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EXCORALLANA DELANEYI, N. SP. (CRUSTACEA: ISOPODA: EXCORALLANIDAE) FROM THE NORTHEASTERN GULF OF MEXICO, WITH OBSERVATIONS ON ADULT CHARACTERS AND SEXUAL DIMORPHISM IN RELATED SPECIES OF *EXCORALLANA* STEBBING, 1904

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ABSTRACT *Excorallana delaneyi* n. sp. was found associated with the sponges *Halichondria* sp. and *Hymeniacidon* sp. in St. Joseph Bay, Florida. *Excorallana delaneyi* is most similar to *E. berbicensis* Boone, 1918 described from Brazil, but it can be distinguished from that species and other members of the genus by the shape and spination of the uropods and pleotelson. A key is presented to separate *E. delaneyi* and the other seven species of *Excorallana* that lack lateral notches in the pleotelson. Morphological differences between the subadults and adults of *E. delaneyi* are described, and possible taxonomic problems resulting from such differences in other members of the genus are discussed. Based on field observations and known life history patterns for some members of the genus *Excorallana*, we consider *E. delaneyi* to be an intermittent fish parasite which lives and reproduces in a sponge domicile between feedings.

Introduction

The New World genus *Excorallana* Stebbing, 1904, is currently represented by 20 species (Lemos de Castro and Lima, 1976; Delaney, 1984). Three species, *Excorallana antillensis* (Hansen, 1890), *E. tricornis tricornis* (Hansen, 1890), and *E. mexicana* Richardson, 1905, have been reported from the Gulf of Mexico (see Richardson, 1905; Menzies and Krucynski, 1983; Delaney, 1984). During the summers of 1982–1985, specimens of a fourth undescribed species were found in the interior of sponges (*Halichondria* sp. and *Hymeniacidon* sp.) collected from a *Thalassia* grass bed habitat in St. Joseph Bay, Florida. The description of this new species is the subject of this report. Type material has been deposited in the collections of the National Museum of Natural History (USNM), Gulf Coast Research Laboratory Museum (GCRL), and Los Angeles County Museum (LACM).

Excorallana delaneyi, new species

Figures 1–8

Material examined

Holotype – 1 ovigerous female; width 3.5 mm; length 9.6 mm (USNM 240035), from *Halichondria* sp in grassbeds at St. Joseph Bay, Florida, 29°48" N, 29°48' 85°24' ~~089°24"~~ W, sal. 32‰, temp. 30°C, depth 0.5–1 m, coll. I. Stone and R.W. Heard, 9 July 1985.

Paratypes – 10 males, 10 females (USNM 240036), same collection data as holotype. – 10 males, 10 females (GCRL 1133), same collection data as holotype. – 5 males and 5 females (LACM 85-198.1), same collection data as holotype. 105 males (adults and juveniles), 210 females (adults and juveniles), collection of RWH, same collection data as holotype. 4 males, 7 females, collection of RWH, from *Hymeniacidon* sp. in grassbeds at State Park, St. Joseph Bay, Florida, sal. 33‰, temp. approx. 18°C, depth 0.5 m, coll. I. Stone, 20 April 1988.

Diagnosis

Cephalon with distinct anteromedial rostral point. Adult male with 3 cephalic horns; 1 directed anteriorly as continuation of rostrum; 2 placed anterolaterally above eyes, directed dorsally, anteromedial horn being a continuation of rostrum. Adult females with rudimentary pair of cephalic horns represented by 2 low tubercles above eyes. Subadult males and females lacking cephalic horns. Eyes large, distinctly separated, lateral. Frontal lamina widening anteriorly before narrowing to form subacute apex. Maxilliped with article 3 of palp elongate, length 2.5 times width. Pereonite 1 of adult male with pair of submedial tubercles near anterior margin, these tubercles lacking

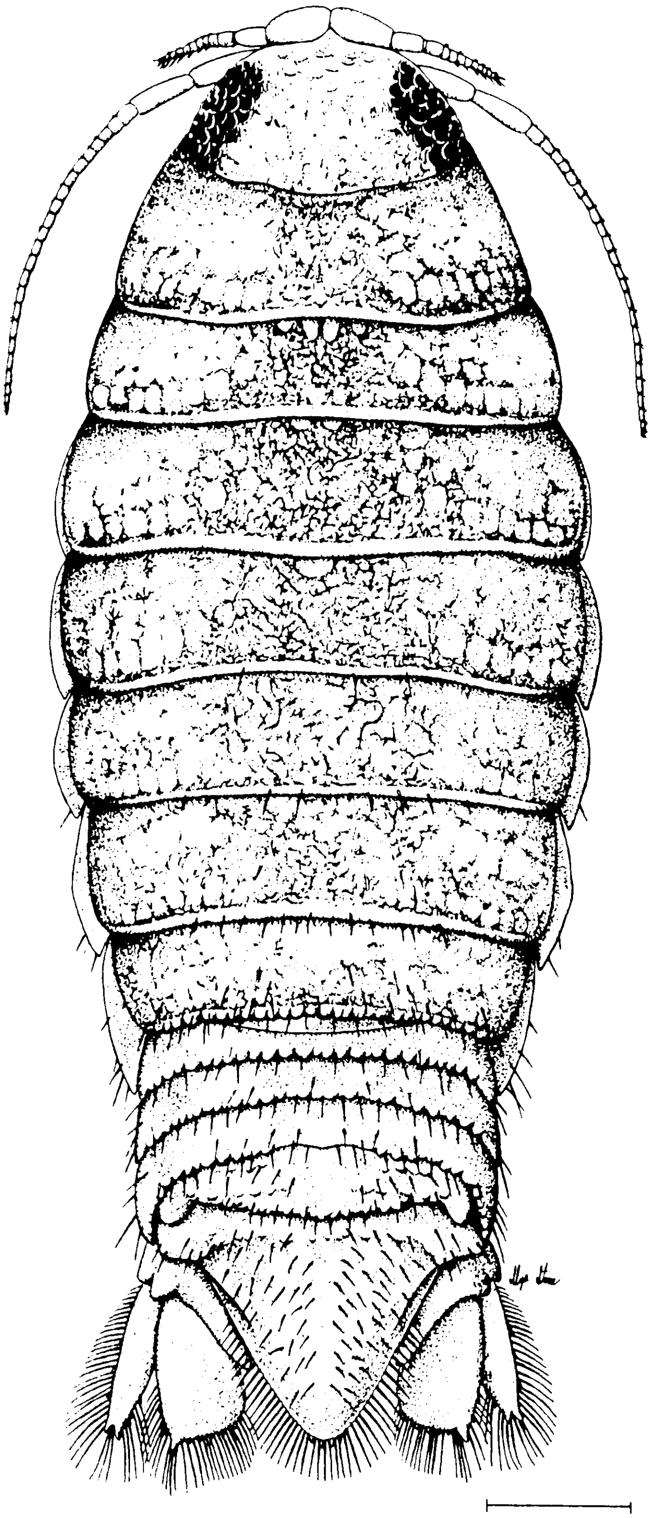

Figure 1. *Excorallana delaneyi*, n. sp. Dorsal aspect of female holotype, entire (scale = 1 mm).

on females and subadults. Pereopods 1–3 with merus and ischium having, respectively, 4 and 1 stout spineson flexor margins. Uropods extending slightly beyond pleotelson; endopods somewhat truncate with distinct posterior tooth separating 5 submedial and 2 lateral marginal spines, length nearly twice width; exopod narrow, length nearly 3 times width, subequal to endopod, with bifurcate tip separating 2 submedial and 3 lateral marginal spines. Pleotelson triangular with lateral margins nearly straight, lacking incision or notches; 4 (rarely 6) spines present on subacute apex; bifid spinules present on dorsal, submedial surface of adults.

Description of adult female

Length 8.6–11.7 mm; width 3.2–3.6 mm. Cephalon – With 2 small, low, submedial tubercles (rudimentary horns), or indications of such, present above eyes (Fig. 6D); eyes relatively large, lateral, distinctly separated. Anterior margin of cephalon with medial rostral point (Fig. 1).

Antenna 1 (Fig. 2I) reaching posterior margin of cephalon; peduncle of 3 articles, with broad basis having distinct anterior ridge; flagellum consisting of 8 to 12 articles with esthetes along medial margin.

Antenna 2 (Fig. 2H) extending beyond posterolateral margin of pereonite 2; peduncle with 5 articles; flagellum with 17–26 articles, each with relatively short, simple setae along distolateral margin; fewer present along medial margin.

Frontal lamina visible, distinct, widening anteriorly before narrowing to subacute apex (Figs. 2E, 5). Clypeus and labrum may be partly obscured by mandibles (Fig. 2D).

Mandibles each with elongate curved incisor, possessing 2 subapical cusps (Figs. 2F, 2G); molar process apparently absent; left mandible with lacinia mobilis represented by small lobe ending in 2 long and 2 short spines; right mandible with lacina mobilis represented by 2, or occasionally 3, long spines and blunt process; proximal and middle articles of mandibular palp subequal in length, distal article less than half length of middle article; comb row of marginal setae along middle and distal articles; distolateral corner of distal article with 2–3 long setae.

Maxilla 1 (Fig. 2L) forming large recurved spine; inner lobe simple, with slightly bulbous end.

Maxilla 2 with bifid, setose apex (Fig. 2M).

Maxilliped typical of genus (Fig. 2K); composed of 7 articles, with length of fifth article (third article of palp) 2.5 times width; modified epipod and oostegite arising from base.

Pereon – Pereonite 1 anterolaterally produced, partly covering posterior parts of eyes. Pereonites 1-3 without setae. Dorsum of pereonites 4–7 with setae becoming more numerous posteriorly. Coxae on pereonites 2–7 distinct, becoming progressively more produced posteriorly; anterior coxae subquadrate, posterior coxae gradually becoming more triangular with their posterior angle becoming more acute (Fig. 2A); coxae 3–7 with setae becoming more numerous on posterior somites. Pereonite 7 weakly tuberculate along posterior margin (Fig. 1).

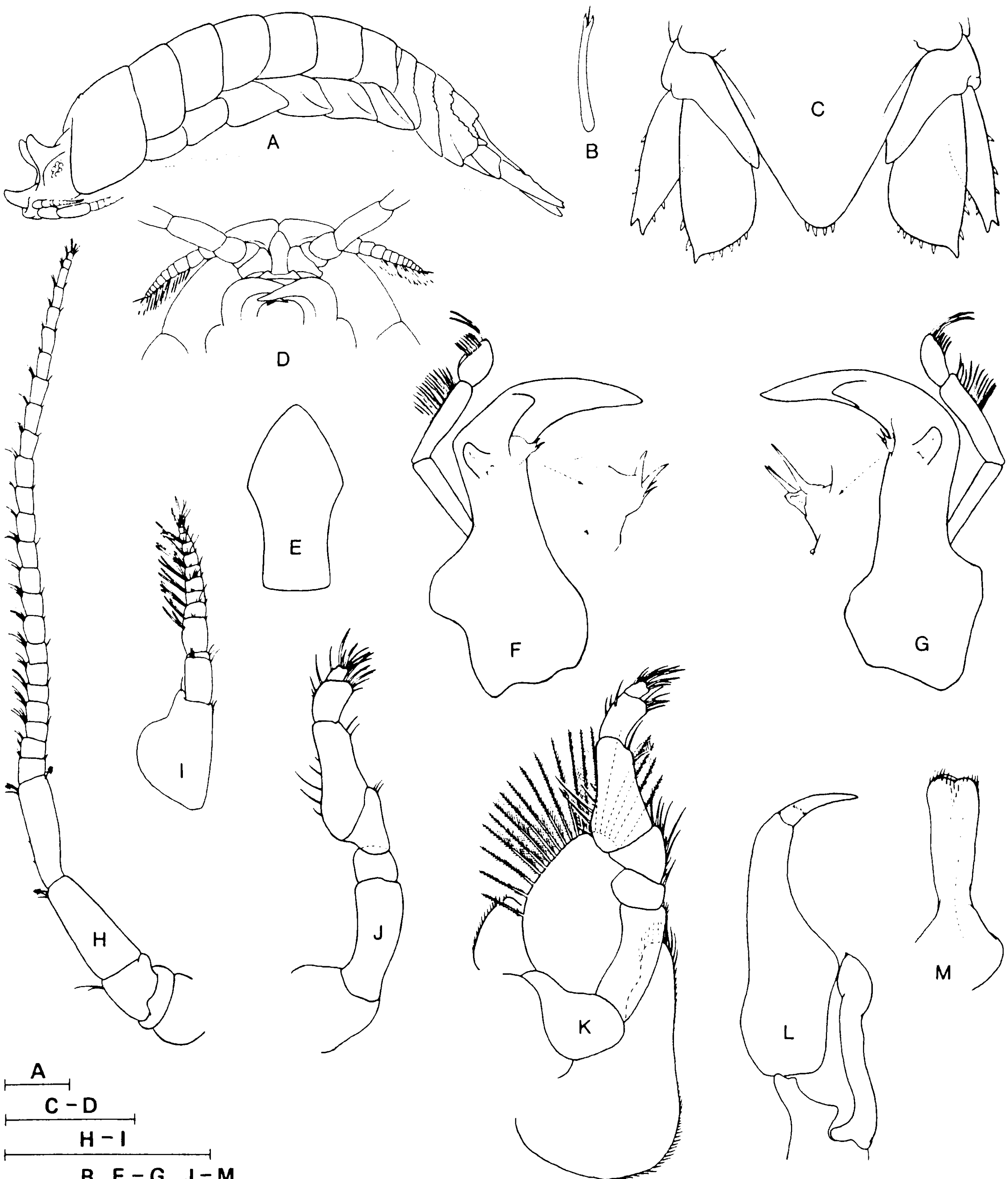

Figure 2. *Excorallana delaneyi.* (A) lateral view (adult male); (B) spinule from dorsum of pleotelson (adult female); (C) dorsal view of pleotelson and uropods of adult female (setae omitted); (D) cephalon, ventral view (adult female); (E) frontal lamina (adult female); (F) left mandible of adult female (lacinia mobilis enlarged); (G) right mandible of same; (H) antenna 1 (adult female); (I) antenna 2 (adult female); (J) maxilliped (adult male); (K) maxilliped (adult female); (L) and (M), maxilla 1 and maxilla 2, respectively, of adult female. Scales = 1 mm.

Figure 3. *Excorallana delaneyi.* A-E, right pleopods 1-5 (adult male). F-I, (adult female) – (F) pereopod 1; (G) pereopod 3; (H) pereopod 7, (lateral view); (I) pereopod 7, distal segments (medial view) showing modified setae. Scales = 1 mm.

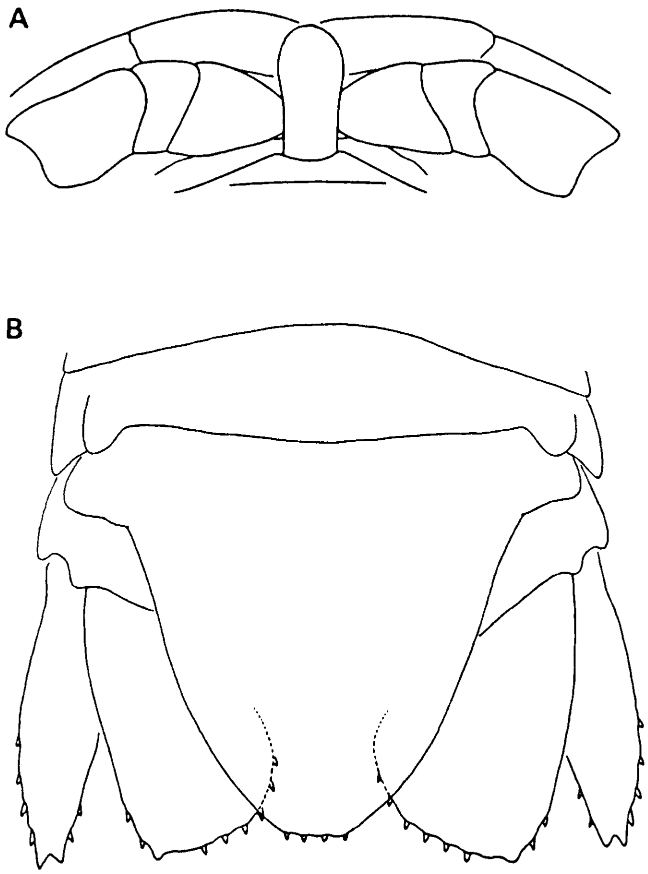

Figure 4. *Excorallana berbicensis* (13 mm subadult female holotype). (A) frontal lamina (setae omitted); (B) telson and uropods (setae omitted).

Pereopods 1–3 prehensile (clinging), directed anteriorly. Pereopod 1 (Fig. 3F) robust; basis with long spinose setae posterodistally; ischium and merus with 1 and 4 stout spines, respectively, on flexor margin, 2–3 long spinose setae on distal extensor margins of both; carpus reduced, triangular, inserted deeply into notch of merus, 2 spines distally on flexor margin; prodopus with 3 spines and 1–2 long spinose setae on flexor margin. Propodus and dactylus of nearly equal length; unguis well developed, curved. Pereopods 2 and 3 similar but less robust; carpus inserted into shallower notch of merus.

Pereopods 4–7 ambulatory, directed posteriorly. Pereopod 4 (Fig. 2G) with numerous stout spines extending laterally on distal flexor margins of prodopus, carpus, merus, and ischium; spines and spinose setae along extensor margins of same, with setae extending medially. Specialized setae with bilateral blade-like serrations (Fig. 3I) occurring on inner distolateral margin of propodus and carpus, becoming more abundant distally, particularly on carpus. Pereopod 5 similar, but more elongate and with additional serrate blade-like setae on distal extensor margin of ischium. Pereopods 6 and 7 similar with numerous, serrate setae on distomedial margin of carpus (Figs. 3H and 3I).

Pleon with Pleonite 1 lacking both setae and tubercles, partly or completely covered by pereonite 7. Pleonites 2–5 weakly tuberculate on posterior margins. Pleonite 5 laterally overlapped by pleonite 4. Stout setae (spinules) along dorsum of pleonites 2–5 (Fig. 1).

Pleopods (Figs. 3A–3E) lamelliform. Endopods of pleopods 1–4 with plumose marginal setae along distal margin; such setae absent on endopod of pleopod 5 (Fig. 3E). Exopods of pleopods 3–5 with partial suture (or pleat) indicated by 2 small notches on lateral and medial margins; exopods 2–5 with row of small scale-like structures, with 2–4 annulated setae on their lateral margins, extending inward from distomedial margin (Fig. 3E). Peduncles of pleopods 1–5 with lateral lobe ending in spine; peduncles of pleopods 1–4 with row of 5 (pleopod 1) or 4 (pleopods 2–4) coupling spines and 4–11 plumose setae on medial margin; peduncle of pleopod 5 reduced and lacking such spines and setae on medial margin.

Uropods (Fig. 2C) – Extending slightly beyond apex of pleotelson, bearing plumose marginal setae; endopods subtruncate, length twice as long as width, extending slightly beyond apex of pleotelson, with distinct distal tooth separating 5 submedial and 2 lateral marginal spines; exopods narrow, length 4 times width, with distinct bifurcate tip separating 2 medial and 3 lateral marginal spines.

Pleotelson – Triangular, margins nearly straight, weakly crenulate, bearing plumose setae; apex subacute, with 4 (rarely 6) subterminal spines (Fig. 2C); bifid spinules (Figs. 2B, 7B–D) on dorsal surface, except for narrow region along dorsal midline (Fig. 1).

Description of adult male

Length 8.4–10.8 mm; width 2.6–3.7 mm. Similar to adult female with following exceptions. General body form somewhat smaller. Tuberculation and setation on dorsum of pereon and pleon more pronounced than on adult female.

Cephalon with 3 well developed cephalic horns (Figs. 2A, 6A–C), 1 directed anteriorly as continuation of the rostrum and 2 placed posterolaterally above eyes, directed dorsally; concave depression between cephalic horns.

Pereonite 1 with 2 small submedial tubercles located near anterior margin, usually present on dorsum of males with fully developed horns (Fig. 6A).

Antenna 2 with longer setae and esthetes on flagellar articles than in females (Fig. 6C).

Maxilliped (Fig. 2J) similar to female, but lacking epipod and oostegite.

Male copulatory stylet present (Fig. 3B), arising from proximal medial margin of pleopodal endopod 2, slightly bulbous tip extending just beyond distal end of pleopod.

Penes present at bases of pereopods 7.

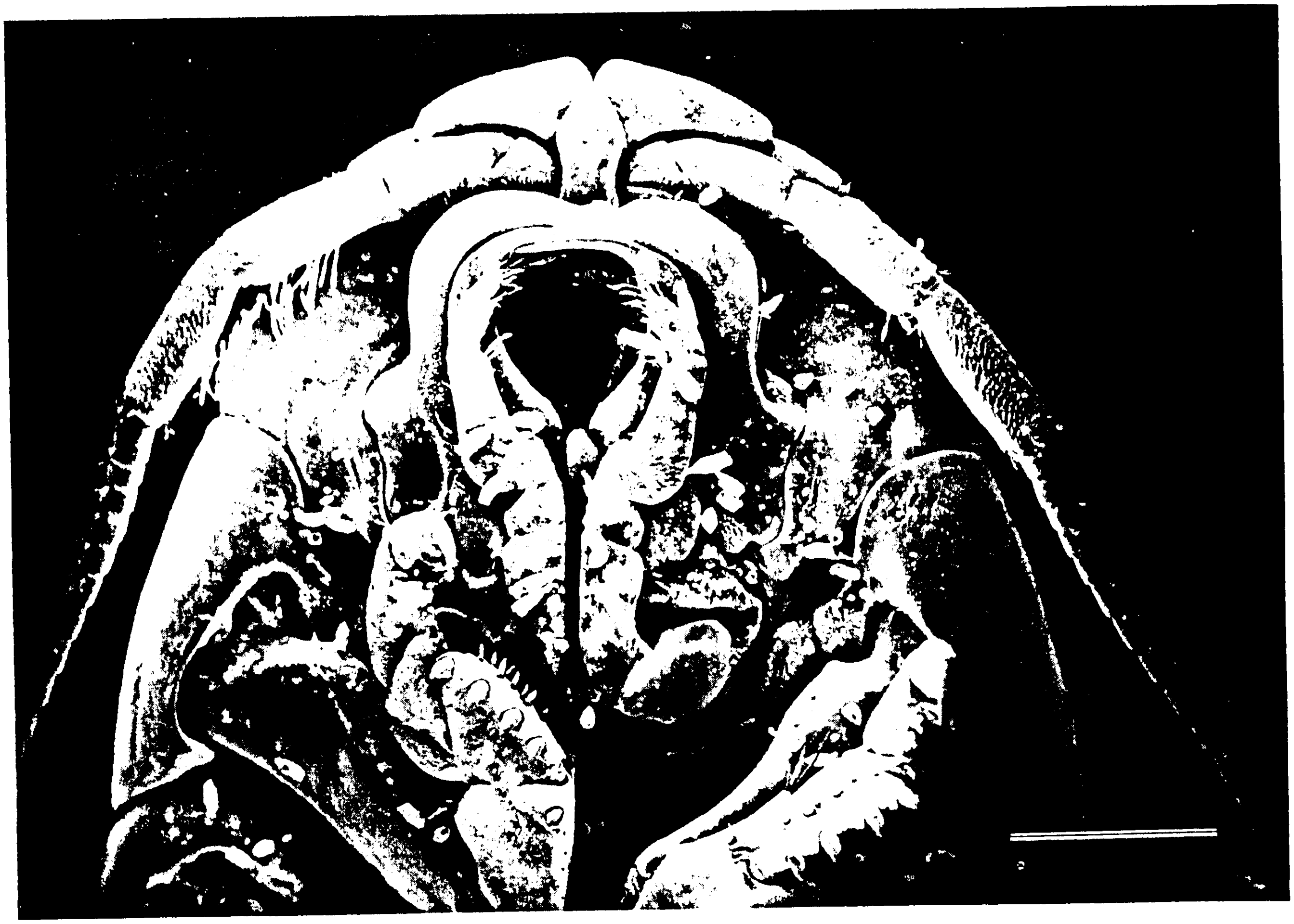

Figure 5. *Excorallana delaneyi.* Anteroventral view of 9 mm subadult female (scale = 500 μm).

Description of subadults

Subadults, in addition to their generally smaller size, lack or have reduced tuberculation on the dorsum of the pereon and pleon, and lack bifid, spinose setae on the dorsum of the pleotelson (Fig. 7A). Subadult maleslack penes and cephalic horns, but, like adult males, have a male stylet on pleopod 2. In large subadult males, the stylet appears as well developed as in adults. The male stylet, although reduced, is present in small juveniles that appear to have just molted from the last mancastage. Like adult males, subadults of both sexes lack modified epipods on their maxillipeds.

Distribution – Presently only known from St. Joseph Bay, Florida.

Coloration – Background colors are dark and light shades of brown to light gray or white. Branching pigmentation pattern on dorsum of body ranging from dark brown to black.

Etymology – This species is named for Paul M. Delaney in recognition of his work on the genus *Excorallana*.

Remarks

Excorallana delaneyi belongs to the "Berbicensis-complex," which includes eight of the 20 known species of the genus. The members of this group differ from the other 12 species of the genus by lacking a pair of notches or incisions in the lateral margins of their telsons. *Excorallana delaneyi* appears to be most similar to *E. berbicensis* Boone, 1918 and *E. longicornis* Lemos de Castro, 1960, the only other species of the Berbicensis-complex that are known to have well developed cephalic horns on the adult males. However, it can be distinguished from these two species by differences in the uropods, pleotelson, and frontal lamina.

The pleotelson of *E. delaneyi* has nearly straight lateral margins and a rounded, relatively constricted apex, whereas on the holotype of *E. berbicensis* the pleotelson has distinctly convex lateral margins and a truncate and broad apex. There are also differences in the spination of the uropods of the two species. The lateral margin of the exopod and the inner margin of the endopod of *E. delaneyi* bear 3 and 5 spines, respectively, while the subadult holotype of *E. berbicensis*

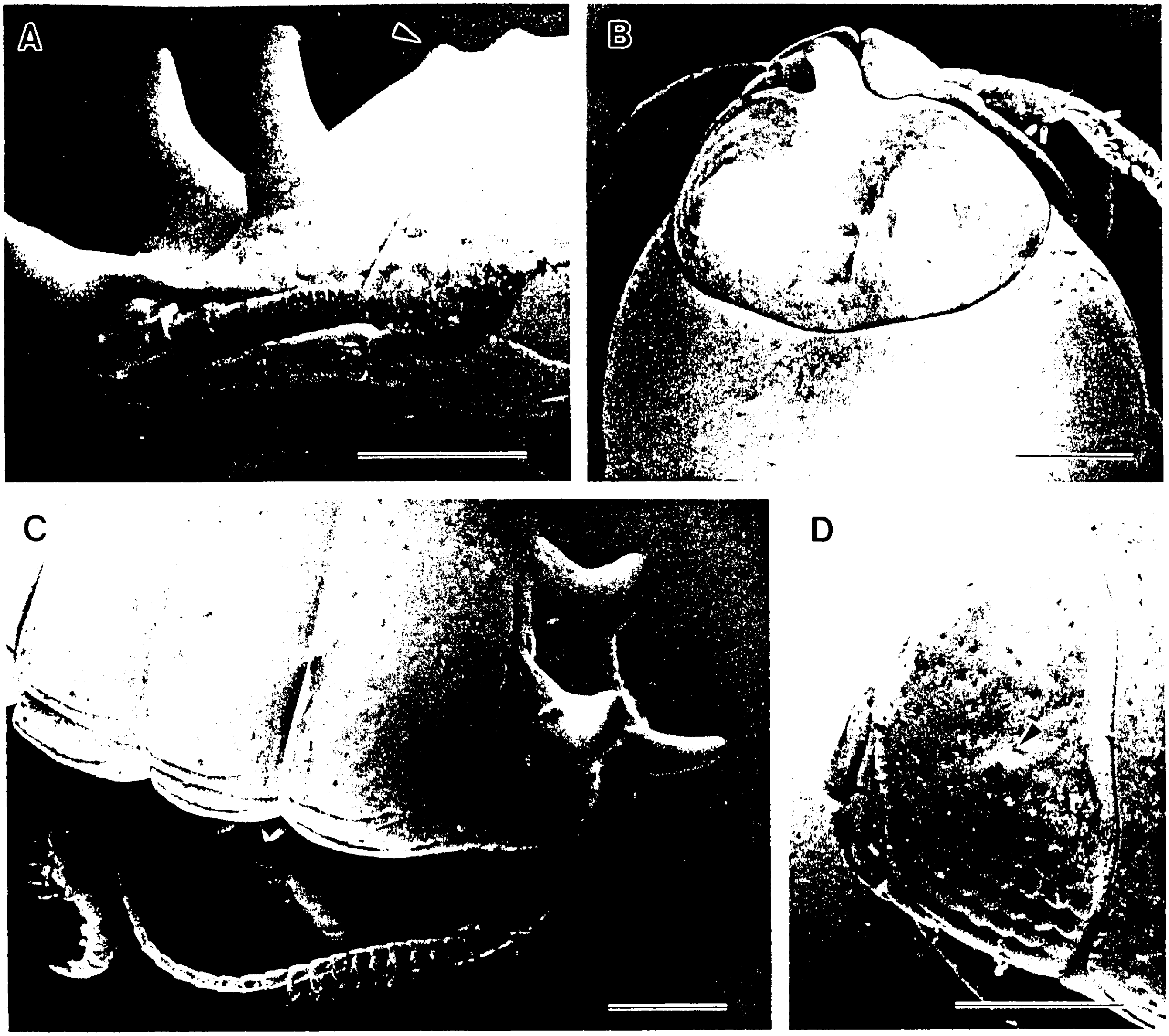

Figure 6. ***Excorallana delaneyi.*** **(A) cephalon of adult male, lateral view; (B) cephalon of adult male, dorsal view; (C) cephalon and right antenna 2 (showing setation) of adult male, dorsolateral view; (D) cephalon of adult female showing rudimentary cephalic horns, dorsolateral view. Scales = 500 μm.**

has 4 and 6 spines on these areas of the uropods. On *E. delaneyi* the apex of the frontal lamina is subacute or bluntly pointed, but in *E. berbicensis* it is rounded. Additional differences between the two species include the larger body size and more weakly developed tooth on the uropodal endopod of the subadult holotype of *E. berbicensis* compared to the adults and subadults of *E. delaneyi*.

The adult males of *E. delaneyi*, like those of *E. longicornis*, have three processes or "horns" on the cephalon and a pair of small tubercles on the dorsum of the first pereonite. The cephalic horns of *E. delaneyi*, however, are shorter and the posterolateral pair is directed dorsally, unlike the long, anteriorly directed pair reported and described for *E. longicornis*. Another character that may be useful in separating the adult males of the two species is the much longer male stylet on *E. longicornis*. Characters that separate both the adult and large subadult stages of *E. delaneyi* from those of *E. longicornis* include the: (1) more pointed frontal lamina, (2) presence of fewer spines on the dactyl and propodus of first pereopod, (3) presence of more spines on the uropods, and (4) presence of adistinct bifid tip on the uropodal exopod. These same characters, at least in part, were also employed by Monod (1969) and Carvacho (1977) to separate the adults and subadults of *E. berbicensis* from *E. longicornis*.

Excorallana stebbingi Lemos de Castro and Lima, 1976 also appears to be closely related to *E. delaneyi*, but differs in the following characters: (1) cephalic horns reportedly not present in males, (2) frontal lamina not subacute, but rounded anteriorly as in *E. berbincensis*, (3) subterminal article of maxilliped produced distomedially, almost extending to tip of terminal article, and (4) the absence of dorsal tubercles on the first pleonal somite.

The following key separates the eight described species of *Excorollana* which lack lateral incisions in the pleotelson:

KEY TO THE KNOWN SPECIES OF *EXCORALLANA* LACKING LATERAL INCISIONS IN THE PLEOTELSON

1. Pleotelson with apical cleft, (Eyes contiguous along medial margin of cephalon) . . . . *E. fissicauda* (Hansen, 1890)

   Pleotelson without apical cleft 2

2. Eyes contiguous or fused . . . . *E. warmingii* (Hansen, 1890)

   Eyes separate 3

3. Frontal lamina with apex acute or subacute 4

   Frontal lamina with apex rounded or flattened 5

4. Maxilliped with article 3 of palp broad (length less than twice width); pleonites 2-5 with large median tubercle increasing in size posteriorly; males with rostrum, without cephalic horns; uropods having endopods with rounded convex lateral margins and weak apical tooth, exopods weakly bifurcate . . . . *E. angusta* Lemos de Castro, 1960

   Maxilliped with article 3 of palp narrow, length more than twice width; males with 3 cephalic horns; uropods, endopods subtruncate with strong apical tooth, apex of exopods distinctly bifurcate . . . . *E. delaneyi*, new species

5. Uropods with endopods broad, rounded, without distal tooth; frontal lamina with anterior end flattened, edges rounded; maxilliped with article 3 of palp broad, length less than twice width . . . . *E. houstoni* Delaney, 1984

   Uropods with endopods subtruncate, with distinct distal tooth; frontal lamina with anterior end rounded; maxilliped with article 3 of palp elongate, length greater than twice width 6

6. Maxilliped with article 2 having mesiodistal margin elongate, extending parallel to distal end of article 1 to form a subchelate end; adult males apparently lacking cephalic horns . . . . *E. stebbingi* Lemos de Castro and Lima, 1976

   Maxilliped not so modified; adult males with 3 cephalic horns 7

7. Pereopod 1 with merus armed with 5 blunt spines; cephalic horns of adult males relatively long, directed anteriorly; pereonite 1 with anterior region having medial depression between 2 well-developed submedian tubercles; uropod with exopod entire . . . . *E. longicornis* Lemos de Castro, 1960

   Pereopod 1 with merus armed with 4 blunt spines; cephalic horns of adult males directed dorsally; uropod with exopod bifurcate distally . . . . *E. berbicensis* Boone, 1918

DISCUSSION

A series of over 350 specimens of *E. delaneyi* from the type locality was examined, including adults, subadults, and mancas. Based on this series, we consider males with distinct cephalic horns, tubercles on the dorsum of the pleon, and bifid spinules on the pleotelson to be "adults" and those lacking these char-

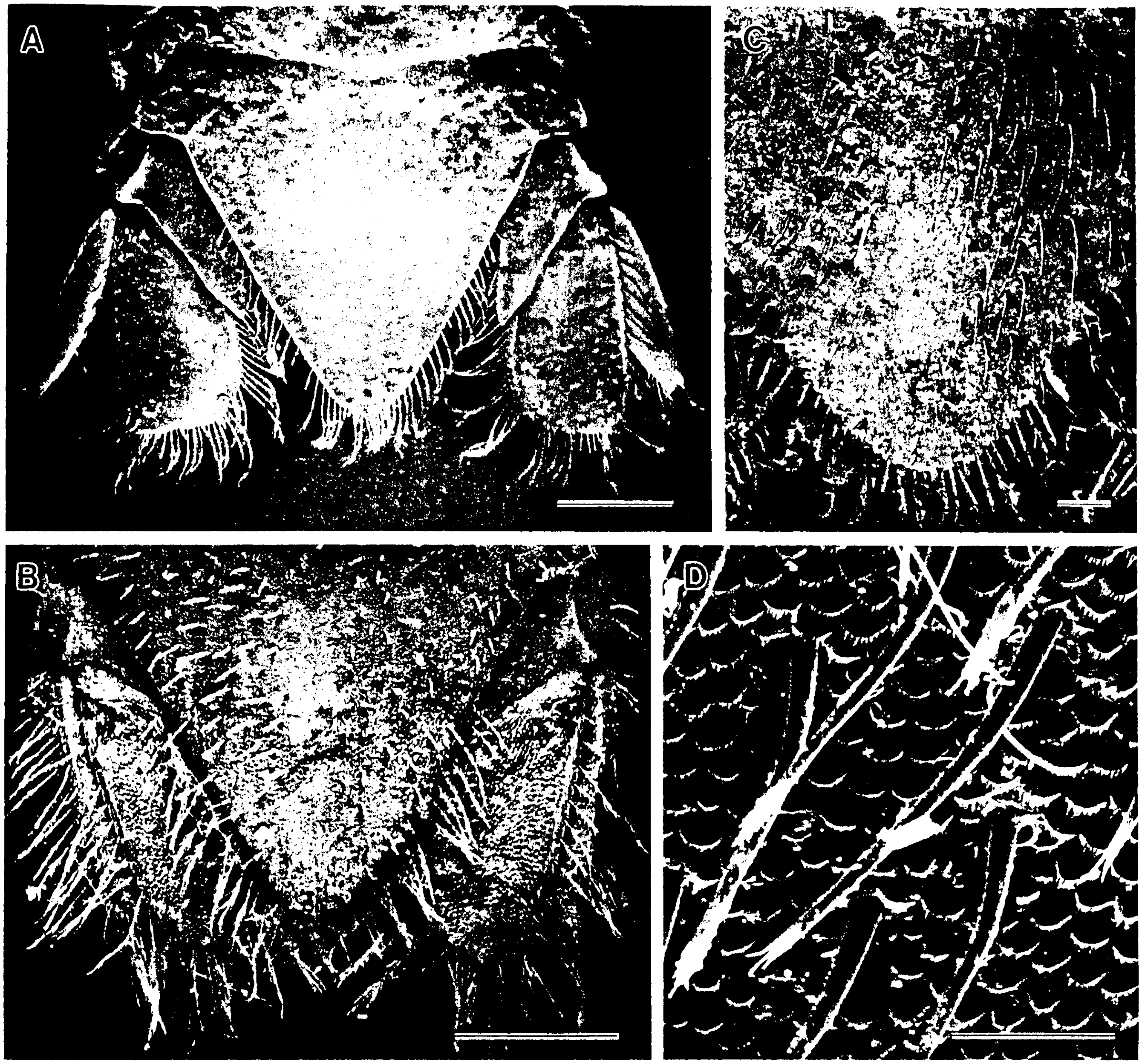

Figure 7. ***Excorallana delaneyi.*** **(A) pleotelson and uropods of large subadult female without dorsal spinules; (B) pleotelson and uropods of ovigerous female showing dorsal spinules; (C) pleotelson of ovigerous female showing dorsal spinules; (D) dorsal spinules enlarged. Scales: A, B = 500 μm; C = 100 μm; D = 50 μm.**

acters to be "subadults." Adult females are characterized by having oostegites, as well as pleonal tubercules and bifid spinules on the telson.

Over 30 subadult or incompletely differentiated males without cephalic horns, but with a well developed copulatory stylet on pleopod 2 were examined. Some of these specimens were only a little smaller than horned adults and it might be possible to mistake their lack of horns or pleonal tubercles for valid adult taxonomic characters. This would be especially troublesome when studying a small series of specimens which did not contain fully adult (horned) males. We believe that for males of *E. delaneyi* the presence of cephalic horns is indicative of sexual maturity; however, as discussed by Monod (1969) this does not preclude the possibility that males lacking horns are sexually mature and that "typical" and "gynecoid" males may occur. To rectify this uncertainty would require histologic and seasonal studies on the reproductive biology of the species. Such studies would be especially useful for other species, such as *E. stebbingi*, whose adult stages are presently characterized as lacking distinct dorsal tubercles on the first pleonal somite and lacking cephalic horns on the male.

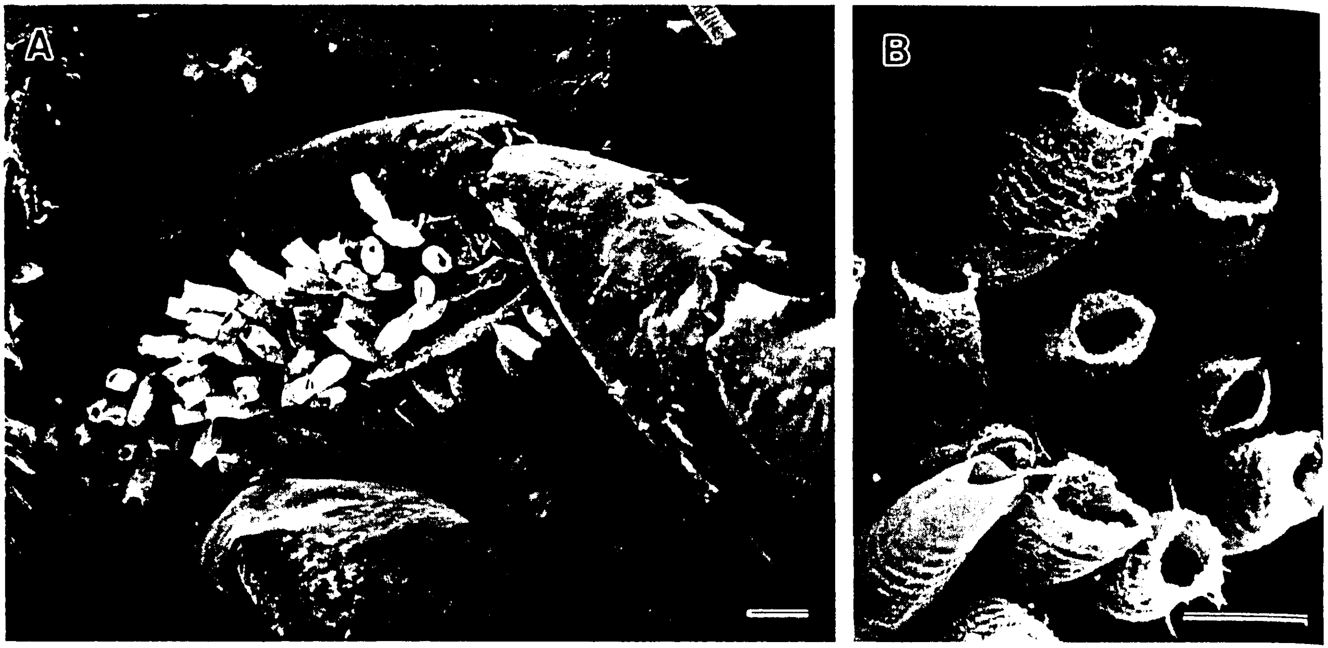

Figure 8. ***Excorallana delaneyi.*** **(A) protozoans on pereopod, (B) same enlarged. Scales: A = 100 μm; B = 50 μm.**

Excorallana berbicensis was originally described as lacking cephalic horns and having pleonites devoid of posterior marginal tubercles. We examined the female holotype of *E. berbicensis*, which is a subadult female lacking oostegites and bifid spinules on the dorsum of the pleotelson. The smaller specimen reported by Boone from the type locality also lacks these features and closer examination revealed it to be a subadult male with a well developed stylet on pleopod 2 and indications of developing cephalic horns.

Van Name's (1925, 1936) supplemental description of *E. berbicensis* was based on two specimens, an adult male and female, collected on the gills and pectoral fin, respectively, of different specimens of *Lycengraulis grossideus* (Cuvier). The fish hosts were caught in a tidal fresh or oligohaline area of the British Guiana near the type locality. Van Name described and illustrated the adult male as having cephalic horns and distinct pleonal and pleotelsonic tubercles, but although he described "posteriorly directed hairs" on the pleon, he does not mention or illustrate spinules on the pleotelson. The body lengths of Van Name's two adult specimens are distinctly less (6 and 7.8 mm) than that of the subadult holotype (13 mm). Based on a reexamination of Van Name's material, Brian Kensley (pers. comm.) observed bifid spinules on the pleotelson of both specimens and considers that they may not be conspecific with Boone's type material.

There are two other records of *E. berbicensis* in the literature. Monod (1969) studied specimens from the gills of the lemon shark, *Negaprion brevirostris* (Poey), collected in two freshwater areas of French Guiana. Based on a comparison of the type material of *E. berbicensis* with the detailed illustrations and supplemental description presented by Monod (1969), we consider his specimens, except for the telson, to be more similar to Boone's type material than to *E. delaneyi*. Carvacho (1977) reported *E. berbicensis* from the island of Guadeloupe, and indicated that his material agreed in all major aspects with the supplemental description and illustrations presented by Monod (1969). A detailed comparison of Monod's and Carvacho's specimens with Boone's type material is needed to verify their identifications.

Males of five species, *E. fissicauda*, *E. oculata*, *E. angusta*, *E. warmingii*, and *E. stebbingi*, belonging to the Berbicensis-complex are described as lacking cephalic horns. This condition, coupled with small size of some species such as *E. houstoni*, might indicate a neotenic condition. However, with the possible exception of *E. stebbingi*, these five species are described or illustrated as having dorsal tubercles and spinules on the adults of both sexes, characters which are indicative of the fully developed adults. We do not believe that cephalic horns have arisen independently within the genus, but consider them to be an ancestral or pleisiomorphic condition and their absence a derived or apomorphic condition. This view is further supported by the presence of rudimentary or vestigial cephalic horns on the adult females *E. delaneyi* (Fig. 6D).

The presence of rudimentary cephalic horns on the females of *E. delaneyi* may be useful in distinguishing it taxonomically, unless such horns have been overlooked on other females of Berbicensis-complex. We believe that the rudimentary cephalic horns on adult females of *E. delaneyi* are not the result of protandry since no large intermediate forms having vestigial horns, penes, or male copulatory stylets have been observed. If fresh material becomes available, we plan to conduct a histological study of the adult females to determine if vestiges of male gonads are present. Since the adult males that we examined were usually smaller than adult females, we do not consider protogyny (gynandry) to be a possible cause of "horned" condition in females, especially since all of the "horned" females examined had well developed oostegites and many were gravid. Other possible causes may include ecophenotypic or xenobiotic factors which alter or suppress secondary sex characters in the Berbicensis-complex, as well as in the other members of the genus. Such factors might involve hormones or other biochemical agents from a host fish's blood or the physiological and biochemical conditions occurring within the isopods' sponge domicile.

Initially we thought the presence of rudimentary horns on large incubatory females of *E. delaneyi* might be caused by a biochemical imbalance or hormonal depletion brought on by senescence or a "spent" reproductive condition. However, after careful reexamination, all of the incubatory females in our collection were found to have at least some remnants of vestigial horns. The females and some males of other species in the Berbicensis-complex have either (1) lost the genetic ability to develop cephalic horns or (2) they have developed hormones or associated biochemical reproductive processes which have completely suppressed development of cephalic horns. To test this hypothesis, it would be useful to design experiments to determine if the growth of cephalic horns could be induced or suppressed biochemically in both adult males and females of *E. delaneyi*. Such experiments would be particularly important if conducted on species such as *E. angusta* and *E. stebbingi*, whose males reportedly lack cephalic horns. If the genetic capability to develop cephalic horns in these two species still exists but is being suppressed biochemically in their males (and possibly in their females), then horn development might be induced biochemically under laboratory conditions. Such studies should yield important information on the systematics and biochemical mechanisms involved in inducing or suppressing crustacean secondary sex characters.

The presence of stout spinules on the dorsum of the pleotelson appears to be a reliable indicator of maturity among excorallanid species. In Menzies' (1962) description of *E. kathyae* Menzies, 1962 (= *E. truncata* Richardson, 1899), such bifid spinules were mentioned as a taxonomic character for the species, and Menzies and Kruczynski (1983) noted the presence of similar spinules on *E. tricornis tricornis* (Hansen 1890) and *E. mexicana* (Richardson 1905). The spinules on the latter are slightly different in that they are weakly serrate; however, the spinules on both species have the characteristic forked tip with sensory hair as illustrated for *E. delaneyi* (Figs. 2B, 7D). The dorsal spinules on the pleotelson of *E. antillensis* as described by Menzies and Kruczynski (1983) are not bifid, but are conical and "burr-like." However, they do have apical sensory hairs and a submedial arrangement similar to some other species of *Excorallana*.

Excorallana stebbingi was briefly described from a relatively small series of specimens. A supplemental or redescription based on a larger series of specimens is needed. Lemos de Castro (1976) does report the presence of "stout hairs" on the pleotelson, but gives no detailed illustration of these structures. If these "stout hairs" are homologous with the various modified "spinules" characteristic of the adult forms of *E. delaneyi* and other species of *Excorallana*, they could be very useful in distinguishing between subadult and adult males for the species whose males lack horns.

Specialized serrate setae (Fig. 3I) similar to those present on pereopods 4–7 of *E. delaneyi* (Fig. 3I) have been reported on *E. antillensis*, *E. berbicensis* and *Corallana hirsuta* Schioedte and Meinert (see Hansen 1890; Monod 1934, 1969). These distinct setae may have been overlooked or not described for several species of *Excorallana* related genera. The fine structure and location of these setae on the pereopods might prove to be useful characters in future studies on the taxonomy of *Excorallana* and related genera.

ECOLOGICAL NOTES

Three other species of *Excorallana*, *E. tricornis occidentalis* Richardson, 1905, *E. bruscai* Delaney, 1984, and *E. quadricornis* (Hansen, 1890) have been reported as occasional commensals of sponges (see Delaney 1984), but apparently not to the exclusive degree that we have observed for *E. delaneyi*. During this study, *Excorallana delaneyi* was found associated with two sponges, *Halichondria* sp. and *Hymeniacidon* sp. At the type locality in the upper part of St. Joseph, *Halichondria* sp. was the most common and heavily infested of the two host sponges. A single specimen of *Halichondria* sp., approximately 30 cm in diameter, contained over 75 individuals of *E. delaneyi* in various stages of maturity (mancas, subadults, adults). Examination of the three other common sponges, *Microciona prolifera* (Ellis and Solander) and two unidentified species, from the vicinity of the type locality did not yield specimens. Extensive collecting and examination of other possible hosts and microhabitats within the grassbeds at the type locality did not yield additional specimens of *E. delaneyi*. The collecting gear used included a kick net and an A-frame scallop dredge, both with 1 mm mesh netting.

All specimens of *E. delaneyi* that we examined came from sponges collected in *Thalassia* grassbeds at St. Joseph Bay, Florida. Two or more individuals of *E. delaneyi* were often found inhabiting the same chamber or cavity within the sponge. Another isopod, *Paracerceis caudata* (Say 1818), was found associated with the sponge hosts of *E. delaneyi*. This sphaeromatid occurred in far fewer numbers and was limited to the depressions and more accessible canals on the surface of the sponge. *Excorallana delaneyi* usually occupied cavities and canals deeper within the sponge host. Other invertebrates commonly found on or within the sponge hosts of *E. delaneyi* included the decapods, *Dyspanopeus texana* (Stimpson 1859), and *Alpheus* sp.; the amphipods, *Dulichiella appendiculata* (Say 1818), *Leucothoe* sp., *Colomastix* sp.; and the polychaetes, *Haplosyllis spongicola* (Grube 1855), unidentified terebellids, and *Marphisia* sp.A.

When removed from its sponge host, *E. delaneyi* exhibited a constant grasping behavior when in the presence of suitable object or substratum. It also was observed to be an excellent swimmer. When specimens were placed in an aquarium, they usually swam rapidly for about a minute before forming spherical aggregations by clinging together in groups of 10 or more individuals. When a small piece of the host sponge was placed with these isopods they quickly burrowed inside, until the spongey frame was engorged with a mass of isopods. Other macroinvertebrates and small fishes placed in the same aquarium were generally ignored. In several instances, groups of mancas and juveniles were found within the thoracic cavities of dead or dying adult *E. delaneyi*. We did not determine if this behavior represented cannibalism or an instinctive burrowing response. Notwithstanding, this behavior was probably an aberration caused by our attempt to maintain the specimens under laboratory conditions in the absence of their normal food source and sponge domicile.

Members of the genus *Excorallana* are known to parasitize fishes, including sharks and rays (Van Name 1925, Monod 1969, Menzies and Glynn 1968, Delaney 1984), thus indicating the possibility that *E. delaneyi* may parasitize fish during some stage of its development, retiring to the sponge host to molt and reproduce between feedings. Many of the specimens collected had guts greatly swollen with what appeared to be blood indicating that they may have recently fed on a fish host. During our limited survey, *Excorallana delaneyi* was not found on the several fish species – *Opsanus beta* (Goode and Bean), *Lagodon rhomboides* (Linneaus), *Menidia byrillina* (Cope), *Fundulus similis* (Baird and Girard), *Fundulus grandis* (Baird and Girard), *Cyprinodon variegatus* Lacepede, and *Mugil cephalus* Linnaeus – examined from the type locality. Since *Excorallana berbicensis*, *E. t. tricornis*, and *E. tricornis occidentalis* are known to parasitize fishes (Delaney 1984), our limited observations do not preclude the possibility that *E. delaneyi* may intermittantly parasitize fishes during all or part of its life cycle. Monod (1969) reported *E. berbicensis* as a parasite of the lemon shark *Negaprion brevirostris* in South American waters. Lemon sharks occur in the vicinity of the type locality of *E. delaneyi*; however, we have not had an opportunity to examine specimens from this area. Examination of sharks, rays, and a larger number of other fish species collected during both night and daylight hours from the type locality is needed to confirm the presence of a fish host.

Protozoans, loricated peritrichs similar to those reported by Delaney (1982), were often found attached to the body surface, especially the pleopods, mandibles, and pereopods of the larger specimens of *E. delaneyi* examined (Figs. 5, 7, 8). Another symbiont, and epicaridian isopod parasite most closely resembling the cabiropsid genus *Clypeoniscus* Giard and Bonnier, was found within the brood chamber of female *E. delaneyi*. To our knowledge, there are no previous reports of cabiropsid isopods occurring on members of the family Excorallanidae. The description of this apparently new species of *Clypeoniscus* will be the subject of another publication.

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