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## THREE SPECIES OF CRUSTACEA DECAPODA MACRURA FROM SOUTHERN BRAZIL, INCLUDING A NEW SPECIES OF UPOGEBIA

by

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In June 1954, during an ecological study of the mangroves near the Research Station of the São Paulo University Oceanographic Institute at Cananeia, about 200 km south of Santos, southern Brazil, Dr. S. Gerlach of the Zoological Institute and Museum of the University of Kiel, Germany, collected some Crustacea representing three species of Decapoda Macrura; two of these belong to the family Alpheidae and one to the Callinassidae. I am most grateful to Dr. Gerlach for the privilege to study this small but interesting collection, which now is the property of the Kiel Museum; duplicate specimens are inserted in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden.

### Family ALPHEIDAE

The two species of Alpheidae were collected near Cananeia, partly under stones, wooden boards, etc., in the tidal zone of a sandy mud beach, and partly in the mud of the edges of mangrove pools. As all the specimens were combined to one lot it is not possible to find out whether the two species occurred at both localities, or that in one or both habitats only one of the species was found.

#### ***Alpheus armillatus*** H. Milne Edwards

The material consists of 13 specimens, the body length of which varies between 12 and 32 mm, the two ovigerous females being 24 and 32 mm long.

The specimens agree quite well with the descriptions given in the literature and especially with that by Zimmer (1913, p. 401, figs. K<sup>1</sup>—T<sup>1</sup>). Like in Zimmer's material, my specimens show the external demarcation of the

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grooves on either side of the rostrum far less sharply than in Coutière's (1899) figs. 66 and 67, though the grooves themselves are quite distinct. The stylocerite in my specimens is somewhat more slender, especially in its distal part, than either of those figured by Coutière (1899, fig. 117) and Zimmer (1915, fig. K<sup>1</sup>); in this respect it shows a closer resemblance to the figure given by the latter author than to that of Coutière's. The second segment of the antennular peduncle, however, shows a greater resemblance to that figured by Coutière than to Zimmer's figure. The scaphocerite has the final tooth of a variable length, but it always reaches distinctly beyond the lamella; in none of my specimens, however, it is as long as in the right-hand scaphocerite figured by Zimmer. Furthermore the carpus of the fifth pereopod in my specimens always is slightly shorter than the propodus and not longer than the latter joint as in Zimmer's material.

The species is known from Bermuda and North Carolina southwards to the West Indies and Brazil; it has not previously been reported from as far south as Cananea.

#### ***Alpheus heterochaelis* Say**

Of this species 14 specimens with a length of 10 to 33 mm were examined; the material contains 8 ovigerous females of 23 to 33 mm long.

*Alpheus heterochaelis*, which strongly resembles the previous species, may be distinguished by the following characters:

1. The grooves at each side of the rostrum very gradually disappear posteriorly, no posterior limit of this groove is visible, while also the rostral carina in its posterior part insensibly merges with the rest of the carapace.
2. The last joint of the antennular peduncle is relatively shorter than in *A. armillatus*, being less than half as long as the second joint.
3. The final tooth of the scaphocerite reaches hardly, if at all, beyond the lamella.
4. The dactylus of the larger first leg has the upper margin not evenly rounded as in *A. armillatus*, but almost rectangularly rounded; it is thereby much higher.
5. The merus of the first pair of legs shows no spine, while in *A. armillatus* such a spine is present on the inner anterior angle of the lower surface of the merus.
6. The dactyli of the last three pereopods are scoop-shaped in *A. heterochaelis*, being normally compressed in *A. armillatus*.

The present specimens agree quite well with the descriptions given in the literature, apart from the fact that in the 2 large males (length 29 and 31 mm) the smaller chela has the dactylus not balaeniceps-shaped.

The species has almost the same range as the previous, it is known from Bermuda and Virginia southwards to Brazil. The southernmost locality in Brazil from where the species has been reported is Iguape, which lies slightly north of Cananea.

Family CALLIANASSIDAE

***Upogebia brasiliensis*** new species

Cananea, S. Brazil, in burrows under stones and pieces of wood in the tidal zone of a sandy mud beach in front of the Research Station of the São Paulo University Oceanographic Institute; June 1954: leg. Dr. S. Gerlach. — 10 specimens (including 1 ovigerous female, 29 mm) 14-30 mm.

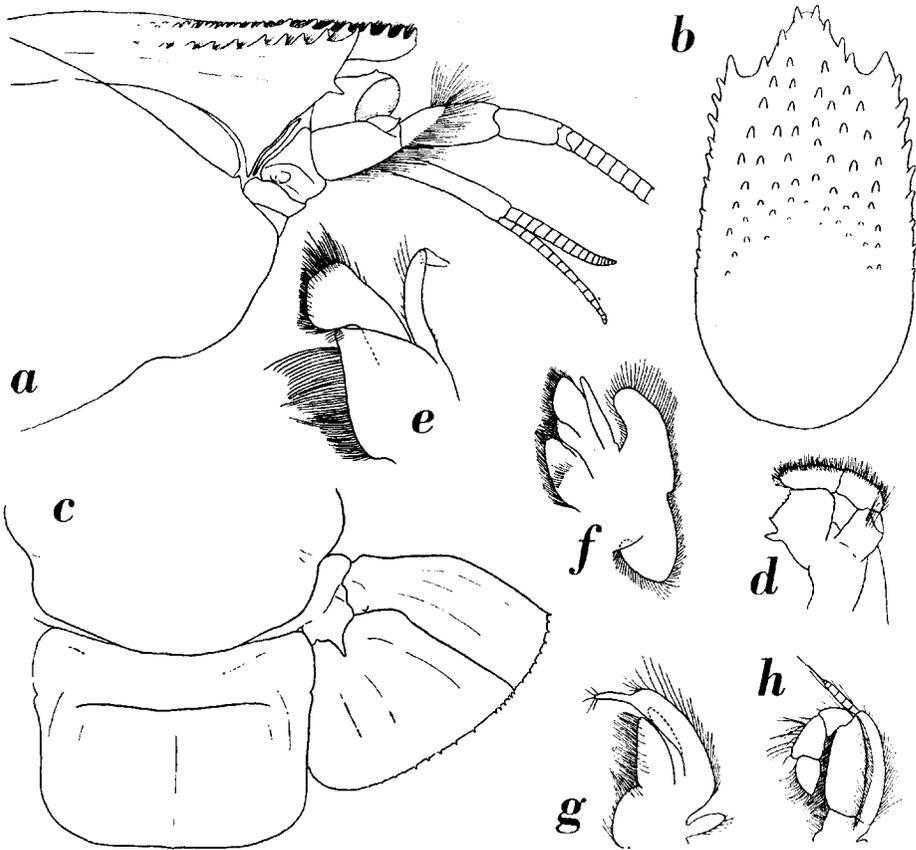


Fig. 1. *Upogebia brasiliensis* new species, female. a, anterior part of body in lateral view; b, anterior part of carapace in dorsal view (hairs omitted); c, telson and uropod; d, mandible; e, maxillula; f, maxilla; g, first maxilliped; h, second maxilliped. a-c, f-h,  $\times 10$ ; d, e,  $\times 20$ .

Description. The rostrum reaches to or slightly beyond the base of the penultimate joint of the antennal peduncle. It is short and bluntly triangular, its length being about half its basal breadth. Each lateral margin bears three (rarely four) strong and rather sharply pointed spines. The right and left anterior spines are placed close together near the tip of the rostrum. The dorsal surface of the rostrum and the anterior part of the dorso-median region of the carapace are rather thickly beset with tubercles and hairs. The hairs are densest in the anterior part, where they almost entirely conceal the tubercles. The tubercles are placed in about 6 indistinct longitudinal

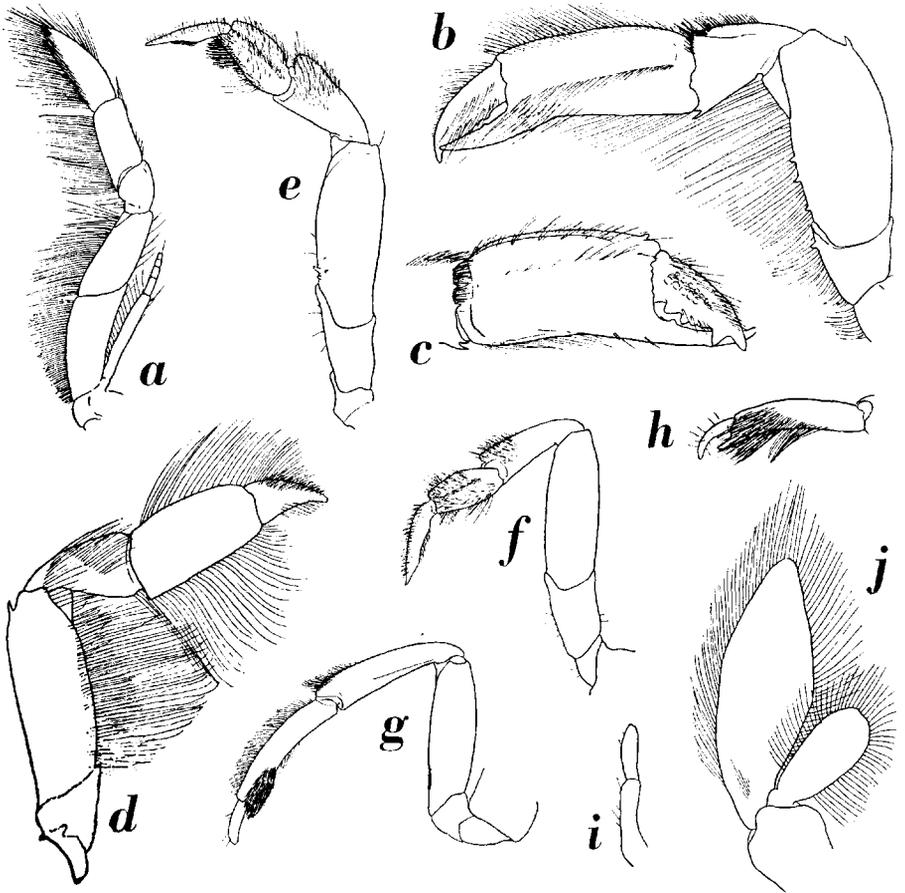


Fig. 2. *Upogebia brasiliensis* new species. a, third maxilliped; b, first pereiopod of female, external view; c, chela of first pereiopod of male, inside view; d, second pereiopod; e, third pereiopod; f, fourth pereiopod; g, fifth pereiopod; h, propodus and dactylus of fifth pereiopod; i, first pleopod; j, second pleopod. All figures except c after a female specimen. a,  $\times 10$ ; b-j,  $\times 7$ .

rows; in the lateral parts of the tuberculated area the tubercles reach farther backwards than in the middle. The anterior tubercles are stronger and more spine-like than the posterior. Most of the hairs are placed just before the tubercles, often forming a semi-circle along the anterior part of their bases. The lateral frontal teeth fail to reach the middle of the rostrum and end in a strong dorsally or obliquely directed spine. Behind this spine there is a longitudinal ridge bearing a row of about 10 tubercles. The posterior of these are low and rather inconspicuous, anteriorly they become stronger and more spine-like, the ultimate being practically as strong as the lateral frontal teeth. This row of tubercles is separated from the tubercles of the median post-rostral region by a smooth groove, which becomes obsolete posteriorly. The lower surface of the rostrum is unarmed in all my specimens. The anterior margin of the carapace, at the level of the eye, bears a distinct ocular spine. The cervical groove is well marked throughout its course and is rather deep. There are no spinules whatsoever placed behind it, though in one specimen the carina behind the cervical groove shows some faint indications of one or two blunt tubercles. The *linea thalassinica* is distinct.

The abdomen is normal in shape. The pleura of the first segment is bluntly triangular, those of the second to fifth segments are broadly truncated with the lateral margin slightly convex. A dense pubescence extends from the posterior part of the pleura of the second to the anterior part of that of the fifth segment. A row of hairs also is present along the posterior margin of segments II, III, and IV. The sixth segment has the pleura bluntly and broadly triangular. This segment is about 1.5 times as broad as long and has the same length as the telson. The telson is somewhat broader than long. It narrows very slightly posteriorly, to end in a very broad posterior margin, which is slightly convex, being straight or slightly concave in the middle, while often a trace of a median tooth is visible. The lateral margin, before the middle, shows a notch of variable distinctness, before and behind of which the margin often is convex. A high and sharp transverse carina is visible in the anterior part of the telson.

The eyes reach about to the end of the rostrum. The cornea is small and placed obliquely on the stalk. A small spinule often is visible at the inner surface of the stalk near the line separating it from the cornea; in a few specimens a minute tubercle is to be seen at the upper surface of the stalk.

The antennular peduncle reaches with its ultimate joint beyond the rostrum. The second joint is less than half as long as the first. Together the first and second are about as long as the third. There are two simple flagella, which are slightly shorter than the peduncle.

The scaphocerite is oval and ends in a minute sharp point. None of the joints of the peduncle bears a spine. The epistome bears no spines either.

The mandible has the cutting edge provided with several minute teeth, below this denticulated edge a single large tooth is visible. The palp is distinctly three-jointed. The maxillula has the lower endite very broad, the upper is narrower and more rounded. The palp is well developed, its tip is deflexed. The maxilla has both endites bilobed. The upper lobe of the lower endite is very small. The palp is well developed and the scaphognathite is large. The endites of the first maxilliped are separated by a distinct notch. The palp is well developed, the exopod has the flagellum rather short, and much narrower than the basal part; the epipod is small and oval. The second maxilliped is normal in shape. The exopod is well developed and has the flagellum subdivided into several joints; a small elongate epipod is present. The third maxilliped reaches with the dactylus beyond the rostrum. The propodus is somewhat shorter than the dactylus and is about 1.5 times as long as the carpus. The ischium is about as long as the dactylus and is slightly longer than the merus. The exopod almost reaches the distal end of the merus, it is jointed in the distal part. A small and narrow epipod is present.

The branchial formula is as follows:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
pleurobranchs	—	—	—	—	—	—	—	—
arthrobranchs	—	—	2	2	2	2	2	—
podobranchs	—	—	—	—	—	—	—	—
epipods	1	1	1	—	—	—	—	—
exopods	1	1	1	—	—	—	—	—

The first pereiopods are very heavy, the left and right are equal in size and shape. They reach with the carpus and the chela beyond the rostrum. The chela is slightly less than  $\frac{1}{3}$  as high as long, in the females it is somewhat more slender than in the only full grown male of my material. In the male specimen the dactylus is about as long as the slender fixed finger, in the females the fixed finger generally is shorter than the dactylus. The dactylus of the male specimen shows on the cutting edge a row of six blunt teeth, the proximal of which is the largest, the teeth diminishing in size distally. Just before the tip of the dactylus, however, an extremely large tooth is present on the edge; this tooth being larger than any of the other teeth. The inner surface of the dactylus bears two longitudinal rows of 5 or 6 blunt, rather large, rounded pearly tubercles. The upper surface of the dactylus bears several smaller tubercles; these are placed in about 4 more

or less distinct longitudinal rows in the basal part of the dactylus. Several longitudinal rows of hairs are implanted on the dactylus. The fixed finger is slender and bears one tooth in the proximal half of the cutting edge, behind this tooth up to three small teeth may be seen. The upper surface of the palm shows two more or less distinct longitudinal ridges which extend over practically its full length. Anteriorly, a short distance behind the articulation with the dactylus, the dorsal surface of the palm shows a small but distinct blunt spinule. Near the basal part of the inner of the two ridges some small tubercles may be seen. The lower surface of the palm in its proximal half bears a longitudinal ridge, in the basal part of which a few tubercles are placed. The extreme proximal part of the inner surface of the palm in its lower half shows a minutely crenulated curved ridge, above which there are one or more small tubercles. In the female the chelae are far less ornate. The dactylus lacks the large tooth that in the male is placed just before the apex. The other teeth are less pronounced than in the male. There is only one row of pearly tubercles on the inner surface of the dactylus and this is less conspicuous than in the male. The tubercles on the dorsal surface of the dactylus are vague and few in number. The ridges and the tubercles on the palm too are far more distinct in the male than in the female. The carpus is about half as long as the chela. The anterior margin bears on the inner side three teeth, all of which are placed in its upper half, the largest of these teeth is situated almost dorsally, the two other are distinctly smaller. A fourth tooth is placed on the lower margin of the carpus just behind the anterior margin. The carpus narrows distinctly towards the base, and in the upper half of its external surface shows a longitudinal groove. The merus is about as long as the palm. Its upper margin, at some distance behind the anterior margin, bears a distinct anteriorly directed spine. The lower margin bears three or four teeth in its proximal half. The ischium is short and bears one tooth on its lower margin. The second leg reaches with the ultimate three joints beyond the rostrum. The dactylus is triangular and measures about  $\frac{2}{3}$  of the length of the propodus. The propodus is quadrangular, it slightly broadens proximally. The carpus is somewhat shorter than the propodus and narrows towards its base. The merus is almost twice as long as the carpus; it bears a sharp tooth on the upper margin at some distance behind the anterior margin. Apart from the dorsal tooth of the merus, no spines or teeth are to be observed on any of the joints of this leg. The third leg reaches with the propodus beyond the rostrum. The dactylus is slender, slightly behind the middle it is somewhat widened. The propodus is much broader than the dactylus, but is of about the same length. The outer surface shows

three distinct longitudinal rows of hairs. The carpus is about 1.5 times as long as the propodus. The merus is about as long as the carpus and propodus combined. It shows a few (three or four) tubercles in the basal part of its outer surface near the lower margin. None of the joints bears any spines or teeth. The fourth leg reaches slightly beyond the rostrum, it has roughly the same shape as the third. The dactylus is decidedly longer than the propodus. The carpus is almost 1.5 times as long as the propodus. The merus is about as long as the dactylus and propodus combined, and shows no tubercles. The fifth leg reaches almost to the end of the rostrum. The dactylus is slender, curved, and somewhat spoon-shaped. The propodus is about 2.5 to almost three times as long as the dactylus and is produced in its lower anterior part to a process resembling a fixed finger, which almost reaches the middle of the dactylus. The carpus is slightly longer than the propodus. The merus is about as long as the propodus.

The first pleopods lack in the male. In the female they consist of a single, slender, two-jointed appendage; the ultimate joint being shorter than the proximal. The other pleopods are large and leaf-like, with the endopod oval, the exopod larger and more shaped like a diamond with rounded angles. The protopod of the uropods bears a sharply pointed slender tooth, which reaches over the base of the endopod. No spine, but a small tubercle is present in the basal part of the exopod. The outer margin of the exopod is convex in the basal half, straight in its distal part; the posterior margin is convex and provided with several small denticles. The upper surface of the exopod in its outer half shows three longitudinal carinae, two at some distance from the outer margin and one along that margin. The endopod has the outer margin bluntly angular in its basal part, and slightly concave in its distal part. The posterior margin is straight or slightly convex and, like that of the exopod, bears several denticles. The upper surface shows two longitudinal carinae, one over the middle and one along the outer margin. The eggs are numerous and small, they are  $0.5 \times 0.6$  mm in diameter.

Until now two species of this genus have been reported from Brazil: *Upogebia affinis* (Say) and *Upogebia spinigera* (Smith). The former of these two species is known from Massachusetts (U.S.A.) to the West Indies and Brazil, and was reported from the last named country by Rathbun (1900, p. 151) who dealt with material from Mamanguape, Parahyba River and Maceio; in the first and the last Brazilian locality the specimens were found on a reef, in the second in mangroves. *Upogebia spinigera* (Smith) is known from the American westcoast from Nicaragua to Colombia, while it was reported from Fernando Noronha by Pocock (1890, p. 515) under the name *Gebia spinigera*. A reexamination of Rathbun's and Pocock's

Brazilian *Upogebia* material, of which no description has been published, is most desirable.

*Upogebia brasiliensis* is rather closely related to *U. affinis* (Say). A comparison of our present material with about 15 variously sized specimens of *Upogebia affinis* collected in 1952 and 1954 in different localities within Massachusetts (U.S.A.) by Dr. Marian H. Pettibone and kindly donated by her to the Leiden Museum, revealed the following differences between the two species.

1. *U. affinis* attains a larger size (in my material up to 58 mm) than *U. brasiliensis*.

2. The lower surface of the rostrum in *U. brasiliensis* does not have any teeth, while one or more teeth may be present there in *U. affinis* (in some specimens of *U. affinis* these teeth are absent).

3. In *U. affinis* distinct spines are placed behind the cervical groove, slightly below the linca thalassinica.

4. The chelae of the first leg in *U. affinis* are different: the dactylus always is distinctly longer than the fixed finger, the male does not bear a large subterminal tooth on the cutting edge; the anterior margin of the palm at its external side bears a strong spine between the bases of the fingers; the tubercles and spines are more distinct and more numerous.

5. In *U. affinis* the carpus of the first leg shows far more spines (especially in its antero-dorsal part), while a longitudinal row of spines extends over the lower part of the inner surface ending in a strong spine on the anterior margin; furthermore a distinct spine is present in the proximal part of the upper margin, while the spines on the inner part of the anterior margin are far stronger than in *U. brasiliensis*.

6. The merus of the second leg of *U. affinis* bears a strong spine in the proximal part of the posterior margin, while such a spine lacks entirely in *U. brasiliensis*.

7. The tubercles of the merus of the third leg in *U. brasiliensis* are represented in *U. affinis* by spines.

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