

Arquivos de Zoologia

ARQ. ZOOL., S. PAULO, VOL. 20 (3): 191-223

15.VI.1971

MUD SHRIMPS OF THE GENUS *CALLIANASSA* LEACH FROM THE BRAZILIAN COAST (CRUSTACEA, DECAPODA)

SÉRGIO DE ALMEIDA RODRIGUES

ABSTRACT

Callianassa branneri Rathbun was the only species of the genus recorded from the Atlantic coast of South America. In the present work five other species are recorded. *Callianassa guassutinga*, *C. guara* and *C. mirim* are considered as new to science. *Callianassa major* Say, 1818 and *C. jamaicensis* Schmitt, 1935, were previously known from the Atlantic coast of North America.

The variety *louisianensis* of *Callianassa jamaicensis* is considered without systematic value as the present material fills most gaps between the variety and the typical form.

All the species here described (or redescribed) fit perfectly in the subgenus *Callichirus*, besides having the same branchial formula and number of pleopods, characteristics also considered as significant to their taxonomy.

INTRODUCTION

The genus *Callianassa* Leach contains more than 90 species but, up to now, only *C. branneri* (Rathbun, 1900) had been recorded from the Atlantic coast of South America. This lack of information is in part due to the fact that these animals live in rather deep galleries that makes their capture quite difficult.

A collecting method, similar to that described by Hailstone & Stephenson (1961), has permitted the survey of several beaches in the State of São Paulo and one in the State of Bahia. About 90 specimens, belonging to five different species, were captured.

The subdivision of *Callianassa* established by Borradaile (1903) was abandoned by the majority of later authors after the criticism of Gurney (1944). Nevertheless the large number of species in the genus requires the use of infra-generic categories.

The species here described fit perfectly in the subgenus *Callichirus* as defined by Borradaile (1903) and De Man (1928b). Moreover, they all have the same branchial formula and number of pleopods, characteristics possibly more significant to the taxonomy, according to Gurney (1944). Taking also into account that *C. major*, type-species of *Callichirus*, can now be considered as thoroughly known in its morphology and development, the latter subject soon to be published, I decided to make use of this subgeneric unit. As my experience is restricted to *Callichirus* I will not try to judge the validity of the remaining subgenera.

Callianassa (Callichirus) major Say, 1818

(Figs. 1-20)

Callianassa major Say, 1818: 238; Gibbes, 1850: 194; Stimpson, 1871: 122; Schmitt, 1935: 3, 8; Lunz, 1937: 1-15, figs. 1-4; Willis, 1942: 2; Pearse, Hum & Wharton, 1942: 153, 155, 156, 185, figs. 10, 14; Gurney, 1944: 83; Pohl, 1946: 71-80, figs. 7-28; Hoyt & Weiner, 1963: 10; Williams, 1965: 100-102; Frankenberg, Coles & Johannes, 1967: 113-120.

Callianassa (Callichirus) major; Borradaile, 1903: 547; De Man, 1928a: 30, pls. 7, 8; 1928b: 29, 91, 111.

Callichirus major; Stimpson, 1871: 122; Hay & Shore, 1918: 407, pl. 29 : 10.

MATERIAL EXAMINED

Espírito Santo: Piúma beach, E. Cabral col., IV.1966, one young male, 90 mm.

São Paulo: Ubatuba, beach, M. P. Sawaya col., 1952, one adult female, 100 mm; T. K. S. Björnberg col., I.1964, one young female, 63 mm, one abdomen of an ovigerous female, 42 mm; Caraguatatuba, beach, J. A. Petersen col., XI.1964, one adult male, 95 mm, one ovigerous female, 82 mm, one abdomen of an ovigerous female, 42 mm; São Sebastião, several beaches, S. A. Rodrigues col., VII.1965, six males, 54-86 mm, 16 females, 45-98 mm; Santos, beach, L. R. Tommasi col., III.1954, one adult male, 102 mm; S. A. Rodrigues col., VII.1965, one adult male, 121 mm, three ovigerous females, 122-150 mm; XI.1965, one ovigerous female, 130 mm; XII.1965, four ovigerous females, 125-140 mm, a male, 120 mm; III.1966, two ovigerous females, 130-135 mm, three females, 120-130 mm, a male, 135 mm; VII.1966, two ovigerous females, 122-125 mm, two males, 115-140 mm; Suarão, beach, S. A. Rodrigues col., VIII.1965, one adult male, 103 mm; Itanhaém, estuary, S. A. Rodrigues col. VIII.1965, one adult male, 81 mm.

REDESCRIPTION

The anterior margin of the carapace ends in three obtuse angles. There are no spines. From the outer angle the anterior margin of the carapace curves backwards to the linea thalassinica from where it turns forwards to the rounded antero-lateral angles of the carapace that are situated approximately at the level of the base of the eyestalks. The linea thalassinica is distinct and runs parallel to the longitudinal axis of the body. The cervical groove is deep and defines the posterior part of the oval area that is also distinctly delimited on the anterior part of the carapace. The sternum is expanded as a lozenge-like plate between the fourth legs.

The second abdominal segment is a little longer than the first and almost twice as long as the third. The third, the fifth and the sixth segments are of about the same size and slightly longer than the fourth. The first and second segments are smooth and soft. The sixth segment narrows towards the telson. The remaining segments have the tergum peculiarly sculptured with symmetrical grooves and a lateral median strip of hairs transversally situated reaching the margins of the pleura. The telson is broader than long and is $\frac{2}{3}$ of the length of the sixth segment. There are an anterior median lobe and two posterior mid-lateral lobes separated by a deep notch in the middle of the posterior margin. The position of these three lobes is somewhat variable. The lateral margins are anteriorly sinuous and posteriorly convex. The anteromedian lobe bears one tuft of hairs at each side and the midlateral lobes bear one tuft of hairs or sometimes two in large specimens.

The eyestalks almost reach the end of the basal segment of the antennular peduncle. They are smooth, flattened, with pointed tips and almost 2.5 times as long as broad. They touch each other on the inner margins except at the tip where they diverge. The corneas are small and lie near the distal part of the external margins of the eyestalks.

In the antennula the third segment is almost 2.5 times as long as the first and second. The antennular flagellum is slightly longer than the last segment of the peduncle.

The antennal peduncle almost reaches the middle of the last segment of the antennular peduncle. The last joint is as long as the penultimate. The flagellum is almost four times as long as the peduncle.

The mandible is provided with ten small sharp teeth. The mandibular palp is well developed and three-jointed. The maxillula has a trapezoidal coxa provided with simple setae; the basis has the distal part expanded into a triangular lobe of which the apex has serrated setae. The palp is slender and one-jointed. The maxilla has the coxa and basis distinctly separated and bilobed. The inner margin of the basis is provided with serrated setae. The palp is slender, reaching almost the distal extremity of the basis. The exopod is broad and acutely produced posteriorly. The first maxilliped has a single-lobed basis bearing, on the mesial border, serrated setae. The coxa is triangular. The palp is short and rudimentary. The exopod lacks the flagellum, but is somewhat jointed on the distal part. The epipod is well developed and expanded posteriorly into a thin, laminar projection. In the second maxilliped the tip of the dactylus is provided with serrated setae. The propodus is about three times as long as the dactylus and carpus, whereas the merus is longer than the last three joints together. The exopod is almost as long as the merus and has minutely crenulated margins. The coxa has a leaf-like epipod and a rudimentary arthrobranch. The third maxilliped has a slender dactylus with about $\frac{2}{3}$ of the length of the propodus. The propodus is a little broader than long and $\frac{2}{3}$ of the length of the carpus. The merus is as long as the propodus and ischium. Coxa and basis bear no exopod or epipod.

The branchial formula is represented on Table 1.

Table 1

Branchial formula of *C. major*

	Maxillipeds			Pereiopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	-	-	-	-	-	-	-	-
Arthrobranchs	-	1*	2	2	2	2	2	-
Podobranchs	-	-	-	-	-	-	-	-
Epipods	1	1	-	-	-	-	-	-
Exopods	1	1	-	-	-	-	-	-

* rudimentary

The first pereiopods are very unequal in shape, chiefly in the males. The larger leg of the males reaches with part of the merus beyond the antennular peduncle. The shape closely agrees with the description given by De Man (1928a:31). The fingers are gaping. The dactylus is curved and provided with a proximal and a subterminal tooth on its cutting edge. The upper border of the propodus is as long as the merus and ischium. The carpus is about twice as long as broad and 1.5 times as long as the merus. The latter has a strong granulated tooth near the proximal extremity of the lower edge. The ischium is about four times as long as broad; its upper border is smooth and the lower is granulated. In the females the larger cheliped reaches as far as the tip of the antennal flagellum. It differs from the males chiefly in the merus where the granulated tooth has completely disappeared or is rudimentary and smooth. The fingers are less gaping. The carpus is only 1.5 times as long as wide. The merus and ischium are completely smooth. The smaller first leg has the same shape in either sex. The fingers almost reach the end of the antennular flagellum. The dactylus is almost straight, as long as the merus, and bears many tiny teeth on the prehensile edge. The palm is as long as wide. The carpus and merus are smooth and about twice as long as wide. The ischium is a little longer than the merus and more than three times as long as wide.

The second legs are equal and reach with part of the carpus beyond the antennular peduncle. The fingers are of about the same size, not gaping, and with many small teeth on the cutting edges. The dactylus is about three times as long as the palm. The carpus is twice as long as the dactylus. The merus is a little longer than the carpus and about

three times as long as wide. The ischium is as wide as the merus and almost as long as wide.

The third legs reach with a small part of the carpus beyond the antennular peduncle. The dactylus is as long as wide and has two small notches on the upper border. The propodus is a little longer than the dactylus and its hinder lobe is as long as the merus. The carpus is about 2.5 times as long as the dactylus. The merus is twice as long as the propodus and about three times as long as wide. The ischium is two times as long as wide.

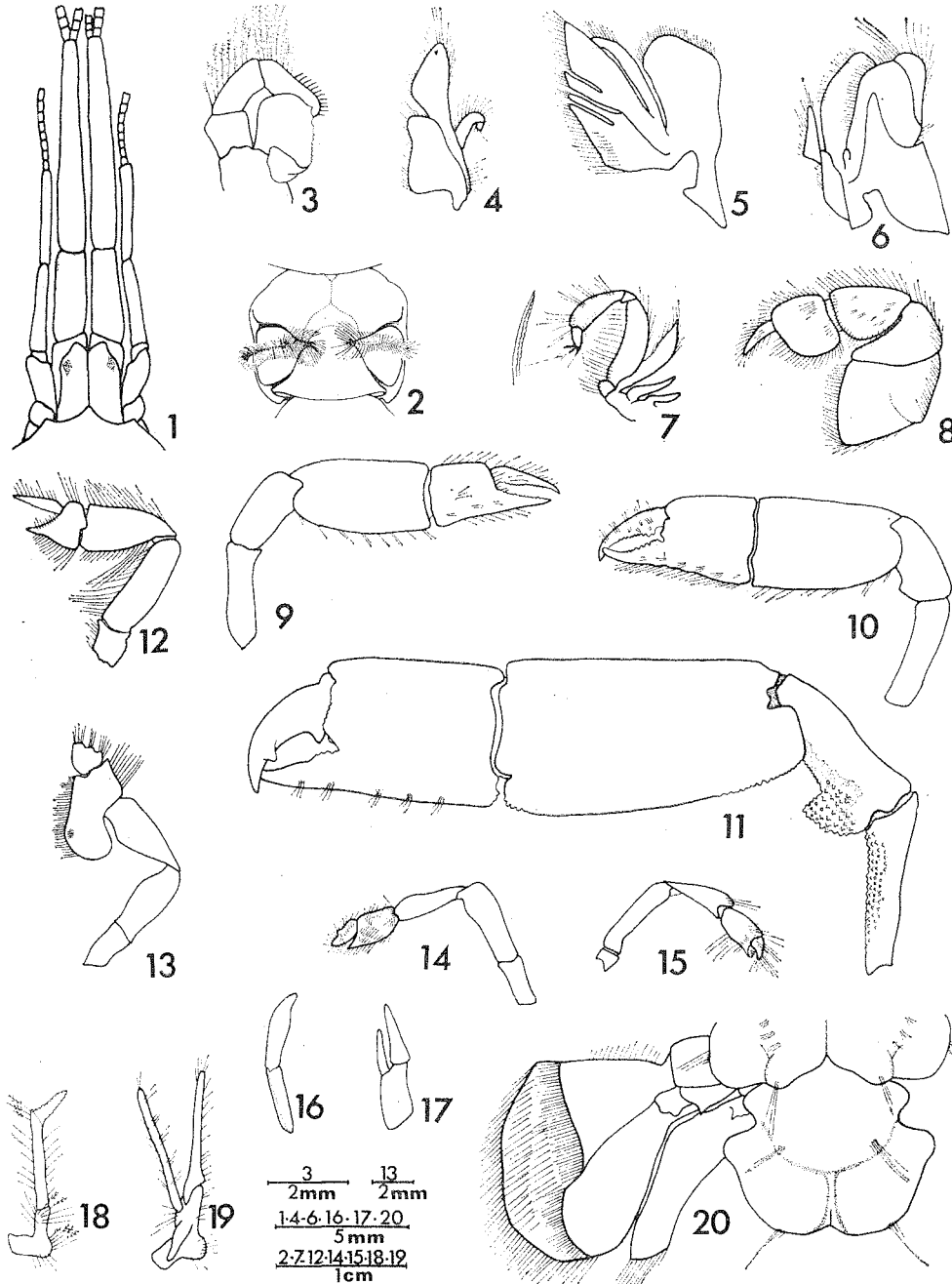
The fourth legs reach with the distal extremity of the fixed finger the end of the antennular peduncle. They have an imperfect chela. The dactylus is as long as the palm, with two notches on the upper border. The fixed finger is small, rounded at the tip and less than one half as long as the dactylus. The manus is densely covered by hairs. The carpus is about twice as long as the dactylus. The merus is a little longer than the carpus and almost twice as long as the ischium.

The fifth legs reach with the dactylus beyond the eyestalks. They have a perfect chela with spoon-shaped fingers with the cutting edges minutely denticulated. The distal part of the chela is extremely pilose. The palm is twice as long as the dactylus. The carpus is about 1.5 times as long as the palm and narrows towards the merus. The merus is about five times as long as broad and twice as long as the palm. The ischium is about as long as wide.

In the male the first pleopods are slender, uniramous and with two equally long joints. The last joint narrows towards the tip. The second pleopods are biramous. The proto- and endopod have about the same length and the exopod is $\frac{2}{3}$ of the endopod. In the females the first pleopods are longer than in the males. The proximal joint is short and hammer-like, the distal has the tip (at least on the ovigerous females) produced laterally in a slender and flattened process. Both joints are covered by many long plumose setae. The second pleopods have the protopod also hammer-like, the exo- and endopod are slender, uni-jointed and with the same length. The endopod has the distal extremity provided with an appendix interna. The pleopods of the third to fifth segments are well developed and leaf-like. The uropods are about 1.5 times as long as the telson. The protopod bears a small pointed spine produced over the dorsal surface of the endopod. The exopod is triangular with the superior blade shorter than the inferior. The distal border is densely covered by hairs and in the proximal there is a small blunt spine. The endopod is narrow, about four times as long as broad. The proximal extremity is armored with a small pointed spine.

COLORATION

The carapace, telson and extremities are whitish. The yellowish digestive glands are seen through the first and second abdominal segments. Likewise the gonads show through the integument as red in the females and as orange in the males.



Callinassa major Say. 1, anterior part of body in dorsal view; 2, third abdominal segment in dorsal view; 3, mandible; 4, maxillula; 5, maxilla; 6, first maxilliped; 7, second maxilliped; 8, third maxilliped; 9, smaller first leg of female; 10, larger first leg of female; 11, larger first leg of male; 12, second leg; 13, third leg; 14, fourth leg; 15, fifth leg; 16, first pleopod of male; 17, second pleopod of male; 18, first pleopod of female; 19, second pleopod of female; 20, telson and left uropod in dorsal view.

REMARKS

Although *C. major* was the second species of *Callianassa* described, the morphological knowledge of this species was rather unsatisfactory. Lunz (1937:3) examined more than 20 specimens but his description fits the classical standards. According to Gurney (1944) all known descriptions are inadequate. Considering that in the system established by Borradaile (1903) *C. major* is the type-species of the subgenus *Callichirus* I have described my specimens as completely as possible to fill in the gaps of the previous accounts and to provide further information for a future generic revision as proposed by Gurney (1944:90).

My specimens disagree in a few points from some of the previous accounts. The males have two teeth on the cutting edge of the dactylus of the large first leg as in Lunz's specimens (1937, fig. 1) instead of one as described by De Man (1928a). In large specimens the tip of the dactylus hooks over the outside of the fixed finger as in the accounts of De Man (1928a) and Willis (1942); in small specimens it hooks over the inside as described by Lunz (1937). Hay & Shore (1918) pointed out that the fourth and fifth legs are subcylindrical and Willis (1942) says that only the fifth legs are truly subcylindrical. In the present specimens the fourth leg has all the joints flattened except the carpus, which is more or less conical; the fifth legs are really subcylindrical. The second pleopods of the males are like the ones described by Stimpson (1871), differing from those figured by Pohl (1946, fig. 14).

HABITAT

I found this species in environments of various exposures. In the São Sebastião Channel it was captured at Praia do Araçá, a very sheltered place and also in the more exposed beaches towards the south of the Channel. It also occurs at Praia Grande (Santos), a quite open shore. The capture of one specimen in the estuary of the Rio Negro, Itanhaém, at a distance of about 500 meters from the mouth of the river, suggest tolerance to variations of salinity.

All the macroscopic burrowing crustaceans that live at Beaufort on sandy beaches with *C. major* (Pearse *et al.*, 1942, fig. 10) were also found here with the exception of *Calappa* and *Ovalipes*.

C. major seems to be confined to the mean low tide level (m.l.w.), possibly not occurring on permanently immersed levels. The strips of beach that are emmersed in exceedingly low tides are inhabited by other species of *Callianassa*, for example *C. mirim* in the Bay of Santos.

The burrows agree in general with those described by Lunz (1937) and Pohl (1946). The chimney-like structure of the opening (Say, 1818; Pohl, 1946) and the brown lining of the galleries (Pohl, 1946) were also observed.

One or two specimens of a crab (*Pinnixa angeloi*) described by Righi (1967:110) are frequently found in the narrow upper part of the burrow. Several specimens of a bivalve (*Ceratobornia cema*) described by Narchi (1966:513) and a reddish copepod (*Hemicyclops* sp.) inhabit the deeper portions of the gallery.

DISTRIBUTION

C. major was recorded from Beaufort, North Carolina (Hay & Shore, 1918); mouth of St. John River, Florida (Say, 1818); Grand Terre, Grand Isle and Timbalier, Louisiana (Willis, 1942). The present records extend the range of this species considerably to the south.

***Callianassa (Calichirus) jamaicensis* Schmitt, 1935**

(Figs. 21-40)

Callinanassa jamaicense Schmitt, 1935: 9, pl. 1:1, pl. 2: 6, 8, pl. 4:1.

Callianassa jamaicense var. *louisianensis* Schmitt, 1935: 12, pl. 1: 2, pl. 2: 4, 7, pl. 4: 4. *Syn. n.*

Callianassa jamaicense louisianensis; Willis, 1942: 2; Wass, 1955: 148; Dawson, 1967: 224.

MATERIAL EXAMINED

Pará: Marapanin, beach, P. E. Vanzolini col., IX.1965, two males, 56, 60 mm.

Bahia: mouth of Rio Caravelas, S. A. Rodrigues col., IX.1965, two adult males, 40, 42 mm, one ovigerous female, 47 mm, four females, 49-51 mm, one incomplete female, carapace and first abdominal segment 17 mm.

REDESCRIPTION

Frontal margin with a long pointed rostral spine reaching two thirds of the length of the eyestalks and slightly projected upwards. On each side of the frontal margin, between the anterior end of the linea thalassinica and the rostral spine, there is a small rounded projection. The linea thalassinica is deep at the posterior half running parallel to the longitudinal axis of the carapace; anteriorly it is shallow and slightly divergent. The oval area is faintly delimited anteriorly. The cervical groove is deep. The sternum is similar to that of *C. major*.

The second segment of the abdomen is the longest. It is 1.3 times as long as the first and fifth. The sixth is a little shorter than the second but longer than the third. The fourth is the shortest being 2/3 of the second. The third and fourth segments show a tuft of hairs at the posterolateral angles. The fifth segment has a smaller and similar tuft placed in the middle of the lateral margin. The remaining segments have a few scattered hairs along the lateral margins. In other aspects they are rather smooth. The telson is broader than long and is half the length of the sixth abdominal somite. The lateral margins are straight. The posterior margin shows a slight median protuberance. There is a long tuft of hairs at the lateral posterior angles and a smaller in the middle of the lateral margins. Dorsally the telson shows a slight elevation in its median area and a depression in its posterior half.

The eyestalks reach the distal third of the basal segment of the antennular peduncle. The lateral outer margins are convergent and the inner are parallel. The corneas are oval and occupy the median part of the surface of the eyestalks. Some specimens show a rounded tubercle in front of the corneas.

The first segment of the antennular peduncle is practically as long as the second. The third segment is about 2.5 times as long as the second. The antennular flagellum is about as long as the peduncle.

The antennal peduncle reaches the distal half of the last segment of the antennular peduncle. The ultimate and penultimate joints are of about the same size. The antennal flagellum is about four times as long as its peduncle.

The oral parts up to the second maxilliped are almost as in *C. major*. Only the differences are mentioned here. In the mandible there are 13 teeth and the median one is distinctly stronger than the others. The maxillula, maxilla and the dactylus of the second maxilliped bear strong simple setae. The exopod of the second maxilliped reaches beyond the distal end of the carpus. The epipod is broadened in the median part and has a small lobe provided with setae. The rudimentary arthrobranch is as long as the epipod. The third maxilliped has a slender dactylus that is four times as long as broad. The propodus is as long as broad and longer than the dactylus. The carpus and ischium are 1.5 times as long as the dactylus and longer than the propodus. The merus is as long as the propodus. The inner face of the ischium has five tiny spines near the lower margin.

The branchial formula is as in *C. major*.

In the male the larger cheliped overreaches the antennular flagellum by the chela and carpus. When closed the fingers leave three small gaps. The dactylus is as long as the carpus and a little longer than the fixed finger. It has smooth prehensile edge at the distal third, widely curved inward; the median third shows two, sometimes three, strong teeth with rounded tips; the proximal third bears one or two smaller blunt teeth. At the distal part of the upper border there is a long tuft of hairs. The prehensile margin of the fixed finger shows a single large tooth that is under the second distal tooth of the dactylus. Near the articulation of the dactylus there are two teeth: the inferior is triangular and lies exactly between the fingers, the superior is rounded and small. The propodus has a well marked triangular depression that reaches the middle of its lateral face. The anterosuperior angle of the propodus bears a long tuft of hairs. The carpus, a little longer than the palm, as long as wide, shows a small tooth in the anteroinferior angle. The merus is as long as the carpus, twice as long as wide, and has five to seven blunt spines at the distal inferior half; proximally it has a single peculiar tooth pointed acutely forward; near the spined edge the external face has a well marked ridge. The superior edge shows a notch near the proximal extremity. The ischium is somewhat curved, three times as long as wide. Its lower border shows about 16 spines but only the three distal ones are of a regular size. In the female the large cheliped reaches with half of the merus the end of the antennular peduncle. The

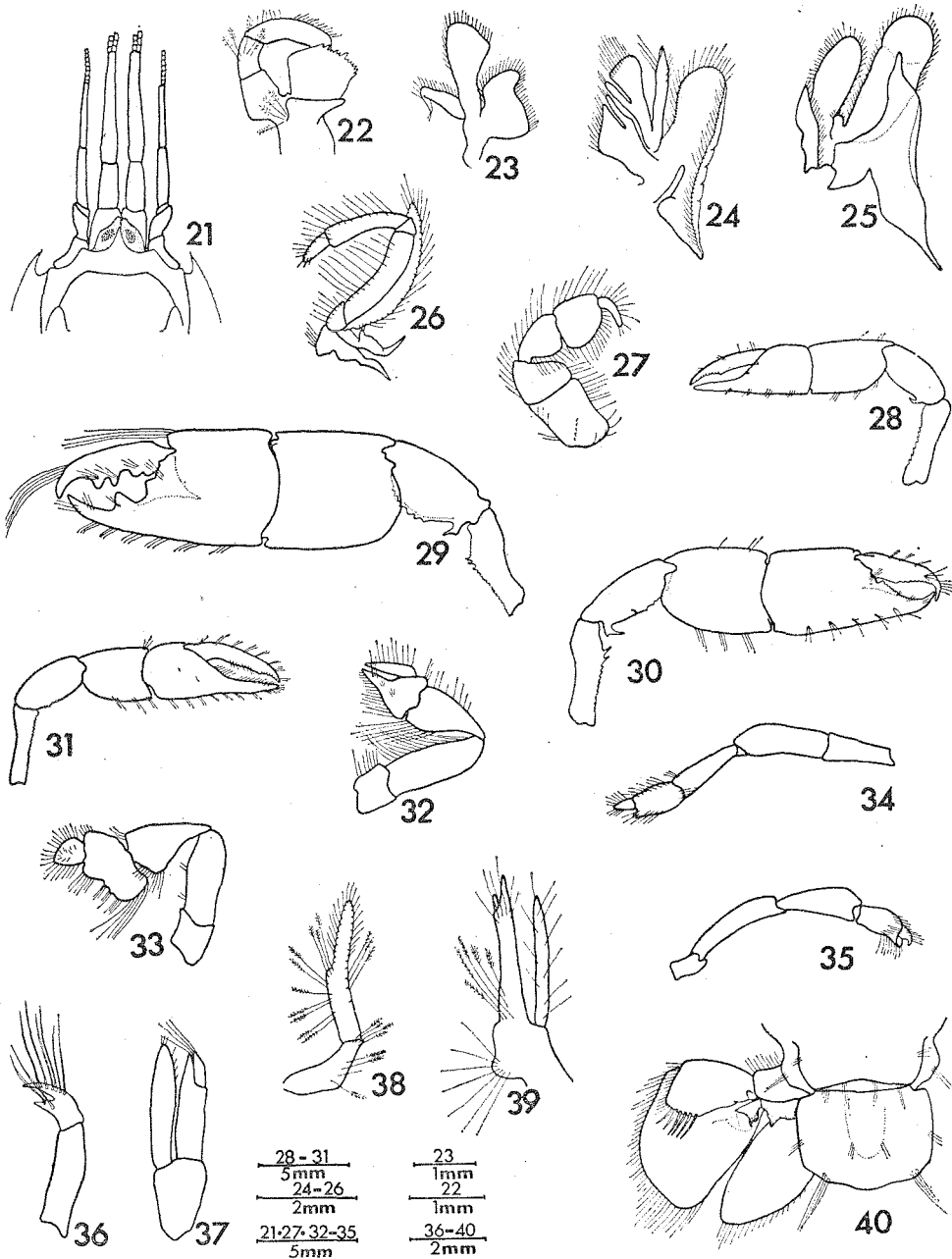
dactylus is longer than the fixed finger. The fingers are not gaping and the cutting edges have small rounded teeth except at the curved tips. Around the articulation of the dactylus there are irregular notches. The palm is as long as the dactylus and as long as wide. The merus differs from that of the males in its smaller width and by the absence of a well marked notch on the superior edge. The ischium is a little longer than the palm and almost as long as the merus and carpus. The lower edge shows two large pointed spines distally placed and a row of small ones. The minor cheliped of the males attains with the entire carpus the end of the antennular peduncle. The dactylus is slightly curved, its prehensile edge is smooth, except at the distal fourth where it shows a row of tiny rounded teeth. The fixed finger reaches as far as the dactylus and its cutting edge is smooth, depressed and provided with hairs. The fingers are gaping. The palm is 1.5 times as wide as long and one third of the length of the dactylus. The carpus is twice as long as the palm. The merus is slightly longer than the carpus and more than twice as long as broad. The proximal extremity of its lower margin may have a spine curved forward. The ischium is almost as long as the merus and has a serrated lower border. In the females the minor cheliped attains with the entire merus the end of the antennular peduncle. It is quite similar to that of the male. The dactylus has the distal third of its cutting edge provided with short and blunt teeth. The merus is a little shorter than the carpus and twice as long as broad. The ischium is as long as the carpus.

The second legs are equal and reach with the entire merus the end of the antennular peduncle. The fingers have the same size and laminated cutting edges. The dactylus is four times as long as the palm. The carpus is about 2.5 times as long as the dactylus. The merus is three times as long as wide. The ischium is half of the length of the carpus and barely longer than wide.

The third leg reaches, with the entire propodus the end of the antennular peduncle. The dactylus is slightly longer than broad. The propodus is almost as long as the dactylus and twice broader than long. Its anterior margin is irregularly undulated. The carpus is 1.5 times as long as its distal width. The merus is three times as long as the propodus. The ischium is half of the length of the carpus.

The fourth leg reaches with the tip of the dactylus as far as the end of the antennular peduncle. The chela is imperfect. The fixed finger is less than $1/3$ of the length of the dactylus. The dactylus is half of the length of the palm. The propodus is 1.3 times as long as broad. The carpus is $3/4$ of the length of the merus, which is 3.5 times as long as broad. The ischium is a little shorter than the carpus.

The fifth leg reaches with the tip of the dactylus the distal end of the second segment of the antennular peduncle. The chela is perfect. The fingers are spoon shaped. The fixed finger is slightly shorter than the dactylus. The palm is twice as long as the dactylus and half as long as the carpus. The merus is five times as long as broad. The ischium is almost as wide as long.



Callinassa jamaicensis Schmitt. 21, anterior part of body in dorsal view; 22, mandible; 23, maxillula; 24, maxilla; 25, first maxilliped; 26, second maxilliped; 27, third maxilliped; 28, smaller first leg of female; 29, larger first leg of male; 30, larger first leg of female; 31, smaller first leg of male; 32, second leg; 33, third leg; 34, fourth leg; 35, fifth leg; 36, first pleopod of male; 37, second pleopod of male; 38, first pleopod of female; 39, second pleopod of female; 40, telson and left uropod in dorsal view.

The first pleopods of the males are uniramous and twojointed. The distal joint is $\frac{2}{3}$ as long as of the proximal and its tip closely resembles a chela provided with long simple hairs. The second pleopods are biramous. The endopod is shorter than the exopod and bears a well marked appendix interna. In the females the first pleopods are longer than those of the males. The ultimate joint is simple, 2.5 times as long as the basal; the distal half is narrow and has crenulated margins. The second pleopods are biramous and three jointed. The endopod is longer than the exopod and bears an appendix interna. The first and second pleopods of the female are provided with long plumose setae. The uropods are longer than the telson. The exopod is wider than long, irregularly oval in outline. The superior blade occupies less than half the width of the exopod. The distal half of its lower margin has six soft setae much larger than the usual ones. On its proximal dorsal surface there is a small tubercle and below this, on the lower blade, there is a larger tubercle that ends in a small spine pointed toward the endopod. The endopod is oval and slightly less than twice as long as broad. Its surfaces are quite smooth with slender setae on the posterior margin.

COLORATION

The body is yellowish in the males and females; the telson is yellower than the body. The large cheliped is slightly pinkish.

REMARKS

Schmitt (1935) described *C. jamaicensis*, from two specimens from Jamaica; he also described the variety *louisianensis* based on a specimen from Grand Isle, Louisiana, that had an incomplete dactylus in the major cheliped in addition to some other minor morphological differences, Willis (1942), collecting in the type-locality of *louisianensis*, reported that the dactylus is identical to the typical form, but confirmed the other differences. Subsequent authors (Wass, 1955; Dawson, 1967) do not mention morphological variations.

My specimens exhibit the peculiarities of the typical form and the variety, with intermediate characters as well (Table 2). This leads to the rejection of the var. *louisianensis* as the present material clearly shows overlap between both forms.

HABITAT

At the mouth of the Rio Caravelas the species is confined to a strip of sand about three meters wide submerged at normal low tides.

The galleries are similar to those of *C. major* although with less distinct regions.

DISTRIBUTION

Gulf of Mexico, from Alligator Harbor, Florida (Wass, 1955) to Grand Isle, Louisiana (Schmitt, 1935); Montego Bay, Jamaica (Schmitt,

Table 2

Comparison of morphological characters of *C. jamaicensis*
(Ht: Holotype; Pt: Paratype)

Source	Schmitt, 1935	Schmitt, 1935	Present data
Locality	Jamaica	Louisiana	Brazil
Mérus*	longer than carpus	almost as long as carpus	almost as long as carpus
Fixed finger, length*	3/4 of palm	1/2 of palm	3/5 of palm
Fixed finger, tooth*	low	high	high
Dactylus, teeth*	3	2	3 or 4
Palmar depression*	present	absent	present
Carpus, antero-inferior teeth*	1	2	1
Merus, spines*	5 (Ht), 7 (Pt)	3	5 to 7
Merus, upper depression*	strong	slight	strong
Ischium, first spine*	short	long	short (♂), long (♀)
Ocular tubercle	inconspicuous(Ht), very small(Pt)	conspicuous	variable
Third maxilliped, inner face	smooth	spined	spined
Telson, dorsal face	convex	posteriorly depressed	posteriorly depressed
Telson, posterior margin	slightly trilobate	nearly straight	slightly rounded
Telson, transverse carina	present	absent	absent
Inner uropod, shape	2 x as long as wide	1.5 x as long as wide	almost 2 x as long as wide
Inner uropod, tubercle	spiny	rounded	spiny

* Large first leg of male

1935). The present records extends the range of this species to the south.

Callianassa (Callichirus) guassutinga, sp. n.

(Figs. 41-60)

TYPE-LOCALITY

Praia do Araçá, São Sebastião, State of São Paulo.

MATERIAL EXAMINED

Bahia: estuary of Rio Caravelas, S. A. Rodrigues & E. Cabral col., IX.1965, one adult male, 90 mm, seven females, 71-94 mm.

São Paulo: São Sebastião, beach, A. L. Castro col., XII.1959, one adult female, 130 mm (Paratype; n.º 93/61, Museu Nacional); J. A. Petersen col., VIII.1962, two adult females, 130, 136 mm; S. A. Rodrigues col., IX.1965, one adult male, 98 mm (Holotype), six females, 125-133 mm; I.1966, one adult male, 108 mm; VII.1966, four females, 130-135 mm, one male, 110 mm.

HOLOTYPE

In the Museu de Zoologia, Universidade de São Paulo (MZUSP 2.728).

Measurements (in millimeters). — carapace and rostrum 27 long; abdomen (including telson) 71 long; telson 6 long, 10 wide. Large first leg: ischium 12 long; merus 14 long; carpus 8 long, 15 wide; propodus, upper border 15, lower border 24, greatest width 15; dactylus 16 long. Small first leg: ischium 11 long; merus 10 long; carpus 11 long, 5 wide; propodus, upper border 6, lower border 12, width 5; dactylus 7.5 long.

DESCRIPTION

The frontal margin of the carapace is trispinose. The rostral spine reaches 1/3 of the eyestalks. The lateral frontal spines are slender, sharp and a little incurved. They are not movable and lie just outside the eyestalks. From the outer margin of the antennae the anterior margin of the carapace curves backwards a little beyond the anterior end of the linea thalassinica, then forward to the anterolateral angles of the carapace. The linea thalassinica is deep and converges to the posterior margin of the carapace. The oval area is delimited from the front by a shallow groove. From the level of the frontal lateral spines this groove curves backwards almost joining the linea thalassinica and the deep cervical groove near the level of the second legs. The sternum is very wide between the fourth and fifth legs and shows two longitudinal carinae that converge to the fifth legs.

The second segment of the abdomen is the longest. The first is slightly shorter than the second and 2.2 times as long as the fourth.

The third and fifth segments are 1.3 times as long as the fourth. The sixth is 1.5 times as long as the fourth. A tuft of hairs is present at the posterolateral angles of the third segment, on the mediolateral angles of the fourth and near the anterolateral angles of the fifth. In other aspects these segments are smooth. The telson is about one half as long as the sixth abdominal somite and distinctly broader than long. It narrows strongly to the posterior margin which shows a strong median depression. Dorsally there is a large anteromedian lobe and two small anterolateral lobes. At both sides of the anteromedian lobe and on each angle formed by the union of the lateral and posterior margins there is a long tuft of hairs.

The eyestalks reach the end of the basal segments of the antennular peduncle. They are about twice as long as broad. The external and internal margins run parallel over 5/6 of the total length. Near the distal extremity they converge ending on a little spine either blunt or sharply pointed or even divided as in one specimen. These spines are not in line with the midpoint of the corneas. The corneas are small and lie near the outer margins of the eyestalks beyond the middle of its length.

The first segment of the antennular peduncle is a little shorter than the second and third. The antennular flagellum is five times as long as the last segment of its peduncle.

The antennal peduncle reaches with one half of its terminal segment beyond the distal extremity of the antennular peduncle. The last segment is a little shorter than the penultimate. The antennal flagellum is about three times as long as its peduncle.

The oral parts differ from those of *C. major* and *C. jamaicensis* in a few details. The mandible is provided with four teeth on the molar process. The maxillula has the internal margin of the basis provided with strong, short and curved setae on its lower part and setae with a serrated apex on its distal extremity; the coxa bears two-pointed setae on the same margin. The maxilla has the coxa and basis bearing strong simple setae. The exopod has a rounded minutely crenulated frontal margin. The scaphognathite is subquadrate. The first maxilliped has the basis provided with twopointed setae. The epipod is produced anteriorly and posteriorly into a slender projection. The second maxilliped has the dactylus, carpus and ischium of about the same size. The propodus is more than three times as long as the dactylus; the merus is two times as long as the propodus. The tip of the dactylus bears a group of setae with a double row of pointed teeth. The exopod has minutely crenulated margins and is about as long as the merus. The epipod is rigid, smaller than the rudimentary arthrobranch and with a few setae. The third maxilliped has the propodus as long as the dactylus and carpus. Its distal margin is slightly trilobate. The carpus is 1.5 times as long as broad. The merus and ischium are flattened with about the same length and longer than the carpus. On the inner face of the ischium there is a curved row of about 18 spines where the proximal and distal ones are more developed and pointed.

The branchial formula is the same as in *C. major*.

The first legs are very unequal in shape and size. The large cheliped of the males reaches with the fingers to the end of the antennal flagellum. The dactylus hooks sharply over the apex of the fixed finger and is just a shade longer than the palm. Its prehensile margin has, near the articulation, a large subquadrate tooth with smooth edge and a triangular tooth almost in the middle of the finger, followed by a group of four short and not very sharp teeth. The fixed finger is shorter than the dactylus. Its cutting edge is smooth with a median elevation. The palm is a little longer than the merus, about 1.7 times as long as the carpus and 1.2 times as long as the ischium. It is as long as wide. The upper border is smooth, the ventral is serrated; the articulation with the dactylus is serrated on both faces; near the sinus between the fingers, the external face bears three small pointed spines directed forwards. The carpus is half as long as the dactylus and almost as wide as the propodus. It narrows proximally. The dorsal margin is straight and smooth; the ventral is crenulated. The merus is twice as long as wide. At the proximal extremity of its lower border there are two or three moderately long spines followed by five short irregular spines and about eight rounded granules. The upper border is smooth. The ischium has a crenulated lower border and is three times as long as wide. In the females the large first leg reaches with half of the fingers beyond the end of the antennal flagellum. Excepting the fingers its shape is similar to that of the males. The dactylus is a little shorter than the palm and sometimes its subquadrate tooth is serrated; between the triangular tooth and the distal extremity there are eight to ten spines, the proximal being stronger. On the proximal border of the prehensile edge of the fixed finger there is a serrated elevation, not clearly defined as a tooth, followed by seven acute spines of different sizes. The palm is as long as the merus and ischium and 1.5 times as long as the carpus. In the lower border of the merus there are two large proximal spines followed by five to eight smaller ones. The ischium has a smooth lower border in some females and it is crenulated in others. The smaller first leg of the males reaches with the distal extremity of the merus as far as the tip of the antennal flagellum. The dactylus is 1.2 times as long as the palm. Both fingers have slightly serrated cutting edges. The palm is a little longer than broad. The carpus is about twice as long as the palm, a little longer than the merus and about as long as the ischium. The merus is little more than twice as long as broad. The ischium is about five times as long as its smallest width. All the joints excepting the fingers are smooth and unarmed. In the females the smaller first leg reaches with the carpus beyond the antennular flagellum. There are no important differences between the minor cheliped of males and females.

The second legs reach with the dactylus as far as the end of the antennular flagellum. The chela is triangular, the fingers are more than three times as long as the palm. They have the cutting edges minutely denticulated. The carpus is about twice as long as the dactylus.

The merus is 1.2 times as long as the carpus. The ischium is a little wider than long.

The third legs reach with the dactylus the middle of the antennal peduncle. The dactylus is triangular in outline with slightly rounded angles. The propodus has the upper border as long as the dactylus. The distal margin of its hinder lobe is slightly indented. The carpus is 2.5 times as long as wide near the distal extremity. The merus is 1.2 times as long as the carpus. The ischium is almost three times shorter than the merus.

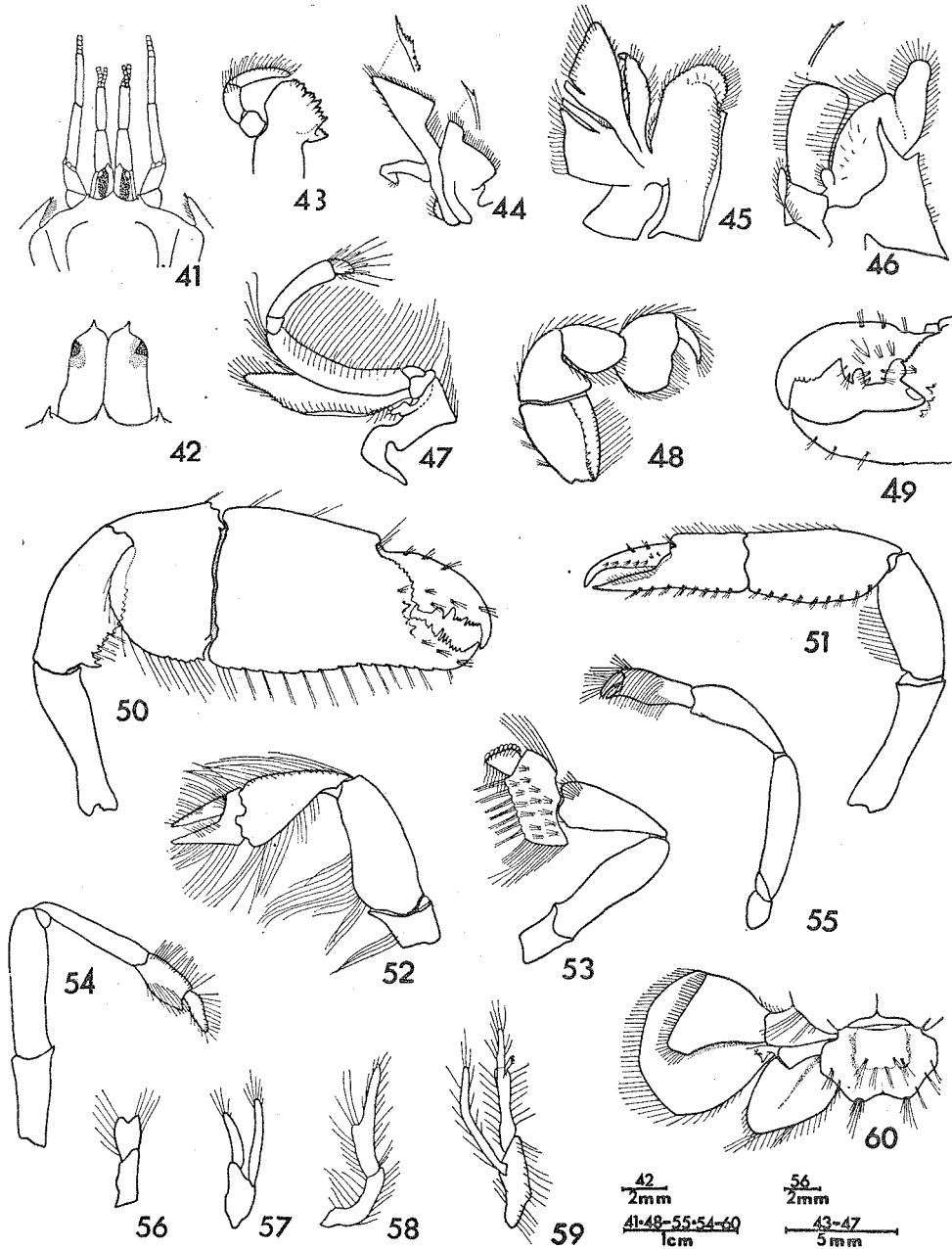
The fourth legs reach with the dactylus beyond the propodus of the third legs. They bear an imperfect chela densely covered by hairs on the outer face. The dactylus is almost as long as the palm. The fixed finger is short and blunt. The palm is about twice as long as wide near the carpus. Innerly only the lower part of its distal extremity and the fixed finger are covered by hairs. The carpus is almost 2.5 times as long as the propodus and three times as long as the dactylus. The merus is longer than the carpus. The ischium is more than twice as long as wide.

The fifth legs reach with the dactylus beyond the ischium of the second legs. They bear a small but perfect chela. The fingers are spoon-shaped with small teeth and densely covered by hairs. The outer face of the propodus is covered by hairs only on the distal half; the inner face is completely naked except along the fingers and part of the lower margin. The carpus is 1.5 times as long as the propodus. The merus is twice as long as the palm. The ischium is a little longer than large.

The first pleopods of the males are short, uniramous and two-jointed. The last joint is the shortest and has the distal extremity slightly bilobed. The second pleopods are biramous. The exopod is longer than the endopod. The first pleopods of the females are long, uniramous and two-jointed. The proximal joint is curved, the distal is longer than the proximal and has the apex laterally expanded on a long flattened projection. The second pleopods are biramous and longer than the first. The endopod is as long as the exopod and its distal extremity is provided with an appendix interna and a long flattened lobe. The other pleopods are as in the usual species of the genus. The uropods are longer than the telson. The exopod is longer than broad with the superior blade distinctly shorter than the inferior. A strong carina runs along its ventral surface. On the posterior part of the outer margin there are several tiny spines hidden among the hairs. There are also two strong spines on the proximal extremity of the dorsal surface. The endopod is broadly triangular with rounded extremities. It bears a dorsal median carina. The ventral surface is smooth. Near the distal extremity there are two strong tufts of hairs.

COLORATION

When alive the females are whitish. Through the tergum of the first and second abdominal segments the ovaries appear as orange



Callinassa guassutunga, sp. n. 41, anterior part of body in dorsal view (male); 42, frontal margin of carapace and eyestalks (female); 43, mandible; 44, maxillula; 45, maxilla; 46, first maxilliped; 47, second maxilliped; 48, third maxilliped; 49, fingers of larger first leg of male; 50, larger first leg of female; 51, smaller first leg of male and female; 52, second leg; 53, third leg; 54, fourth leg; 55, fifth leg; 56, first pleopod of male; 57, second pleopod of male; 58, first pleopod of female; 59, second pleopod of female; 60, telson and left uropod in dorsal view.

masses. In the males the oval area and abdomen are pinkish; the large first leg is pink-yellowish and the eyestalks have a black quadrangular spot occupying the majority of the dorsal surface.

REMARKS

This new species closely resembles *C. rathbunae* Schmitt, 1935, from Jamaica. Besides small differences in the size of the frontal spines, proportions of the joints in the antennular peduncle, armature of the dactylus, merus and ischium of the large cheliped, the two species can be easily distinguished by the outer uropods, which in *rathbunae* consist of two blades of the same size, whereas in *guassutinga* the superior blade is much shorter than the inferior.

The name *guassutinga* is composed of two aboriginal (Tupí) words: *guassu* (large) and *tinga* (white).

HABITAT

At Praia do Araçá, a very sheltered beach near São Sebastião, *C. guassutinga* is found from the normal low-tide-level to the extreme low-tide-level. This part of the beach is also occupied by *Balanoglossus gigas* (Spengel, 1893) and *Eunice sebastiani* Nonato, 1965, both sand burrowing species more than one meter long. Besides there are also the polychaetes *Arenicola* sp., *Glycera* sp., *Amnotripa* sp. and the crustaceans *Albunea paretii* Guérin, 1853 and *Acanthosquilla floridensis* (Manning, 1962). The gastropod *Olivella verreauxii* (Ducros, 1857) is very abundant near the surface of the sediment. *Callianassa major* and *Coronis* sp. are present on this beach a little above the normal low-tide-level.

The gallery of *C. guassutinga* opens on the surface through a narrow tube about 0.5 cm in diameter. This tube runs almost vertically along 30 to 35 cm deep in the sediment and opens in the extremity of a wider horizontal chamber, normally Y shaped or with a dilated extremity. From the "joint of the Y" the gallery runs vertically about 60 cm inside the substrate and then turns abruptly. The walls are not brown-lined as in *C. major*, but have a lining of hard compacted mud.

Some specimens collected from the mouth of Rio Caravelas had red-patterned Clausidiidae copepods and reddish worms inside the galleries, often in contact with the decapod. These worms are *Coenemertes caravelas*, described by Corrêa (1966:365), and an undescribed species of *Stylochoplana*.

DISTRIBUTION

Up to now *C. guassutinga* has been found at the mouth of Rio Caravelas, State of Bahia and São Sebastião, State of São Paulo (type-locality).

Callianassa (Callichirus) guara, sp. n.

(Figs. 61-76)

TYPE-LOCALITY

Enseada de Santo Amaro, Guarujá, State of São Paulo.

MATERIAL EXAMINED

São Paulo: São Sebastião, beach, S. A. Rodrigues col., VII.1966, one adult male, 82 mm; Guarujá, dredge, T. K. S. Björnberg col., X.1961, one adult male, 62.5 mm (Holotype).

HOLOTYPE

In the Museu de Zoologia, Universidade de São Paulo (MZUSP 2.729).

Measurements (in millimeters). — carapace and rostrum 16 long; abdomen (including telson) 46.5 long; telson 4 long, 5.5 wide. Large first leg: ischium 9 long; merus 10 long; carpus 16 long, 9 wide; propodus, upper border 10, lower border 15.5, greatest width 14; dactylus 8.4 long. Small first leg: ischium 5.6 long; merus 5 long; carpus 7 long, 2.8 wide; propodus, upper border 3.2, lower border 6.5, width 4.5; dactylus 4.2 long.

DESCRIPTION

The frontal margin is produced into a very short rostral projection and has no lateral projections near the insertion of the antennae. In other aspects it resembles that of *C. major*. The linea thalassinica is shallow, being very feeble near the anterior end. The oval area is poorly delimited anteriorly. The cervical groove is distinct and almost joins the linea thalassinica at the posterior third of the oval area. The sternum is similar to that of *C. guassutunga*.

The second segment of the abdomen is the longest being just a little longer than the first and the sixth segments. The fourth segment is the shortest being almost half of the length of the second. The third segment is 2/3 the length of the second and the fifth is only a little longer than the third. A strip of hairs covers the lateral margins of the third segment from the median to the posterolateral angles. On the fourth and fifth segments, at the level of the media lateral angles, there is a strip of hairs covering transversly the lateral parts of the tergum. In other aspects the abdominal segments are smooth. The telson is half the length of the sixth abdominal segment, broader than long and its posterior margin has a small median depression. There is a tuft of hairs near the middle of the dorsal surface and also at each lateral angle of the posterior margin.

The eyestalks reach almost to the end of the basal segments of the antennular peduncle. They are subtriangular, with contiguous inner margins except near the tips. The rounded corneas are convex in lateral view and lay near the distal extremities of the external margins.

The first and second segments of the antennular peduncle are about the same length, the third is a little longer. The antennular flagellum is almost five times as long as the last joint of its peduncle.

The antennal peduncle is similar to that of *C. guassutunga*. The antennal flagellum is about three times as long as the two last joints of its peduncle.

The mouth parts differ from those of *C. guassutunga* in a few details.

The mandible is provided with about eight large teeth; three of them are distally grouped and the remaining are separated by groups of two smaller teeth. The maxillula has the distal extremity of the basis provided with setae that have small denticulations at the apex; the coxa bears setae that are plumose at the base and have a double row of rounded teeth at the apex. The maxilla has simple setae with rounded apex or with a double row of pointed teeth. In the first maxilliped the setae of the coxa are simple with rounded or slightly serrated apex. The second maxilliped has the propodus 2.5 times as long as the dactylus; the carpus is smaller than the dactylus, the merus is twice as long as the propodus. The third maxilliped has the propodus as broad as long and longer than the dactylus. The carpus is triangular in outline and its distal width is $\frac{2}{3}$ of its length. The merus is a trifle wider than long. The ischium is almost twice as long as broad and bears a row of 16 small spines at the inner face.

The branchial formula is the same as in *C. major*.

The large first leg of the male reaches with part of the carpus the end of the antennal flagellum. The dactylus has the distal extremity sharply hooked and bears four strong irregular teeth at the cutting edge; near the articulation the upper border shows some small nodules. The propodus has a smooth upper margin, a serrated lower margin and eight denticles at its articulation with the dactylus. The fixed finger is shorter than the dactylus and its cutting edge is inconspicuously serrated. The palm is about as long as the carpus, merus and ischium and a little longer than the dactylus. The carpus is slightly longer than wide. Its upper border is smooth and the proximal half of its inferior margin is serrated. The merus has a strong serrated tooth near the proximal extremity of the lower margin which is denticulated. Only the proximal lateral margin of the tooth is smooth. The proximal part of the upper border is inconspicuously serrated. At the level of the tooth the merus is twice as long as wide. The ischium is about three times as long as wide near the distal extremity. The upper border is smooth and the lower border has nine small sharp teeth at the proximal half. The small first leg reaches with the chela beyond the antennular flagellum. The fingers, with almost the same length, have serrated cutting edges. The carpus is twice as long as the palm and almost 1.5 times as long as the merus. The ischium is a little longer than the merus. All the joints are smooth except the fingers.

The second legs reach with the tip of the dactylus as far as the middle of the antennular flagellum. The cutting edges of the fingers are laminated. The palm is almost three times wider than long. The

carpus is twice as long as wide near the distal extremity. The merus is twice as long as the dactylus and around three times as long as wide. The ischium is three times shorter than the merus.

The third legs reach with the dactylus the distal segment of the antennular peduncle. The dactylus is longer than wide and sharply pointed. The propodus in its distal margin has seven concave notches of which the proximal are smaller. The carpus is about twice as long as the propodus. The merus is three times as long as wide, a little longer than the carpus and twice as long as the ischium.

The fourth legs reach as far as the distal extremity of the first segment of the antennular peduncle. They bear an imperfect chela densely covered by hairs. The palm is 1.5 times as long as the dactylus. The carpus is twice as long as the palm. The merus is 1.5 times as long as the propodus and twice as long as the ischium.

The fifth legs almost reach the end of the eyestalks and bear a small chela similar to that of *C. guassutunga*. The palm is more than twice as long as wide. The carpus is a little longer than the chela. The merus is twice as long as the palm. The ischium is as long as the dactylus.

The first pleopods of the specimens, two males, end in two unequal teeth and consist of two joints of about the same length. The second pleopods are two-jointed, biramous and longer than the first. The exopod is slender. The endopod has the distal extremity somewhat lobed and provided with a rudimentary appendix interna. The uropods are longer than the telson. The exopod, broader than long, bears a longitudinal ventral carina and has the superior blade shorter than the inferior. Near its base there is a tooth projected backwards. The endopod is longer than wide and about triangular in outline; the dorsal and ventral surfaces are smooth. Near its distal extremity there is a strong tuft of hairs.

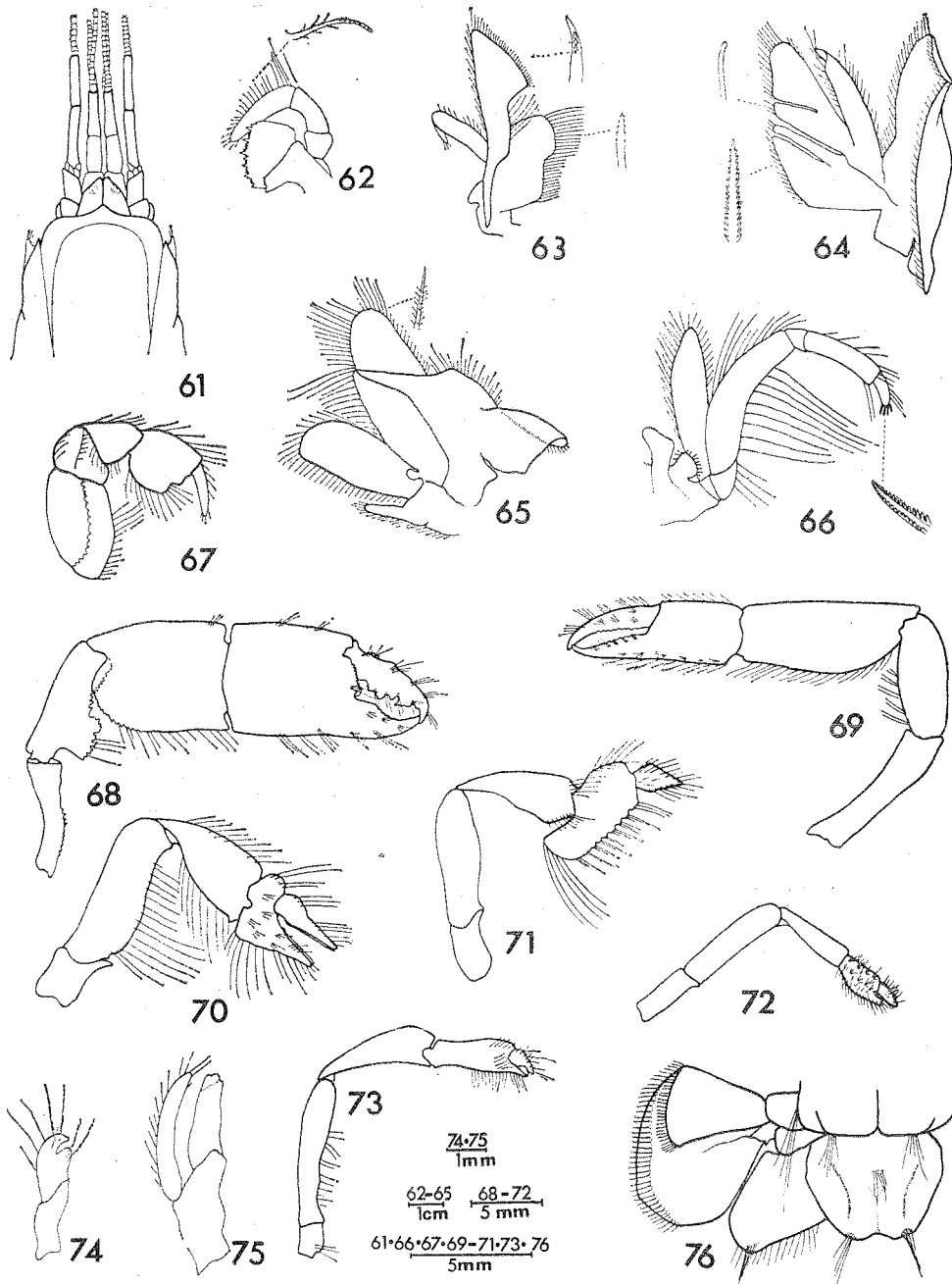
COLORATION

The anterior extremities are yellowish. The oval area is whitish in the outline and purple at the central part and the lateral parts of the carapace are reddish. The first two abdominal somites are deep purple and the remaining are light purple.

REMARKS

This new species is closely related to *C. branneri* (Rathbun, 1900). The differences are the following: absence of subacute projections above the insertion of the antennae; propodus of third maxilliped with a lobed distal margin; large cheliped with more elongated carpus and a serrated tooth in the lower margin.

C. siquanensis (Boone, 1927), a species considered by Schmitt (1935) as probably identical to *C. branneri*, has the frontal margin of the carapace similar to the present new species. In other characters *C. siquanensis* differs from *C. guara* in the same way as *C. branneri*.



Callianassa guara, sp. n. 61, anterior part of body in dorsal view; 62, mandible; 63, maxillula; 64, maxilla; 65, first maxilliped; 66, second maxilliped; 67, third maxilliped; 68, larger first leg of male; 69, smaller first leg of male; 70, second leg; 71, third leg; 72, fourth leg; 73, fifth leg; 74, first pleopod of male; 75, second pleopod of male; 76, telson and left uropod in dorsal view.

C. grandimana Gibbes, 1850, according to Schmitt (1935) seems to stand quite near to *C. branneri*, and could also be related to this new species to which the name *grandimana* is very suitable considering the larger cheliped that is almost as long as the whole animal. From Gibbes' (1850) description the larger cheliped of *grandimana* looks like that of *guara* excepting the carpus, which is longer in *guara* and serrated at its lower margin, instead of smooth as in Gibbes' species. Nevertheless, according to Schmitt, we should be very cautious about using the specific name of Gibbes, since his description is based only upon the first leg.

The name *guara* (from the Tupí language) refers to the purple color of the animal.

HABITAT

The specimen from São Sebastião was collected in muddy sand during a very low tide. The narrow superior part of the gallery was about 50 cm long. The animal from Guarujá was dredged from a muddy bottom at a depth of 12 meters.

This is probably a sublittoral species.

DISTRIBUTION

C. guara is so far only known from two localities in the State of São Paulo: São Sebastião and Guarujá (type-locality).

Callianassa (Callichirus) mirim, sp. n.

(Figs. 77-98)

TYPE-LOCALITY

Bay of Santos, State of São Paulo.

MATERIAL EXAMINED

Bahia: mouth of Rio Caravelas, S. A. Rodrigues col., IX.1965, one female, 28 mm.

São Paulo: São Sebastião, beach, S. A. Rodrigues col., X.1963, one young male, 39 mm; I.1965, one ovigerous female, 50 mm; VII.1966, one adult female, 73 mm; Santos, beach, S. A. Rodrigues col., XI.1965, one ovigerous female, 91 mm, two adult females, 84-95 mm; III.1966, two adult males, 81.5 (Holotype), 84 mm, three adult females, 85-100 mm; VII.1966, four adult females, 70-92 mm.

HOLOTYPE

In the Museu de Zoologia, Universidade de São Paulo (MZUSP 2.730).

Measurements (in millimeters). — carapace and rostrum 20.5 long; abdomen (including telson) 61 long; telson 7 long, 9 wide. Large first

leg: ischium 17 long; merus 18.5 long; carpus 14 long, 11 wide; propodus, upper border 24, lower border 33, width 15; dactylus 12 long. Small first leg: ischium 11 long; merus 10 long; carpus 9 long, 6 wide; propodus, upper border 8, lower border 14, width 2; dactylus 7.5 long.

DESCRIPTION

Frontal margin with a wide rostrum that may reach the proximal $1/3$ of the eyestalks and a small obtuse projection on either side of the outer margins of the eyestalks. In other aspects the anterior margin of the carapace resembles that of *C. guassutunga*. The linea thalassinica and the cervical groove are as in *C. guara*. The sternum, at the level of the fourth legs, is a rather square plate with two lateral carinae that are stronger posteriorly.

The sixth segment of the abdomen is 1.6 times as long as the fourth, 1.5 times as long as the third, 1.4 times as long as the first, 1.2 times as long as the second and 1.1 times as long as the fifth. The tergum of the fourth and fifth segments show a median transversely strip of delicate pilosity. The telson is broader than long and half the length of the sixth segment. The lateral margins are somewhat undulated. The posterior margin shows a deep median notch armed with a distinct central tooth about as long as the notch is deep.

The eyestalks are similar in outline to those of *C. guara*. The corneas are near the middle of the external margins; they are well developed and convex in lateral view.

The second segment of the antennular peduncle is a little shorter than the first. The third segment is around 1.5 times as long as the second. The antennular flagellum is twice as long as its peduncle.

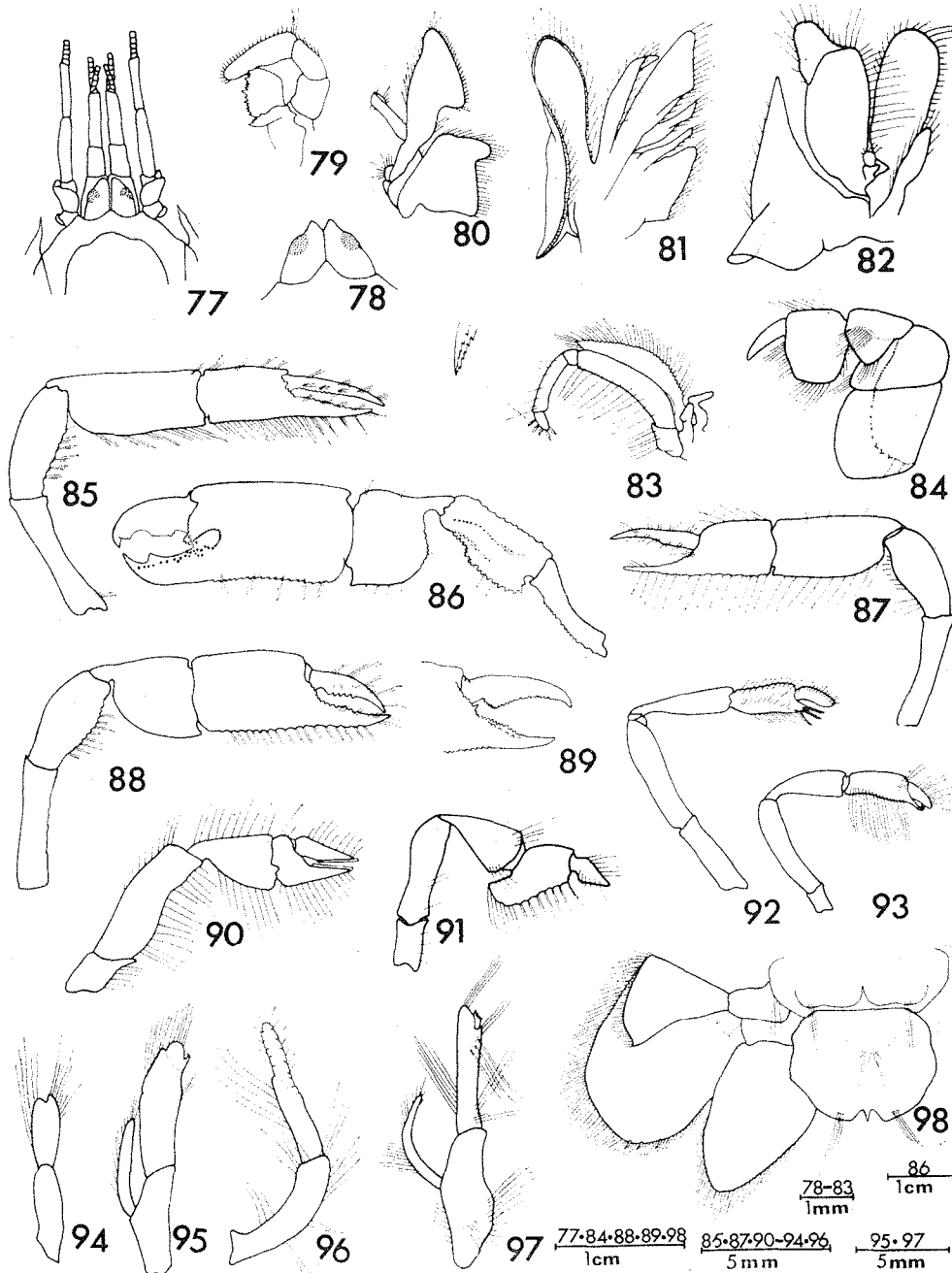
The antennae are as in *C. guassutunga*.

As the oral parts closely resemble those of *C. guassutunga*; only the differences are described here. The mandible is provided with 14 rather sharp teeth. The maxillula has the internal margin of the basis provided with strong short spiniform setae on its proximal extremity. The coxa is provided with plumose setae. The maxilla has coxa and basis with the internal margin bearing setae with a double row of pointed teeth. The scaphognathite is triangular. The first maxilliped has the basis provided with setae serrated at the apex. The second maxilliped has the propodus 2.5 times as long as the dactylus. The carpus is shorter than the dactylus and is practically as long as wide. The merus is two times as long as the propodus. The third maxilliped has the propodus a trifle broader than long and with the distal margin nearly straight. The carpus is slightly longer than the propodus, as long as the merus and distinctly shorter than the ischium. The merus is a little wider than long. The ischium is almost as long as wide. In young animals its face bears a curved row of 13 acute spines and in the adults there are only three spines and some nodules.

The branchial formula is as in *C. major*.

The first pereopods are considerably different only in the fully grown males. In these the large cheliped reaches with half of the propodus the end of the antennal flagellum. The dactylus closes over the inner face of the fixed finger. Its prehensile margin shows two depressions: one near the articulation and the other at the distal half. Out of these depressions the edge is denticulated. The prehensile margin of the fixed finger has an acute and smooth median tooth. The inner and outer faces are granulated along the superior half. The palm is almost twice as long as the dactylus, 1.3 times as long as the merus and 1.5 times as long as the ischium. Its outer face shows a small depression near the fixed finger and a triangular granulated tooth between the fingers. The inner face has a few granules that are more dense and smaller near the fingers. The superior and inferior margins are serrated. The carpus is as long as the dactylus and as long as wide. The merus has a serrated upper border, a longitudinal granulated ridge along the middle of the outer face and the lower edge produced into a laminar serrated tooth. The ischium is four times as long as wide, serrated at its lower border and with a few nodules on the upper margin. The large cheliped of young males is very similar to that of the females. In the females the large cheliped reaches with the distal extremity of the merus the end of the antennular flagellum. The fingers are not gaping. The dactylus has a denticulated cutting edge. In the fixed finger this edge is depressed and provided with a double row of teeth. The palm is 1.3 times as long as the dactylus and carpus, slightly longer than the merus and as long as the ischium. There are denticles near its articulation with the dactylus. Its upper edge is smooth and the lower is serrated. The carpus is as long as its distal width and has smooth margins. The merus is twice as long as wide. Its upper border is smooth and the lower is serrated. The ischium is less than four times as long as wide. The minor cheliped of the adult males reach with the tip of the dactylus the distal extremity of the carpus of the large cheliped. In young animals the first pereopods are of about the same size. The dactylus is slender and a little longer than the fixed finger. The cutting edges of the fingers are serrated at the proximal half. The palm is about 1.5 times as long as wide. The carpus is almost twice as long as the palm, 1.3 times as long as the merus and a little longer than the ischium. The merus is 2.5 times as long as wide and has an undulated lower edge. The ischium is smooth. In the female the minor cheliped reaches with the apex of its dactylus the middle of the dactylus of the large cheliped. It is similar to the minor cheliped of the males the differences concerning only the lower edge of the merus which has less distinct undulations.

The second legs reach with half of the carpus the end of the antennular peduncle. The fingers are not gaping and are more than twice as long as the palm. The cutting edge of the dactylus is smooth and sharp, that of the fixed finger is serrated at the proximal end. The carpus is as long as the manus. The merus is at the most 1.5 times as long as the carpus and 2.5 times as long as the ischium.



Callianassa mirim, sp. n. 77, anterior part of body in dorsal view; 78, frontal margin of carapace and eyestalks of a young animal; 79, mandible; 80, maxillula; 81, maxilla; 82, first maxilliped; 83, second maxilliped; 84, third maxilliped; 85, smaller first leg of adult male; 86, larger first leg of adult male; 87, smaller first leg of adult female; 88, larger first leg of young male; 89, fingers of larger first leg of adult female; 90, second leg; 91, third leg; 92, fourth leg; 93, fifth leg; 94, first pleopod of male; 95, second pleopod of male; 96, first pleopod of female; 97, second pleopod of female; 98, telson and left uropod in dorsal view.

The third legs reach with the entire carpus the end of the antennal peduncle. The dactylus is twice as long as wide. The propodus is as long as the dactylus and its inferior margin is slightly undulated. The carpus is distally twice as long as wide. The merus is 1.2 times as long as the carpus. The ischium is 1.5 times as long as broad.

The fourth legs reach as far as the second legs. They have an imperfect chela. The dactylus is about 1.5 times shorter than the palm. The fixed finger is blunt and short, less than half as long as the dactylus. The palm is twice as long as broad. The carpus is slightly longer than the ischium, distinctly shorter than the merus and as long as the manus.

The fifth legs reach with the dactylus the distal extremity of the merus of the fourth leg. It has a perfect chela. The fingers are half the length of the palm and spoon-shaped. The carpus is about 1.5 times as long as the propodus. The merus is distinctly longer than the carpus and about four times as long as the ischium.

In the males the first pleopods are short and with two segments. The terminal is the shortest and has a slightly bilobed apex provided with long setae. In a male 39 mm long these pleopods are absent. In the first pleopods of the females the ultimate joint is the longest and ends in a flattened projection. The second pleopods of the male consist of a narrow protopod, a slender exopod and a broad endopod. The exopod is almost as long as the protopod. The endopod shows a very small appendix interna. In young males this pleopod does not differ from those of the adults. In the female the second pleopods are similar to those of the males but the appendix interna is more developed. The uropods are longer than the telson. The endopod is nearly twice as long as wide and almost oval in outline. At the base there is a blunt tooth. The exopod is slightly longer than wide and formed by two blades, the superior much shorter than the inferior. Its posterior margin is convex and armoured with three pointed spines. Near the base of the exopod there are two teeth directed backwards.

COLORATION

Both male and female are slightly pinkish when alive.

REMARKS

This new species is easily distinguished by the peculiarities of the telson, which is broader than long and exhibits a single median tooth on the posterior margin. Many other species of *Callianassa* exhibit a posterior median tooth in the telson, but they have either additional teeth on the lateral margins or the telson is distinctly longer than broad.

The name *mirim* is an aboriginal (Tupi) word meaning small.

HABITAT

C. mirim is a rather common species along the Bay of Santos, living in a level lower than that occupied by *C. major*.

The opening of the gallery has 5 mm of diameter and is followed by a tunnel 20 to 30 cm long, being up to this point quite similar to that of the species described in this work. After this there is a widening in the tunnel and the gallery becomes quite irregular, reminding one of the gallery of *C. californiensis* (MacGinitie, 1934:168). Its walls lack the brown lining found in the galleries of *C. major* and are less consistent than those of *guassutinga* and *major*.

A species of *Hemicyclops*, probably the same found in *C. major*, occurs in the galleries of *C. mirim*.

DISTRIBUTION

Up to now *C. mirim* has been recorded from Caravelas, in the State of Bahia and from São Sebastião and Santos (type-locality), in the State of São Paulo.

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to those who kindly placed at my disposal the few specimens available in Brazilian collections. Their names are mentioned with the lists of material referred to each species.

REFERENCES

- BORRADAILE, L. A.
 1903. On the classification of the Thalassinidea. *Ann. Mag. Nat. Hist.* (7) 12: 534-551.
- CORRÉA, D. D.
 1966. A new hermaphroditic nemertean. *An. Acad. Brasil. Ciênc.* 38 (2): 365-369.
- DAWSON, C. E.
 1967. Notice of the occurrence of the alpheid shrimp *Leptalpheus forceps* Williams in the northern Gulf of Mexico. *Crustaceana* 12 (2): 224.
- DE MAN, J. G.
 1928a. A contribution to the knowledge of twenty-two species and three varieties of the genus *Callinassa* Leach. *Capita Zoologica* 2 (6): 1-56, pls. 1-12.
 1928b. The Thalassinidae and Callinassidae collected by the *Siboga*-Expedition with some remarks on the Laomediidae. The Decapoda of the *Siboga*-Expedition. Part VII. *Siboga Exped. Monogr.* 39 a6, 187 pp., 20 pls.
- FRANKENBERG, D., & AL.
 1967. The potential trophic significance of *C. major* fecal pellets. *Limnol. Oceanog.* 12 (1): 113-120.
- GIBBES, L. R.
 1850. On the carcinological collections of the cabinets of natural history in the United States. With an enumeration of the species contained therein, and description of new species. *Proc. Amer. Assoc. Adv. Sci.* 3: 165-201.
- GURNEY, R.
 1944. The systematics of the crustacean genus *Callinassa*. *Proc. Zool. Soc. London* 114: 82-90.
- HAILSTONE, T. S. & W. STEPHENSON
 1961. The biology of *Callinassa (Trypaea) australiensis* Dana, 1852 (Crustacea, Thalassinidae). *Univ. Queensl. Papers, Dept. Zool.*, 1 (12): 259-285, pls. 1-3.
- HAY, W. P. & C. A. SHORE
 1918. The decapod crustaceans of Beaufort, N.C., and the surrounding region. *Bull. U.S. Bur. Fish.* 35: 371-475, pls. 25-39.
- HOYT, J. H. & R. J. WEINER
 1963. *Callinassa major* burrow, geologic indicators of littoral and shallow neritic environment. *Bull. Georgia Acad. Sci.* 21: 10, 11.
- LUNZ, G. R.
 1937. Notes on *Callinassa major* Say. *Charleston Mus. Leafl.* 10: 1-15, pls. 1-2.
- MACGINITIE, G. E.
 1934. The natural history of *Callinassa californiensis* Dana. *Amer. Midl. Nat.* 15: 166-176, pls. 5-6.

NARCHI, W

1966. The functional morphology of *Ceratobornia cema*, new species of Erycinacea (Mollusca, Eulamellibranchiata). *An. Acad. Brasil. Ciênc.* 38 (3/4): 513-524.

PEARSE, A. S. & AL.

1942. Ecology of sand beaches at Beaufort, North Carolina. *Ecol. Monogr.* 12 (2): 135-190.

POHL, M. E.

1946. Ecological observations on *Callinassa major* Say at Beaufort, North Carolina. *Ecology* 27 (1): 71-80.

RIGHI, G.

1967. Sobre alguns Decapoda do Brasil (Crustacea, Brachyura: Pinnotheridae e Parthenopidae). *Papéis Avulsos Zool., S. Paulo*, 20 (10): 99-116, 32 figs.

SAY, T.

1818. An account of the Crustacea of the United States. *J. Acad. nat. Sci. Philadelphia* 1 (2): 235-253.

SCHMITT, W. L.

1935. Mud shrimps of the Atlantic coast of North America. *Smithson. misc. Coll.* 93 (2): 1-21, pls. 1-4.

STIMPSON, W.

1871. Notes on North American Crustacea, in the Museum of the Smithsonian Institution, n° 3. *Ann. Lyc. nat. Hist. New York* 10: 92-136.

WASS, L. M.

1955. The decapod crustaceans of Alligator Harbor and adjacent inshore areas of north-western Florida. *Quart. J. Florida Acad. Sci.* 18 (3): 129-176.

WILLIAMS, A. B.

1965. Marine decapod crustaceans of the Carolinas. *Fish. Bull.* 65 (1): 1-298.

WILLIS, E. R.

1942. Some mud shrimps of the Louisiana coast. *Occ. Papers Mar. Lab. Louisiana Univ.* 2: 1-6.

INDEX

Synonyms in italics.

guara, sp. n.	210
guassutinga, sp. n.	204
jamaicensis	198
var. <i>louisianensis</i>	198
major	192
mirim	214