

Pontoniine shrimps (Decapoda: Caridea: Palaemonidae) of the northwest Atlantic. V. *Periclimenes mclellandi*, a new species, a gorgonian associate from Pine Cay, Turks and Caicos Islands, British West Indies

Richard W. Heard and Stephen Spotte

(RWH) Invertebrate Zoology Section, Institute of Marine Sciences, University of Southern Mississippi, P.O. Box 7000, Ocean Springs, Mississippi 39566, U.S.A.;(SS) Marine Sciences & Technology Center, The University of Connecticut at Avery Point, Groton, Connecticut 06340, U.S.A.

Abstract.—Specimens of *Periclimenes mclellandi*, new species, were collected from gorgonians, primarily *Pseudopterogorgia americana* Gmelin, at depths of 14 to 43 m off Pine Cay, Turks and Caicos Islands, British West Indies. The new species belongs to the “*iridescens*” complex and is similar to *P. patae* Heard & Spotte, 1991, also associated with gorgonians at Pine Cay and the Florida Keys, but at shallower depths. *Periclimenes mclellandi* is distinguished from *P. patae* by a bilobate endite on the second maxillae, two rows of combsetae on the propodus of fifth pereopods, shorter and deeper rostrum with fewer rostral teeth, and an overall greenish coloration in life. Both species are distinguished from other described members of the “*iridescens*” complex by the chelae of the second pereopods, which are similar and equal or nearly equal in size, and by the dactyls of pereopods 3-5, which are simple instead of biunguiculate. Some specimens of *P. mclellandi* were parasitized by an unidentified aceolid trematode metacercaria and an undescribed bopyrid isopod.

This report is fifth in a series devoted to the taxonomy, distribution, and ecology of shrimps belonging to the palaemonid subfamily Pontoniinae. Previous contributions to this series are Heard (1986), Heard & Spotte (1991), Heard et al. (1993), and Spotte et al. (1994).

An undescribed species of *Periclimenes* Costa, 1844, was discovered on colonies of gorgonians, primarily *Pseudopterogorgia americana* (Gmelin, 1791), along the fore-reef slope west of Pine Cay in the Turks and Caicos Islands, British West Indies, near 21°53'N, 72°05'W. The new species resembles *P. patae* Heard & Spotte, 1991, another gorgonian associate from Pine Cay and the Florida Keys. Carapace length (CL) is defined here as the distance from the tip of the rostrum to the posterodorsal margin of the carapace. Type material has been de-

posited in the collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), and Gulf Coast Research Laboratory Museum (GCRL).

Periclimenes mclellandi, new species
Figs. 1-5

Periclimenes sp. A.—Spotte & Bubucis
1996:229

Material examined.—Holotype, Ovigerous female, CL = 2.40 mm, (USNM 276042), forereef slope west of Pine Cay, Turks and Caicos Islands, British West Indies, on gorgonian *Pseudopterogorgia americana*, 29 m, 14 Nov 1989, colls. S. Spotte and P. M. Bubucis. Paratypes from *P. americana*, same general locality as holotype, colls. S. Spotte and P. M. Bubucis.

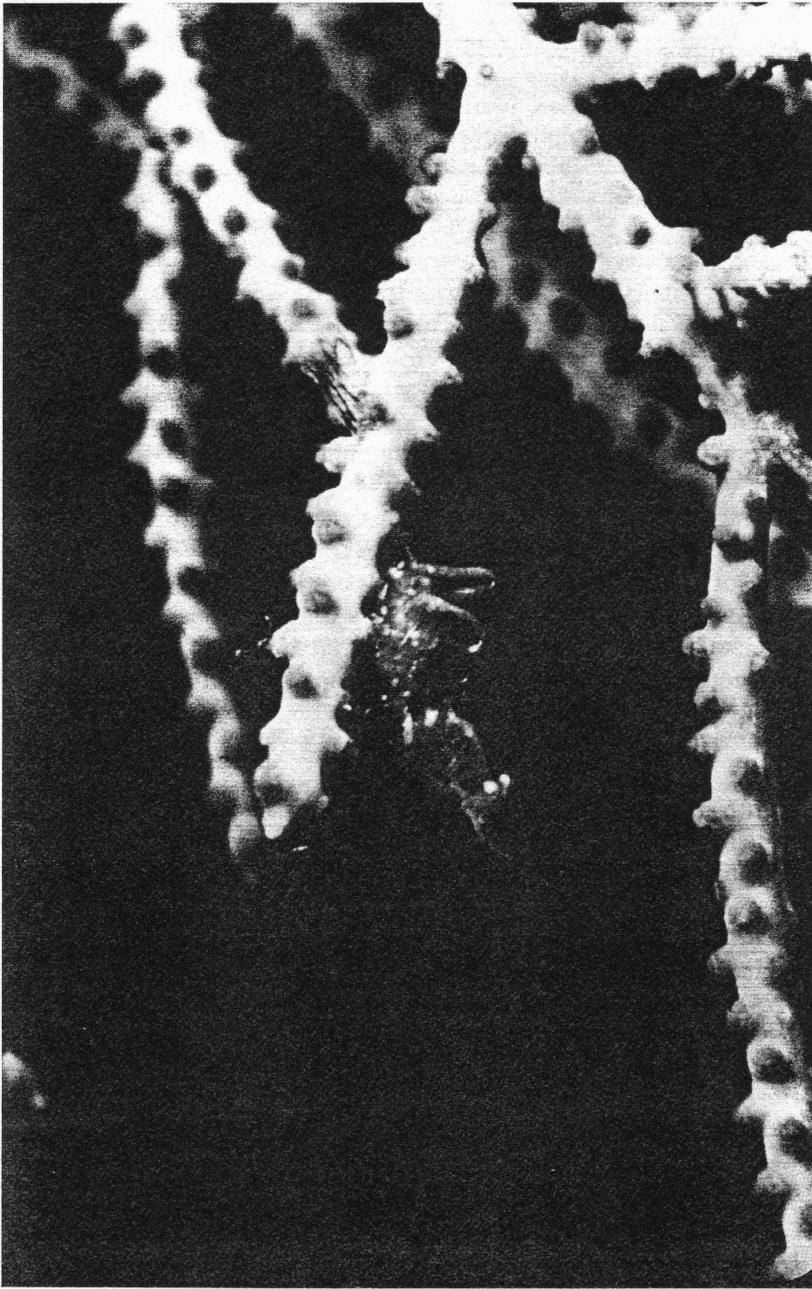


Fig. 1. *Periclimenes mcllellandii*, new species, lateral view of an ovigerous female on an unidentified gorgonian. Note the two transverse bands. Photographed in situ at Pine Cay, Turks and Caicos Islands, 5 July 1990, 15 m.

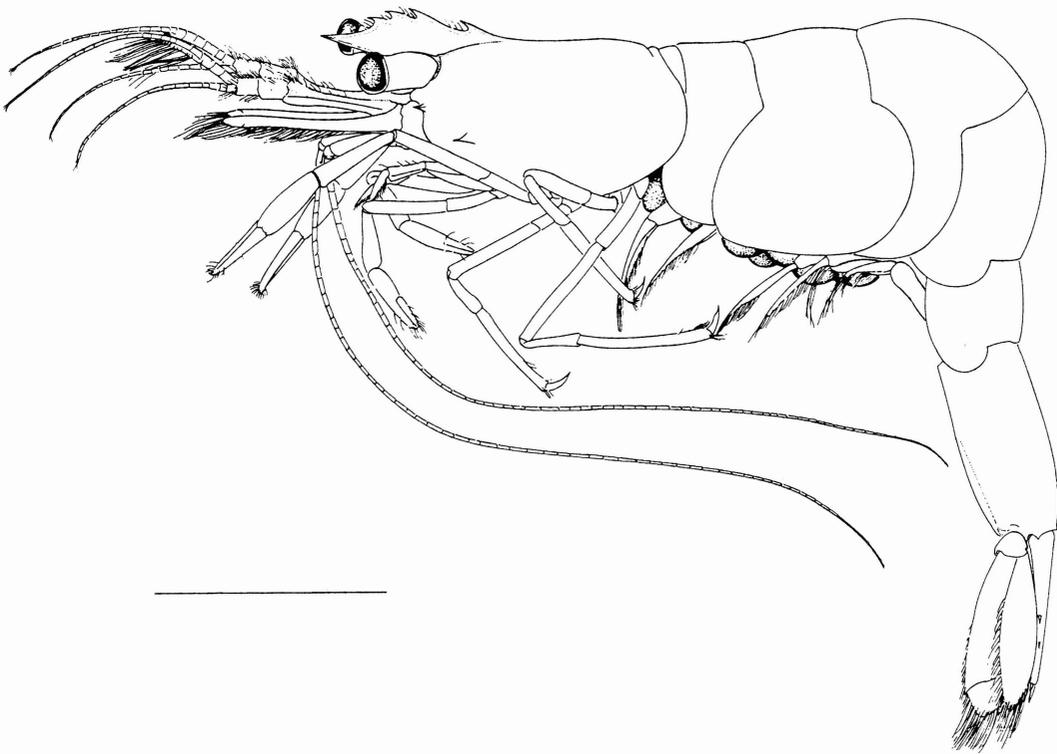


Fig. 2. *Periclimenes mclellandi*, new species, lateral view of ovigerous female. Scale = 2.0 mm.

Male, CL = 1.92 mm, (USNM 276043), 21 m, 8 Nov 1989; male, CL = 1.67 mm, (USNM 276044), 20 m, 9 Nov 1989; 1 ovigerous female, CL = 2.88 mm, 1 male, CL = 2.05 mm, (USNM 276045), 26–29 m, 14 Nov 1989; 2 females, CL = 2.40, 2.43 mm, (USNM 276046), 17–19 m, 10 May 1990; 1 male, CL = 1.92 mm, 1 female, CL = 2.46, (GCRL 1342), 26–32 m, 8 May 1990.

Diagnosis.—Small (CL less than 3 mm), greenish in life. Rostrum deep, unarmed ventrally, nearly straight or curved upward at tip, in females extending anteriorly beyond midsection of first segment of antennular peduncle, in males not extending to midsection of first segment of antennular peduncle; both sexes with as many as 5 dorsal rostral teeth, rarely more than 4 in males. Carapace with well developed antennal and hepatic spines, lacking other spines or ornamentation. Abdominal pleura rounded, abdominal somite 6 twice length of somite 5. Mesial spines on posterior margin

of telson $\frac{3}{4}$ length of intermediate spines. Cornea slightly narrower than eye-stalk, constricted at junction with eye-stalk; accessory pigment spot and associated ommatidia present on dorsoproximal margin of cornea. Maxilla 2, endite bilobate. Pereopods 2 equal or nearly equal, undifferentiated, chelae lacking distinct teeth (vestiges of teeth sometimes present). Pereopods 3–5 with dactyls simple, propodi with 1 spine-seta on distoflexor margin; propodus of pereopods 5 with 2 rows of comb-setae on distal inner margin, (1 or both rows can be absent in small specimens).

Description of adult female (Figs. 1, 2, 4a–f, h, i, 5, 6).—Carapace with rostrum curved slightly upward at tip, not reaching to distal margin of first article of antennular peduncle; 4, or occasionally 5, dorsal teeth interspersed with small setae; first tooth of rostrum usually even with hepatic spine, second tooth usually anterior to posterior margin of orbit; ventral surface without

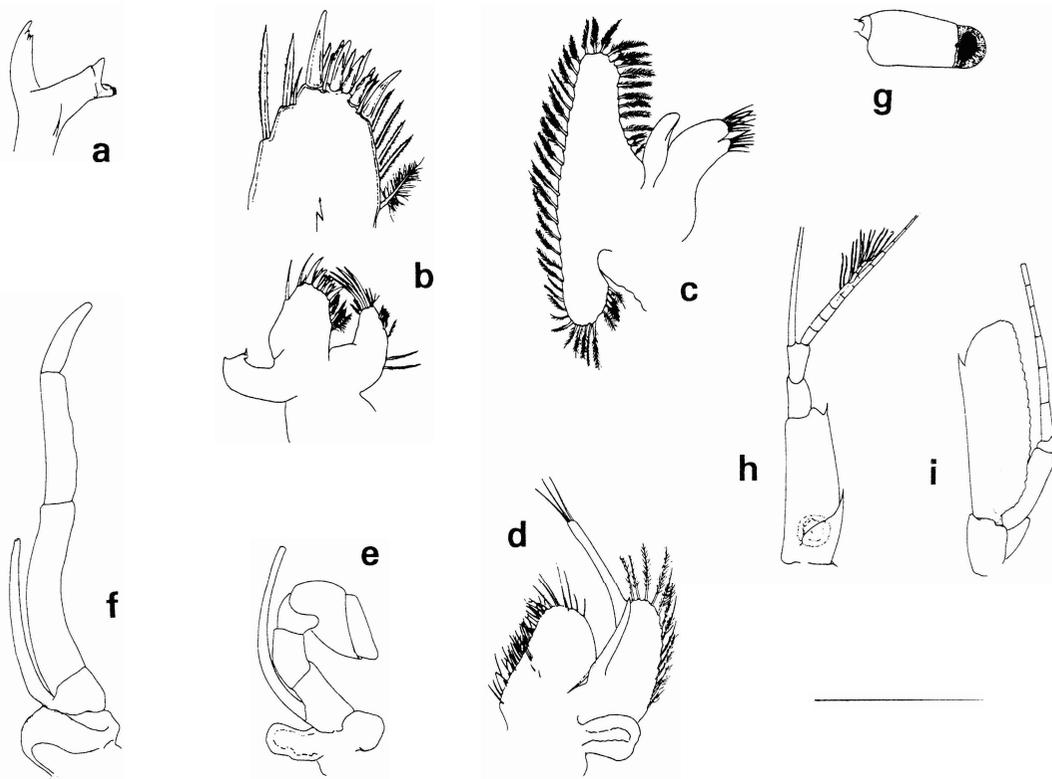


Fig. 3. *Periclimenes mcLellandi*, new species: a, mandible; b, maxilla 1; c, maxilla 2; d, maxilliped 1; e, maxilliped 2 (setae omitted); f, maxilliped 3; g, eye; h, left antennule (ventral aspect); i, right antennule (ventral aspect). Scale = 0.4 mm for a-e, 1.0 mm for g-i.

teeth, posterior $\frac{1}{2}$ with setae. Antennal spine well developed. Hepatic spine well developed, slightly larger, more robust, and less attenuated than antennal spine. No other spines or ornamentation on carapace.

Abdominal somites (Fig. 2) with pleura rounded, somite 6 twice length of somite 5 and same length as telson when measured along dorsal margin.

Telson (Fig. 4i) with 2 pairs of dorsolateral spines, anterior pair slightly anterior to mid-length, posterior pair closer to end of telson than to anterior pair. Three pairs of apical spine-setae; lateral pair short; intermediate pair longest, 4 times length of lateral pair; mesial pair plumose, approximately $\frac{3}{4}$ length of intermediate pair. Minute, acute apical process present between mesial spine-setae.

Antennular peduncle (Fig. 3h) with

sharp, slender stylocerite extending nearly to midline of basal article; distolateral margin of basal article with 1 spine; combined length of second and third articles $\frac{1}{2}$ that of basal article. Lateral antennular flagellum with 2 branches fused for approximately 5 articles; shortest unfused part of branch consisting of 3 articles, each bearing aesthetascs (3 on terminal article, 2 on proximal unfused articles), shorter than fused portion, distal articles of which bear 2-4 aesthetascs.

Antennal scale (Fig. 3i) with just overreaching antennular peduncle, length 3 times width, lateral margin nearly straight, distolateral spine well short of anteromesial angle of blade. Antennal peduncle extending to mid-length of blade.

Eye (Fig. 3g) with cornea diameter distinctly less than proximile diameter of eye-

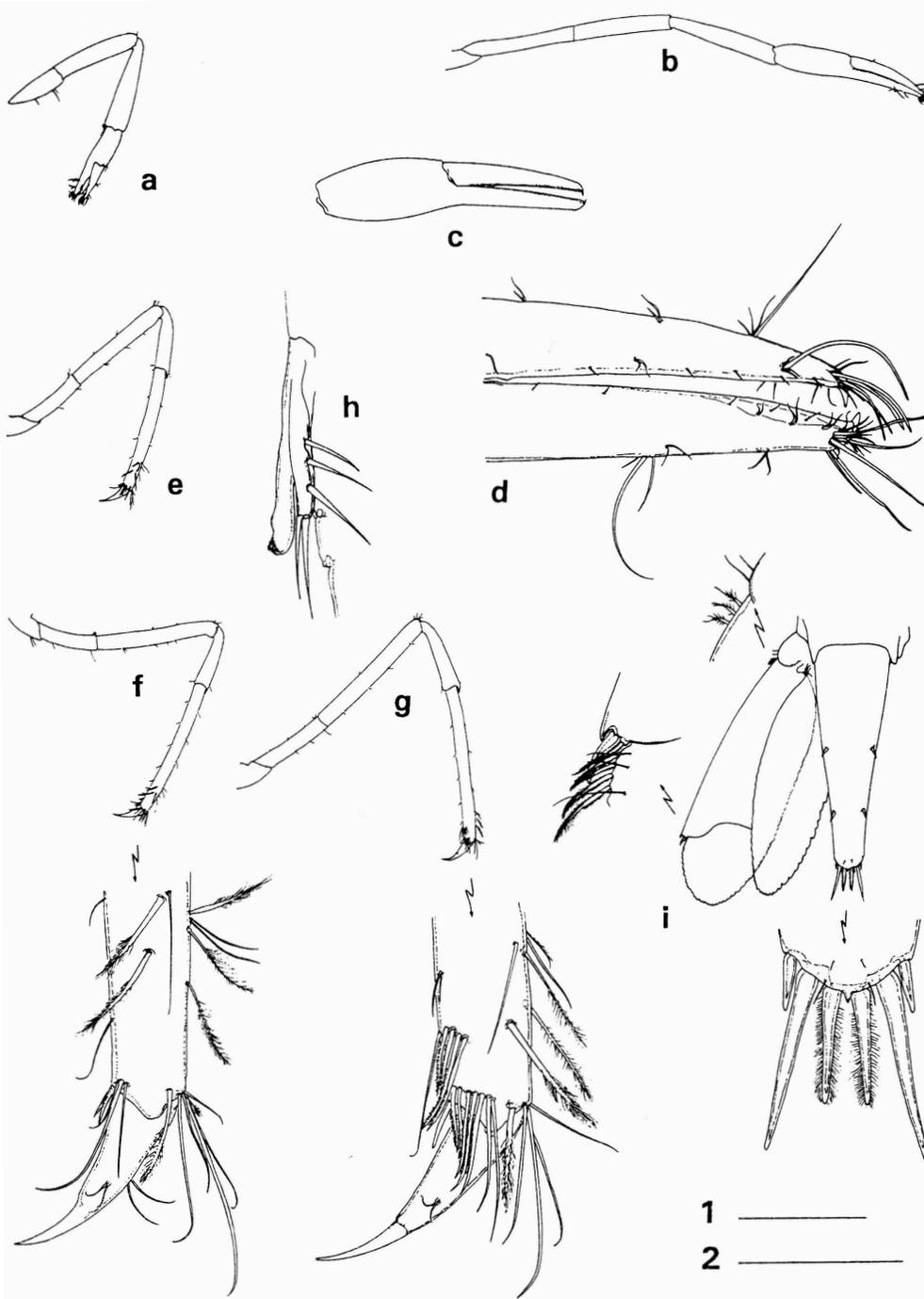


Fig. 4. *Periclimenes mcllelandi*, new species (ovigerous female except for g): a, pereopod 1; b, pereopod 2 (dorsolateral aspect); c, same (lateral aspect of propodus and dactyl, setae omitted); d, same (distal aspect of fingers); e-g, pereopods 3-5; h, appendix interna and appendix masculina of adult male (CL 2.1 mm); i, telson and left uropod (fringing plumose setae omitted). Scale 1: a, d-g = 1.0 mm, b = 0.4 mm. Scale 2: c, h = 0.2 mm, i = 1.0 mm.

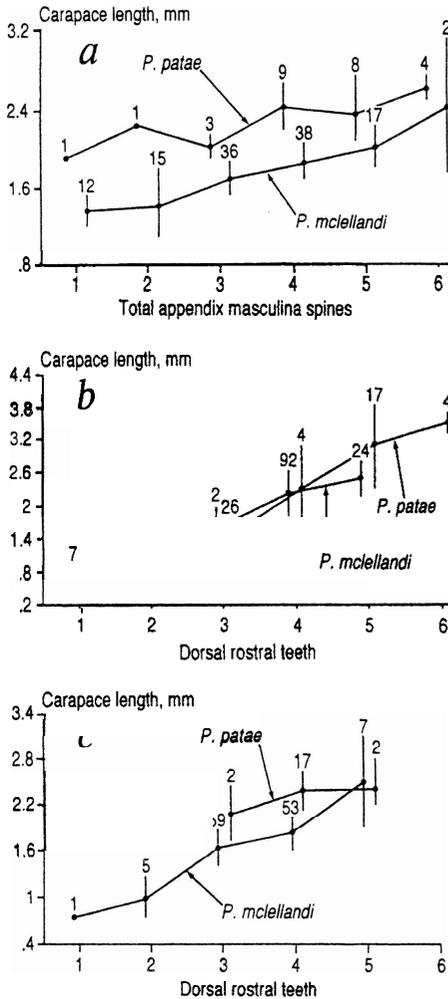


Fig. 5. a, Males of *Periclimenes mclellandi*, new species, compared with males of *P. patae*. Standard deviation plot of carapace length against total number of spines on the *appendix masculina* (both apical and lateral). Bars are 1 SD with *n* shrimp shown above. Correlation between variables is significant for both species: *P. mclellandi* (Spearman's $r = 0.74$, $t_{n-2} = 11.99$, $P < 0.001$); *P. patae* (Spearman's $r = 0.55$, $t_{n-2} = 3.24$, $P < 0.01$). b, Females of *Periclimenes mclellandi*, new species, compared with females of *P. patae*. Standard deviation plot of carapace length against the number of dorsal rostral teeth. Bars are 1 SD with *n* shrimp shown above. Correlation between the variables is significant for both species: *P. mclellandi* (Spearman's $r = 0.51$, $t_{n-2} = 6.36$, $P < 0.001$); *P. patae* (Spearman's $r = 0.69$, $t_{n-2} = 5.00$, $P < 0.001$). c, Males of *Periclimenes mclellandi*, new species, compared with males of *P. patae*. Standard deviation plot of carapace length against the number of dorsal rostral teeth. Bars are 1 SD with *n* shrimp shown above. Correlation between the variables is significant for *P. mclellandi*

stalk, barely constricted at junction with eye-stalk; accessory pigment spot and associated ommatidia present on dorsoproximal margin of cornea.

Mandible (Fig. 3a) with lacking palp; incisor process terminating in 4 distinct teeth, distal tooth of incisor distinctly larger than others; molar process dentate with numerous small spine setae. Maxilla 1 as illustrated (Fig. 3b). Maxilla 2 (Fig. 3c) with bilobate endite; palp slender, lacking setae. Maxilliped 1 (Fig. 3d) having well-developed exopodal flagellum (lash) bearing 3 or 4 terminal plumose setae; epipod present. Maxilliped 2 (Fig. 3e) with well developed exopod bearing 2 terminal setae; epipod present. Maxilliped 3 (Fig. 3f) with well developed exopod bearing 4 terminal plumose setae; exopod (excluding setae), not extending to distal end of antepenultimate article of endopod.

Pereopods 1 (Fig. 4a) of equal size, not extending to distal end of antennal scale; dactyls of chelae weakly bifid, same length as palm; carpus $\frac{1}{4}$ longer than propodus; merus and carpus of equal length; ischium $\frac{1}{2}$ length of merus. Pereopods 2 (Fig. 4b-d) equal or subequal in size, undifferentiated, weakly developed, both extending past antennal scale by less than length of dactyls; fingers same length as palm, lacking distinct teeth (vestiges of teeth sometimes present; Fig. 4c, d); carpus less than $\frac{3}{4}$ length of propodus; merus $\frac{4}{5}$ length of carpus, slightly shorter than ischium. Pereopods 3-5 (Fig. 4e-g) of nearly equal size and shape, dactyls simple, propodi each with 1 pair of spine-setae on distal flexor margin. Pereopods 3 and 4 nearly equal in size and shape, not extending past antennular peduncle; pereopods 5 longer than 3 or 4, morphologically distinct. Pereopods 3 (Fig. 4e) with propodus 4 times length of

(Spearman's $r = 0.51$, $t_{n-2} = 6.36$, $P < 0.001$) but not for *P. patae* (Spearman's $r = 0.19$, $t_{n-2} = 0.97$, $P > 0.05$).

Table 1.—*Periclimenes mclellandi* vs. *P. patae*, size comparison based on carapace length (CL).

Species	Mean CL (\pm SD), mm	CL range, mm
<i>P. mclellandi</i> (males)	1.73 (0.33), $n = 119$	0.73–2.91
<i>P. mclellandi</i> (females)	1.95 (0.63), $n = 172$	0.72–3.17
<i>P. patae</i> (males)	2.40 (0.30), $n = 26$	1.82–3.04
<i>P. patae</i> (females)	2.80 (0.97), $n = 29$	1.11–5.02

— dactyl, carpus $\frac{1}{2}$ length of propodus, merus slightly less than twice length of carpus, ischium slightly more than $\frac{1}{2}$ length of merus. Pereopods 4 (Fig. 4f) with propodus nearly 5 times length of dactyl, carpus $\frac{2}{5}$ length of propodus, merus slightly more than twice length of carpus, ischium slightly less than $\frac{1}{2}$ length of merus. Pereopods 5 (Fig. 4g) longer than pereopods 3 or 4, extending to or beyond proximal end of second article of antennular peduncle; propodus nearly 5 times longer than dactyl, 2 rows of comb-setae on inner distal surface (Fig. 4g) (not always present on small specimens); carpus slightly more than $\frac{2}{5}$ length of propodus; merus slightly less than twice length of carpus; ischium slightly more than $\frac{1}{2}$ length of merus.

Uropods (Fig. 4i) with exopods extending well beyond telson; strong, moveable spine-seta between distolateral spine and blade; moveable spine distinctly longer than distolateral spine-seta. Endopods extending beyond telson, shorter than exopod.

Description of male.—Adult usually smaller than adult female (Table 1), less robust. Rostrum deep, relatively short, not extending to cornea or beyond mid-region of basal peduncular article of antennule; shorter branch (fused and unfused parts) of antennule of lateral flagellum bearing 6 to 8 groups of aesthetascs; appendix masculina of second pleopod (Fig. 4h) armed with 1 to 3 weakly serrate apical spine-setae and 0 to 4 simple lateral spine-setae along inner margin. Similar to female in other respects.

Color pattern.—The overall appearance in life is iridescent green shading toward aquamarine; two transverse greenish-gold bands are often evident on large specimens (Fig. 1). Subtle markings vary and probably are not diagnostic. Carapace clear (transparent), speckled faintly with tiny gold and russet spots. Cornea gold, sometimes with an aquamarine ring around base. Eye-stalks with aquamarine spots and smaller spots of russet and ringed distally in deep aquamarine. Antennules and antennular peduncle clear with russet and aquamarine spots; alternatively, antennules clear and tinged with aquamarine, containing spots of gold and russet; antennal peduncle clear with red, russet, and gold spots. Antennal scale, flagella, and rostrum clear; alternatively, antennal scale rimmed with gold. Antennae clear with tiny russet spots. Maxillipeds clear. Abdominal somites edged with faint gold spots, dorsal surfaces marked strongly by two transverse bands of greenish gold. The first band crosses the posterior section of abdominal somite 2; a second band traverses somite 3 directly across the hump. Both bands widen ventrolaterally, becoming narrowest on dorsal surface, sometimes with an underlying band of aquamarine; gold band sometimes contains russet spots; there is occasionally a fainter third band of gold and russet on posterior dorsal surface of abdominal somite 5; somites 4 and 5 often are rimmed at dorsoposterior surface with aquamarine. Pereopods clear. Uropods clear with small gold spots distributed evenly; alternatively, telson and uropods iridescent aquamarine, pigmented most strongly near edges; base of telson sometimes aquamarine tinged with greenish-gold and having a greenish-gold band across base. Pleopods with gold and russet spots. Protopodites with irregular longitudinal markings of aquamarine speckled with gold and russet but mainly clear; exopods and endopods clear. Early ova gold, later (eyed) ova pale aquamarine often tinged with gold.

Habitat.—Associated with the slimy sea plume (*Pseudopterogorgia americana*) and

other species of gorgonians along the fringing reefs of Pine Cay in depths from 14 to at least 43 m.

Distribution.—Presently known only from the type locality off Pine Cay, Turks and Caicos Islands, British West Indies.

Etymology.—Named for Jerry A. McLelland, in recognition of his contributions to the investigations of the marine invertebrate fauna of the West Indies.

Remarks.—Lebour (1949) described *Periclimenes iridescens* from an adult female netted off Bermuda. The “*iridescens*” complex comprises several species of close morphological affinity with *P. iridescens* (Heard & Spotte 1991, Heard et al. 1993, Spotte et al. 1994), and we include *P. mclellandi* in this complex. *Periclimenes mclellandi* is similar to *P. patae*, a species also collected on gorgonians at Pine Cay and the Florida Keys (Heard & Spotte 1991) and tentatively reported from the British Virgin Islands as *Periclimenes* cf. *patae* (see Spotte et al. 1995).

Several characters of *Periclimenes mclellandi* appear to be transitional between larger, less highly derived members of the “*iridescens*” complex (e.g., *P. iridescens* Lebour, 1949; *P. iridescens* sensu Holthuis 1951; *P. infraspinis* (Rathbun, 1902); *P. antipathophilus* Spotte, Heard, & Bubucis, 1994), none of which are known to associate with gorgonians, and the apparently more highly derived *P. patae*. The affinity of *P. mclellandi* to the larger members of the “*iridescens*” complex is indicated by the presence of a bilobate endite on the second maxillae and more than one row of comb-setae on the propodi of pereopods 5.

Periclimenes mclellandi and *P. patae* are distinguished from other described members of the “*iridescens*” complex by: their smaller size, the chelae of pereopod 2 being equal or nearly equal; and having simple dactyls on pereopods 3–5. In these characteristics they resemble juveniles of the larger members of the complex, raising the possibility that a neotenic condition has

evolved in *P. mclellandi* and *P. patae* during their close association with gorgonians.

Based on adult specimens, *Periclimenes mclellandi* differs from *P. patae* by its maxilla 2 having a bilobate endite; propodus of pereopods 5 with two rows of comb-setae, rostrum shorter, deeper, and generally with fewer rostral teeth; smaller adult body size (Table 1); smaller corneal diameter relative to eye-stalk; overall greenish coloration in life accentuated by two transverse, greenish-gold bands on the first and second abdominal somites (Fig. 1); and occurrence at a greater mean depth.

To highlight some of the size and meristic differences between *Periclimenes mclellandi* and *P. patae*, we plotted the standard deviation of carapace length against total number of spines on the *appendix masculina* (both apical and lateral) for males of the species (Fig. 5a) and graphed the standard deviation of carapace length against the number of dorsal rostral teeth in the sexes of both species (Fig. 5 b, c). Correlations for the variables were significant for *P. mclellandi* in all comparisons (see Fig. 5). Mean carapace lengths for adults of both sexes are displayed in Table 1, indicating that adults of *P. patae* are larger than those of *P. mclellandi*.

At Pine Cay, *Periclimenes patae* is found at a mean depth of 9.6 m (range 2.7–22.2 m); in contrast, *P. mclellandi* was never collected at depths shallower than 14 m, and its range extended to 43 m (Spotte & Bubucis 1996). We emphasize that 43 m marked our deepest descents. *Pseudopterogorgia americana* occurs even deeper off Pine Cay, and *P. mclellandi* might also.

Associates and symbionts.—Other caridean shrimps, most commonly *Hippolyte nicholsoni* Chace, 1972 and *Pseudocouitiera antillensis* Chace, 1972, co-occurred with *P. mclellandi* on *Pseudopterogorgia americana* and other gorgonians at Pine Cay. Co-inhabiting less frequently the same gorgonian with *P. mclellandi* were three other species, *P. patae*, *Periclimenes* sp. B, and *Tozeuma* sp. (Spotte & Bubucis 1996).

Periclimenes mclellandi serves as the second intermediate host of an opaceolid digenean parasite. When microscopically examining living specimens of *P. mclellandi* that are infected with opaceolid larvae, the oval metacercarial cysts can be easily observed in the shrimp host's transparent abdominal muscles. An unknown gastropod mollusk serves as the first intermediate host. The adult stages of all known members of family Opacoelidae are intestinal parasites of fishes (Yamaguti 1971). At some collection sites, ordinarily between 18 and 26 m, up to 20% of the adult *P. mclellandi* studied were infected with the metacercarial cysts of this larval digenean.

A bopyrid isopod occasionally occurred underneath the abdomen of *P. mclellandi*. This parasite was found most often on shrimp collected in depths between 25 and 30 m. It appears to be an undescribed species of *Hyperphrixus* Niertrasz & Brender á Brandis, 1931, a genus known to parasitize other shrimps of the subfamily Pontoniinae (see Markham 1985).

Acknowledgments

This research was sponsored by the Oakleigh L. Thorne Foundation through a grant to Stephen Spotte. We thank members and staff of The Meridian Club and the Turks and Caicos Islands government for support and encouragement. Patricia M. Bubucis, Cherie S. Heard, Jerry A. McLelland, and Roy Manstan provided technical assistance. Patricia M. Bubucis, Sara LeCroy, and Jerry A. McLelland kindly reviewed earlier drafts of the manuscript. This is contribution No. 289 of the Marine Sciences & Technology Center.

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