

*PERICLIMENES INGRESSICOLUMBI*, NEW SPECIES, A  
PONTONIINE SHRIMP ASSOCIATED WITH DEEP-WATER  
ECHINOIDS OFF SAN SALVADOR ISLAND IN THE  
BAHAMAS, AND A COMPARISON WITH  
*PERICLIMENES MILLERI*

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ABSTRACT

A new species of bathyal pontoniine shrimps, *Periclimenes ingressicolumbi*, found on an echinoid, *Palaeopneustes tholoformis*, is described. The host was collected off San Salvador Island in the Bahamas by means of the Johnson Sea Link II submersible at a depth of 550-600 m. A morphological comparison with the closely related shrimp *Diapontonia maranulus* is presented.

Reports on pontoniine shrimps from deep water are rare, and, due to the sampling methods which are commonly used, associations with other animals are poorly known (Bruce, 1981). With the possibility of obtaining both shrimps and host animals by using submersibles, such as the Johnson Sea Link, a greater understanding of these associations, based on both direct observations and delicate sampling, can be obtained.

Bruce (1986a) described a new genus and species, *Diapontonia maranulus*, of pontoniine shrimps which was collected at a depth of 244-309 m off Grand Bahama Island by the Johnson Sea Link II submersible. Furthermore, he described a new species, *Periclimenes milleri*, collected at 527 m southwest of San Salvador Island (Bruce, 1986b). The shrimp described in this paper was collected from approximately the same locality and depth as in Bruce (1986b). The description of the species follows that given by Bruce (1986a), with the exception of a few important characters which indicate that the animal collected is a new species within the genus *Periclimenes*. The differences between the described species and *Diapontonia maranulus* are discussed.

MATERIAL AND METHODS

Shrimps were collected from the spines of two species of deep-water echinoids, *Palaeopneustes tholoformis* Chesher and *Archaeopneustes hystrix* Agassiz. The animals were collected by the Johnson Sea Link II submersible when diving at depths of 550-600 m off San Salvador Island in the Bahamas. Two species of shrimps were recognized, both host specific.

The abbreviation CL is used for postorbital carapace

length. All the morphometrics are made on the holotype, except those on male pleopods that are made on the allotype, if not otherwise mentioned.

RESULTS

*Periclimenes ingressicolumbi*,  
new species

*Material.*—10 specimens (4 ♂♂, 1 ♀, and 5 ovigerous ♀♀), San Salvador Island, 24°02.91'N, 74°32.7'W, 1,900 ft (579 m), Johnson Sea Link Dive no. 2039, 11 May 1987. Holotype ♀ and allotype ♂ deposited in collections of National Museum of Natural History, Washington, D.C., catalogue number USNM 241931, together with 9 paratypes. Two paratypes placed in collection of Harbor Branch Oceanographic Institution, catalogue number IRCZM 089:06554, 1 in Swedish Museum of Natural History, Stockholm, catalogue number SMNH type coll. 4106, and 2 in Rijksmuseum van Natuurlijke Historie, Leiden, RMNH D 37738.

*Description.*—Medium-sized pontoniine shrimp. Rostrum (Figs. 1, 2A, B) slender, straight, or slightly downward curved, extending to about distal border of second segment of antennular peduncle. Dorsal carina of rostrum distinct with 9-11 small acute teeth, of these 2 or 3 postorbital and more prominent; single small acute tooth ventrally, minute in small males. Lateral carina distinct and confluent with orbital margin. Orbital notch well developed with more or less prominent small notch close to feebly produced inferior orbital angle. Antennal and hepatic spines well developed. No supraorbital spine. Hepatic spine situated slightly below and well behind antennal spine. Anterolateral angle of carapace obtusely rounded.

Eye (Fig. 2C) well pigmented with large globular, hemispherical cornea, without ac-

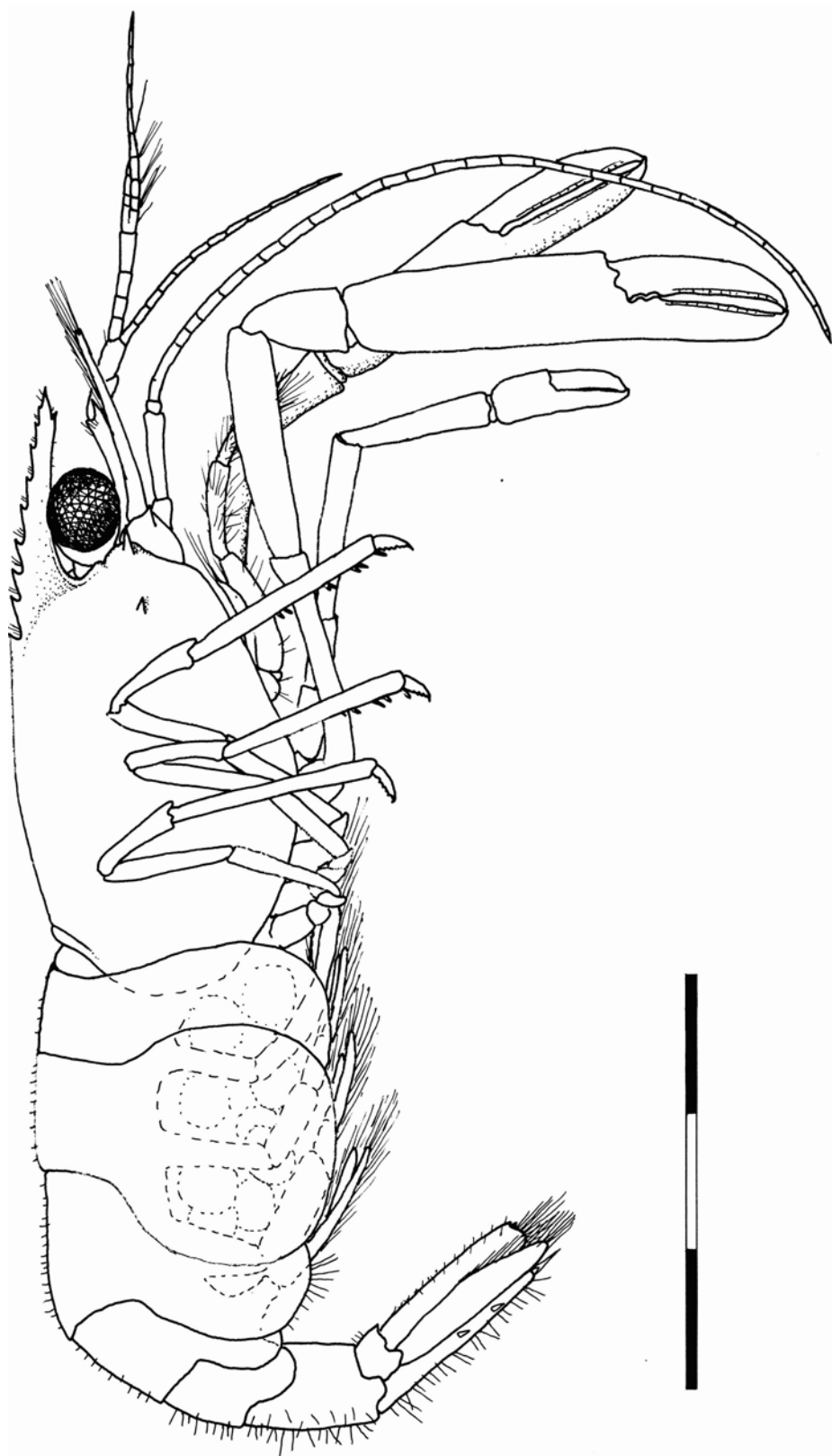


Fig. 1. *Periclimenes ingressicolumbi*, new species, holotype female (ovigerous), San Salvador Island. (Scale bar = 3 mm.)

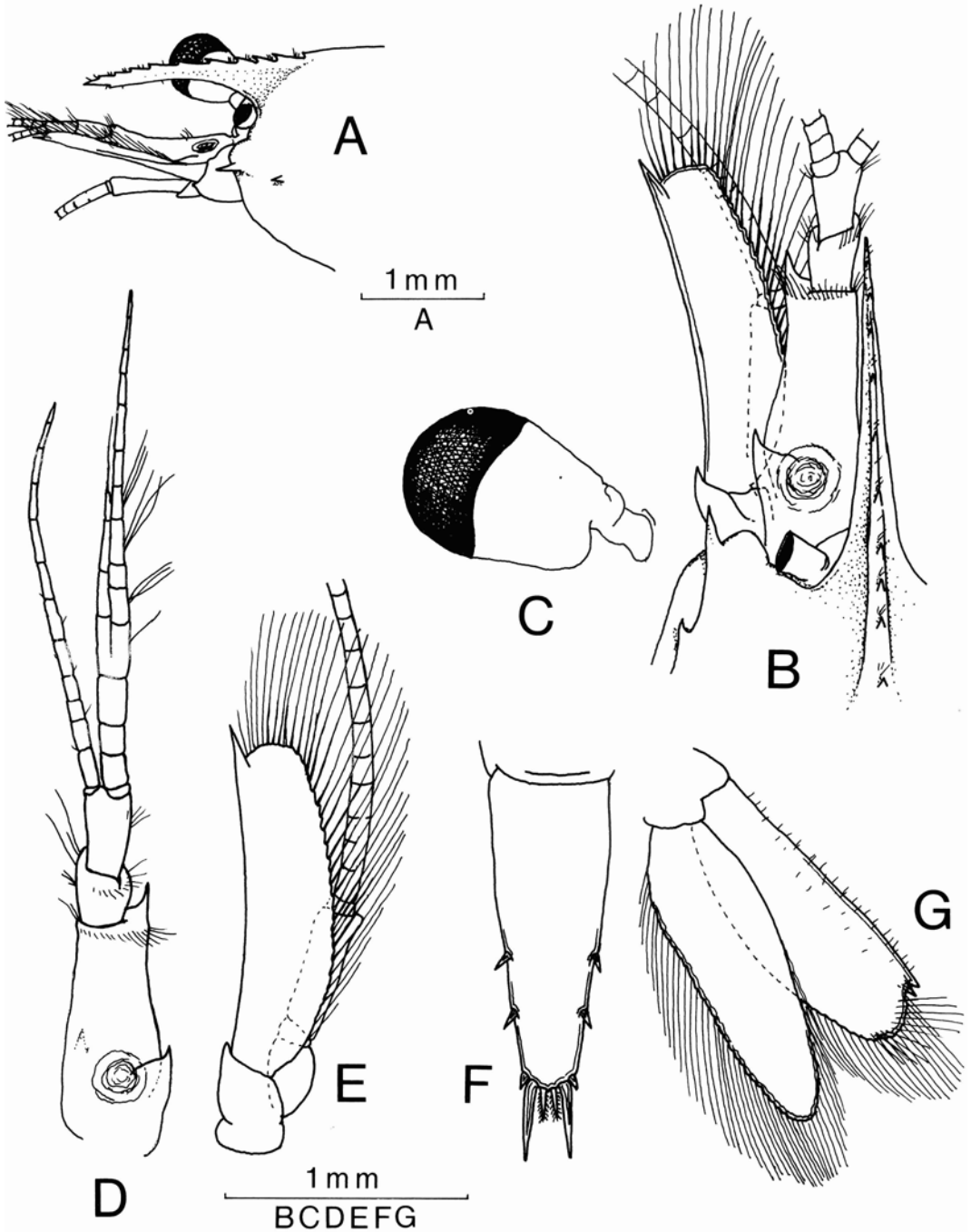


Fig. 2. *Periclimenes ingressicolumbi*, new species, holotype female (ovigerous). CL = 2.4 mm. A, anterior carapace with left eye removed, rostrum, antennal peduncles, lateral; B, same, dorsal; C, eye; D, antennule, right side, dorsal; E, antenna, left side, dorsal; F, telson; and G, uropod, right side, dorsal.

cessory pigment spot, stalk slightly compressed, 1.3 times broader than long, with maximum width same as corneal diameter. Antennular peduncle (Fig. 2B, D) without

special features, proximal segment about 2.9 times longer than distal width, with short acute stylocerite reaching about third of total length, anterolateral lobe produced with

acute distolateral tooth almost reaching to level of proximal margin of distal peduncular segment, small ventral tooth 0.4 from base of proximal segment and located on medial side. Stylocerite well developed with more or less round statolith, intermediate and distal peduncular segments short, and together 0.6 of proximal segment length. Upper flagellum short, biramous, with 4 or 5 proximal segments robust and fused (mostly 4), shorter ramus with 3 free segments (2 on small individuals), 4 small groups of aesthetascs, longer ramus short with 7–11 segments (7 or 8 on small individuals), subequal to length of peduncle. Lower flagellum shorter than upper with approximately 11 segments, exceeded by longer ramus of upper flagellum.

Antenna (Fig. 2E) with robust basicerite, small acute anterolateral tooth; carpocerite reaching just above half of scaphocerite length, 3.0 times longer than distal width. Flagellum equal to 2.3 of postorbital carapace length. Scaphocerite well developed, subequal to length of antennular peduncle, lamina 4.0 times longer than broad, tapering only slightly distally, with rounded anterior margin. Lateral border slightly but distinctly concave, with strong anterolateral tooth extending well beyond anterior border of lamina.

Epistome with pair of small rounded lobes and antennal gland opening on small process. Thoracic sternites unarmed, except second with feeble median knob and fifth with low transverse ridge with median notch.

Abdomen smooth with setae, especially on last 2 segments and telson. Third somite not posterodorsally produced; sixth segment about 1.5 times longer than fifth and about 1.5 times longer than deep. Pleura of first 5 somites broadly rounded with first 3 enlarged in adult females, all unarmed in both sexes. Telson (Fig. 2F) 1.6 times length of sixth abdominal somite, 2.6 times longer than wide, sides straight or slightly convex, posteriorly convergent, posterior margin 0.4 of maximum telson width, angular, with minute median point; with 2 pairs of dorsal spines at 0.6 and 0.8 of telson length, subequal, marginal, 0.06 of telson length; lateral posterior spines slightly smaller than dorsal ones, intermediate posterior spines 4 times longer than lateral spines, 0.2 times telson length and 7 times longer than basal

width; submedian spines 0.38 of intermediate spines, 1.6 times length of lateral spines and feebly plumose.

Uropod (Fig. 2G) with protopodite unarmed, rami extending beyond tip of telson; exopod 2.9 times longer than broad, lateral border feebly convex, sparsely setose, with acute tooth distally and mobile spine medially, endopod about 1.1 times length of exopod, 3.2 times longer than wide.

Mandible (Fig. 3A–C) moderately robust, without distinguishing features; palp absent; molar process obliquely truncate distally, with 4 large blunt teeth and small tufts of setae just under 1 tooth; incisor process with 4 small teeth distally, 2 central teeth smaller than outer teeth. Maxillula (Fig. 3D, E) with feebly bilobed palp; lower lobe minute and with small uncinata seta; upper lacinia not expanded, with about 8 stout spines and some setae distally, lower lacinia slender, with numerous setae distally. Maxilla (Fig. 3F) with tapering palp, basal endite well developed, deeply bilobed, distal lobe slightly larger than proximal, with about 10 slender distal setae on distal lobe and about 7 on proximal lobe, coxal endite absent, only feebly rounded lobe present. Scaphognathite slender 4.5 times longer than wide, posterior lobe well developed, anterior lobe narrow, sinuously concave medially. First maxilliped (Fig. 3G) with slender palp, with preterminal plumose seta medially, basal endite broad and rounded with numerous setae medially, separated by notch from broadly rounded and less setose coxal endite; exopod long and slender with small setose cardian lobe, flagellum with 4 plumose setae distally; epipod large, deeply bilobed. Second maxilliped (Fig. 3H) normal, coxa rounded with few setae and epipod trapezoidal, without podobranch; exopod with long slender flagellum with 4 plumose distal setae, propodal segment slightly produced distomedially, with 7 spines on distomedial margin; dactylar segment moderately narrow, 3.6 times longer than central width, with numerous serratulate spines medially. Third maxilliped (Fig. 3I) moderately robust, just exceeding carpocerite by tip of dactyl; antepenultimate segment 5.5 times longer than broad, uniform, slightly bowed, with simple setae medially; ischiomerus incompletely fused to basis; penultimate segment 0.8 of length of antepen-

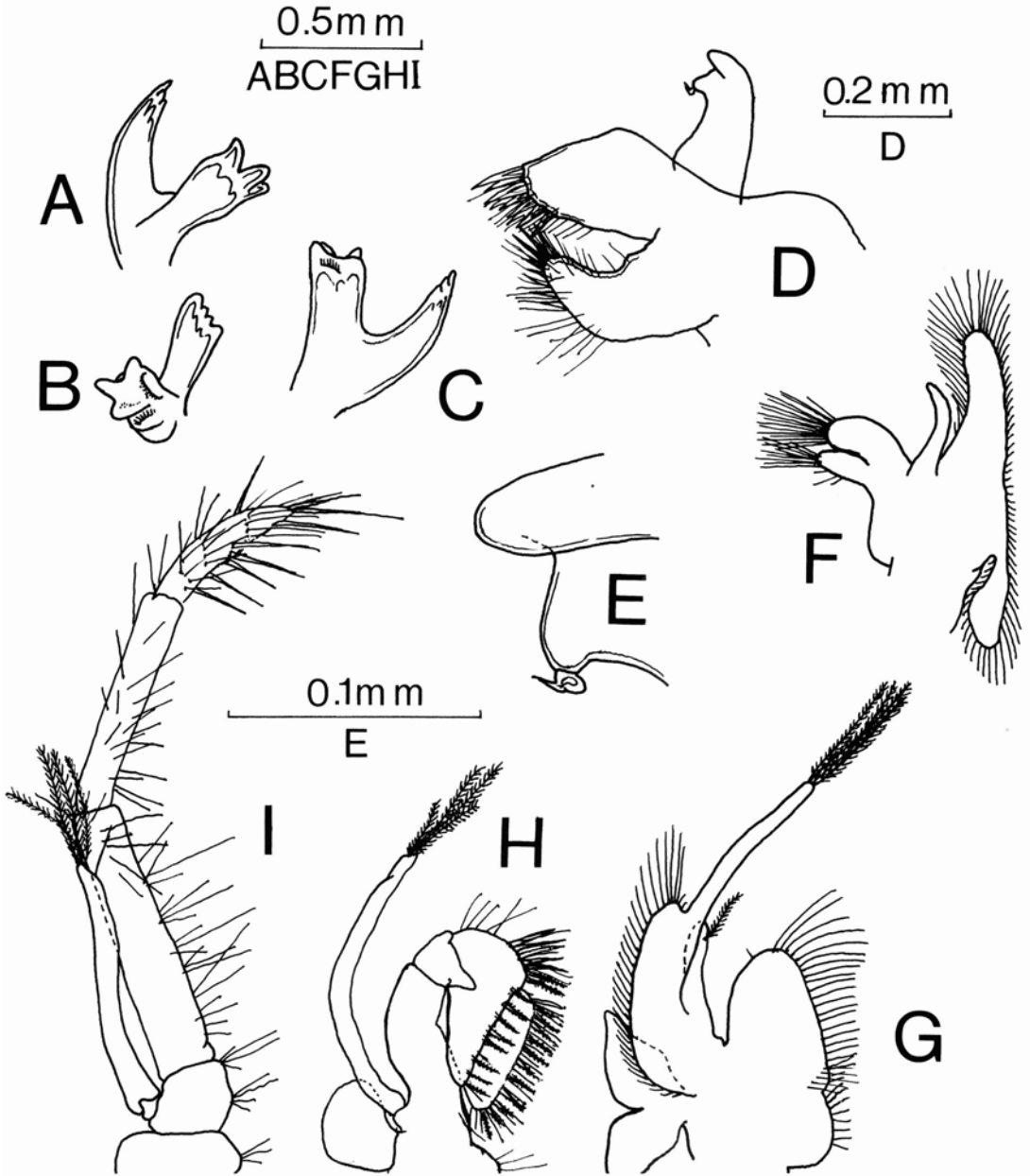


Fig. 3. *Periclimenes ingressicolumbi*, new species. A, mandible, right side; B, same, molar process above; C, same, side view, with setae tuft; D, maxillula, left side; E, same, palp; F, maxilla, left side; G, first maxilliped, left side; H, second maxilliped, left side; and I, third maxilliped, left side. A-C, E-I, holotype female; D, paratype female, ovigerous, CL = 2.7 mm.

ultimate, 6.4 times longer than wide, with scattered setae; terminal segment 0.7 of penultimate segment length, tapering, with 3 rows of setae; exopod as on second maxilliped; epipod feebly developed, arthrobranch absent.

First pereopod (Fig. 4A) with distal bor-

der of carpus extending to level of distal border of scaphocerite, palm of chela compressed, 1.4 times longer than deep, fingers compressed, tapering to acute tips, 3.5 times longer than deep, entire cutting edges on distal two-thirds of fingers, with numerous groups of short setae. Carpus 0.9 of chelae

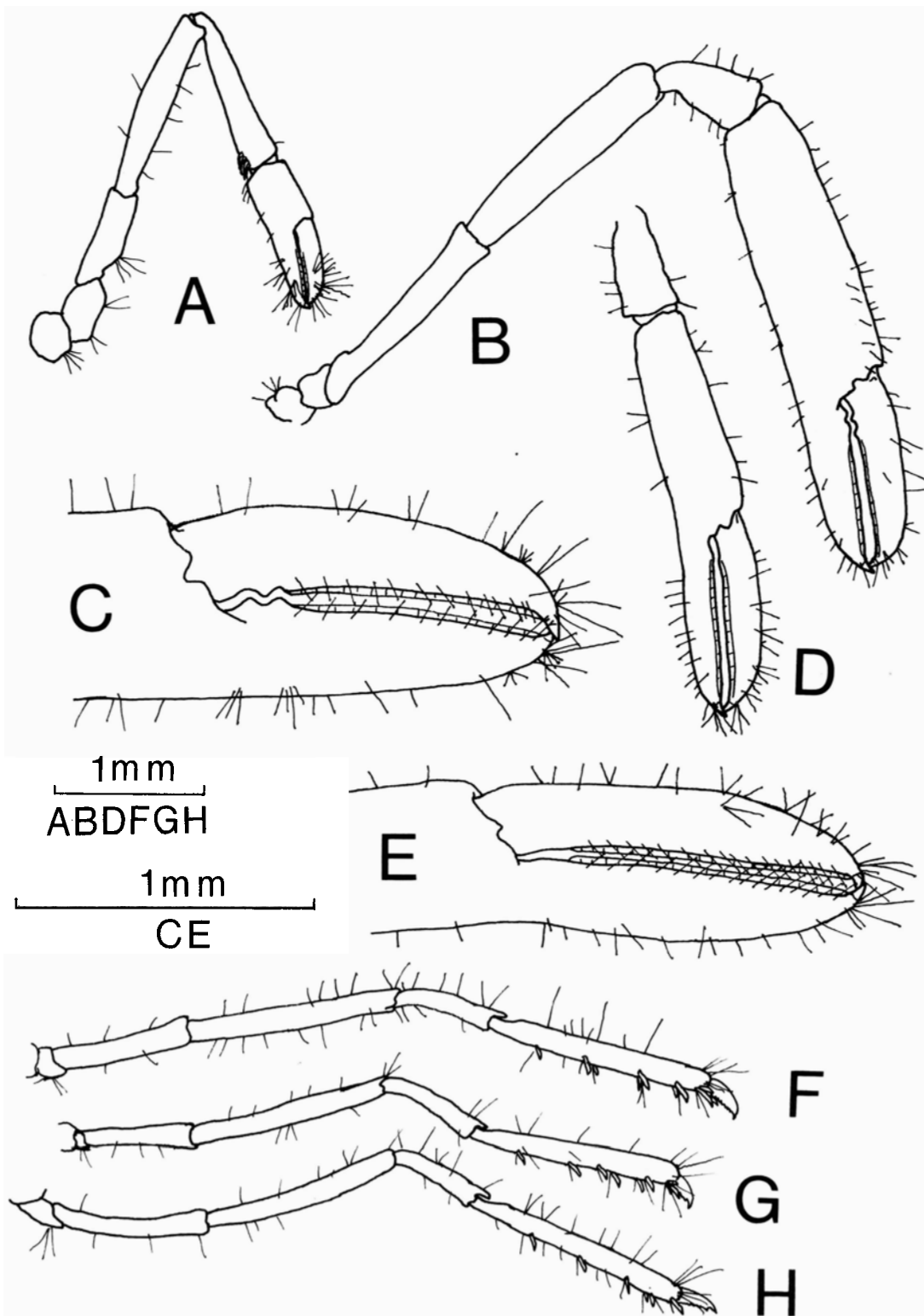


Fig. 4. *Periclimenes ingressicolumbi*, new species. A, first pereiopod; B, major second pereiopod; C, same, fingers; D, minor second pereiopod, chela; E, same, fingers; F, third pereiopod; G, fourth pereiopod; and H, fifth pereiopod. A, F-H, holotype female, ovigerous; B-E, allotype male, CL 2.3 mm.

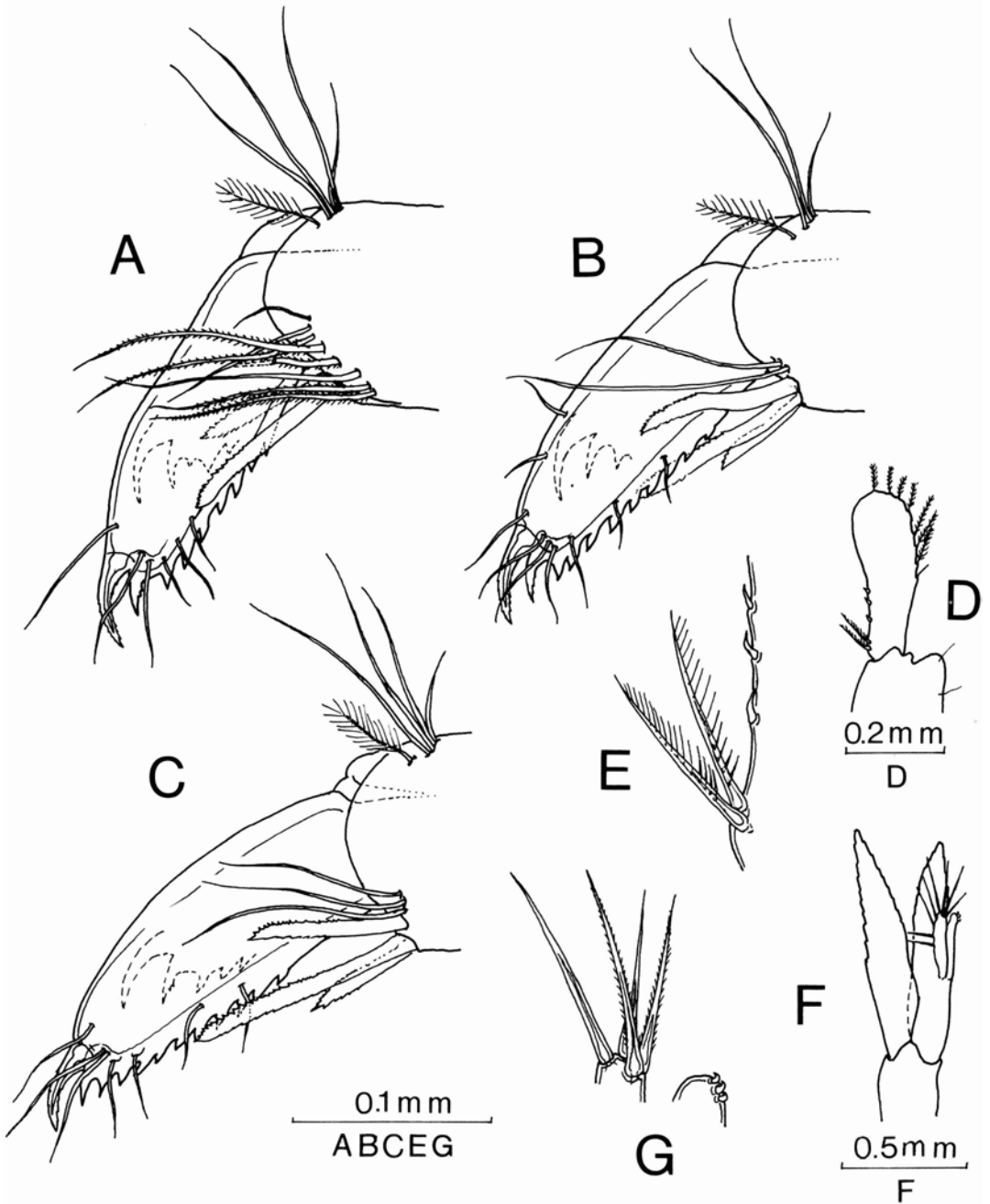


Fig. 5. *Periclimenes ingressicolumbi*, new species. A, third pereiopod, distal propod and dactyl; B, fourth pereiopod, distal propod and dactyl; C, fifth pereiopod, distal propod and dactyl; D, endopod of first pleopod; E, same, proximal median border; F, endopod and exopod of second pleopod; and G, same, tip of appendix masculina and appendix interna. A-C, holotype female, ovigerous; D-G, allotype male.

length, 4 times longer than distal width; merus 5.3 times longer than central width, slightly longer than chela; ischium 0.5 of meral length; basis and coxa normal, sparsely setose, without medial processes.

Second pereiopods (Fig. 4B-D) with similar nearly equal chelae. Major chela with palm 3 times longer than deep, smooth, uniform, subcylindrical, fingers robust, 0.6 of palm length, tapering to acute tips, about

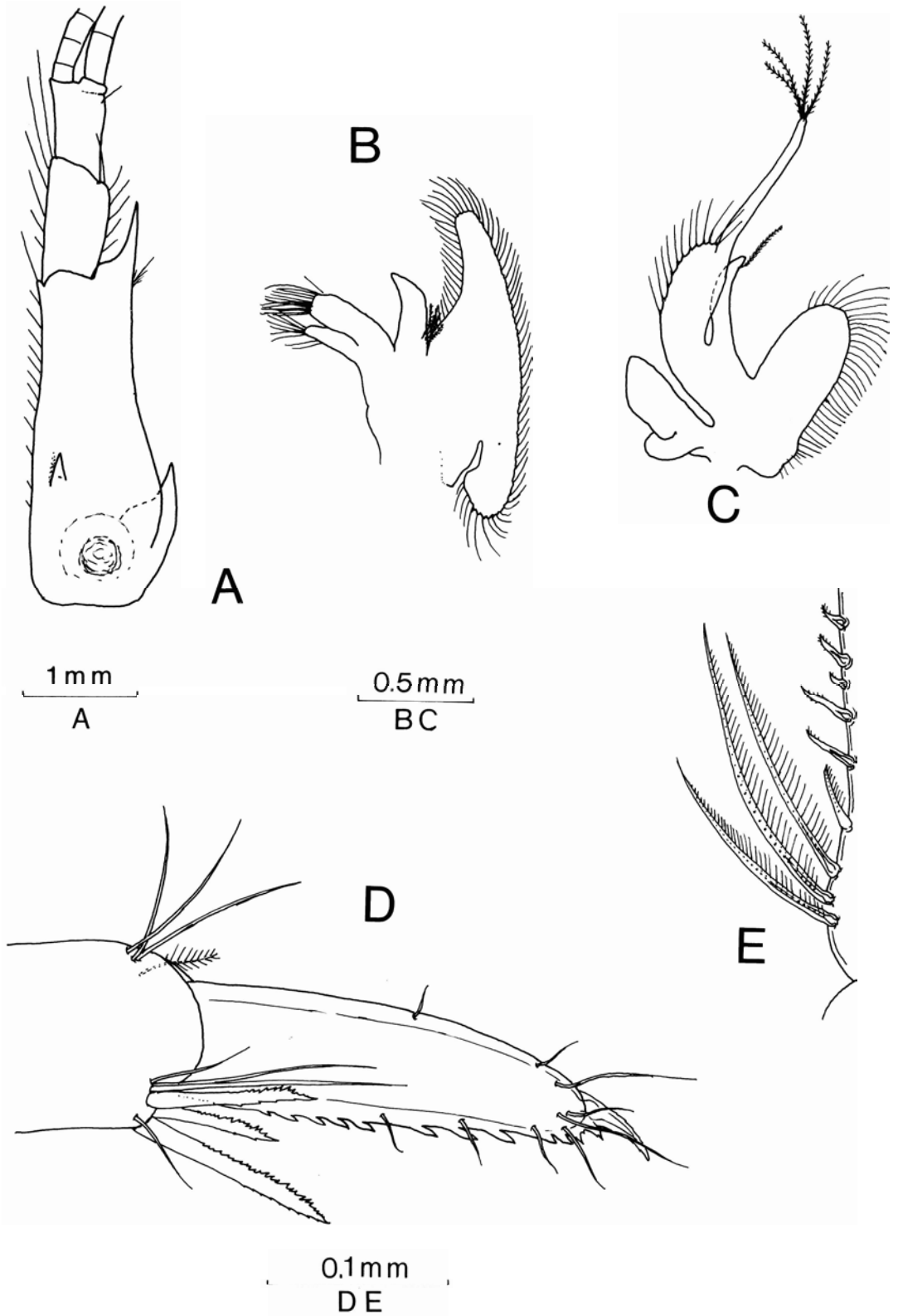


Fig. 6. *Periclimenes milleri*, female, CL 3.6 mm. A, antennule, right side, ventral; B, maxilla; C, first maxilliped; D, third pereopod, distal propod and dactyl; and E, same, proximal medial border.



Table 1. Morphological characters of *Periclimenes ingressicolumbi*, new species, compared with *Diapontonia maranulus*. Some characteristic measurements are from a whole sample ( $N = 9$ ) with mean and 95% confidence intervals. All other measurements are from the holotype female only.

		<i>Diapontonia maranulus</i> (Bruce, 1986)	Holotype female	Allotype male
Rostrum	No. of dorsal teeth	7-9	9	9
	No. of ventral teeth	1	1	1
Antennulae	Fused segments	3	4	5
	No. of segments on short ramus	2	3	3
Antenna	No. of segments on long ramus	9	10	10
	Length of flagellum to postorbital carapace length	1.6	2.3	2.8
Third maxilliped	Exceeding carapocerite (length of dactyl)	about one-half tip(= one-sixth)		tip
	Exceeding distal border of scaphocerite by length of (ch = chela, ca = carpus)	ch	one-third ca	one-third ca
First pereiopod	Palm (length : depth)	1.2	1.4	
	Finger (length : depth)	3.0	3.5	
	Carpus: chela (length : length)	0.6	1.0	0.9
	Carpus (length : distal width)	2.5	4.0	4.4
	Merus (length : distal width)	4.0	5.3	
Second pereiopod (major)	Ischium: merus (length : length)	0.6	0.5	
	Palm (length : depth)	2.6	3.0	
	Finger (length : depth)	3.2	4.4	4.5
	Finger: palm (length : length)	0.6	0.6	
	Carpus: chela (length : length)	0.2	0.2	
	Carpus (length : distal width)	1.3	1.5	
	Merus: chela (length : length)	0.4	0.5	
	Merus (length : distal width)	3.3	4.6	5.0
Third pereiopod	Ischium: merus (length : length)	1.0	0.8	
	Ischium (length : distal width)	4.1	4.0	
	Exceeding antennular peduncle by length of propodus	0.5	two-thirds	two-thirds
	Corpus of dactylus (length : width)	2.8	2.9	
	No. of ventral teeth on dactylus	6	9	
	Propodus: dactylus (length : length)	3.5	5.5	5.0
	Propodus (length : distal width)	7.0	11.0	10.0
	No. of spines on propodus	8	10	
	Carpus: propodus (length : length)	0.5	0.4	
	Carpus (length : distal width)	2.5	4.0	4.5
	Merus: propodus (length : length)	1.1	0.9	
	Merus (length : distal width)	5.5	9.0	7.9
	Ischium: propodus (length : length)	0.8	0.7	
	Ischium (length : distal width)	4.5	5.0	
	First pleopod (endopod)	Endopod (length : central width)	4.0	4.0
No. of plumose setae		2	7	
No. of setae plumose on one side		1	2	
Second pleopod (endopod)	No. of spines	3	3	
	Appendix masculina (length : width)	6.0		6.0
	Appendix masculina: endopod (length : length)	0.3		0.3
Telson	No. of spines on appendix masculina	4		8
	Telson (length : maximum width)	2.6	2.6	
	Telson (posterior width : anterior width)	0.4	0.4	
Carapace	Dorsal length (mm)	2.8-3.3/3.5-5.1	2.42	2.30
Sex	M = male, F = female, OF = ovigerous female	7 M/3 F + 1 OF	OF	M

4.4 times longer than deep, with laterally situated entire cutting edges, except on inner fifth of finger, on fixed finger 2 blunt teeth, matching single tooth and 2 hollows on

flexed finger, sparsely setose. Carpus short and stout, unarmed, slightly expanded and excavate distally, 1.5 times longer than distal width and 0.2 of chela length. Merus 4.6

Table 1. Continued.

<i>Periclimenes ingressicolumbi</i> , new species Paratype number							Mean value	95% Confi- dence intervals
1	2	3	4	5	6	7		
9	10	9	9	9	11	11	9.56	± 0.68
1	1	1	1	1	1	1	1	± 0.00
4	4	3	3	3	4	5	3.89	± 0.60
3	3	3	2	2	3	3	2.78	± 0.34
10	9	9	7	8	11	10	9.33	± 0.94
2.3	broken	broken	2.0	1.8 (tip cut)	2.4	2.8	2.34	± 0.31
about one-third	tip	about one-third	tip	tip	about one-third	tip	0.22	± 0.06
one-half ca	one-half ca	one-half ca	one-half ca	one-third ca	one-half ca	one-third ca	0.43 ca	± 0.07
0.9	0.9	0.9	0.9	1.0	0.9	1.0	0.93	± 0.04
4.1	5.2	4.2	4.3	4.1	4.7	4.9	4.43	± 0.32
4.0	4.6	3.4	4.6	3.6	5.2	lost	4.29	± 0.49
5.1	4.5	4.4	4.9	4.6	5.2	lost	4.79	± 0.25
two-thirds	two-thirds	two-thirds	two-thirds	two-thirds	lost	two-thirds	0.67	± 0.00
5.2	5.5	5.2	5.2	5.6	lost	5.3	5.31	± 0.17
10.4	11.0	10.8	10.8	10.3	lost	10.1	10.55	± 0.33
4.0	4.6	3.9	4.3	4.0	lost	4.7	4.25	± 0.26
8.0	7.5	7.7	8.3	8.3	lost	8.5	8.15	± 0.40
2.72 OF	2.39 OF	2.04 OF	2.17 F	2.14 OF	2.25 M	2.35 M	2.31	± 0.15

times longer than wide, uniform, unarmed, equal to about 0.5 of chela length. Ischium 0.8 of merus length, more slender, tapered proximally, unarmed, 4 times longer than

distal width. Basis and coxa normal, without special features. Minor chela generally similar to major but less robust, about 0.9 of major chela length, palm 3.3 times longer

than wide, slightly broadened distally, fingers equal to 0.8 of palm length, cutting edges entire except on proximal sixth part, no teeth. Carpus, merus, ischium, basis, and coxa as in pereopod with major chela but more slender.

Ambulatory pereopods (Figs. 4, 5) moderately robust, third exceeding antennular peduncle by two-thirds of propodus length. Dactyl of third pereopod with corpus compressed, 2.9 times longer than wide, broadest centrally with unguis distinct, slender, strongly curved, 0.2 of corpus length, with dorsal border minutely crenulate and ventral border denticulate; with acute distoventral accessory spine, ventral border more or less straight with 9 very acute teeth, groups of 3 sensory setae present medio- and distolaterally at base of unguis, with some setae on distal dorsal borders; propodus 5.5 times dactyl length, 11 times longer than deep, uniform, with 3 strong serrulate spines distoventrally and 7 similar spines along ventral border, sparse scattered setae, 1 plumose small setae distodorsally. Carpus unarmed, 0.4 of propodus length, about 4 times longer than distal width; merus 0.9 times propodus length, unarmed, 9 times longer than wide; ischium 0.7 of propodus length, 5 times longer than distal width, unarmed; basis and coxa without special features. Fourth and fifth pereopods similar to third with number of spines of dactylus and propodus slightly reduced, propodus of fifth equal to 0.9 of length of third, with cleaning setae distoventrally.

Endopod (Fig. 5D, E) of male first pleopod 4 times central width, with distal half slightly expanded medially, distal half of lateral border with 7 plumose setae, proximal half of medial border with 2 single-sided plumose setae and 3 short spines or setae. Second pleopod (Fig. 5F, G) with appendix masculina subequal to appendix interna, corpus 6 times longer than wide, 0.3 of length of endopod, with 8 spines from half of lateral border including 4 at distal end.

*Measurements.* — Postorbital carapace length; males, 2.3–2.4 mm; female, 2.17 mm, ovigerous females, 2.0–2.7 mm. Holotype 2.4 mm, allotype 2.3 mm. Egg diameter (longest/shortest) 0.33/0.45 mm.

Color red, without conspicuous markings.

*Host.* — *Palaeopneustes tholoformis* Chesher (Echinodermata: Echinoidea: Asterostomatidae).

*Etymology.* — The specific name is derived from the belief that the landfall of Columbus took place on the island of San Salvador (*ingressus* = entrance or landfall; *columbi* = Columbus).

#### *Periclimenes milleri* Bruce, 1986

*Material.* — Seven specimens (4 ♂♂, 3 ovigerous ♀♀), San Salvador Island, 24°02.91'N, 74°32.7'W, 1,900–2,000 ft (579–610 m), Johnson Sea Link Dive no. 2032, 8 May 1987. Thirteen specimens (4 ♂♂, 2 ♀♀, and 7 ovigerous ♀♀), San Salvador Island, same position as above, Johnson Sea Link Dive no. 2039, 11 May 1987.

*Description.* — Some additional characteristics are added to the description given by Bruce (1986b). Antennular peduncle (Fig. 6A) having small ventral tooth 0.4 from base of proximal segment and located on inner side. Sternite of second thoracic segment showing small median knob, third sternite unarmed, fourth sternite with distinct transverse ridge with deep median notch, broader than height of ridge. Fifth sternite having larger ridge with much narrower notch. Sixth to eighth sternites unarmed.

Maxilla (Fig. 6B) with tapering palp, with 4 small plumose setae proximolaterally. First maxilliped (Fig. 6C) with slender palp, with preterminal plumose seta medially.

Ambulatory pereopods (Fig. 6D) with strong serrulate spines at distal end of propodus. These spines serrulated on both sides, more strongly on dorsal side. Endopod of male first pleopod (Fig. 6E) with 4 setae plumose on 1 side and 5 short spines or setae.

Color red without conspicuous markings.

*Host.* — *Archaeopneustes hystrix* (Agassiz) (Echinodermata: Echinoidea: Asterostomatidae).

#### DISCUSSION

Of five species of echinoids (*A. hystrix*, *P. tholoformis*, *Aspidodiadema jacobyi*, *Salenia goesiana*, and *Aerosoma* spp.) sampled during dives with the Johnson Sea Link II submersible on the deep slopes off San Salvador Island in the Bahamas, only the two first mentioned species carried the commensal pontonine shrimps described in this paper. The shrimps were host specific and

Table 2. Carapace length, sex, and presence of the hepatic spine in a sample of *Periclimenes ingressicolumbi*, new species, collected at Salt Cay 24 May 1988 at a depth of 570–340 m.

		Paratype number						
		1	2	3	4	5	6	7
Carapace	Length (mm)	1.38	1.70	1.75	2.20	1.72	1.60	1.61
Sex	M = male, F = female, OF = ovigerous female	M	F	F	OF	F	F	F
Hepatic spine	+ = with spine, - = without spine	-	+	-	+	+	+	+

no individuals were observed free-living on the coral sand where the echinoids were abundant. The shrimps were found on the test among the dorsal spines of the echinoids, both of which are short-spined urchins.

Bruce (1986a) described the new genus *Diapontonia* and the new species *Diapontonia maranulus* which in appearance resembles the species described in this paper. However, *P. ingressicolumbi* possesses a hepatic spine on the carapace and may accordingly be classified as belonging to the genus *Periclimenes*. A morphological comparison with *D. maranulus* is presented in Table 1.

The two different shrimps (*D. maranulus* and *P. ingressicolumbi*) have been collected in only two different localities and depths in the Bahama archipelago. The major differences between *D. maranulus* and *P. ingressicolumbi*, apart from the hepatic spine absent on the former, are the length and also the number of segments in the antennule and antenna, a small ventral tooth on the antennular peduncle, the length of the first pereopod, the length of the second pereopod (e.g., merus), the length of the third pereopod and dactylus, the number of setae and spines on the endopod of the first pleopod, and the size and number of spines on the appendix masculina on the second pleopod. Furthermore, an overall impression is that *P. ingressicolumbi* is a more slender shrimp than *D. maranulus*.

Differences between *P. ingressicolumbi* and *P. milleri* are mainly the ventral rostral dentition (2 teeth in *P. milleri*), the length and number of segments and length of antennules and antennae, the length of all pereopods, the number of setae and spines on the endopod of the first pleopod, and the size and number of spines on the appendix masculina.

During the preparation of this study, we received additional material of both species collected by the Johnson Sea Link II submersible. This material, however, was from different echinoid hosts: *P. milleri* was found on *Cidaris lolakei* (1 ♂, CL 5.28 mm; 1 ovigerous ♀, CL 3.72 mm) collected from a depth of 621–785 m at Southwest Reef (Dive no. 1551, 23 May 1988) and on *Paleopneustes tholoformis* (2 ♂♂, CL 3.41 mm and 5.45 mm; 1 ovigerous ♀, CL 5.30 mm) collected from a depth of 661–500 m at Stanniard Rock (Dive no. 1556, 26 May 1988). Furthermore, seven specimens of *P. ingressicolumbi* were found on *P. tholoformis* from a depth of 340–500 m at Salt Cay (Dive no. 1552, 24 May 1988). In two of these shrimps the hepatic spine was missing and in the others the spine was very small. However, all these animals were generally small and only one had a CL > 2 mm (an ovigerous female which carried few eggs) (see Table 2). The genus dependent character separating *Diapontonia* and *Periclimenes*, the hepatic spine, seems not to be present in small individuals, but on individuals with a CL > 2.3 mm this spine is fully developed. Furthermore, one male had a shorter rostrum with only 6 dorsal spines, and lacked hepatic spines. Due to the overall appearance of this specimen, it is considered aberrant. Since only one individual with these characteristics was found no classification was made. The specimens used by Bruce (1986a) in the description of *D. maranulus* had a CL of 2.8–5.1 mm and all lacked a trace of a hepatic spine, while all specimens of *P. ingressicolumbi* with a CL > 2.0 mm possess a hepatic spine.

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