

BULLETIN
OF
THE AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME LIII, 1926

59.53,841 (67.5)

Article I.—THE MACRURAN, ANOMURAN, AND STOMATOPOD CRUSTACEANS COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION, 1909-1915¹

BY WALDO L. SCHMITT

WITH FIELD NOTES BY HERBERT LANG AND JAMES P. CHAPIN²

PLATES I-IX, TEXT FIGURES 1-75

INTRODUCTION

As with the brachyuran crustaceans,³ about a third of the total number of decapod crustaceans known from the western coast of Africa,⁴ or the faunal area extending from Senegal to Angola, are represented in the present collection. However, the very comprehensive series of several little-known species has enhanced the value of the material obtained far above what the mere acquisition of a species-representation would have been.

Of particular interest is the excellent series of Palæmonidæ, which has furnished data making possible a revision of the described species. Several forms heretofore considered distinct, having been based on inadequate material, are given what appears to be their true status as growth stages of the species to which they are assigned. So *Macrobrachium lenzii* and *M. dux* variety *congoensis* are but *M. dux* (Lenz), and *Macrobrachium jamaicense* variety *herklotsii*, a variant of *M. vollenhovenii* (Herklots).

The several varieties of *Caridina togoensis* prove, in the very large series of over 800 specimens obtained, to be founded on variations normal

¹Scientific Results of the American Museum Congo Expedition. General Invertebrate Zoölogy, No. 9.

²These notes are indicated in the text by quotation marks and the collectors' initials.

³Rathbun, 1921, Bull. Amer. Mus. Nat. Hist., XLIII, pp. 379-474.

⁴Based on Rathbun, 1900, Proc. U. S. Nat. Mus., XXII, pp. 271-316; de Man, 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), pp. 197-253; Balss, 1916, 1921, 'Beitr. Kenntnis Meeresfauna Westafrikas,' Crust. Decapoda Macrura, and Anomura.

to the species, and to be indistinguishably linked to the type by a rather complete series of intergrading forms.

The two apparently new species, *Crangon langi* and *Clibanarius chapini*, have undoubtedly long been confused with others supposedly existing on the African coast, but it has not been possible to secure material determined by other workers to definitely clear up this point. The newly described species are distinct from all previously known, so far as I have been able to ascertain.

The ranges of a number of species are extended southward along the West African coast: *Athanas grimaldii*, *Pontonia tyrrhena*, *Dardanus pectinatus* and *Upogebia furcata* to Angola; and *Crangon intrinsecus*, *Dardanus granulimanus*, *Clibanarius senegalensis*, *C. cooki*, *C. africanus*, *Diogenes denticulatus*, and *Scyllarus arctus paradoxus* (?) to the mouth of the Congo.

A review of the zoögeographic distribution of the marine decapods is given by Balss in the 'Beiträge zur Kenntnis der Meeresfauna Westafrikas.'¹ Of the twenty-five marine forms he reports from the French and Belgian Congo and Angola, only nine are represented in the present collection, which, however, has added at least thirteen new records for this particular region, two being apparently hitherto unrecognized species, the others extensions of range.

The economic utilization of certain species elsewhere along the West African coast has formed the basis of an interesting account by Gruvel on 'Les Crustacés comestibles de la Côte occidentale d'Afrique,'² embodying the fishery methods and species taken in lower Dahomey. The Congo *Macrura* also found on that coast and included in his report are: *Peneus trisulcatus* Leach (= *P. caramote* Risso), *Peneus brasiliensis* Latreille, *Macrobrachium (Palæmon) macrobrachion* (Herklots), and *Macrobrachium (Palæmon) vollenhovenii* (Herklots).

Great credit for whatever value this report may have is due to the care with which the collections were made by Messrs. Lang and Chapin, and the excellent series of the various species contained in those collections.

The photographs, except the first figure in each of Plates VIII and IX taken in the field by Mr. Herbert Lang, are by Mr. Clarence R. Shoemaker. Text figures 67, 68, 69b, 70-73 are the work of Mr. J. F. Mueller; the others are by the author.

Pages 64 to 67 comprise a "POSTSCRIPT" embodying several comments upon two papers which appeared while this report was in press.

¹1922, III, pp. 89-110.

²1912, Ann. Inst. Océan., V, fasc. 1, pp. 1-16, Pls. I, II, text figs. 1-6.

NOTES ON COLLECTING OF THESE CRUSTACEA; AND THE MAMMALIAN
AND AVIAN ENEMIES OF SHRIMPS¹

"Shrimps are considered a favorite tidbit by all of the natives of the Belgian Congo whom we saw. As a rule, they are consumed while fresh after being boiled and seasoned. The larger kind (*Palæmonidæ*) are much relished by white men stationed here.

"The headwaters of the Congo in the northeastern section of Belgian territory offer in this respect a particularly favorable hunting ground. Here the natives need not wait for the dry season. Although the shrimps are common in all of the larger streams, it is in the numerous shallow forest brooks that they are caught most easily, as even heavy freshets swell them for only a few hours.

"To secure these shrimps a party of a dozen or more women and children erect a temporary dam at certain favorable places. Branches, sticks, large leaves, mud, and sand make this barrier fairly water-tight. For the next few hours, as the section downstream from the structure runs dry the natives, of course, pick up everything eatable. The fish, crabs, and shrimps stranded there or hiding among and beneath rotten pieces of wood, branches, and leaves are rapidly collected. But real success comes with the bailing dry of the many pools and puddles still remaining. With small hand-nets of narrow meshes stretched on round wooden frames the natives scoop out whatever they can. Shrimps often hide in crevices on stony ground, or among roots and débris. Very often the largest shrimps (*Palæmonidæ*) are taken in regular fish-traps baited with manioc.

"Another method is commonly observed along the large rivers. On the banks of the Congo near Stanleyville in September, at certain shallow places near the shore, where the water is nearly stagnant, masses of tiny, grayish, dark-speckled shrimps, *Caridina togoensis* Hilgendorf, swim about. Women stand in the water up to their hips catching these little creatures. Working in pairs, one drives the hosts of shrimps toward her partner's small hand-net, which, after each successful dip, is emptied into the baskets hanging from their shoulders.

"Among the mammalia the West African otter-shrew, *Potamogale velox* Du Chaillu, being an excellent swimmer and diver, plays greatest havoc with shrimps. Its stomach contents, and also its excrement deposited on stones projecting above the water or near the bank of the

¹For an account of general ecological conditions of the Congo Estuary and typical photographs thereof, as well as of the water-courses farther inland, cf. Lang, in Rathbun, 1921, *Bull. Amer. Mus. Nat. Hist.*, XLIII, pp. 387-392, Pls. xvi, fig. 2, and lv-lxiv.

river, when washed, distinctly show particles of the carapace and abdominal segments of smaller forms of shrimps. Sometimes, too, the larger ones (Palæmonidæ) are eaten, as is evident from remains at its feeding places, most of the harder parts being rejected. Its general diet includes river-crabs (Potamonidæ), small fishes, and aquatic insects.

"Both of the African otters, *Lutra maculicollis* Lichtenstein and *Aonyx capensis* (Schinz), make crustaceans an important part of their diet. Shrimps, of course, are eaten in only small quantities, except during the dry season when in the savannah many of the rivers dry out and such creatures are left stranded.

"The water mongoose of the Ituri Rain Forest, *Atilax macrodon* J. A. Allen, and its northern relative, *Atilax robustus* Gray, from the Uele and White Nile region feed on shrimps, as is shown by stomach contents. They generally go to swampy areas for all sorts of prey, even hemipterous insects commonly found in puddles on the road. The typical tracks of their feet, with the entirely free, unwebbed digits, give irrefutable proof of their identity." (H. L.)

"The fresh-water shrimps of the Congo do not form a very large item in the food of birds. Looking through our rather extensive notes on stomach-examinations of the birds we collected, I find only seven species which had eaten shrimps or nearly allied crustacea which we listed under the same term. In only two cases did it seem as though such crustacea would form a fair percentage of the birds' food. One of these was the common, small river-cormorant, the other the malachite kingfisher. The relative importance of this component of the diet will be taken up under the respective species.

"The small cormorant of the rivers of tropical Africa, *Phalacrocorax africanus* (Gmelin), is stated by most authorities to feed mainly upon fish, and it will also take insects (grasshoppers, for example), frogs, and mollusca.¹ In the stomachs of two individuals, one from Stanley Falls, the other from Faradje, I found numbers of small shrimps: twelve in one case and an even greater quantity in the other. A few fish-bones were also present in one of them. I think it likely, if I had been able to examine more of the cormorants, that the shrimps would have proved a relatively important food.

"Among fourteen species of herons and bitterns I am surprised to find that only two, both egrets, had taken any crustaceans other than crabs. Of the little egret, *Egretta garzetta* (Linnæus), the only stomach

¹Heuglin, 1873, 'Ornithologie Nordost-Afrika's,' p. 1495; Stark and Sclater, 1906, 'Birds of South Africa,' IV, p. 10.

examined disclosed a great many small shrimps, ten small dragon-flies, three spiders, a grasshopper, and a water-strider. In South Africa the food of the species is said to consist of fishes, frogs, small crustacea, and occasionally aquatic molluscs of small size.

"Of the somewhat larger yellow-billed egret, *Melanophox intermedius brachyrhynchos* (Brehm), we likewise investigated only a single stomach, but found in it pieces of an aquatic hemipteron and some shrimps.

"The hammerhead stork, *Scopus umbretta* Gmelin, is anything but common in the forested area of the Upper Congo. Of three stomachs, we found two containing only dark gray, muddy refuse, such as is often present in the stomachs of true storks; in the third there were four small fish and a shrimp.

"Of seven species of Anatidæ which we secured in the Upper Congo, only Hartlaub's teal, *Pteronetta hartlaubi* (Cassin), was found to have eaten a shrimp. Moreover, this occurred but once in ten stomachs examined. Six of the stomachs, to be sure, held only coarse sand; the four remaining had numbers of aquatic insect-larvæ, mainly dragon-flies, many small seeds, some snails, a spider, two tiny bivalve molluscs, and a single shrimp.

"The African sun-grebe or finfoot, *Podica senegalensis senegalensis* (Vieillot), seldom if ever dives, and is certainly not a great fish-eater. In the seven stomachs we studied there were invariably remains of insects, often beetles, but also a dragon-fly larva, a green grasshopper, and wings of a dragon-fly. One of the birds had also eaten a small crab; another two snails, some small shrimps, and a small millipede. G. L. Bates¹ has likewise recorded bits of prawns as found in the gizzard of *Podica senegalensis camerunensis* Sjöstedt.

"The foremost shrimp-fisher among the African birds I have studied is undoubtedly the tiny malachite kingfisher, *Corythornis cristata* (Pallas). It is often stated to eat small fish, and Dr. van Someren² has photographed it with a minnow, as well as a tiny frog, in its bill. But in my experience in the Upper Congo it seemed far more fond of small crustacea. In the six stomachs of which I took special note, no fish remains were met with; but in four cases they were crammed with pieces of small, fresh-water shrimps. The two others held bits of insects, including beetles and one grasshopper. I do not know whether the principal item of food has an influence on the local abundance of this small king-

¹1909, *Ibis*, p. 8.

²1922, *Novitates Zoologicae*, XXIX, Pls. II-IV.

fisher, but it is worthy of mention that *Corythornis cristata* is a rare bird in those parts of the Congo, such as the Ituri, where the rivers attain no great size and their banks are completely covered with rain-forest." (J. P. C.)

NEW SPECIES, WITH THEIR TYPE LOCALITIES

Crangon langi. Banana.
Clibanarius chapini. St. Paul de Loanda.

LIST OF SPECIES AND SUBSPECIES TAKEN BY THE AMERICAN MUSEUM CONGO EXPEDITION

	Page
<i>Peneus trisulcatus</i> Leach.....	9
<i>Peneus brasiliensis</i> Latreille.....	9
<i>Parapeneopsis atlantica</i> Balss.....	10
<i>Caridina togoensis</i> Hilgendorf.....	11
<i>Athanas grimaldii</i> Coutière.....	19
<i>Crangon langi</i> , new species.....	20
<i>Crangon intrinsecus</i> (Bate).....	23
<i>Crangon</i> species ?.....	23
<i>Desmocarid trispinosus</i> (Aurivillius).....	23
<i>Palæmon squilla</i> (Linnæus).....	24
<i>Palæmon maculatus</i> (Thallwitz).....	25
<i>Macrobrachium macrobrachion</i> (Herklots).....	27
? <i>Macrobrachium sollaudii</i> (de Man).....	28
<i>Macrobrachium foai</i> (Coutière).....	29
<i>Macrobrachium luzæ</i> (de Man).....	30
<i>Macrobrachium dux</i> (Lenz).....	33
<i>Macrobrachium vollenhovenii</i> (Herklots).....	37
<i>Macrobrachium olfersii</i> (Wiegmann).....	40
<i>Pontonia tyrrhena</i> (Petagna).....	40
<i>Panulirus regius</i> Brito Capello.....	42
? <i>Scyllarus arctus paradoxus</i> Miers.....	43
<i>Upogebia furcata</i> (Aurivillius).....	44
<i>Dardanus pectinatus</i> (Ortmann).....	45
<i>Dardanus granulimanus</i> (Miers).....	49
<i>Clibanarius chapini</i> , new species.....	49
<i>Clibanarius senegalensis</i> Chevreux and Bouvier.....	52
<i>Clibanarius cooki</i> Rathbun.....	52
<i>Clibanarius africanus</i> Aurivillius.....	55
<i>Diogenes denticulatus</i> Chevreux and Bouvier.....	56
<i>Hippa cubensis</i> (Saussure).....	57
? <i>Pseudosquilla ferussaci</i> (Roux).....	57

LIST OF LOCALITIES WITH NAMES OF SPECIES AND SUBSPECIES TAKEN
AT EACH

Aba	Malela
<i>Macrobrachium lujæ</i>	<i>Macrobrachium macrobrachion</i>
Avakubi	<i>Macrobrachium vollenhovenii</i>
<i>Caridina togoensis</i>	<i>Macrobrachium olfersii</i>
<i>Macrobrachium dux</i>	Moanda
Banana	<i>Dardanus granulimanus</i>
<i>Peneus trisulcatus</i>	Niangara
<i>Peneus brasiliensis</i>	<i>Caridina togoensis</i>
<i>Parapeneopsis atlantica</i>	Niapu
<i>Crangon langi</i>	<i>Macrobrachium dux</i>
<i>Crangon intrinsecus</i>	San Antonio, Angola
<i>Palæmon maculatus</i>	<i>Upogebia furcata</i>
<i>Macrobrachium macrobrachion</i>	St. Paul de Loanda, Angola
<i>Panulirus regius</i>	<i>Peneus trisulcatus</i>
? <i>Scyllarus arctus paradoxus</i>	<i>Athanas grimaldii</i>
<i>Upogebia furcata</i>	<i>Crangon</i> species?
<i>Dardanus granulimanus</i>	<i>Palæmon squilla</i>
<i>Clibanarius senegalensis</i>	<i>Pontonia tyrrhena</i>
<i>Clibanarius cooki</i>	<i>Dardanus pectinatus</i>
<i>Clibanarius africanus</i>	<i>Clibanarius chapini</i>
<i>Diogenes denticulatus</i>	Stanleyville
<i>Hippa cubensis</i>	<i>Caridina togoensis</i>
<i>Pseudosquilla ferussaci</i>	<i>Desmocariss trispinosus</i>
Batama	<i>Macrobrachium foai</i>
<i>Macrobrachium dux</i>	<i>Macrobrachium lujæ</i>
Faradje	Locality not recorded
<i>Caridina togoensis</i>	<i>Macrobrachium sollaudii</i>
	<i>Macrobrachium dux</i>

Tribe **PENEIDEA**

Peneidæ

Peneinæ

PENEUS Weber

Peneus WEBER, 1795, 'Nomenclator entomologicus,' p. 94.

Peneus trisulcatus Leach

Penæus trisulcatus LEACH, 1815, Trans. Linn. Soc. London, XI, p. 347; 1816, 'Malac. Pod. Brit.,' Pl. XLII. PESTA, 1915, Archiv f. Naturg., LXXXI, Abteil. A, Heft 1, p. 109, and synonymy.

Penæus caramote RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 311, and synonymy. DE MAN, 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 248, and synonymy. BALSS, 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 15, and synonymy.

This well-known Mediterranean species ranges along the West African coast as far as Benguela, and is also found off the coast of Spain and Portugal.

Banana, July 1915, 3 ♂, 3 ♂; August 1915, 5 ♀, 12 ♀. St. Paul de Loanda, September 22, 1915, 1 ♂, 1 ♀.

"These shrimps are brought to the market in St. Paul de Loanda in great quantities. At low tide, not far from town, on the flat sandy beach of the bay, every day I saw (September) the shrimp-catchers, barefoot boys and girls, walking back and forth along the shore. In the rather soft wet sand they feel about with their feet for their victims which they throw alive into the baskets hanging from their shoulders.

"It is interesting to watch these shrimps manage to become imbedded one or two inches below the surface of the sand without leaving a trace of their presence. Previous to this they are moved back and forth by the waves. One has to be on the spot at the time of the receding tide. At about the point where the incoming waves are checked by the force of the undertow, the seething waters carry up clouds of sand in suspension. Into these the shrimps steer and with much dexterity and ease arrange to be covered over with the descending grains of sand under which they are habitually found. In that part of the beach the sand always remains loose and moist.

"In life *Peneus trisulcatus* is transparent, of a grayish color with dark gray and greenish brown mottlings, and about three and one-half inches long over all." (H. L.)

Peneus brasiliensis Latreille

Penæus brasiliensis LATREILLE, 1817, 'Nouv. Dict. Hist. Nat.,' 2nd Ed., XXV, p. 156. RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 311. LEFEBVRE, 1908, Bull. Mus. Hist. Nat., Paris, XIV, p. 267. MILNE EDWARDS and BOUVIER, 1909,

Mem. Mus. Comp. Zool., Cambridge, XXVII, p. 235, Pl. vi, figs. 11, 12, text figs. 64-67. PESTA, 1915, Archiv f. Naturg., LXXXI, Abteil. A, Heft 1, p. 113. BALSS, 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 14.

On the West African coast, this familiar American form ranges from Senegal as far south as Angola (Balss).

Banana, July 1915, 1 ♂, 1 ♀.

Balss directs attention to the observations of Lefebvre which indicate its adaptation to a fresh-water habitat in Lake Ahémé, Dahomey. This species is readily distinguished from the next in not having lateral marginal spines on the telson.

PARAPENEOPSIS Alcock

Parapeneopsis ALCOCK, 1901, 'Cat. Indian Deep-Sea Crust.,' p. 14; 1906, 'Cat. Indian Decapod Crust., Pt. 3, fasc. 1, p. 34.

Parapeneopsis atlantica Balss

Plate I, Figure 2

Parapeneopsis atlantica BALSS, 1914, Zool. Anz., XLIV, p. 593; 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 16, text fig. 2.

Trachypenæus constrictus var. *africana* BALSS, *loc. cit.*, 1916, p. 17, text figs. 3, 4.

Known from a number of localities from the Gold Coast, Togo, Dahomey, Cabinda, the French Congo and Angola (Balss).

Banana, 1 ♂, 12 ♀.

MEASUREMENTS.—Of the single male: rostrum 7.5, carapace 10.8, abdomen and telson 30, telson 7 mm. long; of largest female: rostrum 28, carapace 26, abdomen and telson 65, telson 16 mm. long.

The females here assigned to *Parapeneopsis atlantica* are so in agreement with the figures Balss gives for his variety *africana* that I feel sure that he failed to note that the last three and not only the last two pairs of legs lack epipodites, and the fact that the longitudinal suture of the carapace extends nearly to the posterior margin, as in the male *P. atlantica*.

The male has a short, evident post-rostral carina behind the epigastric tooth half-way to the posterior margin of the carapace. In the female it is equally long and, moreover, it extends backward nearly to the posterior margin of the carapace as a smooth band, a suggested but not raised carina. The triangular area lying between the hepatic spine, the orbital margin and the post-rostral carina is more or less lightly pubescent in both male and female. The spines and sulci of the carapace are in exact agreement in both sexes; the groove beneath the hepatic spine fails to reach the margin of the carapace near the antero-lateral angle. Balss's figure of the female (*loc. cit.*, 1916, text fig. 3) is surely incorrect

in showing this groove as reaching the margin of the carapace. The antennular flagella are relatively the same length in both sexes. Basal spines are present on both of the first two pairs of legs; Balss says (*loc. cit.*, 1914) on the first pair only.

The rostrum of the male, though having about the same appearance, shape, and number of teeth as in the female, is quite a bit shorter, attaining but the middle of the last segment of the antennular peduncle; above it has nine teeth in addition to the epigastric, as in the type. The last dorsal tooth is about over the middle of the second segment of the antennular peduncle, thus leaving about the distal fourth unarmed. In the largest female almost the distal third of the rostrum is without teeth, and, as in Balss's figure 3, the last tooth about coincides with the end of the antennular peduncle. In the twelve females before me the dorsal teeth, counting the epigastric, vary from ten to twelve in number; one had a broken rostrum, six had ten dorsal teeth including the epigastric, four had eleven, and one twelve.

Tribe CARIDEA

Atyidae

CARIDINA Milne Edwards

Caridina H. MILNE EDWARDS, 1837, 'Hist. Nat. Crust.,' II, p. 362.

Caridina togoensis Hilgendorf

Text Figures 1 to 62

Caridina togoensis HILGENDORF, 1893, Sitzb. Gesell. Naturf. Freunde Berlin, p. 156. RATHBUN, 1900, Proc. U. S. Nat Mus., XXII, p. 314.

Caridina togoensis var. *stuhmanni* HILGENDORF, 1898, 'Deutsch-Ost-Afrika,' IV, No. 7, p. 35.

Caridina togoensis var. *decorsei* BOUVIER, 1904, Bull. Mus. Hist. Nat., Paris, X, p. 131; 1905, Bull. Sci. France et Belgique, XXXIX, p. 81, fig. 5. BALSS, 1914, 'Ergeb. Zweiten Deutschen Zentral-Afrika-Exped. 1910-1911,' I, Zool., p. 97.

Caridina togoensis var. *breviatus* LENZ, 1910, 'Wissen. Ergeb. Deutschen Zentral-Afrika-Exped. 1907-1908,' III, Zool., I, p. 131.

Previously recorded from Adeli near Bismarckburg, Togoland (type locality, Hilgendorf); Bangoran River,¹ Gribingi-Tchad territory, and river near Mpoko (=Kukuru River), French Congo (Bouvier, var. *decorsei*); Fort Crampel (Gribingi, Balss, var. *decorsei*); Libenge, Upper Ubangi (Balss, var. *decorsei*); near Mawambi in an affluent of the Ituri River, in a pool of the same river near Avakubi (Lenz, var. *decorsei*); brook at Undussuma (Hilgendorf, var. *stuhmanni*); and in a brook in the virgin forest ("Urwaldbäche") northwest of Beni (Lenz, var. *breviatus*).

¹The Gribingi, Kukuru, and Bangoran are headwaters of the Shari River.

Stanleyville, April 1915, about 515 (49 ovig. ♀). Avakubi, October 7, 1909, about 200 (7 ovig.). Niangara, November 1909, 11 ♂, 19 ♀. Faradje, January 1913, about 141 (19 ovig.).

Beni lies to the east of the Congo-Nile divide. Lenz's statement (in the tabular summary of the distribution of his material) places his *C. t.* var. *breviatus* 20 kilometers northwest of Beni. An orographical map published in 1918 by the Royal Geographical Society of London shows that a river lying in that direction might well belong to the Congo watershed, although the map accompanying Schubotz's preliminary account of the German Central African Expedition¹ seems to place these specimens within the Nile watershed, an occurrence of considerable interest with respect to the geographical distribution of the Crustacea of the Congo region.

MEASUREMENTS.—Of the largest specimen observed, a female from Stanleyville: length of rostrum, of which the extreme tip is missing, 5.5; preorbital length of antennular peduncle, 4.25; post-orbital length of carapace, 5.5; depth of carapace, 4; length of abdomen about 18; length of telson exclusive of terminal spines, 3.5 mm.

DESCRIPTION.—A much more variable species than hitherto realized by authors. The rostrum varies in length, reaching from about as far as the middle of the last segment of the antennular peduncle to, in exceptional cases, twice the length of the last segment beyond the end of the antennular peduncle. Most specimens seem to have the rostrum a little longer than the antennular peduncle. The rostrum varies in both shape and direction; sometimes it is directed a little downwards proximally, while distally it is ascendant with a very slightly curved tip; in some specimens the upper outline is slightly convex, but in many it is quite straight. The length of the free portion of the rostrum, as compared to its depth, varies from about 5 to 8.3 times as long as deep, not including the dorsal spines.

Of the 153 specimens tabulated below the dorsal rostral teeth range from 10 to 29 in number; of these from 2 to 6 may be on the carapace, though in the specimens with 28 teeth but 2, and in one with 29 teeth, but 3 teeth were situated on the carapace. The more usual number of dorsal rostral teeth lies between 14 and 22, the greater number of specimens having 17, 18, or 19 teeth; of these the greater number of specimens have 3 teeth on the carapace. Below, the teeth vary from 3 to 17 in number; the more usual range, however, being 6 to 12; the greater number of specimens had 7, 8 or 9. The tooth-free portion of the rostrum varies considerably above and below. In any large series about 50 per cent of the specimens will have the unarmed distal portion well marked, occupying dorsally in one case more than one-third the length of the free portion of the rostrum; in the remaining 50 per cent the teeth, above and below, run quite close to the tip, practically eliminating what might be called a tooth-free portion.

¹1909, Sitzb. Gesell. Naturf. Freunde Berlin, pp. 383-400, 1 map.

The carpus of the first pair of chelipeds is usually just about twice as long as broad, varying from 1.9 in one case to 2.2 times as long as broad in another. In Bouvier's figured var. *decorsei*, the carpus appears to be about 2.3 times as long as broad, while in Hilgendorf's var. *stuhmanni* this relation rises as high as 2.5. The movable finger seems to be most often five-ninths the length of the palm, but in many cases about equals the palm, or half the hand, in length.

The carpus of the second pair of chelipeds is usually just about six times as long as its greatest width, varying from 5 to 6.6 times as long as broad; the movable finger is predominantly 1.3 times the length of the palm, occasional specimens having the movable finger as much as 1.4 to 1.5 times as long; the carpus is from 1.2 to 1.3 times the length of the hand.

The dactyl of the third legs is about 5 times as long as wide, exclusive of the marginal spines, and is contained in the propodus about 3.5 times; the spines on the under or lower margin, including the apical or terminal one, number from 7 to 10 (based on a count of twenty specimens); mostly there were 7 or 8 spines on the dactyl.

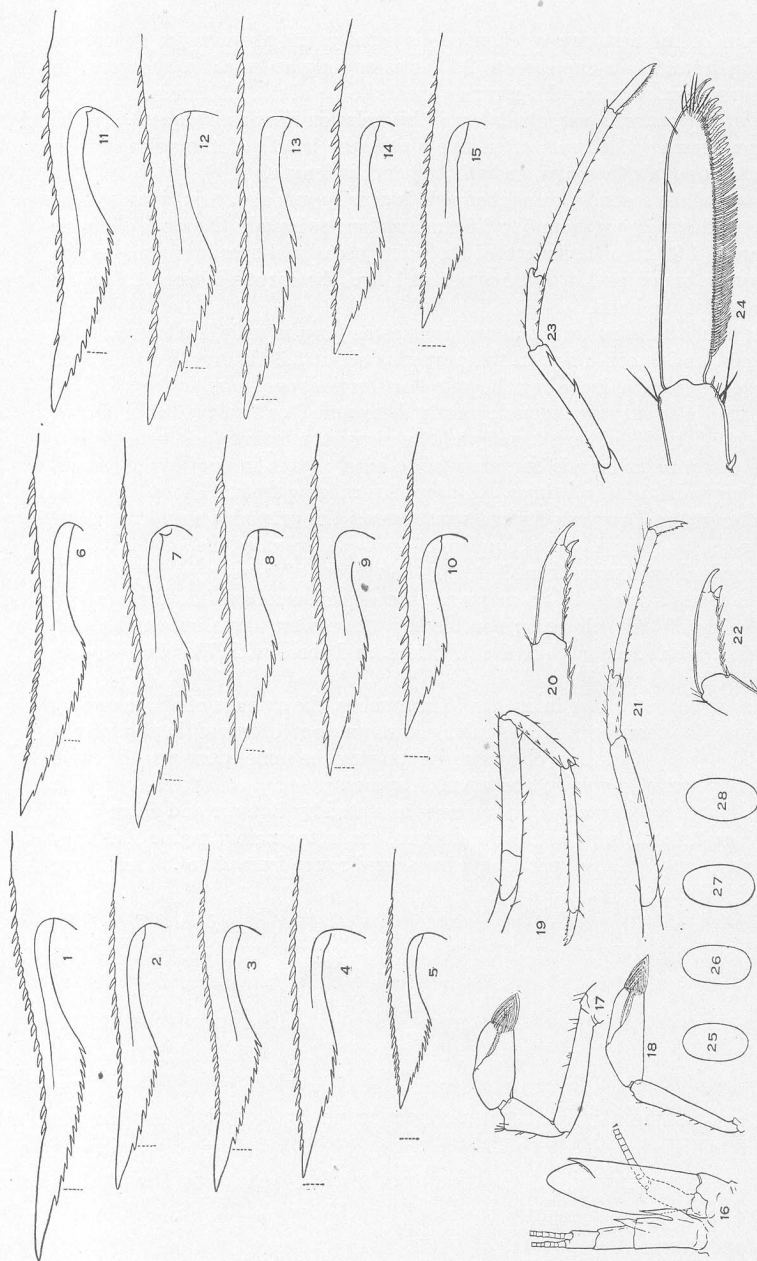
The dactyl of the fifth legs is usually a little more than 6 times as long as broad, ranging from 5.8 times as long in one instance to nearly seven in another; it is contained in the propodus nearly 3 times, the propodus ranging from 2.7 to 3.1 times as long as the dactyl; in Bouvier's figured var. *decorsei* the propodus seems to be 2.4 times as long as the dactyl. The number of movable spinules, not counting the immovable terminal one, varies from 51 to 80, the average of twenty specimens being 65.6. Only in two instances did as many as three specimens have the same count, only the right leg of the pair being considered; these were three specimens each having 62 spinules on the dactyl of the fifth legs, and three with 73 spinules; two specimens had 51, and two 60.

The uropodial spines range from 9 to 16 in number, the average of about twenty specimens being 12, though this particular count was not observed in any of the specimens. The greatest number of specimens showing the same count was five with 10 spines, and five with 14 spines; three had 11 spines.

The eggs do not appear to be quite as large as stated by Bouvier and Hilgendorf, the former giving $1.1 \times .6$ mm. as the dimensions, the latter merely saying that they were over 1 mm. long. Those that I have measured range from .9 to .98 mm. long by from .55 to .57 mm. wide.

Our specimens conform nicely with the key to the species of *Caridina* elaborated by Bouvier¹ as the result of his detailed analysis of 'Les Caridines des Seychelles' obtained by J. Stanley Gardiner. In this key the usual number of uropodial spines in *C. togoensis* is given as 10 or 11, and the spinules on the dactyl of the fifth legs 42. As noted above, the number of uropodial spines varies from 9 to 16, with 10 and 14 being apparently the counts of most frequent occurrence, but, as to the spinules upon the dactyl of the fifth pair of legs, in none of the twenty specimens in which these were examined did the number fall as low as that given by Bouvier; the average number was about 65, with 62 and 73 most frequently occurring.

¹1913, Trans. Linn. Soc. London, (2) XV, Zoöl., pp. 462-465.



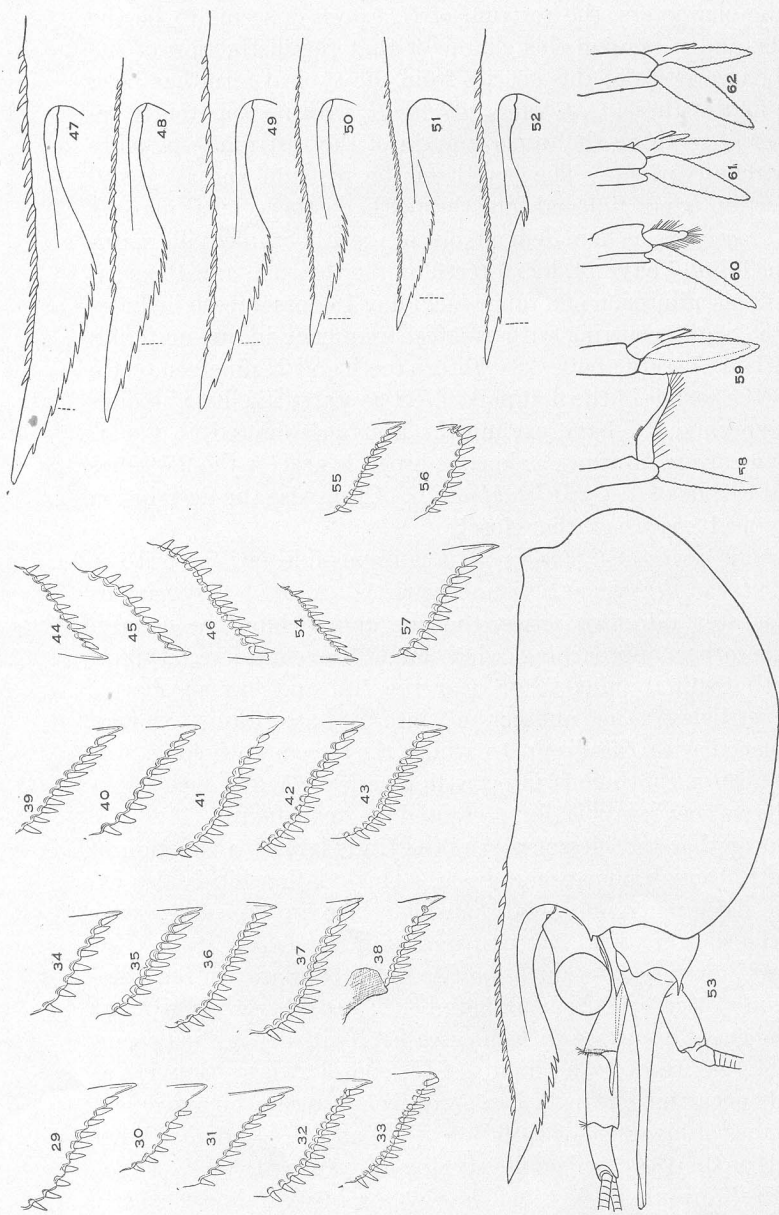
Figs. 1-28. *Caridina togoensis* Hilgendorf, from Stanleyville.

Figs. 1-5: Rostra of males. Figs. 6-10: Rostra of ovigerous females. Figs. 11-15: Rostra of non-ovigerous females. All $\times 9.5$. (The dotted line below or just in advance of the rostrum marks the position of the distal end of the antennular peduncle.)
 Figs. 16-28: Details from same specimen as in Fig. 7. Fig. 16: Antennular peduncle and antennal scale, $\times 6$. Fig. 17: First cheliped of right side, $\times 9.5$. Fig. 18: Hand and carpus of second cheliped of right side, $\times 9.5$. Fig. 19: Third leg of right side, $\times 9.5$. Fig. 20: Dactyl of same enlarged, $\times 31$. Fig. 21: Fourth leg of right side, $\times 9.5$. Fig. 22: Dactyl of same enlarged, $\times 31$. Fig. 23: Fifth leg of right side, $\times 9.5$. Fig. 24: Dactyl of same much enlarged ($\times 47.5$). Figs. 25, 26: Two eggs, $\times 9.5$.
 Figs. 27, 28: Two eggs from same specimen as in Fig. 10. $\times 9.5$.

Of all the characters, the rostrum of *C. togoensis* seems to be the most variable, and it is upon this character that the distinction of the three described varieties of this species from the typical form has been based. The first of these, *C. t. var. stuhlmanni*, with its apparently reduced number of teeth on the upper margin of the rostrum is possibly the most extreme variant. The length of the rostrum and its distal tooth-free portion is not unusual, nor the teeth on the ventral margin. Though in *C. togoensis*, as here defined, out of the 133 Stanleyville specimens examined, but 7 have 14 dorsal teeth on the rostrum, and 10 specimens 15 teeth, his admission of a range including 18 dorsal teeth includes the number of teeth occurring with greatest frequency in our material; 20 specimens had 17 teeth above, 23 eighteen teeth and 21 nineteen teeth. The width of the carpus of the first pair of feet as stated is a little broader than in the specimens I have examined. Bouvier's figured *C. t. var. decorsei* with a carpus 2.3 times as long as broad is nearest the 2.5 times long as broad carpus of *C. t. var. stuhlmanni*. Otherwise the description fits that of typical *togoensis* rather closely.

Given a fair series of *C. togoensis*, it is impossible satisfactorily to distinguish *C. t. var. decorsei* as a distinct variety. A lot of 81 specimens could be separated into two series, the one approaching the *decorsei* type and the other approaching what might be considered typical *togoensis*, with teeth running to or near the tip, and having shorter rostra. Nevertheless, the number of intermediate forms, though arbitrarily placed with the group to which they seem to belong, was sufficient to form a continuous intergrading series. A few such intergradations have been graphically presented as text figures 1 to 15. It would appear that toothlessness near the tip is largely a function of rostrum length, though not absolutely so. This relationship is also exhibited in the accompanying tabulation, where the more typical *togoensis* forms have the shorter rostra, as compared with the *decorsei* type. Inspection shows, however, how much the two series overlap. In the original description of *togoensis* the usual number of rostral teeth is given as about $\frac{17}{6}$; the count occurring with the greatest frequency in the present material is $\frac{18}{9}$. As regards the figure $\frac{2+20}{9}$, considered by Bouvier as the commonly occurring one in *decorsei*, there is not so close an agreement though extremes of his range of variation, $\frac{2+17}{6}$ and $\frac{2+24}{9}$ admit 39, not quite a third, of the 133 Stanleyville specimens examined.

The rostral formula of *C. t. var. breviatus* coincides almost exactly with the range of the number of teeth based on 133 specimens from Stanleyville, with the exception of one specimen having but twelve



Figs. 29-62. *Caridina togoensis* Hilgendorf, from Stanleyville.

Figs. 29-43: Uropodial spines of right side of specimens whose rostra are shown in Figs. 1-15; Figs. 29 and 1 being both from the same specimen, as also Figs. 30 and 2; 31 and 3; 32 and 4; 33 and 5; 34 and 6; 35 and 7; 36 and 8; 37 and 9; 38 and 10; 39 and 11; 40 and 12; 41 and 13; 42 and 14; 43 and 15. All $\times 31$.

Figs. 44-46: Uropodial spines, left side; Figs. 44, 30 and 2 being both from the same specimen, as also Figs. 45, 34 and 6; 46, 38 and 10. All $\times 31$. Figs. 47-49: Rostra of ovigerous females from Stanleyville. Fig. 50: Rostrum of male from Stanleyville. Figs. 51-52: Rostra of females from Avakubi. All $\times 9.5$.

Fig. 53: Lateral view of carapace and antennal region of female from Stanleyville. $\times 9.5$.

Fig. 54: Uropodial spines, left side. Same specimen as in Fig. 51. $\times 31$.

Figs. 55-57: Uropodial spines, right side; Figs. 55 and 50 being from the same specimen, as also Figs. 56 and 52; 57 and 53. All $\times 31$. Fig. 58: First pleopod of female from Stanleyville. Fig. 59: Same specimen, second pleopod. Fig. 60: First pleopod of male from Stanleyville.

dorsal teeth, and 13 having 22 or more dorsal teeth; the ventral range takes in all but 8 of our Stanleyville specimens, four having less than five teeth and four more than twelve teeth. Neither the shortness of the rostrum nor the variability of the tooth-free portion of the rostrum is a distinguishing character for this supposed variety. Nearly three-fifths (seventy-eight) of the examined Stanleyville specimens have the rostrum ranging from a little longer, to one-half the length of the last segment shorter, than the antennular peduncle.

With respect to the number of dorsal rostral teeth situated on the carapace, unless this point were carefully considered and an accurate count made, the number might well have been rated too low in the rostral formula of the several described varietal forms here discussed. For typical *togoensis*, Hilgendorf gives 2 or 3, and for his variety *stuhlmanni* 2-3 (rarely 4), Bouvier has but 3 for *decorsei* and Lenz 3-4. Two teeth on the carapace seem to be of rather rare occurrence; only in eleven of 153 specimens was this found to be the case; sixty-six specimens had 3, forty-seven had 4, twenty-eight 5, and just one was found which had as many as 6 dorsal rostral teeth on the carapace.

So far as I have been able to ascertain, there is no correlation between the number of dorsal or ventral rostral teeth, teeth on the carapace, uropodial spines, spinules on the dactyls of the fifth pair of legs, and sex.

TABULATION OF ROSTRAL LENGTH OF SPECIMENS OF *Caridina*
togoensis EXAMINED

Length of rostrum, as compared with antennular peduncle	Number of Specimens									
	From Stanleyville, April, 1915							Based on random 10 of about 200 specimens from Avakubi, 2 ♂ 8 ♀ (1 ovig.)	Based on random 10 of 30 specimens from Niangara, 4 ♂ 6 ♀ (1 ovig.)	Based on all specimens examined, 153
	Based on 133 examined specimens out of a total of over 500	Based on 81 specimens not sexed, of 133 examined	Based on 33 of 81 specimens with teeth nearly to tip of rostrum, <i>togoensis</i> type	Based on 48 of 81 specimens with <i>decoesei</i> type of rostrum	Based on total of 52 sexed specimens of 133 examined	Based on 19 ♂ of the 52 sexed specimens	Based on 18 ovigerous ♀ of the 52 sexed specimens			
Twice the length of the last segment longer.....	2				2		2			2
More than the length of the last segment longer.....	8				8		3	5	2	10
Longer than the peduncle by the length of the last segment..	22	10		10	12	5	1	6	4	28
Longer by one-half of the last segment, more or less.....	23	8		8	15	9	5	1	5	30
Little longer than the antennular peduncle	30	21	3	18	9	2	5	2		30
Subequal.....	22	18	8	10	4	2	1	1	1	26
Little shorter than the antennular peduncle	16	14	12	2	2	1	1		1	17
Shorter than the antennular peduncle by one-half the length of the last segment..	10	10	10							10
Number of specimens.	133	81	33	48	52	19	18	15	10	153

TABULATION OF ROSTRAL COUNT OF SPECIMENS OF *Caridina*
togoensis EXAMINED

Number of rostral teeth		Number of Specimens										Number of rostral teeth	
		From Stanleyville, April, 1915								Based on random 10 of about 200 specimens from Avakubi, 2 ♂ 8 ♀ (1 ovig.)	Based on random 10 of 30 specimens from Niangara, 4 ♂ 6 ♀ (1 ovig.)		Based on all specimens examined, 153
		Based on 133 examined specimens out of a total of over 500	Based on 81 specimens not sexed, of 133 examined	Based on 33 of 81 specimens with teeth nearly to tip of rostrum, <i>togoensis</i> type	Based on 48 of 81 specimens with <i>decorsei</i> type of rostrum	Based on total of 52 sexed specimens of 133 examined	Based on 19 ♂ ♀ of the 52 sexed specimens	Based on 18 ovigerous ♀ of the 52 sexed specimens	Based on 15 non-ovigerous ♀ of the 52 sexed specimens				
Teeth on carapace												Teeth on carapace	
2	7	4		4	3			3	3	1	11	2	
3	56	34		34	22	11	5	6	4	6	66	3	
4	41	23	14	9	18	6	8	4	3	3	47	4	
5	28	19	18	1	9	2	5	2			28	5	
6	1	1	1								1	6	
No. of specimens	133	81	33	48	52	19	18	15	10	10	153	No. of specimens	
Total No. of dorsal teeth												Total No. of dorsal teeth	
10										1	1	10	
12	1	1		1							1	12	
14	7	7		7							7	14	
15	10	10	3	7							10	15	
16	11	6	1	5	5	1	1	3			11	16	
17	20	15	9	6	5	1	3	1		1	21	17	
18	23	15	5	10	8	4	2	2		1	24	18	
19	21	13	6	7	8	3	2	3			21	19	
20	15	6	4	2	9	2	6	1	2	2	19	20	
21	12	5	3	2	7	1	3	3	1	1	14	21	
22	7	3	2	1	4	4			1	3	11	22	
23	3				3	2		1			3	23	
24	1				1	1			1	1	3	24	
25	1				1		1				1	25	
26									1		1	26	
27									2		2	27	
28									2		2	28	
29	1				1			1			1	29	
No. of specimens	133	81	33	48	52	19	18	15	10	10	153	No. of specimens	
Ventral teeth												Ventral teeth	
3	2				2			2			2	3	
4	2	2	2								2	4	
5	2	2	1	1							2	5	
6	14	10	9	1	4	1	2	1	2		16	6	
7	21	16	10	6	5	3	1	1	3	1	25	7	
8	29	17	5	12	12	3	6	3	1	1	31	8	
9	21	12	3	9	9	4	2	3	3	3	27	9	
10	15	7	3	4	8	5	2	1		1	16	10	
11	15	9		9	6	2	4		1	1	17	11	
12	7	4		4	3			3		3	10	12	
13	3	2		2	1	1					3	13	
16	1				1		1				1	16	
17	1				1			1			1	17	
No. of specimens	133	81	33	48	52	19	18	15	10	10	153	No. of specimens	

TABULATION OF THE COUNT OF SPINES ON THE DACTYLS OF THE THIRD
AND FIFTH LEGS, AND THE UROPODIAL SPINES OF FIFTEEN
SPECIMENS OF *Caridina togoensis*

Sex	Specimen No.	Rostral formula	Spines on dactyl of third leg, counting terminal one	Spinules on dactyl of 5th leg, not including terminal one	Uropodial Spines
♂	1	$\frac{4+15}{13}$	7	62	10
♂	2	$\frac{3+12}{9}$	7	51	7, 9
♂	3	$\frac{4+17}{11}$	7	legs wanting	10
♂	4	$\frac{5+14}{6}$	9	67	14
♂	5	$\frac{4+16}{9}$	8	60	15
♀ (ovig.)	6	$\frac{4+17}{14}$	8	legs wanting	8, 9
♀ "	7	$\frac{3+14}{10}$	8, 9	64	11
♀ "	8	$\frac{5+15}{7}$	legs wanting	66	14
♀ "	9	$\frac{5+14}{7}$	7	80	15
♀ "	10	$\frac{6+11}{6}$	8	73	10, 15
♀	11	$\frac{3+13}{15}$	8	61	11
♀	12	$\frac{4+15}{11}$	8	69	10
♀	13	$\frac{4+15}{9}$	7	79	14
♀	14	$\frac{3+15}{8}$	9	73	14
♀	15	$\frac{5+18}{9}$	legs wanting	legs wanting	16

Crangonidæ

ATHANAS Leach

Athanas LEACH, 1813-14, 'Edinburgh Encyclopedia,' VII, p. 432.

Athanas grimaldii Coutière

Athanas grimaldii COUTIÈRE, 1911, Bull. Inst. Océan. Monaco, No. 197, p. 1, text figs. 1-6. DE MAN, 1911, 'Siboga Exped.,' XXXIXa', Decapoda, Pt. II, Alpheidæ, pp. 145, 146. BALSS, 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 18, and synonymy.

Originally known from the Cape Verde Islands; Balss had one ovigerous female from Lagos, southern Nigeria, and with the present record its range is extended southward to Angola.

Of this interesting species, 19 specimens (9 ovigerous) were taken at St. Paul de Loanda, September 22, 1915.

The largest specimen is about 12 mm. long from rostral tip to end of telson.

"During the low, equinoctial tides I had a splendid opportunity of investigating the many dark brown and greenish knolls scattered over the bottom of the bay of St. Paul de Loanda. So uniform is their appearance that they might be taken for moss-covered stones, though actually they represent a great variety of associations of sponges, ascidians, mollusks, and other invertebrates. Seldom more than a foot in diameter, these bunches are nearly flat below and lie loose on the ground. An interesting exception is when they are formed about the upper fifth, or protruding portion, of the large razor shells *Pinna rudis* Linnæus, which thus are completely concealed. The *Pinna* is of course anchored in the sand by its long silk-like byssus but can be removed by placing one's hands on either side beneath such bunches and pulling slowly. After removing the various sponges, the shell can be easily opened by inserting a knife in it. Covered by the mantle, and well concealed inside the *Pinna*, *Athanas grimaldii* lives as one of its commensals. Often it is necessary to turn the shell upside down and shake it vigorously to make the *Athanas* drop out. In small specimens of *Pinna* only one was found, in larger ones mostly two, but in several three. To this symbiotic community belong also *Pontonia tyrrhena* and *Crangon* of an undetermined species. When placed in alcohol these decapods shed their chelæ and limbs to such an extent that I used separate vials for the specimens removed from any one shell.

"Hiding in these bunches, among the different creatures or below them, are a number of crustaceans such as *Palæmon squilla* Linnæus (p. 24), *Pisa carinimana* Miers,¹ *Dromia atlantica* Doflein,² and *Pilumnus verrucosipes* Stimpson.³" (H. L.)

CRANGON Weber

Crangon WEBER, 1795, 'Nomenclator entomologicus,' p. 94

Crangon langi, new species

Text Figure 63

TYPE LOCALITY.—Banana, July 1915, 17♂, 29♀ (1 ovig.); August 1915, 3♂, 7♀ (Amer. Mus. No. of type 4799.)

MEASUREMENTS.—The largest specimen is a female 54.5 mm. long from rostral point to end of telson. The figured male, holotype, is 34 mm. long from rostral point to end of telson; carapace 11, abdomen and telson 23, telson 5, large chela 18 mm. long.

¹Lang, in Rathbun, 1921, Bull. Amer. Mus. Nat. Hist., XLIII, pp. 467-468.

²Lang, loc. cit., p. 394.

³Rathbun, loc. cit., p. 437.

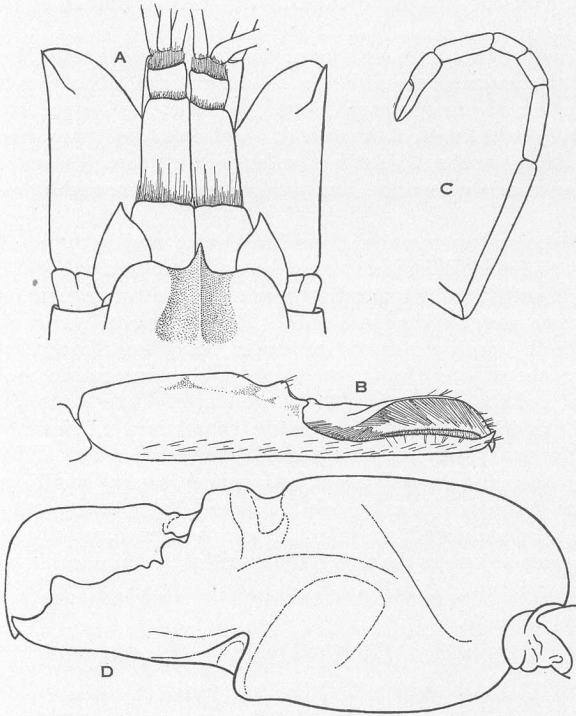


Fig. 63. *Crangon langi*, new species, from Banana. Male holotype.

A, dorsal view of anterior portion, \times about 7.5; B, outer view of smaller, right chela, \times about 4.1; C, second, left leg, \times about 7.5; D, outer view of larger (left) chela, \times about 4.1.

DESCRIPTION.—An apparently new species near *bouvieri* Milne Edwards¹ (= *edwardsii* Dana²), *leviusculus* Dana³ (de Man)⁴ and *bastardi* Coutière.⁵ At first glance it appears to be the *bouvieri* of Milne Edwards, but it is readily distinguished by the relation of the spine to the blade of the antennal scale. In *C. bouvieri* the spine exceeds the narrow scale by about one-fourth its length (de Man, *loc. cit.*, p. 412), as it does also in *C. leviusculus*. From *C. bastardi* our species differs in having longer antennal scales, shorter antennal peduncles, and more distinctly carinated rostrum.

The rostral projection is acute, and apparently more sharply carinated than in any of the related species; the rostral carina is continued backward on the carapace to the level of the bases of the corneæ; on either side it is separated from the orbital hoods by a shallow depression; anteriorly the rostrum extends forward nearly one-

¹1878, Bull. Soc. Philom. Paris, (7) II, p. 231. Coutière, 1905, 'Fauna Maldive and Laccadive Archipelagoes,' II, p. 907, Pl. LXXXV, fig. 44.

²1852, 'U. S. Expl. Exped.,' XIII, pt. 1, p. 542; atlas, 1855, Pl. XXXIV, fig. 2.

³1852, *Alpheus edwardsii* var. *leviusculus*, 'U. S. Expl. Exped.,' XIII, pt. 1, p. 543; atlas, 1855, Pl. XXXIV, fig. 3.

⁴1911, 'Siboga Exped.,' XXXIXa, Decapoda, Pt. 2, Alpheidæ, p. 411, Pl. XXIII, fig. 98.

⁵1905, 'Fauna Maldive and Laccadive Archipelagoes,' II, p. 907, Pl. LXXXV, fig. 45. 1898, as *Alpheus bouvieri* var. *bastardi*, Bull. Soc. Ent. France, p. 133, fig. 1a.

half the length of the exposed portion of the basal segments of the antennular peduncles.

The antennular peduncles are shorter than the antennal scales, but are slightly exceeded by the antennal peduncles; antennular scales, about reaching, or often slightly exceeding, the first segment of the peduncle; visible portion of the basal articles two-thirds the length of the second; third about half the length of the second. The blade of the antennal scale is at least as long as the spine. The antennal peduncle is shorter than in related species, being at least equalled or slightly exceeded by the antennal scales.

In the shape and proportions of the large chela, and of the small one as well, there are no profound differences from the nearly related species. *C. edwardsii* as figured by Coutière¹ is distinguished from all of the before-mentioned species in having the lower margin ending in a spine. The rostrum of *C. edwardsii* is not continued back on the carapace as a distinct carina, being broadly rounded between the orbital hoods; the spine of the antennal scale reaches beyond the blade much as in *C. leviusculus*, and the antennal peduncles are longer. As regards the carpal joints of the second pair of legs, our species is nearest the specimen of *C. leviusculus* described by de Man (*loc. cit.*), and very near Dana's *edwardsii* (*loc. cit.*), differing from the latter in that the second article is about half again as long as the fifth, not equal to it in length; the first article is as long as the second, third, and fourth articles taken together, the third and fourth are subequal, and the second, as has just been stated, is about half again as long as the fifth. The merus of the third legs is unarmed below.

Considering the close resemblance of our species in almost all characters except the blades of the antennal scales and the length of the antennal peduncle, I am inclined to believe that many, if not all, of the specimens of *Crangon bouvieri* listed by various authors as from the West Coast of Africa are identical with the material before me.

"Nearly all the specimens of this new species were taken at low tide from galleries in highly brackish water on the gently sloping shore of Banana Bay, east of Banana Peninsula. They were nearly always associated with a large, mostly solitary stone crab, *Panopeus africanus*² A. Milne Edwards, which had burrowed under flat stones, pieces of brick, wood or other hard objects partly imbedded in the firm fine sand by the action of the tides. In the mangrove swamps *Crangon langi* lived near the beautiful blue crab, *Sarmatium curvatum* H. Milne Edwards. They always make their own tunnels, which are seldom over six inches long and much too narrow to admit either of these crabs. Often as many as three might be found in the same retreat, but generally each one had its own burrow. Even at low tide the fine sand contained sufficient clayey matter to keep their retreats moist, although their channels might be several feet above the level of the water. When teased with a small

¹1905, 'Fauna Maldives and Laccadive Archipelagoes,' p. 912, Pl. LXXXVI, figs. 50, 50a, 50b.

²Lang, in Rathbun, 1921, Bull. Amer. Mus. Nat. Hist., XLIII, pp. 439-440.

stick, they promptly emerged, nearly always producing a sharp click by opening the large pincer. To judge from the repetition of this sound at such times, it apparently is by way of warning. They walk forward, but swim backward. In life they are transparent grayish with dark gray markings, the large chela being still darker with a tinge of green. I never saw one free-swimming, but probably they take refuge near the relatively large burrows of stone crabs only when the tide is subsiding. The natives take not the slightest interest in them." (H. L.)

Crangon intrinsecus (Bate)

Alpheus intrinsecus BATE, 1888, 'Rept. Sci. Results Voy. Challenger,' Zoöl. XXIV, p. 557, Pl. c, fig. 1. RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 313.

Previously known only from off Bahia, Brazil, 7 to 20 fathoms (Bate), and Iogo-Iogo, St. Thomas Island, West Africa (Osorio).

Banana, August 1915, 1 ♀.

MEASUREMENTS.—Length from tip of rostral projection to end of telson 30 mm., carapace and rostrum 11 mm.

"One morning after a heavy storm had raged during the night I found a large piece of coral rock washed up in the shallow water just off Banana Point. On it were huge barnacles (*Balanus*), some alive, others empty. In one of the latter *Crangon intrinsecus* (Bate) was found. With it were a number of other shrimps, some sponges, and corals. The nearest coral reef is on the Angolan coast some fifteen miles south of the mouth of the Congo River." (H. L.)

Crangon species?

One small alpheid without legs from St. Paul de Loanda, September 22, 1915, measured over all, 21 mm., carapace 7 mm. Behind the rostral point, the carapace is carinated between the unarmed orbital hoods.

"Associated with *Pontonia tyrrhena* and *Athanas grimaldii* in the shells of *Pinna rudis* Linnæus." (H. L.)¹

Palæmonidæ

Palæmoninæ

DESMOCARIS Sollaud

Desmocariss SOLLAUD, 1911, Compt. Rend. Acad. Sci., Paris, CLII, p. 913.

Desmocariss trispinosus (Aurivillius)

Palæmonetes trispinosus AURIVILLIUS, 1898, Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, p. 29, Pl. iv, figs. 1, 2.

¹(Cf. p. 20.)

Desmocarisc trispinosus SOLLAUD, 1911, Compt. Rend. Acad. Sci., Paris, CLII, p. 913. DE MAN, 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), pp. 197, 202.

From de Man: rivers of the Gold Coast (Sollaud); in brook at Kitta, Cameroon (Aurivillius); Brazzaville, French Congo (Sollaud); Ottenge River near Banzyville (de Man).

Stanleyville, April 1915, 1 ♀ (ovigerous).

MEASUREMENTS.—Length over all, rostrum to end of telson, about 28 mm.; the same size as the type and having like it six teeth on the dorsal margin of the rostrum, but below only one instead of the typical two. The rostrum exceeds the antennal peduncle by one-fourth the length of the free portion, reaching one-third the distance between the end of the antennular peduncle and the end of the antennal scale.

PALÆMON Fabricius

Palæmon FABRICIUS, 1798, 'Entom. Syst. Suppl.,' p. 402.

Palæmon squilla (Linnæus)

Text Figure 64

Cancer squilla LINNÆUS, 1758, 'Syst. Naturæ,' 10th Ed., I, p. 632.

Leander squilla DE MAN, 1915, Tijds. Ned. Dierk. Vereen., (2) XIV, p. 120, Pl. x, [figs. 1-1n, and varieties, pp. 127, 133, Pls. x, figs. 1o-1v, xi, figs. 1w-1z⁴, and synonymy. BALSS, 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 24.

The species, including its varieties, ranges from Norway and Sweden southward along the European coast, British and Irish waters, throughout the Mediterranean and Black Sea, Azores, Madeira, Canaries and Cape Verde Islands (de Man). Balss (*loc. cit.*) has recorded it on the West African coast from Portuguese Guinea, Cameroon, and the French Congo to (former German) Southwest Africa. The correctness of the determination of Stebbing's South African record is held doubtful by de Man (*loc. cit.*, p. 139).

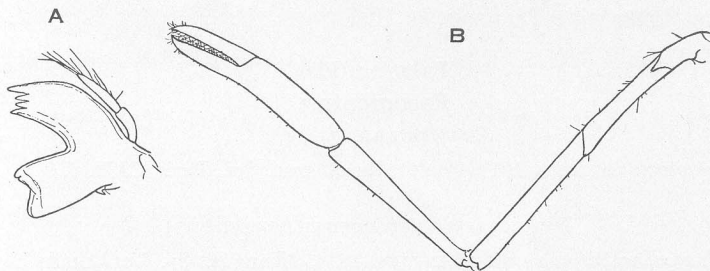


Fig. 64. *Palæmon squilla* (Linnæus), from St. Paul de Loanda. Ovigerous female.

A, mandible, $\times 16.5$; B, right leg of second pair, $\times 7$.

Four specimens (two ovigerous) of this species from St. Paul de Loanda, September 22, 1915. "Was caught hiding among bunches of ascidians and sponges in the bay of St. Paul de Loanda." (H. L.)¹

These specimens represent one of the forms of this variable species. The mandibular palp is unquestionably two-jointed; the coalesced portion of the shorter ramus of the outer antennular flagellum is about two-thirds the length of the free portion. The fingers of the second legs, however, are from two-thirds to three-fourths the length of the palm; the carpus is subequal to or a little longer than the merus, and about three-fourths, or a little more, the length of the chela.

The rostrum of all four specimens had uniformly ten teeth above and three below, except one specimen lacking the rostral tip which had nine above. Three teeth are on the carapace in all but one of the specimens; in this two were behind the orbit and the third just over the orbital margin. The anterior dorsal tooth is subapical, close behind the tip.

***Palæmon maculatus* (Thallwitz)**

Text Figure 65

Leander maculatus nov. spec. ? THALLWITZ, 1891, Abh. Ber. K. Zool. Mus., Dresden, III, No. 3, (1890-91), p. 19, Pl., fig. 4.

Palæmon edwardsii RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 314.

Palæmon (*Leander*) *edwardsii* LENZ, 1910, 'Wissen. Ergeb. Deutschen Zentral-Afrika-Exped. 1907-1908,' III, Zool. I, p. 126.

Leander edwardsii BALSS, 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 26, text figs. 7, 8.

Leander maculatus DE MAN, 1923, Tijds. Ned. Dierk. Vereen., (2) XIX, pp. 2, 3, 4. (In, '*Leander longirostris* (H. M. Edw.) var. *robusta* nov. var., the common prawn of the estuary of the Meuse and of the Hollandsch Diep.')

It has been recorded from Monrovia and Mt. Coffee, Liberia (Rathbun), Old Calabar, South Nigeria (Balss), Landana at the mouth of the Tschiloango River (Lenz), Banana (de Man), West Africa (Thallwitz).

Banana, July 1915, 56♂, 103♀ (3 ovig.); "from the brackish water of the mouth of the Congo west of Banana Peninsula" (H. L.), July 1915, 63♂, 138♀ (7 ovig.).

De Man (*loc. cit.*) has anticipated me in announcing the identity of *Leander* [*Palæmon*] *edwardsii* of Balss with the species described by Thallwitz. He compares it with *Leander* [*Palæmon*] *longirostris* (H. Milne Edwards) saying that "*L. [Palæmon] maculatus* may be distinguished from the typical *L. [Palæmon] longirostris* (H. M. Edw.) especially by the shape of the rostrum, by the shorter ramus of the outer antennular

¹Cf. p. 20.

flagellum, and by the measurements of the legs of the second pair. Of the rostrum of *L. [Palæmon] maculatus* the distal, toothless part of the upper margin is *longer*, only one tooth is situated on the carapace behind the orbit, the second being placed above the orbital margin, and the lower margin is always tridentate; in *L. [Palæmon] longirostris* and the variety *robusta* constantly two teeth are situated on the carapace and the lower margin of the rostrum carries 3, 4, or 5 teeth. The shorter ramus of the outer antennular flagellum is fused to the longer for half or a little more than half its length, being coalesced until to the middle or to just

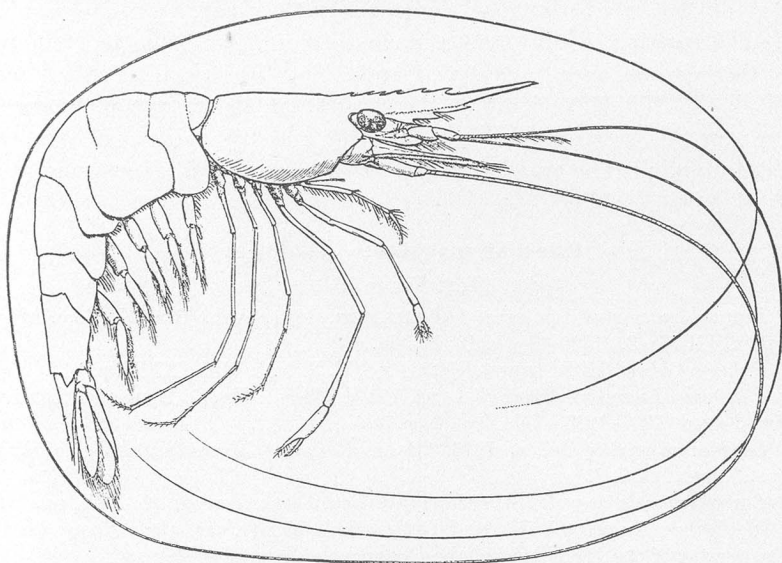


Fig. 65. *Palæmon maculatus* (Thallwitz).

Lateral view, \times about $2\frac{1}{2}$ (after Balss).

beyond the middle, that of *L. [Palæmon] longirostris* only for one-third of its length. The carpus, finally, of the second pair of legs is constantly a little more than one and a half as long as the chela, whereas in *L. [Palæmon] longirostris* carpus and chela are of equal or subequal length."

Exceptionally the rostrum may be scarcely a little longer than the antennal scale, but usually it extends one-third or one-fourth its length beyond. Above there are from 7 to 10 teeth, below from 2 to 5; very few specimens have as many as 10 dorsal teeth, and I have seen but two specimens with 2 ventral teeth, eighteen with 4, one with 5. The usual number of teeth on the lower margin of the rostrum is 3; of the dorsal

teeth, almost invariably there is but one on the carapace; one specimen only had 2 teeth behind the orbital border; this specimen had 10 above and 3 beneath. As described and figured by Thallwitz and Balss, a considerable portion of the distal part of the rostrum is devoid of teeth above and below; usually that portion before the antennular peduncle, except for one tooth close behind the tip, which gives it a bifid appearance. One specimen from Liberia had the rostrum ending simply. Usually the last ventral tooth is a little in advance of the penultimate dorsal tooth, but sometimes 2, as in Thallwitz's figure.

According to Thallwitz the shorter ramus of the outer antennular flagellum is fused with the longer for more than half its length; he distinguished 8 free and 12 to 13 coalesced articles in the shorter ramus, which count may vary up to 11 united and 14 free segments. Balss figures 12 fused segments.

The fingers of the second pair of legs are about two-thirds the length of the palm, the hand about two-thirds of the carpus, sometimes a little less, and the hand and merus are about subequal; the merus may be a very little longer than the hand. One-third to one-half the carpus of the second legs extends beyond the tip of the antennal scale. In the fifth pair of legs the dactyl does not appear quite as long as one-half the propodus as given in the original description; as in the two preceding pairs, it is rather more nearly one-third the length of the propodus. Thallwitz's statement that the second legs exceed the antennal scale by the length of the fingers is surely an error. The sixth abdominal segment and the telson are about equal in length. The mandibular palp is three-jointed.

These specimens are identical with those Miss Rathbun had from Liberia, and no doubt also with those briefly characterized by Lenz (*loc. cit.*).

MACROBRACHIUM Bate

Macrobrachium BATE, 1868, Proc. Zool. Soc. London, p. 363.

Macrobrachium macrobrachion (Herklots)

Palæmon macrobrachion HERKLOTS, 1851, 'Addit. Faun. Carcin. Afr. Occ.', p. 15.

Palæmon acanthurus AURIVILLIUS, 1898, Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, p. 19.

Bithynis acanthurus RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 315, part, specimens from West Africa.

Palæmon (Eupalæmon) macrobrachion DE MAN, 1912, Ann. Soc. Roy. Zool. Malac. Belgique, XLVI, (1911), p. 203, Pl. II, fig. 1, Pl. IV, fig. 1a, and synonymy. BALSS, 1914, 'Ergeb. Zweiten Deutschen Zentral-Afrika Exped. 1910-1911,' I, Zool., p. 98.

Found on the West Coast of Africa from Liberia to Benguela; always found in the mouths of rivers (de Man).

Malela, 23♂, 13♀ (3 ovigerous). Banana, July 1915, 1♂, August 1915, 1♂; these last two specimens are doubtfully placed under this species; they are both incomplete specimens, near if not identical with *M. macrobrachion*.

This species can always be readily distinguished from other West African congeners by the felted fingers; the pubescence is found in very young specimens of as little as 58 to 60 mm. in length (*vide* de Man).

"Malela is about twelve miles up-river from Banana, which lies at the mouth of the Congo. These shrimps were caught at low tide with fine-meshed nets in the relatively narrow channels that traverse the open mud flats between the mangrove swamps such as are common near the outer edge of the mangrove belt northwest of Malela in the neighborhood of the higher lying savanna." (H. L.).

? *Macrobrachium sollaudii* (de Man)

Palæmon (*Eupalæmon*) *sollaudii* DE MAN, 1912, Rev. Zool. Africaine, I, p. 413, and synonymy; 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 205, Pl. 1, figs. 2-2i.

Type locality, River Ottenge near Banzyville, Ubangi district. Known also from Cameroon and Spanish Guinea.

Five incomplete specimens without data, 2♂, 3♀.

There are three species of *Macrobrachium* in the Congo region having the carpus of the second legs distinctly longer than the palm, and, on the basis of the rostral count, I at first thought that these specimens represented *M. macrobrachion*, in spite of the unfelted fingers of the largest (79 mm. long) male, but the position of the anterior spines on the telson definitely precludes this. In smaller specimens of *M. macrobrachion* the anterior spines are distinctly before the middle of the telson, though in larger, full-grown specimens, they may be at about the mid-point; in *M. sollaudii* they are behind the middle. This is decidedly so in the four smaller specimens of the lot under discussion, slightly so in the largest; moreover, the telson has a stouter form than in young *M. macrobrachion*. The distinctive shape of the rostrum, and the slenderness of the second pair of legs of *M. foai* at once keep one from confusing them with that species.

Measurements of the larger male in millimeters: rostrum (without tip and reaching about as far forward as the antennal scale) 15, carapace 22, abdomen and telson 42, telson 10.5 long; left leg of second pair, movable finger 11.5, palm 18.3 (3 wide at middle), carpus 21 (2.66 wide

distally), merus 14.75 (2.66 wide distally) long; right leg, movable finger 11, palm 18.25 (2.5 wide at middle), carpus 20.1 (2.5 wide distally), merus 14.5 (2.5 wide distally) long.

The rostral count of these specimens is as follows (in each there were two teeth on the carapace proper): ♂ 79 mm. long $\frac{11}{4}$; 2 ♀ 46 mm. long $\frac{11}{5}$; ♂ 44 mm. long $\frac{11}{5}$; ♀ 38 mm. long $\frac{11}{4}$.

Macrobrachium foai (Coutière)

Plate I, Figure 1

Palæmon (*Eupalæmon*) *foai* COUTIÈRE, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 517; 1908, 'Résult. Scient. Afrique,' Paris (Impr. Nationale), p. 574, figs. 1-4. DE MAN, 1912, Ann. Soc. Roy. Zool. Malacol., Belgique, XLVI, (1911), pp. 198, 200, 205, 206, 214, 217.

This species is known only from the Upper Congo, Coutière's specimens having but the designation "Haut-Congo" for the type locality.

Stanleyville, April 1915, 6 ♂, 6 ♀ (5 ovig.).

The straight rostrum, the slender second legs, and the minute, scarcely discernible dorsal spines placed far back on the telson distinguish this species from all related Congo *Palæmonidæ*. The specimens before us were associated with those of *M. lujæ* listed below, from the same locality, but they are readily sorted out from the young of that species by means of any one of those three characters.

The rostrum is as long as the antennal scale and often slightly longer; in one specimen only it was no longer than the spine of the scale; almost invariably the tips of the dorsal teeth are in an approximately straight line beginning with the second tooth and ending with the rostral extremity; the dorsal teeth are quite evenly spaced, often right up to the tip; the second is usually a little farther from the first than the rest from each other, and, too, the distance from the last one to the tip is often reduced so that it might well be considered subapical. The rostral count of the twelve Stanleyville specimens gives us a range of $\frac{10-12}{8-4}$; eleven being the usual number of dorsal teeth; two teeth are quite regularly on the carapace, but one of the twelve specimens had one tooth on the carapace.

The third legs exceed the antennal scale by the length of the dactyl in the largest specimen; the fifth legs are almost as long. Even under low magnification, the spines on the telson look more like punctæ than otherwise; in the largest specimen, an ovigerous female, the anterior pair is at about the beginning of the distal third of the telson; the spines of either pair are about twice as far apart transversely as the two pairs are from each other in a longitudinal direction.

The body from tip of rostrum to end of telson ranges in length from 55 mm. for the largest to 37 mm. for the smallest, a male. The following tabulation gives the measurements of the largest female, and of the largest male having both second legs:

Measurements in millimeters	Of largest specimen, an ovigerous female from Stanleyville April, 1915 (No. 331)		Of the largest male of the same lot, with both second legs	
Length of rostrum.....	11.5			
Length of carapace.....	12.5		10	
Second Pair of Legs	Lft.	Rt.	Lft.	Rt.
Length of movable finger ¹	3.5	3.5	4.6	4.5
Length of palm.....	5.6	5.6	4.3	4.2
Width at middle ²	1	1	.9	.9
Length of carpus.....	9	9	.8	.8
Width.....	1.1	1.1	.75	.75
Length of merus.....	6.6	6.6	6	6
Length of ischium.....	7	7	6.3	6.3
Length of telson.....	7.8		7	
Length of body.....	55		45 ³	

Macrobrachium lujæ (de Man)

Plates II; III; IV, Figure 1

Palæmon (*Eupalæmon*) *lujæ* DE MAN, 1912, Rev. Zool. Africaine, I, p. 415; 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 215, Pl. II, figs. 3, 3a, 3b, Pl. III, figs. 3c, 3d, 3e.

Previously known only from the type lot of six males from Kondue, near Lusambo, on the Sankuru River.

Stanleyville, April 1915, 14♂ (8 immature), 8♀ (3 ovigerous), 1 juv. Aba River at Aba, December 1911, 1♂.

The three localities from which this species is now known are rather widely separated from one another on three distinct branches of the Congo; Aba near the head-waters of the Ubangi-Uele-Dungu-Aba River branch; Stanleyville on the major or middle branch, the Congo proper; and Kondue, near Lusambo, on the Sankuru-Kasai branch.

The rostrum does not always "distinctly" surpass the antennal scale, as described by de Man; true, it is rarely shorter than the blade,

¹Measured from the articulation to tip; palm measured back from same point.

²Measured on lateral, upper face; width of other joints measured as viewed when measuring length of upper margin.

³Rostrum broken off, length measured from distal margin of antennal scale.

usually as long, and only occasionally longer, and this may be by almost one-sixth its length. As de Man described its shape: "The rostral crest (fig. 3 and 3a) which arises just in front of the middle of the carapace, is directed rather strongly upward to the level of the posterior border of the cornea, extends forward and then bends downward almost to the distal extremity of the antennular peduncles; the distal portion is always more or less distinctly upturned. The result of the direction of the rostral crest is, that the rostrum appears rather strongly convex above the eyes, extending forward and that at this level the part situated above the very wide lateral crest appears much higher than the portion situated below, which is almost *nil* because the teeth are placed almost directly on the crest."

His figure hardly shows the dorsal or upper blade of the rostrum as it appears. This high upper blade, together with the slender, non-crested (without dorsal blade), upturned terminal portion is so distinctive in this species, that as a distinguishing character, it is almost next in importance to the proportions of the second legs. Usually two of the dorsal teeth are on the carapace, less often is the second far enough in front of being over the orbital margin, that one can truly say there is but one on the carapace. The last of the dorsal teeth is "apical" or rather subapical, and the penultimate tooth is almost always far enough removed from the ante-penultimate to be considered as a second "apical" tooth, being as a rule farther from the ante-penultimate than this is from its predecessor, or in fact than any of the other teeth are from each other except possibly the first from the second. The dorsal teeth may be as many as eleven, as in our one male from Aba. I know of none with less than nine, the usual number being nine or ten; of these one or two are on the carapace while below there may be from four to seven, with four or five of commoner occurrence.

The position of the hepatic spine with respect to the first rostral tooth seems to be of little consequence. It may be directly under that tooth, before or behind it. In our largest male it is directly under the first rostral tooth, in the measured immature and smallest males and in the Aba specimen it is before the first tooth and in the smallest measured female behind it. The proportions of the telson approximate those given by de Man; the dorsal spines are situated far behind, but are readily discernible, furnishing in lieu of other characters a means of distinguishing this species from *M. foai* (Coutière) (cf. de Man, *loc. cit.*, 1912, p. 217).

The mature males differ from the immature males and females of *M. lujæ* by characters comparable to those found in *M. dux* below, the fingers

TABULATION OF THE MEASUREMENTS OF CERTAIN SPECIMENS OF *Macrobrachium lujæ* (DE MAN)

Measurements in millimeters	Of de Man's largest male (No. 1) from the Sankuru River (loc. cit., 1912, p. 215 and table, p. 218)		Of de Man's third largest male (No. 3) from the Sankuru River (loc. cit., 1912, p. 215, and table, p. 218)		Of de Man's smallest male (No. 6) from the Sankuru River (loc. cit., 1912, p. 215, and table, p. 218)		Of the smallest male specimen with both legs of second pair, from Stanleyville, April, 1915		Of largest female of preceding lot with both legs of second pair.		Of male specimen from Aba River at Aba, December, 1911
	Lft.	Rt.	Lft.	Rt.	Lft.	Rt.	Lft.	Rt.	Lft.	Rt.	
Length of rostrum.....			14.5		14		10		14		15.5
Length of carapace.....			22.8		20.3		12		13.5		19.1
Second Pair of Legs											
Length of movable finger ¹	10.5	11	12.5	13	9	9.1	4.5	4.3	3.6	4	10
Length of palm.....	19.5	21.5	26	27.25	18.5	18.5	8	7.2	5.5	6	17.5
Width of middle ²			28	3	2.5	2.6	1.3	1.1	1.1	1	2.2
Length of carpus.....	19	20.5	29	16.5	16.5	20	10.5	10	8.6	10	19.6
Width at distal end.....			3.2	3.3	2.6	2.8	1.3	1.1	1	1	2.2
Length of merus.....	14.5	15	19.6	19.6	13	14	7	7	7.3	7.6	13.5
Length of ischium.....	12	12	14	14	11	11	7	7	6.5	7.3	12.1
Rostral formula.....	$\frac{9}{5}$		$\frac{10}{5}$	$\frac{10}{5}$	$\frac{9}{5}$	$\frac{9}{5}$	$\frac{10}{5}$	$\frac{10}{5}$	$\frac{10}{5}$	$\frac{11}{4}$	10
Teeth on carapace.....	1	1	$\frac{10}{5}$	$\frac{10}{5}$	1	2	1	2	1	1	2
Subapical teeth ³	1		1		1		1		1		1
Length of telson.....	10.5		10.5		8.75		7		8		9.5
Width at base.....	3.75		4		3.9		2.2		2.6		3
Width distally.....	1.16		2		1.6		1		1		1.5
Length of body.....	86.5		79		79.5		48.5		59		71.3

¹Measured from the articulation to tip; palm measured back from same point.

²Measured on lateral upper face; width of other joints measured as viewed when measuring length of upper margin.

³The penultimate tooth is called the second apical by de Man; in all but one of the measured Stanleyville specimens this tooth is farther removed from the antepenultimate than the latter is from the fourth from the last.

TABULATION OF THE MEASUREMENTS OF CERTAIN SPECIMENS OF *Ma*

Measurements in millimeters	Of de Man's largest male <i>M. vollehovenii</i> (loc. cit., 1912, p. 235, table; 1879, p. 178)	Of largest male from Mal- ela, July, 1915	Of another male from the preceding lot	Of the ovigerous female from the preceding lot	Of the female type <i>M.</i> <i>vollehovenii</i> , after de Man (loc. cit. p. 225)
Length of rostrum.....	40(?)	25	17.2	21	
Length of carapace.....	30(?)	48.5	33	33	
Combined.....	70	73.5	50.2	54	
Second Pair of Legs.....	Lft. Rt.	Lft. Rt.	Lft. Rt.	Lft. Rt.	Lft.
Length of movable finger ¹ ..	45 35	46 39	29 24	17.5 20	21
Length of palm.....	62 44	65 57	43.5 33	19 21.5	22.5
Width at middle of length ² .	12.5 8.5	14.5 12	9 7.5	4 4	6.5
Length of carpus.....	33 27.5	38 29	22 20	16 16	15.5
Width at distal end.....	10 8.5	12 10	7.75 7.25	4 4.5	45
Length of merus.....	32 29	37 29	22 19	16 16	15.5
Greatest width.....	9 7.5	10 10	8 6.75	3.25 3.75	4.5
Left Third Leg ³					
Length of merus.....	22	22	14	15.5 14.75	
Width at middle of length ² .	3.25	4	2.5	1.75 1.66	
Length of propodus.....	19	18	12.5	12.5 12	
Width at middle of length ² .	1.7	1.75	1.2	1.1 1	
Length of dactyl.....	6.5	7	5	4.8 4.66	
Rostral formula.....	$\frac{12}{4}$	$\frac{13}{6}$	$\frac{15}{4}$	$\frac{12}{4}$	$\frac{14}{4}$
Teeth on carapace.....	4	6	5	4	
Length of abdomen and telson	70	76	58	58	
Length of telson.....		17.5	13	15	

¹Measured from the articulation to the tip, in the case of our Congo specimens.

²Measured on lateral face, upper in case of the second legs, outer in the t

³deMan does not state which of the third pair of legs was measured; in

⁴"These fish are much eaten, and are found in the market of Colima, esp

⁵Antennal flagella missing; were said to have measured "26½ inches" (

⁶Right third leg in this specimen as left is wanting; dactyl lacks tip.

chium vollenhovenii (HERKLOTS) AND TWO OF *M. jamaicense* (HERBST)

Of the best developed male from Mt. Coffee, Liberia, (Rathbun, <i>loc. cit.</i>) (Cat. No. 20663 U. S. N. M.)		Of the next best developed male of the preceding lot		Of the largest male from Kuanza River, Cunga (Benedict, <i>loc. cit.</i>) (Cat. No. 14936 U. S. N. M.)		Of another male of the preceding lot		Of de Man's large male of his variety <i>herkloti</i> (<i>loc. cit.</i> , p. 241, table, p. 46)		Of large male of <i>M. jamaicense</i> from Armeria River, Colima, Mexico (Cat. No. 21343, U. S. N. M.) ⁴		Of large male of <i>M. jamaicense</i> from Devil's River, Texas (Cat. No. 41488, U. S. N. M.) ⁶	
20.25		19		25		26				18		32.5	
40.5		40		52		46				49		87	
60.75		59		77		72		75		67		117.5	
Lft.	Rt.	Lft.	Rt.	Lft.	Rt.	Lft.	Rt.	Lft.	Rt.	Lft.	Rt.	Lft.	Rt.
29	24.5	25.25	27	46.5	40	46	40	45	40	30	35	80	88
36	28.25	31	34	63	52.25	62	53	63	50	30	36.5	83	100
10.25	8	7.5	8	12	9	14.5	9.5	18	14	11	13	22	28
20	16.75	20	20.5	35	32	36	32	33	31	16.5	17	40	40
8	7	7	7.5	12	10	11.5	10	13	12.5	9.33	10	20	21
21	18.5	20.5	20.5	35	32	36	32	34	31	20	21	50.5	50.5
7	6	6.75	7	10	9	10.5	9.2	10	11	8.2	8.5	18	19
6.5		16		21		24.5		23		18		36 ⁶	
2.75		2.75		4		4.3		4.25		4		7	
4		13		17.5		19		19		12.5		26	
1.66		1.66		2.1		2.1		2.5		2.5		4.	
5.25		5		7		7.25		5.5		6		10	
$\frac{14}{4}$		$\frac{14}{4}$		$\frac{14}{4}$		$\frac{14}{3}$		$\frac{13}{4}$		$\frac{13}{2}$		$\frac{12}{4}$	
4		4 { 5th over orbital margin }		4 { 5th over orbital margin }		4		5		3 { 4th over orbital margin }		5	
70		68		84		83		107[?]		83		149	
16		15		20		20				18		31.5	

width of the other joints of the second legs was measured as viewed dorsally.
ous female from Malela, the right leg of the third pair also was measured.
Fridays and Sundays as an article of food" (Dr. Edw. Palmer, collector).
"Weight 3 pounds" (John Roth, collector).

and carpi of the second legs becoming longer in relation to the palm the less mature the male, or in the females as compared with the mature males. In the proportions of these legs the immature males and females stand together, and apart from the mature males, just as they do in *M. dux*. De Man is correct in saying that the merus is always longer than the ischium if the statement is restricted to the mature males, in which it exceeds the ischium "by a third or fourth." In our smallest measured male of 48.5 mm. long these joints are of equal length, and but little different in the females. It does not appear, in our specimens at least, that the carpus is shorter than the palm in the adult males. Maybe de Man measured his palmar length, and that of the fingers as well from the base of the sinus between the latter; this would give a slightly longer palm than the measurements presented in the accompanying table above. As one goes from mature to immature, the carpus becomes relatively longer as compared to the hand; the females resemble the immature males. The fingers vary from a little less than, or about half the length of the palm in larger specimens, to more than half, or, as in the second right leg of the smallest measured female, as much as two-thirds the length. Otherwise the proportions of the second legs are much in agreement with de Man's detailed description; likewise also the relative length of the third and fifth legs. In our largest specimens of about the size of de Man's No. 3 (*loc. cit.*, table, p. 218) the third legs exceed the antennal scale by just a little more than the dactyls, in our younger specimens and females, as in his young males, by only a part of the fingers.

The ovoid eggs are rather large for the females (about 58 to 67 mm. long) carrying them, measuring from 3.35 to 3.40 mm. long by about 2.17 mm. for the shorter diameter.

Macrobrachium dux (Lenz)

Plates IV, Figure 2; V; VI, Figure 1

Palæmon (*Eupalæmon*) *dux* LENZ, 1910, 'Wissen. Ergebn. Deutschen Zentral-Afrika Exped. 1907-1908,' III, Zool. I, p. 129, Pl. III, figs. 2-5; 1911, Sitzb. Gesell. Naturf. Freunde Berlin, p. 313. DE MAN, 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 222, Pl. IV, figs. 5, 5a, 5b, and synonymy.

Palæmon (*Eupalæmon*) *dux* var. *congoensis* DE MAN, 1912, Rev. Zool. Africaine, I, p. 416; 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 229, Pl. IV, figs. 6, 6a.

Palæmon (*Eupalæmon*) *lenzii* DE MAN, 1911, Notes Leyden Mus., XXXIII, p. 255; 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 222, Pl. II, figs. 4, 4a, 4b, Pl. III, figs. 4c, 4d, 4e.

Previously recorded by de Man, from the Lower Congo (near Boma?), the River Kole, a tributary of the Lohali (Aruwimi), and from Bima, Uele; by Lenz, from the Ituri River at Avakubi, and the Falls of the Bim, a tributary of the Rio Benito, Spanish Guinea.

Avakubi, Ituri River, October 8, 1907, 1♂; October 1909, 18♂ (7 immature), 23 ♀ (7 ovigerous); October 31, 1909, 4♂ (1 immature); November 21, 1909, 2♂; December 1913, 7♂ (4 immature), 4 ♀ (3 ovigerous). Batama, September 18, 1909, 1♂ (immature), 3 ♀. Niapu, November 1913, 36♂ (mostly immature), 11 ♀. No locality, 4♂ (2 immature) and a carapace; without data, 2♂ (1 immature).

An examination of the splendid series of specimens here referred to this species, comprising 75 males and 41 females, of which ten are ovigerous, convinces me that *M. lenzii* (de Man) and *M. dux* var. *congoensis* (de Man) represent but growth stages of the male sex. Of the males, just about half have hands of the *lenzii* type. In each of the lots in which they were found, they are smaller and undoubtedly immature individuals. Were one to segregate them on the basis of their *lenzii* characters, there would be left no smaller or younger stages of the adult *M. dux* in the entire collection. Moreover, the female specimens would all separate out with the *lenzii* males, as the relative proportions of the joints of their second legs approach that type more than they do the typical *dux* form. In fact, they tend considerably toward the females of *M. sollaudii* (de Man), especially as the carpus is longer than the palm. The female of *M. dux* has been well characterized by de Man (*loc. cit.*, 1912, p. 31), in spite of his meager material. As he remarks, the stouter second legs will always distinguish the females of this species from those of *M. sollaudii*, as will the more ovoid eggs in ovigerous specimens.

De Man (*loc. cit.*, 1912, p. 13) has already suggested that his *M. lenzii* might be the immature male of *M. dux*, and, as stated above, our material certainly seems to indicate that this is so. The larger and better developed males are very typical *dux*, the smaller, less mature specimens *M. lenzii*, and the variety *congoensis* but an intermediate growth stage between the other two, showing possibly in the case of de Man's only specimen a palm relatively a little more shortened than is usually the case. *M. dux* variety *congoensis* may be the dimorphic male of *M. dux*, as de Man is inclined to think, but I have not found a single male specimen having the pronounced characters of the variety. Some of the *lenzii* forms, however, strongly suggest them, and it might well be that it is either an alternative form or else a rather rare developmental stage.

In a tabular summary below, the measurements of several of the specimens examined are given, together with similar data taken from

de Man's descriptions of the species. The largest of the three mature males taken at Avakubi in December, 1913 (Pl. V, fig. 1) has a rostrum of much the typical shape, with downward and then distally up-curved midrib, seemingly a little more so than in Lenz's figure of the type (*loc. cit.*, 1910, Pl. III, fig. 2); of the ten dorsal rostral teeth of this specimen, the last one is subapical, being placed at three-fourths the distance from the penultimate tooth to the tip; the rostrum reaches as far as the end of the antennal scale. The largest of the immature males (Pl. VI, fig. 1, lower figure), from this same lot of Avakubi specimens has the rostrum as long as in the largest mature male, reaching about to the end of the blade of the scale.

In the largest female (Pl. VI, fig. 1, upper figure), the rostrum reaches slightly beyond the spine of the antennal scale, none of the seven dorsal teeth is placed far enough forward as to be called subapical, of the two on the carapace the anterior is immediately behind the orbital margin; the second legs are subequal and, as seems to be usual with the females and immature males, the fingers of the chelæ of these legs are about subequal. In the older, fully developed males, there is often considerable difference in the lengths of the two fingers, and they may be also more or less twisted. The ischial and meral joints of the second legs are nearly always of the same, or nearly the same, size on the two sides of the body. To a lesser degree, this is also true of the carpal joints, the differences in size and proportions between the right and left second legs being confined almost wholly to the relative development of the palm and fingers.

The most fully developed male (Pl. IV, fig. 2), one of four from Niapu, collected November, 1913, has the last ventral rostral tooth just beneath the acuminate tip; being subequal in size to the terminal portion of the rostrum, and reaching just as far forward, it gives the rostrum an abnormally bifid tip, surely the result of a repaired injury, as the rostrum scarcely exceeds the antennular peduncle. In one or two other mature males of this lot with undamaged rostra the rostrum exceeds the spine of the scale, while the other attains almost the end of the scale. Both of these specimens have eight teeth above; one three below and the other four.

The one male (Pl. V, fig. 2) from the preceding Niapu lot with the extreme tip of the rostrum wanting is immature and has the legs of the second pair of the *lenzii* type. The spinulation of the second legs, both adult and immature, is much as has been carefully described by de Man; below in this immature specimen the spines on the inner margin form

TABULATION OF THE MEASUREMENTS OF CERTAIN SPECIMENS OF *Macrobrachium dux* (LENZ)

Measurements in millimeters																																																	
Most fully developed male, one of four from Nlapu, November, 1913 (No. 328)	25.5	Largest of three mature males from Avakubi, December, 1913 (No. 324)				De Man's large male from the River Kolo (loc. cit., 1912, p. 26)				Male, type of the variety <i>congostensis</i> , from the River Kolo (de Man, loc. cit., 1912, p. 26)				Immature male, one of four from Nlapu, November, 1913 (No. 328)				Largest of four immature males from Avakubi, December, 1913 (No. 324)				Largest of type lot of four specimens of <i>M. lenzi</i> from Lower Congo (de Man, loc. cit., 1911, p. 225)				De Man's female <i>M. dux</i> from Bima (loc. cit., 1912, p. 227)				Ovigerous female, largest of four (three ovigerous) from Avakubi, December, 1913 (No. 324)																			
Length of rostrum.....		17.5				50				46				14 { tip off }				15				15				30				11																			
Length of carapace.....	29	34.5				32				20				23				26.5				23				22.25				16																			
Combined.....	54.5	52				32				20				23				40.5				38				37.25				27																			
Second Pair of Legs																																																	
Length of movable finger ¹	30	23.2				20				22				20				16.5				15.5				14.8				17				15				14											
Length of palm.....	42	34.5				31				50				39.5				25				27				22				20				17.5				20.3				22				19			
Width at middle ²	7	6.5				5.2				7.25				4.5				5				6.1				4.75				4				3.75				4.5				3.6				3.2			
Length of carpus.....	33	32.5				27.5				30				35				23				20				19.5				16				17				21				20							
Width at distal end.....	7	6.2				5.6				5				7.5				6.4				6				6				4.5				4				3.5				3.4							
Length of merus.....	26.5	26.5				21				30.5				28				19.5				19.5				17				14				14.2				16				16							
Greatest width.....	6	5.5				5.1				7.5				5.6				5.75				5.75				4.25				4.1				3.5				4				3.4							
Length of ischium.....	16.5	17				17				19				17				15.5				15.5				13				12				12.2															
Rostral formula.....	$\frac{8}{5}$	$\frac{10}{4}$				$\frac{8}{4}$				$\frac{8}{4}$				$\frac{8}{4}$				$\frac{8}{4}$				$\frac{8}{4}$				$\frac{8}{4}$				$\frac{8}{4}$				$\frac{8}{4}$				$\frac{8}{4}$											
Teeth on carapace.....	2	2				1 or 2?				2 or 3?				2				2				2				2				2				2															
Subapical teeth.....	1 below	1				1				1				tip off				1				1				1				1?				0															
Length of abdomen and telson.....	ca. 66	47				65				65				ca. 60				44				47				35				8.5																			
Length of telson.....	14	12				15				14.3				12				11				9.75				3.7				1.6																			
Width at base.....	5.25	4.5				6				5.6				4.5				4				15				just before middle				1.25																			
Width distally.....	1.75	1.75				2.3				just behind middle				1.5				well behind middle				just before middle				at middle																							
Fraction of length of telson that most anterior spine or spines are behind middle.....	$\frac{1}{10}$	at middle				at middle				at middle				$\frac{1}{13}$				middle				middle				at middle																							

¹Measured from the articulation to tip; palm measured back from same point.

possibly but one principal row, maybe two. The spinulation of this margin though mentioned in the original description of *M. lenzii* (de Man, *loc. cit.*, 1911, p. 230) is not again referred to in the remarks on *lenzii* under *M. dux* (de Man, *loc. cit.*, 1912, p. 3). As in the largest specimen the second rostral tooth is just behind, nearly over, the orbital margin; other than this, and the fact that the antennal scale is more like that of *M. dux* as figured by de Man (*loc. cit.*, 1912, Pl. IV, fig. 5a), there is much resemblance to the variety *congoensis*.

The number of rostral teeth varies from $\frac{7-10}{2-7}$; usually there are seven or eight teeth above, and three or four below; one or two of the dorsal teeth are on the carapace, and often the most anterior is subapical; very rarely are two placed so close to the tip as to warrant being designated as subapical.

The collectors of this comprehensive series of specimens, Messrs. Lang and Chapin, entered the following note upon the label of the December, 1913, Avakubi specimens: "Color, dark greenish-gray, blackish on large claws, becoming bluish on tail. Common in brooks."

"This large shrimp, which is about $4\frac{1}{2}$ inches long over all, is one of those commonly brought to the government stations by the natives. It is generally caught in the smaller forest streams after they have been dammed up as described above (cf. p. 3)." (H. L.)

Macrobrachium vollenhovenii (Herklots)

Plates VI, Figure 2; VII

Palæmon vollenhovenii HERKLOTS, 1858, Tijds. Entom., Nederl. Entomol. Vereen., I, p. 96. DE MAN, 1879, Notes Leyden Mus., I, p. 178.

Palemon jamaicensis OSORIO, 1892, Jorn. Sci. Nat. Lisboa, (2) II, p. 200.

Palæmon jamaicensis ? BENEDICT, 1894, Proc. U. S. Nat. Mus., XVI, (1893), p. 540.

Palæmon jamaicensis var. *vollenhoveni* AURIVILLIUS, 1898, Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, p. 16, Pl. II, figs. 1-5.

Bithynis jamaicensis vollenhovenii RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 315. SENDLER, 1912, Jahrb. Nassauischen Ver. Naturk., Wiesbaden, Jahrg. LXV, p. 206.

Palæmon (*Macrobrachium*) *jamaicensis* var. *vollenhovenii* PEARSE, 1911, Thirtieth Rept. Michigan Acad. Sci., p. 135.

Palæmon (*Parapalæmon*) *vollenhovenii* DE MAN, 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 232.

Palæmon (*Macrobrachium*) *jamaicensis* var. *herklotsii* DE MAN, 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), p. 239.

Recorded from Liberia (Rathbun, de Man); coast of Guinea (de Man); Cameroon (Aurivillius, Pearse, Sandler); St. Thomas (Osorio); Congo coast (de Man); Benguela (Osorio, de Man).

Malela, July 8, 1915, 9 ♂, 1 ♀, 1 juvenile; July 1915, 6 ♂, 1 ♀ (ovigerous).

These specimens approximate more nearly de Man's (*loc. cit.*, 1912) elaborated description of *M. vollenhovenii* (Herklots) than that of the variety *herklotsii*, which name he (*loc. cit.*) has given to certain specimens: one from the Congo and others from Liberia and the River Prah, Ashanti, that he thought represented the American *M. jamaicense* on the west coast of Africa.

On the basis of de Man's remarks and the series of specimens before me I believe his new variety to be one of the extremes of variation of the species *M. vollenhovenii*. In many respects our Congo specimens are intermediate between these two forms, which he considered distinct.

M. jamaicense cannot well enter into any discussion of African forms. It is quite distinct: the carpus of the second legs is very short and stout, being in younger specimens about twice as long as broad, and in older scarcely that and often less, and always shorter than the merus, varying with age from about two-thirds to about five-sixths of the meral length. The rostrum is usually shorter than the antennular peduncle, and never, so far as I have been able to ascertain, does it reach as far as the spine of the antennal scale; the post-rostral carina begins some distance behind the first rostral tooth, usually as far back of the first tooth as this is removed from the sixth or seventh in front of it. The third maxillipeds may exceed the antennular peduncle by as much as the length of the terminal joint, or a little more, but I have seen no specimens in which they reach to the end of the antennal scale or beyond it. The fingers of the second legs are about as long as the palm, or nearly so, and the length of the largest tooth on the fingers is not more than two-thirds the width of the adjacent part of the finger in the rare, very large specimens, usually it is rather insignificant compared to the finger width in most specimens taken.

In our Congo specimens the carpus is easily two and one-half or more times as long as its distal width and the carpal and meral joints are subequal; the rostrum always surpasses the antennular peduncle and reaches at least about to the tip of the spine of the antennal scale, and often as far as the blade; in older specimens the first rostral tooth rises out of the dorsum of the carapace, in younger specimens there is more or less of a carina running as far back of the first tooth as the second or third is in front of it. The third maxillipeds exceed the antennular peduncle by their terminal joint—this character, by the way, I find of no great assistance in distinguishing the species here discussed. The

fingers in the adult specimens vary from two-thirds to three-fourths the length of the palm and the largest tooth on the movable finger is almost as long as the width of the adjacent part of the finger.

In several of the Liberian specimens reported on by Miss Rathbun, none of which have the adult or fully mature characters at all well developed as compared to the largest Congo specimens before me, the rostrum, though surpassing the antennular peduncle, scarcely reaches the tip of the spine of the antennal scale; the post-rostral carina runs back as in the younger Congo specimens, reaching in some specimens about as far behind the first rostral tooth as the fourth is before it; the third maxillipeds exceed the antennular peduncle by the length of their terminal joint and often by a part of the penultimate joint as well; the fingers of the second legs are a little shorter than the palm (about five-sixths its length) and the carpus is more than twice as long as wide. However, these characters can all be so more or less closely approximated in one or another of the Congo specimens, especially the smaller or younger ones. The Liberian material, at least that which I have examined, is specifically identical with that of the Congo.

With respect to the relative slenderness of the third pair of legs also stressed by de Man (*loc. cit.*, 1912, p. 242) as distinguishing his variety *herklotsii* from *M. vollenhovenii*, it appears in our largest Congo male, which is about the size of the two males de Man compared, that the measurements of these legs are intermediate between them, except for the dactyls which are longer than either. None of the Congo specimens has the legs quite as in the measured *herklotsii* specimen, but in the larger and better developed males recorded by Benedict from the Kuanza River at Cunga, the third legs have just about the proportions of *herklotsii*. The relative length of the fifth pair of legs as given for the variety *herklotsii* also fits our Congo specimens, though often the fifth pair reaches a little beyond the antennular peduncle; in the one ovigerous female the fifth legs attain only the distal end of the second segment of the peduncle. De Man's statement regarding the large male of *M. vollenhovenii* (*loc. cit.*, 1912, p. 43), "legs of the third pair, extended, reach beyond the scaphocerites by their terminal article," would give them, it seems, about the same relative length as in the variety *herklotsii*.

An inspection of the tabular summary of the measurements of several of the specimens examined together with those presented by de Man, seems to bring out that the differences between *M. vollenhovenii* and *M. jamaicense* var. *herklotsii* are of no greater magnitude than admitted by the range of variation that can be considered normal to the species. The measurements of the two specimens of *M. jamaicense* have been included as a matter of record only.

Macrobrachium olfersii (Wiegmann)

Palæmon olfersii WIEGMANN, 1836, Archiv f. Naturg., II, pt. 1, p. 150.

Bithynis olfersii RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 316.

Palæmon (*Macrobrachium*) *olfersii* DE MAN, 1904, Trans. Linn. Soc. London, (2) Zool., IX, p. 314, Pl. xx, figs. 54-74, and synonymy; 1912, Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI (1911), p. 109.

Macrobrachium olfersii RATHBUN, 1910, Proc. U. S. Nat. Mus., XXXVIII, p. 604.

African, according to de Man (1912): Islands of Annobon, Rolas, Saint Thomas, Princess, Fernando Po (Greef, Osorio, Bouvier); River Prah, Ashantee (de Man), Bibundi and Etome, Cameroon (Aurivillius), Catumbella River, Angola (de Man). American, from Rathbun (1910): La Paz, Mexico, to Rio Sabana, Darien; West Indies to Rio de Janeiro.

Malela, July 8, 1915, 1♂ young.

Pontoniinæ**PONTONIA** Latreille

Pontonia LATREILLE, 1829, In Cuvier's 'Règne Animal,' 2d Ed., IV, p. 96.

Pontonia tyrrhena (Petagna)

Text Figure 66

Astacus tyrrhenus PETAGNA, 1792, 'Inst. Entom.,' p. 418, Pl. v, fig. 3 (I have not seen this work).

Pontonia custos GUÉRIN, 1832, 'Exped. Morée,' III, Zool., sect. 2, p. 36, Pl. xxvii, figs. 1, 1a-m (except j). PESTA, 1918, 'Decapodenfauna der Adria,' p. 128, fig. 43 (part).

Pontonia tyrrhena BORRADAILE, 1917, Trans. Linn. Soc. London, (2) Zool., XVII, p. 390, Pl. LVII, fig. 29, and synonymy. KEMP, 1922, Rec. Indian Mus., XXIV, pt. 2, p. 260.

Heretofore this species was not definitely known to occur in other than Mediterranean waters. The present record represents a considerable extension of its range.

St. Paul de Loanda, September 22, 1915; between bunches of ascidians and sponges, 1♀ ovig.; 2♂, 2♀; September 24, 1915, 1♂, 1♀ (ovig.).

MEASUREMENTS.—The figured ovigerous female is about 37.5 mm. long over all, carapace alone 12, and rostrum 3.8 mm.

Having comparative material from Naples at hand, it is possible to identify with certainty these specimens taken at St. Paul de Loanda with the well-known Mediterranean form, *Pontonia tyrrhena*.

Since the mouth-parts are playing an increasingly important part in the proper diagnosis of pontoniids, these appendages of one of our specimens have been drawn (text figs. 66*d-i*). This specimen, of which

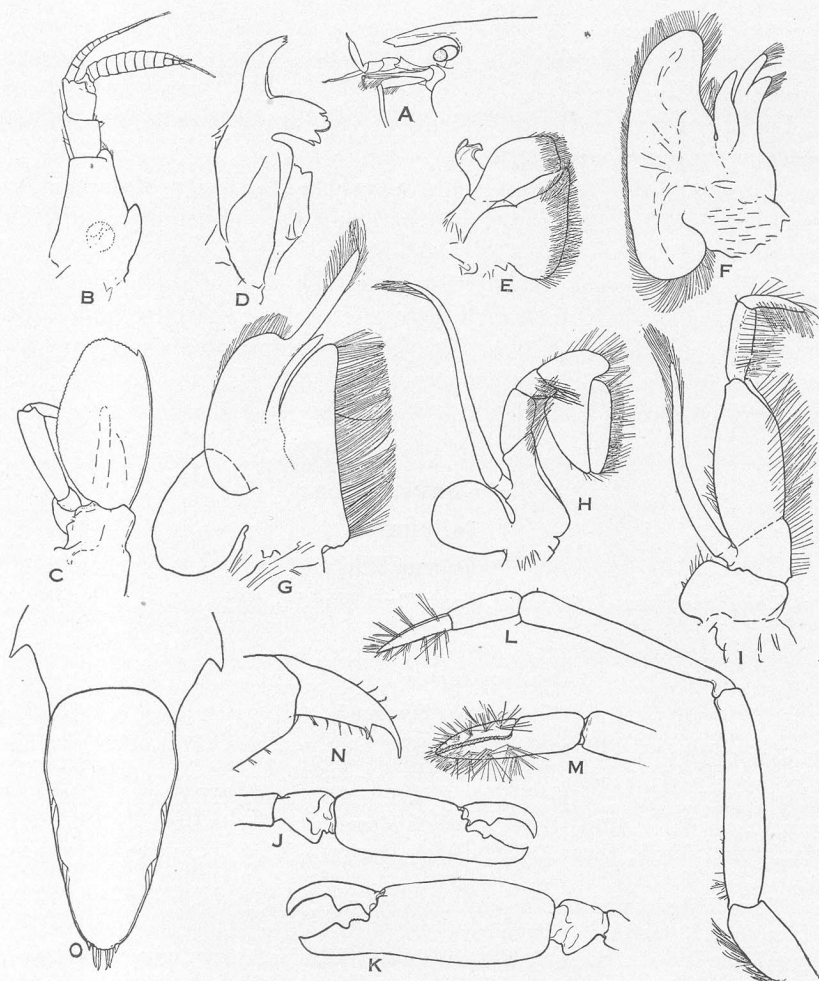


Fig. 66. *Pontonia tyrrhena* (Petagna), from St. Paul de Loanda. Female.

A, lateral view of rostral region, $\times 2.5$; B, antennule, $\times 4.7$; C, antennal scale and peduncle, $\times 4.7$.
 D-I, mouth-parts, $\times 7$: D, mandible; E, first maxilla; F, second maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped.
 J, inner face of chela of first left leg, $\times 2.1$; K, same of first right leg, $\times 2.1$; L, second right leg, $\times 4.7$; M, same, inner face of chela, $\times 4.7$; N, dactyl of third right leg, $\times 25$; O, dorsal view of telson, $\times 6.8$.

also the lateral rostral view is given, is perhaps a little unusual. The rostrum carries ventrally a small tooth near the tip. Strange to say, the specimen figured by Guérin (*loc. cit.*) seems to show a similar peculiarity. His figure (*loc. cit.*) has a small lobule on the under side of

the rostrum in much the same position as the tooth in our specimen. Only one other specimen of the nine I have been able to examine had any indication of this condition—the male taken by Mr. Chapin at St. Paul de Loanda on September 24, which had a slight notch or tiny tooth beneath at the anterior end of the rostrum.

From published figures it would appear that the fingers of the smaller hand were not toothed; however, the hands are very similar, differing only in size.

"This species was found living inside the shell of the large *Pinna rudis* Linnæus.¹ In a small shell there was only one specimen, in a large one as many as three; and another shell accommodated a male and an ovigerous female. In *Pinna* also live *Athanas grimaldii* and *Crangon* of an undescribed species." (H. L.)

Tribe SCYLLARIDEA

Palinuridæ

Panulirus White

Panulirus WHITE, 1847, 'List Crust. Brit. Mus.,' p. 69.

Panulirus regius Brito Capello

Text Figure 67

Panulirus regius BRITO CAPELLO, 1864, 'Desc. esp. nov. Crust. Afr. Occ.,' Lisboa, p. 5, Pl., fig. 1; 1865, Mem. Acad. R. Sci. Lisboa, Cl. Sci. Nat., (new ser.) III, pt. 2, p. 5, Pl., fig. 1. GRUVEL, 1911, Ann. Inst. Océan., III, fasc. 4, p. 35, and synonymy. BALSS, 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 32. DE MAN, 1916, 'Siboga Exped.,' XXXIX a², Decapoda, pt. 3, Eryonidæ, Palinuridæ, etc., pp. 34, 43.

From Balss (based for the greater part on Gruvel, *loc. cit.*): West coast of Africa, from 23° north latitude to 16° south. Cape Barbas, Rio de Oro; Mauretania; Cape Verde Islands; Senegal; French Guinea; Liberia; Ivory Coast; Gold Coast; Dahomey; Cameroon; island of St. Thomas; French Congo; mouth of the Congo; and Angola, as far south as Mossamedes. De Man notes that this species has been "observed in 1907 off Marseille by Darboux and Stephan" (1917, Feuille Jeunes Naturalistes, Paris, XXXVIII, pp. 16-17).

Banana, August 1915, "taken from the surf, whitish when alive" (H. L.). One specimen of the "puerulus" or natant stage.

MEASUREMENTS.—Length from end of rostral plate to posterior margin of teslon, 22 mm., carapace, 8.5 mm.

¹Cf. notes under *Athanas grimaldii*, p. 20.

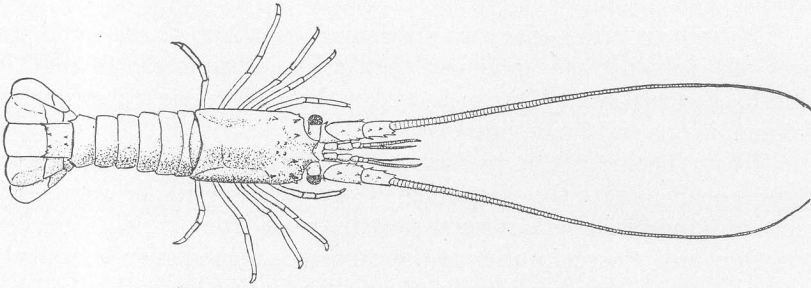


Fig. 67. *Panulirus regius* Brito Capello, from Banana.
"Puerulus" or natant stage. \times about 1.8.

Gruvel cites "*Puer inermis*" Pocock,¹ under this species, and again under *P. laevicauda* (Latreille) (Gruvel, *loc. cit.*, p. 45) with a query. On a distributional basis alone it would seem that the latter citation were the less doubtful of the two.

Scyllaridæ

SCYLLARUS Fabricius

Scyllarus FABRICIUS, 1775, 'Syst. Entom.,' p. 413.

? *Scyllarus arctus paradoxus* Miers

Text Figure 68

Scyllarus (Arctus) arctus var. *paradoxus* MIERS, 1881, Ann. Mag. Nat. Hist., (5) VIII, p. 364.

Scyllarus arctus paradoxus RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 309. From Goree Bay, Senegal, 9 to 15 fathoms, the type locality.

Banana, August 1915, two specimens, representing first littoral, or natant stage, "from the surf." (H. L.)

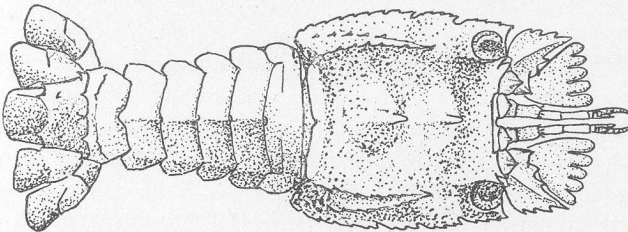


Fig. 68. ? *Scyllarus arctus paradoxus* Miers, from Banana.
First littoral or natant stage. \times about 5.

¹1890, Journ. Linn. Soc. London, Zool., XX, p. 516.

MEASUREMENTS.—The two specimens are about of the same size over all, including the antennæ; they are approximately 16 mm. in length, of which the carapace measured on the median line represents but 4.5 mm. in one and 5 mm. in the other.

I have not been able to compare the young stage represented by these specimens with the same stage of any other species, or even specimens of those species of anywhere near the same size.

Of course, the sculpturing of the carapace and abdomen is scarcely evident, nor does the armature of the median carina seem to have been developed. The spines along the lateral margin of these very juvenile specimens are much more clear-cut, sharper, and finer than in the smallest *S. arctus* available for examination.

Tribe **THALASSINIDEA**

Callianassidæ

Upogebiinae

UPOGEBIA Leach

Upogebia LEACH, 1814, 'Edinburgh Encyclopedia,' VII, p. 400.

Upogebia furcata (Aurivillius)

Plate VIII

Gebia furcata AURIVILLIUS, 1898, Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, p. 13, Pl. I, figs. 5-7.

Previously known only from the type locality, "river of Bibundi, Cameroon, in decaying fragments of wood."

Banana, July 1915,¹ 70♂, 80♀; August 1915, 86♂, 118♀ (1 ovig.). San Antonio, August 1915, 1♂ juvenile.

Aurivillius's figures lack a spine which occurs at the outer infero-distal angle of the carpus of the chelipeds.

"The habitat of the 'scorpion lobster' *Upogebia furcata* in Banana Creek (Pl. VIII, fig. 1) is only near the shores some five miles up from the mouth where the water is still strongly brackish. From a distance the places where *Upogebia* is common look like many others—low fringes of mud—but a closer view shows that they consist of a dark brown peaty mass completely pitted with large and small holes and, though water-soaked, are extremely tough. Over them the tides wash so strongly that plants apparently have great difficulty securing a foothold. This peat-

¹Two species of bopyrid isopods (*Pleurocrypta langi* and *Pseudione chapini*) were found parasitic in the branchial chambers of specimens of this lot. Cf. Van Name, 1920, Bull. Amer. Mus. Nat. Hist., XLIII, pp. 67, 69.

like ground may be several feet in thickness and is essentially composed of tiny rootlets of mangroves (*Rhizophora mangle* Linnæus), which by this means are able to secure anchorage in such sites.

"The larger holes are the work of the beautiful blue crab, *Sarmatium curvatum* (H. Milne Edwards), whose carapace is nearly one inch and a half across and which may be seen at any time outside. Its galleries criss-cross the peat-like mass in every direction and some usually reach slightly beyond the level of the lowest tide. After cutting off large chunks with a hatchet, I found that the snugly fitting tiny channels of *Upogebia* may start at the surface or from any point along the larger tunnels of *Sarmatium*. It would be difficult to give an estimate of their number but in a piece of peat the size of a man's fist as many as a dozen might be found. Only by cutting and breaking the galleries apart could *Upogebia* be removed. In spite of their numbers they seem to be fairly localized, for I never found them anywhere else, with the exception of one specimen from San Antonio which had burrowed into decomposed mangrove wood. They apparently never come to the surface from their burrows. When alive they are pale reddish. They are not eaten by the natives." (H. L.)

Tribe **PAGURIDEA**

Paguridæ

Dardaninæ

DARDANUS Paulson

Dardanus PAULSON, 1875, 'Crust. Red Sea,' p. 90; RATHBUN, 1902, Proc. U. S. Nat. Mus., XXVI, p. 33.

Dardanus pectinatus (Ortmann)

Text Figure 69

Pagurus striatus var. *pectinata* ORTMANN, 1892, Zool. Jahrb. Syst., VI, p. 284, Pl. XII, fig. 10.

Petrochirus arrosor pectinatus RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 302.

Pagurus arrosor var. *pectinata* BALSS, 1921, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, p. 43.

Brazil (Ortmann); Dakar, Senegal (Rathbun).

St. Paul de Loanda, September 23, 1915, 1 ♂, 1 ♀ (ovig.).

The variety *pectinatus* of *Dardanus arrosor* is so strikingly distinct that it unquestionably should be considered a separate species as Miss Rathbun (*loc. cit.*) has suggested. Literally, one can distinguish them with the eyes shut.

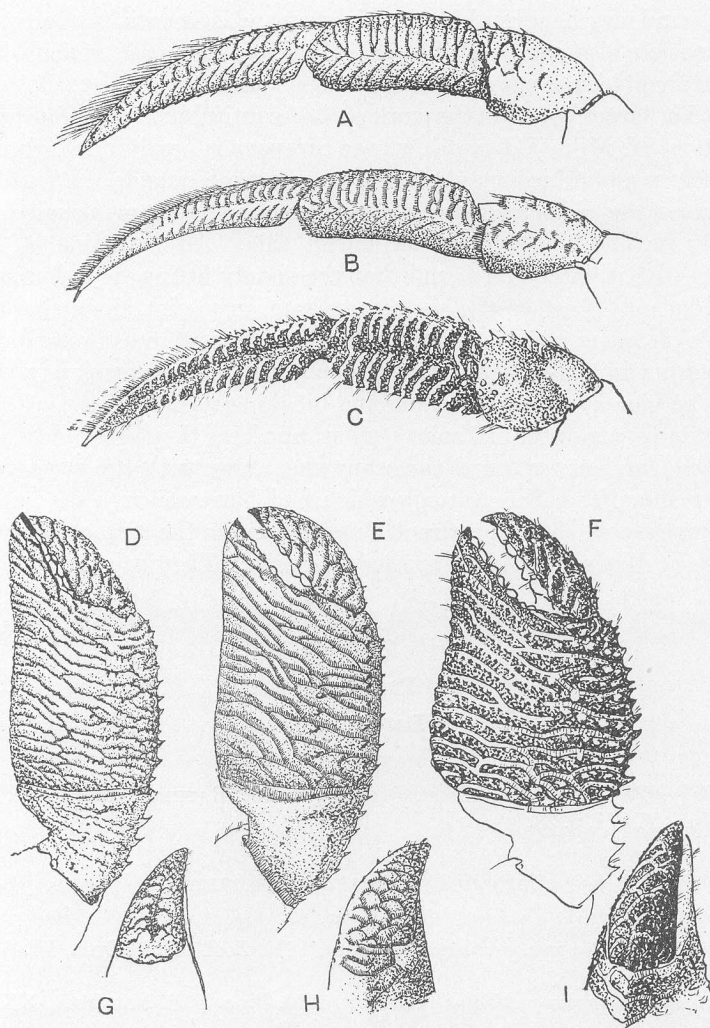


Fig. 69. Details of species of *Dardanus*. All $\times 1.6$.

Lateral aspect of second left ambulatory leg: A, *Dardanus insignis*; B, *D. arrosor*; C, *D. pectinatus*.
 Dorsal view of large (right) chela: D, *D. insignis*; E, *D. arrosor*; F, *D. pectinatus*.
 Dactyl of large (right) chela as seen from above: G, *D. insignis*; H, *D. arrosor*; I, *D. pectinatus*.

The dactyl of the outer left ambulatory leg of *D. pectinatus* is about four and one-half times as long as its greatest depth; in typical *arrosor*, it is in excess of five and one-fourth times as long. The propodal joint of the same leg of *D. pectinatus* is a little short of being twice as long as

high; in the typical *arrosor* it is more than twice (nearly two and one-fourth times) as long as high at the middle of its length; moreover in the latter the outer face of this joint is not at all grooved, though the meeting of the striæ running down from the upper half of the outer surface with those running up from the lower half, along the median longitudinal line, gives the optical illusion that the surface is grooved along that line. In reality, the outer face of the propodus is quite bowed out, rather evenly convex and more ridged than not along its median longitudinal axis. Along this line the propodus of *D. pectinatus* is distinctly depressed or grooved, as is also the dactyl; in *arrosor* this joint shows but little more than a suggestion of a groove as compared to the rather widely and deeply troughed dactyl of *D. pectinatus*.

The striæ on the outer surface of the second ambulatory leg in *D. arrosor* are but minutely, almost imperceptibly roughened at the bases of the hairs inserted along the anterior margins of the striæ, while in *D. pectinatus* they are noticeably roughened and rugulose over their surface, the anterior margins of the striæ plainly spinous-tuberculate. This difference in armature is even more pronounced in the striations of the hands, not only being very evident to the eye, but also to the touch when running the finger over them. In fact, the strongly spined chela of *D. pectinatus* readily differentiates it from the typical form with which it has long been associated. In *D. arrosor* approximately the outer two-thirds of the upper surface of either hand is unarmed, except for the characteristic transverse striæ or rugæ; the inner remaining third or less of the upper surface has three or four not-too-distinct rows of spinous tubercles. In *D. arrosor*, except in the case of the more continuous row of spines forming the inner margin of the palm, these spines occur, one or two (or rarely three) to each of the longer, less interrupted rugæ. In *D. pectinatus* almost the entire rugæ on the hands are crowded with spinous tubercles, each and every one; moreover, these tubercles become increasingly prominent as one goes across the upper face of the palm from the outer margin toward the inner one, where they are two and three times as large as the spines in specimens of *D. arrosor* of about the same size.

The proportions and the shape of the larger chela differ also in the two species. The palm is more squat and less parallel-sided in *D. pectinatus*, the greatest width just before the base of the hand is contained about one and one-third times in its length from the outer articulation with the wrist to the tip of the immovable finger; in *D. arrosor* the greatest width of the palm is contained twice in the corresponding longitudinal

measurement; moreover, the lateral margins of the palm of the latter species are sub-parallel, while in the former the "heel" of the palm—the outer proximal angle—below the immovable finger is quite prominently bowed out, so much so that there is a very pronounced concavity in the external margin of the palm about opposite the base of the immovable finger.

Just behind the rostral convexity on the median anterior portion of the carapace of *D. pectinatus* there is a small, approximately smooth raised area near the anterior margin on which a tuft or tufts of hair are anteriorly excentrically inserted; no such area is to be observed in *D. arrosor*.

These comparisons are based principally upon two female specimens of good size, the one *D. arrosor* from the Mediterranean of which the anterior portion of the carapace is 13 mm. long, and the other the ovigerous female, above, from St. Paul de Loanda, with the anterior portion of the carapace 15 mm. long. In addition, I have examined two male specimens of *D. pectinatus*, one with the anterior portion of the carapace 13 mm. long from Dakar, Senegal, and the St. Paul de Loanda male, with about a 9 mm. long anterior portion of the carapace; and a further specimen of *D. arrosor*, a small female with the anterior portion of the carapace only 8 mm. long.

In this connection, at the suggestion of Dr. Mary J. Rathbun, I examined several specimens of *D. insignis* (Saussure).¹ This species seems in many ways to be intermediate between the two foregoing species. The ambulatory legs of *D. insignis* are proportioned much like those of *D. pectinatus*, though dactyls may in older males become quite slender; the propodal joint of the outer left ambulatory leg, though similarly armed, is no more grooved than in *D. arrosor*. The larger chela is armed as in *D. pectinatus*, but in outline resembles more *D. arrosor*, having the greatest width across the palm contained one and two-thirds in the distance from the outer, lower articulation of the hand to the tip of the immovable finger.

The pit, depression, or groove on the outer margin of the movable finger of the larger hand, just before the articulation, by means of which Milne Edwards and Bouvier² distinguish the former's *D. petersii* is present in *D. insignis*, which leads me to believe that *petersi* is but a synonym of Saussure's species. This pit has a bare suggestion in *D.*

¹*Pagurus insignis* Saussure, 1858, Mém. Soc. Phys. Hist. Nat. Genève, XIV, p. 453.

²"*Pagurus striatus*, Latr., var. *Petersii*," 1893, Mem. Mus. Comp. Zool., Cambridge, XIV, p. 162, Pl. xi, figs. 24-35, and synonymy.

pectinatus and is not evident in *D. arrosor*. The variety of *D. arrosor*, described by Moreira¹ as *divergens* I have not seen, nor am I altogether assured that it represents a distinct form.

Dardanus granulimanus (Miers)

Pagurus granulimanus MIERS, 1881, Ann. Mag. Nat. Hist., (5) VIII, p. 276, Pl. XVI, fig. 3. CHEVREUX AND BOUVIER, 1891, Bull. Soc. Zool. France, XVI, p. 254; 1892, Mém. Soc. Zool. France, V, p. 116, Pl. III, figs. 11–15. BALSS, 1921, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, p. 43.

Petrochirus granulimanus RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 303.

Arguin Bank (Balss); according to Rathbun: Cape Verde Islands (Milne Edwards and Bouvier); Dakar, Gorée, and Rufisque (Chevreux and Bouvier); Gorée Bay, 9 to 15 fathoms (Miers); Dakar (Rathbun); Senegambia (Ortmann).

Moanda, August 1915, 17 ♂. Banana, August 1915, 1 ♂.

CLIBANARIUS Dana

Clibanarius DANA, 1852, 'Crust. U. S. Expl. Exped.,' Pt. 1, p. 461.

Clibanarius chapini, new species

Text Figures 70 and 71

TYPE LOCALITY.—St. Paul de Loanda, October 21, 1915, 7 ♂, 5 ♀ (1 ovig.); October 23, 1915, 2 ♂, 1 ♀. (Amer. Mus. No. of type 4798.)

MEASUREMENTS.—Of male holotype, length of anterior portion of carapace 5.1 mm., width 4.1 mm., longer eye-stalk 4.8 mm. long.

DESCRIPTION.—An apparently new species which I cannot reconcile with the descriptions of any of the *Clibanarii* so far recorded from West Africa.

In some respects it seems to resemble *C. virescens* Krauss,² but aside from striking color differences, the relative length and proportions of the eye-stalks at once separate the two. The eye-stalks of *virescens* are about six and one-fifth times more or less as long as wide, while their length in *chapini* approaches eight times their width at the middle.

The eye-stalks of *C. chapini* are slightly shorter than the antennular peduncles, but exceed the antennal peduncles by about the space occupied by the cornea, or a little more; they are about one-seventh to one-eighth longer than the greatest width of the anterior portion of the carapace. The ophthalmic scales are more squarish in outline and more deeply incised with spine-like denticulations than in *virescens*, where the scales are rather more triangular with fewer and less prominent teeth. The antennal scale extends a little way beyond the base of the terminal segment of the antennal peduncle; the acute rostral projection of the front extends well in advance of the lateral antennal projections, which are armed with a spiniform tubercle at, or just below the anterior margin; the anterior portion of the carapace is about four-fifths as wide as long.

¹1905, Arch. Mus. Nac. Rio de Janeiro, XIII, p. 133, Pl. iv, fig. 1.

²1843, 'Südafr. Crust.,' p. 56, Pl. iv, fig. 3. McCulloch, 1913, Sec. Australian Mus., IX, p. 346, Pl. xi, fig. 2, and synonymy.

Measured on the upper margin the dactyl of the outer left ambulatory leg is about five-sixths as long as the propodus, the latter joint is virtually three times as long as high at the middle. As is characteristic of this and related species of *Clibanarius*, the outer face of the propodus of this leg is more or less flattened, with an overlapping subacute, obscurely serrated upper margin; these obscure serrations are formed, as it were, around the ten or eleven tufts of hair arising from prominent punctæ, for the reception of which the margin seems to be indented.

In the genus *Clibanarius* color is very diagnostic and, except in very much faded specimens, usually furnishes a ready means for distinguishing species. In this respect our species is very distinct; in alcohol it appears to be generally white, marked with red orange-brown; the whitish ambulatory legs are margined, more or less, especially on the upper margins of the dactylar, propodal and carpal joints, with the reddish-brown color; the meral joints have a single median band of the same color on the outer or posterior surface; in addition there are scattered spots of the reddish color on the lateral faces of the legs. General color of the chelipeds red orange-brown, with the teeth yellowish white, the spines light corneous, with tufts of straw-colored hairs or setæ arising from anterior side of their bases, and the fingers black-tipped.

Of the species of *Clibanarius* other than *C. virescens* reported from the West African coast and having dactyls shorter than or at least not longer than the propodus, *C. æquabilis* Dana¹ is possibly the only one for which our species might be mistaken. Most authors like Stimpson² and Osorio³ merely list it from West

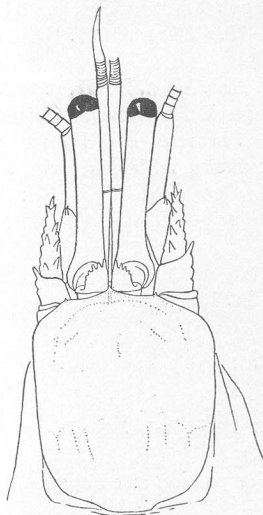


Fig. 70. *Clibanarius chapini*, new species, from St. Paul de Loanda.

Dorsal view of anterior portion. $\times 6$.

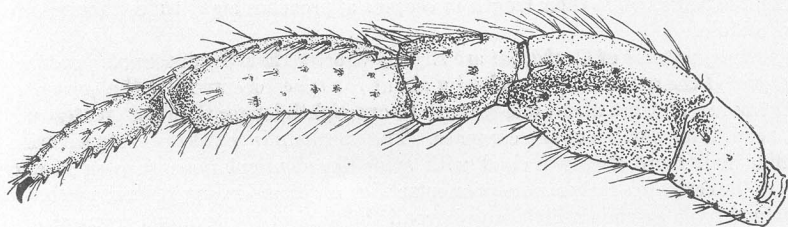


Fig. 71. *Clibanarius chapini*, new species, from St. Paul de Loanda.

Lateral aspect of second left ambulatory leg. $\times 6$.

¹1852, 'Crust. U. S. Expl. Exped.', pt. 1, p. 464; atlas, 1855, Pl. xxix, fig. 4.

²1858, Proc. Acad. Nat. Sci., Philadelphia, X, p. 247. Loc. Madeira.

³Vide Rathbun, 1900, Proc. U. S. Nat. Mus., XXII, p. 304. Loc. Princess Island.

Africa. Chevreux and Bouvier¹ contrast what they have taken to be *C. æquabilis* with *C. senegalensis*, from which our species also differs by the very characters they enumerate. I have been unable to obtain any specimens determined as *C. æquabilis* from the West Coast of Africa, though, through the kind offices of Dr. W. T. Calman of the British Museum, I have been enabled to examine a specimen of the variety *merguiensis* de Man² from Singapore. From the variety our species differs in having a longer rostral projection (in *merguiensis* it does not surpass the antennal angles of the carapace), and the eye-stalks of the varietal form are relatively shorter as compared both with the width and length of the anterior portion of the carapace, though they are slightly longer than the antennular peduncle. From Dana's typical species as described and figured, our species appears to differ not only in coloration, so far as this can be determined from his text, but also in having the outer surface of the second and third legs not naked, but "pitted" or punctate with irregular colored spots, from which tufts of hair arise; moreover, the subacute upper margin of the propodus of the outer left ambulatory leg is figured by Dana (*loc. cit.*, Pl. xxix, fig. 4c) with a rather even edge; our species has it rather wavy or notched at intervals to accommodate tufts of hair arising from punctæ within those "notches."

But Dana's species certainly is not a very clearly defined one, and to me it seems probable that he has confused two different things. The length of the dactyl of the outer left leg, as compared to the propodus of his Tahiti specimens differs from that of those from Madeira; in the latter the dactyl and propodus are subequal, while the former have the dactyl only two-thirds the length of the propodus. And the manner in which he speaks of the Tahiti specimens being not striped almost gives rise to the inference that his Madeira and Cape Verde specimens were.

Judging from distributional records, Mediterranean, Cape Verde, and central and northern West African species of *Clibanarius* do not ordinarily range into the Pacific, as do some of the Cape and southernmost West African forms. Where a West African occurrence is recorded for a South African or Indo-Pacific species of this genus, such as *C. cli-banarius* (Herbst),³ *C. virescens* Krauss (recorded from West Africa by

¹1892, Mém. Soc. Zool. France, V, p. 134.

²1888, Jour. Linn. Soc., Zool., XXII, p. 247. Alcock, 1905, 'Cat. Indian Decapod Crust.,' Pt. II, fasc. 1, p. 47, Pl. iv, fig. 5.

³Osorio, 1887, Journ. Sci. Nat., Lisboa, XI, p. 228, as *C. vulgaris*; loc. Angola or the Congo. Thallwitz, 1891, Abh. Ber. K. Zool. Mus. Dresden, III, No. 3, (1890-1891), p. 33, as *C. vulgaris* var.?; loc. Ogoe; given as a synonym of *C. africanus* by Balss, 1921, 'Beitr. Kenntnis Meeresfauna Westafrikas, III, p. 40.

Osorio),¹ and *C. æquabilis*, I am tempted to doubt the correctness of the determinations on which these records are based.

From the brief color note given by Aurivillius² it is possible that at least some of his Cameroon specimens are identical with *C. chapini*.

***Clibanarius senegalensis* Chevreux and Bouvier**

Clibanarius senegalensis CHEVREUX AND BOUVIER, 1891, Bull. Soc. Zool. France, XVI, p. 256; 1892, Mém. Soc. Zool. France, V, p. 131, Pl. iv, figs. 7-11. BALSS, 1921, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, p. 40.

Previously reported from Gross-Friedrichsburg, Gold Coast, and Victoria, Cameroon (Balss), and Dakar, Senegal (Chevreux and Bouvier).

Banana, July 1915, 6♂, 4♀ (1 ovig.); 39♂, 27♀ (5 ovig.).

Red; punctate with bluish spots; rather distinctive and striking white dactyls with reddish margins and tip; terminal claw corneous, black.

***Clibanarius cooki* Rathbun**

Plate IX, Figure 2b; Text Figure 72

Clibanarius cooki RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 305, text figs. 1, 2.

Not definitely found again since first described by Miss Rathbun from a specimen taken at the mouth of the Mesurado River, Monrovia.

Banana, July 1915, 23♂, 8♀ (3 ovig.). One of the males is very large (total length from rostral projection to end of telson not less than 80 mm.; carapace, over all, 20.5 mm., anterior portion 14.5 mm.).

Balss³ has taken this species to be identical with *C. africanus* Aurivillius,⁴ but probably had only that species before him, though their ranges are more or less the same.

Comparing specimens of about the same size, it will be seen at once that *C. cooki* is much the more hairy species, with hairs two and three times as long as in its very sparsely haired relative. The dactyls, propodi, and carpi of the ambulatory legs of *C. cooki* are well provided with long hairs, while in *C. africanus*, though the dactyls are short-haired, the propodal and carpal joints are naked. The chelæ of *C. cooki* are also very hairy, whereas those of *C. africanus* are without hair except for the inconspicuous hairs on the fingers. Figures given by Miss Rathbun and by Aurivillius (*loc. cit.*) indicate fairly well the relative hairiness of the ambulatory legs.

¹1887, Journ. Sci. Nat., Lisboa, XI, p. 228; loc. Zaire or the Congo.

²1898, Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, p. 12, Pl. iv, fig. 8.

³1921, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, p. 40.

⁴1898, Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, p. 12, Pl. iv, fig. 7.

In *C. cooki* the median rostral point of the front is more prominent and more pointed than the lateral projections, extending half its length beyond them. In *C. africanus* the median projection is no more conspicuous than the lateral ones, nor does it extend forward in advance of them. The anterior portion of the carapace is laterally thickly haired in the former and the median gastric region is always more or less roughened; in the latter the antero-lateral region carries only a few scattered hairs and the median gastric region is smooth.

Measured from the orbital margin to the end of the cornea, the eye-stalks of *C. cooki* are as long as the anterior portion of the carapace measured in the same line from the orbital margin backward. The eye-stalks of *C. africanus* are shorter than the anterior portion of the carapace by the length of the cornea, and for their length the eye-stalks are

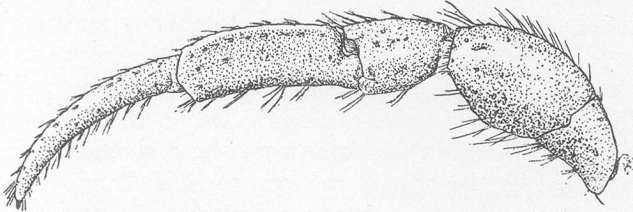


Fig. 72. *Chibanarius cooki* Rathbun, from Banana.

Lateral aspect of second left ambulatory leg. $\times 2.5$.

distally more dilated and slightly stouter throughout than in *C. cooki*. When extended, the eye-stalks and antennular peduncles of *C. cooki* are subequal, while in *C. africanus* the eye-stalks are shorter by the length of the cornea.

The hands of *C. africanus* are irregularly rather coarsely tuberculate with blunt more or less rounded tubercles; the intervening spaces are rather closely filled with granulations of varying sizes. In *C. cooki* the more or less pointed or spiniform tubercles are distinct and the intervening spaces smooth. The upper margin of the carpus of the chelipeds of the latter has a slight furrow or groove between two rows of scaliform tubercles from the anterior margins of which tufts of long hair arise; the anterior scale of the inner of the two rows of each carpus carries a strong, anteriorly directed spine. In *C. africanus* there is a similarly placed spine, but behind it is a row of strong, posteriorly diminishing spines, often bifid or twinned, forming the inner margin of the external surface of the carpus. Further, the upper margin of the merus of *africanus* carries anteriorly a small inverted triangular patch of close-set

spines, often in threes and fours from a common base; *C. cooki* has but a few low scales on the upper margin carrying anteriorly tufts of long hairs.

The propodus of the outer left leg of *C. africanus* is more or less cylindrical, the rounded outer and upper faces passing over rather evenly, one into the other; in *C. cooki* the outer face is more flattened, and therefore forms a blunt angle with the upper face, marked by a narrow smooth band lying between the upper row of hair tufts of the outer face and the external, or outer row of the upper face of the propodus.

Moreover, the ambulatory dactyls of *C. cooki* are less slender, less curved, and shorter. In the two specimens compared, though the anterior portions of their carapaces are approximately the same in length, the dactyls of *C. africanus* are from one-third to one-half longer than in *C. cooki*.

"On certain parts of the sandy shore along the bay just east of Banana Peninsula one can see during low tide many apparently empty shells, scattered about, of two varieties of *Potamides fuscatus* and a few of *Thais coronata*. They are inhabited by hermit crabs of chiefly two species, *Clibanarius cooki* and *C. africanus*. On cloudy or rainy days they generally remain wherever, or not far from where, the tides strand them. But, if bothered by the heat of the sun, these shells move into shady patches near mangroves or grass-covered places. In such favored sites they form, for the time being, small heaps of a hundred and more, as if some one had deliberately brought them together (Pl. IX, fig. 1). Before the tide reaches them again, however, they disperse.

"It is interesting that on Bulabemba Island, just across Banana Bay, one of the very shells these hermit crabs use, *Potamides fuscatus*, at times comes together in numbers, often exceeding several thousand. This happens only during the dry season (July–September) when certain parts of its habitat as well as the lagoons are drying out. They crawl, however, into available depressions where they remain. To prevent the sun from heating up their shells they keep turning about, the dry, whitish shells on top seeking to work themselves under the moist, dark ones below. But, even so, late in the afternoon considerable moisture has been removed by the sun. The *Potamides* certainly could not withstand the daily repetition of such a baking process were it not that through the hygroscopic action of the salt thus crystallized a large amount of moisture is retained every night from the heavy dewfall." (H. L.).

Clibanarius africanus Aurivillius

Plate IX, Figure 2a; Text Figure 73

Clibanarius africanus AURIVILLIUS, 1898, Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, p. 12, Pl. IV, fig. 7. RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 305. LENZ, 1910, 'Wissen. Ergeb. Deutschen Zentral-Afrika-Exped. 1907-1908,' III, Zool. I, p. 133. BALSS, 1921, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, p. 40 (part?).

Aurivillius's material came from Cameroon, in the river at Bibundi, and Kitta, and Lenz's from the mouth of the Tschiloango River. Balss lists the species as occurring at numerous localities ranging from French Guinea and Liberia on the north to the French Congo on the south. Though possible, it is not altogether certain that he had just the one species represented in his material (see "Remarks" under *Clibanarius cooki* above).

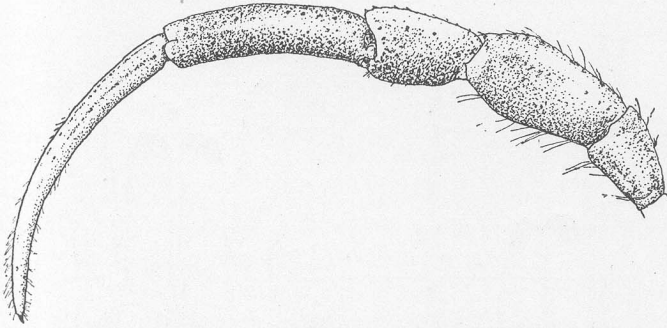


Fig. 73. *Clibanarius africanus* Aurivillius, from Banana.

Lateral aspect of second left ambulatory leg. $\times 2.5$.

Banana, July 1915, 35♂, 23♀ (11 ovig.), 9 juvenile.

Aurivillius gives the general color of the species as yellowish, brown or darker on the exposed, harder parts of the body, with hinder part of "thorax" grayish yellow. Lenz adds that the darker colored anterior hard parts, in alcohol, tend to become greenish.

The broad dark, transverse bands, alternating with lighter, mentioned by Aurivillius as occurring on the ambulatory legs must refer to the dark transverse band occupying about the distal half of the propodal joints of the walking legs, except for the extreme tip of that joint, which is lighter colored, like the proximal half of the propodus, the dactyls and the rest of these legs.

In some of the specimens there is a faint suggestion of a longitudinal band or banding on the outer surfaces of the carpus and merus, and more questionably on the proximal half of the propodus and the dactylus.

For notes on habitat, etc., cf. under *C. cooki*, p. 54.

DIOGENES Dana

Diogenes DANA, 1852, 'Crust. U. S. Expl. Exped.,' Pt. 1, p. 438.

Diogenes denticulatus Chevreux and Bouvier

Text Figure 74

Diogenes denticulatus CHEVREUX AND BOUVIER, 1891, Bull. Soc. Zool. France, XVI, p. 254; 1892, Mém. Soc. Zool. France, V, p. 122, Pl. III, figs. 16–20. RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 307.

West African Coast from Rufisque, Senegal (type-locality) and the mouth of the Mesurado River, Monrovia (Rathbun).

Banana, August 1915, 2 small ♀, in rather poor condition, the one lacking both hands and the other the abdomen. The carapace of the larger specimen measures 5 mm. long, of the smaller 3.2 mm.

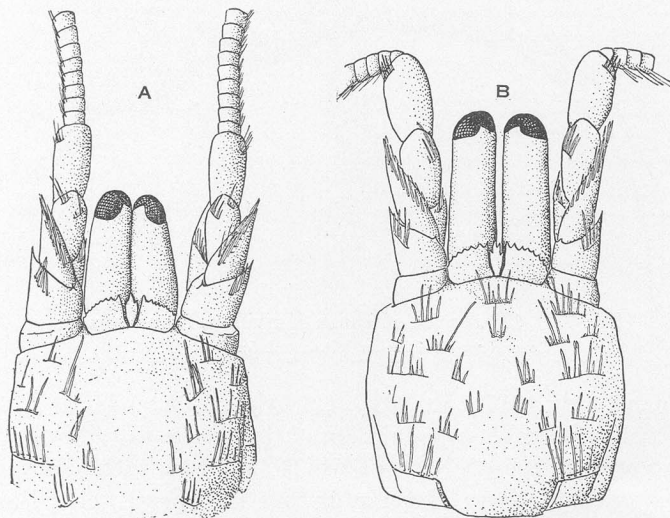


Fig. 74. *Diogenes denticulatus* Chevreux and Bouvier, from Banana.

Dorsal view of anterior region of the two small females. \times about 6.5.

I am inclined to be very doubtful about Balss's suggestion that *D. denticulatus* might be a variety of *D. pugilator* Roux. In addition to the typical form, there are now not less than five varieties of that species listed which I should not care to separate from one another on the rather meager characterizations on which they are based. To add Stimpson's *brevicristatus* and *D. denticulatus* Chevreux and Bouvier to the

¹1921, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, p. 41 *et seq.*

varieties of *pugillator* as Balss (*loc. cit.*) suggests seems only to make the confusion worse.

Of the two Congo specimens, the rostral point of the smaller is as figured by Chevreux and Bouvier, the larger has a supernumerary second spine to the right of the tip, making it appear unequally bifid. The hands too, are much as figured by the authors of the species and are, if anything, more coarsely spinous-granular; the palms are about as broad as long and the depression near the postero-lateral angle of the palm not so pronounced nor so evident as in the figured type.

Tribe **HIPPIDEA**

Hippidæ

HIPPA Fabricius

Hippa FABRICIUS, 1787, 'Mantissa Insect.,' I, p. 329.

Hippa cubensis (Saussure)

Remipes cubensis SAUSSURE, 1857, Rev. Mag. Zool., (2) IX, p. 503. BALSS 1916, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, p. 39.

Hippa cubensis RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 300.

From Rathbun: Cape Verde Islands (Studer, Miers, Cunningham, Henderson); Dahomey (Osorio); St. Thomas (Osorio); Isla das Rolas (Osorio); Quinchoxo (Studer); Ascension Island (Miers, Benedict). From Balss: Cameroon and Annobon.

From Banana, 1 ♂, 1 ♀ (ovig.).

"From the shore of Banana Peninsula on the Atlantic Ocean side; taken from the sand at low tide near the drift line, together with amphipods." (H. L.).

Order **STOMATOPODA**

Chloridellidæ

PSEUDOSQUILLA Dana

Pseudosquilla DANA, 1852, 'Crust. U. S. Expl. Exped.,' Pt. 1, p. 621.

? **Pseudosquilla ferussaci** (Roux)

Text Figure 75

Squilla ferussaci ROUX, 1828, 'Crust. Méditerranée,' p. [147], Pl. xxviii.

Pseudosquilla ferussaci GIESBRECHT, 1910, 'Fauna u. Flora Neapel' (Monogr. 33 Zool. Station Neapel), p. 34, Pl. i, fig. 8, Pl. iv, figs. 37-48. KEMP, 1913, Mem. Indian Mus., IV, pp. 96 and 202, and synonymy.

?*Pseudosquilla ferussaci* (sp.?) GIESBRECHT, *loc. cit.*, pp. 125, 142, Pl. iv, figs. 49-56.

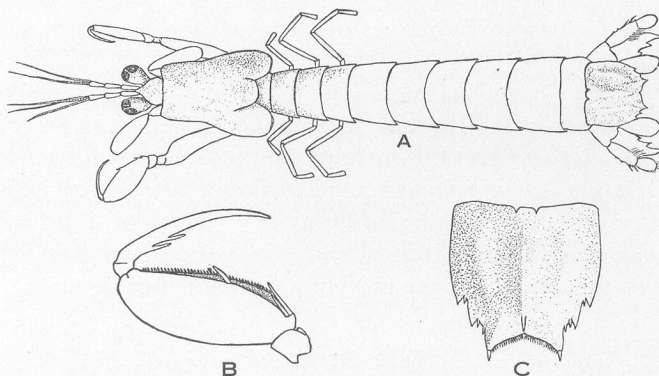


Fig. 75. ?*Pseudosquilla ferussaci* (Roux), from Banana.

First littoral stage? A, dorsal view, \times about 2; B, hand, \times 6; C, telson enlarged, \times about 4.5.

Banana, August 1915, 1 specimen, first littoral stage? "from the surf on the sandy shores of the Atlantic Ocean (H. L.)"

MEASUREMENTS.—From tip of rostrum to end of telson about 33 mm. long.

There can be no question that this specimen is a *Pseudosquilla*, but it may not be the species *ferussaci*, for the shape of the rostral plate is different, being triangular and not rounded as in the figure given by Giesbrecht (*loc. cit.*, Fig. 49) for the first littoral stage; in all other particulars, however, it seems to be in rather close agreement with his figures.

LITERATURE CITED¹

- ALCOCK, A. 1901. 'A Descriptive Catalogue of the Indian Deep-Sea Crustacea Decapoda Macrura and Anomala, in the Indian Museum.' 'Roy. Indian Survey Ship Investigator,' Calcutta, pp. 1-286, i-iv, Pls. I-III.
1905. 'Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum. Pt. II. Anomura, fasc. 1. Pagurides.' Calcutta, pp. xi+197, Pls. I-XVI.
1906. 'Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum. Pt. III, Macrura, fasc. 1. The Prawns of the Peneus Group.' Calcutta, pp. 1-55, Pls. I-IV.
- AURIVILLIUS, CARL W. S. 1898. 'Krustaceen aus dem Kamerun-Gebiete.' Bihang K. Sv. Vet.-Akad. Handl., Stockholm, XXIV, Afd. IV, No. 1, pp. 1-31, Pls. I-IV.
- BALSS, H. 1914. 'Diagnosen neuer Macruren der Valdivia-expedition.' Zool. Anz., XLIV, pp. 592-599.

¹A more complete bibliography of the West African decapod fauna is given by Balss, 1916, 1921, 1922.

1914. 'Decapode Crustaceen von den Guinea-Inseln, Süd-Kamerun und dem Congogebiet.' In 'Ergeb. Zweiten Deutschen Zentral-Afrika Exped. 1910-1911,' I, Zool., pp. 97-108, text figs. 1-12.
1916. 'Decapoda Macrura und Anomura (ausser Fam. Paguridæ).' In Michaelsen, 'Beitr. Kenntnis Meeresfauna Westafrikas,' II, pp. 13-46, text figs. 1-16.
1921. 'Decapoda Anomura (Paguridea) und Brachyura (Dromiacea bis Brachygnatha).' In Michaelsen, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, pp. 39-67, text figs. 1-7.
1922. 'Decapoda Brachyura (Oxyrhyncha und geographische Übersicht über Crustacea Decapoda).' In Michaelsen, 'Beitr. Kenntnis Meeresfauna Westafrikas,' III, pp. 71-110, 1 text fig.
- BATE, C. SPENCE. 1868. 'On a new Genus, with four new Species, of Freshwater Prawns.' Proc. Zool. Soc. London, pp. 363-368, Pls. xxx, xxxi.
1888. 'Report on the Crustacea Macrura collected by H. M. S. "Challenger" during the years 1873-1876.' In 'Report on the Scientific Results of the Voyage of H. M. S. "Challenger."' Zoöl., XXIV, pp. xc + 942, Pls. I-CL, text figs. 1-76.
- BENEDICT, J. E. 1894. 'Notice of the Crustaceans collected by the United States Scientific Expedition to the West Coast of Africa.' Proc. U. S. Nat. Mus., XVI, (1893), pp. 535-541.
- BORRADAILE, L. A. 1917. 'On the Pontoniinae.' Being Report No. 113 of 'The Percy Sladen Trust Expedition to the Indian Ocean.' Trans. Linn. Soc. London, (2) Zoöl., XVII, pp. 323-396, Pls. LII-LVII.
- BOUVIER, E. L. 1904. 'Crevettes de la famille des Atyidés: espèces qui font partie des collections du Muséum d'Histoire Naturelle.' Bull. Mus. Hist. Nat., Paris, X, pp. 129-138.
1905. 'Observations nouvelles sur les Crevettes de la Famille des Atyidés.' Bull. Sci. France et Belgique, XXXIX, pp. 57-134, text figs. 1-26.
1913. 'Les Caridines des Seychelles.' Being No. XXVIII, Vol. IV, 'Reports of the Percy Sladen Trust Expedition to the Indian Ocean in 1905.' Trans. Linn. Soc. London, (2) XV, Zoöl., pp. 447-472, Pls. xxvii-xxix.
- BRITO CAPELO, FELIX DE. 1864. 'Descrição de tres especies novas de Crustaceos d'Africa occidental. Observações acerca do Penoeus Bocagei. Johnson. Especie nova dos mares de Portugal.' Lisboa, pp. 1-11, 1 Pl.
1865. Idem, Mem. Acad. R. Sci. Lisboa, Cl. Sci. Nat., (N. S.) III, pt. 2.
- CHEVREUX E. AND BOUVIER, E. L. 1891. 'Note préliminaire sur les Paguriens [de la "Melita"].' Bull. Soc. Zool. France, XVI, pp. 252-256.
1892. 'Paguriens. Voyage de la Goelette *Melita* aux Canaries et au Sénégal, 1889-1890.' Mém. Soc. Zool. France, V, pp. 83-144, Pls. II-IV.
- COUTIÈRE, HENRI. 1898. 'Note sur quelques formes nouvelles d'Alphéidés voisines de *A. Bouvieri* A. M.-Edwards [Crust.].' Bull. Soc. Ent. France, pp. 131-134, text fig. 1.
1899. 'Les "Alpheidæ" Morphologie externe et interne Formes larvaires, bionomie.' Ann. Sci. Nat., Paris, Zool., (8) IX, pp. 1-559, Pls. I-VI, text figs. 1-405.

1902. 'Note sur les Palæmonidæ africains provenant des explorations d'Ed. Foà.' Bull. Mus. Hist. Nat., Paris, VIII, pp. 515-521.
1905. 'Les Alpheidæ.' In 'The Fauna and Geography of the Maldives and Laccadive Archipelagoes,' II, pt. 4, pp. 852-921, Pls. LXX-LXXXVII, text figs. 127-139.
1908. 'Note sur les Palæmonidæ africains.' In 'Résultats Scientifiques des Voyages en Afrique d'Édouard Foà.' Paris (Impr. Nationale), pp. 572-578, figs. 1-4'.
1911. 'Sur les Alpheidæ du genre *Athanas* Leach, provenant des collections de S. A. S. le Prince de Monaco.' Bull. Inst. Océan. Monaco, No. 197, pp. 1-7, text figs. 1-6.
- DANA, J. D. 1852-1853. 'Crustacea,' Pts. 1, 2, in 'United States Exploring Expedition,' XIII, XIV, pp. 1-1620; Folio Atlas, 1855, Pls. I-XCVI.
- DARBOUX, G., ET STEPHAN, P. 1907. 'Capture de Palinuriens longicornes dans le Golfe de Marseille.' Feuille Jeunes Naturalistes, Paris, XXXVIII, (1907-1908), pp. 16-17.
- EDWARDS, A. MILNE. 1878. 'Description de quelques espèces nouvelles de Crustacés provenant du voyage aux îles du Cap-Vert de MM. Bouvier et de Ces-sac.' Bull. Soc. Philom. Paris, (7) II, pp. 225-232.
- EDWARDS, A. MILNE AND BOUVIER, E. L. 1893. 'Description des Crustacés de la Famille des Paguriens recueillis pendant l'Expédition.' Part XXXIII, 'Reports on the Results of Dredging . . . by the U. S. Coast Survey Steamer "Blake."' Mem. Mus. Comp. Zool., Cambridge, Mass., XIV, No. 3, pp. 1-172, Pls. I-XII.
1909. 'Les Pénéides et Sténopides.' Part XLIV, 'Reports on the Results of Dredging . . . by the U. S. Coast Survey Steamer "Blake."' Mem. Mus. Comp. Zool., Cambridge, Mass., XXVII, pp. 176-274, Pls. I-IX, text figs. 1-91.
- EDWARDS, H. MILNE. 1834-1840. 'Histoire Naturelle des Crustacés.' I, 1834, pp. xxxv+468; II, 1837, pp. 1-531; III, 1840, pp. 1-638; with atlas, Pls. I-XLII.
- FABRICIUS, J. C. 1775. 'Systema Entomologiæ,' pp. 1-832.
1787. 'Mantissa Insectorum,' I, pp. xx+348.
1798. 'Entomologiæ Systemicæ Suppl.,' pp. 1-572 + 1-52 + 1.
- GIESBRECHT, W. 1910. 'Stomatopoden (Erster Theil).' 'Fauna und Flora Neapel' (Monograph 33 Zool. Station Neapel), Berlin, pp. 1-239, Pls. I-XI, text figs. 1-12.
- GRUVEL, A. 1911. 'Contribution à l'étude générale systématique et économique des Palinuridæ.' Ann. Inst. Océan., III, 1911-1912, fasc. 4, pp. 5-56, Pls. I-VI, text figs. 1-22.
1912. 'Les Crustacés comestibles de la Côte occidentale d'Afrique.' Ann. Inst. Océan., V, fasc. 1, pp. 1-16, Pls. I-II, text figs. 1-6.
- GUÉRIN, F. E. 1832. 'Expédition Sci. Morée,' III, pt. 1, Zool., sect. 2, pp. 30-50, Pl. XXVII, fig. 1.
- HERKLOTS, J. A. 1851. 'Additamenta ad Faunam Carcinologicam Africæ Occidentalis.' Lugduni-Batavorum, pp. 1-31, Pl. I.
1858. '*Palæmon Vollenhovenii*, nouvelle espèce de Crustacé,' being No. 2, of 'Notices Entomologiques.' Tijds. Entom., Nederl. Entomol. Vereen., I, pp. 96-97.

- HILGENDORF, F. 1893. 'Die von Herrn Dr. Büttner im Togolande gesammelten Onisciden und zwei neue Macruren.' Sitzb. Gesell. Naturf. Freunde, Berlin, pp. 152-157.
1898. 'Die Land- und Süßwasser-Dekapoden Ostafrikas.' In 'Deutsch-Ost-Afrika,' IV, No. 7, pp. 1-37, 1 Pl., text figs. A-C.
- KEMP, STANLEY. 1913. 'An Account of the Crustacea Stomatopoda of the Indo-Pacific Region based on the Collection in the Indian Museum.' Mem. Indian Mus., IV, pp. 1-217, Pls. I-X, 10 text figs.
1922. 'Notes on Crustacea Decapoda in the Indian Museum. XV. Pontoniinae.' Rec. Indian Mus., XXIV, pt. 2, pp. 113-288, Pls. III-IX, text figs. 1-105.
- KRAUSS, FERDINAND. 1843. 'Südafrikanischen Crustaceen.' Stuttgart, pp. 1-68, Pls. I-IV.
- LATREILLE, P. A. 1817. 'Nouveau Dictionnaire d'Histoire Naturelle,' nouv. [2nd.] édit., XXV, pp. 1-610.
1829. Crustacés, In Cuvier's 'Le Règne Animal,' nouv. [2nd.] édit., IV.
- LEACH, W. E. 1813-1814. Crustaceology in 'Edinburgh Encyclopedia,' VII, pp. 383-437.
1815. 'A Tabular View of the External Characters of Four Classes of Animals which Linné arranged under Insecta.' Trans. Linn. Soc. London, (1) XI, pp. 306-400.
- 1815-1875. 'Malacostraca Podophthalmia Britanniae,' Pls. I-XLV, with descriptive text.
- LEFEBVRE, M. 1908. 'Notice sur le *Penæus brasiliensis*, Crevette du Bas-Dahomey (Crevette du lac Ahémé).' Bull. Mus. Hist. Nat., Paris, XIV, pp. 267-270.
- LENZ, H. 1910. 'Dekapode Crustaceen Äquatorialafrikas.' In 'Wissen. Ergeb. Deutschen Zentral-Afrika Exped. 1907-1908,' III, Zool. I, pp. 120-134, Pl. III.
1911. '*Palæmon (Eupalæmon) dux* Lenz und *paucidens* Hilg.' Sitzb. Gesell. Naturf. Berlin, pp. 313-316, 1 text fig.
- LINNÆUS, C. 1758. 'Systema Naturæ,' 10th Ed., I, pp. 1-823.
- MCCULLOCH, A. R. 1913. 'Studies in Australian Crustacea. No. 3.' Rec. Australian Mus., IX, pp. 321-353, Pls. X, XI, text figs. 42-53.
- MAN, J. G. DE. 1879. 'On some species of the genus *Palæmon* Fabricius with descriptions of two new forms.' Notes Leyden Mus., I, pp. 165-184.
1888. 'Report on the Podophthalmous Crustacea of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F. R. S., Superintendent of the Museum.' Part V. Journ. Linn. Soc., Zoöl., XXII, pp. 241-312, Pls. XVI-XIX.
1904. 'On Some Species of the Genus *Palæmon* Fabr., from Tahiti, Shanghai, New Guinea, and West Africa.' Trans. Linn. Soc. London, (2) Zoöl., IX, pp. 291-327, Pls. XVIII-XX.
1911. 'The Decapoda of the Siboga Expedition, Part II, Family Alpheidae.' 'Siboga-Expeditie,' XXXIXa¹, pp. 133-465; 1915, Pls. I-XXIII.
1911. 'On Two New Species of Decapod Crustacea.' Notes Leyden Mus., XXXIII, pp. 223-232.
1911. 'On the West-African Species of the Subgenus *Eupalæmon* Ortm.'

- Notes Leyden Mus., XXXIII, pp. 261-264.
1912. 'Sur Deux Espèces et une Variété Nouvelles du Genre *Palæmon* Fabr. Provenant du Congo Belge.' Rev. Zool. Africaine, I, pp. 413-417.
1912. 'Sur Quelques Palæmonidæ et sur une Espèce de *Penæus* de l'Afrique Occidentale, avec des Observations sur le *Palæmon* (*Eupalæmon*) *acanthurus* Wieg. de l'Amérique du Sud.' Ann. Soc. Roy. Zool. Malacol. Belgique, XLVI, (1911), pp. 197-253, Pls. I-IV.
1915. 'On Some European Species of the Genus *Leander* Desm., also a Contribution to the Fauna of Dutch Waters.' Tijds. Ned. Dierk. Vereen., (2) XIV, pp. 115-179, Pls. X-XII.
1916. 'The Decapoda of the Siboga Expedition, Part III, Families Eryonidæ, Palinuridæ, Scyllaridæ and Nephropsidæ.' 'Siboga-Expeditie,' XXXIXa, pp. 1-122, Pls. I-IV.
1923. '*Leander longirostris* (H. M. Edw.) var. *robusta* nov. var., The Common Prawn of the Estuary of the Meuse and of the Hollandsch Diep.' Tijds. Ned. Dierk. Vereen., (2) XIX, Af. 1, pp. 1-9.
- MIERS, E. J. 1881. 'On a Collection of Crustacea made by Baron H.-Maltzan on Gorée Island, Senegambia.' Ann. Mag. Nat. Hist., (5) VIII, pp. 204-220, 259-281, 364-377, Pls. XIII-XVI.
- MOREIRA, CARLOS. 1905. 'Crustaceos' in 'Campanhas de pesca do "Annie."' Arch. Mus. Nac. Rio de Janeiro, XIII, pp. 123-145, Pls. I-V, 2 text figs.
- ORTMANN, A. 1892. 'Die Decapoden-Krebse des Strassburger Museums, IV, Galatheidea und Paguridea.' Zool. Jahrb., Syst., VI, pp. 241-326, Pls. XI-XII.
- OSORIO, B. 1887. 'Liste des crustacés des possessions portugaises d'Afrique occidentale dans les collections du Muséum d'Histoire Naturelle de Lisbonne.' Journ. Sci. Nat., Lisboa, XI, pp. 220-231.
1892. 'Nova contribuição para a fauna carcinologica da ilha de S. Thomé.' Journ. Sci. Nat., Lisboa, (2) II, pp. 199-204.
- PAULSON, O. 1875. [Investigations of the species of Crabs in the Red Sea], I, Imperial Univ. Vladimir, Kiev., pp. xiv+144, Pls. I-XXI.
- PEARSE, A. S. 1911. 'Notes on a *Palæmon* from Kamerun.' Thirteenth Rept. Michigan Acad. Sci., p. 135.
- PESTA, O. 1915. 'Die Penæidea des Wiener naturhistorischen Hofmuseums.' Archiv f. Naturg., LXXXI, Abteil. A, Heft 1, pp. 99-122, text figs. 1-8.
1918. 'Die Decapodenfauna der Adria.' Monograph. Ak. Wiss., Wien, pp. 1-500, text figs. 1-150, 3 maps.
- PETAGNA, V. 1792. 'Institutiones Entomologicae.' Neapoli, 2 vols., 8°, pp. xii+718 (10), Pls. I-X (I have not seen this work).
- PILSBRY, HENRY A. 1919. 'A Review of the Land Mollusks of the Belgian Congo, chiefly based on the collections of the American Museum Congo Expedition, 1909-1915.' Bull. Amer. Mus. Nat. Hist., XL, Art. 1, pp. 1-370, Pls. I-XXIII, text figs. 1-163.
- RATHBUN, MARY J. 1900. 'The Decapod Crustaceans of West Africa.' Proc. U. S. Nat. Mus., XXII, pp. 271-316, text figs. 1-2.

1902. 'Japanese Stalk-Eyed Crustaceans.' Proc. U. S. Nat. Mus., XXVI, pp. 23-55, text figs. 1-24.
1910. 'The Stalk-eyed Crustacea of Peru and the adjacent coast.' Proc. U. S. Nat. Mus., XXXVIII, pp. 531-620, Pls. xxxvi-lvi.
1921. 'The Brachyuran Crabs collected by The American Museum Congo Expedition, 1909-1915.' Bull. Amer. Mus. Nat. Hist., XLIII, pp. 379-474, text figs. 1-22, Pls. xv-lxiv, 1 map.
- ROUX, POLYDORÉ. 1828. 'Crustacés de la Méditerranée et de son Littoral.' Marseille, pp. [1-176], Pls. i-xlv.
- SAUSSURE, H. DE. 1857. 'Diagnoses de quelques Crustacés nouveaux de l'Amérique tropicale.' Rev. Mag. Zool., (2) IX, pp. 501-505.
1858. 'Mémoire sur divers Crustacés Nouveaux des Antilles et du Mexique.' Mém. Soc. Phys. Hist. Nat. Genève, XIV, pp. 417-498, Pls. i-vi.
- SCHUBOTZ, H. 1909. 'Vorläufiger Bericht über die Reise und die zoologischen Ergebnisse der Deutschen Zentral-afrika-Expedition 1907-1908.' Sitzb. Gesell. Naturf. Freunde Berlin, pp. 383-410, 1 map.
- SENDER, A. 1912. 'Zehnfusskrebse aus dem Wiesbadener Naturhistorischen Museum.' Jahrb. Nassauischen Ver. Naturk., Wiesbaden, Jahrg. 65, pp. 189-207, text figs. 1-7.
- SOLLAUD, E. 1911. '*Desmocariss trispinosus* (= *Palæmonetes trispinosus* Aurivillius, type d'un nouveau genre, à nombreux caractères ancestraux, de *Decapodes palémonides*.' Compt. Rend. Acad. Sci., Paris, CLII, pp. 913-916.
- STIMPSON, W. 1858. 'Prodromus descriptionis animalium evertibratorum, quæ in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit W. Stimpson. Pars VII. Crustacea Anomura.' Proc. Acad. Nat. Sci. Philadelphia, X, pp. 225-252 [63-90].
- THALLWITZ, J. 1891. 'Decapoden-Studien.' Abh. Ber. K. Zool. Mus. Dresden, III, No. 3, (1890-1891), pp. 1-55 +i, 1 Pl.
- WEBER, FRIDERICUS. 1795. 'Nomenclator entomologicus secundum Entomologiam systematicam ill. Fabricii adjectis speciebus recens detectis et varietatibus.' (Chilonii [Kiel] et Hamburgi, Bohn), pp. viii+171.
- WHITE, A. 1847. 'List of the Specimens of Crustacea in the Collection of the British Museum.,' pp. viii+143.
- WIEGMANN, A. F. A. 1839. 'Beschreibung einiger neuen Crustaceen des Berliner Museums aus Mexiko und Brasilian.' Archiv f. Naturg., II, pt. I, pp. 145-151.

POSTSCRIPT

Since this paper has been set up in page form, there has appeared a 'Contribution à l'étude des Décapodes Macroures marins et fluviatiles du bassin du Congo Belge,' by Dr. J. G. de Man (Ann. Mus. Congo Belge, Zool., Sér. III, Arthropodes, Sec. III, Crustacés, I, fasc. 1, 1925).

De Man adds three new varieties to the long list of such forms already attributed to *Caridina togoensis* in a very detailed analysis of his material. He has not convinced me that my stand, that the many variations recorded for this species are not worthy or distinct enough to receive varietal names, is a mistaken one. I have seen specimens with rather large rostral teeth much as in his variety *kwamouthensis* of this species. Indeed the specimens with fewer dorsal teeth usually have them individually larger. Had I examined all of my 800 or more specimens with this point in mind, I feel sure lower counts for the ventral rostral teeth might have been recorded such as one or two only, or maybe none. Three is the least number I observed, on the other hand at least two of the only nine (or let me say, of the six measured) specimens of *kwamouthensis* had four teeth below, while one had three ventral rostral teeth.

The lengthening out of the interval between the distal dorsal teeth of the rostrum in de Man's variety *schoutedeni* is also characteristic of the cotype of the typical species figured by de Man. Even though the ventral teeth do not run, in this particular specimen, as near the tip as in *schoutedeni*, de Man nevertheless did have several variants of variety *stuhlmanni* much resembling *schoutedeni* (cf. his figures 2c, 2g 1, 2r 5). Besides, every lot of *schoutedeni* de Man had at hand represented but from about 50 per cent to approximately only 25 per cent of collections, the balance of which was, as he says, the variety *decorsei* (= *stuhlmanni*). Among these, furthermore, were occasional specimens with characters approaching *schoutedeni*.

Moreover this same cotype (*op. cit.*, fig. 2a from Bismarkburg) has large teeth somewhat resembling those of *kwamouthensis* and rather longer hairs like those of this species also.

The variation in the size of the eggs of *Caridina togoensis* and its varieties taken from de Man's tabular summaries is great enough to blot out any real distinctions that one might endeavor to base on such a character. In the variety *kasaiensis* larger egg-size is a stressed character, but in spite of the less slender, ambulatory legs, as described, I do not believe it can be maintained as a distinct variety.

The range of size of the *kasaiensis* eggs is not unlike that of *stuhlmanni* (= *decorsei*). In fact de Man himself remarks of what he calls a local race of *decorsei* from Kidada (*op. cit.*, pp. 17-20), "Les oeufs ont communément la même taille que chez la variété *Decorsei*, mais parfois, comme dans les exemplaires Nos. 88 et 95 du Tableau, ils étaient plus grands, comme chez la variété *Kasaiensis*, une variabilité observée aussi dans la variété *Kwamouthensis*."

With respect to de Man's retention of *Macrobrachium* (*Palæmon*) *lenzii*, on the face of the evidence presented, it would still seem to be but one of the growth stages in the development of *M. dux*. His female *lenzii* is certainly a *dux*, and the males too compare in a most satisfying way with the *M. dux* series when their tabulated measurements are taken into consideration. Regarding *M. dux* var. *congoensis* our conclusions are in accord, and de Man's case for his newly described variety *tenuicarpus* of this species appears no better than did the original one for the variety *congoensis*. Between the tabular measurements of the variety *tenuicarpus* and those of *lenzii* for specimens of approximately the same size, there is also a close correspondence, surely unmistakably corroborative of their identity (cf. de Man, *op. cit.*, tab. E., No. 2, and tab. G, No. 30).

The single or double row of large spines on the internal border of the palm, distinguishing *M. dux* from *M. lenzii* as a character, is "more or less distinct" and was so originally described by de Man (1911, p. 230). In a seemingly unquestionable series of *dux* specimens, it does not appear to be an easy matter to say definitely in all cases whether there is but one row or, sometimes, as it seems for part of the way at least, possibly two rows of larger spines on the internal border of the palm.

I also still remain to be convinced that *Macrobrachium jamaicense* var. *herklotsii* is not identical with *M. vollenhovenii* (cf. de Man's measurements of the young male of the latter, *op. cit.*, p. 51, with the male No. 13 in his tabular summary of var. *herklotsii*, tab. H.). The difference in the relative slenderness of the last three pairs of legs to my mind is not sufficient ground for considering the two as belonging to distinct specie, to say nothing of their being placed in different subgenera.

Miss Rathbun has already stated our views on the subject of the generic names of *Palæmon* and *Macrobrachium* (*Annals of the Institute of Jamaica*, I, No. 1, 1897, p. 45), but as carcinologists still seem to be at loggerheads over the matter, I venture this restatement of the case:

(1). "The type of the genus *Palæmon* was specified by Latreille in 1810 (*Consid. Génér. Crust.*, p. 421) as *P. squilla*; the genus was thus

restricted to the section containing that species." · Though Latreille specified the type, Weber's use of the generic name takes precedence. So *Palæmon* must date from 1795 ('Nomenclator entomologicus'; cf. Opinions rendered by the International Commission of Zoological Nomenclature, Smithsonian Institution, Pub. 1938, 1910, Opinion 17, p. 40). This is the genus, or rather coextensive with the genus dealt with by continental authors under the name *Leander* Desmarest, 1849.

(2). "The genus *Bithynis*, Philippi, Arch. f. Natur., XXVI., pt. 1, p. 161, 1860, is restricted by Ortmann (Zool. Jahr., V., p. 748, 1891) to the type species only. If this restriction be sustained, the genus *Palæmon* of Stimpson and Ortmann may be known as *Macrobrachium*, Bate." This restriction of *Bithynis*, which seems to have been well founded, automatically brings *Macrobrachium* into good standing.

(3). Ortmann's use of *Macrobrachium* as a subgenus of *Palæmon* which contained none of Bate's original species is of course untenable and de Man rightly substitutes it for Ortmann's subgenus *Brachycarpus*. At this writing I am not aware what name de Man offered in place of the subgenus *Macrobrachium* as used by Ortmann, if any.

(4). This mistaken use of the name by Ortmann does not invalidate it, as Stebbing seems to think; his substitution of *Macroterochair* for *Macrobrachium* is therefore beside the point, and de Man's adoption of it as a subgeneric name cannot be sustained. Stebbing's tacit acknowledgement that *Palæmon* can no longer be used for these forms is in line with Miss Rathbun's earlier reasoning.

(5). Therefore it appears that:

- (a) *Palæmon* Weber, 1795, is the correct name for the genus of shrimps of which *Palæmon squilla* (L.) is the type, and to which authors have commonly given the name of *Leander*.
- (b) *Macrobrachium* Bate, 1868, is the correct generic name for the group of shrimps of which Bate's *M. americanum* = *M. jamaicense* (Herbst) is the type and which, until Stebbing suggested the name *Macroterochair*, was commonly known by recent, non-American authors as *Palæmon*.
- (c) *Macroterochair*, Stebbing, 1908, is but a synonym of *Macrobrachium*.
- (d) *Bithynis* Philippi 1860 is a valid, well founded genus of which *Bithynis longimana* = *B. cæmentarius* (Pöppig) is the type.

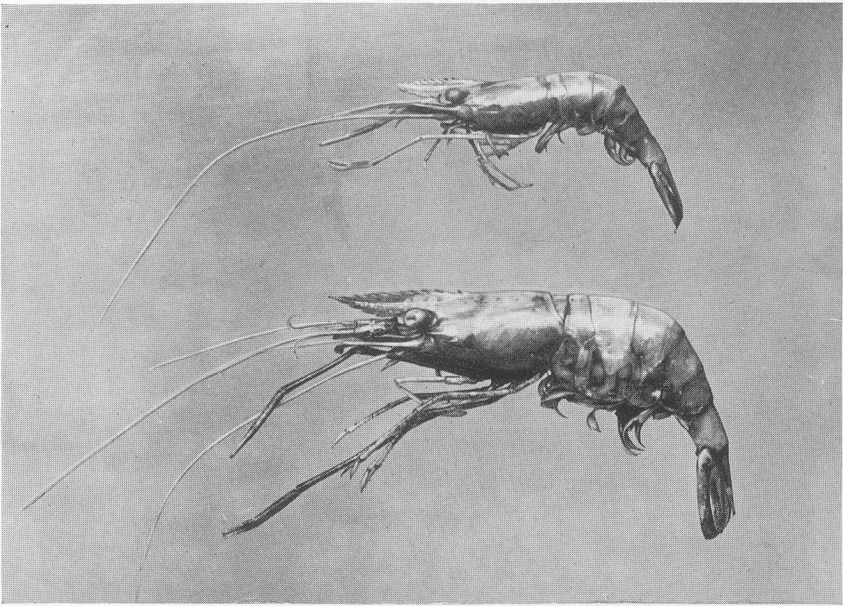
In his much delayed publication, 'Macrura der Deutschen Tiefsee-Expedition,' Dr. Heinrich Balss (2 Natantia, Teil A., Wissen Ergeb. Deutschen Tiefsee-Exped., "Valdivia" 1898-1899, XX, Heft 5, p. 229, figs. 5-7, 1925) surely overlooked the fact that the female of his *Trachypeneus constrictus* var. *africana* and that of *Parapeneopsis atlantica* are identical, for the figures he now publishes of the latter, barring differences in the respective artists' interpretations, are representations of one and the same species.

PLATES I TO IX

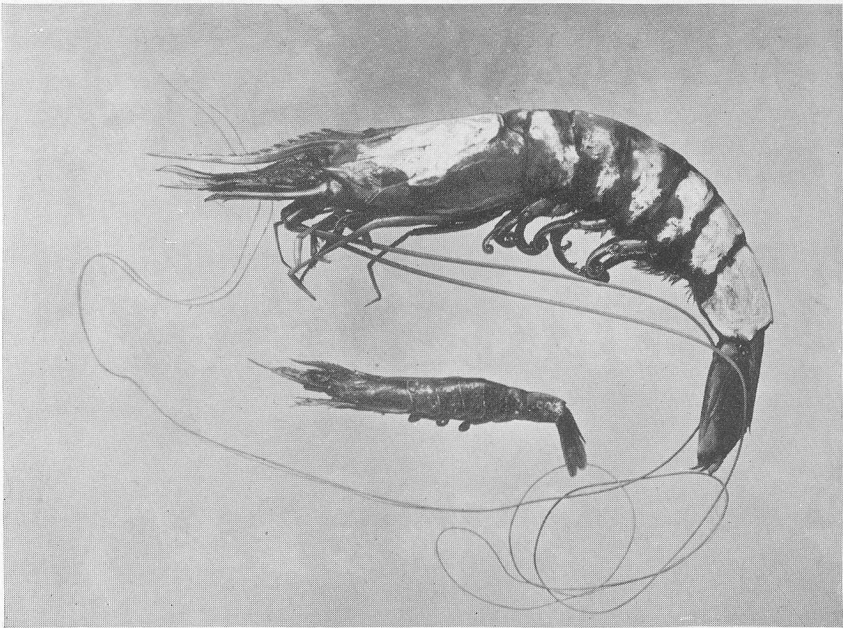
PLATE I

Fig. 1. *Macrobrachium foai* (Coutière), from Stanleyville. Above, male 37 mm. long; below, largest female 55 mm. long, carapace and rostrum 34.

Fig. 2. *Parapeneopsis atlantica* Balss, from Banana. Above, largest female, carapace and rostrum 54 mm. long; below, male, carapace and rostrum 18.3 long.



1

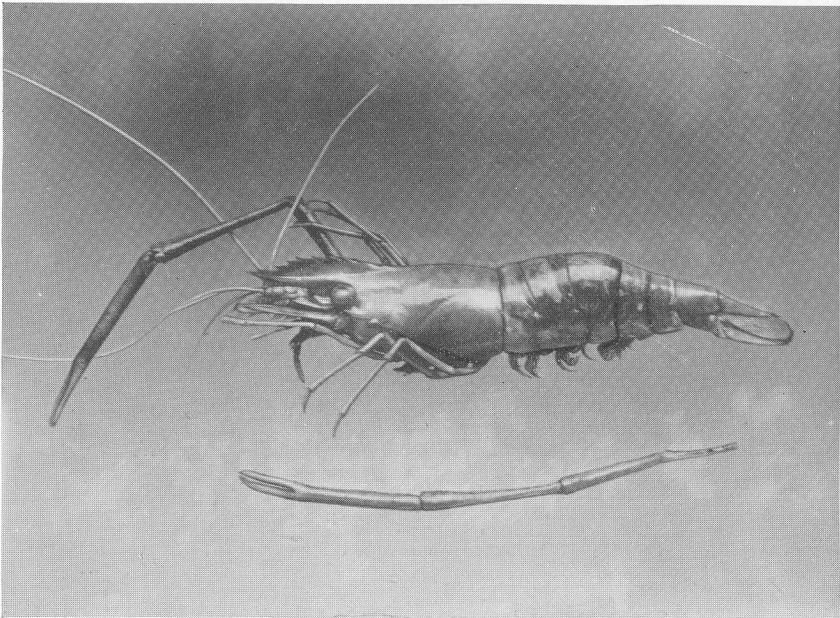


2

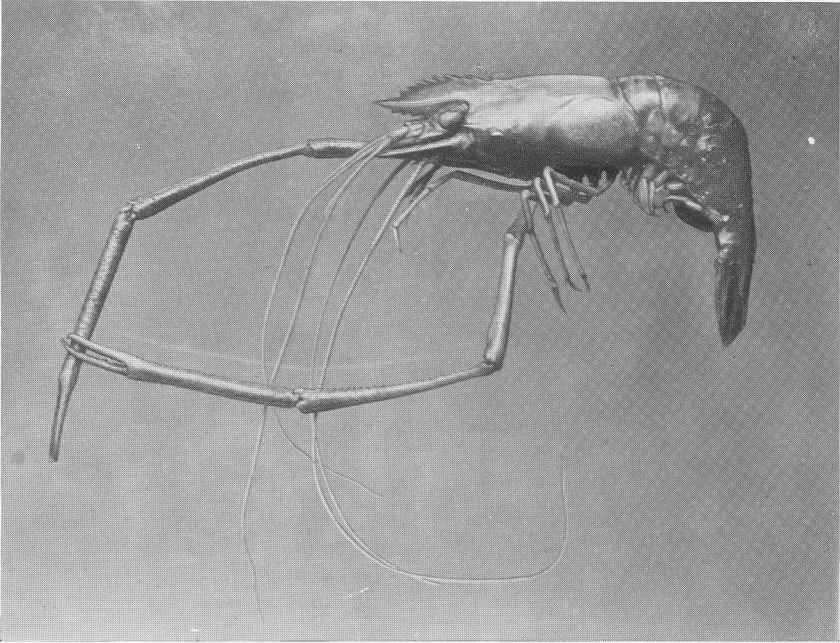
PLATE II

Macrobrachium lujæ (de Man) from Stanleyville

- Fig. 1. Largest immature male, 72 mm. long, carapace and rostrum 34.3.
Fig. 2. Largest of five mature males, 79 mm. long, carapace and rostrum 37.3.



1



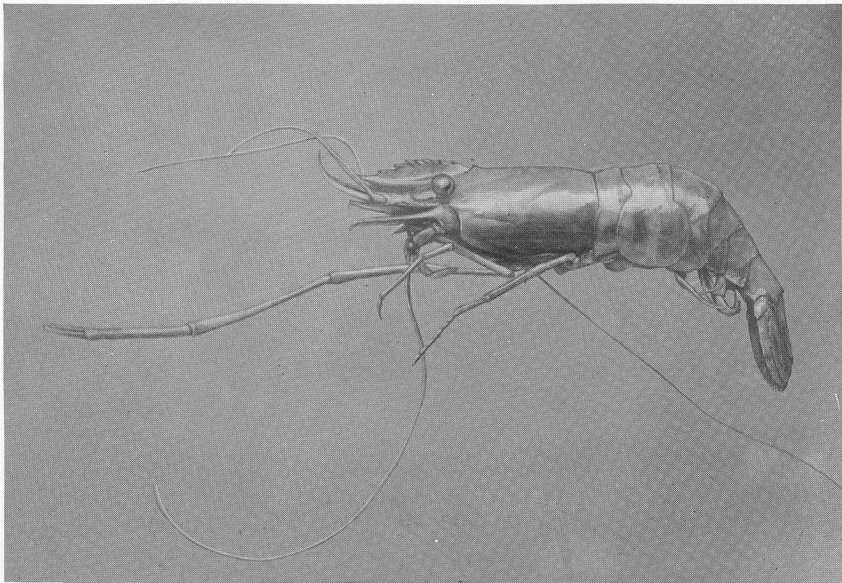
2

PLATE III

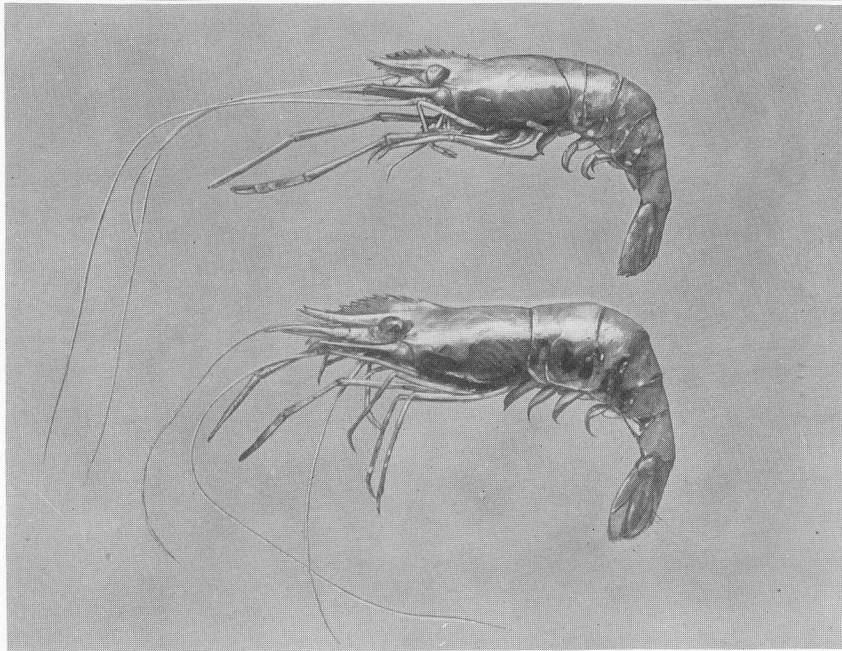
Macrobrachium lujæ (de Man) from Stanleyville

Fig. 1. Largest female, 73 mm. long, carapace and rostrum 33.

Fig. 2. Above, smallest male with both legs of second pair, 48.5 mm. long, carapace and rostrum 22; below, smallest female with both legs of second pair, 59 mm. long, carapace and rostrum 27.5.



1

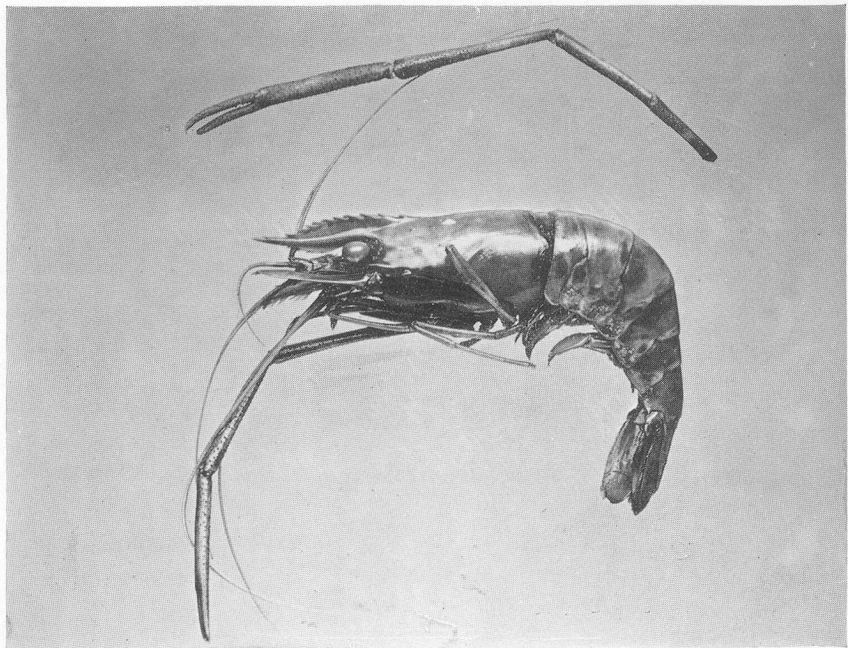


2

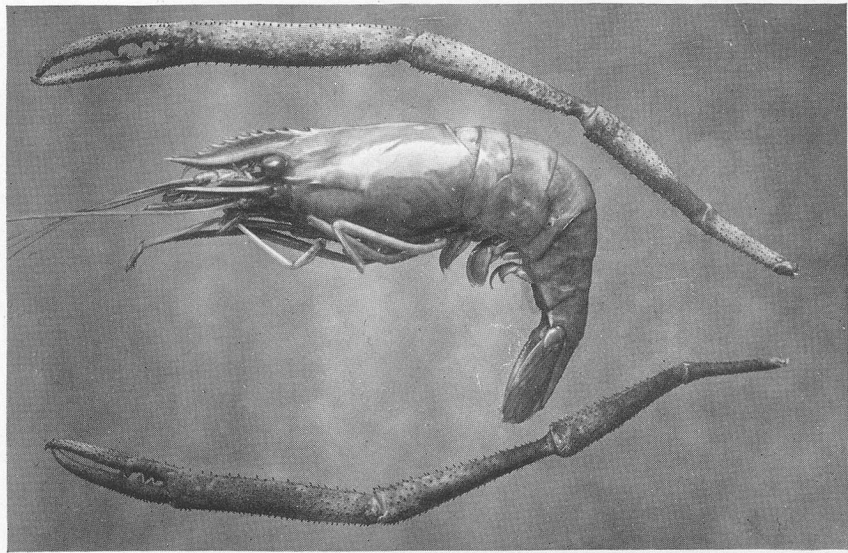
PLATE IV

Fig. 1. *Macrobrachium lujæ* (de Man), from Aba. Male 71.3 mm. long, carapace and rostrum 34.6.

Fig. 2. *Macrobrachium dux* (Lenz), from Niapu. Most fully developed of four males, carapace and rostrum 54.5 mm. long.



1



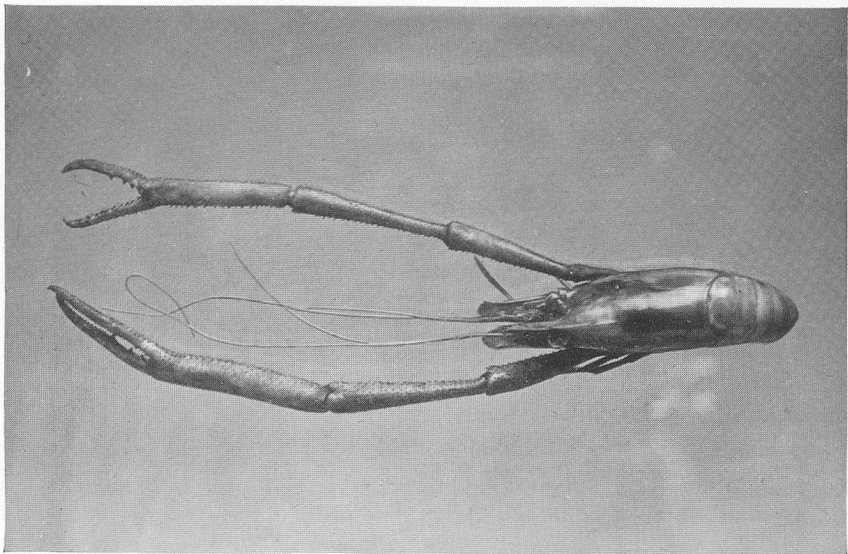
2

PLATE V

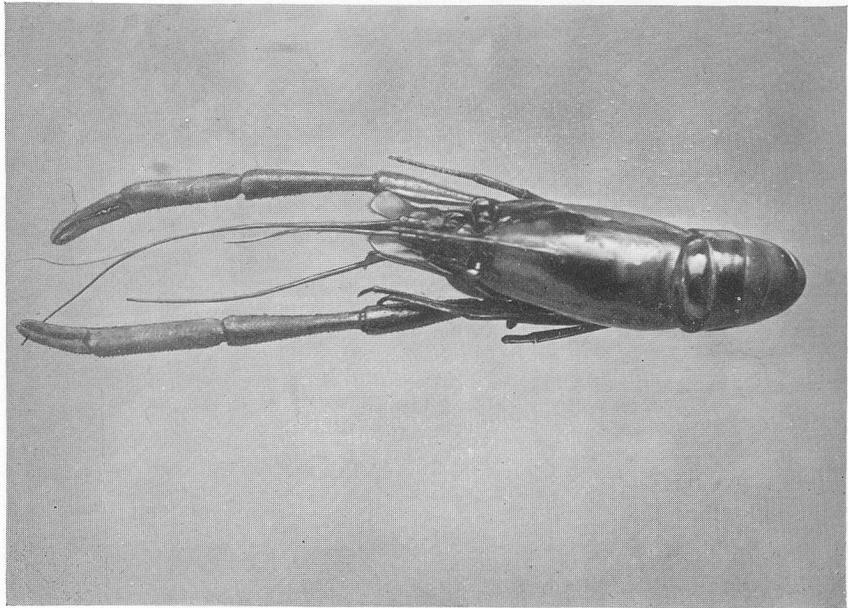
Macrobrachium dux (Lenz)

Fig. 1. Largest of three mature males from Avakubi, carapace and rostrum 52 mm. long.

Fig. 2. One of four immature males from Niapu, carapace and rostrum 40.5 mm. long.



1

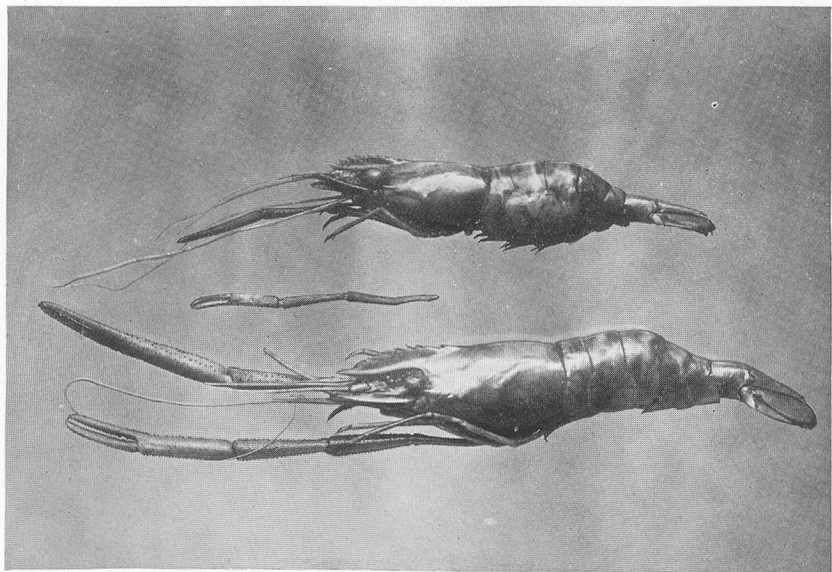


2

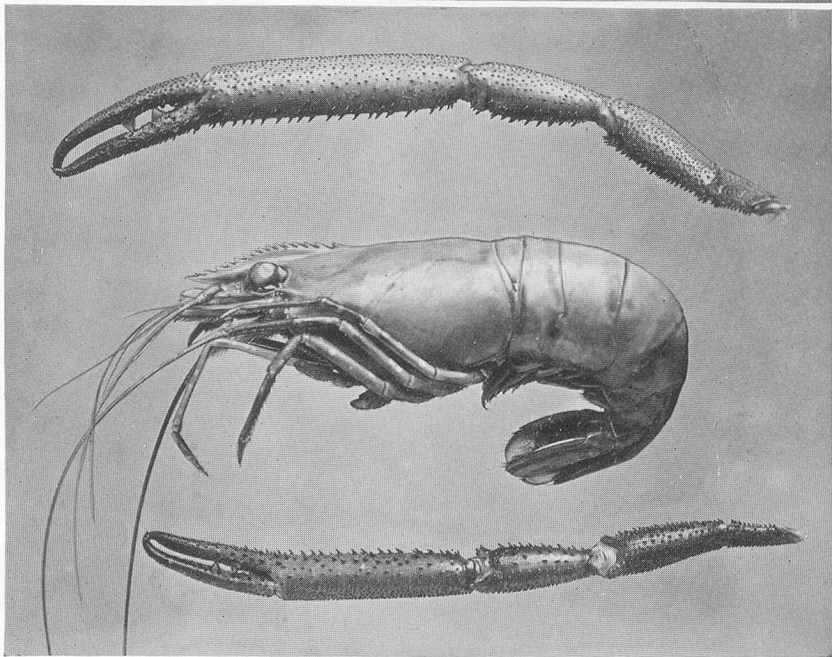
PLATE VI

Fig. 1. *Macrobrachium dux* (Lenz), from Avakubi. Above, ovigerous female, largest of four, carapace and rostrum 27 mm. long; below, largest of four immature males, carapace and rostrum 38 mm. long.

Fig. 2. *Macrobrachium vollenhovenii* (Herklots), from Malela. Male, carapace and rostrum 50.2 mm. long.



1



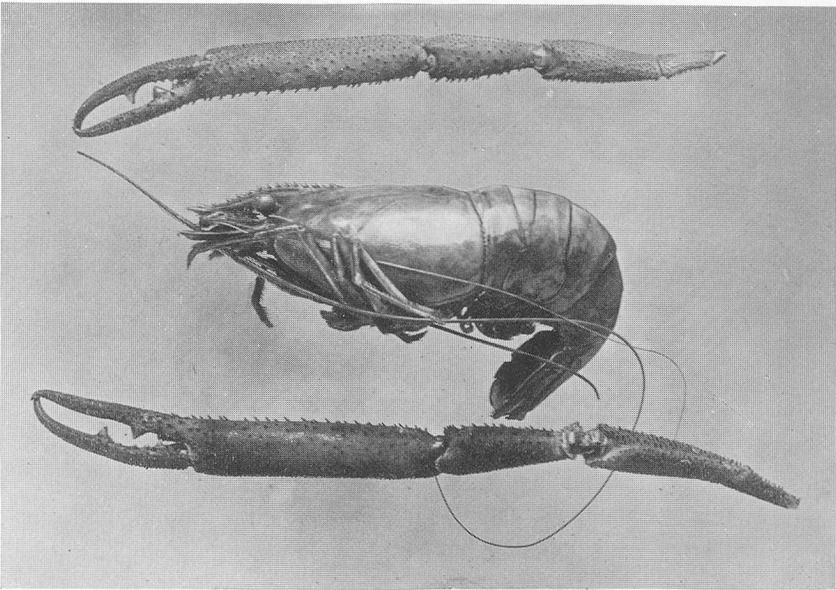
2

PLATE VII

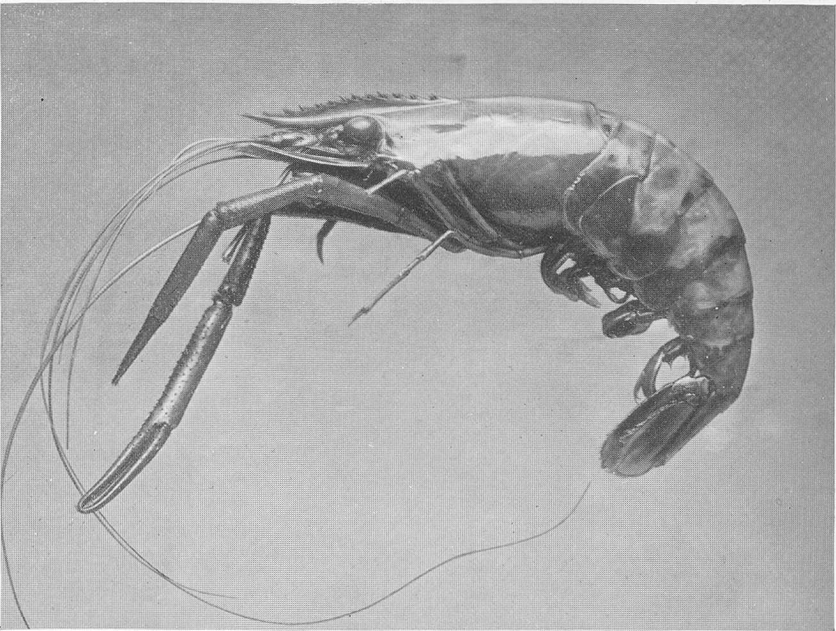
Macrobrachium vollenhovenii (Herklots) from Malela

Fig. 1. Largest male, carapace and rostrum 73.5 mm. long.

Fig. 2. Ovigerous female, carapace and rostrum 54 mm. long.



1



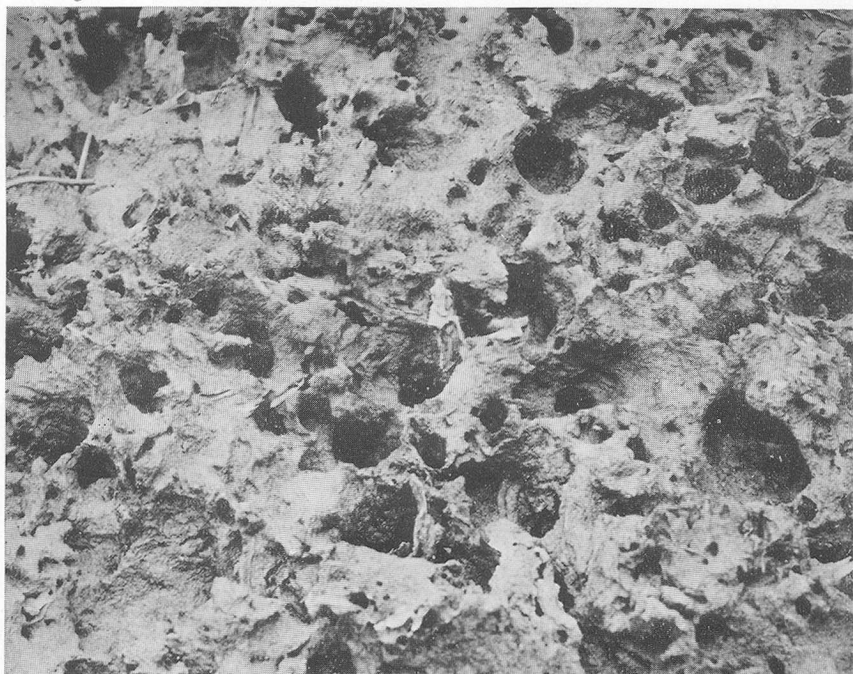
2

PLATE VIII

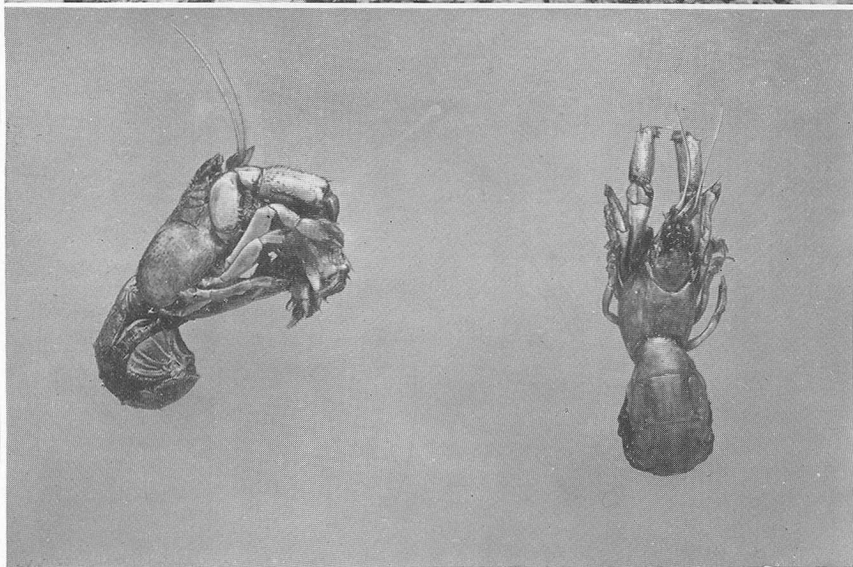
Fig. 1. Usual habitat of *Upogebia furcata* (Aurivillius), at Banana.

"A tough, peat-like mass of minute rootlets, often several feet in thickness, is formed by mangroves, *Rhizophora mangle* Linnæus, in sandy places where anchorage can not be gained in any other way. The large holes are made chiefly by the beautiful blue crab, *Sarmatium curvatum* (H. Milne Edwards), and usually extend a few inches deeper than the level of the lowest tide. Here this is the most common crab, whereas in typical, muddy mangrove swamps several kinds are equally abundant; the smaller holes are the exits to long tunnels made by a whitish, thalassinid crustacean about an inch in length, *Upogebia furcata* (Aurivillius). Young eels and a few other creatures also use the tunnels as refuges." (H. L.).

Fig. 2. *Upogebia furcata* (Aurivillius). Left, male; right, female, $\times 1 \frac{2}{3}$.



1



2

PLATE IX

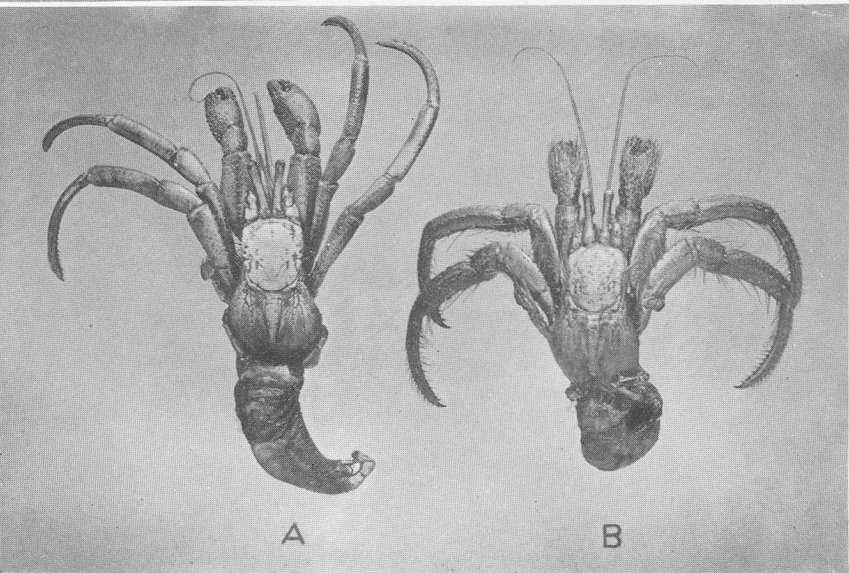
Fig. 1. Habitat of *Clibanarius africanus* Aurivillius and *C. cooki* Rathbun, at Banana.

"These hermit crabs at low tide are ordinarily stranded all over the sandy beach. But if this happens during the hours of sunshine, they move into the shadow of the vegetation the shore offers. It is peculiar that only a few places are selected to which a great number of them come apparently for the same reasons. The photograph shows one of these heaps of hermit crabs benefited by the shadow of the tall and partly overhanging shore grass." (H. L.)

Fig. 2. A, *Clibanarius africanus* Aurivillius, male; B, *C. cooki* Rathbun, male. Both about natural size.



1



2