

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 ♀. Vankerckhoven-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.

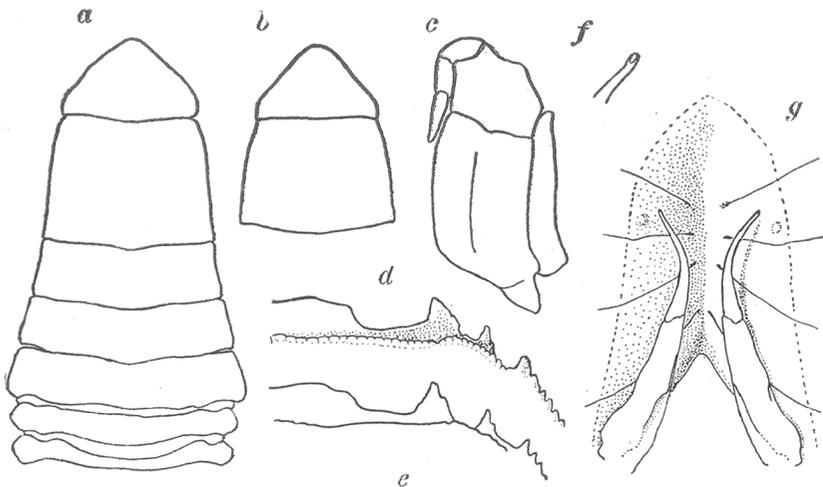


Fig. 13. *Potamon (Acanthothelphusa) faradjensis*, Faradje.

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)¹ 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.

¹*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*,¹ 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.);

¹Named 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.

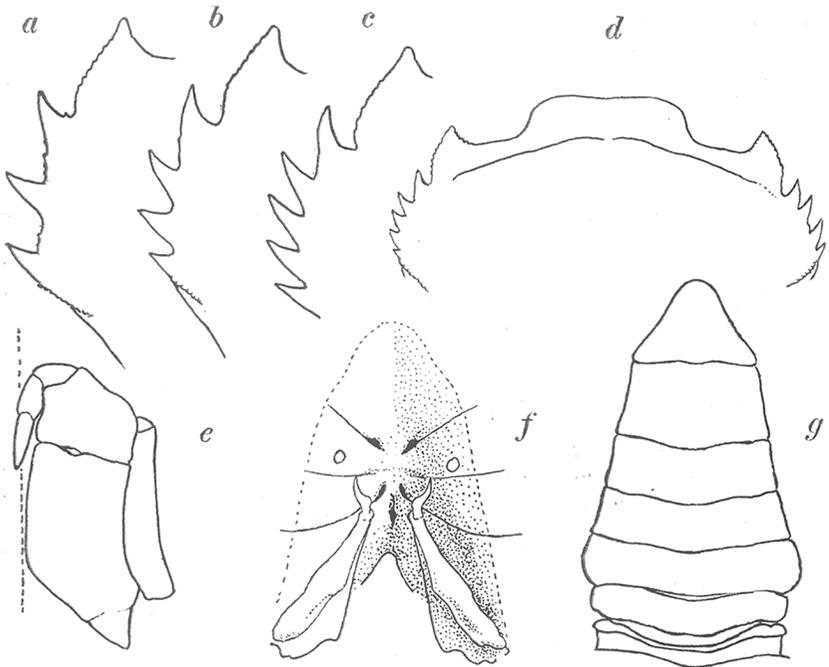


Fig. 14. *Potamon (Acanthothelphusa) langi*, Stanleyville.

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. *Ermetopus 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 Potamonidæ 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 antennæ are lodged entirely at the inner end of the orbital cavity. Antennulæ 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 Potamonidæ], 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.

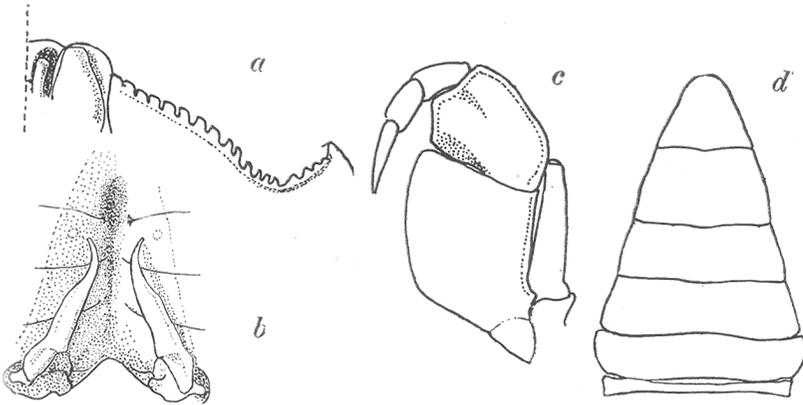


Fig. 16. *Deckenia mitis*, male 36 mm. wide, U. S. N. M. No. 32298.

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.

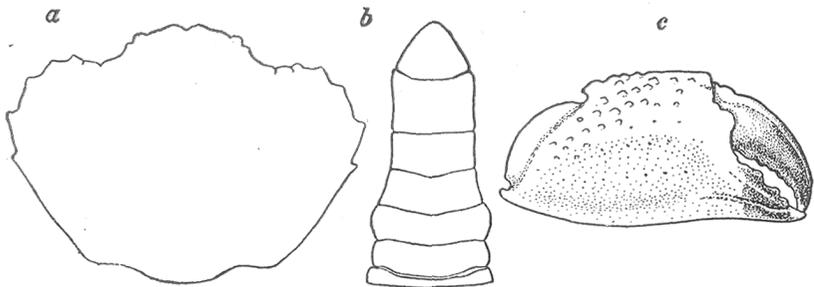


Fig. 17. *Menippe nanus*, male 10.7 mm. wide, Padron Point.

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 (♀).

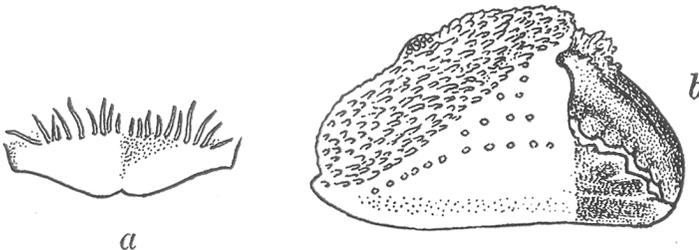


Fig. 18. *Pilumnus verrucosipes*, female 9.6 mm. wide, St. Paul de Loanda. A, front of carapace viewed from before; b, right, major chela.

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.

PAÑOPEUS 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, Journ. 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.

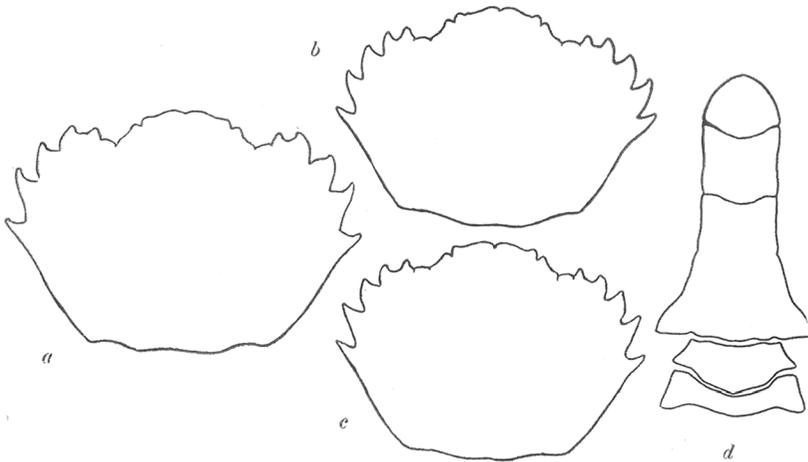


Fig. 19. *Panopeus africanus*, male, Banana.

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

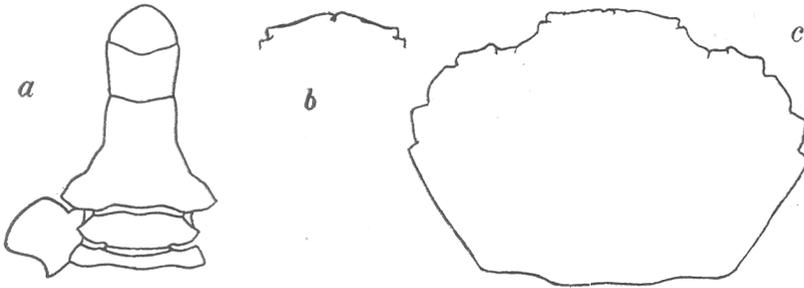


Fig. 20. *Eurypanopeus blanchardi* (?) male 9.3 mm. wide, San Antonio.

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. I (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-

tles 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 Africa¹; 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

¹Doflein, 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 débris, 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 Zambé; 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 Zambi 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 (Parasarma) 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,¹ 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

¹Tesch, *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 "plicas . . . 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 *guanhumii*). GRUVEL, 1912, Ann. Inst. Océanog., V, fasc. 1, pp. 3 and 4 (habits, and use as food).
Cardisoma armatum NOBLI, 1906, Mem. Soc. Esp. Hist. Nat., I, p. 319, text-fig. 1.
Cardisoma guanhumii STIMPSON (not Latreille), 1907, Smithson. 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.

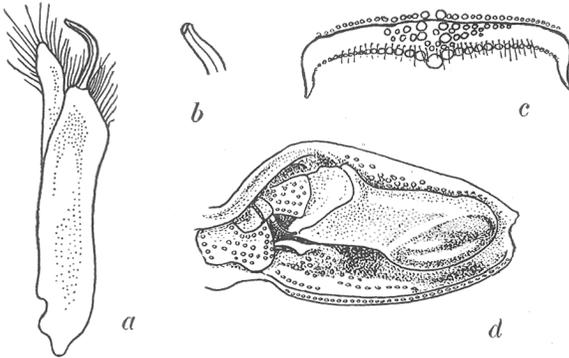


Fig. 21. *Cardisoma armatum*, male 94 mm. wide, Banana.

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 *guanhumii*; 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 *guanhumii*. 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 *guanhumii*, 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 *guanhumii*.

(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. guanhumii*.

A comparison of males of large and medium size (70 mm. wide and upwards) with a series of about forty specimens of *C. guanhumii*, 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 *guanhumii* 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 *guanhumii* 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 *Phœnix* 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.¹ 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 anterolateral 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.

¹Gravel, 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 anterolateral 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.

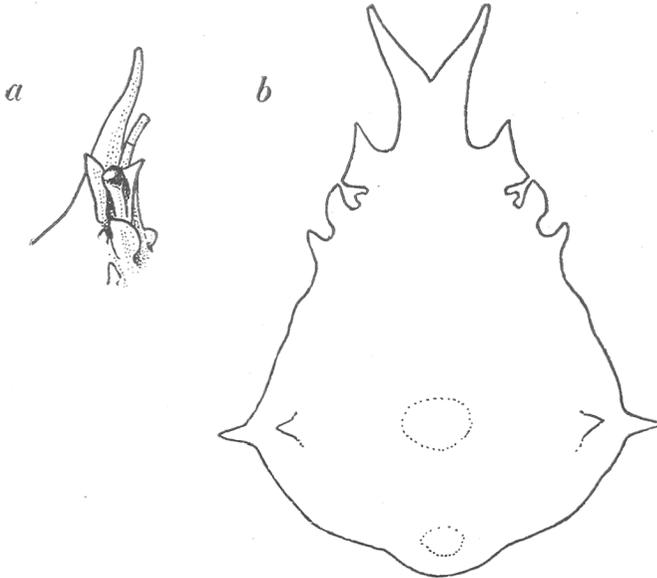


Fig. 22. *Pisa carinimana*, female, total length of carapace 14.8 mm.
A, side view of orbital region; b, carapace.

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 eave 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 pterygostomial 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.

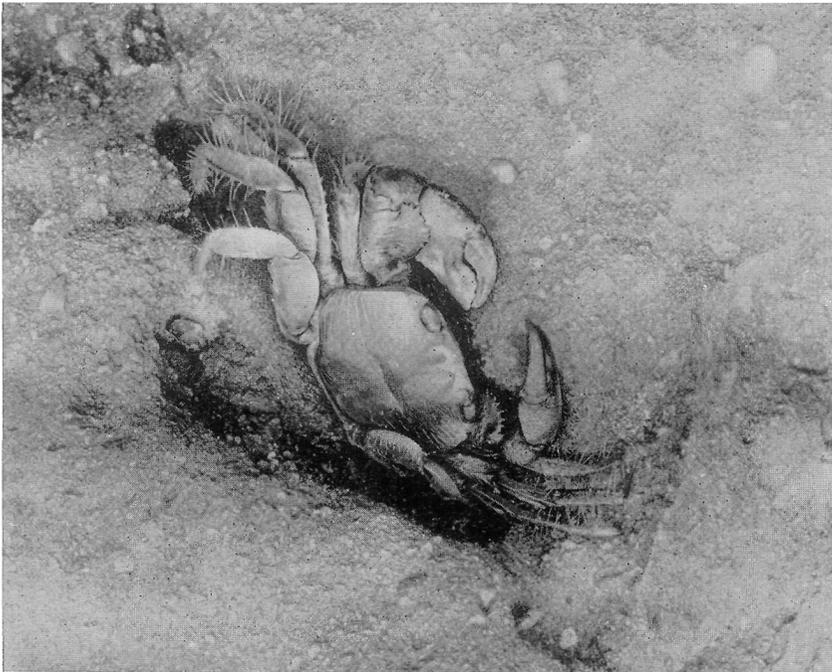
“When the equinoctial tides are at their lowest, the interesting marine fauna in the more shallow portions of the harbor of St. Paul de Loanda can be easily reached. Among the attractions are the fragile shells of *Pinna*, always associated with a firm cluster of other sea animals,

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.)

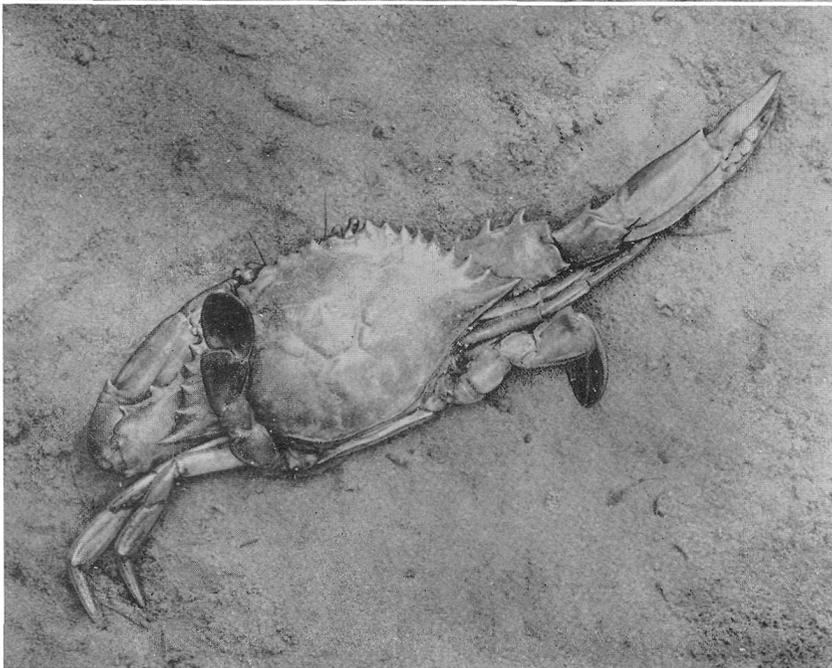
PLATE XV

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.)