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CARIDEAN SHRIMPS ASSOCIATED WITH THE SLIMY SEA PLUME (*PSEUDOPTEROGORGIA AMERICANA*) IN MIDSUMMER AT GUANA ISLAND, BRITISH VIRGIN ISLANDS, WEST INDIES

Stephen Spotte, Patricia M. Bubucis, and Robin M. Overstreet

ABSTRACT

Fifty-one slimy sea plumes (*Pseudopterogorgia americana* Gmelin, 1791) were sampled for caridean shrimps at Guana Island, British Virgin Islands, during one week in July 1992. Sampling depth ranged from 3–22 m. Nine species were collected: *Hippolyte nicholsoni* Chace, 1972; *Latreutes* sp.; *Neopontonides chacei* Heard, 1986; *Perclimenes* cf. *patae* Heard and Spotte, 1991; *Perclimenes* cf. *pauper* Holthuis, 1951; *Perclimenes* sp.; *Pseudocoutierea antillensis* Chace, 1972; *Tozeuma* cf. *cornutum* Milne Edwards, 1881; and *Trachycaris rugosa* (Bate, 1888). A total of 1,418 specimens (including fragments) was obtained. The number of shrimp species per gorgonian ranged from 1–5; one gorgonian harbored 156 shrimps. The 2 predominant species, *N. chacei* and *H. nicholsoni*, occupy different mean depths (12.6 and 8.2 m, respectively). Sexual dimorphism assessed with Mann-Whitney *U*-tests was not apparent in the specimens of *N. chacei* ($P > 0.05$), but females of *H. nicholsoni* were significantly larger than males ($P < 0.001$). Minimum carapace length (CL, the tip of the rostrum to the posterior dorsal margin of the carapace) at which male *N. chacei* acquire a single appendix masculina spine is 1.25 mm; male *H. nicholsoni* can acquire a single spine at 0.9 mm CL. Histological sections of male *N. chacei* showed that shrimp with 0 or 1 spine are least likely to be mature. Female *N. chacei* can become ovigerous at 1.9 mm CL and female *H. nicholsoni* at 1.2 mm CL. The taxonomic status of 5 of the 9 species collected is uncertain.

Gorgonians (octocorallians) indigenous to the West Indies are intricate habitats that harbor a diverse array of caridean shrimps. Several authors have mentioned gorgonians as sources of holotypes or paratypes of new shrimp species (e.g., Chace, 1972; Heard, 1986; Heard and Spotte, 1991); others have noted the shrimp-gorgonian association but left its nuances unquantified (e.g., Borradaile, 1920; Patton, 1963, 1972; Criales, 1980, 1984; Cantera *et al.*, 1987). Here we describe aspects of the biology of caridean shrimps collected in midsummer from colonies of the slimy sea plume (*Pseudopterogorgia americana* Gmelin, 1791) at Guana Island, British Virgin Islands.

MATERIALS AND METHODS

Collection of Samples.—Gorgonians often are difficult to identify in the field, but *P. americana* can be recognized easily, is numerous throughout the West Indies, and inhabits a wide range of depths. Our collections were therefore limited to this species. Collections were made during daylight hours between 21 and 26 July 1992 in White Bay at Guana Island, British Virgin Islands, within ~200 m of a point of land known as Iguana Head. At this location the bottom slopes steeply from shore, terminating at 22 m in a level expanse of sand. The site has little wave action, although strong subsurface currents are sometimes encountered. Gor-

gonians grow in profusion along the slope, and *P. americana* is especially abundant. Because of time constraints, sample collection was completed in 6 days.

We follow convention in treating individual gorgonians as sampling units and restricting use of the term samples to collections from all sampling units obtained during a single dive (Ludwig and Reynolds, 1988; Waters and Erman, 1990). Gorgonian colonies were selected haphazardly by diving to the predetermined depth (see below), swimming perpendicular to the slope, and sampling the first colony of *P. americana* encountered.

A numbered plastic bag (45.7 × 91 cm, 0.08-mm thickness) was placed over the gorgonian, cinched by hand at the base, and shaken vigorously to dislodge any shrimps. The bag was then pulled away while still cinched tightly, and its mouth was sealed with a rubber band. Afterward, a yellow plastic tie-wrap was fastened to the base of the colony to prevent repeat sampling. Bags were used only once. Shrimps were recovered by pouring the contents of the bags through a 355- μ m sieve; afterward, they were fixed for several days in 10% Formalin-sea water, then preserved in 70% ethanol. The collection procedure introduces minimal sampling bias, as assessed in a previous study (Spotte and Bubucis, unpublished data). In this other work, shrimps ($N = 0-29$) from 16 colonies of *P. americana* were collected by the method described. Immediately afterward the entire colonies were collected in separate bags and examined for any remaining shrimps. None could be found.

Random numbers corresponding to sampling depths between 3 and 22 m were generated with a hand calculator before every dive in an effort to avoid bias introduced by replicate sampling at arbitrarily selected depth ranges. Excess random numbers were generated

in case a bag broke. We arranged the numbers from deepest to shallowest to facilitate planning of the dives. The sampling sequence within samples was therefore nonrandom. After completion of field work, calibration of the depth gauge was checked in a pressure chamber against known simulated depths using a gauge accurate to within 0.025%. The test was conducted 3 times at 1.5-m intervals (rate of ascent and descent = 0.3 m/s) within a simulated depth range of 0 to 45.7 m. The paired values showed significant correlation, as determined by linear least-squares regression analysis: $N = 126$, $t_{(n-2)} = -3.834$, multiple $R^2 = 0.99$, $P < 0.001$. Depth adjustments in the data therefore were not required.

Collection of Data.—Shrimps were identified from keys of Chace (1972) and Heard (1986). Morphologic and reproductive data recorded were size (measured as carapace length, CL, see below), sex, number of dorsal and ventral rostral teeth (RTD and RTV), whether females were ovigerous or nonovigerous, whether ova were eyed or uneyed, and, where appropriate, number and type of appendix masculina spines (apical and lateral) of males. As defined here, carapace length is the distance between the tip of the rostrum and posterior dorsal margin of the carapace (Heard and Spotte, 1991). The males of some species (e.g., *Hippolyte nicholsoni* Chace, 1972) do not have lateral appendix masculina spines. In one species that has such spines (*Neopontonides chacei* Heard, 1986), the distal lateral spines appear to change into apical spines. The designations apical and lateral are therefore arbitrary, and we chose to express results for *N. chacei* as total appendix masculina spines. Some of the smaller shrimps had rounded nubs where an appendix masculina spine ought to be. We recorded them as males with zero spines. Nonovigerous specimens were sexed by placing one of the second pleopods in a wet mount and examining it with light microscopy for an appendix masculina. Since the sex of some immature specimens could not be determined, this factor was recorded as unknown. For *N. chacei*, chelae of pereopods 2 were recorded as symmetrical or asymmetrical because of discrepancies in available taxonomic keys (see Discussion).

Because *N. chacei* was the predominant species recovered at Guana Island, a series of males ($N = 35$) was sectioned to determine whether the spination of the appendix masculina relates directly to the state of maturity. These specimens were selected from the collections haphazardly, postfixed in Davidson's fixative, embedded in paraffin, sectioned at 4 μm , and stained with hematoxylin and eosin.

Damaged and Fragmented Specimens.—A few specimens removed from the sieve were badly damaged; others were fragmented. Fragments were recovered either as heads (with carapace) or abdomens. We recorded these fragments as individual shrimps for the following reason. If a gorgonian yielded several heads and abdomens of the same species, we could not know whether the fragments belonged together (and if so, which fragments) or matched parts of other individuals perhaps lost during sample collection. In any case, the numbers of detached heads and abdomens were occasionally unequal. True N is therefore unknown.

Fragmented specimens yielded incomplete information. A detached head with carapace could be measured and the rostral teeth counted, but sex was in-

Table 1. Partial frequency table and mean depth of shrimps recovered from the gorgonian *Pseudoptergorgia americana*.

Species	Frequency (N)	Percentage	Mean depth, m
<i>Hippolyte nicholsoni</i>	383	27.01	8.2
<i>Latreutes</i> sp.	13	0.92	14.5
<i>Neopontonides chacei</i>	967	68.19	12.6
<i>Periclimenes</i> cf. <i>patae</i>	36	2.54	11.9
<i>Periclimenes</i> cf. <i>pauper</i>	2	0.14	10.0
<i>Periclimenes</i> sp.	2	0.14	21.3
<i>Pseudocoutierea antillensis</i>	9	0.63	13.6
<i>Tozeuma</i> cf. <i>cornutum</i>	4	0.28	10.2
<i>Trachycaris rugosa</i>	2	0.14	13.7

determinate; a detached abdomen allowed the specimen to be sexed but not measured. Rostrums without tips yielded indeterminate rostral tooth counts and precluded carapace measurement. When both second pleopods were missing from a damaged or fragmented specimen and the shrimp was not ovigerous, sex could not be assessed from external characters.

Analysis of Data.—Data were analyzed first for ecological patterns. We assessed depth distributions by species, by numbers of species, and by numbers of shrimps (all species combined). Possible size (as carapace length) and sex effects on depth distribution were analyzed for the two predominant species. We examined the data for species associations by depth, number of species per gorgonian, numbers of each species per gorgonian, and population intensity (total numbers of shrimps per gorgonian; see Discussion).

Assessed next were biological attributes of the two predominant species based on morphologic and reproductive data. We tested for the effects of sex on size and on numbers of dorsal rostral teeth. In addition, we measured the extent of sexual dimorphism, assessed the relationship between size and numbers of appendix masculina spines (or whether females were ovigerous), and estimated minimum size for possession of one appendix masculina spine or the presence of ova. Absent characters from damaged and fragmented specimens were treated statistically as missing data. Shrimps of indeterminate sex and size were omitted from data analyses involving these factors.

Only the pressure-gauge variables were distributed normally. Transformation did not relieve heteroscedasticity in the other variables, and they were assessed mainly by nonparametric methods.

RESULTS

Over six days we collected nine samples comprising 51 gorgonians, recovering 1,418 specimens (including fragments) of nine species (Table 1). Of the total number, 1,364 (96%) were whole, undamaged shrimps yielding complete data. *Neopontonides chacei* and *Hippolyte nicholsoni* were present in the greatest numbers (Table 1). The number of species per gorgonian ranged from

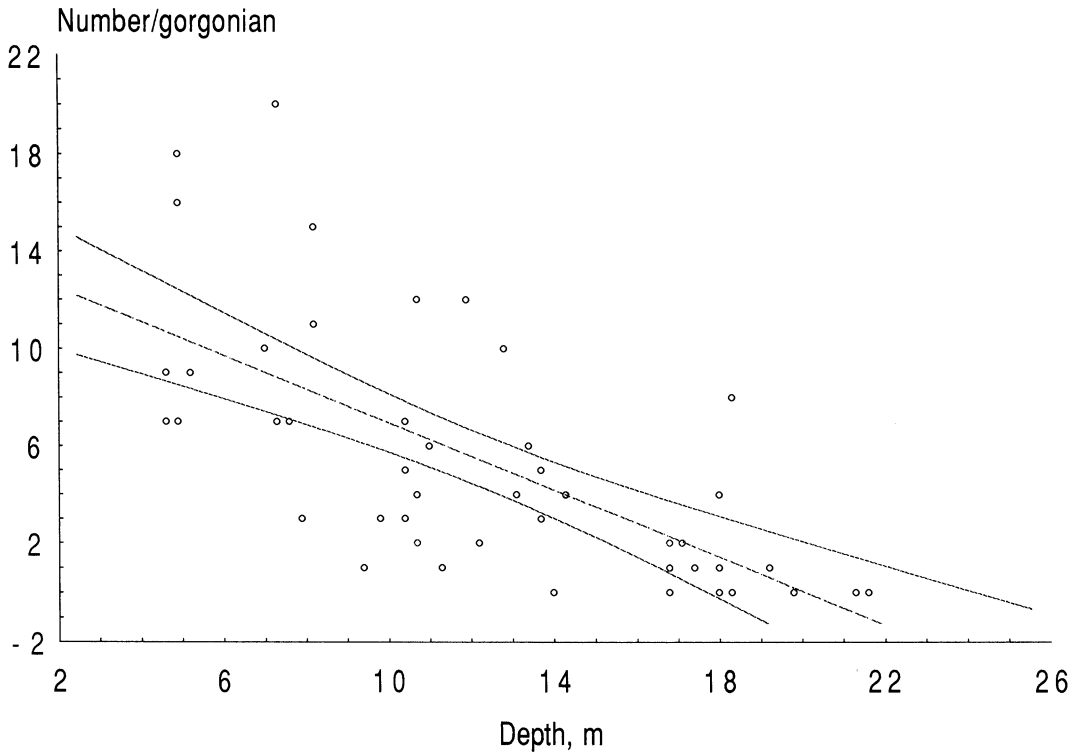


Fig. 1. *Hippolyte nicholsoni*, scatterplot of numbers per gorgonian against depth. Curve fit is linear, confidence intervals are 95%, $N = 51$. Casewise plots of the regression residuals revealed three outliers that exceeded ± 2.5 times the standard deviations of the residuals. These were removed prior to plotting. Regression results: $R^2 = 0.46$, $a = 13.84$, $b = -0.69$, $F_{(1,46)} = 39.86$, $P = 0.00$.

1–5 ($\bar{x} = 2.4$). The range in total population intensity was 1–156 with a mean of 27.71 (± 32.71 SD). The large standard deviation (relative to the mean) is indicative of a clumped distribution (Ludwig and Reynolds, 1988).

Mean depth distributions by species are summarized in Table 1. The predominant species, *N. chacei* and *H. nicholsoni*, occupy different mean depths. A casewise scatterplot of the numbers of *N. chacei* per gorgonian against depth yielded a horizontal regression line, suggesting little variation. The negative regression line in a similar plot of the data for *H. nicholsoni* (Fig. 1) indicates that the numbers of *H. nicholsoni* per gorgonian diminish with depth.

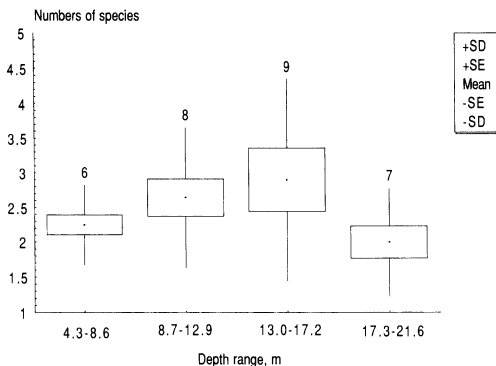


Fig. 2. Numbers of shrimp species (range = 1–9), box and whisker plots against four arbitrarily selected depth ranges; $N = 51$. Maximum numbers of species are shown above the whiskers.

We converted raw depth data into four octaves of arbitrarily selected ranges. The greatest mean number of species occurred between 13.0 and 17.2 m (Fig. 2), although the greatest mean number of shrimps was found between 8.7 and 12.9 m (Fig. 3). Depth distributions of *N. chacei* and *H. nicholsoni* by size (i.e., by CL) were tested independently with Spearman's rank correlation test. The slope of the curve was slightly negative in each analysis, and the paired variables in both instances showed significant correlation. For *N. chacei* $N =$

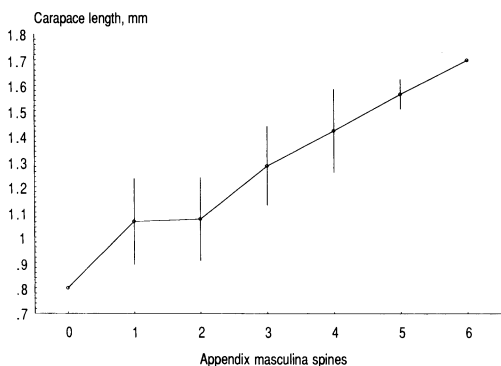


Fig. 5. *Hippolyte nicholsoni* males, standard deviation plots of carapace length against total numbers of appendix masculina spines.

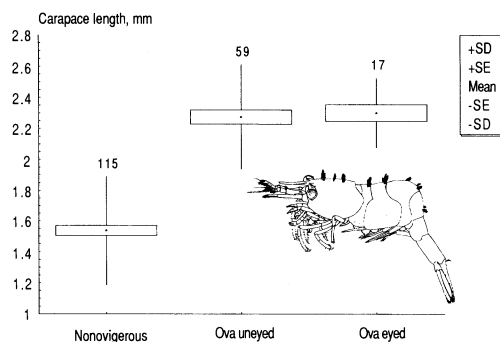


Fig. 7. *Hippolyte nicholsoni* females, box and whisker plots of reproductive status with *N* shown above the whiskers.

Figures 6, 7 summarize relative egg-bearing status of the two predominant species. Female *N. chacei* can become ovigerous at 1.9 mm CL (\bar{x} = 2.4 mm, range = 1.9–2.8 mm). For female *H. nicholsoni*, minimum carapace length of ovigerous specimens is 1.2 mm (\bar{x} = 2.3 mm, range = 1.2–2.9 mm). In both species, carapace lengths of females with uneyed versus eyed ova were statistically indistinguishable, as tested with Mann-Whitney *U*-tests using CL as the dependent variable: for *N. chacei*, $U = 1,331.50$, $P = 0.74$; for *H. nicholsoni*, $U = 437.50$, $P = 0.77$.

In his species description of *Neopontonides chacei*, Heard (1986) reported that the chelae of pereopods 2 are symmetrical (see Discussion). In our material, 11% (101 of 903 specimens) had asymmetrical chelae. We recorded these data in dichotomous form (specimens missing a chela were excluded)

and performed a 2×2 contingency analysis to test the null hypothesis of independence between sex and chelae symmetry. The null was rejected ($N = 892$, $\chi^2 = 78.74$, $P = 0.00$; $\phi^2 = 0.09$). At Guana Island, female *N. chacei* are more likely than males to have asymmetrical chelae (Fig. 8).

The reproductive status of males of *N. chacei* was readily apparent histologically in most of the 35 sectioned specimens. Figures 9, 10 illustrate the testis and associated vasa deferentia of immature (Fig. 9A–C) and mature specimens (Figs. 9D–F, 10A–D). Shrimp without appendix masculina spines or with a single spine are least likely to be mature.

DISCUSSION

To summarize some of the salient results, individual colonies of *Pseudopteroorgia americana* harbored up to 156 caridean shrimps of as many as five species. *Neo-*

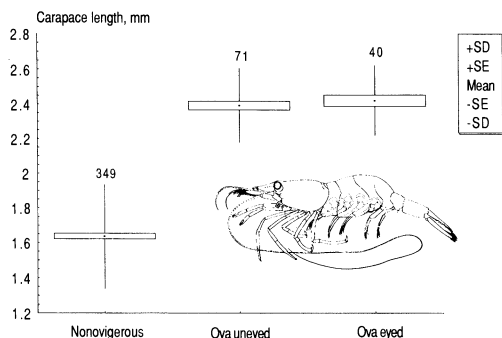


Fig. 6. *Neopontonides chacei* females, box and whisker plots of reproductive status with *N* shown above the whiskers.

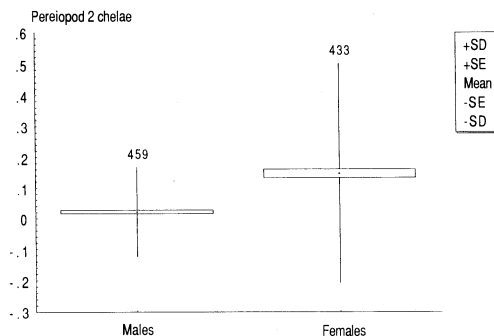


Fig. 8. *Neopontonides chacei*, box and whisker plots of the relative incidence of pereopod 2 symmetry by sex with *N* shown above the whiskers. Scale of the ordinate: 0 = symmetrical, 1 = asymmetrical.

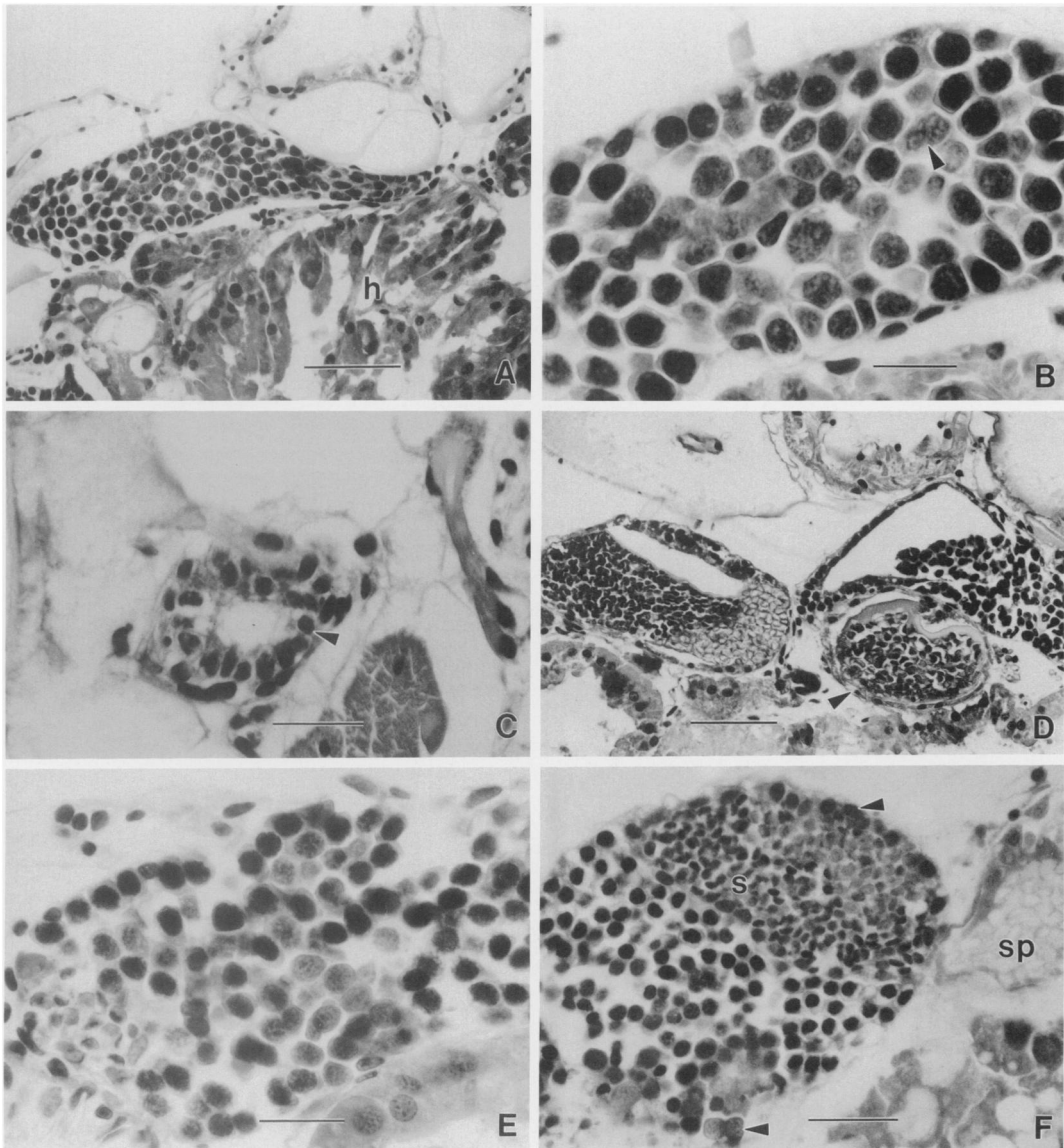


Fig. 9. *Neopontonides chacei*, histological sections of male reproductive system, hematoxylin and eosin. A–C, Immature specimens. A, Testis overlying hepatopancreas (h), sagittal section, anterior end of shrimp to left of photograph, 1 spine on pleopod 2, CL = 1.4 mm, scale bar = 50 μ m. B, Close-up of (A) showing spermatogonia (e.g., arrowhead), scale bar = 15 μ m. C, Vas deferens showing relatively thick columnar epithelial lining (arrowhead), transverse section with median of shrimp to left, 1 spine, CL = 1.3 mm, scale bar = 20 μ m. D–F, Mature specimens, sagittal sections. D, Testis showing proximal secretory portion of vas deferens (arrowhead) with anterior end of shrimp to right of photograph, 7 spines, CL = 2.1 mm, scale bar = 60 μ m. E, F, Poorly defined germinal cysts showing relatively small spermatids (s), 3 and 7 spines, CL = 1.6 and 2.0 mm, scale bars = 20 and 30 μ m. Note nurse cells (arrowheads) in periphery of testis and spermatozoa (sp) in proximal vas deferens of F.

pontonides chacei and *Hippolyte nicholsoni*, the predominant species, occupy different mean depths. The depth distribution of *H. nicholsoni* shows the stronger trend, with numbers of shrimp per gorgonian declining

as depth increases. Most of the nine species collected occurred near the shallow end of the sampled depth range. The depth at which the greatest mean number of shrimps was found (Fig. 3) bracketed the mean depth

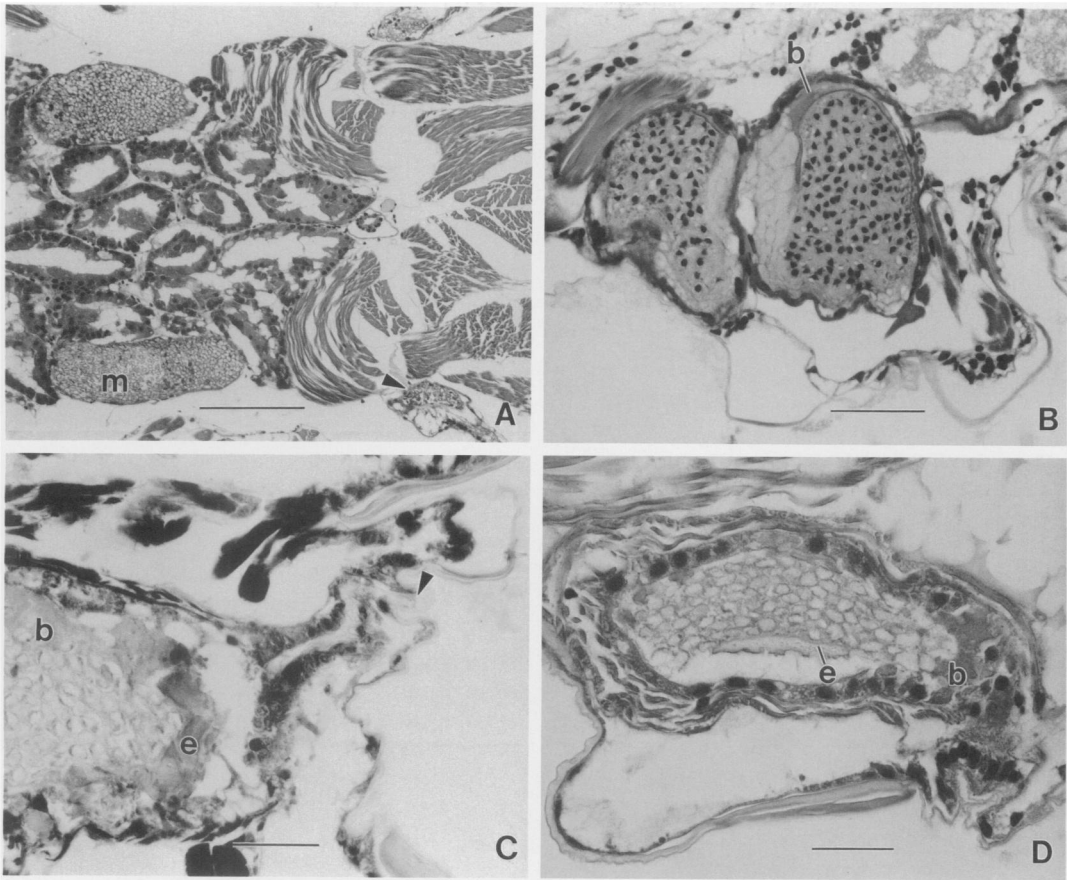


Fig. 10. *Neopontonides chacei*, histological sections of male reproductive system showing vasa deferentia of mature specimens, hematoxylin and eosin. A, Frontal section showing pair, with anterior distended medial vasa deferentia (m) on both sides of hepatopancreas and posterior distal vasa deferentia (arrowhead) associated with pair of pereopods 5 lateral to abdominal muscles, 8 spines on pleopod 2, CL = 2.3 mm, scale bar = 150 μ m. B, Sagittal section of distal vas deferens with basophilic matrix (b), dorsum of shrimp on top and anterior of shrimp toward right of photograph, 4 spines, CL = 1.5 mm, scale bar = 50 μ m. C, Transverse section showing basophilic (b) and eosinophilic (e) matrices in addition to constricted ejaculatory duct leading to gonopore (arrowhead) that opens at exterior of coxa of pereopods 5, lateral margin of shrimp on top, 6 spines, CL = 1.8, scale bar = 30 μ m. D, Sagittal section showing gonopore and basophilic (b) and eosinophilic (e) matrices, 7 spines, CL = 2.4 mm, scale bar = 30 μ m, dorsum of shrimp toward top of photograph.

occupied by *N. chacei*, which outnumbered all other species combined. Depth distributions of *N. chacei* and *H. nicholsoni* were independent of sex and weakly dependent on size.

Significant differences in between-species associations as a function of depth were apparent mainly when *H. nicholsoni* was included as a pair member, emphasizing the comparatively limited vertical range of this species. Sexual dimorphism was apparent in *H. nicholsoni*, with females significantly larger than males. Relatively more *H. nicholsoni* than *N. chacei* were ovigerous,

which raises the possibility of offset timing of reproduction. In both species, females with eyed versus uneyed ova were of similar size. If female reproduction is size dependent, those with uneyed ova might have been younger. Intraspecific differences in mean carapace length were not significant between the two groups. However, specimens with uneyed ova were slightly smaller (2.39 versus 2.41 mm for *N. chacei*; 2.27 versus 2.30 mm for *H. nicholsoni*).

According to data obtained from sectioned specimens, the state of maturity of males of *N. chacei* relates positively to both

size and the number of appendix masculina spines. Histological aspects of the male reproductive system of palaemonids and other decapod crustaceans vary considerably (Krol *et al.*, 1992). Our Figs. 9, 10 depict the weakly delineated germinal cysts containing distinct stages of spermatogenesis in mature individuals that were not apparent in immature specimens. At least two types of epithelial secretions consolidate the spermatophore. A mucoid substance, presumably the eosinophilic matrix illustrated in Fig. 9C, D, if analogous to the adhesive matrix of *Macrobrachium rosenbergii* described by Chow *et al.* (1982), surrounds and adheres the mass to the female. The adhesive matrix hardens within a few hours of mating; the basophilic matrix (Fig. 9B–D) swells, becomes softer, and serves as a protective substance (Chow *et al.*, 1982). As in other crustaceans, the appendix masculina, the spinous process on the endopod of pleopod 2, and the special setation on pleopod 1 apparently function in transfer of the spermatophoric mass to the ventral surface of the female's first abdominal sternite (e.g., Bauer, 1986).

Our overall results are clouded by the uncertain taxonomic status of the shrimps collected. Of nine species, only *H. nicholsoni*, *Pseudocoutierea antillensis* Chace, 1972, and *Trachycaris rugosa* (Bate, 1888) could be identified with confidence using morphologic characters and existing keys. *Neopontonides chacei* was described by Heard (1986) based on 31 specimens from St. Lucia (West Indies), Antigua (British West Indies), Carrie Bow Cay (Belize), and the Florida Keys (U.S.A.). Some had been collected from *Pseudopterogorgia americana*. Heard listed the principal diagnostic characters as: (1) rostrum with 0–4 dorsal teeth but no ventral teeth, (2) chelae of pereopods 2 symmetrical, and (3) merus of pereopods 3–5 lacking a well-developed tubercle or keel-like swelling on the distal flexor margin. These characters distinguish *N. chacei* from *N. beaufortensis* Borradaile, 1920, and *N. dentiger* Holthuis, 1951, the only other described members of the genus. Heard considered *N. chacei* to be most closely related to *N. beaufortensis*, differing in the symmetry of its pereopod 2 chelae, in the comparative slenderness of its pereopods 3–5, in the absence of a tubercle on the merus of

pereopods 3–5, in the shape of the rostrum and eyelobe, and in the setation and spination of pleopods 1 and 2 and the propodus of pereopod 5.

The Guana Island specimens agree with Heard's species diagnosis in having 0–4 dorsal rostral teeth (three specimens have a single ventral tooth). However, many of the Guana Island shrimp have asymmetrical pereopod 2 chelae; still others have a prominent tubercle on the distal flexor margin of the merus of pereopods 3–5. These last two characters are diagnostic of *N. beaufortensis*. Heard (1986) was aware of overlapping characters and suggested that all specimens of *N. beaufortensis* in reference collections be compared with *N. chacei*.

Deviation from diagnostic species characters might not be unusual in a large series of specimens such as ours; alternatively, regional variation should not be discounted. Heard (1986) mentioned examining several shrimp collected from species of gorgonians other than *P. americana* and finding them similar to *N. beaufortensis* in some characters but distinct in others. He concluded: "These forms may represent new taxa or they may be ecophenotypic variants of *N. beaufortensis*."

Neopontonides dentiger, the remaining described species, is generally thought to be restricted to the northeastern Pacific (Wicksten, 1983; Rios, 1986; Cantera *et al.*, 1987). An apparent exception is a male labeled *Neopontonides* nr. *dentiger* from collections of the National Museum of Natural History. The shrimp (USNM 249877), which has 9 dorsal rostral teeth, was captured at Ubaituba, Brazil, on 16 January 1963. Another shrimp (USNM 143356, ovigerous) labeled *Neopontonides* sp., collected 5 July 1970 from the Pacific side of Panamá (off Taboga), has a pronounced rostral shelf. It could represent an undescribed genus (R. W. Heard, personal communication).

We have not compared the Guana Island shrimps with type material of *N. chacei*. They bear little resemblance to descriptions of *N. dentiger* and differ noticeably from the specimens of *N. beaufortensis* supplied to us by R. W. Heard. Based on the evidence available, we conclude that the Guana Island shrimps are *N. chacei* and not an undescribed species of *Neopontonides*.

Criales (1992) recently clarified the tax-

onomic status of *Trachycaris rugosa*. She was able to examine only nine males in existing reference collections. Two had been collected at 25 m off Isla de Aguja (Colombia) and the remaining seven between 33 and 68 m off South Carolina (U.S.A.). Females available for examination were far more numerous and came from depths of 8–20 m. Known substrata from which both sexes had been collected included coral, coral sand, and calcareous algae. Criales speculated that male *T. rugosa* are more cryptic than females and live at greater depths.

Both Guana Island specimens of *T. rugosa* in our collections are small males (CL = 2.5 mm) obtained from the same gorgonian at 13.7 m. Males examined by Criales (1992) were larger (CL = 3.03–5.65 mm). Our findings extend the habitable depth of male *T. rugosa* into the known range of females, but add little to knowledge of substratum occupancy. Although we were careful to sample only gorgonian colonies, small bits of substratum might have entered the sample bags inadvertently.

The Guana Island specimens of *Latreutes* sp. are juveniles of an apparently undescribed species (R. W. Heard, personal communication). The species of *Tozeuma* is represented by developed juvenile specimens and appears to be closest to *T. cornutum* Milne Edwards, 1881. The rostrum is unarmed dorsally, and the margins of pereopods 3–5 lack accessory spines.

Any small shrimps collected from the western North Atlantic and identified as species of *Periclimenes* require careful examination. This applies especially to those of the “iridescens” complex (Heard and Spotte, 1991; Spotte *et al.*, 1994), an unknown number of species conforming with *P. iridescens* Lebour, 1949, in Chace’s key (Chace, 1972). Most of the *Periclimenes* spp. that we collected at Guana Island are juveniles, which makes their identities even more uncertain. Those labeled *P. cf. pauper* Holthuis, 1951, deviate from *P. iridescens* in Chace’s key by having lateral branches of the antennular flagella that are less than half as long as the fused portion.

Shrimps labeled *Periclimenes cf. patae* Heard and Spotte, 1991, have the requisite single row of comb setae on the distal end of the pereopod 5 propodus, but the setae are slender and fewer in number (see fig. 3f,

p. 44, of Heard and Spotte, 1991). In addition, the dactyl of pereopod 5 is much longer and narrower than comparable dactyls of *P. patae* that we have seen. Two juvenile shrimps labeled *Periclimenes* sp. bear a superficial resemblance to *P. pauper* until compared directly with the holotype of *P. pauper*. These specimens, unlike the holotype, have bifid dactyls.

Counts of total numbers of shrimps per gorgonian are a measure of “population intensity,” defined by Waters and Erman (1990) as an estimate of a population expressed as the number of organisms per habitat unit (i.e., sampling unit). This is to be distinguished from “population density,” which is the number of organisms per surface area or volume of the sampling unit (Waters and Erman, 1990). We were unable to calculate population densities because we knew neither the surface area nor the volume of the individual gorgonians. *Pseudopterogorgia americana* grows in protean forms. Branches are often partly or completely dead, and overall shape varies from gnarled and bent to fully upright and bushy. As in other cnidarians, the percentage of polyps expanded and contracted, and the extent of expansion and contraction, substantially affect both the surface area and volume of a colony. Newly collected colonies retract their polyps and shed mucus copiously. The result of this trauma is colony deformation within minutes. The common name “slimy sea plume” has not been bestowed loosely, and separating shrimps from mucus retained in the sample bags became the most tedious aspect of our collection procedure. The prospect of obtaining useful information about the surface area or volume of gorgonian colonies is bleak. Any future method of determining population densities of gorgonian shrimps should probably be applied in the field under conditions of minimal disturbance. Our sampling technique appears to stress colonies of *P. americana* severely, but does not kill them (Spotte and Bubucis, unpublished data). Full recovery, however, might take weeks or months. The alternative is to devise collection procedures that are less stressful to the host.

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