

TWO NEW CALLIANASSID SHRIMPS FROM BRAZIL
(CRUSTACEA: DECAPODA: THALASSINIDEA)

Sérgio de A. Rodrigues and Raymond B. Manning

Abstract.—*Biffarius delicatulus* and *Eucalliax cearaensis* are described from Brazil. Each species is the third of their genus to be recorded from the western Atlantic and the first of their genus known from South America.

Among the unstudied callianassids accumulated by the senior author since his review of the Brazilian callianassids (Rodrigues 1971) are two previously undescribed species. One of these is referable to the genus *Biffarius* and the other to *Eucalliax*; both of these genera were recently erected for American species by Manning & Felder (1991).

The holotypes have been deposited in the Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP) and paratypes are in that collection and in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Carapace length (cl) is postorbital carapace length in millimeters (mm). Other abbreviations used include: A1, antennule; A2, antenna; leg., collector; m, meters; Mxp1-3, maxillipeds 1-3; P1-5, pereopods 1-5; Plp1-5, pleopods 1-5.

Biffarius delicatulus, new species

Fig. 1

Material.—Brazil, State of São Paulo: São Sebastião, Praia de Enseada [city of São Sebastião = 23°40'S, 45°20'W], dug from sand at low tide, 3 Jun 1981, leg. S. Rosso: 1 ♂, cl 3.8 mm (paratype, USNM 252546).—São Sebastião, Praia do Araça, collected in sand at low tide with yabby pump, 18 May 1985, leg. S. A. Rodrigues: 6 ♂, cl 4.0-6.8 mm, 2 ♀, cl 4.3, 4.4 mm (1 ♂ is holotype, MZUSP 10582; other specimens are paratypes, MZUSP (uncat.) and USNM 252547).

Diagnosis.—Size very small, cl less than 7 mm in adults. Telson subquadrate, unarmed. Mxp3 ischium-merus operculiform, without exopod, inner surface without crest or teeth. Male with one form of cheliped, merus of both chelipeds with ventral hook. Plp2 of male small, uniramous. Uropods unarmed.

Description.—Carapace smooth, with dorsal oval, without cardiac prominence, cervical groove distinct, linea thalassinica distinct, parallel to longitudinal axis of body; rostrum short; lateral frontal projections absent.

Abdominal somites smooth, somite 1 saddle-like, shorter than others; somite 2 longer than others, with small tuft of setae on posterolateral margin; somites 3-5 subequal in length, each with small lateral row of setae; somite 6 about as long as telson, with small posterolateral rows of setae. Telson subquadrate, slightly wider than long, with 1 tuft of setae on mid-dorsal surface, 2 other tufts near extremities of distal margin.

Eyes flattened, slightly convex, about as long as first segment of A1 peduncle, external margins moderately convergent, mesial margins parallel up to level of cornea, there divergent towards pointed tips; cornea rounded, darkly pigmented, subterminal.

A1 peduncle reaching slightly beyond tip of penultimate segment of A2 peduncle; segment 3 twice as long as segment 2, segment 1 a little longer than segment 2; flagellum shorter than peduncle. A2 peduncle with segment 4 slightly shorter than segment 3

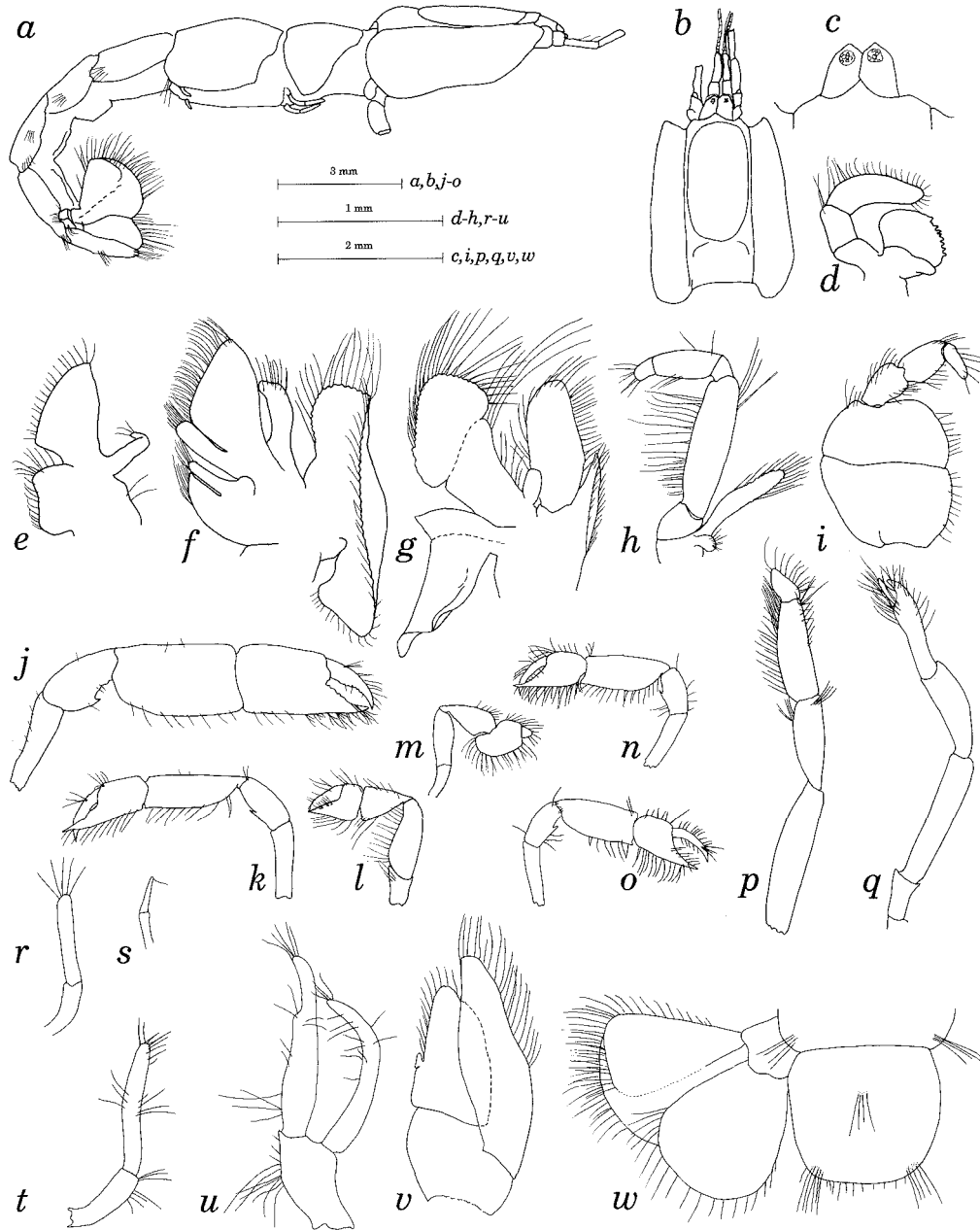


Fig. 1. *Biffarius delicatulus*, new species. a, Lateral view; b, Carapace and anterior appendages; c, Front and eyes; d, Mandible; e, Maxilla 1; f, Maxilla 2; g, Mxp1; h, Mxp2; i, Mxp3; j, Major cheliped of male; k, Minor cheliped of male; l, P2; m, P3; n, Left cheliped of female; o, Right cheliped of female; p, P4; q, P5; r, Male Plp1; s, Male Plp2; t, Female Plp1; u, Female Plp2; v, Plp4; w, Telson and left uropod. a-m, p-s, v-w, male paratype, cl 4.0 mm; n-o, t-u, female paratype, cl 4.3 mm.

Table 1.—Gill formula of *Biffarius delicatulus*.

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	—	—	—	—	—	—	—	—
Arthrobranchs	—	—	2	2	2	2	2	—
Podobranchs	—	—	—	—	—	—	—	—
Epipods	1	1	—	—	—	—	—	—
Exopods	1	1	—	—	—	—	—	—

and as long as segment 1 and 2 together; antennal scale small; flagellum about 3 times longer than peduncle.

Mandible with 7 sharp teeth on incisor process; molar process unarmed; palp 3-segmented, segment 3 longer than segments 1 and 2 combined. Maxillule with broad protopodal endites; palp slender, with curved tip. Maxilla with protopodal endites bilobed; palp slender, reaching slightly beyond middle of basal endite; exopod broad, with crenulated margins bearing equally-spaced setae, longer on distal margin. Mxp1 with protopodal endites as illustrated (Fig. 1g); palp small but distinct, longer than wide; exopod appearing articulated, distal portion with crenulated margin bearing long setae; epipod divided by constriction, anterior portion short and truncate, posterior portion produced into curved lobe. Mxp2 with endopod 5-segmented, as illustrated (Fig. 1h); exopod unsegmented, shorter than endopodal merus; protopod with small setose exopod, lacking arthrobranch. Mxp3 ischium-merus operculiform; ischium 1.5 times wider than long, mesial surface with sparse small setae, without crest or teeth; merus 2 times wider than long, proximal margin as long as distal margin of ischium, 4 times wider than carpus and propodus; propodus longer than wide, only slightly wider than digitiform dactylus.

Larger cheliped of male with ischium smooth, unarmed; merus with anterior margin smooth, posterior margin produced into distally directed hook and with distal

portion serrated; carpus about 1.5 times longer than wide; palm shorter than carpus, slightly longer than wide; fingers shorter than palm, gaping, tips acutely pointed, cutting edges minutely serrated. Smaller cheliped of male with ischium smooth, merus usually with small, acute hook at midlength of posterior margin (absent in 1 specimen); carpus longer than other joints, length about 3 times width; propodus widening distally; fingers subequal, curved, longer than palm, sharply pointed, with some serrations on cutting edges. Females with both chelipeds of same size and shape, differing from small cheliped of male only in setation and proportions of carpus (2.2 rather than 3 times longer than wide).

P2 with fingers not gaping, cutting edges straight, smooth. P3 with ischium and merus of about same width, merus longer than ischium; carpus broadening distally; propodus wider than carpus, anterior and posterior margins convex, posterior margin much longer than anterior; dactylus as long as wide, with rounded tip. P4 with posterior margin of propodus bending towards dactylus, lacking subchelar projection. P5 distinctly chelate, fingers small, tips curved.

Branchial formula, differing from normal callianassid formula in complete absence of arthrobranch on Mxp2, as shown in Table 1.

Plp1 of male uniramous, 2-segmented; distal segment spatulate, with 5 long apical setae. Plp2 rudimentary, uniramous, 2-segmented; distal segment with 1 short apical

seta. Plp1 of female uniramous, 2-segmented; proximal segment with a few subterminal short setae; distal joint about 2 times longer than proximal, with about 12 small setae at midlength, 4 small subterminal slender setae, and 4 spiniform apical setae. Plp2 of female biramous; endopod straight, with 5 terminal setae and a few setae scattered along its length; exopod similar to endopod but curved. Plp3–5 with stubby, projecting appendices internae in both sexes.

Uropodal endopod widening to its distal extremity, about as long as broad, marginal setae delicate; exopod slightly longer than endopod, upper plate incomplete, distal margin convex, without strong setae.

Etymology.—From the Latin, *delicatus*, delicate, as, like *B. biformis* and *B. fragilis*, specimens are very easily damaged when handled.

Remarks.—This species resembles *B. biformis* (Biffar, 1971) and *B. fragilis* (Biffar, 1970), the only other species assigned to the genus, but differs from both in having vestigial pleopods on the second abdominal somite of the male. It further differs from *B. biformis* in lacking spinules on the posterolateral corner of the telson and in having only one form of major cheliped in the male. It differs from *B. fragilis* in having a weak hook on the merus of the smaller cheliped, a relatively short antennular peduncle, and no spinules on the inner face of the ischium of the third maxilliped. As in *B. biformis*, the female of *B. delicatulus* lacks a major cheliped—both chelipeds are of the same size and shape. All three species lack an arthrobranch on the second maxilliped.

Eucalliax cearaensis, new species

Fig. 2

Material.—Brazil, State of Ceará: Fortaleza [3°45'S, 38°35'W], Barro de Ceará, right bank of river mouth, collected in sand at low tide with yabby pump, 21 Feb 1984,

leg. S. A. Rodrigues: 2 ♂, cl 7 mm, 3 ♀, cl 6–7.2 mm (1 male is holotype, MZUSP 10583; other specimens are paratypes, USNM 252546).

Diagnosis.—Rostrum short, not spined. Carpus of chelipeds lacking distal acute projections or spines. Male Plp1 terminating in single hook.

Description.—Carapace about $\frac{1}{3}$ as long as body, lacking cardiac prominence, dorsal oval, rostral spine, and rostral carina, cervical groove indistinct, present as suture; dorsal midline with 2 small rounded pits, one on anterior portion of gastric area, other on caudal portion of cardiac area; linea thalassinica parallel to midline of body; rostrum short; lateral frontal projections of carapace inconspicuous. Abdominal somites smooth, somite 1 shortest, somite 2 longest; somites 3–5 subequal in length, each with small lateral row of setae. Telson distinctly broader than long, subquadrate, unarmed.

Eyes flattened, extending slightly beyond distal margin of first segment of A1, almost 2 times longer than wide; external margins convergent, internal margins parallel for most of length, diverging near pointed tips; cornea distinct, darkly pigmented, subterminal.

A1 peduncle about as long as A2 peduncle; segment 1 shortest, segment 3 longest; antennular flagellum about 1.5 times longer than peduncle. Antennal scale absent; antennal flagellum about 5 times as long as peduncle.

Mandible with molar process smooth, incisor process with about 10 small, unequal teeth; mandibular palp 3 segmented, segment 3 larger than the preceding and bearing many stiff setae. Maxillule with many short spiniform setae on mesial margin of protopodal endite; palp slender, curved, unsegmented. Maxilla with protopodal endites bilobed, mesial margins bearing numerous slender setae; palp about as long as endites; exopod broad with anterior and posterior margins rounded.

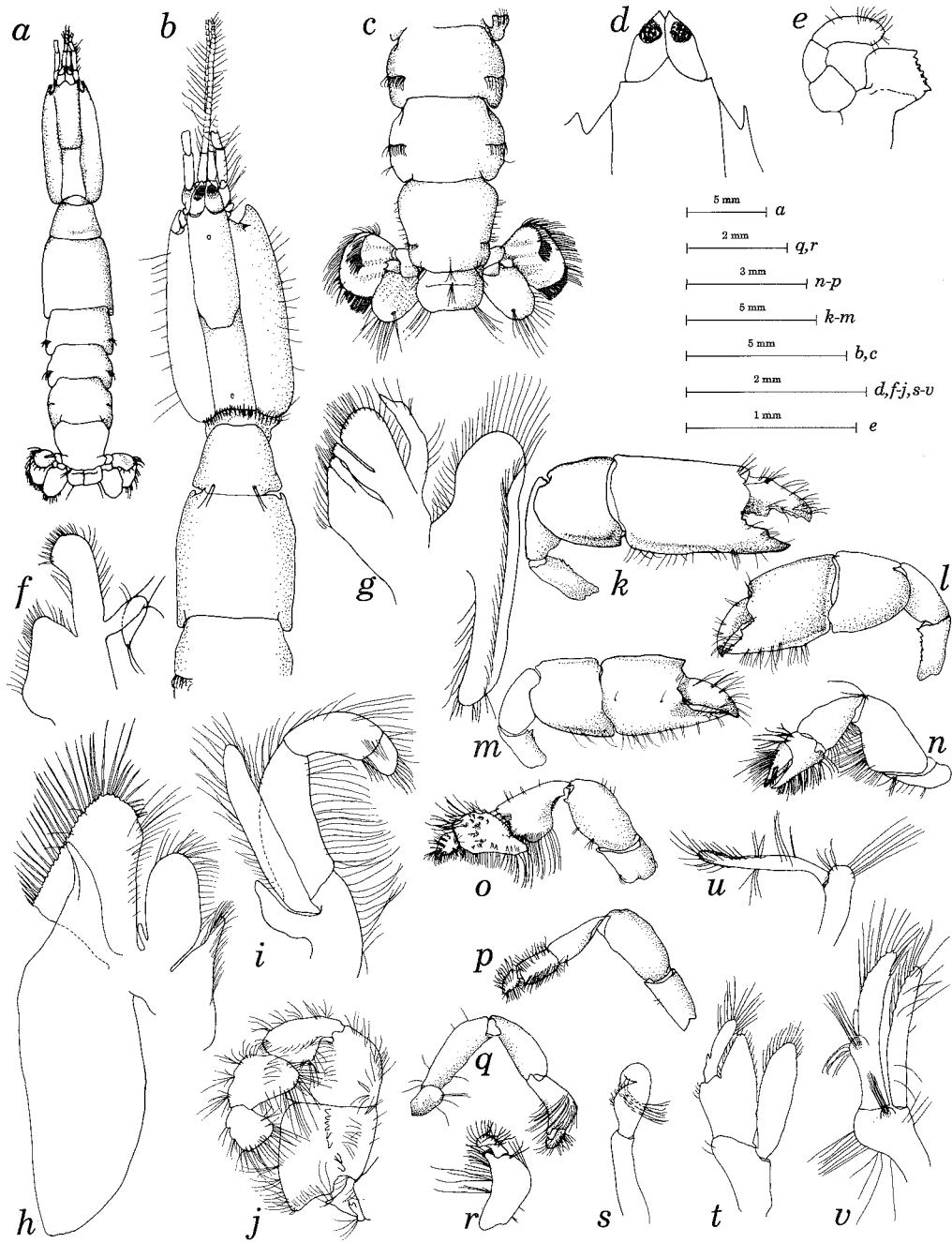


Fig. 2. *Eucalliax ceareaensis*, new species. a, Dorsal view; b, Carapace, frontal appendages, and anterior abdominal somites; c, Posterior part of abdomen and tail fan; d, Front and eyes; e, Mandible; f, Maxilla 1; g, Maxilla 2; h, Mxp1; i, Mxp2; j, Mxp3; k, Right cheliped of male; l, Left cheliped of female; m, Right cheliped of female; n, P2; o, P3; p, P4; q, P5; r, P5 propodus and dactylus; s, Male Plp1; t, Male Plp2; u, Female Plp1; v, Female Plp2. a-k, n-t, male paratype, cl 7 mm; l-m, u-v, female paratype, cl 6 mm.

Table 2.—Branchial formula of *Eucalliax cearaensis* (r = rudimentary).

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	—	—	—	—	—	—	—	—
Arthrobranchs	—	r	2	2	2	2	2	—
Podobranchs	—	—	—	—	—	—	—	—
Epipods	1	1	—	—	—	—	—	—
Exopods	1	1	—	—	—	—	—	—

Mxp1 with coxa triangular, base rounded; palp short and narrow; exopod unsegmented; epipod large, tapering anteriorly, broadening posteriorly. Mxp2 with pediform endopod; exopod slightly longer than half of endopod; protopod with small leaf-like epipod. Mxp3 with ischium-merus subpediform, length about twice merus width; ischial ridge with about 8 denticles; carpus oval; propodus about as broad as carpus, broader proximally than distally; dactylus blunt, ovate, about as long as wide.

Branchial formula as shown in Table 2.

Chelipeds subequal, slightly sexually dimorphic. Large cheliped of male with row of spines on ischium increasing in size distally; merus unarmed, about 2 times longer than wide; carpus shorter than merus, about as long as wide, anterior and posterior margins distally rounded, without acute projections; palm longer than wide, margins smooth; fixed finger strong, blunt at tip, much shorter than dactylus, cutting edge with median triangular tooth; dactylus blunt, curving inward distally, cutting edge with strong proximal tooth and 3 small teeth diminishing in size distally. Larger cheliped of female with ischium, merus, and carpus as in male; palm as long as wide, fixed finger with rather sharp teeth; dactylus with acute tip, cutting edge slightly serrated near proximal extremity. Smaller cheliped with merus, carpus, and palm as in larger cheliped of female; fingers with acute tips and nearly smooth cutting edges.

P2 with ischium small, wider than long;

merus the widest joint, narrowing distally; palm wider than long; fingers with pointed tips, cutting edges straight, not gaping. P3 with ischium as wide as merus; merus subcylindrical, tapering to articulation with carpus; carpus widening near midlength; posterior margin of propodus with small lobe proximally, anterior margin convex. P4 simple, ischium and merus about as long as carpus, propodus and dactylus combined; merus the widest joint, carpus slender, propodus and dactylus with dense tufts of setae. P5 chelate, ischium and merus shorter than combined lengths of carpus, propodus and dactylus; carpus and propodus the widest joints; propodus and dactylus with dense tufts of setae; fixed finger spoon-shaped; dactylus curved.

Plp1 of male uniramous, 2-segmented; distal segment with flattened, curved tip bearing marginal row of long setae, posterior margin convex at midlength, with row of minute setae; proximal segment longer than distal, smooth, with tuft of short setae near distal extremity of posterior margin. Plp2 of male biramous, exopod and endopod leaf-like; endopod 3-segmented, proximal segment with inner projection almost as long as distal segment; latter narrow, with small appendix interna. Plp1 of female uniramous, 2-segmented, distal segment articulated to distal portion of anterior margin of proximal segment, forming an angle of 90° with it, distal extremity flattened, with long marginal setae; proximal segment with group of long and group of short setae on

dilated distal portion of posterior margin. Plp2 of female biramous, exopod and endopod narrow, spatulate, with distal half bearing long marginal setae; endopod with knob near midlength of inner margin, adjacent to appendix interna, bearing a rod-like tuft of long setae; protopod with similar tuft of setae near distal margin, almost between exopod and endopod, and with stronger tuft of setae on anterior surface. Plp3–5 with finger-like appendices internae in both sexes.

Uropodal endopod oval, about 1.5 times longer than wide, distal tip extending well beyond posterior margin of telson, margins with widely spaced setae, dorsal surface with tuft of long setae near distal extremity of mesial margin; exopod about as long as endopod, upper plate distinctly shorter than lower plate, with double row of about 14 spiniform setae on mesial portion of distal margin, lower plate with single row of 12 spiniform setae on central part of distal margin, increasing in size medially.

Etymology.—The specific name is derived from the State of Ceará which contains the type locality.

Remarks.—Two species of *Eucalliax* have been described from the American tropical Atlantic: *E. quadracuta* (Biffar, 1970) and *E. jonesi* (Heard, 1989). This new species differs from both in having the A1 and A2 peduncles subequal in length. It further differs from *E. quadracuta* in lacking acute distal processes or spines on the dorsal and ventral margins of the carpus of the chelipeds, in having a row of spiniform setae on the uropods, and in the shape and setation of Plp1–2 in the male which in *E. quadracuta* is a simple spatulate lobe, not recurved into a distal hook. *Eucalliax cearaensis* resembles *E. jonesi* in the smooth carpus of the chelipeds and the presence of spiniform setae on the uropods, but differs

in having a much shorter rostral spine and in having the male Plp1 terminating in a single apical lobe rather than in two lobes.

Acknowledgments

The figures were inked and prepared for publication by Marion Erwin, for which we are most grateful. One of us (SAR) studied the material reported here at the National Museum of Natural History under a short-term visitor grant from the Office of Fellowships and Grants, Smithsonian Institution.

This is Contribution number 295 from the Smithsonian Marine Station at Link Port, Florida.

Literature Cited

- Biffar, T. A. 1970. Three new species of callianassid shrimp (Decapoda, Thalassinidea) from the western Atlantic. — *Proceedings of the Biological Society of Washington* 83:35–49.
- . 1971. New species of *Callianassa* (Decapoda, Thalassinidea) from the western Atlantic. — *Crustaceana* 21(3):225–236.
- Heard, R. W. 1989. *Calliax jonesi*, n. sp. (Decapoda: Thalassinidea: Callianassidae) from the northwestern Bahamas. — *Gulf Research Reports* 8(2): 129–136.
- Manning, R. B., & D. L. Felder. 1991. Revision of the American Callianassidae (Crustacea: Decapoda: Thalassinidea). — *Proceedings of the Biological Society of Washington* 104(4):762–790.
- Rodrigues, S. de A. 1971. Mud shrimps of the genus *Callianassa* Leach from the Brazilian coast (Crustacea, Decapoda). — *Arquivos de Zoologia, São Paulo* 20(3):191–223.

Addresses: (SAR) Departamento de Ecologia Geral, Instituto de Biociências, Universidade de São Paulo, Caixa Postal 11461, CEP 05499 São Paulo, Brazil; (RBM) Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A.