

STUDIES ON THE FAUNA OF CURAÇAO AND OTHER
CARIBBEAN ISLANDS: No. 34.

WEST INDIAN CRABS OF THE GENUS *CALAPPA*,
WITH A DESCRIPTION OF THREE NEW SPECIES

by

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In recent years several extensive collections of West Indian Decapod Crustacea have been received for identification by the Rijksmuseum van Natuurlijke Historie. On various visits to the Netherlands Antilles Dr. P. WAGENAAR HUMMELINCK, Curator of the Zoological Laboratory at Utrecht, collected numerous Decapoda including many most interesting forms. Dr. J. S. ZANEVELD, Director of the Caribbean Marine Biological Institute at Curaçao, not only assisted Dr. HUMMELINCK on his last (1955) visit to that island, but also sent in to the Rijksmuseum van Natuurlijke Historie important material which he had collected before and since; furthermore, during my own stay in the Netherlands Antilles (November 1956 to April 1957), Dr. ZANEVELD did everything in his power to enable me to get together a fully representative collection of Decapoda of the region. Important material of Decapoda from St. Eustatius was received from Mr. P. A. VAN DEN HEUVEL, Oranjestad. Through the kindness of Dr. D. C. GEIJSKES, Director of the Surinaams Museum at Paramaribo, Suriname, the Decapoda collected by the trawler "Coquette" during trawling experiments off the coast of Suriname were placed at my disposal. In all of these collections the genus *Calappa* is well represented.

A study of this *Calappa* material revealed that until now at least three species have been confused under the name *Calappa flammea* (Herbst), and that a fourth species of the *flammea*-group occurs off the Suriname coast. Furthermore some interesting observations on *Calappa sulcata* Rathbun could be made.

A visit to the U.S. National Museum in Washington, D.C., made

it possible for me to consult the large east American *Calappa* collection of that institution. The results of this study helped me considerably in obtaining a better idea of the systematic status of the various species dealt with here. The material of these species present in the collections of the Rijksmuseum van Natuurlijke Historie at Leiden and of the Zoologisch Museum at Amsterdam is also listed in the present paper.

I wish to tender my best thanks to Messrs. HUMMELINCK, ZANEVELD, VAN DEN HEUVEL, and GEIJSKES for entrusting me with the study of their material, all of which is now incorporated in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden. I am also most grateful to Dr. FENNER A. CHACE, Jr., Curator of the Division of Marine Invertebrates, U.S. National Museum, Washington, D.C., for the privilege of examining the *Calappa* collection of the U.S. National Museum, and to Dr. J. H. STOCK for making the material of the Amsterdam Museum available to me.

For the drawings of the entire animals I am much indebted to Mr. H. HEYN; those of the abdomina were made by Mr. H. HEYN and Mr. G. W. M. KURPERSHOEK.

TABLE 14.

Geographical distribution of the *Calappa* material treated in this paper.

Species of <i>Calappa</i>	Massachusetts	North Carolina	South Carolina	Georgia	Florida	Louisiana	Texas	Mexico	Panama	Colombia	Suriname	Brazil	Bermuda	Bahamas	Jamaica	Hispaniola	Porto Rico	St. Thomas	St. Croix	St. Martin	St. Eustatius	Margarita	Bonaire	Curaçao	Aruba
<i>flammea</i> (Herbst)	x	x	x	x	x	x	x	x					x	x											
<i>ocellata</i> n.sp.		x			x	x			x	x		x	x		x										
<i>cinerea</i> n.sp.																	x	x							
<i>nitida</i> n.sp.											x	x							x	x					
<i>sulcata</i> Rathbun		x			x	x	x				x											x			x

Calappa flammea (Herbst, 1794)

[Figs. 28-35]

- Cancer chelis crassissimis* CATESBY, 1754, p. 36, pl. 36.
Cancer flammeus HERBST, 1794, vol. 2 pt. 5, p. 161, pl. 40 fig. 2.
Calappa marmorata, LATREILLE, 1802-1803, p. 392 (non *Cancer marmoratus* Fabricius, 1787).
Calappa flammea, MIERS, 1886, p. 284, pl. 23 fig. 1; VERRILL, 1908, p. 420 (p.p.), not pl. 25 fig. 1; FOWLER, 1912, p. 391, pl. 116; HAY & SHORE, 1918, p. 421, pl. 31 fig. 8; RATHBUN, 1937, p. 198 (p.p.), pl. 59, pl. 60 fig. 1; REED, 1941, p. 44; SPRINGER & BULLIS, 1956, p. 18.

Museum Leiden

Hadley Harbor, between Uncatena and Naushon Island, MASSACHUSETTS, U.S.A.; bottom sandy mud; Sep. 2, 1952; Dr. Marian H. Pettibone. — 2 juveniles, cb. 8 and 9 mm, cl. 7 and 7.5 mm (no. 9860).¹⁾

BAHAMA ISLANDS; 1887; A. de Haas. — 1 female, cb. 115 mm, cl. 90 mm (no. 7295).

Tortugas, FLORIDA, U.S.A.; July 1925; H. Boschma. — 1 male, cb. 136 mm, cl. 98 mm (no. 4905).

Museum Washington

Near Cape Hatteras, NORTH CAROLINA, U.S.A., 35°21'25"N, 75°24'25"W; coarse gray sand; depth 13 fms; Oct. 19, 1884; Albatross Sta. 2285. — 1 male, cb. 98 mm, cl. 76 mm (No. 7235).

Beaufort, N. C.; U.S. Bureau of Fisheries. — 1 male, cb. 136 mm, cl. 99 mm (No. 66415).

Beaufort, N. C.; Nov. 1919; R. L. Barney. — 1 male, cb. 124 mm, cl. 88 mm (No. 54162).

Off Beaufort, N. C.; Nov. 1, 1947; A. S. Pearse. — 2 males, cb. 117 and 133 mm, cl. 84 and 96 mm (No. 85536).

Morehead City, N.C.; sand flat; April 7, 1891; "Fish Hawk". — 1 male, cb. 92 mm, cl. 71 mm (No. 17169).

Off Cape Lookout, N.C., 34°11'N, 76°18'W; 22 fms.; Feb. 27, 1940; "Pelican" Sta. 187-2. — 1 male, cb. 43 mm, cl. 36 mm.

Off Cape Fear, N.C., 33°45'N, 77°59'W; 6 fms.; Feb. 15, 1940; "Pelican" Sta. 184-2. — 1 male, cb. 44 mm, cl. 36 mm.

Long Bay, SOUTH CAROLINA, 33°28.5'N, 78°13.5'W; 13 fms.; Feb. 13, 1940; "Pelican" Sta. 183-8. — 1 female, cb. 34 mm, cl. 30 mm.

Off Charleston Harbor, S.C.; Aug. 19, 1933; Chas. Mallard. — 1 male, cb. about 135 mm, cl. 100 mm (No. 81927).

Charleston Harbor, S.C.; April 1, 1880; R. E. Earl. — 1 female, cb. 135 mm, cl. 106 mm (No. 4036).

¹⁾ The abbreviations cb. and cl. are used for carapace breadth and carapace length, respectively.

Off Edisto Island, S.C., 32°26.5'N, 79°50'W; 8 fms.; March 13, 1940; "Pelican" Sta. 195-2. — 1 male, cb. 63 mm, cl. 49 mm.

Umbrella Creek near St. Andrew Sound, GEORGIA; Aug. 11, 1931. — 1 male, cb. 65 mm, cl. 53 mm.

Off Georgia, 31°03.5'N, 79°54.5'W; 50 to 100 fms; March 15, 1940; "Pelican" Sta. 197-8. — 1 female, cb. 67 mm, cl. 56 mm.

Off Fernandino, FLORIDA; 30°45'N, 80°34'W; 19 fms; Jan. 26, 1940: "Pelican" Sta. 177-4. — 1 male cb. 29 mm, cl. 25 mm.

Off Jacksonville, Fla., 30°28'N, 80°43.5'W; 18 fms; Jan. 25, 1940; "Pelican" Sta. 176-8. — 1 male cb. 29 mm, cl. 25 mm.

N. of Cape Canaveral, 28°57.5'N, 80°47.5'W; 9 fms; April 5, 1940; "Pelican" Sta. 209-2. — 1 male, cb. 38 mm, cl. 31 mm.

S. of Cape Canaveral, Fla., 28°09.5'N, 80°12.0'W; 18 fms; Jan. 17, 1940; "Pelican" Sta. 168-3. — 1 male, cb. 54 mm, cl. 44 mm.

Lake Worth, north of Palm Beach Inlet, Fla.; McGinty. — 1 male, cb. 45 mm, cl. 34 mm.

Singer Island in Lake Worth, Palm Beach Co., Fla.; sand bar; Jan. 17, 1950; McGinty. — 2 males, cb. 30 and 40 mm, cl. 25 and 30 mm.

Boca Geiga Bay, inner shore of Pine Key, Fla.; Jan. 1884; H. Hemphill. — 1 male, cb. 120 mm, cl. 86 mm (No. 6444).

Key West, Fla.; 1885; H. Hemphill. — 4 males, cb. 56 to 118 mm, cl. 46 to 87 mm (no. 8956).

Key West, Fla.; U.S. Bureau of Fisheries. — 2 males, cb. 73 and 83 mm, cl. 57 and 64 mm, and 3 females, cb. 50 to 79 mm, cl. 42 to 63 mm (no. 66441).

Tortugas, Fla.; 1931; W. L. Schmitt. — 1 female, cb. 128 mm, cl. 95 mm (no. 66364).

Fort Jefferson moat, Tortugas, Fla.; Aug. 4, 1924, July 1930, and Aug. 1930; W. L. Schmitt and D. Thompson. — 2 males, cb. 104 and 120 mm, cl. 87 and 90 mm, and 1 female, cb. 100 mm, cl. 79 mm (nos. 66365, 66366, 69317).

Four miles W. of Sanibel Island, Fla.; Dec. 7, 1935; Bass Biological Laboratory. — 1 male, cb. 43 mm, cl. 36 mm (no. 77257).

Boca Grande Pass, Fla.; March 4, 1889; U.S. Fish Comm. — 1 male, cb. 124 mm, cl. 90 mm (no. 20103).

Lemon Bay near Gasparilla Sound, Fla.; Jan. 1938; O. Hartman. — 1 female, cb. 70 mm, cl. 55 mm, 1 juv., cb. 51 mm, cl. 27 mm.

North end of Longboat Key, Sarasota Bay, Fla.; Jan. to April 1950; J. B. Knight. — 1 male, cb. 82 mm, cl. 58 mm.

Anclote section, Fla., 28°19'45"N, 83°06'30"W; 8.5 fms.; rocky bottom; Jan. 24, 1902; "Fish Hawk". — 1 female, cb. 55 mm, cl. 45 mm (no. 68517).

Pensacola, Fla.; from fish stomachs; S. Stearns and H. Hemphill. — 1 male, cb. 131 mm, cl. 96 mm, and 2 females, cb. 127 and 132 mm, cl. 97 and 102 mm (no. 5233).

Off Pass à Loutre, mouth of Mississippi River, LOUISIANA; 12 fms; 1931; Caribbean Biological Laboratories. — 1 female, cb. about 128 mm, cl. 101 mm (no. 64080).

Vicinity of Grand Isle, La.; 1930; H. Adam. — 1 female, cb. 46 mm, cl. 40 mm.

Gulf of Mexico due south of Houma, La.; deep water; H. L. Whitten. — 1 female, cb. 85 mm, cl. 68 mm (no. 94254).

Galveston, TEXAS; Aug. 11, 1940; J. L. Baughmann. — 1 male, cb. 85 mm, cl. 64 mm, 1 female, cb. 94 mm, cl. 75 mm.

Off Galveston, Texas; 28°47.5'N, 94°39'W; 11 fms; Jan. 21, 1939; "Pelican" Sta. 105-2. — 1 male, cb. 106 mm, cl. 80 mm.

Kingsville, Texas; C. Reed. — 1 male, cb. 98 mm, cl. about 76 mm (no. 71069).

Gulf of Campeche, MEXICO, 20°07'N, 91°41.2'W; 20 fms; Aug. 24, 1951; "Oregon" Sta. 436. — 3 females, cb. 46 to 113 mm, cl. 38 to 87 mm (no. 92639).

Gulf of Campeche, Mex., 19°54.1'N, 91°43'W; 23 fms; Dec. 10, 1952; "Oregon" Sta. 719. — 1 male, cb. 95 mm, cl. 72 mm (no. 94450).

Gulf of Campeche, Mex., 19°48'N, 91°20'W; 14 fms; Aug. 25, 1951 "Oregon" Sta. 441. — 1 male, cb. 110 mm, cl. 80 mm, and 2 females, cb. 86 and 112 mm, cl. 68 and 84 mm (no. 92876).

BERMUDA; F. V. Hamlin. — 2 males (1 damaged, the other with cb. 44 mm, cl. 38 mm).

Bermuda; G. Brown Goode. — 2 males, cb. 89 and 145 mm, cl. 67 and 102 mm, 1 female, cb. 86 mm, cl. 66 mm.

The carapace is 1.14 to 1.42 times as broad as it is long. In the small specimens (cb. 8 and 9 mm) the ratio of cb. to cl. is 1.14 and 1.20; in specimens with cb. 30 to 60 mm it is 1.16 to 1.24 (in one

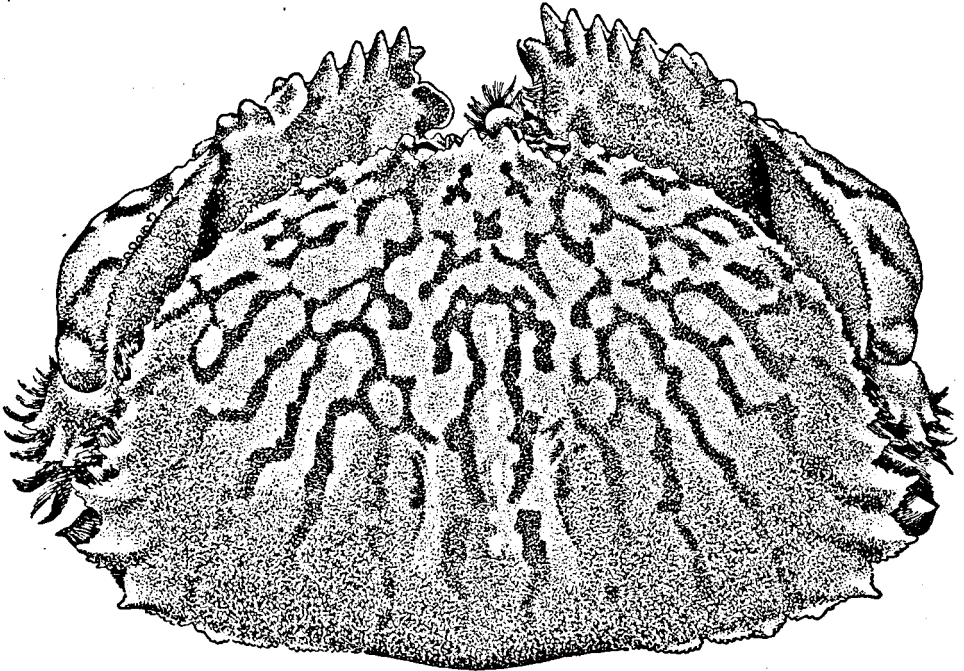


Fig. 28. *Calappa flammea* (Herbst). Female from Tortugas (Mus. Washington, no. 66365). Natural size.

specimen 1.32); in specimens with cb. 60 to 80 mm it is 1.20 to 1.30; in specimens with cb. 80 to 100 mm it is 1.25 to 1.41; in specimens with cb. 100 to 120 mm it is 1.28 to 1.40 (in one specimen 1.20); and in specimens with cb. 120 to 150 mm it is 1.27 to 1.42. The

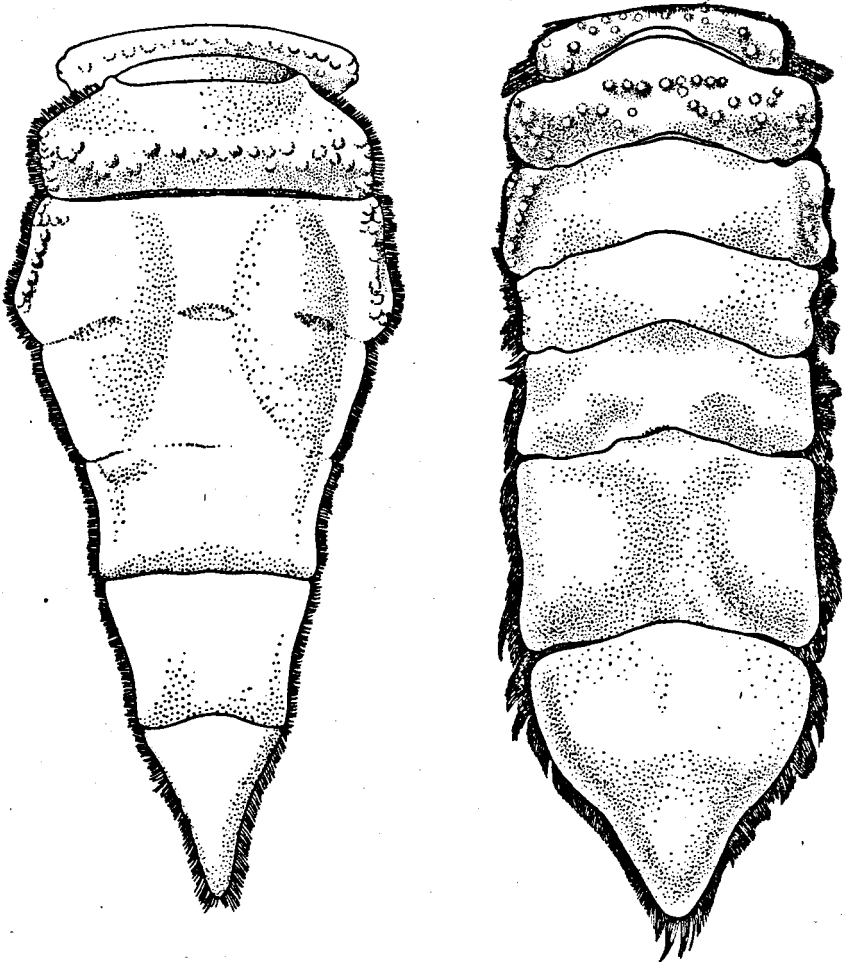


Fig. 29. (left) *Calappa flammea* (Herbst). Male from Tortugas (Mus. Leiden, no 4905). Abdomen. $\times 2$.

Fig. 30. (right) *Calappa flammea* (Herbst). Female from Bahama Islands (Mus Leiden, no. 7295). Abdomen. $\times 2$.

surface of the carapace is granular. As a rule the granules are more numerous, smaller and placed closer together than in *Calappa ocellata* new species; as far as the size is concerned, the granules resemble those of *C. cinerea* new species, but are more numerous and placed closer together than in that species. In the posterior half of the carapace the granules become smaller, less conspicuous, and slightly more widely spaced, with some larger granules scattered

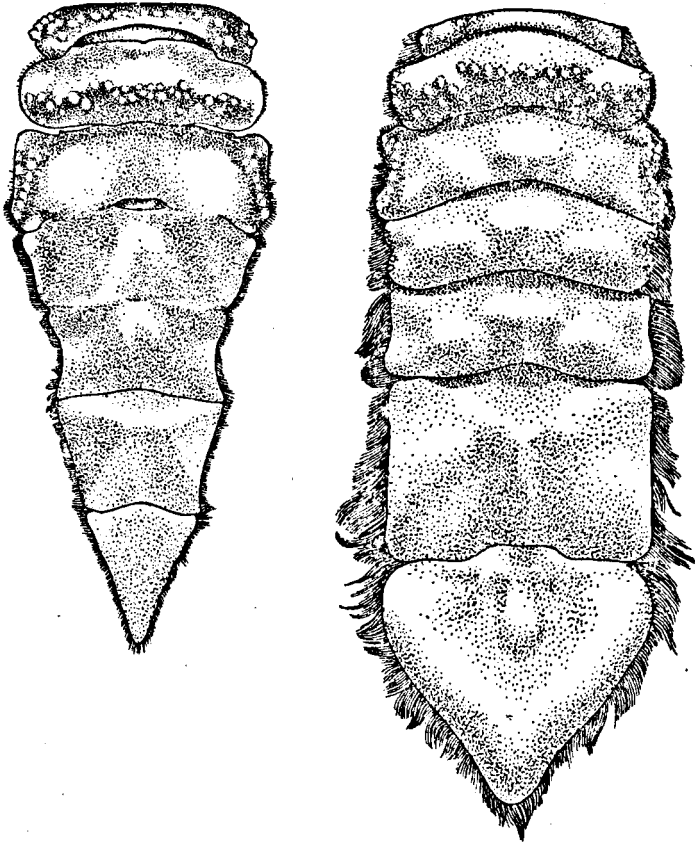


Fig. 31. (left) *Calappa flammea* (Herbst). Male from Gulf of Campeche (Mus. Washington, no. 94450). Abdomen. $\times 2$.

Fig. 32. (right) *Calappa flammea* (Herbst). Female from Tortugas (Mus. Washington, no. 66364). Abdomen. $\times 2$.

in between. The branchio-cardiac grooves are distinct. The surface of the carapace, especially in the anterior part, shows some tubercular elevations of different size, which are distinct in the juveniles and obsolete in the adults. The front projects somewhat beyond the orbits and is deeply emarginate anteriorly; a minute tooth is visible at the deepest point of the notch. The orbit shows two indistinct fissures in the outer half of the dorsal part. The antero-lateral margins together form a semicircle in the younger specimens and are less strongly arched in the larger. The postero-lateral wing-like expansions of the carapace are distinct and consist of five broad teeth, the second and third of which end in a sharply pointed, almost rectangular apex, but are never produced to a slender point. The teeth are far less slender than in *C. ocellata*, while the wing-like expansions are shorter and less conspicuous. Furthermore these expansions are less sharply set off from the antero-lateral margin of the carapace, the first tooth of the wing being less than twice as long as the last tooth of the antero-lateral margin, so that the antero-lateral margin and the outline of the wing merge into each other rather gradually. The fifth tooth of the wing shows a notch in the inner basal part.

The outer surface of the palm of the chelipeds is divided into three horizontal zones. In the lower of these zones there are many very large granules. The second zone is sharply set off from the first by the total absence of these large granules; sometimes this zone is slightly sunken. In the females it shows only a few scattered small granules, while in the males the granules there are more numerous, their density being not much different from that of the granules of the third zone. The third zone occupies practically the whole of the upper half of the outer surface of the palm of the chelipeds. It bears many rather small granules and some large but low granular tubercles; it is separated from the second zone by a horizontal row of rather small granules. In the females the third zone is more densely granulated than the second; in the males this difference in granulation is inconspicuous. The upper margin of the palm of the large (= right) chela bears seven, that of the small (left) chela six teeth. The proximal of these teeth is broad, low and distinctly two-topped. A strong tooth is present in the lower proximal part

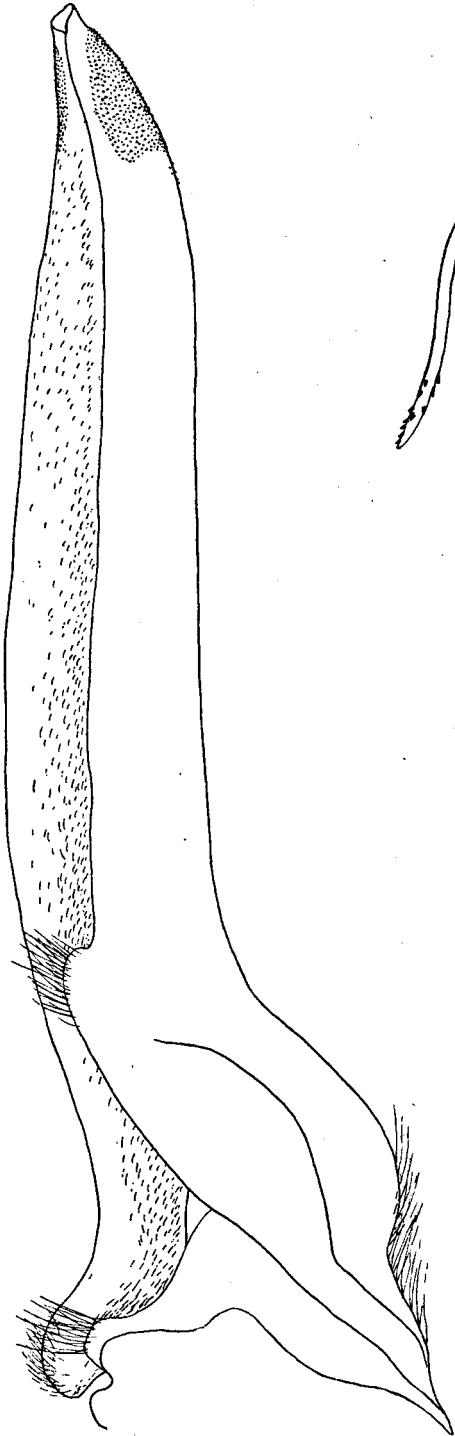


Fig. 33

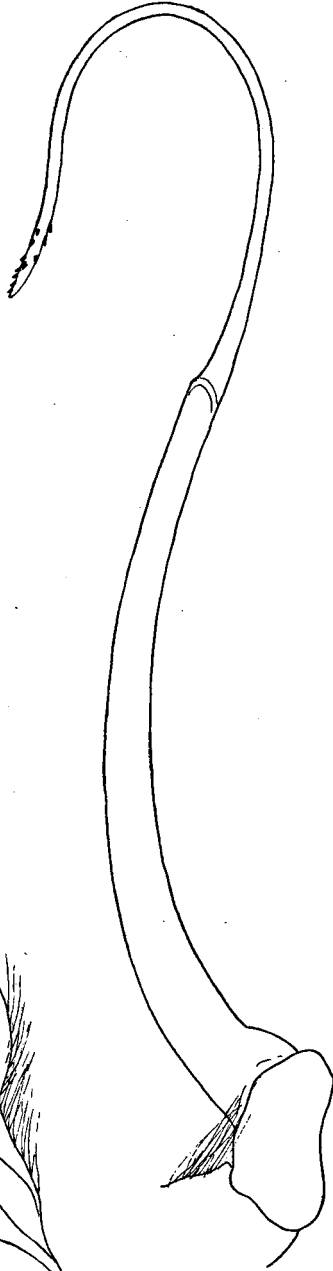


Fig. 34

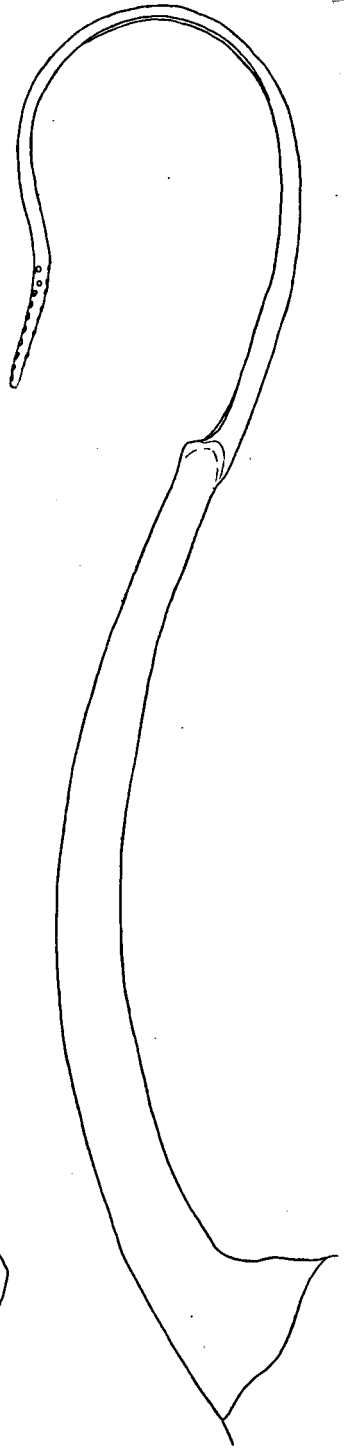


Fig. 35

of the outer surface of the palm; the apex of this tooth is approximately rectangular, with a sharp tip. The external part of the anterior margin of the merus is widened and cut into 4 teeth, the ventralmost of which is the broadest, the others becoming successively narrower. The teeth end in small acute tips. In the last four legs the carpus shows an indistinct antero-dorsal tooth. The meri of these legs have no granules on the lower surface, which is smoothly rounded in the second and third legs, indistinctly carinate in the fourth and provided with a distinct, sharp, uninterrupted carina in the fifth.

In the male the abdomen is rather narrow, but is slightly to distinctly broader than that of the following species. The first and second segments are free and show granules on their surface. The third to fifth segments are fused. The fourth is only slightly narrower at its base than the third is at the top. The surface of the fourth segment shows a narrow, flat or concave, rim-like area along each lateral margin. The fifth segment has a basal breadth twice as great as its length (measured on the median line). The sixth segment is free; its breadth (measured at the narrowest portion in the middle of its length) is greater than its length (measured on the median line). The seventh segment is elongate triangular, being somewhat less than 1.5 times as long as broad. In the female all the segments of the abdomen are free. The first two have granules distributed throughout their entire breadth, in the third a longitudinal row of granules extends close to the lateral margins, while in the fourth segment a few granules are visible near these margins. The sixth segment is about 1.5 times as broad as long. In the seventh segment the median part of the basal margin is slightly convex; the length of this segment is equal to, or slightly exceeds, the breadth.

The first pleopod of the male is an elongate conical tube which

Fig. 33. *Calappa flammea* (Herbst). Male from Tortugas (Mus. Leiden, no. 4905). First pleopod in ventral (= posterior) view. $\times 7$.

Fig. 34. *Calappa flammea* (Herbst). Male from Gulf of Campeche (Mus. Washington, no. 94450). Second pleopod in dorsal (= anterior) view. $\times 7$.

Fig. 35. *Calappa flammea* (Herbst). Male from Tortugas (Mus. Leiden, no. 4905). Second pleopod in dorsal (= anterior) view. $\times 7$.

gradually tapers towards the tip, at which there is a small, narrow opening. A field of minute horny tubercles is present near this distal opening. On the rest of the inner half of the lower surface of the pleopod numerous very short, stiff hairs are visible. A tuft of larger hairs is implanted on a tubercle in the proximal half of the lower surface of the pleopod. The second pleopod of the male is very slender; it consists of two parts. The distal part is strongly recurved inwards, becoming \cap -shaped. The tip bears two rows of horny spinules; one extends along the inner side of the tip and consists of about 7 to 10 spinules; the other starts at the outer side and curves over to the dorsal surface, and consists of about 4 to 6 spinules. Fig. 34 is a drawing of the second pleopod of a male with cb. 95 mm; in the large male (cb. 136 mm) from Tortugas the spinules at the tip of the pleopod are no longer visible, their former presence being indicated by small holes (fig. 35). In the large specimen the spinules are more numerous than in the smaller. No process is observed at the line separating the two halves of the pleopod. The basal part of the pleopod is slightly and evenly curved, the inner side being convex. The distal part is of a pale yellowish horn-colour.

The carapace of preserved specimens shows a conspicuous brownish-red colour pattern on a pale yellowish background. Over the posterior and postero-lateral part of the carapace there are about 14 longitudinal streaks of this reddish colour, which extend almost to the margin of the carapace. In the anterior part of the carapace the pattern is more of a loosely reticulated nature, which posteriorly passes gradually into the parallel streaks of the posterior half. On the carpus of the chelipeds there are four reddish streaks which, when the chela is folded against the body, form the continuation of the streaks of the carapace. The palm of the chela shows two or three distinct red spots; generally there are two on the large and three on the smaller chela. These red spots cover some of the granular tubercles of the palm. Furthermore, there are faint reddish markings in the extreme upper part of the palm. The dactylus of the large chela bears a pale reddish spot in the upper basal part. The inner surface of the palm shows two large reddish spots: a large irregularly shaped one in the centre and a smaller

one along the antero-dorsal margin. The basal part of the inner side of the dactylus of the large chela is red. The inner surface of the carpus also shows red markings.

The two juveniles from Massachusetts show a strong resemblance to the present species, but since practically nothing is known about the changes which the various characters of this and related forms undergo during the growth of the animals, they cannot be identified with complete certainty. The same is true of most specimens of this species with cb. less than 40 mm, in which the colour is no longer noticeable.

CATESBY (1754) described and illustrated a species of *Calappa* which he named "Cancer chelis crassissimus". His picture shows an animal which, judging by the colour pattern of the carapace and by the shape of the basal tooth of the palm of the chelipeds, might belong to *C. flammea*, though the postero-lateral wings are more like those of *C. ocellata*. It seems most probable that the latter difference is only due to an inaccuracy of the artist.

The first post-Linnean description of this species is by HERBST (1794), who also gave a coloured illustration of it. The colour pattern as shown by HERBST leaves little doubt that his species is identical with the present form.

LATREILLE (1802-1803) identified *Cancer flammeus* Herbst, 1794, with *Cancer marmoratus* Fabricius, 1787, and used the name *Calappa marmorata* (Fabr.) for the species. *Cancer marmoratus* was based by FABRICIUS (1787, p. 319) on a specimen in the collection of J. F. W. HERBST. In the original description FABRICIUS referred to a (then unpublished) description of the species by HERBST: "*Cancer marmoratus* Herbst. Cancr. App. Habitat — Dom. Herbst". HERBST's description of *Cancer marmoratus* was published in 1790 (vol. 1, p. 261, pl. 20 fig. 114) in the first Appendix to volume I of his work ("Erste Mantissee zu den Krabben"). HERBST's description and picture show that the species is a *Pachygrapsus*, which is nowadays correctly called *Pachygrapsus marmoratus* (Fabr.). For unknown reasons FABRICIUS (1798, p. 346) placed his *Cancer marmoratus* in the genus *Calappa* Weber, 1795, as WEBER (1795, p. 92) had already done before him. This action by FABRICIUS and WEBER was not approved by HERBST (1803, vol. 3 pt. 3, p. 15), who declared: "Sehr unnatürlich scheint es daher, dass in Fabricius Supplementen der *C. marmoratus* mitten unter diesen Krabben [*Cancer Calappa*, *C. granulatus*, *C. lophos*, etc.] zum Vorschein kommt, da dieser doch in seiner ganzen Struktur von jenen ganz und gar verschieden ist". LATREILLE (1802-1803) was evidently misled by the fact that FABRICIUS placed *Cancer marmoratus* in *Calappa*, and this is obviously the reason why he identified that species with *Cancer flammeus*. LATREILLE has been followed by several later authors, who also used the incorrect name for the present species. MIERS (1886, p. 284) was one of the first authors to re-establish the specific name *flammea* for it. Judging by MIERS's description and figure, it seems very probable that his specimens belong to the present form.

VERRILL (1908, p. 420) reported upon two colour varieties of *Calappa flammea* from Bermuda. His first variety is clearly the true *C. flammea*, since it was described as follows: "The most common color variety . . . had the ground-color of the carapace dull olive-brown, in life, streaked irregularly with many flame-shaped blotches of bright red; edges of carapace bright yellow. Distal part of chelipeds yellow, with large broad patches of dark red: digits pale red or pink. Ambulatory legs pink

above; the anterior edges bright red; the posterior edges and tarsi bright yellow" VERRILL's second variety proves to belong to *Calappa ocellata* (see p. 165).

FOWLER (1912, p. 391, pl. 116) described and figured a juvenile specimen of *Calappa* from New Jersey (cb. 28 mm, cl. 22 mm), which seems to belong to the present species.

HAY & SHORE's (1918, p. 421, pl. 31 fig. 8) description and figure leave not the least doubt that their material from North Carolina belongs to the true *C. flammea*.

The specimens enumerated by RATHBUN (1937, p. 198, pl. 59, pl. 60 fig. 1) in her monograph as *Calappa flammea* only partly belong to that species; some of the material proves to be *C. ocellata* and some belongs to *C. cinerea*. The specimen figured by RATHBUN is a true *Calappa flammea*.

Material collected by C. REED is preserved in the U.S. National Museum; it is probable that REED's (1941) record is based on this specimen. The specimens reported upon by SPRINGER & BULLIS (1956) have been identified by CHACE, and were also examined by me in the U.S. National Museum.

The range of *Calappa flammea* extends from North Carolina southwards to the Florida Keys, Tortugas and the Gulf Coast of the United States and Mexico, and from Bermuda to the Bahamas. HAY & SHORE (1918) say: "The natural range of the species extends as far northward as Cape Hatteras but in the larval stages it often drifts as far to the north as southern New England. Some of these are supposed to now and then survive a mild winter and to develop by the next summer into the small specimens which have at rare intervals been taken on the coasts of Massachusetts and Rhode Island." This remark still holds good.

Type. The type locality of *Cancer flammeus* given by HERBST (1794, p. 161), i.e. "Das Vaterland ist Ostindien" is incorrect; his material evidently being wrongly labelled. Later HERBST (1803, p. 19) remarked "Man findet diese Art auch in Amerika". The type specimen is no longer extant (see RATHBUN, 1937, p. 199).

MIRS' (1886) record of the species from Simon's Bay, Cape of Good Hope, is also, as was pointed out by BARNARD (1950, p. 3, 347), undoubtedly due to a mistake in labelling.

Calappa ocellata new species

[Figs. 36-40]

Guaja apara MARCGRAF, 1648, p. 182, fig.

Guáia-Apara PISO, 1658, p. 75, fig.

Cancer flosculosus, Amboinensis, varior, elegantissimus SEBA, 1761, p. 47, pl. 19 fig. 13.

Calappa flammea, RATHBUN, 1902, p. 84 (p.p.), pl. 2; VERRILL, 1908, p. 420 (p.p.), pl. 25 fig. 1; RATHBUN, 1919, p. 331 (p.p.); RATHBUN, 1936, p. 388; RATHBUN, 1937, p. 198 (p.p.), not pl. 59, not pl. 60 fig. 1 (not *Cancer flammeus* Herbst, 1794).

Museum Leiden

Tortugas, FLORIDA, U.S.A.; July 1925; H. Boschma. — 1 female, cb. 55 mm, cl. 44 mm (no. 4921).

Simson's Bay, ST. MARTIN, Netherlands Antilles; from fish trap; depth about

6 m; Feb. 23, 1957; obtained from fishermen; L. B. Holthuis no. 1114. — 1 male, cb. 124 mm, cl. 92 mm (no. 11208).

Simson's Bay, St. M.; washed ashore on sandy beach; Feb. 19, 1957; L. B. Holthuis, no. 1116. — 1 carapace, cb. 90 mm, cl. 68 mm (dry).

Oranje Bay, St. EUSTATIUS, N.A.; 15 m; May, 1957; P. A. van den Heuvel. — 1 male, cb. 107 mm, cl. 81 mm (no. 11245).

Oranje Bay, St. E.; about 5 fms.; Aug. 18, 1957; P. A. van den Heuvel. — 1 male, cb. 132 mm, cl. 96 mm (no. 11413).

N.W. coast of ARUBA, N.A.; 1953; A. Bartels. — 1 carapace, cb. 70 mm, cl. 55 mm (dry).

San Nicolas Bay, Aruba; July 31, 1905; J. Boeke. — 1 male, cb. 104 mm, cl. 78 mm (no. 1169).

Westpunt, CURAÇAO, N.A.; Dec. 1954; J. S. Zaneveld. — 1 male, cb. 81 mm, cl. 64 mm (dry).

Bullen Bay, Cur.; in fine-meshed fish trap; April 1, 1955; J. S. Zaneveld. — 1 female, cb. 78 mm, cl. 61 mm (no. 10817).

St. Michiels Bay, Cur.; in sea; Feb. 1, 1955; J. S. Zaneveld. — 1 male, cb. 111 mm, cl. 82 mm (no. 11209).

St. Michiels Bay, Cur.; in muddy bay; Feb. 4, 1955; J. S. Zaneveld. — 1 male, cb. 79 mm, cl. 60 mm (no. 10819).

St. Michiels Bay, Cur.; sandy bottom; 4 m; Jan. 17, 1957; M. Thiebau. — 1 female, cb. 99 mm, cl. 75 mm (no. 11210).

Caracas Bay, Cur.; dredge; Oct. 7, 1908; J. Boeke. — 1 female, cb. 120 mm, cl. 93 mm (no. 2306).

Caracas Bay, Cur.; from fish trap; 1955; P. J. Scheer. — 2 males, cb. 32 and 89 mm, cl. 27 and 68 mm (no. 10818).

Klein Bonaire, near BONAIRE, N.A.; shore, among corals, caught with hand net; June 5, 1905; J. Boeke. — 1 male, cb. 114 mm, cl. 83 mm (no. 1223).

America. — 1 male, cb. 101 mm, cl. 75 mm (dry).

Museum Amsterdam

Piscadera Bay, CURAÇAO, N.A.; among stones in very shallow water; July 21, 1905; J. Boeke. — 1 female, cb. 46 mm, cl. 40 mm.

Rifwater near Willemstad, Cur.; shallow water of lagoon; depth 0.5 fms; beam trawl; Oct. 21, 1905; J. Boeke. — 1 male, cb. 59 mm, cl. 48 mm.

Entrance of Lac, BONAIRE, N.A.; found dead; Jan. 10, 1930; P. Wagenaar Hummelinck. — 1 male, cb. 120 mm, cl. 87 mm (dry).

Locality unknown. — 1 female, cb. 102 mm, cl. 80 mm.

Museum Washington

Near Cape Hatteras, NORTH CAROLINA, U.S.A., 35°21'10"N, 75°22'40"W; 14 fms.; bottom black sand; "Albatross" Sta. 2282. — 1 female, cb. 76 mm, cl. 61 mm (no. 7226).

Beaufort harbour, N.C.; W. Stimpson. — 1 male, cb. 99 mm, cl. 74 mm (no. 2023).

Big Pine Key, FLORIDA; off S.E. point; Feb. 21, 1935; G. S. Miller. — 1 female, cb. 92 mm, cl. 72 mm (no. 71285).

Key West, Fla.; 1885; H. Hemphill. — 2 males, cb. 96 and 81 mm, cl. 71 and 63 mm, and 1 female, cb. 77 mm, cl. 61 mm.

Tortugas, Fla.; 1928; A. S. Pearse. — 1 female, cb. 81 mm, cl. 63 mm (no. 62152).
Tortugas, Fla.; July–Aug., 1930; W. L. Schmitt. — 1 male, cb. 97 mm, cl. 74 mm (no. 69316).

Off Bush Key, Tortugas, Fla.; shallow water; July 14, 1936; H. H. Darby. — 1 male, cb. 105 mm, cl. 80 mm (no. 76147).

BERMUDA; G. Brown Goode. — 1 damaged male, cl. 59 mm (no. 428).

JAMAICA; March 1–11, 1884; "Albatross". — 1 female, cb. 89 mm, cl. 71 mm (no. 7676).

Montego Bay, Jam.; C. B. Wilson. — 2 males, cb. 70 and 72 mm, cl. 52 and 56 mm (no. 42915).

Montego Bay, Jam.; June 24, 1910; C. B. Wilson. — 1 female, cb. 88 mm, cl. 71 mm (no. 42891).

Montego Bay, Jam.; University of Iowa. — 1 male, cb. 64 mm, cl. 48 mm (no. 77294).

Port-au-Prince, Haiti, HISPANIOLA; 1946; A. Curtiss. — 1 male, cb. 95 mm, cl. 77 mm.

Port Plata, Dominican Republic; C. A. Fraser. — 1 male, cb. 103 mm, cl. 80 mm (no. 4156).

Cataño, San Juan Harbour, PORTO RICO; 1898–1899; "Fish Hawk".

1 female, cb. 66 mm, cl. 53 mm (no. 24072).

Mayaguez, P.R.; coral reef; Jan. 20, 1899; "Fish Hawk". — 1 male, cb. 90 mm, cl. 65 mm (no. 24069).

Arroyo, P.R.; Feb. 17, 1899; "Fish Hawk". — 1 male, cb. 105 mm, cl. 77 mm (no. 24071).

ST. CROIX, Virgin Islands; H. A. Beatty. — 1 female, cb. 86 mm, cl. 68 mm (no. 69323).

Fox Bay, Colon, PANAMA; March 31, 1911; S. E. Meek & S. F. Hildebrand. — 1 male, cb. 88 mm, cl. 68 mm, and 1 female, cb. 53 mm, cl. 44 mm (no. 43998).

Toro Point, Canal Zone, Pan.; Jan. 25, 1925; S. E. Meek & S. F. Hildebrand. — 1 male, cb. 95 mm, cl. 74 mm (no. 59276).

Sabanilla, COLOMBIA; March 16–22, 1884; "Albatross". — 1 male, cb. 89 mm, cl. 69 mm (no. 7567).

BONAIRE, Netherlands Antilles; shallow water; 1905; J. Boeke. — 1 male, cb. 97 mm, cl. 74 mm (no. 42947).

Maria Farinha, Pernambuco, BRAZIL; 1875–1877; R. Rathbun. — 1 male, cb. 115 mm, cl. 86 mm (no. 40575).

Until now this new species has been confused with *Calappa flammea*, to which it is in fact very closely related. The differences between the two are as follows.

The granulation of the carapace is far coarser in *C. ocellata* than in the previous species: the granules are larger, fewer and placed wider apart. The carapace in *C. ocellata* is relatively slightly narrower than in *C. flammea*. In specimens with the carapace breadth between 30 and 60 mm the ratio of cb. to cl. is 1.15 to 1.25, in specimens with cb. 60 to 80 mm it is 1.25 to 1.35, in specimens with cb. 80 to

100 mm it is 1.23 to 1.38, and in specimens with cb. 100 to 132 mm it is 1.28 to 1.40. In *C. ocellata* the winged postero-lateral part of the carapace is distinctly set off from the antero-lateral margin. The last tooth of the antero-lateral margin is less than half as long as the first tooth of the wing-like expansion. As a result the outline of the wing projects suddenly beyond that of the antero-lateral margin. The teeth of the postero-lateral expansion of the carapace taper to slender pointed tips and are decidedly more slender than those of *C. flammea*. As a rule the antero-lateral margin in *C. flammea* is less convex than in *C. ocellata*. The notch in the last tooth of the wing-like expansion is very inconspicuous in the present species.

The chelipeds in the two species are very similar as far as the shape and tuberculation are concerned, though neither in the males nor in the females of *C. ocellata* is there a great difference in the granulation of the second and third zones of the outer surface of the palm. In the females of the present species this tuberculation is, as a rule more conspicuous than in the males. In *C. ocellata* the tooth in the basal part of the outer surface of the palm is usually sharply

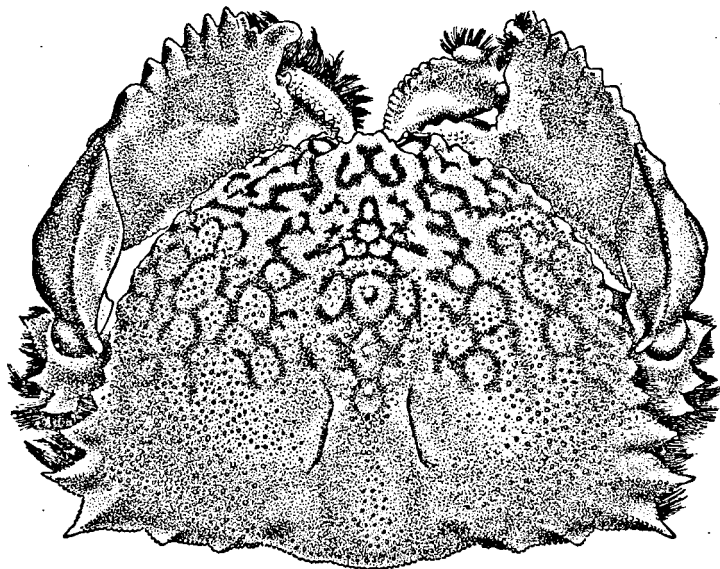


Fig. 36. *Calappa ocellata* new species. Male paratype from Caracas Bay, Curaçao (Mus. Leiden, no. 10818). Natural size.

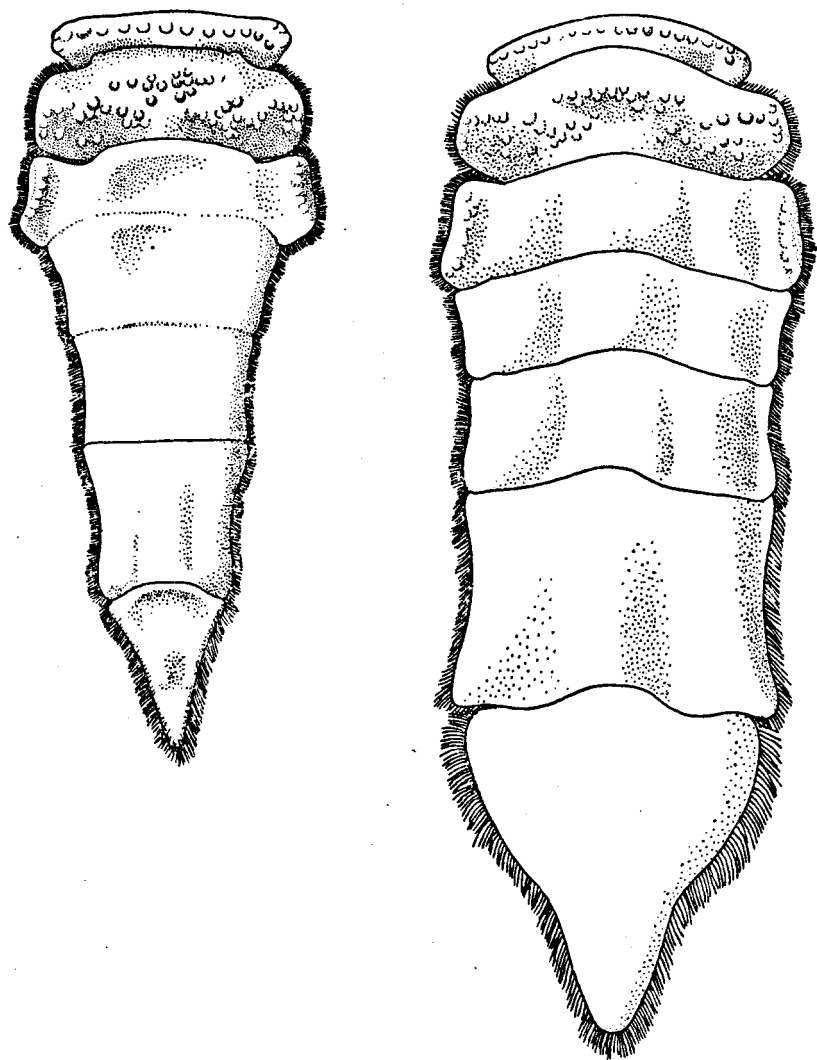


Fig. 37. (left) *Calappa ocellata* new species. Male holotype from Klein Bonaire (Mus. Leiden, no. 1223). Abdomen. $\times 2$.

Fig. 38. (right) *Calappa ocellata* new species. Female paratype from Caracas Bay, Curaçao (Mus. Leiden, no. 2306). Abdomen. $\times 2$.

pointed, gradually narrowing to an acute tip; in *C. flammea* this tooth as a rule is approximately rectangular at the top. The proximal of the teeth at the upper margin of the palm is narrower in *C. ocellata* than in *C. flammea*, and it is not, or only very indistinctly, two-topped in the former species. In *C. ocellata* the teeth along the anterior margin of the merus of the chelipeds are more sharply pointed than in *C. flammea*. The last four pairs of legs in *C. ocellata* are very similar to those of *C. flammea*, the only difference being that the antero-dorsal tooth of the carpus is better developed in *C. ocellata*. In that species, as in the previous one, no granules are present on the lower surface of the meri of the walking legs.

The abdomen of *C. ocellata* is distinctly more slender than that of *C. flammea*. Just as in the latter species, the abdomen of the males has the third to fifth segments fused. The fourth segment is relatively narrower at its base than in *C. flammea*. The lateral parts of the upper surface of this segment curve regularly down towards the lateral margin, so that there is no such flat or concave rim on each side of the segment as is found in *C. flammea*. The length of the fifth segment, measured on the median line, is distinctly more than half its basal breadth. The breadth of the sixth segment (measured in the middle of the segment, where it is narrowest) is as great as or smaller than the length of the segment (measured on the median line). Furthermore, the seventh segment is more slender than in the previous species. In the female too the abdomen is relatively narrower than in *C. flammea*. The fourth segment in the present species never shows granules near the lateral margins. The submedian grooves of the third, fourth and fifth abdominal segments in the females of the present species are more distinct than in *C. flammea*. The median part of the basal margin of the seventh segment is more distinctly convex than in that species. This segment is always distinctly longer than broad. In juvenile specimens the abdomen is more slender than in adults.

The first pleopod of the male is more robust than in *C. flammea* and has a distinctly wider orifice. The general structure of this appendage, however, is the same in both species. The second pleopod of the male also strongly resembles that of *C. flammea*. It consists of two parts and has the distal part strongly recurved and

∩-shaped. The top reaches beyond the base of the distal part. The apex bears two almost straight rows of spinules; the inner of these rows has fewer spinules (about 9 to 14) than the outer row (about 14 to 23). Sometimes a spinule is found between the two rows. The distal part of the pleopod is of a yellowish horn-colour.

In preserved specimens the entire anterior half of the carapace is red with a large number of white, often ocellate spots, and a few white streaks, so that a close reticulate pattern of red is formed.

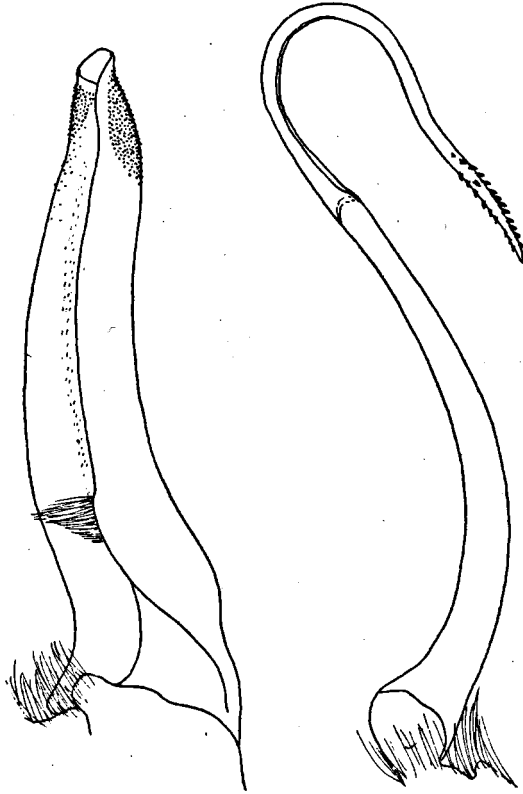


Fig. 39. (left) *Calappa ocellata* new species. Male paratype from St. Michiels Bay, Curaçao (Mus. Leiden, no. 10819). First pleopod in ventral (= posterior) view. $\times 7$.

Fig. 40. (right) *Calappa ocellata* new species. Male paratype from St. Michiels Bay, Curaçao (Mus. Leiden, no. 10819). Second pleopod in dorsal (= anterior) view. $\times 7$.

This reticulate pattern, which is far more compact and complete than in *C. flammea*, extends over the full breadth of the anterior half of the carapace and is completely absent in the posterior half. This posterior half only shows (a) a few distinct spots, which are placed between the bases of the teeth of the postero-lateral wings and (b) two distinct red spots at some distance before the posterior margin of the carapace, in the submedian region above the bases of the last legs. The outer surface of the palm of both chelipeds shows one or two red spots near the articulation with the dactylus; the lower of these spots is larger and more distinct than the upper, while in the larger chela the spots are more distinct and persistent than in the smaller. There are some red markings between the teeth of the upper margin of the palm. The large red spots on the outer surface of the palm, present in *C. flammea*, are entirely absent in my preserved material of *C. ocellata*. The outer surface of the dactylus of the large chela shows a large reddish spot in the basal half and a small spot close to the articulation with the palm. Only the smaller spot is found on the dactylus of the smaller chela. The colour on the inside of the chelipeds is very similar to that found in *C. flammea*, though the central spot on the palm is distinctly smaller, while the markings on the carpus and merus are likewise less clear.

The first description and illustration of this species was published by MARCGRAF (1648, p. 182), who described the colour of his Brazilian material as follows: "Anterior pars testae ultra medietatem coloris est obscure brunni & variegata maculis ex albo flavescens, & quasi solis punctulis constantibus, ac in sui medio maculam brunnam habentibus: posterior pars ex albo flavescit, striis brunnis, secundum longitudinem ornata". It is strange to see that this species, which was evidently the first of its genus to become known as occurring in extra-European waters, has had to wait for more than three centuries after its discovery before receiving its proper scientific name.

An excellent figure of the carapace of this species is given by SEBA (1761), who stated that the species originated from Amboina in the Moluccas. This locality indication, like so many of those given by SEBA, is obviously incorrect.

RATHBUN (1902) gave a beautiful coloured drawing of the present species made from a living specimen from Porto Rico. VERRILL (1908, p. 420) distinguished two colour varieties of what he thought to be *Calappa flammea*. The first of these varieties is the true *Calappa flammea*, the second is evidently the present species. The latter was described by VERRILL as follows: "Other specimens had the carapace covered with pretty regular, round ocellated spots, the center white, surrounded by a ring of dark red or reddish brown. Chelipeds pink, spotted with roundish spots of deep red; spines red; tips of digits yellow. Ambulatory legs

purple, with the articulations and posterior edges red; tarsi yellow". This colour description agrees quite well with RATHBUN's (1902) figure. VERRILL's pl. 25 fig. 1 also distinctly shows the present species.

The material collected by Dr. J. BOEKE in 1905 in the Netherlands Antilles and reported upon as *Calappa flammea* by RATHBUN (1919) could be examined. All the specimens from Aruba, Curaçao and Bonaire proved to belong to the present species, while the material from St. Martin is *C. cinerea*. Furthermore, the male specimen collected by Dr. P. WAGENAAR HUMMELINCK at Bonaire, and reported upon by RATHBUN (1936) as *Calappa flammea* was found on examination to be *C. ocellata*. Both the BOEKE and the HUMMELINCK material was mentioned again by RATHBUN (1937) in her monograph on the American Oxystomata.

The dry male from "America" in the collection of the Leiden Museum is labelled "*Calappa kraussi* Herkl.". As far as I am aware HERKLOTS never described this species, and the name is evidently a manuscript name.

Calappa ocellata is a West Indian species, the range of which extends to the north as far as North Carolina and Bermuda, to the south as far as Pernambuco, Brazil. In the northern part of its range (from Tortugas northwards) it is far less common than *C. flammea*.

Type. Holotype is the male from Klein Bonaire preserved in the Rijksmuseum van Natuurlijke Historie at Leiden under the registered number Decapoda 1223, referred to above. The other specimens are paratypes.

Calappa cinerea new species

[Figs. 41-45]

Calappa flammea, RATHBUN, 1902, p. 84 (p.p.), not pl. 2; RATHBUN, 1919, p. 331 (p.p.); RATHBUN, 1937, p. 198 (p.p.), not pl. 59, not pl. 60 fig. 1 (not *Cancer flammeus* Herbst, 1794).

Museum Leiden

Bay of Philipsburg, ST. MARTIN, Netherlands Antilles; Aug. 1905; Dr. Shaw, no. 1442. — 1 male, cb. 73 mm, cl. 59 mm (no. 10813).

Simons Bay, St.M.; washed ashore on a sandy beach; Feb. 19, 1957; L. B. Holthuis, no. 1116. — 1 fragment of a carapace (dry).

Lac, BONAIRE, N.A.; in sandy bay near the end of the northern peninsula forming the mouth of the lagoon; depth about 0.5 m; sandy bottom; March 6, 1957; L. B. Holthuis, no. 1138. — 2 females, cb. 66 and 90 mm, cl. 52 and 69 mm (no. 11204).

25 miles N. of MARGARITA Island, Venezuela; 20 fms; Dec. 9, 1954; Skipper A. Blok. — 8 males, cb. 66 to 105 mm, cl. 54 to 80 mm, one female, cb. 95 mm, cl. 74 mm (nos 10814 and 10815).

Museum Amsterdam

Antilles; Ch. Tamrach. — 1 male, cb. 120 mm, cl. 89 mm (dry).

Museum Washington

Boqueron Bay, west coast of Porto Rico; Jan. 25, 1899; "Fish Hawk". — 1 male, cb. 103 mm, cl. 75 mm (no. 24070).

San Juan Harbour, P.R.; Jan. 17, 1899; "Fish Hawk". — 1 male, cb. 57 mm, cl. 49 mm (no. 24073).

St. THOMAS Harbour, Virgin Islands; July 28, 1915; C. R. Shoemaker. — 1 male, cb. 129 mm, cl. 91 mm, 1 female, cb. 98 mm, cl. 77 mm (no. 50509).

Off Buch Island, St. CROIX, Virgin I.; 5 fms; H. A. Beatty. — 1 male, cb. 111 mm, cl. 84 mm (no. 81989).

Porlamar, MARGARITA, Venezuela: July 7, 1895; W. Robinson. — 1 male, cb. 104 mm, cl. 80 mm (no. 18817).

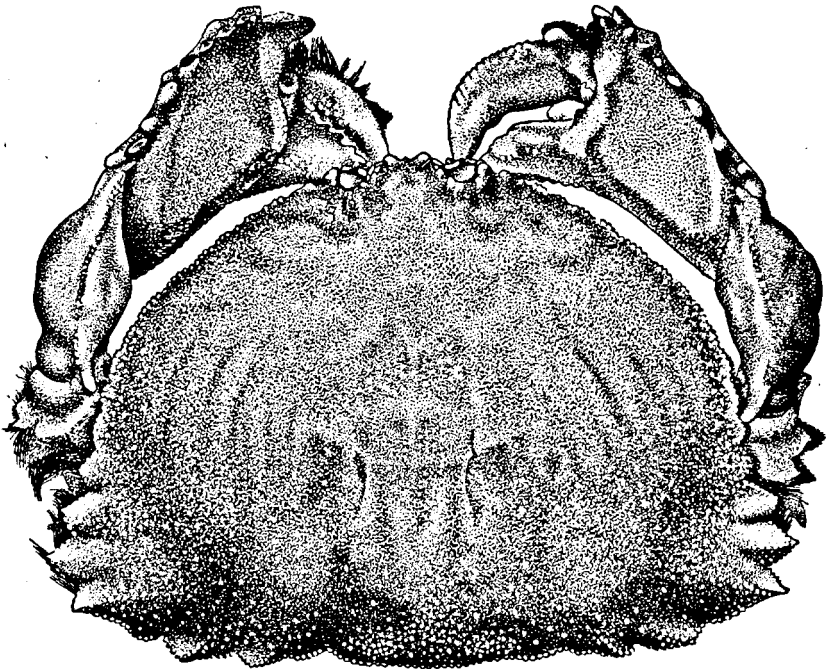


Fig. 41. *Calappa cinerea* new species. Male paratype from 25 miles N. of Margarita (Mus. Leiden, no. 10814). Natural size.

The species is very closely related to *Calappa flammea* (Herbst) and has been confused with that species by RATHBUN (1902, 1919, 1937).

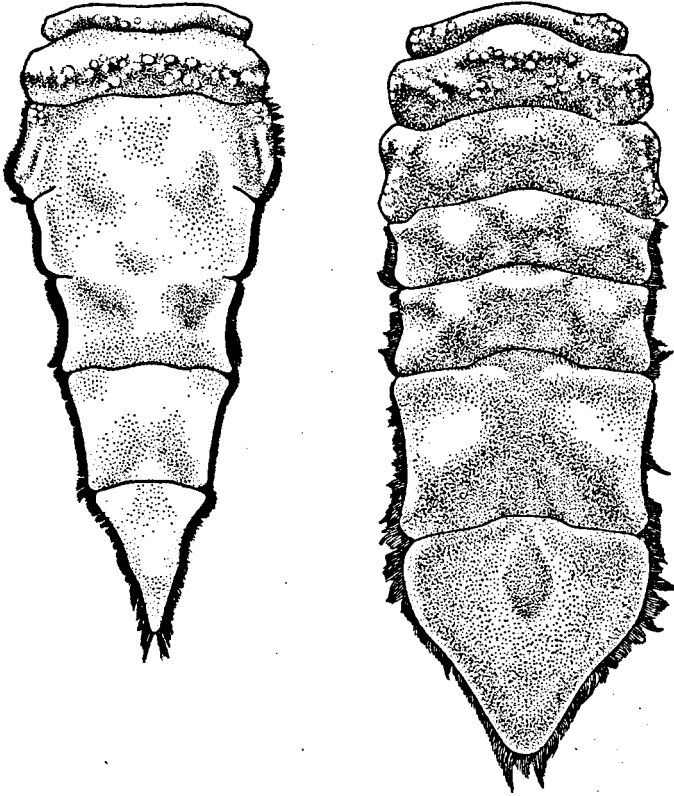


Fig. 42. (left) *Calappa cinerea* new species. Male paratype from 25 miles N. of Margarita (Mus. Leiden, no. 10814). Abdomen. $\times 2$.

Fig. 43. (right) *Calappa cinerea* new species. Female paratype from 25 miles N of Margarita (Mus. Leiden, no. 10815). Abdomen. $\times 2$.

The carapace is usually of about the same shape as in *C. flammea*. The ratio of cb. to cl. in the specimen with cb. 57 is 1.16, in specimens with cb. between 60 and 80 mm it is 1.22 to 1.27, in specimens with cb. between 80 and 100 mm it is 1.27 to 1.30, and in specimens with cb. between 100 and 120 mm it is 1.30 to 1.37. The granulation

of the carapace is slightly less dense than in *C. flammea*, though it is not as coarse as in *C. ocellata*. In the males from Margarita (coll. A. Blok) the posterior part of the carapace shows very few granules and in some specimens it is almost smooth and shining. In the females and in the male from Philipsburg the granulation is stronger. The antero-lateral margins of the carapace in *C. cinerea* are somewhat more strongly arched than in *C. flammea*, but just as in that species, these margins merge gradually into the outline of the postero-lateral wing-like expansions of the carapace. The last tooth of the antero-lateral margin is half or more than half as long as the first tooth of the postero-lateral wing. The shape of the teeth of the postero-lateral expansion is very similar to that of the teeth in *C. flammea*, though the tips are sometimes slightly more slender; they differ considerably from those of *C. ocellata*. The wings are often bent somewhat downwards. The notch in the last tooth of the wing-like expansion is not very distinct, as a rule.

The shape of the chelipeds is very similar to that found in *C. flammea*. The granulation of the second zone of the outer surface of the palm does not differ much from that of the third zone. In the females the granulation in these two zones is coarser than in the males, while the differences between the granulation of the two zones is more distinct. The proximal tooth of the upper margin of the palm generally ends in two or three blunt tops. The tooth in the lower proximal part of the outer surface of the palm resembles that of *C. flammea* in that it is about rectangular and does not taper to a slender point. The walking legs are similar to those of *C. flammea*; they have the antero-dorsal tooth of the carpus poorly developed, and have no granules on the lower surface of the merus.

The abdomen in the male strongly resembles that of *C. flammea*. There is practically no difference in the shape of the first four segments of both species. The fourth segment distinctly shows the rim-like flattening of the region along the lateral margins. The fifth segment has a basal breadth somewhat less than twice its length. The sixth segment is slightly broader in *C. cinerea* than in *C. flammea*, while the seventh segment is more slender in the former species, being 1.5 times as long as broad. In the females of *C. cinerea*, which I could compare directly with those of *C. flammea*,

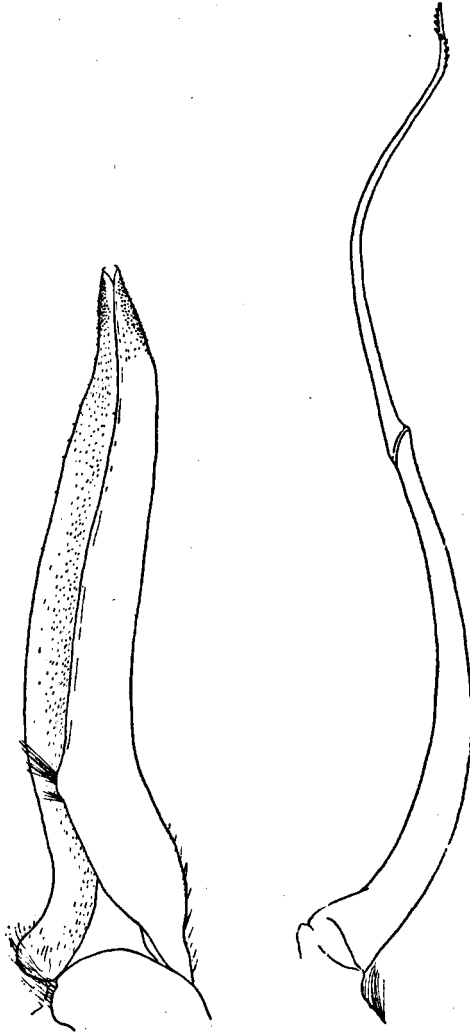


Fig. 44. (left) *Calappa cinerea* new species. Male paratype from 25 miles N. of Margarita (Mus. Leiden, no. 10814). First pleopod in ventral (= posterior) view. $\times 7$.

Fig. 45. (right) *Calappa cinerea* new species. Male paratype from 25 miles N. of Margarita (Mus. Leiden, no. 10814). Second pleopod in dorsal (= anterior) view. $\times 7$.

the abdomen is noticeably more slender; since the females of *C. flammea* used for this comparison were larger (cb. 104 to 128 mm) than those of *C. cinerea* (cb. 66 to 95 mm), this difference may be due to the difference in age of these specimens. This is the more probable since in the three *C. cinerea* specimens the abdomen is less slender in the larger than in the smaller specimens: the female from Margarita Island has the sixth abdominal segment 1.4 times as broad as long and the seventh is 1.1 times as long as broad; in the larger and the smaller female from Bonaire these ratios are for the sixth segment 1.3 and 1.3, and for the seventh segment 1.3 and 1.4, respectively.

The first pleopod of the male is similar to that of *C. flammea*, but is slightly more slender with the orifice very narrow. The main difference between *C. cinerea* and *C. flammea* is found in the shape of the second male pleopods. These pleopods are very slender and, as in the other species, consist of two distinctly separated parts. The proximal part is curved with the inner side convex; the distal part is not recurved, but is slightly sinuous, and directed forwards. The top bears a single spirally arranged row of about 9 to 15 spinules. No process is observed at the line separating the two parts. The distal part of this pleopod is of a horn colour; in the Margarita specimens (coll. Museum Leiden) this colour is much darker than in the male from St. Martin.

The carapace of the Margarita specimens (coll. Museum Leiden) is dark dull ash grey, the granules being lighter. The colour is quite uniform and no trace of a reticulated red colour pattern is visible. However, some faint longitudinal dark reddish streaks may be seen in the posterior part of the carapace. These streaks begin at the incisions in the posterior and postero-lateral margins and extend anteriorly; furthermore, there are two streaks in the submedian area. The streaks in all the Margarita specimens are very faint, and practically only visible in their extreme posterior parts. The chelae are bluish grey. Just as in *C. flammea*, a red spot covers two of the granular tubercles of the palm of the large (= right) chela and three of these tubercles in the smaller chela, while there are also some red markings in the upper part of the outer surface of the chelae. In the large chela a red spot is present

on both the palm and the dactylus near the articulation of the two, and a second red spot is visible in the basal part of the dactylus. The carpus shows the same red streaks as in *C. flammea*, and also the coloration of the inner surface of the chela is like in that species. The legs are pale bluish grey. The specimens from Bonaire are white with a few faint scattered red specks or irregular red streaks in the anterior half of the carapace, while very faint traces of about 8 reddish streaks are noticeable in the posterior half. The chelae have the same arrangement of the red spots as in the Margarita specimens, except for the spots near the articulation between palm and dactylus, which spots are absent in the Bonaire specimens.

A male (cb. 97 mm) and the female from Margarita Island were parasitized by Sacculinidae.

The specimen from St. Martin has a right chela which is very small and of abnormal shape, somewhat resembling the small chela. It is evidently in process of regeneration.

Type. Holotype is a male (cb. 95 mm) from 25 miles N. of Margarita Island, December 9, 1954, leg. A. Blok (Museum Leiden Reg. No. Decapoda 10814). The other specimens are paratypes.

Calappa nitida new species

[Figs. 46-50]

Museum Leiden

20 miles off the coast of SURINAME between the mouths of the Nickerie and Coppename Rivers; depth 27 m; April 15-20, 1957; third voyage of the "Coquette". — 2 males, cb. 32 and 90 mm, cl. 29 and 67 mm, 1 female, cb. 59 mm, cl. 48 mm, 1 juvenile, cb. 21 mm, cl. 19 mm (no. 11201).

N. of the mouth of the Coppename River, 6° 53'N 55° 55'W, Sur.; 27 fms; mud, shells, and coral; June 27, 1957; "Coquette" Sta. 290. — 1 juvenile, cb. 12 mm, cl. 11 mm (no. 11570).

N. of the mouth of the Suriname River, Sur.; about 20 miles offshore; 0 to 9 m; May 6 to 9, 1957; sixth voyage of the "Coquette". — 1 male, cb. 29 mm, cl. 25 mm, 1 juvenile, cb. 19 mm, cl. 17 mm (no. 11198).

N. of the mouth of the Suriname River, 6° 22'N 55° 06'W, Sur.; 14 fms; mud; May 11, 1957; "Coquette" Sta. 1. — 1 juvenile male, cb. 14 mm, cl. 12 mm (no. 11566).

N. of the mouth of the Suriname River, 6° 23'N 55° 05.5'W, Sur.; 15 fms; mud; May 11, 1957; "Coquette" Sta. 2.—3 females, cb. 60 to 72 mm, cl. 48 to 59 mm (of these one is ovigerous, cb. 65 mm, cl. 52 mm), 1 juvenile, cb. 19 mm, cl. 16 mm (no. 11567).

N. of the mouth of the Suriname River, 6° 24'N 55° 05'W, Sur.; 15 fms; shells; May 11, 1957; "Coquette" Sta. 3. — 1 juvenile, cb. 20 mm, cl. 17 mm (no. 11568).
 N. of the mouth of the Suriname River, 6° 24'N 55° 01'W, Sur.; 15 fms; mud; May 11, 1957; "Coquette" Sta. 11. — 2 females, cb. 71 and 73 mm, cl. 58 and 58 mm (the larger is ovigerous) (no. 11569).

N.N.W. of the mouth of the Marowijne River, Sur.; about 30 miles offshore; 0 to 37 m; April 29 to May 3, 1957; fifth voyage of the "Coquette". — 15 males, cb. 63 to 91 mm, cl. 51 to 67 mm, 7 females, cb. 62 to 78 mm, cl. 49 to 62 mm (of these two are ovigerous, cb. 63 and 71 mm, cl. 49 and 57 mm) (nos. 11202 (holotype) and 11203).

N.N.W. of the mouth of the Marowijne River, Sur.; about 20 miles offshore; 35 m; April 8 to 12, 1957; second voyage of the "Coquette". — 1 male, cb. 66 mm, cl. 52 mm, 1 female, cb. 45 mm, cl. 39 mm, 2 juveniles, cb. 21 mm, cl. 18 and 19 mm (no. 11200).

N. of the mouth of the Marowijne River, Sur.; about 20 miles offshore; 27 m; April 23 to 27, 1957; fourth voyage of the "Coquette". — 2 males, cb. 32 and 34 mm, cl. 28 and 29 mm, 3 females, cb. 34 to 35 mm, cl. 29 to 30 mm (no. 11199).

In the present species the carapace is distinctly broader than in any of the three previous forms. As in the other species, the relative breadth of the carapace increases with age. In juveniles (cb. 19 to

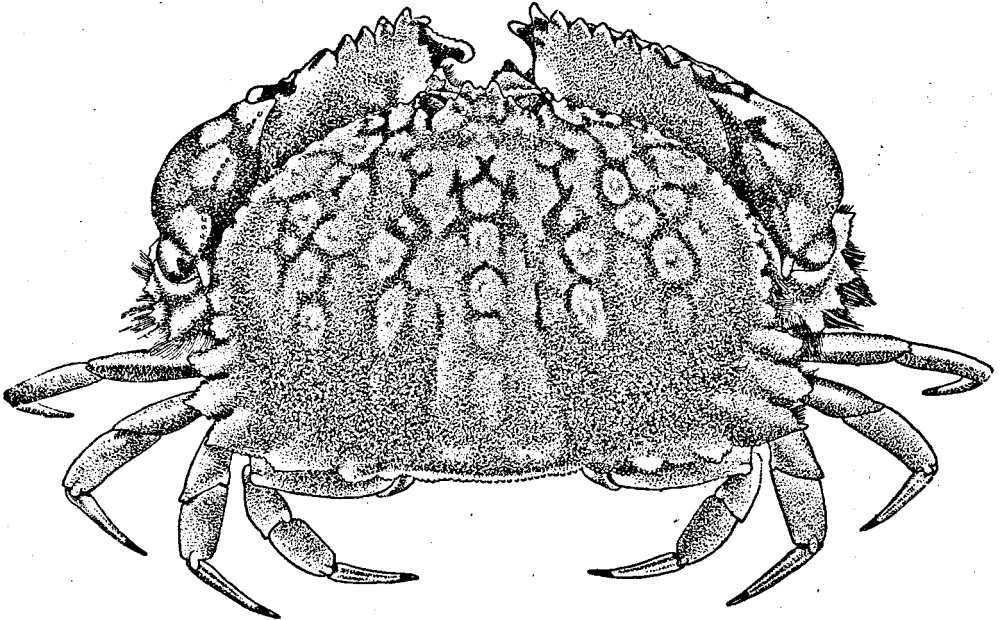


Fig. 46. *Calappa nitida* new species. Male paratype from N.N.W. of mouth of Marowijne River, Suriname (Mus. Leiden, no. 11203). Natural size.

22 mm) the ratio of cb. to cl. is 1.27 to 1.40, in specimens with cb. between 30 and 60 mm it is 1.33 to 1.44, in specimens with cb. between 60 and 80 mm it is 1.38 to 1.50, and in specimens with cb. between 80 and 91 mm, 1.49 to 1.69. In the males and old specimens the carapace is usually less strongly arched than in the females and juveniles. The granules of the carapace are small and numerous, as in *C. flammea*. In the males they are very inconspicuous in the posterior part of the carapace where the surface is smooth and shining; in the females the posterior part of the carapace, though smoother than the anterior, shows more, and more distinct, granules than in the males. The tubercular elevations in the anterior half of the carapace are present but are rather indistinct. The curve of the antero-lateral margin, especially in the males, is somewhat gentler than in *C. flammea*. The wing-like expansions of the postero-

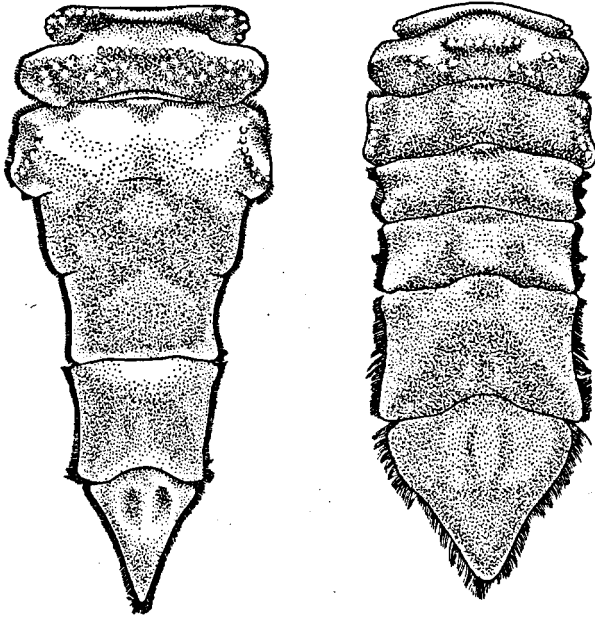


Fig. 47. (left) *Calappa nitida* new species. Male paratype from N.N.W. of mouth of Marowijne River, Suriname (Mus. Leiden, no. 11203). Abdomen. $\times 2$.

Fig. 48. (right) *Calappa nitida* new species. Female paratype from "Coquette" Station 11, Suriname (Mus. Leiden, no. 11569). Abdomen. $\times 2$.

lateral part of the carapace are not very strongly pronounced and their outline gradually merges with the antero-lateral margin. The last tooth of that margin is about half as long as the first tooth of the wing. The teeth of the wing-like expansion, like those of *C. flammea*, are broad. The notch in the fifth tooth is indistinct.

The general shape of the chelipeds is as in *C. flammea*. Of the three horizontal zones, the lower, as in *C. flammea*, bears many large granules. In the large males the second zone is smooth and shining, in the females and young males scattered granules are visible there. The second zone is separated from the first by a very distinct ridge which slopes rather steeply down towards zone 2 and very gently towards zone 1. This ridge is absent in the three previous species. Owing to the presence of this ridge the second zone becomes distinctly concave. The third zone is separated from the second by a horizontal row of small granules. This third zone occupies the upper half of the palm and shows several very small scattered granules and some granular tubercles. In the females and the young males the granules are relatively larger and often more numerous than in the males, where this zone is usually rather smooth and shining. The teeth on the upper margin of the palm are as in *C. flammea*, except for the proximal, which is narrower and shows a single top, with at most, a feeble indication of a second top. The tooth in the lower proximal part of the outer surface of the palm has a rectangular top, as in *C. flammea*. The teeth on the anterior margin of the merus resemble those of *C. flammea*.

In the walking legs the joints, and especially the propodus, are relatively longer and more slender than in the previous species. In the males of *C. nitida* the propodus of the first walking leg is longer than the breadth of the second abdominal segment, while in *C. flammea* it is shorter. No granules are present on the lower surface of the merus of any of the walking legs. The antero-dorsal tooth on the carpus of these legs is very poorly developed.

The abdomen of the males of the present species is somewhat more slender than in *C. flammea*. In the fourth segment the upper surface curves regularly down towards the lateral margin, so that there is no rim-like area along this margin. The base of the fourth segment is distinctly more narrow than the top of the third.

The fifth segment has a basal breadth less than twice its length. The sixth segment has the base broader than the top of the fifth, so that its basal angles reach beyond the latter segment. The lateral margins of the sixth segment are concave. The length of the segment (measured on the median line) is about equal to the breadth (measured in the middle at the narrowest point of the segment). The seventh segment is triangular with the basis convex and the lateral margins slightly concave; it is about 1.5 times as long as broad. The abdomen in the female is somewhat more slender than that in *C. flammea*. The first three segments show no appreciable differences from those of the latter species. The fourth segment is entirely smooth and has no granules near the lateral margins. The sixth segment is 1.3 to 1.5 times as broad as long. The seventh segment is slightly longer than broad.

The first pleopods of the male of the present species resemble those of *C. ocellata* in that they are less slender than those of *C. flammea* and *C. cinerea*, and have a wider orifice. The second pleopods are also very similar to those of *C. ocellata*. The top is strongly recurved inwards and is \cap -shaped, reaching beyond the base of the distal half of the pleopod. There are two rows of spinules on the top; the inner of these consists of about 11 to 14, the outer of about 17 to 19 spinules; the two rows converge in their proximal part on the dorsal (= anterior) surface of the pleopod. No process is visible at the line separating the two parts of the pleopod. The distal part is of a horn-colour.

In young specimens the various teeth are sharper and more slender, furthermore the carapace is narrower and has the tubercles more strongly pronounced.

The ground colour of the carapace in my preserved specimens is pink with a greyish or yellowish tinge. A reticulate, almost ocellate pattern of dark red lines occupies the anterior half of the carapace. On the posterior half, apart from a few red spots between the bases of the teeth of the postero-lateral wings, no spots or streaks are visible in the adult specimens; the two submedian spots that are so characteristic of *C. ocellata* are altogether absent here, while longitudinal streaks only are visible in juvenile specimens. In the coloration of the anterior half of the carapace the present species shows some

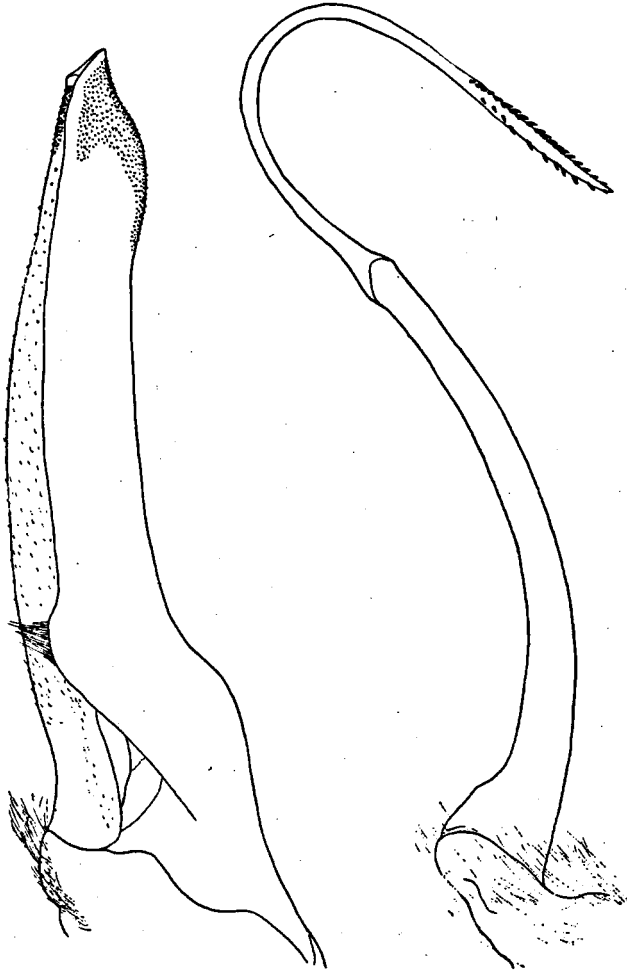


Fig. 49. (left) *Calappa nitida* new species. Male paratype from N.N.W. of mouth of Marowijne River, Suriname (Mus. Leiden, no. 11203). First pleopod in ventral (= posterior) view. $\times 7$.

Fig. 50. (right) *Calappa nitida* new species. Male paratype from N.N.W. of mouth of Marowijne River (Mus. Leiden, no. 11203). Second pleopod in dorsal (= anterior) view. $\times 7$.

resemblance to *C. ocellata*. The smooth surface of the carapace often has an iridescent sheen. The outer surface of the chela is of a pink colour which becomes fainter ventrally. Two of the larger granular tubercles which are located in the extreme upper part of the palm are reddish with white tops; in a few specimens some of the other granular tubercles also have a reddish colour. Between the teeth of the upper margin of the chela there are red lines. In the large chela a conspicuous orange spot is visible on the palm near the articulation with the dactylus, while another is located somewhat above the first; this second spot is smaller and less distinct than the first. The dactylus of the large chela is white, with a small orange spot near the articulation with the palm and a larger spot somewhat before the middle. In the small chela the lower of the two spots of the palm is absent, the other being vague, while the dactylus shows no orange colour at all. The inner surface of the dactylus of both chelae shows a large reddish spot in the basal half. The inner surface of the palm is pink, with a rather large but indistinct orange spot in the centre, a darker orange-red spot near the dorsal part of the distal margin, two smaller spots on the first and second teeth of the dorsal crest of the palm, and one at the base of the fixed finger. The outer surface of the carpus is pink and shows three transverse reddish streaks, which are quite distinct near the upper margin but very vague throughout the rest of their course. The merus has a pink outer surface with reddish spots between the teeth of the anterior margin. The larger part of the inner surfaces of carpus and merus are of a salmon-red colour; in the merus there is a large central spot, a small distal spot and a dark streak along the anterior margin of the inner surface. The walking legs are pink, while the anterior surfaces of carpus and propodus have an orange-red longitudinal streak. This streak is most distinct in the anterior legs, and least noticeable in the posterior. The sternum is pinkish, the abdomen and the lower surface of the carapace are more greyish.

Type. The holotype is a male (cb. 91 mm) from N.N.W. of the mouth of the Marowijne River, Suriname, about 30 miles offshore (April 29 to May 3, 1957, fifth voyage of the "Coquette"); it is preserved in the Rijksmuseum van Natuurlijke Historie under the registered number Decapoda 11202. The other specimens are paratypes.

Calappa sulcata Rathbun

[Figs. 51-54]

- Calappa sulcata* RATHBUN, 1898, p. 289, pl. 9 figs. 3, 4; RATHBUN, 1902, p. 85; RATHBUN, 1937, p. 211, pl. 64 figs. 7, 8, pl. 65 fig. 1; SPRINGER & BULLIS, 1956, p. 18.
- Calappa springeri* RATHBUN, 1931, p. 71; RATHBUN, 1937, p. 205, pl. 60 fig. 2, pl. 61; HILDEBRAND, 1954, p. 276; SPRINGER & BULLIS, 1956, p. 18.

Museum Leiden

25 miles N. of MARGARITA Island, Venezuela; 20 fms; Dec. 9, 1954; Skipper A. Blok. — 2 males, cb. 116 and 140 mm, cl. 98 and 115 mm (no. 10816).

20 miles off the coast of SURINAME between the mouths of the Nickerie and Coppename Rivers; 27 m; April 15 to 20, 1957; third voyage of the "Coquette". — 1 juvenile, cb. 37 mm, cl. 36 mm (no. 11217).

15 miles N. of the mouth of the Suriname River, Sur.; 18 m; May 3, 1957; fifth voyage of the "Coquette". — 1 juvenile, cb. 21 mm, cl. 21 mm (no. 11214).

20 miles N. of the mouth of the Suriname River, Sur.; 0 to 9 m; May 6 to 9, 1957; sixth voyage of the "Coquette". — 3 juveniles, cb. 22 to 36 mm, cl. 22 to 35 mm (no. 11216).

15 miles N. of the light vessel "Suriname River", Sur.; 18 m; May 3, 1957; fifth voyage of the "Coquette". — 1 juvenile, cb. 24 mm, cl. 23 mm (no. 11215).

N.N.W. of the mouth of the Marowijne River, Sur.; about 20 miles offshore; 35 m; April 8 to 12, 1957; second voyage of the "Coquette". — 1 male, cb. 118 mm, cl. 98 mm, 1 female, cb. 117 mm, cl. 102 mm, 3 juveniles, cb. 27 to 39 mm, cl. 25 to 35 mm (no. 11212).

N.N.W. of the mouth of the Marowijne River, Sur.; about 30 miles offshore; 0 to 37 m; April 29 to May 3, 1957; fifth voyage of the "Coquette". — 3 males, cb. 57 to 125 mm, cl. 53 to 102 mm, 4 females, cb. 100 to 108 mm, cl. 89 to 92 mm (no. 11211).

20 miles N. of the mouth of the Marowijne River, Sur.; about 27 m; April 23 to 27, 1957; fourth voyage of the "Coquette". — 1 male, cb. 58 mm, cl. 51 mm, 10 juveniles, cb. 37 to 42 mm, cl. 36 to 39 mm (no. 11213).

Museum Washington

Off Cape Hatteras, NORTH CAROLINA, U.S.A., 35°35'20"N, 74°58'45"W; 27 fms; Oct. 20, 1884; "Albatross" Sta. 2296. — 1 juvenile, cb. 12 mm, cl. 11 mm (no. 8817).

S. of Tortugas, FLORIDA; 100 fms.; 1930; W. L. Schmitt no. 14. — 2 chelipeds (no. 77170).

About 10 miles S. of Tortugas, Fla.; 49 fms; July 2, 1932; W. L. Schmitt no. 31-32. — 1 male, cb. 145 mm, cl. 106 mm (no. 66383).

Off LOUISIANA, 30°06'N, 88°W; 11 fms; Dec. 8, 1953; "Oregon" Sta. 869. — 1 juvenile, cb. 11 mm, cl. 10 mm (no. 97488).

- Off Louisiana, 29°24'30"N, 88°01'W; 35 fms; March 4, 1885; "Albatross" Sta. 2388. — 1 female, cb. 18 mm, cl. 15 mm (no. 14941, holotype of *C. sulcata* Rathbun).
- Off Louisiana, 29°40'N, 88°17'W; 21 fms; Jan. 23, 1938; "Pelican" Sta. 3. — 1 male, cb. 98 mm, cl. 77 mm.
- Off Louisiana, 29°06'N, 88°47'W; 50 fms; Aug. 8, 1950; "Oregon" Sta. 73. — 1 male, cb. 58 mm, cl. 48 mm (no. 91110).
- Off Louisiana, 29°11'N, 88°30'W; 88.5 fms; Feb. 5, 1938; "Pelican" Sta. 11. — 2 females, cb. 114 and 120 mm, cl. 88 and 97 mm.
- Off Louisiana, 29°02'N, 88°51.5'W; 70 to 89 fms; Feb. 4, 1938; "Pelican" Sta. 10. — 1 female, cb. 119 mm, cl. 92 mm.
- 10 miles east of Pass à Loutre Light Buoy, La., 29°10'N, 88°42'W; 45 fms; Feb. 3, 1938; "Pelican" Sta. 8. — 1 male, cb. 95 mm, cl. 72 mm.
- 6 miles off Pass à Loutre, La.; March 13, 1931; "Pelican". — 1 specimen, cb. 92 mm, cl. 72 mm.
- Off Pass à Loutre, La.; 12 fms; 1931; Caribbean Biological Laboratories no. 40. — 1 female, cb. 125 mm, cl. 97 mm (no. 64073, holotype of *Calappa springeri* Rathbun).
- 3 to 6 miles E.S.E. of Southwest Pass, La.; Feb. 16, 1934; "Pelican". — 1 female, cb. 120 mm, cl. 96 mm.
- Off Louisiana, 28°38'–28°40'N, 90°01'–89°45'W; 60 to 150 m; Nov. 14, 1938; "Pelican" Sta. 96–6. — 2 females cb. 125 and 127 mm, cl. 98 and 100 mm.
- Directly south and within 2 miles of Timbalier Island, La.; bottom trawling; 10 to 30 ft; Oct. 2, 1944; H. L. Whitten. — 1 juvenile, cb. 30 mm, cl. 24 mm (no. 80494).
- Off Louisiana, 28°34'N, 90°56'W; 13 fms; March 18, 1938; "Pelican" Sta. 34. — 1 male, cb. 67 mm, cl. 54 mm.
- Three miles south of Ship Shoal Buoy, La., 28°36'N, 90°59'W; 12 fms; March 28, 1938; "Pelican" Sta. 35. — 2 juveniles, cb. 42 and 46 mm, cl. 35 and 38 mm.
- Off Louisiana, 28°11'N, 91°24.5'W; 47 fms; July 12, 1938; "Pelican" Sta. 85–4. — 1 female, cb. 107 mm, cl. 88 mm.
- Off Louisiana, 28°59'N, 92°15.5'W; 12.5 fms; Nov. 13, 1938; "Pelican" Sta. 93–2. — 1 juvenile, cb. 25 mm, cl. 23 mm.
- Gulf coast of TEXAS; South-western Biological Supply Co. — 1 female, cb. 110 mm, cl. 89 mm (no. 72140).
- Galveston, Texas; 9 fms; Aug. 11, 1940; J. L. Baughman. — 3 males, cb. 57 to 67 mm, cl. 47 to 55 mm, 9 females, cb. 62 to 98 mm, cl. 51 to 78 mm.
- Rockport, Texas; G. Gunter. — 1 male, cb. 130 mm, cl. 100 mm (no. 81988).
- Aransas Pass, Texas; 1 to 5 miles offshore from the jetties; otter trawl; Jan., 1942; G. Gunter. — 1 female, cb. 119 mm, cl. 96 mm (no. 81987).
- Off Port Aransas, Texas; May 14, 1948; J. W. Hedgpeth. — 2 specimens (1 damaged, the other with cb. 45 mm, cl. 37 mm) (no. 85903).
- South of Aransas Pass, Texas, 27°37.5'N, 97°00.5'W; 12 fms; April 26, 1938; "Pelican" Sta. 47–3. — 1 juvenile, cb. 27 mm, cl. 25 mm.
- South of Aransas Pass, Texas, 27°08'N, 97°15'W; 12 fms; April 28, 1938; "Pelican" Sta. 49–5. — 6 juveniles, cb. 17 to 39 mm, cl. 16 to 33 mm.
- Off S. Texas, 26°34'N, 96°32'E; 45 fms; Feb. 4, 1939; "Pelican" Sta. 116–4. — 1 male, cb. 67 mm, cl. 53 mm.

The specimens correspond quite well with the descriptions and illustrations of this species provided by RATHBUN (1937). The granulation of the carapace is very uniform, so that it gives the impression of being smooth. The postero-lateral wings of the carapace are very inconspicuous and it is very hard to tell where they begin and where the antero-lateral margin ends. The teeth

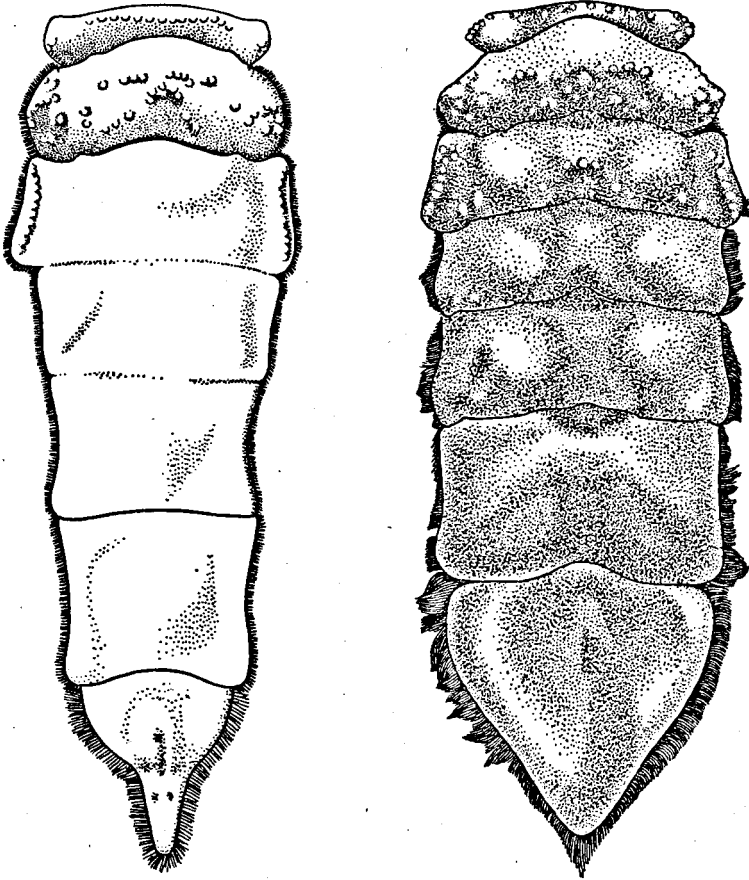


Fig. 51 (left). *Calappa sulcata* Rathbun. Male from 25 miles N. of Margarita (Mus. Leiden, no. 10816). Abdomen. $\times 2$.

Fig. 52 (right). *Calappa sulcata* Rathbun. Female from N.N.W. of mouth of Marowijne River, Suriname (Mus. Leiden, no. 11212). Abdomen. $\times 1.5$.

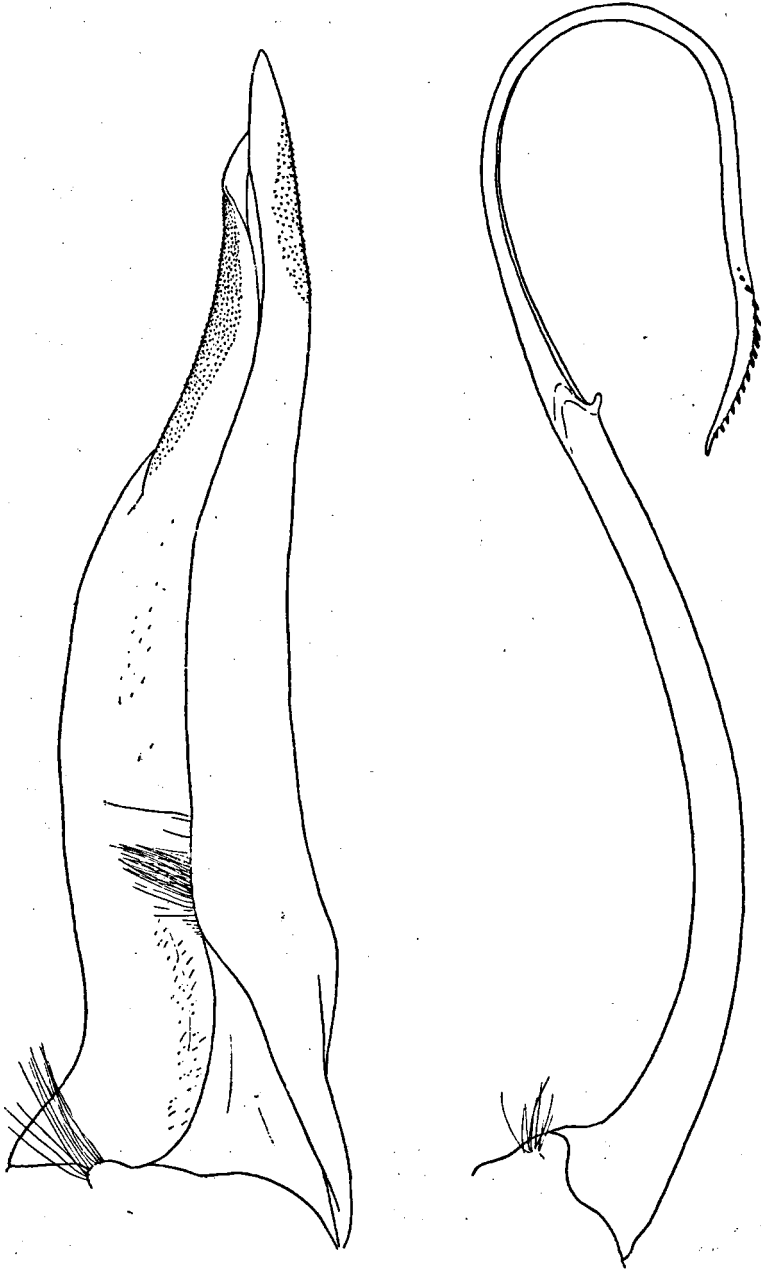


Fig. 53 (left). *Calappa sulcata* Rathbun. Male from 25 miles N. of Margarita (Mus. Leiden, no. 10816). First pleopod in ventral (= posterior) view. $\times 7$.

Fig. 54 (right). *Calappa sulcata* Rathbun. Male from 25 miles N. of Margarita (Mus. Leiden, no. 10816). Second pleopod in dorsal (= anterior) view. $\times 7$.

are triangular and pointed. The posterior margin of the carapace at each side of the base of the abdomen shows a tooth which is sharper in the males than in the females, being most slender and sharp in the juveniles. These teeth are lacking in other West Indian species of this genus. In the juveniles the third tooth of the posterolateral expansion is very slender and sharply pointed.

The outer surface of the palm of the chelae shows three horizontal zones, similar to those found in the previous species. The large tubercles of the lower zone are low and inconspicuous, a row of sharply pointed tubercles separating this first zone from the second. Zone 2 does not extend horizontally, but curves dorsally in the distal part; it is smooth with very minute granules. A row of pointed tubercles and granules separates the second and third zones. The latter zone is as smooth as the second; only two very low and inconspicuous granular tubercles are found near the upper margin of the palm. In the females the granulation of the palm is more distinct than in the males. The tooth in the lower proximal part of the outer surface of the palm is practically rectangular in large specimens, slender and acute in the small ones. The meri of the walking legs have the lower surface provided with granules. Along the posterior margin of this surface the granules are arranged in a row; the other granules are scattered over the rest of the surface, or may form a rather indistinct row along the anterior margin. On the fifth leg the posterior row of granules has become a distinct, sharply serrated crest. Neither of the previous species shows such ventral granules on the meri of the walking legs: there, the meri are smooth or provided with an uninterrupted smooth ridge. RATHBUN (1937) did not mention the presence of these granules in her specimens, but the serrated crest on the merus of the last pereopod is distinctly visible in her pl. 60 fig. 2, and especially so in pl. 61 fig. 2.

The first male pleopod of *C. sulcata* differs from that of the previous species in that the orifice is very large, oblique, and extends far downwards, thereby acquiring a rather irregular outline. The second pleopod resembles that of *C. flammea* in the \cap -shaped distal part; however, the apex bears only one row of spines (about 16 in number). Furthermore, the pleopod shows a short, blunt,

and narrow process near the line which separates the distal from the proximal part; no such process was found in any of the previous species. The tip of the distal half does not lie in the same plane with the rest of the pleopod, but is curved ventrally.

The colour of the present specimens is grey with a reddish tinge, which is especially distinct in the anterior part of the carapace. The frontal and orbital margins show small red spots. Furthermore, there is a very distinct dark reddish-brown spot in the centre of the carapace near where the branchio-cardiac grooves come closest together; a pale ring is visible inside this spot, near its outer margin. In juveniles the spot is visible as a ring. RATHBUN (1937, p. 205) also described this spot as a ring; the other eight spots described by RATHBUN in most of my material are not or only very vaguely visible. In some specimens a spot is visible near the lateral margin, this spot being ring-shaped in the juveniles, horse shoe-shaped in some of the larger specimens; in some of the juveniles a second ring-like spot is located close to the first. The posterior part of the carapace shows an iridescent sheen. The outer surface of the palm and the carpus of the chelipeds show small red spots in the upper region. These spots are very similar to those along the orbital margin of the carapace. A red spot is present in the proximal half of the upper quarter of the outer surface of the palm. In some specimens a reddish spot is likewise visible on the carpus, this spot being similar to the one found on the palm. The ground colour of the carpus and the palm is reddish, becoming more yellowish ventrally. The inner surface of the palm, the carpus and the merus is red, of varying brightness. The inner surface of the palm shows a red spot on the antero-dorsal margin and some irregular spots on the dorsal teeth. The basal part of the inner surface of the dactylus is brownish grey; this colour extends along the cutting edge, and is also visible along the cutting edge of the fixed finger. In juveniles the spots on the outside of the carpus and the palm are ring-shaped. In the males the chelae have an iridescent sheen.

The original description of *Calappa sulcata* Rathbun (1898) is based on a juvenile specimen of this species (cb. 18 mm). The fact that in adult specimens the carapace is far broader, with the various teeth shorter and blunter, and the grooves and

tubercles less pronounced, was evidently the reason why RATHBUN (1931) later described such an adult specimen (cb. 125 mm) as a distinct species, *C. springeri*. Examination of the material of *C. springeri* and *C. sulcata* in the collection of the U.S. National Museum in Washington, which includes the types of both species, clearly showed that the two forms are actually nothing but growth stages of the same species. Specimens of a size intermediate between the two types showed characters intermediate between the characters that have been used until now to distinguish *C. springeri* from *C. sulcata*. In all other important characters, and even in the colour pattern, the two species prove to be identical. There can therefore not be the least doubt that we have to do here with a single species, which must bear the oldest of the two names, viz., *Calappa sulcata* Rathbun.

Hitherto *C. sulcata* was only known from the northern Gulf of Mexico (from Texas to Florida), North Carolina and Porto Rico. The present material from off Margarita Island and off Suriname considerably extends our knowledge of the range of this species.

Type. The type locality of *C. sulcata* is "Off Louisiana, 29°24'30"N, 88°01'W; depth 35 fms", that of *C. springeri* is "Off Pass à Loutre, Louisiana; depth 12 fms". Both holotypes are preserved in the collection of the U.S. National Museum.

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