

A new species of *Periclimenes* Costa, 1844 (Crustacea: Decapoda: Palaemonidae) from the Caribbean coast of Quintana Roo, Mexico, and a key for the “*iridescens*” complex

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Abstract.—A new species of pontoniine shrimp, *Periclimenes siankaanensis*, is described from the Mexican Caribbean coast. The new species shares morphological features with *P. patae* Heard & Spotte, 1991, *P. antipathophilus* Spotte, Heard & Bubucis, 1994, and *P. mclellandi* Heard & Spotte, 1997, all species belonging to the “*iridescens*” complex, and with *P. platalea* Holthuis, 1951, of the tropical east Atlantic. *Periclimenes siankaanensis* differs from *P. patae* and *P. mclellandi* by its large size, pereopods 3–5 with 2 or 3 spines on propodal inner margin and the presence of bifid dactyl, and is distinguished from *P. antipathophilus* by its smaller size, entire endite on the second maxilla, pereopods 2 of same shape, and by the lack of tooth on the movable finger. In addition, *P. siankaanensis* can be separated immediately from *P. platalea* by having the second pereopods equal in shape and length, and bifid dactyl present on pereopods 3–5. *Periclimenes siankaanensis* inhabits shallow water *Thalassia testudinum* seagrass meadows and sandy bottoms, while the other species here compared are associated with gorgonians in deeper zones.

Species of the genus *Periclimenes* Costa, 1844, are widely distributed through subtropical to warm-temperate marine and brackish waters worldwide (Chace & Bruce 1993), and to date 175 valid species are recognized (Bruce 2004). Most of the species in the genus are commensal or are associated with cnidarians, sponges, mollusks, or echinoderms; some species are cleaners of fishes (Bruce 1978, Li 2004) whereas others are free-living species (Holthuis 1951a, Chace & Bruce 1993).

For the coast of Quintana Roo, Caribbean coast of Mexico, few studies except for Chace (1972) have presented extensive information on the Pontoniinae. In a revision of the crustaceans in the Bahía de la Ascensión, Mexico, Markham & Donath-Hernández (1990) and Markham

et al. (1990) have recorded only the presence of *Periclimenes americanus* (Kingsley, 1878b) and *Periclimenes rathbunae* Schmitt, 1924, reflecting the necessity to generate more studies for this group of species in these areas.

During a study on the biology and ecology of bopyrid parasites of the caridean fauna carried out in the Reserva de la Biosfera de Sian Ka'an, state of Quintana Roo, a large number of specimens of an unfamiliar pontoniine species were collected using a Colman-Seagrave sledge net in the meadows of turtle grass *Thalassia testudinum*. In the present paper these shrimps are described as a new species of *Periclimenes*.

Holotype and paratypes are deposited in the Colección Nacional de Crustáceos (CNCR), Instituto de Biología, Universi-

dad Nacional Autónoma de México (UNAM). Carapace length (CL) was measured from the tip of the rostrum to posterodorsal margin of carapace as proposed by Heard & Spotte (1991, 1997), but the postorbital carapace length (POCL) and the approximate total length (TL) were also measured. The illustrations were made with the aid of camera lucida.

Family Palaemonidae Rafinesque, 1815
Subfamily Pontoniinae Kingsley, 1878a

Genus *Periclimenes* Costa, 1844

Periclimenes siankaanensis, new species

Material examined.—Holotype: ovigerous female (CL 4.0 mm, POCL 2.31 mm, TL 13 mm), Cayo Culebras, Bahía de la Ascensión, Quintana Roo, México, 1.0 m coll. Román-Contreras et al., 29 Jan 2003 (CNCR 24608). Paratypes: 27 females (CL 2.53–4.85 mm, POCL 1.56–2.91 mm, TL 9.34–15.50 mm) (CNCR 24609); 23 males (CL 2.36–3.32 mm, POCL 1.36–2.1 mm, TL 8.6–12.90 mm), 0.80 m, 20 Nov 2001 (CNCR 24610). Non-types: 8 females (CL 2.96–4.70 mm, POCL 1.7–2.85 mm, TL 9.69–14.60 mm) and 7 males (CL 2.9–3.36 mm, POCL 1.77–2.0 mm, TL 10.25–12.40 mm), 1.0 m, 29 January 2003 (deposited in authors' collections). All specimens have same locality and collectors as holotype.

Diagnosis.—Small shrimp (2.36–4.85 mm CL, 1.36–2.91 mm POCL, 8.6–15.50 mm TL). Rostrum ventrally nearly straight, tip sloping slightly upward; upper margin somewhat convex; in females the rostrum reaches to distal margin of first article to middle of second article of antennular peduncle; in males falling slightly short of distal margin of proximal segment of the antennular peduncle; females often with 5 or 6 teeth on upper margin, in males usually 5; in lower margin when teeth present, 1 or 2 extremely small. Antennal and hepatic spines on carapace, no other spines or ornamentation. Abdominal pleura round-

ed; dorso-posterior margin of third abdominal pleura elevated, with posterodistal protrusion of tergum; sixth abdominal somite more than twice length of fifth, longer than telson. Eyes well developed, cornea globular and almost as wide as eye-stalk, barely constricted at junction; accessory pigmented spot, ommatidia present on dorsoproximal margin of cornea. Second maxilla with endite entire. Second pereopods equal in shape and nearly of same size; fingers of the chelae lacking distinct teeth. Propodus of pereopods 3–5 with 2 or 3 spine-setae along of distal third of inner margin and one pair on flexor margin; dactyl bifid; 2 rows of comb-setae on inner distal margins of propodus of fifth pereopods. Telson with minute, acute apical process between mesial pair of spine-setae.

Description of adult female.—Rostrum ventrally straight, short, tip slightly directed upward and unarmed (Fig. 1A); upper margin somewhat convex reaching middle of second segment of antennular peduncle and armed with 5 teeth interspaced with setae; first tooth somewhat separated from others and nearly posterior to level of hepatic spine, second tooth even with orbital margin, other teeth regularly distributed over rostrum; lower margin unarmed, with small setae at mid-region and lacking a ventral carina; a faint midrib present close to lower margin of rostrum. Carapace smooth (Fig. 1B), inferior orbital angle semi-quadrate lacking a ventro-medial flange; antennal spine well developed. Hepatic spine larger, more robust than antennal spine. No other spines on carapace. Abdomen smooth; pleura rounded; third abdominal somite posterodorsally produced and elevated posteromedially, with posterior protrusion of tergum; sixth somite about 2.2 times longer than fifth somite and 1.1 times length of telson. Antennular peduncle (Fig. 2A) with sharp, slender stylocerite reaching 0.5 length of basal article; outer margin somewhat convex, ending

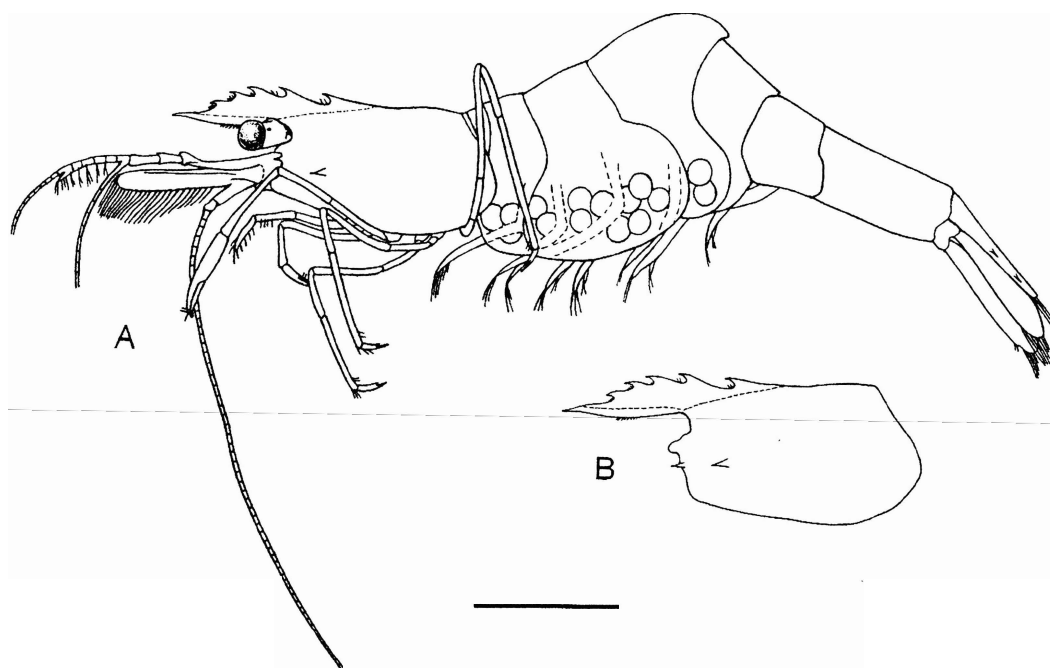


Fig. 1. *Periclimenes siankaanensis*. Holotype ovigerous female (CL 4.00 mm) A, lateral view; B, lateral view of carapace. Scale = 2.0 mm.

distally in single tooth not overreaching the distolateral margin of segment, ventromesial spine absent; statocyst rounded, well developed; second article broader and 1.4 times longer than third article; combined length of second and third articles 0.6 the basal article. Upper flagellum biramous, fused by approximately 5 or 6 articles; shorter free ramus composed of 4 articles; approximately 6 groups of aesthetascs on articles of flagellum. Antennal scale (Fig. 2B) slightly overreaching antennular peduncle, about 3 times longer than wide, lateral margin straight, ending in acute tooth overreached by the anteromesial angle of the lamella. Antennal peduncle extending about 0.3 of length of antennal scale; basal segment armed ventrolaterally with acute tooth. Eyes well developed (Fig. 2C); cornea globular, slightly broader than junction with eye-stalk and 0.5 times their length; pigment spot accessory and ommatidia present on dorsoproximal margin; eye-stalk 1.5 times

longer than broad. Mandible (Fig. 2D) lacking palp; incisor process ending in 4 teeth; molar process bearing 5 stout teeth with small setae. First maxilla (Fig. 2E) with slender bilobed palp; upper lacinia broad, armed with 3 stout spine-setae apically and 2 or 3 adjacent setae; lower lacinia furnished with 3 spine-setae distally and setae in the proximolateral margin. Second maxilla (Fig. 2F) with slender tapering palp, lacking setae; basal endite entire, setose distally; scaphognathite well developed, 4.4 times longer than wide, marginally furnished with plumose setae. First maxilliped (Fig. 2G) having slender simple non-setose tapering palp; endite large and rounded, furnished with several spines and setae. Caridean lobe well developed with setae along the margin; exopod with well developed flagellum with 3 terminal setae; bilobed epipod present. Second maxilliped (Fig. 2H, I) with normal endopod, dactylar segment about 3.6 times longer than broad, plumose setae medially;

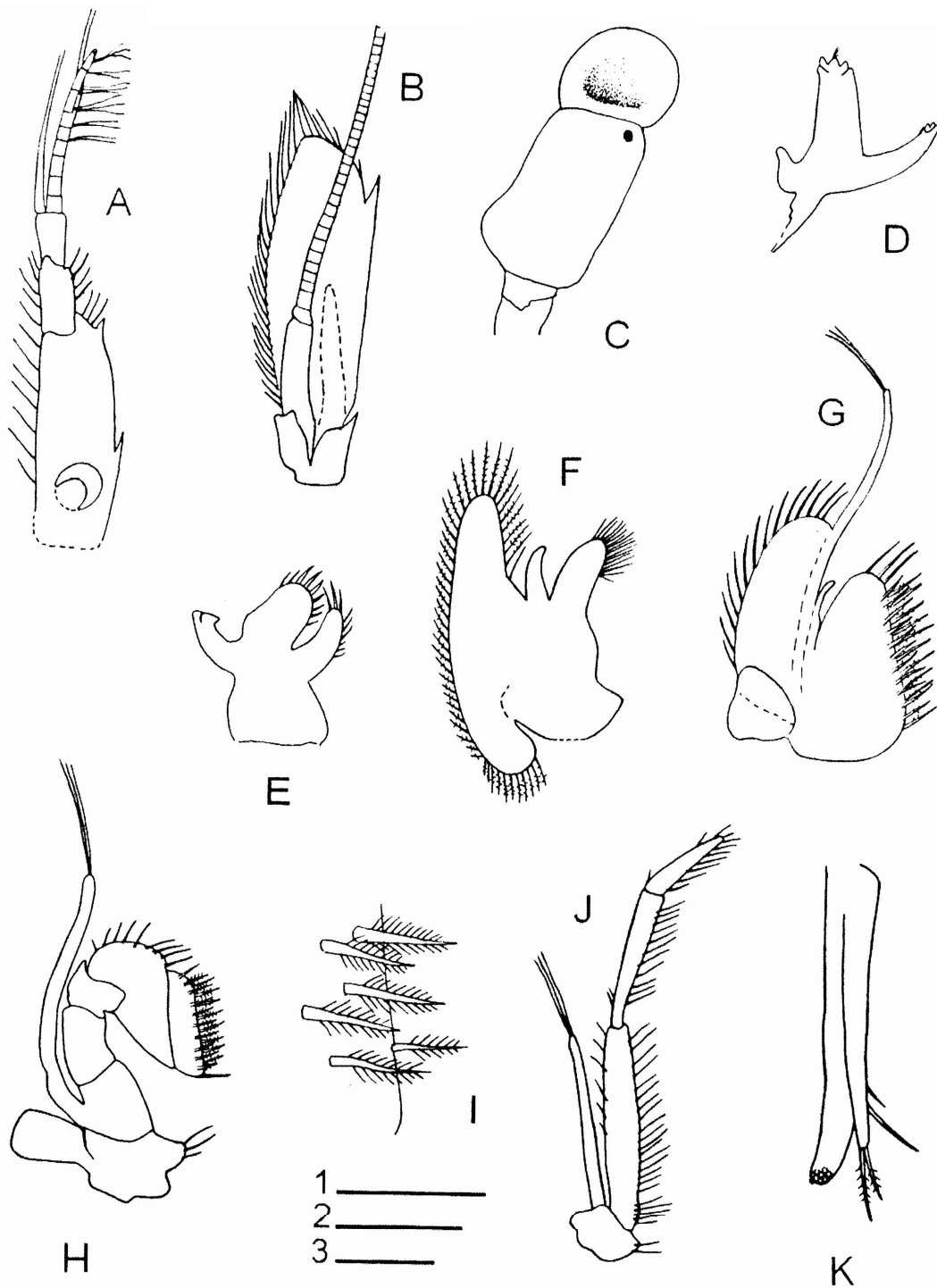


Fig. 2. *Periclimenes siankaanensis*. Female paratype (CL 4.70 mm). A, left antennule (ventral view); B, left antennal scale (ventral view); C, eye of holotype; D, mandible; E, maxilla 1; F, maxilla 2; G, maxilliped 1; H, maxilliped 2; I, detail of medial setae of same maxilliped; J, maxilliped 3; K, *appendix masculina* of adult male. Scale 1 = 1 mm (A, B); scale 2 = 0.5 mm (C–H, J); scale 3 = 0.2 mm (K).

anteromedial margin of propodial segment rounded, bearing 9 setae; carpus and ischiomerus normal; exopod with well developed flagellum, 3 setae distally; coxa bearing 3 setae laterally, subrectangular epipod present. Third maxilliped (Fig. 2J) with endopod nearly reaching the end of peduncle of antennal scale; antepenultimate article cylindrical, almost 1.5 times longer than penultimate article; ultimate article tapering distally, 0.7 times length of penultimate article; setose margins; exopod well developed bearing 3 terminal setae and extending (excluding setae) nearly to the end of antepenultimate article. First pereopods (Fig. 3A, B) almost equal in size, more slender than second pair, reaching the distal end of antennal scale; chela with palm cylindrical and serrate setae proximoventrally; fingers of chelae 0.8 length of palm, cutting edges lacking teeth; carpus 1.1 times as long as chela, with 3 setae distally; merus about same length as carpus; ischium 0.5 length of merus, with 2 simple setae distoventrally. Second pereopods (Fig. 3C, D) equal in shape and nearly of same length, tip of fingers and part of palm overreaching antennal scale. Palm of chelae cylindrical, about 1.2 times longer than fingers. Both propodus and dactyl with 5 or 6 setae distally and one medial seta. Cutting edges unarmed; with small setae along edges; carpus about 0.76 of chelae length; merus about 0.96 length of ischium and carpus. Third to fifth pereopods with dactyli bifid (Fig. 3E–G), extending to distal margin or slightly overreaching antennal scale by tip of dactyl. Propodus of third pereopod (Fig. 3E) 3.5 times length of dactyl and 2.2 times longer than carpus; merus 0.9 length of propodus and about 1.8 times longer than ischium; propodus with 2 spine-setae on distal third of inner margin and 1 pair on flexor margin. Propodus of fourth pereopod (Fig. 3F) 3.5 times length of dactyl, 2 spine-setae on distal third of inner margin, and 1 pair on flexor

margin; carpus 0.4 times as long as propodus; merus 2 times carpus length; ischium about 0.6 of merus length. Fifth pereopod (Fig. 3G) longer than third and fourth pereopods; propodus 4 times length of dactyl, with one spine-seta distally on inner margin; merus 2.1 times length of carpus; ischium 0.6 length of merus; propodus with one row of 4 comb spine-setae on inner subdistal margin, and one row of 5 comb spine-setae on distal border, 3 spine-setae on inner flexor margin (one pair in holotype) (Fig. 3H). Pleopods typical for the genus. Telson (Fig. 3I, J) with triangular posterior margin, 2 pairs of dorsolateral spines; anterior pair situated at 0.5 and posterior pair approximately 0.75 of telson length; posterior margin bearing three pairs of apical spine-setae; lateral pair short; intermediate pair larger, 3.8 times length of lateral pair; mesial pair plumose, 0.6 as long as intermediate pair; apex of telson with small acute process between mesial spines. Uropods (Fig. 3I) with broad exopod, overreaching posterior margin of telson, lateral margin straight, ending in small tooth, with mobile spine proximal to distolateral tooth; endopod oval, slightly shorter than exopod.

Description of male.—Adult males smaller than females (Table 1); body slender and less robust than females; rostrum shorter, generally 5 teeth in upper margin, extending nearly to distal margin of basal segment of antennular peduncle; antenna and pleopods longer; lateral antennular flagellum bearing approximately 15–23 groups of aesthetascs. *Appendix masculina* (Fig. 2K) slightly shorter than *appendix interna*, commonly armed with 2 apical serrate spine-setae, and 2 simple lateral spines along the inner margin. Other characters similar to female.

Color pattern.—Not recorded.

Habitat.—Collected on sandy substrate with turtle grass *Thalassia testudinum* meadows in depth from 0.80–1.0 m.

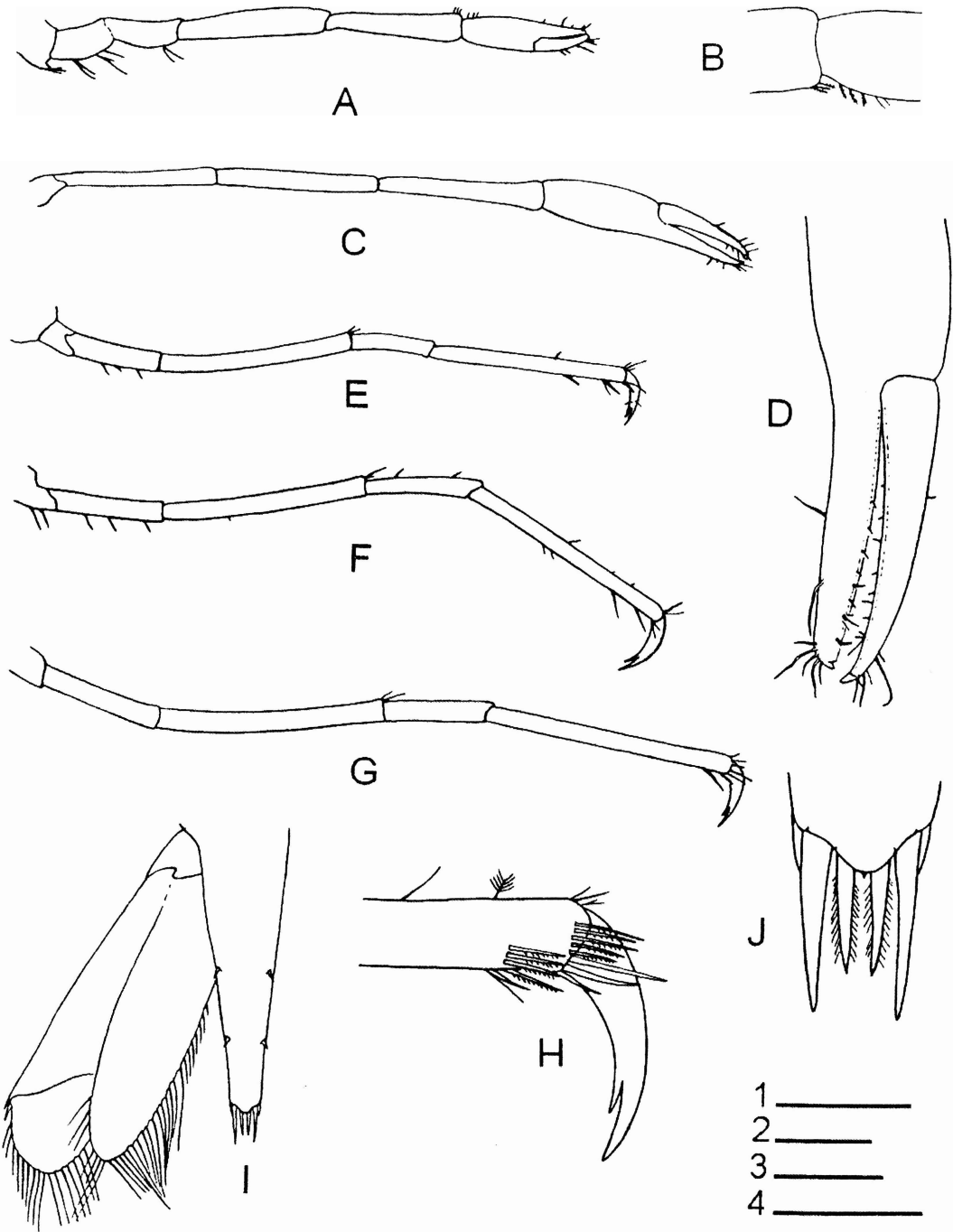


Fig. 3. *Periclimes siankaanensis*. Female paratype (CL 4.70 mm). Right pereopods 1-5. A, pereopod 1; B, detail of same pereopod; C, pereopod 2 (dorsolaterally); D, same (detail of fingers); E-G, pereopods 3-5; H, pereopod 5 (distal detail of propodus and dactyl); I, telson and left uropod; J, telson distal margin. Scale 1 = 1 mm (A, C, E, F, G); scale 2 = 0.25 mm (D); scale 3 = 0.20 mm (H, J); scale 4 = 1 mm (I).

Table 1.—Distinctive characters of species of the genus *Periclimenes* considered in this study.

Characters	Species					
	<i>P. iridescens</i>	<i>P. platalea</i>	<i>P. patae</i>	<i>P. antipathophilus</i>	<i>P. mclellandi</i>	<i>P. siankaensis</i>
Mean CL (mm)	?	?	Males 2.40 Females 2.80	Males 2.98 ^a Females 3.94 ^a	Males 1.73 Females 1.95	Males 2.91 Females 3.82
Pereopods 2	Unequal	Generally unequal	Equal or nearly equal	Unequal or nearly equal	Equal or nearly equal	Nearly equal
Number of rostral teeth	7	8 or 9	3–6	3–7	4 or 5	4–8
Dactyl of pereopod 3–5	Bifid	Simple	Simple	Bifid	Simple	Bifid
Endite of maxilla 2	Entire or incised	Entire	Entire	Bilobate	Bilobate	Entire
Row of comb setae on propodus of pereopod 5	?	?	1	3	2	2
Number of apical spines on <i>appendix masculina</i>		?	2 or 3	1 or 2	1–3	2 or 3
Number of spines on lateral margin of <i>appendix masculina</i>	?	?	3–5	0–5	0–4	2 or 3
Apical process in posterior margin of telson	Present	Present	Present	Absent	Present	Present
Habitat	Sand and algae, sea anemones, antipatharians	Bottom of foraminifera, and associated with <i>Antipathes</i> sp. and <i>Leptogorgia gaini</i>	Associated with <i>Pseudopterogorgia americana</i>	Associated with <i>Antipathes</i> sp.	Associated with <i>Pseudopterogorgia americana</i>	In <i>Thalassia testudinum</i> meadows

^a Calculated from original source data.

Table 1.—Continued.

Characters	Species					
	<i>P. iridescens</i>	<i>P. platalea</i>	<i>P. patae</i>	<i>P. antipathophilus</i>	<i>P. mclellandi</i>	<i>P. stankcanensis</i>
Collection depth (m)	3.0–183	10–21	1–12	17–45	14–43	0.80–1.0
Source	Criales 1984, Williams 1984	Holthuis 1951b, Wirtz & d'Udekem-d'Acoz 2001	Heard & Spotte 1991, 1997	Spotte et al. 1994	Heard & Spotte 1997	Present work

Distribution.—Known only from Bahía de la Ascensión and Bahía Espiritu Santo, Mexican Caribbean coast.

Etymology.—The name is an adjective in reference to the locality of collection, Reserva de la Biosfera Sian Ka'an.

Variation in females.—The specimens show variation in number of rostral teeth, ranging from 4–8 dorsally, with 61% having 6 teeth. 58% of shrimps bear 1–2 vestigial teeth on the distal ventral margin; sometimes 1 well developed ventral tooth is present in largest females. Rostrum in females is broader than in males; the number of aesthetascs in the lateral antennular flagellum varies from 6–10.

In males there are 5 or 6 dorsal teeth but 76% only have 5, and 78% lack ventral teeth, showing the common rostral formula of 5/0 teeth on upper and lower margins, respectively. Another variation is the number of spine setae on the *appendix masculina*, which ranges from 2 or 3 on the inner margin and the apex. In both sexes the number of spine-setae on the distal third of the inner margin of the propodi of pereopods 3–5 varies from 1–3.

Remarks.—Lebour (1949) described a female *Periclimenes* collected in Bermuda, which she named *Periclimenes iridescens*; later Criales (1984) reported great morphological variations in specimens that she considered as the same species. Criales (1984), however, also stated that these shrimps could be referred to an undescribed species. Spotte et al. (1995) pointed out that any shrimp collected from the western North Atlantic identified as a species of *Periclimenes* needed a careful examination, especially those morphologically similar to *P. iridescens*.

Three new species associated with gorgonians were recently described from the British West Indies and Roatan, Honduras: *Periclimenes patae* Heard & Spotte, 1991, *Periclimenes antipathophilus* Spotte, Heard, & Bubucis, 1994, and

Periclimenes mclellandi Heard & Spotte, 1997, which by their morphological affinities with *P. iridescens* were included in the group named the “*iridescens*” complex by those authors. Another species described by Holthuis (1951b), *Periclimenes platalea* from the east Atlantic, also appears to be closely related to these pontoniines due to their similar morphology and its close association with gorgonians (Wirtz & Udekem-d’Acoz 2001). Some morphological characters of the new species herein described overlap with those forms (Table 1) and we propose that it be included in the “*iridescens*” species complex.

Periclimenes siankaanensis resembles *P. patae* and *P. mclellandi* in the following characters: the second pereopods in all species are nearly equal in size and development; the chelae have equal shape and lack teeth on cutting border; in *P. siankaanensis* and in *P. patae* the rostrum reaches the middle of the second article of antennular peduncle, and the maxilla 2 has an entire endite; two rows of comb setae on the distal inner margin of the propodus of pereopod 5 are present in *P. siankaanensis* as in *P. mclellandi*.

Periclimenes siankaanensis can be distinguished from *P. patae* and *P. mclellandi* by its larger size, presence of 2 or 3 spines on the propodal inner margin of pereopods 3–5, and bifid dactyli on pereopods 3–5; in contrast *P. patae* and *P. mclellandi* have only 1 spine-seta on the distal flexor margin, and all dactyli are simple. Holthuis (1951a) noted the bifid character on pereopods 3–5 of some specimens of *P. iridescens*, while in others the dactyli were simple or distinctly bifid. Heard & Spotte (1997) similarly mentioned that the dactyli may vary according to the state of development of the specimens; in *P. siankaanensis* the bifid dactyli are constant even in the smallest specimens.

Periclimenes siankaanensis is similar to *P. antipathophilus* in having bifid dactyli

on pereopods 3–5 and displays the same number of spine-setae on the propodal inner margin. *Periclimenes siankaanensis* can be differentiated from *P. antipathophilus* by its smaller size, second maxilla having an entire endite, and propodus of pereopod 5 with two rows of comb setae on the distal inner margin. Additionally, in *P. siankaanensis* the second pereopods are equal in shape and lack a tooth and present a small acute process between the mesial pair of spine-setae on the apex of the telson, whereas *P. antipathophilus* has the second pereopods unequal in size and with triangular teeth on the movable finger, and the apical process between the mesial spine-setae on the posterior margin of the telson is absent.

Moreover, *P. siankaanensis* and *P. platalea* have the upper flagellum of the antennule fused for about 5 or 6 articles, the chelae lack teeth on the cutting border, and in both species the endite of maxilla 2 is entire. *Periclimenes siankaanensis* can be separated from *P. platalea* by the second pereopods having equal shape and nearly the same length. Additionally, in *P. siankaanensis* the carpus is shorter than the chela and in pereopods 3–5 the dactyli are bifid. In *P. platalea* the second pereopods are unequal and the carpus is longer than the chela, likewise the dactyli of pereopods 3–5 are not bifid (Table 1).

The posterior protrusion of the tergum of the third abdominal pleura in *P. siankaanensis* is not evident in the figures shown by Holthuis (1951b) for *P. platalea*, but can be seen in the figures of Heard and Spotte (1991) for *P. patae* and *P. iridescens*, and by Spotte et al. (1994) for *P. antipathophilus*, although the protrusion in those species is smaller and the medial posterior margin is not as elevated as in *P. siankaanensis*.

Ecologically, *Periclimenes siankaanensis* differs from the species compared above because those are associated with

gorgonians in deeper zones (Heard & Spotte 1991, 1997, Spotte et al. 1994, Wirtz & Udekem-d'Acoz 2001) whereas *P. siankaanensis* is abundant in shallow water *Thalassia testudinum* seagrass meadows and sandy bottoms. Similarly, Bauer (1985) stated that *P. americanus* also occurs both on seagrass leaves and sandy bottoms in large numbers.

Interspecific variation was observed in the number of apical and inner spines of the *appendix masculina* in males of *Periclimenes* (Table 1); therefore, these features could be useful criteria to identify species of the genus *Periclimenes* as Fleming (1969) proposed for the genus *Palaemonetes*, and as used by Heard & Spotte (1997) to separate *Periclimenes mclellandi* and *P. patae*.

Two rows of comb setae on propodus of pereopod 5; endite of maxilla 2 bilobate *P. mclellandi*

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Key to Species of the “*iridescens*” Complex of *Periclimenes*

- 1. Second pereopods unequal in shape and length 2
 Second pereopods equal or nearly equal in shape and length 4
- 2. Apical process absent between the mesial spine-setae on the posterior margin of telson .. *P. antipathophilus*
 Apical process present between the mesial spine-setae on the posterior margin of telson 3
- 3. Major chela of second pereopods with a single rounded tooth on dactyl *P. iridescens*
 Major chela of second pereopods lacking tooth *P. platalea*
- 4. Dactyli of pereopods 3–5 bifid; medial posterior region of tergum of third abdominal somite moderately elevated *P. siankaanensis*
 Dactyli of pereopods 3–5 entire; medial posterior region of tergum of third abdominal somite not as elevated 5
- 5. Row of comb setae on propodus of pereopod 5; endite of maxilla 2 entire *P. patae*

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