

**Article VIII.—THE BRACHYURAN CRABS COLLECTED  
BY THE AMERICAN MUSEUM CONGO EXPEDITION,  
1909–1915<sup>1</sup>**

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ECOLOGICAL AND OTHER NOTES<sup>2</sup> BY HERBERT LANG

PLATES XV TO LXIV, 22 TEXT FIGURES, 1 MAP

INTRODUCTION

The collection of brachyuran crustaceans (nearly 3,000 specimens) obtained by Messrs. Lang and Chapin is a large one, especially in relation to the brief period devoted to its acquisition. Although the number of marine, brackish-water, and terrestrial species obtained is only about a third of the total number known to inhabit the western coast of Africa,<sup>3</sup> or that faunal area extending from Senegal to Angola, yet the large series of many of the species enables us to define them with greater accuracy. Furthermore, the occurrence at the mouth of the Congo means in many cases an extension of the previously known range, and also adds five species to the marine fauna of the continent of Africa; two of these, *Geograpsus lividus* and *Pachygrapsus gracilis*, are American species; two others, *Menippe nanus* and *Cyclograpsus occidentalis*, were described from the Cape Verde Islands, while the third represents a new species of the extensive and unusually plastic genus *Sesarma*, viz., *S. (Chiromantes) alberti*.<sup>4</sup> Five new species were found among the river crabs, or Potamonidæ.

Plates XV, XVI, XVII, and LV to LXIV are from photographs made in the field by Mr. Herbert Lang. Plates XL and LIV were borrowed from the U. S. National Museum. Plates XVIII to XX, XXIII to XXXVI, and XLII are from photographs taken by Mr. Clarence R. Shoemaker and retouched by Mr. Seward H. Rathbun. The remaining plates were photographed at the American Museum. The drawings of the text figures were made by Miss Violet Dandridge, except Fig. 1c by Mr. Seward H. Rathbun.

<sup>1</sup>Scientific Results of The American Museum Congo Expedition. General Invertebrate Zoology, No. 6.

<sup>2</sup>These notes are indicated in the text by quotation marks and Mr. Lang's initials. Short field notes by Mr. Lang are also given in connection with the locality records.

<sup>3</sup>A list of the decapod crustaceans of western Africa between 16° north latitude and 17° south latitude, including the fauna not only of the coast but of the fresh waters tributary to the coast and of the neighboring islands, was published in 1900 in the Proceedings of the United States National Museum, XXII, No. 1199, pp. 271–316.

<sup>4</sup>Named for the King of the Belgians.

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## LIST OF LOCALITIES, WITH NAMES OF THE SPECIES TAKEN AT EACH

Avakubi	Libreville, Gaboon
<i>Potamon (Potamonautes) dybowskii</i>	<i>Potamon (Potamonautes) floweri</i>
Bafwabaka	" " <i>dybowskii</i>
<i>Potamon (Potamonautes) dybowskii</i>	" ( <i>Geothelphusa</i> ) <i>congoënsis</i>
" ( <i>Geothelphusa</i> ) <i>congoënsis</i>	<i>Sesarma (Chiromantes) africanum</i>
Bafwamoko	Lopez (Cape), French Congo
<i>Potamon (Potamonautes) dybowskii</i>	<i>Ocypodeippeus</i>
" " <i>stanleyensis</i>	Malela
Bafwasende	<i>Sesarma (Chiromantes) alberti</i>
<i>Potamon (Potamonautes) dybowskii</i>	" ( <i>Holometopus</i> ) <i>büttikoferi</i>
" ( <i>Geothelphusa</i> ) <i>congoënsis</i>	" " <i>angolense</i>
Banana	<i>Sarmatium curvatum</i>
<i>Callinectes marginatus</i>	<i>Cardisoma armatum</i>
" <i>gladiator</i>	Moanda
" <i>latimanus</i>	<i>Callinectes marginatus</i>
<i>Potamon (Potamonautes) floweri</i>	<i>Grapsus grapsus</i>
<i>Panopeus africanus</i>	<i>Goniopsis cruentata</i>
<i>Grapsus grapsus</i>	<i>Sesarma (Holometopus) elegans</i>
<i>Geograpsus lividus</i>	<i>Sarmatium curvatum</i>
<i>Goniopsis cruentata</i>	<i>Cardisoma armatum</i>
<i>Pachygrapsus transversus</i>	<i>Ocypodeippeus</i>
" <i>gracilis</i>	" <i>africana</i>
<i>Sesarma (Chiromantes) africanum</i>	<i>Uca tangeri</i>
" " <i>alberti</i>	Nepoko River (Affluents of), near
" ( <i>Holometopus</i> ) <i>büttikoferi</i>	Gamangui (Ituri Forest)
" " <i>elegans</i>	<i>Potamon (Potamonautes) floweri</i>
<i>Sarmatium curvatum</i>	" " <i>dybowskii</i>
<i>Cyclograpsus occidentalis</i>	" ( <i>Geothelphusa</i> ) <i>congoënsis</i>
<i>Cardisoma armatum</i>	Ngayu
<i>Ocypodeippeus</i>	<i>Potamon (Potamonautes) floweri</i>
" <i>africana</i>	" " <i>dybowskii</i>
<i>Uca tangeri</i>	Padron Point
Batama	<i>Menippe nanus</i>
<i>Potamon (Potamonautes) dybowskii</i>	Poko
Comarock (River near), Athi Plains,	<i>Potamon (Potamonautes) floweri</i>
British East Africa	" " <i>dybowskii</i>
<i>Deckenia mitis</i>	" ( <i>Geothelphusa</i> ) <i>congoënsis</i>
Faradje	San Antonio, Angola
<i>Potamon (Potamonautes) floweri</i>	<i>Callinectes gladiator</i>
" ( <i>Acanthothelphusa</i> ) <i>faradjensis</i>	<i>Eurypanopeus blanchardi</i> ?
Garamba	<i>Goniopsis cruentata</i>
<i>Potamon (Potamonautes) floweri</i>	<i>Pachygrapsus gracilis</i>
Leopoldville	<i>Sesarma (Chiromantes) africanum</i>
<i>Potamon (Acanthothelphusa) langi</i>	" " <i>alberti</i>
<i>Erimetopus brazze</i>	" ( <i>Holometopus</i> ) <i>büttikoferi</i>
	" " <i>elegans</i>

*Sarmatium curvatum**Ocypode ippeus*" *africana**Uca tangeri**Pisa carinimana*

Stanleyville

*Potamon (Potamonautes) dybowskii*" " *lirrangensis*" " *stanleyensis*" (*Potamon*) *ballayi*" (*Geothelphusa*) *perparvus*" (*Acanthothelphusa*) *langi*

St. Paul de Loanda, Angola

*Dromia atlantica**Callinectes marginatus**Thalamita africana**Pilumnus verrucosipes**Panopeus africanus**Pachygrapsus transversus**Pisa carinimana*

Tshopo River (Affluents of), near

Stanleyville

*Potamon (Potamonautes) floweri*" " *dybowskii*" " *stanleyensis*" (*Potamon*) *ballayi*" (*Geothelphusa*) *congoënsis*" " *perparvus*

Vankercckhovenville

*Potamon (Potamonautes) floweri*" (*Acanthothelphusa*) *faradensis*

Yakuluku

*Potamon (Potamonautes) floweri*

Zambi

*Sesarma (Holometopus) büttikoferi*" " *angolense*

## APPROXIMATE LOCATION OF PLACES MENTIONED IN THIS PAPER

Albert Edward L.—0° to 0° 30' S., 29° 30' E.

Aruwimi R.—1° 20' N., 27° 40' E.

Assinie.—5° N., 3° 20' W.

Avakubi.—1° 20' N., 27° 40' E.

Bafwabaka.—2° 10' N., 27° 50' E.

Bafwamoko.—0° 40' N., 26° 55' E.

Bafwasende.—1° 10' N., 27° 15' E.

Bahr-el-Djebel.—7° 30' to 9° 30' N., 30° 15' to 30° 40' E.

Bahr-el-Gebel, see Bahr-el-Djebel.

Banana.—6° S., 12° 20' E.

Banana Creek.—6° S., 12° 25' to 12° 35' E.

Bangui.—4° 25' N., 18° 35' E.

Batama.—1° N., 26° 40' E.

Benguela.—12° 30' S., 13° 20' E.

Beyah R., Elmina, see Elmina.

Bird Island.—5° 55' S., 12° 55' E.

Boma.—5° 50' S., 13° 10' E.

Bomokandi R.—3° 45' to 2° 50' N., 26° 10' to 29° 45' E.

Boutry.—4° 55' N., 1° 50' W.

Bulabemba.—6° 3' S., 12° 28' E.

Bulikoko Island.—6° S., 12° 45' E.

Cape Lopez.—0° 40' S., 8° 45' E.

Chinchoxo.—5° 15' S., 12° 15' E.

Comarock, Athi Plains.—1° 20' S., 37° 5' E.

Dakar.—14° 40' N., 17° 35' W.

Daressalaam.—6° 50' S., 39° 15' E.

Dungu R.—4° 40' N., 28° 35' to 30° 40' E.

Elmina.—5° 5' N., 1° 30' W.

Faradje.—3° 40' N., 29° 40' E.

Gamangui.—2° 10' N., 27° 20' E.

Gansch, see Nganchu.

Garamba.—4° 10' N., 29° 40' E.

Gorée Bay.—14° 35' N., 17° 30' W.

Hippopotamus Island.—5° 55' S., 12° 50' E.

Ituri R.—1° 30' N., 26° to 30° E.

Katala.—6° S., 12° 45' E.

Kituri, Upper Lualaba.—5° 40' S., 26° 55' E.

Koloka.—3° 5' N., 24° 35' E.

Kunga.—5° 55' S., 12° 35' E.

Kwamouth.—3° 20' S., 16° 10' E.

- Lagos.—6° 30' N., 3° 25' E.  
 Landana.—5° 15' S., 12° 15' E.  
 Leopoldville.—4° 25' S., 15° 20' E.  
 Libreville.—0° 25' N., 9° 25' E.  
 Lindi R.—1° 25' N. to 0° 25' S., 25° 5' to 29° E.  
 Liranga.—0° 45' S, 17° 45' E.  
 Lobito Bay.—12° 25' S., 13° 25' E.  
 Lualaba R.—1° to 12° S., 25° to 27° E.  
  
 Malela.—6° S., 12° 40' E.  
 Matadi.—5° 50' S., 13° 35' E.  
 Moanda.—5° 55' S., 12° 25' E.  
 Moanda R., see Moanda.  
 Mombasa.—4° S., 39° 50' E.  
 Monrovia.—6° 30' N., 10° 50' W.  
 Muserra.—7° 25' S., 12° 55' E.  
  
 Nairobi.—1° 5' S., 36° 50' E.  
 Nemlao.—5° 55' S., 12° 30' E.  
 Nepoko R.—2° 20' to 1° 35' N., 27° 35' to 29° 20' E.  
 Netona.—5° 55' S., 12° 30' E.  
 Nganchouno, see Nganchu.  
 Nganchu.—3° 18' S., 16° 6' E.  
 Ngancin, see Nganchu.  
 Ngayu.—1° 40' N., 27° 40' E.  
  
 Padron Point.—6° 5' S., 12° 50' E.  
 Plettenbergs Bay.—34° S., 23° 15' E.  
 Poko.—3° 10' N., 26° 50' E.  
  
 Ponta da Lenha.—6° S., 12° 45' E.  
  
 Rock Spring, Monrovia, see Monrovia.  
 Ruwenzori Mt.—0° 30' N., 29° 50' E.  
  
 San Antonio.—6° 10' S., 12° 20' E.  
 Shiloango R.—5° S., 12° to 13° E.  
 Simons Bay.—34° 10' S., 18° 25' E.  
 Spring Rock, Monrovia, see Monrovia.  
 Stanley Pool.—4° 15' S., 15° 30' E.  
 Stanleyville.—0° 30' N., 25° 15' E.  
 St. Paul de Loanda.—8° 55' S., 13° 10' E.  
  
 Tanga.—5° 5' S., 39° 5' E.  
 Tanganyika L.—3° to 9° S., 29° to 31° E.  
 Tshopo R., see Stanleyville.  
  
 Ubangi R.—0° to 5° N., 18° to 23° E.  
 Uele R.—3° 30' N., 23° to 30° E.  
  
 Vankerckhovenille.—3° 20' N., 29° 20' E.  
  
 Wembere Steppe.—4° 10' S., 34° 15' E.  
  
 Yakuluku.—4° 20' N., 28° 50' E.  
 Yei R.—6° 35' to 3° 50' N., 30° 20' to 30° 45' E.  
  
 Zambi.—6° S., 12° 50' E.

#### CALLINECTES FROM THE MOUTH OF THE CONGO

Among the species from the mouth of the Congo, those of the genus *Callinectes* are the most important in the collection, as they have been hitherto little known. Four species inhabit the West African coast. One was discovered more than a century ago during the earliest expedition to the Congo, for in Appendix No. IV to the 'Narrative of an Expedition to explore the River Zaire, usually called the Congo, in South Africa, in 1816, under the direction of Captain J. K. Tuckey, R. N.,' London, 1818, Leach says, under *Lupa* [= *Neptunus* of authors, with which *Callinectes* was early combined]: "Of this genus three new species were discovered, all of which belong to that section in which the hinder lateral spine of the shell is very much elongated." Leach never published descriptions of these species but some specimens labeled by him are in the British Mu-

seum; his *Lupa smythiana* is identical with *Callinectes gladiator*, while his *L. cranchiana* is not a *Callinectes*, but is equivalent to *Portunus* (= *Neptunus*) *sayi*, and the identity of his third species is unknown.<sup>1</sup>

Three species of *Callinectes* are present and are well represented in the American Museum collection; a fourth is figured in color by A. Milne Edwards and Bouvier, 1900,<sup>2</sup> and by Gruvel in 1912,<sup>3</sup> under the name of "*Callinectes diacanthus* var. *africanus*." This seems to be more closely related to *C. sapidus* (= *hastatus*), the common edible crab of the Atlantic coast of America, than to any other species; it has only two teeth instead of four on the frontal margin between the antennæ, and the shape of all the teeth and spines and the disposition of the granules are similar to those of *C. sapidus*. On the other hand, the intramedial region is shorter, as are the chelipeds also.<sup>4</sup> The writer doubts that the name "*africanus*" is correctly applied to this form. *C. africanus* was first described by A. Milne Edwards<sup>5</sup> in 1879 from the Cape Verde Islands. In 1896 the writer examined in Paris what she supposed were the type specimens of *africanus*, although they were not labeled "types," and came to the conclusion that they were synonymous with *marginatus* and *larratus*.

#### THE LAND CRABS, OR CARDISOMAS

The bulkiest part of the collection is formed by the land crabs, of which 120 specimens were collected, enough to demonstrate that certain differences between the African species, *Cardisoma armatum*, and the American species, *C. guanhumi*, are constant. It has not yet, however, been proved that *armatum* is the sole representative of the genus in western Africa, as it is claimed by some authors that the true *guanhumi* does exist there.

#### THE RIVER CRABS, OR POTAMONIDÆ

By far the most important part of the results of the Museum's expedition, in the line of decapods, is the group of river crabs (Potamoni-dæ) which inhabit the Congo and its tributaries and their banks.

<sup>1</sup>This information has been obtained through Dr. W. T. Calman who has kindly examined such of Leach's specimens as remain in the British Museum.

<sup>2</sup>Expéd. Sci. du Travailleuse et du Talisman, 1880-1883, Crust. Déc., 1ère partie, Paris, p. 71, Pl. iv, fig. 5.

<sup>3</sup>Ann. Inst. Océanog., V, fasc. 1, pp. 5, 6 and 11, Pl. II, fig. 1.

<sup>4</sup>May not the specimen found in a basin at Rochefort, France (See Bouvier, 1901, in Bull. Mus. Paris, VII, p. 16) be this species and have emigrated from the West African instead of the American coast?

<sup>5</sup>1879, Crust. Rég. Mex., p. 229.

## Distribution of African River Crabs

Half of the African species of the family Potamonidae are referable to the subgenus *Potamonautes* of the genus *Potamon*. This subgenus is said to be restricted to Africa, but *Potamon fruhstorferi* Balss,<sup>1</sup> from Annam, French Indo-China, has every indication of belonging to *Potamonautes* and was placed in that subgenus by its author.

*Potamon* (*Geothelphusa*) ranges from western Africa to eastern Africa, including Madagascar (*P. (G.) ankaraharae* Nobili),<sup>2</sup> to northern Africa, and through southern Asia (Indian peninsula excluded) to Japan; Australia (?).

*Potamon*, the typical subgenus of *Potamon*, is scantily represented on the continent of Africa, although Madagascar yields a number of species. Two typical species inhabit northern and northeastern Africa respectively and extend, one into southern Europe, the other into western Asia. The three Potamons of middle Africa (*didieri*, *nigrens*, and *ballayi*) are all atypical and have much in common, the first and second, with *Potamonautes*, the third with *Geothelphusa*.

*Acanthothelphusa*, one of the subgenera of spined Potamons, is known from northeastern and middle Africa and southern Asia (peninsular India excepted). Seven species inhabit the Congo district; another (*niloticus*) extends from Egypt to British East Africa; still another (*chaperi*) inhabits Assinie on the Ivory Coast; while *antongilensis* is restricted to the island of Madagascar.

*Platythelphusa* (three species) is peculiar to Lake Tanganyika.

*Hydrothelphusa* (one species) is restricted to Madagascar.

*Erimetopus* (one species) inhabits the Congo.

Of the genus *Deckenia*, two species are found in East Africa, one in the Seychelles.

*Cylindrotelphusa*, of the subfamily Gecarcinucinae, is said by Alcock<sup>3</sup> to live in peninsular India and New Guinea; two West African species should be referred to the genus, *C. macropus* from Liberia and *C. perrieri* from the Congo.<sup>4</sup>

<sup>1</sup>1914, Zool. Jahrb., Syst., XXXVII, p. 403, text-figs. A, B, C, Pl. xv, fig. 2.

<sup>2</sup>1906, Boll. Mus. Zool. Anat. Torino, XXI, No. 532 [pp. 1-4], text-figs. A-C.

<sup>3</sup>1910, Rec. Indian Mus., V, p. 259.

<sup>4</sup>Bouvier, 1917, Comptes Rendus Acad. Sci. Paris, November 12, CLXV, p. 658, doubts the locality of *perrieri* because of the absence of a collector's name from the label and would consider *Cylindrotelphusa* wholly Indo-Australian. The occurrence of *C. macropus* in Liberia is, however, indisputable.

## List of Congo Potamonidæ

## SUBFAMILY POTAMONINÆ

*Potamon (Potamonautes)*

*africanus* (A. Milne Edwards). Cameroon; French Congo.

*aloyssi-sabaudiæ* Nobili. Mt. Ruwenzori.

*aubryi* (H. Milne Edwards). Guinea; Cameroon; French and Belgian Congo.

*decazei* (A. Milne Edwards). Togo; Cameroon; Island of Fernando Po; French Congo.

\**dybowskii* Rathbun. French and Belgian Congo.

\**floweri* de Man. Soudan; French and Belgian Congo.

\**lirrangensis* Rathbun. Belgian Congo.

*lueboensis* Rathbun. Belgian Congo.

*pobeguini* Rathbun. Spanish Guinea; Cameroon (?); French Congo.

*regnieri* Rathbun. French Congo.

\**stanleyensis*, new species. Belgian Congo.

*Potamon (Potamon)*

\**ballayi* (A. Milne Edwards). French and Belgian Congo.

*didieri* Rathbun. Abyssinia; British East Africa; Belgian Congo.

*Potamon (Geothelphusa)*

\**congoënsis*, new species. Belgian Congo.

*emini* (Hilgendorf). Abyssinia; British East Africa; German East Africa; Belgian Congo.

\**perparvus*, new species. Belgian Congo.

*Potamon (Acanthothelphusa)*

*campi* Rathbun. Belgian Congo.

*chavanesii* (A. Milne Edwards). Cameroon; French and Belgian Congo.

\**faradjensis*, new species. Belgian Congo.

\**langi*, new species. Belgian Congo.

*marchei* (Rathbun). French Congo.

*pæcilei* (A. Milne Edwards). French Congo.

*schubotzi* Balss. Belgian Congo.

*Erimetopus* \**brazzæ* (A. Milne Edwards). French and Belgian Congo.

## SUBFAMILY GECARCINUCINÆ

*Cylindrotelphusa perrieri* (Rathbun). Congo.

## Relations of Congo Potamonidæ

Two species from the above list do not belong to the fauna of the Congo Valley, but are in the Belgian Congo; one of these (*aloyssi-sabaudiæ*) occurs only at Mt. Ruwenzori, and one (*emini*) in Lake Albert-Edward-Nyanza, as well as farther east. Of the twenty-five species enumerated, seventeen are restricted to the valley of the Congo and its tributaries. Of those with wider range, four species occupy other watercourses farther up the western coast of Africa, one (*P. decazei*) reach-

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\*Represented in the American Museum collection.

ing as far north as Togo, Guinea. Two species, only, show a connection between the Congo and northeastern or eastern Africa; the distribution of *P. floweri* in the upper Nile Valley and throughout west-central Africa is comparable to the distribution of many (nearly 100) species of freshwater fishes. ( See Nichols and Griscom, 1917, Bull. Amer. Mus. Nat. Hist., XXXVII, p. 740.) *P. didieri* of the upper Congo has been found elsewhere only in British East Africa (Nairobi) and Abyssinia.

#### GENERAL ECOLOGY OF THE CONGO ESTUARY<sup>1</sup>

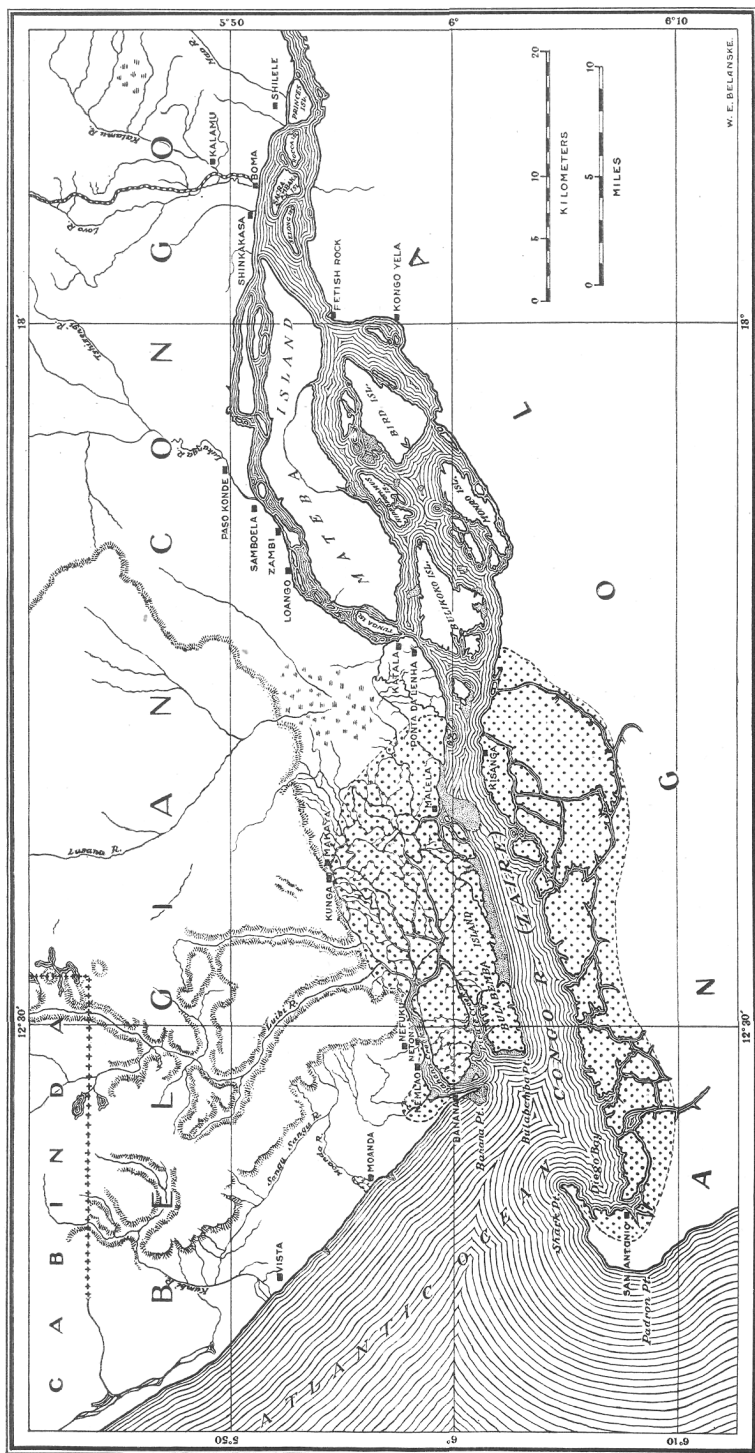
"The crabs from the Lower Congo dealt with in this paper were collected chiefly at Zambi, Banana, Bulabemba, and in mangrove swamps north and east as far as Moanda, Kunga, and Malela. Fortunately I was in this region at the most opportune time, the dry season, from the middle of June to the beginning of September 1915. Then the crabs were more concentrated in places still retaining sufficient moisture, for the water was at its lowest and rain scarce. A week was spent on the southern, or Portuguese, side of the river, near Padron Point and San Antonio, where the conditions seemed less favorable for crabs.

"From the hillside just north of Banana, at the edge of the Savannah, one can embrace with a glance the great estuary of the Congo (Map, p. 388). Along both sides of the main channel extend great areas of low-lying mangrove swamps, separated into many islands and inundated by the tides (Pls. LVIII, LIX, and LX). The biota of the immediate neighborhood of the river proper, practically to the mouth, is that of fresh water. At Zambi, where conditions are not brackish enough for the growth of mangroves, we found on the trip down-river that the crabs commenced to be common and gregarious in some of the papyrus and reed swamps on nearby islands.

"The mouth of the river is only six miles wide and, naturally, the force of the current is so great that most minor forms of marine life have no chance to flourish along its ruthless course. Sixty miles from the coast the billowing brown waters of the Congo still pollute the transparent emerald of the ocean. Hardly weakened by estuarine shallows, the mighty river, in a single broad channel, drives its silt-bearing floods like a huge wedge into the crystal-clear, white-crested deep. Near Bulabemba Island even ocean steamers are rocked as by a heavy gale, due to the powerful struggle of over half a billion gallons of water dashed every minute against the Atlantic surf.

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<sup>1</sup>In the preparation of the ecological notes relating to the estuary of the Congo and of the captions to Plates LV to LXIV, I have had the benefit of the criticism and advice of Dr. J. Bequaert, who has made an extensive botanical survey of the Lower Congo.—H. L.



Map of the estuary of the Congo River showing localities where crabs have been collected. The dotted areas cover the extent of true mangrove forest (*Rhizophora mangle* Linneus), being the region periodically inundated by saline water at high tide.



"Banana peninsula is a mere sandy tongue less than a mile long and only a few hundred yards wide. Sand bars stretching southward into the mouth of the Congo practically shut off the waves of the Atlantic at this point, and the result is a rather quiet bay (Pl. LVI, fig. 1). Here the salinity of the water is slightly reduced and the environmental conditions are sufficiently different from those on the surf-beaten Atlantic shores to allow a distinctive fauna both on the beach and in the water. To the southeast, Bulabemba Island and adjoining mangrove swamps form a divide between the rush of fresh water in the main channel and the creeks of various salinity. In certain parts of the more extensive mangrove swamps the ground is densely pitted with thousands of holes, the entrances to the burrows of the crabs. One or two species generally predominate, though naturally a few other forms may be met with in suitable places.

"The chief ecological conditions associated with different kinds of crabs at the mouth of the Congo or a few miles up-river are more varied than a superficial estimate might promise. They include fresh or salt water or a mixture of both; quiet, shallow coves or wave-battered Atlantic shores; mangrove jungles, *Raphia* swamps and tangles of *Pandanus* roots; firm bases of papyrus and grass tussocks (Pl. LXI) tunneled as runways and resting places; gaps in stone heaps or the recesses in laterite boulders; a thin line of drift an inch high; decayed hollow shoots and branches still covered with bark; firm sand flats submerged at high tide (Pl. LV, fig. 2); the water-soaked level several feet below the burning hot sand or beneath mud baked as hard as rock; the oozy mire or morasses so deep that man becomes helpless in them; the tough, peat-like mass the mangroves have built up; impenetrable stockades of well-anchored prop-roots (Pl. LVI, fig. 2); the lofty outlook above the water on branch or root; and, not the least of them, the water, a safe resort making escape doubly easy.

"Whenever ecological conditions of a particular type are prevalent, crabs of one kind are apt to be more common and are often gregarious. The naturalist must then be satisfied with quantitative results rather than qualitative, for no extraordinary variety of species could be expected in sites which are fairly uniform. Typical of this are the mangrove swamps, though mud is by no means the only habitable medium they offer. A considerable amount of slowly decaying vegetable matter is held fast among the roots, and other plants also secure a firm hold. The ever recurring tides with the various changes in the level of the water, in both dry and wet seasons, must keep some of the crabs busy to remain

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 Expedition<sup>1</sup> 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.

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<sup>1</sup>1909, Sitzb. Gesell. Naturf. Freunde Berlin, pp. 383-400, 1 map.

"The halophilous shore vegetation, which generally creeps up to or across the line of drift, appears more varied on the Angolan side. There, too, beyond the reach of salt water, dense groves of *Borassus* palms and *Sansevieria* are common (Pl. LV, fig. 1). On and near Banana peninsula *Phœnix* palms are abundant (Pl. LVII, fig. 1) and these sites are generally frequented by land crabs only, whereas several species of shore crabs live on the nearby sandy beach.

"Coral reefs are unknown along the Belgian shore but on the Angolan side several miles south of Padron Point such a formation commences, introducing a richer crustacean and molluscan fauna, just as is the case with the small field of laterite blocks below the lighthouse at Moanda near the base of the precipitous wall of red laterite soil (Pl. LVII, fig. 2).

"Though mangroves are common in similar tropical regions, in the Congo estuary they are especially vigorous and seem to rival those of Malaysia in size. The gigantic trunks attain seventy-five feet in height and more than two feet in diameter, and are cut at Malela into splendid boards and beams. In the mangrove swamps a considerable number of creeks of various widths make access by rowboat easy. At high tide, from a distance, the mass of dark green leaves glistening in the sun, the gray and brown streaks of aerial roots, and portions of trunks give the impression of a uniformly luxuriant growth of bushes and forests (Pl. LVIII). At low tide, the tangle of stilt-roots, anchoring the whole firmly into the mud, are forced on the attention (Pl. LIX). They help consolidate, or at least hold fast, the slush, débris, and sand, and thereby offer a home of perfect safety to millions of crabs that need not burrow far. The prop-roots of these extensive and often dense mangrove forests, and those of *Pandanus* (Pl. LXII), tangled and entwined, form an impenetrable stockade often fringed by *Raphia* palms (Pl. LX, fig. 1). Here at low tide the soft miry edges and slanting roots are the preferred hunting grounds of small troops of walking fish (*Periophthalmus*).

"According to Dr. Bequaert, the common mangrove of the Congo swamps is the *Rhizophora Mangle* Linnæus. Wherever at high tide the ground is regularly covered by salt or brackish water, they flourish together with their halophilous associates, generally not within the reach of heavy waves. On the Belgian shore the mangrove belt extends about 18 miles up-stream from Banana. On the Angolan side the considerably narrower strip reaches farther west and extends up-river about 28 miles, but the mangroves do not seem to attain as great a size as on the Belgian shore; this is true also of the patches at the mouth of the Moanda and Shiloango Rivers." (H. L.)

## COLLECTING AND PRESERVING

"The greatest drawback in collecting crabs is the habit they have of shedding their limbs the very instant they are caught. In the field one usually kills them by injecting beneath their recurved abdomen some preserving fluid, which is most effective when forced into the slightly raised portion along the center. But too often in the creature's last spasms, chelipeds and legs are snapped off at certain points beyond the joints. Some species are more apt to do this than others and there is a great difference in the manner in which the young and fully adult react. Of the crabs represented in the collection, the adults of *Cardisoma armatum* are least liable to autotomize, but in the genus *Ocypode* the young were less subject to self-mutilation than the adult. *Grapsus grapsus*, *Goniopsis cruentata*, *Sesarma* (*H.*) *africanum*, and *S.* (*H.*) *elegans* were in this respect the most difficult to deal with.

"To overcome partly these difficulties one should avoid touching the crabs directly. After allowing them to retreat into their refuges, they may be enveloped within a quantity of the substance in which they are hiding, be it vegetable débris, mud, sand or soil, or held down below the gravel or in the crevices. They can then be injected just as easily and, with this method, limbs are seldom dropped off. Perfect specimens can also be obtained by exposing the crabs to the sun, which kills them quickly, or by drowning.

"In some crabs a rapid injection of a solution of 40 per cent formaldehyde mixed with half the quantity of 90 per cent alcohol gave the most satisfactory results. In tropical climates the large claws should be specially injected before the specimen is permanently preserved in 70 per cent alcohol. If glass jars are used, care should be taken to open them every day for the first week, as gases form and develop sufficient pressure to break the containers." (H. L.)

## SYSTEMATIC DISCUSSION OF SPECIES COLLECTED

Tribe **BRACHYURA**Subtribe **DROMIACEA****Dromiidae****DROMIA** Weber

*Dromia* WEBER, 1795, *Nomenclator entomologicus*, p. 92.

***Dromia atlantica*** Doflein

Plate XVIII, Figure 3; Text Figure 1

*Dromia atlantica* DOFLEIN, 1904, *Brachyura 'Valdivia' 1898-1899*, VI, p. 10; Atlas, Pl. VII, figs. 3 and 4.

*Locality*.—St. Paul de Loanda; September 23, 1915; 1 ♀.

*Range*.—Mouth of the Congo, 44 meters (Doflein). St. Paul de Loanda.

*Measurements*.—Length of carapace to end of median tooth, 27.4; length of carapace to median sinus of front, 26; greatest width measured between tips of the posterior of the lateral teeth, 30 mm.

*Description*.—Sutures of carapace feeble except the longitudinal portions of the H-form depression in the center of the carapace. Rostral horns stout, conical, the two lateral spines as long as their basal width, and longer than the depressed median spine. A short, thick, triangular spine at upper, inner angle of orbit; a much smaller

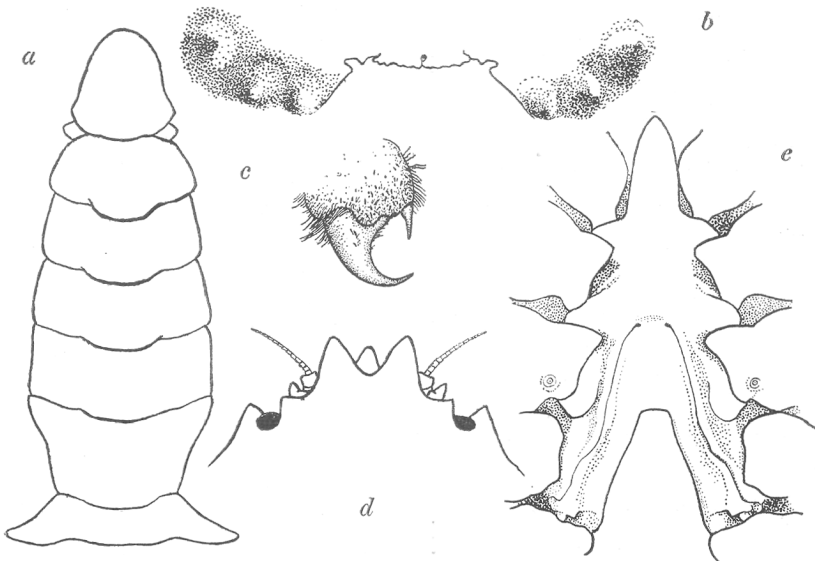


Fig. 1. *Dromia atlantica*, female 30 mm. wide, St. Paul de Loanda.

A, abdomen; b, edge of epistome and neighboring tubercles; c, extremity of left third leg; d, anterior part of carapace with antennae and eyes; e, sternum, showing sulci.

spine at lower, inner angle; just below the outer fissure lies the largest of the orbital spines, conical, pointing forward. Four anterolateral spines; the interspaces of the anterolateral border are of different lengths, represented by 3.1.2.4, the fourth interspace being the longest, the second nearly as long, the first, or that lying next the orbital tooth, still shorter, while the third interspace is a little more than half as long as the fourth. The first anterolateral tooth is one of a row of three protuberances leading to the buccal cavity and diminishing in size, the interspaces subequal. Edge of epistome crenulate, with about ten crenules.

Carpus of cheliped uneven with a few low nodules, and two large, conical ones on the border next to the manus. The pubescence, which coats the entire animal, reaches to the middle of the immovable finger, but farther down the outside of the dactylus, and only a third the length of the upper surface of the same. Carpus of last leg subtriangular, strongly widened toward the distal end. The propodus of the last two legs bears a very slender, short spine at its extremity which forms a sort of chela with the dactylus.

Sternal sulci slender, inconspicuous, reaching only to a line which, if continued, would run between the first and second ambulatory legs. Terminal segment of abdomen (of female) a little longer than wide.

Doflein described this species from a male specimen, from the mouth of the Congo, only 8 mm. long, in which the length of the carapace including the rostrum was as great as the width; in the adult female here described the carapace is a little wider than its total length. In Doflein's figure 3, Plate VII, the rostral horns are narrower and the interspace wider than in the female. In the female there is a difference in color between the outer and inner portions of the pterygostomian regions. Otherwise the two specimens seem to agree.

"This small crab was found at a depth of only a few feet between sponges that surrounded *Pinna*, a description of which is given under *Pisa carinimana*. Its carapace, with its peculiar 'mossy' color and hairiness, completely matched the surroundings." (H. L.)

Subtribe **BRACHYGNATHA**

Superfamily **Brachyrhyncha**

**Portunidae**

**CALLINECTES** Stimpson

*Callinectes* STIMPSON, 1860, Ann. Lyc. Nat. Hist. New York, VII, p. 220.

**KEY TO THE WEST AFRICAN SPECIES IN THE CONGO COLLECTION**

- A. Lateral spine of carapace elongate, about three times as long as the tooth just in front of it. Size small, carapace about three inches or less than 80 mm. wide. Appendages of male abdomen reaching to middle of penultimate segment.  
*gladiator*.

- A'. Lateral spine two and one-half, or less than two and one-half, times as long as the tooth just in front of it. Size larger, carapace four or more inches (100 mm. or more) wide.
- B. Lateral teeth trending forward, the second to fifth teeth, inclusive, having convex outer margins. Maximum size about four and three-quarters inches, or 120 mm. Appendages of male abdomen very short, overreaching antepenult segment but little if at all.....*marginatus*.
- B'. Lateral teeth trending forward little if at all, the margins nearly straight. Maximum size about six inches, or 152 mm. Appendages of male abdomen very long, reaching end, or beyond end, of abdomen. Immovable finger of major chela extraordinarily swollen in its basal half.....*latimanus*.

***Callinectes marginatus* (A. Milne Edwards)**

Plates XIX, Figure 1, XX, Figure 1; Text Figure 2

*Neptunus marginatus* A. MILNE EDWARDS, 1861, Arch. Mus. Hist. Nat., Paris, X, p. 318, Pl. xxx, fig. 2, Gaboon. Types examined (3 young ♀ ♀).

*Callinectes larvatus* ORDWAY, 1863, Boston Journ. Nat. Hist., VII, p. 573, Key West, Tortugas, Bahamas, Haiti. RATHBUN, 1895, Proc. U. S. Nat. Mus., XVIII, p. 358, Pls. xvii; xxiv, fig. 5; xxv, fig. 4; xxvi, fig. 4; xxvii, fig. 4.

*Callinectes larvatus* A. MILNE EDWARDS, 1879, Crust. Rég. Mex., p. 225 (variety of *C. diacanthus*).

*Callinectes africanus* A. MILNE EDWARDS, 1879, Crust. Rég. Mex., p. 229 (variety of *C. diacanthus*), Cape Verde Islands. Types examined (2 large ♂ ♂).

*Callinectes larvatus* var. *africanus*? BENEDICT, 1893, Proc. U. S. Nat. Mus., XVI, p. 537.

*Callinectes marginatus* RATHBUN, 1897, Proc. Biol. Soc. Washington, XI, p. 149.

DE MAN, 1900, Mém. Soc. Zool. France, p. 41, Pl. I, figs. 5, 5a (♀ not ♂).

BOUVIER, 1901, Bull. Mus. Hist. Nat., Paris, p. 16.

*Localities*.—Banana; July 1915; 7 ♂ ♂, 7 ♀ ♀, 1 young. One specimen, a ♂, is of large size, the remainder are medium or small. Banana; August 1915; 10 ♂ ♂, 9 ♀ ♀, varying from 21.5 to 40.5 mm. in length. Moanda; July 1915; 2 ♂ ♂, immature. St. Paul de Loanda; September 23, 1915; 1 ♀, young. Locality not given; 1 ♂, half grown.

*Range*.—West coast of Africa, from Cape Verde Islands to Lobito, Angola. Florida Keys and Bahamas to Bahia, Brazil.

*Measurements*.—Length of male (Banana, July 1915) to the median sinus of the front, 43.8; width, 101; length of lateral spine, 10.6; length of preceding tooth, 4 mm.

*Description*.—Areolations of carapace well marked; granules coarse; gastric ridges slightly curved and parallel; length of intramedial area (that part of the gastric region behind the posterior of the gastric ridges) a little less than half of its anterior width and from two-thirds to three-quarters of its posterior width. Front, between the antennæ, four-toothed; median teeth small but well marked; lateral teeth broadly obtuse. Suborbital tooth prominent, arcuate, curved upward. The anterolateral teeth trend forward and are, in the adult, separated by deep rounded sinuses; the second to fifth teeth, inclusive, have convex posterior or outer margins;

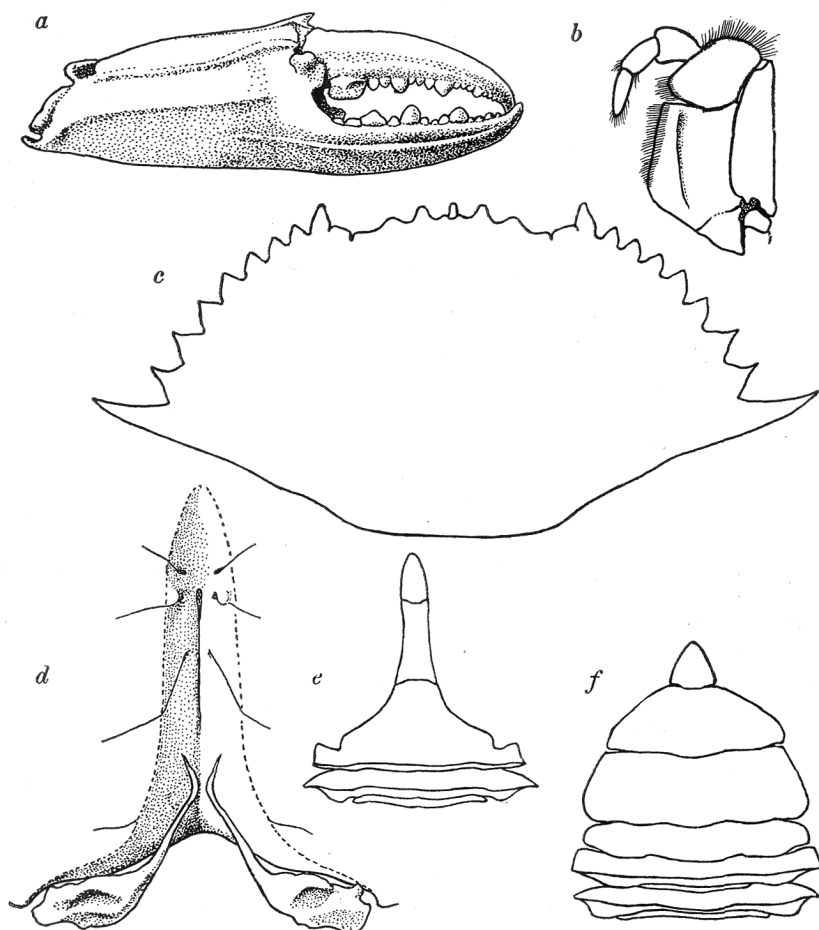


Fig. 2. *Callinectes marginatus*, Banana.

*A*, right, major chela of male 101 mm. wide; *b*, outer maxilliped of same; *c*, outline of carapace of same; *d*, appendages of first abdominal segment, in sternal cavity, same specimen; *e*, abdomen of same; *f*, abdomen of female 85 mm. wide.

first three or four teeth obtuse or subacute, the remainder acute or sharp; lateral spine between two and two and one-half times the length of the preceding tooth.

Distal end of merus of maxilliped strongly arched. Costæ of manus of cheliped prominent, roughened with granules of medium size. The lowest costa of the outer surface vanishes on the proximal half of the segment. Large tooth at base of dactylus of major chela broader than long.

Male abdomen small; penultimate segment wider at proximal than at distal end, margins slightly concave; appendages very short, overreaching third segment but little or not at all. Terminal segment of female abdomen a little longer than wide.



The crosswise sternal groove just in front of the abdomen is not straight but is directed obliquely backward a little from the outer ends to the median line.

The female is smaller than the male; the carapace is more swollen; the granules coarser, more bead-like. In the medium-sized and young specimens the sinuses between the lateral teeth are relatively smaller and less rounded than in the adult or old, but the teeth always curve forward in the manner characteristic of this species.

### ***Callinectes gladiator* Benedict**

Plate XIX, Figure 2; Text Figure 3

*Lupa smythiana* LEACH (*nomen nudum*) in White, 1847, List Crust. Brit. Mus., p. 27. Not *Neptunus sanguinolentus* (Herbst).

*Callinectes tumidus* var. *gladiator* BENEDICT, 1893, Proc. U. S. Nat. Mus., XVI, p. 537, Beyah River, Elmina, Ashantee.

*Callinectes tumidus gladiator* RATHBUN, 1895 (1896), Proc. U. S. Nat. Mus., XVIII, p. 360.

*Callinectes gladiator* RATHBUN, 1897, Proc. Biol. Soc. Washington, XI, p. 150.

*Localities*.—Banana; August 1915; 6 young (4 ♂♂, 2 ♀♀). Banana (no date); 2 ♂♂, 1 ♀, all adult. San Antonio; August 1915; 1 ♂ adult, 2 young (♂, ♀).

*Range*.—Liberia to San Antonio, Angola.

*Measurements*.—Length of male (San Antonio) to the median sinus of the front, 30.3; width, 78.7; length of lateral spine, 10.8; length of preceding tooth, 3.4 mm.

*Description*.—A smaller and more delicate looking species than *C. marginatus*.

The carapace is more strongly areolated, the six bosses (four branchial, two cardiac) which surround the posterior part of the gastric region are very prominent; a still higher elevation lies just outside the inner branchial nodules and is finely and closely granulate. The granulation of the carapace as a whole is finer and sparser than in *marginatus*; both raised gastric lines are curved forward at outer ends and are subparallel; one or both, however, may be slightly bent forward at the middle. The intramedial area is more constricted behind than in the preceding species; its length is considerably less than half its anterior width and is from two-thirds to three-quarters its posterior width. The four median teeth are narrower, those of the median pair more prominent, tuberculiform. The anterolateral teeth are separated by narrower sinuses; the lateral spine is very long, about three times as long as preceding tooth.

Distal end of merus of outer maxilliped strongly arched; outer angle more strongly produced sideways.

Fingers of cheliped more slender than in *marginatus*; basal tooth of major dactylus broad, low and of moderate size.

Male abdomen small; the spine at each end of the second segment in both sexes is compressed, slender, and curved upward and sometimes backward. The male abdominal appendages reach quite to the middle of the penultimate segment.

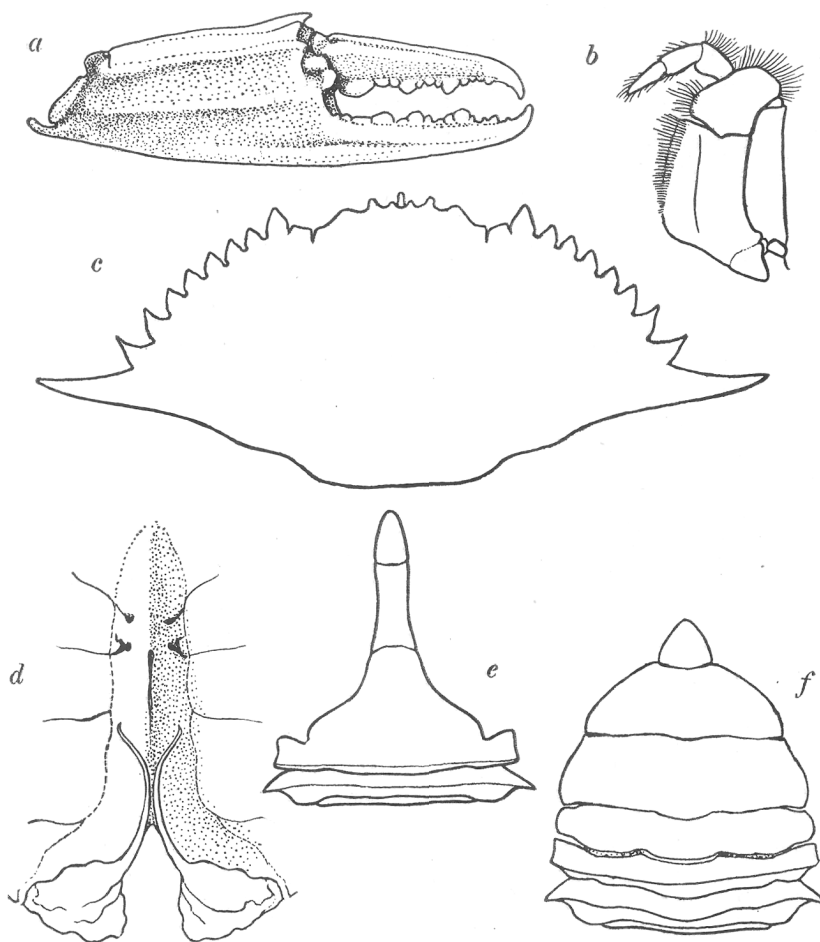


Fig. 3. *Callinectes gladiator*.

A, right, major chela of male 79.8 mm. wide, Banana; b, outer maxilliped of male 78.7 mm. wide, San Antonio; c, outline of carapace of same; d, appendages of first abdominal segment, in sternal cavity, same specimen; e, abdomen of same; f, abdomen of female 74 mm. wide, Banana.

### ***Callinectes latimanus* Rathbun**

Plates XV, Figure 2, XXI, XXII, Figure 1; Text Figure 4

*Callinectes bocourti* RATHBUN (not A. Milne Edwards), 1897, Proc. Biol. Soc. Washington, XI, p. 151, African specimens only.

*Callinectes latimanus* RATHBUN, 1897, Proc. Biol. Soc. Washington, XI, p. 151, text-figs. 6-8, Lagos, Bight of Benin, Guinea.

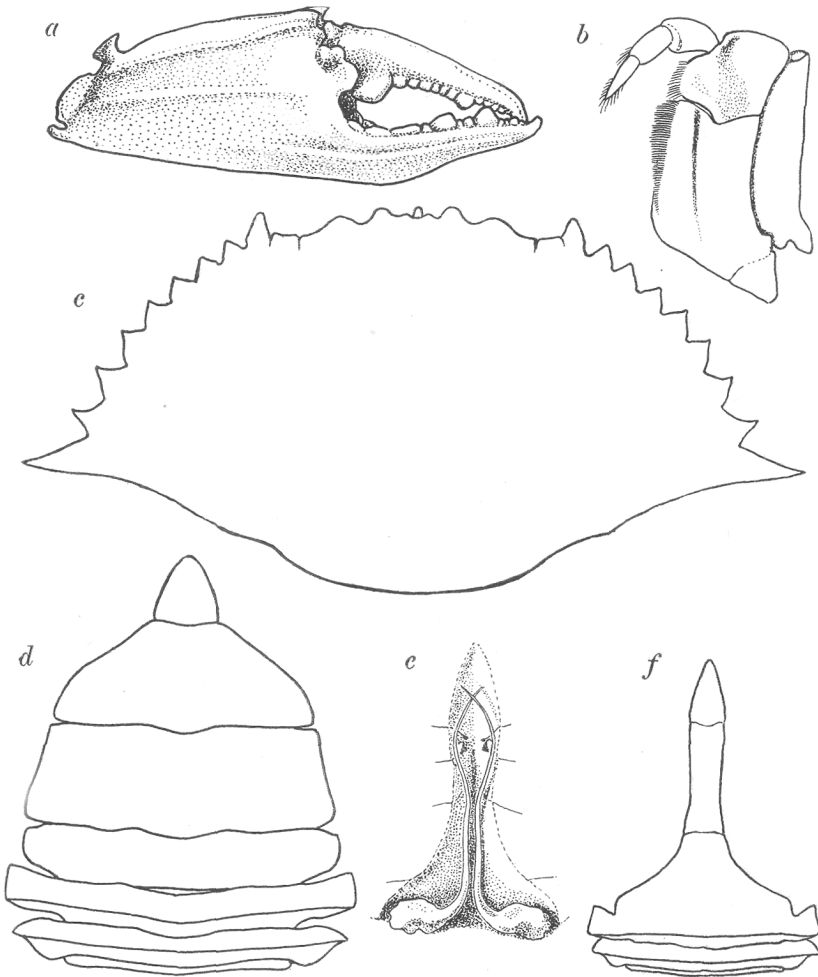


Fig. 4. *Callinectes latimanus*, Banana.

A, right, major chela of male 129.3 mm. wide; b, outer maxilliped of same; c, outline of carapace of same; d, abdomen of female 109.8 mm. wide; e, appendages of first abdominal segment, in sternal cavity, of same male as a; f, abdomen of same.

*Neptunus marginatus* var. *truncata* AURIVILLIUS, 1898, K. Svenska Vet.-Akad. Handlingar, XXIV, Afd. IV, No. 1, p. 5, Pl. I, figs. 1-4, Cameroon, immature ♀, not ♂.

*Callinectes diacanthus* var. *africanus* LENZ, 1910, Wiss. Ergeb. d. Deutschen Zentral-Afrika Exped. 1907-1908, Leipzig, III, Zool. I, Lief. 3, p. 5, Landana, two young specimens.

*Locality*.—Banana; July 1915; 10 ♂♂, 6 ♀♀ of large size, 1 ♂ of medium size, 1 young ♂, 1 young ♀. Banana; August 1915; 2 ♂♂ medium. Banana; September 1915; 1 ♂ medium, 1 very large dried ♂.

*Range*.—From Senegal to the mouth of the Congo.

*Measurements*.—Largest male, dried: length of carapace to median sinus of front, 72 mm.; width to tip of lateral spines, 152 mm.; width immediately in front of lateral spines, 127.5 mm.

*Description*.—Of larger size than *marginatus*; surface near the margins very sparsely granulated. Raised gastric lines curved forward at outer ends, especially the anterior line, so that the distance between these lines is less at the middle than toward the outer ends. Intramedial region longer in proportion to its width than in *marginatus*; its length just equal to its posterior width and half, or nearly half, its anterior width. Raised branchial line straighter than in that species, not directed toward the tooth in front of the lateral spine but, throughout its slightly sinuous course, toward the spine itself. Frontal teeth more triangular than in either of the other species, and the median pair larger and more advanced in proportion to the outer pair. Lateral spine moderate, from 2.25 to 2.5 times the length of next tooth. Lateral teeth more triangular than in the other species, sides nearly straight (in teeth 2 to 6), and edges coarsely granulate; in teeth 2 to 7, inclusive, the anterior or inner margin of each tooth is shorter than the posterior or outer margin.

Distal margin of merus of outer maxilliped subtruncate. Costæ of manus not prominent, granulated lines narrow, almost disappearing on the two lower costæ of the outer surface. In the major chela the basal part of the immovable finger is excessively swollen along the lower margin; the basal tooth of the dactylus is very large, obliquely placed and normally longer than wide.

The male abdomen is much larger in proportion to the sternum than in *marginatus*; the terminal segment is nearly twice as long as broad. The appendages reach beyond the tip of the abdomen itself. The last segment of the female abdomen is very little longer than wide; the lateral margins of the penultimate segment are for the most part nearly straight, then curve gently backward to meet the antepenult segment; this last is a little shorter than the penult segment.

The crosswise sternal groove just in front of the abdomen is transverse or very nearly so.

The female is smaller than the male. Its carapace is more regularly convex than that of the male and the surface less uneven. The surface is more densely and coarsely granulous, although granules are always sparse near the lateral margins, still sparser near the front, and quite absent from the posterior and posterolateral margins in the male, while in the female there are a few fine granules near the posterior angles.

In the female the intramedial region is less constricted than in the male, and its length may be a little less than its posterior width. On the other hand, in some males the length of the intramedial region is a little greater than its posterior width.

The swollen immovable finger of the large cheliped is common to males and females, from the largest down to one 36 mm. long by 71.3 mm. wide. An exception is a male, 45.2 by 92 mm., in which the fingers of the major cheliped are narrow and elongate, almost meeting when closed, and the basal tooth of the dactylus only slightly enlarged. This may be due to injury and consequent regeneration of the chela; the chela resembles that of a young male, 22.5 mm. long by 42 mm. wide. On the other hand, a still smaller specimen, female, 17.4 mm. by 35 mm., has a stout major chela, with gaping fingers; large, characteristic, basal tooth on the dactyl; and the faint beginning of a swelling of the immovable finger. In proportion to its size the lateral spine is longer than in older specimens, and the four teeth preceding the spine are unusually sharp.

I think that I was mistaken in 1897 (*loc. cit.*) in referring African specimens to *C. bocourti*. The young specimen (18735) in the National Museum from Senegal is, I believe, *C. latimanus*; it had been labeled "*C. africanus*" at the Paris Museum, but it is not one of the type lot. The types of *africanus* consist of two large males from the Cape Verde Islands and, although I am unable to re-examine them at present, I still consider them *marginatus*, because A. Milne Edwards's brief description of *africanus* applies better to *marginatus* than to the other African species. From notes made long ago at the Berlin Museum on a large male (5566) from Chinchoxo and a small female (3647) from Liberia, I conclude that these too should be referred to *latimanus*.

"Crabs of the genus *Callinectes* were common on submerged flats in sites where the fine, loose sand was constantly but gently moved by the action of the waves. They were numerous near Banana (Pl. LVI, fig. 1), Moanda, San Antonio, and Padron Point, but the different species were not distinguished in the field. Most of the series of *C. latimanus*, including the largest male, which measured six inches across the carapace from spine to spine, were taken in the bay to the east of and about half-way up Banana peninsula in a sheltered place where the salinity of the water was considerably reduced. Here at low tide these crabs can be observed when hurrying over the sand in shallow water. With one claw fully outstretched and with adjoining limbs pressed alongside, both rudder and limbs unite in sudden efforts by which they shoot like an arrow in short zigzags. With surprising dexterity they shift their rudder-blades and limbs. So rapidly do they move beneath the protecting clouds of fine sand they stir up that it becomes difficult to discover their whereabouts; and so suddenly do they assume immobility that the sand drifting

back covers all trace of their new hiding place, usually just below the sandy surface which the waves have helped to smooth. None were seen on land.

"The species included in this genus represent the well-known 'soft-shelled' crabs, yet in the estuary of the Congo neither white men nor natives use them as food. The flatness of the carapace, the slender claws, and the modification of the posterior limbs into flat rudders, easily shifted, make this group first-class swimmers, and the strong spines at the edge of the hard carapace undoubtedly protect them against being swallowed by fishes. Their rapidity in defense, and the quick use of their sharp hands make catching them a lively sport." (H. L.)

#### **THALAMITA** Latreille

*Thalamita* LATREILLE, 1829, in Cuvier, *Le Règne Animal*, IV, p. 33, footnote.

#### **Thalamita africana** Miers

Plate XXIII; Text Figure 5

*Thalamita integra* var. *africana* MIERS, 1881, *Ann. Mag. Nat. Hist.*, (5) VIII, p. 218, Canaries.

*Locality*.—St. Paul de Loanda; September 21 and 23, 1915; 9 ♂♂, 10 ♀♀ ovig., 1 ♀ young.

*Range*.—Canary Islands; Gorée Bay, Senegambia, 9 to 15 fathoms (Miers); St. Thomas Island (Osorio); St. Paul de Loanda.

*Measurements*.—Length of carapace of male, 26.7; width of same, 42.1; fronto-orbital width, 31 mm.

*Description*.—This species belongs to the group of *Thalamita* in which the front between the antennæ is bilobed, or between the orbits quadrilobed; in which the two median lobes form a convex arch, and are separated from each other by a slight fissure, the margin of each lobe slightly concave at middle. The overlapping lobes of the outer pair are oblique and considerably narrower than those of the inner pair. Anterolateral margins considerably curved for a *Thalamita*; first tooth widest and subtruncate; second and third teeth similar to each other and blunt-pointed; fourth and fifth teeth acute; fourth much the smallest but not rudimentary; fifth projecting laterally much beyond the others. Three finely crenulated transverse ridges; one between the teeth of the last pair, interrupted at the cervical suture and on the median line; one protogastric, narrowly interrupted by the mesogastric region; and one in front of this, widely separated in the middle. Besides, there is a very short ridge on the branchial region not far from its inner boundary; this is most evident in females and may disappear in old males. Epigastric lobes rather prominent. Remainder of carapace smooth.

Ridge on basal segment of antennæ smooth, nondentate but finely granulate.

Chelipeds of male not very unequal, nearly smooth. Inner margin of merus provided with a distally-directed rounded lobe or tooth, followed by three or four small

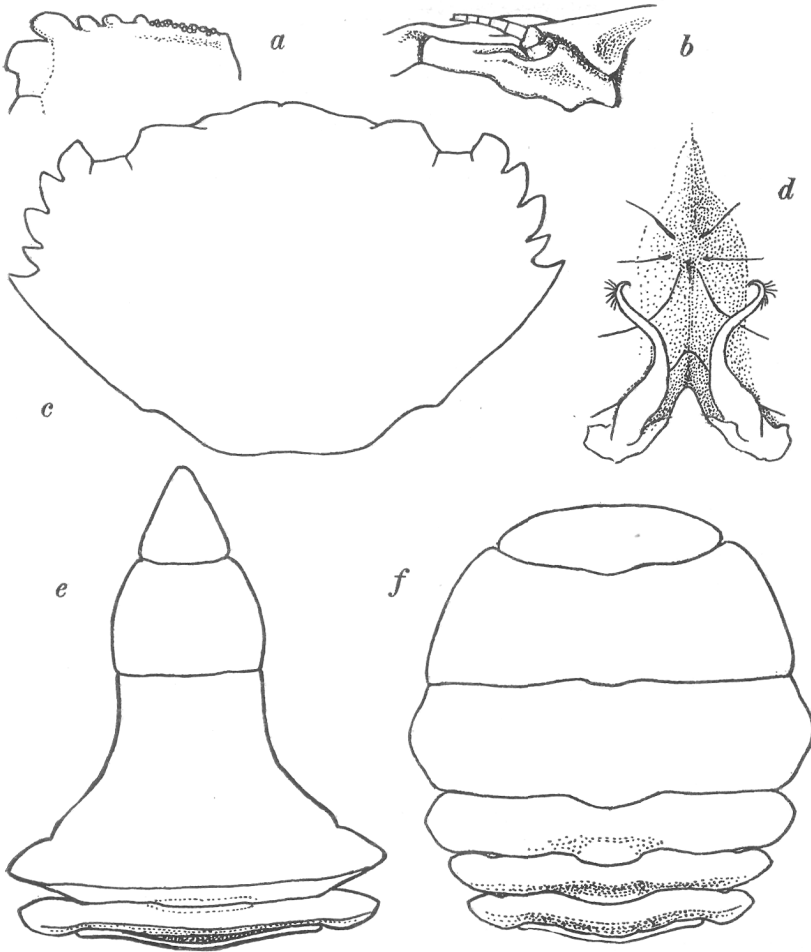


Fig. 5. *Thalamita africana*, St. Paul de Loanda.

A, anterior edge of merus of left cheliped of male 42.1 mm. wide; b, right antenna of same, showing basal segment; c, outline of carapace of same; d, appendages of first abdominal segment, in sternal cavity, of same specimen; e, abdomen of same; f, abdomen of female 33 mm. wide.

lobes and a number of granules, gradually diminishing to the proximal end. The carpus has a strong, horny-tipped inner spine and a few blunt ridges on the outer and upper surface. The palm bears at most three blunt ridges, one continued from the propodal finger and two superior, each of which is provided with a blunt tooth or spine distal to the middle; one or both of these teeth may be suppressed. In the female only is there a spine at the articulation with the carpus. In the female, also, the lowest ridge of the palm is longer and sharper than in the male. The merus of the swimming-foot is twice as long as wide; the propodus is armed below with a few fine spinules.

The front is more arcuate than in *T. integra*,<sup>1</sup> its lateral lobes arcuate instead of straight; the fourth lateral tooth is small but not minute, as in *integra*; the protogastric regions bear each a short granulated ridge, which is lacking in *integra*; and the two spines on the upper edge of the hand are blunt, not sharp.

"The most common species in the quiet stretches of the bay near the town of St. Paul de Loanda, and easily caught at low tide on the many submerged sand flats. Their behavior is much the same as that of *Callinectes* (p. 401), but their habitat there is typically marine." (H. L.)

### Potamonidæ

Carapace broader than long, subquadrilateral, oblate-oval, or almost circular. Anterolateral borders arched, no longer, and often much shorter, than the posterolateral borders, which are convergent. Regions seldom areolated; the cervical suture may be deep and conspicuous or interrupted, often well defined only behind the mesogastric area. Branchial regions much dilated.

Front typically broad, not separated from the inner supraorbital angles, usually obliquely deflexed, sometimes horizontal or vertically deflexed, commonly bilobed or entire, seldom armed with spines or tubercles.

Antennules usually folded transversely in narrow fossæ, antennal peduncles occupying the orbital gap, the distal joints overlapped by the front. Antennal flagella short, sometimes quite vestigial.

Epistome transverse, of fair length fore and aft, well demarcated and never encroached upon by the external maxillipeds. The palpus of the latter articulates at, or near, the inner angle of the merus. Buccal cavity usually square.

Chelipeds in male unequal, often very much so; in female, equal or nearly so. Legs gressorial.

Sternum broad. Abdomen of male occupying all the space between the last pair of legs. The genital ducts of the male open on the coxopodites of the last pair of legs.

### Potamoninæ

Mandibular palp composed of two or three distinct segments; terminal segment simple, often thickened at base for the attachment of a bunch of hairs, or occasionally with a small lobe on the ventral side of its base.

Merus of external maxillipeds transverse.

Efferent branchial channels not abnormally produced.

Antennules transverse.

Dactyli of walking-legs strongly spinose.

Abdomen of adult male almost never abruptly contracted distally; its sixth segment is almost always much broader than long, and its seventh segment is almost always broadly triangular.

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<sup>1</sup>Dana, 1852, Proc. Acad. Nat. Sci. Philadelphia, VI, p. 85; 1852, U. S. Expl. Exped., XIII, Crust., part 1, p. 281; 1855, Atlas, Pl. xvii, figs. 6a-d.



**POTAMON** Savigny

*Potamon* SAVIGNY, 1816, Mém. Anim. sans Vert., I, p. 107. RATHBUN, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VI, p. 247 (part).

Carapace traversed by a crest which consists of two portions, namely, (1) a shorter, coarser, epigastric portion, and (2) a longer, sharper, postorbital portion; these two portions may be distinct and discontinuous, or may be continuous, or one or both of them may be indistinct to the verge of disappearance.

Front broader than orbit, about one-fifth to about two-sevenths the greatest breadth of the carapace, deflexed, usually broadly bilobed or sinuous.

Outer orbital angle usually dentiform.

Anterolateral borders of carapace usually well defined, often cristiform and serrulate or crenulate, sometimes cut into large teeth or spines; their curve is usually broken, near the level of the postorbital crest, by a notch and spine, but these may be indistinct or obsolete. Posterolateral borders usually rounded and indefinite, crossed by oblique wrinkles continued from the side walls of the carapace.

Dactyli of legs armed with four rows of spines.

Abdomen of adult male regularly triangular. Abdomen of adult female broad, its terminal joint not elongate. In both sexes all seven abdominal segments are distinct and separate. (Condensed from Alcock.)

*Subgenera*.—The division of the genus *Potamon* into the three large subgenera *Potamonautes*, *Potamon*, and *Geothelphusa* is an arbitrary one, as it is based on the completeness, continuity, and distinctness of the postfrontal crest; and between any three groups into which the genus may be so divided there are various intergrading forms which it is difficult to place without violating the letter of the definitions. Alcock, in his key,<sup>1</sup> put *Potamonautes* under the headings, "3. Postorbital crests and lateral epibranchial spine very distinct" and "5. The epigastric and postorbital crests of each side form an unbroken line." In "3" I would insert after "lateral epibranchial spine" the words "if present." In my monograph of the Potamonidæ, 1904–1906, there were included in *Potamonautes* a number of species in which the crest was not distinct throughout its length. Today I would restrict that subgenus to those forms having a very distinct, meaning a sharp-edged, crest (it very often overhangs the surface in front of it), which shows no break except on the median line. There may or may not be a spine or tooth on the lateral margin at the end of the crest. I would omit from *Potamonautes* those species which I previously placed there in which the crest is strong but is interrupted by a notch at the outer end of the epigastric lobes.

It is difficult to define the limits of the subgenus *Geothelphusa*. Alcock gives in his key, "3. Postorbital crests and lateral epibranchial spine indistinct or obsolete." In reality, the outer portion or outer half

<sup>1</sup>1910, Records Indian Mus., V, p. 257.

or two-thirds of the postorbital crests may be very distinct (e. g., *congoënsis*, two-thirds grown), although separated from the epigastric crests by an appreciable space where the surface rounds smoothly downward anteriorly. This pattern of geothelphusid crest is but slightly removed from that of *ballayi* and that again from *obesus*, both in the subgenus *Potamon*, while in some similar species also in the subgenus *Potamon* the postorbital crests are much more indistinct although more extensive than in the geothelphusids *congoënsis* or *perparvus*.

*Acanthothelphusa* is here reckoned as a subgenus of *Potamon*, because it is separated from the three subgenera discussed above by only one character, that of having several epibranchial spines or teeth. In other respects the species agree with one or another of the older subgenera.

#### Subgenus **POTAMONAUTES** MacLeay

*Potamonautes* MACLEAY, 1838, Illus. Zool. S. Africa, Annulosa, p. 64.

Postorbital crest very distinct or sharp-edged, forming an unbroken line with the epigastric crest. The spine or tooth or angle at the outer end of the crest is very distinct. There may be a tooth between the epibranchial tooth and the orbital tooth.

#### **Potamon (Potamonautes) floweri** de Man

Plate XX, Figure 2; Text Figure 6

*Potamon (Potamonautes) floweri* DE MAN, 1901, Proc. Zool. Soc. London, p. 94, Pl. x. RATHBUN, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VI, Pl. xvii, figs. 2 and 6; 1905, (4) VII, p. 193.

*Localities*.—Libreville, in the Gaboon; February 1916; J. P. Chapin, collector; A4518; 10 ♂♂, 7 ♀♀. The following localities are all in the Belgian Congo. Yakuluku; November 1911; 1 ♂. Garamba; June 1912; 1 ♀. Faradje; March-June 1911, 17 ♂♂, 5 ♀♀; 1911, No. 250, 1 ♀; October 1912, 3 ♂♂, 1 ♀ young; without date, 5 ♂♂, 7 ♀♀. Vankerekhovenille; April 1912; No. 414; 2 ♂♂, 1 ♀; the larger male has an emargination in the right side of the crest; the smaller male has regenerated the right maxilliped, which is reduced and abnormal. Ngayu; December 16, 1909; 1 ♀ ovig. Affluents of the Nepoko River near Gamangui (Ituri Forest): No. 68; 1 ♂. No. 69; 4 ♂♂, 7 ♀♀ (1 ovig., 1 with newly hatched crabs). No. 72; 4 ♂♂, 2 ♀♀ (1 ovig., 1 with newly hatched crabs). No. 73; 2 ♂♂, 5 ♀♀ (1 ovig.). No. 75; 3 ♂♂, 1 ♀. Poko; August 1913; No. 638, 1 ♀; October to December 1913, 1 ♂, 1 ♀, both small and with thin shell. South of Poko; October to December 1913; 2 ♂♂, 7 ♀♀ (1 ovig., 1 with newly hatched crabs). Affluents of the Tshopo River near Stanleyville; No. 884; 2 ♂♂. Banana; August 1915; 4 ♂♂.

*Range*.—The type locality is Bahr-el-Gebel, Soudan. The species has been taken also in the Yei River, affluent of the Nile, 1130 meters altitude; Upper Ubangi, French Congo; and at Faradje, "Dougou" River (probably Dungu), 1060 meters altitude.

*Measurements*.—Length of largest specimen, male (No. 68), 37.4; width, 59.8 mm. Length of smallest, free-living specimen in the collection, a male (Faradje March-June 1911), 13 mm.; width, 19.3 mm.

*Diagnosis*.—Carapace very convex. Postfrontal crest partly overhanging orbit. Lateral margin with two small teeth behind orbital tooth.

*Description*.—The carapace is very wide, its length about three-fifths of its width; very convex from front to back, much less so from side to side; surface smooth, finely punctate. Grooves in center of carapace of moderate depth; lateral portions of cervical groove indistinct; mesogastric suture tectiform; furrow behind orbits very deep.

Postfrontal crest transversely sinuous, more advanced behind orbits, edge crenulate in outer half. The crest occupies a much more advanced position than in allied species, and this is accented by the convexity of the carapace, with the result that, when viewed from above, the crest covers more or less of the orbital margin and also the tooth lying between the orbital and epibranchial teeth.

Anterolateral margins strongly arcuate, granulate or denticulate, often obscurely so, when it appears smooth and entire; posterolateral margins concave.

Front, measured below, one-fourth the width of the carapace; from above the edge appears widely emarginate; sides very oblique.

Outer orbital tooth acutangular, sharp. Between this tooth and the epibranchial angle there is a small, granulated tooth or prominence, immediately behind the deep groove which separates the suborbital and subbranchial areas. On the lateral margin, in front of this groove there may be one or two denticles or tubercles.

Lower margin of orbit almost transverse, little arcuate; a deep, outer notch commonly V-shaped.

Mandibular palp composed of two distinct joints, the terminal joint cut into two lobes (the outer one very short), which embrace the incisor process of the mandible.<sup>1</sup> Furrow on ischium of outer maxillipeds slightly nearer inner than outer margin; exopod with a flagellum half as long as its stalk.

Sternum thickened along insertion of chelipeds, and having a transverse groove between posterior outer corners of maxillipeds.

The subterminal projection of the inner face of the arm is a large, rather sharp, tubercle. Outer face of arm and wrist almost smooth. Primary and secondary spines of wrist acute. Fingers long, narrowly gaping, marked with a few rows of punctæ; upper margin of dactylus serrated with tubercles pointing distad. Similar but fewer tubercles on upper surface of palm. The prehensile teeth on the proximal half of the fingers are larger than on the distal half.

Merus of last two pairs of legs three times as long as broad.

Posterior width of terminal segment of male abdomen one-third greater than its length; penult segment the same length as the last, its anterior margin four-fifths

<sup>1</sup>The mandible has the terminal segment of the palp more deeply divided than in *Potamon madagascariensis* (See Calman, 1913, Proc. Zool. Soc. London, text-fig. 161B, on p. 923) and forms a closer link with the subfamily Gecarcinucinae.

of its posterior. Appendage of first segment with a long slender tip, directed obliquely outward.

The species is well figured with details on Plate x, de Man, *op. cit.*

The crest varies much in direction: the middle half may be either quite transverse or slope back a little each side of the middle; it then runs obliquely forward to the extremity, in an arcuate or a straight line.

In many specimens of medium size, the anterolateral margin forms a sharper rim than in the old. Likewise the upper surface of the palms and movable fingers is usually rougher than in the old, and there may be an additional row of serrations on the inner surface just below the upper margin of the dactylus. These characters are by no means constant. Individuals of both sorts and of similar size may be found in the same lot. The palm and fingers are shorter and wider in medium than in the largest specimens.

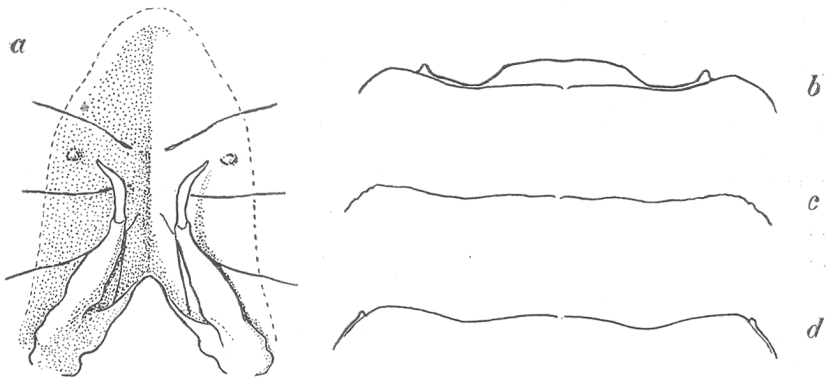


Fig. 6. *Potamon (Potamonantes) floweri*, male, Faradje.

A, appendages of first abdominal segment, in sternal cavity, of specimen 55.6 mm. wide; b, crest and anterior outline of a carapace 51.5 mm. wide; c, crest of a carapace 53.4 mm. wide; d, crest of same specimen as a.

The newly hatched young measure from 4.4 mm. long, 5 mm. wide (No. 69), to 4.8 mm. long, 5.3 mm. wide (S. of Poko). The front of the carapace is much less deflexed than it becomes later; sides of front subparallel, outer orbital tooth minute, epibranchial tooth still more so.

The eggs vary in diameter from 3 mm. (No. 69) to 3.5 mm. (No. 73).

*P. (Potamonantes) aubryi* Milne Edwards has the terminal segment of the mandibular palp bilobed as in *P. floweri*; the two species resemble each other in their very convex, subcylindrical form.

"The habits of this common and widely distributed species are so different from those of all other river crabs that in the field we soon called

specimens of *Potamon* (*Potamonautes*) *floweri* 'land crabs.' To be sure they occurred in nearly all the shallow brooks (Pls. LXIII and LXIV), but in the parts of the Rain Forest we visited they were equally at home on land, at least in all humid places, whether high on a hill, or beneath overhanging banks of brooks. Heaps of dead vegetation in the water-courses are among their favorite haunts and may also help their wide distribution when forced down-stream by the floods.

"The puffed, smooth appearance of the short, deep, unarmed carapace is associated with the air-breathing habit, and contrasts with the more flattened, well-modeled, rough, and even spiny carapace of crabs typical of the rivers of the interior. The color of this species is peculiarly protective in the various habitats, and to such an extent that on land the crabs often could be discovered only when rustling among dead leaves. Most of the upper surface is dark purplish brown, tones of yellow predominate on the big shears and legs, and the lower side is purplish gray; a yellowish line on the orbital border is more or less accentuated in different individuals.

"Our failure at first to see any of these crabs when we marched northward across the plains of the Uele District led us to believe that they were entirely absent, even from the rivers of the Savannah region. To our surprise we later found that during the dry season these 'land crabs' were all estivating in burrows. As the rainy season sets in they scatter again and may be found in brooks, swamps, and on land.

"At Faradje one of them had dug its burrow in the neighborhood of the Dungu River near the edge of a swamp we passed every day. Four times in two months it pushed new, damp soil outward, though it always kept the entrance clogged up. Finally, its successive efforts had raised a rough mound, in form resembling a reversed funnel. On opening the entrance, a thin rod could be lowered nearly five feet into the practically perpendicular channel. The crab always responded to this unwelcome disturbance by pinching the stick with its big claws. As the dry season advanced, the level of the ground-water fell lower and lower, and our crab found it necessary to keep within immediate neighborhood of moisture, or rather near the water-level where it then rested. The continued burrowing to a greater depth is evidently for the purpose of reaching the ground-water. This was especially true in one of the largest colonies met with. As a result of the first showers that introduce the rainy season, at the beginning of March the Yakuluku River had inundated its banks for about two days. In a sheltered cove about two feet above the usual water-level the black mud still showed a smooth, miry

condition. On its surface numerous small heaps of excavated mud were very conspicuous and all proved to be from burrows of these crabs. In a stretch of thirty yards two hundred were scattered. Each of the several dozen burrows examined contained but one crab. The floods had obliterated most of the former excavations, though those not reached by the current still showed the previous diggings of these crabs.

"The eggs are relatively large (about 3 mm.) and, as usual, are retained by modified pleopods beneath the recurved abdomen, which is forced far from its usual position by their great numbers. This is especially true after the hatching of the young, which are carried about for some time.

"The chief enemy of these and other river crabs is not man, for natives in the interior of the country do not use them as food.<sup>1</sup> They are extensively preyed upon by young crocodiles, monitors (*Varanus niloticus* Linnaeus), insectivorous otters (*Potamogale velox* Du Chaillu), and several small carnivores, chiefly belonging to the mongooses. Large waterbirds are relatively scarce in the West African Rain Forest and none were found to feed on crabs. In a hornbill's (*Ceratogymna*) nest, however, were seen pieces of carapace, evidently brought there by the nursing male bird.

"Their known distribution and the general physiographic conditions of the country inhabited by these crabs indicate that probably they occur all across the equatorial zone from the Nile (Bahr-el-Djebel) to the Atlantic, though on the coast they have been collected only at Libreville (Gaboon) and Banana (mouth of the Congo) and none have been recorded in the regions between the eastern and western localities given by Miss Rathbun." (H. L.)

#### **Potamon (*Potamonautes*) *dybowskii* Rathbun**

Plate XXIV; Text Figure 7

*Potamon* (*Potamonautes*) *dybowskii* RATHBUN, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VI, Pl. xv [vii of *Potamonidæ*], fig. 3; 1905, (4) VII, p. 177, text-fig. 44.

*Localities*.—This species was described from a single specimen, a male, from Bangui in the French Congo, on the border of the Belgian Congo. Balss records it from Koloka (between Uele and Ituri).

In the Lang-Chapin collection there is a fine series of ninety-one specimens from eleven localities. They are as follows. Libreville, Gaboon, French Congo; February 1916; J. P. Chapin; 3 ♂♂, 5 ♀♀. South of Poko; October to December 1913; J. P. Chapin; 10 ♂♂, 5

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<sup>1</sup>The crabs brought back from Libreville, by Mr. J. P. Chapin, were all bought in the market.

♀ ♀. Bafwabaka; December 31, 1909; 1 ♂, 6 ♀ ♀ (1 young), variety; "above dark brownish mottled with pale greenish-yellow." Affluents of Nepoko River, near Gamangui (Ituri Forest); Nos. 68, 70, 71, 80; 6 ♂ ♂, 7 ♀ ♀. Ngayu; December 13, 1909; 1 ♂, 2 ♀ ♀; "brownish above." Avakubi; October 11, 1909, 3 ♀ ♀; from the Aruwimi River, October 14, 1909, 1 ♂, 1 ♀; October 21, 1909, 1 ♀; September 1913, 2 ♀ ♀. Bafwasende; common in the Lindi; September 23 and 25, 1909; 2 ♂ ♂, 3 ♀ ♀. Bafwamoko; September 14, 1909; 1 ♂, found in same brook as *P. stanleyensis*. Batama; July 18, 1909, 2 ♂ ♂, 1 ♀; September 16, 1909, 1 ♂ immature; September 17, 1909, 1 ♀ immature. Affluents of the Tshopo River, near Stanleyville; No. 884, 3 ♂ ♂, 3 ♀ ♀. Stanleyville; August 21, 1909, 1 ♀; April 1915, Nos. 833, 843, 859, and 932, 3 ♂ ♂, 1 ♀ ovig., 2 young; from affluent of Tshopo, April 1915, No. 841, 12 young. Locality not given; 1 ♀ with newly hatched young.

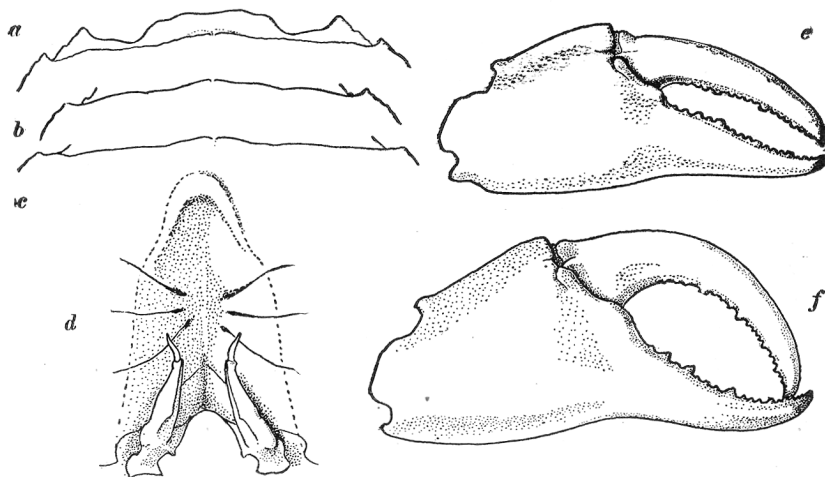


Fig. 7. *Potamon (Potamonautes) dybowskii*.

*A*, crest and anterior outline of female 64 mm. wide, Nepoko River; *b*, crest of female 52.8 mm. wide, Bafwabaka; *c*, crest of female 70 mm. wide, Bafwasende; *d*, appendages of first abdominal segment, in sternal cavity, of male 62.7 mm. wide, Nepoko River; *e*, right, major chela of same female as *c*; *f*, right major chela of same male as *d*.

*Measurements*.—Length of carapace of male (S. of Poko), 47.3 mm.; width of same, 63.4 mm.

*Description*.—The chief characters of the full-grown, adult male are as follows. The carapace is crossed by deep sutures, especially around the hinder border of the mesogastric region; the branchial region is distinctly divided into two subequal parts; the cervical suture disappears just before it reaches the postfrontal crest;

the anterior end of the mesogastric region is roof-shaped; the crest is deeply divided on the median line and slopes backward therefrom to a small, forward-pointing tooth at either end; behind the crest the lateral margin is subentire, obscurely denticulated; orbital angle subrectangular; margin behind it interrupted by the cervical suture and discontinuous with the margin behind the crest, which is on a much higher level than the orbital tooth; a deep notch under orbital angle; front bilobed, outer corners obtusangular.

Mandibular palp two-segmented; a faint suture shows indication of an additional segment at the proximal end; terminal segment simple. Ischial furrow of outer maxillipeds faint; antero-external margin of merus arcuate.

Chelipeds very unequal; one carpal spine, followed behind by several denticles; larger palm widening distally, convex below, palmar finger much deflexed, fingers widely gaping, teeth small, unequal, not crowded; fingers of smaller chela very long, horizontal, narrowly gaping.

The larger chela of the adult female is similar to that figured for the medium-sized male in text-figure 44, cited above, except that the fingers are longer. Eggs about 1.7 mm. in diameter.

Occasionally in adults the tooth at the end of the postfrontal crest, either on one side or both, is lacking or is only indicated; this is the case in a large female from Bafwasende, September 25, 1909.

In most specimens 55 mm. in width and under, the tooth of the crest is altogether lacking. On the other hand, a few carapaces even as small as 13 mm. wide possess one or both small teeth. (See figure 3 of the type cited.)

The exorbital tooth varies in width. In a female from Stanleyville, August 21, 1909, the tooth is narrower than common, the outer margin being definitely though not deeply concave.

In some instances the cervical suture is traceable, though faintly, quite to the inner base of the lateral tooth.

In a set of one male and six females from Bafwabaka, December 31, 1909, the crest has a tendency to be more sinuous and rougher than usual; the terminal tooth is broader and sharper; and the edge behind it is more distinctly serrate. The anterolateral striations of the upper surface are more pronounced. This form I have designated as a variety.

In a lot of three males and five females from Nepoko River, one female has a well-marked V-shaped indentation near the outer end of the crest. This might be thought accidental, if it were not duplicated on the opposite end of the crest.

"In all the small watercourses (Pls. LXIII and LXIV) that meander between the low hills of the Rain Forest *Potamon* (*Potamonantes*) *dybowskii* is fairly common and this should be no surprise since in a single day's march thirty or more of these heavily shaded brooks may be crossed. Wherever the crystal-clear water bubbles and gurgles over a rock-strewn



bed one may expect to find this large and lively crab between and beneath the algæ-covered stones, though its discovery is rendered difficult by its protective coloration. The dark brown upper surface of the carapace is mottled with pale greenish yellow, which is still more abundant on the legs. Often the crabs appear to be a dirty, yellowish gray. The tips of the shears are purplish; the abdomen and adjoining parts are usually a dirty, yellowish white, sometimes with a few purple markings on the former.

"It is probably to be found in suitable sites in all the watercourses of the West African Rain Forest. Some of these crabs were infested with hydroid-like parasites." (H. L.)

**Potamon (Potamonautes) lirrangensis** Rathbun

Plates XXV, XXVI, Figure 3; Text Figure 8

*Potamon (Potamonautes) lirrangensis* RATHBUN, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VI, Pl. xiv [vi of Potamonidæ], fig. 8; 1905, (4) VII, p. 169.

*Localities*.—The different lots of *P. lirrangensis* taken at Stanleyville are as follows. August 14, 1909; 1 ♀; "above dark greenish blue, joints of big shears vermilion." August 14, 1909; 1 ♂; caught at the edge of the Congo River. 1 ♀ young; "above greenish blue." August 18, 1909; 1 ♂; "dark brownish blue, abdomen yellowish white." August 28, 1909; 4 ♀ ♀; "dark bluish brown above." August 1909; 1 ♀. September 3, 1909; 1 ♂. February 1915; 2 ♂ ♂, 12 ♀ ♀ (2 ovig.). April 1915; Nos. 832, 833, 834, 836, 839; 4 ♂ ♂, 19 ♀ ♀ (6 ovig.). April 1915; Nos. 835, 838, 840; 3 ♂ ♂, 14 ♀ ♀ (3 ovig.); from the Congo River. April 1915; No. 837; 1 ♂, 2 ♀ ♀ (1 ovig.); the male was regenerating the smaller cheliped.

*Range*.—This species was described from a single adult female of moderate size, taken at Liranga, French Congo, at the confluence of the Ubangi with the Congo. We have at hand from the present collection sixty-seven individuals, all from Stanleyville and vicinity, which is situated twice as far as Liranga from the mouth of the Congo, and near its union with the Tshopo River.

Balss<sup>1</sup> reports the species from Kituri, upper Lualaba (headwater of the Congo), Katanga region, which is in the southernmost part of the Belgian Congo.

*Measurements*.—Male (February 1915): length of carapace, 44.7; width of same, 62.6 mm. Female (No. 836): length of carapace, 45.6; width of same, 61 mm. The

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<sup>1</sup>1914, Zool. Jahrb., Syst., XXXVII, Heft 4, p. 404.

smallest specimen taken (August 18, 1909) is a male, 22.9 mm. long, 30 mm. wide. The eggs vary in diameter from 1.8 to 2 mm.

*Description*.—*P. lirrangensis* is of the same general type as *P. dybowskii*: the sutures in the center of the carapace are deep; the anterior portion of the mesogastric region is distinctly outlined; and the median groove crossing the postfrontal crest is equally as deep as in *dybowskii*. However, the cervical groove is ill defined after leaving the mesogastric region; the groove dividing the branchial region in two is not accented; the narrow part of the mesogastric region tapers to a point; the postfrontal crest is more transverse than in the foregoing species, its edge is more sinuous and outwardly more crenulate and does not form a tooth at the outer end. Behind the crest the lateral margin is rough with numerous sharply marked acorn-shaped denticulations which point forward and are consequently oblique to the margin. Outer orbital angle narrow, acutangular, outer margin denticulate; orbital margin subparallel to crest; a deep U-shaped notch under orbital angle; margin of frontal lobes rather regularly arched.

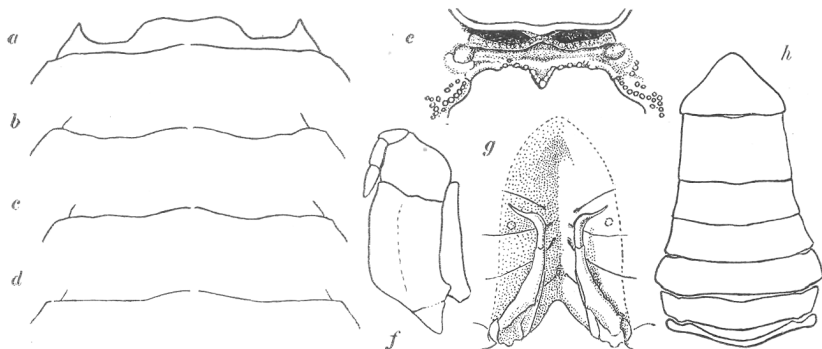


Fig. 8. *Potamon (Potamonauies) lirrangensis*, Stanleyville.

A, crest and anterior margin of carapace of female 56.6 mm. wide; b, crest of female 58.6 mm. wide; c, crest of female 54.3 mm. wide; d, crest of female 61 mm. wide (crests shown without crenulations); e, epistome of male 58.2 mm. wide; f, outer maxilliped of same; g, appendages of first abdominal segment, in sternal cavity, of same male; h, abdomen of same.

The median teeth of the anterior and the posterior margins of the epistome are triangular and longer in an axial direction than the corresponding teeth in *dybowskii*.

Mandibular palp two-jointed; terminal joint simple. Ischial furrow of outer maxillipeds easily visible though not deep; merus longer and narrower than in *dybowskii*, its antero-external margin less oblique.

Chelipeds of adult male very unequal; the sharp and more or less denticulated spine of the merus on the inner surface is just below the middle of the inner margin. Two sharp, good-sized spines on the inner margin of the carpus, the posterior spine smaller than the anterior. The palms increase but little in height distally; the fingers are longer than the middle of the palm in both chelæ, slightly deflexed, little gaping, gradually tapering, armed with irregular teeth, in general alternating large and small, the largest teeth of the immovable finger more distally placed than those of the dactylus; the fingers are dark colored, the color persisting in alcohol, the darkest shade being next the horny tips and followed usually by a lighter band than the main brown shade of the fingers.

The ambulatory legs are more slender than in *P. dybowskii*; the male abdomen is wider, its terminal segment is less narrowed in the distal half, the outer margins therefore less concave.

The larger chela of the female is much stouter and shorter than that of the male; this is an anomaly, as, in this family as well as in most other crabs, the major as well as the minor cheliped of the female is slenderer and feebler than the corresponding member of the male. The excessive development of the major claw in the female *lirrangensis* may indicate the need for a defensive weapon in an inhabitant of the main body of the Congo.

In some specimens, No. 833, the postfrontal crest curves well forward at the outer end, so that in the largest female, it reaches as far forward in that place as at the middle. In other individuals, the crest bends backward near the outer end, as in a female, No. 832. In still others, the crest is very sinuous, as in a female taken August 28, 1909.

"The favorite haunts of *Potamon* (*Potamonautes*) *lirrangensis* are in large rivers near their banks or wherever drifting logs and similar material is caught; also in shallow water where canoes are habitually fastened and where the natives dump their refuse. At Stanleyville they were common in such sites both above and below the falls. In the Tshopo River, at low water, they were fairly numerous among the rocks and boulder fields above the falls, but apparently were absent from the shallow water on the sandy flats below.

"The deep blue shade on the upper surface is especially bright in newly hardened carapaces, but later turns to a distinctly brown or even greenish tint. The lower side is pinkish blue with gray and the joints on the inner side of the big shears are vermilion." (H. L.)

***Potamon* (*Potamonautes*) *stanleyensis*, new species**

Plate XXVI, Figures 1 and 2; Text Figure 9

*Type locality*.—Stanleyville, from the small affluents of the Tshopo River; April 1915; No. 841; 11 ♂♂, 15 ♀♀, 91 young.

*Holotype*.—Male (Amer. Mus. Nat. Hist.).

*Locality*.—Upwards of 250 specimens of all ages were taken at Stanleyville as follows. August 21, 1909; 5 young; "carapace above, dark water-green; towards abdomen more grayish; limbs greenish gray above; abdomen whitish gray." April 1915; No. 833; 4 ♂♂, 2 ♀♀; from brooks. April 1915; No. 841; 11 ♂♂, 15 ♀♀, 91 young; from the small affluents of the Tshopo River. April 1915; No. 843; 1 ♀ with newly hatched crabs, 10 young. April 1915; Nos. 844, 847, 859, 890, 925, 928, 944; 4 ♂♂, 1 ♀, 51 young. April 1915; Nos. 845, 846; 1

♂, 6 young; from forest brook. April 1915; No. 932; 9 ♂♂, 5 ♀♀, 45 young; one very small specimen has a break in the postfrontal crest. May 1915; No. 945; 1 ♂ young. Bafwamoko; September 14, 1909; 1 ♀; found in the same brook as *P. dybowskii*.

*Measurements*.—Male holotype: length of carapace, 25.2; width of same, 34.7 mm. Largest male, No. 845: length of carapace, 28; width, 39.4 mm. Female, No. 841: length of carapace, 30; width, 40 mm.

*Diagnosis*.—Front not more than one-third as wide as carapace. Carapace cordiform, rather flat, little granulate below. A shallow, outer, suborbital sinus. Merus of outer maxillipeds nearly as long as broad.

*Description*.—A rather small species. The carapace is moderately convex from front to back and from side to side; the areoles of the middle are well marked; mesogastric region distinctly delimited; cervical suture stopping a little behind postfrontal crest. Crest most advanced at middle, where it is divided by a deep groove; slightly oblique on either side and nearly straight up to a small, shallow sinus, just within the outer angle which is devoid of a tooth; the edge is smooth to the naked eye, but very finely crenulate. The lateral margin behind the crest is also smooth to the naked eye, but the lens shows minute, distant denticles. The lateral margin in front of the crest is sinuous and discontinuous with the margin behind the crest.

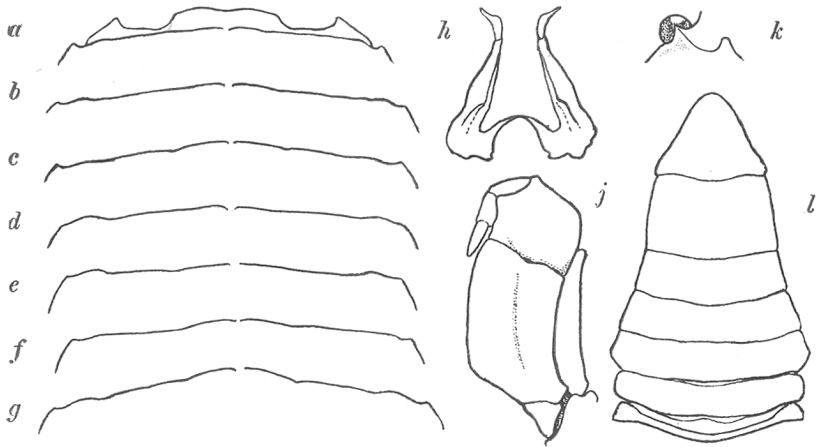


Fig. 9. *Potamon (Potamonautes) stanleyensis*.

A, crest and anterior margin of carapace of female 30.6 mm. wide, Bafwamoko; b, crest of carapace of male 31 mm. wide; c, crest of female about 36 mm. wide; d, crest of female 38 mm. wide; e, crest of female 39 mm. wide; f, crest of male holotype 34.7 mm. wide; g, crest of male 24.2 mm. wide; h, appendages of first abdominal segment of holotype; j, outer maxilliped of same; k, lateral and slightly ventral view of left orbit showing sinus below outer angle of same female as c; l, abdomen of holotype.

The edge of the front is bilobed, the lobes arcuate and forming an angle with the side margins of the front. The distance between the angles on the two sides is less than one-third the width of the carapace, while the posterior width of the front is just one-third the width of the carapace. The upper margin of the orbit slopes forward and outward and is sinuous. The outer orbital tooth is much less produced than the front; the notch below it is broad, and shallow; lower margin entire.

The mandible is two-jointed, the terminal joint simple. The groove on the ischium of the outer maxillipeds is deep and near the middle but not parallel to either margin; it stops short of either end of the segment; the merus is nearly as long as it is broad, the angle at which the anterior and the convex outer margins meet being itself rounded off.

The chelipeds of the adult male are unequal. The tooth on the inner surface of the merus, near the distal upper corner, is pyramidal, denticulated, and bluntly pointed. There are two conical, sharp spines on the inner margin of the carpus; the secondary one is much smaller and is followed by a few denticles. The larger palm is much swollen, its lower margin very convex; the smaller palm has similar features but less pronounced. Fingers long, deflexed, tips crossing, prehensile edges slightly gaping, their teeth irregular; in general, a few larger teeth alternate with two or three smaller ones, except at the proximal end where three or four teeth increase in size from the palmar end of the finger; the largest tooth is on the immovable finger.

Ambulatory legs of moderate length, rather slender; the merus of the second leg is three and two-fifths times as long as wide.

The sixth segment of the male abdomen is nearly as long as the seventh. The latter is subtriangular, broader than long, the margins only slightly sinuous and the tip rounded. The appendages of the first segment are strongly bent outward at the tip in the shape of a goose head.

This species is near *P. (Potamonautes) perlatus*,<sup>1</sup> but is flatter and more cordiform. It is also a much smaller species. The front is narrower; there is a sinus, though a shallow one, in the orbital margin below the outer angle; the lower surface of the carapace is smoother, having no bead granules on the suborbital and subbranchial regions; the merus of the outer maxillipeds is squarer, its length approaching its width; the ambulatory legs are narrower.

It is akin also to *P. (Potamonautes) anchietae*<sup>2</sup> from Portuguese West Africa, but differs from it (according to Capello's figure) in its smaller size, narrower front, more oblique and more uneven crest, and in not having a distinctly denticulated anterolateral margin.

In some cases there is a slight prominence in the postfrontal crest just before it reaches the outer sinus. Sometimes there is an arching forward in place of the sinus, or sometimes the existence of the sinus produces a little tooth at the outer angle at the junction of the crest and the lateral margin. On the other hand the crest may be almost straight.

The females run larger than the males. The fingers are less deflexed and usually more nearly meet.

The young in the mother's apron (No. 843) are very narrow, the carapace of one measuring 3 mm. long by 3 mm. wide. The front is longer than in larger specimens and is very slightly bent down. The

<sup>1</sup>1905, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VII, p. 163, Pl. xiv [vi of Potamonidae], fig. 4.

<sup>2</sup>Brito Capello, 1870, Jorn. Sci. Lisboa, III, p. 132, Pl. II, fig. 11.

carapace is strongly areolated and the crest relatively feeble and sinuous, divided into three scallops each side of the middle. Chelipeds equal and similar; ambulatory legs very slender.

In the smallest free-living specimen obtained (No. 928) the same characters exist but the carapace has already widened, being 4.3 mm. long by 4.7 wide. Three larger specimens (No. 928) are, respectively, 8 by 9.5 mm., 9 by 11.2 mm., and 12.4 by 15.2 mm.

The young, up to about 25 mm. wide, are covered with a very short, coarse, but not dense, pubescence. The epigastric portion of the post-frontal crest has often a tendency to separation from the protogastric portion, either by an emargination or by a broader depression of the crest itself. The crest is often more oblique than in the adult and shows more variation in individuals; it is also rougher or slightly more crenulate than in the adult. The lateral margins are minutely roughened or denticulate; those microscopic denticles which at older stages are imbedded in the smooth margin are, in the young, projecting, and visible with a low-power lens or even with the naked eye.

At about 25 mm. wide the crab changes color, from a very dark brownish green (in alcohol) to a much lighter, yellowish green (in alcohol).

"This medium-sized species is fairly common in the more shallow forest brooks (Pl. LXIV), a habitat which also attracts *P. (Potamonautes) dybowskii* and other forms. It, however, prefers places along the edge of the current, where dead branches and leaves, as well as overhanging green vegetation, create a semi-nocturnal environment even during hours of bright sunshine. At low water such sites are shared only with shrimps, smaller fishes, and a few water-snakes, while the larger forms of this fluvial fauna retreat into the deeper holes and washouts.

"The general tone of the carapace above is dark green, that of the abdomen gray, and the big shears and limbs greenish gray on the upper side. This crab is not very active when adult, perhaps trusting to its protective coloration and immobility, but the much paler young scamper into hiding readily and prefer the more stagnant and even miry places." (H. L.)

#### Subgenus **POTAMON**

Epigastric and postorbital crests not continuous; the former may be more or less in advance of the latter, or they may be in the same line and well developed, even having a sharp edge, but separated by a notch.

Lateral epibranchial spine distinct.

**Potamon (Potamon) ballayi** (A. Milne Edwards)

Plates XXVII, XXVIII, Figure 1; Text Figure 10

*Thelphusa ballayi* A. MILNE EDWARDS, 1886, Bull. Soc. Philom. Paris., (7) X, p. 149; 1887, Ann. Sci. Nat., (7) IV, Zool., p. 132, figs. 2 and 2a.*Potamon ballayi* DE MAN, 1898, Ann. Mus. Civ. Stor. Nat. Genova, (2) XIX, p. 436 [55].*Potamon (Potamonautes) ballayi* RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 284.*Potamon (Potamon) ballayi* RATHBUN, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VI, p. 294, text-fig. 27, Pl. XII [IV of Potamonidae], fig. 9.

*Locality*.—All the specimens from this expedition were taken in the neighborhood of Stanleyville as follows. August 28, 1909; 1 ♂, "dark brown above with a tinge of red, lighter near edge of carapace." April 1915: No. 833, 1 ♂, 1 ♀, "common in brooks"; No. 840, 10 ♂♂, 21 ♀♀; No. 841, 44 ♂♂ (1 with abnormal claw), 55 ♀♀ (2 with newly hatched young), from affluent of Tshopo River; No. 843, 10 ♂♂, 14 ♀♀ (1 with newly hatched young); No. 844, 1 ♂, 6 ♀♀, from forest brooks; No. 846, 5 ♂♂, 3 ♀♀, from forest brook; No. 932, 31 ♂♂, 29 ♀♀, 6 young; No. 934, 3 ♂♂, 7 ♀♀; No. 944, 4 ♂♂, 8 ♀♀, 2 young; No. 945, 4 ♂♂, 2 ♀♀; No. 946, 4 ♂♂, 6 ♀♀. Bottle 79, 4 ♂♂, 8 ♀♀ (1 ovig.), 1 young.

*Range*.—Previously taken in the French Congo at Ngancin<sup>1</sup> (type locality) and Gaboon.

*Measurements*.—Largest male (No. 846): length of carapace, 19.8; width 30 mm. Largest female (No. 932): length of carapace, 21.1; width 30 mm. Diameter of eggs (No. 841), 1.5 to 1.7 mm.

*Diagnosis*.—Carapace smooth, suboval. An epibranchial spine present. Postfrontal crest broadly, but not sharply, interrupted behind the outer angles of the front. No furrow on ischium of outer maxillipeds.

*Description*.—A small species. Carapace suboval, smooth, punctate; H-shaped depression in middle of carapace deep; cervical suture deep in the middle of its length; it stops anteriorly before reaching the postfrontal crest and posteriorly before reaching the inner branchial lobe. The anterolateral margin is an arcuate, granulate line interrupted by a small, sharp, forward-pointing spine at the postfrontal crest and by a very slight sinus in front of the spine; postlateral margin concave. The crest is in general oblique, its outer half margined and advanced at an angle directly behind the external tooth of the orbit; its inner half divided into an epigastric portion which is blunt and well marked, followed by a section in which the crest is almost obsolete; the median furrow is broad and deep and is continued backward for a little distance,

<sup>1</sup>The original description of *P. ballayi* states that this species "habite le ruisseau du poste Ngancin (Mission de Brazza, avril 1884)". In April 1884, Dr. Ballay, one of de Brazza's companions, was at Nganchu, a poste on the right bank of the River Congo, opposite Kwamouth, according to the account of 'French Explorations in the Ogowe-Congo Region' published in 1886, Proc. Roy. Geogr. Soc. London, N. S., VIII, pp. 770-778. Ngancin is therefore to all appearances a misspelling for Nganchu. This locality is spelled Nganchouno on the map of the French Congo published in 1884, Petermanns Mittheilungen, XXX, Pl. XII. On more recent maps it is often given as Ganschu. (H. L.).

forming the acuminate point of the mesogastric region. The front, measured at its lower angles, is one-third the width of the carapace, bilobed, its sides oblique. Upper margin of orbit oblique and sinuous, outer angle short, broad, and obtuse-angled, the orbit having a strong dorsal inclination; a very shallow outer emargination.

Mandibular palp three-jointed, last joint simple; exognath of outer maxilliped long and plumose. No furrow on ischium of endognath; outer margin of merus arcuate, forming a slight angle with anterior margin.

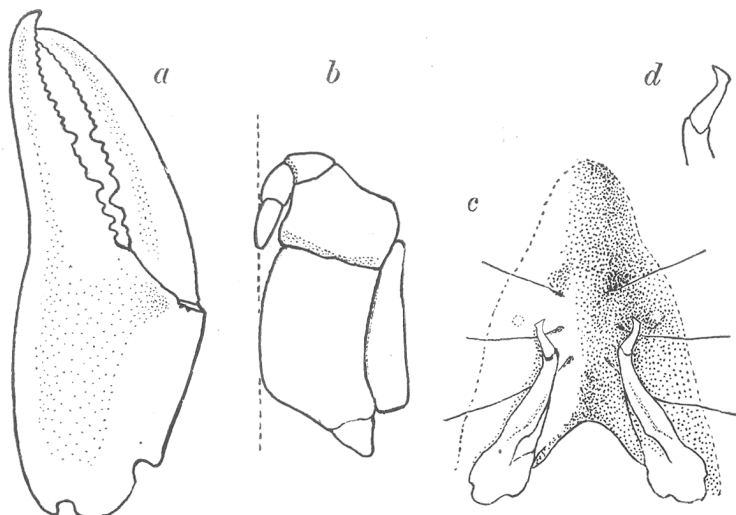


Fig. 10. *Potamon (Potamon) ballayi*, male, Stanleyville.

*a*, left, major chela of specimen 26.6 mm. wide; *b*, outer maxilliped of specimen 26 mm. wide; *c*, appendages of first abdominal segment, in sternal cavity, of same specimen; *d*, tip of one of these appendages, more enlarged.

Chelipeds very unequal; spine at distal, anterior corner of lower surface low, conical, granulated. Primary spine of carpus conical, acuminate; secondary spine very small, conical. Larger palm of male swollen; fingers elongate, deflexed; dactylus longer than middle length of palm; gape wide in old males; one, two, or three larger teeth on the basal half of each finger. Smaller chela of male much feebler than larger one; margins of palm subparallel; fingers almost horizontal, dactylus just as long as middle length of palm; fingers not gaping; teeth minute. The two chelipeds of the female are nearly of a size, but the major one shows a slightly swollen palm, and uneven prehensile teeth, with the gape scarcely more than in the minor chela.

Ambulatory legs of moderate size; a few spines towards the distal end of the dactyls are noticeably larger than the remainder.

The male abdomen is broad at base, subtriangular, the sixth and seventh segments having partially concave sides; the sixth segment is about half as long as its proximal width and about two-thirds as long as its distal width; seventh slightly longer than sixth segment.

The carapace of the newly hatched young (No. 843) is 3.2 mm. long by 3.5 mm. wide; the grooves of the carapace are deeper than in older



specimens; the front, between the eyes, is squarer and less deflexed and shows three deep longitudinal furrows, the median furrow and one on either side leading back from the lateral angle; the postorbital portion of the crest is not well marked, the outer angle of the orbit is not at all produced, and the epibranchial spine is very feeble.

The smallest specimen collected (No. 932), except those just from the egg, measures 4.5 mm. long and 5.5 wide. It has already taken on many adult characters; it is true that the front is long and little deflexed, but it lacks deep, longitudinal furrows; the postorbital portion of the crest is sharp-edged; the outer angle of the orbit is produced and the epibranchial spine well developed.

In some instances, an epibranchial spine is suppressed, as in female, No. 843 (left spine), or lacks a sharp tip, as in male, No. 843 (right spine).

In an old male, No. 841, carapace 19.7 by 28.9 mm., the epibranchial tooth has almost disappeared, remaining on both sides as a low, blunt tubercle; the postorbital part of the crest is almost blunt; the secondary spine of the carpus is reduced to a low tubercle on the larger cheliped and is obsolete on the smaller cheliped; the palm increases greatly in width toward the distal end, the fingers are widely gaping, the immovable finger much deflexed, all the prehensile teeth much worn and very short.

An old male, No. 843, a little smaller than the above, has similar epibranchial tubercles and blunt postorbital crests. The outer orbital angle is less advanced than usual, and there is no sinus below it.

In adult males, but not the oldest, the gape of the fingers is moderate and the enlarged basal teeth are larger than in more gaping fingers.

One male, No. 841, has the large chela abnormally developed; the fingers are strongly arched, the propodal finger curving abruptly down from the palm. When the fingers are widespread, the distance between their tips is 17 mm., between their middles 22 mm.

The figures given by A. Milne Edwards do not adequately represent the species. In reality, the epibranchial spine is very tiny and inconspicuous and the carapace bows out strongly behind it. The crest is not so sharply marked, so even, nor so regularly curved as in the figure. The outer angle of the orbit is not so pointed nor so produced as there represented. The figure does not show the secondary spine on the carpus of the chelipeds nor the prehensile teeth of the fingers.

"These crabs were common about Stanleyville in all the more shallow forest brooks (Pl. LXIV) and probably have a much wider distribution than our collecting would imply. It was only in that place that we

took crabs in greater numbers and specially dammed various brooks in native fashion, gathering below such barriers all specimens we could secure with small native nets. It is probable that they can live out of water and are only dependent on a certain amount of moisture. When disturbed they instantly cover themselves with mud or secure protection beneath any object." (H. L.)

Subgenus **GEOTHELPHUSA** Stimpson

*Geothelphusa* STIMPSON, 1858, Proc. Acad. Nat. Sci. Philadelphia, X, p. 100 [46].

Epigastric and postorbital crests either obsolete, or only partially developed; that is, the epigastric crests slightly developed, while the outer portion of the post-orbital crest may be very distinct, even sharp-edged, but separated by a considerable smooth space from the epigastric crest.

Lateral epibranchial spine either indistinct or obsolete.

**Potamon (Geothelphusa) congoënsis**, new species

Plates XXVIII, Figure 3, XXIX; Text Figure 11

*Type locality*.—Nepoko River, above Gamangui; February 1, 1910; 1 ♂.

*Holotype*.—Male (Amer. Mus. Nat. Hist.).

*Localities*.—French Congo: Libreville, Gaboon; February 1916; J. P. Chapin, collector; A4518; 4 ♂♂, 2 young. The remainder are from the Belgian Congo. Poko; 10 ♂♂, 17 ♀♀ (one with newly hatched young). Bafwabaka; December 31, 1909; 3 ♂♂, 1 ♀; "above a dark glossy purple, nearly black." Nepoko River, above Gamangui; February 1, 1910; 1 ♂ holotype. Near Bafwasende; September 28, 1909; 1 ♂; "above reddish brown, limbs grayish, abdomen bluish white." Affluent of the Tshopo River, near Stanleyville; No. 884; 1 ♀.

*Measurements*.—Male holotype: length of carapace, 29 mm.; width, 44 mm. Female (Poko): length of carapace, 23.3 mm.; width, 31.6 mm. Smallest specimen except those just from the egg, female (Libreville): length of carapace, 13.1 mm.; width, 17 mm.

*Diagnosis*.—Postfrontal crest almost transverse at outer end. Front bilobed. An outer orbital sinus present. Ischial furrow of outer maxillipeds shallow.

*Description of old male*.—Carapace suboval, smooth, covered with large punctæ visible to the naked eye; depressions in center of carapace deep, also the midbranchial groove and the short median groove which parts the crest; anterior mesogastric region tectiform. A pit on either side at the widest part of the mesogastric region; another pit on the protogastric region in a longitudinal line with the articulation of the eye-stalk. Epigastric lobes blunt, oblique, separated by a smooth area from a short, feeble, crenulated crest which begins behind the cornea (when the eye is flat in the orbit) and is continued almost transversely to the lateral margin. In front of it and behind the outer orbital angle, there is a rounded seal-like pit. Edge of front dis-

tinctly bilobed, sides oblique, forming an angle with the anterior edge. Upper margin of orbit sloping backward and outward a little, sinuous; outer angle of orbit obtuse, little prominent, the outer sinus is broad, shallow and rounded at bottom; lower edge transverse, regularly tuberculate or crenulate. Anterolateral border of carapace lightly margined, coarsely punctate; the portion in front of the crest is curved downward; posterolateral border with a deep concavity.

Palp of mandible two-jointed; terminal joint simple. A shallow furrow on the ischium of the outer maxilliped, a little nearer the inner than the outer margin; outer margin of merus arcuate, forming a slight angle with the anterior margin; exognath bearing a long, plumose palp.

Chelipeds very unequal; superodistal prominence on inferior surface of merus low, surmounted by a bead tubercle, with two or three tubercles clustered around it; primary spine of carpus short, conical, acute; secondary spine very small, broad, and situated at the end of a denticulate ridge. Larger propodus one and one-half times as long, through the middle, as its distal or greatest height; lower margin convex; propodal finger curved, deflexed; fingers armed with small irregular teeth, and widely gaping. The fingers of the smaller chela almost meet when closed.

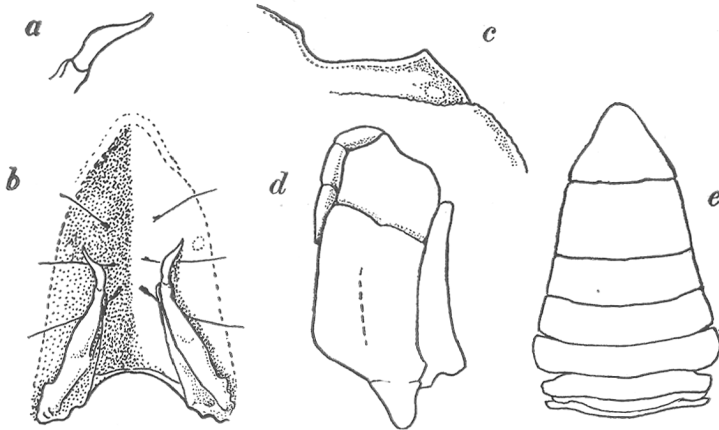


Fig. 11. *Potamon (Geothelphusa) congoënsis*, male.

A, tip of appendage of first abdominal segment of specimen 40.2 mm. wide from Bafwabaka; b, appendages of same segment, in sternal cavity; c, anterolateral portion of carapace showing extent of postorbital crest, of Bafwasende specimen 36 mm. wide; d, outer maxilliped of same specimen as a and b; e, abdomen of same.

The spines of the dactyli of the ambulatory legs increase in size toward the tip of the segment.

The transverse groove on the sternum which connects the two maxillipeds is very deep; behind it, on either side, a short, deep groove runs inward just in front of the cheliped.<sup>3</sup>

Abdomen narrow-triangular; sides of fifth and sixth segments feebly or partially concave; sides of terminal segment more deeply concave. The extremity of the appendages of the first segment curves outward and is produced in a slender tip.

*Newly hatched specimens.*—Carapace, 2.7 mm. long, 2.9 mm. wide. Lateral margin (from the anterolateral to the posterolateral angle) gently convex; antero-

lateral angle not advanced; crest wanting; front long, little deflexed, its sides subparallel, a deep median furrow throughout its length, back to the mesogastric region, which is completely delimited.

The short, sharp, outer crest may be lacking altogether (one male from Bafwabaka) or, as more often happens, may be continued inward as far as a point behind the articulation of the eyestalk (male from Bafwasende). In specimens of medium size, the crest is more oblique or directed more backward and outward than in the old. Occasionally the crest is a little scalloped. In some specimens the intermediate portion of the mesogastric region is more definitely limited (female from Bafwabaka). The protogastric pits may be very slightly impressed. In carapaces of 35 mm. in width and less the anterolateral margin is sharply margined and denticulate in inverse proportion to the size. The outer sinus of the orbit may be more distinctly V-shaped than in the old, but even then, it is a little rounded at the base. In smaller specimens the ischial furrow of the maxilliped is deeper. In many adult, but not full-grown, individuals the deep, oblique furrows of the sternum are continued quite to the abdominal cavity. In male specimens of medium size and age (carapace up to 36 mm. wide), the major cheliped is not strikingly larger than the minor one, and the gape of its fingers is moderate.

This species is related to the East African species *emini*,<sup>1</sup> of which I have no specimens at hand for comparison. *Emini* was never figured by Hilgendorf, its author, and I am doubtful whether the Selti specimen which I tentatively referred to this species in 1904 and 1905 is really conspecific with the types.

*P. emini* is a much smaller species than *congoënsis*; its postorbital crest is short and directed forward at the outer end; the lower edge of the front is nearly straight; the furrow on the ischium of the outer maxilliped is deeper.

*P. congoënsis* is also very close to *P. (P.) didieri*,<sup>2</sup> although placed in a different subgenus. When specimens of similar size are compared, the carapace is wider in *congoënsis* in relation to its length, but is more constricted posteriorly. The epigastric lobes are more oblique and are separated from the intermediate part of the crest by a wider interval; the intermediate part of the crest is less sharply marked; the outer part is straighter, less sinuous. The sides of the front are much more convergent and, in consequence, its lower edge is much narrower than in

<sup>1</sup>*Telphusa emini* Hilgendorf, 1892, Sitzungsber. Ges. Naturf. Freunde Berlin, p. 11. *Potamon (Geothelphusa) emini* Rathbun, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VI, Pl. xviii [x of Potamonidæ], fig. 9; 1905, (4) VII, p. 209, text-fig. 49.

<sup>2</sup>*Potamon (Potamonautes) didieri* Rathbun, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VI, Pl. xiv [vi of Potamonidæ], fig. 9; 1905, (4) VII, p. 170.

*didieri*. The anterolateral regions are considerably smoother than in *didieri*. The anterolateral margin of the merus of the outer maxilliped is more angular; in *didieri* that margin is a single curve to the insertion of the palpus. The exognath is shorter, not reaching beyond middle of merus.

"The nearly black upper surface of the carapace shows a distinct purplish hue which is much paler on the big shears. The limbs are mottled with dirty yellow; the eye-stalks have an orange tint. Most of the under side is pale grayish yellow, somewhat stronger than that on the abdomen and lower side of the legs. About the mouth-parts the color is a grayish blue. At Poko specimens of *Potamon (Geothelphusa) congoënsis* were caught in small native fish-traps baited with decomposed manioc to attract the small silurids in one of the heavily forested affluents (Pl. LXIV) of the Bomokandi River." (H. L.)

***Potamon (Geothelphusa) perparvus*, new species**

Plates XXVIII, Figure 2, XXX; Text Figure 12

*Type locality*.—Stanleyville; August 12, 1909; 2 ♂♂.

*Holotype*.—Male (Amer. Mus. Nat. Hist.).

*Localities*.—This species was taken only at Stanleyville and vicinity. The different lots were distributed as follows. August 21, 1909; 2 ♂♂ (1 is holotype); "dark brown, lighter toward abdomen, with tinge of red; shears a tinge of purple; abdomen whitish gray." From affluent of Tshopo River; April 1915; No. 841; 2 ♂♂, 1 ♀ young. From forest brooks; April 1915; No. 844, 1 ♂, 1 ♀; No. 847, 3 ♂♂, 1 ♀. April 1915; No. 932, 1 ♀ immature; No. 944, 3 ♀♀. May 1915; No. 945; 1 ♂.

*Measurements*.—Male holotype: length of carapace, 13.6; width of same, 19.6; fronto-orbital width, 13.7 mm. Largest female, No. 944: length of carapace, 12.4; width of same, 17.2; fronto-orbital width, 12.6 mm.

*Diagnosis*.—Postfrontal crest curved forward at outer end. Edge of front with a small median lobe. Maximum width of carapace about 2 cm. No outer orbital sinus. Ischial furrow of outer maxillipeds deep.

*Description of type male*.—Although the specimens are all small, the larger ones appear to be full grown. The carapace is very convex, the anterior portion inclined strongly downward, the lateral portions inclined moderately. Surface rather densely punctate; furrows deep on posterior half, the cardiac region wholly delimited; the furrow crossing the branchial region at its middle is noticeable, as is also one just in front of its posterior margin. Epigastric lobes low and smooth; a short carinated crest is situated behind the outer half of the orbit; it is nearly parallel to the orbital margin, is lightly sinuous and reaches the lateral margin of the carapace.

The margin of the front (between the eyes) is not visible in a strictly dorsal view, but, when the carapace is tipped back a little, it is seen to be sinuous, or trilobed,

there being a small median lobule; viewed from in front, the edge is nearly transverse; it meets the slightly oblique lateral edges with a rounded angle. Upper margin of orbit sinuous and directed forward and outward to the outer angle, which is obtuse and not at all prominent. The lateral border of the carapace is margined as far back as the widest part of the carapace, where it fades out gradually; that part of the margin lying in front of the crest curves strongly downward.

There is no sinus in the outer margin of the orbit. The lower surface of the carapace is almost smooth (devoid of granulation). The efferent branchial openings are large in proportion to the size of the crab and are transversely oblong. The mandible has a two-jointed palp, the last joint simple. The ischium of the outer maxillipeds is deeply furrowed, the furrow being approximately at the middle of the segment but a trifle nearer the inner edge; the merus is distinctly wider than long, outer margin very arcuate, anterior margin, outside the articulation of the palp, almost transverse. The palp of the exognath is of good length.

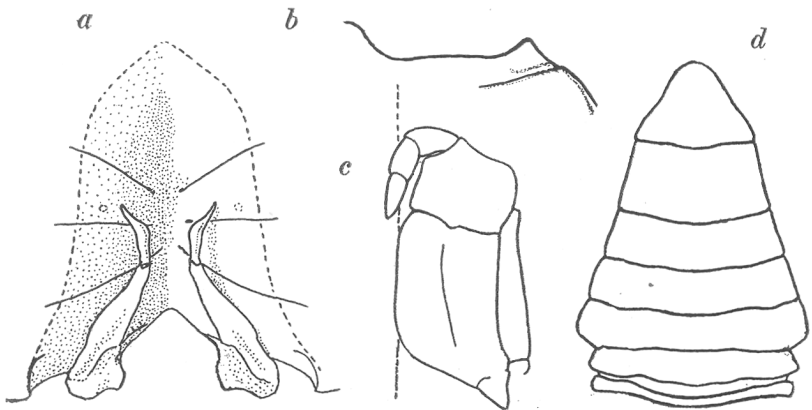


Fig. 12. *Potamon (Geothelphusa) perparvus*, male, 18.3 wide, Tshopo River.

A, appendages of first abdominal segment, in sternal cavity; b, anterolateral portion of carapace showing extent of postorbital crest; c, outer maxilliped; d, abdomen.

Chelipeds very unequal; protuberance at upper distal angle of lower surface stout, conical, tuberculate; two conical spines on the carpus, the secondary one much the smaller; larger palm much swollen, fingers moderately gaping, their fine, triangular, prehensile teeth interspersed with three or four larger ones. The smaller palm is inflated laterally but scarcely in a vertical direction, and the fingers have a very narrow interspace.

The anterior sternum has two deep, hairy grooves, one between the maxillipeds, the other a broken line which nearly touches the tip of the abdominal cavity.

The male abdomen tapers regularly from the third to the sixth segment inclusive, but the triangular seventh segment is a little wider at its base than the adjacent part of the sixth segment. The appendage of the first segment is similar to that of *P. (G.) congoënsis*.

This species is the counterpart in West Central Africa of *P. (G.) emini* (see page 424) of East Central Africa. It resembles *emini* in its

small size and in many other characters; the principal difference is that the fronto-orbital distance is greater than in *emini*, more than two-thirds of the width of the carapace instead of just two-thirds, and that the lateral margins are much less bowed outward. The regions of the carapace are more strongly defined than in *emini*.

*P. (G.) perparvus* is also related to *P. (G.) congoënsis*, but is more convex and of smaller size; the upper median point of the epistome is produced in the edge of the front so as to form a median lobe in the latter, a lobe which does not exist in *congoënsis*; the postfrontal crest curves forward at its outer end almost parallel with the orbital margin, while in *congoënsis* the crest is transverse or inclines a little backward at that point. *P. perparvus* has no outer orbital sinus, *congoënsis* has one; the former has a deep furrow on the ischiognath, the latter a shallow one; the groove bordering the distal end of the male abdominal cavity is pointed in *perparvus*, arcuate in *congoënsis*.

The chelipeds of the adult female are very small, subequal, and partake more of the character of the minor cheliped of the adult male. The same is true in general of immature individuals of both sexes. However, a male only 14.9 mm. wide, No. 847, shows a decided inequality in chelipeds.

The anterolateral margin of the carapace of all but the largest specimens is sharper and more denticulate than in the type and shows a definite posterior termination on the dorsal surface.

The efferent branchial openings vary from transversely oblong to oval (female, No. 844).

"Taken from a forest brooklet, the first left affluent below the falls of the Tshopo River near Stanleyville (Pl. LXIII). The shallow bed was only a few feet across at most and the running water hardly as many inches wide. The whole was practically covered by abundant vegetable débris with only a few blotches of white sand between and here and there little stagnant pools. These environmental conditions would rather encourage partially land-living habits. The smooth, roundish, unarmed carapace of this tiny crab should facilitate getting about among moist leaves. The dark brown color of the upper surface has a tinge of red and is lighter toward the abdomen. The big shears are purplish and the abdomen is whitish gray." (H. L.)

#### Subgenus **ACANTHOTHELPHUSA** Ortmann

*Acanthothelphusa* ORTMANN, 1897, Zool. Jahrb., Syst., X, pp. 299, 300.

Anterolateral borders of carapace strongly laciniate or spinose. Upper border of merus of chelipeds without a subterminal spine. The crest may be unbroken as in *Potamonautes* or interrupted as in subgenus *Potamon*.

**Potamon (Acanthothelphusa) faradjensis**, new species

Plate XXXI; Text Figure 13

*Type locality*.—Faradje, Belgian Congo; December 1912; No. 516; 1 ♂.

*Holotype*.—Male (Amer. Mus. Nat. Hist.).

*Localities*.—Faradje: December 1912, No. 516, 1 ♂ holotype; No. 518, 1 ♀ mature; from Dungu River, 1 ♀ immature, "color above nearly black." Faradje; March 7, 1912; 1 ♂, 1 ♀. Vankerkhoven-ville; April 1912; No. 414, 1 ♂.

*Measurements*.—Male holotype: length of carapace, 52; width of same, inclusive of spines, 74 mm. Female, Faradje, No. 518: length of carapace, 49; width of same, inclusive of spines, 68.5 mm.

*Diagnosis*.—Lateral border with two large spines and many spinules. Exorbital spine acute. Secondary spine of carpus well developed.

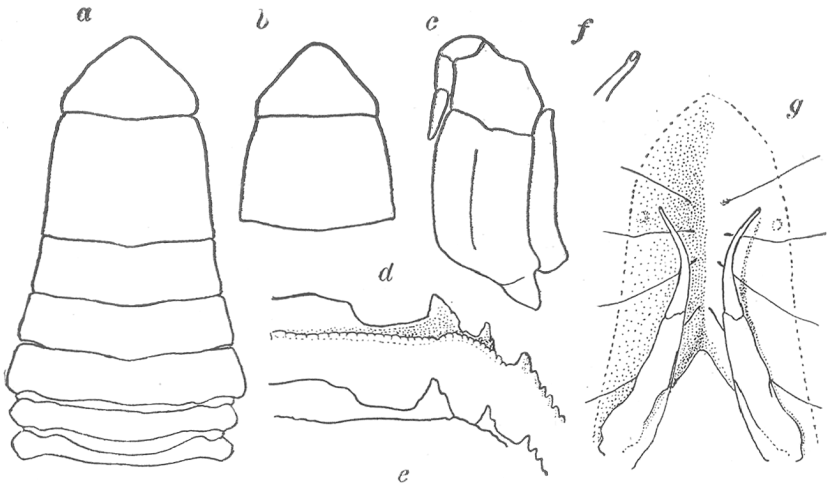


Fig. 13. *Potamon (Acanthothelphusa) faradjensis*, Faradje.

a, abdomen of male holotype, carapace 74 mm. wide; b, last two segments of abdomen of a male 49 mm. wide; c, outer maxilliped of holotype; d, right, anterior portion of carapace of female 68.5 mm. wide; e, right, anterior portion of carapace of holotype; f, tip of appendage of first abdominal segment of same; g, appendages of first abdominal segment of same.

*Description*.—Carapace rough with crowded, blister-like granules, which are largest on the anterolateral regions, least prominent on the mesogastric region. Central part of carapace areolated; groove separating mesogastric from branchio-cardiac regions deep; urogastric lobes and cardiac regions strongly marked; an areole occupying the inner angle of the branchial region and extending into the protogastric region is limited by shallow grooves and small pits. Anterior part of cervical suture faint, but may be seen crossing the postfrontal crest behind the outer half of the exorbital tooth. Anterior end of mesogastric region well marked; from it a deep groove makes a V-shaped sinus in the postfrontal crest. Intestinal region depressed.



Postfrontal crest transverse, edge crenulate, projecting forward, the surface in front of it being on a much lower level; toward the outer ends it curves backward, at the same time becoming more uneven, until it joins the lateral margin. At the point of union there is a slender spine or tooth; this is followed by seven or eight small, irregular serrations. The front, between the eyes, is, in its greatest width, one-third the width of the carapace; on either half there is a cluster of raised granules; the edge is bilobed, its outer angles are obliquely truncated, and the sides are oblique and elevated. Upper margin of orbit transverse, outer tooth almost an equilateral triangle, its outer edge slightly convex. Between the outer orbital tooth and the tooth at the end of the crest, and separated from each by a broad U-shaped sinus, there is a sharp-pointed, conical, forward-pointing tooth. The outer orbital sinus is V-shaped; the lower margin of the orbit is crenulated and more advanced than the upper margin.

Middle lobe of epistome very prominent. Mandibular palp three-jointed; terminal joint simple but expanded at the base, showing a tendency toward the bilobed form. Furrow on ischium of outer maxillipeds well marked and nearer the inner than the outer margin; the antero-external margin of the merus is angled.

Chelipeds of fully developed male very unequal; a slender spine at the distal end of the inner surface of the merus; and, along the upper edge of this surface, two rows of tubercles or blunt spines. The larger spine at the inner angle of the carpus is long and strong; the secondary spine is equally sharp but much smaller. Surface of palms reticulated and punctate; upper and lower margins convex; fingers long, slightly deflexed, grooved, tips dark brown and crossing when closed; in the larger chela, each finger has two large teeth, which are situated at the base of the dactylus and near the base of the immovable finger in such a way that the opposing teeth meet and form a small gape at the base, cut off from the long gape farther on; in the smaller chela the teeth are all very small and the fingers almost meet when shut.

Ambulatory legs of moderate length; upper margin of merus joints hairy, also upper margin of carpus and both margins of propodus of last pair. Dactylus of last pair much shorter and proportionally much wider than of the second and third pairs; in addition to the four customary rows of marginal spinules, there is on the upper surface near the tip a larger recurved spine similar to the terminal one, giving the tip in sidewise view a bispinose appearance. A stridulating apparatus is present on the coxæ of the first and second legs and on the corresponding branchiostegal edge of the carapace.

Length of sixth segment of male abdomen a little less than distal width, length of seventh segment about three-fifths of its width.

Closely related to *P. (A.) chaperi* (A. Milne Edwards)<sup>1</sup> from Guinea; in that species, however, the carapace is wider (compare measurements of females) and less deeply areolated, the front less advanced, the orbits less deeply cut so that the outer orbital tooth is much broader than long, and the secondary spine of the carpus of the chelipeds is lacking.

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<sup>1</sup>*Parathelphusa chaperi* A. Milne Edwards, 1887, Ann. Sci. Nat., Zool., (7) IV, p. 144, Pl. VIII, fig. 4; Assinie. *P. (Parathelphusa) chaperi* RATHBUN, 1905, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VII, p. 262, Pl. XIV [XII of Potamonidæ], fig. 6.

In the two small males, the lateral margins of the terminal segment of the abdomen are more sinuous than in the type and the abdomen is slightly constricted at the distal end of the sixth segment.

The large female (No. 518) is proportionally narrower than the type male and the upper margin of the orbit slants forward and outward instead of being transverse. The orbit is more or less oblique in all the other specimens also. The front varies a little in the sharpness of the angles.

"These handsome, well-modeled crabs are probably the largest among the river crabs of the interior. Their favored haunts are the quiet, stony portions near rapids in larger rivers of the Uele District. Such sites are also the refuges of many large, carnivorous fishes and often of crocodiles, the young of which habitually feed on crabs. These are among the liveliest of river crabs, quick in defense, and rapid in escape. A rather turbulent environment and the many hazards of such a habitat undoubtedly foster these qualities.

"The nearly black color of these crabs helps render them invisible and the flatness of the carapace facilitates an easy retreat between or beneath stones. Even the rather tough, granular carapace with strong lateral spines must often secure them immunity from many enemies." (H. L.)

**Potamon (*Acanthothelphusa*) *langi*,<sup>1</sup> new species**

Plate XXXII; Text Figure 14

*Type locality*.—Congo River, at Stanleyville; April 1915; No. 838; 3 ♂♂, 5 ♀♀ (3 ovigerous).

*Holotype*.—Male (Amer. Mus. Nat. Hist.).

*Localities*.—Leopoldville: August 11, 1909; 1 ♀; "greenish brown above; caught near the shore." The following are all from Stanleyville. August 8, 1909; 1 ♀; "caught on the shore; above dark brownish green." August 14, 1909; 1 ♀; "above dark greenish brown, below gray-yellow." August 15, 1909; 4 ♀♀; "above brownish with a tinge of yellow; common under logs in the water." August 17, 1909; 1 ♀. August 18, 1909; 1 ♂; "brownish above, below brownish gray." August 20, 1909; 1 ♀ ovig.; "above dark greenish brown, abdomen whitish gray and brown." August 21, 1909; 1 ♀. August 28, 1909; 2 ♀♀, "dark brownish green"; 1 ♀ ovig., "dark greenish gray." February 1915; 1 ♂, 13 ♀♀ (8 ovig.). April 1915: No. 832, from Congo River, 1 ♂, 10 ♀♀ (4 ovig.);

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<sup>1</sup>Named in honor of Mr. Herbert Lang, leader of the Congo Expedition.

No. 833, 3 ♀ ♀ (2 ovig.); No. 834, from Congo River, 3 ♂ ♂, 8 ♀ ♀ (5 ovig.), 1 young; No. 835, from Congo River, 7 ♂ ♂, 21 ♀ ♀ (6 ovig.); No. 836, from Congo River, 2 ♂ ♂, 11 ♀ ♀ (5 ovig.); No. 837, from Congo River, 3 ♂ ♂, 16 ♀ ♀ (8 ovig.), 3 young; No. 838, 3 ♂ ♂, 5 ♀ ♀ (3 ovig.), 1 ♂ is holotype; No. 839, 2 ♀ ♀ ovig; No. 840; 2 ♀ ♀ ovig.

*Measurements*.—Male holotype: length of carapace, 35.4; width of same, exclusive of spines, 46; width inclusive of spines, 49 mm.

*Diagnosis*.—Four strong lateral spines. Epigastric and protogastric crests continuous. Anterior mesogastric region feebly outlined. Front between eyes one-third as wide as carapace.

*Description*.—Surface of carapace rather uniformly covered with fine, depressed, confluent granules, and irregularly spaced punctæ; fine, inconspicuous striæ near the lateral borders. Depressions in center of carapace deep; outer part of cervical suture obsolete except for a large depression in which there is a short thumb-nail imprint. Epigastric and protogastric portions of postfrontal crest continuous, strong except near outer ends; crest granulate, divided on median line by a short deep groove; the two halves oblique and nearly straight. Front, measured on anterior or lower end, about one-third as wide as greatest width of carapace; edge obscurely bilobed, outer corners rounded. Outer orbital tooth acute; outer margin sinuous, subentire, and very finely serrulate. Four strong lateral spines, the anterior of which is at the end of the postfrontal crest.

Mandibular palp two-jointed; terminal segment simple. Merus of outer maxilliped definitely broader than long, antero-external border arcuate; ischial furrow obsolete.

Chelipeds of well-developed male very unequal; a sharp spine just below the anterior margin of the merus and midway of its length; two long sharp spines on the inner margin of the carpus, the secondary spine of important size; larger palm increasing in height distally, fingers long, slender, and widely gaping, teeth very irregular; palm of smaller cheliped increasing in width but little toward the distal end, fingers long, very slender, and almost meeting.

Ambulatory legs elongate, merus joints not dilated.

Related to *P. (A.) niloticus* (Milne Edwards), in which lateral spines are smaller and more numerous on the carapace, spinules are present on the outer slope of the orbital tooth, the narrow part of the mesogastric region is deeply defined, the cervical groove is continued to the postfrontal crest, the spine on the merus of the chelipeds is stouter and less clear cut, the secondary spine of the carpus is smaller, and the abdomen of male wider.

In specimens of small and medium size the outer extremities of the postfrontal crest may be interrupted or disappear altogether. The lateral spines vary in number from three to six, although four is the normal number, and may be different on opposite sides of the same individual.

"A strictly fluviatile crab that prefers the quieter stretches where floating material accumulates and sunken logs offer suitable protection. It is quick in hiding and when pursued dives even into the mud. Apparently it is fond of putrid or baked manioc for many of the specimens were caught in native fish-traps baited with this substance and laid in the deeper, miry places where small silurids and certain mormyrids were habitually taken.

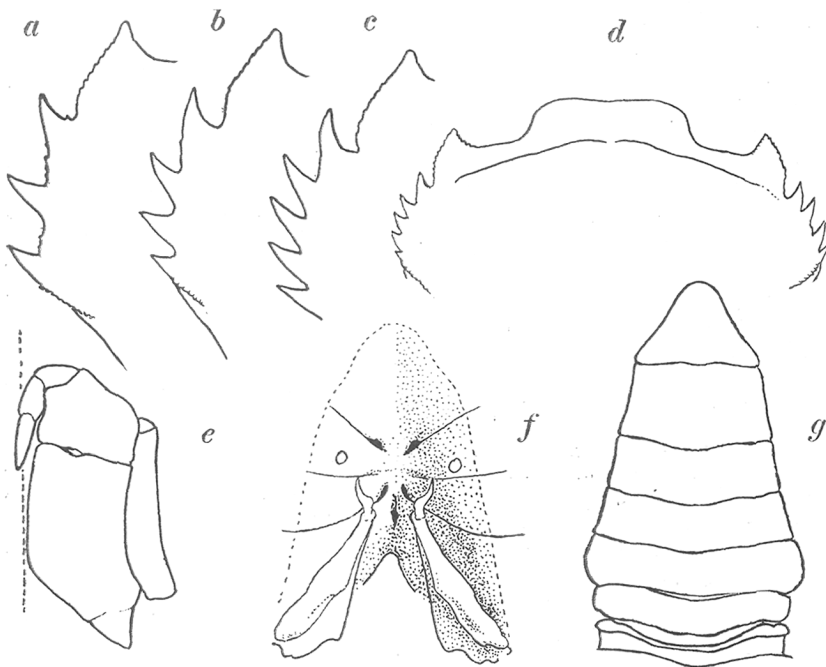


Fig. 14. *Potamon (Acanthothelphusa) langi*, Stanleyville.

A, three-spined anterolateral margin of carapace of female 41 mm. wide; b, four-spined anterolateral margin of carapace of female 40 mm. wide; c, five-spined anterolateral margin of carapace of male 42.8 mm. wide; d, anterior part of carapace of young male 20 mm. wide, showing disappearance of crest near lateral margin; e, outer maxilliped of male 48 mm. wide; f, appendages of first abdominal segment, in sternal cavity, of same specimen; g, abdomen of same.

"The color is undoubtedly protective; the upper side is dark brownish green, of a tone, however, that makes it difficult to state whether brown or green predominates; in some it appears even yellowish. The differences in shade may depend partly on the environment and partly on the degree to which the carapace has been hardened; those newly shed are much lighter, but none of these have been preserved." (H. L.)

**ERIMETOPUS Rathbun**

*Erimetopus* RATHBUN, 1894, Proc. U. S. Nat. Mus., XVII, p. 26; 1905, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VII, p. 270. ORTMANN, 1903, Proc. Amer. Philos. Soc., XLI, p. 300.

Fronto-orbital width small; front narrow, much advanced. Orbits small; eyes still smaller, cylindrical, the cornea not covering the end of the stalk.

Epistome short (fore and aft); antennular cavities correspondingly large. Mandibular palp composed of two distinct joints, terminal joint simple.

Outer maxillipeds as in *Potamon*; no ischial furrow.

Merus joints of chelipeds and legs armed with a subterminal spine; wrist with two strong inner spines and a row of smaller spines on anterior border. Carpus and propodus of ambulatory legs armed with spines on anterior margin and propodus of last pair with spines on posterior margin.

Eggs small and numerous.

***Erimetopus brazzæ* (A. Milne Edwards)**

Plate XXXIII; Text Figure 15

*Thelphusa brazzæ* A. MILNE EDWARDS, 1886, Bull. Soc. Philom. Paris, (7) X, p. 148.

*Parathelphusa brazzæ* A. MILNE EDWARDS, 1887, Ann. Sci. Nat., Zool., (7) IV, p. 142, Pl. VII, fig. 6. DE MAN, 1898, Ann. Mus. Civ. Stor. Nat. Genova, (2) XIX, p. 438 [57].

*Erimetopus spinosus* RATHBUN, 1894, Proc. U. S. Nat. Mus., XVII, p. 26.

*Potamon (Acanthothelphusa) brazzæ* ORTMANN, 1897, Zool. Jahrb., Syst., X, p. 300.

*Erimetopus brazzæ* RATHBUN, 1905, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VII, p. 270, text-fig. 73, Pl. XXI [XIX of Potamonidæ], fig. 8.

*Locality*.—Leopoldville; July 11, 1909; 1 ovig. ♀; "grayish brown; caught on the shore under a piece of tin."

*Range*.—Previously taken at Gaboon and Ngancin, French Congo, and at Stanley Pool, on whose shores is Leopoldville. The male is not known.

*Measurements*.—Female from Leopoldville: length of carapace, 20.2; width of same, 26; fronto-orbital width, 15.2; diameter of eggs, 1.5 mm.

*Description*.—Carapace narrow, almost horizontal from side to side, anterior third inclined downward. Anterolateral margins very oblique, posterolateral little converging. Cardiac and posterior part of mesogastric region defined; a shallow median groove marks the narrow portion of the mesogastric region; the lateral portion of the cervical groove is indicated by a roundish depression at the widest part of the carapace.

Epigastric lobes smooth, low; in large specimens no other part of the crest is developed; in small specimens there is an indistinct arcuate ridge, crenulate or granulate, beginning behind the orbital tooth and continued toward the largest epibranchial spine.

Front narrow, inclined, prominent, far advanced beyond the antennular cavities, deeply bilobed, sinus V-shaped, sides very oblique, margin crenulate.

Orbits small, almost semicircular in dorsal view, upper margin granulate or denticulate, outer angle a strong inward-pointing spine, which is followed by a number

(four to eight or even more) of smaller irregular spines on the margin of the hepatic region. Farther back and higher up there is a strong epibranchial spine, sometimes bifid, followed by from three to five smaller spines, all of which are strongly upturned. The lateral marginal line ends midway of the length of the carapace. Orbit nearly horizontal in front view, lower margin crenulate or granulate, without tooth at inner angle. The eyestalks taper a little to the end:



Fig. 15. *Erismetopus brazzae*, female 35 mm. wide, U. S. N. M. No. 18066. Outer maxilliped.

Under surface of carapace nearly smooth. Merus of maxilliped much broader than long, antero-external angle rounded.

Chelipeds of female similar, not very unequal. Lower surface of arm bordered on three sides by tubercles and spinules; upper margin also spinulose, with a subterminal spine. Palms unarmed; fingers elongate, narrowly gaping.

Ambulatory legs of moderate length, rather broad, the merus joints have a subterminal and a terminal spine. The propodal joints have two terminal spines below, while those of the last pair have spines also along the posterior margin. Spines of dactylus strong and directed away from the segment. All the spines of carapace and legs have corneous tips.

Abdomen of female very large.

#### Deckeniinae

*Deckeniinae* ORTMANN, 1897, Zool. Jahrb., Syst., X, pp. 297 and 314; 1903, Proc. Amer. Philos. Soc., XLI, p. 305.

Differs from the other Potamonidae and approaches the subtribe Oxystomata in the disposition of the efferent branchial channels, which are prolonged to the frontal border and open between the antennular cavities and the orbits. The antennae are lodged entirely at the inner end of the orbital cavity. Antennulae longitudinal. Merus of outer maxillipeds allied to that of the Pseudothelphusinae, the anterolateral margin broadly rounded, the palpus articulated just inside the apex.

Mandibular palp composed of two distinct segments; terminal joint simple in *Deckenia imitatrix* and *D. mitis*, but distinctly bilobed in *D. alluaudi*.

#### DECKENIA Hilgendorf

*Deckenia* HILGENDORF, 1868, Sitzungsber. Ges. Naturf. Freunde Berlin, p. 2; 1869, in von der Decken, Reisen in Ost-Afrika, Zool., III, p. 77; 1898, Deutsch-Ost-Afrika, IV, Lief. IX, Dekap., p. 23. RATHBUN, 1906, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VIII, p. 69, and references to literature.

Carapace cordiform, very convex from front to back. One epibranchial tooth present. Anterolateral border sharp. Front narrow, triangular. None of the abdominal segments fused.

#### *Deckenia mitis* Hilgendorf

Plate XXXIV; Text Figure 16

*Deckenia mitis* HILGENDORF, 1898, Deutsch-Ost-Afrika, IV, Lief. IX, Dekap., p. 24, fig. 8. ORTMANN, 1903, Proc. Amer. Philos. Soc., XLI, p. 306. RATHBUN, 1906, Nouv. Arch. Mus. Hist. Nat., Paris, (4) VIII, p. 71, text-fig. 123, Pl. XXI [XIX of Potamonidae], fig. 7.

*Locality*.—River near Comarock, Athi Plains, British East Africa; 1906 (H. Lang, collector); 2 ♂♂, 1 ♀. Small and immature specimens in bad condition, having dried out. "Common beneath stones and accumulated dead vegetation in a small brook."

*Range*.—British East Africa: Mombasa. German East Africa: Tanga; Daressalaam; Wembere Steppe.

*Measurements*.—Male, Mombasa (U. S. N. M.): length of carapace, 34.1; width, 40 mm.

*Description of specimens in U. S. National Museum*.—Carapace very convex from side to side as well as from front to back; smooth, with scarcely any separation between regions; epigastric lobes smooth, little elevated; no postorbital crest. Frontal, upper orbital and anterolateral margin, a narrow, acute rim. Epibranchial tooth small, subacute, not far from orbit. Front with a narrow median lobe, scarcely projecting beyond the efferent tubes; lateral lobes oblique, confluent with the upper margin of the orbit, which also is oblique, sinuous, sloping back to the broad, subacute outer angle. The anterolateral marginal line runs up on the carapace and terminates opposite the anterior part of the cardiac region; the posterolateral border is crossed by a few sharp striæ.

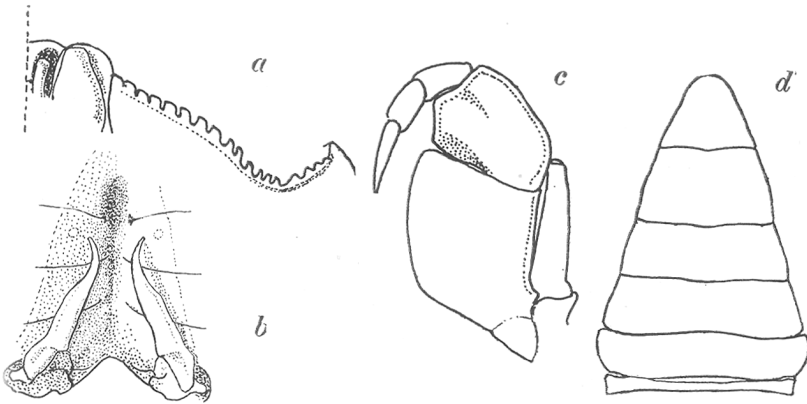


Fig. 16. *Deckenia mitis*, male 36 mm. wide, U. S. N. M. No. 32298.

a, lower margin of orbit, with antennæ; left dotted line represents the median line; b, appendages of first abdominal segment, in sternal cavity; c, outer maxilliped; d, abdomen.

The lower margin of the orbit is very oblique and is armed with more or less spinous teeth, which are slightly curved inward; those at the inner half of the orbit are truncate; toward the outer angle of the orbit the teeth become gradually narrower and more acute. The subhepatic region is short, compared to its width, and bears a transverse, curved, broken, and finely granulate line, similar to the oblique striæ of the subbranchial region.

The antero-external border of the merus of the maxilliped forms a continuous curve to the apex of the segment. No furrow on the ischium.

Chelipeds subequal and rather small, except the larger one in the old male. The ischium has a broad spine on its inner edge; the merus has a similar, subterminal spine above; its lower surface, including the outer terminal lobe, is bordered by blunt spines or tubercles, with a larger one at middle of inner edge; carpus armed with two equal inner spines anteriorly placed; the distal margin, outside the articulation, is spinulous. Fingers long, finely toothed, narrowly or not at all gaping.

Ambulatory legs broad, compressed, including even the dactyls. The merus joints have a very short, subterminal tooth.

The abdomen of the male reaches nearly as far forward as the anterior base of the chelipeds.

Color, according to Hilgendorf, violet; finger brownish; under side light violet. Female light brownish with fine violet dots.

### Xanthidæ

#### MENIPPE de Haan

*Menippe* DE HAAN, 1833, Fauna Japon., Crust., pp. 4 and 21.

#### *Menippe nanus* A. Milne Edwards and Bouvier

Plate XXXV, Figures 1 and 2; Text Figure 17

*Menippe nanus* A. MILNE EDWARDS AND BOUVIER, 1898, Bull. Mus. Hist. Nat., Paris, IV, p. 185; 1900, Expéd. Sci. Travailleur et Talisman, 1880-1883, Crust. Déc., part 1, p. 80, Pl. xv, figs. 9 and 10.

*Locality*.—Padron Point; August 1915; 1 ♂. "From a coral reef south of it, was clinging to a sea-fan."

*Range*.—Taken previously only at the type locality, off La Praya, Cape Verde Islands, 10 to 30 meters.

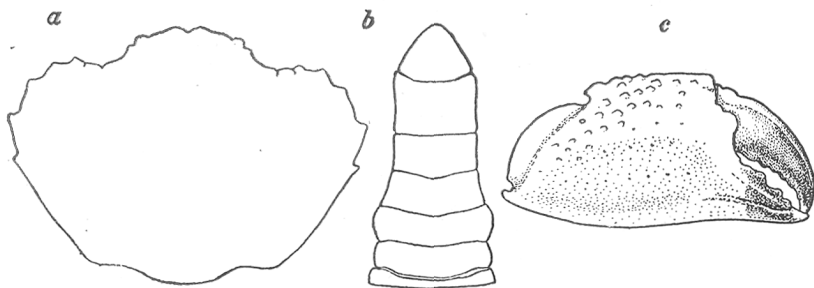


Fig. 17. *Menippe nanus*, male 10.7 mm. wide, Padron Point.

A, outline of carapace; b, abdomen; c, right, major chela.

*Measurements*.—Length of carapace of male, 7.4 mm.; width of same, 10.7 mm. This specimen is almost half again as large as the larger of the cotypes.

*Description*.—This is by far the smallest species of *Menippe*. The carapace is suboval; the grooves delimiting the gastric and the mesogastric regions are well marked. The anterior and anterolateral area is roughened with granulated elevations;



one of these is on each frontal region, three (one in front of the other two) on each epigastric region, while two irregular and oblique ridges cross the anterolateral area.

Front cut into two oblique lobes separated by a deep sinus and subdivided into three lobes, the middle one of which is very shallow, the outer one small but prominent. The orbit has a slight superior inner angle, two superior fissures, a small tooth at the outer angle, a larger tooth directly below it, and a large lobe at the inferior inner angle. Anterolateral teeth five, the last four much larger than the one at the orbit. A short, deep groove in front of the last tooth. Carapace widest at the penultimate tooth.

The chelipeds are unequal and are covered dorsally (manus and carpus) with unequal, spaced granules, which extend about half-way down the outer surface of the manus. Fingers grooved, light brown, the color not reaching quite to the proximal end of either finger.

Margins of legs hairy, especially those of the propodus and dactylus and the superior margin of the carpus.

### **PILUMNUS** Leach

*Pilumnus* LEACH, 1815, Trans. Linn. Soc. London, XI, pp. 309 and 321.

#### ***Pilumnus verrucosipes* Stimpson**

Plates XXXV, Figure 3, XXXVI, Figure 1; Text Figure 18

*Pilumnus verrucosipes* STIMPSON, 1858, Proc. Acad. Nat. Sci. Philadelphia, X, p. 36, Simons Bay, Cape of Good Hope, 11 fathoms; 1907, Smithsonian Misc. Coll., XLIX, p. 67, Pl. VIII (facing p. 66), fig. 5 (12 fathoms). MIERS, 1881, Ann. Mag. Nat. Hist., (5) VIII, p. 216, Pl. XIII, fig. 5. DOFLEIN, 1904, Brachyura 'Valdivia' 1898-1899, VI, p. 100; Atlas, Pl. XXXII, figs. 3 and 4 (♀).

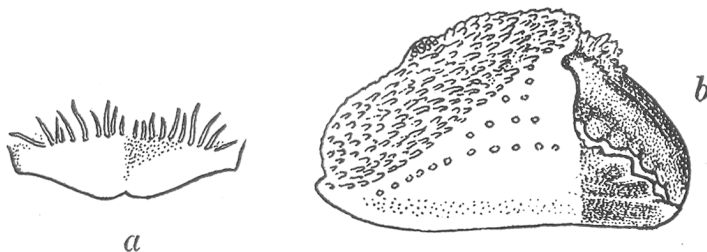


Fig. 18. *Pilumnus verrucosipes*, female 9.6 mm. wide, St. Paul de Loanda.

A, front of carapace viewed from before; b, right, major chela.

**Locality.**—St. Paul de Loanda: September 21, 1915, 1 young; September 23, 1915, 1 ♀. "At a depth of four feet, from a sponge."

**Range.**—From Gorée Bay, Senegambia, 9 to 15 fathoms (Miers), to Plettenbergs Bay, Cape Colony, shallow water (Doflein).

**Measurements.**—Length of carapace of male, 7.6; width, 10.7 mm. (Stimpson). Length of carapace of female from St. Paul de Loanda, 7.1; width, 9.6 mm.

**Description.**—Upper surface of body and feet minutely pubescent, with scattered long clavate setæ, most conspicuous on the margins of the feet and in a trans-

verse line behind the front. Surface toward the anterior margins somewhat areolate; a strong protuberance near the middle lateral tooth. Front and anterolateral teeth free from pubescence. Front projecting, slightly emarginate at middle, lobes oblique. Anterolateral margin with three projecting, obtuse teeth, in addition to the angle of the orbit. Inferior margin of the orbit thick and protuberant, especially at the inner angle. Feet all verrucose above. In the cheliped, the carpus bears nine large verrucæ; hand with four, dactylus with one, verruca on the upper edge; larger hand sparsely granulous externally, smooth and glossy below; smaller hand with outer surface granulous and pubescent. In the ambulatory legs, the penult and antepenultimate segments have each two large warts above.

### **PANOPEUS** A. Milne Edwards

*Panopeus* A. MILNE EDWARDS, 1834, Hist. Nat. Crust., I, p. 403.

### **Panopeus africanus** A. Milne Edwards

Plate XXXVII; Text Figure 19

*Panopeus africanus* A. MILNE EDWARDS, 1867, Ann. Soc. Entom. France, (4) VII, p. 276.

?*Panopeus herbstii* OSORIO (not Milne Edwards), 1887, Jorn. Sci. Lisboa, XI, p. 224; 1890, (2) II, p. 45.

*Eupanopeus africanus* RATHBUN, 1898, Bull. Lab. Nat. Hist. State Univ. Iowa, IV, p. 273; 1900, Proc. U. S. Nat. Mus., XXII, p. 287. DE MAN, 1900, Mém. Soc. Zool. France, XIII, p. 35, Pl. I, figs. 4-4f.

*Localities*.—Banana; July and August 1915; 68 ♂♂, 43 ♀♀ (11 ovig.), 3 young. St. Paul de Loanda; September 21 and 23, 1915; 1 ♂, 2 ♀♀, 14 young.

*Range*.—From Monrovia to Angola; (?) St. Thomas Island (Osorio).

*Measurements*.—Male from Banana: length of carapace, 34; greatest width, between tips of last teeth, 51.5; fronto-orbital width, 26.3; front between the antennæ, 13 mm.

*Description*.—Carapace well areolated, very coarsely granulated, bearing several raised lines composed of a single row of granules; one at the widest part of the mesogastric region, and widely interrupted at the middle; one long and two short lines on each protogastric region; one on each epigastric region; one hepatic, which may be curved or broken; one branchial, opposite the last tooth; one leading obliquely backward from the tip of that tooth. Each lobe of the front is divided into two, the small outer lobe being subrectangular but well marked. The middle, supraorbital lobe is separately arcuate; the inner suborbital lobe is conical, spiniform; the adjacent lobe is broad and subdivided into two shallow, rounded lobules, the outer of which is more advanced than the inner. Of the five anterolateral teeth, the first, forming the outer angle of the orbit, is partially fused with the second; the first is the smallest, its free part is triangular; the second has a strongly convex outer margin; the third is larger than the second and similar; the fourth and fifth are narrow-triangular, with nearly straight outer margin directed forward and outward, to a sharp and slightly curved tip. There is a stout, subhepatic tubercle below the second tooth, invisible from above.

The chelipeds are unequal, and the larger may be right or left. The carpus is

rough with reticulated granules and a few low tubercles and irregular rugæ; it has a shallow groove and bears a stout, blunt tooth at the inner angle. The palms are smoother, their upper surface flattened and somewhat bimarginate, the fingers grooved, immovable one bent down, the light brown color running back a little on the palm but not reaching the tips, prehensile edges bearing low, triangular teeth, with a large, oblong, backward-pointing tooth at the base of the dactylus of the larger chela; the fingers of that chela sometimes, but not always, gape narrowly.

The sternum of the male is coarsely granulate, except on the posterior end and on the furrow in front of the abdomen. The third segment of the abdomen is in contact with the coxa of the posterior leg. A narrow piece of the sternum is exposed at either end of the second abdominal segment.

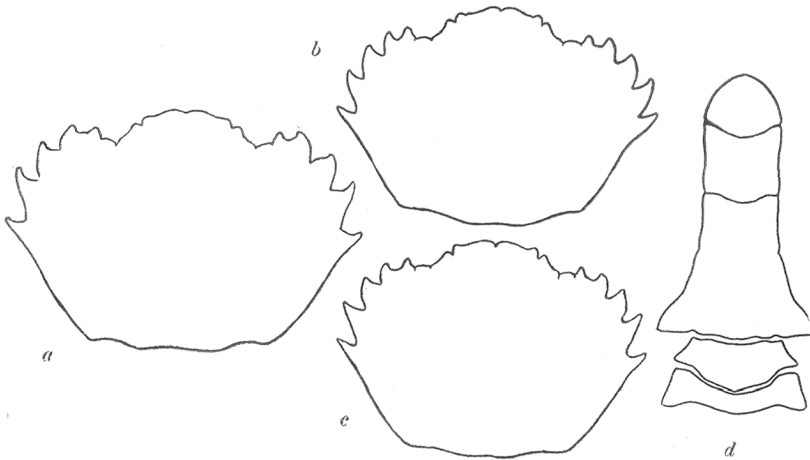


Fig. 19. *Panopeus africanus*, male, Banana.

A, carapace 51.4 mm. wide; b, carapace 34.2 mm. wide; c, carapace 33.7 mm. wide; d, abdomen of same specimen as a.

There is considerable variation in the shape of the lateral teeth of the carapace, especially the coalesced tooth; its sinus may be deep or shallow, the two parts of the tooth may be very unequal or nearly equal, and may be equally advanced, more often in large specimens, or their tips form a more or less oblique line.

"These large, tough-shelled, dark gray stone crabs with black and white-tipped claws are fairly common along the gently sloping shore of the bay east of Banana peninsula (Pl. LVI, fig. 1). Their favorite haunts are the quiet, highly brackish sites, sufficiently removed from the drift-line to be uncovered by the tide only a few hours a day. Sand or loosely heaped stones are avoided, their strong shears enabling them to burrow in firm ground strewn with rocks which the softly lapping waves keep partly imbedded. Here, just beneath the flatter stones, bricks, or similar,

hard objects, a usually solitary crab digs out a short gallery, seldom more than ten inches long and wide enough to allow it to turn about easily. Away from the entrance is a deeper part where water remains even at low tide. It is here that the crab seeks refuge when the various stones are lifted, churning up the mud and hiding beneath it, or pressing itself against the sides of the hole.

"Very often one or more shrimps use this same burrow, but they fashion their own tunnels a little beyond or to the side. Apparently they only profit by the easy access to a welcome hiding place, the entrance to which is left open, except when incidentally covered by the action of the retreating water, and are not disturbed by the crab.

"At St. Paul de Loanda these crabs had established themselves in similar sites, but were also seen to hide in crevices in the old masonry of the harbor." (H. L.)

**EURYPANOPEUS** A. Milne Edwards

*Eurypanopeus* A. MILNE EDWARDS, 1880, Crust. Rég. Mex., p. 318.

***Eurypanopeus blanchardi*** (A. Milne Edwards) ?

Plate XXXVI, Figures 2 and 3; Text Figure 20

*Panopeus blanchardi* A. MILNE EDWARDS, 1880, Crust. Rég. Mex., p. 323, west coast of Africa.

*Eurypanopeus parvulus* A. MILNE EDWARDS AND BOUVIER, 1900, Expéd. Sci. Travailleur et Talisman, 1880-1883, Crust. Déc., part 1, p. 99, not *Eurypanopeus parvulus* (Fabricius) or (A. Milne Edwards, 1880).

*Locality*.—San Antonio; August 1915; 1 ♂. "Pulled in with a seine from a depth probably not over 20 feet."

*Range*.—Cape Verde Islands, 10 to 30 meters, and Gaboon (A. Milne Edwards and Bouvier); San Antonio, Angola.

*Measurements*.—Male from San Antonio: length of carapace, 6.3; width, 9.3 mm.

*Description*.—This species has the anterior half of the carapace coarsely rugose; the anterolateral teeth little projecting but separated by deep grooves, the first and second teeth coalesced and separated by a shallow sinus; front beveled, the upper edge nearly transverse, as in Fig. 20c, but, viewed obliquely from above, the lower or true edge shows two lobes sloping backward to an outer rectangle (Fig. 20b).

The carpus of the unequal chelipeds is very rugose and lumpy and has a groove near and parallel to the articulation with the palm. The palms are also very rugose, especially in the upper and more proximal portions; the upper surface has two longitudinal ridges separated by a furrow, the inner ridge having a lobate prominence near the proximal end. The fingers are rather deeply grooved and the larger dactylus carries a large basal tooth.

I am unable positively to identify the San Antonio specimen with A. Milne Edwards's types, because the arrangement of crustaceans in the

Paris Museum was interrupted by removal during the war and has not yet been restored. I think, however, that this is with little doubt the species named *blanchardi*. Bouvier makes it a synonym of the American *parrulus* or *abbreviatus*. Our African specimen, however, differs from *abbreviatus* of equal size as follows. The carapace is slightly narrower in

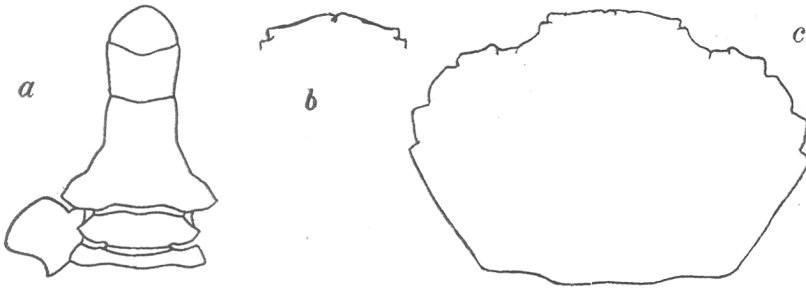


Fig. 20. *Eurypanopeus blanchardi* (?) male 9.3 mm. wide, San Antonio.

A, abdomen and coxa of posterior right leg; b, lower edge of front, viewed obliquely from above; c, outline of carapace.

proportion to its length, but is wider in its posterior half, the posterolateral margins less convergent, so that the carapace appears less regularly ova than in *abbreviatus*. The anterolateral teeth are more pronounced and more elevated; the chelipeds more rugose, fingers more deeply grooved. A small piece of the sternum shows at each end of the second abdominal segment, between it and the coxa of the last leg; this is not the case in *abbreviatus*.

### Grapsidæ

### Grapsinæ

### GRAPSUS Lamarck

*Grapsus* LAMARCK, 1801, Syst. Anim. sans Vert., p. 150.

### *Grapsus grapsus* (Linnaeus)

Plate XXXVIII

*Cancer grapsus* LINNÆUS, 1758, Syst. Nat., 10th Ed., I, p. 630.

*Grapsus grapsus* IVES, 1891, Proc. Acad. Nat. Sci. Philadelphia, p. 190. RATHBUN, 1918, Bull. U. S. Nat. Mus., No. 97, p. 227, Pls. LIII and LIV, text-fig. 135, and synonymy.

*Localities*.—Banana; Moanda; July 1915; 10 ♂♂, 4 ♀♀ (3 ovig.).

*Range*.—Madeira; Canary Islands; Cape Verde Islands; Ascension Island; Senegal; Liberia; St. Thomas Island; Moanda; Banana; Angola. Also inhabits the tropical and subtropical shores of eastern and western America.

*Diagnostic characters*.—Front vertical. Tooth on carpus of cheliped ending in a short, spiniform tip.

The deflexed front of this species is very variable in its proportions. The front of the African specimens is high and narrow, resembling the form prevailing on the Pacific coast rather than that on the Atlantic coast of America.

"Its habits are marine, and its shell is so thin that one is surprised to find it at home in the most surf-beaten, rocky parts near Banana. Five miles north on the Atlantic shore, just at the foot of the lighthouse near Moanda, is a boulder field of laterite (Pl. LVII, fig. 2), a welcome interruption of the monotonous stretches of sandy beach. It naturally provides a real oasis for a multitude of rock-living, marine animals. Here, in the deep recesses and hollows of these rocks and beneath them, is the home of these crabs. Not only is it difficult to gather them from the crevices of the cutting, rough stones, but the crab when handled instantly sheds its big claws and legs. The best specimens secured were those injected with a solution of alcohol and formalin while in their very hiding places. Of course the rocks had to be first broken and forced apart to allow access.

"In the same place, but hiding among stones near the sandy shore and generally out of water, were a few specimens of *Geograpsus lividus*. At Banana only a single specimen of *Grapsus grapsus* was seen and taken from the loosely heaped stones (Pl. LVI, fig. 1) on the east side of the peninsula. At St. Paul de Loanda I saw many of these crabs on parts of the masonry in the harbor, and there they were gregarious." (H. L.)

#### **GEOGRAPSUS** Stimpson

*Geograpsus* STIMPSON, 1858, Proc. Acad. Nat. Sci. Philadelphia, X, p. 101.

#### **Geograpsus lividus** (H. Milne Edwards)

Plates XV, Figure 1, XXII, Figures 2 and 3

*Grapsus lividus* H. MILNE EDWARDS, 1837, Hist. Nat. Crust., II, p. 85.

*Geograpsus lividus* STIMPSON, 1860, Ann. Lyc. Nat. Hist. New York, VII, p. 230.

RATHBUN, 1918, Bull. U. S. Nat. Mus., No. 97, p. 232, Pl. LV, and synonymy.

*Locality*.—Banana; July and August 1915; 6 ♂♂, 7 ♀♀ (4 ovig.).

*Range*.—Not before recorded from the African mainland. Cape Verde Islands; also Bermudas; from Florida Keys to São Paulo, Brazil; from Lower California to Chile; Hawaiian Islands.

*Measurements*.—Male from Banana: length of carapace, 34.2; width, 41.7 mm. The African specimens are considerably larger than any American ones examined.

*Diagnostic characters*.—Front little deflexed. Lateral margin well defined throughout its extent. Fingers pointed. Last three joints of legs bristly.

"The numerous stiff hairs on the limbs undoubtedly enable this crab to scurry in secure fashion over the slimy, smooth surfaces of the stones among which it lives. Usually during the morning hours, before the sun becomes hot, they can be observed feeding in the vicinity of their refuges. At the slightest disturbance they disappear into the crevices, where as many as a dozen may remain together. If further pursued they retreat into shallow, water-filled burrows established in the muddy soil beneath the stones. Their habitat on the edge of the shore-line is submerged for only a few hours every day. They were numerous on the east side of Banana peninsula in sheltered, rocky sites (Pl. LVI, fig. 1) with water of very slightly reduced salinity. Single specimens occurred on the western side hiding among the heaps of old iron wreckage, and a few in Moanda among the rocks at the foot of the lighthouse (Pl. LVII, fig. 2). Perhaps the constant rush of the waves of the Atlantic and the high salinity of the ocean deter them." (H. L.)

**Goniopsis** de Haan

*Goniopsis* DE HAAN, 1833, Fauna Japon., Crust., p. 5; 1835, p. 33.

**Goniopsis cruentata** (Latreille)

Plate XXXIX

*Grapsus cruentatus* LATREILLE, 1803, Hist. Nat. Crust., VI, p. 70.

*Goniopsis cruentata* RATHBUN, 1901, Bull. U. S. Fish Comm., for 1900, XX, part 2, p. 15, Pl. 1 (colored); 1918, Bull. U. S. Nat. Mus., No. 97, p. 237, Pl. LVII, text-fig. 136, and synonymy.

*Localities*.—Moanda; July 1915; 6 ♂♂, 7 ♀♀; all the specimens are small except one ovigerous female. Banana; July and August 1915; 19 ♂♂, 15 ♀♀ (10 ovig.), 6 young. San Antonio; August 1915; 1 ♂.

*Range*.—From Dakar, Senegal, to Lobito, Angola. Also at the Bermudas and from the Bahamas to São Paulo, Brazil.

*Color*.—A very showy crab, distinguished by its colors; carapace brownish yellow or brick-red; legs red, with spots of a darker red, extremities yellow. Chelipeds red, except the palms, which are almost white, and the fingers, which are yellow.

"At first it is a surprise to see these crabs stolidly perched upon a branch, five feet or more above the maze of decayed vegetation and reeking mud in which hundreds of crab-holes, partly filled with stagnant water, are scattered among a mass of stilt-roots. On these slanting roots the crabs creep up and down in very deliberate fashion, often accelerating their climbing performance along the vertical stem. The larger trees, though having rougher bark, are not visited and only the smaller ones serve for these promenades. With the needle-sharp tips and strong bris-

cles of their legs they gain an easy foothold and, though they feed on the ground, they also work their mouth-parts even when loitering among the leaves. An instinctive shyness makes them move so rapidly when approached that it was impossible to catch one on a branch. Instantly they let themselves drop, landing in the mud without ever injuring themselves or losing a leg, even when striking a log. They quickly seek protection among the roots or between any other objects offering shelter. Should they enter one of the many burrows of other crabs they soon reappear, usually without paying any attention to the cause of their speedy retreat.

"At Banana they were also common among the loosely heaped stones (Pl. LVI, fig. 1) along a part of the shore in the bay and merely used the interstices as refuges, climbing about in the same way as upon smaller mangrove trees and bushes.

"A number of young were found hiding below the bark of decayed branches and mangrove shoots, a great heap of which had been thrown into the bay, where, submerged at high tide, the woody portion had become paste-like; only the bark had preserved its former toughness. Adults were scarce in this place at that time (July).

"From the range given by Miss Rathbun it is apparent that *Goniopsis cruentata* is known from a great part of the tropical portion of the West African coast. Yet these crabs avoid the seashore, and on finding them in good numbers in mangrove swamps one might at first consider these their favorite habitat. However, they are not found in any of these swamps far inland for they remain near the mouth of rivers, where the salinity of the water is less than in the sea but still greater than about the creeks up-river where mangroves are still able to flourish. Furthermore, they appear to be equally at home among rocks in favorable sites." (H. L.)

#### **PACHYGRAPSUS** Randall

*Pachygrapsus* RANDALL, 1840, Journ. Acad. Nat. Sci. Philadelphia, VIII (1839), p. 137.

#### **Pachygrapsus transversus** (Gibbes)

Plate XL, Figures 2 and 3

*Grapsus transversus* GIBBES, 1850, Proc. Amer. Assoc. Adv. Sci., III, p. 181.

*Pachygrapsus transversus* GIBBES, 1850, Proc. Amer. Assoc. Adv. Sci., III, p. 182.

RATHBUN, 1918, Bull. U. S. Nat. Mus., No. 97, p. 244, Pl. LXI, figs. 2 and 3, and synonymy.

*Localities*.—Banana; July and August 1915; 30 ♂♂, 19 ♀♀ (4 ovig.); "living among and underneath stones in the bay on the eastern



side of Banana peninsula." St. Paul de Loanda; September 21 and 23, 1915; 1 ♂, 2 ♀.

*Range*.—Madeira; Cape Verde Islands; Banana, Belgian Congo; St. Paul de Loanda and Lobito, Angola. Also Bermudas; from the Bahamas to Rio de Janeiro; from California to Peru; Oriental Region.

*Diagnostic characters*.—A small species. Carapace with one lateral tooth, sides strongly convergent posteriorly, and slightly arched behind the tooth. Front a little more than half as wide as carapace, edge granulate and sinuous with three shallow sinuses, surface smooth, except a transverse granulate line on each of the two marginal lobes; middle pair of upper lobes of front prominent, outer pair oblique, flattened. Inner tooth of wrist blunt. Upper edge of movable finger nearly smooth. Inner surface of palm very finely and closely granulate, proximal half finely striate. Merus of last leg dentate at posterior distal end.

### ***Pachygrapsus gracilis* (Saussure)**

Plate XL, Figure 1

*Metopograpsus gracilis* SAUSSURE, 1858, Mém. Soc. Phys. Hist. Nat. Genève, XIV, p. 443 [27], Pl. II, fig. 15.

*Pachygrapsus gracilis* STIMPSON, 1871, Ann. Lyc. Nat. Hist. New York, X, p. 113.

RATHBUN, 1918, Bull. U. S. Nat. Mus., No. 97, p. 249, Pl. LX, fig. 3, Pl. LXI, fig. 1.

*Localities*.—Banana; July-August 1915; 102 ♂♂, 113 ♀♀ (39 ovig.), 12 young. San Antonio; August 1915; 4 ♂♂, 1 ♀.

*Range*.—Not before recorded from Africa<sup>1</sup>; Bermudas; from the Bahamas and Florida to Rio Parahyba do Norte, Brazil.

*Measurements*.—Largest male (from Banana): length of carapace, 10.3; width at lateral tooth, 19.4; fronto-orbital width, 18.4 mm.

*Diagnostic characters*.—Similar to *P. transversus*. Differs as follows. Margin behind lateral tooth concave or nearly straight. Front nearly two-thirds as wide as carapace, edge convex, upper surface smooth, without granulated lines; upper lobes of front obsolescent, outer pair considerably wider than inner pair. Inner projection of wrist a sharp spine or tooth. Movable finger spinulose or tuberculate above. Inner surface of palm rough with tubercles or coarse granules; proximally striate.

"These tiny, big-clawed crabs were found only near highly brackish water in the bay on the eastern side of Banana peninsula (Pl. LVI, fig. 1). First they were taken among and beneath loose heaps of stone along the shore. Later, numbers of them were found concealed, together with mollusks, behind the boards of a dilapidated landing place, just below the high-tide mark. Here, too, some had sought refuge in the cracks in the masonry, and others frequented the heaps of débris along the drift-line or those washed up among mangrove roots. In all cases darkness is

<sup>1</sup>Doflein, 1904, *Brachyura 'Valdivia'* 1898-1899, VI, p. 129, records *P. simplex* (Herklots) from Banana; but Herklots' *simplex*, according to de Man, 1900, is a synonym of *Goniopsis cruentata*.

an important requisite in their shelter. Driven out, they proceed rapidly and even the blazing sun does not prevent them from making a careful selection of their new retreats. The indistinct shades of brown on the upper side of the carapace match their hiding places well." (H. L.)

### Sesarminæ

#### SESARMA Say

*Sesarma* SAY, 1817, Journ. Acad. Nat. Sci. Philadelphia, I, p. 76.

"The five species of the genus *Sesarma* represented in the collection were found only in regularly inundated swamps of brackish water and none on the open Atlantic coast. The relatively great abundance of the different species in certain sites, as noted in the field, indicates that the amount of salinity of the water plays a more important rôle in their distribution than other conditions of environment. In the area we visited, they are naturally not restricted to the localities recorded, and it is probable that in other regions these crabs flourish in approximately similar habitats. *S. (Chiromantes) africanum* favored the more strongly saline bays or marshes near the seashore; *S. (C.) alberti*, *S. (Holometopus) büttikoferi* and *S. (H.) elegans* were plentiful in the Congo estuary from about 5 to 15 miles up-river to the regions about Malela; and *S. (H.) angolense* was common about 30 miles up-stream from Banana, where the salinity of the water is so slight as to be hardly noticeable to the taste.

"The most striking characteristic of their behavior is the persistent back-and-forth motion of the arm of the big claw (merus of cheliped) across the finely reticulated and granular portions of the side-front of the carapace. To all appearances this is an important function, serving as a milling process to disintegrate particles of food. My native helpers soon called all the members of this genus 'milling crabs,' being reminded of the way native women grind flour between two stones, an equally monotonous performance. As an incidental result of this grinding action the different species produce a more or less loud noise. The sharp, nipper-like tips of their fingers aid them in feeding and digging." (H. L.)

#### Subgenus **CHIROMANTES** Gistel

*Chiromantes* GISTEL, 1848, Natur. Thierreichs, p. x.

Carapace with at least one lateral tooth behind the outer orbital tooth. Manus with oblique, coarsely pectinated ridges on upper surface.

#### **Sesarma (Chiromantes) africanum** H. Milne Edwards

Plates XLI, XLII, Figure 2

*Sesarma africana* H. MILNE EDWARDS, 1837, Hist. Nat. Crust., II, p. 73.

*Sesarma (Chiromantes) africanum* RATHBUN, 1918, Bull. U. S. Nat. Mus., No. 97, p. 287, Pl. LXXV.

*Localities*.—Libreville, Gaboon; February 13, 1915; 1 ♂; J. P. Chapin, collector. Banana; July and August 1915; 35 ♂♂, 14 ♀♀ (1 ovig.), 6 young. San Antonio; August 1915; 7 ♂♂, 3 ♀♀ (1 ovig.).

*Range*.—From Senegal to Benguela, Angola; also Barbados.

*Measurements*.—Male from San Antonio: length of carapace, 39; width at antero-lateral angles, 41.4; width at the next tooth, 43.8 mm.

*Description*.—A large, hairy species; the hair on the carapace coarse and arranged in horizontal lines. The four postfrontal lobes deeply separated; the middle pair wider than the outer pair. A small second tooth on the lateral margin. A very protuberant transverse ridge on inner surface of palm; upper surface crossed by four or more oblique granulated ridges, the most distal of which is the most longitudinal and most distinctly pectinated. The upper edge of the movable finger is crossed by about fifteen short, oblique, blunt, shallow ridges, each of which is crossed by fine impressed lines. On the inner surface and close up to the marginal striæ there are several irregular rows of horny-tipped granules. Color of chelæ in alcohol a light violet red. Propodites of first and second pairs of legs densely furry on the anterior or lower surface.

“Of the crabs of this genus represented in the collection, *S. (C.) africanum* occurs nearest the sea, as it prefers the most brackish water. On the Belgian side of the river the greatest colonies were found in the mangrove swamps along Banana Creek west of Nemlao and also in many suitable sites near Netona. On the Angolan side (Pl. LV, fig. 2), the direct flow of the fresh-water current of the Congo allows these crabs to go even closer to the Atlantic Ocean. After having observed their type of habitat in the mangrove swamps near Banana, I was rather surprised to see them in great numbers near San Antonio in a drained mangrove swamp which then more resembled a salt marsh. The surface layer of the ground had the consistency of moist soil, and here the crabs ventured outside their burrows only early or late in the day. Their galleries in such sites were a foot deep and did not intersect. Near Banana these crabs favored the dense, well-shaded mangrove swamps; the extremely soft, miry parts were more apt to be frequented by the young, which accommodated themselves among the rubbish and in shallow holes with which the earth was literally pitted; the adults, however, are excellent diggers and prefer the firmer ground.

“Though nearly as large as *S. (H.) angolense* and quite as gregarious, *S. (C.) africanum* attracts but little notice in dusky places, and in the more open sites remains hidden during most of the day. With the exception of the heavy claws, the reddish brown color of the upper side is often rendered inconspicuous by the particles of dirt that cling to the numerous, transverse patches of stiff hairs scattered over carapace and limbs. A remarkable feature is the fine, soft hair that covers the anterior

lower portion of the legs like plush and forms a dense, long brush on the inner side above the sharp terminal tip. This allows the crabs to scurry about easily in the slush and slippery debris, and perhaps the brush is still more helpful in the evacuation of material as they excavate their burrows." (H. L.)

**Sesarma (Chiromantes) alberti**, new species

Plates XLII, Figure 1, XLVIII, Figure 3

*Type locality*.—Malela; July 8, 1915; 35 ♂♂, 25 ♀♀.

*Holotype*.—Male (Amer. Mus. Nat. Hist.).

*Localities*.—Malela; July 8, 1915; 35 ♂♂, 25 ♀♀, including type ♂. Banana; July and August 1915; 2 ♀♀ (1 ovig.), 4 young. San Antonio; August 1915; 2 ♂♂, 3 ♀♀ (1 ovig.), 2 young. In addition to these, which are from the American Museum Congo Collection I have seen from Rock Spring, Monrovia, 9 young specimens, taken along with *S. africanum* by O. F. Cook and G. N. Collins (Cat. No. 53641, U. S. Nat. Mus.).

*Measurements*.—Largest male, holotype: length of carapace, 30.4; width at the anterolateral angles, 33; width at next lateral tooth, 34.3 mm.

*Description*.—This species is associated with *S. africanum* and is so much like it that one may easily be mistaken for the other. The dorsal aspect of the carapace and legs is the same. The distinctive characters of *S. alberti* consist in (1) the milling on the upper edge of the movable finger, which is sharply cut, scarcely striated, the mills about thirty in number instead of fifteen, not bordered by granules on the inner surface of the finger; (2) the shorter and more swollen chelæ of the adult male, the lower margin of the propodus more convex, both fingers more curved; (3) the slightly different outline of the lower margin of the front, the two downward-projecting lobes being separated from the outer angles by an almost indistinguishable sinus, which is farther from the angles than is the well-marked sinus of adult *africanum*; (4) the color of the chelipeds is deep red in alcohol; (5) the heavy fur on the anterior surface of the propodus of the first two legs covers only the inferior half.

"From about 10 to 15 miles up Banana Creek to beyond Malela (Pls. LIX and LXII) and thence to Kunga lie the mangrove swamps which offer suitable environment to *S. (C.) alberti*; near San Antonio these crabs were taken in similar sites. Though sometimes associated with the larger *S. (C.) africanum*, they especially favor the more open stretches where dwarfed mangroves are widely scattered. As a rule, refuge is secured in holes close to the surface, but the single tunnel of some may be as much as six inches deep. Never as gregarious as the other related species in their favored haunts, they were most numerous along shallow channels into which small streamlets still meander at low tide, although they may be found singly even where *Potamides* shells abound, sites usually avoided by crabs.

"The reddish brown of the upper side is often rather dusky, the transverse patches of fine hair on the carapace, strongly pronounced in *S. (C.) africanum*, are rudimentary, and the soft-haired pads and stiffer hair on the legs slightly developed, but the curved finger-tips (dactylus) are very sharp." (H. L.)

Subgenus **HOLOMETOPUS** H. Milne Edwards

*Holometopus* H. MILNE EDWARDS, 1853, Ann. Sci. Nat., Zool., (3) XX, p. 187 [153].

Carapace without a lateral tooth behind the outer orbital tooth. Manus without oblique, coarsely pectinated ridges on upper surface.

**Sesarma (Holometopus) büttikoferi** de Man

Plate XLVII, Figures 5 to 9

*Sesarma büttikoferi* DE MAN, 1883, Notes Leyden Mus., V, p. 163; 1891, idem, XIII, p. 50. AURIVILLIUS, 1898, K. Svenska Vet.-Akad. Handlingar, XXIV, Afd. IV, No. 1, p. 11, Pl. III, figs. 1-4.

*Sesarma (Parasesarma) büttikoferi* RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 280.

*Sesarma (Holometopus) büttikoferi* TESCH, 1916, Zool. Med. Mus. Leiden, III, p. 140, and synonymy.

*Localities*.—Katala near Zambi; July 4, 1915; 3 young. Malela: July 8, 1915, 100 (+) ♂♂, 70 (+) ♀♀ (5 ovig.); July 9, 1915, 37 ♂♂, 40 ♀♀, 1 young. Banana; July and August 1915; 4 ♂♂, 4 ♀♀ (1 ovig.). San Antonio; August 1915; 1 ♂, 1 ♀.

*Range*.—From Liberia to San Antonio, Angola.

*Measurements*.—Male from Banana: length of carapace, 10.4; width at post-orbital angles, 12.6 mm.

*Description*.—Carapace widest at anterolateral angles, smooth or non-granulate in the middle. Front vertical, concave, lower edge projecting, surface highest in the middle half.

Propodus of cheliped produced proximally beyond the carpus; outer surface very flat, punctate; almost smooth; upper surface at right angles to outer, with a few granules and oblique striæ, scarcely pectinate.

In alcohol, the hand is slate-color, the fingers orange-red.

In females and young specimens the propodus of the cheliped is not produced beyond the carpus; in consequence, the young (less than 10 mm. in width) are easily confused with the following species, *S. angolense*, with which it is associated. They may be easily detected by the different surface of the carapace, the upper surface of the fingers, and the persistent reddish color of the tips of the fingers in *büttikoferi*.

"These small mud crabs, named after Dr. Büttikofer, the well-known Director of the Zoological Garden at Rotterdam, who discovered them in Liberia, were common in the Congo only about Malela (Pls.

LVIII, LIX, and LXII). There the salinity of the water apparently offers the most suitable habitat. At Zambo none were found; the records farthest up-river are represented by three young picked up on a mud flat near Katala, where they had probably been stranded by the incoming tide. In Banana also their occurrence appears to be incidental and those from San Antonio were taken from the borders of a creek a few miles southward.

"So well do the dark grayish brown tones on the upper side match the favorite environment that, when not moving, these crabs might be overlooked. The big shears, though relatively small compared with those of other crabs, are considerably larger and more specialized in form in the male than in the female. Those of the former are curiously flattened in front and slightly turned forward near the 'elbow.' In life this smooth-looking surface is a color-bearing shield of conspicuous, enamel-like, purplish blue, set forth still more by the red of the pinchers. Usually this shield is invisible, for it lies against the ground, but the males have a habit of flashing upward at intervals one of these colored escutcheons. This is not in itself a remarkable performance amongst crabs, for many of them often lift one of their shears seemingly in defense against their neighbors, and fiddler crabs may do this for hours. But these tiny mud crabs, otherwise so deliberate in their ways, by the occasional display of the highly colored portion of the claws, remind one of certain butterflies which are inconspicuous as they sit in the sun until they spread their wings and reveal the beauty of their pattern. Such 'showing off' by the males is often supposed to attract the attention of the females. The latter in this species certainly can not vie with the male, for the patch on the claws of the female is small, slightly concave, and less highly colored.

"Their favorite sites are not the muddy mangrove swamps, but the well-shaded, adjoining portions farther inland. While daily inundations from the high tide last only a few hours, the steady decay of an abundance of drift material has formed a rich black humus. So numerous are the burrows here that one might at first considerably overestimate the numbers of crabs, which in these places are gregarious. Their tunnels are evidently deserted frequently, and the tides are so gradual as not to efface the old ones. Many of these refuges are shallow, six inches seeming to be a fair depth for the single gallery, which often passes along or near logs and roots. Some of the entrance holes are so wide that one expects to find a much larger crab. After the tide retreats, they usually sit or crawl about investigating the surface of the mud and flashing their

'colors.' Very often they are found singly near the shore below the drift, where they do not burrow, a fact indicating that they just happened to land there and are merely hiding from the sun." (H. L.)

**Sesarma (Holometopus) angolense** Brito Capello

Plates XLIII, XLV, Figure 1

*Sesarma angolensis* BRITO CAPELLO, 1864, Desc. tres esp. nov. Crust. Afr. Occ., Lisboa, p. 4, Pl. , fig. 2; reprinted, 1865, in Mem. Acad. R. Sci. Lisboa, Cl. Sci. Nat., Nova Ser., III, part 2.

*Sesarma (Holometopus) angolensis* DE MAN, 1900, Mém. Soc. Zool. France, XIII, p. 59, Pl. II, fig. 11. TESCH, 1916, Zool. Med. Mus. Leiden, III, p. 130, and synonymy.

*Sesarma (Parasesarma) angolensis* RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 280.

*Localities*.—Zambi; June and July 1915; about 120 specimens, showing all sizes. Malela: July 4, 1915, 3 ♀♀ (1 ovig.), 1 young; July 8 and 9, 1915, 32 specimens, of which all but 2 ♂♂ are small.

*Range*.—From Liberia to Angola. Ponta da Lenha (Studer).

*Measurements*.—Largest male (from Zambi): length of carapace, 37.7; width at outer orbital angles, 43.7; greatest width, 44; width across top of front, 28.3 mm.

*Description*.—Carapace rough with small, scabrous and partly confluent granules; lateral regions crossed with a few oblique ridges. Carapace distinctly wider anteriorly than posteriorly. Upper edge of front marked by a single, nearly transverse row of granules; lower edge convex, projecting, wider than upper edge, outer angles rounded.

Chelæ very high, granulate; upper margin a granulate line, with several oblique ridges of granules just within; fingers flattened, narrowly gaping distally, immovable finger broad triangular. Inner surface of palm coarsely granulate on the swollen portion.

Legs broad; lower edge of propodus and both edges of dactylus thorny; last three segments long-hairy.

"Passing down-stream in a canoe from Boma, I was surprised to see near Zambi numbers of these crabs along the shore. At our approach they took refuge in their burrows in the soil or beneath stones or let themselves drop into the water. Large colonies on the nearby islands were the first to show the gregariousness typical of crabs in the neighborhood of the sea. Yet we were still about 30 miles from the mouth of the river and the salinity of the water was so slight as not to be readily perceptible to the taste, though the tide during the dry season (June to August) is so strong near Zambi that it may raise the water-level about three feet. This, too, is the section of the river where the large *Neritina* shells are found clinging to rocks and floating logs.

"Wherever the water is distinctly saline one need not look for *S. (Holometopus) angolense*, which is replaced farther down-river by *S. (H.)*

*büttikoferi*, *S. (H.) elegans*, and *S. (Chiromantes) alberti*. The young of *S. (H.) angolense*, however, assemble in great numbers beneath washed-up heaps of decomposed vegetable matter, which is lifted and moved by the high tides, so that many of them are liable to be stranded far from their homes. The adults are rarely distributed in this manner, as our collecting showed.

"Their most favored haunts were the low-lying, regularly inundated portions of swamps of papyrus and other reeds along the banks of the Congo and near the edge of neighboring islands. Especially numerous were these crabs on Bird, Hippopotamus, and Bulikoko islands, nearer the Angolan shore, opposite Zambi and east of Ponta da Lenha, though there were none in the mangrove swamps about Malela, but a few miles northeast.

"The reddish brown shade of the upper surface is often considerably dulled by particles of dirt clinging chiefly to the lateral ridges of the carapace. The external edge of the legs has a narrow, velvety pad and many long, soft bristles, an arrangement which may prevent slipping on steeper surfaces or in soft mire. The inner side of the leg is even better adapted to environmental conditions; the velvety pad, so strongly developed in *S. (C.) africanum*, in this species is only rudimentary, but instead the scattered, short, spiny bristles must certainly be of great assistance in climbing about the slippery stalks.

"As with other diurnal crabs, the early morning hours are the most favorable for observation. Most of them are then engaged in feeding from the miry mass into which they soon transform the puddles left among the tussocks by the retreating tide. Here dozens of them scurry about, many steadily rasping their arms along the milling plates and making a noise resembling that produced when walnut shells are slowly rubbed against each other.

"They are apparently not very shy, for the proximity of their burrows in the completely undermined tussocks offers such instant and secure refuge that in a moment they can find ample protection. Probably the burrows are not individually owned, for too many of them intersect. Some galleries lead to the tops of the hillocks and a few establish underground connections with neighboring colonies; the crabs usually remain in the part near the lowest level of the water. On pulling up one of these honeycombed bunches (Pl. LXI), there is a rapid exodus of crabs into the nearest tunnels. These crabs are not eaten by the natives, but I was told that at times large numbers are crushed and used as bait in certain types of fish traps." (H. L.)



**Sesarma (Holometopus) elegans** Herklots

Plates XLIV, XLV, Figure 2

*Sesarma elegans* HERKLOTS, 1851, Addit. Faun. Carcin. Afr. Occ., p. 10, Pl. I, fig. 10.

NOBILI, 1906, Mem. Soc. Esp. Hist. Nat., I, p. 314, Pl. VIII, figs. 2-2b.

*Sesarma (Holometopus) elegans* RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 280.

TESCH, 1916, Zool. Med. Mus. Leiden, III, p. 148, and synonymy.

*Localities*.—Moanda; July 1915; 1 ♂, 2 ♀ ♀. Banana; July and August 1915; 93 ♂ ♂, 110 ♀ ♀ (10 ovig.). San Antonio; August 1915; 2 ♂ ♂, 1 ♀.

*Range*.—From Boutry, Guinea, to San Antonio, Angola.

*Measurements*.—Male from Banana: length of carapace, 18.8; width at post-orbital angles, 18 mm.

*Description*.—Posterior margin of carapace short and posterolateral regions bent strongly downward, so that the carapace appears narrower behind than it really is. Lateral margins for the most part convex, and carapace usually widest behind the postorbital angles. Anterior half of carapace rough with granules arranged in twos or threes or even singly. Front subvertical; lower edge sinuous and advanced; superior lobes oblique, seen from above, those of the outer pair with a secondary and horizontal lobe behind them.

The palms of the male are much swollen and rough, the fingers irregularly toothed and gaping. On the upper margin of the merus of the legs there is a sharp terminal as well as subterminal tooth; last three joints very slender, the propodus very long, the dactylus very short.

"This small, tender-shelled, and agile crab had its habitat in the strongly brackish environment of mangrove swamps (Pl. LVIII). As our canoe glided along their edges in Banana Creek, one heard from time to time a noise like small pebbles being dropped into the water, mostly too late to see anything but ripples. At first I thought some of the commoner shells (*Littorina* or *Cuma*) were incidentally releasing their hold. But, on slowing down, the real cause was seen to be this crab. They were assembled in numbers upon the roots just above the water-level, as if driven up by the high tide.

"Their freckled, dirty greenish gray and yellow color so completely matched the surroundings, that they were easily overlooked. At the slightest alarm they let themselves drop, evidently trusting the water more than their spider-like dexterity to scurry out of sight. From their behavior I concluded that, in broad daylight, they were on the lookout for tiny morsels collecting about the mangrove bark with the receding tide.

"For a while I had given up hope of ever securing a good series of specimens until I happened to discover their place of refuge. At low tide, in particularly dense and well-shaded tangles of prop-roots, the

soft mire fairly teemed with these crabs, and now our former attempts to catch them on the run or to fish them out of the water seemed ludicrous. We found it best to let them hide in shallow burrows, under pieces of bark, or even beneath dead leaves where they could be readily caught." (H. L.)

### **SARMATIUM** Dana

*Sarmatium* DANA, 1851, Amer. Journ. Sci., (2) XII, p. 288 [5].

#### **Sarmatium curvatum** (H. Milne Edwards)

Plates XVI, XLII, Figure 3, XLVI, XLVII, Figure 1

*Sesarma curvata* H. MILNE EDWARDS, 1837, Hist. Nat. Crust., II, p. 75.

*Sarmatium curvatum* KINGSLEY, 1880, Proc. Acad. Nat. Sci. Philadelphia, p. 212.

TESCH, 1916, Zool. Med. Mus. Leiden, III, p. 215, and synonymy.

*Localities*.—Malela: July 4, 1915, 1 ♀; July 8, 1915, 22 ♂♂, 16 ♀♀ of assorted sizes, 14 very young. Moanda; July 1915; 2 small ♂♂. Banana; July and August 1915; 10 ♂♂, 8 ♀♀, 1 young. San Antonio; August 1915; 8 ♂♂, 4 young.

*Range*.—From Senegal to Lobito, Angola. Also at Martinique, West Indies.

*Measurements*.—Male, San Antonio: length of carapace, 28.7; greatest width, 36; fronto-orbital width, 28 mm.

*Description*.—Carapace convex in an anteroposterior direction, closely punctate, four or five oblique striæ on the posterolateral regions. The superior frontal lobes are smoothly rounded, the two middle ones much wider and better marked than the outer ones; middle of free edge of front concave as seen from above, straight as seen from before. Anterolateral margins arched, elevated and tridentate.

Chelipeds of male stout. Upper margin with a tuberculated edge for its proximal two-thirds; parallel to it but at considerable distance farther down on the outer surface, there is a granulated ridge from the carpus to the base of the movable finger, somewhat curved inward in its distal fourth; here, for sometimes half its length, it is modified into a pectinated crest with erect horny teeth. The upper margin of the movable finger is granulate near the palm, for the rest it is marked by a row of from twelve to fifteen short, low, oblique ridges,<sup>1</sup> directed forward, each having a few cross furrows or crenulations; just outside this row the border is transversely milled.

"The bright navy blue of a new carapace makes this crab for some time the most brilliantly colored among its kind in these regions. Later, however, in the subdued light of the mangrove swamps (Pls. LVIII, LIX, and LXII), the dusky violet of the well-hardened shell is less conspicuous against the irregular, muddy ground. It is undoubtedly not only the

<sup>1</sup>Tesch, *op. cit.*, p. 216, describes these ridges as "low spines" in the type specimens of *S. violacea* Herklots, a synonym of *curvatum*, but Herklots himself calls them "plicae . . . obliquas," a statement borne out by his figure (Addit. Faun. Carcin. Afr. Occ., 1851, p. 10, Pl. I, fig. 9).

most typical of mangrove crabs, but strictly fossorial and gregarious in habits. A very hard, resistant shell, stocky build, and especially powerful hands stamp it as a first class earthworker, which no doubt provides retreats for many of its relatives in any kind of moist ground. It surpasses most other crabs in this ability to burrow through various mediums, though it avoids the open seashore, and stony and sandy ground. Noteworthy is the fact that in the ensuing labyrinths the principal channels, like those dug by *Cardisoma armatum*, always extend down to the water-bearing stratum, generally a few inches deeper than the level of the lowest tide. In the dry season in certain swamps, and at low tide near the shore, they reach a depth of nearly six feet.

"Surprising are its colonies in the tough, peatlike masses bordering some of the upper reaches of Banana Creek (Pl. XVI, fig. 2). There mangroves have succeeded in establishing themselves over former sand flats by an abundant formation of minute rootlets which secure as perfect an anchorage as their stilt-roots usually do in mud. This peculiarity of mangroves is apparently not recorded, yet the peaty mass they form is often several feet thick and completely honeycombed by burrows of various creatures. Here the largest holes are made by this beautiful crab, where its colonies predominate, while in typically muddy mangrove swamps a number of other species are found. *Sarmatium curvatum* is bound to brackish water and its distribution in the Congo estuary coincides with that of the mangroves shown on the map (p. 388)." (H. L.)

### **Cyclograpsus H. Milne Edwards**

*Cyclograpsus* H. MILNE EDWARDS, 1837, Hist. Nat. Crust., II, p. 77.

### **Cyclograpsus occidentalis A. Milne Edwards**

Plate XLVII, Figures 2 to 4

*Cyclograpsus occidentalis* A. MILNE EDWARDS, 1878, Bull. Soc. Philom. Paris, (7) II, p. 228. DE MAN, 1900, Mém. Soc. Zool. France, p. 57. A. MILNE EDWARDS AND BOUVIER, 1900, Expéd. Sci. Travailleur et Talisman, 1880-1883, Crust. Déc., part 1, p. 111, Pl. XVIII, figs. 1-5.

*Localities*.—Banana: July 1915, 12 ♂♂, 8 ♀♀ (4 ovig.); August 1915, 23 ♂♂, 13 ♀♀ (7 ovig.).

*Range*.—Cape Verde Islands, 10 to 30 meters; mouth of the Congo; Lobito, Angola.

*Measurements*.—Male from Banana: length of carapace, 11.7; greatest width, 15; fronto-orbital width, 10 mm.

*Description*.—The carapace is almost as wide at the level of the second ambulatory as it is a little in front of the chelipeds. Lateral border marked by a raised, granulate rim. Dorsal surface smooth and punctate in the middle but finely granulate

along the frontal and lateral regions, especially in the corners of the carapace. Groove between cardiac and gastric regions well marked; the outer portions of the cervical suture are very faint. Front strongly deflexed, edge almost straight. Below the orbit there is a smooth ridge which breaks up outwardly into two elongate tubercles.

The chelipeds are granulate along the marginal ridges of the merus, along the prominent inner border of the carpus, and on the protuberant portion of the inner surface of the propodus; otherwise smooth. The gaping fingers have five or six prehensile teeth and end in a short, horny tip. The carpus of the ambulatory legs is almost as long as the propodus, which is largely covered with a short, dense velvet, and a few long, silky hairs; the dactylus is as long as the propodus and ends in a long, slender, yellow nail.

The first segment of the male abdomen is transversely ridged, the third to sixth segments inclusive appear distinctly separate but their articulations are a little less flexible, as if partly fused.

These specimens have been compared directly with one of the *Talisman* specimens from La Praya.

"These small, rufous crabs were collected along the shore of only the highly brackish portion of the bay east of Banana peninsula and on the northwestern edge of Bulabemba Island. The vegetable débris along the drift-line, which also attracts tiny snails (*Melampus*), furnishes their most favored shelter. But whereas the mollusks merely seek concealment therein, our crabs generally embed themselves in the sand or mud flush with the ground. Any suitable refuge beneath stones is equally acceptable, but they avoid extensive digging. The slight amount of excavating which they may do clearly marks their hiding place, as they burrow mostly after the tide has retreated. Their tendency to hide themselves during the day suggests nocturnal habits, but late in the afternoon I have repeatedly seen them scurrying about the sand and grass in the small, marshy belt, just at the time when the incoming tide was washing the drift back and forth." (H. L.)

### **CARDISOMA** Latreille

*Cardisoma* LATREILLE, 1825, Encyc. Méth., Hist. Nat., Entom., X, p. 685.

### **Cardisoma armatum** Herklots

Plates XVII, XLVIII, Figures 1 and 2, XLIX-LI; Text Figure 21

*Cardisoma armatum* HERKLOTS, 1851, Addit. Faun. Carcin. Afr. Occ., p. 7, Pl. I, figs. 4 and 5. RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 277 (distribution; perhaps some of the localities belong to the real *guanhum*). GRUVEL, 1912, Ann. Inst. Océanog., V, fasc. 1, pp. 3 and 4 (habits, and use as food).

*Cardisoma armatum* NOBILI, 1906, Mem. Soc. Esp. Hist. Nat., I, p. 319, text-fig. 1. *Cardisoma guanhum* STIMPSON (not Latreille), 1907, Smithsonian Misc. Coll., XLIX, p. 111.

*Localities.*—A large series, about 81 ♂♂ and 34 ♀♀, of fine specimens showing all ages was taken at Banana, July 1915. Moanda; July 1915; 4 small ♂♂. Malela; July 8, 1915; 1 small ♂.

*Range.*—Cape Verde Islands; from Senegal to Angola. Specimens are in the U. S. National Museum from Dakar, Senegal, and from Porto Praya, Cape Verde Islands, the latter identified as *C. guanhumi* by Dr. Stimpson. I have seen no specimens of the true *guanhumi* from West Africa.

*Measurements.*—Largest male (from Banana): length of carapace, 95; greatest width, 121; fronto-orbital width, 78.3; length of propodus of larger cheliped, 159; greatest height of same, 61.3; length of dactylus of same cheliped, 126 mm. Largest female (from Banana): length of carapace, 77; greatest width, 95.6; fronto-orbital width, 67.2; length of propodus of larger cheliped, 79.5; greatest height of same, 40.6; length of dactylus of same cheliped, 50.2 mm.

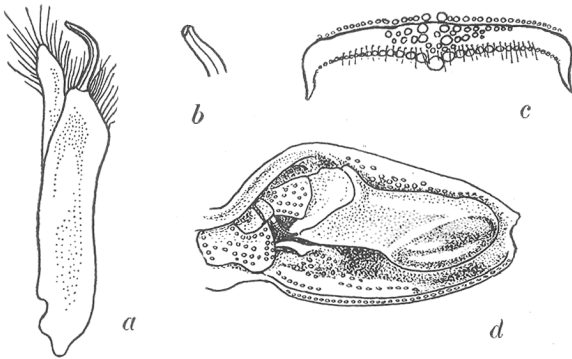


Fig. 21. *Cardisoma armatum*, male 94 mm. wide, Banana.

A, left appendage of first abdominal segment; b, tip of terminal spine of same; c, epistome, front view; d, eye in orbit, front view.

*Description.*—This species is closely related to *C. guanhumi*, the large land crab common throughout tropical America. The carapace is very convex fore and aft; the anterolateral marginal line begins at a small denticle behind the orbital tooth; sides of front oblique, the sinuous upper border of the orbit runs slightly backward to the outer tooth.

The inequality in the chelipeds increases with age, the large cheliped attaining enormous size in the old; the margins, especially of the merus, propodus, and dactylus, are armed with coarse tubercles or spines; these reach over on to the outer and inner surfaces of the chelæ, especially the inner surface of the large chela. The legs are furnished with long black bristles down to the proximal fourth of the dactylus.

*C. armatum*, although by some authors united with *C. guanhumi*, differs from it as follows.

(1) In the form of the appendages of the first segment of the abdomen of the male; in *guanhumi* the appendages terminate in two lobes

of nearly equal length; in *armatum* the two lobes are very unequal, the inner or more ventral one bearing a long curved spine which reaches distally as far as the outer or more dorsal lobe.

(2) In the sixth segment of the male abdomen, which is wider in proportion to its length in *armatum* than in *guanhumi*; of two specimens with the same sized carapace, this segment measures 24.5 mm. long and 22.3 wide in *armatum*, and 25.8 mm. long and 21.8 wide in *guanhumi*. In eleven other specimens of *armatum* in which the length of the sixth segment is between 18 and 25 mm., the length exceeds the width by from .5 to 1.7 mm. with one exception, 2.9 mm. In eleven specimens of *guanhumi*, the length exceeds the width by from 2.1 to 4.1 mm. This difference does not hold good for specimens under 60 mm. in width of carapace.

(3) In the tubercles and spinules arming the chelæ which are longer and stronger in *armatum* than in *guanhumi*.

(4) In the epistome whose lower border (edge of buccal cavity) is more strongly tuberculated in the African form.

Nobili (*op. cit.*, p. 319) suggests a possible difference in the form and dentation of the chelæ of *C. armatum* and *C. guanhumi*.

A comparison of males of large and medium size (70 mm. wide and upwards) with a series of about forty specimens of *C. guanhumi*, shows that the major chela is built on the same lines in the two species; it is normally much larger than the minor chela in medium-sized specimens, but there are occasional exceptions to this rule. In the old the fingers of the major chela become long and narrow and widely gaping. The only difference in outline in the two species which is worthy of mention is the greater development in *armatum* of the large tooth near the middle of the finger. In *guanhumi* the tooth at this point is usually small or absent in the old and is represented by several moderately enlarged teeth in the medium-sized. This rule has its exceptions. Several very large *armatum* chelæ have a large tooth on the lower finger only, while two *guanhumi* chelæ of similar size also have a large tooth on the lower finger. In medium-sized specimens a similar overlapping of characters occurs.

"These bulky crabs, by far the largest collected, generally avoid the seashore. At first it seemed very puzzling that these land crabs should be restricted to a narrow coastal border and the interior of the larger islands. An investigation of their burrows in various sites, however, clearly proved that they are dependent on moisture of the substratum. In every burrow at least one of the galleries extends down to the saline underground water, sometimes more than four feet below the surface. At Kunga I found young individuals having access to only fresh

water in their temporary retreats about twenty feet up a slope near an extensive swamp. A little above the level of this underground water, they rest in a usually widened chamber. Their branchial apparatus requires suitably moist conditions and direct exposure to the rays of the sun is fatal to these crabs. When unearthing them, the presence of numerous, slightly tougher, smooth, old galleries proved that they often shift their resting places, evidently to adjust themselves to various water-levels, especially during the height of the dry season (July), when even larger lagoons dry up entirely. Under such circumstances some of these crabs are forced to undergo a period of estivation, during which the entrances to their burrows are obstructed from within. The sun-baked, fissured surface of the mud indicates that no burrowing is carried on during that time. Crabs established in more favorable sites (Pl. LIX), however, seem active throughout the year, though many of them do not leave their refuges for some time. The related *Cardisoma guanhumi* of tropical America and the Antilles frequently lives inland, far away from the seashore, to which it is said to repair during the breeding season. According to information kindly given me by the late Dr. Etienne, for many years a resident of Banana, such migrations were never observed for *Cardisoma armatum* at the mouth of the Congo, where these crabs never extend into the higher lying savannah country.

"In the neighborhood of villages the great numbers of these crabs render an efficient service by promptly disposing of all sorts of refuse. Like most scavengers they are nocturnal and travel sometimes for considerable distances, apparently guided by a keen sense of smell. In places sheltered from the sun an exceptionally satisfactory food supply may induce them to feast even during the day.

"Their large hands and powerful fingers are of great assistance in digging and pushing aside excavated material, as well as in the destruction of plants on the ground. I have never observed these crabs climb. They also use the hands as a means of defense and frequently fight among themselves; the natives credit the large, generally solitary males with driving other individuals from their burrows. In feeding, they use their smaller claw (cheliped) in the same manner as do fiddler crabs, which, moreover, very often contest their feasts, the two species maintaining the same relations as jackals and hyenas.

"The peculiar mounds of freshly excavated ground near or at some distance from the large entrances of their numerous burrows are the most conspicuous signs of the presence of these crabs, though wind and rain may rapidly efface them. Some of these burrows are very shallow

and merely the temporary refuges of younger individuals, others are uninhabited. Those tunneled into firm soil, as at Kunga, and those several feet below hardened mud, as on Bulabemba Island, are undoubtedly made when moist conditions facilitate this process, as is the case with dusty or loose sand, which the crabs seem to moisten with fluid they carry around in their body. The sites they favor most are the level, sandy stretches beyond the drift-line, especially open spaces between boskets of *Phoenix* palms and other bushy vegetation, or the higher-lying slopes bordering mangrove swamps. Their burrows generally start obliquely downward and may then turn or branch in any direction. Usually one or two individuals may live together, and in large colonies the whole ground seems honeycombed by intersecting galleries. On Banana peninsula these crabs often invade the closed-in areas beneath white men's houses which have been elevated on iron pillars to be out of the reach of the equinoctial tides. Ordinarily, little attention is paid to their tunneling, but owners of vegetable gardens keep a sharp lookout for freshly raised mounds, since in spite of palisades driven deep into the ground these crabs often succeed in passing below, causing great destruction among the more tender plants.

"In open ground they are easily dug out, but to catch them in heavier vegetation large, empty kerosene cans are set flush into the ground. Into these they scamper without hesitation—completely helpless in their efforts to escape. Boys often succeed in capturing a few merely by teasing them inside their burrows with a flexible stick which the crabs grasp with their claws. Pulled out, they may often be carried for hours, stubbornly maintaining their firm grip. Others are caught in nooses set near the entrances to their burrows and very seldom free themselves by dropping their hand or even the single leg by which they are caught. In hard soil, hot lye of woodashes poured into their holes is said to be most effective in driving them out.

"At Banana Dr. J. Bequaert observed a curious case of phoresy, in which tiny ephydrid flies had themselves carried about by these crabs. Eleven such insects were taken from the body of a single specimen, over the carapace of which they were running to hide beneath the recurved abdomen. During the hours of sunshine some of these Diptera were seen to fly near the burrows of the crustaceans. It is not known for what purpose they are associated with the crabs.

"On the Belgian side of the estuary no one would think of using these crabs for food purposes, their scavenger habits evidently repelling the natives; but north and south of the Congo they seem to be eaten,



and in some cases considered a relish.<sup>1</sup> According to the late Dr. Etienne of Banana the excellence of such a dish aroused general surprise at a dinner given by a visiting host.

"After becoming well acquainted with their general habits, I was rather interested in visiting 'a very large colony far inland,' as the natives expressed it. I was surprised when shown a colony several miles north of Banana, but only half a mile from the shore, in low, but savannah-like surroundings. A grove of *Phoenix* palms badly damaged by passing grass-fires (Pl. LVII, fig. 1) was their headquarters. The presence of the palms clearly indicated that not far below was a water-bearing stratum, though at that time the burned aspect of the vegetation imparted to the country more the appearance of a desert.

"In young individuals rather beautiful violaceous and red tones predominate on the carapace and hands, but in older ones dirty yellow with only slight reddish and bluish hues prevail." (H. L.)

### **Ocypodidæ**

#### **Ocypode** Fabricius

*Ocypode* FABRICIUS, 1798, Entom. Syst., Suppl., p. 312.

#### **Ocypode ippeus** Olivier

##### Plate LII

*Ocypode ippeus* OLIVIER, 1804, Voy. Empire Ottoman, IV, p 52; Atlas, part 2, Pl. XXX, fig. 1. RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 275, and synonymy.

*Localities*.—Cape Lopez, French Congo; February 8, 1915; 1 small ♂; J. P. Chapin, collector. Moanda; July 1915; 5 ♂♂, 1 young. Banana; July and August 1915; 25 ♂♂, 18 ♀♀, and over 100 young ones. Banana; September 1915; 11 ♂♂, 3 ♀♀. San Antonio; August 1915; 3 ♂♂, 4 ♀♀.

*Range*.—Cape Verde Islands; from Cape Verde, Senegal, to Angola. Eastern and southern shores of the Mediterranean.

*Measurements*.—Male from Banana: length of carapace, 38.4; width at antero-lateral angles, 45.7; greatest width near middle of carapace, 46.2 mm.

*Description*.—Carapace coarsely granulate; anterolateral angles forming a large lamellate tooth; lateral margins arcuate; front broadly spatulate. Eyestalks terminating in a brush of hairs about as long as the cornea.

Propodus of larger chela about as broad as its middle length; lower edge with prominent denticulation; stridulating ridge on inner surface finely milled with sixty or more striæ and bordered distally by a brush of short hair.

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<sup>1</sup>Gruvel, 1912, Les Crustacés comestibles de la Côte occidentale d'Afrique, Ann. Inst. Océanog., V, fasc. 1, p. 4.

Merus of legs elongate, with nearly parallel sides; the propodus of the first two pairs is armed with several rows of short, sharp spines, longest on the lower or posterior border.

The sixth segment of the male abdomen is nearly as long on the median line as it is wide, and has converging lateral margins.

The young, down to a carapace length of 11.6 mm., have a brush of hairs at the end of the eye; smaller specimens show only a tubercle at that point.

### ***Ocypode africana* de Man**

#### Plate LIII

*Ocypode africana* DE MAN, 1881, Notes Leyden Mus., III, p. 253. RATHBUN, 1900, Proc. U. S. Nat. Mus., XXII, p. 275, and synonymy.

*Localities*.—Moanda; July 1915; 4 young. Banana: July and August 1915, 35 ♂♂, 15 ♀♀ (2 ovig.); September 1915, 5 ♂♂, 1 ♀ ovig. San Antonio; August 1915; 1 ♂.

*Range*.—From Senegal to Muserra, Angola.

*Measurements*.—Male from Banana: length of carapace, 24; width at antero-lateral angles, 27.9; greatest width, 29.4 mm.

*Description*.—Carapace covered with low granules; anterolateral angles inconspicuous, pointing forward; lateral margins angled, the anterior third of the two sides subparallel; front very little widened at the middle. Eyestalks without a terminal brush or style.

Propodus of larger chela distinctly broader than its middle length (at the articulation with the carpus); lower edge with shallow denticulations; stridulating ridge milled in its lower half, changing gradually to more distant tubercles in the upper half; the total number of ridges is less than half as many as in *O. ippeus*. Merus of first three pairs of legs dilated at the middle. The ornamentation of the legs consists of low denticulations and rugæ.

The sixth segment of the male abdomen is distinctly wider than long, its sides strongly arcuate.

“Very few of the other closely related species of crabs represented in the collection are so similar in behavior as the two of the genus *Ocypode*, clearly a result of the uniformity of their habitat. These handsome, partly diurnal crabs enliven the lone, sandy stretches along the Atlantic shore and are common between Banana and Moanda, but scarcer on the Angolan coast near San Antonio (Pl. LV, fig. 1). The ceaseless pounding of the waves and of the powerful breakers may have contributed much toward developing their speedy ways and quick reactions. Furthermore, the strong, battering surf, constantly bringing about shifting conditions, makes them more or less vagrant, for old quarters are torn away and new ones piled up. High up on the steeper portions of the beach which slope

at an angle of at least thirty degrees, one may find their single burrows. These are widely distant from one another, and, with rare exceptions, each is owned by one individual.

"The great shyness of these sand crabs contrasts strangely with the relative tameness of mangrove crabs. In the dense tangles of roots and débris, the latter are generally so close to a dozen hiding places that they need not move far for safety, and can be observed at leisure only a few feet away. But at the very moment one hopes to grab them they dodge to cover. Sand crabs, however, living in open spaces and often loitering at some distance from their burrows, have an alertness that prompts them to race for shelter at the first sign of danger. As with a peacefully grazing herd of antelopes, when one takes to flight all the others follow suit. So, at the slightest alarm these crabs clear the field when the intruder is still a hundred feet or more from the nearest. It is amusing to see how rapidly they speed across the sand and with what unerring accuracy each individual locates its burrow even when a sudden squall has closed it and effaced every outward trace.

"So rapidly do these crabs dig that seldom can they be caught before disappearing into their subterranean home. This consists of a downward sloping tunnel, slightly wider than the carapace and usually not over eighteen inches deep. However dry and hot the sand may become on the surface, the lower half of the tunnel remains moist. Several of my first attempts to capture them in their burrows were in vain. Pursued closely, they sometimes concealed themselves in a short gallery leading upward at right angles to the main tube about ten inches from the entrance. At first thought, this offshoot seems evidently for escape from danger, but failure to discover any possible enemies on so bleak a coast raises doubt as to this. There are no other kinds of crabs to invade their burrows, and among themselves they fight but little. Only a few times did I see a crab follow another into a hole, one always immediately leaving. Nor are these crabs eaten by the natives, who, moreover, would not be deceived by such a device. This supplementary gallery, so far above the level of the ordinary resting place at the bottom of the tunnel, may have something to do with the necessary reënforcing of the main channel by supplying sand from above after the waves have swept over it. Then, too, it may be a temporary refuge when, at high tide, water fills the lower quarters, for they perish by drowning as surely as from insufficient moisture.

"The easiest way to catch these crabs is to scoop out a hole about a foot wide and two deep. In throwing out the sand, one never fails to

unearth the crab, which for a moment at least may then assume a comatose state. Its revival, however, is so sudden and unexpected that it often makes good its escape while being picked up as half dead. When escaping, generally in zigzags, these crabs suddenly disappear into the loose, hot sand as by enchantment, but shortly emerge again, for they can not stand heat.

"Relatively long legs keep their light body well off the ground and the needle-sharp tips speed along without leaving a mark. With them they dig their burrows, the claws only assisting in carrying to the entrance some of the excavated material, much of which is forced against the sides of the tunnel to strengthen it. When deprived of their refuge, they dart about confusedly and may have a few skirmishes with their nearest neighbors, but generally disappear into the sea after running along the shore for a while. Those starting a new burrow reach a depth of about five inches in a quarter of an hour, but most of such beginnings are soon abandoned and only a few were found completed next day.

"A most curious display they offered when swept off unawares by a wave. Their first frantic struggles to retain hold on the sand were as amusing as their sudden doubling up when the full power of the water exerted itself on the downward sweep. But it was decidedly interesting to see how, at the very moment the wave had spent its force and the crabs could feel ground again, they immediately used all possible speed to keep ahead of the silver border of the new rush that might repeat the catastrophe.

"Both species show great alacrity in feeding, with a predilection for decaying animal and vegetable matter; under certain circumstances, especially at night, they may come in numbers to remains of fish, but they are not really gregarious and shift for themselves. As a rule *O. ippeus* is seen farther down the shore than *O. africana* and more often runs to the water's edge, preferring moister sites, and is less partial to sunshine.

"The cinnamon color of *O. ippeus* appears more yellowish and always lighter on bright days, but when the crabs are taken from their burrows it is considerably darker, as on rainy days or at night, evidently from the effect of the moisture. Some specimens even show a blotched appearance, but seldom with as distinct a reticulated, dark gray pattern as the young. The latter select shallow, sheltered places where twenty or more divert themselves at the edge of a cove, probably for feeding purposes. When approached, they usually dive beneath the sand, which is kept partly floating by the constant play of the waves; they seldom burrow and are rather apt to escape into the sea.

"*O. africana* loves the early morning hours. Then the pink of the finely granulated carapace is brightest, whereas late in the afternoon, when these crabs appear again, or during the rain, the color is indistinct, showing only a faint trace of their former beauty; then from a distance one often is not able to distinguish the two species. Their burrows are somewhat higher up the slopes than those of *O. ippeus*, and only a few feet below the uppermost drift-line, where the water seldom stays very long. Perhaps in their refuges they are less dependent on moisture than their close relatives. In the open they show a great preference for remaining near the streak of moist sand just above the surf-line, where countless tiny burrows of sand fleas (amphipods) give the surface a rough, pitted aspect." (H. L.)

#### **Uca** Leach

*Uca* LEACH, 1814, *Edinburgh Encyc.*, VII, p. 430.

#### **Uca tangeri** (Eydoux)

Plates XLV, Figures 3 and 4, LIV

*Gelasimus tangeri* EYDOUX, 1835, *Mag. de Zool.*, Cl. 7, Pl. xiv, colored.

*Uca tangeri* RATHBUN, 1900, *Proc. U. S. Nat. Mus.*, XXII, p. 276; 1918, *Bull. U. S. Nat. Mus.*, No. 97, p. 387, Pls. cxxxv and cxxxvi, and synonymy.

*Localities*.—Moanda; July 1915; 2 ♂♂, 2 ♀♀. Banana; July and August 1915; 67 ♂♂, 54 ♀♀ (2 ovig.), 4 young. San Antonio; August 1915; 2 ♂♂, 1 ♀.

*Range*.—From Portugal to northern and western coasts of Africa, as far as Algiers and Angola. Also reported from the West Indies and with doubt from Bahia.

*Description*.—Carapace much narrower posteriorly than anteriorly in the male, less so in the female; surface rough with irregular tubercles and granules; the front occupies about two-fifths of the anterior margin. The exposed surface of the large cheliped is coarsely tuberculate; there is a very strong, right-angled ridge within the palm; the very elongate fingers are thin, flat, closely granulate, the immovable finger is widest near the middle, dactylus more slender, gradually tapering to the tip.

"The fiddler crabs nearly always occur in numbers, are diurnal in habits, and naturally arouse considerable interest. On the upper parts two general tones prevail—dark reddish brown and yellow, with transitions between. The bigger shears of the male vary in practically the same manner; in some dusky blue is distinct. The tiny claws of the female are paler, even pink or cream. There is evidently but one species about Banana, though specimens of all colors and sizes and from every possible nearby locality are represented in the collection.

"They were common only in highly brackish water and avoided the open seashore. In the bay east of Banana peninsula they lived in numbers on smooth, sandy flats completely submerged at high tide. Some of the edges of mangrove swamps (Pls. LVI, fig. 2 and LX, fig. 2), both muddy and sandy, literally swarmed with them on either shore of the Congo; in San Antonio they also frequented sites resembling salt marshes.

"Shortly after the tide receded the sand was pushed up from below and pressed outside, mainly with the part of the big claw in front of the wrist by the males, and mostly with the carapace by the females. The amount of sand thus evacuated showed that only two or three inches of their burrows had been obstructed by the passing tide. The slightly slanting tunnel is somewhat wider than the carapace and in sandflats may be a foot deep; there are usually no side shoots, but in densely inhabited places they often intersect.

"When feeding, these crabs use their smaller claw, which supplies enough food to keep the mouth-parts steadily moving. Though attracted by decomposed vegetable and animal matter and even human feces, near Banana they practically 'grazed' on the hardly visible surface film left by the retreating tide upon sand and mud, consisting chiefly of tiny algæ and plankton.

"In one place hundreds of fiddler crabs used to convene regularly to go through their strange antics. One of their pastimes seems to be the moving of their big claws in a most monotonous fashion. On observing their often threatening gestures among themselves one feels that they would not mind other disturbance. Yet at the first sign of danger from without, harmony is restored, and all hurry towards numerous open holes, which great colonies have dug beneath and between protecting roots." (H. L.)

#### Superfamily **Oxyrhyncha**

##### **Inachidæ**

##### **Pisa** Leach

*Pisa* LEACH, 1814, Edinburgh Encyc., VII, p. 431.

##### **Pisa carinimana** Miers

Plate XVIII, Figures 1 and 2; Text Figure 22

*Pisa carinimana* MIERS, 1879, Ann. Mag. Nat. Hist., (5) IV, p. 11, Pl. iv, figs. 6, 6a, Canaries; 1881, Ann. Mag. Nat. Hist., (5) VIII, p. 207.

*Localities*.—San Antonio; August 1915; 1 young ♀. St. Paul de Loanda; September 23, 1915; 1 ♀ ovig.

*Range*.—Canary Islands (Miers); Gorée Bay, Senegambia, 9 to 15 fathoms (Miers); mouth of the Congo, 44 meters (Doflein); San Antonio and St. Paul de Loanda, Angola.

*Measurements*.—Female from St. Paul de Loanda: length of carapace on median line, 12.7; length to end of rostrum, 14.8; width, 11.5 mm.

*Description*.—A small species, with its carapace covered with a short pubescence and a few longer curled hairs. A spine at the posterolateral angle of the carapace, a shorter, branchial spine in the same transverse line and, in front of that, a low tubercle.

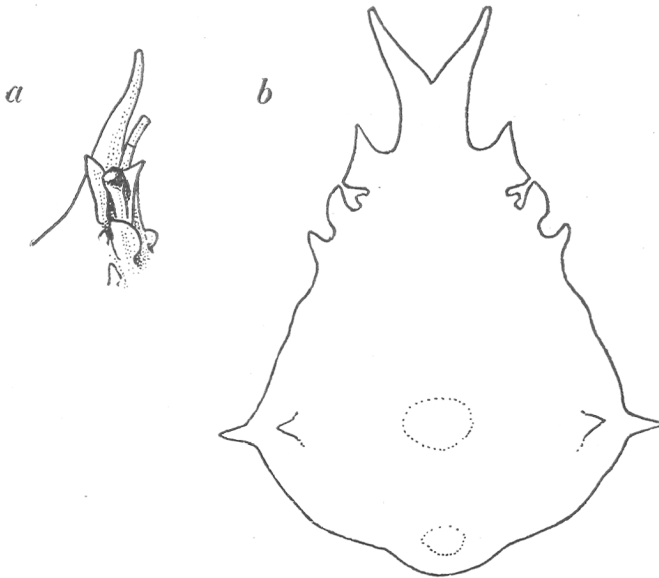


Fig. 22. *Pisa carinimana*, female, total length of carapace 14.8 mm.

*a*, side view of orbital region; *b*, carapace.

A stout, oblong protuberance on the hepatic margin, and a few low tubercles on the gastric region. Cardiac region very convex, elevated and rounded. Rostrum divided for more than half its length, horns very divergent, slender, acuminate. Supraocular cave a broad, alate expansion; supraorbital tooth pointing outward and free on either side; postocular cup somewhat crescent-shaped in dorsal view, ovate in ventrolateral view. A row of tubercles on the pterygostomian and the subbranchial region.

Chelipeds shorter than the first pair of legs, in the female slender, in the male stouter; wrist irregularly carinate. Last three pairs of legs short, diminishing in length to the posterior pair.

"When the equinoctial tides are at their lowest, the interesting marine fauna in the more shallow portions of the harbor of St. Paul de Loanda can be easily reached. Among the attractions are the fragile shells of *Pinna*, always associated with a firm cluster of other sea animals,

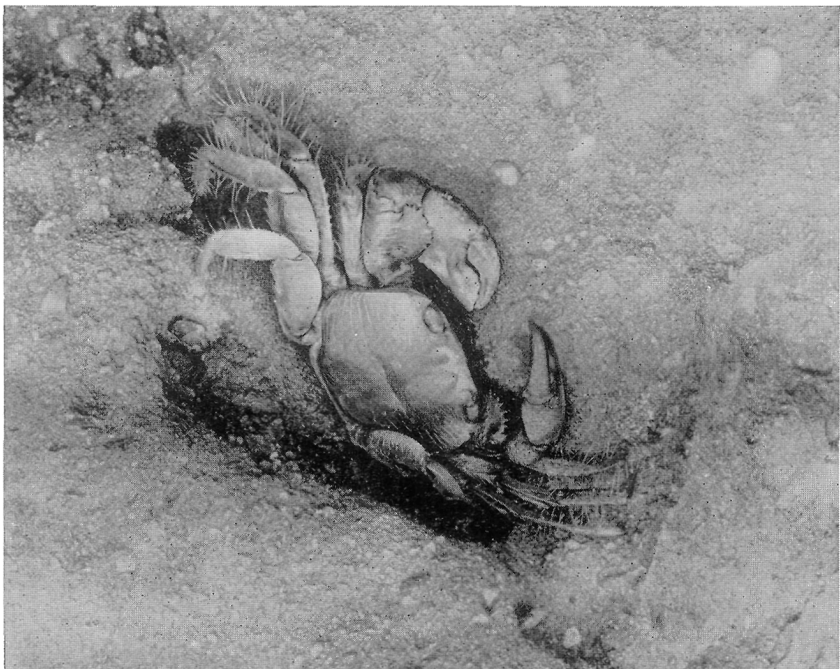
chiefly ascidians and sponges, which completely surround the upper, outstanding portion of these huge shells. This mass is generally irregular and brownish, looking in all respects like many others on the bottom of the bay. As one inserts both hands below such lumps, one incidentally comes across those that hide the *Pinna*, which can then be slowly lifted from the sand with its large byssus still adhering. This proved a fruitful way to collect several species of mollusks and crustaceans, which are well concealed. In one such mass this crab was found, its carapace being completely covered by a sponge which rendered it invisible; it was taken at only four feet below the surface. The one from San Antonio was found among clusters of gigantic barnacles washed into a coral reef somewhat south of Padron Point." (H. L.)



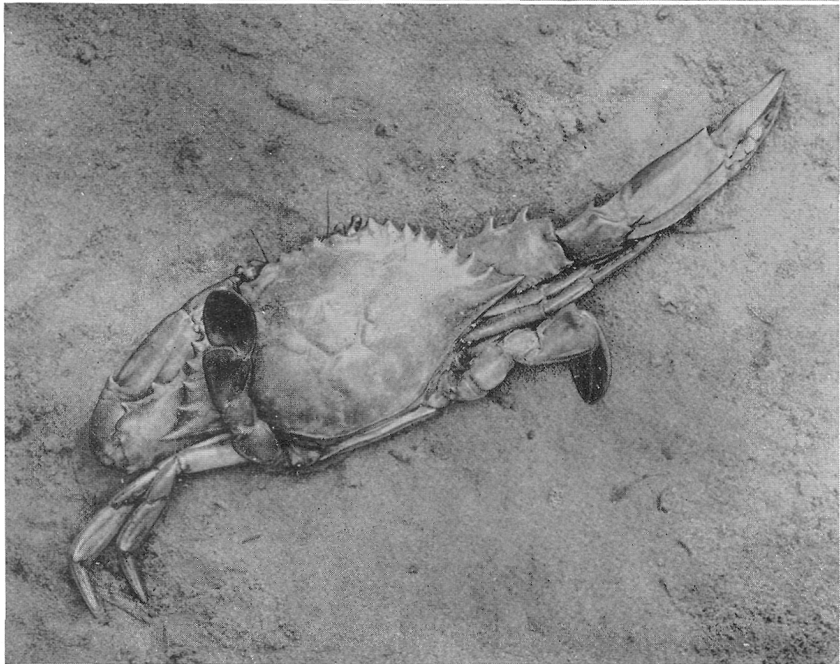
PLATE XV

Fig. 1. *Geograpsus lividus*, freshly killed specimen in characteristic habitat, Banana. Reduced.

Fig. 2. *Callinectes latimanus*, freshly killed specimen in characteristic attitude in shallow water, Banana. Reduced. See p. 398.



1



2

PLATE XVI

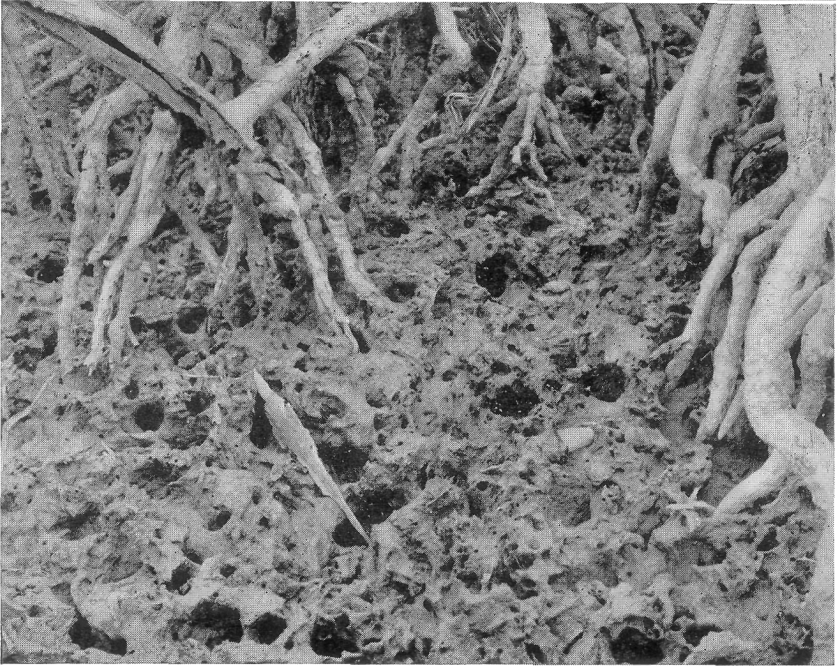
Fig. 1. *Sarmatium curvatum*, freshly killed specimen in characteristic habitat, Banana. Reduced.

Fig. 2. Habitat of *Sarmatium curvatum* near Banana. Reduced. See p. 454.

"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*) 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*). Young eels and a few other creatures also use the tunnels as refuges." (H. L.)



1



2

PLATE XVII

Fig. 1. View showing habitat of *Cardisoma armatum*, with crab near mouth of burrow, Banana. Much reduced.

Fig. 2. Detail of Fig. 1 on a larger scale.



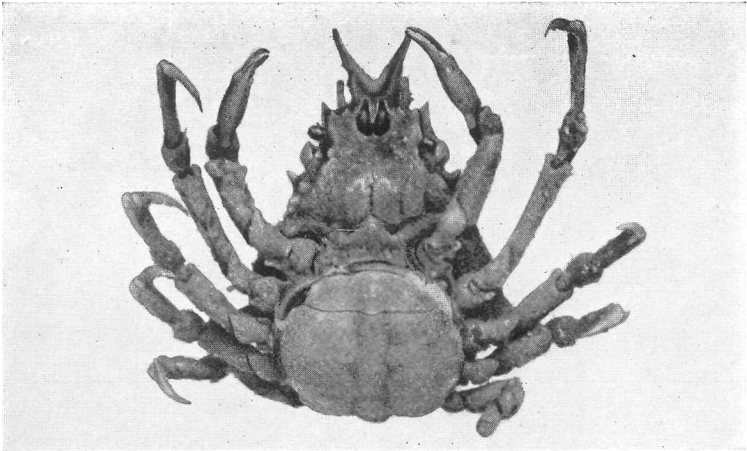
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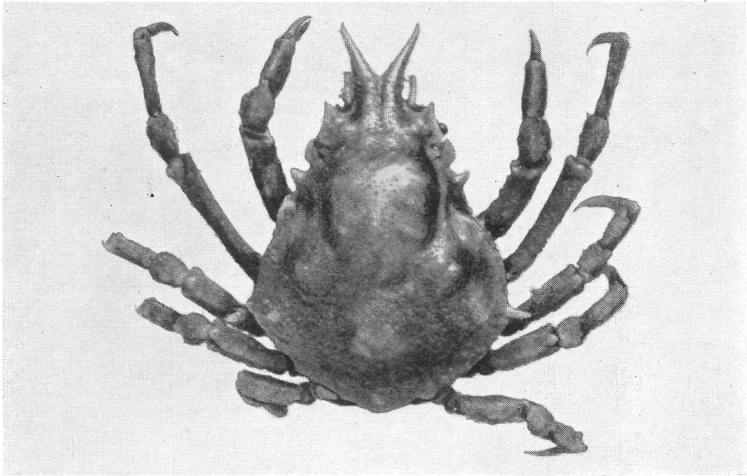
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PLATE XVIII

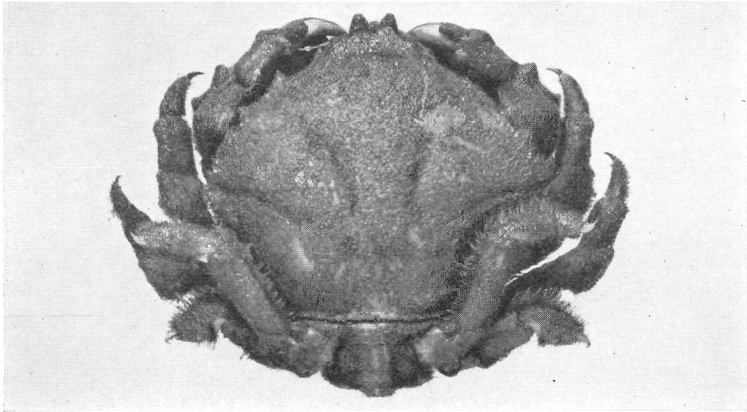
- Fig. 1. *Pisa carinimana*, female, 14.8 mm. long, St. Paul de Loanda, ventral view.  
Fig. 2. Same, dorsal view.  
Fig. 3. *Dromia atlantica*, female, 30 mm. wide, St. Paul de Loanda, dorsal view.



1



2



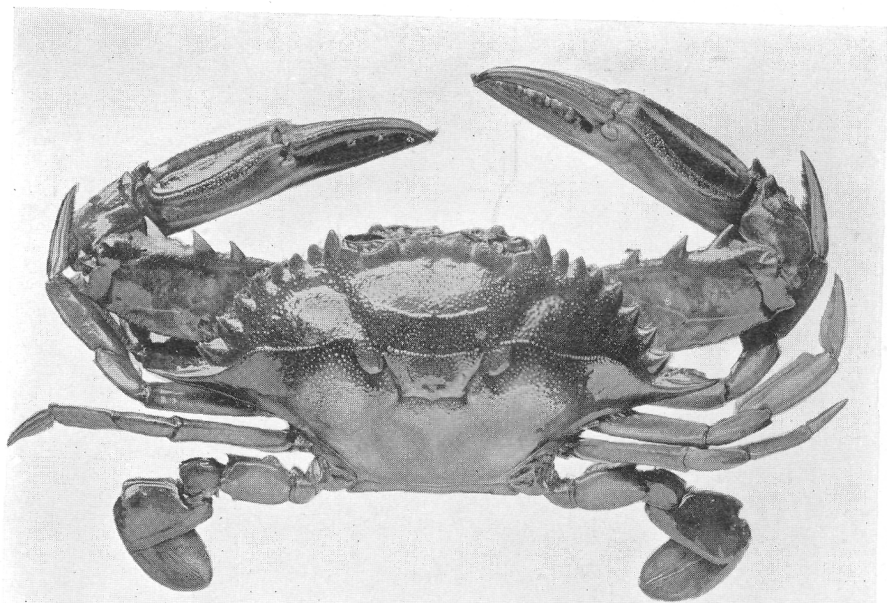
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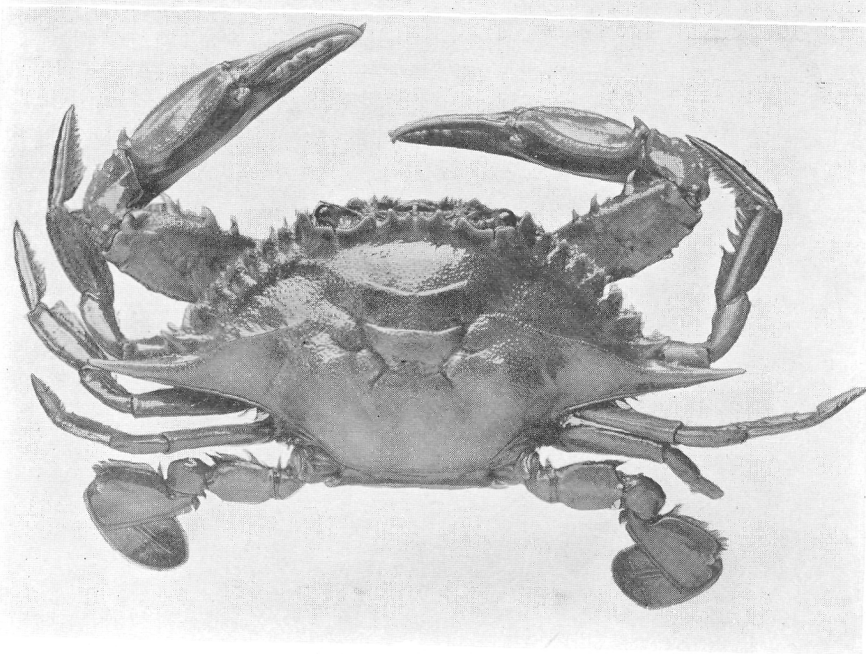
PLATE XIX

Fig. 1. *Callinectes marginatus*, male, 101 mm. wide, Banana, dorsal view.

Fig. 2. *Callinectes gladiator*, male, 78.7 mm. wide, San Antonio, dorsal view.



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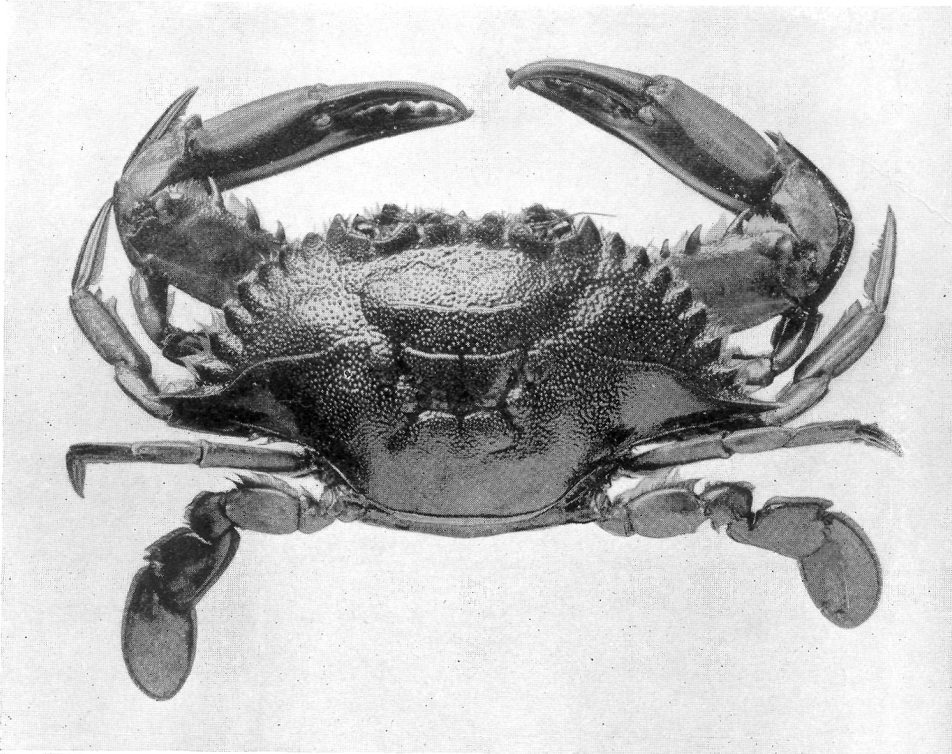


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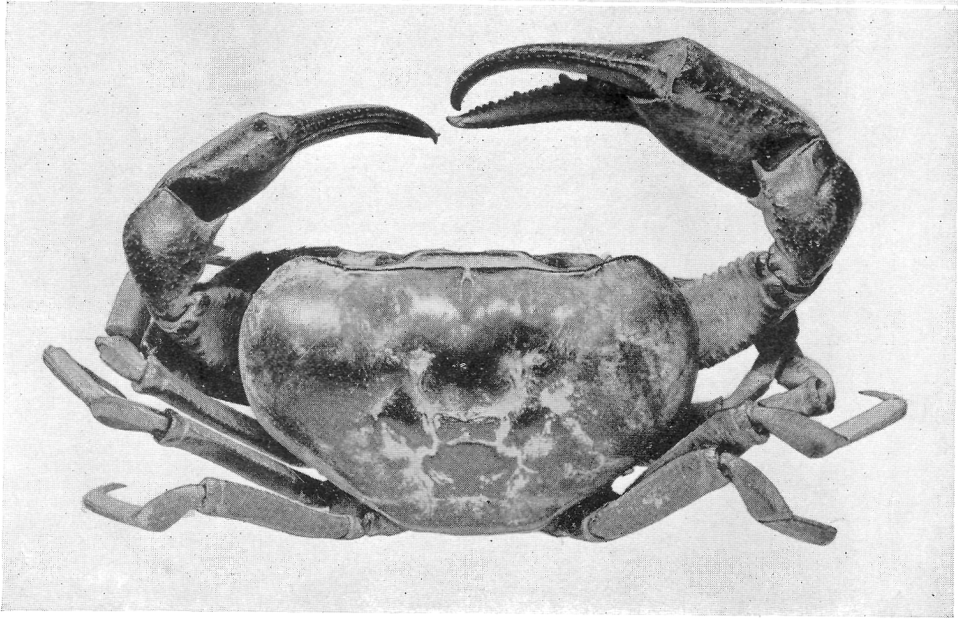
PLATE XX

Fig. 1. *Callinectes marginatus*, female, 85 mm. wide, Banana, dorsal view.

Fig. 2. *Potamon (Potamonautes) floweri*, male, 59.8 mm. wide, Nepoko River, dorsal view.



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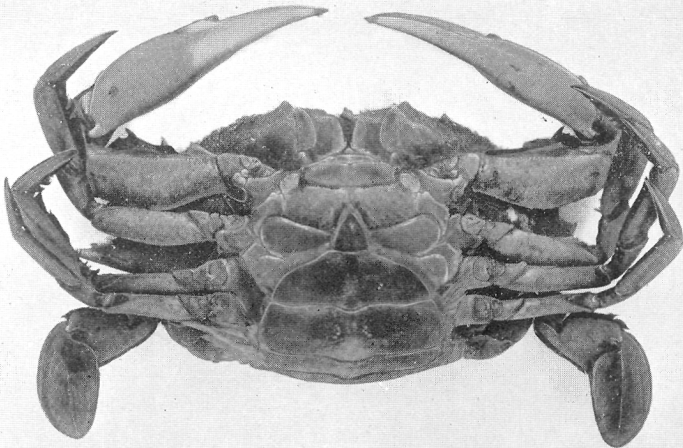


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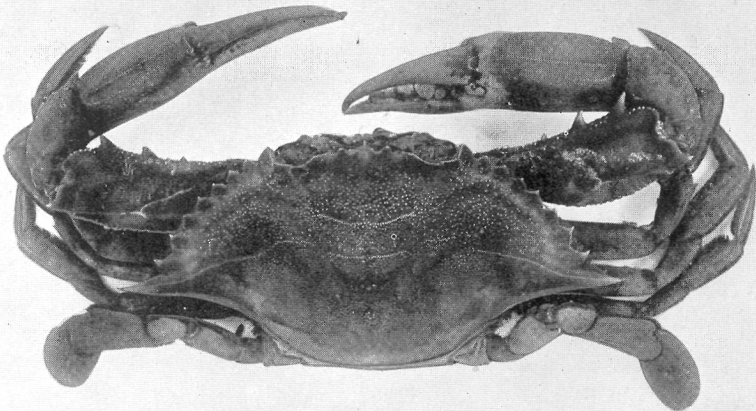
PLATE XXI

*Callinectes latimanus*

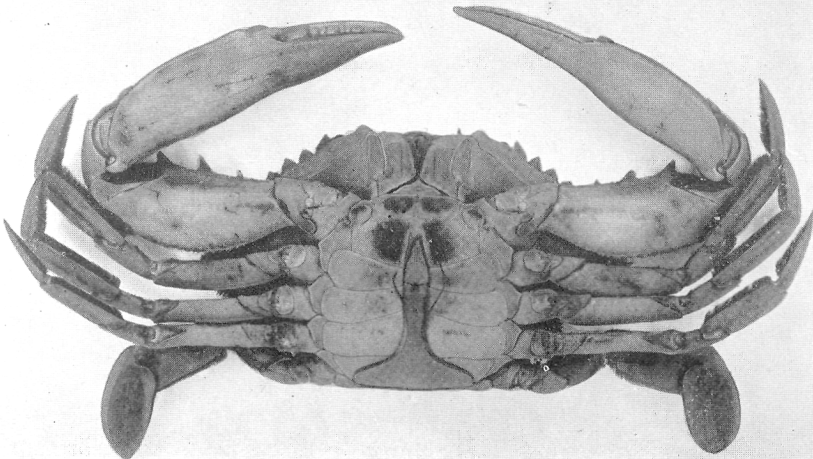
- Fig. 1. Female, 130 mm. wide, A. M. N. H. No. 3112, ventral view.
- Fig. 2. Male, 142 mm. wide, A. M. N. H. No. 3272, dorsal view, carapace fore-shortened.
- Fig. 3. Same specimen, ventral view.



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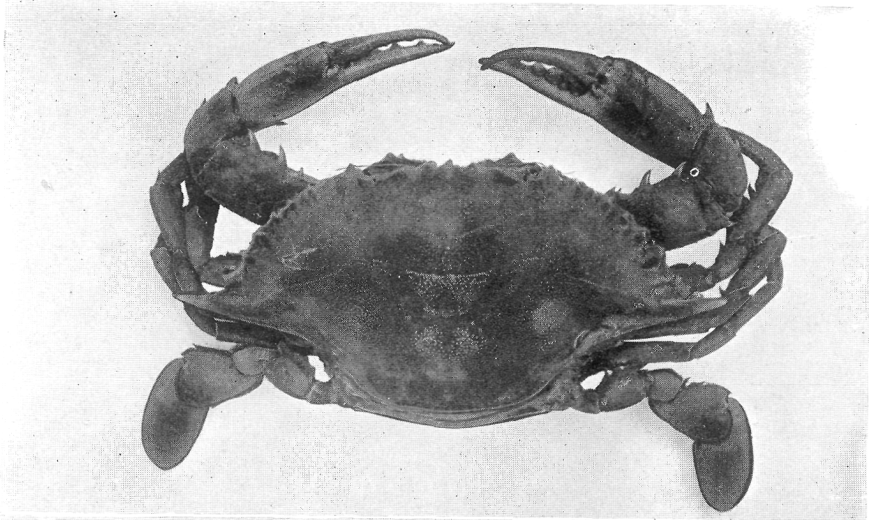
3

PLATE XXII

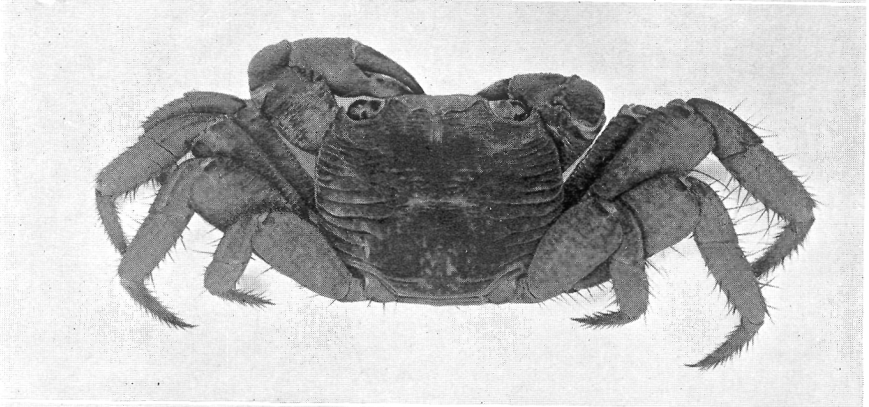
Fig. 1. *Callinectes latimanus*, female, 130 mm. wide, A. M. N. H. No. 3112, dorsal view.

Fig. 2. *Geograpsus lividus*, male, 35 mm. wide, A. M. N. H. No. 3069, dorsal view.

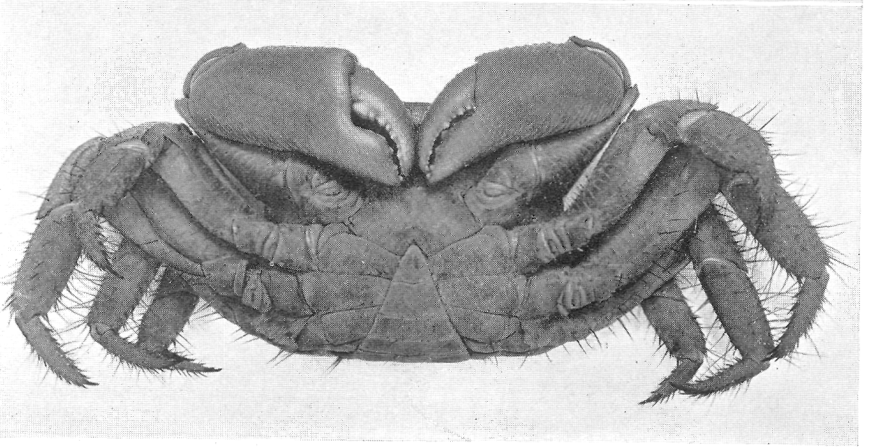
Fig. 3. Same species, very large male, A. M. N. H. No. 3069, ventral view.



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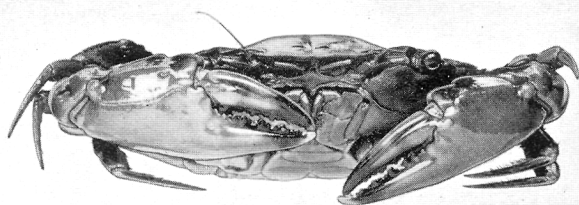
PLATE XXIII

*Thalamita africana*, St. Paul de Loanda

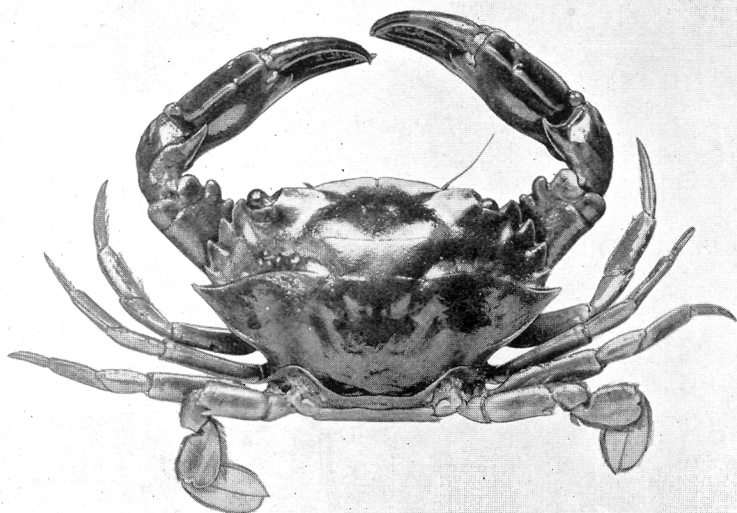
Fig. 1. Male, 41 mm. wide, front view.

Fig. 2. Same, dorsal view.

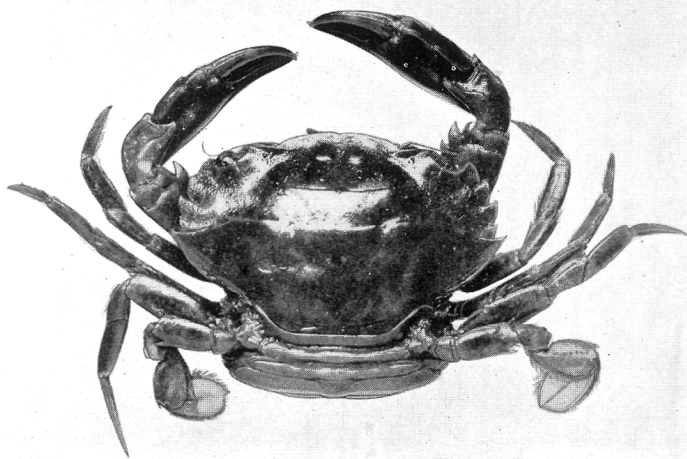
Fig. 3. Female, 29.4 mm. wide, dorsal view.



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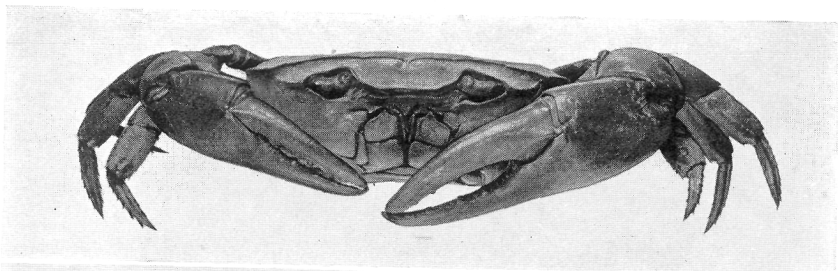
PLATE XXIV

*Potamon (Potamonautes) dybowskii*, male, 58.6 mm. wide, Nepoko River

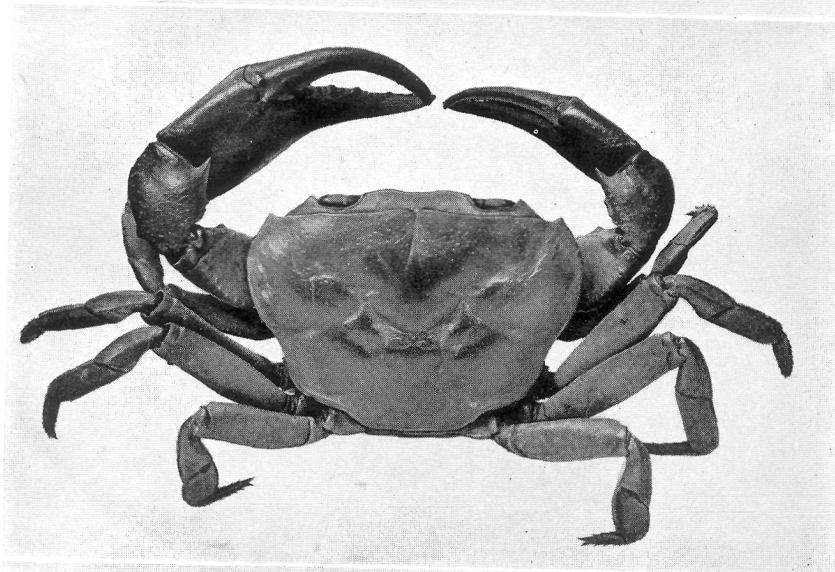
Fig. 1. Front view.

Fig. 2. Dorsal view.

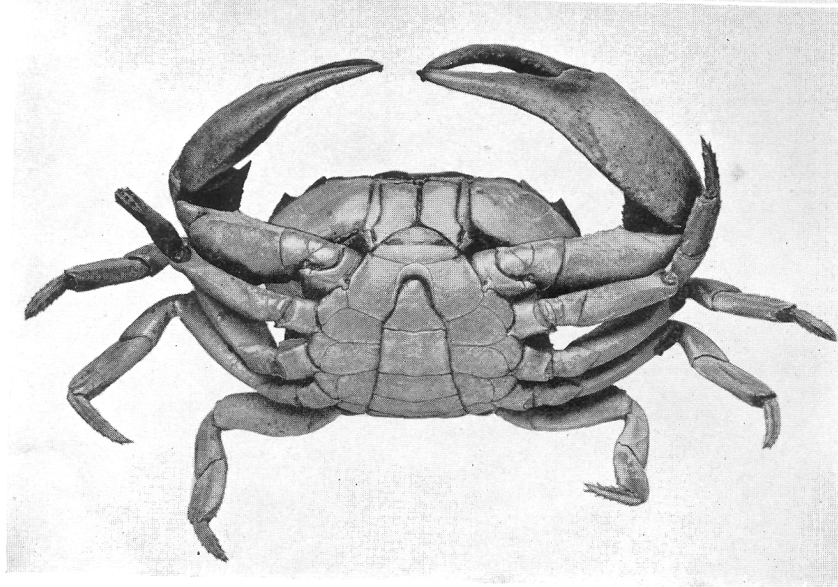
Fig. 3. Ventral view.



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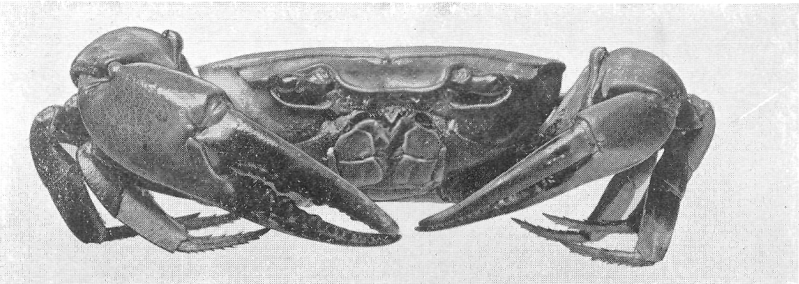
PLATE XXV

*Potamon* (*Potamonautes*) *lirrangensis*, male, 62 mm. wide, Stanleyville

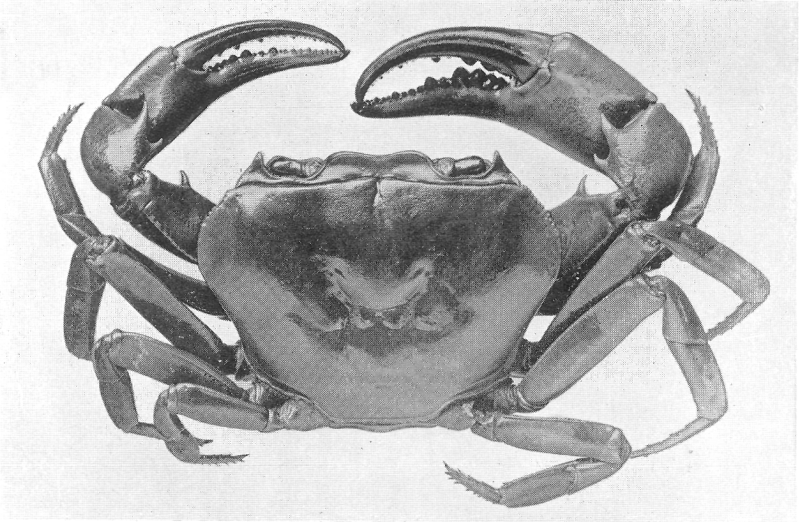
Fig. 1. Front view.

Fig. 2. Dorsal view.

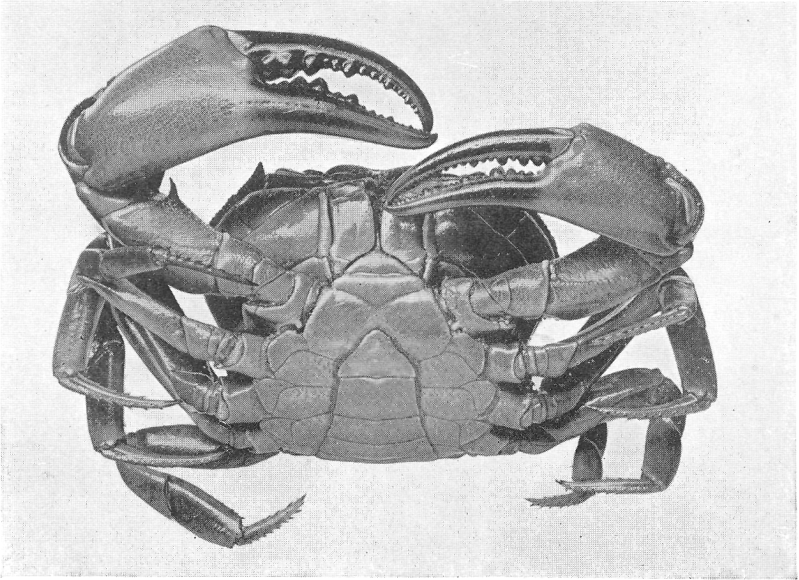
Fig. 3. Ventral view.



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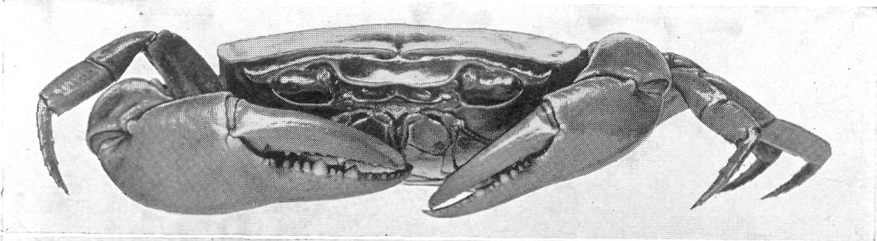
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PLATE XXVI

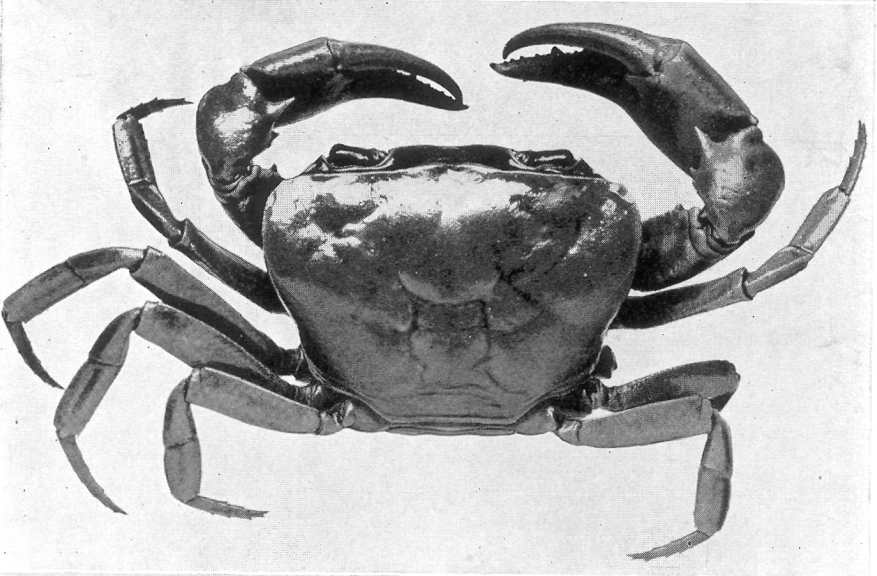
Fig. 1. *Potamon (Potamonautes) stanleyensis*, male holotype, 34.7 mm. wide, front view.

Fig. 2. Same, dorsal view.

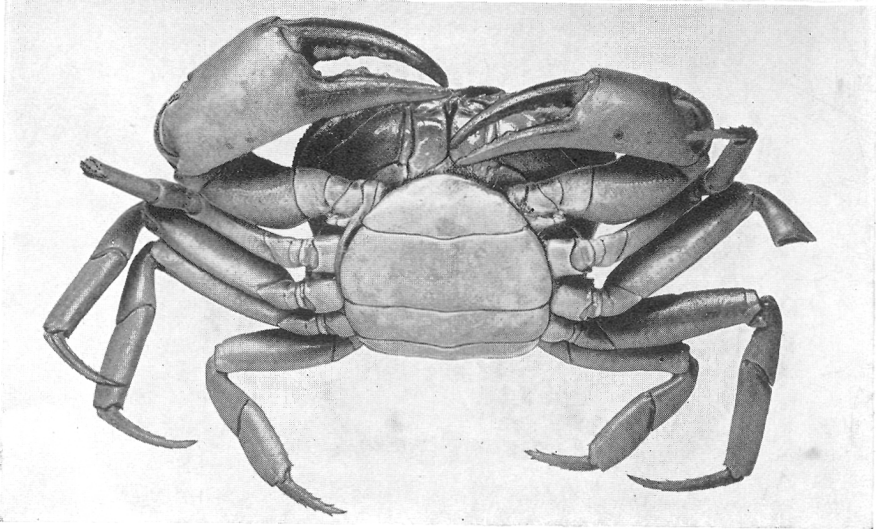
Fig. 3. *Potamon (Potamonautes) lirrangensis*, female, 61 mm. wide, Stanleyville, ventral view.



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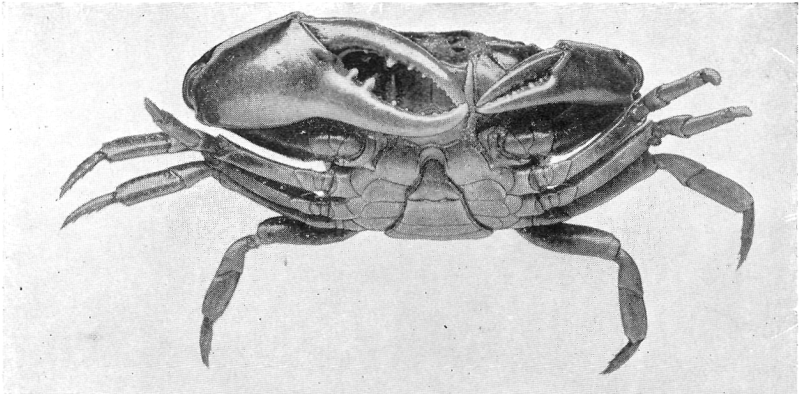
PLATE XXVII

*Potamon (Potamon) ballayi*, Stanleyville

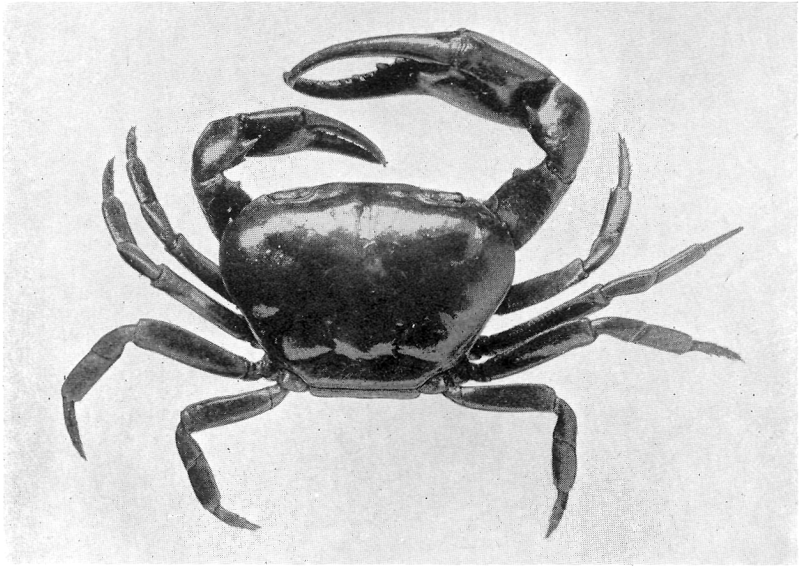
Fig. 1. Male, 27.4 mm. wide, ventral view.

Fig. 2. Same, dorsal view.

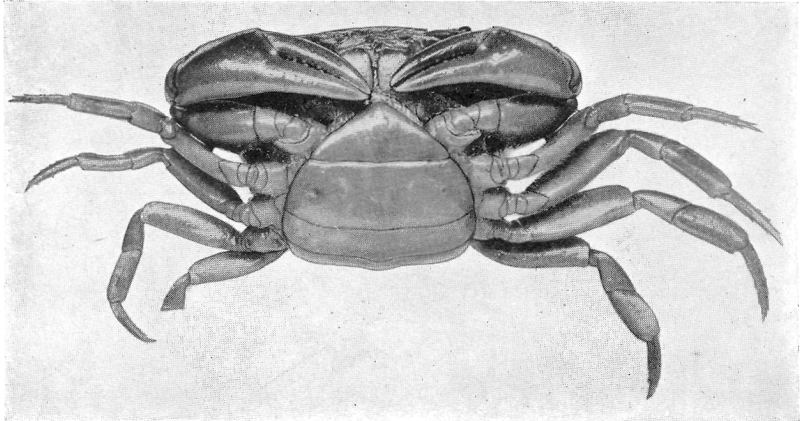
Fig. 3. Female, 29.8 mm. wide, ventral view.



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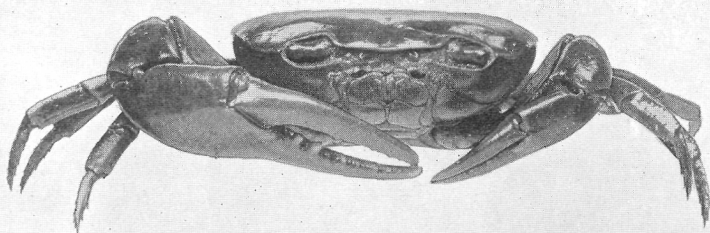
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PLATE XXVIII

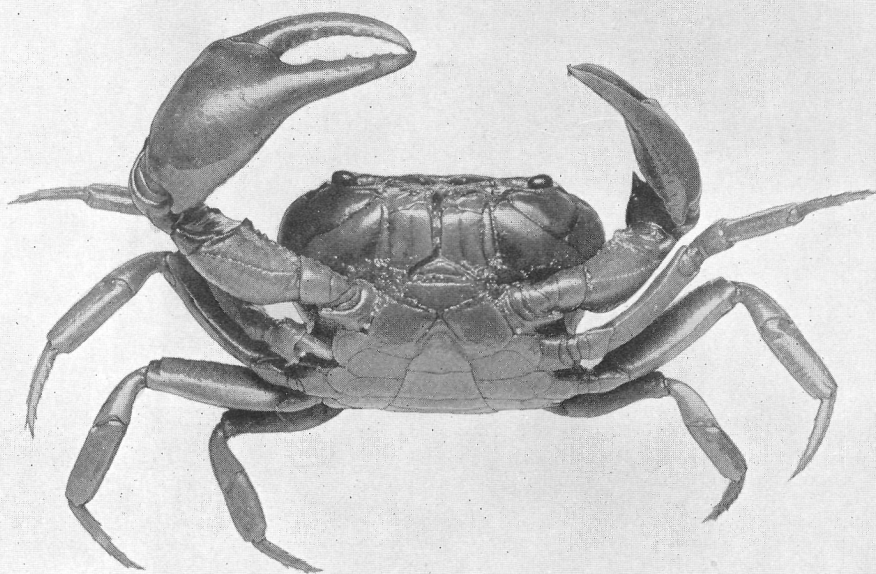
Fig. 1. *Potamon (Potamon) ballayi*, male, 27.4 mm. wide, Stanleyville, front view.

Fig. 2. *Potamon (Geothelphusa) perparvus*, male holotype, 19.6 mm. wide, ventral view.

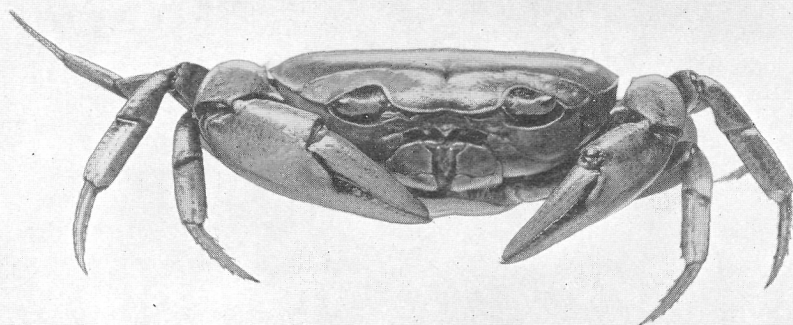
Fig. 3. *Potamon (Geothelphusa) congoënsis*, female, 31.7 mm. wide, Poko, front view.



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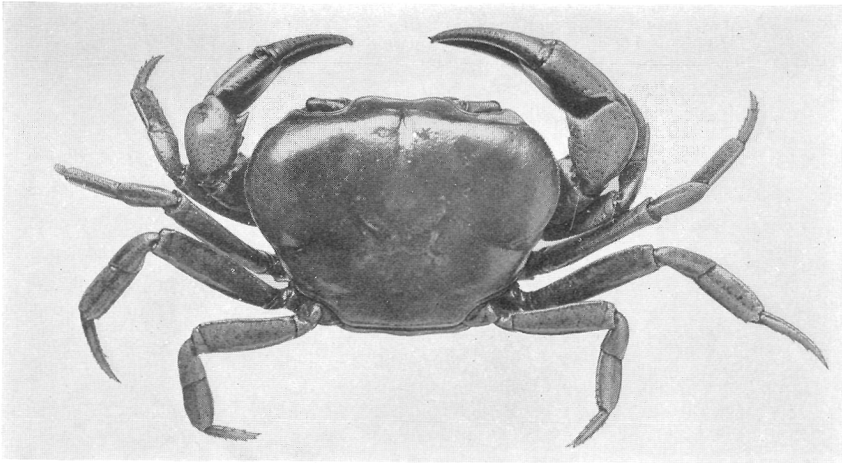


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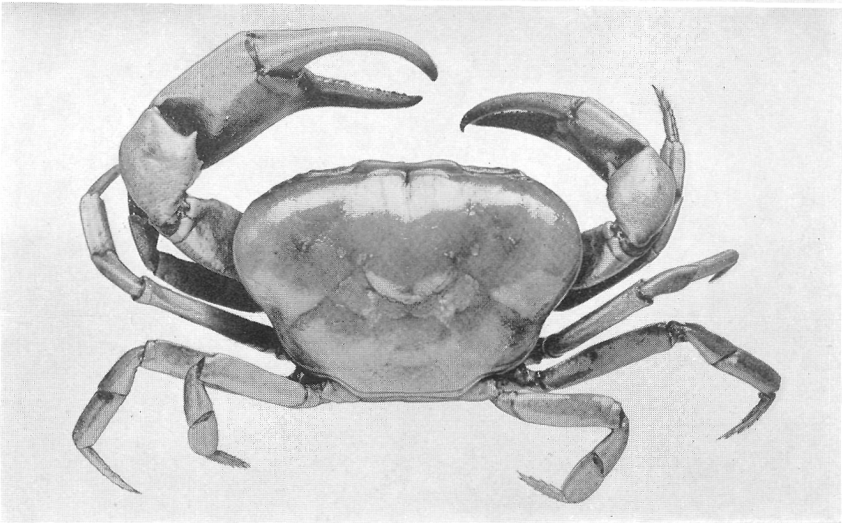
PLATE XXIX

*Potamon (Geothelphusa) congoënsis*

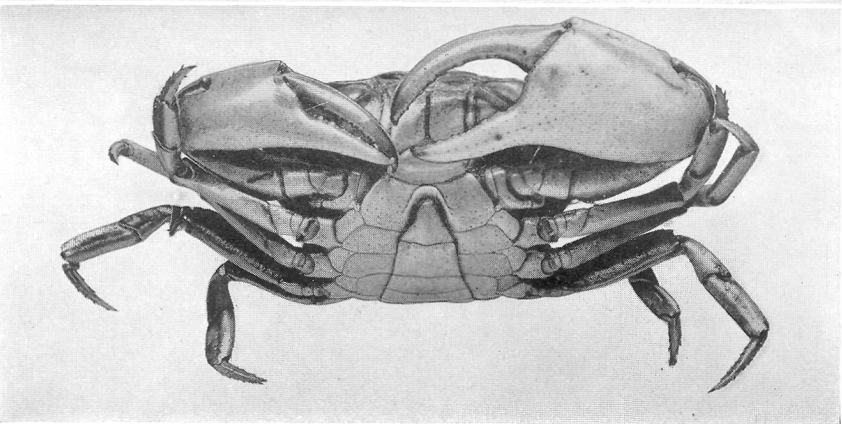
- Fig. 1. Female, 31.7 mm. wide, Poko, dorsal view.  
Fig. 2. Male holotype, 44 mm. wide, dorsal view.  
Fig. 3. Same, ventral view.



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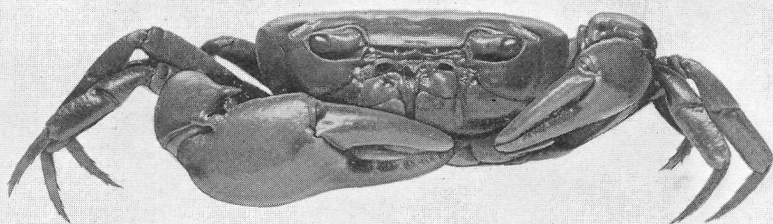


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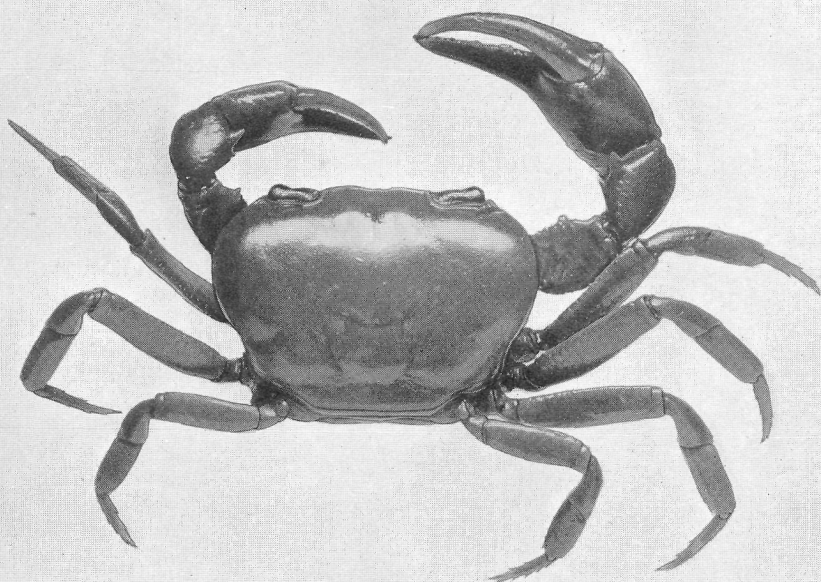
PLATE XXX

*Potamon (Geothelphusa) perparvus*

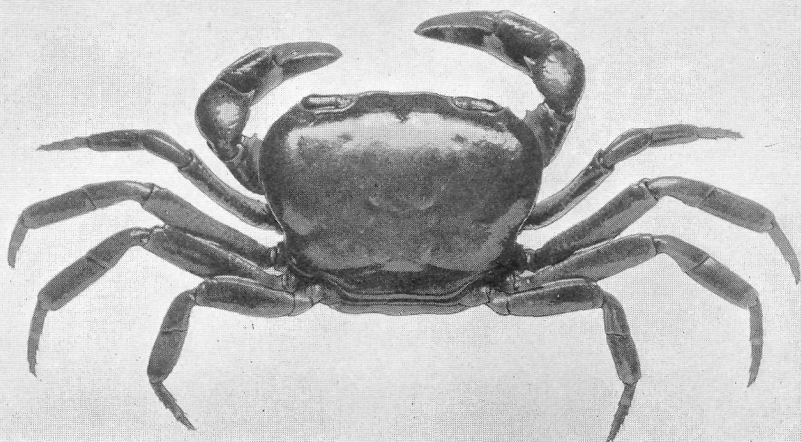
- Fig. 1. Male holotype, 19.6 mm. wide, front view.  
Fig. 2. Same, dorsal view.  
Fig. 3. Female, 17.2 mm. wide, Stanleyville, dorsal view.



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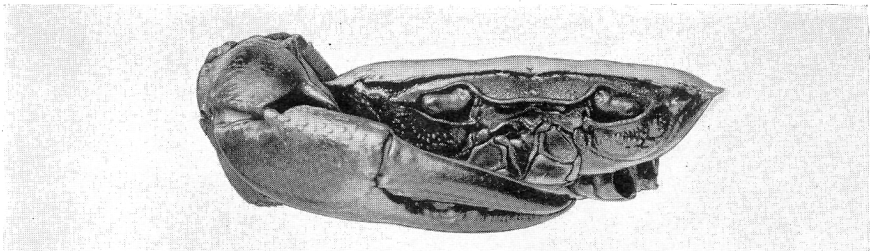
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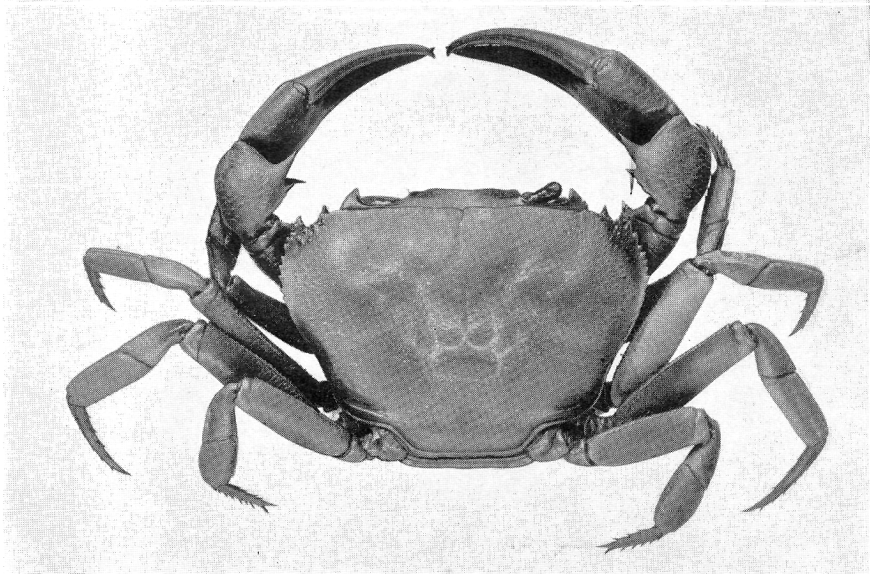
PLATE XXXI

*Potamon (Acanthothelphusa) faradjensis*

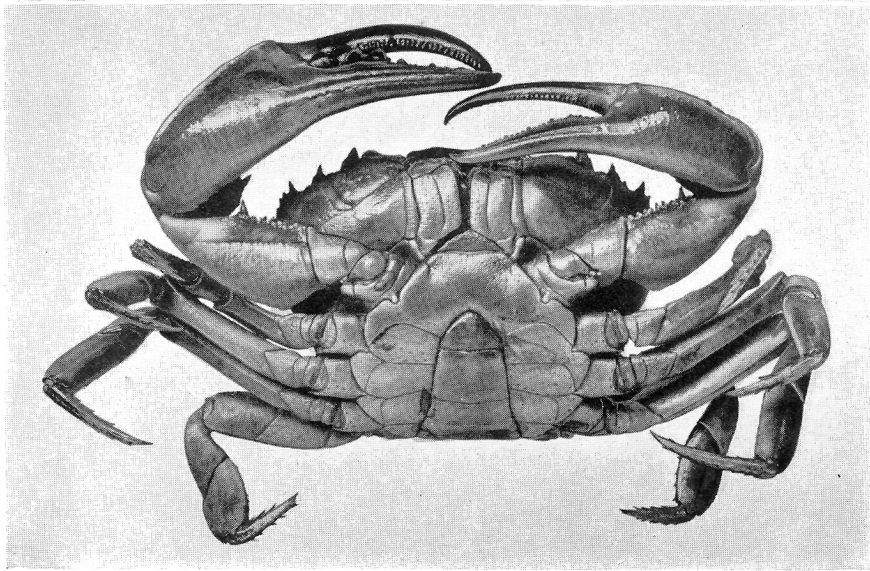
- Fig. 1. Male holotype, 74 mm. wide, front view.  
Fig. 2. Female, 68.5 mm. wide, Faradje, dorsal view.  
Fig. 3. Male holotype, ventral view.



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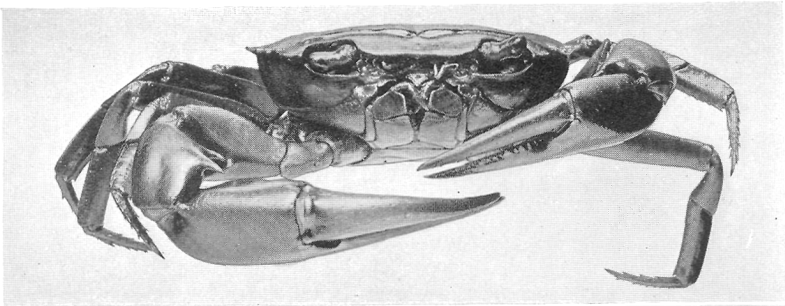
PLATE XXXII

*Potamon (Acanthothelphusa) langi*, male holotype, 49 mm. wide

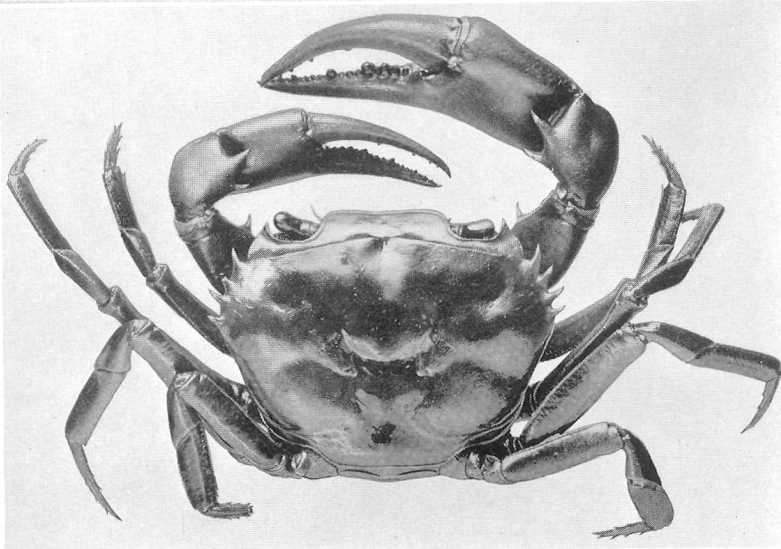
Fig. 1. Front view.

Fig. 2. Dorsal view.

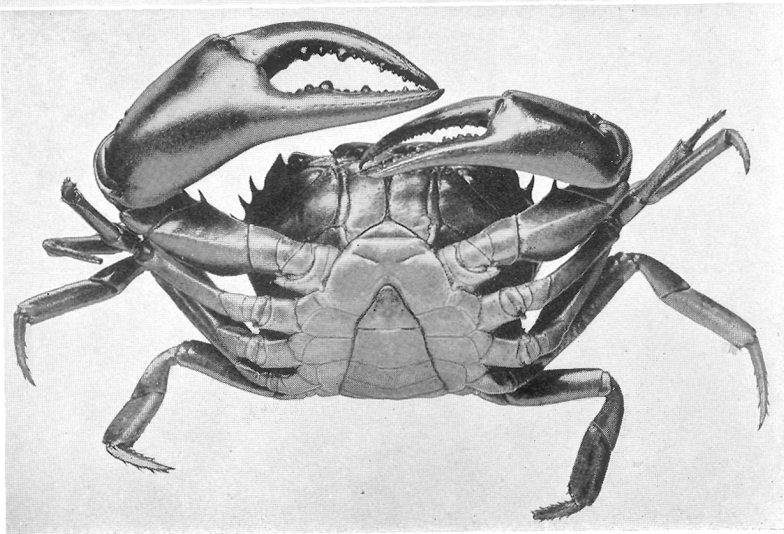
Fig. 3. Ventral view.



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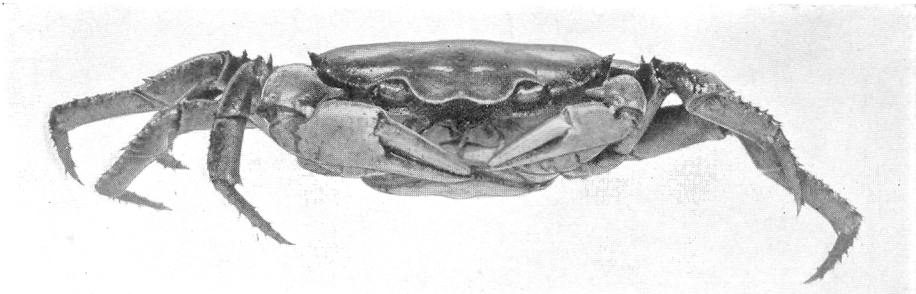
PLATE XXXIII

*Erimetopus brazzae*, female, 82 mm. wide, Leopoldville

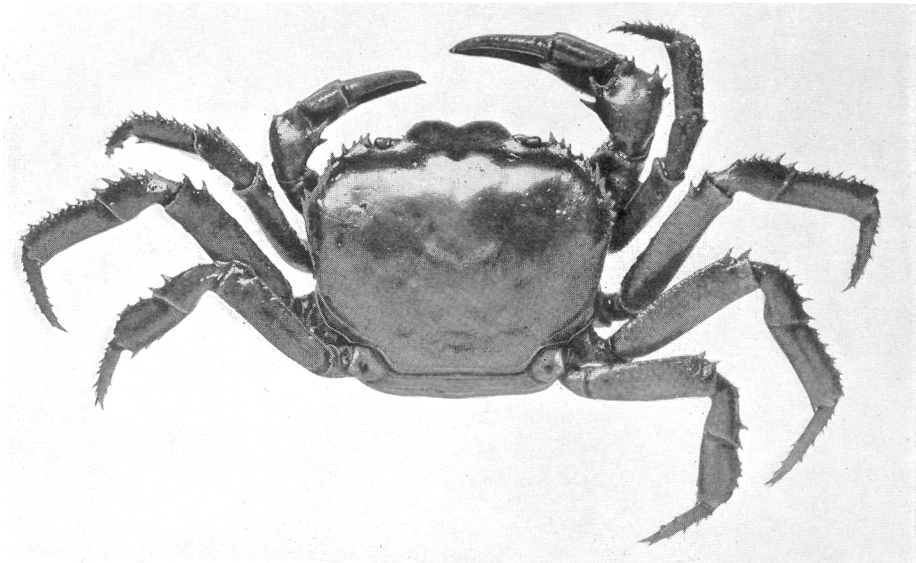
Fig. 1. Front view.

Fig. 2. Dorsal view.

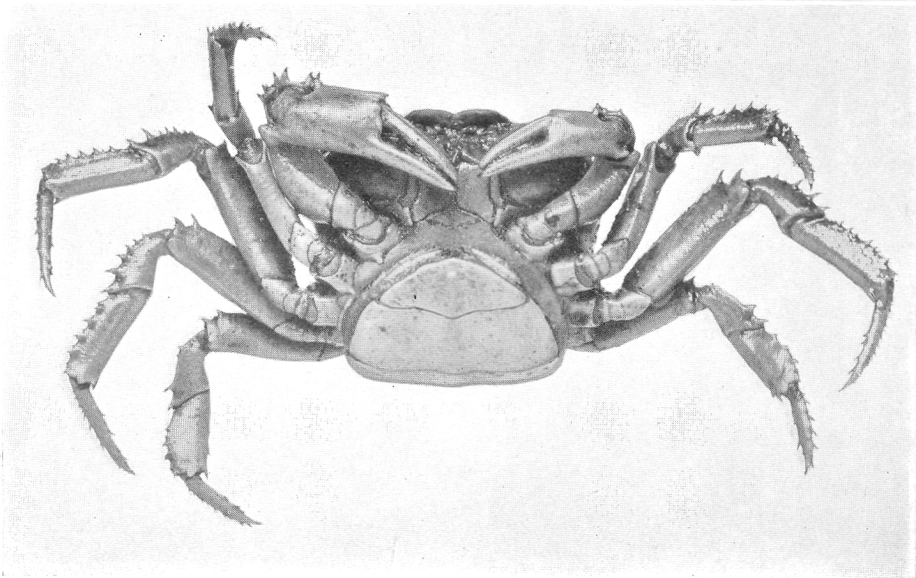
Fig. 3. Ventral view.



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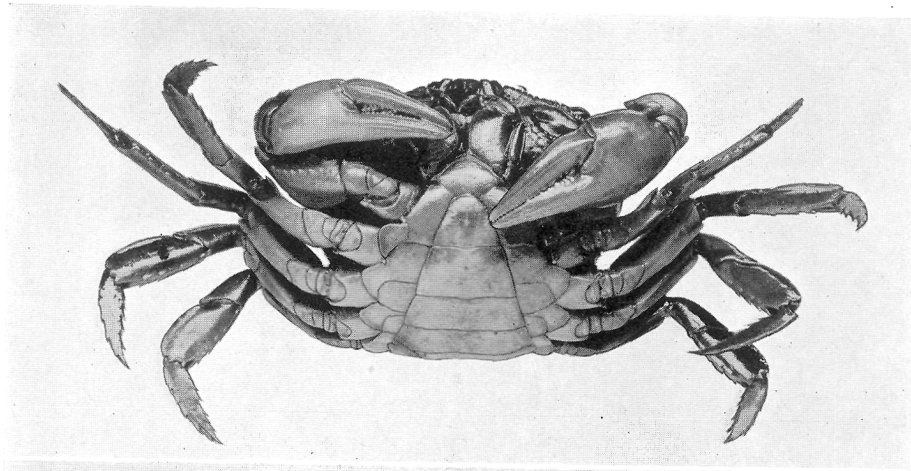
PLATE XXXIV

*Deckenia mitis*, male, 36 mm. wide, U. S. N. M. No. 32298

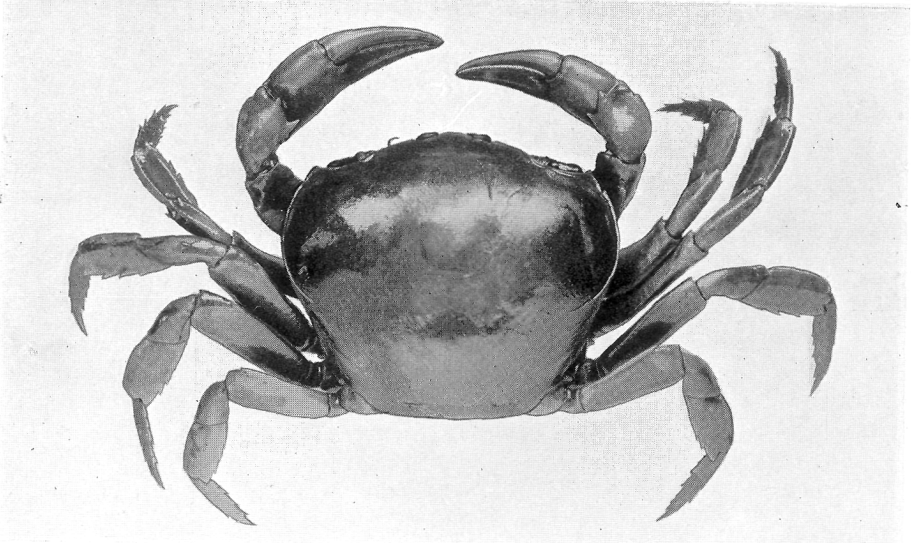
Fig. 1. Ventral view.

Fig. 2. Dorsal view.

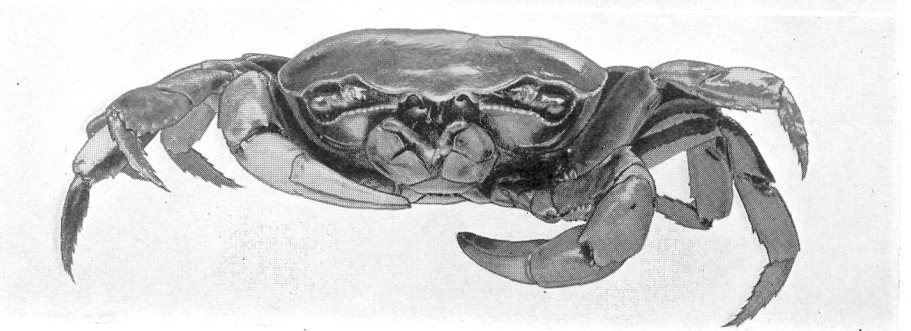
Fig. 3. Front view.



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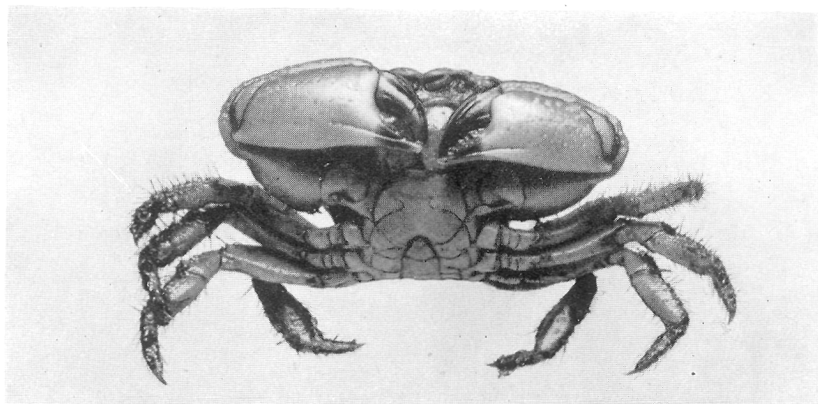


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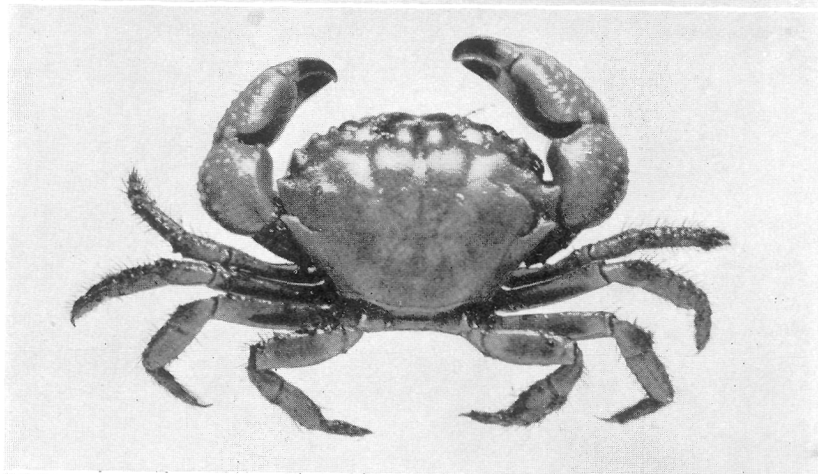


PLATE XXXV

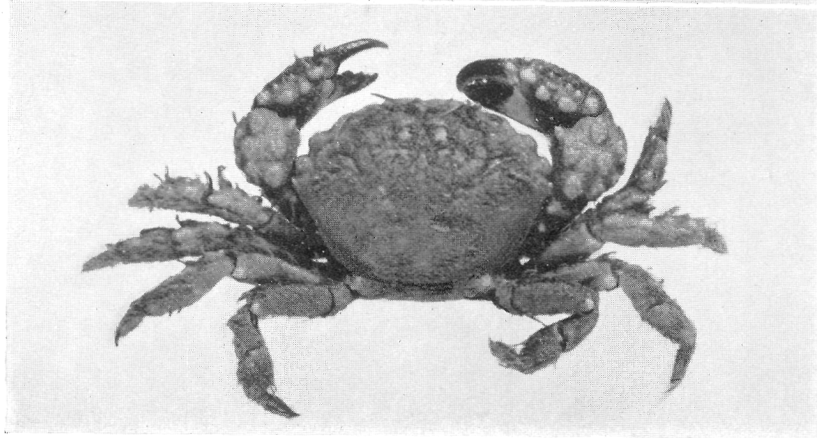
- Fig. 1. *Menippe nanus*, male, 10.7 mm. wide, Padron Point, ventral view.
- Fig. 2. Same, dorsal view.
- Fig. 3. *Pilumnus verrucosipes*, female, 9.6 mm. wide, St. Paul de Loanda, dorsal view.



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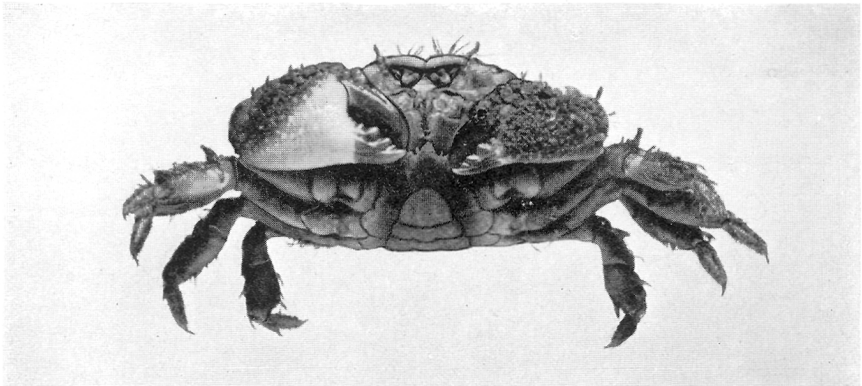
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PLATE XXXVI

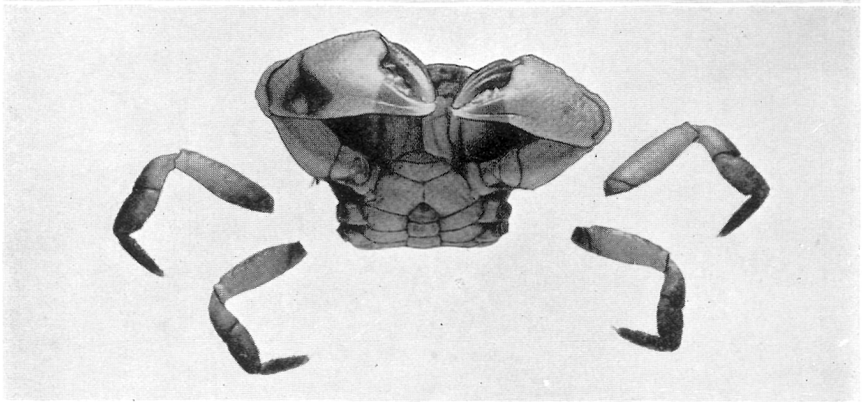
Fig. 1. *Pilumnus verrucosipes*, female, 9.6 mm. wide, St. Paul de Loanda, ventral view.

Fig. 2. *Eurypanopeus blanchardi* (?), male, 9.3 mm. wide, San Antonio, ventral view of body, chelipeds and four loose legs.

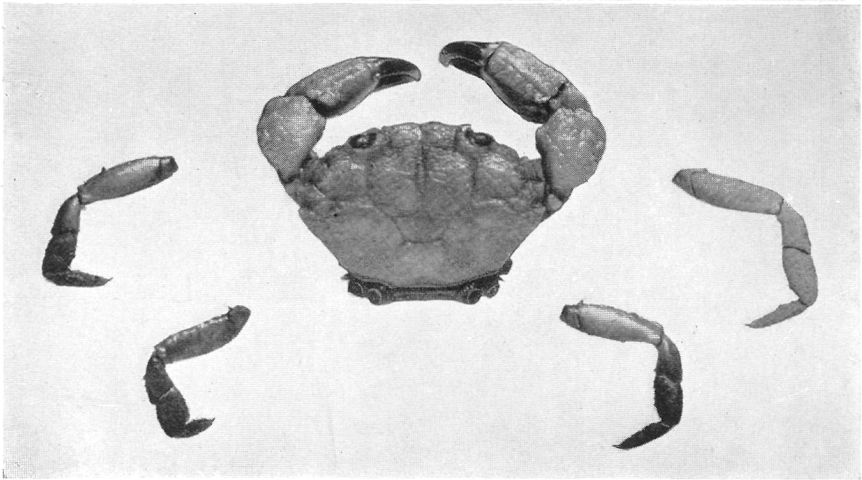
Fig. 3. Same, dorsal view.



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PLATE XXXVII

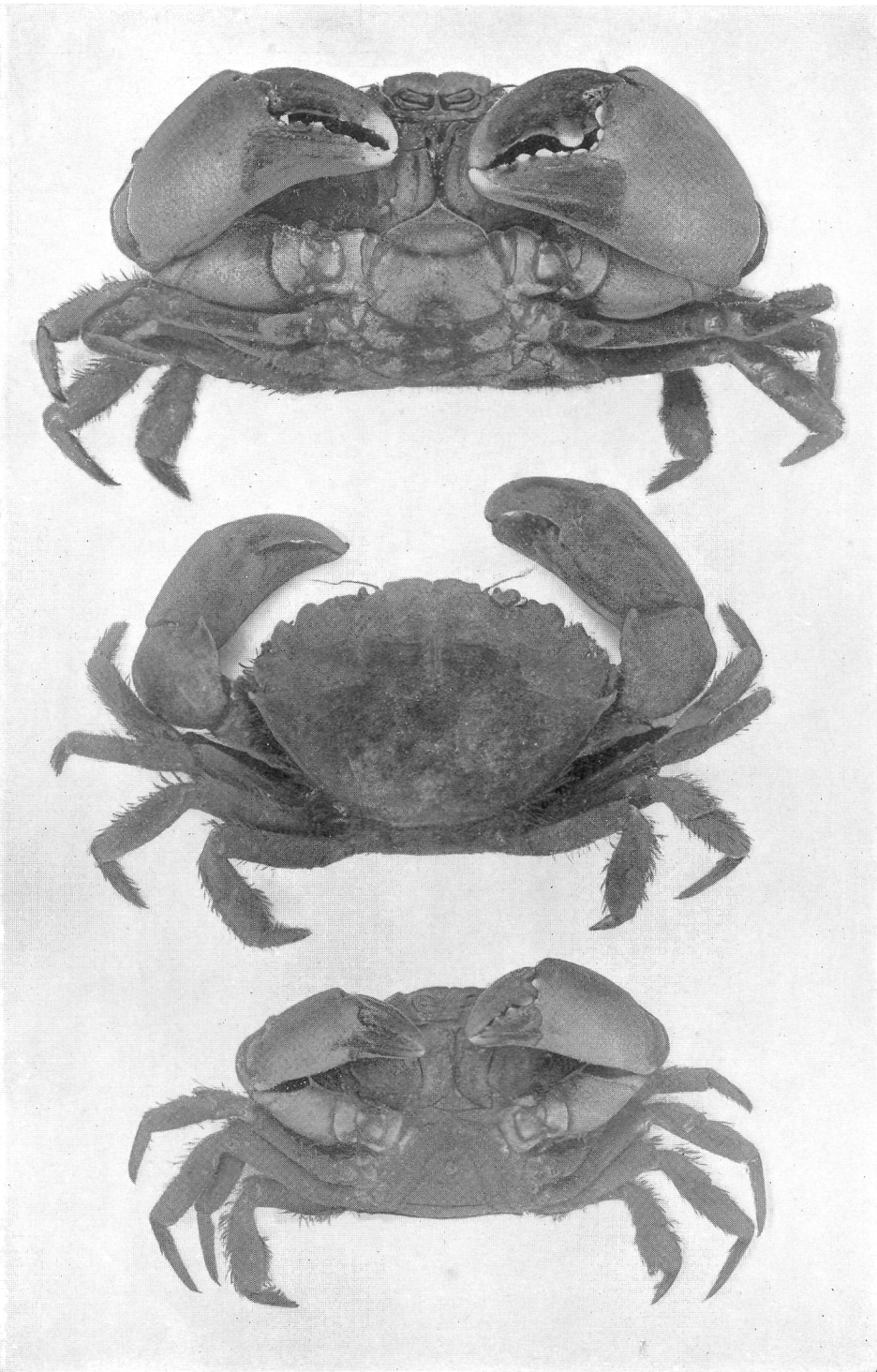
*Panopeus africanus*, A. M. N. H. No. 3281

Fig. 1. Male, 38.5 mm. wide, ventral view.

Fig. 2. A smaller male, dorsal view.

Fig. 3. Female, ventral view.

All figures to same scale.



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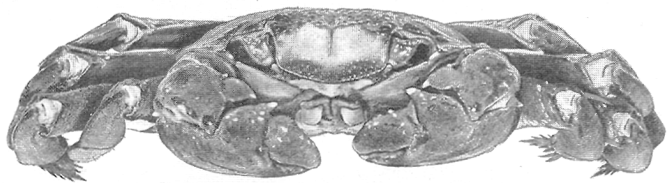
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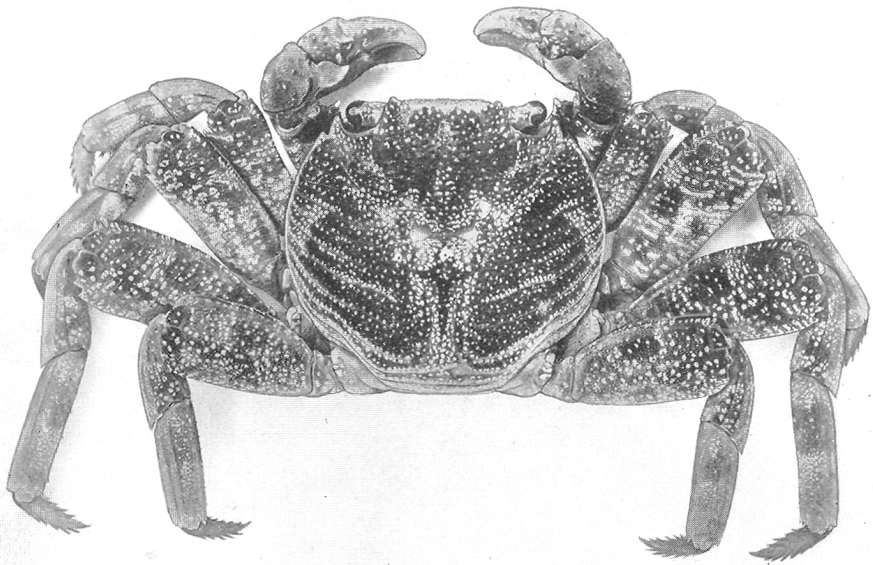
PLATE XXXVIII

*Grapsus grapsus*, A. M. N. H. No. 3070

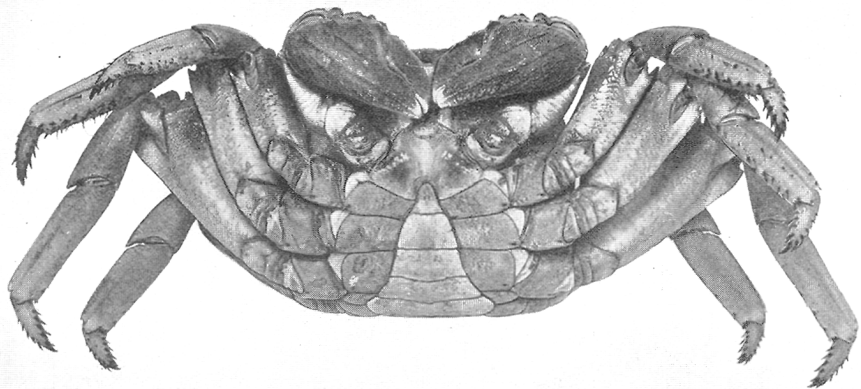
- Fig. 1. Male, 64 mm. wide, front view.
- Fig. 2. Same specimen, dorsal view.
- Fig. 3. A smaller male, ventral view.



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PLATE XXXIX

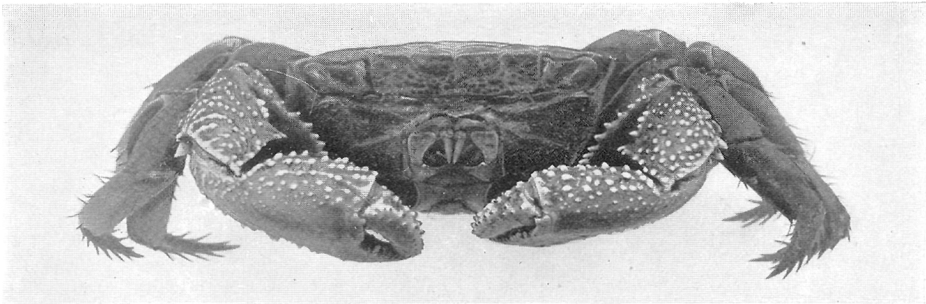
*Goniopsis cruentata*, A. M. N. H. No. 3084

Fig. 1. Male, 54 mm. wide, front view.

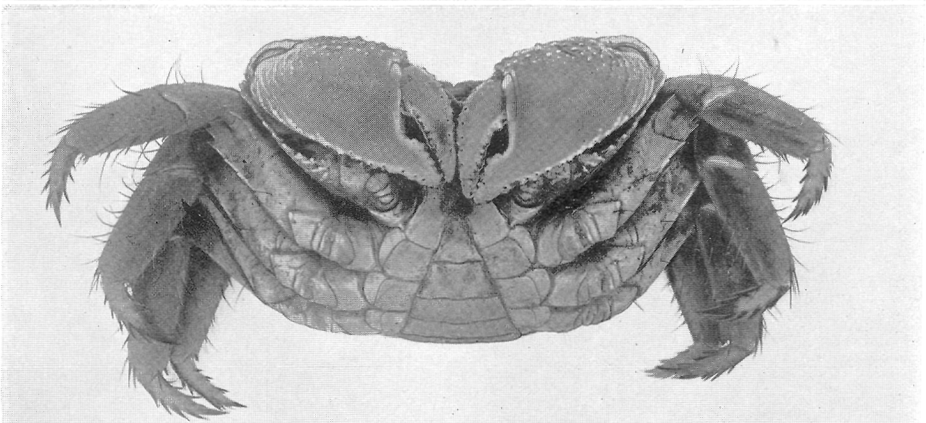
Fig. 2. Another male, ventral view.

Fig. 3. Same specimen as Fig. 1, dorsal view.

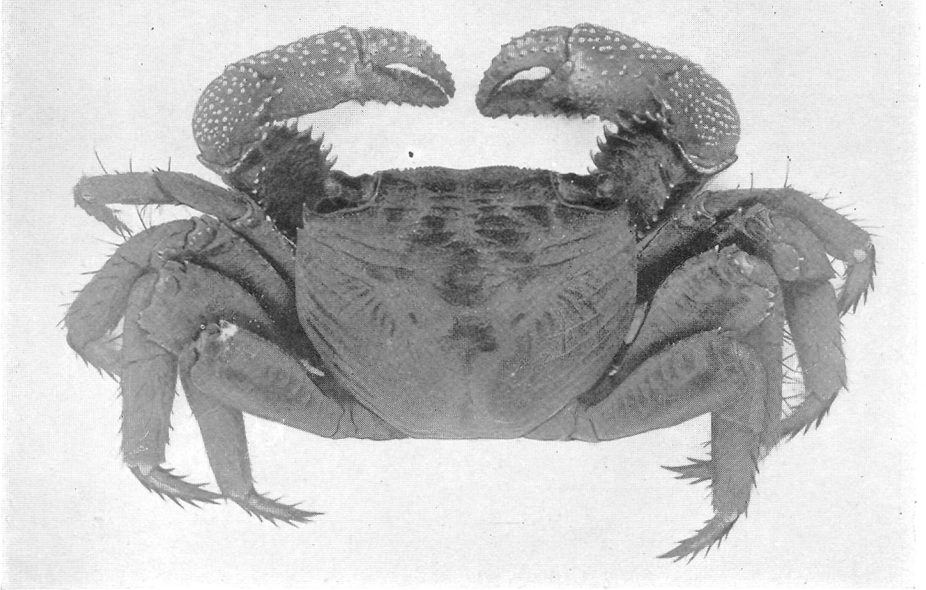
All figures to same scale.



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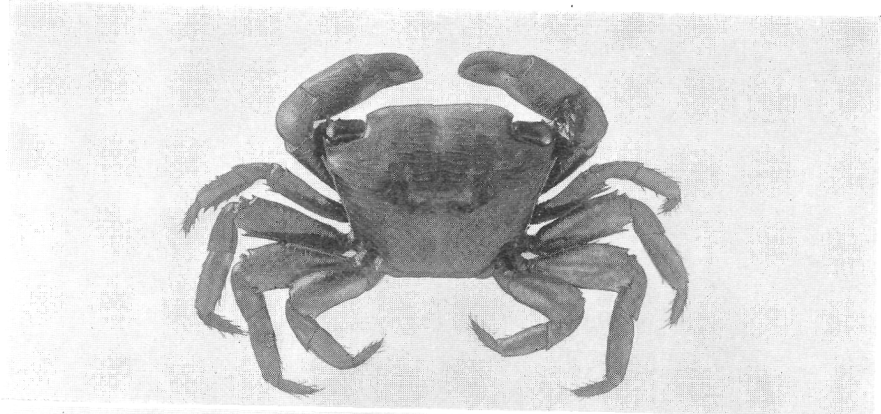
3

PLATE XL

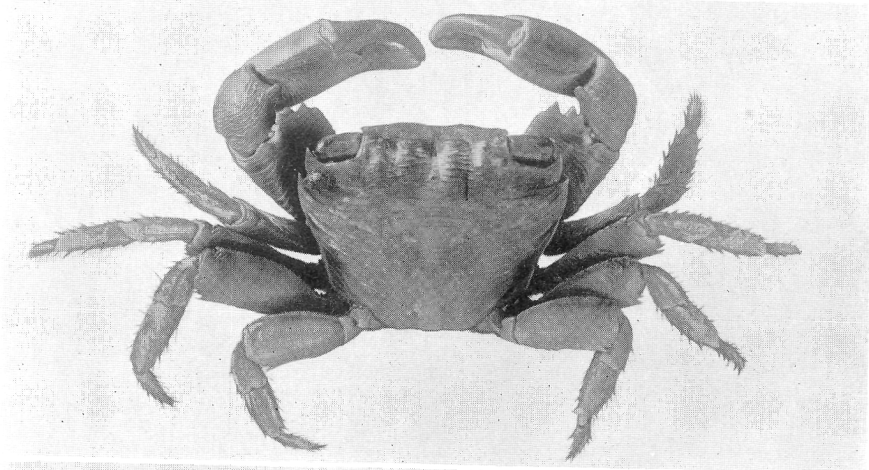
Fig. 1. *Pachygrapsus gracilis*, male, 16.6 mm. wide, U. S. N. M. No. 49254, dorsal view.

Fig. 2. *Pachygrapsus transversus*, male, 19.7 mm. wide, U. S. N. M. No. 40825, dorsal view.

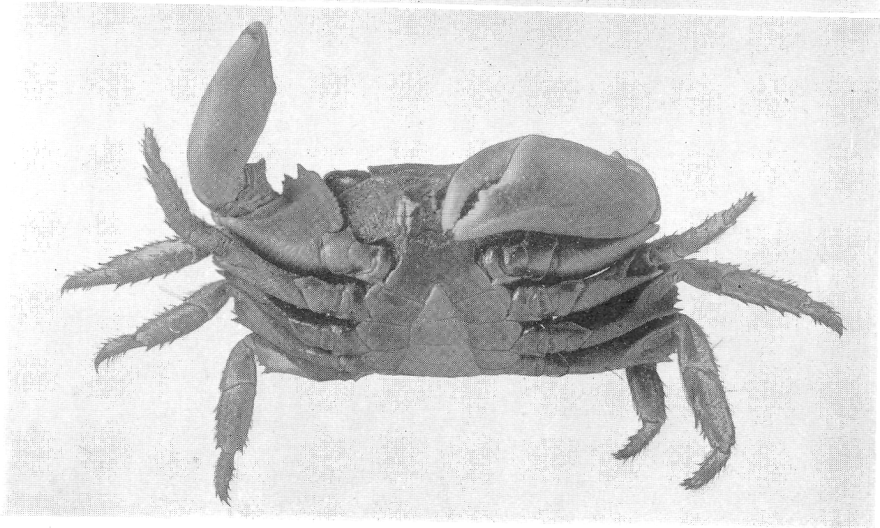
Fig. 3. Same specimen, ventral view.



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PLATE XLI

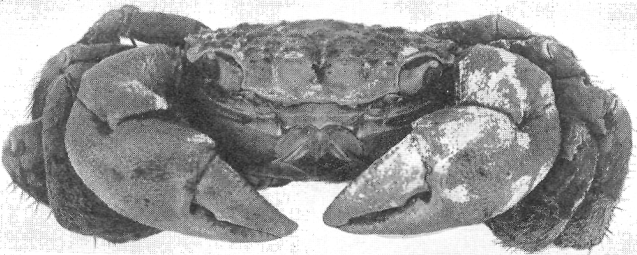
*Sesarma (Chiromantes) africanum*, A. M. N. H. No. 3279

Fig. 1. Male, 43 mm. wide, front view.

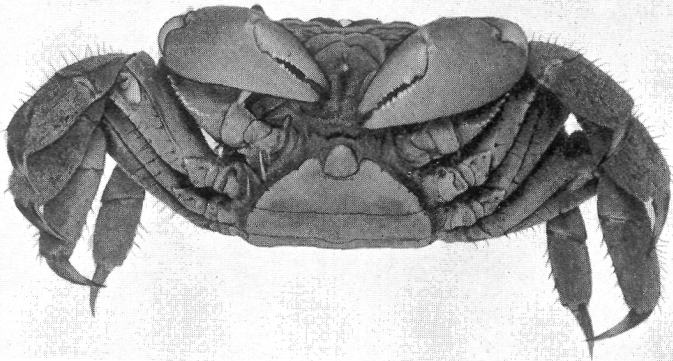
Fig. 2. Female, ventral view.

Fig. 3. Male, 41 mm. wide, dorsal view.

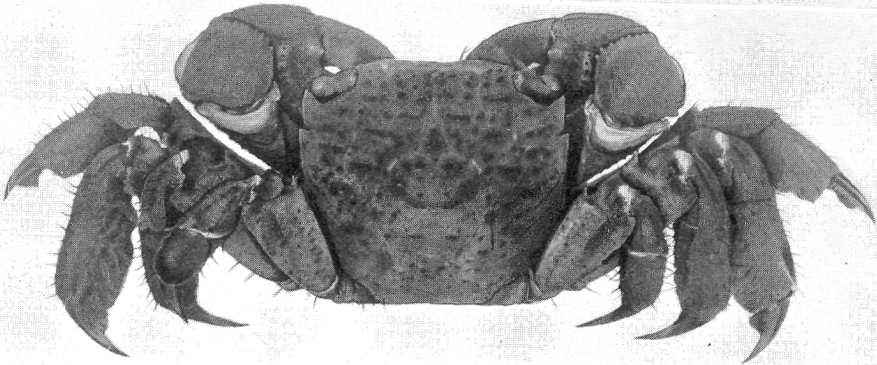
Fig. 4. Another male, ventral view.



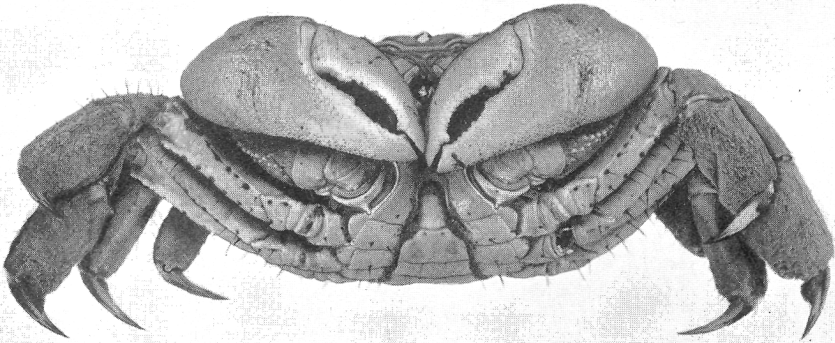
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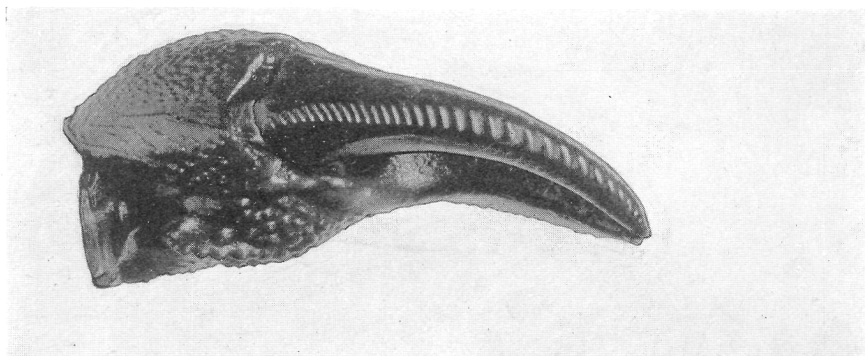
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PLATE XLII

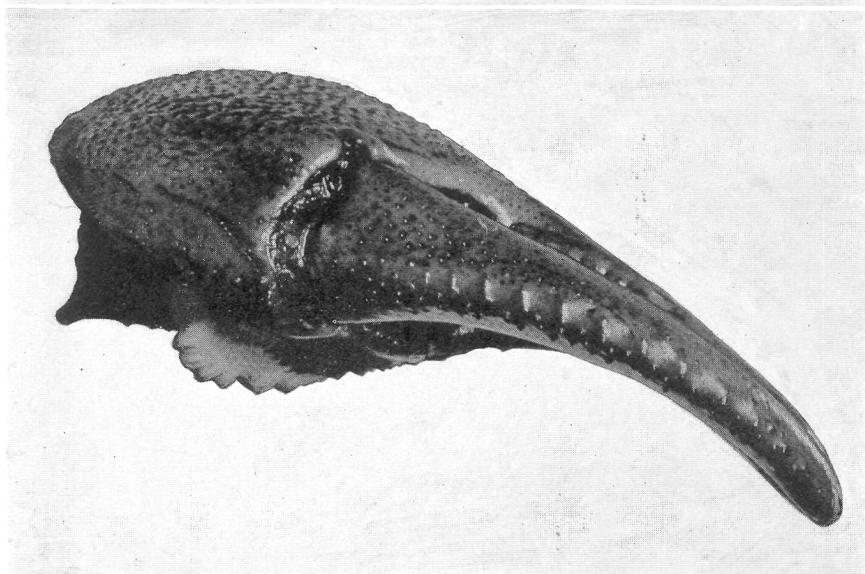
Fig. 1. *Sesarma (Chiromantes) alberti*, male holotype, dorsal view of left chela, finger 19.7 mm. long.

Fig. 2. *Sesarma (Chiromantes) africanum*, male, Banana, dorsal view of left chela, finger 28.3 mm. long.

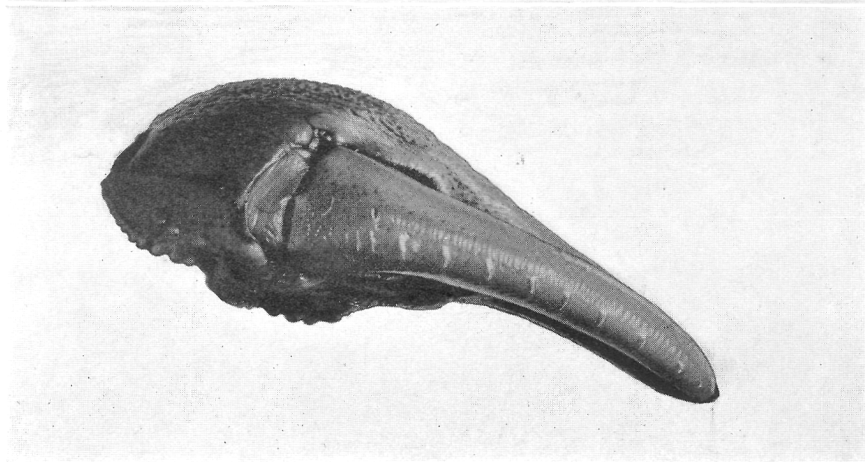
Fig. 3. *Sarmatium curvatum*, male, San Antonio, dorsal view of left chela, finger 22.1 mm. long.



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PLATE XLIII

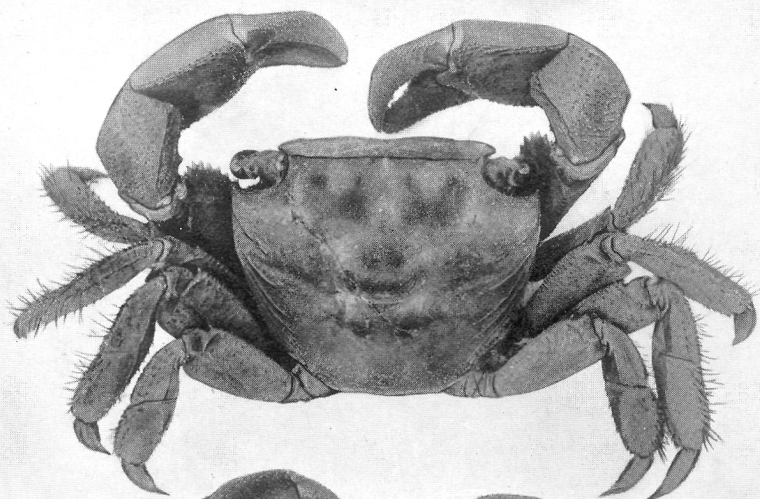
*Sesarma (Holometopus) angolense*, A. M. N. H. No. 3278

Fig. 1. Male, 46 mm. wide, dorsal view.

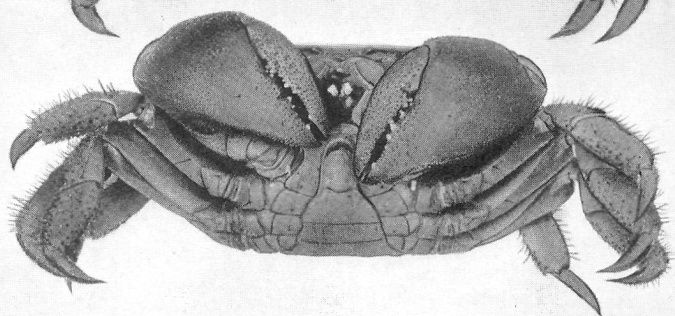
Fig. 2. A smaller male, ventral view.

Fig. 3. Female, ventral view.

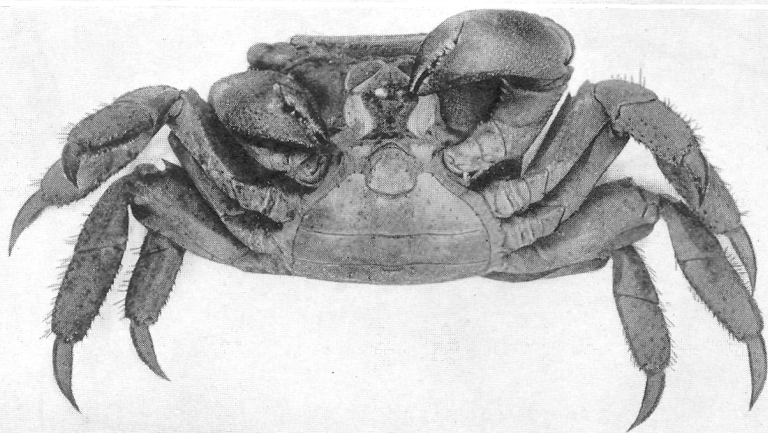
All figures to same scale.



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PLATE XLIV

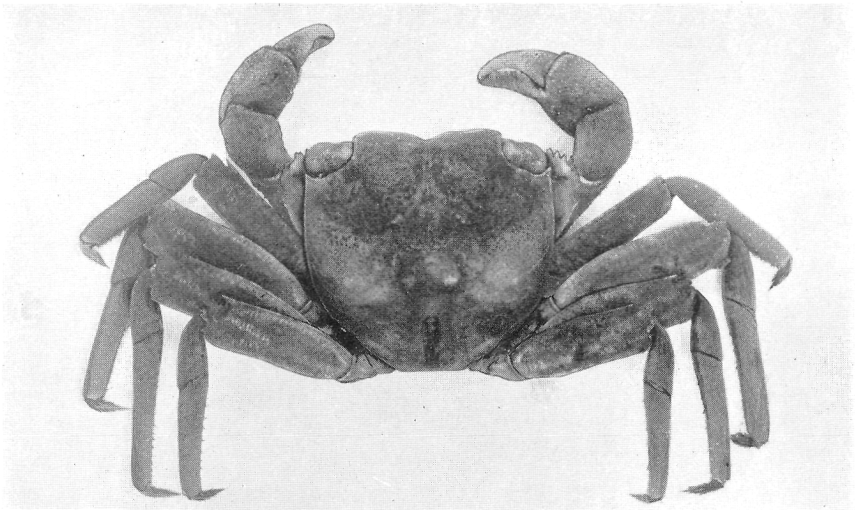
*Sesarma (Holometopus) elegans*, A. M. N. H. No. 3274

Fig. 1. Male, 21 mm. wide, dorsal view.

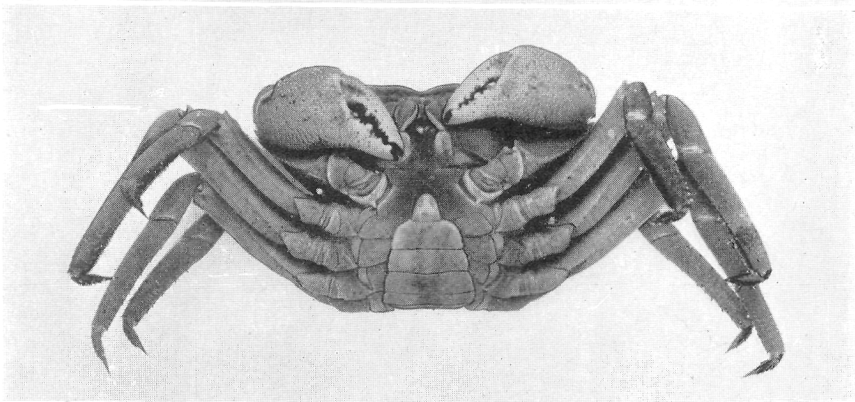
Fig. 2. A smaller male, ventral view.

Fig. 3. Female, ventral view.

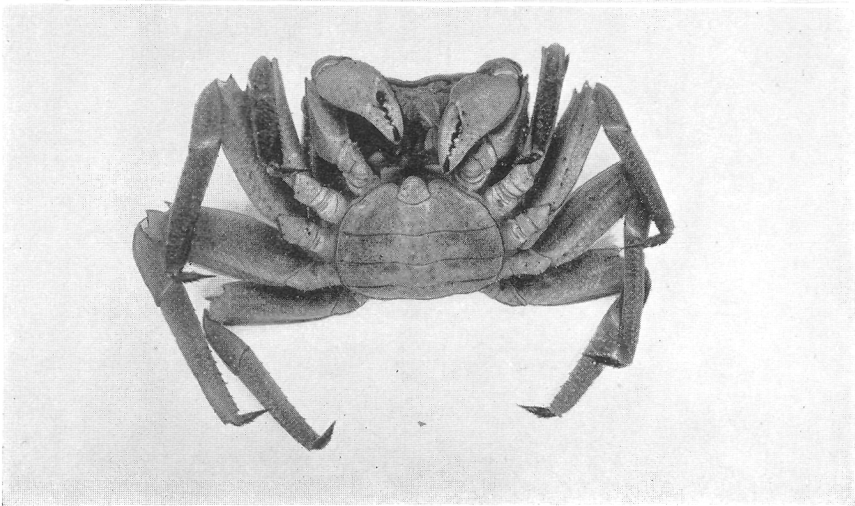
All figures to same scale.



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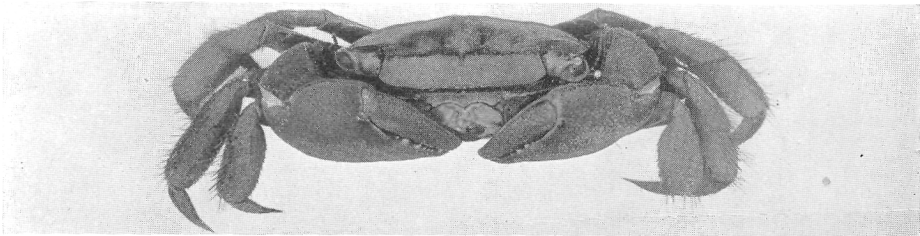
PLATE XLV

Fig. 1. *Sesarma (Holometopus) angolense*, male, A. M. N. H. No. 3278, front view.

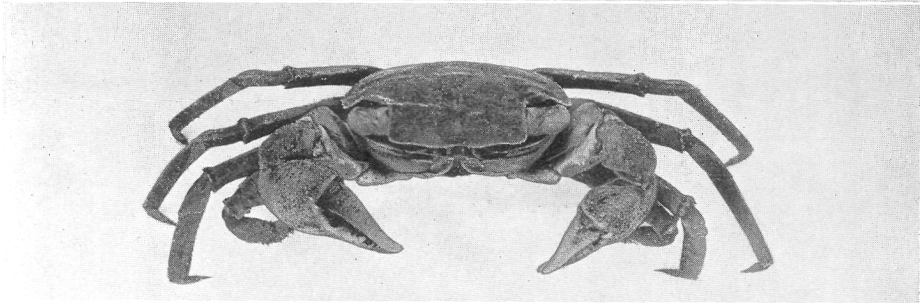
Fig. 2. *Sesarma (Holometopus) elegans*, male, A. M. N. H. No. 3274, front view.

Fig. 3. *Uca tangeri*, female, 29 mm. wide, A. M. N. H. No. 3275, dorsal view.

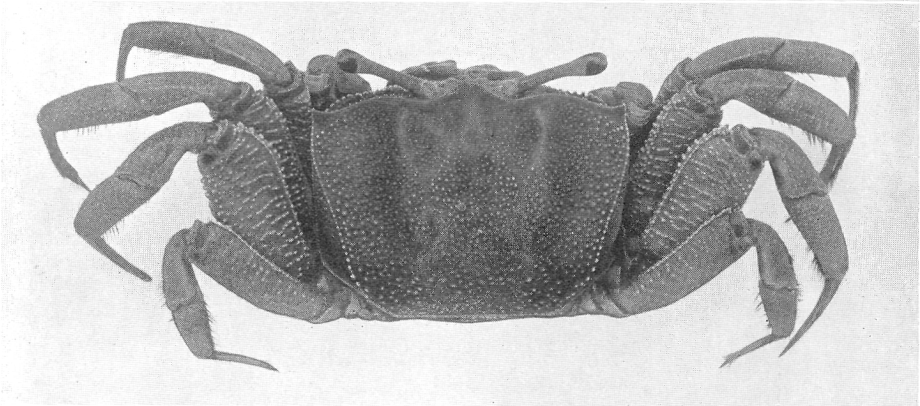
Fig. 4. Same species and No., a smaller female, ventral view.



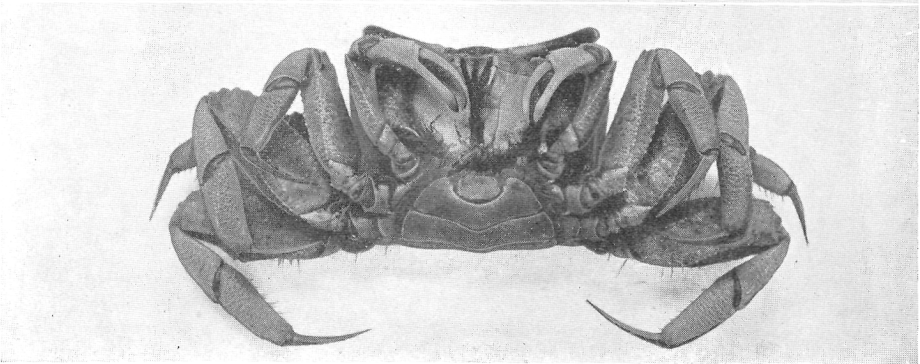
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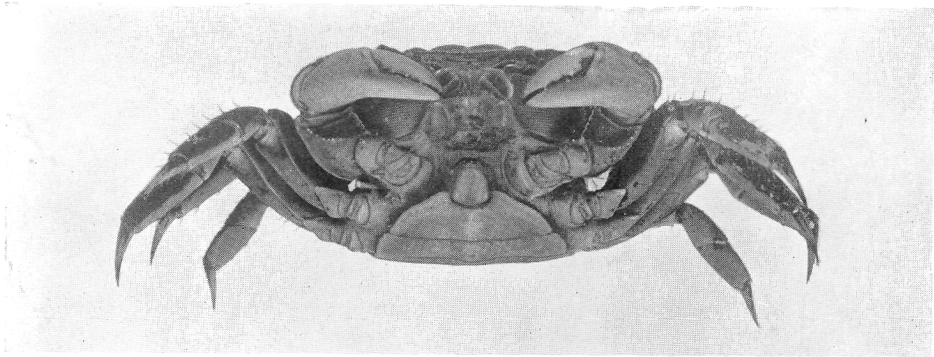
PLATE XLVI

*Sarmatium curvatum*, A. M. N. H. No. 3284

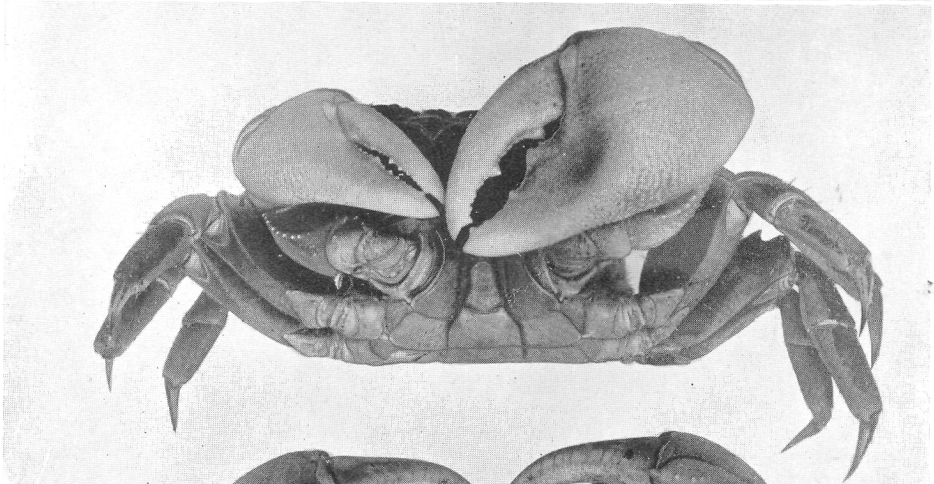
Fig. 1. Female, ventral view.

Fig. 2. Male, ventral view.

Fig. 3. Male, 36 mm. wide, dorsal view.



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2



3



PLATE XLVII

Fig. 1. *Sarmatium curvatum*, male, 36 mm. wide, A. M. N. H. No. 3284, front view.

Figs. 2-4. *Cyclograpsus occidentalis*, A. M. N. H. No. 3276.

Fig. 2. Female, ventral view.

Fig. 3. Male, ventral view.

Fig. 4. Another male, 13.2 mm. wide, dorsal view.

Figs. 5-9. *Sesarma (Holometopus) büttikoferi*, A. M. N. H. No. 3277.

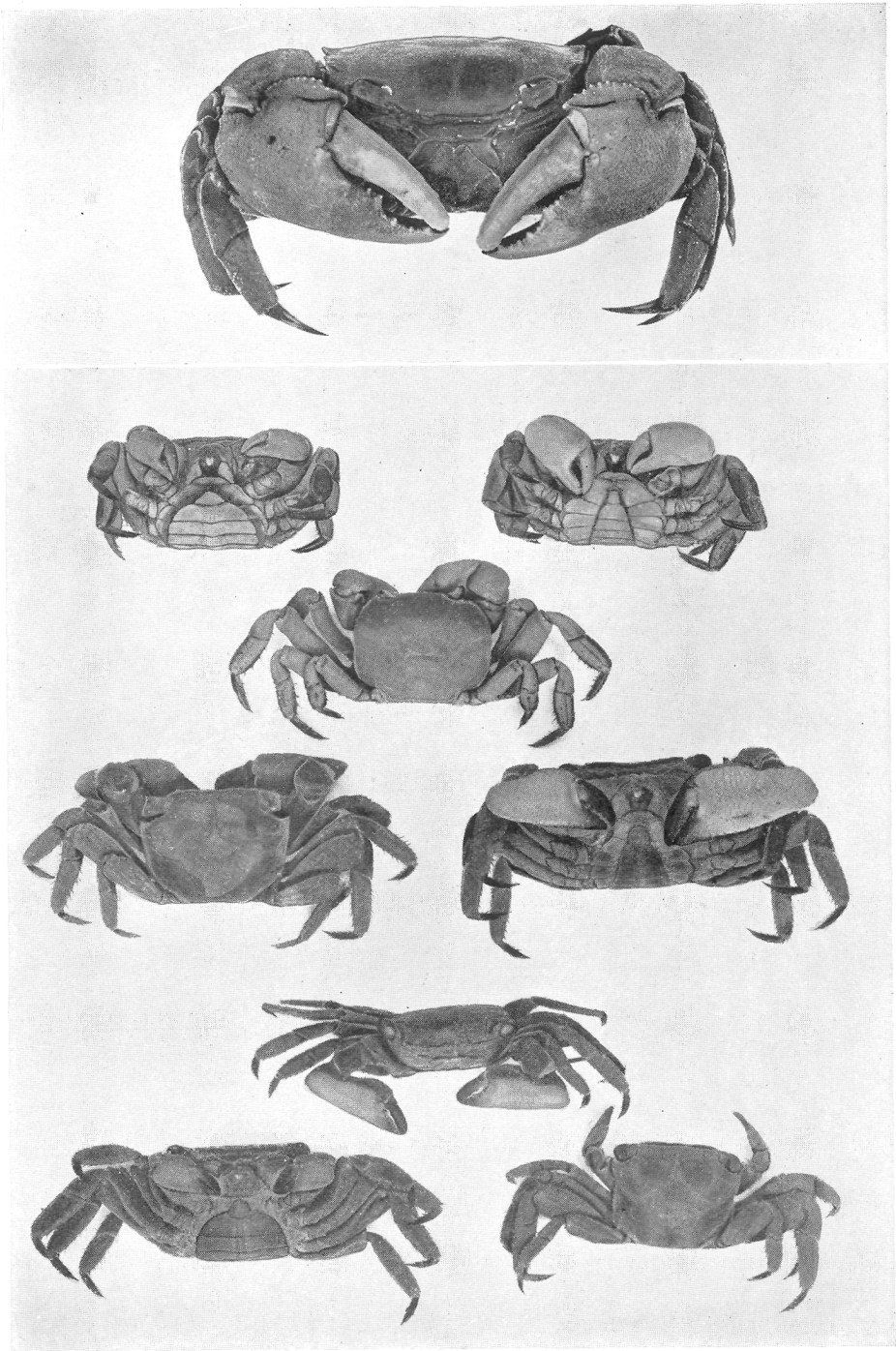
Fig. 5. Male, dorsal view.

Fig. 6. Another male, ventral view.

Fig. 7. Still another male, front view.

Fig. 8. Female, ventral view.

Fig. 9. Female, dorsal view.



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6

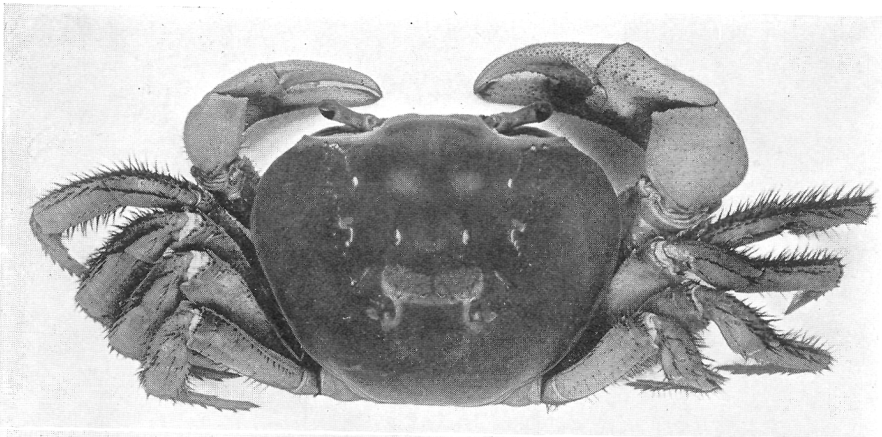
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PLATE XLVIII

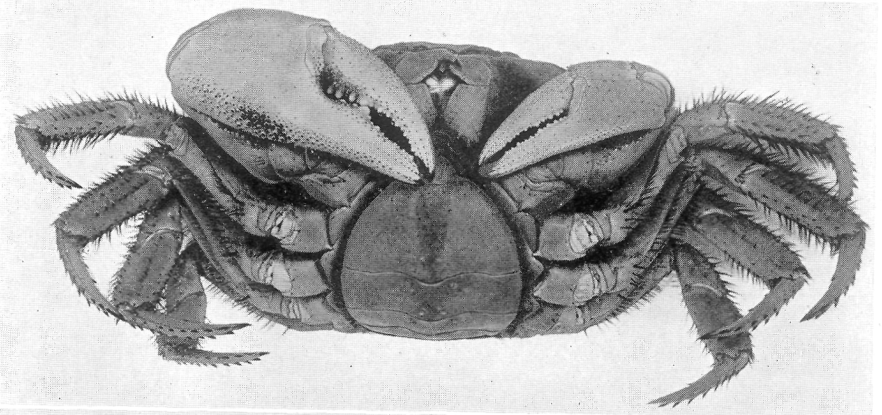
Fig. 1. *Cardisoma armatum*, female, 95.6 mm. wide, A. M. N. H. No. 3273, dorsal view.

Fig. 2. Same specimen, ventral view.

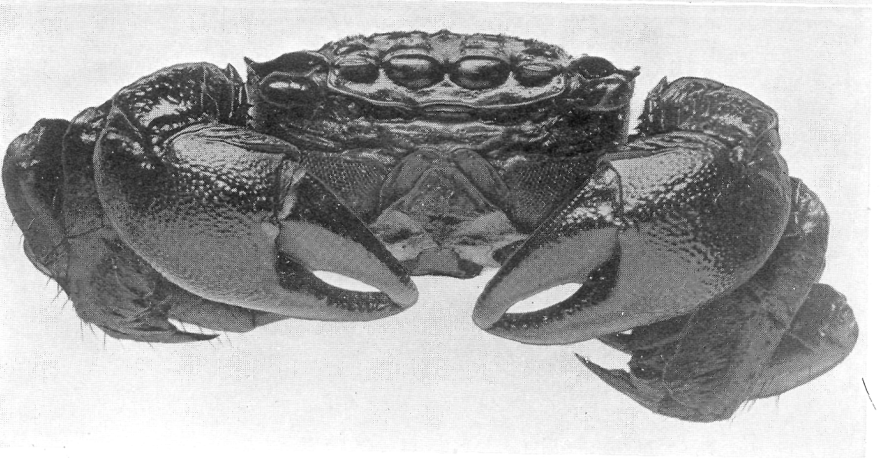
Fig. 3. *Sesarma (Chiromantes) alberti*, male holotype, 34.3 mm. wide, front view.



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PLATE XLIX

*Cardisoma armatum*; male, 117 mm. wide, A. M. N. H. No. 3273, dorsal view.

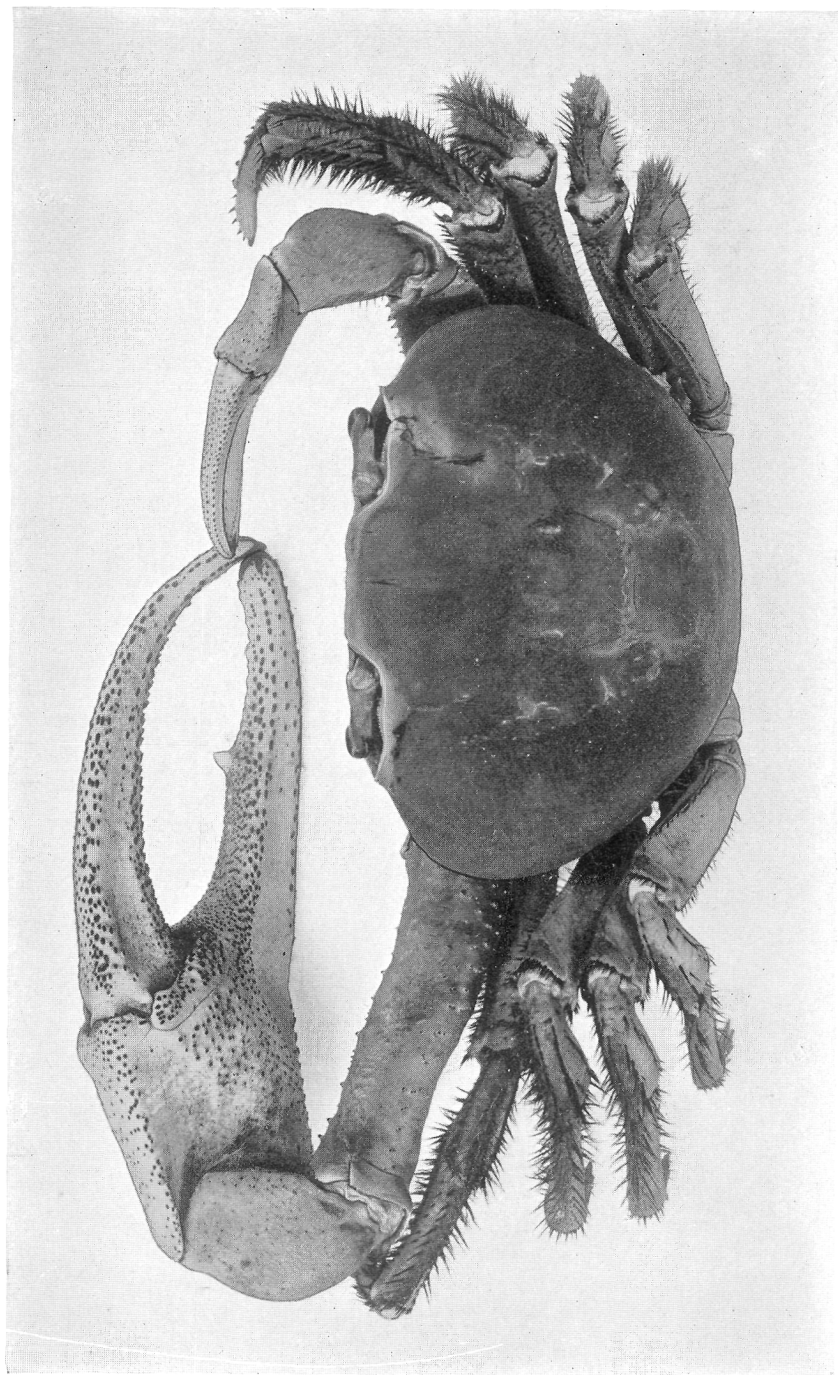


PLATE L

*Cardisoma armatum*, same specimen as Pl. XLIX, ventral view.

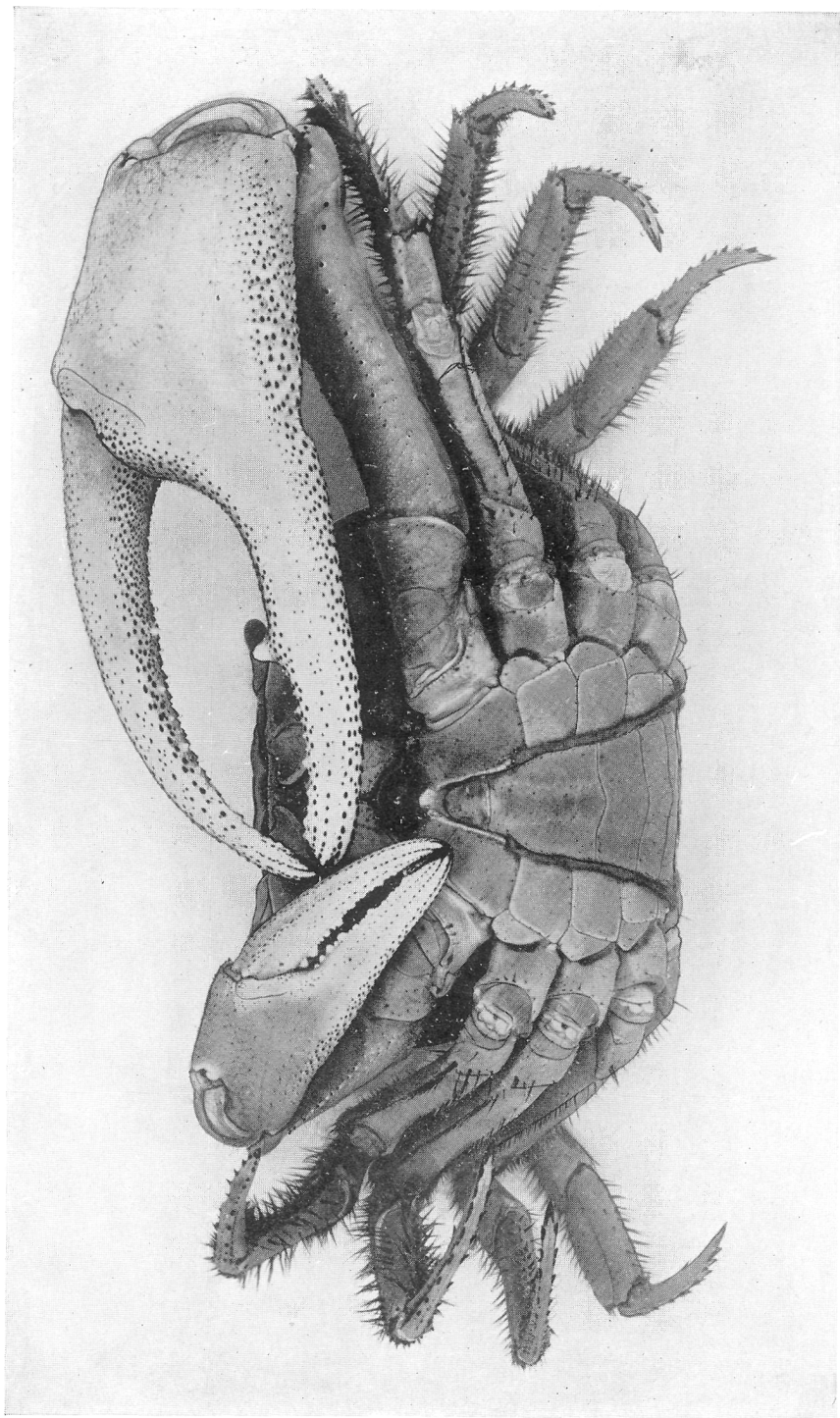
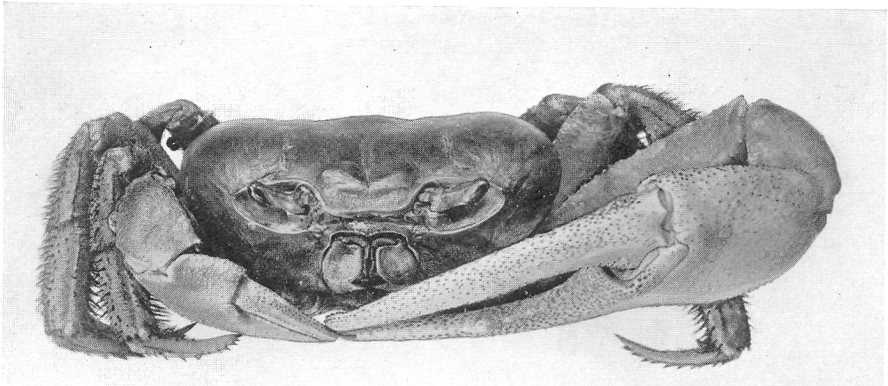




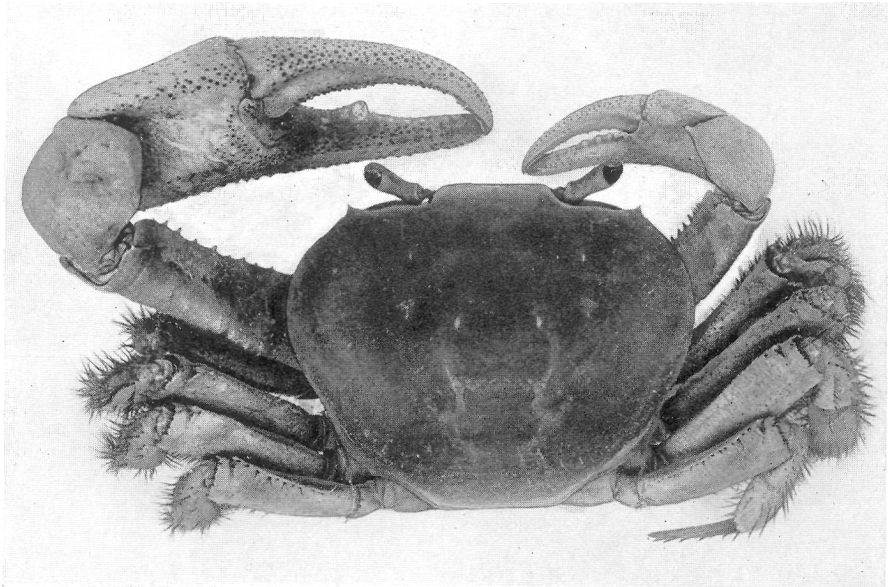
PLATE LI

*Cardisoma armatum*

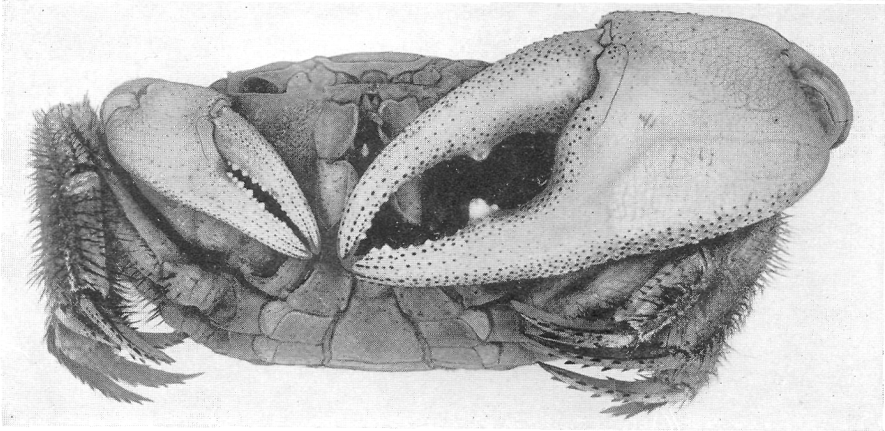
- Fig. 1. Same specimen as Pl. XLIX, front view.  
Fig. 2. Male, 88 mm. wide, A. M. N. H. No. 3273, dorsal view.  
Fig. 3. Same as Fig. 2, ventral view.



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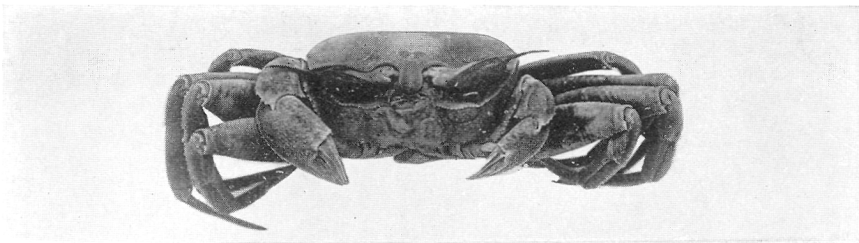


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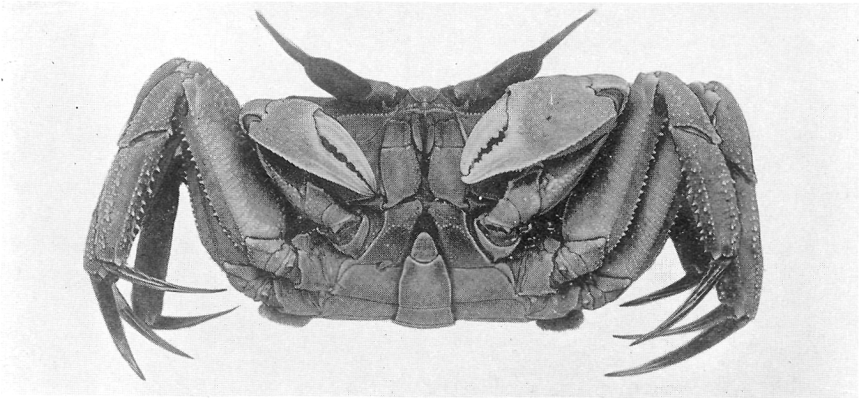
PLATE LII

*Ocypode ippeus*

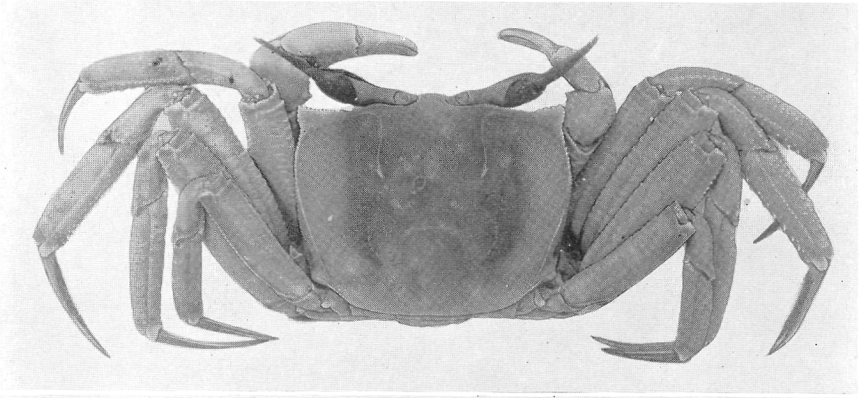
- Fig. 1. Male, 33 mm. wide, A. M. N. H. No. 3080, front view.
- Fig. 2. A larger male, same No., ventral view.
- Fig. 3. Another male, A. M. N. H. No. 3087, dorsal view.
- Fig. 4. Female, 41 mm. wide, dorsal view.



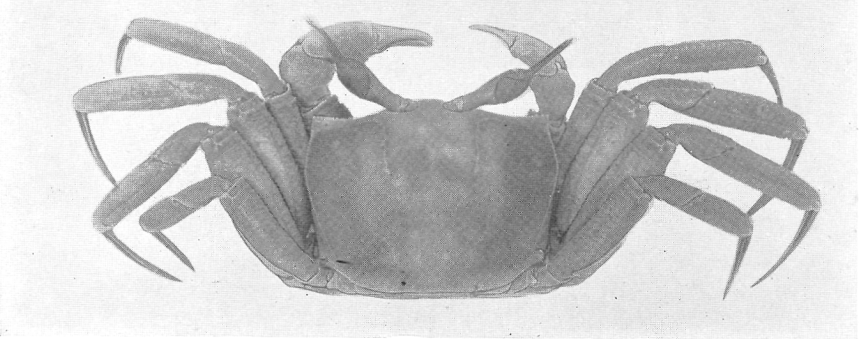
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PLATE LIII

*Ocypode africana*, A. M. N. H. No. 3282

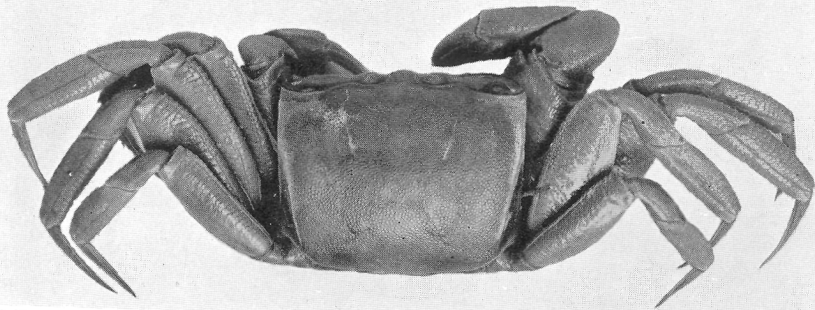
Fig. 1. Male, 29 mm. wide, dorsal view.

Fig. 2. Another male, ventral view.

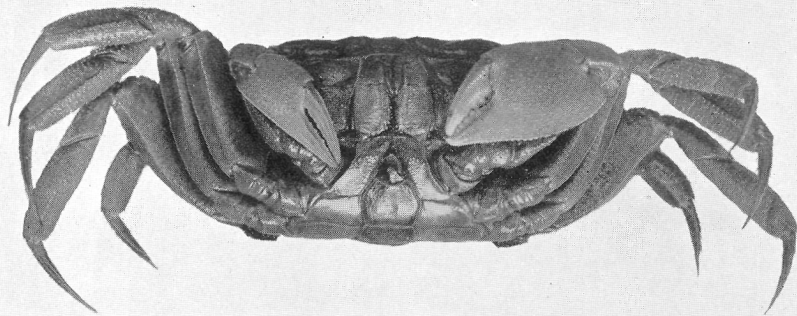
Fig. 3. Still another male, front view.

Fig. 4. Female, dorsal view.

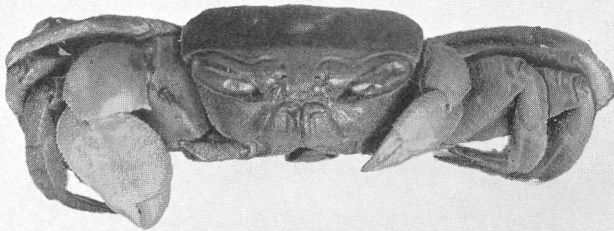
All figures to same scale.



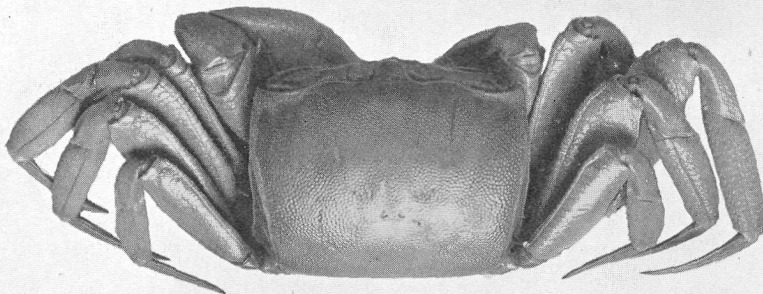
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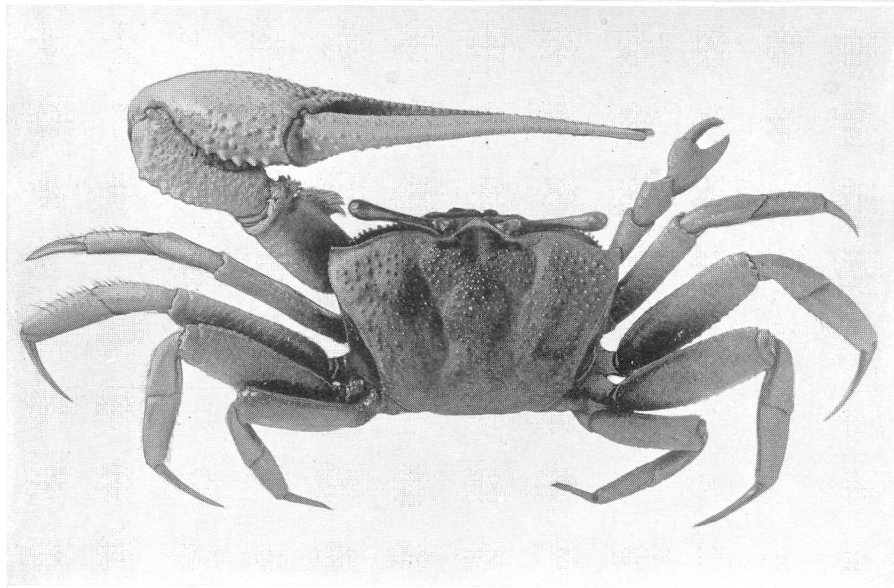
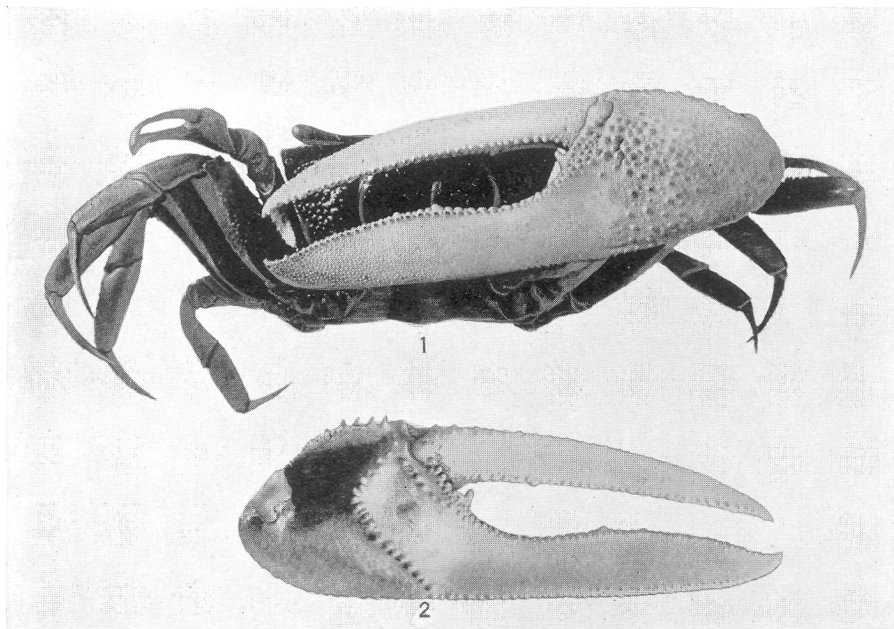
PLATE LIV

*Uca tangeri*, male, 31.3 mm. wide, U. S. N. M. No. 14874

Fig. 1. Front view.

Fig. 2. Inner face of major chela.

Fig. 3. Dorsal view.





## PLATE LV

Fig. 1. Shore of the Atlantic Ocean near the mouth of the Congo along the sandy peninsula which shelters San Antonio from the inroads of the high surf.

"On both sides of the estuary, the wave-swept portions are much alike, varying chiefly in details due to the more or less furious onslaught of the breakers. True dunes are unknown in this part of West Africa, and typical savannah formation reaches out to the very edge of the slope bordering the sea. Along the Angolan coast, dense groves of false Borassus (*Hyphane guineensis* Schumacher and Thonning) greatly enhance the pictorial effect and clusters of *Sansevieria* are not rare among the thorny shrub and fine grass. On the Belgian side, ecological conditions in the vicinity of the ocean are evidently less favorable for *Hyphane* which appear scattered and only near Zambezi become more numerous.

"The two levels on the higher part of the steep beach, which sometimes varies in width, mark the limit of the ordinary high tide and that of the equinoxes. All along this shore the encroachment of the sea has been continuous in more recent years. As a result of the constantly shifting conditions, but little drift accumulates and very few of the halophilous plants can secure a foothold, though even here a few shoots of the wild sweet potato (*Ipomoea pes-caprae* Roth) have crept over the edge of the slope.

"Such shores are the favorite haunts of sand crabs (*Ocypodeippeus* and *O. africana*).'" (H. L.)

Fig. 2. Sandy cove along a bay on the left bank of the estuary of the Congo near San Antonio, at low tide.

"Formerly a great mangrove forest (*Rhizophora Mangle* Linnæus) flourished here, as is proved by the presence of many huge stumps and decaying roots. Part of an immense prop-root of the remains of a gigantic tree is seen to the left and in the background still thrives a fine growth. As the mangroves disappear, the swamps are filled in with sand, and clusters of false date palms (*Phoenix reclinata* Jacquin) here testify to the changed conditions and subsequent consolidation of the ground along the shores of the bay. The tussock of a slender reed-grass near the center is a typical feature of the halophilous vegetation frequently found in sheltered places in the estuary of the Congo.

"In the foreground to the left mangrove prop-roots show a peculiar adaptation by dividing more and more as they near the incoherent particles of sand. The ordinary prop-roots, so efficient in mud, could not secure a hold here, so masses of moss-like rootlets have been formed, which, weighted down by the sand washed up by the tide, admirably answer the purpose of anchoring the trees. These rootlets are responsible for the peat-like formation shown on Plate XVI, fig. 2.

"Here and nearby are the haunts of great colonies of crabs such as *Uca tangeri* and *Sesarma (C.) africanum*." (H. L.)



1



2

## PLATE LVI

Fig. 1. Shore on the east side of Banana peninsula opposite the Dutch trading houses, at the incoming tide.

"The rough embankment of loose stones was made long ago to protect part of the sandy beach along the mouth of Banana Creek from inroads of the waves. This rocky, highly brackish environment has attracted a relatively rich fauna of certain mollusks, worms, and crustaceans. Of the latter, some gregarious isopods (*Ligyda exotica* and *L. olfersii*) love to scurry over the rocks; in the interstices *Grapsus grapsus* occasionally seeks refuge and *Geograpsus lividus* and *Pachygrapsus gracilis* are more common; *Goniopsis cruentata* is well represented near the mangroves; *Panopeus africanus*, often associated with a shrimp, occurs in the more frequently inundated portions, and farther seaward *Callinectes latimanus* may be stirred up from the sand. Even *Uca tangeri* has colonies beyond the mangroves, which, on account of the high salinity of the water, are here the only shore vegetation and remain stunted bushes. The cocoanut-palms in the background are a rather recent introduction." (H. L.)

Fig. 2. Shore vegetation along a bay north of San Antonio at low tide, at the point where sand and mud struggle for the upper hand.

"In such sites, as well as in places where strong currents must be resisted, real stockades of prop-roots are formed by the mangroves (*Rhizophora Mangle* Linnæus). Towards the right, a few heavy stilts support the long, spiny blades of bunches of a stunted *Pandanus*. The palms and other trees in the background are *Phoenix reclinata* Jacquin and *Avicennia africana* Palisot de Beauvois respectively; their presence indicates firmer soil. Such sandy places at low tide are the ideal feeding grounds of fiddler crabs (*Uca tangeri*), whose numerous burrows are practically inaccessible to the collector, being tunneled among the mass of stilt-roots." (H. L.)



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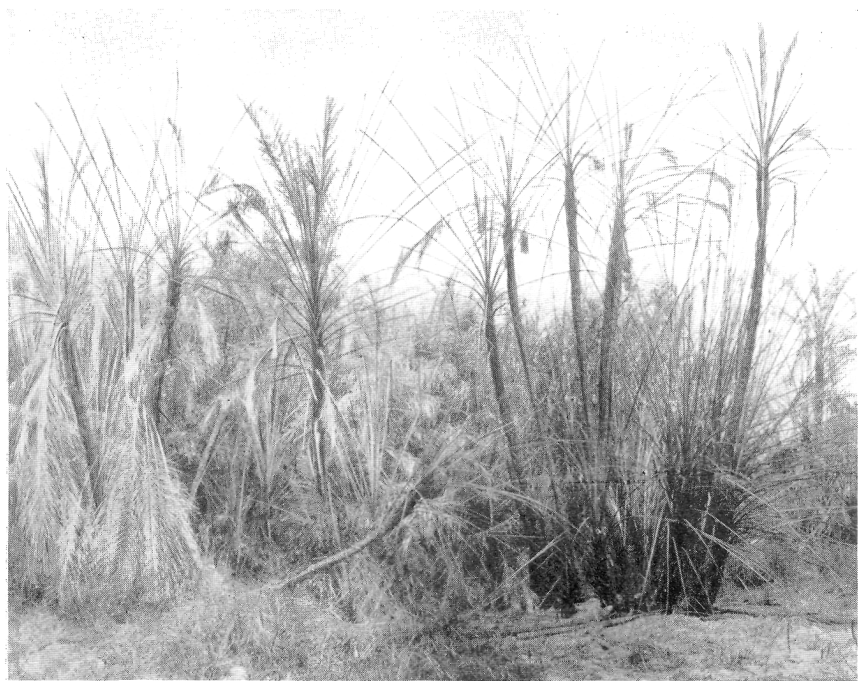
## PLATE LVII

Fig. 1. Wild date palms (*Phœnix reclinata* Jacquin) a few miles north of Banana after a grass fire had consumed most of their fronds and scorched the trunks.

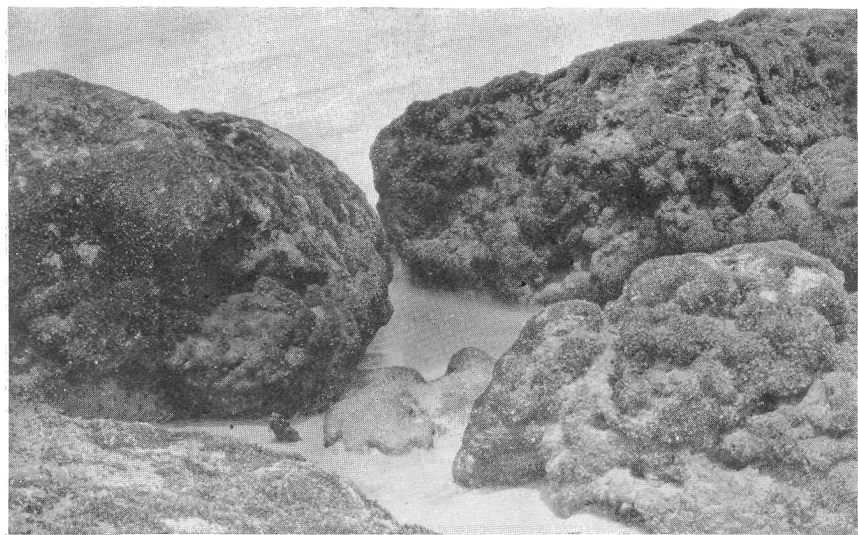
"Bunches of ripe fruits (in August) dangle from the tops of several trees at the right center. Groves of these palms are common across Africa and always indicate ground-water at a slight depth. They are especially numerous on Banana peninsula and in the neighboring savannah. Such sites near the coast are the favored haunts of the great land crabs (*Cardisoma armatum*), whose extensive burrows are established among the roots below the scorching hot surface sand and lead down to the water-level, near which the crabs rest." (H. L.)

Fig. 2. Laterite blocks on the beach of the Atlantic near Moanda at the lowest equinoctial tides.

"At the foot of the cliff, just below the lighthouse, extends a real boulder field, which is remarkably rich in marine animals not found near Banana nor along the sandy beach extending from the mouth of the Congo northward. Tiny mussels cover a great portion of the rocks like cushions of heavy moss. Numerous shells and even a few sea-anemones find a suitable environment on some of these boulders, which at normal times are constantly lashed by the incoming surf. A number of crabs which are extremely difficult to gather, such as *Grapsus grapsus*, seek shelter here beneath the rocks, in their cavities, and about the tide-pools; *Geograpsus lividus* occurs nearer the beach." (H. L.)



1



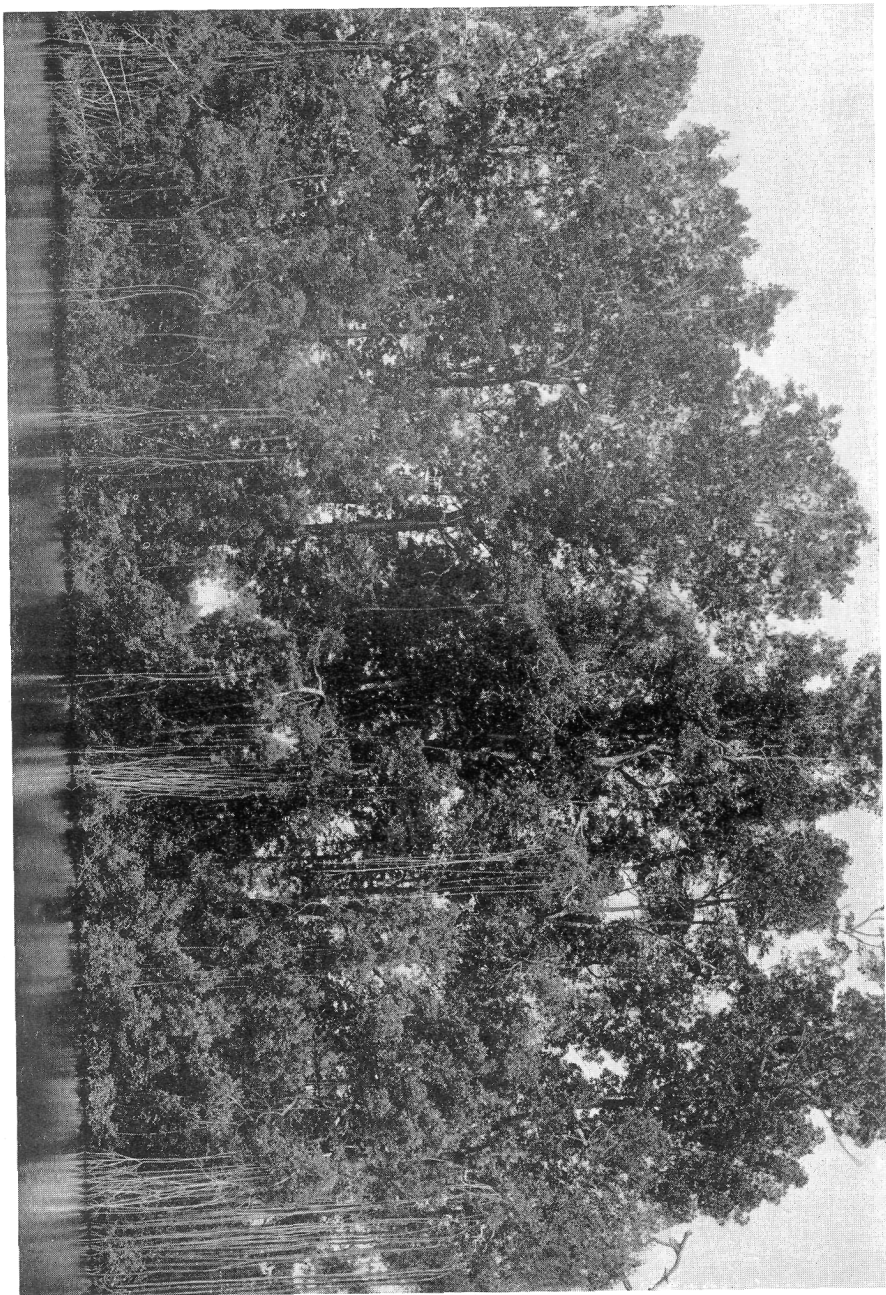
2

#### PLATE LVIII

Forest of mangroves (*Rhizophora Mangle* Linnæus) bordering a creek near Malela, at high tide.

"Such sites, especially at some distance from the shore, are the homes of *Sesarma* (*H.*) *elegans*, *S.* (*H.*) *büttikoferi*, *S.* (*C.*) *alberti*, *Sarmatium curvatum*, and even *Cardisoma armatum*. The thick outer fringe of foliage generally gives the impression of a continuously dense growth; but the photograph on Plate LIX, the interior view of the same site, shows the open formation in such forests. The rope-like, aerial roots are a characteristic feature and often dangle in masses from branches or trunks from a height of over forty feet. Near the water, or far above, they branch out in the manner of prop-roots, but, not always being anchored, they offer no support to the trees and are swayed back and forth by the wind and currents. Their function is also partly physiological, since they act as supplementary aërating organs (pneumatophores), the numerous rugosities (lenticels) on the surface of the bark providing for an exchange of gases." (H. L.)







## PLATE LIX

The interior of a mangrove forest near Malela, about 12 miles east of Banana, at low tide.

"All the trees seen here are *Rhizophora Mangle* Linnæus. The great swampy areas in the estuary of the Congo on both sides of the main stream are divided by more or less wide creeks into numerous islands. On many of these the mangroves form real forests, and the finer trees attain a height of 75 feet, with straight columnar trunks over two feet in diameter.

"From the outside, a fairly dense curtain of foliage allows only a faint view of the interior, which is comparatively open. Progress, however, is rendered difficult by the miry condition of the ground, decaying logs, and the maze of prop-roots. By means of the latter the trees are solidly anchored into the muddy substratum, and they also serve as pneumatophores. In the foreground, mangrove seedlings, after dropping from the branches, have developed shoots with a few leaves. The holes in the fallen trunk are due to devastations by ship-worms (*Teredo navalis*) during the high water-level in the rainy season. To the right, many aerial roots from higher branches are evident.

"Among the crabs found here *Sarmatium curvatum* and *Sesarma* (*C.*) *alberti* are most numerous, with a few stray specimens of *S. (H.) büttikoferi*; in the drier places the young of *Cardisoma armatum* are also present.

"Relative sizes may be judged by comparison with the negro standing near the center. This is the inside view of the mangrove swamp shown on Plate LVIII." (H. L.)



## PLATE LX

Fig. 1. Forest of mangroves (*Rhizophora Mangle* Linnæus) bordered by *Raphia* palms (probably *Raphia vinifera* Palisot de Beauvois) near Malela, about ten miles east of Banana, at incoming tide.

"The somber green walls of the mangrove forest extend for considerable distances along the narrow and gloomy creeks. Here and there the monotony of the scenery is relieved by low, impenetrable fringes of *Raphia* palms and thick clusters of long leaved screw-pines (*Pandanus*) on heavy stilt-roots.

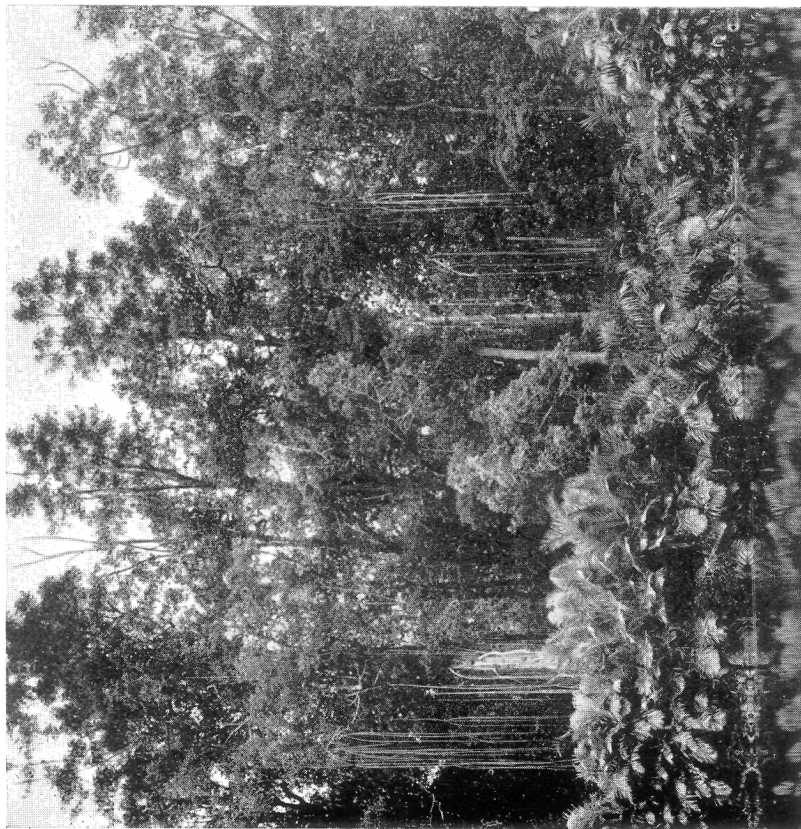
"In such muddy sites the stem of the *Raphia* remains short and stocky, the often dwarfed leaves practically emerging from the ground. On flat, more continually inundated shores, as near Malela, these palms show a remarkable adaptation to environmental conditions; their dense mass of blackish roots, exposed by the waves, send numerous vertical shoots above the water which serve as aërating roots (pneumatophores). Under favorable conditions the palms often overgrow large tracts, and the midribs then attain a length of fifteen feet or more.

"These sites are inhabited, according to their location, by the same species as are found living in landscapes pictured on Plates LVIII, LIX, and LXI." (H. L.)

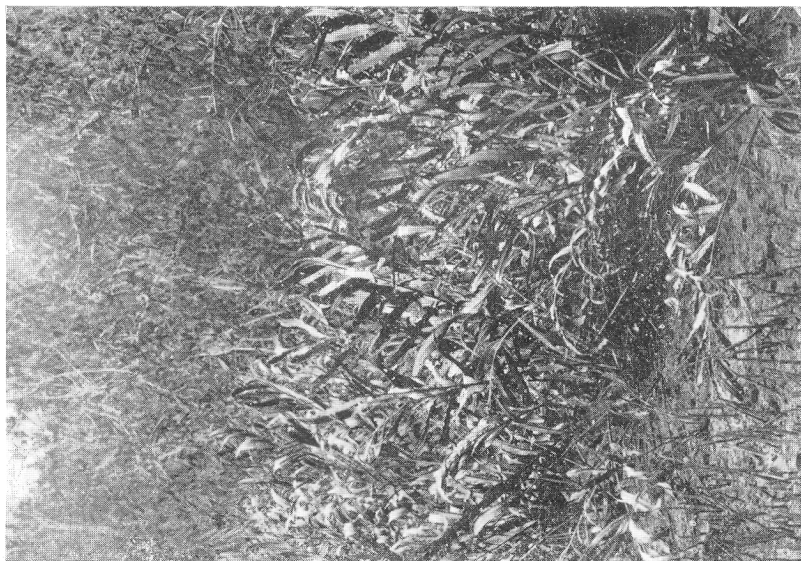
Fig. 2. The edge of bushy mangrove formation along Banana Creek at low tide.

"In many sites in the estuary of the Congo flooded by highly brackish water, mangrove ferns (*Acrostichum aureum* Linnæus), like those conspicuous near the foreground, flourish in rather continuous thickets or occur in scattered clusters. Usually their big, rough rhizomes are imbedded in the mud to a slight depth, or they creep along the surface among the maze of prop-roots. The bushes in the background are *Avicennia africana* Palisot de Beauvois, which sends out, often to some distance, many slender, dark shoots, like those in the foreground. These are supplementary aërating roots, negatively geotropic and emerge from the soil much as the shoots of asparagus do.

"The numerous holes in the foreground are entrances to burrows of a species of fiddler crab (*Uca tangeri*), illustrating one of its various habitats." (H. L.)



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2

## PLATE LXI

Bank of the Congo at low tide about 17 miles from Banana, between Malela and Ponta da Lenha.

"In the background the tall bushes mark the farthest up-stream occurrence of mangroves (*Rhizophora Mangle* Linnæus), swamps of which on the Angolan shore extend about three miles farther east. In this zone the salinity of the water is evidently too slight to allow the development of real mangrove forests as in the vicinity of Malela. To the left a patch of stunted papyrus (*Cyperus Papyrus* Linnæus) also demonstrates dwarfed growth as a result of unfavorable environment. In the right foreground an uprooted tussock of reeds has been stranded on the sand flat; its root stock has been completely honey-combed by the burrows of *Sesarma (Holometopus) angolense*. It is probable that such drifting 'rafts' contribute to the distribution of these crabs. In the swamps farther in-shore may be found *S. (Chiro-mantes) alberti*, *S. (H.) büttikoferi* and *S. (H.) elegans*." (H. L.)



## PLATE LXII

Bank of the Congo just below Malela at outgoing tide.

"Like a promontory, reaching out into the river, a great thicket of screw-pines (*Pandanus*) has conquered and maintained its place against all currents and floods. As with mangroves, their heavy stilt roots oppose the encroachment of the water, and, once established, they form an impenetrable jungle; the edges and midribs of the long, thick leaves being serrated by curved spiny teeth. Here the masses of drift that are constantly piling up along the shore often carry with them many crabs (*Sesarma* (*C.*) *alberti*, *S.* (*H.*) *büttikoferi*, *S.* (*H.*) *elegans*, and *Sarmatium curvatum*), most of which soon make their way into the neighboring mangrove swamps, here represented by a single tree. The few oil palms (*Elais guineensis* Jacquin) shown are part of a fairly extensive grove that was able to flourish beyond the reach of high tides; they probably mark the former site of a native village.

"At the extreme left, the distant bank of the wide creek shows the typical aspect of mangrove forests in the estuary of the Congo, which are often fringed with a luxuriant growth of *Raphia* palms." (H. L.)

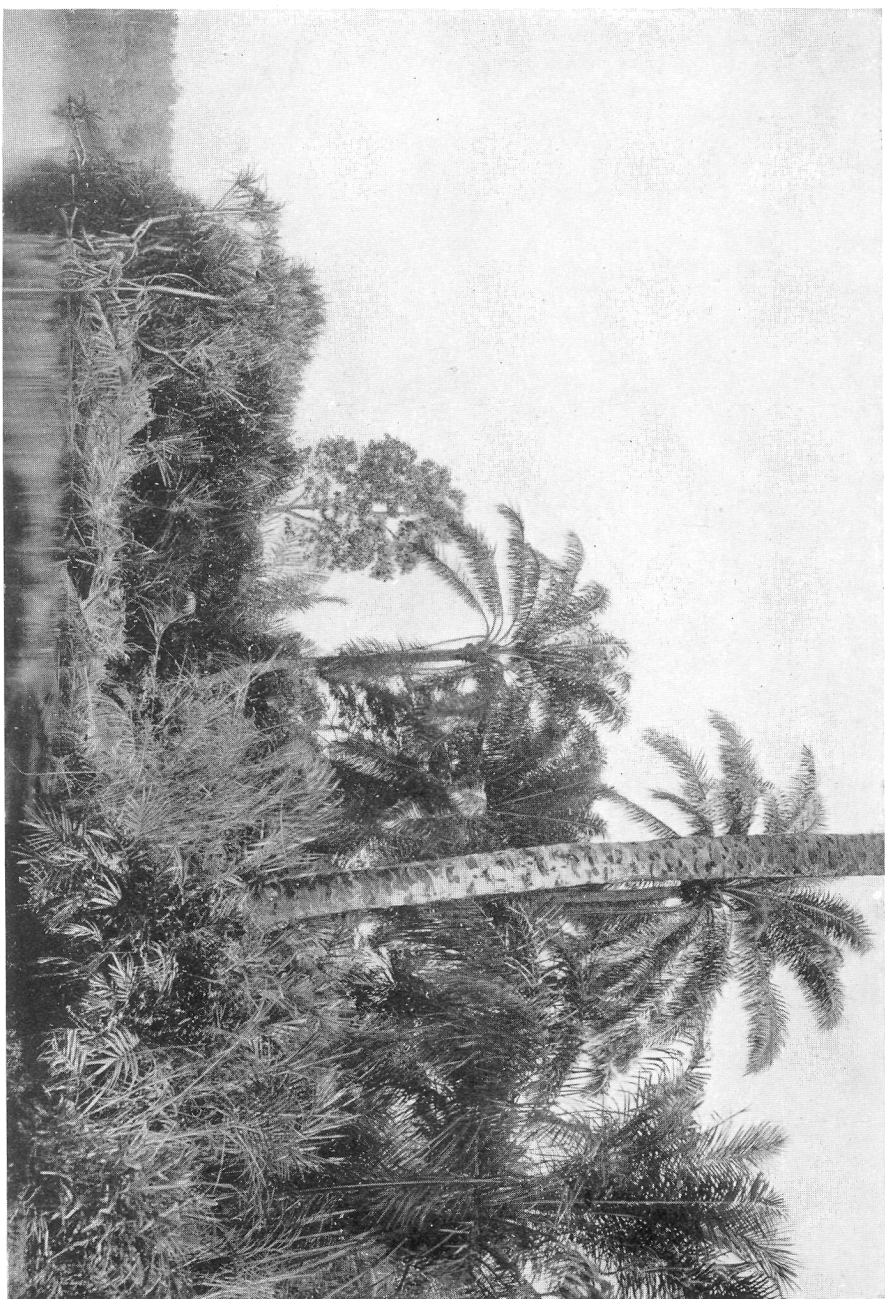




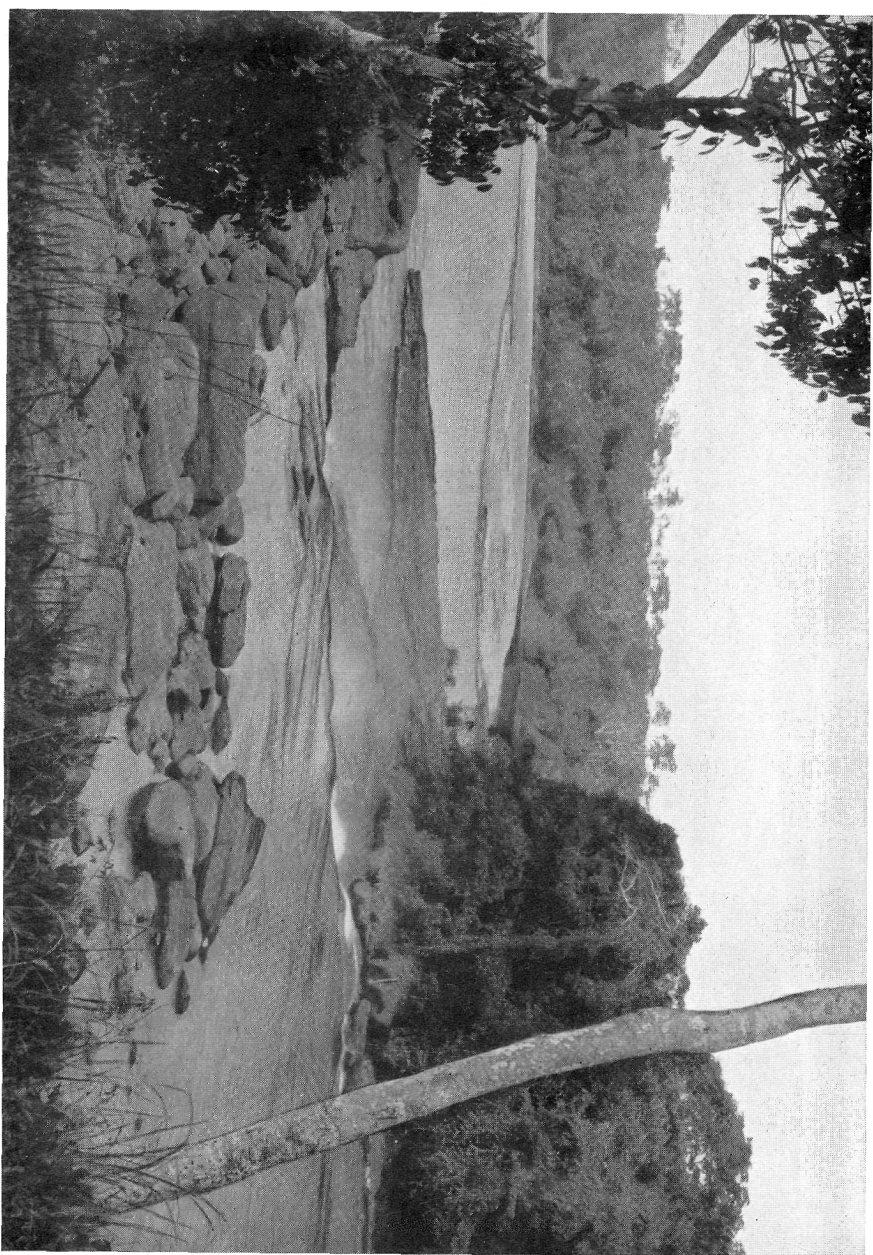
PLATE LXIII

Tshopo River near Stanleyville at low water in March.

"The crest of the well-known falls is here seen from behind. In the distance the sandflats give the appearance of a lake-like expanse, which at high water serves to temper the rush of the foaming floods.

"In so densely inhabited a region one must expect to find that primeval woods have long since been succeeded by secondary forest, as shown on the shore beyond. In many inundated portions along the banks the characteristically impenetrable aspect is evident. The rocks are often covered with a peculiar alga or moss-like growth of Podostemaceæ. Constant moisture in the form of spray carried by the wind has engendered a tropical luxuriance to the far side of the falls.

"Here in the shallows, swamps, boulder-fields and neighboring brooks a systematic search for crabs gave excellent results, one species collected, *Potamon* (*Geothelphusa*) *perparvus*, proving new to science, and others of this genus being common." (H. L.)



## PLATE LXIV

Forest brook in the Rain Forest of the northeastern Belgian Congo south of Poko, at the end of January.

"In such low-lying parts of the forest, moisture fosters an excessive luxuriance, which is most noticeable in the greater density of the foliage. Typical features are the mass of creepers, ferns, marantaceous reeds, mosses and liverworts.

"In all the hilly, undulating regions where the headwaters of the Congo slowly gain in volume, the many, clear, meandering streamlets are the habitat of *Potamon* (*Potamonautes*) *floweri*, *P. (P.) dybowskii*, and *P. (Geothelphusa) congoensis*. The torrential rush of the roiled floods after every freshet clears the beds of these brooks or chokes them with still greater masses of debris. The crabs and other creatures are thus constantly shifted. The marble-white sand in the shallow parts is generally avoided by all species of *Potamon*, but dead branches, leaves, and quiet pools beneath overhanging vegetation attract *P. (G.) congoensis* and *P. (P.) floweri*, whereas the moss-grown stones and the neighborhood of rapids are favored by *P. (P.) dybowskii*.

"On the northern and southern edge of the Rain Forest a dry period of over two months may cause the forest brooklets to dwindle somewhat, thus concentrating their fauna, so that crabs can be more easily found. At low water is the opportune time for some of these creatures to invade the larger streams, which, in spite of the absence of definite dry and rainy seasons near the equator, have their periods of fluctuation. Numerous inlets of adjoining brooks and swamps aid the wide distribution of these crabs."

(H. L.)



## INDEX

New names of species are printed in **heavy-faced type**, also the main references in a series of references; synonyms are printed in *italics*.

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   1-4; Pl. XLII, Fig. 2; Pl. LV,  
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