinton, Hickman Co.; Lynngrove, Graves Co.; Shady Grove, Crittenden Co.; Owensboro, Davies Co.; S. of Island, Muhlenberg Co.; Woodbury, Butler Co.), Florida (Jackson Lake, Leon Co.; Waldo and Gainesville, Alachua Co.), Alabama (Harris Station, Limestone Co.; Wheeler, Lawrence Co.; Tuscaloosa, Tuscaloosa Co.; Selma, Dallas Co.; Auburn, Lee Co.), Mississippi (Friarpoint, Coahoma Co.; Tupelo, Lee Co.; West Point, Clay Co.; Itta Bena and Browning, Leflore Co.; Inverness and Lake Shakelford, Sunflower Co.; Greenville and Leland, Washington Co.; Belzoni, Humphreys Co.; Yazoo City, Yazoo Co.; Canton, Madison Co.; Carthage, Leake Co.; Vicksburg, Warren Co.; Rawles Springs and Hattiesburg, Forrest Co.), Louisiana (Campti, Natchitoches Parish; Opelousas, St. Landry Parish; Fordoche, Pointe Coupee Parish; Baton Rouge, East Baton Rouge Parish; Erwinville, West Baton Rouge Parish; Tickfaw, Tangipahoa Parish; Bogalusa, Washington Parish; Bayou Lacombe and Talisheek, St. Tammany Parish; Kraemer, Lafourche Parish; New Orleans, Orleans Parish; Fallen Switch), Arkansas (Phillips Bay, Lawrence Co.; St. Francis River; Newport, Jackson Co.; Higginson, White Co.; Conway, Faulkner Co.), Oklahoma (Clear Lake, McCurtain Co.), Texas (near Dallas, Dallas Co.; Chandler, Henderson Co.; near Palestine, Anderson Co.; Beaumont, Jefferson Co.; near Houston, Harris Co.; Schulenburg, Fayette Co.;

Eaglelake, Colorado Co.; Guthrie Lake and Carancahua Creek, Jackson Co.; Garcitas Creek and Bridhams Lake, Victoria Co.; Pleasantown, Atacosa Co.; Laredo, Webb Co.; Corpus Christi, Nueces Co.).

Distribution: The species inhabits the fresh-waters of the central part of the U. S. A., namely, the shores of Lakes Ontario, Erie and Michigan, the Mississippi basin and the basins of several rivers emptying east and west of the Mississippi in the Gulf of Mexico. It furthermore is known from S. Canada and N. E. Mexico. The records in literature are: Hamilton, Ontario, Canada (Johansen, 1929), Weland River, Ont. (Huntsman, 1915), Rondeau Harbor, Ont. (Pearse, 1913), Detroit River, Ontario, Canada (Huntsman, 1915), New York State (Creaser, 1931), Erie, Erie Co., Pennsylvania (Pearse, 1913), Put-in-Bay, South Bass Island, Lake Erie, Ottawa Co., Ohio (Pearse, 1913), Sandusky Bay, Ohio! (Smith, 1874!; Herms, 1907; Pearse, 1913; Huntsman, 1915), Wyandotte Cave, Crawford Co., Indiana (Sharp, 1893), Ecorse, Wayne Co., Michigan! (Smith, 1874), Oldport and Newport, Monroe Co., Michigan (Creaser, 1931), Wisconsin (Creaser, 1931), near Hudson, St. Croix Co., near Maiden, Pierce Co., near Alma, Buffalo Co., and near Prairie du Chien, Crawford Co., Wisconsin (Creaser, 1932), Iowa (Creaser, 1931), Illinois River, Illinois (Forbes, 1876), Springvalley and Depue Lake, Bureau Co., and between Henry and Chillicothe, Marshall Co., Ill. (Forbes and Richardson, 1913), Pekin, Tazewell Co., Ill. (Forbes, 1876), between Liverpool, Fulton Co. and Havana, Mason Co., Illinois (Richardson, 1925), Kentucky (Creaser, 1931), Reelfoot Lake, Obion Co., Tennessee (Hoff, 1944), Memphis, Shelby Co., Tennessee (Hay, 1882), Tuscaloosa, Tuscaloosa Co., Alabama (Herrick, 1887), Tuscaloosa Co., Alabama (Reeves, 1942), Tombigbee and Moxubee Rivers, Mississippi (Hay, 1882), Jackson, Hinds Co., and Enterprise, Clarke Co., Mississippi (Hay, 1882), Louisiana (Creaser, 1931), Natchitoches, Natchitoches Parish, La. (Meehean, 1936), Grand Isle, Jefferson Parish, Louisiana (Anonymous, 1942), Missouri (Creaser, 1933), Arkansas (Creaser, 1931), Oklahoma (Creaser, 1931), Poteau River, Leflore Co., Oklahoma (Creaser & Ortenburger, 1933), Kaimichi River, Pittsburgh Co., Oklahoma (Creaser & Ortenburger, 1933), Dallas, Dallas Co., Texas! (Geiser, 1933), near Palestine, Anderson Co., Magnolia Pt. near Palestine, Anderson Co., and near Houston, Harris Co., Tex. (Evermann, 1892), San Marcos, Hays Co., Tex. (Neher, 1902), Corpus Christi, Nueces Co., Texas! (Evermann, 1892), Nuevo Leon State, Mexico (Creaser, 1932), ? Kodiak Island, Alaska (M. J. Rathbun, 1902b, 1904).

Type: The type locality is Kodiak Island, Alaska.¹⁴ The type specimens are in the collection of the United States National Museum (Cat. No. 6246).

Remarks: Up till now the fresh-water specimens of *Palaemonetes* from Central and Eastern U. S. A. were considered to be one species, though some authors (e.g., Smith, 1874) noticed differences between those specimens. Now it is clear that we have to do with 2 well marked species, one occurring east of the Alleghanies, from New Jersey to Florida, the other occupying the region west of this mountain range from New York, Ontario and Wisconsin in the north to Alabama, Texas and N. E. Mexico in the south. The differences, though being rather small, are constant. Within the species some characters are varying, often being constant in one locality. These characters, however, are so unimportant, and the differences being so slight and not very constant, that no value can be attached to them.

The name generally used for both forms is *Palaemonetes exilipes*, though various authors employed the name *P. paludosa* (an error for *P. paludosus*). As already pointed out the type of specimens of both *Palaemonetes exilipes* Stimpson and *Hippolyte paludosa* Gibbes originated from S. Carolina, thus both belonging to the eastern species, which consequently has to be named *Palaemonetes paludosus* (Gibbes), Gibbes's name being the older.

In 1902 M. J. Rathbun gave a preliminary description of *Palaemonetes kadiakensis*, of which species a more complete description and a figure were published in 1904 by the same author. Kemp (1925, p. 317) already remarked that he was unable to distinguish between *P. kadiakensis* and *P. exilipes*. Comparing the type specimens of *P. kadiakensis* with specimens of the two forms of fresh-water *Palaemonetes* from the U. S. A., I found them completely identical with the form from the central U. S. A. So nothing could be done except to consider them as belonging to the same species. The name *kadiakensis* is the first valid name, employed for specimens of the western form, so that that name has to be used for the species. In my opinion it is very probable that the type specimens of *P. kadiakensis* were wrongly labelled and do not originate from Alaska at all. Since Rathbun's record the species has not been rediscovered in Alaska. It seems very strange, too, that the species should occur "under stones at low water," certainly an unusual habitat for a *Palaemonetes*. The more so as the habitat of

¹⁴ The correctness of this type locality is very doubtful, vid. p. 212.

this species is described by Herms (1907) as being, "clear, shallow water ranging in depth from one to perhaps four or five feet, with vegetation and sandy bottom."

In some places in the region which is inhabited by the present species, the closely related *Palaemonetes paludosus* may occur. In the U. S. National Museum for instance, specimens of the latter species are present from Louisiana (neighbourhood of New Orleans and Morgan City), Texas (San Marcos) and Oklahoma. At first sight this seems very strange, but when we keep in mind that both species are used as a fish food and for that reason are transported over great distances, this anomaly in the distribution may be explained. So Worth (1908) mentions a shipment of 3300 specimens of *Palaemonetes paludosus* from "Halifax, N. C., for delivery at Washington, D. C., 200 miles distant," and other shipments "from the same place [Halifax, N. C.] to the Neosho, Mo., station," which under proper circumstances were very successful.

Palaemonetes (Palaemonetes) carteri Gordon

Pl. 52, figs. c-o; pl. 53, figs. a-c

Palaemonetes cubensis Sollaud, 1923, Bull. Biol. France Belg., vol. 57, p. 577, fig. 20 (non Hay, 1903).

Palaemonetes carteri Gordon, 1935a, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 324, fig. 12; Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 1113; 1950a, Siboga Exped., mon. 39a9, p. 10; 1950b, Zool. Meded., vol. 31, p. 32.

Description: The rostrum is slender, being distinctly curved upwards in the distal part. It reaches to or slightly beyond the tip of the scaphocerite. The proximal half of the upper margin bears 5 to 8 teeth, the first of which is situated mostly behind the posterior limit of the orbit, seldom all teeth are placed on the rostrum proper. The first tooth is somewhat smaller than the others. One or two subapical teeth are placed close to the apex. There is a large unarmed space between these subapical teeth and the proximal rostral teeth. The lower margin bears 3 to 7 teeth, mostly 5 or 6; these teeth are placed in the distal half of the rostrum. The branchiostegal spine is almost as strong as the antennal, it is slightly remote from the anterior margin of the carapace; this margin, however, is overreached by the tip of the branchiostegal spine. The branchiostegal groove is situated some distance dorsally of the branchiostegal spine.

The abdomen is smooth. The apex of the pleura of the fifth segment is pointed. The sixth segment is 1.6 times to twice as long as the fifth. The telson is somewhat longer than the sixth abdominal segment. The dorsal surface of the telson bears two pairs of spinules, the anterior of which is placed in the middle of the telson, the posterior is situated about midway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a sharp median point, which is flanked at each side by two spines and a feathered seta. The outer spine is much shorter than the inner, the feathered setae are placed between the inner spines.

The eyes are well developed and possess black pigment.

The basal segment has the stylocerite slender and pointed, it fails to reach the middle of the basal segment. The outer margin of the basal segment is almost straight and ends in a strong anterolateral tooth, which reaches beyond the middle of the second segment of the antennular peduncle. The anterior margin of the basal segment is strongly convex and even overreaches the anterolateral tooth. The second segment of the antennular peduncle is about as broad as, but distinctly shorter than the third. Together these two segments are more than half as long as the basal segment. The fused part of the upper antennular flagellum consists of 5 to 8 joints, the free part of the shorter ramus of 7 to 20 joints, being thereby about 2.5 to 5 times as long as the fused portion.

The scaphocerite reaches far beyond the antennular peduncle, but fails or almost fails to reach the end of the rostrum. It is about thrice as long as broad. The outer margin is straight or slightly concave and ends in a strong final tooth, which, however, is distinctly overreached by the lamella.

The oral parts are quite typical.

The first pereiopod reaches to or almost to the end of the scaphocerite. The chela is rather broad, the fingers are longer than the palm. The carpus is almost twice as long as the chela. The merus is somewhat shorter than the carpus, while the ischium is about half as long as the merus. The second pereiopods are slender, they reach with the chela and sometimes with a small part of the carpus beyond the scaphocerite. The fingers measure about $\frac{2}{3}$ of the length of the palm; the fixed finger as well as the dactylus possess one small tooth in the middle of their cutting edges, the tooth of the dactylus is placed slightly anteriorly of that of the fixed finger. The rest of the cutting edges is entire, but the part proximal of the teeth is concave, so that when the fingers are closed a distinct gap is visible between the proximal parts of the fingers.

The carpus is about 1.5 to almost twice as long as the chela, it is distinctly broadened in the distal part. The merus is about as long as the chela, and distinctly shorter than the ischium. The last three pereopods are slender, the third is shortest, it slightly overreaches the antennular peduncle, but greatly falls short of the tip of the scaphocerite. The dactylus measures about $2/5$ of the length of the propodus. The propodus is slender and provided with some 5 spines at the posterior margin. The carpus is about half as long as the propodus. The merus is about as long as the propodus and the ischium is about as long as the carpus. The fifth pereopod is the most slender, it reaches with part of or with the entire dactylus beyond the scaphocerite. The propodus is somewhat more than thrice as long as the dactylus. The carpus is about half as long as the propodus. The merus is somewhat shorter than the propodus, the ischium is somewhat shorter than the carpus.

The pleopods and uropods are normal in shape. The outer margin of the exopod of the uropod ends in a tooth, which at its inner side is provided with a movable spine.

Size: The specimens seen by me measured 16 to 35 mm. The males generally are smaller than the females, they are up to 28 mm long. The eggs are large and few, the diameter is 1.0 to 1.65 mm.

Colour: In life the animals are perfectly colourless and transparent, except for a dark mass which lies in the thorax around the stomach. (Holthuis, 1950b, p. 34.)

Some specimens of this species were brought alive from Surinam to Holland together with tropical aquarium fishes. The material was studied by me in Leiden and the following colour pattern was noted: The body is colourless transparent, with the intestine shining through. Rather many scattered small red chromatophores are visible on the body when examined with a strong lense. The chromatophores are rather regularly distributed over the body. On the carapace, however, some more or less distinct bands of a darker colour are visible; here the chromatophores are placed closer together than on the rest of the carapace. A horizontal red band runs on each side of the carapace from the antennal spine backwards. Below this band there are two short vertical bands: one in and one slightly before the middle of the carapace. Furthermore a short horizontal band is visible just below the posterior part of the large horizontal band. Also some whitish chromatophores are visible on the body. A line of such chromatophores extends over the full length of the rostrum, a few of them are placed near the posterior margin of the abdominal segments and on the tail fan, while they form a transverse band

over the base of the telson and the uropods. The eyes have the cornea dark brown to black. The peduncle bears white and reddish chromatophores on the upper side and a broad dark blackish line below. Scattered chromatophores are visible on the antennular peduncle and the scaphocerite, they are most numerous near the outer and inner margins. A broad dark red line is visible at the base of the antennulae, behind the statocysts. The flagella are pale yellowish brown. The legs generally are not coloured, though sometimes chromatophores are present near the articulations. In one of my specimens the fingers of the second chelipeds are pinkish, while the articulation between the dactylus and the palm is of a pale greyish blue colour. The pleopods have some scattered red chromatophores. On the ventral surface of the body some very conspicuous dark red streaks are visible. One of these streaks is placed in the basal part of the third maxilliped, another in the basal part of the third pereopod, two more on the last two pairs of pleurobranches, and finally there is a streak along the abdominal part of the intestine.

Material examined: In the collection of the U. S. National Museum 2 small specimens of this species from Rio Amava, 2 km south of Maturin, E. Venezuela are preserved. The Rijksmuseum van Natuurlijke Historie at Leiden, Holland, possesses some thousands of individuals of this species from various localities in Surinam (Dutch Guiana); between Coronie and Paramaribo, Paramaribo, Zanderij I. and Republiek both at about 40 km S. of Paramaribo, Sectie Q and Guyana Goud Placer both at about 70 km S. of Paramaribo, Kabelstation at about 130 km S. of Paramaribo, Saramacca River basin, and N. of Moengotapoe in N. E. Surinam.

Distribution: The species is known at present from fresh-water in Venezuela, British, Dutch and French Guiana. The records in literature are: Upper Cuyuni River, British Guiana (Gordon, 1935a), Mazaruni River near Penal Settlement, British Guiana (Gordon, 1935a), between Coronie and Paramaribo, Surinam! (Holthuis, 1950b), Paramaribo, Republiek at about 40 km S. of Paramaribo, Guyana Goud Placer at about 70 km S. of Paramaribo, and Saramacca River basin! (Holthuis, 1950b), Zanderij I. at about 40 km S. of Paramaribo, and Sectie Q at about 70 km S. of Paramaribo! (Holthuis, 1948), Kabelstation at about 75 km S. of Paramaribo! (Holthuis, 1948, 1950b), N. of Moengotapoe, N. E. Surinam! (Holthuis, 1950b), Cayenne, French Guiana (Sollaud, 1923).

Type: The type locality is Upper Cuyuni River, British Guiana. The holotype (Reg. No. 5.20.19) and the paratypes (Reg. No. 5.20.20-29) are preserved in the collection of the British Museum, London.

Remarks: The species shows a strong resemblance to *Palaemon pandaliformis* Stimpson. The differences, however, are:

1. The branchiostegal spine in *Palaemonetes carteri* lies behind the anterior margin of the carapace, in *Palaemon pandaliformis* it lies on that margin.

2. The mandible in *Palaemonetes carteri* lacks a palp, while it is present in *Palaemon pandaliformis*.

3. The eggs of *Palaemonetes carteri* are much larger than those of *Palaemon pandaliformis*.

Palaemonetes (*Palaemonetes*) *ivonicus* Holthuis

Pl. 53, figs. d-h

Palaemonetes ivonicus Holthuis, 1950, Proc. Kon. Nederl. Akad. Wetensch., vol. 53, p. 98.

Palaemonetes (*Palaemonetes*) *ivonicus* Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 10.

Description: The rostrum is straight and extends beyond the antennular peduncle, it fails, however, to reach as far as the end of the scaphocerite. The upper margin is arched in the larger proximal part, and bears 6 to 10 teeth, the first of which is placed behind the orbit. The distal teeth are placed wider apart than the proximals; a small subapical tooth is situated just before the apex. The lower margin bears 3 teeth. The carapace is smooth, the branchiostegal groove is very distinct. The branchiostegal spine is placed much below the groove and is so far removed from the anterior margin of the carapace that even its tip falls short of that margin.

The abdomen is smooth. The pleura of the 5th segment ends in a rounded tip, the posterior margin of the pleura is, however, concave. The sixth segment is almost twice as long as the fifth and is slightly shorter than the telson. The anterior of the 2 dorsal pairs of spines of the telson is placed about in the middle of the length of the telson, the posterior pair lies somewhat closer to the anterior pair than to the posterior margin of the telson. This posterior margin is truncate and ends in an acute median point, it bears the usual 2 pairs of spinules and 2 feathered setae. The inner spines overreach the tip of the telson.

The eyes are well developed, have the cornea globular and provided with pigment.

The antennules have the basal segment very broad, becoming broader anteriorly. The stylocerite is small and just fails to reach the middle of the basal segment. The anterolateral angle bears a distinct tooth.

The anterior margin of the basal segment is produced extremely far forward and reaches to the end of the second segment of the peduncle. The third segment of the peduncle is as broad as but distinctly longer than the second. The upper antennular flagellum has the two rami fused for about 3 joints, the free part of the shorter ramus consists of about 8 joints and is twice as long as the fused part.

The scaphocerite is about thrice as long as broad. The outer margin is straight or slightly convex. The final tooth is far overreached by the lamella.

The oral parts are normal in shape. The epipod of the first maxilliped is not bilobed.

The first pereopod reaches with the fingers beyond the scaphocerite. The fingers are about as long as the palm. The carpus is fully twice as long as the chela and 1.2 times as long as the merus. The second legs are distinctly longer and stronger than the first, they reach with the chela and part of the carpus beyond the scaphocerite. The fingers are only slightly shorter than the palm. The dactylus has the cutting edge provided with 2 teeth, the distal of which is placed somewhat before the middle of the edge. The fixed finger bears one tooth which is placed just between the teeth of the dactylus. The carpus is 1.6 times as long as the chela and about 1.8 times as long as the merus. In my specimens, both of which are ovigerous females, the ischium is distinctly longer than the merus. The third leg reaches about to the end of the scaphocerite. The propodus is slightly more than 2.5 times as long as the dactylus and twice as long as the carpus, but is somewhat shorter than the merus. The fifth leg reaches slightly beyond the scaphocerite. The propodus is more than thrice as long as the dactylus, twice as long as the carpus, and slightly longer than the merus.

The pleopods and uropods are normal in shape. The final tooth at the outer margin of the exopod is provided at its inner side with a small, but distinct movable spine.

Size: Both specimens at my disposal are ovigerous females. They are 26 and 29 mm long. The eggs are few and large, being 1.0 to 1.5 mm in diameter.

Material examined: The U. S. National Museum possesses two specimens of this species from Ivon at the Beni River, N. Bolivia (February, 1922, W. M. Mann coll., The Mulford Biological Exploration of the Amazon Basin). The locality lies in the Amazon Basin.

Type: The larger of the females is the holo-, the other the paratype (U.S.N.M. Cat. No. 85234).

Remarks: The species seems to be closest related to *Palaemonetes argentinus*, but may immediately be distinguished from that species by the situation of the branchiostegal spine, and by the strongly forwardly produced anterior margin of the basal segment of the antennular peduncle.

***Palaemonetes (Palaemonetes) argentinus* Nobili**

Pl. 53, figs. i-m

Leander brasiliensis Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 524, pl. 37, fig. 16.

Palaemon (Leander) brasiliensis Thallwitz, 1892, Abh. Ber. Zool. Anthrop. Mus. Dresden, 1890-91, pt. 3, p. 7 (non Heller, 1862).

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

Leander brasiliensis Ortmann, 1897, Rev. Mus. Paulista, vol. 2, p. 191, pl. 1, fig. 12; Von Ihering, 1897, Rev. Mus. Paulista, vol. 2, p. 422.

Palaemonetes argentinus Nobili, 1901b, Boll. Mus. Zool. Anat. Comp. Torino, vol. 16, n. 402, p. 3.

Palaemon Borellii p.p. Nobili, 1901b, Boll. Mus. Zool. Anat. Comp. Torino, vol. 16, n. 402, p. 5.

Leander brasiliensis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 291.

Palaemonetes argentinus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 316.

Palaemon brasiliensis Sawaya, 1946, Zoologia, São Paulo, vol. 11, p. 397.

Palaemonetes argentinus Ringuelet, 1949, Notas Mus. La Plata, vol. 14, Zool., n. 119, p. 84, text fig. 1, pls. 2, 3, 6.

Palaemonetes (Palaemonetes) argentinus Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 10.

Description: The rostrum is straight and high, its upper margin is slightly arched over the eyes. It reaches to or a little beyond the end of the scaphocerite. The upper margin bears 6 to 10 teeth, generally 8, the first of which is placed behind the orbit on the carapace. The teeth are regularly divided over the upper margin. The lower margin is provided with 2 or 3 teeth. The branchiostegal spine is placed on the anterior margin of the carapace, just below the place where the branchiostegal groove reaches the anterior margin.

The pleura of the fifth abdominal segment ends in a more or less distinct angle. The sixth segment is 1.5 times longer than the fifth. The telson is about as long as the sixth abdominal segment. The anterior pair of dorsal spinules lies about in the middle of the telson, the posterior pair lies midway between the anterior pair and the posterior margin

or somewhat closer to the posterior margin. The posterior margin has the usual shape and armature; it ends in a sharp median point, which is flanked by two pairs of spinules, the inner of which overreach the median point. Between the inner (longer) spinules two feathered setae are present.

The eyes are well developed. The cornea is globular and pigmented.

The antennular peduncle has the stylocerite slender, reaching about to the middle of the basal segment. The anterolateral spine is rather strong and reaches to the end of the forwards produced anterior margin of the segment, sometimes, however, the margin reaches somewhat beyond the spine. The second segment of the peduncle is about as long as, but broader than the third segment. The upper antennular flagellum has the two rami fused for 8 to 12 joints. The free part of the shorter ramus consists of 13 to 17 joints and is about $1\frac{1}{2}$ times to almost twice as long as the fused part.

The scaphocerite is thrice as long as broad and of nearly equal breadth throughout the largest part of its length. The lamella distinctly overreaches the final tooth.

The oral parts are typical. The epipod of the first maxilliped is distinctly bilobed.

The first pereopod reaches to or almost to the end of the scaphocerite. The fingers are as long as the palm. The carpus is somewhat less than twice as long as the chela, and slightly longer than the merus. The second pereopod is distinctly stronger than the first, it reaches with the fingers, sometimes even with part of the palm, beyond the scaphocerite. The fingers are $\frac{2}{3}$ - $\frac{3}{4}$ of the length of the palm. The fingers have the cutting edge unarmed, the edges are gaping in their proximal part. The carpus is 1.15 to 1.20 times as long as the chela, and somewhat longer than the merus. The ischium is almost as long the merus. The third pereopod fails to reach the end of the scaphocerite. The propodus is slightly less than twice as long as the dactylus, also less than twice as long as the carpus, and somewhat shorter than the merus. The fifth leg reaches to or just beyond the scaphocerite. The propodus is less than three times as long as the dactylus, twice or slightly more than twice as long as the carpus, and distinctly longer than the merus. In small specimens the legs reach less far forwards.

Pleopods and uropods are normal in shape. The exopod of the uropod possesses a movable spinule at the inner side of the immovable tooth at the end of the outer margin.

Size: The largest male specimen seen by me measured 25 mm. The ovigerous females are 28 to 40 mm long. The eggs are rather numerous and small, measuring 0.6 to 1.0 mm in diameter.

Colour: Ringuelet (1949) states that the colour of living specimens is absolutely white.

Material examined: In the collection of the United States National Museum this species is represented from the following localities: Rio Grande do Sul State, S. Brazil (Lagoa dos Quadros, and river between Lagoa dos Quadros and Lagoa Itapeva), S. Uruguay (Arroyo Canelon Grande near Canelones, Canelones Department; Rio Santa Lucia; Punta Yeguas, Arroyo Miguelete and Paso Molino all three localities near Montevideo, Montevideo, Montevideo Department), Argentina (Concordia and Gualeguaychu, Entre Rios Province; Rio Lujan, Rio de las Conchas, San Isidro, Tigre near Buenos Aires, Buenos Aires, Punta de Lara, and Rio Santiago, Buenos Aires Province).

In the Turin Museum I was able to examine the type specimens of the present species: five specimens from Buenos Aires (1900, coll. C. Berg), four specimens from Buenos Aires (1901, coll. Silvestri), ten specimens and some larvae from Tigre, Rio de la Plata (1901, coll. F. Silvestri). Furthermore a specimen of this species was found among the type material of *Palaemon Borellii* Nobili from San Luis Province, Argentina. In the Natural History Museum in Genoa, Italy, I examined part of the material from La Plata, which Nobili (1901b) identified as *Palaemon Borellii*. The lot contained 30 specimens, of which only 9 actually belong to *Macrobrachium borellii*, the other specimens all are *Palaemonetes argentinus*.

Distribution: *Palaemonetes argentinus* lives in fresh water in E. South America from S. Brazil to Argentina. The records in literature are: Rio Grande do Sul, S.E. Brazil (Ortmann, 1890), Rio Camaquam, Rio Grande do Sul State, S.E. Brazil (Von Ihering, 1897), Rio Parana Mini, Goya, near La Invernada Island, Reconquista Department, Santa Fé Province, Argentina (Ringuelet, 1949), Buenos Aires!, Tigre near Buenos Aires!, and La Plata!, Argentina (Nobili, 1901b), San Luis Province, Argentina! (Nobili, 1896).

Type: The type localities are Buenos Aires and Tigre, Rio de la Plata, near Buenos Aires. The type specimens are preserved in the Museo di Zoologia ed Anatomia comparata at Turin, Italy.

Remarks: Ortmann (1890) was the first to describe the present species. He named it *Leander brasiliensis*, overlooking the fact that the mandible bears no palp. Probably he did not examine the mandible,

as he does not say anything about it in his description. Nobili (1901b), not realizing Ortmann's mistake correctly referred the species to *Palaemonetes* and described it as new under the name *Palaemonetes argentinus*. Though Ortmann's name *brasiliensis* is older than *argentinus*, it may not be used, as Thallwitz (1892) brought both *Palaemon brasiliensis* Heller (1862) and *Leander brasiliensis* Ortmann (1890) to the genus *Palaemon*. Heller's name thus preoccupies that of Ortmann, the latter thereby becoming invalid. The name *Palaemon brasiliensis* (Ortmann) also has been used by Sawaya (1946).

Palaemonetes (*Palaemonetes*) *hiltoni* Schmitt

Pl. 53, figs. n-s

Palaemonetes hiltoni Hilton, 1916, Journ. Ent. Zool. Pomona Coll., vol. 8, p. 69 (nom. nud.); Schmitt, 1921, Univ. Calif. Publ. Zool., vol. 23, p. 36, pl. 12, fig 5; Kemp, 1925, Rec. Indian Mus., vol. 27, p. 317.

Palaemonetes (*Palaemonetes*) *hiltoni* Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 92, fig. 2 a-d; 1950a, Siboga Exped., mon. 39a9, p. 10.

Description: The rostrum is straight, it reaches about to the end of the scaphocerite. The upper margin bears 8 to 11 teeth, which are regularly divided over that margin though the proximal teeth are placed closer together than the distals, sometimes there is a naked space before the tip. The first of these teeth is placed behind the orbit. The lower margin bears 2, or 3 teeth. The branchiostegal spine stands on the anterior margin of the carapace just below the branchiostegal groove.

The fifth abdominal segment has the tip of the pleura rounded. The sixth segment is 1.5 times to about twice as long as the fifth and is shorter than the telson. The anterior dorsal spines lie about in the middle of the telson, the posterior pair is situated about midway between the anterior pair and the posterior margin. The posterior margin of the telson is typical, it ends in a median point, with at each side a short and a long spine and a feathered seta. The longer spines overreach the median point.

The eyes are well developed. The cornea is globular and provided with pigment.

The stylocerite is rather strong and pointed, it reaches about to the middle of the basal segment of the antennular peduncle. The anterior margin of the segment is strongly forward produced and distinctly overreaches the strong anterolateral spine. The third segment of the anten-

nular peduncle is more slender and slightly longer than the 2nd segment. The upper antennular flagellum has the two rami fused for 6 to 8 joints. The free part of the shorter ramus is 1.3 to 1.5 times as long as the fused part, and consists of 9 to 11 joints.

The scaphocerite is three times as long as broad. The final tooth is strong but fails to overreach the apex of the lamella.

The oral parts are typical in shape, the epipod of the first maxilliped is deeply bilobed.

The first pereopod reaches about to the end of the scaphocerite. The fingers are about as long as the palm and the carpus is 1.5 to 1.75 times as long as the chela, and a little longer than the merus. The 2nd leg reaches with the fingers, and often with part of the palm, beyond the scaphocerite. The palm is 1.3 to 1.4 times as long as the fingers. In ovigerous females the dactylus possesses 2 teeth in the proximal part of the cutting edge, the fixed finger has 1 tooth there. The carpus is as long as the palm and half the length of the fingers and is only slightly shorter than the merus. The ischium is $\frac{2}{3}$ to $\frac{3}{4}$ of the length of the merus. The third pereopod reaches to, or with part of the dactylus beyond, the scaphocerite. The propodus is 2.0 to 2.3 times as long as the dactylus, less than twice as long as the carpus, and shorter than the merus. The fifth leg reaches about as far as the third, the propodus is 2.5 to 3 times as long as the dactylus, slightly more than twice as long as the carpus and distinctly longer than the merus.

The pleopods and uropods are normal in shape. The exopod of the latter has a movable spine at the inner side of the final tooth of the outer margin.

Size: Ovigerous females are 19 to 24 mm long. The largest male seen by me measures 19 mm. The eggs are numerous and small being 0.6 to 0.9 mm in diameter.

Material examined: In the U. S. National Museum material of this species is present from the following localities: S. California (San Pedro, Los Angeles Co.; Del Mar, San Diego Co.), Mexico (Guaymas, Sonora State; estuary in Sinaloa State).

Distribution: The species is known so far only from the localities above. The records in literature are: San Pedro, S. California! (Hilton, 1916; Schmitt, 1921), Sonora and Sinaloa States, Mexico! (Holthuis, 1949). Very little is known about the habitat of the species. The specimens from Del Mar are provided with the indication that they are collected in a slough, those from Sinaloa are collected in an estuary.

Type: The type locality is San Pedro, Los Angeles Co., S. California. The type specimens (1 holo- and 3 paratypes) are preserved in the United States National Museum (holotype, Cat. No. 48990).

Remarks: The species shows most resemblance to *Palaemonetes pugio*, but may be separated by having the teeth of the rostrum placed generally up to the tip, by having the anterior margin of the basal segment of the antennular peduncle produced strongly forwards, by having the fingers of the second chela provided with distinct teeth in the adult female and by having the tip of the pleura of the fifth abdominal segment rounded.

***Palaemonetes* (*Palaemonetes*) *schmitti* Holthuis**

Pl. 54, figs. a-e

Palaemonetes spec. Hildebrand, 1939, *Zoologica*, New York, vol. 24, pp. 23, 24.

Palaemonetes schmitti Holthuis, 1950, *Proc. Kon. Nederl. Akad. Wetensch.*, vol. 53, p. 99; 1950a, *Siboga Exped.*, mon. 39a9, p. 10.

Description: The upper margin of the rostrum is straight, the midrib, however, is curved upwards. It reaches slightly beyond the scaphocerite. Compared with those of other *Palaemonetes* species the rostrum is very deep. The upper margin bears 11 to 13 teeth, the first two of which are placed behind the posterior limit of the orbit. The distance between the first and the second dorsal tooth is larger than that between the other teeth. The other teeth are divided regularly over the upper margin of the rostrum, though the proximals are placed slightly closer together than the distals. The ventral margin bears 3 or 4, seldom 2, large and broad teeth. The branchiostegal spine is placed on the anterior margin of the carapace just below the branchiostegal groove. The fifth abdominal segment has the apex rounded. The sixth segment is about 1.7 times as long as the fifth and shorter than the telson. The telson has the 2 pairs of dorsal spinules placed in the middle and at three quarters of its length. The posterior margin of the telson ends in a point and is provided with the usual 2 pairs of spines and two feathered setae; the inner spines overreach the posterior point.

The eyes are well developed, the cornea is globular and provided with pigment.

The antennular peduncle has the stylocerite slender and reaching about to the middle of the basal segment. The anterolateral spine is very strong and reaches as far as the forward produced anterior margin

of the basal segment. The third segment of the antennular peduncle is somewhat slenderer than the second. The upper antennular flagellum has the fused portion of the two rami consisting of 6 to 8 joints, the free part of the shorter ramus is formed by 11 to 14 joints and is about twice as long as the fused portion.

The scaphocerite is about thrice as long as broad. The outer margin is straight or somewhat concave. The final tooth is strong and reaches almost to the end of the lamella. The oral parts are typical for the genus. The first maxilliped has the epipod deeply bilobed.

The first pereopod reaches about to the end of the scaphocerite. The fingers are somewhat shorter than the palm. The carpus is somewhat more than 1.5 times as long as the chela. The merus is slightly shorter than the carpus. The second legs are much stronger than the first, in adult specimens they reach with the entire chela beyond the scaphocerite. The fingers are about 0.6 to 0.9 of the length of the palm. The cutting edge of the dactylus bears 2 distinct teeth in the proximal part, while 1 similar tooth is present on the edge of the fixed finger, placed between the 2 teeth of the dactylus. The rest of the edges is entire. The carpus is of about the same length as the palm, and about $\frac{3}{4}$ of the length of the merus. The ischium is about 0.6 times as long as the merus. The third pereopod reaches with a distinct part of the propodus beyond the scaphocerite. The propodus is thrice as long as the dactylus, less than twice as long as the carpus and a little shorter than the merus. The fifth leg reaches slightly beyond the third. The propodus is about 3.5 times as long as the dactylus, 1.7 times as long as the carpus and somewhat longer than the merus.

The pleopods and uropods are normal in shape. The uropods reach far beyond the telson. The outer margin of the uropodal exopod has the final tooth provided with a movable spine at the inner side.

In juveniles the legs reach less far than in the adult specimens described above. The second leg has the teeth on the cutting edges less distinct than in the adult specimens. The carpus in a specimen of 15 mm is as long as the palm and half the length of the fingers combined, and slightly shorter than the merus. In still younger specimens the carpus may become even longer in relation to the chela. No difference could be found in the shape of the 2nd legs of adult males and females.

Size: The largest male seen by me measures 28 mm. Ovigerous females are 20 to 33 mm long. The eggs are numerous and small, measuring 0.5 to 0.7 mm in diameter.

Material examined: In the U. S. National Museum material is present from: Venado Beach, Canal Zone, east of the Panama Canal (Jan. 29, 1937; G. S. Miller, Jr., coll.), Farfan Beach, Canal Zone, east of the Panama Canal (Feb. 24, 1937; S. F. Hildebrand coll.), Miraflores Locks, Upper Chamber, East side, Panama Canal (April 28, 1937, S. F. Hildebrand coll.), Miraflores Locks, Upper Chamber, West side, Panama Canal (March 24, 1937, S. F. Hildebrand coll.), Miraflores Locks, Lower Chamber, Panama Canal (Mar. 26 and 29, 1937, S. F. Hildebrand coll.), San Francisco Beach near Panama City, Republic of Panama (Feb. 10 and 17, 1937, S. F. Hildebrand coll.), in tide pool, San Francisco Reef near Panama City, Republic of Panama (Feb. 13, 1937, S. F. Hildebrand coll.). The species obviously is marine, but it also is collected in the Upper Miraflores Locks, where the salinity, according to Hildebrand (1939, p. 18) sometimes is considerably lowered by the fresh-water which gets in from Miraflores Lake during the passage of southbound traffic through the canal.

Type: Holotype (U.S.N.M. Cat. No. 85233) is an ovigerous female of 30 mm from the Upper Chamber, East side, Miraflores Locks. The other specimens (about 100 in number) mentioned above may be considered paratypes.

Remarks: The species seems to be most closely related to *P. vulgaris*. It differs from that species by having the rostrum very deep, with the upper margin straight and provided with more teeth (11 to 13 instead of 8 to 11), by having the telson shorter, and the legs distinctly longer.

I deem it a great pleasure to name this species in honour of Dr. Waldo L. Schmitt, who discovered it to be new, but who from lack of time was not able to describe it, and kindly gave me the opportunity to make and publish the description.

***Palaemonetes (Palaemonetes) vulgaris* (Say)**

Pl. 54, figs. f-1

! *Palaemon vulgaris* Say, 1818, Journ. Acad. Nat. Sci. Phila., vol. 2, p. 248.

Palaemon vulgaris Hitchcock, 1835, Catal. Anim. Plants Massach., p. 29.

! *Palaemon vulgaris* H. Milne Edwards, 1837, Hist. Nat. Crust., vol. 2, p. 394.

Palaemon vulgaris Gould, 1841, Rep. Invert. Massach., p. 332.

! *Palaemon vulgaris* DeKay, 1844, Zool. New York, vol. 6, p. 29, pl. 9, fig. 30.

- Palaemon vulgaris* White, 1847, List Crust. Brit. Mus., p. 77; Gibbes, 1848, Tuomey's, Rep. Geol. S. Carolina, App., p. xvi; Gibbes, 1850, p. 29.
- Palaemon vulgaris* Gibbes, 1850a, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198. non *Palaemon vulgaris* Jones, 1859, The Naturalist in Bermuda, p. 129.
- ! *Palaemonopsis carolinus* Stimpson, 1860a, Amer. Journ. Sci., ser. 2, vol. 29, p. 444 (nom. nud.).
- Palaemon vulgaris* Coues, 1871, Proc. Acad. Nat. Sci. Phila., 1871, p. 124.
- ? *Palaemonetes vulgaris* Stimpson, 1871, Ann. Lyc. Nat. Hist., New York, vol. 10, p. 129.
- ? *Palaemonopsis vulgaris* Stimpson, 1871, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 129.
- ! *Palaemonetes carolinus* Stimpson, 1871, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 129.
- ! *Palaemonopsis carolinus* Stimpson, 1871, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 129.
- ? *Palaemon (Leander) vulgaris* Von Martens, 1872, Arch. Naturgesch., vol. 38, pt. 1, p. 136.
- non *Palaemonetes vulgaris* Smith, 1873, Rep. U. S. Fish Comm., vol. 1, pp. 339, 369, 516, 520, 528, 550, pl. 2, fig. 9.
- Palaemonetes vulgaris* Coues & Yarrow, 1878, Proc. Acad. Nat. Sci. Phila., 1878, p. 298.
- non *Palaemonetes vulgaris* Kingsley, 1878, Proc. Acad. Nat. Sci. Phila., 1878, p. 330.
- ! *Palaemonetes carolinus* Kingsley, 1878, Proc. Acad. Nat. Sci. Phila., 1878, p. 330.
- Palaemonetes vulgaris* Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 65.
- Palaemonetes carolinus* Kingsley, 1878a, Bull. Essex Inst., vol. 10, p. 65.
- Palaemonetes vulgaris* Uhler, 1878, Sci. Res. Chesapeake Zool. Lab., 1878, p. 26; Faxon, 1879, Bull. Mus. Comp. Zool. Harv., vol. 5, p. 304, pls. 1-4; Leidy, 1879, Proc. Acad. Nat. Sci. Phila., 1879, p. 198; Smith, 1879, Trans. Conn. Acad. Arts Sci., vol. 5, p. 88; Verrill, 1879, Check-List Invert. Atlant. Coast, p. 2.
- Palaemonetes carolinus* Kingsley, 1880, Proc. Acad. Nat. Sci. Phila., 1879, p. 424.
- Palaemonetes vulgaris* Kingsley, 1880, Proc. Acad. Nat. Sci. Phila., 1879, p. 424; R. Rathbun, 1880, Proc. U. S. Nat. Mus., vol. 9, p. 120.

- non *Palaemonetes vulgaris* Gissler, 1881, Scientific American, vol. 45, p. 151, fig. 1.
- Palaemonetes vulgaris* Faxon, 1882, Mem. Mus. Comp. Zool. Harvard, vol. 9, pt. 1, pl. 11, figs. 10-14.
- Palaemonetes carolinus* Howard, 1883, South Carolina, p. 294.
- Palaemonetes vulgaris* Howard, 1883, South Carolina, p. 294; R. Rathbun, 1883, Bull. U. S. Fish Comm., vol. 2, p. 145.
- non *Palaemonetes vulgaris* R. Rathbun, 1884, Fish. Fish Industr. U. S., vol. 1, p. 818, pl. 275, fig. 2.
- Palaemonetes vulgaris* Benedict, 1885, Rep. U. S. Fish Comm., vol. 11, p. 176.
- non *Palaemonetes vulgaris* Herrick, 1887, Mem. Denison Sci. Ass., vol. 1, pt. 1, p. 45, pl. 5, fig. 7.
- Palaemonetes vulgaris* Leidy, 1888, Proc. Acad. Nat. Sci. Phila., 1888, p. 330.
- non *Palaemonetes vulgaris* Evermann, 1892, Bull. U. S. Fish Comm., vol. 11, p. 90.
- Palaemon (Palaemonetes) carolinus* Thallwitz, 1892, Abh. Ber. Zool. Anthropol. Mus. Dresden, 1890-91, pt. 3, p. 7.
- Palaemon (Palaemonetes) vulgaris* Thallwitz, 1892, Abh. Ber. Zool. Anthropol. Mus. Dresden, 1890-91, pt. 3, p. 14.
- Palaemonetes vulgaris* Sharp, 1893, Proc. Acad. Nat. Sci. Phila., 1893, p. 124; Bumpus, 1898, Science, N. Y., n. ser., vol. 7, p. 485; Bumpus, 1898a, Science, N. Y., n. ser., vol. 8, p. 854.
- non ?*Palaemonetes vulgaris* Kingsley, 1899, Amer. Nat., vol. 33, p. 718, fig. 47.
- Palaemonetes carolinus* Kingsley, 1899, Amer. Nat., vol. 33, p. 718.
- Palaemonetes vulgaris* Thompson, 1899, Science, N. Y., n. ser., vol. 9, p. 581.
- non *Palaemonetes vulgaris* Duncker, 1900, Amer. Nat., vol. 34, p. 621, pls. 1-3.
- Palaemonetes vulgaris* Wilson, 1900, Amer. Nat., vol. 34, p. 352; Prentiss, 1901, Bull. Mus. Comp. Zool. Harv., vol. 36, p. 180, pls. 1-3, pl. 4, figs. 13-18; Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
- non *Palaemonetes vulgaris* Arnold, 1901, Sea-Beach at Ebb-Tide, p. 260, fig.
- non *Palaemonetes vulgaris* Paulmier, 1905, Bull. N. Y. State Mus., vol. 91, p. 132, fig. 4.

- Palaemonetes vulgaris* M. J. Rathbun, 1905, Occ. Pap. Boston Soc. Nat. Hist., vol. 7, p. 25; Coulon, 1907, Bull. Soc. Étud. Sci. Nat. Elbeuf, 1907, p. 191.
- non *Palaemonetes vulgaris* Fowler, 1907, Science, N. Y., n. ser., vol. 26, p. 639.
- non *Palaemonetes vulgaris* Fowler, 1908, Rep. New Jersey State Mus., 1907, p. 161.
- Palaemonetes carolinus* p.p. Cary & Spaulding, 1909, Contr. Mar. Fauna Louisiana, p. 11.
- ?*Palaemon vulgaris* Valdés Ragués, 1909, Mis. Trabajos Acad., p. 183.
- non *Palaemonetes vulgaris* Fowler, 1912, Ann. Rep. New Jersey State Mus., 1911, p. 324, pl. 94.
- ! *Palaemonetes carolinus* Fowler, 1912, Ann. Rep. New Jersey State Mus., 1911, p. 328.
- Palaemon vulgaris* Stafford, 1912, Contr. Canad. Biol., 1906-1910, p. 60.
- non *Palaemonetes vulgaris* Fowler, 1913, Proc. Acad. Nat. Sci. Phila., 1913, pp. 61, 64.
- Palaemonetes vulgaris* Sumner, Osburn & Cole, 1913, Bull. U. S. Bur. Fish., vol. 31, pp. 139, 663.
- Palaemon vulgaris* Williamson, 1915, Nord. Plankt., vol. 18, p. 407, figs. 140-143.
- ! *Palaemonetes carolinus* Hay & Shore, 1918, Bull. U. S. Bur. Fish., vol. 35, p. 393, pl. 27, fig. 4.
- non *Palaemonetes vulgaris* Hay & Shore, 1918, Bull. U. S. Bur. Fish., vol. 35, p. 393, pl. 27, fig. 5.
- Palaemonetes vulgaris* Ortmann, 1918, in Ward & Whipple's Fresh-water Biol., p. 845; Allee, 1923, Biol. Bull., vol. 44, p. 180; Sollaud, 1923, Bull. Biol. France Belg., vol. 57, p. 527; Fish, 1925, Bull. U. S. Bur. Fish., vol. 41, p. 156, figs. 55, 56.
- ! *Palaemonetes vulgaris* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 317.
- non *Palaemonetes carolinus* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 317.
- Palaemonetes vulgaris* Stiles & Hassall, 1927, Hygienic Lab. Bull., n. 148, p. 216.
- ! *Palaemonetes vulgaris* M. J. Rathbun, 1929, Canad. Atlant. Fauna, vol. 10m, p. 19, non fig. 23.
- Palaemonetes vulgaris* Cowles, 1930, Bull. U. S. Bur. Fish., vol. 46, pp. 355, 356, 357.

- non *Palaemonetes carolinus* Cowles, 1930, Bull. U. S. Bur. Fish., vol. 46, pp. 355, 356.
- non *Palaemonetes vulgaris* Richards, 1931, Ecology, vol. 12, p. 444; Crowder, 1931, Between the Tides, p. 316, pl. 27, fig. 5.
- Palaemonetes carolinus* Creaser, 1936, Publ. Carnegie Inst., vol. 457, p. 126.
- ! *Palaemonetes vulgaris* Pearse, 1936, Journ. Elisha Mitchell Sci. Soc., vol. 52, p. 195.
- non *Palaemonetes carolinus* Pearse, 1936, Journ. Elisha Mitchell Sci. Soc., vol. 52, p. 195.
- non *Palaemonetes vulgaris* Townes, 1937, Ann. Rep. Biol. Surv. New York, vol. 11, p. 226, fig. 2.
- Palaemonetes vulgaris* Richards, 1938, Animals of the Seashore, p. 220, non fig. 38.
- non *Palaemonetes vulgaris* Townes, 1939, Ann. Rep. New York Conserv. Dept., vol. 28 suppl., p. 165, figs. 35, 36B, 37B, 38.
- ! *Palaemonetes carolinus* Townes, 1939, Ann. Rep. New York Conserv. Dept., vol. 28 suppl., p. 165, fig. 36A.
- Palaemonetes vulgaris* Reed, 1941, Marine Life Texas, p. 46.
- Palaemonetes carolinus* Anonymus, 1942, Ann. List Fauna Grand Isle Reg., p. 6.
- Palaemonetes carolinus* McDougall, 1943, Ecol. Monogr., vol. 13, p. 371.
- Palaemonetes vulgaris* Dexter, 1944, Ecology, vol. 25, p. 356; Gunter, 1945, Publ. Inst. Mar. Sci. Texas, vol. 1, pt. 1, pp. 69, 93, 108; Hedgpeth, 1946, Texas Game and Fish, vol. 4, n. 12, p. 31; Burkenroad, 1947, Amer. Nat., vol. 81, p. 392; Dexter, 1947, Ecol. Monogr., vol. 17, p. 291.
- Palaemonetes carolinus* Pearse, 1947, Journ. Parasitol., vol. 33, p. 454.
- Palaemonetes vulgaris* Ferguson & Jones, 1949, Amer. Midl. Nat., vol. 41, p. 442.
- Palaemonetes carolinus* Ferguson & Jones, 1949, Amer. Midl. Nat., vol. 41, p. 442.
- Palaemonetes (Palaemonetes) vulgaris* Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 94, fig. 2e-i; 1950a, Siboga Exped., mon. 39a9, p. 11.

Description: The rostrum reaches to or slightly beyond the end of the scaphocerite. The tip is directed upwards, the upper margin thereby often being more or less concave. There are 8 to 11 upper rostral teeth the first two of which are situated behind the posterior orbital margin

on the carapace. The first tooth generally is separated from the second, by a space, which is larger than that between the other proximal teeth. The teeth are rather regularly divided over the rostrum, though the proximals generally are placed closer together than the distals, there is no unarmed space behind the apex. Often the apex is bifid. The lower margin of the rostrum is provided with 3 to 5, generally 4, teeth. The branchiostegal spine is situated on the anterior margin of the carapace just below the branchiostegal groove.

The fifth abdominal segment has the tip of the pleura rectangular or slightly acute. The sixth segment is 1.5 times as long as the fifth, and somewhat shorter than the telson. The anterior pair of dorsal spines lies somewhat behind the middle of the length of the telson, the 2nd pair lies halfway between the first pair and the posterior margin of the telson. This margin has the usual shape, it ends in a rather long and sharp median point and is provided with 2 pairs of spines, the inner of which are very long. Between these inner spines 2 feathered setae are present.

The eyes are well developed and provided with dark pigment.

The basal segment of the antennular peduncle has the stylocerite slender and reaching slightly beyond the middle of the basal segment. The anterolateral spine of the basal segment is strong and overreaches the rounded anterior margin of the segment. The upper antennular flagellum has the two rami fused for 7 to 9 joints, while the free part of the shorter ramus consists of 10 to 17 joints and is 1.5 times to twice as long as the fused portion.

The scaphocerite is about thrice as long as broad. The final tooth is very strong and almost reaches to the end of the lamella.

The oral parts are normal in shape. The epipod of the first maxilliped is distinctly bilobed.

The first pereopod generally fails to reach the end of the scaphocerite, sometimes it just reaches the end of that scale. The fingers are about as long as the palm. The carpus is 1.3 to 1.7 times as long as the chela, and is slightly longer than the merus. The second legs are distinctly longer and stronger than the first. In adult females they are much stronger than in the males and reach with the fingers and part of, sometimes with the whole, palm beyond the scaphocerite. The fingers are 0.6 to 0.7 times as long as the palm. The cutting edge of the dactylus bears 2 small teeth in the proximal part, while that of the fixed finger is provided with one similar tooth, which fits between the two teeth of the dactylus. The rest of the cutting edges is straight and entire. The carpus is slightly or distinctly shorter than the palm and about 0.75

times as long as the merus. The ischium is 0.7 times as long as the merus. In the full grown male the second leg is less robust than in the female, it reaches with the fingers beyond the scaphocerite. The fingers are about 0.75 times as long as the palm. The cutting edges bear very faint indications of teeth, which have the same position as in the female. The carpus is 1.1 times as long as the palm and 0.8 times as long as the merus. The ischium is 0.7 times as long as the merus. The third leg (in both sexes) reaches about to the end of the 2nd segment of the antennular peduncle, sometimes, however, it may reach the end of the scaphocerite. The propodus is twice or slightly more than twice as long as the dactylus, somewhat less than twice as long as the carpus and distinctly shorter than the merus. The fifth leg reaches slightly farther than the third. The propodus is about thrice as long as the dactylus, twice as long as the carpus and somewhat longer than the merus.

The pleopods and uropods are normal in shape. The outer margin of the uropodal exopod ends in a strong tooth, which at its inner side is provided with a slender movable spine.

Size: Ovigerous females seen by me ranged between 22 and 42 mm in length. The size of the males is about 30 mm. The eggs are numerous and small, being 0.5 to 0.7 mm in diameter.

Material examined: In the collection of the United States National Museum a large amount of material of this species is present. It originated from the following localities: Massachusetts (Sandwich, Provincetown, off Falmouth, Quissett Harbor, Nobska Beach and Woods Hole, Barnstable Co.; Hadley Harbor at Naushon Island, Dukes Co.; Vineyard Sound; Wareham River, Plymouth Co.), Rhode Island (off Newport, Newport Co.; Narragansett Bay), New York (Peconic Bay, Patchogue, Scallop Pond and Clam Pond Cove, Long Island), New Jersey (Atlantic City, Atlantic Co.; Sea Isle City, off Cape May and Dennis Creek, Cape May Co.), Delaware (Mispillion River, between Kent and Sussex Co.), Maryland ($38^{\circ} 07' .2$ N $76^{\circ} 13' .5$ W, Chesapeake Bay; Thomas Point Light, Anne Arundel Co.; Cove Pt. Light, Patuxent River, Calvert Co.; St. George Point, St. Marys Co.; Bloody Point Light, Queen Anne's Co.), Virginia ($37^{\circ} 54'$ N $76^{\circ} 06' .3$ W, Tangier Island, $37^{\circ} 13' .2$ N $76^{\circ} 04' .5$ W, and $37^{\circ} 12'$ N $76^{\circ} 10'$ W, Chesapeake Bay; Lewisetta, Northumberland Co.; Weems and Windmill Point Light, Lancaster Co.; between Back River and Thimble Light, Thimble Shoal, Hampton and Phoebus, Elizabeth City Co.; Norfolk, Norfolk Co.; Chincoteague Island, Accomac Co.; Sandy Point Light, Cherrystone Light, Kings Creek, Cape Charles City and Planta-

tion Light, Northampton Co.), North Carolina (Beaufort and Fort Macon, Carteret Co.), South Carolina (Winyah Bay, Georgetown Co.; Bull Bay, Charleston Co.; Jericho Creek), Georgia (Brunswick, Glynn Co.), Florida (Apalachicola, Franklin Co.; St. Joseph's Bay near Port St. Joe, Gulf Co.), Alabama (Mobile Bay), Mississippi (near Biloxi, Harrison Co.), Louisiana (Errol Island and Chandeleur Islands, Bernard Parish; Grand Isle and Fort Livingston, Jefferson Parish). Furthermore I examined some specimens of this species from the collection of the Institute of Marine Science at Port Aransas, Texas. This material originated from: Harbor Island near Port Aransas, Nueces Co., Texas, and from Port Isabel near Rio Grande, Cameron Co., Texas.

Distribution: The species occurs along the east and south coast of the U.S.A. in salt or brackish water. It is known with certainty from Massachusetts (Provincetown) to Texas (Port Isabel, Cameron Co.). In literature it is recorded from the following localities: North America (White, 1847), Gaspé, New Brunswick, Canada (Stafford, 1912), Cape Breton Island, Nova Scotia, Canada (M. J. Rathbun, 1929), Hampton, New Hampshire¹⁵ (M. J. Rathbun, 1905), Massachusetts (Hitchcock, 1835; Gould, 1841), Ipswich Bay, Mass. (Dexter, 1944), Cape Ann, Mass. (Dexter, 1947), Salem, Mass. (Kingsley, 1878), Charles River near Cambridge, Mass. (Prentiss, 1901), Provincetown, Mass. (R. Rathbun, 1880), Nantucket, Mass. (Sharp, 1893), Woods Hole, Mass. (Faxon, 1879; Bumpus, 1898, 1898a; Thompson, 1899; Coulon, 1907; Sumner, Osburn & Cole, 1913; Allee, 1923; Fish, 1925), Vineyard Sound, Mass. (Smith, 1879), Buzzards Bay, Mass. (Smith, 1879), Newport, R. I. (Faxon, 1879), Narragansett Bay, R. I. (Thompson, 1901), Connecticut (M. J. Rathbun, 1905), Fisher's Island Sound, N. Y. (Smith, 1879), Long Island Sound, N. Y. (Smith, 1879), Long Island, N. Y. (Smith, 1879; Townes, 1939), Montauk Point, Long Island, N. Y. (Benedict, 1885), Greenport, Long Island, N. Y. (Sharp, 1893), Hudson River, N. Y. (De Kay, 1844), New Jersey (Smith, 1879), Beachhaven, N. J. (Leidy, 1888), Atlantic City, N. J. (Leidy, 1879), Great Egg Harbor, N. J. (Stimpson, 1871), Beesleys Point, N. J. (Sharp, 1893), Chesapeake Bay. (Cowles, 1930), Northampton Co., Va. (Kingsley, 1880), Ocean View, Norfolk Co., and Virginia Beach, Princess Anne Co., Va. (Ferguson & Jones, 1949), Fort Macon, N. C.! (Coues, 1871; Coues & Yarrow, 1878; Kingsley, 1878!; Smith,

¹⁵ In all probability this record was based by Miss Rathbun on a specimen in the U. S. National Museum, which, however, does not originate from Hampton, N. H., but from Hampton, Va.

1879), Beaufort, N. C. (Stimpson, 1860a, 1871; Kingsley, 1880; Wilson, 1900; Hay & Shore, 1918; Pearse, 1936, 1947; McDougall, 1943), South Carolina (Gibbes, 1848; Howard, 1883), Charleston Harbor, S. C. (Gibbes, 1850a; Stimpson, 1871), East Florida (Say, 1818), St. Johns River, Fla. (Smith, 1879), Marco Pass, Fla. (Kingsley, 1880), Charlotte Harbor, Fla. (Kingsley, 1880), Chandeleur Islands, La. (Cary & Spaulding, 1909), Grand Isle, La. (Anonymous, 1942), Texas (Reed, 1941; Hedgpeth, 1946), Copano and Aransas Bays, Texas (Gunter, 1945), Rio Champoton and near Progreso, Yucatan, Mexico (Creaser, 1936), ?Cuba (Von Martens, 1872; Valdés Ragués, 1909). As up till now three species have been included in *Palaemonetes vulgaris*, all references in literature must be considered with much reserve, even if a description or a figure is given. The three species namely often occur together, so that it is not always certain that the material of a certain author was homogeneous.

Type: The type locality is Atlantic coast of the United States "as far south as East Florida." It is not known if Say's type specimens are extant.

Remarks: A considerable confusion existed in regard to the *Palaemonetes* species of the salt and brackish water of the eastern and southern coast of the United States. Usually two species were accepted: *P. vulgaris* and *P. carolinus*. According to Kemp (1925) the two species differ by having the carpus of the second leg differently shaped: in *P. carolinus* the carpus is much more elongate than in *P. vulgaris*. Hay and Shore (1918), however, just like Townes (1939), apply the name *vulgaris* to the form with the elongate, *carolinus* to that with the short carpus. Kingsley's (1878) material from Fort Macon was studied by me; his *P. carolinus* proves to be a *P. vulgaris*, while his *P. vulgaris* is the species named here *P. pugio*. When studying the large quantity of material of this species in the United States National Museum, I came to the conclusion that there are three species involved, one with a short carpus, and two with elongate carpi, the two latter differ in the shape of the rostrum, of the scaphocerite and of the chela.

The original description of Say states: "carpus of the second pair [of pereopods], nearly equal to the preceding joint, unarmed, shorter than the palm of the hand." This indicates that Say's specimens belong to the first form, in which the carpus of the adult female is shorter than the palm (in both other species the carpus is longer than the palm), which thus has to bear the name *Palaemonetes vulgaris* (Say). Stimpson's description of *Palaemonetes carolinus* (his type specimens, un-

fortunately, are no longer extant in the U. S. National Museum) states the rostrum to be curved upwards, with the teeth regularly divided over the whole length, while the third dorsal rostral teeth is situated "directly above the base of the eye-peduncles," indicating thereby, that the first two teeth are placed behind the orbit. The lower margin of the rostrum of Stimpson's specimens bears four teeth, while the second legs are much stouter than in "*P. vulgaris*." This description only fits for the true *Palaemonetes vulgaris*, as it is the only one of the three species with two dorsal teeth of the rostrum behind the orbit, furthermore its rostrum generally is recurved (though this character is variable). The stout legs also indicate that his specimens must be females of *P. vulgaris*, which have the legs much more robust than any of the other forms. All other characters mentioned by Stimpson are in good accordance with those of *P. vulgaris*. The specimens identified by Stimpson as *Palaemonetes vulgaris* either are the males of that species, or belong to one of the two other Atlantic American *Palaemonetes* species. *Palaemonetes carolinus* Stimpson thus is a synonym of *Palaemonetes vulgaris* (Say). As no other names have ever been given to the other *Palaemonetes* species mentioned above, I have indicated them with the names *Palaemonetes pugio* and *Palaemonetes intermedius*.

The great confusion which exists in the literature regarding these three species, makes it generally impossible to find out which of the three species an author meant if he mentioned *P. vulgaris* or *P. carolinus*, while also the possibility exists that he had a mixture of two or all of the species at his disposal. References to authors giving a good description or figure of their species the identity of (at least part of) their material could be made sure, have been given an exclamation point in the list of references.

Jones's (1859) *Palaemon vulgaris* does not belong in the present species, but in all probability is *Palaemon northropi*.

Von Martens's (1872) record of *Palaemon (Leander) vulgaris* from Cuba needs special confirmation. His specimens may belong to *Palaemon northropi*, but his description is too short to give certainty in this matter. Valdés Ragués's (1909) record probably is based on that of Von Martens.

There is very little to say about the ecology of this species. The information in literature generally is not to be trusted, as it may deal with more than one species. The general impression I got is that *Palaemonetes vulgaris* is much more confined to salt water than *Palaemonetes pugio* is. This is confirmed by the observations made by Mr. Gordon Gunter and Mr. Joel W. Hedgpeth on *Palaemonetes vulgaris* at the

Texas coast near Port Aransas. Mr. Gunter (in litt.) furthermore remarks: "I can say, however, that we have never found any *Palaemonetes* on the outside beaches (the open Gulf), but always in the bays. However, I suspect that absence of these shrimps on the Gulf beach is due not to the higher salinity, but the lack of vegetative cover, etc." *Palaemonetes vulgaris* material in the U. S. National Museum collected by the *Fish Hawk* Expeditions in Chesapeake Bay ranges from depths up to 45.75 m. generally, however, it occurs in less deep water.

***Palaemonetes* (*Palaemonetes*) *intermedius* Holthuis**

Pl. 55, figs. a-f

Palaemonetes vulgaris Smith, 1873, Rep. U. S. Fish Comm., vol. 1, pp. 339, 369, 516, 520, 528, 550, pl. 2, fig. 9; Gissler, 1881, Scientific American, vol. 45, p. 151, fig. 1; R. Rathbun, 1884, Fish. Fish Industr. U. S., vol. 1, p. 818, pl. 275, fig. 2; Herrick, 1887, Mem. Denison Sci. Ass., vol. 1, pt. 1, p. 45, pl. 5, fig. 7; Kingsley, 1899, Amer. Nat., vol. 33, p. 718, fig. 47; Arnold, 1901, Sea-Beach at Ebb-Tide, p. 260, fig.; Paulmier, 1905, Bull. N. Y. State Mus., vol. 91, p. 132, fig. 4; M. J. Rathbun, 1929, Canad. Atlant. Fauna, vol. 10m, fig. 23. (non *Palaemon vulgaris* Say, 1818.)

?*Palaemonetes vulgaris* Townes, 1937, Ann. Rep. Biol. Surv. New York, vol. 11, p. 226, fig. 2.

Palaemonetes vulgaris Richards, 1938, Animals of the Seashore, fig. 38; Townes, 1939, Ann. Rep. New York Conservation Dept., vol. 28 suppl., p. 165, figs. 35, 36B, 37B, 38.

Palaemonetes (*Palaemonetes*) *intermedius* Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 94, fig. 2j-1.

Palaemonetes intermedius Hedgpeth, 1950, Publ. Inst. Mar. Sci. Texas, vol. 1, n. 2, p. 113.

Palaemonetes (*Palaemonetes*) *intermedius* Holthuis, 1950a, Siboga Exped., mon. 39a9, p. 10.

Description: The rostrum reaches to or somewhat beyond the end of the scaphocerite. The tip is directed upwards, the upper margin is generally more or less concave. The number of dorsal teeth varies between 7 and 10, generally being 8 or 9. The first tooth in most cases is separated from the second tooth by a larger distance than the other teeth are separated from each other. The teeth are rather regularly divided over the dorsal margin of the rostrum up to the tip, which often is bifid. The distal teeth are more widely spaced than the proximals. The first

tooth is placed behind the posterior margin of the orbit, the second tooth is placed either before or just over the margin. The lower margin bears 4 or 5 teeth, in few cases 3. The branchiostegal spine is situated on the anterior margin of the carapace, just below the place where the branchiostegal groove hits this margin.

The pleurae of the fifth abdominal segment have the apex rounded. The sixth abdominal segment is 1.5 times as long as the fifth and somewhat shorter than the telson. The telson has the anterior pair of dorsal spinules situated in the middle of its length; the posterior pair lies midway between the posterior margin of the telson and the anterior pair, or somewhat closer to the anterior pair. The posterior margin of the telson is similar to that of *P. vulgaris* and *P. pugio*.

The eyes are well developed, with a globular, pigmented cornea.

The antennular peduncle is of the same shape as in *P. vulgaris*. The upper antennular flagellum has the fused part of the two rami consisting of 7 to 10 joints, the free part of the shorter ramus consists of 7 to 12 joints and is 1.2 to 1.7 times as long as the fused portion.

The scaphocerite is slender, it is 3 to almost 4 times as long as broad in the females, in the males it is even more slender. The outer margin is straight or slightly concave. The final tooth is strong and almost reaches to the end of the lamella.

The oral parts are typical.

The first leg almost reaches the end of the final tooth of the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela and slightly longer than the merus. In the adult female the second legs reach with almost the entire chela beyond the scaphocerite. The fingers are 0.6 to 0.8 times as long as the palm. The dactylus has the cutting edge provided with 1 tooth in the proximal part, the rest of the edge, as well as the entire cutting edge of the fixed finger is entire. The carpus is 1.2 to 1.5 times as long as the palm and is as long as the merus. The male has the second legs somewhat more slender than the female, they reach with the fingers only beyond the scaphocerite. The fingers are about $\frac{2}{3}$ to $\frac{3}{4}$ of the length of the palm. The dentition is like the female. The carpus is 1.4 to 1.5 times as long as the palm, being about $\frac{4}{5}$ of the length of the chela and is as long as the merus. The third leg reaches about to the end of the final tooth of the scaphocerite or falls distinctly short of it. The propodus is twice as long as the dactylus, and somewhat less than twice as long as the carpus. The merus is somewhat longer than the propodus. The fifth leg reaches slightly

beyond the third. The propodus is somewhat less than thrice as long as the dactylus, it is twice as long as the carpus and slightly longer than the merus.

The pleopods and the uropods have the usual shape. The exopod of the uropod has the outer margin ending in a strong tooth, which at its inner side bears a movable spine.

In the males and juveniles the legs reach less far forwards than in the female (the above description is made after an ovigerous female).

Size: The largest male seen by me is 26 mm long. Ovigerous females of 25 to 37 mm length are present in the collection studied. The eggs are numerous and small, measuring 0.6 to 0.9 mm in diameter.

Material examined: In the collection of the U. S. National Museum material of this species is present from the following localities: New York (Long Island: Southampton and Great South Bay near Belfort), Maryland (Island Creek near Oxford, Talbot Co.; Broome's Island, Calvert Co.; Cobb Island, Charles Co.), Virginia (Chincoteague Bay, Accomac Co.; Weems, Lancaster Co.; Parrot Island, Middlesex Co.), Florida (Titusville, Brevard Co.; Pelican Island near Sebastian, Indian River Co.; Indian River Inlet and Fort Pierce, St. Lucie Co.; Jupiter Inlet and Lantana, Palm Beach Co.; New River Inlet, Broward Co.; Card Sound, Dade Co.; Key West, Monroe Co.; Fort Myers, Lee Co.; Gasparilla Pass, Charlotte Co.; Lemon and Sarasota Bays, Sarasota Co.; Cedar Keys, Levy Co.; Apalachicola, Franklin Co.; Pensacola, Escambia Co.), Alabama (Big Lake, Gulf Shores), Mississippi (Cat Island, Harrison Co.), Louisiana (Cameron, Cameron Parish), Texas (Galveston, Galveston Co.). Through the kindness of Mr. Joel W. Hedgpeth I was able to examine material of this species from Aransas Wildlife Refuge, Aransas Co., Texas, and from Lydia Ann Channel near Port Aransas, Nueces Co., Texas.

Distribution: The species is known from the Atlantic coast of the United States from the Vineyard Sound to Texas. According to the material in the U. S. National Museum, it seems to be especially abundant in Florida. The only trustworthy records in literature are: Vineyard Sound (Smith, 1873), Long Island, New York (Townes, 1939), Mississippi Sound, Alabama (Herrick, 1887); Aransas National Wildlife Refuge, Texas (Hedgpeth, 1950). Smith's (1873) figure is reproduced by many authors (Gissler, 1881; R. Rathbun, 1884; Kingsley, 1899; Arnold, 1901; Paulmier, 1905; M. J. Rathbun, 1929; Richards, 1938), this, however, is not proof that their material indeed belongs to the present species. So for instance M. J. Rathbun's (1929) descrip-

tion fits for *P. vulgaris*. The popularity of Smith's figure is shown by the fact that it even is inserted in Webster's Collegiate Dictionary (ed. 5, 1947, p. 779), where, however, it is given as "Prawn (*Peneus sentiferus*)."

Type: Holotype (U.S.N.M. Cat. No. 58209) is an ovigerous female of 32 mm from Box Iron Bay, Chincoteague Bay, Virginia (June 1, 1922, R. V. Truitt coll.). The other specimens from the same lot (28 ovigerous females, 5 non-ovigerous females, and 12 males) are the paratypes.

Remarks: The present species is more or less intermediate in its characters between *Palaemonetes vulgaris* and *Palaemonetes pugio*. The differences with both species are pointed out under the latter form.

Palaemonetes (*Palaemonetes*) *pugio* Holthuis

Pl. 55, figs. g-1

- Palaemonetes vulgaris* Kingsley, 1878, Proc. Acad. Nat. Sci. Phila., 1878, p. 330; Evermann, 1892, Bull. U. S. Fish Comm., vol. 11, p. 90; Duncker, 1900, Amer. Nat., vol. 34, p. 621, pls. 1-3; Fowler, 1907, Science, N. Y., n. ser., vol. 26, p. 639; Fowler, 1908, Rep. New Jersey State Mus., 1907, p. 161. (non *Palaemon vulgaris* Say, 1818.)
- Palaemonetes carolinus* p.p. Cary and Spaulding, 1909, Contr. Mar. Fauna Louisiana, p. 11.
- Palaemonetes vulgaris* Fowler, 1912, Rep. New Jersey State Mus., 1911, p. 324, pl. 94; Fowler, 1913, Proc. Acad. Nat. Sci. Phila., 1913, pp. 61, 64; Hay and Shore, 1918, Bull. U. S. Bur. Fish., vol. 35, p. 393, pl. 27, fig. 5.
- Palaemonetes carolinus* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 317; Cowles, 1930, Bull. U. S. Bur. Fish., vol. 46, pp. 355, 356. (non Stimpson, 1871.)
- Palaemonetes vulgaris* Crowder, 1931, Between the Tides, p. 316, pl. 27, fig. 5; Richards, 1931, Ecology, vol. 12, p. 444.
- Palaemonetes carolinus* Pearse, 1936, Journ. Elisha Mitchell Sci. Soc., vol. 52, p. 195.
- Palaemonetes vulgaris* Townes, 1937, Ann. Rep. Biol. Surv. New York, vol. 11, p. 226, fig. 2.
- Palaemonetes carolinus* Richards, 1938, Animals of the Seashore, p. 220.
- Palaemonetes* (*Palaemonetes*) *pugio* Holthuis, 1949, Proc. Kon. Nederl. Akad. Wetensch., vol. 52, p. 95, fig. 2 m-o; 1950a, Siboga Exped., mon. 39a9, p. 10.

Description: The rostrum reaches to or slightly beyond the end of the scaphocerite, it is straight, sometimes the tip is directed slightly upwards. There are 7 to 10 (almost always 8 or 9) upper rostral teeth, the first of which is placed behind the orbit. The teeth are separated by intervals, which are of about equal size. The ultimate of the teeth is placed a rather large distance from the apex, so that the end of the upper margin is unarmed. The lower margin of the rostrum bears 2 to 4, generally 3 teeth, here too the ultimate tooth is separated by a rather large distance from the apex. The apex thereby is dagger shaped. The branchiostegal spine is situated on the anterior margin of the carapace, just below the branchiostegal groove.

The fifth abdominal segment has the pleura ending in a small acute tooth which, however, sometimes is extremely small. The sixth segment is about $1\frac{1}{2}$ times as long as the fifth and somewhat shorter than the telson. The telson has the same shape and spinulation as that of *P. vulgaris*.

The eyes have the cornea well developed and provided with dark pigment.

The antennular peduncle does not differ essentially from that of *P. vulgaris*. The upper antennular flagellum has the two rami fused for 10 to 14 joints. The free portion of the shorter ramus consists of 12 to 18 joints and is 1.1 times to twice as long as the fused part.

The scaphocerite is rather broad, being about 2.5 to almost 3 times as long as broad (in the males it is thrice as long as broad). The outer margin is convex. The final tooth is strong and almost reaches the end of the lamella.

The oral parts are typical. The epipod of the first maxilliped is deeply bilobed.

The first leg fails to reach the end of the scaphocerite by a short distance. The fingers are as long as the palm. The carpus is almost twice as long as the chela and somewhat longer than the merus. The second legs are stronger than the first. In adult females they reach with the fingers beyond the scaphocerite. The fingers are 0.6 to 0.8 times as long as the palm. The cutting edges of both dactylus and fixed fingers are entire, no teeth are observed here. The fingers often are gaping in the extreme proximal part. The carpus is 1.3 to 1.5 times as long as the palm, but shorter than the entire chela. The merus is as long as the carpus. The ischium is somewhat shorter than the merus. The males have the second legs more slender than the females, they reach only with a part of the fingers beyond the scaphocerite. The fingers are 0.7

to 0.8 times as long as the palm. The carpus is almost as long as the whole chela. The merus is as long as the carpus. The ischium is somewhat shorter than the merus. The third legs reach about to the base of the third segment of the antennular peduncle, sometimes they reach slightly beyond the scaphocerite. The propodus is twice as long as the dactylus and also twice as long as the carpus, it is somewhat shorter than the merus. The fifth leg reaches with its tip beyond the scaphocerite. The propodus is thrice as long as the dactylus, 2.5 times as long as the carpus, and somewhat longer than the merus. The males have the legs reaching less far forwards.

The pleopods and uropods are as in *P. vulgaris*.

The males differ from the females by being smaller, having the rostrum more slender, by having the free part of the shorter ramus of the upper antennular flagellum longer in relation to the fused part, by having the legs reaching less far forwards and having the carpus of the second leg longer in relation to the chela. Similar differences were also observed in *P. vulgaris*. The young specimens resemble more the males than the females.

Size: The largest male I measured was 33 mm long. Ovigerous females ranged from 30 to 50 mm in length. The eggs are numerous and small, being 0.6 to 0.9 mm in diameter.

Material examined: In the United States National Museum material of this species is present from the following localities: Massachusetts (Woodbridges Island near Newburyport, Essex Co.; Truro, Davis Neck Beach near Falmouth, Woods Hole, and Monument River, Barnstable Co.; Vineyard Sound; Buzzard's Bay; Wareham River near Parker's Mill, Plymouth Co.; Acushnet River, Bristol Co.), Rhode Island (Beach near Newport, Newport Co.; Providence, Providence Co.), Connecticut (Grovebeach, Middlesex Co.), New York (Shinnecock Bay near Southampton and Patchogue, Long Island, Suffolk Co.; Haverstraw Bay in Hudson River, Rockland Co.; Princess Bay, Richmond Co.), New Jersey (Barnegat Bay), Delaware (Bombay Hook and Woodland Beach, Kent Co.; Bethany Beach, Sussex Co.), Maryland (39°01'.2N, 76°22'.5W, Chesapeake Bay; Lake Ovington near Bay Ridge, Thomas Point Light and Herring Creek, Anne Arundel Co.; Parker Creek, Chesapeake Beach, Plum Point, Dare's Wharf, Cove Point, Drum Point, Solomons and Patuxent River, Calvert Co.; Cedar Point, Point Lookout, Ridge, St. George Island, Piney Point and Blakistone Island, St. Mary Co.; Indian Head, Morgantown near Wayside, Nanjemoy, Riverside, Port Tobacco, Neal Sound, Cobb Island, Benedict, Charles Co.; Chester River, Kent Co.; Island Creek and Oxford,

Talbot Co.; Crisfield, Somerset Co.), Virginia (Smith Island, Chesapeake Bay; Lower Machodoc Creek and Colonial Beach, Westmoreland Co.; Smith's Point, Northumberland Co.; off Weems, Lancaster Co.; Parrot Island, Middlesex Co.; Mobjack Bay, Gloucester Co.; Hampton, Elizabeth City Co.; Craney Island near Norfolk, and Grassfield near Dismal Swamp, Norfolk Co.; tidepool near Cape Charles, Northampton Co.), North Carolina (Fort Raleigh on Roanoke Island, and Cape Hatteras, Dare Co.; North River near Beaufort, Carteret Co.; New River, near Camp Lejeune, Onslow Co.), South Carolina (Winyah Bay, Georgetown Co.; Bull's Creek, Morris Island and Seven Reaches, Charleston Co.; Oat Island Creek near Port Royal, Beaufort Co.; Camp Island Pond and Clambank Creek near Town Creek), Georgia (Savannah, Chatham Co.; St. Simon Island, Brunswick and Turtle River, Glynn Co.), Florida (Titusville, Brevard Co.; Lake Butler, Orange Co.¹⁶; Fort Pierce, St. Lucie Co.; Jupiter Inlet, Palm Beach Co.; Gordon's Pass, Collier Co.; Gasparillo Pass, and Myakka River, Charlotte Co.; Cedar Keys, Levy Co.; St. George Island and Jends Bayou, Franklin Co.; Cape San Blas, Gulf Co.; Pensacola, Escambia Co.), Mississippi (Biloxi and Cat Island, Harrison Co.; Baldwin Lodge, Hancock Co.; Grand Plains Bayou), Louisiana (Pilottown, Plaquemines Parish; Barataria Bay; Fort Livingston and Grand Isle, Jefferson Parish; Calcasieu Pass, Cameron Parish; Indian Isle), Texas (East Bay, Chambers Co.; Galveston, Swan Lake near Galveston and Dickinson's Bayou, Galveston Co.; Copano Bay; Mustang Lake, Aransas Co.; Aransas Pass, San Patricio Co.; Harbor Island near Port Aransas, and Corpus Christi, Nueces Co.). Through the kindness of Mr. Joel W. Hedgpeth of the Marine Institute of Science at Port Aransas, Texas, I was able to examine specimens from Allyns Bight, St. Joseph Island, Aransas Bay, Aransas Co., Texas, and from Lydia Ann Channel near Port Aransas, Nueces Co., Texas.

Distribution: The species is known to inhabit brackish to almost fresh-water along the coast of the U.S.A. from N. Massachusetts to Texas. The records in literature are: Cold Spring Harbor, Long Island, New York (Duncker, 1900), Haverstraw Bay, Rockland Co., New York (Townes, 1937), Barnegat Bay and Spray Beach, Ocean Co., New Jersey (Fowler, 1912), New England Creek, Cape May Co., New Jersey (Fowler, 1907, 1908, 1912), Cold Spring Inlet, Grassy Sound, Cedar Swamp Creek, Coxe's Hall Creek, Corson's Inlet, Dennis Creek, and Bidwell's Channel, Cape May Co., New Jersey (Fowler, 1912), Maurice River at Elmer, Cumberland Co., New Jersey (Fowler, 1912),

¹⁶ This record is not very reliable

Chincoteague and Assateague, Accomac Co., Virginia (Fowler, 1913), Cape Charles, Northampton Co., Virginia! (Richards, 1931), Chesapeake Bay (Cowles, 1930), Newport River near Beaufort, N. C. (Hay and Shore, 1918), Harlowe Creek, Morton's Mill Pond, Mullet Pond, Calico Creek, Core Creek Canal and Eastman's Creek, near Beaufort, N. C. (Pearse, 1936), Fort Macon, N. C.! (Kingsley, 1878), Calcasieu Pass, Louisiana! (Cary and Spaulding, 1909), Galveston Bay, Swan Lake near Galveston!, Dickinson Bayou!, Corpus Christi!, Texas (Evermann, 1892). These localities must be taken with some reserve, as the authors may have had specimens of other species mixed up with their material of the present form.

Type: The holotype (U.S.N.M. Cat. No. 69599) is an ovigerous female from Lagoon near Cove Point Light, Chesapeake Bay (July 14, 1934; W. L. Schmitt, J. O. Maloney and C. R. Shoemaker coll.). The paratypes are 75 females (74 of which are ovigerous) and 1 male from the same locality. All the types are preserved in the U. S. National Museum at Washington.

Remarks: The present species, and the two preceding for a long time have been confused under the names *Palaemonetes vulgaris* and *carolinus*. From a few references in literature only the real identity of the material mentioned (or at least part of it) could be made certain, either by actual examination of the material or by the descriptions and figures given. The differences between the species are:

	<i>P. vulgaris</i>	<i>P. intermedius</i>	<i>P. pugio</i>
Rostrum dorsal	teeth up to tip	teeth up to tip	tip naked
Rostrum ventral	generally 4 or 5 teeth	generally 4 or 5 teeth	generally 2 or 3 teeth
Dorsal rostral teeth on carapace	2	1	1
Scaphocerite $\frac{\text{length}}{\text{breadth}}$	about 3	about 3	about 2.5
Carpus second legs female	shorter than palm, 0.7 times merus	distinctly longer than palm, as long as merus	distinctly longer than palm, as long as merus
Carpus second legs male	1.1 times as long as palm, 0.8 times merus	almost as long as chela, as long as merus	almost as long as chela, as long as merus
Teeth of chela of second legs $\frac{\text{dactylus}}{\text{fixed finger}}$	$\frac{2}{1}$	$\frac{1}{0}$	$\frac{0}{0}$
Pleura of fifth abdominal segment	rounded or rectangular	rounded	generally pointed

The character of the relation between the length of the fused and free portions of the shorter ramus of the upper antennular peduncle is too variable in the three species to be used as a character for their separation.

Though the three species generally are easily separable, there are instances, especially in juveniles in which it gives some difficulty to make the identity of specimens certain.

The specific name *pugio* (= dagger) is chosen on account of the dagger-like shape of the tip of the rostrum.

BIBLIOGRAPHY

- ALLEE, W. C.
1923. The Distribution of common littoral Invertebrates of the Woods Hole Region. Studies in Marine Ecology. I. Biol. Bull., vol. 44, pp. 167-191, 1 pl.
- ANDREWS, E. A.
1892. Notes on the Fauna of Jamaica. Johns Hopkins Univ. Circ., vol. 11, pp. 72-77, 2 figs.
- ANONYMUS
1942. Annotated List of the Fauna of the Grand Isle Region, pp. 1-20.
- ARMSTRONG, J. C.
1940. New Species of Caridea from the Bermudas. Amer. Mus. Novit., n. 1096, pp. 1-10, figs. 1-4.
1941. The Caridea and Stomatopoda of the second Templeton Crocker-American Museum Expedition to the Pacific Ocean. Amer. Mus. Novit., n. 1137, pp. 1-14, figs. 1-4.
- ARNDT, W.
1933. Die biologischen Beziehungen zwischen Schwämmen und Krebsen. Mitt. zool. Mus. Berlin, vol. 19, pp. 221-305.
- ARNOLD, A. F.
1901. The Sea-Beach at Ebb-Tide. A Guide to the Study of the Seaweeds and the Lower Animal Life found between Tide-Marks, pp. i-x, 1-490, text figs., pls. 1-85.
- AURIVILLIUS, C. W. S.
1898. Krustaceen aus dem Kamerun-Gebiete. Bih. Svenska Vetensk. Akad. Handl., vol. 24, pt. 4, n. 1, pp. 1-31, pls. 1-4.
- BALSS, H.
1915. Die Decapoden des Roten Meeres. I. Die Macruren. Expedition S. M. Schiff "Pola" in das Rote Meer. Nördliche und südliche Hälfte 1895/96-1897/98. Zoologische Ergebnisse XXX. Berichte der Kommission für ozeanographische Forschungen. Denkschr. Akad. Wiss. Wien, vol. 91 suppl., pp. 1-38, figs. 1-30.
- BARBOUR, T.
1945. A Naturalist in Cuba, pp. i-x, 1-317, pls.
- BARCELO, Y COMBIS, F.
1875. Catálogo de los Crustáceos marinos observados en las costas de las islas Baleares. In: Barceló y Combis, F., Apuntes para la Fauna Balear. An. Soc. Esp. Hist. nat., vol. 4, pp. 59-68.
- BARNARD, K. H.
1947. Descriptions of new species of South African Decapod Crustacea, with notes on synonymy and new records. Ann. Mag. Nat. Hist., ser. 11, vol. 13, pp. 361-392.
1950. Descriptive Catalogue of South African Decapod Crustacea. Ann. S. Afr. Mus., vol. 38, pp. 1-837, figs. 1-154.
- BATE, C. S.
1868. On a new Genus, with four new Species, of Freshwater Prawns. Proc. Zool. Soc. Lond., 1868, pp. 363-368, pls. 30, 31.

1888. Report on the Crustacea *Macrura* collected by H.M.S. Challenger during the years 1873-76. Rep. Voy. Challenger, Zool., vol. 24, pp. i-xc, 1-942, text figs. 1-76, pls. 1-150.
- BEEBE, W.**
1924. Galapagos: World's End, pp. i-xix, 1-443, figs. 1-49.
1926. The Arcturus Adventure. An Account of the New York Zoological Society's First Oceanographic Expedition, pp. i-xix, 1-439, figs. 1-69.
- BELANSKE, W. E.**
1927. Fishes and Birds Caught. An Outline. In: Vanderbilt, W. K., to Galápagos on the *Ara* 1926. The events of a pleasure-cruise to the Galápagos Islands and a classification of a few rare aquatic findings, including two specimens of a new species of shark never caught before and here described for the first time, pp. 127-158, pls. 1-30.
- BENEDICT, J. E.**
1885. Report of the Naturalist, Mr. James E. Benedict. In: Tanner, Z. L., Report on the Work of the United States Fish Commission Steamer *Albatross* for the Year ending December 31, 1883. Rep. U. S. Fish Comm., vol. 11, pp. 175-177.
1892. Decapod Crustacea of Kingston Harbor. Johns Hopkins Univ. Circ., vol. 11, p. 77.
1893. Notice of the Crustaceans collected by the United States scientific Expeditions to the West Coast of Africa. Proc. U. S. Nat. Mus., vol. 16, pp. 535-541.
1896. Preliminary Descriptions of a new Genus and three new Species of Crustaceans from an artesian Well at San Marcos, Texas. Proc. U. S. Nat. Mus., vol. 18, pp. 615-617.
- BOLIVAR, I.**
1892. Lista de la colección de crustáceos de España y Portugal del Museo de Historia Natural de Madrid. Act. Soc. Esp. Hist. nat., vol. 21, pp. 124-141.
1916. Los Crustáceos de las Baleares. Bol. Soc. Esp. Hist. nat., vol. 16, pp. 246-253.
- BOONE, L.**
1927. Crustacea from tropical east American Seas. Scientific Results of the First Oceanographic Expedition of the "Pawnee." Bull. Bingham Oceanogr. Coll., vol. 1, pt. 2, pp. 1-147, figs. 1-33.
1930. Crustacea: Anomura, *Macrura*, Schizopoda, Isopoda, Amphipoda, Mysidacea, Cirripedia, and Copepoda. Scientific Results of the Cruises of the Yachts "Eagle" and "Ara," 1921-1928, William K. Vanderbilt, Commanding. Bull. Vanderbilt Mar. Mus., vol. 3, pp. 1-221, pls. 1-83.
1931. A collection of Anomuran and Macruran Crustacea from the Bay of Panama and fresh Waters of the Canal Zone. Bull. Amer. Mus. Nat. Hist., vol. 63, pp. 137-189, figs. 1-23.
1938. The marine Algae, Coelenterata, Annelida Polychaeta, Echinodermata, Crustacea and Mollusca of the World Cruises of the Yachts "Ara," 1928-1929, and "Alva," 1931-1932, "Alva" Mediterranean Cruise, 1933, and "Alva" South American Cruise, 1935, William K. Vanderbilt, Commanding. Bull. Vanderbilt Mar. Mus., vol. 7, pp. 1-372, text figs. 1-22, pls. 1-152.
- BORRADAILE, L. A.**
1898. On some Crustaceans from the South Pacific. Part III. *Macrura*. Proc. Zool. Soc. Lond., 1898, pp. 1000-1015, pls. 63-65.

- 1898a. A Revision of the Pontoniidae. *Ann. Mag. Nat. Hist.*, ser. 7, vol. 2, pp. 376-391.
1899. On the Stomatopoda and Macrura brought by Dr. Willey from the South Seas. In: Willey, A., *Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the Years 1895, 1896 and 1897*, pp. 395-428, pls. 36-39.
1917. On the Pontoniinae. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner. *Trans. Linn. Soc. Lond. Zool.*, ser. 2, vol. 17, pp. 323-396, pls. 52-57.
1920. On a new Commensal Prawn. *Ann. Mag. Nat. Hist.*, ser. 9, vol. 5, pp. 132-133.
- Bosc, L. A. G.
1801. *Histoire naturelle des Crustacés, contenant leur description et leurs moeurs*, vol. 2, pp. 1-296, pls. 9-18.
- BOUVIER, E. L.
1895. Sur les Palémons recueillis dans les eaux douces de la Basse-Californie par M. Diguët. *Bull. Mus. Hist. Nat. Paris*, vol. 1, pp. 159-162, figs. 1, 2.
1918. Sur une petite Collection de Crustacés de Cuba offerte au Musée par M. de Boury. *Bull. Mus. Hist. Nat. Paris*, vol. 24, pp. 6-15, figs. 1-7.
- BROOKS, S. T.
1931. List of Types of Crustacea in the Carnegie Museum on January 1, 1931. *Ann. Carnegie Mus.*, vol. 20, pp. 161-167.
- BROWNE, P.
1789. *The Civil and Natural History of Jamaica. Containing I. An accurate Description of that Island, its Situation, and Soil; with a brief Account of its former and present State, Government, Revenues, Produce, and Trade. II, An History of the Natural Productions, including the various Sorts of native Fossils; Perfect and Imperfect Vegetables; Quadrupeds, Birds, Fishes, Reptiles, and Insects; with their properties and Uses in Mechanics, Diet, and Physic*, pp. i-viii, 1-503, pls. 1-49, 1 map.
- BUEN, O. DE
1887. *Materials para la Fauna carcinológica de España. An. Soc. Esp. Hist. nat.*, vol. 16, pp. 405-434.
1916. *Los Crustáceos de Baleares. Bol. Soc. Esp. Hist. nat.*, vol. 16, pp. 355-367.
- BUMPUS, H. C.
1898. *The Breeding of Animals at Woods Hole during the Month of March, 1898. Science, New York, n. ser.*, vol. 7, pp. 485-487.
- 1898a. *The Breeding of Animals at Woods Hole during the Months of June, July and August. Science, New York, n. ser.*, vol. 8, pp. 850-858.
- BURKENROAD, M. D.
1947. *Reproductive Activities of Decapod Crustacea. Amer. Nat.*, vol. 81, pp. 392-398.
- CALMAN, W. T.
1907. On a Freshwater Decapod Crustacean collected by W. J. Burchell at Pará in 1829. *Ann. Mag. Nat. Hist.*, ser. 7, vol. 19, pp. 295-299, figs. 1-8.

CALVET, L.

1905. La Station zoologique de Cette (Son Origine-Son Evolution-Son Organisation actuelle) avec une esquisse de la faune et de la flore marines de la région et un compte rendu des fêtes jubilaires de la station. Trav. Inst. Zool. Univ. Montpellier, ser. 2, vol. 15, pp. 1-91, 16 pls.
1910. Invertébrés marins utilisés pour la Consommation ou servant d'Appât dans les différents genres de pêche. Trav. Inst. Zool. Univ. Montpellier, ser. 2, vol. 20, pt. 4, pp. 1-20.

CANO, G.

1890. Specie nuove o poco conosciute di Crostacei Decapodi del Golfo di Napoli. Boll. Soc. Nat. Napoli, ser. 1, vol. 4, pp. 33-39, pl. 4.

CARUS, J. V.

1885. Coelenterata, Echinodermata, Vermes, Arthropoda. Prodrum Faunae Mediterraneae sive Descriptio Animalium Maris Mediterranei Incolarum quam comparata silva rerum quatenus innotuit adiectis locis et nominibus vulgaribus eorumque auctoribus in commodum Zoologorum congestit, vol. 1, pp. i-xi, 1-524, addenda.

CARY, L. R. AND SPAULDING, H. M.

1909. Further Contributions to the Marine Fauna of the Louisiana Coast, pp. 1-21.

CHACE, F. A.

1937. Caridean Decapod Crustacea from the Gulf of California and the West Coast of Lower California. The Templeton Crocker Expedition. VII. Zoologica, New York, vol. 22, pp. 109-138, figs. 1-9.
1942. Six new Species of Decapod and Stomatopod Crustacea from the Gulf of Mexico. Proc. New Engl. Zool. Cl., vol. 19, pp. 79-92, pls. 23-28.
1943. Two new blind Prawns from Cuba with a Synopsis of the subterranean Caridea of America. Proc. New Engl. Zool. Cl., vol. 22, pp. 25-40, pls. 5-7.

— AND HOLTHUIS, L. B.

1948. Land and Fresh Water Decapod Crustacea from the Leeward group and northern South America. In: P. Wagenaar Hummelinck, Studies on the Fauna of Curaçao, Aruba, Bonaire and the Venezuelan Islands, vol. 3, pp. 21-28.

CHAPPUIS, P. A.

1927. Die Tierwelt der unterirdischen Gewässer. In: Thienemann, A., Die Binnengewässer. Einzeldarstellungen aus der Limnologie und ihren Nachbargebieten, vol. 3, pp. 1-175, text figs. 1-62, pls. 1-4.

COKER, R. E.

1938. Anomalies of Crustacean Distribution in the Carolinas with List of Cyclopoids of the general Region of Chapel Hill, N. C. Journ. Elisha Mitchell Sci. Soc., vol. 54, pp. 76-87, figs. 1-16.

CORDERO, E. H. AND VAZ FERREIRA, R.

1938. La variabilité des crevettes d'eau douce du genre *Pseudopalaemon* Sollaud (Decapoda Palaemonidae). Ann. Acad. Brasil. Sci., vol. 10, pp. 383-388, text figs. 1-3, pls. 1, 2.

COUES, E.

1871. Notes on the natural History of Fort Macon, N. C., and Vicinity. (No. 2.). Proc. Acad. Nat. Sci. Phila., 1871, pp. 120-148.

— AND YARROW, H. C.

1878. Notes on the natural History of Fort Macon, N. C., and Vicinity. (No. 5.). Proc. Acad. Nat. Sci. Phila., 1878, pp. 297-315.

COULON, L.

1907. Les Crustacés du Musée d'Histoire naturelle d'Elbeuf. Bull. Soc. Étud. Sci. Nat. Elbeuf, vol. 26, pp. 119-194, 1 pl.

COUTIERE, H.

1901. Note sur Coralliocaris Agassizi n. sp. provenant des dragages du Blake (1878-1879). Bull. Mus. Hist. Nat. Paris, vol. 7, pp. 115-117, 1 fig.
- 1901a. Les Palaemonidae des eaux douces de Madagascar. Ann. Sci. nat. Zool., ser. 8, vol. 12, pp. 249-342, pls. 10-14.

COVENTRY, G. A.

1944. The Crustacea. Results of the Fifth George Vanderbilt Expedition (1941) (Bahamas, Caribbean Sea, Panama, Galápagos Archipelago and Mexican Pacific Islands). Monogr. Acad. Nat. Sci. Phila., vol. 6, pp. 531-544.

COWLES, R. P.

1930. A biological Study of the offshore Waters of Chesapeake Bay. Bull. U. S. Bur. Fish., vol. 46, pp. 277-381, tabs. 1-13, figs. 1-16.

CREASER, E. P.

1931. The Michigan Decapod Crustaceans. Pap. Michigan Acad. Sci., vol. 13, pp. 257-276, figs. 31-40, maps 3-8.
1932. The Decapod Crustaceans of Wisconsin. Trans. Wisconsin Acad. Sci. Arts Lett., vol. 27, pp. 321-338, figs. 1-13.
1933. A Fresh-Water Shrimp for the tropical Aquarium. The Aquarium, Phila., vol. 1, pp. 261, 262, 1 fig.
1936. Crustaceans from Yucatan. In: Pearse, A. S., Creaser, E. P. & Hall, F. G., The Cenotes of Yucatan. A zoological and hydrographic Survey. Publ. Carnegie Inst., n. 457, pp. 117-132, figs. 1-43, tabs. 1-3.
1938. Larger Cave Crustacea of the Yucatan Peninsula. In: Pearse, A. S., Fauna of the Caves of Yucatan. Publ. Carnegie Inst., n. 491, pp. 159-164, figs. 1-8.

—AND ORTENBURGER, A. I.

1933. The Decapod Crustaceans of Oklahoma. Publ. Univ. Oklahoma Biol. Survey, vol. 5, pp. 14-80, text figs. 1-19, 23-33.

CROWDER, W.

1931. Between the Tides, pp. 1-461, text figs. 1-450, pls. 1-34, 2 unnumbered plates.

CUNNINGHAM, R. O.

1878. Notes on the Reptiles, Amphibia, Fishes, Mollusca, and Crustacea obtained during the voyage of H.M.S. "Nassau" in the years 1866-69. Trans. Linn. Soc. Lond., vol. 27, pp. 465-502, pls. 58, 59.
- 1871a. Notes on the Natural History of the Strait of Magellan and the West Coast of Patagonia made during the Voyage of H.M.S. "Nassau" in the Years 1866, 67, 68, & 69, pp. i-xvi, 1-517, 21 pls., 1 map.

DANA, J. D.

1852. Crustacea. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842 under the command of Charles Wilkes, U.S.N., vol. 13, pp. 1-1620.
1855. Crustacea. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842 under the command of Charles Wilkes, U.S.N., vol. 13, atlas, pp. 1-27, pls. 1-96.

DE KAY, J. E.

1844. Crustacea. Zoology of New-York, or the New-York Fauna; comprising detailed Descriptions of all the Animals hitherto observed within the State of New-York, with brief Notices of those occasionally found near its Borders, and accompanied by appropriate Illustrations, vol. 6, pp. 1-70, pls. 1-13.

DESMAREST, A. G.

1823. Malacostracés. Dict. Sci. nat., vol. 28, pp. 138-425, atlas vol. 4, 58 pls.
1825. Considérations générales sur la classe des Crustacés, et description des espèces de ces animaux, qui vivent dans la mer, sur les côtes ou dans les eaux douces de la France, pp. i-xix, 1-446, pls. 1-56, 5 tabs.
1830. Bosc, L. A. G., Manuel de l'histoire naturelle des Crustacés, contenant leur description et leurs moeurs, vol. 2, pp. 1-306, pls. 1-18bis.

DESMAREST, E.

1849. Description d'un nouveau genre de Crustacés de la section des Décapodes Macroures, famille des Salicoques, tribu des Palémoniens, (Genre Leander.) Ann. Soc. ent. France, ser. 2, vol. 7, pp. 87-94, 2 figs.

DEXTER, R. W.

1944. The Bottom Community of Ipswich Bay, Massachusetts. Ecology, vol. 25, pp. 352-359.
1947. The Marine Communities of a Tidal Inlet at Cape Ann, Massachusetts: A Study in Bio-Ecology. Ecol. Mongr., vol. 17, pp. 261-294, figs. 1-17, tabs. 1-11.

DOFLEIN, F.

1899. Amerikanische Decapoden der k. bayerischen Staatssammlungen. S. B. Bayer. Akad. Wiss., vol. 29, pp. 177-195.
1900. Weitere Mitteilungen über dekapode Crustaceen der k. bayerischen Staatssammlungen. S. B. Bayer. Akad. Wiss., vol. 30, pp. 125-145, figs. 1-3.

DUNCKER, G.

1900. On Variation of the Rostrum in *Palaemonetes vulgaris* Herbst. Amer. Nat., vol. 34, pp. 621-633, pls. 1-3.

EDMONDSON, C. H.

1923. Crustacea from Palmyra and Fanning Islands. With Descriptions of New Species of Crabs from Palmyra Island by Mary J. Rathbun. Bull. Bishop Mus. Honolulu, vol. 5, pp. 1-43, text figs. 1-3, pls. 1, 2.
1924. A Preliminary Comparison between Hawaiian and Australian Crustacea. Proc. Pan-Pacif. Sci. Congr. Aust., vol. 2, pp. 1548-1553.
1925. Crustacea. Marine Zoology of Tropical Central Pacific. (Tanager Expedition Publ. 1). Bull. Bishop Mus. Honolulu, vol. 27, pp. 3-62, pls. 1-4.
1946. Reef and Shore Fauna of Hawaii. Spec. Publ. Bishop Mus. Honolulu, vol. 22, pp. i-iii, 1-381, figs. 1-223.

EIGENMANN, C. H.

1900. A Contribution to the Fauna of the Caves of Texas. Proc. Amer. Ass. Adv. Sci., vol. 49, pp. 228-230.
1909. Cave Vertebrates of America. A Study in degenerative Evolution. Publ. Carnegie Inst. Wash., n. 104, pp. i-ix, 1-241, text figs. 1-72, pls. 1-29.

EVERMANN, B. W.

1892. A Report upon Investigations made in Texas in 1891. Bull. U. S. Fish Comm., vol. 11, pp. 61-90.

FABRICIUS, J. C.

1775. *Systema Entomologiae, sistens Insectorum Classes, Ordines, Genera, Species, adiectis Synonymis, Locis, Descriptionibus, Observationibus*, pp. 1-832.
1781. *Species Insectorum exhibentes eorum Differentias Specificas, Synonyma Auctorum, Loca natalia, Metamorphosin adiectis Observationibus, Descriptionibus*, vol. 1, pp. i-viii, 1-552.
1787. *Mantissa Insectorum sistens eorum Species nuper detectas adiectis Characteribus Genericis, Differentiis Specificis, Emendationibus, Observationibus*, vol. 1, pp. i-xx, 1-348.
1793. *Entomologia systematica, emendata et aucta. Classes, Ordines, Genera, Species adiectis Synonymis, Locis, Observationibus, Descriptionibus*, vol. 2, pp. i-viii, 1-519.
1798. *Supplementum Entomologiae systematicae*, pp. 1-572.

FAXON, W.

1879. *On the Development of Palaemonetes vulgaris*. Bull. Mus. Comp. Zoöl. Harvard, vol. 5, pp. 303-330, pls. 1-4.
1882. Crustacea. In: Agassiz, A., Faxon, W. & Mark, E. L., *Selections from embryological Monographs. I. Mem. Mus. Comp. Zoöl. Harvard*, vol. 9, pt. 1, pls. 1-14.
1895. *The Stalk-eyed Crustacea. Reports on an Exploration off the west Coasts of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. Mem. Mus. Comp. Zoöl. Harvard*, vol. 13, pp. 1-292, text figs. 1-6, pls. A-K, 1-57, 1 map.

FERGUSON, F. F. AND JONES, E. R.

1949. *A Survey of the Shore-Line Fauna of the Norfolk Peninsula. Amer. Midl. Nat.*, vol. 41, pp. 436-446.

FILHOL, H.

1885. *Considérations relatives à la Faune des Crustacés de la Nouvelle-Zélande. Bibl. Étud.*, vol. 30, pt. 2, pp. 1-60. *École nav.*
1886. *Catalogue des Crustacés de la Nouvelle Zélande, des îles Auckland et Campbell. Passage de Vénus. Mission de l'île Campbell, Zool.*, vol. 3, pt. 2, pp. 349-510, pls. 38-55.

FISH, C. J.

1925. *Seasonal Distribution of the Plankton of the Woods Hole Region. Bull. U. S. Bur. Fish.*, vol. 41, pp. 91-179, figs. 1-81.

FOLIN, L. DE AND PÉRIER, L.

- 1867-1887. *Les Fonds de la Mer. Étude internationale sur les particularités nouvelles des régions sous-marines*. vol. 1, pp. 1-316, pls. 1-32; vol. 2, pp. 1-365, pls. 1-11; vol. 3, pp. 1-337, pls. 1-9; vol. 4, pp. 1-240, pls. 1-15.1

¹ Some parts of this work are issued indicating as authors: Berchon, E., Folin, L. de & Périer, L., while of some others the authors were given as: Fisher, P., Folin, L. de & Périer, L. The dates of publication as far could be found out by me from the copy of the U. S. National Museum are:

- vol. 1. pp. 1-48 (1867); pp. 49-112 (1868); pp. 113-176, pls. 11-19 (1869); pp. 77-256 (1870); pp. 257-272 (1871); pp. 273-316 (1872).
- vol. 2. pp. 1-64 (1872); pp. 65-112 (1873); pp. 113-128 (1874); pp. 129-160 (1875); pp. 161-208 (1873); pp. 209-304 (1874); pp. 305-362 (1875); pp. 363-365 (1876).
- vol. 3. pp. 1-96 (1876); pp. 97-208 (1877); pp. 209-304 (1879); pp. 305-337 (1880).
- vol. 4. pp. 1-32 (1880); pp. 33-49 (1880 or 1881); pp. 50-148 (1881?); pp. 149-224 (1884-1887); pp. 225-240 (August 22, 1887).

FORBES, S. A.

1876. List of Illinois Crustacea, with Descriptions of new Species. Bull. Illinois Mus. Nat. Hist., 1876, pt. 1, pp. 3-25, pl. 1.

— AND RICHARDSON, R. E.

1913. Studies on the Biology of the Upper Illinois River. Bull. Illinois Lab. Nat. Hist., vol. 9, pp. 481-574, pls. 65-85.

FORSTER, J. R.

1771. A Catalogue of the Animals of North America. Containing, an Enumeration of the known Quadrupeds, Birds, Reptiles, Fish, Insects, Crustaceous and Testaceous Animals; many of which are New, and never described before. To which are added, short Directions for Collecting, Preserving, and transporting, all Kinds of Natural History Curiosities, pp. 1-43, 1 pl.

FOWLER, H. W.

1907. Gambusia in New Jersey. Science, New York, n. ser., vol. 26, p. 639.
1908. Further Notes on New Jersey Fishes. Rep. New Jersey State Mus., 1907, pp. 120-189, pls. 66-68.
1912. The Crustacea of New Jersey. Ann. Rep. New Jersey State Mus., 1911, pp. 29-650, pls. 1-150.
1913. Notes on the Fishes of the Chincoteague Region of Virginia. Proc. Acad. Nat. Sci. Phila., 1913, pp. 61-65.

GEISER, S. W.

1933. Notes on Texas Crustacea. Field and Lab., Dallas, vol. 2, pp. 29-32.
1933a. The Freshwater Prawns (Palaemonidae) of Texas. (Demonstration). Abstr. Pap. Ann. Meeting N. Texas Biol. Soc., April 22, 1933, p. 7. (mimeographed)

GIBBES, L. R.

1845. Catalogue of the Collection of Crustaceans in the Cabinet of the Boston Society of Natural History. Proc. Boston Soc. Nat. Hist., vol. 2, pp. 69, 70.
1848. Catalogue of the Fauna of South Carolina. In: Tuomey, M., Report on the Geology of South Carolina, Appendix, pp. i-xxiv.
1850. Catalogue of the Crustacea in the Cabinet of the Academy of Natural Sciences of Philadelphia, August 20th, 1847 with Notes on the most remarkable. (With Additions and Observations by the Committee.) Proc. Acad. Nat. Sci. Phila., 1850, pp. 22-30.
1850a. On the carcinological Collections of the Cabinets of Natural History in the United States. With an Enumeration of the species contained therein, and descriptions of new species. Proc. Amer. Ass. Adv. Sci., vol. 3, pp. 165-201.

GISSLER, C. F.

1881. The Common Prawn and its Parasite. Scientific American, vol. 45, p. 151, figs. 1, 2.

GMELIN, J. F.

1789. Caroli a Linné, Systema Naturae per Regna Tria Naturae, secundum Classes, Ordines, Genera, Species cum Characteribus, Differentiis, Synonymis, Locis, ed. 13 vol. 1 pt. 5, pp. 2225-3020.

GOODSIR, H. D. S.

1845. Descriptions of some Animals found amongst the Gulf-weed. Ann. Mag. Nat. Hist., vol. 15, pp. 73, pl. 7.

GORDON, I.

1935. On two rare Crustacea Macrura. Proc. Linn. Soc. Lond., 1934-35, pp. 134-136.
 1935a. On new or imperfectly known species of Crustacea Macrura. Journ. Linn. Soc. Lond. Zool., vol. 39, pp. 307-351, figs. 1-27.

GOULD, A. A.

1841. Report on the Invertebrata of Massachusetts, comprising the Mollusca, Crustacea, Annelida, and Radiata, pp. i-xiii, 1-373, figs. 1-213.

GRONOVIVS, L. T.

1764. Zoophylacii Gronoviani Fasciculus secundus exhibens Enumerationem Insectorum quae in Museo suo adservat, examini subjecti, systematice disposuit atque descripsit, pp. 141-236, pls. 15-17.

GRUBE, E.

1864. Ueber die Crustaceenfauna des adriatischen und Mittelmeeres. Jber. Schles. Ges. Vaterl. Cult., vol. 41, pp. 59-64.

GUERIN, MENVILLE, F. E.

1856. Crustaceos. In: Sagra, R. de la, Historia fisica politica y natural de la isla de Cuba, Historia Natural, vol. 7, pp. v-xxxii, pls. 1-3.
 1857. Crustacés. In: Sagra, R. de la, Histoire physique, politique et naturelle de l'île de Cuba, pp. i-xxxvii, pl. 2.

GUILDING, L.

1825. An Account of some rare West Indian Crustacea. Trans. Linn. Soc. Lond., vol. 14, pp. 334-338.

GUNDLACH, J.

1887. Crustáceos. Apuntes para la Fauna Puerto-Riqueña. VI. An. Soc. Esp. Hist. nat., vol. 16, pp. 115-134. (Cf. also Torralbas, 1917 and Valdés Ragués, 1909).

GUNTER, G.

1937. Observations on the River Shrimp, *Macrobrachium ohionis* (Smith). Amer. Midl. Nat., vol. 18, pp. 1038-1042, figs. 1-3.
 1945. Studies on marine Fishes of Texas. Publ. Inst. mar. Sci. Texas, vol. 1 pt. 1, pp. 1-190, figs. 1-11.

GURNEY, R.

1924. The Larval Development of some British Prawns (Palaemonidae). II. *Leander longirostris* and *Leander squilla*. Proc. Zool. Soc. Lond., 1924, pp. 961-982, figs. 1-12.
 1936. Notes on some Decapod Crustacea of Bermuda.-III.-V. Proc. Zool. Soc. Lond., 1936, pp. 619-630, pls. 1-7.
 1938. The Larvae of the Decapod Crustacea. Palaemonidae and Alpheidae. Sci. Rep. Great Barrier Reef Exped., vol. 6, pp. 1-60, figs. 1-265.
 1939. A late Larval Stage of the Sargassum Prawn, *Leander tenuicornis* (Say), and a Note on the Statocyst of the Adult. Ann. Mag. Nat. Hist., ser. 11 vol. 3, pp. 120-126, figs. 1, 2.
 1943. Notes on *Periclimenes americanus* and the Growth of the Cheliped in this and other Palaemonid Prawns. Ann. Mag. Nat. Hist., ser. 11, vol. 10, pp. 495-504, figs. 1, 2.

— AND LEBOUR, M. V.

1941. On the Larvae of certain Crustacea Macrura, mainly from Bermuda. Journ. Linn. Soc. Lond. Zool., vol. 41, pp. 89-181, figs. 1-26.

HAAN, W. DE

- 1833-1850. Crustacea. In: Siebold, P. F. de, Fauna Japonica sive Descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batava Imperium tenent, suscepto, annis 1823-1830 collegit, notis, observationibus et adumbrationibus illustravit, pp. i-xvii, i-xxxii, 1-244, pls. 1-55, A-Q, 1, 2.

HASWELL, W. A.

1882. Catalogue of the Australian stalk- and sessile-eyed Crustacea, pp. i-xxiv, 1-324, pls. 1-4.

HAY, O. P.

1882. Notes on Some Fresh-water Crustacea, together with Descriptions of Two New Species. Amer. Nat., vol. 16, pp. 143-146, 241-243.

HAY, W. P.

1891. The Crustacea of Indiana. Proc. Indiana Acad. Sci., 1891, pp. 147-151.
1903. On a small Collection of Crustaceans from the Island of Cuba. Proc. U. S. Nat. Mus., vol. 26, pp. 429-435, figs. 1-3.
1917. Preliminary descriptions of five new species of Crustaceans from the coast of North Carolina. Proc. Biol. Soc. Wash., vol. 30, pp. 71-74.

——— AND SHORE, C. A.

1918. The Decapod Crustaceans of Beaufort, N. C., and the surrounding Region. Bull. U. S. Bur. Fish., vol. 35, pp. 369-475, textfigs. 1-20, pls. 25-39.

HEDGPETH, J. W.

1946. Texas Shrimp. Texas Game and Fish, vol. 4 n. 12, pp. 18, 19, 31, figs.
1947. Fresh Water Shrimp. Texas Game and Fish, vol. 5 n. 8, pp. 14, 15, 5 figs.
1947a. River Shrimps, interesting Crustaceans about which little has been written. Progressive Fish-Culturist, Oct. 1947, pp. 181-184, 9 figs.
1949. The North American Species of Macrobrachium (River Shrimp). Texas Journ. Sci., vol. 1, pp. 28-38, figs. 1-5.
1950. Notes on the Marine Invertebrate Fauna of Salt Flat Areas in Aransas National Wildlife Refuge, Texas. Publ. Inst. mar. Sci. Texas, vol. 1 n. 2, pp. 103-119, figs. 1, 2.

HEILPRIN, A.

1888. Contributions to the Natural History of the Bermuda Islands. Proc. Acad. Nat. Sci. Phila., 1888, pp. 302-328.
1889. The Bermuda Islands: a Contribution to the physical History and Zoology of the Somers Archipelago. With an Examination of the Structure of Coral Reefs, pp. 1-231, pls. 1-17, 11 pls. in the text.

HELLER, C.

1862. Beiträge zur näheren Kenntniss der Macrouren. S. B. Akad. Wiss. Wien, vol. 45, pt. 1, pp. 389-426, pls. 1, 2.
1863. Die Crustaceen des südlichen Europa. Crustacea Podophthalmia. Mit einer Uebersicht über die horizontale Verbreitung sämtlicher europäischer Arten, pp. i-xi, 1-336, pls. 1-10.

HENDERSON, J. R. AND MATTHAI, G.

1910. On certain Species of *Palaemon* from South India. Rec. Indian Mus., vol. 5, pp. 277-305, pls. 15-18.

- HERBST, J. F. W.
1791-1796. Versuch einer Naturgeschichte der Krabben und Krebse nebst einer systematischen Beschreibung ihrer verschiedenen Arten, vol. 2, pp. i-viii, 1-226, pls. 22-46.
- HERMS, W. B.
1907. Notes on a Sandusky Bay Shrimp, *Palaemonetes exilipes* Stimpson. Ohio Nat., vol. 7, pp. 73-79, figs. 1, 2.
- HERRICK, C. L.
1887. List of the Fresh-water and Marine Crustacea of Alabama, with descriptions of the New Species and Synoptical Keys for Identification. Contribution to the Fauna of the Gulf of Mexico and the South. Mem. Denison sci. Ass., vol. 1 pt. 1, pp. 1-56, pls. 1-7.
- HEWATT, W. G.
1946. Marine Ecological Studies on Santa Cruz Island, California. Ecol. Monogr., vol. 16, pp. 185-208, figs. 1, 2, tabs. 1, 2.
- HILDEBRAND, S. F.
1939. The Panama Canal as a Passageway for Fishes, with Lists and Remarks on the Fishes and Invertebrates Observed. Zoologica, New York, vol. 24, pp. 15-45, pls. 1, 2.
- HILTON, W. A.
1916. Crustacea from Laguna Beach. Journ. Ent. Zool. Pomona Coll., vol. 8, pp. 65-73, 3 pls.
- HITCHCOCK, E.
1835. Catalogues of the Animals and Plants of Massachusetts, pp. 1-142.
- HOFF, C. C.
1944. The Copepoda, Amphipoda, Isopoda, and Decapoda (exclusive of the Crayfishes) of Reelfoot Lake. Rep. Reelfoot Lake biol. Sta., vol. 8, pp. 16-28, tabs. 1-3.
- HOLMES, S. J.
1895. Notes on West American Crustacea. Proc. Calif. Acad. Sci., ser. 2 vol. 4, pp. 563-588, pls. 20, 21.
1900. Synopsis of California Stalk-Eyed Crustacea. Occ. Pap. Calif. Acad. Sci., vol. 7, pp. 1-262, text figs. 1-6, pls. 1-4.
- HOLTUIS, L. B.
1948. Note on some Crustacea Decapoda *Natantia* from Surinam. Proc. Kon. Nederl. Akad. Wetensch., vol. 51, pp. 1104-1113, figs. 1-3.
1949. Note on the Species of *Palaemonetes* (Crustacea Decapoda) found in the United States of America. Proc. Kon. Nederl. Akad. Wetensch., vol. 52, pp. 87-95, figs. 1, 2.
1950. Preliminary Descriptions of twelve new Species of Palaemonid Prawns from American Waters (Crustacea Decapoda). Proc. Kon. Nederl. Akad. Wetensch., vol. 53, pp. 93-99.
1950a. The Palaemonidae collected by the Siboga and Snellius Expeditions with Remarks on other Species. I. Subfamily Palaemoninae. The Decapoda of the Siboga Expedition. Part X. Siboga Exped., mon. 39a9, pp. 1-268, figs. 1-52.
1950b. Crustacea Decapoda Macrura. Scientific Results of the Surinam Expedition 1948-1949. Part II. Zoology. No. 1. Zool. Meded., vol. 31, pp. 25-37.
1951. The Caridean Crustacea of Tropical West Africa. Atlantide Rep., vol. 2, pp. 7-187, figs. 1-34.

HOULTUYN, M.

1769. Vervolg en Besluit der Insekten. Natuurlyke Historie of uitvoerige Beschryving der Dieren, Planten en Mineraalen, volgens het Samenstel van den Heer Linnæus, vol. 1 pt. 13, pp. 1-534, pls. 99-106.

HOWARD, L. O.

1883. A List of the Invertebrate Fauna of South Carolina. South Carolina. Resources and Population. Institutions and Industries, pp. 265-311.

HULT, J.

1938. Crustacea Decapoda from the Galapagos Islands collected by Mr. R. Blomberg. Ark. Zool., vol. 30A, pt. 5, pp. 1-18, text figs. 1-4, pl. 1.

HUNTSMAN, A. G.

1915. The fresh-water Malacostraca of Ontario. Rep. Dept. mar. Fish. Canada, vol. 47, suppl., pp. 145-163, figs. 1-13.

HUXLEY, T. H.

1879. The Crayfish. An Introduction to the Study of Zoology. Int. sci. Ser., vol. 28, pp. i-xiv, 1-371, figs. 1-81. (Many editions of this book have been issued later.)
1880. L'écrevisse. Introduction à l'étude de la zoologie. Bibl. sci. Int., vol. 36, pp. i-xi, 1-260, figs. 1-81.
1881. Der Krebs. Eine Einleitung in das Studium der Zoologie. Int. wiss. Bibl., vol. 48, pp. 1-313, figs. 1-81.

IHERING, H. VON

1897. Os Camaroes de agua doce do Brazil. Rev. Mus. Paul., vol. 2, pp. 421-432.

IVES, J. E.

1891. Crustacea from the Northern Coast of Yucatan, the harbor of Vera Cruz, the West Coast of Florida and the Bermuda Islands. Proc. Acad. Nat. Sci. Phila., 1891, pp. 176-207, pls. 5, 6.

JOHANSON, F.

1929. Further Observations on Canadian Land and Freshwater-Crustacea, made in 1928. Canad. Field Nat., vol. 43, pp. 104-106. (The year 1928 in the title is a misprint for 1926.)

JOHNSON, F. F. AND LINDNER, M. J.

1934. Shrimp Industry of the South Atlantic and Gulf States, with Notes on other domestic and foreign Areas. Invest. Rep. U. S. Bur. Fish., vol. 21, pp. 1-83, figs. 1-31, tabs. 1-23.

JONES, J. M.

1859. The Naturalist in Bermuda; a Sketch of the Geology, Zoology, and Botany, of that remarkable Group of Islands; together with meteorological Observations, pp. i-xii, 1-200, text figs., 1 map.

KEMP, S.

1915. Crustacea Decapoda. Fauna of the Chilka Lake. Mem. Indian Mus., vol. 5, pp. 199-325, text figs. 1-38, pls. 12, 13.
1922. Pontoniinae. Notes on Crustacea Decapoda in the Indian Museum. XV. Rec. Indian Mus., vol. 24, pp. 113-288, text figs. 1-105, pls. 3-9.
1925. On various Caridea. Notes on Crustacea Decapoda in the Indian Museum. XVII. Rec. Indian Mus., vol. 27, pp. 249-343, figs. 1-24.

KENDALL, W. C.

1923. Fresh-Water Crustacea as Food for young Fishes. Rep. U. S. Fish Comm., 1922 app. 1, pp. 1-32, figs. 1-10.

KINGSLEY, J. S.

1878. List of Decapod Crustacea of the Atlantic Coast, whose range embraces Fort Macon. Proc. Acad. Nat. Sci. Phila., 1878, pp. 316-330.
- 1878a. List of the North American Crustacea belonging to the Suborder Caridea. Bull. Essex Inst., vol. 10, pp. 53-71.
- 1878b. Notes on the North American Caridea in the Museum of the Peabody Academy of Science at Salem, Mass. Proc. Acad. Nat. Sci. Phila., 1878, pp. 89-98.
1880. On a Collection of Crustacea from Virginia, North Carolina, and Florida, with a Revision of the genera of Crangonidae and Palaemonidae. Proc. Acad. Nat. Sci. Phila., 1879, pp. 383-427, pl. 14.
1882. Carcinological Notes: Number V. Bull. Essex Inst., vol. 14, pp. 105-132, pls. 1, 2.
1899. The Caridea of North America. Synopses of North-American Invertebrates. III. Amer. Nat., vol. 33, pp. 709-720, 2 pls.

KRAUSS, F.

1843. Die Südafrikanischen Crustaceen. Eine Zusammenstellung aller bekannten Malacostraca, Bemerkungen über deren Lebensweise und geographische Verbreitung, nebst Beschreibung und Abbildung mehrerer neuen Arten, pp. 1-68, pls. 1-4.

KRUSENSTERN, A. J. VON

1814. Atlas zur Reise um die Welt unternommen auf Befehl Seiner Kaiserlichen Majestät Alexander des Ersten auf den Schiffen Nadescha und Neva unter dem Commando des Capitains von Krusenstern, pls. 1-98.

LAMARCK, J. B. P. A. DE

1818. Histoire naturelle des Animaux sans Vertèbres, présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent; précédée d'une Introduction offrant la Détermination des caractères essentiels de l'Animal, sa distinction du végétal et des autres corps naturelles, enfin, l'Exposition des Principes fondamentaux de la Zoologie, vol. 5, pp. 1-612.

LATREILLE, P. A.

1802. Histoire naturelle, générale et particulière, des Crustacés et des Insectes, vol. 6, pp. 1-391, pls. 44-57.
1818. Crustacés, Arachnides et Insectes. Tableau Encyclopédique et Méthodique des Trois Règnes de la Nature, vol. 24, pp. 1-38, pls. 133-397.

LEACH, W. E.

1815. The zoological Miscellany; being Descriptions of new, or interesting Animals, vol. 2, pp. 1-154, pls. 61-120.

LEBOUR, M. V.

1949. Some New Decapod Crustacea from Bermuda. Proc. Zool. Soc. Lond., vol. 118, pp. 1107-1117, figs. 1-6.
- 1949a. Alteration in the specific name of Periclimenes (Ancylocaris) bermudensis Lebour. Proc. Zool. Soc. Lond., vol. 119, p. 605.

LEIDY, J.

1879. Notices of some Animals on the Coast of New Jersey. Proc. Acad. Nat. Sci. Phila., 1880, pp. 198, 199.
1888. Remarks on the fauna of Beach Haven, N. J. Proc. Acad. Nat. Sci. Phila., 1888, pp. 329-333.

LENZ, H.

1901. Crustaceen. Ergebnisse einer Reise nach dem Pacific (Schauinsland 1896-1897). Zool. Jb. Syst., vol. 14, pp. 429-482, pl. 32.
1902. Die Crustaceen der Sammlung Plate. (Decapoda und Stomatopoda). Fauna Chilensis, vol. 2 pt. 3. Zool. Jb. Suppl., vol. 5, pp. 731-772, pl. 23.

— AND STRUNCK, K.

1914. Die Dekapoden der Deutschen Südpolar-Expedition 1901-1903. I. Brachyuren und Macruren mit Ausschluss der Sergestiden. Deutsche Südpolar-Exp., vol. 15, pp. 257-345, text figs. 1-5, pls. 12-22.

LINNAEUS, C.

1745.
54 Museum S:ae R:ae M:tis Adolphi Friderici Regis Suecorum, Gothorum, Vandalourumque. Haer. Norv. Duc. Slesv. Hols. Storm. Ditm. Com. Oldenb. Delmenhorstiae. &c. &c. in quo Animalia rariora imprimis, et exotica: Quadrupedia, Aves, Amphibia, Pisces, Insecta, Vermes describuntur et determinantur, latine et suetice cum Iconibus. Hans Maj:ts Adolf Frideriks vår allernädigste Konungs Naturalie Samling innehållande sälsynte och främmande Djur, som bevaras på Kongl. Lust-Slottet Ulriksdahl; beskrefne och afritadne samt på nådig Befallning, pp. i-xxx, 1-96, pls. 1-33.
1758. Systema Naturae per Regna tria Naturae, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis, ed. 10, vol. 1, pp. 1-824, i-iii.
1759. Animalium Specierum in Classes, Ordines, Genera, Species methodica dispositio, additis Characteribus, Differentiis atque Synonymis, accommodata ad Systema Naturae & in formam enchyridiï redacta, secundum decimam Holmensem editionem, pp. 1-253.
1760. Systema Naturae per Regna tria Naturae, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis, ed. 11 vol. 1, pp. 1-824, i-iii.
1767. Systema Naturae per Regna tria Naturae, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis, ed. 12 vol. 1, pp. 1-1327.
- 1767a. Systema Naturae, per Regna tria Naturae, secundum Classes, Ordines, Genera, Species cum Characteribus, Differentiis, Synonymis, Locis, ed. 13 vol. 1, pp. 1-1327.

LOCKINGTON, W. N.

1878. Notes on Pacific Coast Crustacea. Bull. Essex Inst., vol. 10, pp. 159-165.

LUCAS, H.

1849. Crustacés, Arachnides, Myriopodes et Hexapodes. Exploration scientifique de l'Algérie pendant les années 1840, 1842. Sciences physiques. Zoologie I. Histoire naturelle des Animaux articulés, pt. 1, pp. 1-403.
1857. Crustacés. In: Animaux nouveaux ou rares recueillis pendant l'expédition dans les parties centrales de l'Amérique du Sud, de Rio de Janeiro à Lima, et de Lima au Para; exécutée par ordre du gouvernement français pendant les années 1843 à 1847, sous la direction du comte Francis de Castelnau, pp. 2-13, pls. 1, 2.

LUCE, W. M.

1933. A survey of the fishery of the Kaskaskia River. Illinois Nat. Hist. Surv. Bull., vol. 20, pp. 71-123. This paper has not been seen by me).

LUEDERWALDT, H.

1919. Lista dos Crustaceos superiores (Thoracostraca) do Museu Paulista que foram encontrados no Estado de S. Paulo. Rev. Mus. Paul., vol. 11, pp. 427-453.
- 1919a. Os manguesaes de Santos. Rev. Mus. Paul., vol. 11, pp. 309-408.
1929. Resultados de uma excursao scientifica á Ilha de Sao Sebastiao no littoral do Estado de Sao Paulo e em 1925. Rev. Mus. Paul., vol. 16, pp. 1-79, 1011-1019, 3 pls.

LUNZ, G. R.

1939. Notes on the Common Shrimp. Science, New York, vol. 81, p. 436.
- 1939a. New Crustacean Records for the Carolinas and Florida. Journ. Elisha Mitchell Sci. Soc., vol. 55, pp. 335-338.

MACCAGNO, T. P.

1939. Contributo alla conoscenza dei Crostacei della Tripolitania. Boll. Mus. Zool. Anat. comp. Torino, vol. 47, pp. 437-452.

MCCLENDON, J. F.

1911. On Adaptations in Structure and Habits of some marine Animals of Tortugas, Florida. Pap. Tortugas Lab. Carnegie Inst., vol. 3, pp. 55-62, pls. 1, 2.

MCCORMICK, R. N.

1933. Studies on *Macrobrachium ohionis*, the large fresh-water shrimp. Abstr. Doct. Diss. Ohio State Univ., no. 11, pp. 47-56.
- 1933a. *Macrobrachium ohionis*, the large freshwater Shrimp. Proc. Indiana Acad. Sci., vol. 43, pp. 218-224, figs. 1-3.

MCDUGALL, K. D.

1943. Sessile Marine Invertebrates at Beaufort, North Carolina. Ecol. Monogr., vol. 13, pp. 321-374., figs. 1-19.

MAN, J. G. DE

1879. On some Species of the Genus *Palaemon* Fabr. with Descriptions of two new Forms. Notes Leyden Mus., vol. 1, pp. 165-184.
1881. Carcinological Studies in the Leyden Museum. No. 1. Notes Leyden Mus., vol. 3, pp. 121-144.
1888. Bericht über die von Herrn Dr. J. Brock im indischen Archipel gesammelten Decapoden und Stomatopoden. Arch. Naturgesch., vol. 53 pt. 1, pp. 215-600, pls. 7-22a.
1897. Bericht über die von Herrn Schiffscapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelten Decapoden und Stomatopoden. Fünfter Theil. Zool. Jb. Syst., vol. 9, pp. 725-790.
1900. Crustacea. Report on a Collection made by Messrs F. V. McConnell and J. J. Quelch at Mount Roraima in British Guiana. Trans. Linn. Soc. Lond. Zool., ser. 2, vol. 8, pp. 57-64, pl. 6.
1912. Sur quelques "Palaemonidae" et sur une espèce de "Penaeus" de l'Afrique occidentale, avec des observations sur le "Palaemon (Eupalaemon) acanthurus" Wieg. de l'Amerique du sud. Ann. Soc. zool. malac. Belg., vol. 46, pp. 197-253, pls. 1-4.
1925. Contribution à l'étude des Décapodes Macroures marins et fluviatiles du bassin du Congo Belge. Ann. Mus. Congo Belge, Zool., ser. 3, sect. 3, pt. 1, fasc. 1, pp. 1-54, text figs. 1-13d, tabs. A-H'.

MARCGRAF, G.

1648. *Historiae Rerum Naturalium Brasiliae, Libri octo: Quorum tres priores agunt de Plantis. Quartus de Piscibus. Quintus de Avibus. Sextus de Quadrupedibus, et Serpentibus. Septimus de Insectis. Octavus de ipsa Regione, et illus Incolis. Cum Appendice de Tapuyis, et Chilensibus.* In: Piso, G. & Marcgraf, G., *Historia Naturalis Brasiliae, Auspicio et Beneficio Illustriss. I. Mauritii Com. Nassua illius Provinciae et Maris summi Praefecti adornata, in qua non tantum Plantae et Animalia, sed et Indigenarum morbi, ingenia et mores describuntur et Iconibus supra quingentas illustrantur*, pt. 2, pp. 1-293, figs.

MARTENS, E. VON

1858. On the Occurrence of Marine Animal Forms in Fresh Water. *Ann. Mag. Nat. Hist.*, ser. 3 vol. 1, pp. 50-63.
1868. Notiz über *Palaemon Gaudichaudii* und *Niloticus*. *Arch. Naturgesch.*, vol. 34 pt. 1, pp. 64-67.
1869. Südbrasilische Süß- und Brackwasser-Crustaceen nach den Sammlungen des Dr. Reinh. Hensel. *Arch. Naturgesch.*, vol. 35 pt. 1, pp. 1-37, pls. 1, 2.
1872. Ueber Cubanische Crustaceen nach den Sammlungen Dr. J. Gundlach's *Arch. Naturgesch.*, vol. 38 pt. 1, pp. 77-147, pls. 4, 5.
1876. Ueber die Thierwelt der besuchten Gegenden im allgemeinen. *Preuss. Exped. Ost-Asien, Zool.*, vol. 1, pp. 1-412, pls. 1-15.

MEEHEAN, O. L.

1936. Notes on the Freshwater Shrimp *Palaemonetes paludosa* (Gibbes). *Trans. Amer. Microsc. Soc.*, vol. 55, pp. 433-441, text fig. 7, pls. 54, 55.
- 1936a. A Short Resume of the Data on the Life History of the Fresh-Water Shrimp, *Palaemonetes Paludosa* (Gibbes). *Proc. Louisiana Acad. Sci.*, vol. 3, pp. 47-49.

MEEK, S. E.

1908. The Zoölogy of Lakes Amatitlan and Atitlan, Guatemala, with special Reference to Ichthyology. *Publ. Field Columb. Mus. Zool.*, vol. 7, pp. 159-206, 19 figs.

MEREDITH, D. W.

1939. Voyages of the *Velero III*. A pictorial Version with historical Background of scientific Expeditions through tropical Seas to equatorial Lands abroad m/v *Velero III*, ed. 2, pp. 1-286, figs.

MEUSCHEN, F. C.

1781. Index, continens Nomina Generica Specierum propria, Trivialia ut et Synonyma. In: Gronovius, L. T., *Zoophylacium Gronovianum, exhibens Animalia Quadrupeda, Amphibia, Pisces, Insecta, Vermes, Mollusca, Testacea, et Zoophyta, quae in Museo suo adservavit, examini subjecit, systematice disposuit atque descripsit*, 19 pp.

MIERS, E. J.

1876. Catalogue of the stalk-eyed and sessile-eyed Crustacea of New Zealand, pp. 1-196, pls. 1-3.
1877. On a Collection of Crustacea, Decapoda and Isopoda, chiefly from South America, with descriptions of New Genera and Species. *Proc. Zool. Soc. Lond.*, 1877, pp. 653-679, pls. 66-69.
1891. Crustacea. Podophthalmia. In: Whympers, E., *Supplementary Appendix to Travels amongst the Great Andes of the Equator*, pp. 121-124, 2 text figs., 1 pl.

MILNE EDWARDS, A.

1862. Faune carcinologique de l'île de la Réunion. Annexe F de l'ouvrage intitulé: Notes sur l'île de la Réunion par L. Maillard, pp. 1-16, pls. 17-19.

MILNE EDWARDS, H.

1837. Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux, vol. 2, pp. 1-532, atlas, pp. 1-32, pls. 1-42.
1838. Arachnides, Crustacés, Annélides, Cirrhipèdes. In: Lamarck, J.B.P.A. de, Histoire naturelle des Animaux sans Vertèbres, présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent; précédée d'une introduction offrant la Détermination des caractères essentiels de l'Animal, sa Distinction du végétal et des autres corps naturels; enfin, l'Exposition des principes fondamentaux de la Zoologie, ed. 2 vol. 5, pp. 1-699.

— AND LUCAS, H.

1843. Crustacés. In: Orbigny, A.d', Voyage dans l'Amérique méridionale (le Brésil, la république orientale de l'Uruguay, la république Argentine, la Patagonie, la république du Chili, la république de Bolivia, la république du Pérou), exécuté pendant les années 1826, 1827, 1828, 1829, 1830, 1831, 1832 et 1833, vol. 6 pt. 1, pp. 1-37, pls. 1-17.

MOLINA, G. I.

1782. Saggio sulla storia naturale del Chili, ed. 1, (number of pages not known to me) 7 pls., 1 map. (A second edition appeared in 1810).
1786. Versuch einer Naturgeschichte von Chili.
- 1788-1795. Compendio de la historia geografica, natural y civil del reyno de Chili. 2 vols.
1789. Essai sur l'histoire naturelle du Chili, pp. i-xvi, 1-351.
1808. The geographical, natural and civil History of Chili. With Notes from the Spanish and French Versions, and an Appendix, containing copious extracts from the Araucana of Don Alonzo de Ercilla, vol. 1, pp. i-xii, 1-271, 1 map; vol. 2, pp. i-viii, 1-305, app., pp. i-iv, 1-68.
1810. Saggio sulla storia naturale del Chili. ed. 2.

MOREIRA, C.

1901. Crustaceos do Brazil. Contribuiçoes para o conhecimento da fauna Brazileira. Arch. Mus. Nac. Rio de Jan., vol. 11, pp. 1-151, i-iv, pls. 1-4.
1903. Crustaceos da Ponta do Pharol em S. Francisco do Sul no Estado de Santa Catharina. Arch. Mus. Nac. Rio de Jan., vol. 12, pp. 119-123.
1912. Crustacés du Brésil. Mén. Soc. zool. France, vol. 25, pp. 145-154, text figs. 1-3, pls. 3-6.
1913. Crustaceos. Comissao de Linhas Telegraphicas Estrategicas de Matto-Grosso ao Amazonas. Anexo N. 5. Historia Natural. Zoologia, pp. 1-21, text figs. 1, 2, pls. 1-7.

MULLER, F.

1830. *Palaemon Potiuna*. Ein Beispiel abgekürzter Verwandlung. Zool. Anz., vol. 3, pp. 152-157.
1892. O camarao preto, *Palaemon Potiuna*. Arch. Mus. Nac. Rio de Jan., vol. 8, pp. 179-206, pls. 11-13.

MURRAY, J. AND HJORT, J.

1912. The Depths of the Ocean. A general Account of the modern Science of Oceanography based largely on the scientific Researches of the Norwegian Steamer Michael Sars in the North Atlantic. With Contributions from A. Appellöf, H. H. Gran and B. Helland-Hansen, pp. i-xx, 1-821, text figs. 1-575, pls. 1-9.

NEHER, E. M.

1902. The Eye of *Palaemonetes Antrorum*. Proc. Indiana Acad. Sci., vol. 12, pp. 96-101, figs. 1-7.

NEUMANN, R.

1878. Systematische Uebersicht der Gattungen der Oxyrhynchen. Catalog der Podophthalmen Crustaceen des Heidelberger Museums. Beschreibung einiger neuer Arten, pp. 1-39.

NICOLET, H.

1849. Crustaceos. In: Gay, C., Historia fisica y politica de Chile segun documentos adquiridos en esta republica durante doce años de residencia en ella y publicada bajo los auspicios del supremo gobierno. Zool., vol. 3, pp. 115-318, pls. 1-4.

NIERSTRASZ, H. F. AND BRENDER à BRANDIS, G. A.

1925. Epicaridea. Bijdragen tot de Kennis der Fauna van Curaçao. Resultaten ener Reis van Dr. C. J. van der Horst in 1920. Bijdr. Dierk., vol. 24, pp. 1-8, pl. 1.

NOBILI, G.

1896. Crostacei decapodi. Viaggio del Dr. Alfredo Borelli nel Chaco Boliviano e nella Repubblica Argentina. Boll. Mus. Zool. Anat. comp. Torino, vol. 11, n. 265, pp. 1-3.
- 1896a. Crostacei decapodi. Viaggio del Dott. A. Borelli nella Republica Argentina e nel Paraguay. Boll. Mus. Zool. Anat. comp. Torino, vol. 11, n. 222, pp. 1-4.
1897. Decapodi e Stomatopodi raccolti dal Dr. Enrico Festa nel Darien, a Curaçao, La Guayra, Porto Cabello, Colon, Panama, ecc. Boll. Mus. Zool. Anat. comp. Torino, vol. 12, n. 280, pp. 1-8.
- 1897a. Decapodi terrestri e d'acqua dolce. Viaggio del Dr. Enrico Festa nella Repubblica dell'Ecuador e regioni vicine. I. Boll. Mus. Zool. Anat. comp. Torino, vol. 12, n. 275, pp. 1-6.
1898. Crostacei Decapodi e Stomatopodi di St. Thomas (Antille). Boll. Mus. Zool. Anat. comp. Torino, vol. 13, n. 314, pp. 1-3.
1899. Contribuzioni alla conoscenza della fauna carcinologica della Papuasìa, delle Molucche e dell'Australia. Ann. Mus. Stor. Nat. Genova, vol. 40, pp. 230-282.
- ~~1900. Contribuzioni alla conoscenza della fauna carcinologica della Papuasìa, delle Molucche e dell'Australia. Ann. Mus. Stor. Nat. Genova, vol. 40, pp. 230-282.~~
1901. Decapodi e Stomatopodi. Viaggio del Dr. Enrico Festa nella Repubblica dell'Ecuador e regioni vicine. Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 415, pp. 1-58.
- 1901a. Decapodi e Stomatopodi Eritrei del Museo Zoologico dell'Università di Napoli. Annu. Mus. zool. Univ. Napoli, vol. 1, pt. 3, pp. 1-20.
- 1901b. Decapodi raccolti dal Dr. Filippo Silvestri nell'America meridionale. Boll. Mus. Zool. Anat. comp. Torino, vol. 16, n. 402, pp. 1-16.
1905. Diagnoses préliminaires de 34 espèces et variétés nouvelles, et de 2 genres nouveaux de Décapodes de la Mer Rouge. Bull. Mus. Hist. Nat. Paris, vol. 11, pp. 393-411.
- 1905a. Identità di "Brachycarpus neapolitanus" Cano e "Palaemon biunguiculatus" Lucas. Res. Italicæ. XVII. Boll. Mus. Zool. Anat. comp. Torino, vol. 20, n. 502, pp. 1-4.
1906. Faune carcinologique de la Mer Rouge. Décapodes et Stomatopodes. Ann. Sci. nat. Zool., ser. 9 vol. 4, pp. 1-347, text figs. 1-12, pls. 1-11.
1907. Nuove osservazioni sulla identità di Brachycarpus neapolitanus Cano e Palaemon biunguiculatus Lucas. Annu. Mus. zool. Univ. Napoli, n. ser. vol. 2 pt. 21, pp. 1-6, pl. 11.

NOUVEL, L.

1932. Les caractères sexuels secondaires de l'abdomen des Crustacés Nantantia. Bull. Mus. Hist. nat. Paris, ser. 2, vol. 4, pp. 407-410.

NUTTING, C. C.

1895. Narrative and preliminary Report of Bahama Expedition. Bull. Lab. nat. Hist. State Univ. Iowa, vol. 3, pp. i-vi, 1-251, pls.

OLIVIER, A. G.

1791. Ecrevisse. Astacus. In: Olivier, A. G., Encyclopédie méthodique. Histoire naturelle. Insectes, vol. 6, pp. 327-349.
1811. Palémon. Palaemon. In: Olivier, A. G., Encyclopédie méthodique. Histoire naturelle. Insectes, vol. 8, pp. 652-667.

ORTMANN, A.

1890. Die Unterordnung Natantia Boas. Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und z. Z. im Strassburger Museum aufbewahrten Formen. I. Theil. Zool. Jb. Syst., vol. 5, pp. 437-542, pls. 36, 37.
1891. Versuch einer Revision der Gattungen Palaemon sens. strict. und Bithynis. Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und z. Z. im Strassburger Museum aufbewahrten Formen. II. Theil. Zool. Jb. Syst., vol. 5, pp. 693-750, pl. 47.
1893. Decapoden und Schizopoden der Plankton-Expedition. *Ergebn. Plankton-Exped.*, vol. 2Gb, pp. 1-120, pls. 1-10.
1897. Os Camaroes da Agua doce da America do Sul. *Rev. Mus. Paul.*, vol. 2, pp. 173-216, pl. 1.
1918. Higher Crustaceans (Malacostraca). In: Ward, H. B. & Whipple, G. C., *Fresh-water Biology*, pp. 828-850, figs. 1303-1318.

PARRA, A.

1787. Descripción de diferentes Piezas de Historia Natural, las mas del Ramo marítimo, representadas en setenta y cinco laminas, pp. 1-4, 1-195, pls. 1-73, and 2 unnumbered plates.

PAULMIER, F. C.

1905. Higher Crustacea of New York City. *Bull. New York State Mus.*, vol. 91, pp. 117-189, figs. 1-59.

PAULSON, O.

1875. Investigations on the Crustacea of the Red Sea with Notes on Crustacea of adjacent Seas. Part I. Podophthalmata and Edriophthalmata (Cumacea), pp. i-xiv, 1-144, pls. 1-21. (text in Russian)

PEARSE, A. S.

1910. A preliminary List of the Crustacea of Michigan. *Rep. Michigan Acad. Sci.*, vol. 12, pp. 68-76.
1911. Report on the Crustacea collected by the University of Michigan-Walker Expedition in the State of Vera Cruz, Mexico. *Rep. Michigan Acad. Sci.*, vol. 13, pp. 108-113, figs. 1-4.
1915. An Account of the Crustacea collected by the Walker Expedition to Santa Marta, Colombia. *Proc. U. S. Nat. Mus.*, vol. 49, pp. 531-556, text figs. 1-9, pls. 70-73.
1921. Crustacea from Lake Valencia, Venezuela. *Proc. U. S. Nat. Mus.*, vol. 59, pp. 459-462, figs. 1, 2.
1932. Inhabitants of certain Sponges at Dry Tortugas. *Pap. Tortugas Lab. Carnegie Inst.*, vol. 28, pp. 117-124, text fig. 1, pls. 1, 2.
1936. Estuarine Animals at Beaufort, North Carolina. *Journ. Elisha Mitchell sci. Soc.*, vol. 52, pp. 174-222, pls. 15, 16.
1947. On the Occurrence of Ectoconsortes on marine Animals at Beaufort, N. C. *Journ. Parasit.*, vol. 33, pp. 453-458.

PEARSON, J.

1905. Report on the Macrura collected by Professor Herdman, at Ceylon, in 1902. In: Herdman, W. A., Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar, vol. 4, pp. 65-92, pls. 1, 2.

PERRIER, E.

1886. Les explorations sous-marines, pp. i-iv, 1-352, figs. 1-243.

PESTA, O.

1931. Crustacea Decapoda aus Costa-Rica. Ergebnisse der Osterreichischen Biologischen Costa-Rica-Expedition 1930. I. Teil. Ann. naturh. Mus. Wien, vol. 45, pp. 173-181, text fig. 1, pls. 5, 6.
1933. Zoogeographische Berichte über Crustaceen. Zool. Anz., vol. 104, pp. 274-282, figs. 1-6.

PETAGNA, V.

1792. Institutiones Entomologicae, pp. i-xii, 1-718, pls. 1-10.

PHILIPPI, R. A.

1860. Bithynis, ein neues Genus der langschwänzigen Krebse. Arch. Naturgesch., vol. 26 pt. 1, pp. 161-164.
1894. Dos Palabras sobre la sinonimia de los Crustáceos, Decápodos, Braquiuros o Jaivas de Chile. An. Univ. Chile, vol. 87, pp. 369-379.

PIKE, F. H.

1906. The degenerate Eyes in the Cuban Cave Shrimp, *Palaemonetes eigenmanni* Hay. Biol. Bull., vol. 11, pp. 267-276, figs. 1-7.

POCOCK, R. I.

1889. Contribution to our Knowledge of the Crustacea of Dominica. Ann. Mag. Nat. Hist., ser. 6 vol. 3, pp. 6-22, pl. 2.
1893. Contribution to our Knowledge of the Arthropod Fauna of the West Indies.- Pt. 1. Scorpiones and Pedipalpi; with a Supplementary Note upon the Freshwater Decapoda of St. Vincent. Journ. Linn. Soc. Lond. Zool., vol. 24, pp. 374-409.

POEPPIG, E.

1835. Reise in Chila, Peru und auf dem Amazonenstrome während der Jahre 1827-1832, vol. 1, pp. i-xviii, 1-466. (vol. 2, pp. i-viii, 1-464, 1 map, was published in 1836)
1836. Crustacea chilensia nova aut minus nota. Arch. Naturgesch., vol. 2 pt. 1, 133-144, pl. 4.

PRENTISS, C. W.

1901. The Otocyst of Decapod Crustacea: its Structure, Development, and Functions. Bull. Mus. Comp. Zoöl. Harvard, vol. 36, pp. 167-251, pls. 1-10.

RAMADAN, M. M.

1936. Report on a Collection of Stomatopoda and Decapoda from Ghardaqa, Red Sea. Bull. Fac. Sci. Egypt. Univ., vol. 6, pp. 1-43, pls. 1, 2.

RANDALL, J. W.

1839. Catalogue of the Crustacea brought by Thomas Nuttall and J. K. Townsend, from the West Coast of North America and the Sandwich Islands, with Descriptions of such Species as are apparently new, among which are included several species of different localities, previously existing in the collection of the Academy. Journ. Acad. Nat. Sci. Phila., vol. 8, pp. 106-147, pls. 3-7.

RANKIN, W. M.

1898. The Northrop collection of Crustacea from the Bahamas. *Ann. New York Acad. Sci.*, vol. 11, pp. 225-254, pls. 29, 30.
1900. The Crustacea of the Bermuda Islands. With Notes on the Collections Made by the New York University Expeditions in 1897 and 1898. *Ann. New York Acad. Sci.*, vol. 12, pp. 521-548.

RATHBUN, M. J.

1897. List of the Decapod Crustacea of Jamaica. *Ann. Jamaica Inst.*, vol. 1, pp. 1-46.
1899. Notes on the Crustacea of the Tres Marias Islands. *North American Fauna*, vol. 14, pp. 73-75.
1900. The Decapod Crustaceans of West Africa. *Proc. U. S. Nat. Mus.*, vol. 22, pp. 271-316.
- 1900a. The Decapod and Stomatopod Crustacea. Results of the Branner-Agassiz Expedition to Brazil. I. *Proc. Wash. Acad. Sci.*, vol. 2, pp. 133-156, pl. 8.
1902. Brachyura and Macrura. Papers from the Hopkins Stanford Galapagos Expedition, 1898-1899. VIII. *Proc. Wash. Acad. Sci.*, vol. 4, pp. 275-291, text figs. 1-4, pl. 12.
- 1902a. The Brachyura and Macrura of Porto Rico. *Bull. U. S. Fish Comm.*, vol. 20 pt. 2, pp. 1-127, text figs. 1-24, pls. 1, 2.
- 1902b. Descriptions of new Decapod Crustaceans from the West Coast of North America. *Proc. U. S. Nat. Mus.*, vol. 24, pp. 885-905.
1904. Decapod Crustaceans of the Northwest Coast of North America. *Harriman Alaska Exped.*, vol. 10, pp. 1-190, text figs. 1-95, pls. 1-10.
1905. List of the Crustacea. *Fauna of New England*. 5. *Occ. Pap. Boston Soc. Nat. Hist.*, vol. 7, pp. 1-117.
1906. The Brachyura and Macrura of the Hawaiian Islands. *Bull. U. S. Fish Comm.*, vol. 23, pp. 827-930, text figs. 1-79, pls. 1-24.
1910. The Stalk-eyed Crustacea of Peru and the adjacent coast. *Proc. U. S. Nat. Mus.*, vol. 38, pp. 531-620, text figs. 1-3, pls. 36-56.
1912. Some Cuban Crustacea. With notes on the Astacidae, By Walter Faxon, and a list of Isopoda, by Harriet Richardson. *Bull. Mus. Comp. Zoöl. Harvard*, vol. 54, pp. 449-460, pls. 1-5.
- 1912a. New Decapod Crustaceans from Panama. *Smithson. Misc. Coll.*, vol. 59 pt. 13, pp. 1-3.
1919. Stalk-eyed Crustaceans of the Dutch West Indies. In: Boeke, J. Rapport betreffende een voorloopig onderzoek naar den toestand van de Visscherij en de Industrie van Zeeproducten in de Kolonie Curaçao ingevolge het Ministerieel Besluit van 22 November 1904, vol. 2, pp. 317-348, figs. 1-5.
1929. Decapoda. *Canadian Atlantic Fauna*. 10. *Arthropoda*. 10 m, pp. 1-38, figs. 1-53.

RATHBUN, R.

1880. The littoral marine Fauna of Provincetown, Cape Cod, Massachusetts. *Proc. U. S. Nat. Mus.*, vol. 9, pp. 116-133.
1883. Notes on the Shrimp and Prawn Fisheries of the United States. *Bull. U. S. Fish Comm.*, vol. 2, pp. 139-152.
1884. Crustaceans, Worms, Radiates, and Sponges. *Natural History of useful aquatic Animals*. Part V.- In: Goode, G. B., *The Fisheries and Fishery Industries of the United States*, vol. 1, pp. 759-850, pls. 260-277.

REED, C. T.

1941. Marine Life in Texas Waters, pp. i-xii, 1-88, figs.

REEVES, W. P.

1942. A Study of the Biology of *Palaemonetes exilipes* with special Reference to biometric and ecological Factors. Journ. Alabama Acad. Sci., vol. 14, pp. 57, 58.

RICHARDS, H. G.

1931. Notes on the Marine Invertebrate Fauna of the Virginia Capes. Ecology, vol. 12, pp. 443-445.

1938. Animals of the Seashore, pp. 1-273, text figs. 1-45, pls. 1-28.

RICHARDSON, R. E.

1925. Illinois River Bottom Fauna in 1923. Bull. Nat. Hist. Surv. Illinois, vol. 15, pp. 391-422.

RITTER, W. E.

1913. The simple Ascidians from the Northeastern Pacific in the Collection of the United States National Museum. Proc. U. S. Nat. Mus., vol. 45, pp. 427-505, pls. 33-36.

ROUX, J.

1928. Note sur deux espèces sud-américaines de Crusacés Macroures d'eau douce. Rev. Suisse Zool., vol. 35, pp. 43-48.

SAUSSURE, H. DE

1857. Diagnoses de quelques Crustacés nouveaux de l'Amérique tropicale. Rev. Mag. Zool., ser. 2 vol. 9, pp. 501-505.

1858. Mémoire sur divers Crustacés nouveaux des Antilles et du Mexique. Mém. Soc. Hist. nat. Genève, vol. 14, pp. 417-496, pls. 1-6.

SAWAYA, M. P.

1946. Sobre alguns camarões d'agua doce do Brasil. Zoologia, Sao Paulo, vol. 11, pp. 393-408, pls. 1-3.

SAY, T.

1817-1818. An Account of the Crustacea of the United States. Journ. Acad. nat. Sci. Phila., vol. 1, 1817: pp. 57-80, 97-101, 155-169, pl. 4; 1818: pp. 235-253, 313-319, 374-401, 423, 441, 445-458.

SCHMITT, W. L.

1921. The marine Decapod Crustacea of California with special Reference to the Decapod Crustacea collected by the United States Bureau of Fisheries Steamer "Albatross" in Connection with the Biological Survey of San Francisco Bay during the Years 1912-1913. Univ. Calif. Publ. Zool., vol. 23, pp. 1-359, text figs. 1-165, pls. 1-50.

1924. Crustacea (Macrura and Anomura). Expedition of the California Academy of Sciences to the Gulf of California in 1921. Proc. Calif. Acad. Sci., ser. 4, vol. 13, pp. 381-388.

1924a. The Macruran, Anomuran and Stomatopod Crustacea. Bijdragen tot de Kennis der Fauna van Curaçao. Resultaten eener reis van Dr. C. J. van der Horst in 1920. Bijdr. Dierk., vol. 23, pp. 61-81, text figs. 1-7, pl. 8.

1924b. The Macrura and Anomura collected by the Williams Galapagos Expedition, 1923. Zoologica, New York, vol. 5, pp. 161-171, figs. 39-41.

1924c. Report on the Macrura, Anomura and Stomatopoda collected by the Barbados-Antigua Expedition from the University of Iowa in 1918. Univ. Iowa Stud. nat. Hist., vol. 10, pt. 4, pp. 65-99, pls. 1-5.

1930. Some Observations on the Crustacea of Tortugas, Florida. Yearb. Carnegie Inst., vol. 29, pp. 343-346, figs. 1-10.
1932. Description of a pontonid shrimp from *Spongia officinalis* L. In: Pearse, A. S. Inhabitants of certain Sponges at Dry Tortugas. Pap. Tortugas Lab. Carnegie Inst., vol. 28, pp. 123, 124, fig. 1.
1933. Notes on shrimps of the genus *Macrobrachium* found in the United States. Journ. Wash. Acad. Sci., vol. 23, pp. 312-317.
- 1933a. Four new Species of Decapod Crustaceans from Porto Rico. Amer. Mus. Novit., n. 662, pp. 1-9, figs. 1-4.
1935. Crustacea Macrura and Anomura of Porto Rico and the Virgin Islands. Sci. Survey Porto Rico Virgin Isl., vol. 15, pp. 125-227, figs. 1-30.
1936. Macruran and Anomuran Crustacea from Bonaire, Curaçao and Aruba. Zoologische Ergebnisse einer Reise nach Bonaire, Curaçao und Aruba im Jahre 1930. No. 16. Zool. Jb. Syst., vol. 67, pp. 363-378, pls. 11-13.
1939. Decapod and other Crustacea collected on the presidential Cruise of 1938 (With Introduction and Station Data). Smithson. Misc. Coll., vol. 98, pt. 6, pp. 1-29, text figs. 1, 2, pls. 1-3.
1946. A Collection of Shrimps from Santa Cruz Island, California. Ecol. Monogr., vol. 16, pp. 208-210.
- SEBA, A.**
1761. Locupletissimi Rerum Naturalium Thesauri accurata Descriptio et Iconibus artificiosissimis expressio per universam Physices Historiam, vol. 3, pp. 1-212, pls. 1-116.
- SEMPER, C.**
1868. Some remarks on the New Genus *Macrobrachium* of Mr. Spence Bate. Proc. Zool. Soc. Lond., 1868, pp. 585-587.
- SENDLER, A.**
1912. Zehnfusskrebse aus dem Wiesbadener Naturhistorischen Museum. Jb. Nassau. Ver. Naturk., vol. 65, pp. 189-207, figs. 1-7.
- SHARP, B.**
1893. Catalogue of the Crustaceans in the Museum of the Academy of Natural Sciences of Philadelphia. Proc. Acad. Nat. Sci. Phila., 1893, pp. 104-127.
- SHELFORD, V. E.**
1913. Animal communities in temperate America as illustrated in the Chicago region. A study in animal ecology. Bull. geogr. Soc. Chicago, vol. 5, pp. i-xiii, 1-362, figs. 1-306, tabs. 1-68.
- SIVERTSEN, E.**
1934. Littoral Crustacea Decapoda from the Galapagos Islands. The Norwegian Zoological Expedition to the Galapagos Islands 1925, conducted by Alf Wollebaek. VII. Nyt Mag. Naturvidensk., vol. 74, pp. 1-23, text fig. 1, pls. 1-4.
- SLOANE, H.**
1725. A Voyage to the Islands Madera, Barbadoes, Nieves, St. Christophers, and Jamaica; with the Natural History of the Herbs and Trees, Four-footed Beasts, Fishes, Birds, Insects, Reptiles, &c. of the last of those Islands. To which is prefix'd, an Introduction, wherein is an Account of the Inhabitants, Air, Water, Diseases, Trade, &c. of that Place; with some Relations concerning the Neighbouring Continent, and Islands of America, vol. 2, pp. i-xviii, 1-499, pls. v-xi, 157-274.

SMITH, S. I.

1869. Notice of the Crustacea collected by Prof. C. F. Hartt on the coast of Brazil, in 1867. Trans. Conn. Acad. Arts Sci., vol. 2, pp. 1-41, pl. 1.
- 1869a. Vid. Verrill, A. S., 1869.
1871. List of the Crustacea collected by J. A. McNeil in Central America. Rep. Peabody Acad. Sci., 1869, pp. 87-98.
1873. Vid. Verrill, A. E., Smith, S. I. & Harger, O., 1873.
1874. The Crustacea of the fresh waters of the United States. Rep. U. S. Fish Comm., vol. 2, pp. 637-665, pls. 1-3.
1879. The stalk-eyed Crustaceans of the Atlantic Coast of North America north of Cape Cod. Trans. Conn. Acad. Arts Sci., vol. 5, pp. 27-138, pls. 8-12.
1882. Report on the Crustacea. Part I. Decapoda. Reports on the Results of Dredging, under the Supervision of Alexander Agassiz, on the East Coast of the United States, during the Summer of 1880, by the U. S. Coast Survey Steamer "Blake," Commander J. R. Bartlett, U. S. N., Commanding. Bull. Mus. Comp. Zool. Harvard, vol. 10, pp. 1-108, pls. 1-15.

SOLLAUD, E.

1911. *Pseudopalaemon Bouvieri*, nouveau genre, nouvelle espèce, de la famille des Palaemonidae. Bull. Mus. Hist. nat. Paris, vol. 17, pp. 12-16, figs. 1, 2.
- 1911a. Sur un nouveau Pseudopalaemon, habitant les eaux douces de l'Amérique du Sud: *Pseudopalaemon Iheringi*, nov. sp. Bull. Mus. Hist. nat. Paris, vol. 17, pp. 285-290, fig. 1.
1923. Le développement larvaire des "Palaemoninae." Bull. Biol. France Belg., vol. 57, pp. 509-603, text figs. 1-25, pls. 16-18.

SPANDL, H.

1926. Die Tierwelt der unterirdischen Gewässer. In: Kyrle, G., Speläologische Monographien, vol. 11, pp. i-xi, 1-235, figs. 1-116.

STAFFORD, J.

1912. On the Fauna of the Atlantic Coast of Canada. Third Report.- Gaspe, 1905-1906. Contr. Canad. Biol., 1906-1910, pp. 45-67.

STEBBING, T. R. R.

1914. Stalk-eyed Crustacea Malacostraca of the Scottish National Antarctic Expedition. Trans. Roy. Soc. Edinb., vol. 50 pt. 2, pp. 253-307, pls. 23-32.

STEINBECK, J. AND RICKETS, E. F.

1941. Sea of Cortez. A leisurely Journal of Travel and Research. With a scientific Appendix comprising Materials for a Source Book on the marine Animals of the Panamic faunal Province, pp. i-x, 1-598, pls. 1-40, 2 maps.

STILES, C. W. AND HASSALL, A.

1927. Key-Catalogue of the Crustacea and Arachnoids of Importance in Public Health. Hygienic Lab. Bull., n. 148, pp. 197-289.

STIMPSON, W.

1857. On the Crustacea and Echinodermata of the Pacific Shores of North America. Boston Journ. Nat. Hist., vol. 6, pp. 444-532, pls. 18-23.
1860. Prodromus descriptionis animalium evertibratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, C. Ringgold et J. Rodgers Ducibus, observavit et descripsit. Proc. Acad. Nat. Sci. Phila., 1860, pp. 22-48.

- 1860a. A trip to Beaufort N. Carolina. Amer. Journ. Sci., ser. 2 vol. 29, pp. 442-445.
1871. Notes on North American Crustacea in the Museum of the Smithsonian Institution. No. III. Ann. Lyc. nat. Hist. New York, vol. 10, pp. 92-136.
- STREETS, T. H.
1871. Descriptions of five new Species of Crustacea from Mexico. Proc. Acad. Nat. Sci. Phila., 1871, pp. 225-227, pl. 2.
1872. Notice of some Crustacea from the Island of St. Martin, W. I., collected by Dr. Van Rijgersma. Proc. Acad. Nat. Sci. Phila., 1872, pp. 131-134.
- SUMNER, F. B., OSBURN, R. C., AND COLE, ~~H.~~ ^{L.} J.
1913. Physical and Zoological. A Biological Survey of the Waters of Woods Hole and Vicinity. Section I. Bull. U. S. Bur. Fish., vol. 31, pp. 11-442, charts 1-227.
- 1913a. A Catalogue of the Marine Fauna. A Biological Survey of the Waters Woods Hole and Vicinity. Section III. Bull. U. S. Bur. Fish., vol. 31, pp. 549-794.
- SUNIER, A. L. J.
1925. Twee Mededeelingen over Palaemoniden. Tijdschr. Nederl. dierk. Ver., ser. 2 vol. 19, p. cxv.
- TATTERSALL, W. M.
1921. Report on the Stomatopoda and Macrurous Decapoda collected by Mr. Cyril Crossland in the Sudanese Red Sea. Journ. Linn. Soc. Lond. Zool., vol. 34, pp. 345-398, pls. 27-28.
- TESCH, J. J.
- 1914-1917. Crustacea. In: Benjamins, H. D. & Snelleman, J. F., Encyclopaedie van Nederlandsch West-Indie, pp. 246-250.
- THALLWITZ, J.
1892. Decapoden-Studien, insbesondere basirt auf A. B. Meyer's Sammlungen im Ostindischen Archipel, nebst einer Aufzählung der Decapoden und Stomatopoden des Dresdener Museums. Abh. zool.-anthrop. Mus. Dresden, 1890-91 pt. 3, pp. 1-55, pl. 1.
- THOMPSON, D' A. W.
1901. A Catalogue of Crustacea and of Pycnogonida contained in the Museum of University College, Dundee, pp. 1-56.
- THOMPSON, M. T.
1899. The Breeding of Animals at Woods Hole during the month of September, 1898. Science, New York, n. ser. vol. 9, pp. 581-583.
- THOMSON, G. M.
1903. On the New Zealand Phyllobranchiate Crustacea-Macrura. Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 8, pp. 433-453, pls. 27-29.
- TILESIIUS, G. G. A.
1819. Ueber das nächtliche Leuchten des Meerwassers. Ann. Wetterau. Ges. Naturk., vol. 4, pp. 1-10, pls. 21a, b.
- TORRALBAS, F.
1917. Contribucion al estudio de los Crustaceos de Cuba. Notas del Dr. Juan Gundlach †1896 compiladas y completadas por el Dr. José I. Torralbas †1903. An. Acad. Ci. méd. fis. nat. Habana, vol. 53, pp. 543-624, figs. 1-73.

TOWNES, H. K.

1937. Studies on the Food Organisms of Fish. A biological Survey of the Lower Hudson Watershed. VI. Ann. Rep. Biol. Survey New York, vol. 11, pp. 217-230, figs. 1, 2.
1939. Ecological Studies on the Long Island marine Invertebrates of Importance as Fish Food or as Bait. Ann. Rep. New York Conserv. Dept., vol. 28 suppl., pp. 163-176, figs. 34-39.

TULIAN, E. A.

1916. Report of the Fisheries Department. Rep. Conserv. Comm. Louisiana, 1914-1916, pp. 87-128, 6 pls.

UHLER, P. R.

1878. List of Animals observed at Fort Wool, Va. Sci. Res. Chesapeake zool. Lab., 1878, pp. 17-34.

ULRICH, C. J.

1902. A Contribution to the subterranean Fauna of Texas. Trans. Amer. Microsc. Soc., vol. 23, pp. 83-101, pls. 14-18.

UNDERWOOD, L. M.

1887. List of the Described Species of Fresh Water Crustacea from America, North of Mexico. Bull. Illinois Lab. nat. Hist., vol. 2, pp. 323-386.

VALDES RAGUES, P.

1909. Clasificación "Gundlach" de Crustáceos cubanos. In: Valdés Ragués, P., Mis Trabajos Académicos, pp. 163-187.

~~VALDES RAGUES, P.~~

- ~~1910. Clasificación "Gundlach" de Crustaceos cubanos. In: Mis Trabajos Académicos, pp. 163-187.~~

VERRILL, A. E.

1869. On the parasitic Habits of Crustacea. Amer. Nat., vol. 3, pp. 239-250, figs. 41, 42.
1879. Preliminary Check-List of the Marine Invertebrata of the Atlantic Coast, from Cape Cod to the Gulf of St. Lawrence, pp. 1-32.
1900. Additions to the Crustacea and Pycnogonida of the Bermudas. Trans. Conn. Acad. Arts Sci., vol. 10, pp. 573-582, text figs. 2-4, pl. 20 figs. 9, 10.
1922. Decapod Crustacea of Bermuda. Part II - Macrura. Trans. Conn. Acad. Arts Sci., vol. 26, pp. 1-179, text figs. 1-12, pls. 1-48.

———, SMITH, S. I. AND HARGER, O.

1873. Catalogue of the Marine Invertebrate Animals of the southern Coast of New England, and adjacent waters. In: Verrill, A. E., Report upon the Invertebrate Animals of Vineyard Sound and the adjacent Waters, with an Account of the physical Characters of the Region. Rep. U. S. Fish Comm., vol. 1, pp. 537-747, pls. 1-38.

VERRILL, G. E.

1892. Notes on the Fauna of the Island of Dominica, British West Indies, with Lists of the Species obtained and observed by G. E. and A. H. Verrill. Trans. Conn. Acad. Arts Sci., vol. 8, pp. 324-355.

VOIGT, F. S.

1836. Die Anneliden, Crustaceen, Arachniden und die ungeflügelten Insekten. In: Cuvier, G., Das Thierreich, geordnet nach seiner Organisation. Als Grundlage der Naturgeschichte der Thiere und Einleitung in die vergleichende Anatomie, vol. 4, pp. i-xiv, 1-516.

WEITENWEBER, W. R.

1854. Aus James Dana's Conspectus of the Crustacea. Lotos, Praha, vol. 4, pp. 5-14, 35-38, 60-63, 107-115, 153-157, 251-254.

WHEELER, J. F. G. and Brown, F. A.

1936. The periodic swarming of *Anchistioides antiguensis* (Schmitt) (Crustacea Decapoda) at Bermuda. Journ. Linn. Soc. Lond. Zool., vol. 39, pp. 413-428, figs. 1, 2.

WHITE, A.

1847. List of the specimens of Crustacea in the collection of the British Museum, pp. i-viii, 1-143.

WIEGMANN, A. F. A.

1836. Beschreibung einiger neuen Crustaceen des Berliner Museums aus Mexico und Brasilien. Arch. Naturgesch., vol. 2 pt. 1, pp. 145-151.

WILLIAMSON, H. C.

1915. Crustacea Decapoda. Larven. Nord. Plankton, vol. 6, pp. 315-588, figs. A-F, 1-529.

WILSON, H. V.

1900. Marine Biology at Beaufort. Amer. Nat., vol. 34, pp. 339-360, figs. 1-5.

WOLF, B.

- 1934-1938. Animalium Cavernarum Catalogus. Catalog der Höhlen-Fauna. Catalogue of the fauna of the caves. Catalogue de la faune cavernicole, vol. 3, pp. 1-918.

WORTH, S. G.

1908. Fresh-Water Shrimp, a natural Fish Food. Bull. U. S. Bur. Fish., vol. 28, pp. 853-858.

YOUNG, C. G.

1900. The Stalk-eyed Crustacea of British Guiana, West Indies and Bermuda, pp. i-xiv, 1-514, text figs., pls. 1-7.

YU, S. C.

1936. Notes on new fresh-water Prawns of the genus *Palaemon* from Yunnan. Bull. Fan Mem. Inst. Biol., vol. 6, pp. 305-314, figs. 1-4.

EXPLANATION OF THE PLATES

(Plates 1-55)

The figures of pl. 12 (figs. a, b), pl. 18 (fig. b), pl. 33, pl. 43 (figs. c-e) and pl. 44 are the work of Mrs. Aime M. Awl, staff artist to the department of zoology of the United States National Museum, Washington, D.C., those of pls. 3, 4, 7-10, 13, 14, 16, 17, 19-23, 31, 34-41, 45 and 46 are executed by Mr. Anker Petersen, staff artist of the Allan Hancock Foundation. The other original drawings have been made in pencil by myself, Mrs. Awl and Mr. Petersen have been kind enough to ink these drawings, which strongly improved their quality. I wish to express here my sincere gratitude to both Mrs. Awl and Mr. Petersen for their excellent work.

PLATE 1

Brachycarpus biunguiculatus (Lucas)

a, carapace in lateral view; b, first pereopod; c, left second pereopod; d, right second pereopod; e, third pereopod; f, dactylus of third pereopod; g, antennula; h, antenna; i, mandible; j, maxillula; k, maxilla; l, first maxilliped; m, second maxilliped; n, third maxilliped; o, first pleopod of female; p, second pleopod of female; q, telson. a-e, x6; f, x16; g, h, x7; i-q, x15. a-q, after Schmitt, 1939.

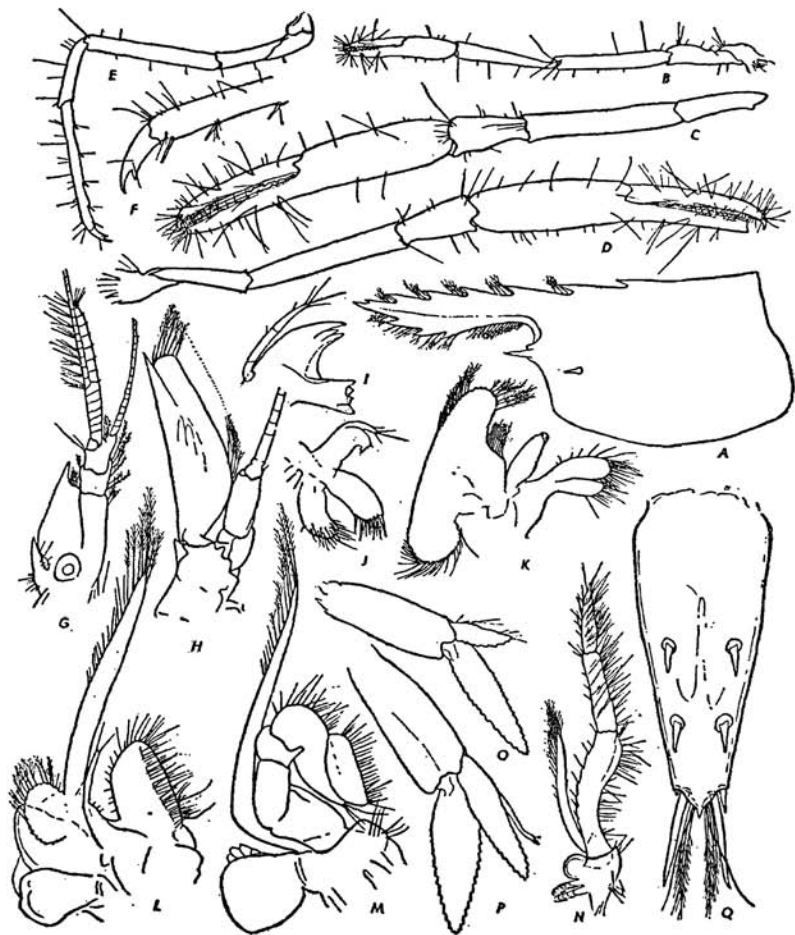


PLATE 2

Macrobrachium amazonicum (Heller)

a, anterior part of body in lateral view; b, tip of telson of adult specimen; c, tip of telson of juvenile; d, scaphocerite; e, first leg; f, second leg of adult male; g, second leg of female; h, third leg of adult male. a, x1.5; b, x10; c, x50; d-h, x2.

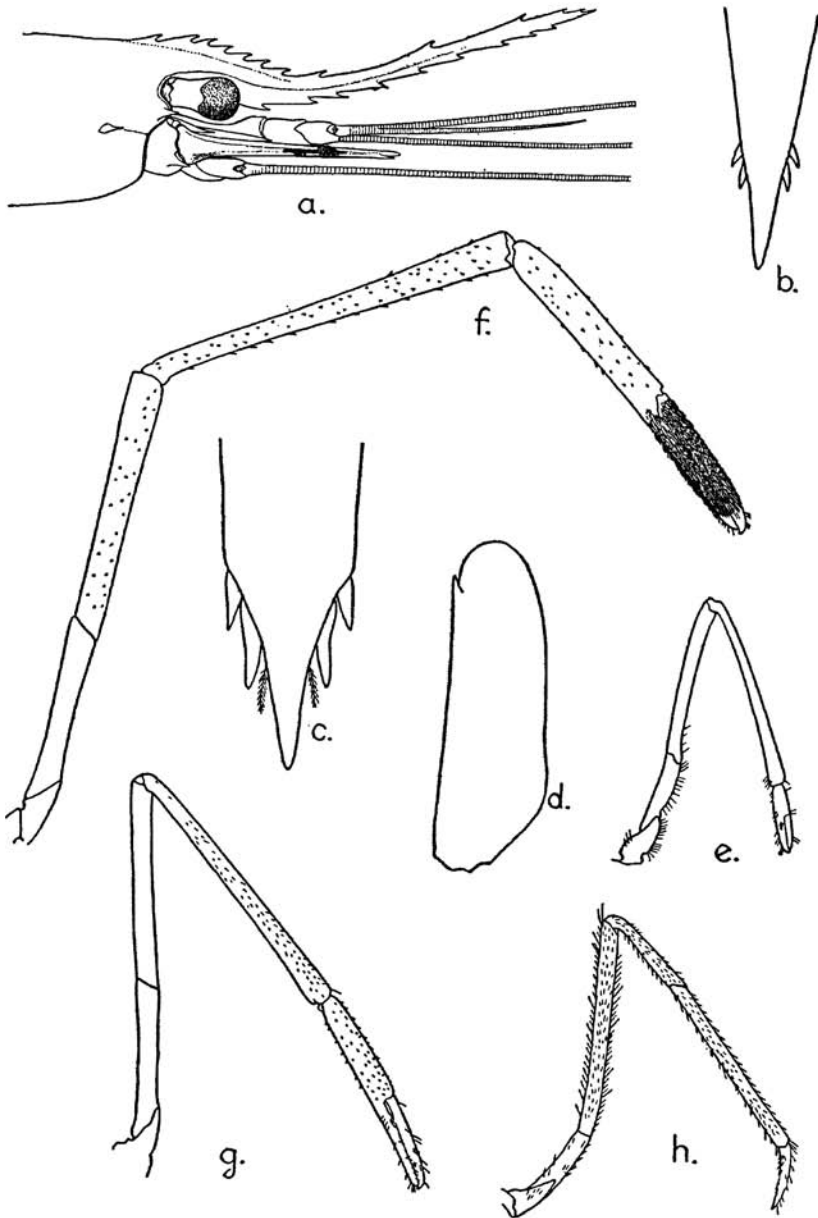
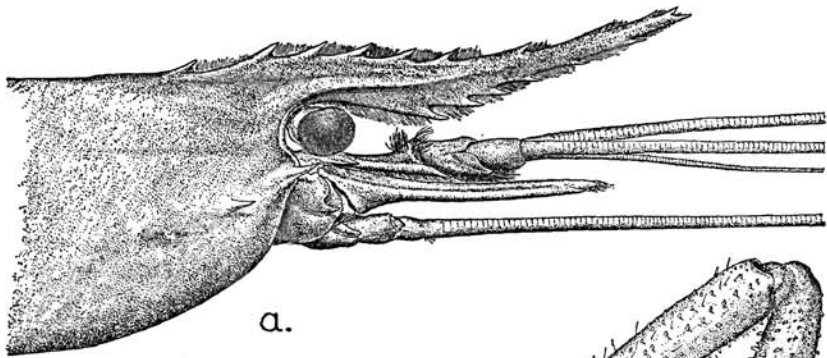


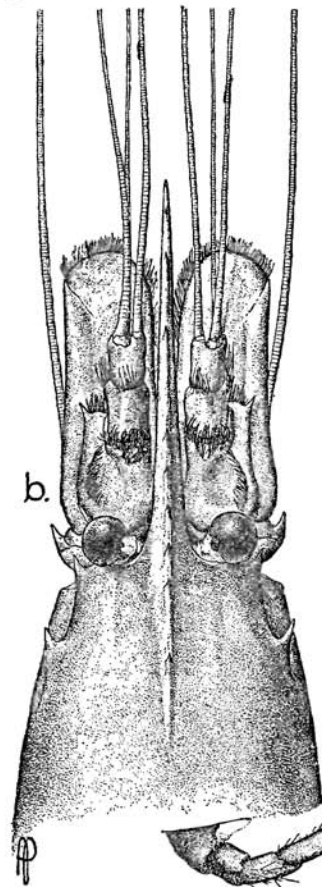
PLATE 3

Macrobrachium panamense Rathbun

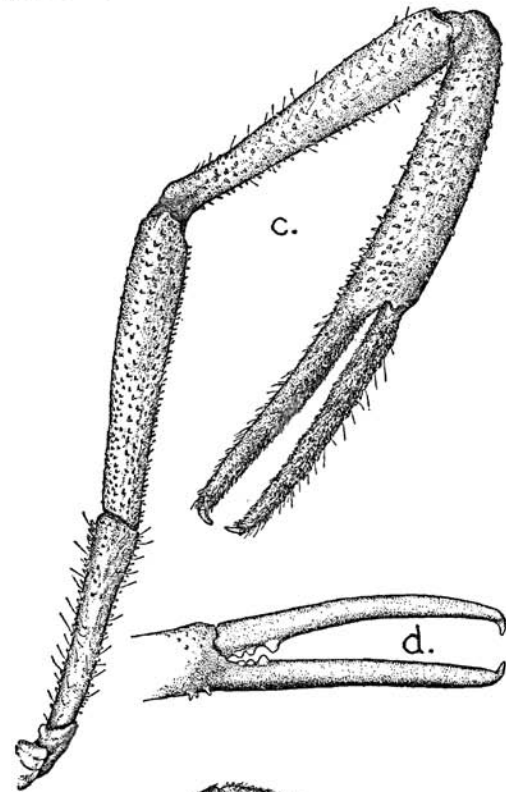
a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, second leg of adult male; d, fingers of second leg of adult male (hairs removed); e, third leg of adult male. a-d, x1.7, e, x3.4.



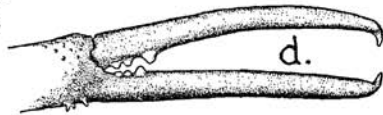
a.



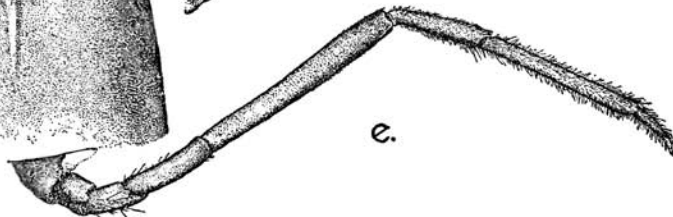
b.



c.



d.



e.

PLATE 4

Macrobromium ^{Jé/ks! (Miers)} ~~*borellii* (Nobili)~~

a, anterior part of body in lateral view; b, scaphocerite; c, second leg of adult male; d, third leg of adult male.

Macrobromium borellii (Nobili)

e, anterior part of body in lateral view; f, scaphocerite; g, second leg of adult male; h, third leg of adult male.

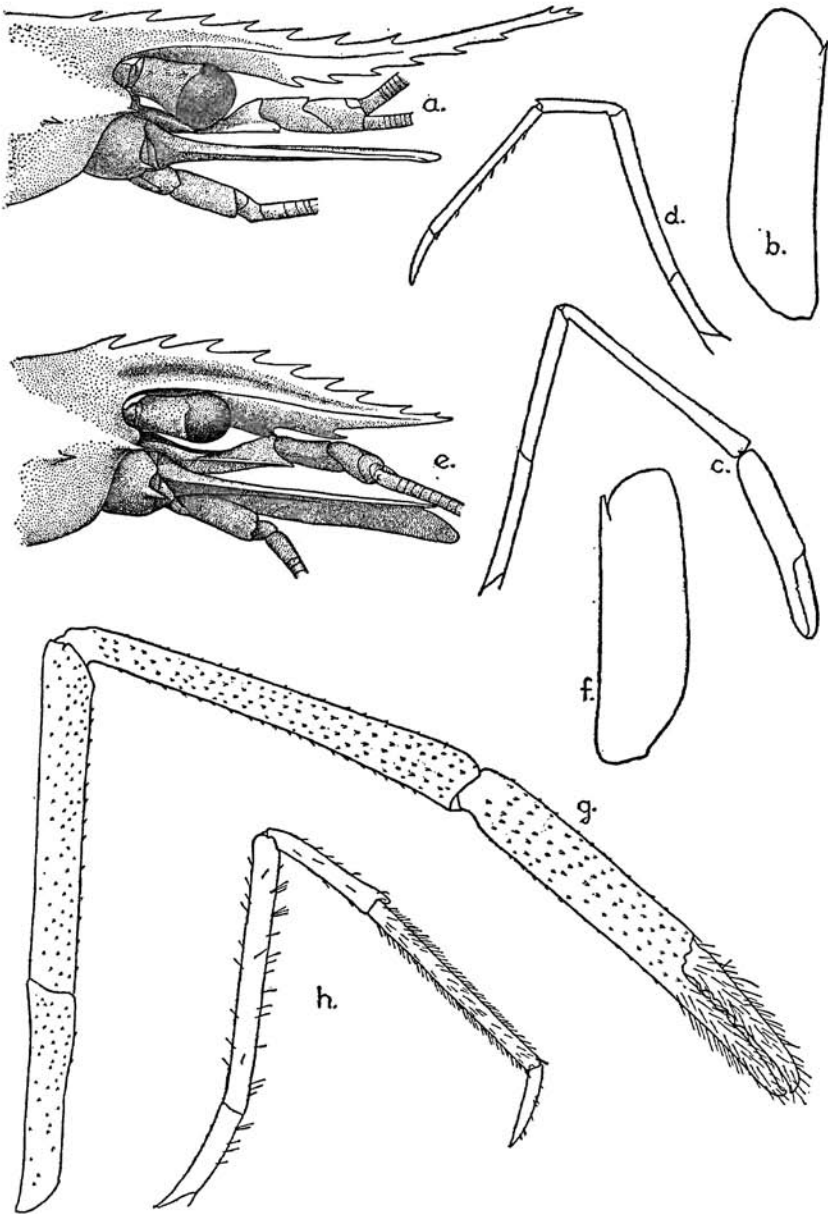


PLATE 5

Macrobrachium quelchi (De Man)

a, b, c, anterior part of carapace in lateral view (3 different specimens); d, second pereiopod of non-ovigerous female; e, right second pereiopod of large male; f, left second pereiopod of large male; g, cutting edge of fingers of second pereiopod of non-ovigerous female; h, fifth leg of large male. a-c, x3; d-f, x2; g, x25; h, x5. a-h, after ~~a-c, x13.~~ De Man, 1900.

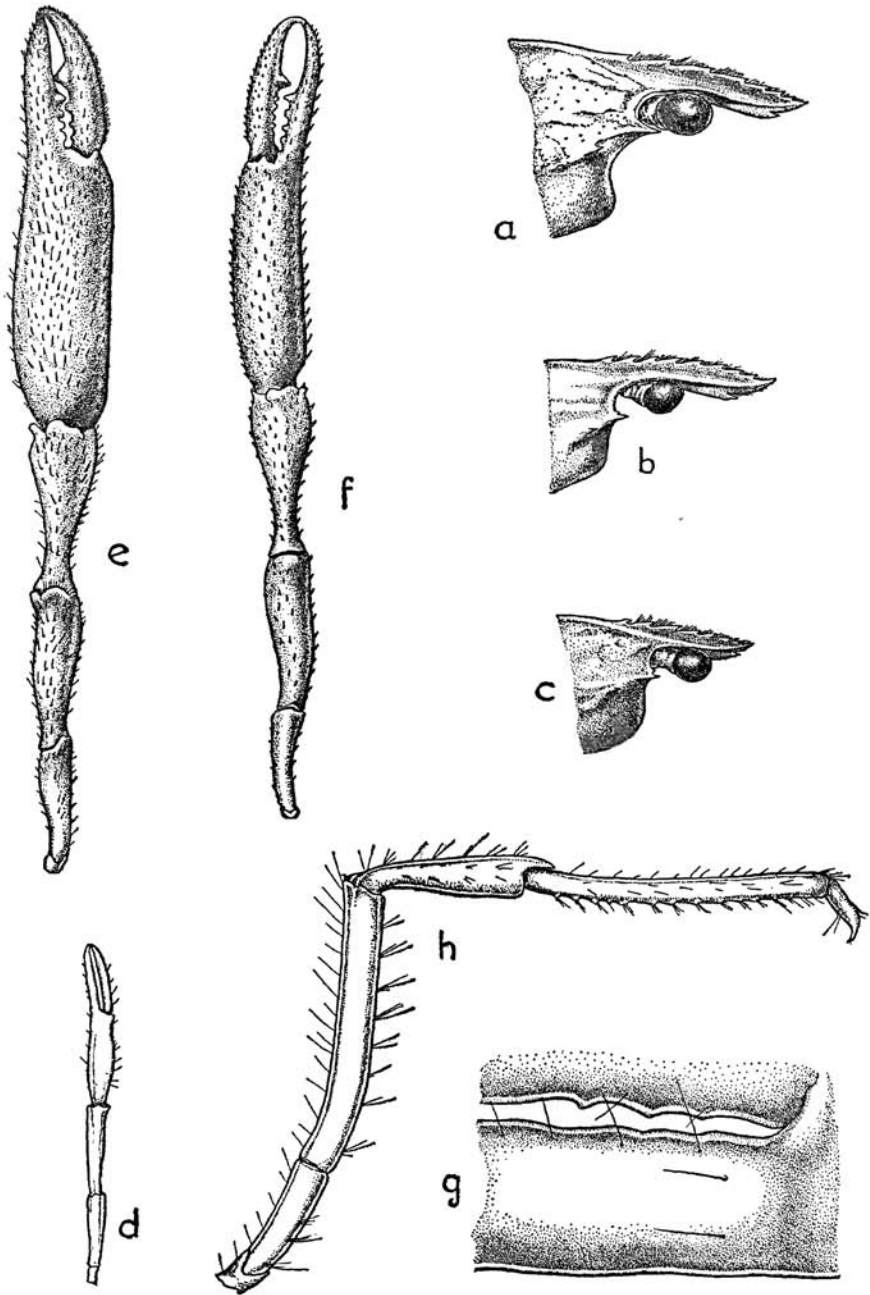


PLATE 6

Macrobrachium inca Holthuis

a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, smaller second pereopod of adult male; d, larger second pereopod of adult male; e, third pereopod of adult male. a-e, x1.8.

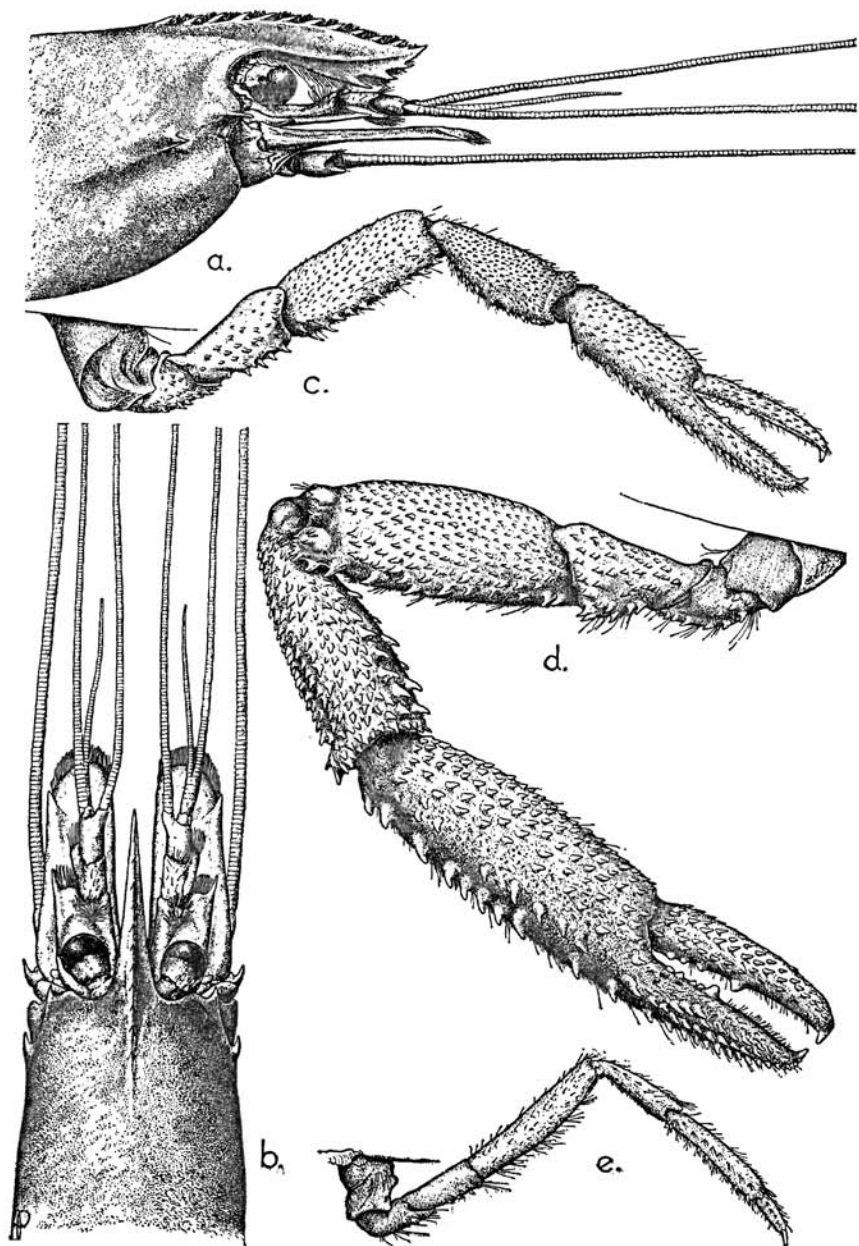


PLATE 7

Macrobrachium rathbunae Holthuis

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. c, first pereopod; d, second pereopod of adult male; e, third pereopod; f, fifth pereopod. a-f, $\times 1.6$.

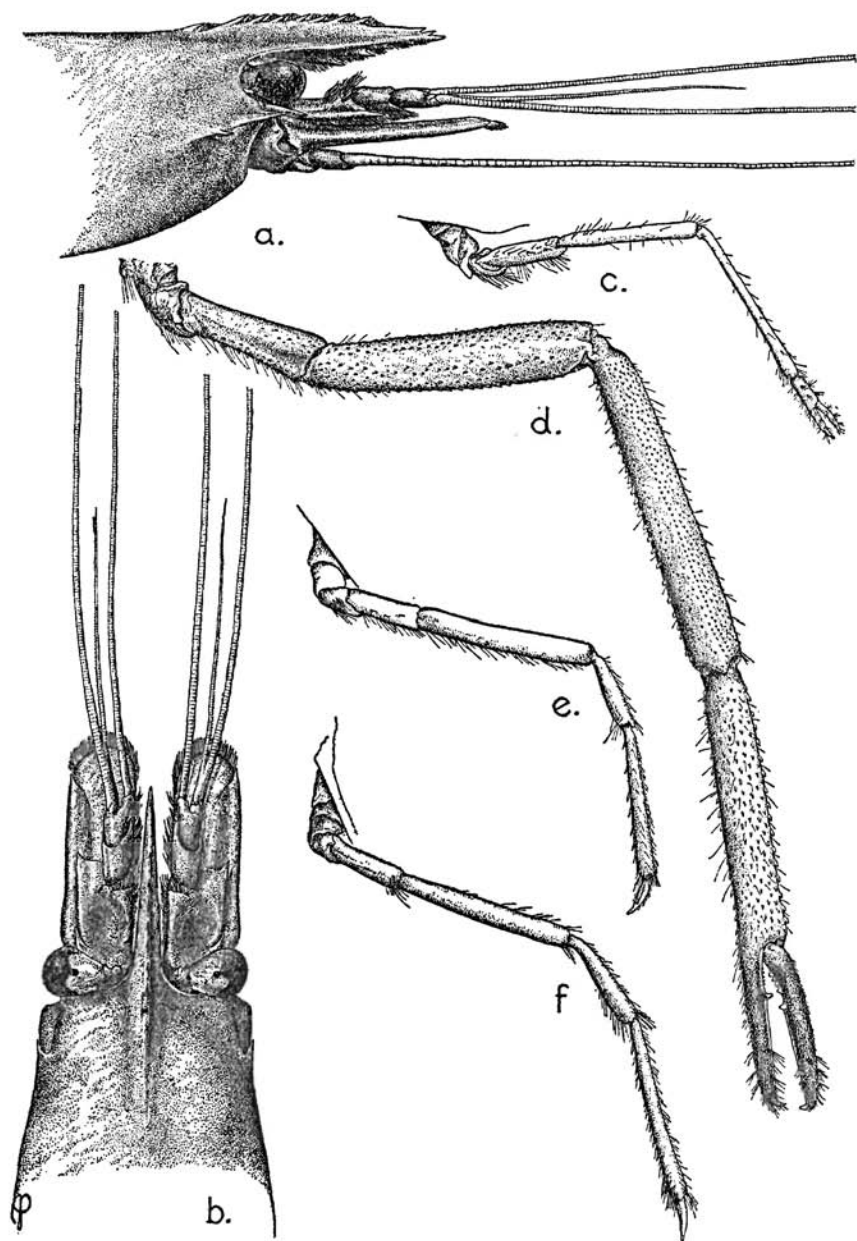


PLATE 8

Macrobrachium acanthurus (Wiegmann)
Animal in lateral view, (after Hedgpeth, 1947).

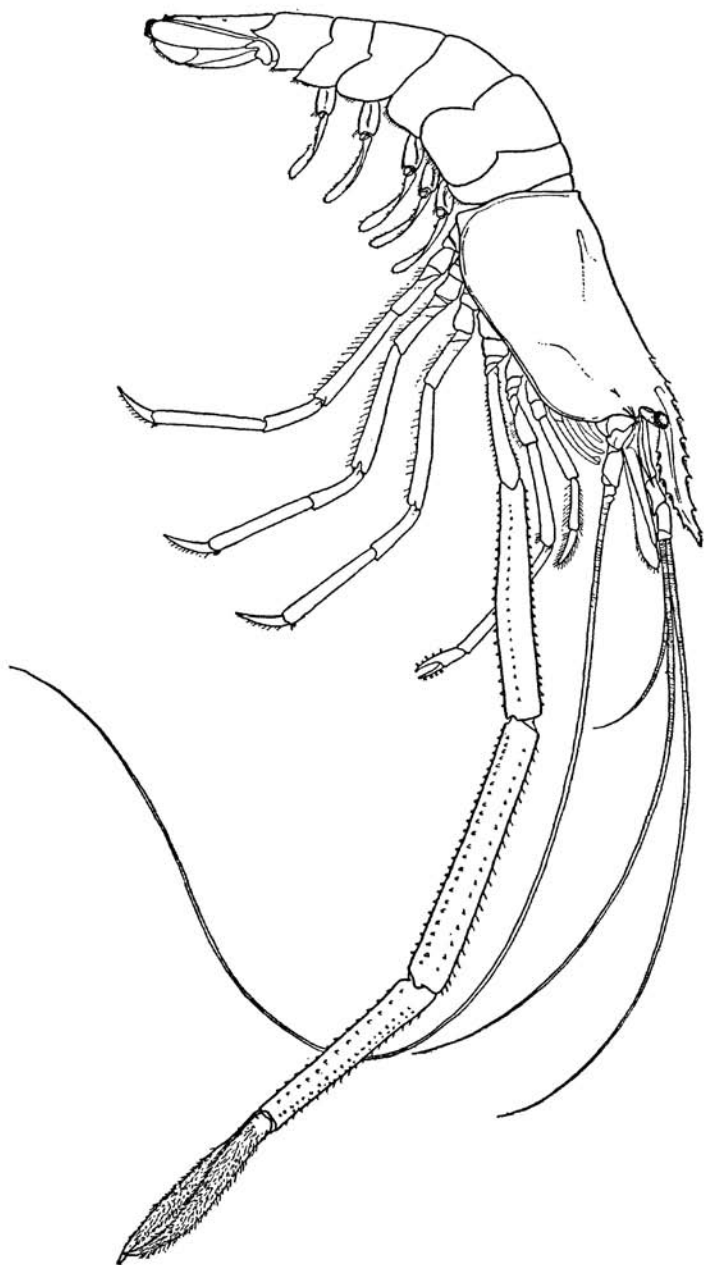


PLATE 9

Macrobrachium acanthurus (Wiegmann)

a, second leg of adult male; b, fingers of second leg of adult male (part of the hairs removed). a, b, x1.

Macrobrachium praecox (J. Roux)

c, anterior part of body in lateral view; d, scaphocerite; e, second leg; f, third leg. c-f, x7.

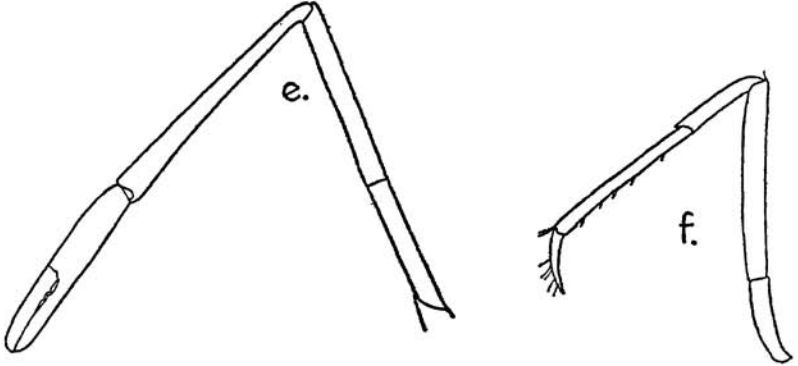
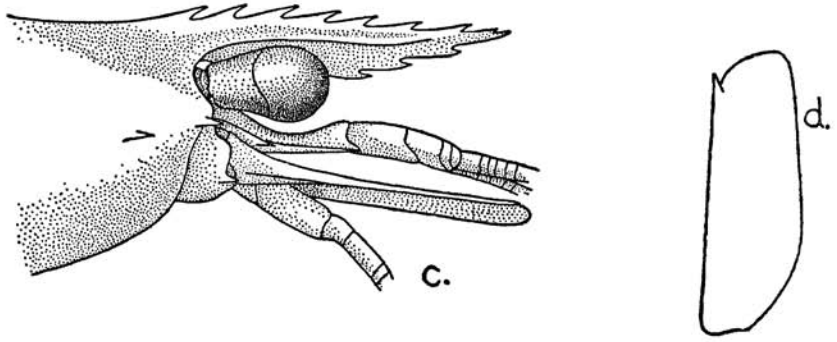
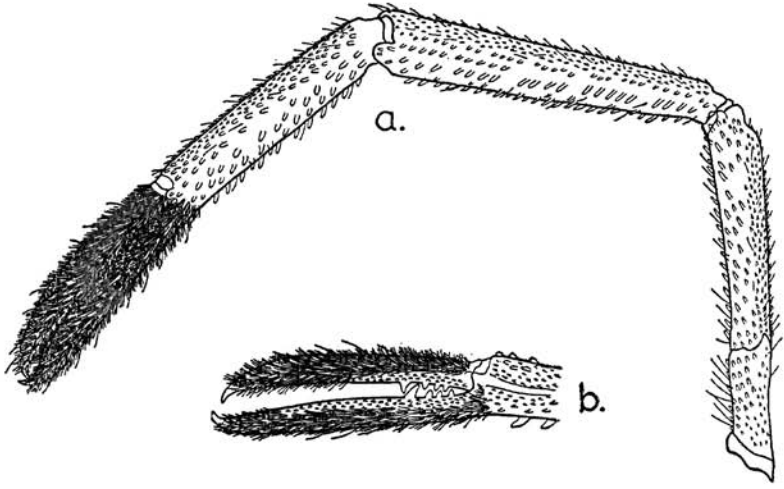


PLATE 10

Macrobrachium tenellum (Smith)

Adult male in lateral view. x1.3.

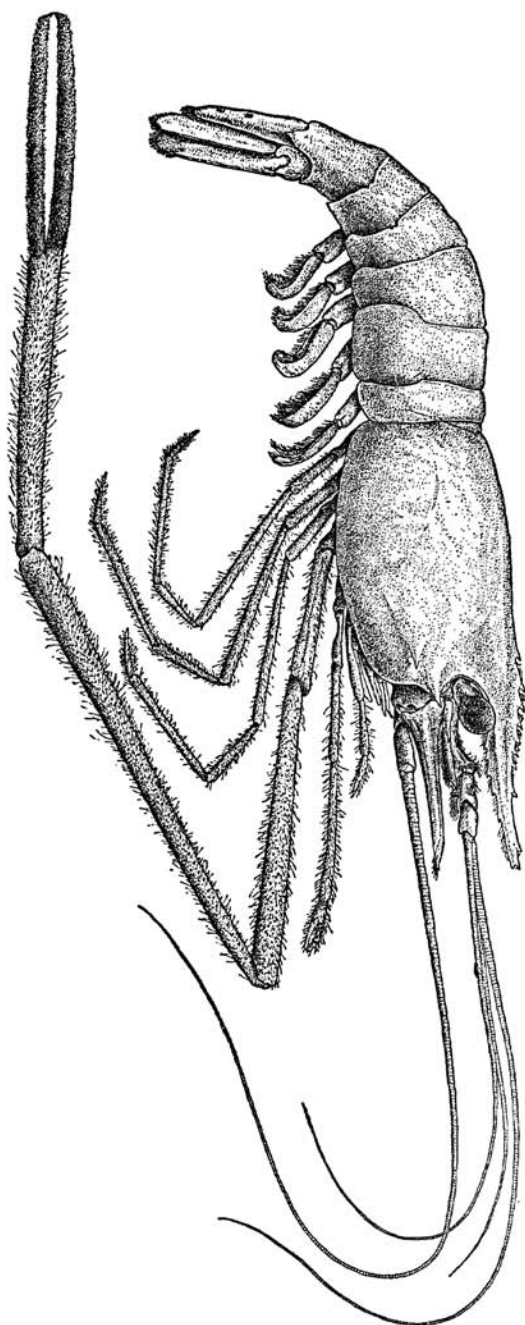
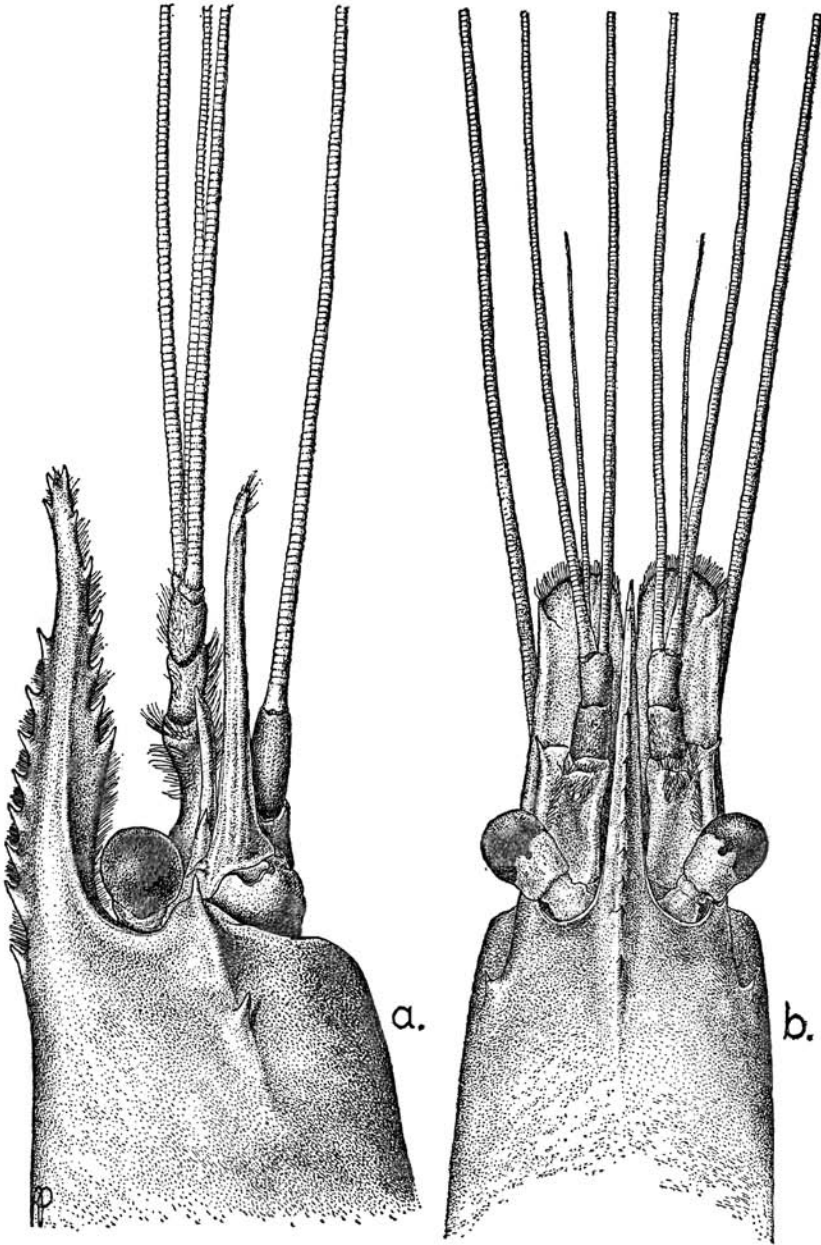


PLATE 11

Macrobrachium tenellum (Smith)

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. a, b, x2.7.



a.

b.

PLATE 12

Macrobrachium surinamicum Holthuis

a, anterior part of body of male in lateral view; b, rostrum of ovigerous female in lateral view; c, tip of telson in dorsal view; d, scaphocerite; e, first pereiopod; f, second pereiopod of adult male; g, second pereiopod of female; h, third pereiopod. a, b, d, e, g, h, x5.5; c, x40; f, x3.

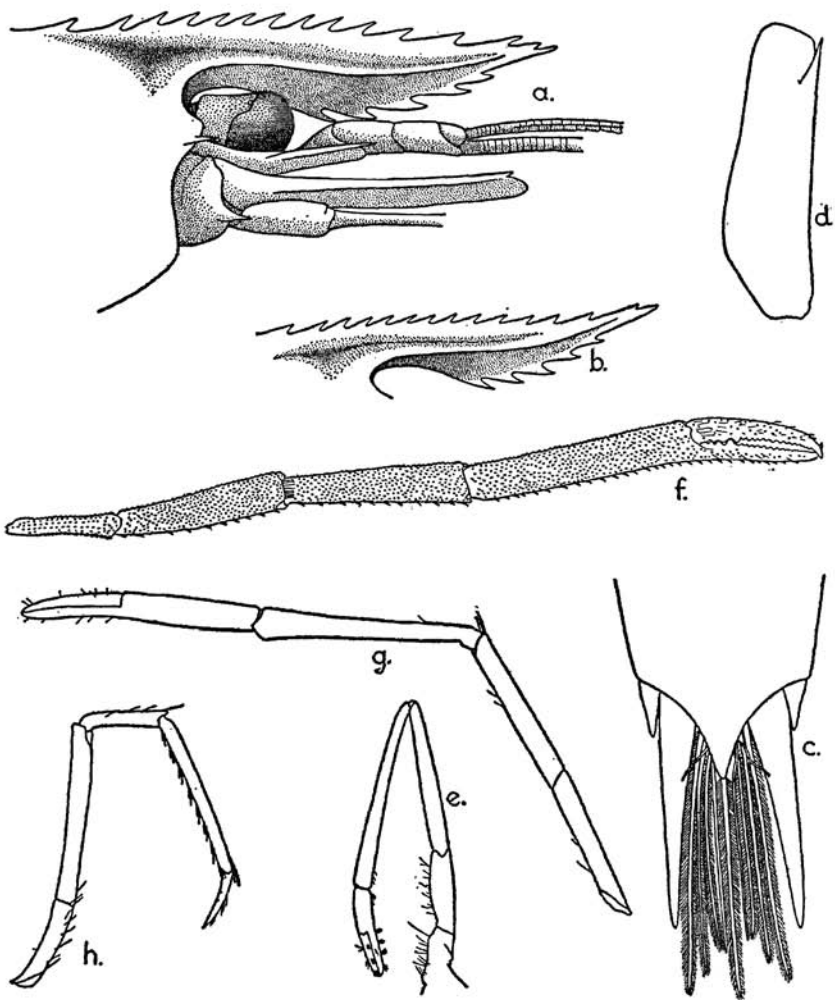
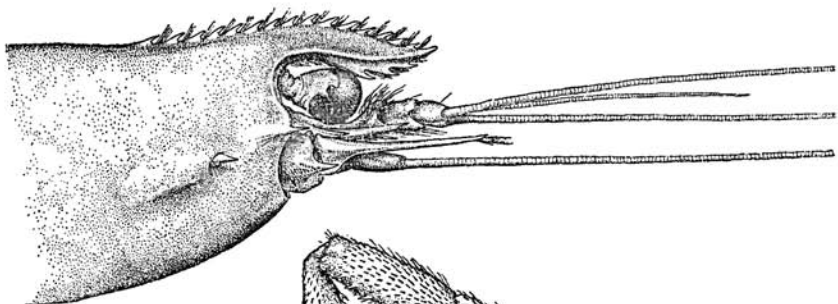


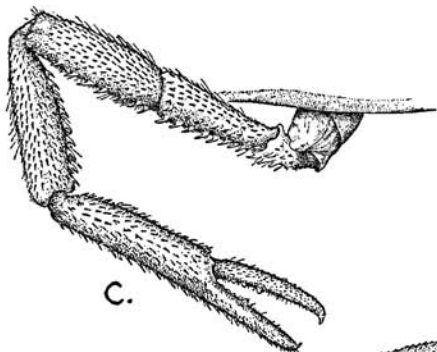
PLATE 13

Macrobrachium transandicum Holthuis

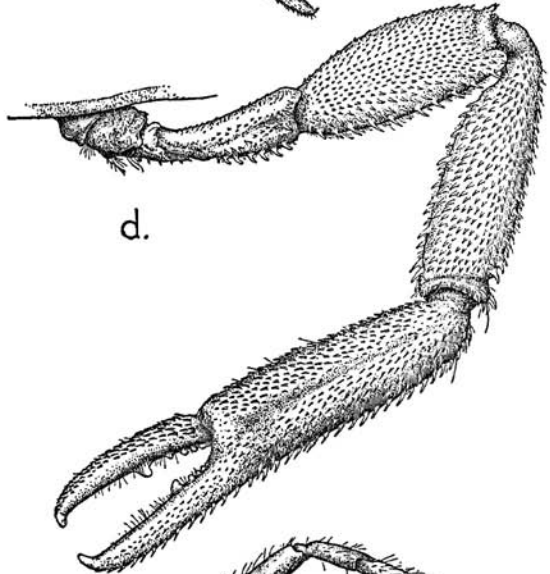
a, anterior part of body in lateral view; b, anterior part of body in dorsal view. a, b, x3.2; c, smaller second pereopod of male; d, larger second pereopod of male; e, third pereopod of male. c-e, x3.2.



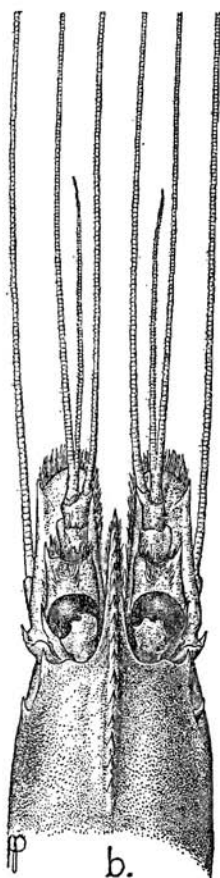
a.



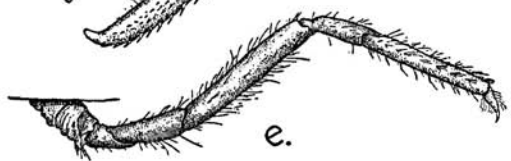
c.



d.



b.



e.

PLATE 14

Macrobrachium ohione (Smith)

a, animal in lateral view; b, second pereopod of adult male. a, after Hedgpeth, 1947.

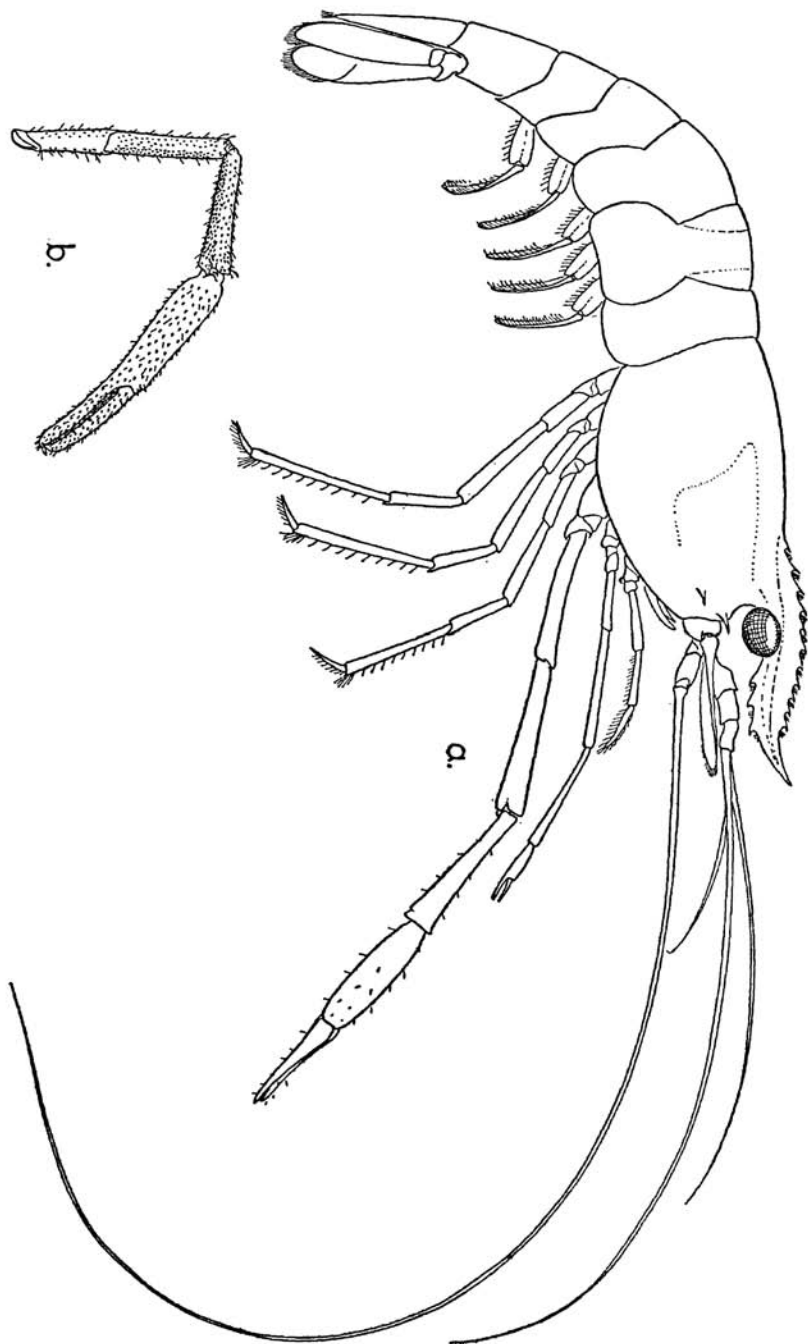


PLATE 15

Macrobrachium heterochirus (Wiegmann)

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. a, b, x1.6.

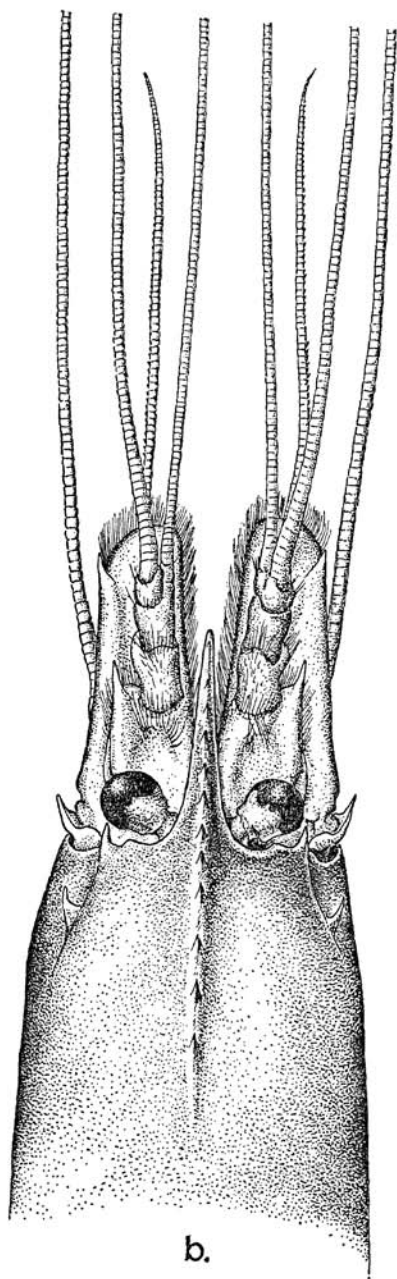
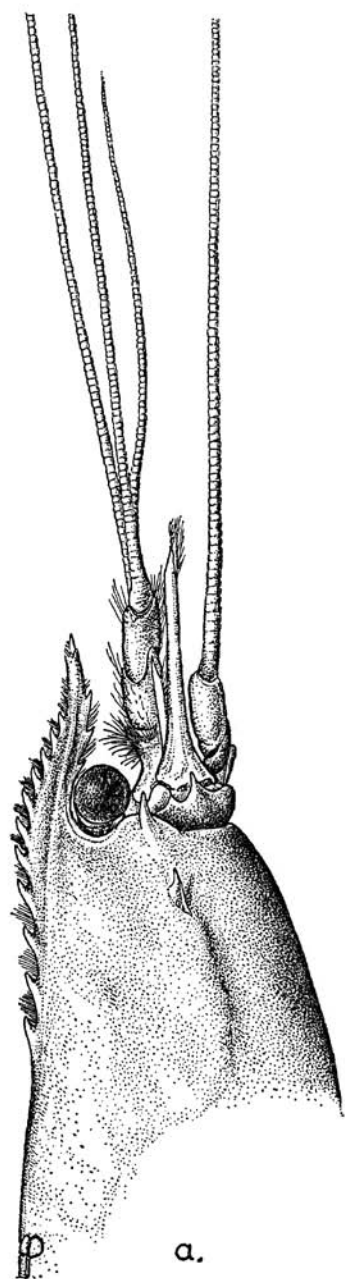


PLATE 16

Macrobrachium heterochirus (Wiegmann)

a, larger second pereiopod of adult male; b, smaller second pereiopod of adult male; c, third pereiopod of adult male. a-c, x1.3.

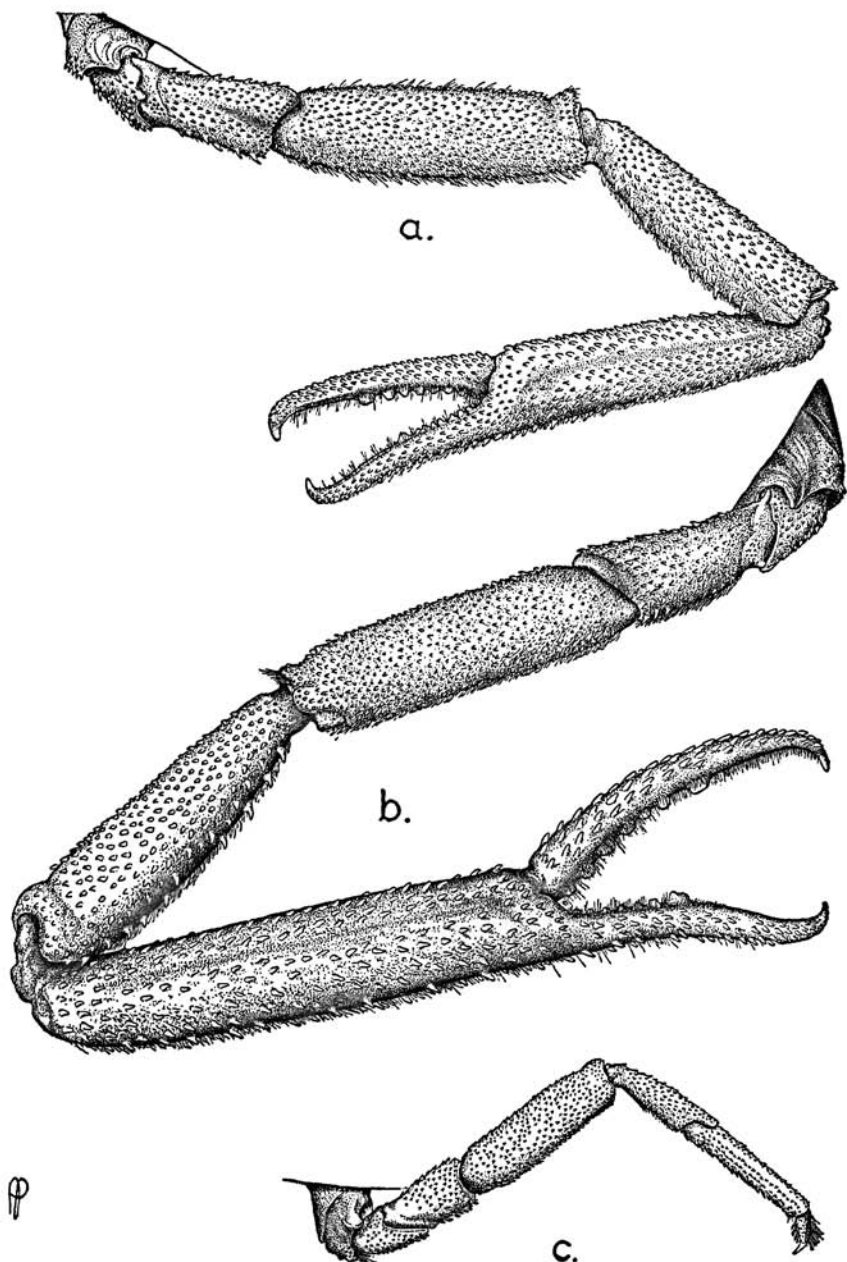
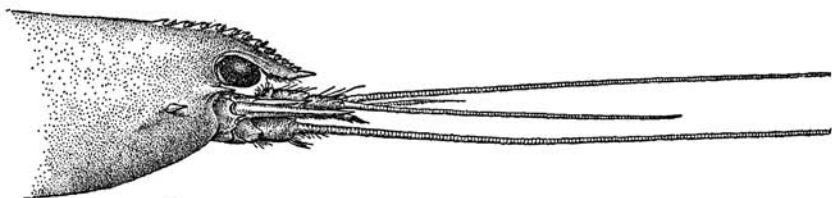


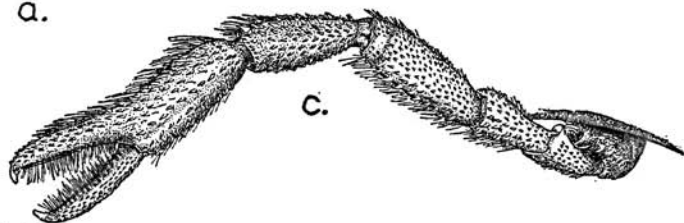
PLATE 17

Macrobrachium occidentale Holthuis

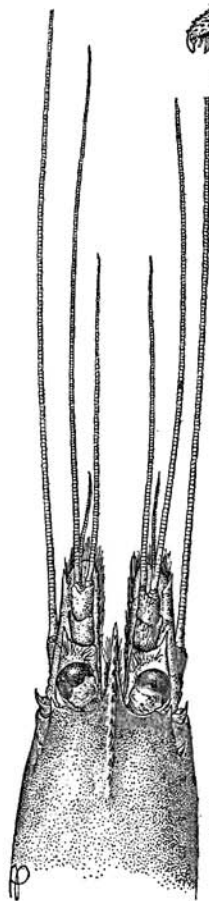
a, anterior part of body in lateral view; b, anterior part of body in dorsal view. c, smaller second pereiopod of adult male; d, larger second pereiopod of adult male; e, third pereiopod. a-e, x1.8.



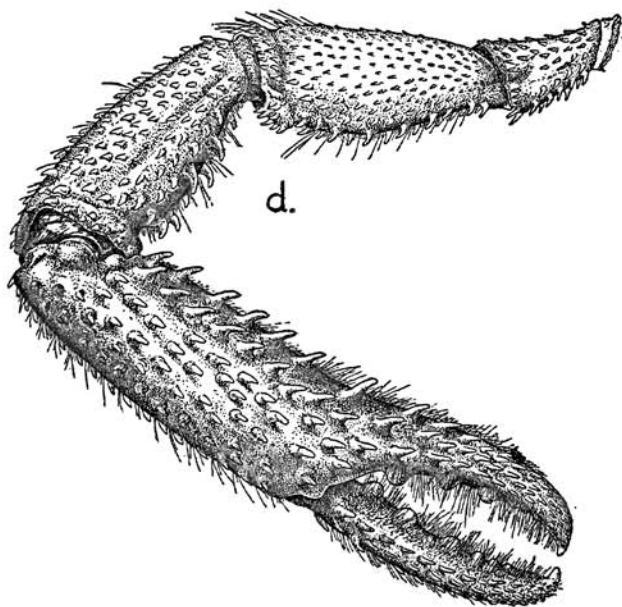
a.



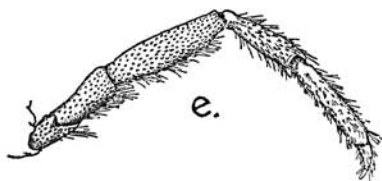
c.



b.



d.



e.

PLATE 18

Macrobrachium potiuna (Müller)

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. c, second leg of adult male; d, third pereopod. a-d, x4.25.

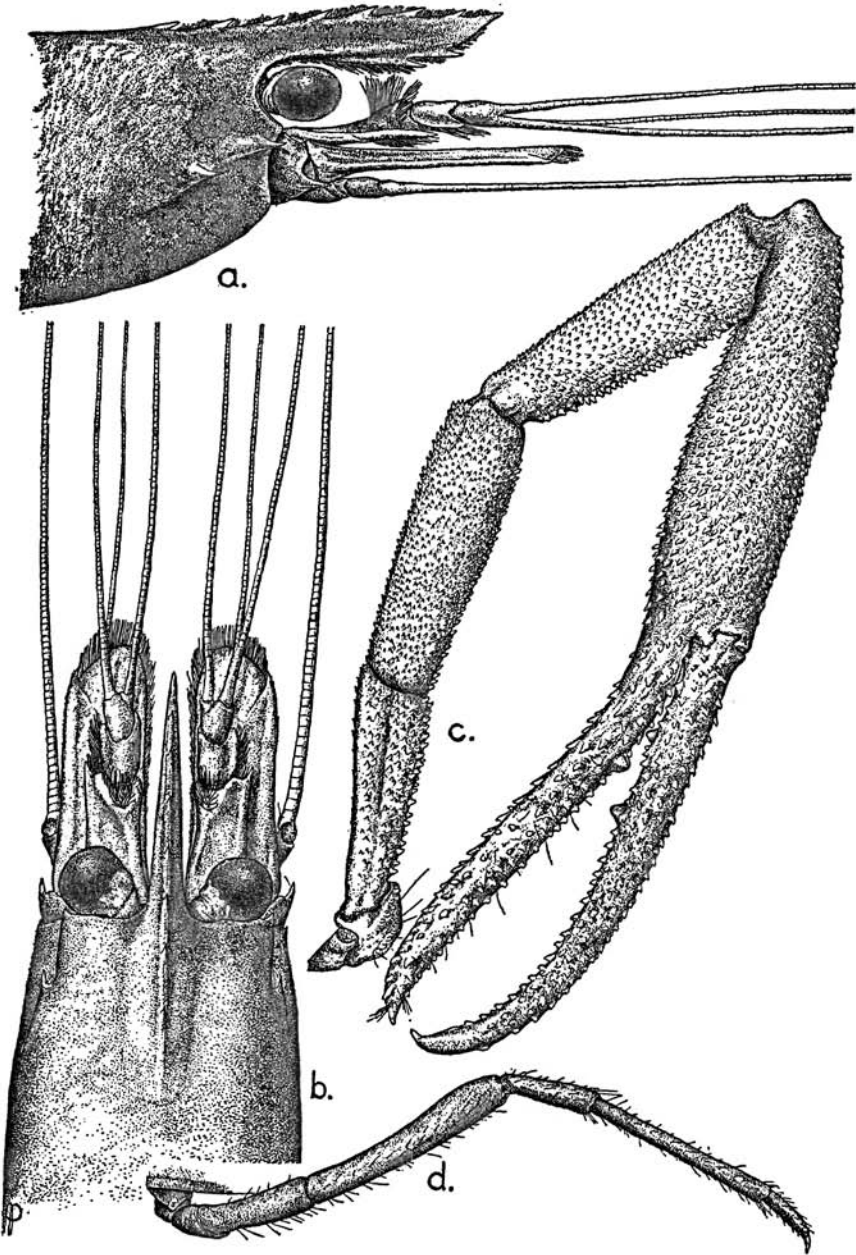


PLATE 19

Macrobrachium brasiliense (Heller)

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. c, second leg of adult male, outside; d, larger second leg of adult male, inside; e, third leg. a-e, x1.6.

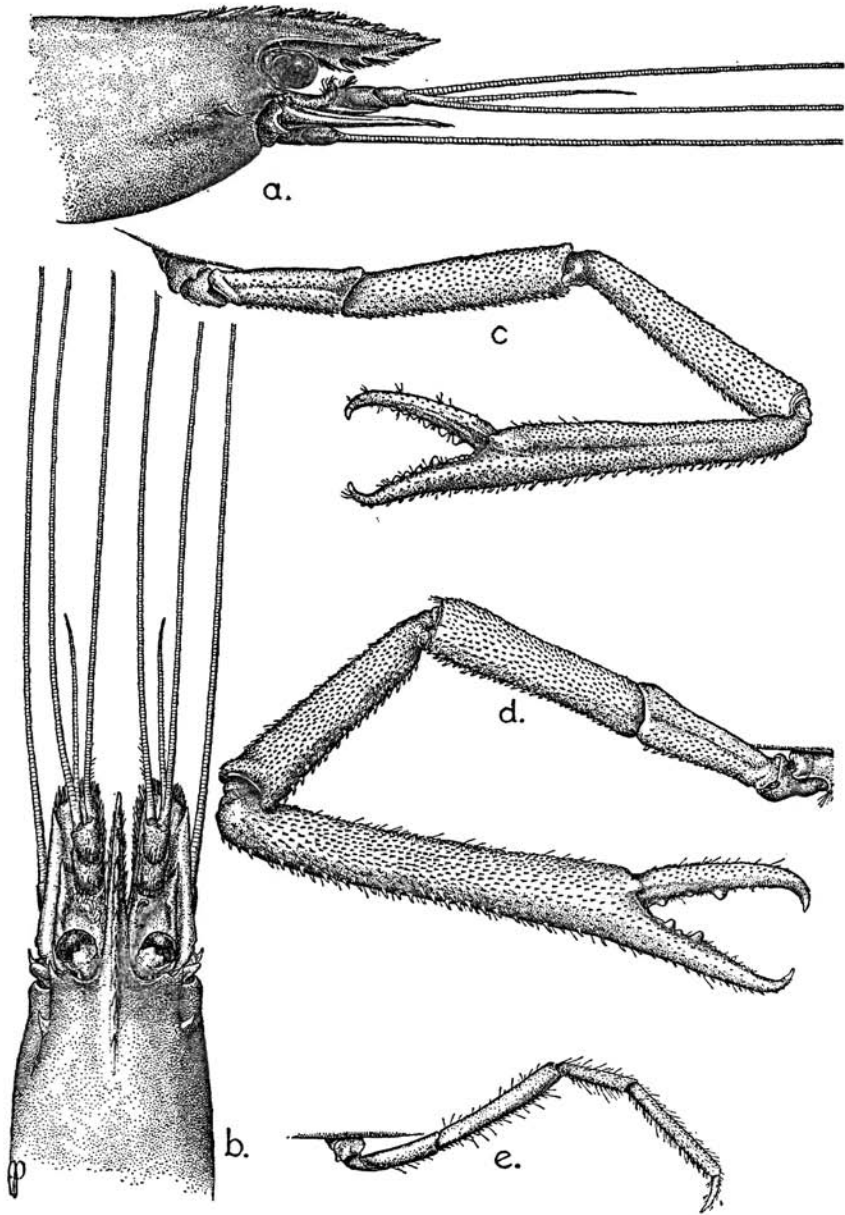


PLATE 20

Macrobrachium nattereri (Heller)

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. c, second leg of adult male; d, third leg. a-d, $\times 3$.

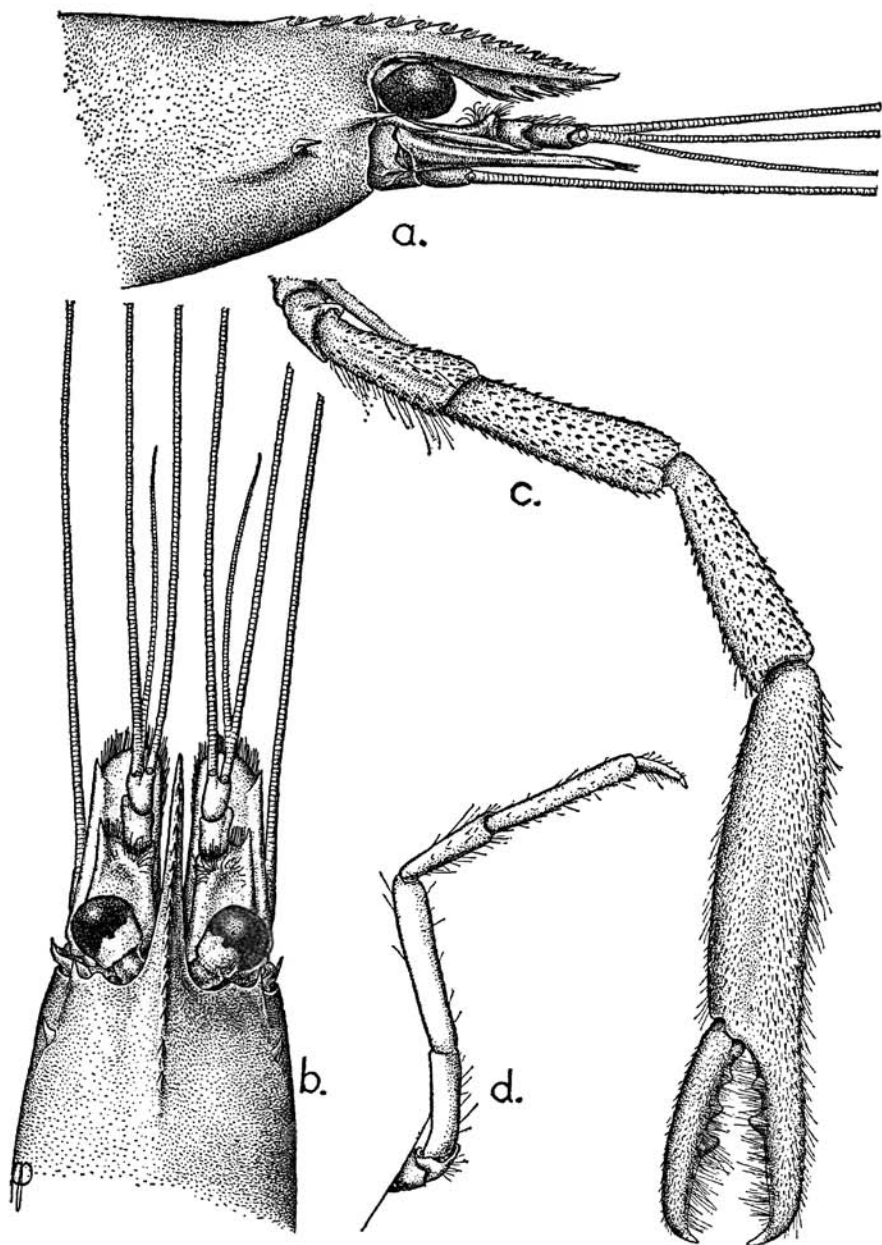


PLATE 21

Macrobrachium iheringi (Ortmann)

a, lateral view of the head; b, second large pereiopod; c, fingers of second pereiopod; d, third pereiopod. a-d, x3.

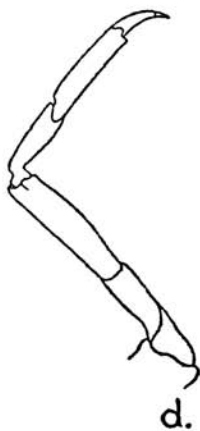
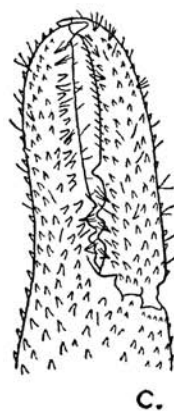
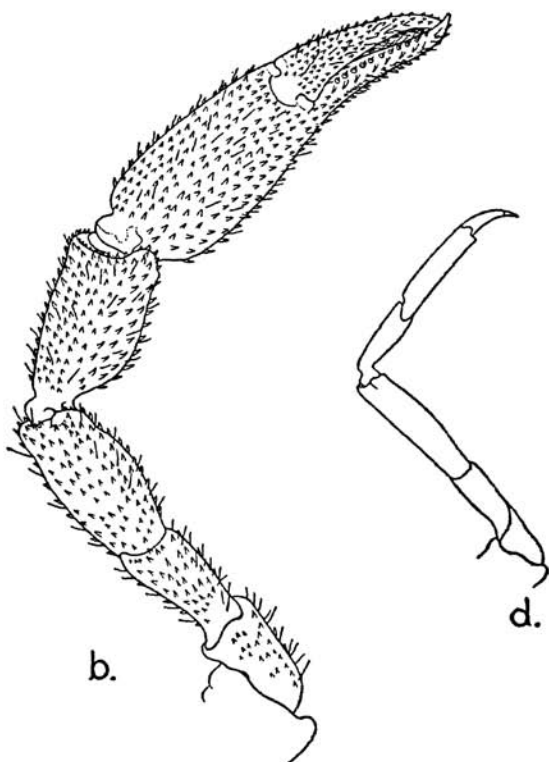
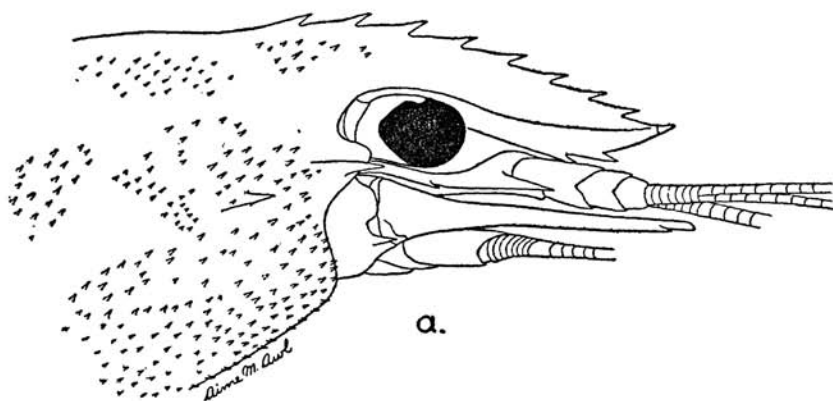


PLATE 22

Macrobrachium faustinum (de Saussure)
Animal in dorsal view, (after de Saussure, 1858).

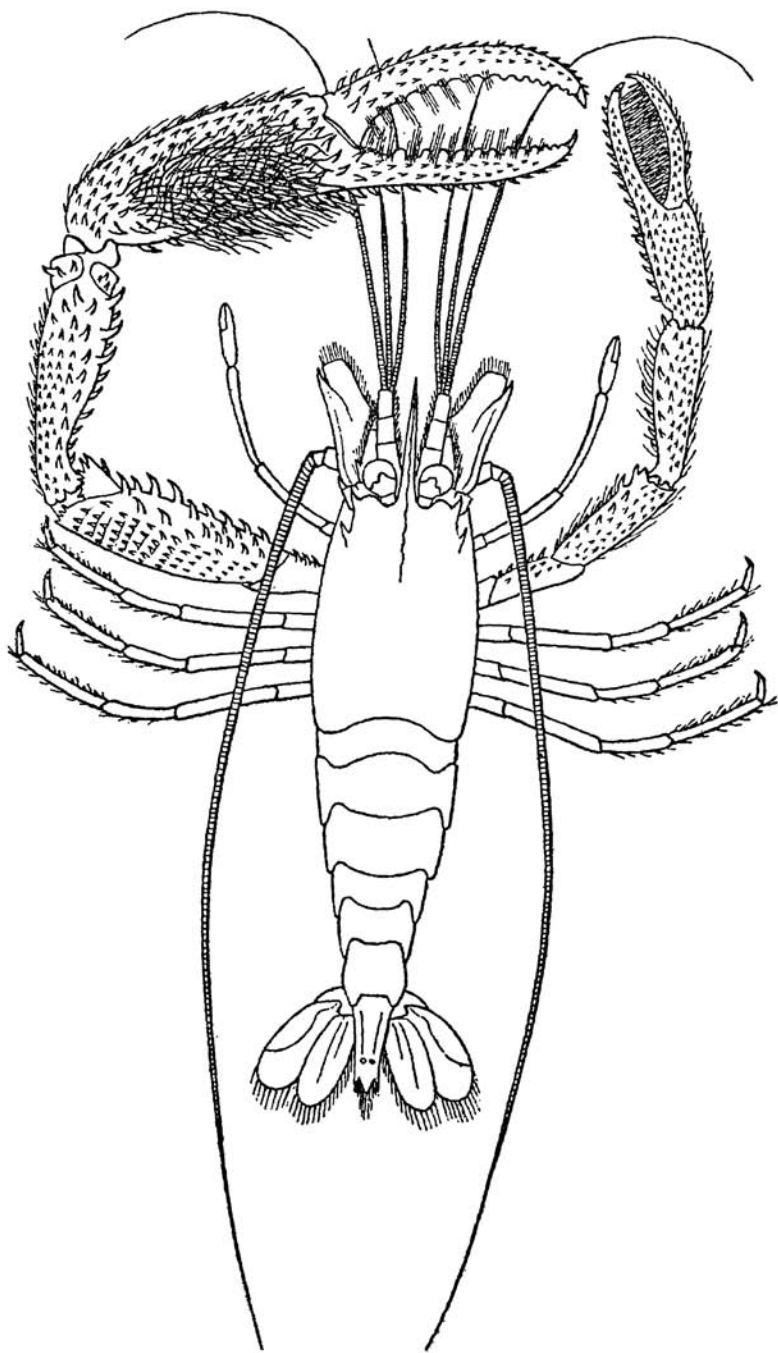


PLATE 23

Macrobrachium faustinum (de Saussure)

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. c, third leg, x2.5. a-c, x2.5.

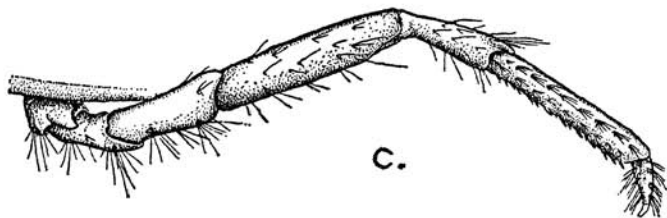
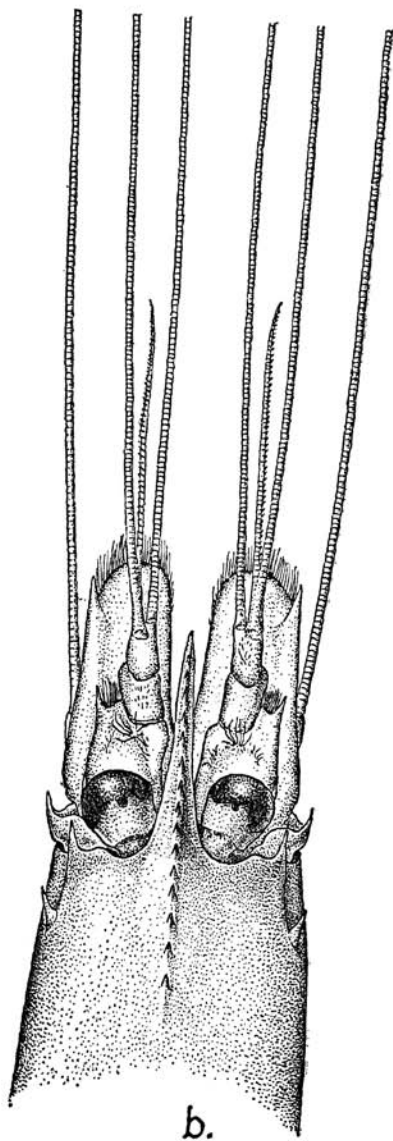
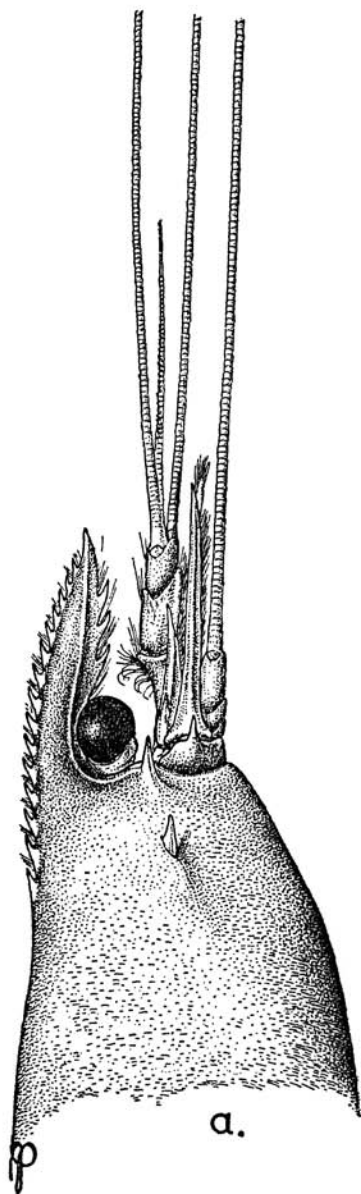


PLATE 24

Macrobrachium olfersi (Wiegmann)

Animal in lateral view, (after Hedgpeth, 1947).

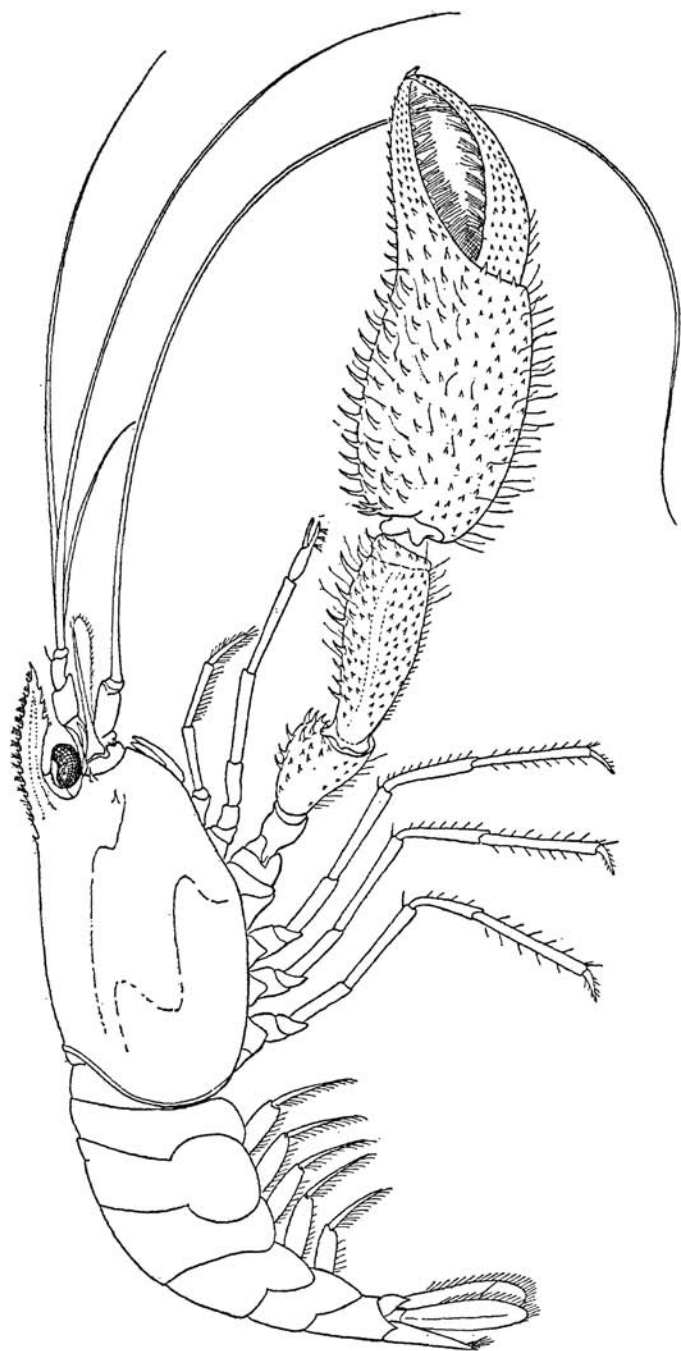


PLATE 25

Macrobrachium olfersi (Wiegmann)

a, larger second pereiopod of adult male; b, smaller second pereiopod of adult male. Drawn by Aime M. Awl.

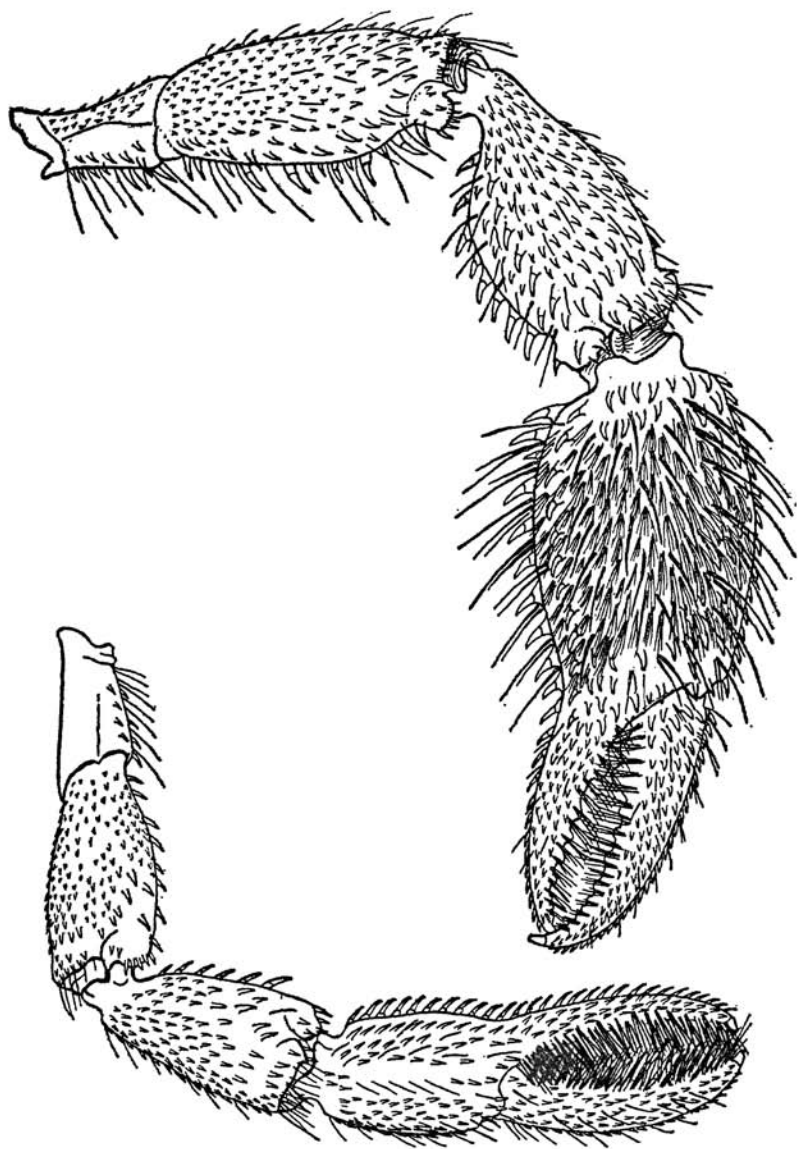
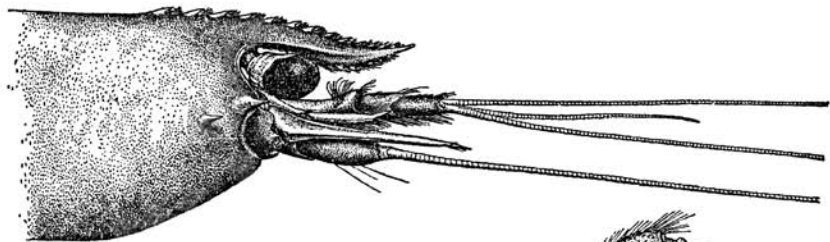


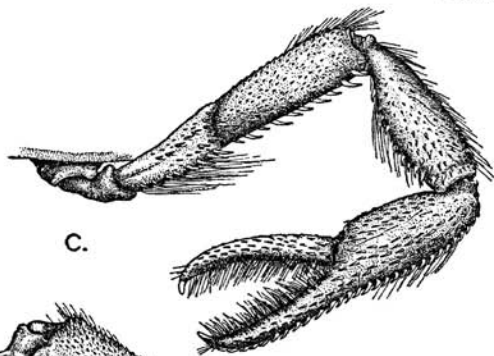
PLATE 26

Macrobrachium digueti (Bouvier)

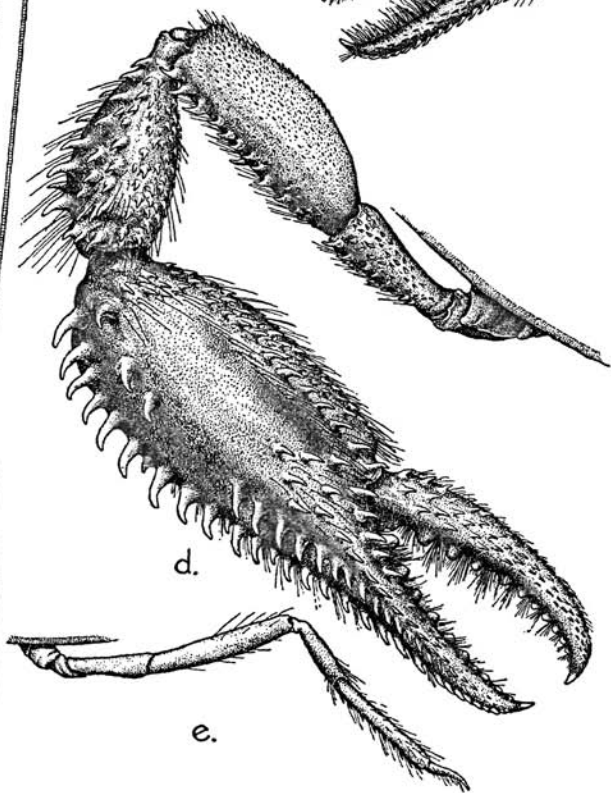
a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, smaller second pereiopod of adult male; d, larger second pereiopod of adult male; e, third leg; a-e, x3.5.



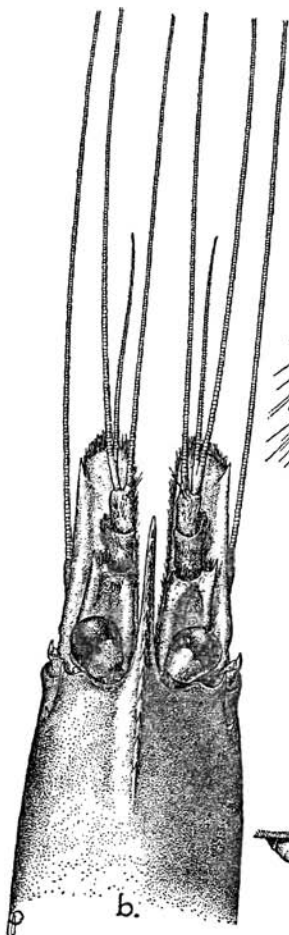
a.



c.



d.



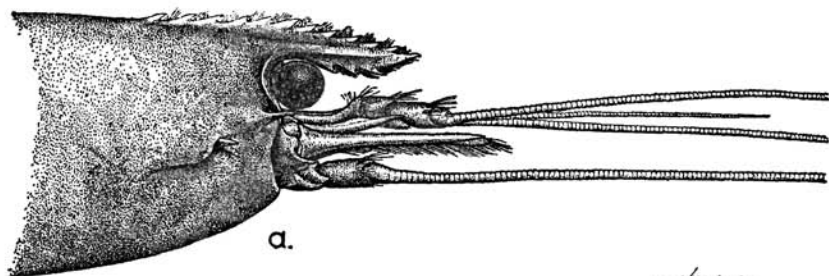
b.

e.

PLATE 27

Macrobrachium crenulatum Holthuis

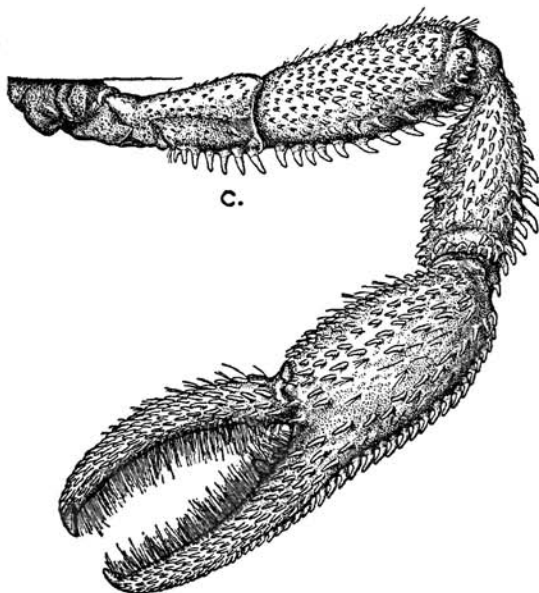
a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, smaller second pereopod of adult male; d, third pereopod of adult male, a-d, x2.



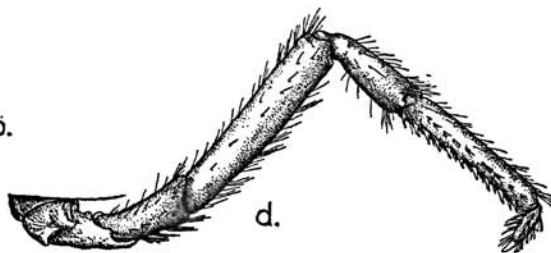
a.



b.



c.



d.

PLATE 28

Macrobrachium crenulatum Holthuis
a, larger second pereopod of adult male, x2.6.

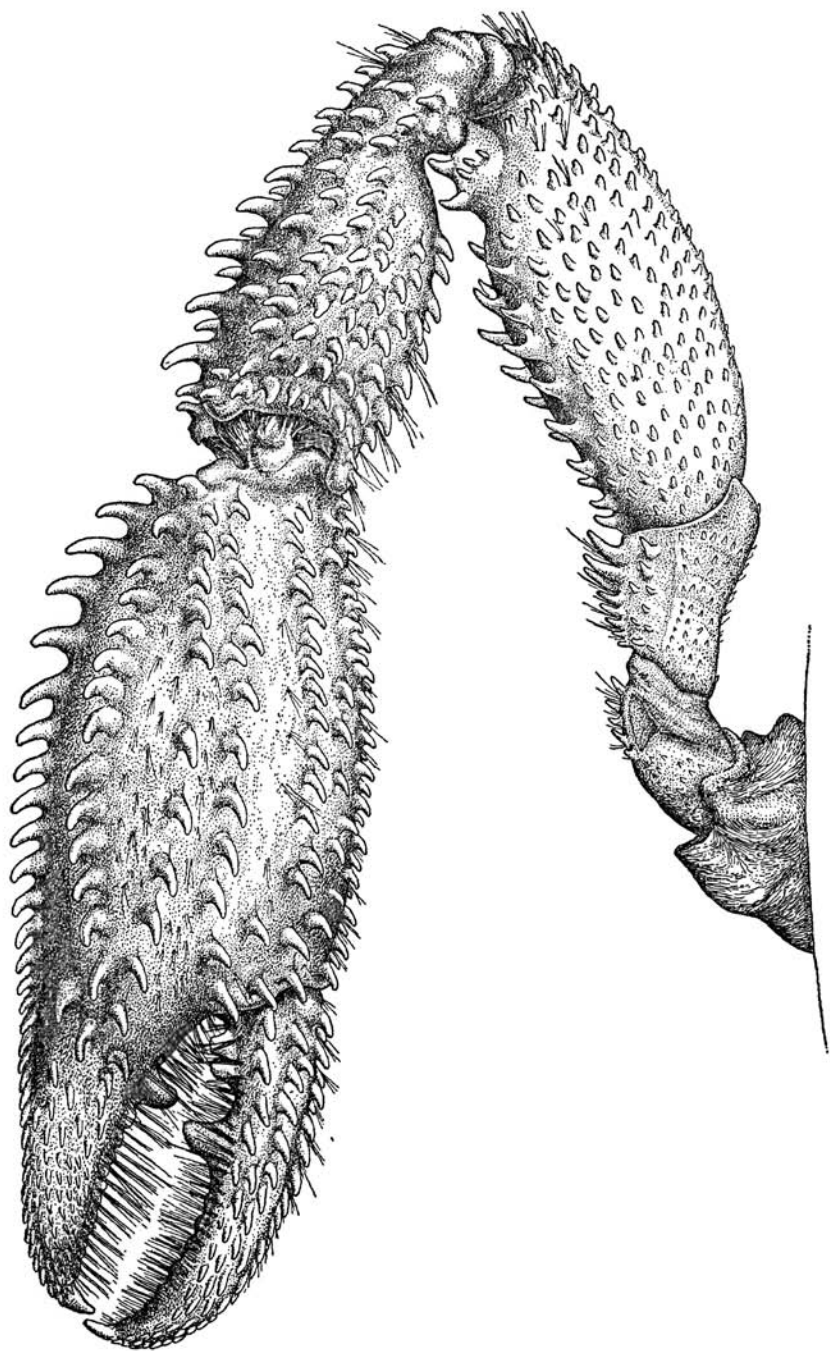
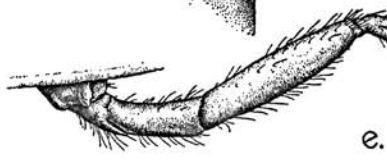
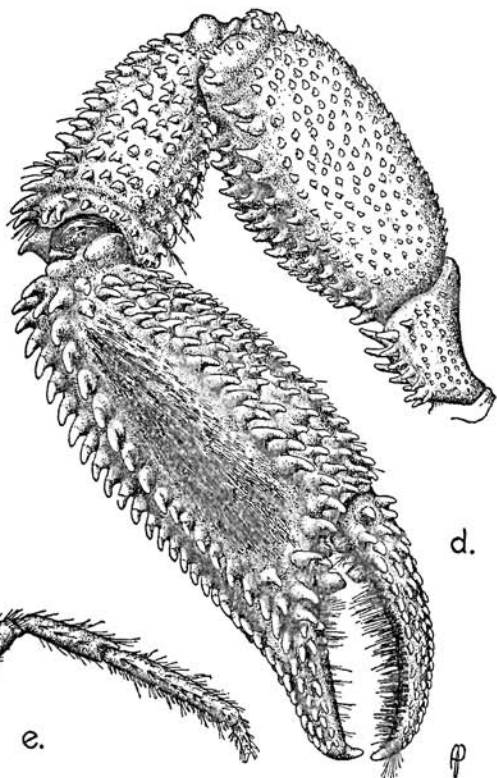
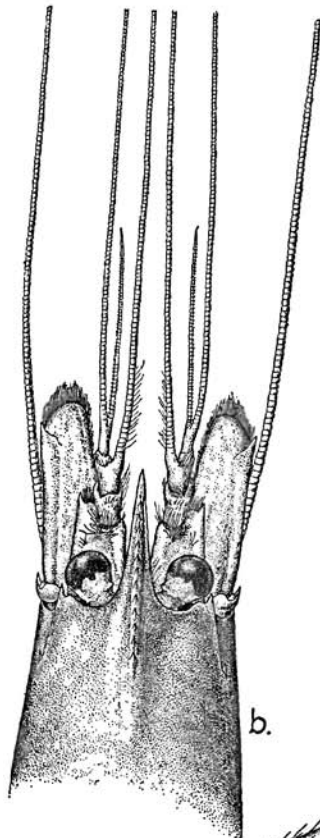
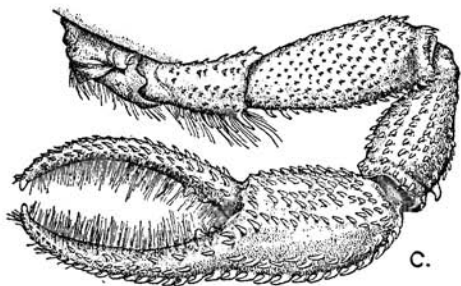
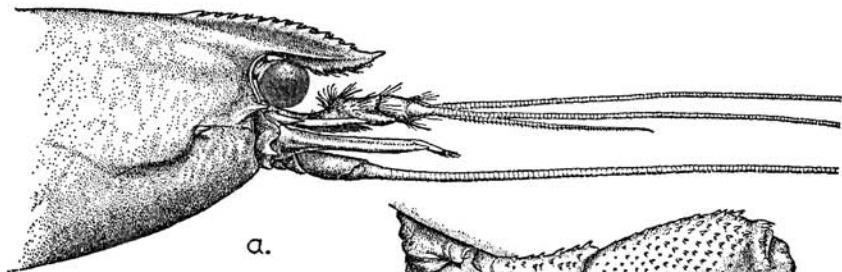


PLATE 29

Macrobrachium hancocki Holthuis

a, anterior part of body in lateral view; b, anterior part of body in dorsal view. c, smaller second pereopod of adult male; d, larger second pereopod of adult male; e, third pereopod of adult male, a-e, x1.9.



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PLATE 30

Macrobrachium carcinus (L.)
Animal in lateral view. x0.5. *after Hedgpeth, 1947.*

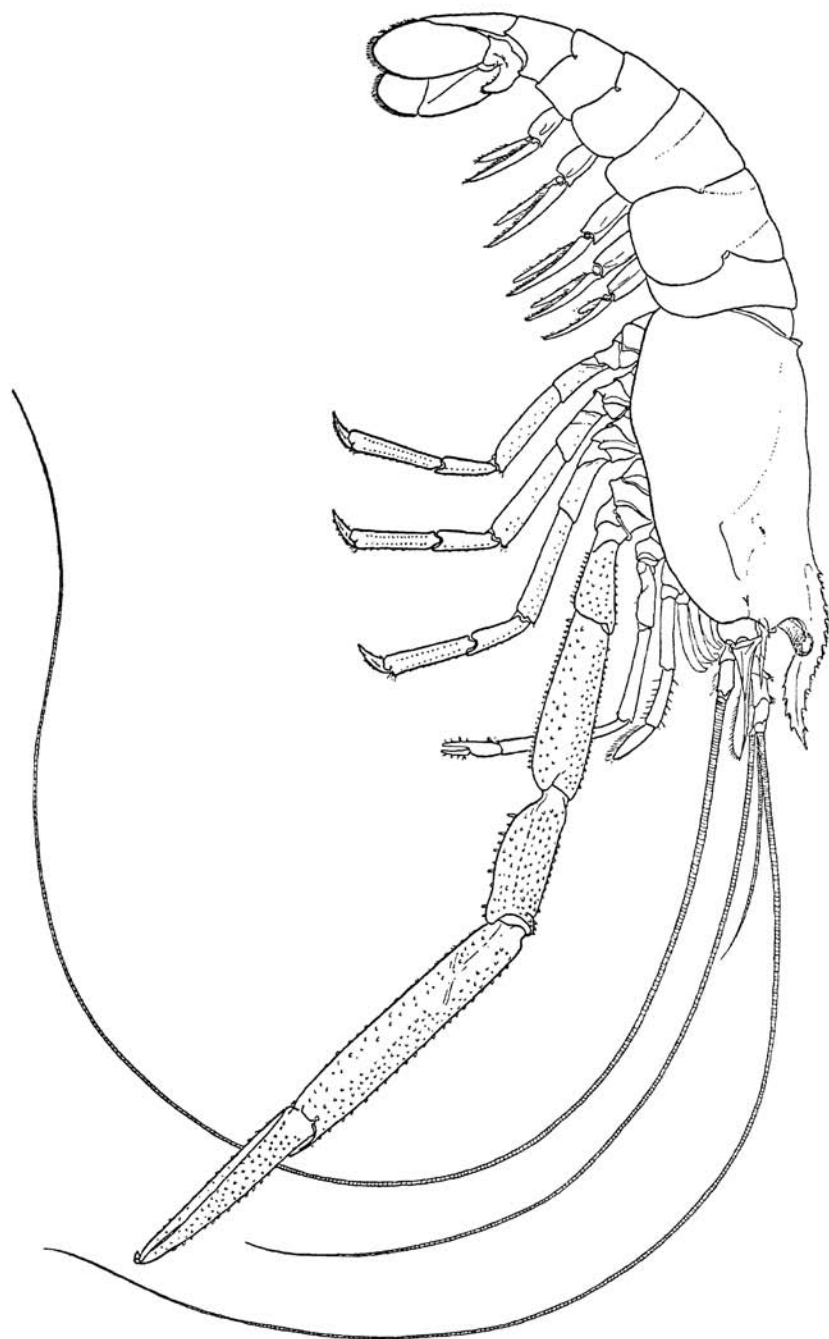


PLATE 31

Macrobrachium carcinus (L.)

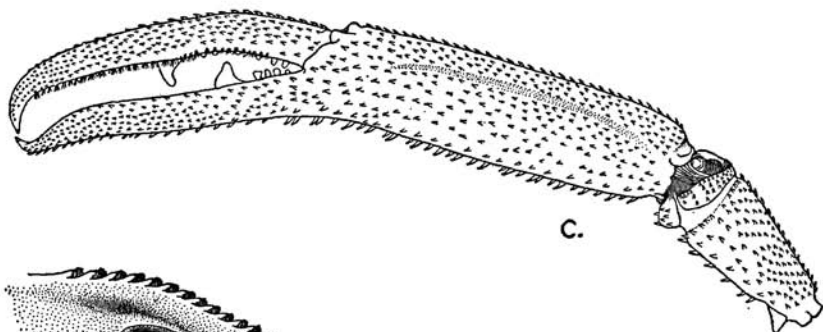
a, scaphocerite; b, first leg; c, chela and carpus of second leg of adult male.

Macrobrachium americanum Bate

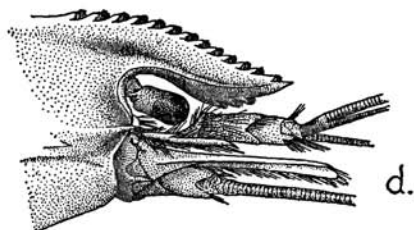
d, anterior part of body in dorsal view; e, second leg of adult male.

"Palaemon fluviatilis" Streets

f, carapace in lateral view; g, second pereopod. f, g, after Streets, 1871.



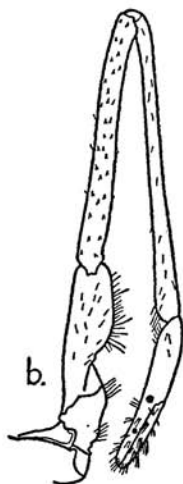
c.



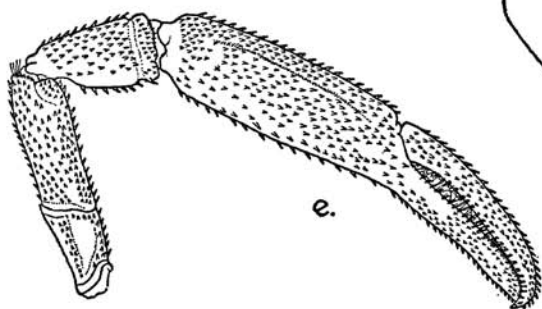
d.



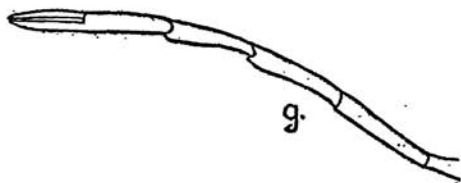
a.



b.



e.



g.



f.

PLATE 32

Pseudopalaemon bouvieri Sollaud

a, anterior part of body in lateral view; b, mandible; c, maxillula; d, maxilla; e, first maxilliped; f, second maxilliped; g, second leg of male; h, second leg of female; i, third leg of male. b-d, x24; e, f, x15; g-i, x7.

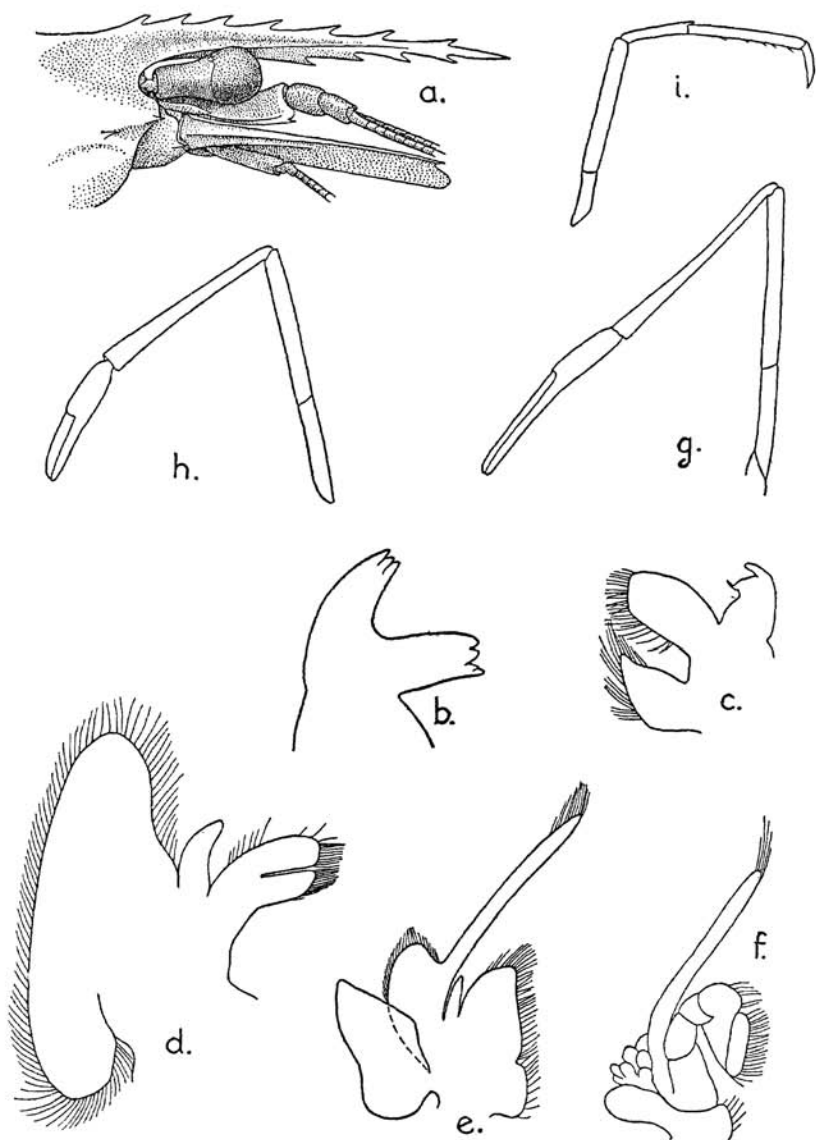
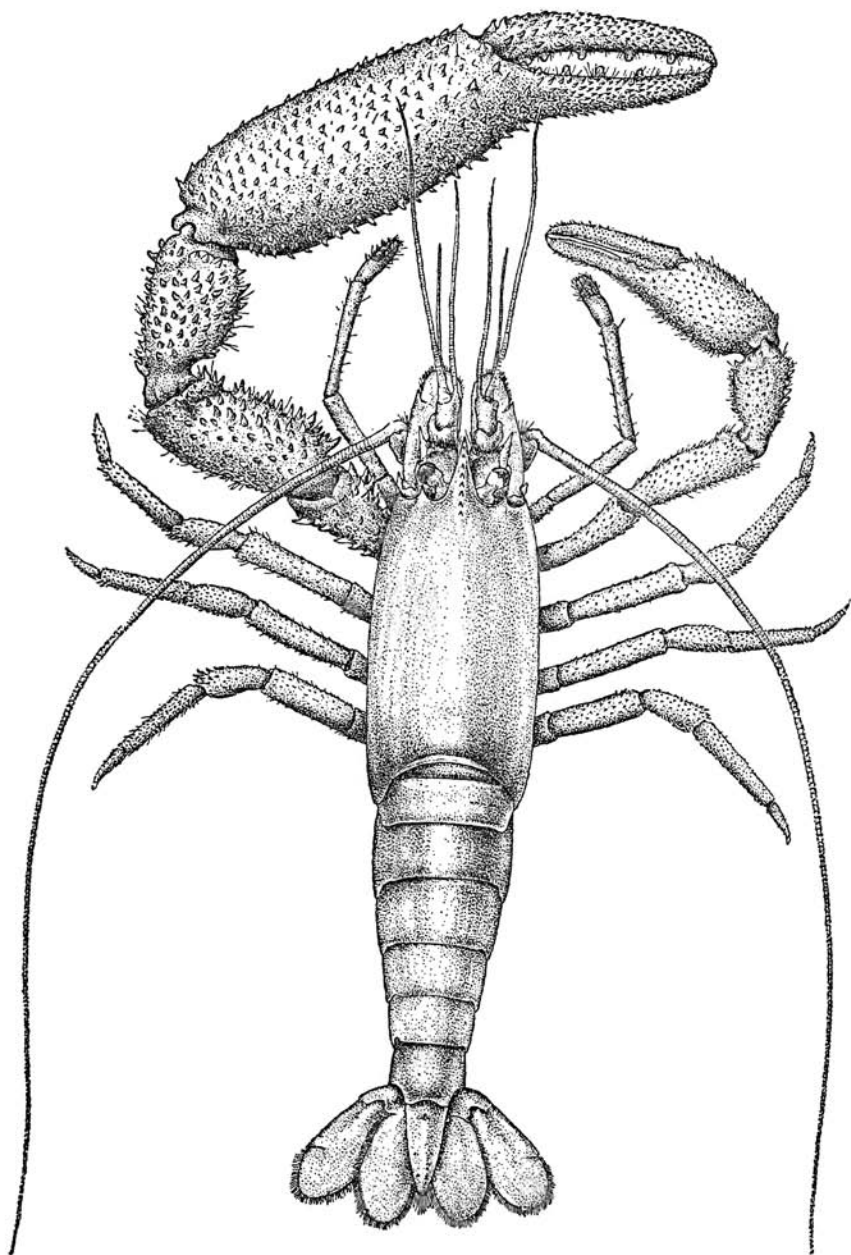


PLATE 33

Cryphiops caementarius (Molina)

Adult male in dorsal view. x0.6.



P

PLATE 34

Cryphiops caementarius (Molina)

a, adult female in dorsal view; b, anterior part of body of female in lateral view. a, x0.6; b, x2.6.

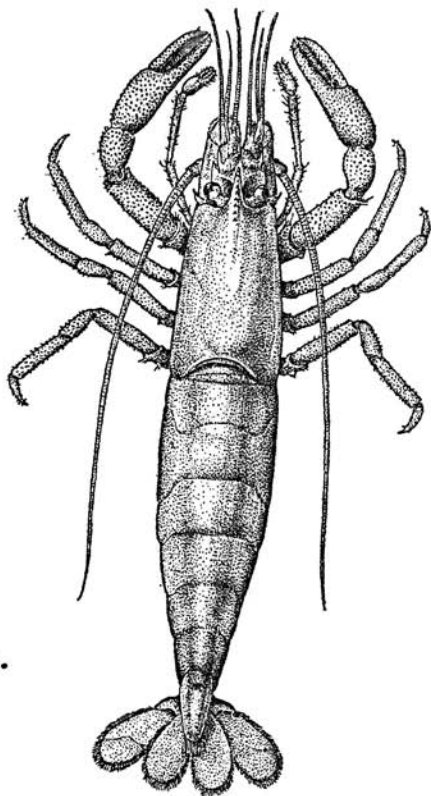
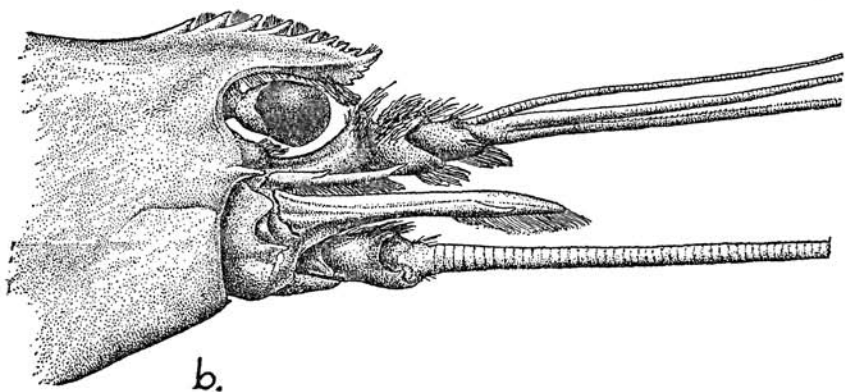


PLATE 35

Cryphiops caementarius (Molina)

a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, endopod of first pleopod of male; g, endopod of second pleopod of male. a-g, x4.6.

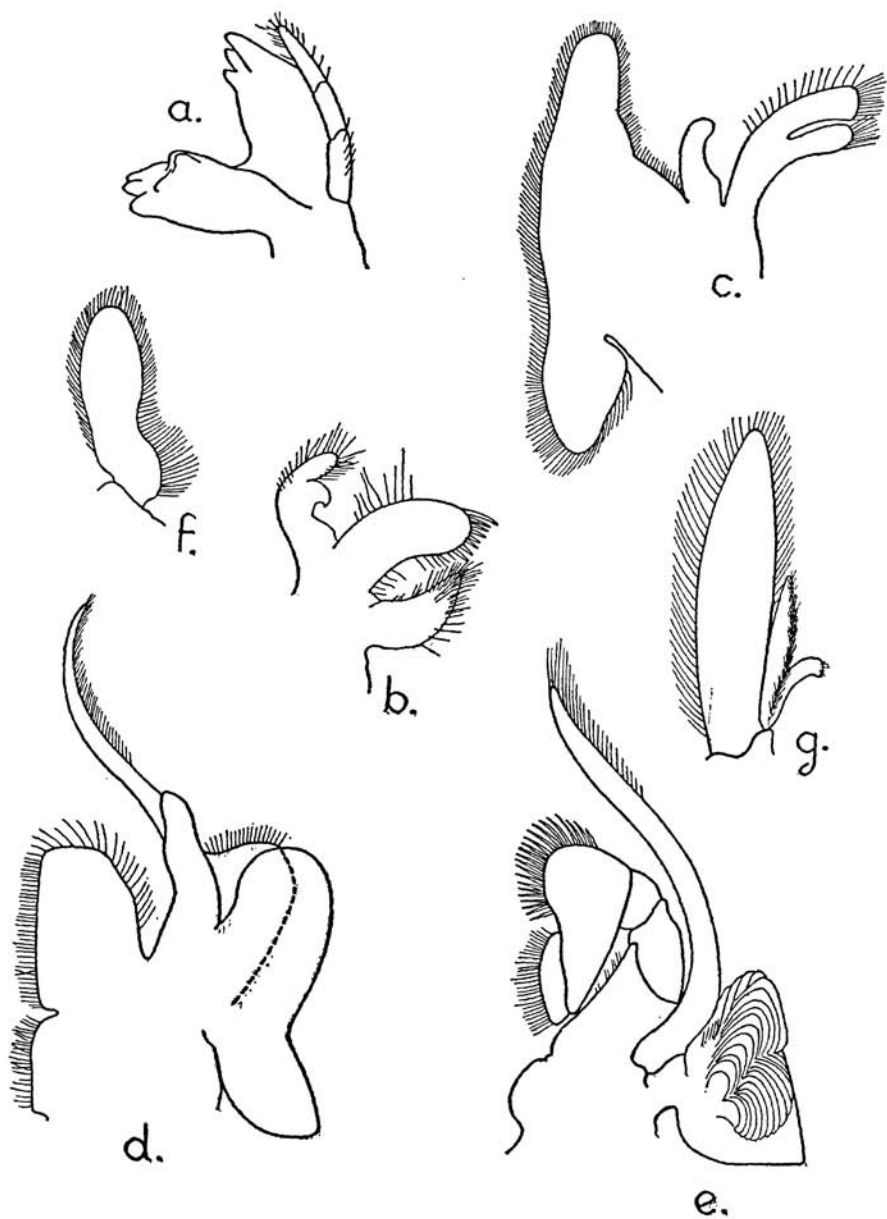


PLATE 36

Troglocubanus calcis (Rathbun)

a, carapace of female holotype in lateral view; b, frontal region of holotype in dorsal view; c, telson in dorsal view; d, mandible; e, maxillula; f, maxilla; g, first maxilliped; h, second maxilliped; i, first pereopod; j, second pereopod. a-h, after Chace, 1943.

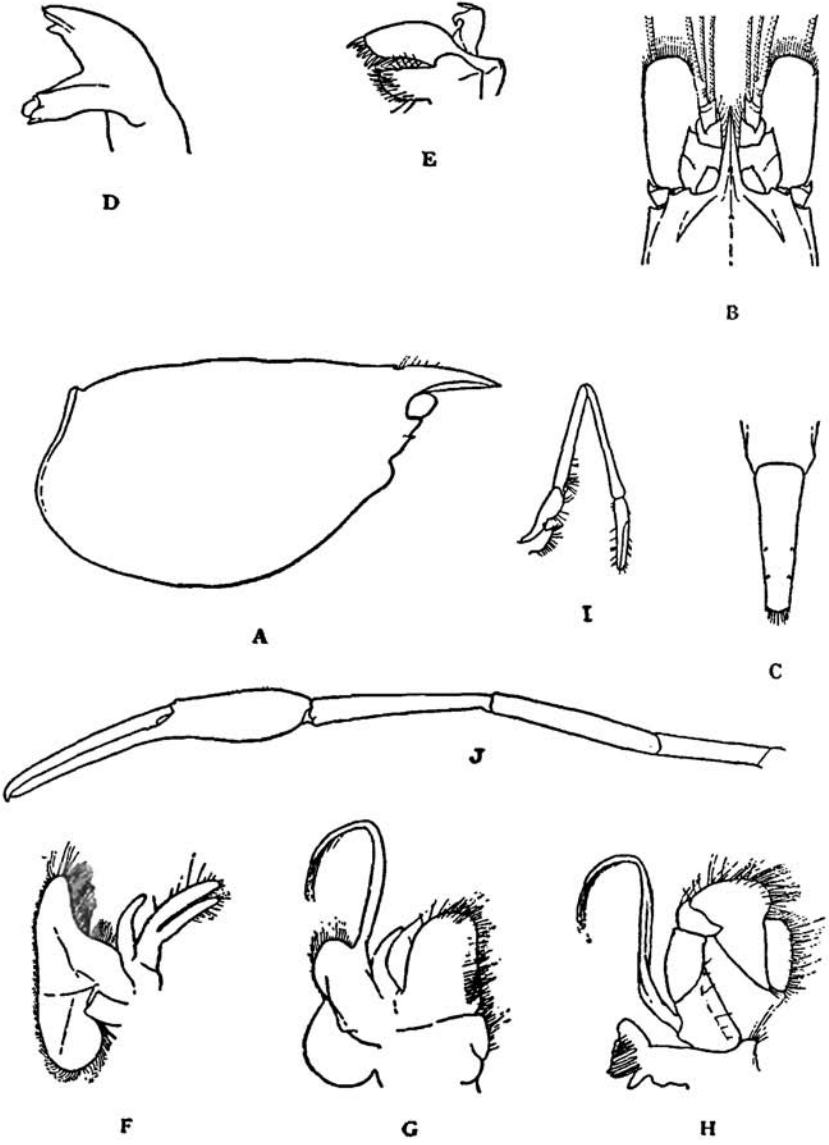
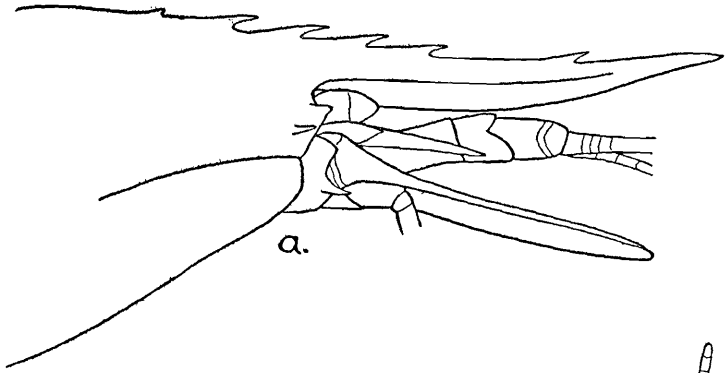


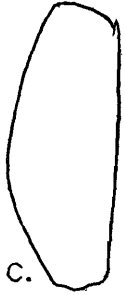
PLATE 37

Troglocubanus eigenmanni (Hay)

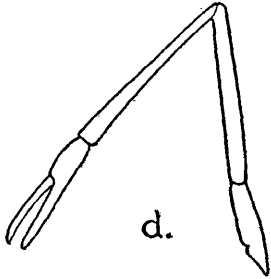
paratype. a, carapace in lateral view; b, antennula; c, scaphocerite;
d, first pereopod; e, second pereopod; f, third pereopod. a-f, x7.5.



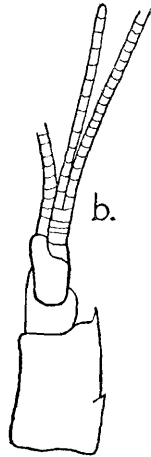
a.



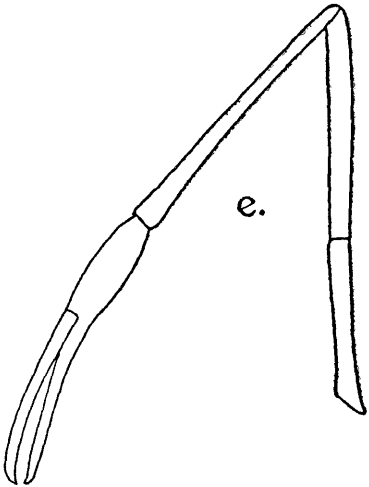
c.



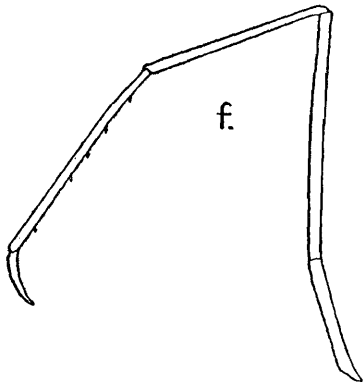
d.



b.



e.



f.

PLATE 38

Troglocubanus gibarensis (Chace)

a, animal in lateral view; b, frontal region in dorsal view; c, telson in dorsal view; d, tip of telson; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped. a-i, after Chace, 1943.

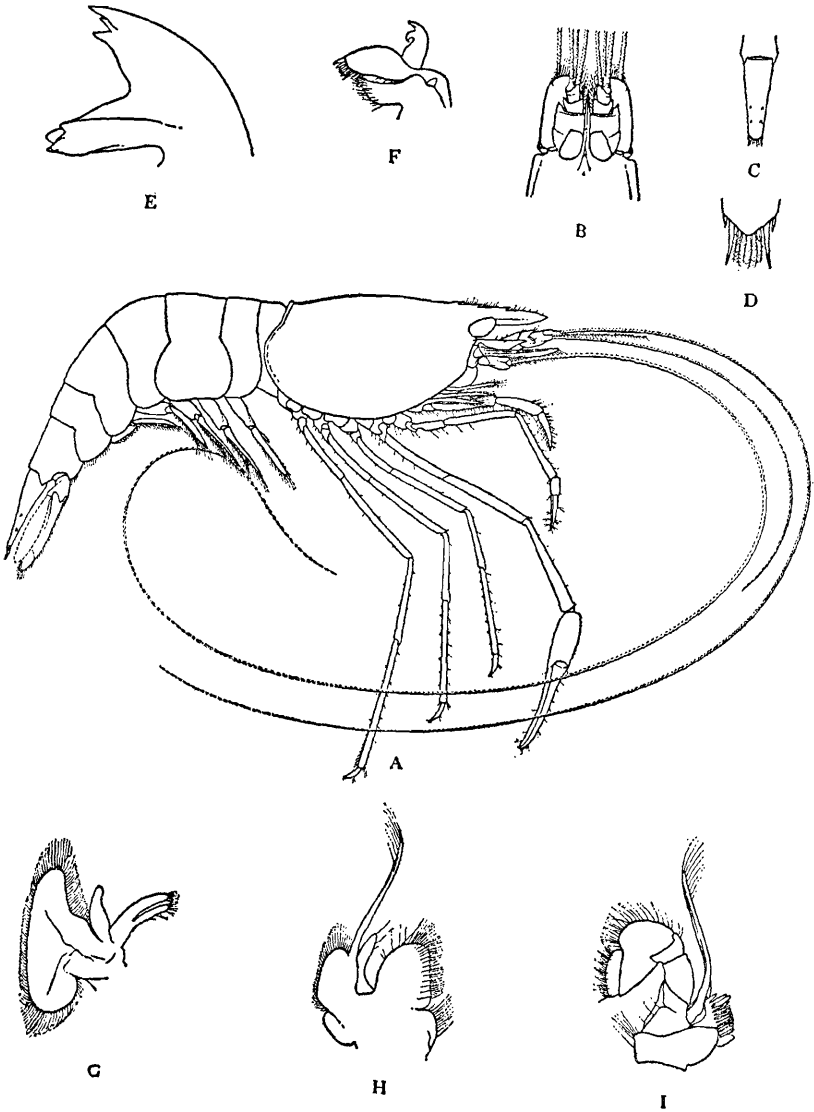


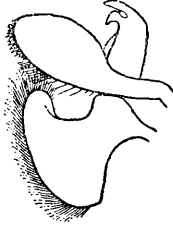
PLATE 39

Troglocubanus inermis (Chace)

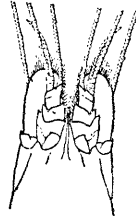
a, animal in lateral view; b, frontal region in dorsal view; c, telson in dorsal view; d, tip of telson; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped. a-i, after Chace, 1943.



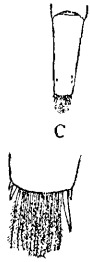
E



F

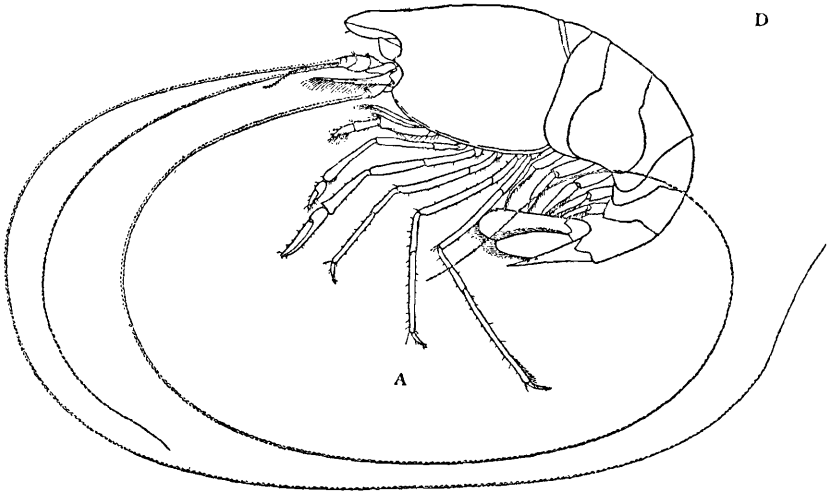


B



C

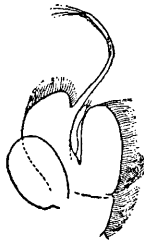
D



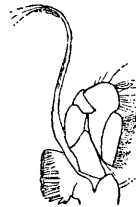
A



G



H



I

PLATE 40

Creaseria morleyi (Creaser)

a, carapace in lateral view; b, telson in dorsal view; c, mandible;
d, maxillula; e, chela of first leg; f, chela of second leg. a-f, after
Creaser, 1936.

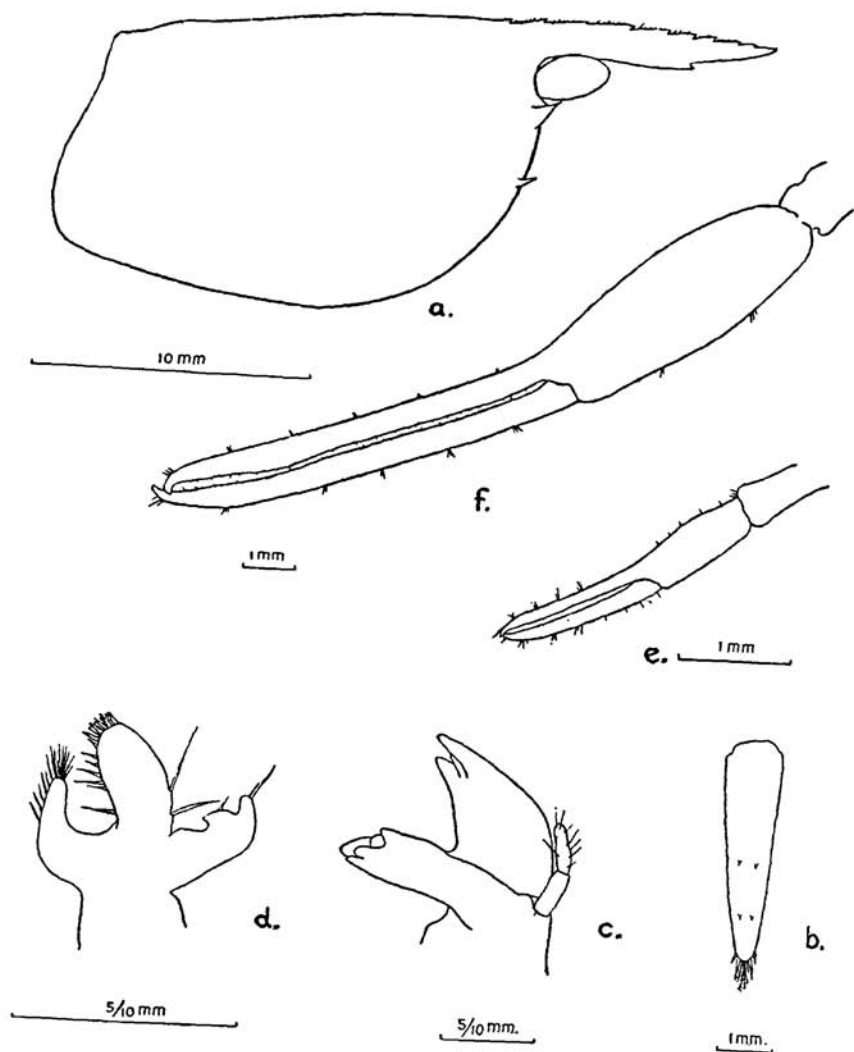


PLATE 41

Leander tenuicornis (Say)

a, anterior part of body of female in lateral view; b, anterior part of carapace of male in lateral view; c, antennula; d, scaphocerite; e, first pereiopod; f, second pereiopod; g, third pereiopod.

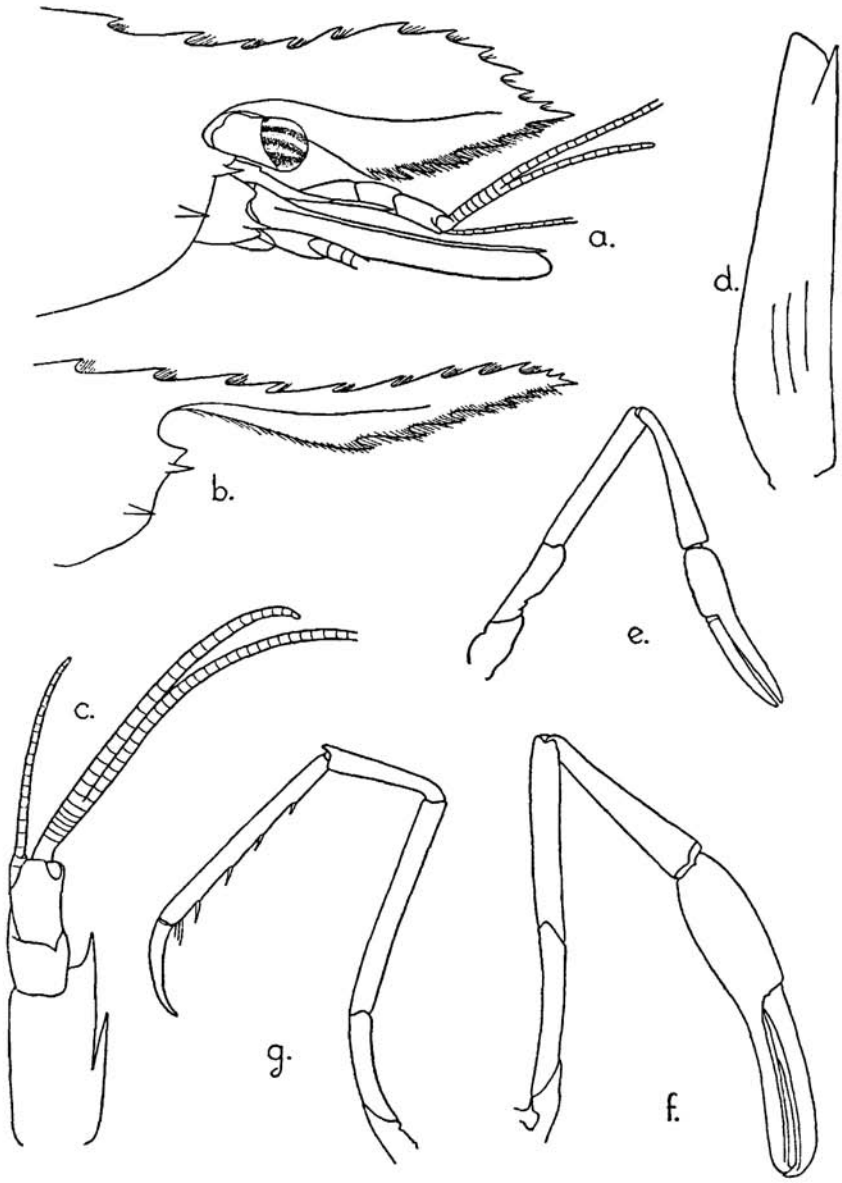


PLATE 42

Leander tenuicornis (Say)

a, fifth pereopod; b, mandible; c, maxillula; d, maxilla; e, first maxilliped; f, second maxilliped.

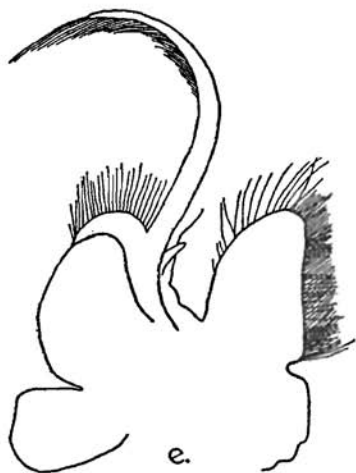
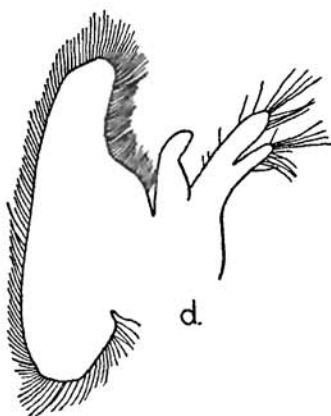
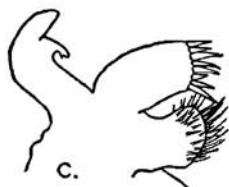
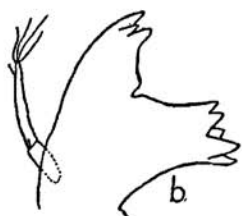
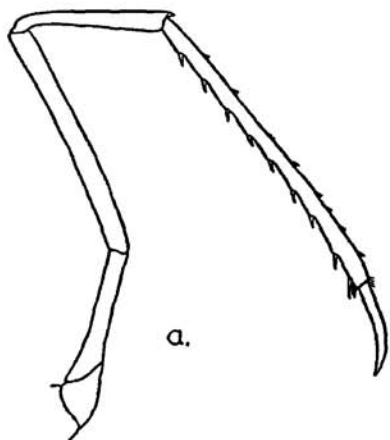


PLATE 43

Palaemon (Nematopalaemon) schmitti Holthuis

a, anterior part of body in lateral view; b, antennula; c, antenna; d, mandible; e, maxillula; f, maxilla; g, first maxilliped; h, second maxilliped; i, third maxilliped; j, first pereopod; k, second pereopod; l, third pereopod. a, x5; b, c, j-l, x7; d-i, x10.

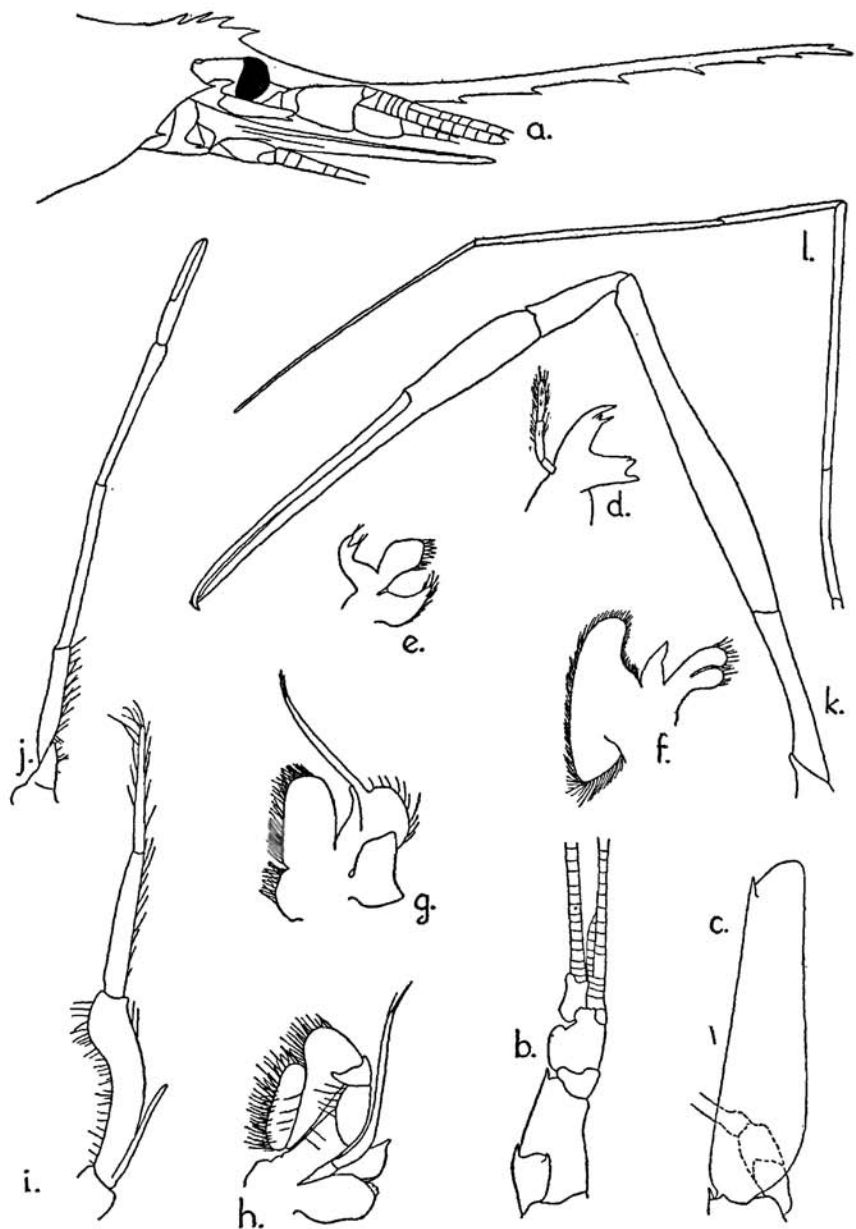


PLATE 44

Palaemon (Palaemon) ritteri Holmes

a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, second leg; e, third leg; f, larva, probably belonging to this species; g, anterior part of another larva. a-g, x6.

Palaemon (Palaemon) gladiator Holthuis

h, anterior part of body in lateral view; i, antennula; j, scaphocerite; k, second leg; l, third leg. h-l, x6.

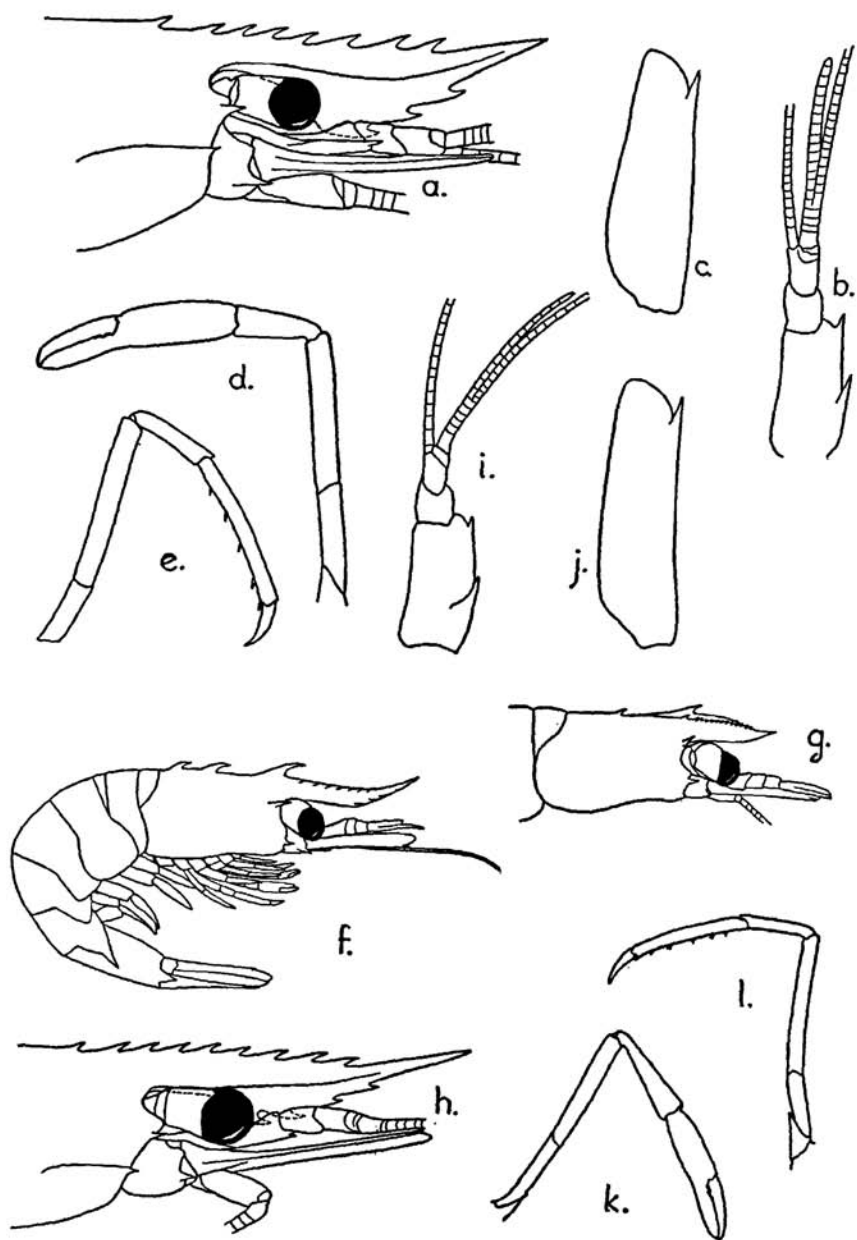


PLATE 45

Palaemon (Palaemon) peruanus Holthuis

a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, second leg; e, third leg. a-e, x6.

Palaemon (Palaemon) gracilis (Smith)

f, anterior part of body in lateral view; g, tip of telson; h, antennula; i, antenna; j, third maxilliped; k, second pereopod; l, third pereopod. f-l, x6.

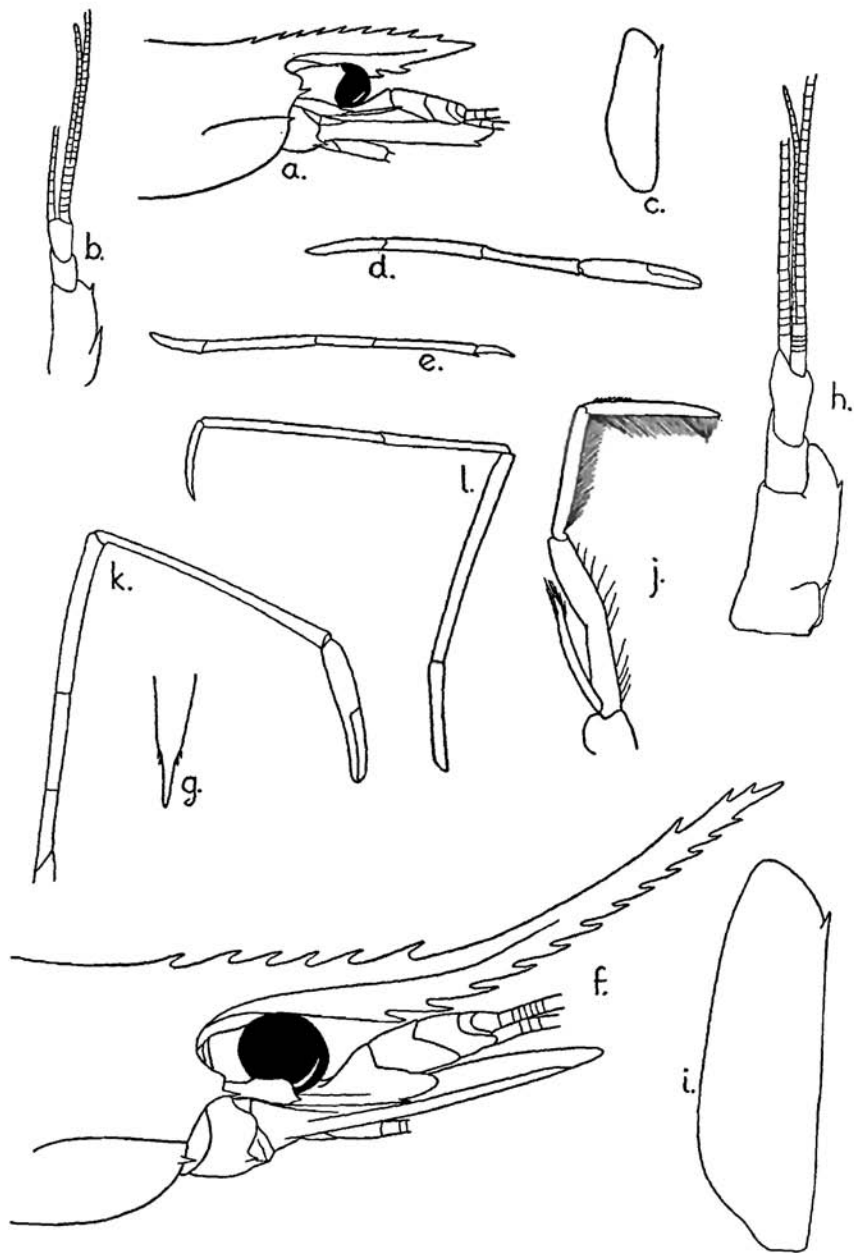


PLATE 46

Palaemon (Palaemon) hancocki Holthuis

a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, third maxilliped; e, second pereopod; f, third pereopod. a-f, x6.

Palaemon (Palaemon) pandaliformis (Stimpson)

g, anterior part of body in lateral view; h, tip of telson in dorsal view; i, antennula; j, scaphocerite; k, second pereopod; l, third pereopod. g-l, x6.

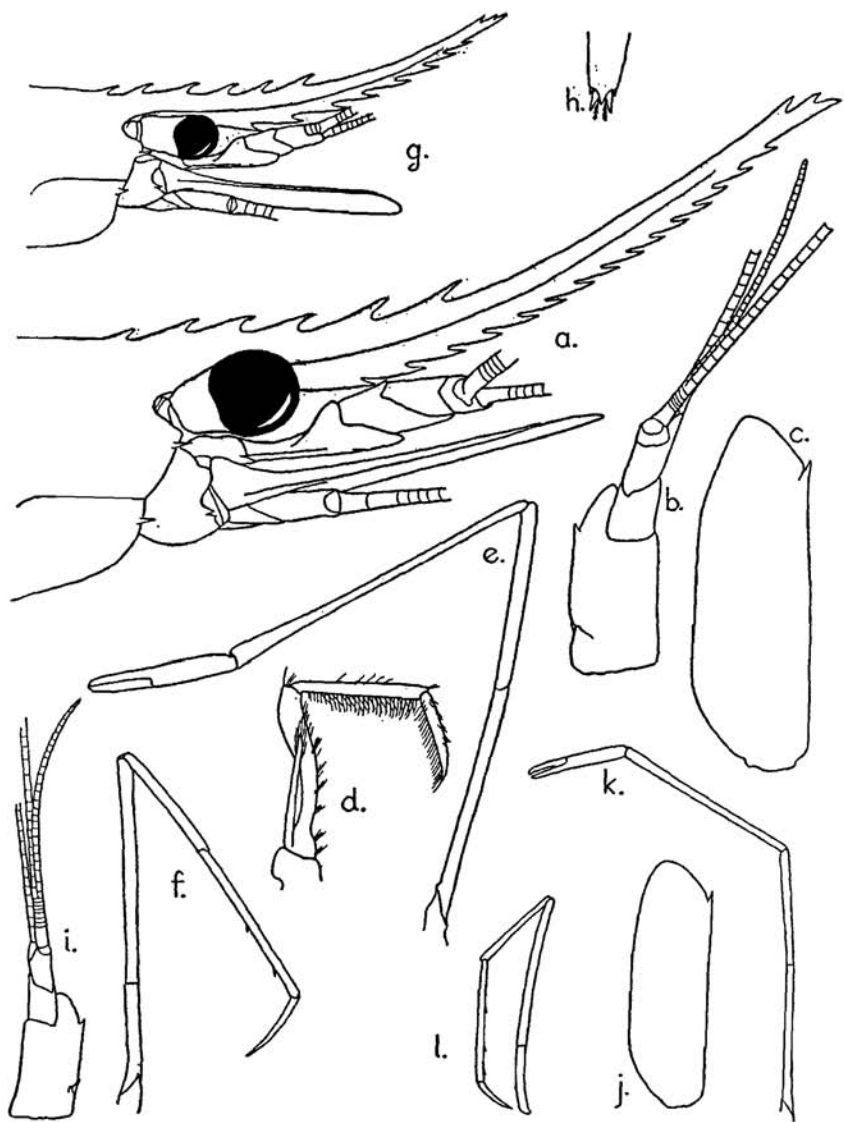


PLATE 47

Palaemon (Palaeander) northropi (Rankin)

a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, mandible; e, maxillula; f, maxilla; g, first maxilliped; h, third maxilliped; i, first pereopod; j, second pereopod; k, third pereopod; l, fifth pereopod. a-c, x7; d-f, x25; g-l, x10.

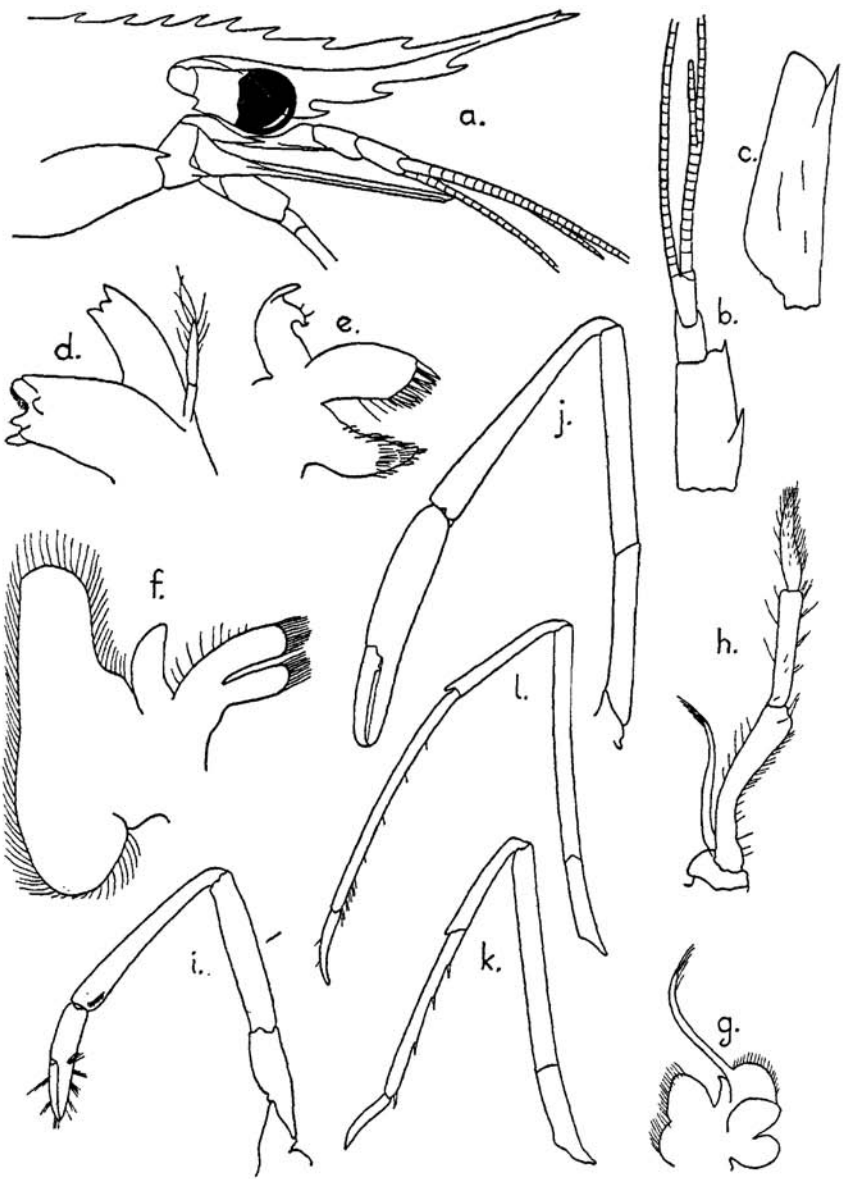


PLATE 48

Palaeomon (Palaeander) floridanus Chace

a, animal in lateral view; b, antennula; c, scaphocerite; d, telson in dorsal view; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped. a-j, after Chace, 1942.

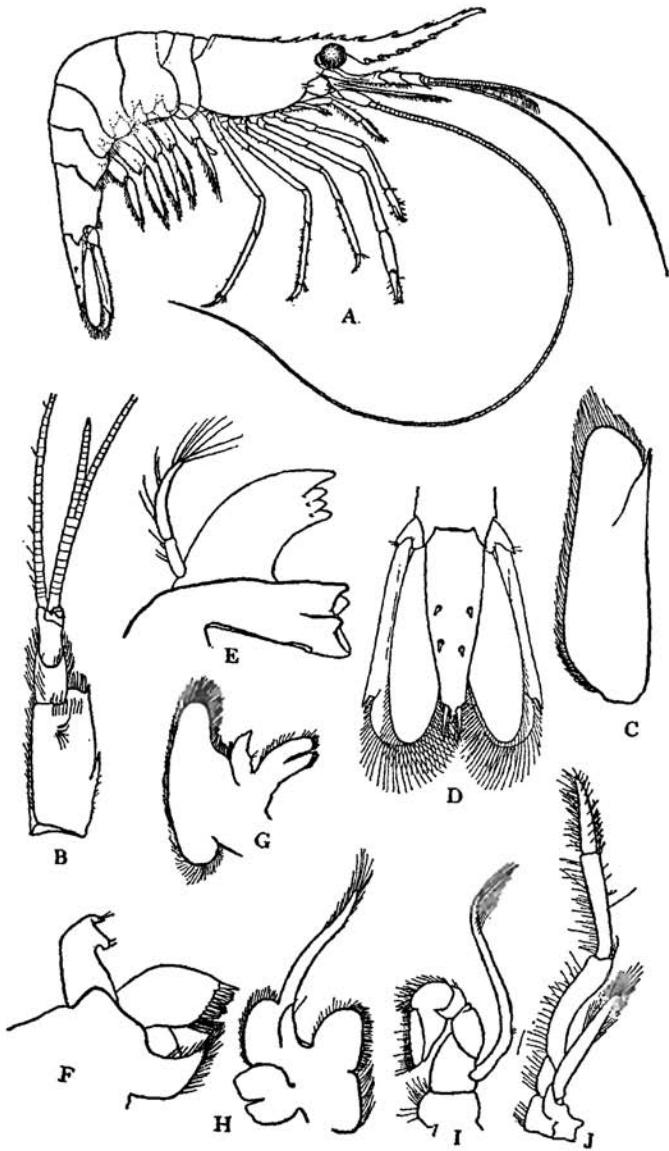


PLATE 49

Palaemonetes (Alaocaris) antrorum Benedict

adult specimen. a, anterior part of body in lateral view; b, telson in dorsal view; c, antennula; d, scaphocerite; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped; k, first pereopod; l, second pereopod; m, third pereopod. a-d, k-m, x15; e-j, x20.

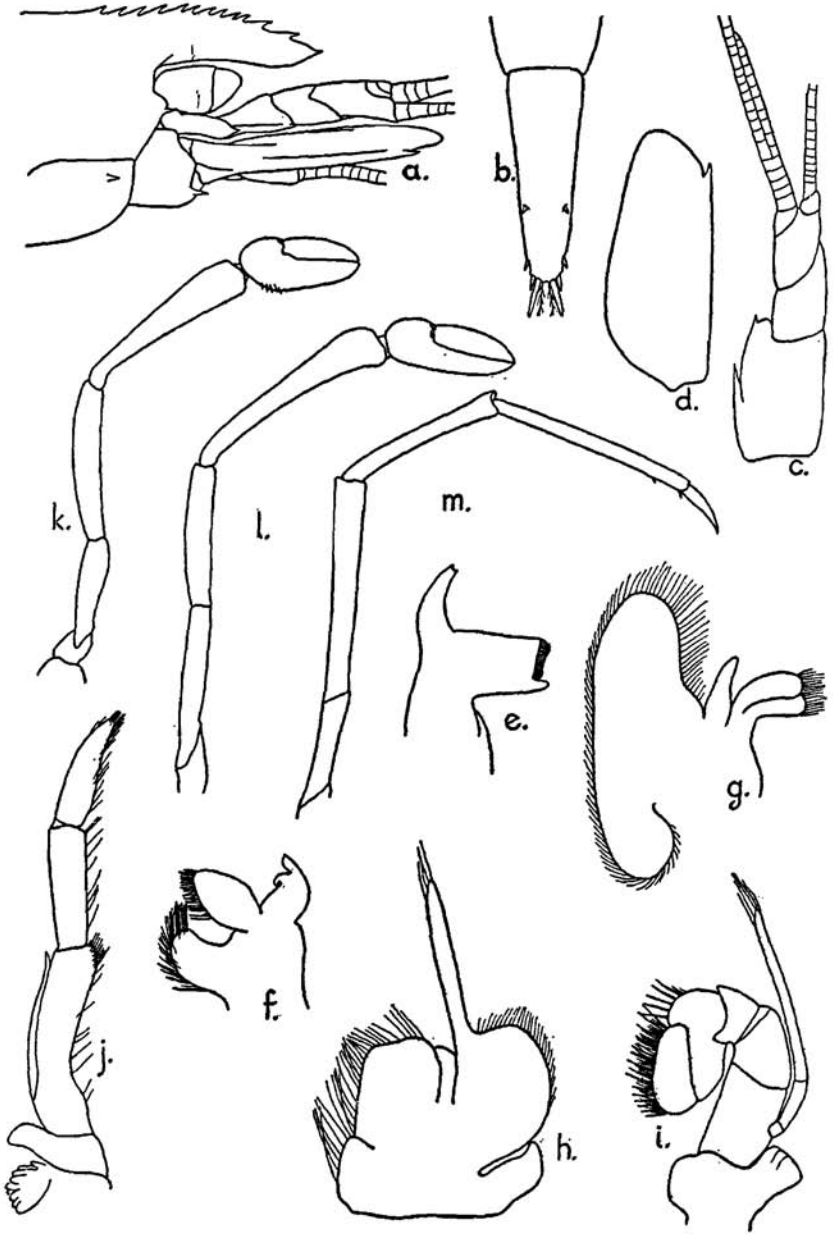


PLATE 50

Palaemonetes (Alaocaris) antrorum Benedict

(?), juvenile (?) specimen from Ezell's Cave. a, rostrum and eye in lateral view; b, antennula; c, antenna; d, mandible; e, maxillula; f, first maxilliped; g, second maxilliped; h, third maxilliped. a-c, h, x15; d-g, x20.

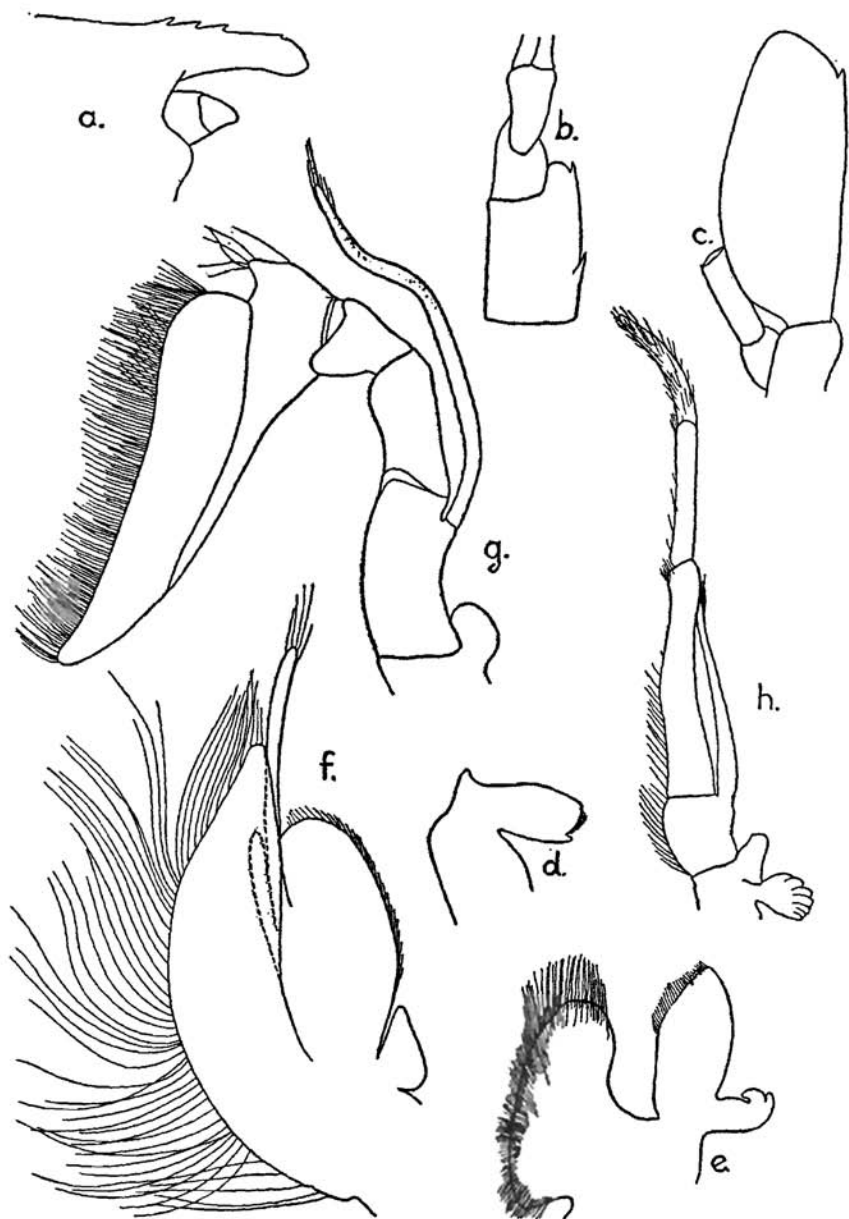


PLATE 51

Palaemonetes (Alaocaris) antrorum Benedict

(?), juvenile (?) specimen from Ezell's Cave. a, telson in dorsal view; b, first pereopod; c, second pereopod; d, third pereopod. a-d, x15.

Palaemonetes (Palaemonetes) paludosus (Gibbes)

e, anterior part of body in lateral view; f, telson in dorsal view; g, antennula; h, scaphocerite; i, second pereopod; j, third pereopod. e-j, x6.

Palaemonetes (Palaemonetes) kadiakensis Rathbun

k, anterior part of body in lateral view; l, telson in dorsal view; m, antennula; n, scaphocerite. k-n, x6.

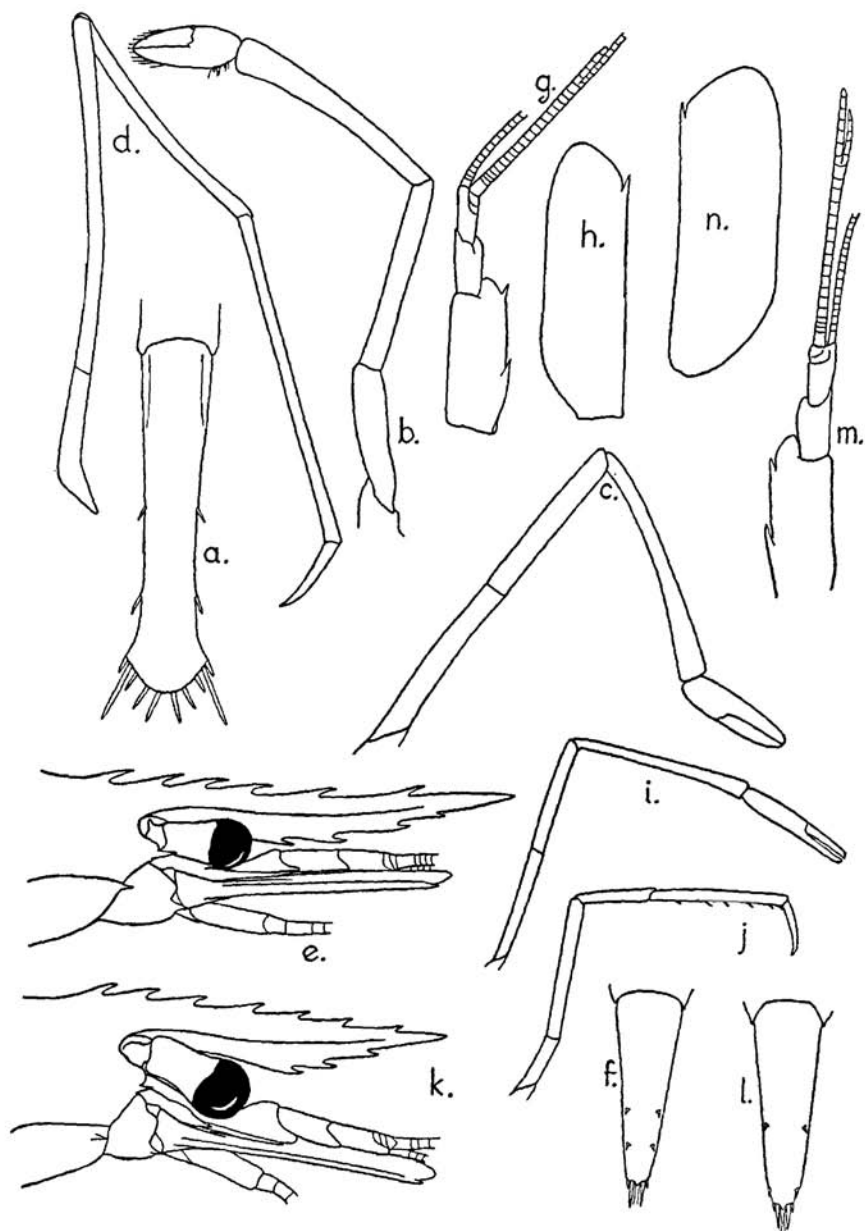


PLATE 52

Palaemonetes (Palaemonetes) kadiakensis Rathbun

a, second pereopod; b, third pereopod. a, b, x6.

Palaemonetes (Palaemonetes) carteri Gordon

c, anterior part of body in lateral view; d, telson in dorsal view; e, antennula; f, scaphocerite; g, mandible; h, maxillula; i, maxilla; j, first maxilliped; k, second maxilliped; l, third maxilliped; m, first pereopod; n, second pereopod; o, chela of second pereopod. c-f, l-p, x10; g-k, x25; o, x20.

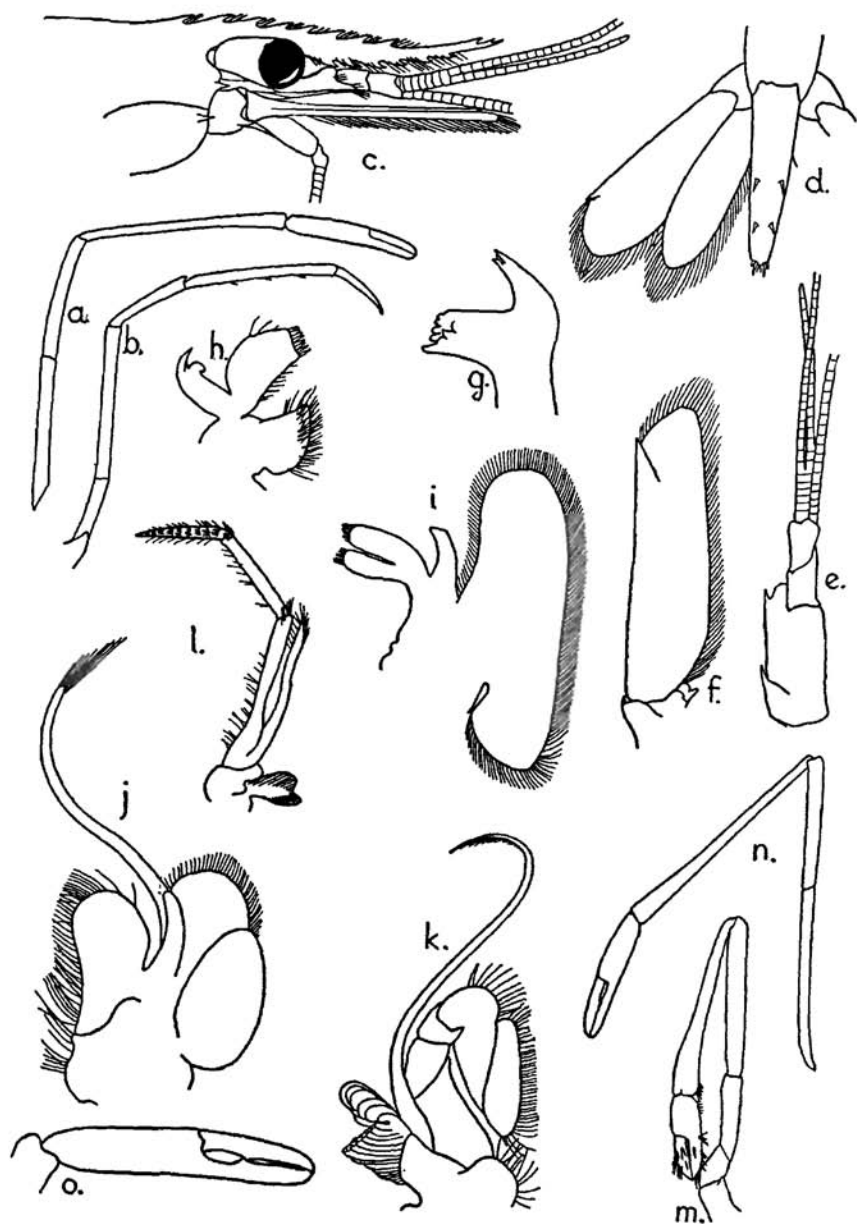


PLATE 53

Palaemonetes (Palaemonetes) carteri Gordon

a, third pereiopod; b, fifth pereiopod; c, first pleopod of male. a-c, x6.

Palaemonetes (Palaemonetes) ivonicus Holthuis

d, anterior part of body in lateral view; e, antennula; f, scaphocerite; g, second pereiopod; h, third pereiopod. d-h, x6.

Palaemonetes (Palaemonetes) argentinus Nobili

i, anterior part of body in lateral view; j, antennula; k, scaphocerite; l, second pereiopod; m, third pereiopod. i-m, x6.

Palaemonetes (Palaemonetes) hiltoni Schmitt

n, anterior part of body in lateral view; o, antennula; p, scaphocerite; q, second pereiopod; r, fingers of second pereiopod; s, third pereiopod. n-s, x6.

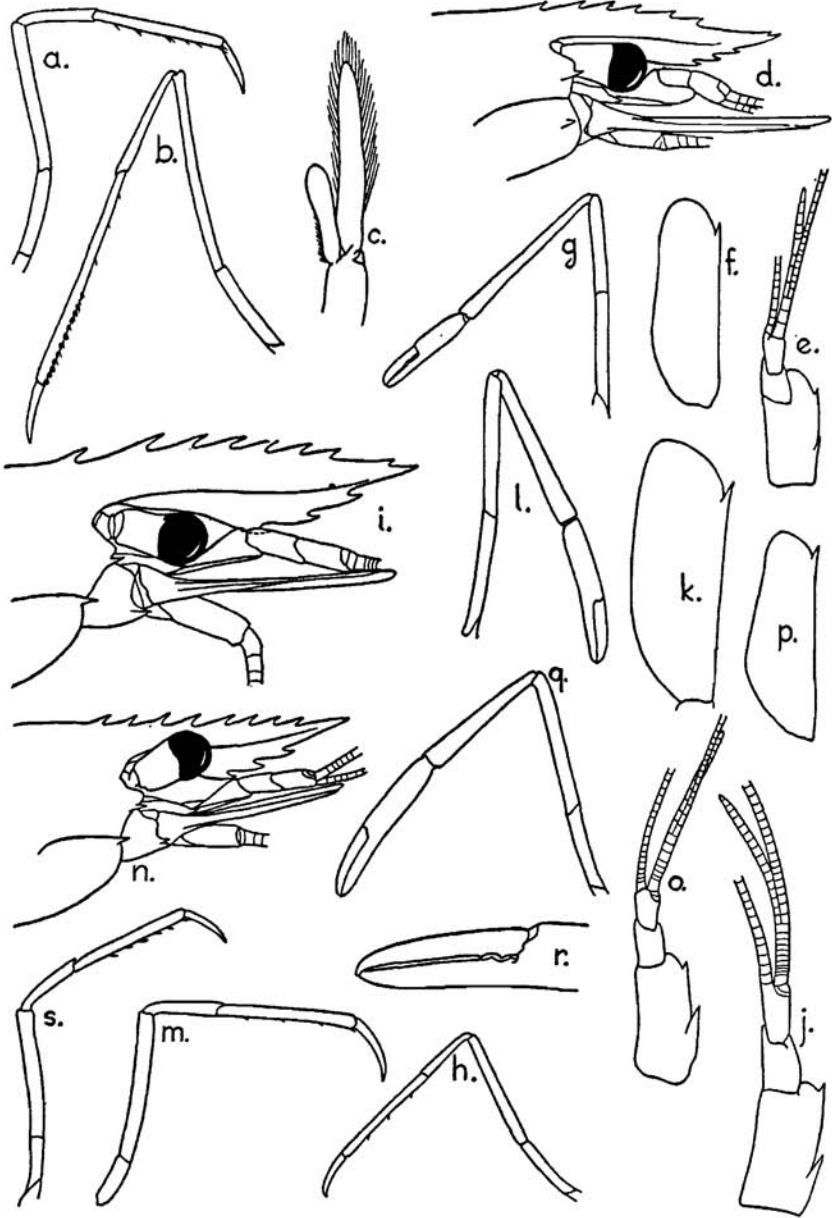


PLATE 54

Palaemonetes (Palaemonetes) schmitti Holthuis

a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, second pereopod; e, third pereopod. a-e, x6.

Palaemonetes (Palaemonetes) vulgaris (Say)

f, anterior part of body in lateral view; g, antennula; h, scaphocerite; i, second leg of female; j, second leg of male; k, fingers of second leg of female; l, third leg. f-l, x6.

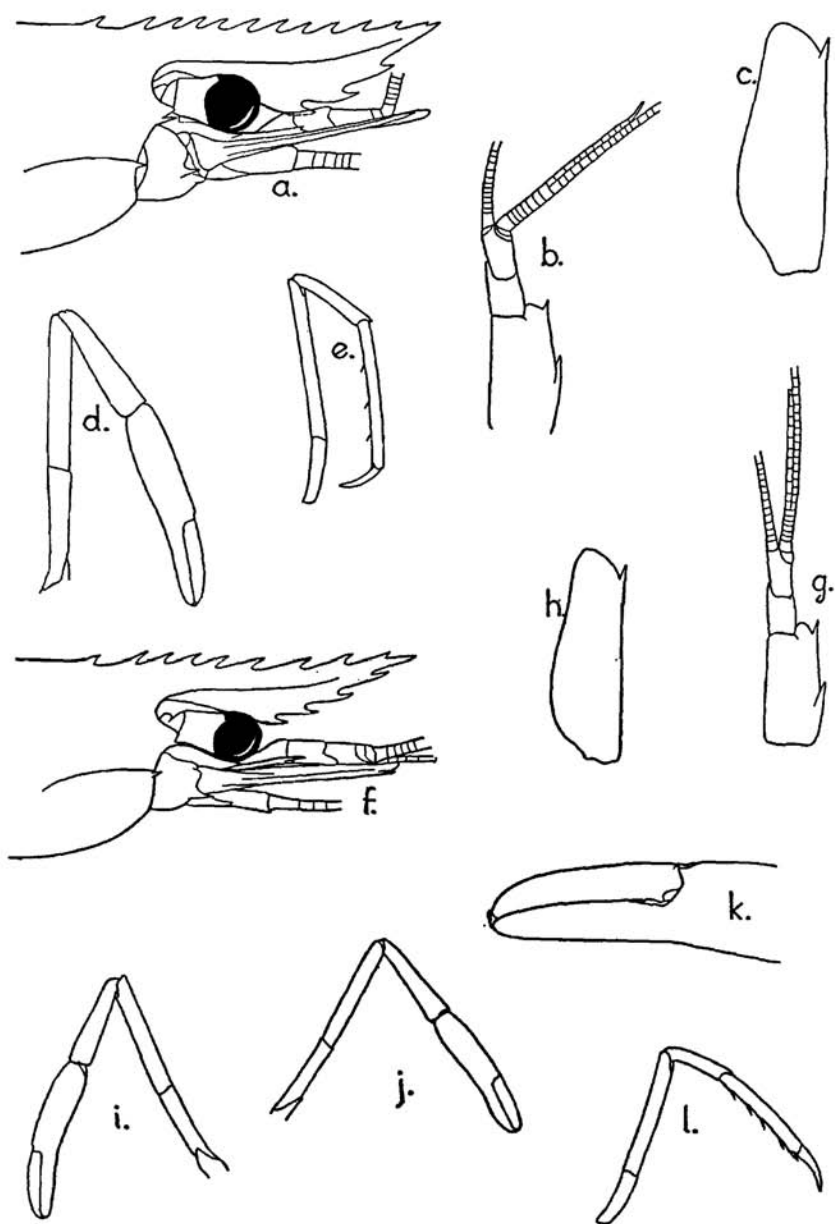


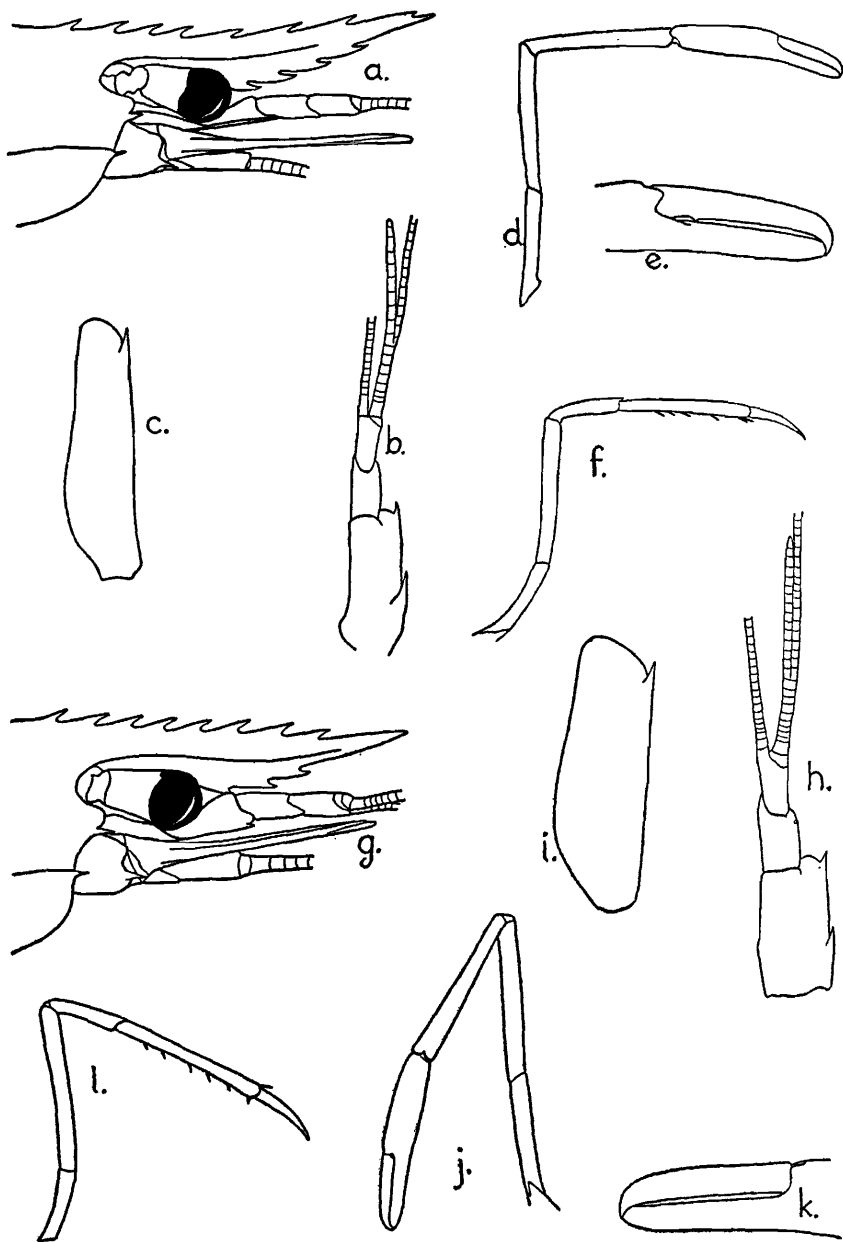
PLATE 55

Palaemonetes (Palaemonetes) intermedius Holthuis

a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, second pereopod of female; e, fingers of second pereopod of female; f, third pereopod. a-f, x6.

Palaemonetes (Palaemonetes) pugio Holthuis

g, anterior part of body in lateral view; h, antennula; i, scaphocerite; j, second pereopod of female; k, fingers of second pereopod of female; l, third pereopod. g-l, x6.





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