

NAUSHONIA MANNINGI, NEW SPECIES (DECAPODA: THALASSINIDEA: LAOMEDIIDAE), FROM ACKLINS ISLAND, BAHAMAS

Fernando Alvarez, José Luis Villalobos, and Thomas M. Iliffe

(FA, JLV) Colección Nacional de Crustáceos, Instituto de Biología, Universidad Nacional Autónoma de México, Apartado Postal 70–153, México 04510, D.F., México; (TMI) Department of Marine Biology, Texas A&M University at Galveston, Galveston, Texas 77553–1675, U.S.A.
(corresponding author (FA) e-mail: falvarez@servidor.unam.mx)

A B S T R A C T

A new species of the rare laomediid genus *Naushonia*, *N. manningi*, is described from a cave in Acklins Island, Bahamas. *Naushonia manningi* represents the seventh species of the genus and the first one to come from a cave. A key to the species of *Naushonia* is presented.

Naushonia Kingsley, 1897, is a rare genus in the family Laomediidae Borradaile, 1903 (Decapoda: Thalassinidea) characterized by: carapace longer than broad, rostrum well developed, linea thalassinica evident, first pair of pereopods somewhat flattened and subchelate, and both rami of uropods with complete transverse sutures (Williams, 1984). Although there are no findings reported from Asian waters, *Naushonia* is a cosmopolitan genus with *N. crangonoides* (Kingsley, 1897) occurring along the east coast of the United States, from Massachusetts to North Carolina; *N. portoricensis* (Rathbun, 1901) in Puerto Rico, Cuba, Bermuda, and Quintana Roo, Mexico; *N. perrieri* (Nobili, 1904) in Somalia, Red Sea; *N. macginitiei* (Glassel, 1938) in southern California, U.S.A., and Sonora, Mexico; *N. panamensis* Martin and Abele, 1982, in the Pacific coast of Panama; *N. lactoalbida* Berggren, 1992, in Moçambique; and the new species described herein from the Bahamas.

Detailed accounts of previous descriptions and of the classification of *Naushonia* have been published by Goy and Provenzano (1979) and Berggren (1992). Goy and Provenzano (1979) also described the juvenile morphology of *N. crangonoides* and presented a morphological comparison of the species known at that time. Williams (1984) reviewed what is known on the biology of *N. crangonoides*. Recently, a new phylogeny of the Thalassinidea has been proposed (Poore, 1994), placing the family Laomediidae in the superfamily Callianassoidea Dana, 1852, being most closely related to the Upogebiidae Borradaile, 1903.

In this study, *N. manningi* is described from a cave in Acklins Island, Bahamas, representing the seventh species in the genus and the first one to be collected inside a cave.

MATERIALS AND METHODS

Individuals of the new species described herein were collected during an expedition to Crooked and Acklins Islands, Bahamas, in January 1999. Descriptions of the cave from which the new species was captured, and collecting details, are as follows. Liza Bay Cave (22°13.00'N, 74°12.212'W), Salina Point, Acklins Island, Bahamas, 14 January 1999 (Fig. 1). This cave underlies a low hill about 1 km inland from the east coast of Acklins Island. Multiple entrances in the hillside provide access to a series of large, interconnected chambers that contain shallow, saline pools. A large colony of bats inhabit the cave and roost directly over the pools. The pools are floored with gravel, guano, and fine silt. Specimens of the new species of *Naushonia* were observed in several pools, 20-m or more long by 5- to 10-m wide, but with only 20- to 30-cm water depths, and collected from one of them. These pools were within 10 to 20 m of cave entrances and so were in twilight conditions during the day. Salinity in the pools was measured at 34‰ with a refractometer, while water temperature was 25.5°C. Shrimps were collected by hand with a plastic bottle. They were observed walking across rock and mud substrates. Other crustaceans collected from the cave pools included amphipods, copepods, archiannelid polychaetes, and shrimp of the genus *Typhlatya* (Atyidae).

The three specimens representing the new species are deposited in the Colección Nacional de Crustáceos (CNCR), Instituto de Biología, Universidad Nacional Autónoma de México. Other abbreviations used are: cl, postorbital carapace length, and tl, total length.

RESULTS

Naushonia manningi, new species
Figs. 2, 3

Material.—*Holotype*.—♂, cl 10.2 mm, tl 24.6 mm; 14 January 1999; Liza Bay Cave, Salina Point, Acklins Island, Bahamas; collected by T. M. Iliffe; CNCR 17988.

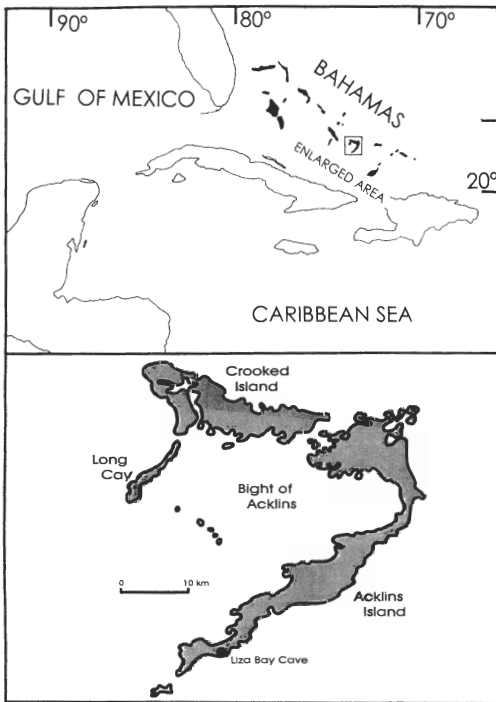


Fig. 1. The location of the type locality of *Naushonia manningi*, Acklins Island in the Bahamas.

Allotype.—♀, cl 11.1 mm, tl 26.5 mm; same date, locality, and collector as holotype, CNCR 17989. *Paratype*.—♀, cl 11.2 mm, tl 27.4 mm; same date, locality, and collector as holotype, CNCR 17990.

Description.—Carapace subcylindrical, 40% of total length, linea thalassinica evident (Fig. 2a). Postorbital spine may be present (absent in holotype, present in allotype and paratype), 1 or 2 strong spines on anterolateral margin below linea thalassinica; anterolateral angle with 3–5 strong, sharp spines, posterior to these, diffuse field of smaller spines (Fig. 2b). Cervical groove wide and deep, anterior margin rounded, smooth, without spines; posterior margin with rounded notch in middle, with 8 large spines (Fig. 2b). Posterior to cervical groove, low ridge bearing spines, decreasing in size posteriorly. Laterally, below linea thalassinica, carapace expanding posteriorly, overlapping with first abdominal somite. Carapace not covering coxa of fifth pair of pereopods (Fig. 2a).

Rostrum subtriangular anteriorly, ending in rounded tip, reaching proximal third of second segment of antennular peduncle; rostral margin with 6 sharp spines, 2 anterior to eyes; dorsal surface with shallow rhomboid de-

pression between third pair of rostral spines (Fig. 2b). Posterior to rostral margin on carapace proper, lateral row of 5 or 6 strong, sharp spines; row of minute spines along midline (Fig. 2b).

Eyes rather stout, with prominent conical projection on distal-superior angle, cornea pigmented (Fig. 2c). Cornea partially filling distal portion of eye, visible in dorsal view; irregular in shape, rounded anteriorly, superior margin straight, posterior margin irregular.

Abdomen 1.5 times carapace length (Fig. 2a). First somite the smallest, bearing line of blunt tubercles along anterior dorsal margin, projected anteriorly in midlateral portion, with prominent ridge on posterolateral portion articulating with second somite. Second somite with blunt tubercles along mid-dorsal line, pleura broadly rounded, overlapping first and third somites, ventral margin with blunt tubercles. Third somite with minute, blunt tubercles along mid-dorsal line; ventral margin of pleura with sharp spines. Somites 4–6 with larger spines on ventral margin of pleurae, lateral and dorsal margins smooth.

Telson broadly rounded, 1.15 times longer than wide; posterior half of lateral margin bearing 5 acute spines; dorsal surface with scattered small spines, 4 on right side, 5 on left side, 2 median ones next to anterior margin; low, ill-defined groove along posterior half of dorsal surface; posterior margin bearing long plumose setae (Fig. 2d). Uropods with complete, finely serrate, transverse sutures; exopods wider than endopods, both pairs longer than telson; with marginal plumose setae, increasing in size distally. Exopod with simple internal margin, external margin bearing 6 or 7 spines, becoming narrower posterior to transverse suture, dorsal surface smooth, with 2 low ridges, 0–2 spines. Endopod with simple internal margin, external margin bearing 4 spines, becoming narrower posterior to transverse suture, dorsal surface smooth, with low ridge, 4 or 5 spines.

Antennule with first 2 segments simple, divided from third segment on. Antenna with scaphocerite reaching first antennular segment. Scaphocerite with 31 long, marginal, plumose setae along distal and external margins; internal margin with 4 spines, 2 proximal ones large and sharp, third small, fourth the largest on distal angle (Fig. 2f).

Mandible with molar and incissor processes fused, forming angle to fit palp; incisor

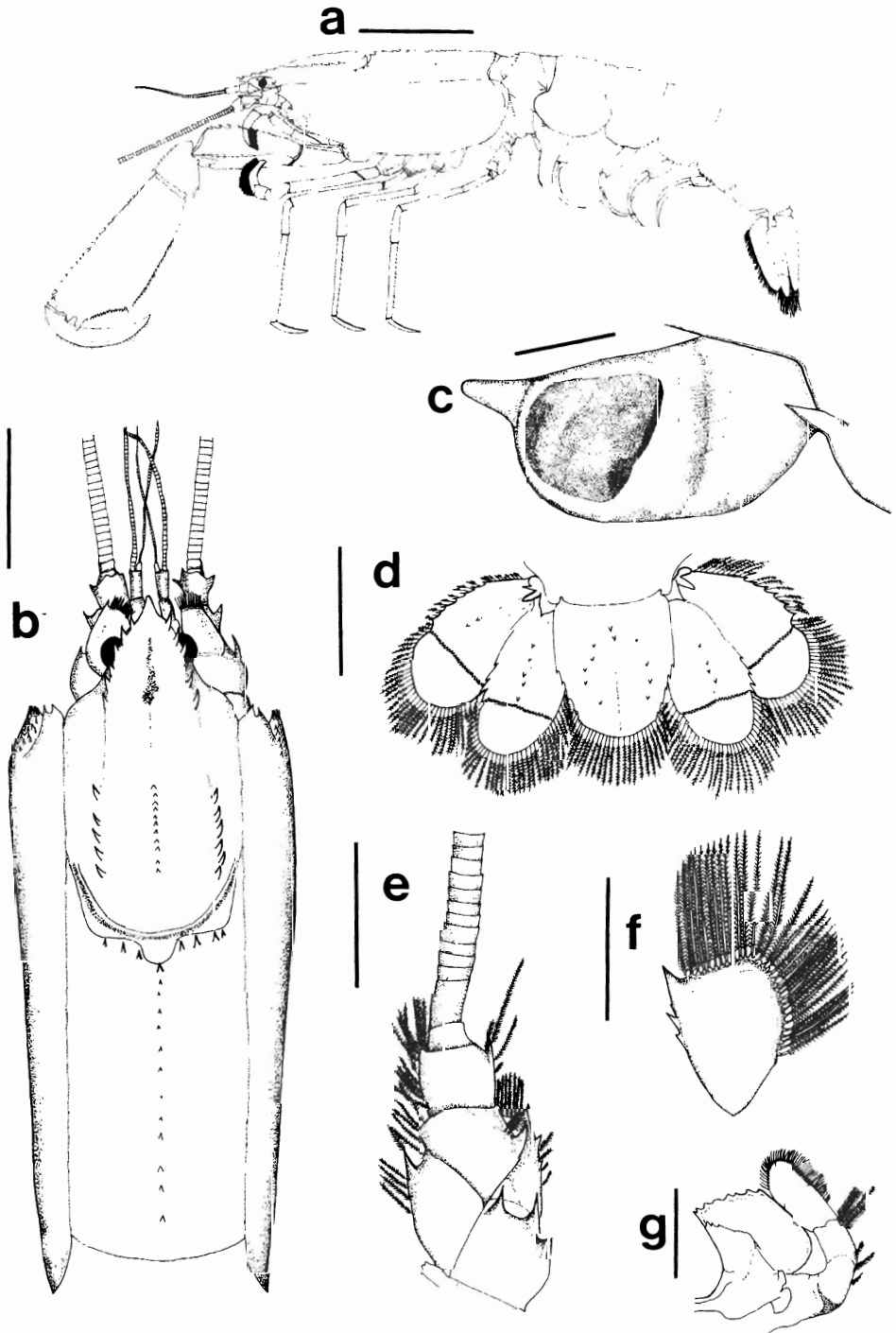


Fig. 2. *Naushonia manningi*, new species, male holotype except for "a" which is the female allotype: a, body, lateral view; b, carapace, dorsal view; c, eye; d, telson and uropods, dorsal view; e, antennal peduncle, ventral view; f, scaphocerite; g, mandible. Scale bars represent: a, 5 mm; b, d, 2.5 mm; c, 0.25 mm; e, f, 1 mm; g, 0.5 mm.

process with 8 irregular teeth, molar process with 3 teeth (Fig. 2g). Palp 2-segmented, scattered plumose setae on proximal segment, distal segment ending in rounded tip, with simple, short setae.

Maxillule with palp 2-segmented, proximal segment with distal row of 6 stout spines; distal segment slender, cylindrical, devoid of setae (Fig. 3a). Anterior lacinia expanded distally, distal margin rounded, with submarginal row of stout spines; scattered plumose setae proximally. Posterior lacinia wide, anterior margin straight, with tightly arranged stout spines, decreasing in size proximally; submarginal tuft of stout spines on distal angle, submarginal row of stout spines next to anterior margin, long plumose setae on posterior margin.

Maxilla with elongated palp bearing stout spines of variable length (Fig. 3b). Distal endite bilobed, upper lobe wider than lower one, both lobes with stout spines; medial endite elongate, distal end rounded, bearing stout spines; proximal endite the widest, approximately trapezoidal, with stout spines. Scaphognathite 3 times as long as wide, anterior lobe wider and rounded, with plumose setae increasing in size posteriorly; posterior lobe subtriangular with truncate tip bearing 9 very long, simple setae, external margin with short plumose setae, basal section of internal margin with minute spines.

First maxilliped (Fig. 3c) with basipodite bearing a notch on superior margin. Palp broadly rounded, with stout spines on internal margin, shorter than endopodite. Endopodite 2-segmented, becoming wider distally, plumose setae of variable length along margin. Exopodite 10-segmented, basal segment expanded laterally, bearing long, plumose setae, second segment elongate, devoid of setae, distal 8 segments short, with long, simple setae. Epipodite large, smooth, devoid of setae, approximately trapezoidal.

Second maxilliped (Fig. 3d) with endopodite 5-segmented, basal and next two segments with long, plumose setae, distal 2 segments bearing stout spines. Exopodite 11-segmented, basal segment with 4 blunt tubercles on distolateral angle and row of long, plumose setae; terminal 4 segments with simple setae, increasing in size distally. Epipodite somewhat flattened, posterior margin armed with small, acute spines; well-developed podobranch.

Third maxilliped (Fig. 3e) with endopodite 6-segmented. Mesial margin of ischium sharp and serrate, with irregular teeth, row of submarginal thick setae next to distal margin; merus devoid of spines except for 1 large spine on distolateral angle, mesial margin with proximal and distal rows of thick setae; carpus with mesial and lateral rows of submarginal simple setae, submarginal row of thick setae next to distal margin; propodus and dactylus with marginal and submarginal rows of simple setae. Exopodite 12-segmented, first segment half total length of exopodite, second segment 1/3 length of first one, distal segments short, bearing long, simple setae. Epipodite blade like, slender, devoid of setae; well-developed podobranch.

First pair of pereopods strong, subchelate, subequal, 0.56 times total length of organism (Fig. 3f). Coxa with large, slender, sharp, internal spine. Ischium devoid of spines, becoming thicker distally. Merus approximately triangular in section, ventral margin lined with blunt tubercles and fine, short setae, ending distally in 3 large, sharp spines; dorsal margin with spines increasing in size distally, 2 large spines on dorsal surface next to distal margin. Carpus short, about 0.5 times length of merus, bearing 2 strong spines on ventral margin, 2 on dorsal surface next to distal margin; on dorsal margin, proximal spines small, distal 2 large. Propodus approximately triangular in section, 2.4 times longer than wide, about the same length as ischium, merus, and carpus together; dorsal margin lined with blunt tubercles proximally, gradually becoming sharp spines distally, covered with short, simple setae; ventral margin lined with spines of similar size and fine, short setae, ending distally in large spine; distal margin broadly rounded, dorsal surface finely serrate, with large spine at base of dactylus, ventral surface with very large spine in central portion, followed by small spines towards ventral margin. Dactylus broadly arched, closing completely against distal margin of propodus, simple, devoid of spines, lateral margin with long, simple setae.

Second pair of pereopods the shortest pair, strong, not chelate (Fig. 3g). Distal margin of ischium diagonal to longitudinal axis of pereopod, 0.42 times length of merus. Merus longest segment, with row of long, simple setae on internal margin. Carpus about 1/5 length of merus, bearing distal tuft of setae

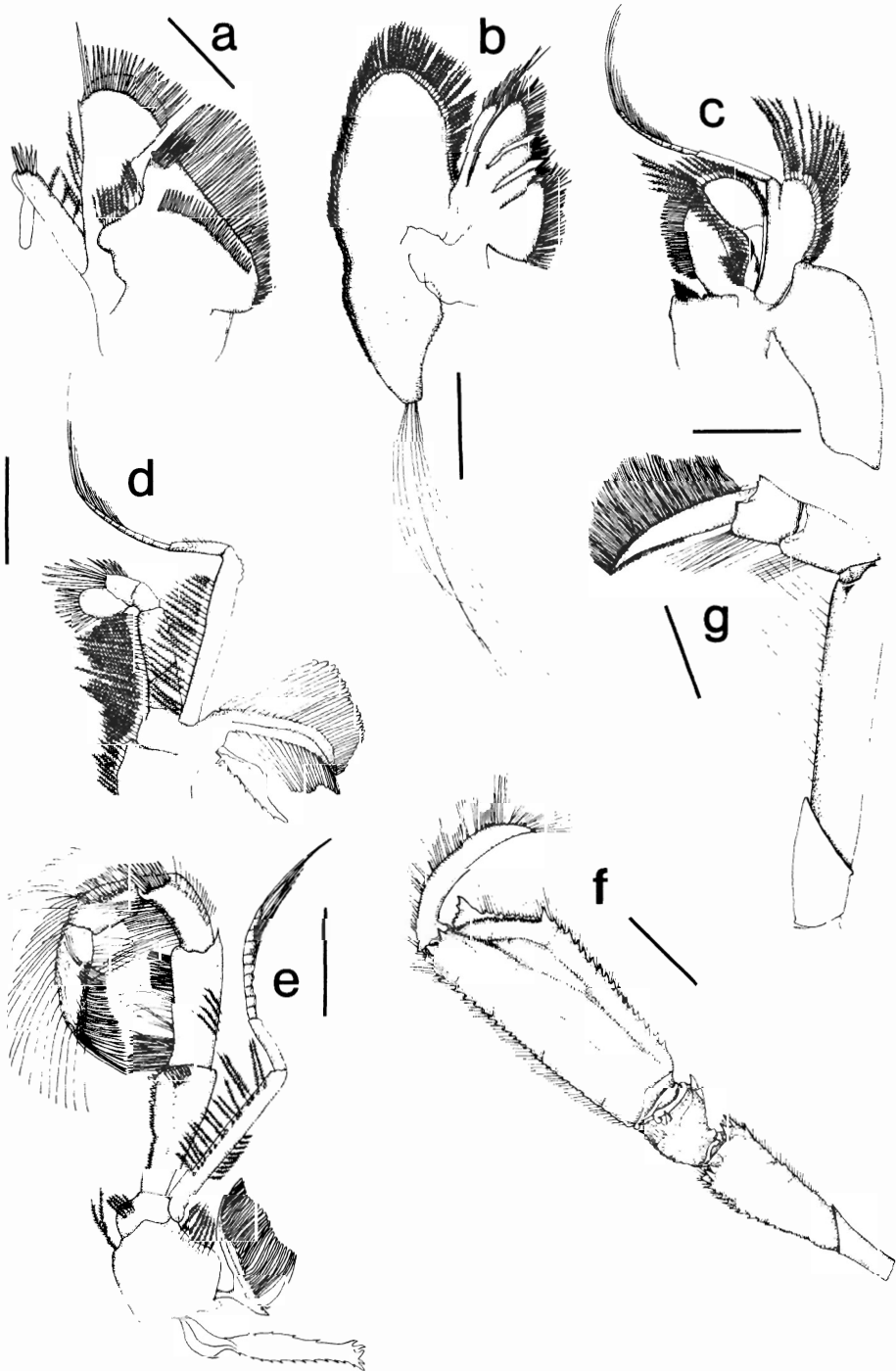


Fig. 3. *Naushonia manningi*, new species, male holotype: a, maxillule; b, maxilla; c, first maxilliped; d, second maxilliped; e, third maxilliped; f, first pereopod; g, second pereopod. Scale bars represent: a–e, g, 1 mm; f, 2.5 mm.

on ventral margin. Propodus the shortest segment, bearing long, simple setae on ventral margin, distal margin markedly sinuous. Dactylus lanceolate, distal half of ventral

margin finely serrate, dorsal margin serrate, with dense row of long, simple setae.

Third to fifth pairs of pereopods uniform in shape, devoid of spines, with short simple

setae: third pair the longest, fourth and fifth pairs of about the same length. Third pair with ischium and carpus of same length and the shortest; merus the longest segment, 0.33 length of pereopod, 3 times length of ischium; propodus slightly shorter than merus, 0.3 length of pereopod; dactylus 0.14 length of pereopod. Fourth and fifth pairs with segments of same lengths, ischium and carpus 0.12–0.14 length of pereopod and the shortest, merus 0.26 length of pereopod, propodus 0.32 length of pereopod and longest segment, dactylus 0.15 length of pereopod. Dactyli of third to fifth pairs with ventral margin comblike, ending in corneous tip.

Etymology.—This species is dedicated to Dr. Raymond Manning, with respect and admiration.

DISCUSSION

The characters that distinguish *N. manningi* from the rest of the species in the genus are: eyes with conical projection on distal-superior angle, posterolateral portion of carapace not covering coxa of fifth pair of pereopods, and ventral margin of pleurae of abdominal somites 2–6 with sharp spines. The species of *Naushonia* can be easily distinguished with the key provided below. Morphologically, *N. manningi* is most similar to *N. lactoalbida*, sharing the same general shape of rostrum, telson, uropods, maxillule, maxilla, and maxillipeds 1–3. *Naushonia crangonoides* and *N. macginitiei* differ from the new species in having a rounded rostrum; *N. portoricensis* and *N. panamensis* have a triangular rostrum devoid of strong spines; and *N. perrieri* has a truncate rostrum. The shape of the cervical groove as well as the shape and proportions of the dactylus and propodus of the first pereopod vary widely among all the species in the genus. No pattern of variation in these characters can be associated with geographical distribution; the three most closely distributed species (*N. crangonoides*, *N. portoricensis*, *N. manningi*) are not the most morphologically similar.

Another highly variable character among species is the total body length/abdomen length ratio; it varies, in six of the seven known species, as follows: *N. portoricensis*, 2.3; *N. panamensis*, 2.37; *N. manningi*, 2.41; *N. macginitiei*, 2.61; *N. crangonoides*, 3.33; and *N. lactoalbida*, 3.41. These data were drawn from the published descriptions of the

species and no statistical error can then be associated to each value. However, the wide variation in such an important trait, as well as the geographical distribution pattern, may reflect a long period of isolation among species.

It is of interest to comment that in the three known specimens of *N. manningi* there is a marked asymmetry, between right and left sides, in the number of the smaller spines in different regions of the carapace, and in the telson and uropods. *Naushonia panamensis* and *N. lactoalbida* show a similar asymmetrical pattern. Also, as described above, there is some degree of variation among the specimens of *N. manningi* in the number of spines in various regions of the carapace. Future descriptions and morphological analysis should determine the relative importance of this variation within and among individuals of these characters.

Regarding the habitat, all species of *Naushonia* occur in very shallow (< 0.5 m) water with a muddy substrate, where they burrow. The occurrence in this particular environment raises the question of why so few species and individuals per species of this genus have been found. The answer could be related to the low sampling effort in potentially rich areas or to a natural rarity and low abundance.

KEY TO THE SPECIES OF NAUSHONIA (MODIFIED FROM BERGGREN, 1992)

1. Rostrum acute to broadly rounded 2
 - Rostrum truncate, with serrate anterior margin *N. perrieri*
2. Postorbital spine simple 5
 - Postorbital spine bifid or trifid 3
3. Antennal scale with 10 or more marginal teeth, uropodal lateral branch with 5 outer spines, telson without lateral spines *N. crangonoides*
 - Antennal scale with fewer than 10 marginal teeth, uropodal lateral branch with 2 outer spines, telson with lateral spines 4
4. Telson with 1 lateral tooth, antennal scale with terminal teeth strongly curved medially *N. portoricensis*
 - Telson with 3 lateral teeth, antennal scale with terminal teeth straight, not curved medially *N. macginitiei*
5. Propodus of first pereopod with 2 strong ventral teeth proximally, dactyl of first pereopod with proximal superior teeth, telson with 1 lateral spine *N. panamensis*
 - Propodus of first pereopod without 2 strong ventral teeth proximally, dactyl of first pereopod without proximal superior teeth, telson with more than 1 lateral spine 6

6. Eyes without conical projections, posterolateral portion of carapace covering coxa of fifth pair of pereopods, ventral margin of pleurae 3–6 smooth without spines, telson with 4 lateral spines
N. lactoalbida
- Eyes with conical projection, posterolateral portion of carapace not covering coxa of fifth pair of pereopods, ventral margin of pleurae 3–6 with sharp spines, telson with 5 lateral spines
N. manningi

ACKNOWLEDGEMENTS

Collection of shrimp described herein was part of the January, 1999, Anchialine Caves Expedition to the southern Bahamas led by Thomas Iliffe. Other members of the expedition included Brett Dodson and Shelley Fetterolf, graduate students at Texas A&M University. This expedition was funded by National Science Foundation, Biotic Surveys and Inventories Program award number 9870219. We thank Neil Sealey (Media Publishing Ltd., Nassau, Bahamas), Dr. Nancy Elliott (Siena College), and Dr. William Keegan (Florida Museum of Natural History) for providing invaluable logistical information on Crooked and Acklins Islands. Rolando Mendoza assisted us with some of the drawings.

LITERATURE CITED

- Berggren, M. 1992. *Naushonia lactoalbida*, new species (Decapoda: Thalassinidea: Laomedidae), a mud shrimp from Inhace Island, Mocambique.—*Journal of Crustacean Biology* 12: 514–522.
- Borradaile, L. A. 1903. On the classification of the Thalassinidea.—*Annals and Magazine of Natural History*, series 7, 12: 534–551.
- Glassel, S. A. 1938. New and obscure decapod Crustacea from the west American coasts.—*Transactions of the San Diego Society of Natural History* 8: 411–454.
- Goy, J. W., and A. J. Provenzano, Jr. 1979. Juvenile morphology of the rare burrowing mud shrimp *Naushonia crangonoides* Kingsley, with a review of the genus *Naushonia* (Decapoda: Thalassinidea: Laomedidae).—*Proceedings of the Biological Society of Washington* 92: 339–359.
- Kingsley, J. S. 1897. On a new genus and two new species of macrurous Crustacea.—*Bulletin of the Essex Institute, Salem, Massachusetts* 27: 95–99.
- Martin, J. W., and L. G. Abele. 1982. *Naushonia panamensis*, new species (Decapoda: Thalassinidea: Laomedidae) from the Pacific coast of Panama, with notes on the genus.—*Proceedings of the Biological Society of Washington* 95: 478–483.
- Nobili, G. 1904. Faune carcinologique de la Mer Rouge: Décapodes et Stomatopodes.—*Annales des Sciences Naturelles, Zoologie, Series 9*, 4: 82–85.
- Poore, G. C. B. 1994. A phylogeny of the families of Thalassinidea (Crustacea: Decapoda) with keys to families and genera.—*Memoirs of the Museum of Victoria* 54: 79–120.
- Rathbun, M. J. 1901. The Brachyura and Macrura of Porto Rico.—*Bulletin of the United States Fish Commission for 1900*, 2: 1–127.
- Williams, A. B. 1984. Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida. Smithsonian Institution Press, Washington, D.C. 550 pp.

RECEIVED: 20 May 1999.

ACCEPTED: 10 November 1999.