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DESCRIPTION OF THE GHOST SHRIMP *EUCALLIAX MCILHENNYI,* NEW SPECIES, FROM SOUTH FLORIDA, WITH REEXAMINATION OF ITS KNOWN CONGENERS (CRUSTACEA: DECAPODA: CALLIANASSIDAE)

Darryl L. Felder and Raymond B. Manning

Abstract.—*Eucalliax mcilhennyi,* new species, is described from an intertidal sandflat bordering Fort Pierce Inlet on the Atlantic coast of Florida. The species is distinguished from known congenerics of the Eucalliinae, all of which are restricted to the western Atlantic. Detailed comparisons are made to *E. jonesi* (Heard 1989), from Bimini Harbor, Bahamas. Specimens from Florida were first thought to represent *E. jonesi* because of superificial resemblance, similarities in habitats, and proximity of collection localities. The two species differ from each other and their congenerics in a number of morphological characters, including relative development of the front and rostrum of the carapace, spination of chelipeds, shape of gonopods, and ventral plating of abdominal somites. Abbreviated larval development and limited capacity for dispersal are inferred by the large eggs found on ovigerous females of species in this genus, and may serve to maintain isolation of regional populations. This would be consistent with morphological evidence that *Eucalliax* has extensively endemized within the tropical western Atlantic, even in the absence of evidence for major historical disjunctures in appropriate habitat.

Over the last decade, we have used yabby pumps (see Hailstone & Stephenson 1961, Manning 1975) to collect extensively from intertidal substrates in the vicinity of Fort Pierce, Florida. Our efforts there have revealed a number of previously unknown infaunal decapods, some of which we have described in previous papers (Felder & Manning 1986; Manning & Felder 1989, 1992). Materials from this region have also provided a basis for systematic revisions and new distribution records, especially for members of the Callianassidae (Manning 1987, 1993; Manning & Felder 1986, 1991; Manning & Heard 1986; Manning & Lemaitre 1994).

One of our collecting sites within the southern Indian River lagoon, a small intertidal sandflat just inside Fort Pierce Inlet (see Felder & Manning 1986), has produced a particularly rich assemblage of fossorial stomatopod, thalassinid, and alpheid crustaceans. The thalassinids taken from this small area have included representatives of *Upogebia, Callichirus, Neocallichirus, Biffarius,* and a new genus (Manning & Lemaitre 1994). Our collections there have also included infrequent occurrence of two species of ghost shrimp that we assigned to a new genus, *Eucalliax* Manning & Felder, 1991. One of these species, perhaps the same as that previously reported from south Florida as "*Eucalliax quadracuta*" (Biffar 1971; specimen destroyed by fire), we have tentatively grouped with the '*Eucalliax quadracuta* complex' until such time as we can complete further comparative studies from throughout the range of that group. The oth-

er, allied to *E. jonesi* (Heard 1989) from the nearby northern Bahamas and *E. cearaensis* from Brazil (Rodrigues & Manning 1992), is herein recognized as a new species.

Material examined is listed by location followed by date, collector, number of specimens per sex and condition (imm = immature, mutl = mutilated, ov = ovigerous), and, if applicable, museum number. Size is expressed as postorbital carapace length (CL) measured in millimeters (mm), except where compared as total length under "Remarks" section. The holotype and some paratypes of *Eucalliax mcilhennyi* have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). Paratypes have been deposited in the University of Southwestern Louisiana Zoological Collections, Lafayette, Louisiana (USLZ). In addition to type materials of *E. cearaensis* and *E. jonesi* available at the Smithsonian Institution, the paratype of *Eucalliax jonesi* was obtained on loan from the Gulf Coast Research Laboratory (GCRL) in Ocean Springs, Mississippi, and the types of *Eucalliax quadracuta* (Biffar, 1970) were obtained on loan from the Museum of Comparative Zoology, Harvard University, in Cambridge, Massachusetts.

Eucalliax Manning & Felder, 1991
Eucalliax mcilhennyi, new species
Figs. 1–6

Type material.—Station RBM FP-89-4, sandflat with sparse seagrass, 27°27.7′N, 80°18.7′W, south side of Fort Pierce Inlet, north side of US Highway A1A causeway between Fort Pierce and South Hutchinson Island, Indian River lagoon, St. Lucie County, Florida, 11 Aug 1989, coll. R. B. Manning, R. Brown, and W. Lee, ♂ holotype (CL 10.1 mm), USNM 267112; (same site as holotype, except where otherwise indicated) station RBM FP-85-4, voucher for color photo, 23 Jul 1985, coll. R. B. Manning and D. L. Felder, 1 ♂ (CL 9.0 mm), USLZ 3538; station RBM FP-86-1, 11 Aug 1986, coll. R. B. Manning, D. L. Felder and W. D. Lee, 1 ov ♀ (CL 10.3 mm), USNM 267113; station RBM FP-86-2, voucher for color photo, 11 Aug 1986, coll. R. B. Manning, D. L. Felder and W. D. Lee, 2 ♀ (1 ov, 1 mutl; CL 11.6 mm, 10.5 mm), USNM 267114; station RBM FP-86-3, 12 Aug 1986, coll. R. B. Manning and D. L. Felder, 1 ♀ (CL 10.9 mm), USNM 267115; station RBM FP-86-4, 12 Aug 1986, coll. R. B. Manning, D. L. Felder and W. D. Lee, 1 ♀ (CL 9.9 mm), USNM 267116; station RBM FP-86-6, 14 Aug 1986, coll. R. B. Manning, D. L. Felder and W. D. Lee, 3 ♀ (1 ov, 1 mutl; CL 11.2, 11.2, 11.0 mm), USNM 267117; no station number, 4 Jun 1993, coll. D. L. Felder, 1 ov ♀ (CL 9.7 mm), USLZ 3537; station RBM FP-88-3, hard packed sand along shore, 27°28.2′N, 80°18.2′W, south side of Coon Island, north shoreline of Fort Pierce Inlet, Indian River lagoon, St. Lucie County, Florida, "with *Pinnixa,*" 21 Apr 1988, coll. R. B. Manning, W. D. Lee, M. Schotte, and C. King, 1 ♂ (CL 7.5 mm), USNM 267118.

Diagnosis.—Rostrum broad, weakly produced. Carapace dorsally lacking strong, longitudinal ridges. Antennal peduncles overreaching antennular peduncles. Chelipeds with hooked marginal spinules on ischium, lacking acute teeth or spines at distal corners of carpus. Male first pleopod originating from distinct ovoid ventral plate on abdomen, terminally bifurcate, with single, short subapical process.

Description.—Dorsally, carapace much less than (about ⅔) combined lengths of abdominal segments 1 and 2 (Fig. 1a). Frontal margin of carapace with broad, triangular rostrum; rostrum acute terminally and flanked by weakly excavate shoulders (Fig. 2a) forming anteriorly produced prominences just lateral to margins of eyestalks; rostrum extending less than ½ visible length of eyestalks in dorsal view, ventrally bearing tuft of setae, longest of which extend anteriorly between eyestalks to cornea. Carapace lacking distinct dorsal oval and cardiac

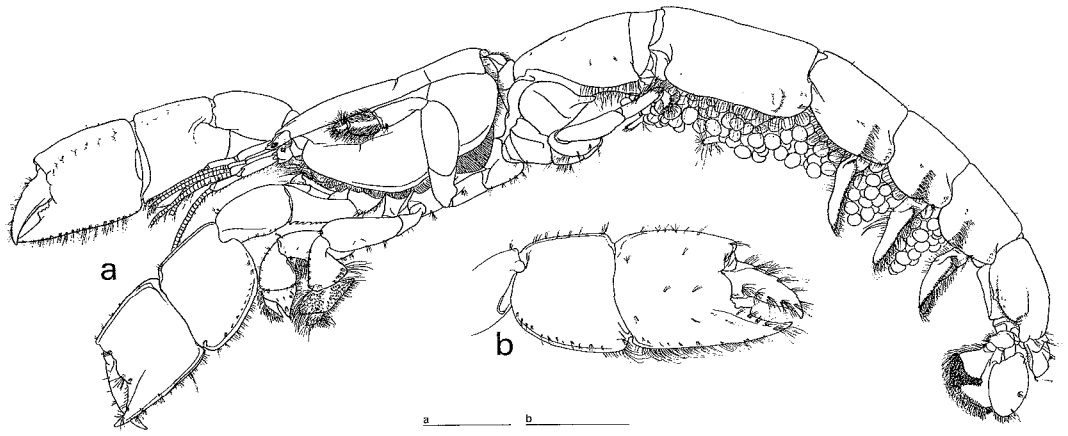

Fig. 1. *Eucalliax mcilhennyi,* new species, from Fort Pierce Inlet, Florida, paratype ovigerous ♀ (CL 11.6 mm) USNM 267114: a, Lateral view; b, External surface of right (major) chela. Scale lines indicate 5 mm.

prominence; lacking rostral carina except for slightly raised postrostral area between pairs of postrostral punctae. Cervical groove evident as suture, disjunct at dorsal midline, extending anteroventrally to complex network of sutures in posterior ⅖ of carapace; one branch from this point continued anteriorly as weakly carinate, sinuous, longitudinal suture, of which longest tract terminates anteriorly in antennal notch of carapace margin. Strong, raised hepatic boss in anterior ⅓ of carapace just dorsal to cervical suture. Linea thalassinica strong, parallel to midline of carapace over most of length, diverging slightly posterior of cardiac suture. Cardiac suture well defined, incomplete across dorsal midline of carapace.

Eyestalks dorsally flattened, length equal to or just greater than 2 times width, in dorsal view reaching beyond basal antennal article; mesial surfaces broadly triangular, flattened so eyestalks fit closely together at midline; anterolateral margin of eyestalk arcuate, joining mesial margin anteriorly in narrow, upturned tip; pigmented region in distal ½ of dorsal surface, area of dark pigmentation variable, sometimes exceeding the weakly evident corneal surface; sometimes with 1 or more setose punctae dorsally near midlength of eyestalk. Antennular peduncle shorter than and not so heavy as antennal peduncle; basal article laterally and ventrally inflated to accommodate statocyst, opening to which is occluded by closely set fan of anteromesially directed setae overlain by eyestalk; second article slightly longer than basal article, third article about ⅔ length of second; second and third articles with ventrolateral row of long, ventrally directed setae, continued onto ventral ramus of flagellum; rami of flagellum about equal in length, near 5 times length of third article of peduncle; ventral ramus ventrally setose, line of long setation ventrolaterally and line of slightly shorter setation ventromesially; dorsal ramus primarily with sparse short setae, subterminal articles of dorsal ramus heavier than those of ventral ramus, and endowed with thick line of ventral aesthetascs. Antennal peduncle more than 1.5 times length of antennular peduncle; basal article with dorsolateral carina bearing regular line of fine setae above laterally produced excretory pore; second article with deep, diagonal ventrolateral furrow, distally with field of long setae below ventrolateral suture and another on dorsolateral surface, broad, articulated dorsal scale at joint with third article; third article elongate, slightly longer than fourth or combined lengths of first two,

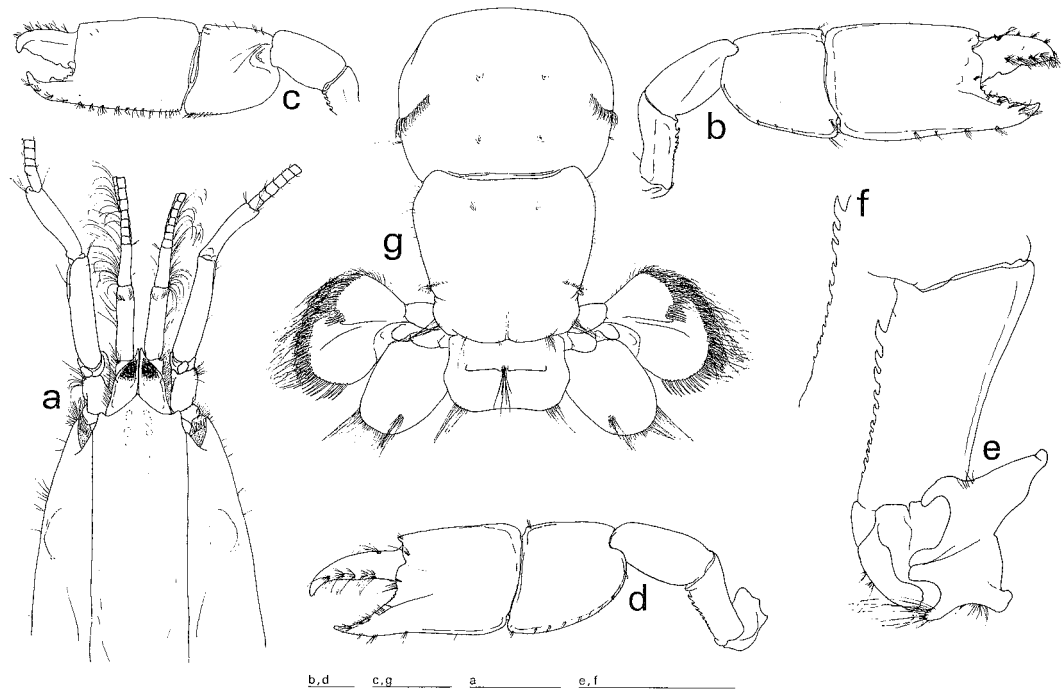

Fig. 2. *Eucalliax mcilhennyi,* new species, from Fort Pierce Inlet, Florida; a–e, g, holotype ♂ (CL 10.1 mm) USNM 267112; f, paratype ♀ (CL 11.6 mm) USNM 267114: a, Anterior carapace, eyestalks, and antennae, dorsal view; b, Right (major) cheliped, external surface; c, Right (major) cheliped internal surface; d, Left (minor) cheliped, external surface; e, Ischium of right (major) cheliped of ♂, internal surface; f, Ischial dentition, right (major) cheliped of ♀, internal surface; g, Posterior abdomen, telson, uropods, dorsal surface. Scale lines indicate 2 mm.

proximolaterally with unfused condylar process articulated to distolateral extreme of second article; fourth article narrower than third; flagellum sparsely setose and more than 4 times length of antennular flagella.

Mandibles set below the produced, rounded, median lobe of epistome; mandible (Fig. 3a) with large, terminally setose, 3-segmented palp, elongated third article of palp terminally rounded; incisor process with well-defined teeth on cutting margin, field of 3–4 large distal teeth separated from large proximal tooth by line of subpectinate lower teeth, internal surface with lip giving rise to molar process proximal to incisor teeth; paragnath (not figured) uncalcified, set against proximal surface of molar process, distolateral corner slightly produced and opposing teeth of molar process. First maxilla (Fig. 3b) with endopodal palp long, narrow, terminal article deflected proximally at articulation; proximal endite densely setose on concave margin, terminally with dense field of complex setae; distal endite elongate, terminally truncate and armed with stiff bristles; exopodite low, rounded. Second maxilla (Fig. 3c) with endopod narrowed abruptly at distal end, terminus directed mesially, first and second endites each longitudinally subdivided, exopod forming large, broad, scaphognathite. First maxilliped (Fig. 3d) with proximal endite triangular, marginal setation including stronger, curved setae at distal corner; distal endite elongate, ovoid, mesial half of external surface and all margins heavily setose, internal surface concave; exopod triangular, divided by transverse suture; distal part broader and

with longer marginal setation at its mesial end, proximal part with field of mesially directed setae near mesial end; epipod large, broad, weakly subdivided by transverse suture, its anterior end tapered, angular. Second maxilliped (Fig. 3e) with long, narrow endopod; endopodal merus arcuate, slightly heavier in proximal half than in distal, flexor margin with dense fringe of long, close-set setae; carpus short; propodus heavy, weakly arcuate, length equal to or less than 2 times width, equal to or less than ½ length of merus; dactylus short, about ½ length of propodus, extensor margin arcuate; exopod about as long as endopodal merus, marginally fringed by long setae, subdivided by weak transverse suture at ⅓ length; epipod small, with short, rounded proximal lobe and narrow distal lobe. Third maxilliped (Fig. 3f) without exopod; endopod with long, dense setation on mesial margin; endopodal ischium subtriangular, slightly longer than broad, proximomesial lip forming produced lobe or subacute corner, internal surface with low medial, longitudinally oriented elevation bearing well-defined curved row of about 9–11 sharp teeth, usually with 2–3 smaller supplementary teeth trailing ventral to proximal end of primary row; merus subquadrate, slightly broader than long; carpus strongly flexed in proximal third, with setose lobe on flexor margin, internal surface faceted, superior facet glaborous except for marginal setae, and inferior facets setose; propodus large, subtriangular, about as broad as long, proximal ⅔ of inferior margin forming large, rounded, densely setose lobe; dactylus broad terminally, slightly longer than broad, fringed with very dense field of close-set, stiff setae on broad terminal margin.

Branchial formula includes exopods and epipods as described for first and second maxillipeds above; branchiae limited to single rudimentary arthrobranch on second maxilliped, pair of arthrobranchs on third maxilliped, and pair of arthrobranchs on each of the first through fourth pereopods.

First pereopods with major and minor cheliped strongly developed (Fig. 1a), near equal in size but dissimilar in shape of propodus and dentition of fingers, especially in males; major cheliped located on either right or left side of body. Major cheliped of mature male (Fig. 2b, c) massive and strongly calcified; ischium slender, superior margin sinuous, inferior (flexor) margin with row of small, distinctly hooked denticles; merus unarmed, about 1.8 times longer than broad; carpus broad, increasing in breadth distally, inferior margin arcuate, superior and inferior margins keeled, terminated distally in blunt corners; propodus heavy, length (including fixed finger) about 1.7 times height, inner surface of palm smooth, without swollen proximal boss; weak unarmed furrow extending posteriorly from just below gape of fingers on outer face of palm; superior and inferior propodal margins keeled, keel of inferior becoming ill-defined beyond midlength and absent on fixed finger; fixed finger thick, heavily calcified, prehensile margin armed with 2 small well-separated triangular teeth in proximal ⅓ and broad, microserrated tooth just proximal to midlength, with distal half of margin unarmed and terminated at subacute upturned tip; dactylus with subacute, hooked tip, external shoulder of superior margin with setose punctum abutted against low tubercle in proximal ¼ of length in addition to line of about 6 setose punctae on internal side of superior margin, inferior (prehensile) margin with low, sinuously margined tooth encompassing distal ½ and separated from tooth on proximal ½ by rounded gap, proximal tooth with weakly bicarinate margin bearing scant small tubercles or microserration, proximal tooth separated from proximal end of inferior margin by rounded gap. Major cheliped of female also massive (Fig. 1a, b) but less heavily calcified and slightly different in sculpture than that of typical mature males; teeth of dactylus usually of slightly lower profile than in males, those of fixed finger usually centered more proxi-

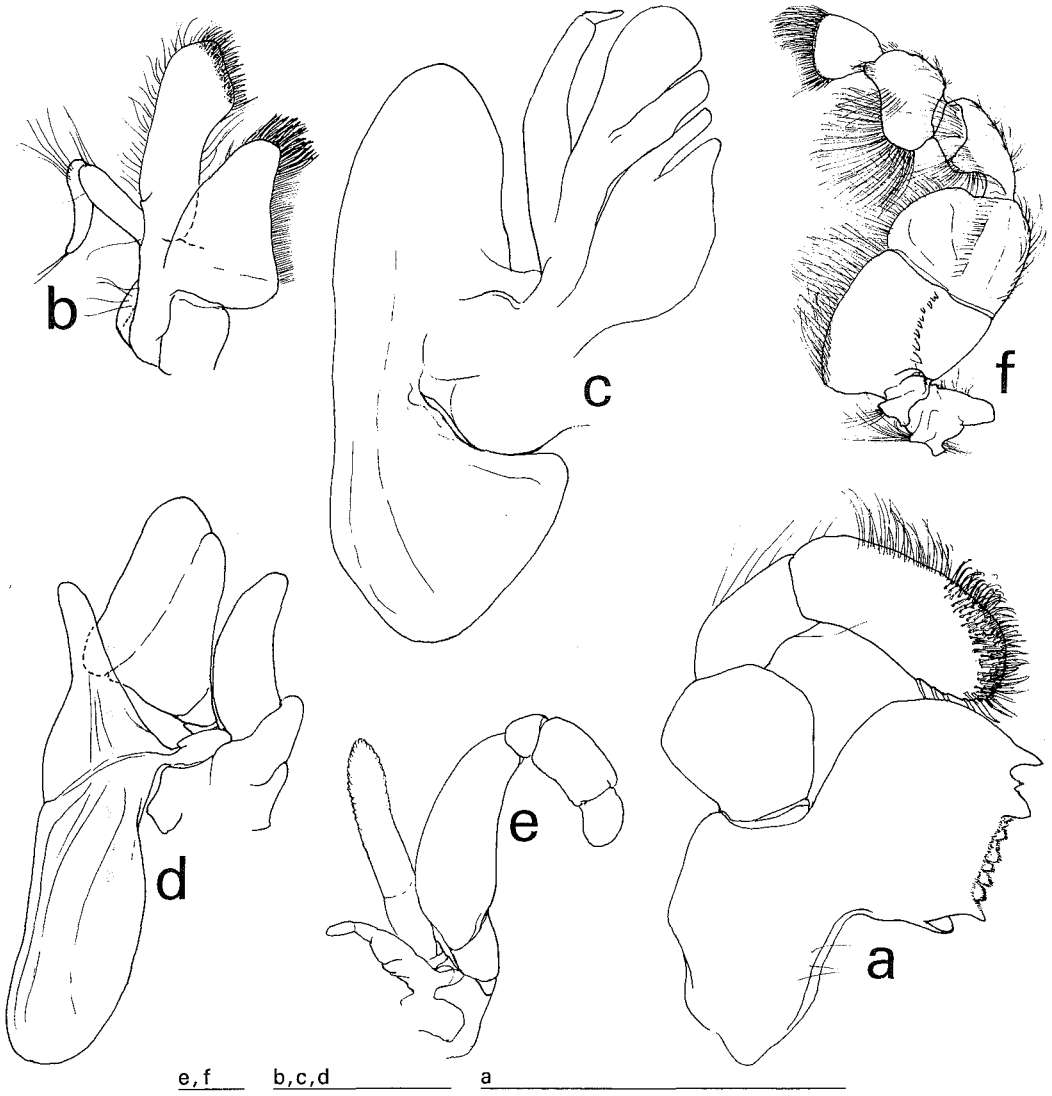

Fig. 3. *Eucalliax mcilhennyi,* holotype ♂ (CL 10.1 mm), from Fort Pierce Inlet, Florida, USNM 267112, right appendages; a–e, external surface; f, internal surface: a, Mandible, excluding paragnath; b, First maxilla; c, Second maxilla, setae not shown; d, First maxilliped, setae not shown; e, Second maxilliped, setae not shown; f, Third maxilliped. Scale lines indicate 1 mm.

mally than in males, both fingers relatively less massive, more narrow, sometimes more acutely tipped, than in males; propodus not as long relative to height, and with margins more arched, than in males.

Minor cheliped (Fig. 2d) slightly lighter, less armed than major, inferior (flexor) margin of ischium with line of distinct hooked spinules; merus unarmed; carpus with blunt distal corners; propodus with distinct unarmed furrow extending posteriorly from just below gape of fingers on outer surface, fixed finger tapered to very narrow acute or subacute tip, prehensile margin proximally serrate; propodus less elongate, relative to height, in females (Fig. 1a) and juvenile

males than in mature males; dactylus narrow, with subacute tip, unarmed on prehensile margin.

Second pereopod (Fig. 4a) chelate, most of flexor margins of ischium and merus lined with evenly spaced long setae, similar setae patchy and restricted primarily to distal patches on flexor margin in carpus, inferior margin of propodus with similar setal patches which are long proximally, progressively more reduced in length and stiffened distally, subterminally becoming dense patch of short, stiff bristles; prehensile margins of both fingers corneous, finely and uniformly microserrate along straight edge over most of length, microserration terminating proximally at small corneous tooth and terminating distally in thickened corneous tips of fingers; superior margin of dactylus slightly sinuous, with patches of stiff, arched bristles becoming increasingly reduced in length, close-set and more arched distally. Third pereopod (Fig. 4b) merus length about 2 times width, flexor margin weakly sinuous, typically with 2 small prominences bearing tufts of setae; carpus broadly flared distally to produce strong inferior lobe, width at this point about ¾ length, inferior lobe terminally with field of long arched setae, diminishing in length toward articulation with propodus; propodus with strong proximally directed lobe on inferior margin, lobe terminally with field of long arched setae diminished distally along margin to close-set shorter bristles that become slightly longer at distal extreme, superior margin with tufts of long arched setae, patterned tufts of lighter setae on outer face of article; dactylus tear-shaped, length about 1.4 times width, terminating in narrow corneous tip hooked toward external side, inferior margin sinuous, outer (external) face crossed by fields of short, slightly hooked setae in which longest setae are near superior margin, with separate, dense field of slightly heavier short weakly hooked setae along lower extreme of external face and inferior margin. Fourth pereopod (Figs. 1a, 4c) not subchelate, inferodistal corner of propodus rounded without evidence of fixed finger; dense setation on outer surface of both propodus and tear-shaped dactylus divided into upper and lower fields, setae slightly stronger in lower fields of both, densest on dactylus, especially on and near inferior margin; internal surface of propodus distally with single large very long seta originating from near superior margin and reaching distally well beyond tip of dactyl; dactyl terminated in narrow corneous tip hooked toward external side. Fifth pereopod (Figs. 1a, 4d) minutely chelate, opposable surfaces of propodus and minute dactylus excavate, spooned, terminally rounded, forming beak-like chela obscured by dense fields of setation on distal ½ of propodus and superior surface of dactylus; corneous prehensile lip of propodus finely divided into arched row of close-set denticles.

Texture of abdominal somites (Figs. 1a, 5a, b) smooth dorsally, glabrous, typically with setae limited to isolated pairs of setose punctae on first tergite, strongest of which are in posterior half; second tergite with posterolateral crescentic line of small, lightly setose granules, anterior to which is short oblique line and posterior of which are several small fields of similar granules and punctae, posterolateral-most of which bears long setae; third to fifth tergites each with a distinct, lateral, transverse field of long soft setae, posterior to each of which lies a small field of long stiff setae on the lateral margin; sixth tergite (Figs. 1a, 2g) with lateral, longitudinal finely setose lines of small granules, primary line turning to transverse and directed toward midline in posterior half on lateral lobe of tergite, posteriorly with strong tuft of long stiff setae at each posterolateral corner, similar tuft on posterior margin overlying each anterolateral corner of telson. Shape of first abdominal tergite narrowed anteriorly, anterior ¼ offset by lateral notch and subquadrate (most striking in mature males); second tergite elongate, at least 1.6 times median length of third; third

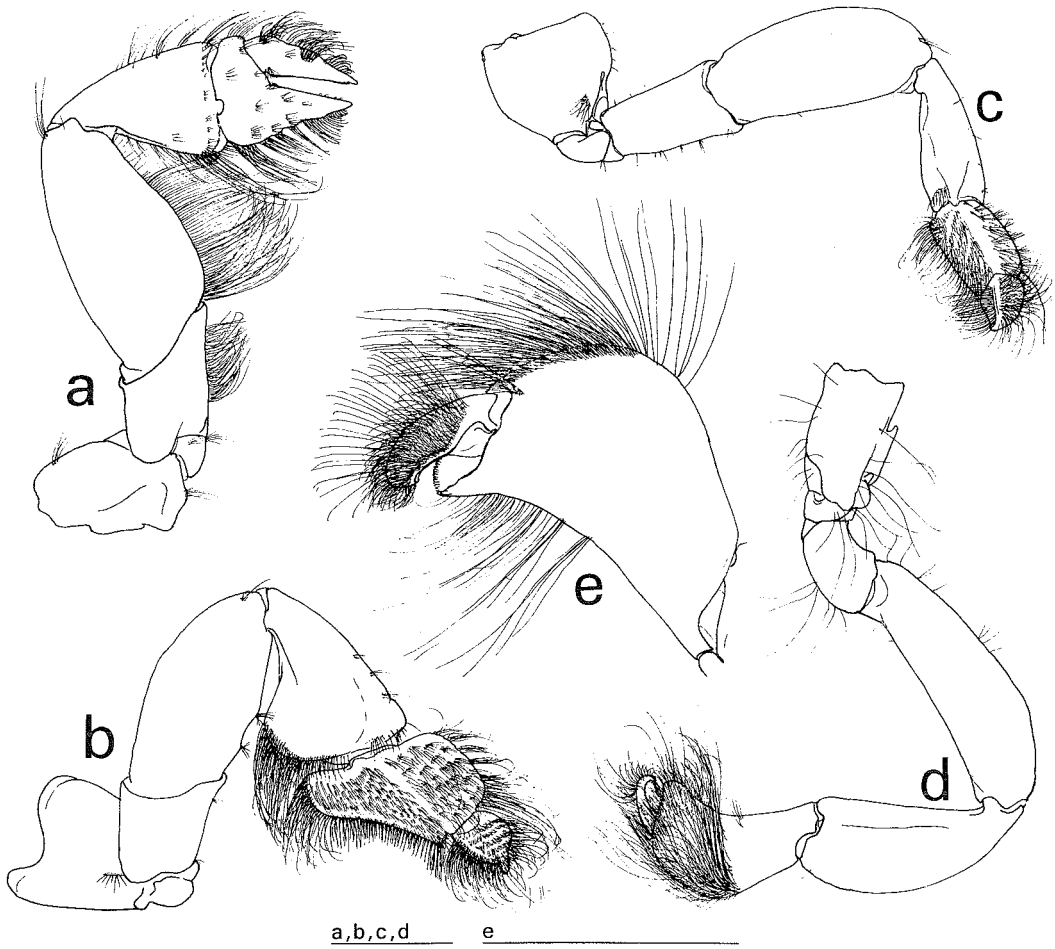

Fig. 4. *Eucalliax mcilhennyi,* new species, from Fort Pierce Inlet, Florida; a–c, holotype ♂ (CL 10.1 mm) USNM 267112; d–e, paratype ♀ (CL 11.6 mm), USNM 267114: a, Right second pereopod, external surface; b, Right third pereopod, external surface; c, Right fourth pereopod, external surface; d, Right fifth pereopod, posteromesial surface; e, Enlarged terminus of fifth pereopod. Scale lines indicate 2 mm.

tergite with deep, elongate anterolateral sulcus extending across anterior ⅓ of each side. Anterior ½ of first abdominal somite wrapped ventrally by girdle of thickened, leathery integument, girdle rounded laterally and transversely bisected by a furrowed suture, posterior half of somite ventrally with pair of conspicuous ovoid plates comprised of similar thickened integument, each of which (in males and females) articulates to first pleopod at its posterior extreme; medial posterior margin of first abdominal somite marked a triangular or rounded, anteriorly extended plate of thickened, leathery integument continuous with massive continuous covering of leathery integument that forms articular membrane between first and second abdominal somites and that covers entire ventral surface of second abdominal somite; similar leathery integument largely covering ventral surfaces of remaining abdominal somites.

First pleopod of male and female uniramous, composed of 2 articles; in male (Fig. 6a, b), total length about ⅔ that of second pleopod, distal article about equal in length

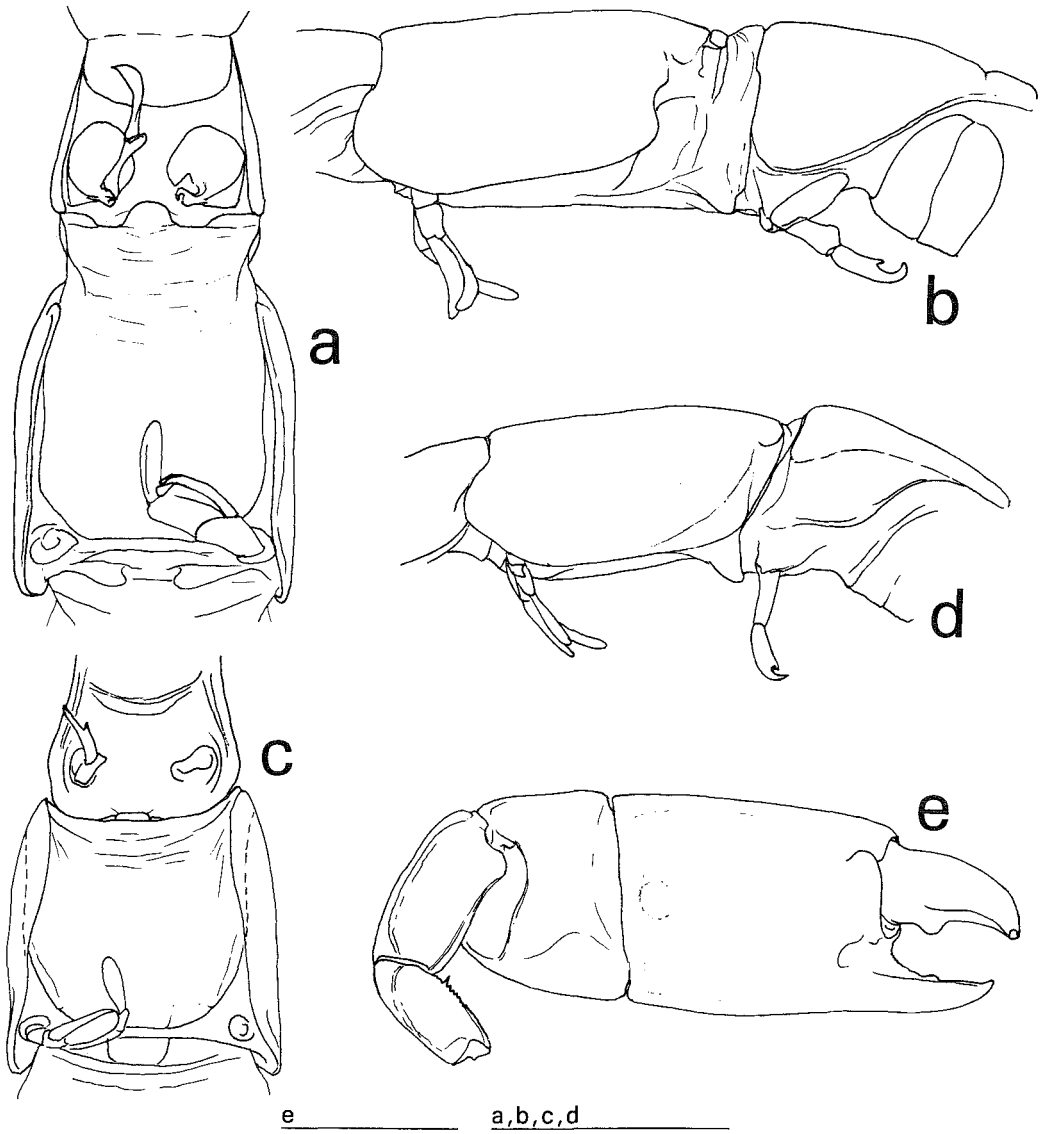

Fig. 5. *Eucalliax mcilhennyi,* new species, holotype ♂ (CL 10.1 mm) from Fort Pierce Inlet, Florida, USNM 267112: a, First and second abdominal segments, ventral surface, setae not shown; b, First and second abdominal segments, right lateral surface, setae not shown. *Eucalliax jonesi* (Heard 1989) from Bimini Harbor, Bahamas; c, d, paratype ♂ (CL 9.6 mm) GCRL 1136; e, holotype ♂ (CL 9.8 mm) USNM 221861: c, First and second abdominal segments, ventral surface, setae not shown; d, First and second abdominal segments, right lateral surface, setae not shown; e, Left (major) chela, internal surface, setae not shown. Scale lines indicate 5 mm.

to proximal and bifurcate at about ⅔ length, with acute tip of spooned terminal end directed laterally; in female (Fig. 6c) total length subequal to that of second pleopod, proximal article about ⅗ length of terminal article, terminal article with longest setae on broad shoulder just beyond midlength. Second pleopod of male and female biramous, with appendix interna on endopod; in male (Fig. 6d), dense setation largely re-

stricted to distal extreme of exopod, distal lobe of endopod and appendix masculina, appendix masculina markedly overreaching distal lobe of endopod and with small appendix interna at its base; in female (Fig. 3e), both rami with long setae, appendix interna small and constricted distally. Third to fifth pleopod pairs (Figs. 1a, 6f) forming large, posteriorly cupped fans when cross-linked by hooked setae of appendices internae on opposed margins of endopods; endopod of each subtriangular, appendices internae finger-like, movably articulated to mesial margin of endopod. Telson (Fig. 2g) broader than long, subrectangular, broadest at lateral lobes in posterior half, posterior margin weakly bilobate; dorsal surface with medial tuft of large setae separating two halves of strong, transverse carina; lateral margins sinuous, without setae; posterior margin with tuft of setae on each of the weak lateral lobes. Uropod (Fig. 2g) with heavy, blunt, posterolaterally directed tooth on protopod, tooth over-reaching anterolateral margin of endopod; endopod broad, subovoval, slightly longer than broad, dorsal surface with tuft of long setae on posterior ⅓, setae of posterior margin longest posterolaterally; exopod with anterodorsal plate falling well short of distal endopod margin, distal edge of plate lined with short, thick spiniform setae grading to thinner longer setae of exopod margin and long stiff, spiniform setae at posterodistal corner of plate, distal margin of exopod with dense fringe of setation grading to large spiniform setae of posterodistal margin.

Size.—Among the materials examined, the largest male is the holotype (CL 10.1 mm) and the largest female is an ovigerous paratype (CL 11.6 mm). Egg size (max. diameter) on this ovigerous specimen ranged from 0.76–0.96 mm, prior to preservation.

Color (from notes and color photographs of live specimens).—Overall whitish opaque to very faint rosy pink; may lack color pattern or sometimes have very faint dorsal patterning of pink on carapace, abdominal segments, and uropods; when present, pattern usually strongest on posteriormost abdominal segments and telson; carapace sometimes with small median square of reddish pigment just posterior to cervical groove. Chelipeds usually opaque white; sometimes with slight evidence of pale yellow at articulations of chelipeds and on uropods.

Known range and habitat.—Known from intertidal burrows in the immediate vicinity of the type locality on the Atlantic coast of Florida, U.S.A. The type locality is a tidally exposed sandflat sparsely vegetated with sea grass, located on the south margin of Fort Pierce Inlet, Florida. A single specimen was taken from a second site a few hundred meters distant, on the lower intertidal reaches of a well-packed sand beach on Coon Island, which forms a northern margin on this same inlet. All of these fossorial specimens were extracted from their burrows with yabby pumps. The burrow of at least one specimen appeared to also harbor a small commensal crab of the genus *Pinnixa.*

Etymology.—This species is named for Mr. John S. McIlhenny of Avery Island and Baton Rouge, Louisiana. True to tradition in his family, Mr. McIlhenny has melded his passion for Tabasco® pepper sauce with an equal enthusiasm for nature and studies in natural history. The financial support that he has contributed to a number of research biologists through his Coypu Foundation, has furthered research in many subdisciplines, including crustacean biology.

Remarks.—Of the four species of the genus, *Eucalliax mcilhennyi,* new species, *E. jonesi* (Heard 1989) from the Bahamas, and *E. cearaensis* Rodrigues & Manning, 1992 from Brazil, all lack the acutely projecting armature that characterizes distal corners of the carpus in the chelipeds of *E. quadracuta* (Biffar 1970) from Venezuela. While each of these corners has typically developed a doublet of spines in *E. quadracuta,* they are instead weakly produced to a single subacute or rounded corner in the other afore-

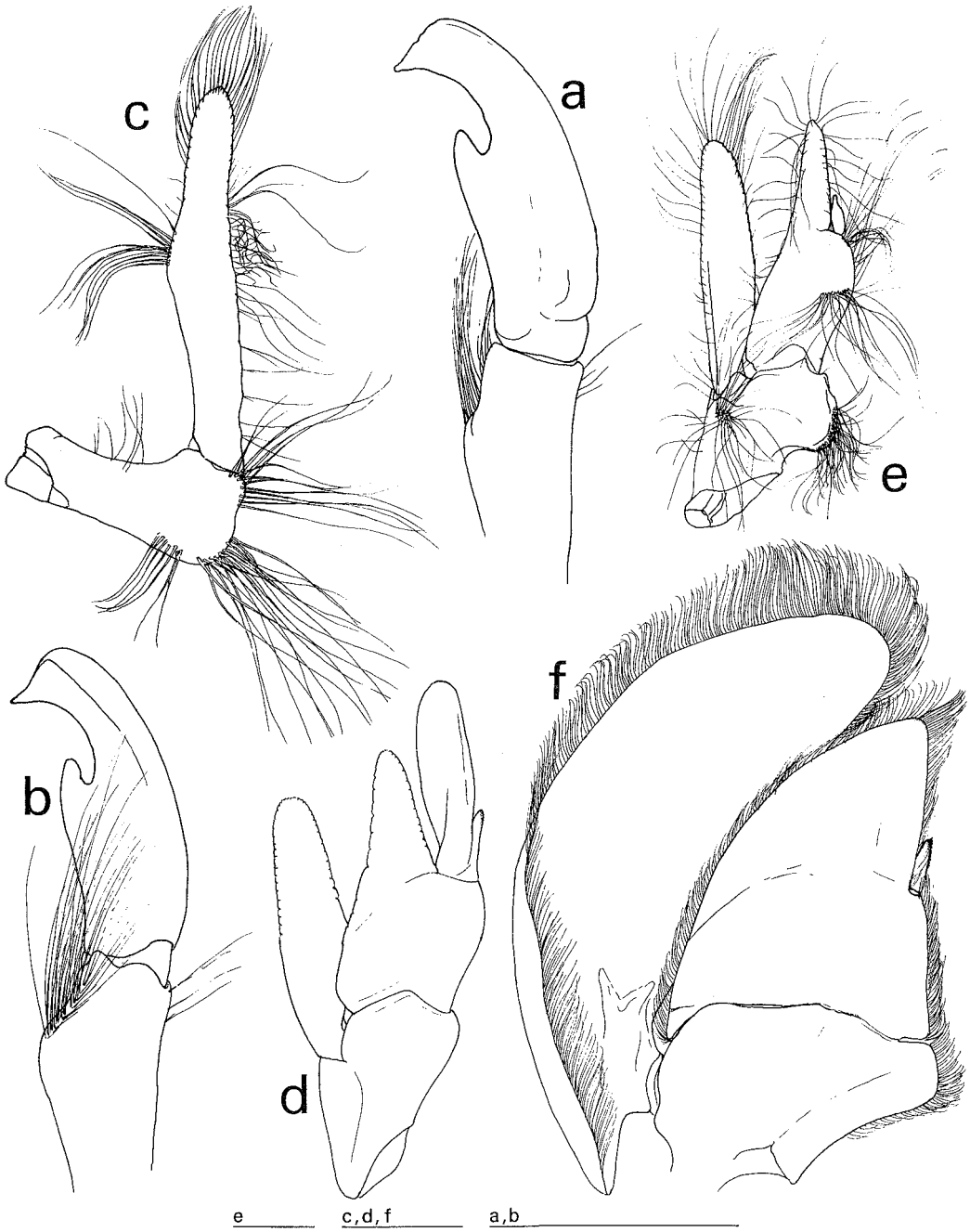

Fig. 6. *Eucalliax mcilhennyi,* new species, from Fort Pierce Inlet, Florida; a–b, d, f, holotype ♂ (CL 10.1 mm) USNM 267112; c, e, paratype ♀ (CL 11.6 mm) USNM 267114: a, Right first pleopod of ♂, external surface; b, Right first pleopod of ♂, internal surface; c, Right first pleopod of ♀, external surface; d, Right second pleopod of ♂, posterior surface; e, Right second pleopod of ♀, posterior surface; f, Right third pleopod, posterior surface. Scale lines indicate 1 mm.

mentioned speices. Materials from Florida that were assigned to *E. quadracuta* by Biffar (1970, 1971) and subsequently destroyed, as well as some materials that we have collected from Fort Pierce Inlet, also have characteristic "*quadracuta*" armature of the chelipeds, but we prefer to recognize them only as members of the "*E. quadracuta* complex" until such time as we can complete a careful comparison with the Venezuelan species. Such caution seems warranted given what appears to be a tendency for restricted distribution in species of this genus. As in *E. mcilhennyi,* the '*E. quadracuta*-complex' materials from Florida include ovigerous females with large eggs (1.1–1.3 mm), a characteristic that may reflect an overall tendency toward abbreviated development and reduced larval dispersal in the genus. This also appears to favor regional endemization in other callianassid populations with such eggs (see Felder & Rodrigues 1993). Owing to this possibility, and in the absence of voucher materials, we must reserve judgment on a report of *Eucalliax jonesi* from the British Virgin Islands (Murphy & Kremer 1992), at least until such time as materials from that locality can be carefully compared to existing types.

In addition to the marked difference in cheliped armature, the strong dorsal ridges present on the carapace in the *E. quadracuta* complex will also serve to readily separate this group from *E. mcilhennyi* and other members of the genus which lack them. Likewise, in mature individuals, size will readily distinguish *E. mcilhennyi* and other members of the genus from the *E. quadracuta* complex. Biffar (1970) reported total lengths of 68–75 mm for the type materials of *E. quadracuta* from Venezuela, with a carapace length of 17 mm in the smallest individual which was the mature holotype male. Our materials of this complex from Florida are even larger with total lengths of 85–91 mm and carapace lengths of 21–22 mm. By contrast, the other known members of the genus are much smaller, with carapace lengths of mature specimens ranging from 10.1–11.6 mm in *E. mcilhennyi,* 9.6–9.8 mm in *E. jonesi,* and 6.0–7.2 mm in *E. cearaensis.*

Among the many characters that can serve to separate *E. mcilhennyi* from both *E. jonesi* and *E. cearaensis* are shape of the rostrum, armature of the cheliped ischium, relative lengths of the antennular and antennal peduncles, shape of the male first pleopod, and ventral plating of the first and second abdominal somites. *Eucalliax cearaensis* differs from both the other species in that its antennular and antennal peduncles are subequal in length, and in that the male first pleopod is not bifurcate and instead terminates in a single hook. In both *E. mcilhennyi* and *E. jonesi* the antennal peduncles markedly overreach the antennular peduncles, and the male first pleopods are bifurcate along their length, producing a short subapical process. *Eucalliax mcilhennyi* can in turn be separated from *E. jonesi* by several characters that are not usually subject to striking sexual dimorphism in this group, and should therefore apply equally well in males and females (despite the fact that female specimens of *E. jonesi* have yet to be described). In comparison to *E. jonesi, E. mcilhennyi* has (i) a much broader and less produced rostrum, (ii) hooked rather than straight spinules lining the ischium of the cheliped, and (iii) a unique pattern of leathery plates (Fig. 5a, b, c, d) on ventral surfaces of the first two abdominal somites. The unique pattern in the ventral integument of the first and second abdominal somites in *E. mcilhennyi* consists not only of the distinct ovoid plates from which the first pleopods originate (Fig. 5a), but also a unique shape in the leathery integument at the posterior margin of the first abdominal somite and the anterior margin of the second abdominal somite. In *E. jonesi,* the median posterior margin of the first abdominal somite is marked ventrally by a short, subquadrate extension of the thick leathery

covering on the intersegmental joint and second abdominal somite (Fig. 5c); immediately posterior to this, the leathery integument is deflected ventrally (Fig. 5d). In *E. mcilhennyi,* the median extension on the posterior margin of the first abdominal somite is anteriorly rounded (Fig. 5a) or subtriangular in shape, and the leathery integument posterior to this structure is not markedly deflected to the ventral side (Fig. 5b). In addition, mature males of *E. mcilhennyi* have first pleopods with an entire rather than bifid subapical lobe and with a more spatulate and laterally directed apical lobe. Our reexamination of the *E. jonesi* holotype also revealed a prominent proximal boss on the internal surface of the major palm in this male (Fig. 5e), and this feature is lacking in both sexes of *E. mcilhennyi.*

In the course of examining morphology in *E. mcilhennyi,* several features were noted which may be of particular significance in phylogenetic placement of the genus. The male second pleopod, previously thought to lack an appendix masculina (see Manning & Felder 1989), does appear to have a large terminal article that may be homologous to structures termed the appendix masculina in various ctenochelid genera. If so interpreted, the presence or absence of an appendix masculina must be dropped as a character to distinguish members of the Callianassidae from members of the Ctenochelidae. Also, a uniquely enlarged and elongate, singular seta was found to occur on the internal superodistal corner of the propodus on the fourth pereopod. This unique seta, which is directed distally and overreaches the tip of the dactyl, was also evident in the type materials of *E. jonesi* (GCRL 1136, USNM 221861) and *E. cearaensis* (USNM 252546) that we have subsequently examined, and was manifest as a distinct elongate pair of setae in materials of the *E. quadracuta* complex from Venezuela (MCZ 760) and Florida. Given their location, these setae appear to serve a specialized cleaning function. We also note that such a pair of setae occurs in the Mediterranean species, *Calliax punica* (Saint Laurent & Manning 1982) (USNM 172356), which represents a genus closely allied to *Eucalliax* within the Eucalliinae Manning & Felder, 1991. As a character, they may be unique to the Eucalliinae or perhaps may define some larger taxocene within the Callianassidae.

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