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A Reevaluation of the *Neopanope texana-sayi* Complex with Notes on *N. packardii* (Crustacea: Decapoda: Xanthidae) in the Northwestern Atlantic[1]

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ABSTRACT: **The status of mud crabs of the family Xanthidae previously referred to *Neopanope texana texana* (Stimpson, 1859) and *N. texana sayi* (Smith, 1869) is reviewed. It is concluded, based on the examination of types and other material, that both are distinct species allopatric in distribution; *N. texana* occurring in the Gulf of Mexico and *N. sayi* occurring along the east coast of North America. Both species are compared to *N. packardii* (Kingsley, 1879) and a key to the genus *Neopanope* in the western Atlantic is presented. Diagnostic characters of the species are illustrated.**

Introduction

Mud crabs of the genus *Neopanope* are among the most abundant xanthids on the Gulf and Atlantic coasts of the United States. The systematic status of crabs previously referred to *N. texana texana* (Stimpson, 1859) and *N. texana sayi* (Smith, 1869) has, however, been the source of much confusion. The present report contains an examination of the *N. texana-sayi* complex and gives notes on *N. packardii* (Kingsley, 1879). The results suggest that three distinct species of *Neopanope* occur in the western Atlantic; *N. texana* (Stimpson, 1859) occurs in the Gulf of Mexico, *N. sayi* (Smith, 1869) occurs from Canada south to the east coast of Florida and has been introduced into Swansea, Wales (Naylor, 1960), and *N. packardii* (Kingsley, 1879) occurs from northwest Florida to Cuba.

The abbreviation *cb* refers to carapace breadth; *cl* to carapace length; MCZ to the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; UMML to the museum of the Rosenstiel School of Marine and Atmospheric Science, Miami, Florida; USNM to the National Museum of Natural History, Washington, D. C.; LM to the Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands; YPMNH to the Yale Peabody Museum of Natural History, Yale University, New Haven, Connecticut; IMS to the Institute of Marine Science, University of North Carolina, Morehead City, North Carolina.

Historical resumé

Panopeus texanus was described by Stimpson (1859) based on material collected by Gustavus Wurdemann at St. Joseph's Island, Texas. This material has long been considered to be lost (Rathbun, 1930) presumably having been destroyed in the great Chicago fire of 1871 (see Evans, 1967). In the Museum of Comparative Zoology there is a lot of material from Texas (MCZ 727) which contains four males (*cb* 23.9, 20.4, 19.2, 15.2 mm) and three non-ovigerous females (*cb* 20.4, 15.2, 11.8 mm) one of which (*cb* 11.8 mm) may have been parasitized by a rhizocephalid cirriped. The largest male has the following measurements, *cb* 23.9 mm, *cl* 18.4 mm, which correspond almost exactly to *cb* 0.97 inch and *cl* 0.76 inch which are the measurements given by Stimpson in the original

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description of *Panopeus texanus*. There is a note in the vial indicating that the specimens were deposited by Wurdemann and came from Texas. The type material of *P. texanus* was collected by Wurdemann at St. Joseph's Island, Texas. The MCZ number indicates that the material was deposited sometime before 1859. Stimpson worked with L. Agassiz at Cambridge and kept part of his material and notes there (Evans, 1967). Although Stimpson notes that he had 20 or more specimens available, the splitting of lots is not uncommon. These indirect lines of evidence suggest that the four males and three females from Texas deposited in the Museum of Comparative Zoology (MCZ 727) are part of the type series of *Panopeus texanus* Stimpson, 1859 and should therefore be considered syntypes. A label has been placed in the vial to this effect. A lectotype is not selected because such a selection in light of the variation of this species (see section on variation) may lead to erroneous interpretation.

Panopeus sayi was described by Smith (1869) based on material collected at New Haven, Connecticut, and Eastham, Cape Cod, Massachusetts. The material from New Haven is in the Yale Peabody Museum of Natural History and consists of four dried specimens (YPMNH 114; 3 males, *cb* 15.6, 18.2 and 20.1 mm; 1 female (non-ovigerous), *cb* 16.1 mm) glued to a board. The type locality is here restricted to New Haven, Connecticut, as the material from Eastham could not be located in the Yale Peabody Museum of Natural History, the Museum of Comparative Zoology or the National Museum of Natural History. The material was originally in the Boston Society of Natural History and was supposed to have been transferred to one of the above museums.

Panopeus packardii was described by Kingsley (1879) based on material from Key West, Florida. The type specimen is in the Museum of Comparative Zoology (MCZ 4800) and is a badly damaged male with only the dorsal portion of the carapace being intact. A. Milne Edwards (1880) described a new genus and species of xanthid crab, *Neopanope pourtalesii*, based on material from Woman Key and off the Dry Tortugas. Syntypes from both localities are in the Museum of Comparative Zoology (MCZ 2985, 1 male, Woman Key, Florida; MCZ 9153, 1 male, 3 females Dry Tortugas). There is little doubt that the type specimen of *N. packardii* from Key West is identical with those from the Dry Tortugas as Rathbun (1898) had already noted. There is some doubt, however, concerning the specimen from Woman Key. The anterolateral teeth are larger and the sinuses between them are deeper than are those of other specimens of comparative size. The frontal region is more advanced and weak lateral lobes are present. The other specimens lack these lobes on the frontal region. The gonopods (first pleopods of the male) of the three groups of specimens, however, appear to be identical. Dr. Danièle Guinot of the Paris Museum compared a photograph of the gonopod of Florida material with syntypes in the Paris Museum and noted that they were identical. The species is somewhat variable, and the specimen from Woman Key may represent only a form of this variation. Additional material is needed before the status of this specimen can be determined.

Kingsley (1880) and A. Milne Edwards (1880) independently synonymized *P. sayi* with *P. texanus* stating they were unable to find any differences between the two species. Benedict and Rathbun (1891) kept the two species distinct and listed a number of differences between them. One of these differences, the form of the dactyli of the fifth pereiopods, was found to be consistent and an important taxonomic character in the present study. In 1898 Rathbun recognized a number of genera previously considered to be synonyms of *Panopeus*. She placed *texanus*, *sayi*, and *packardii* in the genus *Neopanope* and in a footnote noted that specimens intermediate between *texanus* and *sayi* had been found on the east coast of Florida and therefore the species should be considered subspecies. (These specimens were examined and found to be *N. sayi*.) She maintained this subspecific status in her 1930 monograph.

In 1934 Rathbun described a new subspecies, *Neopanope texana nigrodigita*, based on material from South Carolina. The types are in the National Museum of Natural History (USNM 69344; 2 males, 1 female). Williams (1965) examined topotypic material of this subspecies and concluded that it is a synonym of *N. texana sayi*. Examination of the types of both species confirmed this synonymy.

Variation

All three species were found to be variable in a number of characters including the gonopods which were found to be asymmetrical in about 1 of every 25 specimens of *N. sayi.*

Neopanope texana has a number of variable characters: the form of the carapace, anterolateral teeth and chelipeds; the color of the fingers; the presence or absence of pubescence on the carapace; and in the number of teeth on the lateral surface of the gonopods. The ratio of the breadth to the length of the carapace ranges from 1.28 to 1.36, the mean being 1.30. In small specimens, *cb* 3 to 8 mm, the frontal region is proportionately much wider than in larger specimens. The anterolateral teeth are much reduced and the dactylus of the fifth pereiopods is naked in small specimens. The gonopod is recognizable in male specimens of *cb* 7.4 mm. The anterolateral teeth of females are not as strong as those of males and are less often tipped with spines. The size and form of the anterolateral teeth are also variable in adult males. The third tooth may be subrectangular or subtriangular in shape. Most large males are of the form figured (Fig. 1A) and have the anterolateral teeth spine-tipped. The carpus of the cheliped is usually smooth but three females from Franklin County, Florida, have a pattern of pubescent ridges present on the carpus. Each of these specimens has a dorsal groove on the palm and one has a groove also on the outside of the palm. The fingers are more acute than usual and strongly grooved. Specimens usually have white or horn colored fingers but specimens with black fingers are not uncommon. Small specimens of both sexes have pubescence on the dorsal surface of the carapace, and adult females usually had some present. Adult males are usually naked. The number of spines on the lateral surface (Fig. 3B) of the male gonopod ranges from 14 to 24. The single spine on the distal margin of the mesial surface (Fig. 3C) of the male gonopod is present in all specimens examined.

Specimens of *N. sayi* were found to vary in all of the characters noted for *N. texana.* Two forms of *N. sayi* have been figured by Williams (1965: figs. 172 and 173). Additionally, about one of every 25 male specimens examined had asymmetrical gonopods. The gonopods were similar in overall form but the number of spines present on the mesial distal surface (Fig. 3D) was variable. The mesial distal surface of the right gonopod of one specimen was unarmed while the left gonopod was armed with two spines. The number of spines on this portion of the gonopod varies from zero to three. The number of spines on the lateral surface of the gonopod is also variable, ranging from 13 to 22.

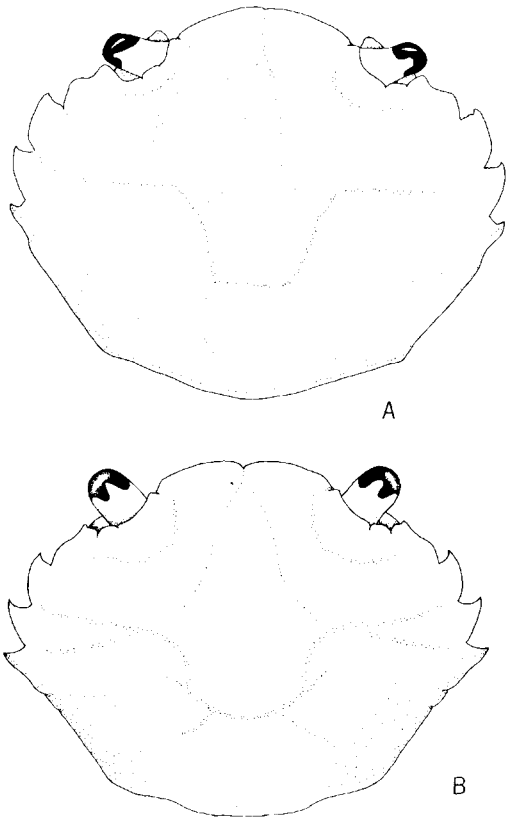

Fig. 1. Dorsal view of carapace. A. *Neopanope texana* (Stimpson), MCZ 727, *cb* 23.9 mm. B. *Neopanope packardii* (Kingsley), UMML, *cb* 10.7 mm.

Specimens of *N. packardii* are much less variable than specimens of *N. sayi* and *N. texana.* The carpus of the chelipeds is either smooth or ridges are present. The grooves of the dorsal surface of the carapace vary in strength and may even be absent. Small specimens, *cb* 4.0 mm, have anterolateral teeth more acute and conical than those of larger specimens. The carapace of smaller specimens is usually smoother than that of larger specimens but occasionally transverse rows of granules may be present. Differences between some of

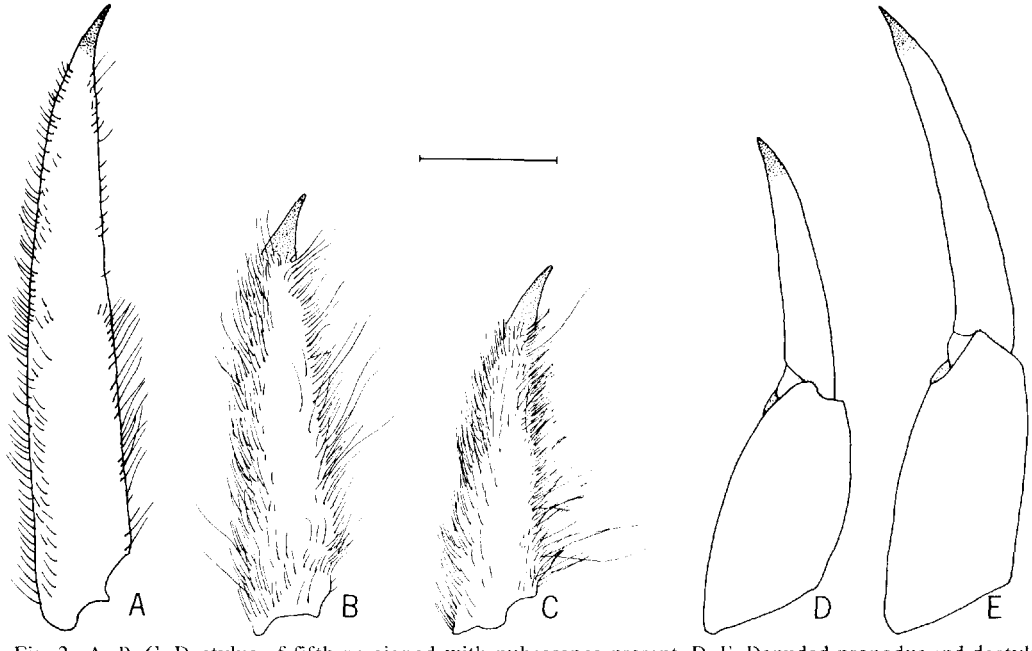

Fig. 2. A, B, C. Dactylus of fifth pereiopod with pubescence present. D, E. Denuded propodus and dactylus of fifth pereiopod. A, E. *Neopanope texana* (Stimpson), MCZ 727. B, C, D. *Neopanope sayi* (Smith), MCZ 977, USNM 69344, MCZ 2254. Scale = 2 mm for D, E; 1 mm for A-C. All specimens adult males of approximately equal size.

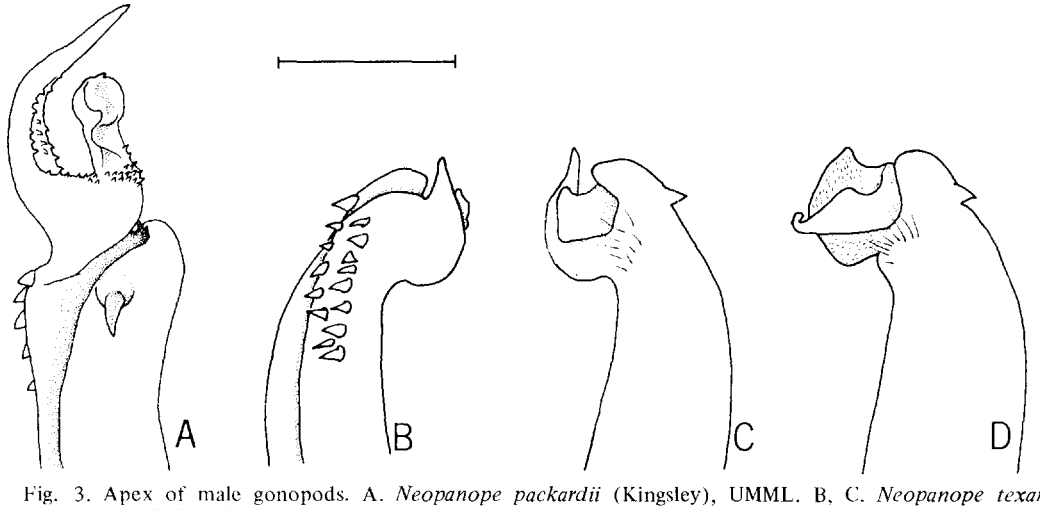

Fig. 3. Apex of male gonopods. A. *Neopanope packardii* (Kingsley), UMML. B, C. *Neopanope texana* (Stimpson), MCZ 727. D. *Neopanope sayi* (Smith), IMS 67. A, B. Lateral view; C, D. Mesial view. Scale = 0.1 mm for A; 0.5 mm for B-D.

the syntypes of *N. pourtalesii* have already been mentioned.

Neopanope texana (Stimpson, 1859)

(Figs. 1A; 2A, E; 3B, C)

Panopeus texanus Stimpson, 1859:55.–Kingsley, 1880:394 [part].–A. Milne Edwards, 1880: 312, pl. 58, figs. 4-4b [part of text = *N. sayi*].–Benedict and Rathbun, 1891: 363, pl. 22, fig. 5, pl. 23, fig. 9.

Neopanope texanus.–Rathbun, 1898:273.

Neopanope texana. Rathbun, 1900:138.

Neopanope texana texana.–Rathbun, 1930:367, text-fig. 57, pl. 168, figs. 1-2.–McMahan, 1967:1 [larvae].

not *Neopanope texana texana*.–Tabb and Manning, 1961:601 [? part; material examined = *N. packardii*].–Williams, 1965:190, figs. 172, 183F [= *N.*

sayi].–Rouse, 1970:143 [? part; material examined = *N. packardii*].
Neopanope sp.– Abele, 1971:217, pl. 1, lower row.

MATERIAL EXAMINED. 4 males, 3 females; Texas; G. Wurdemann; MCZ 127 (syntypes).–2 males, 3 females; Texas; Laguna Madre; USNM 99241.–4 males, 1 female; Florida; Bay County; Panama City; 30 March 1968; C. Swift; UMML.–2 males, 3 females; Florida; Franklin County; 28 January 1968; L. G. Abele, T. Cosper; UMML.–2 males, 1 ovigerous female; Florida; Okaloosa County; Destin jetties; R. W. Hasting; UMML.–32 males, 39 females, 3 ovigerous females; west coast of Florida; USNM 6426, 6653, 6975, 14082, 14089, 15383, 25618 (see Rathbun, 1930:368 for details).

TYPE LOCALITY. St. Joseph's Island, Texas.

DESCRIPTION. Males range in size from *cb* 7.4 to 26.9 mm; females from *cb* 11.8 to 20.5 mm; ovigerous females from *cb* 12.0 to 22.7 mm. The following description is based on specimens (MCZ 127) from Texas. Variation has already been discussed.

The carapace breadth is about 1.3 times its width. It is convex laterally to the base of the anterolateral teeth where it turns upwards. It is evenly convex from anterior to posterior. The regions of the dorsal surface of the carapace are distinct. The frontal (interorbital) margin is arcuate and the median sinus is a much reduced notch. The emargination between the frontal area and the orbit is deep. Five anterolateral teeth (including the outer orbital) are present. The first tooth (outer orbital) is low and partially fused to the second tooth; they are connected by a shallow sinus. The third tooth is subrectangular with the anterior margin being almost straight. The fourth tooth is subtriangular with the posterior margin being longer than the anterior. The fifth tooth is triangular. There is a slight emargination posterior to the fifth tooth on the posterolateral margin of the carapace. The carapace is minutely granulate. The posterolateral margin is longer than the anterolateral margin. The ventral border of the orbit is armed with a distinct mesial tooth and lateral lobe.

The eyestalk is longer than wide; the cornea is well pigmented.

The antennal segment forming the lower mesial portion of the orbit is short and robust being a little longer than wide with a projection on the mesial distal margin. The frontal margin of the carapace is in contact with this segment. The next segment (distally) is less than twice as long as wide and does not extend beyond the frontal margin.

The ischium of the third maxilliped is about 1.7 times as long as wide. The merus has a distolateral projection and a shallow sinus lateral to the mesial angle; proximal to the distal margin the merus expands greatly. The palp is large and robust. There is a longitudinal impression parallel to the mesial margin on the ischium and a deep impression on the mesial distal area of the merus.

The male abdomen has the third through the fifth segments fused. The sixth segment is about 1.4 times as wide as long. The telson is subtriangular and is constricted proximal to the subacute distal margin. It is about 1.5 times as long as wide. The female abdomen has seven segments and is oblong-subcircular in outline.

The chelipeds of the male are unequal with the right usually being larger than the left. The merus is armed with a blunt tooth on the posterior margin of the mesial surface. There is a large blunt lobe on the outer distal margin. The carpus, which is usually smooth, has an indistinct distal groove and is armed with a strong, acute spine on the interior distal margin. The major chela is twice as long as high. The fingers are usually white; the movable one is about as long as the palm. The fingers are armed with low and blunt teeth which decrease in size distally. The length of the minor chela is slightly more than twice its height. The fingers are usually white; the movable one is longer than the palm. They are armed with low, close set teeth; the tips are curved laterally.

The walking legs are long and slender. They are unarmed and similar. The fifth pereiopod has the merus about 3.5 times as long as wide and is slightly less than twice the length of the carpus. The carpus is about twice as long as wide and increases in width distally. It is longer than the propodus. The propodus is less than twice as long as wide and is distinctly shorter than the dactylus. The dactylus is long and slender; the length is about six times the width; it ends in an acute spine. There is scattered pubescence on the merus; a dorsal ridge of short pubescence on the carpus and a dorsal and ventral ridge on the propodus and dactylus.

The gonopod (Fig. 3B, C) is simple. It extends to the level of the base of the second

pereiopod. The tip is directed laterally and the suture of the fold is mesial. The lateral surface of the fold is armed with about 14 short, robust spines, the mesial surface with a single spine. The lateral distal expansion is narrow and elongate distal to the single spine of the mesial surface (Fig. 3C).

The eggs are small and numerous.

The differences between *N. texana* and *N. sayi* are dealt with under the latter species.

DISTRIBUTION. Charlotte County on the west coast of Florida along the Gulf coast of the United States to Texas. If the species occurs farther south than Charlotte County it is rare, because it was not taken during several surveys in Florida Bay or in the Miami area. Material from south Florida reported to be this species was examined and determined to be *N. packardii.*

HABITAT. This species is common among clumps of ascidians and other places of refuge on *Thalassia* grass flats and mud bottoms. Less than a meter to six meters depth. Salinity range of 7.14 to 35.3 o/oo; temperature range of 15.0 to 33.9 C (Dragovich and Kelly, 1964).

REMARKS. Dragovich and Kelly (1964) reported *N. texana* to be the most abundant xanthid in Tampa Bay. They noted ovigerous females during January, February, May, June and July. The species was less common during the summer months and examination of 409 specimens yielded a sex ratio of 1.7:1 (male: female).

McMahan (1967) raised the larvae in the laboratory and found that development of four zoeal and one megalops stage required about 15 days. She compared larvae of species of *Neopanope* giving characters for separation of the zoea and megalops of *N. texana* and *N. sayi* from that of *N. packardii.*

Neopanope sayi (Smith, 1869)

(Figs. 2B, C, D; 3D)

Panopeus sayi Smith, 1869:284. Benedict and Rathbun, 1891:363, pl. 22, fig. 4, pl. 23, figs. 7-8 [rev.].

Panopeus texanus. Kingsley, 1880:394 [part].—A. Milne Edwards, 1880:312 [part].

Neopanope texanus sayi.—Rathbun, 1898:273.

Neopanope texana sayi.—Rathbun, 1900:138.—Rathbun, 1930:369, text-fig. 58, pl. 168, figs. 3-4.—Williams, 1965:190, figs. 173, 183G.

Neopanope texana nigrodigita Rathbun, 1934:3, pl. 1.

Neopanope texana texana.—Williams, 1965:190, figs. 172, 183F.

MATERIAL EXAMINED. 3 males, 1 ovigerous female; Nantucket, Massachusetts; MCZ 975.—3 males, 1 female; Provincetown, Massachusetts; MCZ 977.—25 males, 18 females; Woods Hole, Massachusetts; USNM 3814.—50 males, 25 females, 19 juveniles; Vineyard Sound, Massachusetts; USNM 8487.—5 males; Downville, Providence River, Rhode Island; received 16 November 1875; MCZ 2255.—3 males, 1 female (types of *sayi*); New Haven, Connecticut; YPMNH114.—7 males, 4 females; Morehead City, Carteret County off IMS pier, North Carolina; 26 March 1957; A. B. Williams 679A; IMS 67. 2 males, 1 female, (types of *nigrodigita*); South Carolina; USNM 69344. 18 males, 11 females, 11 ovigerous females; Sapelo Sound, Georgia; summer of 1969; R. Heard; LM; UMML.—7 males, 4 females; east coast of Florida; USNM 39192, 20257, 20255, 20256 (see Rathbun, 1930 for details).—2 males; Florida Keys; MCZ 8365.

TYPE LOCALITY. New Haven, Connecticut.

DESCRIPTION. Males range in size from *cb* 8.1 to 24.5 mm; females from *cb* 9.3 to 16.1 mm; ovigerous females from *cb* 10.0 to 13.1 mm.

This species is very similar to *N. texana* and only the differences will be dealt with here. The most important, consistent differences between the two species are in the form and length of the dactylus of the fifth pereiopod and in the form of the male gonopods. In *N. sayi* the dactylus of the fifth pereiopod (Fig. 2B, C) is as long as or shorter than the propodus (mean of propodus length/dactylus length = 1.02; range = 1 to 1.12) and the dorsal and ventral borders are covered with a thick pubescence. In *N. texana* the dactylus of the fifth pereiopod (Fig. 2A, E) is longer than the propodus (mean propodus length/dactylus length = 0.859; range = 0.787 to 0.920) and the dorsal and ventral borders are covered with a sparse pubescence. The dactylus was measured from the acute tip to the notch which fits against the distal margin of the propodus. The propodus was measured from the proximal ventral angle to the expansion in the middle of the distal margin of the segment. This is the greatest length of the segment because of its irregular shape (compare Figs. 2D, E). In *N. sayi* the mesial lobe of the gonopod (Fig. 3D) is low and broadly rounded while in *N. texana* it is elongate and relatively more narrow (compare Figs. 3C and 3D).

Other differences between the two species were not constant in the material examined, although the following characters were helpful in differentiating adults of the two species. The carapace of *N. sayi* is relatively broader (*cb/cl* = 1.36) than that of *N. texana* (*cb/cl* = 1.30). The posterolateral margin of *N. sayi* is straight posterior to the fifth anterolateral tooth while in *N. texana* there is usually an emargination on the posterolateral border posterior to the fifth anterolateral tooth. From the material examined it appears that *N. sayi* is a smaller species than *N. texana.*

The differences between these two species, although comparatively slight, were constant in the material examined. All specimens referred to as intermediates by Rathbun (1930) were examined and determined to be *N. sayi*. If a cline existed, specimens from southern or northeastern Florida might be expected to be intermediate in form. Specimens from both coasts of Florida were clearly either *N. texana* or *N. sayi*. Two small males (MCZ 8365) from the Florida Keys were *N. sayi*. The available evidence based on morphology of adults, juveniles and larvae (McMahan, 1967) suggests that *N. sayi* and *N. texana* are distinct species.

DISTRIBUTION. Miramichi Bay, Prince Edward Island and Cape Breton Island, New Brunswick, Canada (Bousefield, 1956) to the Florida Keys. The species has been introduced into Swansea, Wales (Naylor, 1960). The species appears to be quite rare south of about Indian River on the east coast of Florida. Intensive collecting in the Miami area has failed to reveal its presence. The only record of this species from southern Florida is based on two small males (MCZ 8365) collected in the 1800's and should perhaps be considered extralimital.

HABITAT. The species occurs on a mud bottom through a salinity range of 14.6 to 31.6 o/oo. Low tide mark to 29 meters (Williams, 1965).

REMARKS. Williams (1965) summarized the available information on this species.

DISCUSSION. The available material suggests that *N. texana* is confined to the Gulf of Mexico while *N. sayi* occurs along the east coast of the United States. This distribution pattern follows the classic example of geographic speciation. During the Miocene and much of the Pliocene when peninsular Florida was submerged, populations now disjunct at peninsular Florida would have been in contact with each other. During the late Pliocene and throughout most of the Pleistocene peninsular Florida was alternately submerged and exposed (see review by Hedgpeth, 1953). This probably greatly reduced gene flow between Gulf and Atlantic coast populations of shallow water marine organisms. The populations have diverged morphologically and presumably genetically due to the random effects of isolating subpopulations or differing selective pressures or both. There are other species pairs among the Decapoda with similar distribution patterns along the Gulf and Atlantic coasts. There are also a number of species with allopatric populations in the Gulf of Mexico and the Atlantic coast of the United States, that are absent from the tropical tip of peninsular Florida. At present, with our scanty knowledge of the population structure and biology of the decapods, it is not possible to state why some populations have undergone differentiation and others with apparent similar structure have not.

Neopanope packardii (Kingsley, 1879)

(Figs. 1B; 3A)

Panopeus packardii Kingsley, 1879:152.

?*Neopanope pourtalesii* A. Milne Edwards, 1880:330, pl. 61, figs. 2-2e [see Historical resumé].

Neopanope packardii.—Rathbun, 1898:273.—Rathbun, 1930:380, text-fig. 59, pl. 168, figs. 5-6.—Costlow and Bookhout, 1967:52 [larvae]. Abele, 1971:218, pl. 1, center.

Neopanope texana texana.—Tabb and Manning, 1961:601 [? in part; material examined = *N. packardii*]. Rouse, 1970:143 [? in part; material examined = *N. packardii*].

MATERIAL EXAMINED. 20 males, 6 females, 10 ovigerous females; northwestern and southern Florida; UMML 32.1388, 32.1404; UMML; LM.—1 male (type of *packardii*); Key West, Florida; MCZ 4800.—1 male (syntype of *pourtalesii*); Woman Key; MCZ 2985.—1 male, 3 females (syntypes of *pourtalesii*); Dry Tortugas; MCZ 9153.

TYPE LOCALITY. Key West, Florida.

DESCRIPTION. Males range in size from *cb* 5.3 to 17.3 mm; females (ovigerous and non-ovigerous) from *cb* 7.0 to 15.8 mm.

This species is quite distinct from both *N. texana* and *N. sayi*. The confusion (see synonymy) has resulted from placing too much reliance upon a single character—the presence or absence of a large basal tooth on the

dactylus of the major chela. The tooth is usually present in *N. packardii* but may be reduced or absent. This is probably due to loss of or damage to the chela and regeneration. The tooth is always absent in both *N. texana* and *N. sayi*.

Males of these species can immediately be distinguished by the form of the gonopod and telson. The gonopod of *N. packardii* (Fig. 3A) has a strong lateral tooth and a distal, elongate accessory process, while the gonopods of both *N. texana* and *N. sayi* (Figs. 3B-D) lack the lateral tooth and the distal accessory process. The telson of males of *N. packardii* is rounded distally (Rathbun, 1930:380, text-fig. 59) while those of males of *N. texana* and *N. sayi* are subtriangular (Rathbun, 1930:367, text-fig. 57; Naylor, 1960:256, fig. 1). The form of the carapace of both sexes of *N. packardii* is different from that of both *N. texana* and *N. sayi* (compare Figs. 1A-B and Williams, 1965, figs. 172-173). In *N. packardii* there are two weak notches on the posterolateral border posterior to the fifth anterolateral tooth. These are absent in *N. sayi* and in *N. texana* there is only a shallow emargination. The third to fifth anterolateral teeth of *N. packardii* are more triangular and acute than those of *N. texana* and *N. sayi*. The antennal segment forming the lower mesial portion of the orbit is distinctly more than twice as long as wide in *N. packardii* while it is only slightly longer than wide in *N. texana* and *N. sayi*. There are differences between the larvae of *N. packardii* and those of *N. texana* and *N. sayi* (cf. McMahan, 1967).

The differences in the form of the gonopod and in the formation of the orbit between *N. packardii* and *N. texana* and *N. sayi* are quite distinct. These differences are of generic importance in the Xanthidae and as *N. pourtalesii* (? = *N. packardii*) is the type species of the genus *Neopanope* A. Milne Edwards, 1880, *N. texana* and *N. sayi* may eventually have to be placed in another genus. The generic placement, however, will have to await a modern revision of the western Atlantic Xanthidae.

DISTRIBUTION. Northwestern Florida south to the Bahamas and Cuba.

HABITAT. The species is common on *Thalassia* grass flats. Low tide mark to 74 meters. Salinity range of 22 to 38 o/oo; temperature range of 16.8 to 28 C (Dragovich and Kelly, 1964; Tabb and Manning, 1961).

REMARKS. Costlow and Bookhout (1967) reared this species in the laboratory at 30 o/oo and 25 C. They described four zoeal and one megalops stage.

The following key will serve to separate the three species of *Neopanope* known to occur in the western Atlantic.

Key to the Species of *Neopanope* in the western Atlantic

1. Gonopod with strong lateral tooth and distal accessory process (Fig. 3A); dactylus of major chela usually with a large basal tooth . . . . . *packardii*
   Gonopod without lateral tooth and distal accessory process (Figs. 3C-3D); dactylus of major chela without a large basal tooth . . .2
2. Dactylus of fifth pereiopod (Fig. 2A, 2E) longer than propodus . . . . . *texana*
   Dactylus of fifth pereiopod (Fig. 2B-D) equal to or shorter than propodus . . . . .*sayi*

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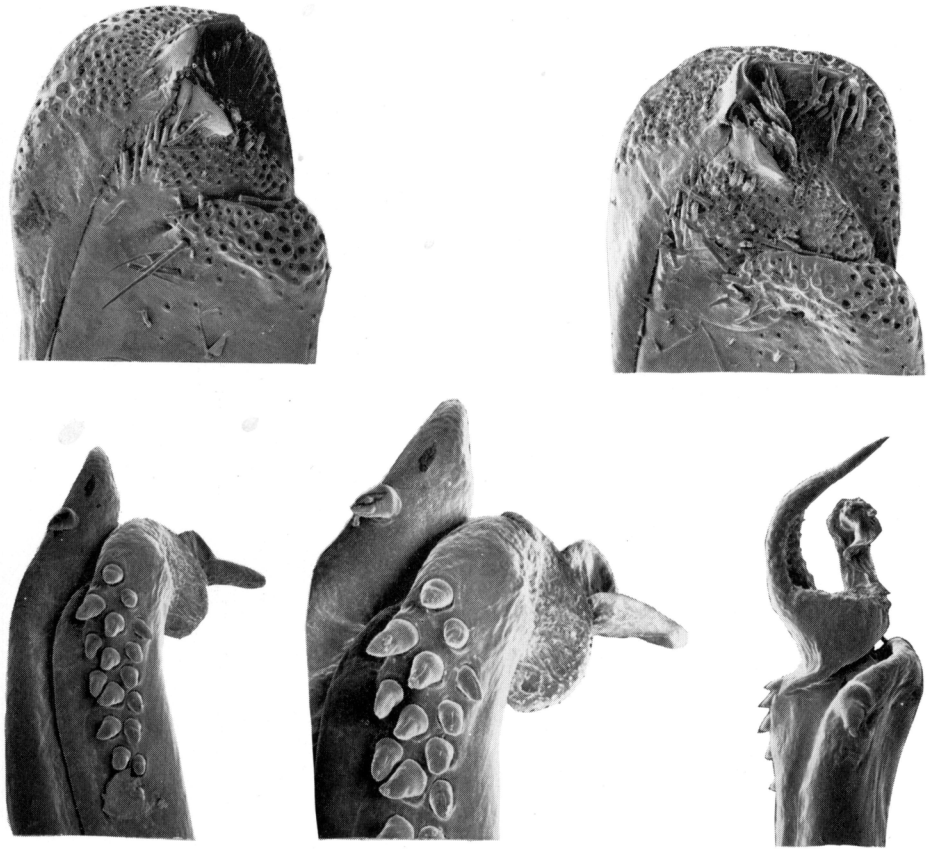

Apex of male gonopods. Upper row: right, *Goniopsis pulchra* (Lockington), × 70; left, *G. cruentata* (Latreille), × 70. Lower row: left and center, *Neopanope* sp.*, left × 108, center × 170; right, *Neopanope packardii* (Kingsley), × 190.

* Neopanope texana (Stimpson). Abele (1972), Chesapeake Science, vol. 13 (4), p. 267 (synonymy).

Replacement plate, to be substituted for pl. 1 opposite p. 218 in Crustaceana vol. 21 part 2.