

*A. J. BRUCE*

*Pontoniinid Shrimps  
from the Ninth Cruise  
of R/V Anton Bruun,  
IIOE, 1964:  
I. Palaemonella Dana  
and Periclimenes Costa*

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## ABSTRACT

Bruce, A. J. Pontoniid Shrimps from the Ninth Cruise of R/V *Anton Bruun*, IIOE, 1964: I. *Palaemonella* Dana and *Periclimenes* Costa. *Smithsonian Contributions to Zoology*, number 82, 13 pages, 1971.—A collection of pontoniid shrimps was made in the western Indian Ocean in 1964, during the International Indian Ocean Expedition. Shrimps belonging to the two genera *Palaemonella* Dana (two species) and *Periclimenes* Costa (eighteen species) are reported upon. The collection provides further information upon the hosts of several of the commensal species of *Periclimenes*, including a number of new records, and extends present knowledge of the distribution of these species, several of which have not been previously recorded in the western Indian Ocean.

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A. J. Bruce

# Pontoniid Shrimps from the Ninth Cruise of R/V *Anton Bruun*, IIOE, 1964: I. *Palaemonella* Dana and *Periclimenes* Costa

## Introduction

During November and December 1964, the writer participated in a cruise of United States research vessel *Anton Bruun*. The cruise was the ninth of a series carried out in the Indian Ocean as part of the United States Program in Biology for the International Indian Ocean Expedition (IIOE), under the sponsorship of the National Science Foundation.

The ninth cruise covered much of the western part of the Indian Ocean and provided numerous opportunities for making littoral collections as well as for obtaining specimens from deeper water by means of trawls. A particular effort was made to collect as wide a range of the commensal shrimps of the subfamily Pontoniinae as possible, and special attention was paid to the identification of their hosts.

Information on the pontoniid fauna of the western Indian Ocean has been based mainly upon the publications of Borradaile (1898, 1915, 1917) and Barnard (1950, 1955, 1958), although many authors have provided numerous records of isolated occurrences. The present collection provides further information upon several rare or little known species, their hosts and the extent of their geographical ranges.

Altogether forty-three species of pontoniid shrimp were collected during the cruise. The major-

ity of species were obtained from coral reefs at depths of less than 3 fathoms, but some of the trawled specimens were obtained from depths of down to 95 fathoms. A number of the specimens reported upon were obtained from material collected by Dr. R. U. Gooding in the course of his examination of suitable hosts for commensal or parasitic copepods. Some of the new taxa have already been described (Bruce, 1967, 1969), and some of the data concerning hosts has also been reported (Bruce, in press).

A general report upon twenty species belonging to the genera *Palaemonella* Dana and *Periclimenes* Costa is now presented and the remaining genera will be dealt with in a subsequent paper. A representative collection of the species obtained will be deposited in the Smithsonian Institution of Natural History (USNM). Full synonymies may be found in Holthius (1952).

The course followed by the research vessel *Anton Bruun* during Cruise 9 is shown on the map (page 3) and the details of the stations from which pontoniid shrimps were obtained are given in Table 1 (page 2).

## Acknowledgments

I wish to express my gratitude to the National Science Foundation, which enabled me to participate in the ninth cruise of the research vessel *Anton Bruun* in the western Indian Ocean Expedition in 1964, and to the Chief Scientist for Cruise Nine,

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A. J. Bruce, East African Marine Fisheries Research Organization.

TABLE 1.—Details of Stations from Which Specimens Reported upon Were Obtained.

No.	Location at which collection was made	Date (1964)	Collection data	Depth, temperature
1.	Andromache Reef, off Mombasa, Kenya	04°05'S. 40°40.7'E.	15 November Reef	0-1 fm.
2.	Latham Island	06°54'S. 39°56'E.	20 November Reef	0-3 fm.
3.	S. of Moroni Grande Comore Island, Comoro Archipelago	11°45.6'S. 43°15.0'E.	22 November Weedy shore with scattered corals	0-2 fm.
4.	Mounimeri Island, Ile Mayotte, Comoro Archipelago	12°48.7'S. 45°15.0'E.	23 November Coral reef in lagoon	0-2 fm.
5.	Pamanzi Island, Ile Mayotte, Comoro Archipelago	12°49.5'S. 45°18.0'E.	23 November Coral reef, outer edge	0-1 fm.
6.	Pamanzi Island, Ile Mayotte, Comoro Archipelago	12°49.5'S. 45°18.0'E.	24 November Coral reef, inner edge	0-1 fm.
7.	Pamanzi Island, Ile Mayotte, Comoro Archipelago	12°50.4'S. 45°18.0'E.	25 November Coral reef, inner edge	0-1 fm.
8.	Mounimeri Island, Ile Mayotte, Comoro Archipelago	12°49.0'S. 45°15.1'E.	25 November Coral reef, in lagoon	0-2 fm.
9.	Bandeli Island, Ile Mayotte, Comoro Archipelago	12°53.3'S. 45°15.8'E.	28 November Coral reef, outer edge	0-1 fm.
10.	Moroni, Grande Comore, Comoro Archipelago	11°35.5'S. 43°15.0'E.	27 November Weedy flats with corals	0-2 fm.
11.	Aldabra Island	8°22.0'S. 45°15.0'E.	3 December Coral reef flats in main entrance channel	0-1 fm.
12.	Aldabra Island	8°23.0'S. 45°17.0'E.	4 December Coral reef flats in lagoon	0-1 fm.
13.	Farquhar Island	9°06.4'S. 51°11.0'E.	6 December Sheltered coral reef flats	0-1 fm.
14.	Resource Island, St. Joseph Atoll Amirante Islands	5°24'23"S. 53°13'18"E. (approx)	8 December Lagoon flats with scattered corals	
15.	Victoria Harbour, Mahé, Seychelles Islands	4°37.3'S. 55°27.7'E.	9 December Sheltered coral reef	0-2 fm.
16.	Anse Royale, Mahé, Seychelles Islands	4°44.8'S. 55°31.0'E.	10 December Coral reef flats	0-1 fm.
17.	Cerf Island, Mahé, Seychelles Islands	4°35.6'S. 55°30.0'E.	11 December Sandy flats with <i>Thalassia</i> and isolated corals	0-2 fm.
18.	Station 9-442	09°35'N. 50°59'E.	16 December Gulf of Mexico shrimp trawl	38-43 fm.
19.	Station 9-444	09°36'N. 51°01'E.	16 December Gulf of Mexico shrimp trawl	42-45 fm. Bottom temp. 16.94°C, salinity 35.345
20.	Station 9-459	11°18'N. 51°08'E.	17 December Gulf of Mexico shrimp trawl	14-16 fm. Bottom temp. 21.22°C, salinity 35.518
21.	Station 9-463	11°24'N. 51°35'E.	18 December Gulf of Mexico shrimp trawl	45-95 fm., mainly 82 fm.
22.	Gold Mohur Bay, Aden		12 December Weedy flats with scattered corals	0-2 fm.

## SPECIES COLLECTED DURING CRUISE 9

- |   |  |
|---|--|
| 1. <i>Palaemonella tenuipes</i> Dana, 1852            | 10. <i>Periclimenes soror</i> Nobili, 1904             |
| 2. <i>Palaemonella vestigialis</i> Kemp, 1922         | 11. <i>Periclimenes incertus</i> Borradaile, 1915      |
| 3. <i>Periclimenes petilthouarsi</i> (Audouin, 1825)  | 12. <i>Periclimenes seychellensis</i> Borradaile, 1915 |
| 4. <i>Periclimenes lutescens</i> (Dana, 1852)         | 13. <i>Periclimenes latipollex</i> Kemp, 1922          |
| 5. <i>Periclimenes ensifrons</i> (Dana, 1852)         | 14. <i>Periclimenes lanipes</i> Kemp, 1922             |
| 6. <i>Periclimenes grandis</i> (Stimpson, 1860)       | 15. <i>Periclimenes diversipes</i> Kemp, 1922          |
| 7. <i>Periclimenes elegans</i> (Paulson, 1875)        | 16. <i>Periclimenes inornatus</i> Kemp, 1922           |
| 8. <i>Periclimenes spiniferus</i> (de Man, 1902)      | 17. <i>Periclimenes antonbruunii</i> Bruce, 1967       |
| 9. <i>Periclimenes brevicarpalis</i> (Schenkel, 1902) | 18. <i>Periclimenes imperator</i> Bruce, 1967          |
|   | 19. <i>Periclimenes zanzibarcus</i> Bruce, 1967        |
|   | 20. <i>Periclimenes mahei</i> Bruce, 1969              |

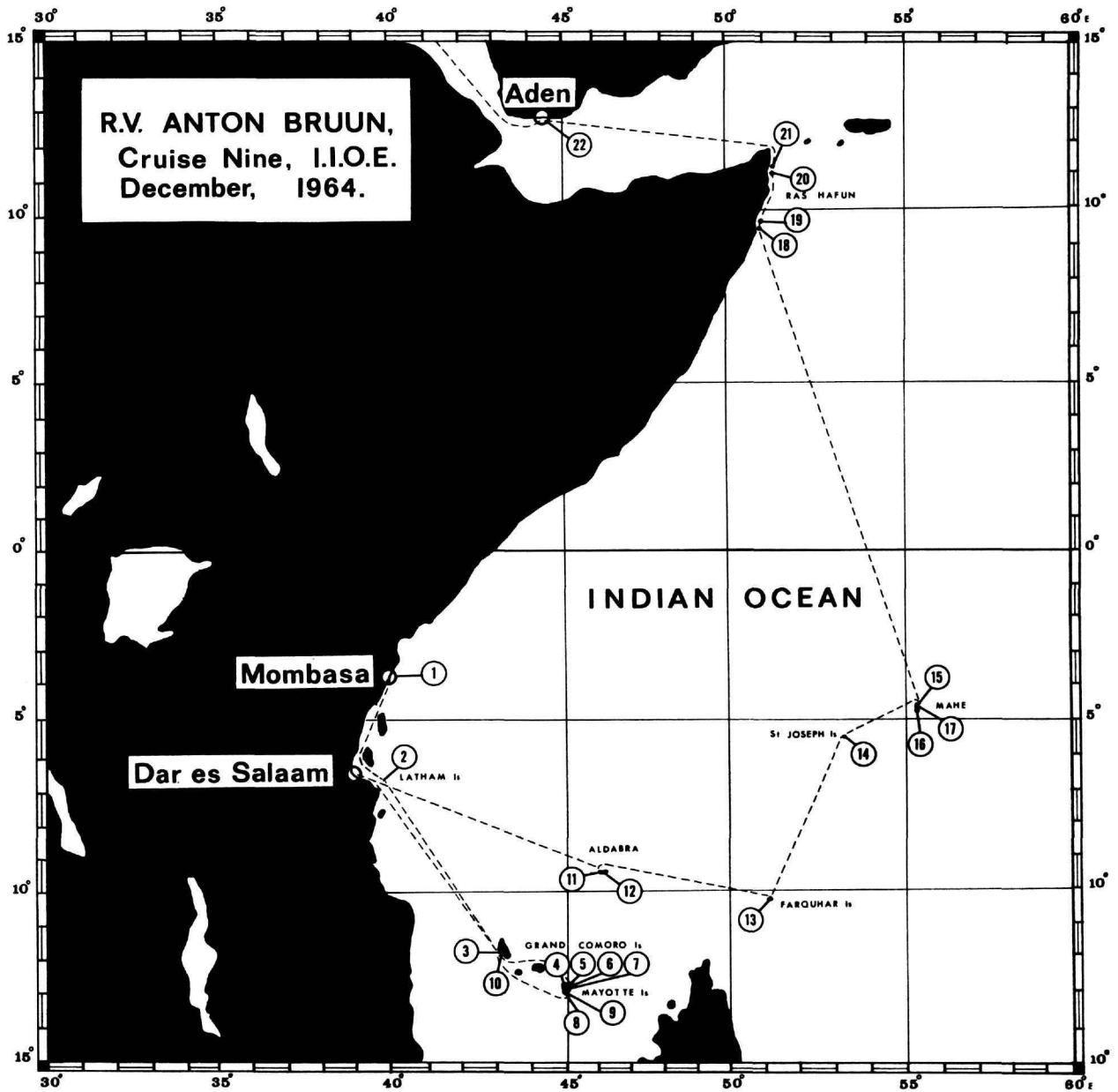


FIGURE 1.—Map of Cruise 9, December 1964, of the research vessel *Anton Bruun* for the International Indian Ocean Expedition, under the sponsorship of the National Science Foundation, showing the collecting stations listed in Table 1.

Dr. E. Chin. I am also indebted to the following systematists for the identification of the host animals of the shrimps reported upon in this paper: Dr. J.W. Wells (corals); Dr. H. Utinomi (gorgonians); Miss A.M. Clark, Dr. D.L. Pawson, and Dr. D.M. Devaney (Echinoderms).

## Family PALAEMONIDAE Samouelle, 1819

### Subfamily PONTONIINAE Kingsley, 1878

#### Genus *Palaemonella* Dana, 1852

##### 1. *Palaemonella tenuipes* Dana, 1852

Restricted synonymy:

*Palaemonella tenuipes* Dana, 1852, p. 25; 1852a, p. 582; 1855, pl. 38 (fig. 3).—Borradaile, 1917, p. 358.—Kemp, 1922, p. 129, figs. 7b, 8.—Holthuis, 1952, pp. 8, 27–28, [full synonymy]; 1953, p. 55.

*Palaemonella tridentata* Borradaile, 1917, p. 323, 358.

**MATERIAL EXAMINED**—(1) Farquhar Is., 6 December 1964, 1 ♂.

**REMARKS**.—The single specimen obtained agrees well with the description given by Kemp and bears a distinct subterminal medial carpal spine on the second pereopods. The species has not been previously recorded from the southwestern Indian Ocean.

**HABITAT**.—The specimen was obtained from shallow barren pools on the outer reef flat.

**DISTRIBUTION**.—Holthuis (1952) has remarked that many of the published records probably apply to the much commoner species *Palaemonella vestigialis* Kemp. The following records can probably be safely referred to *P. tenuipes*: Sulu Sea (Dana); Ellice Is., Maldive Islands, (Borradaile, 1917); Chagos Archipelago, (Kemp, 1922); Red Sea, (Tattersall, 1921).

##### 2. *Palaemonella vestigialis* Kemp, 1922

Restricted synonymy:

*Periclimenes vitiensis* Nobili, 1899, p. 234.

*Palaemonella tenuipes* Rathbun, 1906, p. 925.

*Palaemonella vestigialis* Kemp, 1922, p. 123, figs. 1, 2, pl. 3 fig. 2; 1925, p. 321.—Calman, 1939, p. 210.—Holthuis, 1952, pp. 8, 24, fig. 3 [full synonymy]; 1953, p. 55.—Barnard, 1958, pp. 11, 14, fig. 3.—Holthuis and Gottlieb, 1958, pp. 26, 112.—Johnson, 1961, pp. 58, 61, 62, tab. 1 (p. 75).

*Periclimenes rotumanus* McNeill, 1968, p. 22.

**MATERIAL EXAMINED**.—Mounimeri Is., Zaoudzi, Ile Mayotte, Comoro Islands, 23 November 1964, 1 ovig. ♀, 1 juv. (2) Pamanzi Is., Ile Mayotte, Comoro Islands, 24 November 1964, 2 ♂. (3) Anse Royale, Mahé, Seychelles Islands, 10 December 1964, 1 ♂, 3 ovig. ♀. (4) Cerf Is., Mahé, Seychelles Islands, 11 December 1964, 8, incl. 1 adult ♂, 2 ovig. ♀. (5) Gold Mohur Bay, Aden, 21 December 1964, 1 ♂.

**REMARKS**.—The specimens agree well with the description and figures given by Kemp (1922). The postorbital ridge is well marked but the tubercle is vestigial or absent. In all specimens there is no suggestion of a spine on this position.

Coloration on capture noted as mainly transparent but with a dark brown ring around the middle and the base of the fingers of the second pereopods and the rest of the finger white. The palms of the chela of the second pereopods were feebly yellowish. The cornea shows a pair of dark transverse bars.

**HABITAT**.—The specimens were obtained from shallow pools, often containing corals, from depths 0.5–2.0 fathoms below low water tide level. *Palaemonella vestigialis* has been frequently reported as associated with corals (e.g., Johnson, 1961). Some of the specimens included in this report were obtained from corals of the genera *Pocillopora*, *Acropora*, and *Porites*, but this species is equally common in pools without corals, where it may be commonly found in dead coral lumps or under rocks. The association with corals is therefore to be regarded as accidental.

**DISTRIBUTION**.—*Palaemonella vestigialis* is widely distributed throughout the Indo-West-Pacific region and now also occurs in the eastern Mediterranean (Holthuis and Gottlieb, 1958). The only other record of this species in the southwest Indian Ocean is that of Barnard (1958) who has provisionally reported the occurrence of the species at Delagoa Bay, Mozambique. There seems no reason to doubt that Barnard's record is correct.

##### 3. *Periclimenes petithouarsi* (Audouin, 1825)

Restricted synonymy:

*Palaemon petithouarsi* Audouin, 1825, p. 91.

*Anchistia inaequimana* Heller, 1861, p. 28.

*Anchistia petithouarsi* Paulson, 1875, p. 114.

*Periclimenes petithouarsi* Borradaile, 1898, p. 381.

*Periclimenes (Falciger) petithouarsi* Borradaile, 1917, p. 369.

*Periclimenes (Ancylocaris) petithouarsi* Kemp, 1922, p. 170.

(key), 196.

*Periclimenes (Harpilius) petitthouarsi* Holthuis, 1952, pp. 12, 78-79 [full synonymy]; 1953, p. 3.

?*Periclimenes* sp. Foumanoir, 1955, pp. 25-26, fig. 2.

MATERIAL EXAMINED.—(1) Mounimeri Is., Zaoudzi, Île Mayotte, Comoro Islands, 23 November 1964, 28 specimens. (2) Bandeli Is., Île Mayotte, Comoro Islands, 24 November 1964, 1 ♂. (3) Gold Mohur Bay, Aden, 21 December 1964, 18 specimens.

REMARKS.—The specimens are identical with *Periclimenes spiniferus* (de Man) except for the complete absence of a supraorbital spine. Holthuis (1952, 1953) has remarked that the distribution of *P. petitthouarsi* is limited to the Red Sea and Persian Gulf. The discovery of this species in the Comoro Islands therefore indicates a more extensive distribution in the western Indian Ocean (see remarks under *P. spiniferus*). The specimen figured by Foumanoir (1955, Figure 2) also appears to be *P. petitthouarsi*. Although the characteristic foveae on the cutting edges of the fingers of the second pereopod are not mentioned by Foumanoir, the fixed finger is reported to be provided with a distinct tooth that fits into a hollow in the dactyl when the fingers are closed, as occurs in this species.

HABITAT.—The specimens were obtained from live corals (*Seriatopora* sp.) from depths of 0.5-1.5 fathoms as well as from dead coral and under old coral slabs.

DISTRIBUTION.—Numerous localities throughout the Red Sea and from northeast of Arzani Island, Persian Gulf.

#### 4. *Periclimenes lutescens* (Dana, 1852)

Restricted synonymy:

*Harpilius lutescens* Dana, 1852, p. 25; 1852a, p. 576; 1855, p. 12, pl. 39 (fig. 4).

?*Harpilius lutescens* Kemp, 1922, p. 235, figs. 72-73.

*Periclimenes (Harpilius) lutescens* Holthuis, 1952, pp. 12, 88; 1958, p. 9.—Patton, 1966, p. 275, tab. 1 (p. 288), tab. 2 (p. 290).

*Periclimenes (Harpilius) ? lutescens* Johnson, 1961, pp. 58, 63, tab. 1 (p. 76).

MATERIAL EXAMINED.—(1) Moroni, Grand Comore, Comoro Islands, 22 November 1964, 6 juveniles. (2) Moroni, Grande Comore, Comoro Islands, 27 November, 1964, 1 ♀. (3) Mounimeri Is., Zaoudi, Île Mayotte, Comoro Islands, 23 November 1964 1 ♂.

REMARKS.—The specimens agree with the description of the species as given by Kemp (1922), except that the rostral midrib is continuous with the orbital margin, but can only with reservations be referred to Dana's species (see Patton, 1966). The examination of a wide range of specimens from known hosts throughout the Indo-West-Pacific region is necessary to clarify the position of *P. lutescens* (Dana), *P. lutescens* auctorum and *P. consobrinus* de Man.

HOST.—All specimens were obtained from corals at depths of 2-4 meters. Identified hosts included *Pocillopora hemprichi* (Ehrenberg) (2), and *Acropora convexa* (Dana) (1).

DISTRIBUTION.—Specimens referred to this species have been reported from the Red Sea and from the Malay Archipelago to Samoa and the Great Barrier Reef. The species has not been previously reported in the western Indian Ocean.

#### 5. *Periclimenes ensifrons* (Dana, 1852)

*Anchistia ensifrons* Dana, 1852, p. 21; 1852a, pp. 580-581; 1855, pl. 38, 1a-g.—Müller, 1887, p. 471.—Ortmann, 1894, p. 16.

*Periclimenes ensifrons* Borradaile, 1898, p. 382.—Nobili, 1907, p. 234.

*Periclimenes (Falciger) ensifrons* Borradaile, 1917, pp. 367, 370.

*Periclimenes (Ancylocaris) ensifrons* Kemp, 1922, p. 171 (key), 209-210.

*Periclimenes (Harpilius) ensifrons* Holthuis, 1952, p. 11.

MATERIAL EXAMINED.—(1) Pamanzi Is., Île Mayotte, Comoro Islands, 24 November 1964, 1 ovig. ♀. (2) Aldabra, 3 December 1964, 1 ♂, 1 ovig. ♀.

REMARKS.—The three specimens agree with the short original description and correspond closely to the illustrations. The Aldabra specimens are intact. The rostrum of the female bears seven dorsal teeth and two ventral teeth. The rostrum of the male is distinctly longer and more slender than in the female and bears six dorsal and two ventral teeth. The carpus of the second pereopod is unarmed in the female but in the male bears medial and dorsal low blunt lobes. There is no trace of a spine. In both specimens the posterior pair of dorsal telson spines are situated immediately posterior to the middle of the telson and the anterior pair is situated nearer to the anterior margin of the telson than to the posterior spines. The rostrum, in the Pamanzi Island specimen, bears six dorsal teeth, the most anterior of which is subapical, and two ventral

teeth. The supraorbital spines are distinctly smaller than in Dana's illustration. The specimen has only the left second pereopod fully formed, that on the right side being in the process of regeneration. The carpus of the left second pereopod is unarmed and the distoventral angle of the merus bears only a small spine. In other respects the limb closely resembles the figure given by Dana (1855). The cutting edges of the fingers are unarmed.

The specimens reported upon here show the closest resemblance to *Periclimenes grandis* (Stimpson), except for the lack of teeth on the carpus of the second pereopod. The lack of teeth in this position may well be due to normal variation within the species or to changes due to limb regeneration. A considerable amount of variation in the armament of the carpus of the second pereopod occurs in the related species *P. grandis* (Stimpson) and *P. elegans* (Paulson); the second pereopods do not appear to be a satisfactory means of distinguishing between these species and similar variation may be expected in closely related species. It may be noted, however, that even quite small juveniles of *P. grandis* (see below), bear a very distinct spine on the medial side of the distal border of the carpus of the second pereopod. As the type specimens of *Anchistia ensifrons* are no longer in existence, it is not possible to confirm that *Anchistia grandis* Stimpson, of which a syntype has been recently discovered (Evans, 1967), is a junior synonym.

**HABITAT.**—The specimens were obtained from small pools on coral reef flats.

**DISTRIBUTION.**—North Borneo (Dana, 1852); East Africa (Borradaile, 1898); Tuamotu Islands (Nobili, 1907).

#### 6. *Periclimenes grandis* (Stimpson, 1860)

Restricted synonymy:

*Anchistia grandis* Stimpson, 1860, p. 34.

*Periclimenes grandis* Borradaile, 1898, p. 382.—Evans, 1967, p. 402.—Kalk, 1958, p. 126.

*Periclimenes (Falciger) grandis* Borradaile, 1917, p. 370.

*Periclimenes (Ancylocaris) grandis* Kemp, 1922, pp. 171 (key), 210, figs. 58-59, pl. 7 (fig. 10.—Barnard, 1950, p. 794.

*Periclimenes (Harpilius) grandis* Holthuis, 1952, p. 11, 79 [full synonymy]; 1958, p. 8.—Barnard, 1955, p. 48.—Johnson, 1961, pp. 58, 62, tab. 1 (p. 76).

**MATERIAL EXAMINED.**—(1) Mounimeri Is., Zaoudzi, Ile Mayotte, Comoro Islands, 23 November 1964, 1

ovig. ♀ (2) Resource Is., St. Joseph Atoll, Amirante Islands, 8 December 1964, 3 ovig. ♀, 5 juv. (3) Gold Mohur Bay, Aden, 21 December 1964, 1 ♂, 1 ovig. ♀.

**REMARKS.**—The specimens agree well with the re-description of the species given by Kemp. In all specimens, including the juveniles, the inner spine on distal border of the carpus of the second pereopod was conspicuously developed and distinctly larger than the small acute tooth present on the upper lobe in some specimens.

**HABITAT.**—Shallow reef pools. The species is apparently free-living.

**DISTRIBUTION.**—Red Sea and East Africa to Japan and the Great Barrier Reef. Previously recorded from East Africa, Mozambique, and Ceylon in the Indian Ocean.

#### 7. *Periclimenes elegans* (Paulson, 1875)

Restricted synonymy:

*Anchistia elegans* Paulson, 1875, p. 113, pl. 17 (fig. 1).

*Periclimenes (Falciger) elegans* Borradaile, 1917, p. 371.

*Periclimenes (Ancylocaris) elegans* Kemp, 1922, p. 215, figs. 60-62.

*Periclimenes (Ancylocaris) elegans* var. *dubius* Kemp, 1922, p. 218.

*Periclimenes (Harpilius) elegans* Holthuis, 1952, p. 11, 81, fig. 31; 1953, pp. 55-56.—Johnson, 1961, p. 59, 61, tab. 1 (p. 76). —McNeill, 1968, pp. 7, 23.—Miyake and Fujino, 1968, pp. 406-408, figs. 3a-b.

**MATERIAL EXAMINED.**—(1) Farquhar Is., 6 December 1964, 1 ♂. (2) Gold Mohur Bay, Aden, 21 December 1964, 1 ovig. ♀.

**REMARKS.**—The specimen from Farquhar Island bears a very well developed spine on the distodorsal margin of the carpus of the second pereopod and also a large spine on the inner margin. The Aden specimen also bears a distinct spine on the dorso-distal carpal margin which is subequal to the inner spine. It seems possible that the latter specimen should be referred to *P. grandis* with the other specimens obtained from that locality.

The armament of the distal margin of the carpus of the second pereopod shows considerable variation in the degree of development of the spines in this species and in *P. grandis* and the two species may be synonymous.

**HABITAT.**—The specimens were obtained from a shallow reef pool (1), and coral at 2 fathoms (2).

The species is apparently free-living.

DISTRIBUTION.—Widespread in the Indo-West-Pacific region from the Red Sea to the Great Barrier Reef. The species has not been previously recorded in the southwest Indian Ocean.

### 8. *Periclimenes spiniferus* (de Man, 1902)

Restricted synonymy:

*Anchistia inaequimana* Heller, 1865, p. 109.

*Periclimenes pettitthouarsi* var. *spinifera* de Man, 1902, p. 824.  
—Lenz, 1910, p. 567.

*Periclimenes pettitthouarsi* var. *spinigera* Nobili, 1906, p. 49.

*Periclimenes (Falciger) spiniferus* Borradaile, 1917, pp. 324, 369, pl. 52 (fig. 1).

*Periclimenes (Ancylocaris) spiniferus* Kemp, 1922, pp. 170 (key), 195-196.

*Periclimenes spiniferus* Balss, 1925, p. 293.

*Periclimenes (Harpilius) spiniferus* Holthuis, 1952, pp. 12, 76-77, fig. 30 [full synonymy]; 1955, p. 56.—Patton, 1966, p. 271.

MATERIAL EXAMINED.—(1) Aldabra, December 4 1964, 9 ♂, 8 ovig. ♀. (2) Anse Royale, Mahé, Seychelles Islands, 10 December 1964, 11 specimens, including 5 ovig. ♀. (3) Cerf Is., Mahé, Seychelles Islands, 11 specimens, including 3 ovig. ♀.

REMARKS.—This species is one of the most ubiquitous pontoniid shrimps, found in a wide range of habitats. The specimens reported upon were obtained from small coral heads, including *Stylophora pistillata* (Esper), *Seriatopora angulata* Klunzinger, *Porites cf. convexa* and *Pavona cactus* (Forsskål). Those from Aldabra were obtained from corals along the edges of the channels in the central lagoon and the Seychelles specimens were found in isolated coral heads on sargassum-covered flats.

It is remarkable that *P. spiniferus* is numerous on the island of Aldabra whereas *P. pettitthouarsi* is common in the Comores, about 240 miles to the south. *P. spiniferus* has been reported from numerous localities in the western Indian Ocean but the only record from the eastern African coastline is from Tamatave on the central eastern coast of Madagascar (Lenz, 1910). Collections of pontoniid shrimps have been made at Lourenço Marques (Barnard) and Tulear (Hipeau-Jacquotte, in litt.) without *P. pettitthouarsi* or *P. spiniferus* being found. Where these species are present, they are generally amongst the first pontoniid shrimps to be collected, and it seems probable that neither species

penetrates into the Mozambique channel.

DISTRIBUTION.—Numerous records from the Indian Ocean, including the Seychelles Islands, Maldivian Islands, and Chagos Islands and Tamatave in the west. It extends throughout the tropical Pacific Ocean to the Tuamotu Islands.

### 9. *Periclimenes brevicarpalis* (Schenkel, 1902)

Restricted synonymy:

*Ancylocaris brevicarpalis* Schenkel, 1902, p. 563, pl. 13 (fig. 21).

*Periclimenes (Ancylocaris) brevicarpalis* Kemp, 1922, pp. 169 (key), 185, figs. 40-42, pl. 6 (fig. 8).—Barnard, 1950, p. 794, fig. 150e-h.

*Periclimenes (Harpilius) brevicarpalis* Holthuis, 1952, pp. 10, 69-73, fig. 27 [full synonymy].—Barnard, 1955, p. 48 (key). —Johnson, 1961, p. 59, tab. 1 (p. 75).—Miyake and Fujino, 1968, pp. 410-413, fig. 4.—McNeill, 1968, p. 22.

*Periclimenes brevicarpalis* Kalk, 1958, 43, 47 p. 54, 75, 80, 117, 126.

MATERIAL EXAMINED.—(1) Cerf Is., Mahé, Seychelles Islands, 9 December 1964, 2 non-ovigerous ♀.

REMARKS.—This well known species has been reported on numerous occasions in the Indian Ocean but has not been previously recorded from the Seychelles Islands. The species has been previously reported in East Africa from Zanzibar (Lenz, 1905) and Mozambique (Barnard, 1950).

The specimens agree exactly with the re-description given by Kemp (1922) and the colors noted correspond to those given by Miyake and Fujino (1968). Both specimens have six dorsal rostral teeth and one ventral tooth. The cutting edges of the fingers of the chela of the first pereopod are slightly laterally situated and simple. The coxa bears a small medial setose process and the fourth thoracic sternite is unarmed. It may be noted also that in juvenile specimens the dorsal and terminal telson spines are rather better developed than is shown in Kemp's Figure 42, which represents the condition in large adult females.

HOST.—It was found on the giant anemone *Radianthus ritteri* Kweitniewski, which constitutes a new host record. The hosts for *P. brevicarpalis* are normally anemones of the genus *Stoichactis* and it is interesting to note that no anemones of this genus were observed at the Seychelles collecting stations.

DISTRIBUTION.—Known throughout the Indo-West-



Pacific region from the Red Sea and Mozambique to Palau, Santa Cruz, and the Great Barrier Reef.

### 10 *Periclimenes soror* Nobili, 1904

- Periclimenes soror* Nobili, 1904, p. 232; 1906, p. 50, pl. 2 (fig. 6). Gordon, 1939, p. 395, figs. 1-3.—Jacquotte, 1964, pp. 180-181.—Bruce, 1965, p. 493; 1968, pp. 1167, 1168.
- Periclimenes (Cristiger) frater* Borradaile, 1915, p. 210; 1917, pp. 324, 364, pl. 53 (fig. 6).
- Periclimenes (Cristiger) soror* Borradaile, 1917, p. 363.
- Periclimenes (Periclimenes) soror* Kemp, 1922, p. 141 (key), 165.—Holthuis, 1952, pp. 9, 51-53, fig. 17; 1959, p. 194.
- Periclimenes (Ancylocaris) frater* Kemp, 1922, p. 170.
- Periclimenes bicolor* Edmondson, 1935, p. 10, fig. 3.
- Periclimenes (Harpilius) frater* Holthuis, 1952, p. 11.

MATERIAL EXAMINED.—(1) Andromache Reef, Mombasa, Kenya, 15 November 1964, 7 specimens, including 1 ovig. ♀. (2) Pamanzi Is., Zaoudzi, Île Mayotte, Comoro Islands, 25 November 1964, 1 ♀. (3) Aldabra, 3 December 1964. 1 juv. (4) Cerf Is., Mahé, Seychelles Islands, 9 December 1964, 19 specimens, including 1 ovig. ♀.

REMARKS.—The specimens agree well with previous descriptions. The species has been previously recorded in the western Indian Ocean from Egmont Reef in the Seychelle Islands (Borradaile, 1915) and also from Madagascar (Jacquotte, 1964).

HOST.—The specimens were obtained in shallow water on reef flats from a variety of echinoderms including *Protoreaster lincki* (Blainville) (1 and 4), and *Culcita schmideliana* (Retzius) (2 and 3). The shrimp has also been found to occur on *Acanthaster planci* (Linnaeus), *Linckia multifora* (Lamarck), *Protoreaster nodosus* (Linnaeus) and also on *Holothuria* sp. (Bruce, 1965).

DISTRIBUTION.—Red Sea and Madagascar to Lesser Sunda Isles, Sulu Archipelago, and Hawaii.

### 11. *Periclimenes incertus* Borradaile, 1915

- Periclimenes (Cristiger) incertus* Borradaile, 1915, p. 210; 1917, p. 364, pl. 53 (fig. 7).
- Periclimenes (Periclimenes) incertus* Kemp, 1922, p. 140 (key), 150.—Holthuis, 1952, pp. 9, 39; 1959, pp. 1-2.
- Periclimenes (Periclimenes) impar* Kemp, 1925, p. 140 (key), 150.—Holthuis, 1952, pp. 9, 38; 1955, p. 60, fig. 33a.
- Periclimenes incertus* Bruce, 1969, pp. 276, 277 (key).

MATERIAL EXAMINED.—(1) Gold Mohur Bay, Aden, 21 December 1964, 1 ovig. ♀.

REMARKS.—The single specimen agrees well with

the description and figures of Kemp (1922). The rostrum is slightly more acute and bears nine dorsal and a single ventral tooth. The first pereopods resemble the illustration given by Kemp and the medial ischial and coxal process are most conspicuous. The dactyls of the ambulatory pereopods bear the characteristically robust dactylus with stout accessory spines.

This species has not been previously recorded in the western Indian Ocean.

HOST.—The specimen was obtained from the surface of a sponge collected from a depth of 1 meter.

DISTRIBUTION.—Maldivé Islands, Ceylon, Andaman Islands, Lesser Sunda Islands, and Aru Islands.

### 12. *Periclimenes seychellensis* Borradaile, 1915

- Periclimenes ensifrons* Nobili, 1899, p. 234.
- Periclimenes tenuipes* (part) Nobili, 1899, p. 235.
- Periclimenes (Falciger) seychellensis* Borradaile, 1915, p. 212; 1917, pp. 324, pls. 54-55, figs. 14a-i.
- Periclimenes (Ancylocaris) seychellensis* Kemp, 1922, pp. 169 (key), 176, figs. 34-45, pl. 6 (fig. 7).
- Periclimenes (Harpilius) seychellensis* Holthuis, 1952, pp. 12, 66-67, fig. 25.—Johnson, 1961, pp. 58, 61, tab. 1 (p. 76).

MATERIAL EXAMINED.—(1) Victoria Harbour, Mahé, Seychelles Islands, 9 December 1964, 10 specimens, including 1 ovig. ♀.

REMARKS.—The specimens agree exactly with the information provided by Kemp (1922). The unusual papilla on the eyestalk is well developed in specimens of all sizes. The coxa of the first pereopod bears a broad setose medial lobe and a small subterminal lobe is present on the basis distally. The fourth thoracic sternite bears a slender median process.

HABITAT.—The specimens were obtained from attached *Sargassum*.

DISTRIBUTION.—Red Sea, Seychelles, Gulf of Manaar, Andaman Islands, Singapore, and Papua.

### 13. *Periclimenes latipollex* Kemp, 1922

- Periclimenes (Periclemenes) latipollex* Kemp, 1922, pp. 141 (key), 150-152, fig. 18, pl. 4 (fig. 3). Holthuis, 1952, pp. 9, 47-48, figs. 13-14.

MATERIAL EXAMINED.—(1) Ras Hafun, Somalia, 09°36'N. 51°01'E. to 09°40'N. 51°03'E., 16 December 1964, station 9-444, Gulf of Mexico shrimp trawl, 1 ♂.



REMARKS.—The single specimen appears to be immature and the flange on the dactylus of the second pereopod is rather less developed than in Kemp's specimens. The rostrum is slightly shorter than shown by Kemp and bears eight dorsal and two ventral teeth, and the lamina appears to taper more uniformly from the postorbital teeth to the tip, closely resembling the figure given by Holthuis (1952). The first pereopod bears a small medial setose lobe on the coxa and the fourth thoracic sternite is broad and unarmed.

When freshly caught the shrimp was almost transparent, with very fine white dots scattered widely and uniformly over the carapace and first five abdominal segments. Antennae colorless except for a fine red medial border along basal segment of the peduncle, extending along the epistome and middle of the anterior thoracic sternites. Rostrum, caudal fan, and pereopods also colorless.

HOST.—The shrimp was obtained from a specimen of the gorgonian *Acanthogorgia flabellum* Hickson from 43-45 fathoms. Previous records have been from greater depths, of 61 and 166 fathoms. The association with gorgonians has not been previously recorded.

DISTRIBUTION.—The only previous reports of this species are from the Mergui Archipelago and from the Kei Islands.

#### 14. *Periclimenes lanipes* Kemp, 1922

*Periclimenes (Periclimenes) lanipes* Kemp, 1922, pp. 141 (key), 156-158, pl. 4 (fig. 4).—Holthuis, 1952, p. 9.  
*Periclimenes lanipes* Bruce, 1965, p. 493; 1968, p. 1168.

MATERIAL EXAMINED.—(1) Ras Binnah, Somalia, 11°21'N 51°08'E to 11°21'N 51°09'E, 17 December 1964, Station 9-459, 1 ♀.

REMARKS.—The single specimen agrees closely with Kemp's detailed description. The rostrum bears eight dorsal teeth and a single ventral tooth. The carpus of the first pereopod is slightly longer than the merus as described by Kemp, but the fingers of the chela are subspatulate rather than spatulate, with entire cutting edges. The coxa bears a distinct medial setose lobe and the fourth thoracic sternite is unarmed. The meral spines of the second to fifth pereopods are distinct and it may also be noted that the posterior lateral angle of the basal segment of the uropod is particularly long and acute. The

terminal telson spines are normally developed.

When caught, the body of the shrimp was transparent with broad vertical bands of purple. The first pereopods were transparent and the second to fifth pereopods a uniform purple color. The caudal fan was paler purple.

The species has been previously reported in association with the gorgonocephalids *Astroboa nigra* Döderlein, *Astroglymna sculptum* (Döderlein) and *Euryale purpura* Mortensen (Bruce, 1965) and from depths of 20-25 fathoms (Kemp, 1922). It is the only Indo-West-Pacific pontoniid shrimp known to live in association with ophiuroids and occupies a rather remote systematic position in the genus *Periclimenes* (Bruce, 1968).

HOST.—The specimen was obtained from the purple-black gorgonocephalid *Astroboa nudum* (Lyman) which was collected from a depth of 14-16 fathoms.

DISTRIBUTION.—The only previous records of this species are from the Mozambique Channel and the Mergui Archipelago.

#### 15. *Periclimenes diversipes* Kemp, 1922

*Periclimenes (Ancylocaris) diversipes* Kemp, 1922, pp. 169 (key), 179-184, figs. 36-39.—Gurney, 1938, pp. 15, 17-18, 27-28, figs. 61-66, 123.

*Periclimenes (Harpilius) diversipes* Holthuis, 1952, p. 11.—Patton, 1966, pp. 274, 288.

MATERIAL EXAMINED.—(1) Mounimeri Is., Zaoudzi, Ile Mayotte, Comoro Islands, 23 November 1964, 1 ovig. ♀. (2) Gold Mohur Bay, Aden, 21 December 1964: (a) 8 specimens, including 3 ovig. ♀; (b) 3 specimens, including 1 ovig. ♀; (c) 2 specimens.

REMARKS.—The Mounimeri female has a deep rostral lamina with six dorsal teeth and no ventral teeth. The chelae of the second pereopod are typical of Kemp's forms *a* and *b*. In Kemp's illustration of the third pereopod the dactylus is slightly greater than one quarter of the length of the propodus. In the Mounimeri specimen the dactylus is about 0.4 times the length of the propodus. The sternite of the fourth thoracic segment is broad and unarmed.

The Aden specimens are similar to the Mounimeri specimen. The rostral lamina is shallower than shown by Kemp and less depressed and bears six to eight dorsal teeth in the ovigerous females and five to seven dorsal teeth in the rest. All specimens lack ventral teeth, except for one which has a single very

small ventral tooth. All specimens conform to the *a*, *d* types of second pereopods and there is no differences between males and females. The dactyli of the ambulatory pereopods show a closer resemblance to Kemp's illustration.

The color pattern in the fresh material was noted as being transparent with a pair of fine red lines longitudinally along the sides of the body.

HOST.—The specimens were obtained from shallow water (about 0.5 fathoms) on the corals *Seriatorpora* sp. (1) and *Acropora* sp. (2b, c), and *Montipora circumvallata* (Ehrenberg) (2a). The association with *Montipora* has been previously reported by Kemp (1922).

DISTRIBUTION.—This species has only been reported previously from the Red Sea, Gulf of Manaar, the Andaman Islands, and the Great Barrier Reef.

#### 16. *Periclimenes inornatus* Kemp, 1922

*Periclimenes (Ancylocaris) inornatus* Kemp, 1922, pp. 170 (key), 191-194, figs. 43-46.

*Periclimenes (Harpilius) inornatus* Holthuis, 1952, p. 11.—Bourdon, 1967, p. 171.

MATERIAL EXAMINED.—(1) Moroni, Grande Comoro Islands, 22 November 1964, 10 specimens, including 4 ovig. ♀. (2) Cerf Is., Mahé, Seychelles Islands, 9 December 1964, 12 specimens, including 2 ovig. ♀.

REMARKS.—The specimens correspond closely to Kemp's original description. The only difference noted is that the fingers of the second pereopod are distinctly subspatulate and subequal to the length of the palm. The setose coxal process is well developed, as shown by Kemp, and the fourth thoracic sternite is unarmed.

The colors, alive, were noted as transparent, with a feebly developed red reticulum over the dorsum of the eyestalk and a green ovary in the adult females.

HOST.—The specimens were obtained from specimens of the giant anemone *Radianthus Ritteri* (Kweitniewski) living on the coral reefs in shallow sheltered water. Shrimps have not been previously reported in association with this anemone. Kemp's material was found on "*Discosoma*."

DISTRIBUTION.—The only previous records of this species are from the Andaman and the Maldivé Islands.

#### 17. *Periclimenes antonbruunii* Bruce, 1967

*Periclimenes antonbruunii* Bruce, 1967, pp. 45-53, figs. 19-22.

MATERIAL EXAMINED.—(1) Pamanzi Is., Zaoudzi, Ile Mayotte, Comoro Islands, 24 December 1964, 1 ♀ (holotype), USNM 127358.

REMARKS.—The single specimen has been reported upon earlier (Bruce, 1967). No further specimens have since been reported. The specimen was obtained from a crevice in old coral rock in a pool on bare rock flats.

DISTRIBUTION.—Comoro Islands.

#### 18. *Periclimenes imperator* Bruce, 1967

*Periclimenes rex* Barnard, 1955, p. 47.

*Periclimenes imperator* Bruce, 1967, pp. 53-62, figs. 23-25; 1968, pp. 1166-1167.

MATERIAL EXAMINED.—(1) Moroni, Grande Comoro Islands, 27 December 1964, 1 ♀.

REMARKS.—With the exception of one feature noted below, the single specimen corresponds closely to the original description. The specimen is distinctly smaller than the specimens previously recorded, (carapace length 2.75 mm), and is probably immature. The rostral lamina is deep and bears twenty-two slightly irregular teeth along the dorsal margin. There is no epigastric spine. The basal segment of the antennule, however, differs from the specimens previously described, as only a single spine is present distolaterally, with a simple lobe medially. The other appendages do not differ significantly from the described specimens but the dactyls of the ambulatory pereopods, which lack accessory spines, are slightly longer and more slender.

The color pattern when freshly caught consisted of a pattern of pale and dark red areas. The dorsal part of the rostrum, carapace, abdomen, and caudal fan were pale red with a V-shaped extension downward across the central part of the branchiostegite. The rest of the body was dark red. The colors of the appendages were not noted.

Normally *P. imperator* bears two or three acute teeth distolaterally on the basal segment of the antennular peduncle, but the number of spines in this position in pontonid shrimps, when more than one is present, may be related to the age of the shrimp, being less in the younger specimens. The association with a holothurian is remarkable, as the previously recorded hosts for *P. imperator* have

been nudibranchs of the genus *Hexabranthus*.

In general pontoniid shrimp species are conservative in their selection of hosts, and any particular species tends to be found only in association with the species of a restricted number of closely related genera in the different parts of its geographical range. There are no other reports of a pontoniid shrimp species living in association with hosts belonging to different phyla. Different species of a genus such as *Periclimenaeus* and *Pontonia*, may be found in association with animals of different phyla but each species is apparently consistent in its host selection, such as sponges or tunicates in the former genus and tunicates or bivalves in the latter. The species of the hold-all genus *Periclimenes* may be free-living or associated with a wide spectrum of invertebrate phyla, but in all cases so far reported the range of hosts is restricted to a single phylum and most frequently to a single order.

If the acquisition of further specimens of small size from holothurians should show that the normal armament of the basal segment of the antennule consists of a single spine, the specimens should be given separate specific status. The specimens of *P. rex* found on *Synapta oceanica* (Lesson) from Mozambique, referred to by Macnae and Kalk (1962, p. 118), are possibly conspecific but it has not been possible to locate the specimens. The color, however, was recorded as a royal blue, in marked contrast with the present specimen, in which it did resemble that previously noted for the specimens obtained from *Hexabranthus* sp.

**HOST.**—The specimen was obtained from the holothurian *Stichopus chloronotus* Brandt collected from shallow water on reef flats.

**DISTRIBUTION.**—*Periclimenes imperator* has been previously recorded from Zanzibar, Mozambique, Madagascar, the Red Sea, New Caledonia, and Hawaii.

#### 19. *Periclimenes zanzibaricus* Bruce, 1967

*Periclimenes zanzibarica* Bruce, 1965, pp. 492, 493.

*Periclimenens zanzibaricus* Bruce, 1967, pp. 62-72, figs. 26-29.

**MATERIAL EXAMINED.**—(1) Victoria Harbor, Mahé, Seychelles Islands, 9 December 1964, 2 specimens, including 1 ovig. ♀. (2) Anse Royale, Mahé, Seychelles Islands, 10 December 1964, 2 specimens, damaged.

**REMARKS.**—The specimens have been reported upon earlier (Bruce, 1967). No further specimens have since been reported. The specimens were obtained from *Diadema setosum* (Leske) and *Astropyga radiata* (Leske). The species has also been reported as associated with *Echinothrix calamaris* (Pallas).

**DISTRIBUTION.**—Zanzibar and Seychelles Islands.

#### 20. *Periclimenes mahei* Bruce, 1969

*Periclimenes mahei* Bruce, 1969, pp. 263-264.

**MATERIAL EXAMINED.**—(1) Mounimeri Is., Zaudzi île Mayotte, Comoro Islands, 23 December 1964, 20 specimens, including 7 ovig. ♀.

**REMARKS.**—The smaller specimens have five to seven dorsal and one ventral tooth on the rostral lamina, except one specimen in which the ventral tooth was absent. The ovigerous females had six dorsal teeth and one ventral tooth, except for two specimens with five dorsal teeth, one of which also lacked the ventral tooth. In some of the other specimens the ventral tooth was very small. The fingers of the chela of the major second pereopod are distinctly dentate with distally gaping cutting edges. The minor second pereopod is only slightly smaller and is feebly toothed and without any marked gape in the cutting edges. Six specimens were parasitized by bopyrids.

**HOST.**—The specimens were obtained from the coral *Seriatopora hystrix* Dana in a depth of 0.5 fathoms.

**DISTRIBUTION.**—Seychelles Islands.

#### Literature Cited

- Audouin, V.  
1825. Explication sommaire des planches de Crustacés de l'Égypte et de la Syrie, publiées par Jules-Cesar Savigny, membre de l'Institut: offrant un exposé des caractères naturels des genres avec la distinction des espèces. Description de l'Égypte on recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française. *Histoire naturelle*, 1 (4): 77-98.
- Balss, H.  
1925. Macrura der Deutschen Tiefsee-Expedition. 2. Natantia, Teil A. In Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer *Valdivia* 1898-1899, 20: 217-315, figures 1-75, plates 20-28.

- Barnard, K.H.  
 1950. Descriptive Catalogue of South African Decapod Crustacea. *Annals of the South African Museum*, 38:1-837, figures 1-154.  
 1955. Additions to Fauna List of South African Crustacea and Pycnogonida. *Annals of the South African Museum*, 43:1-107, figures 1-53.  
 1958. Further Additions to the Crustacean Fauna List of Portuguese East Africa. *Memorias do Museu Dr. Alvaro de Castro*, 4:3-23, figures 1-7.
- Borradaile, L.A.  
 1898. A Revision of the Pontoniinae. *Annals and Magazine of Natural History*. (7) 2:367-391.  
 1915. Notes on Carides. *Annals and Magazine of Natural History*, (8) 15:205-213.  
 1917. On the Pontoniinae. The Percy Sladen Trust Expedition to the Indian Ocean, in 1905, Under the Leadership of Mr. J. Stanley Gardiner. *Transactions of the Linnaean Society of London, Zoology*, (2) 17:323-396, plates 52-57.
- Bourdon, R.  
 1967. Sur deux nouveaux épicarides (Isopoda) parasites de crustacés décapodes. *Zoologische Mededeelingen, Leiden*, 42 (17):167-174, figures 1-5.
- Bruce, A.J.  
 1965. Notes on Some Indo-Pacific Pontoniinae. X. *Periclimenes cristimanus* sp.nov., a New Pontoniid Shrimp from Singapore. *Annals and Magazine of Natural History*, (13) 8:487-493, figures 1-2.  
 1967. Notes on Some Indo-Pacific Pontoniinae. III-IX. Descriptions of Some New Genera and Species from the Western Indian Ocean and the South China Sea. *Zoologische Verhandelingen, Leiden*, (87):1-73, figures 1-29.  
 1968. A Report on Some Pontoniid Shrimps from New Caledonia (Crustacea, Decapoda Natantia). *Bulletin du Museum National d'Histoire Naturelle, Paris*, (2) 39(6):1148-1171, figures 1-10.  
 1969. Preliminary Descriptions of Sixteen New Species of the Genus *Periclimenes* Costa, 1844, (Crustacea, Decapoda Natantia, Pontoniinae). *Zoologische Mededeelingen, Leiden*, 43 (20):253-278.  
 197-. A Review of Information Upon the Coral Hosts of Obligate Commensal Shrimps of the Subfamily Pontoniinae Kingsley, 1878, (Crustacea, Decapoda, Palaemonidae). (In press.)
- Calman, W.T.  
 1939. Crustacea:Caridea. *Scientific Reports of the John Murray Expedition*, 6:183-224, figures 1-8.
- Dana, J.D.  
 1852. Conspectus crustaceorum quae in orbis terrarum circumnavigatorio, Carlo Wilkes e classe Reipublicae Foederatae duce, lexit et descripsit. *Proceedings of the Academy of Natural Sciences, Philadelphia*, 1852, pages 10-28.  
 1852a. Crustacea. United States Exploring Expedition During the Years 1838, 1839, 1840, 1841 and 1842 Under the Command of Charles Wilkes, U.S.N., volume 13, 1620 pages.  
 1855. Crustacea. United States Exploring Expedition During the Years 1838, 1839, 1840, 1841 and 1842 Under the Command of Charles Wilkes, U.S.N., volume 13 (atlas), 27 pages, 96 plates.
- Edmondson, C.H.  
 1935. New and Rare Polynesian Crustacea. *Occasional Papers of the Bishop Museum, Honolulu*, 10(24):1-38, figures 1-11, plates 1-2.
- Evans, A.E.  
 1967. Syntypes of Decapoda Described by William Stimpson and James Dana in the Collections of the British Museum (Natural History). *Journal of Natural History*, 1:399-411.
- Foumanoir, P.  
 1955. Notes sur la faune intercotidale des Comores. I. Crustacés macroures et anomoures stomatopodes. *Naturalist Malgache*, 7:19-33, figures 1-5.
- Gordon, I.  
 1939. Re-description of *Periclimenes soror* Nobili (Crustacea, Decapoda). *Annals and Magazine of Natural History*, 11(4):395-400, figures 1-3.
- Gurney, R.  
 1938. The Larvae of the Decapod Crustacea. Palaemonidae and Alpheidae. *Scientific Reports of the Great Barrier Reef Expedition, 1928-29*, 6:1-160, figures 1-265.
- Heller, C.  
 1861. Synopsis der im rothem Meere vorkommenden Crustaceen. *Verhandlungen der K.K. Zoologisch-botanischen Gesellschaft in Wien*, 11:3-32.  
 1865. Crustacea. Reise der oesterreichischen Fregatte *Novara* um die Erde in Jahren 1857-58-59 unter der Befehlen des Commandors B. von Wüllerstorff-Ubair. *Zoologie*, 2(3):1-280, plates 1-25.
- Holthuis, L.B.  
 1952. The Decapoda of the *Siboga* Expedition. Part XI. The Palaemonidae Collected by the *Siboga* and Snellius Expeditions with Remarks on Other Species. II. Subfamily Pontoniinae. *Siboga Expeditie*, Monograph 39a<sup>10</sup>, 252 pages, 110 figures, 1 table.  
 1953. Enumeration of the Decapod and Stomatopod Crustacea from Pacific Coral Islands. *Atoll Research Bulletin*, 24:1-66.  
 1958. Crustacea Decapoda from the Northern Red Sea (Gulf of Aquaba and Sinai Peninsula). I. Macrura. *Bulletin of the Sea Fisheries Research Station, Israel*, 17(8):1-40, figures 1-15.  
 1959. Results of the Re-examination of the Type Specimens of Some Species Belonging to the Subfamilies Pontoniinae and Palaemoninae, (Crustacea, Decapoda Macrura). *Zoologische Mededeelingen, Leiden*, 36(11):193-200, figure 1.
- Holthuis, L. B., and Gottlieb, E.  
 1955. The Recent Genera of Caridean and Stenopodidean Shrimps (Class Crustacea, Order Decapoda, Supersection Natantia) With Keys for Their Determination. *Zoologische Verhandelingen, Leiden*, number 26, 157 pages, 105 figures.  
 1958. An Annotated List of the Decapod Crustacea of the

- Mediterranean Coast of Israel, with an Appendix Listing the Decapoda of the Eastern Mediterranean. *Bulletin of the Research Council of Israel*, 7B (1-2): 1-126, figures 1-15, plates 1-3.
- Jacquotte, R.  
1964. Notes de faunistique et de biologie marine de Madagascar. II. Decapodes nageuses associes aux echinodermes dans la region de Tulear. *Records des Travaux Station Marine d'Endoume*, 32 (48): 179-181.
- Johnson, D.S.  
1961. A Synopsis of the Decapod Caridea and Stenopodidea of Singapore with Notes on Their Distribution and a Key to the Genera of Caridea Occurring in Malayan Waters. *Bulletin of the National Museum, Singapore*, 36:44-79, 1 plate.
- Kalk, M.  
1958. The Crustacea of Inhaca Shores. In Macnae, W., and M. Kalk (editors). *A Natural History of Inhaca Island, Mocambique*, i-vi, 1-163, figures 1-30, plates 1-11. Witwatersrand U.P. Johannesburg.
- Kemp, S.  
1922. Pontoniinae. Notes on Crustacea Decapoda in the Indian Museum. XV. *Records of the Indian Museum*, 24:113-288, figures 1-105, plates 3-9.
- Lenz, H.  
1905. Ostafrikanische Dekapoden und Stomatopoden gesammelt von Herrn Prof. Dr. A. Voeltzkow. In Voeltzkow, A. *Wissenschaftliche Ergebnisse der Reisen in Gesellschaft.*, 29:341-392, plates, 41, 48.  
1910. Crustaceen von Madagaskar, Ostafrika und Ceylon. In Voeltzkow, A. *Reise in Ostafrika den Jahren 1903-1905 mit Mitteln der Hermann und Elize geb. Heckmann Wentzel-Stiftung ausgeführt*, 2:539-576.
- Macnae, W., and M. Kalk.  
1962. The Fauna and Flora of the Sand Flats at Inhaca Island, Mocambique. *Journal of Animal Ecology*, 31:93-128, figures 1-5.
- Man, J.G. de  
1902. Die von Herrn Professor Kükenthal im Indischen Archipel gesammelten Dekapoden und Stomatopoden. In Kükenthal, W.. *Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo. Abhandlungen hrsq. von der Senckenbergischen Naturforschenden Gesellschaft*. Frankfurt a. M., 25: 467-929, plates 18-27.
- McNeill, F.  
1968. Crustacea, Decapoda and Stomatopoda. *Scientific Reports of the Great Barrier Reef Expedition, 1928-29*, 7 (1): 1-98, figures 1-2, plates 1-2.
- Miyake, S., and T. Fujino  
1968. Pontoniid shrimps from the Palau Islands. (Crustacea, Decapoda, Palaemonidae). *Journal of the Faculty of Agriculture, Kyushu University*, 14:399-431, figures 1-8, table 1.
- Müller, F.  
1887. Zur Crustaceen fauna von Trincomali. *Vorhandlungen der Naturforschenden Gesellschaft in Basel*, 8:470-485, plates 4-5.
- Nobili, G.  
1899. Contribuzioni alla conoscenza della fauna carcinologica della Papuaia, della Molucche e del Australia. *Annali del Museo civico di storia naturale, Genova*, 40:230-282.  
1904. Diagnoses préliminaires de vingt-huit espèces nouvelles de stomatopodes et décapodes macroures de la Mer Rouge. *Bulletin du Museum National d'Histoire Naturelle*, Paris, 10:228-238.  
1906. Crustacés décapodes et stomatopodes. Mission J. Bonnier et Ch. Pérès (Golfe Persique 1901). *Bulletin Scientifique de la France et de la Belgique, Londres, Paris, Berlin*, 40:13-159, figures 1-3, plates 2-7.  
1906. Diagnoses préliminaires de crustacés, décapodes et isopodes nouveaux recueillies par M. le Dr. G. Seurat aux îles Touamotou. *Bulletin du Museum National d'Histoire Naturelle*, Paris, 12:256-270.  
1906. Fauna carcinologique de la Mer Rouge. Decapodes et stomatopodes. *Annales des Sciences Naturelles*, (b) Zoologie, (9) 4:1-347, figures 1-12, plates 1-11.  
1907. Ricerche sui crostacei della Polinesia, decapodi, stomatopodi e isopodi. *Memorie della R. Accademia della Scienze di Torino*, (2) 57:351-430, plates 1-3.
- Ortmann, A.  
1894. Crustaccen. In Semon, R., *Zoologische Forschungsreisen in Australien und dem Malayischen Archipel*. Mit unterstützung des Herrn Dr. Paul von Ritter ausgeführt in den Jahren, 1891-1893. V. *Denkschriften der Medizinischnaturwissenschaftliche Gesellschaft zu Jena*, 8:3-80, plates 1-3.
- Patton, W.K.  
1966. Decapod Crustacea Commensal with Queensland Branching Corals. *Crustaceana*, 10:271-295, figures 1-3.
- Paulson, O.  
1875. Investigations on the Crustacea of the Red Sea with Notes on Crustacea of Adjacent Seas, Part I. Podophthalmata and Edriophthalmata. (Cumacea) (in Russian). xiv+144 pages, 21 plates.
- Rathbun, M.  
1906. The Brachyura and Macrura of the Hawaiian Islands. *Bulletin of the United States Fisheries Commission*, 23:827-930, figures 1-79, plates 3-24.
- Schenkel, E.  
1902. Beitrag zur Kenntnis der Dekapoden Fauna von Celebes. *Vorhandlungen der Naturforschenden Gesellschaft in Basel*, 13:485-585, plates 7-13.
- Stimpson, W.  
1860. Prodrum descriptionis animalium evertibratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, C. Ringgold et J. Rodgers ducibus, observavit et descripsit. *Proceedings of the Academy of Natural Sciences, Philadelphia*, 1860, pages 22-48
- Tattersall, W.M.  
1921. Report on the Stomatopoda and Macrurous Decapoda Collected by Mr. Cyril Crossland in the Sudanese Red Sea. *Journal of the Linnaean Society of London, Zoology*, 34:345-398, plates 27-28.





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