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A SYNOPSIS OF THE PONTONIINID SHRIMP FAUNA  
OF CENTRAL EAST AFRICA

## A SYNOPSIS OF THE PONTONIINID SHRIMP FAUNA OF CENTRAL EAST AFRICA

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### ABSTRACT

The pontoniinid shrimp fauna of central East Africa,—Kenya and Tanzania, is summarized. One hundred and thirty-four species, of thirty-six different genera are recorded, of which sixty-seven species are reported for the first time and twenty-one species are newly recorded from the Indian Ocean. The available information on the associated host animals of these commensal shrimps, in East African waters, is provided. The incidence of commensalism in the subfamily and its distribution among the different invertebrate host types, is outlined and the fauna of East Africa is compared with that reported from other localities in the Indo-West Pacific region. The East African fauna shows almost double the number of species found in the Indonesian-Philippine region, often considered the dispersal centre of the Indo-West Pacific shallow-water marine fauna.

### INTRODUCTION

THE study of shrimps collected from the coastal regions of Tanzania (Tanganyika and Zanzibar) and Kenya have indicated that an extremely rich fauna of the subfamily Pontoniinae Kingsley (Palaemonidae Samouelle, 1819) is represented in the western Indian Ocean. These shrimps are of particular importance in the coral reef biotope, where, together with the shrimps of the family Alpheidae Randall, which have been little studied recently in this region, they form the dominant groups of carideans. They are also of special interest on account of their habits which involve many species in highly specific 'commensal' associations with a wide range of the larger marine invertebrate animals. The specific nature of these associations has probably been of major importance in contributing to the evolutionary radiation of this subfamily and the high degree of morphological specialization.

The first pontoniinid shrimp reported from East African waters was reported by Pfeffer (1889), *Oedipus gramineus* var. ( $\equiv$  *Coralliocaris graminea*) from Zanzibar. In 1894 Ortmann recorded *Periclimenes grandis* from Dar es Salaam and in 1905 Lenz reported *Periclimenes brevicarpalis*, *P. grandis* and *Coralliocaris graminea* also from Zanzibar. Taramelli (1955) reporting again on the Zanzibar fauna, recorded five species of shrimps, one of which was the pontoniinid *Periclimenes brevicarpalis*. Recently the fauna of the National Marine Parks at Malindi, Kenya, has been reported upon by Bruce, (in press, i) recording 32 species of pontoniinid shrimp and a number of other papers have dealt with taxa of special interest. Numerous other species have also been collected, many not previously collected from East Africa and several new to the Indian Ocean fauna. The results are here briefly summarised together with the available information on the host animals concerned.

The hosts of many species are still awaiting identification, and a small number of shrimp taxa are not included as further study is still required. Colour photographs of a number of species have been provided by Bruce (1972f, 1974c, 1975).

The study material has been collected particularly from the sheltered west coast coral reefs of Zanzibar Island (1959-62) and from the more exposed fringing reefs and lagoons of southern Kenya, from Malindi to Wasin Island (1970-74). Additional material has been collected principally from Maziwi Is., near Pangani, Tanganyika. The material has been collected from reefs and reef flats exposed at low tides, by skin diving in shallow water and scuba diving in deep water. 'Pronox fish' poison has been successfully used in reef pools. Where possible the hosts have been removed singly in polythene bags or plastic buckets for detailed examination of the uncontaminated associated fauna, but this has not always been practicable. Additional material has also been derived from the trawl and dredge catches of the FRV 'Manihine' and the FL 'Chermin'. Full synonymies for most species are to be found in Holthuis (1952). Species newly recorded from central East African waters are indicated with an asterisk\* after the specific name. Depths recorded in fathoms are converted to the nearest 0.5 metre equivalent.

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#### CENTRAL EAST AFRICAN PONTONIIDAE

##### *Allopontonia iaini* Bruce

Originally described from specimens from Zanzibar Harbour at a depth of 20 m., in association with the echinoid host *Salmaciella dussumieri erythracis* (H. L. Clark) (Bruce, 1972). Two lots of specimens have been collected since at the same locality, and a single specimen has been collected from the same host from Wasin Channel, Kenya, at 10 m.

##### *Anapontonia denticauda* Bruce

Originally described from specimens collected from Pange Reef, Zanzibar (Bruce, 1969) and Bawi Island and Fumba on Zanzibar Island. Only one further juvenile specimen has since been collected from an unnamed reef off the west coast of Zanzibar. All specimens have been in association with the coral *Galaxea fascicularis* (L.). This species has not been found in Tanganyikan or Kenyan waters in spite of the examination of many coral hosts, and seems to be naturally uncommon.

##### *Anchistioides compressus* Paulson\*

A few single specimens have been collected from sponges off the west coast of Zanzibar Island, near Bawi, Fumba and Nyange reef in depths of 2 m 12-13.5 m

and 27.5-31 m. Single specimens have also been collected from Kikambala and Wasin Channel, Kenya, at 1 m and LWS tide level on reef flat. Not recorded from Tanganyika.

***Anchistioides willeyi* (Borradaile)\***

Moderately common in a wide variety of sponges. Specimens have been collected from off Chumbe Island, Marumbi, Shangani and Nyange reef, Zanzibar ; Central Zanzibar Channel ; Wasin Channel, Kenya.

***Anchistioides* aff. *willeyi* (Borradaile)**

Numerous specimens appear to differ consistently from the above species in the form and dentition of the rostrum and the proportions of the chela of the second pereopods. Generally found separately, the two forms appear to constitute another example of a closely related species-pair, like *Harpiliopsis depressus* and *H. spinigerus* or *Jocaste japonica* and *J. lucina*.

Specimens have been collected from Chumbe Is., Mazizini, Nyange reef, Zanzibar ; the Mafia region, Tanganyika, and the Wasin Channel, Kenya.

Identified hosts for this species and the above include *Callyspongia fibrosa* (Ridley & Dendy), *Leucomia* sp., *Lissodendoryx isodictyalis* (Carter) and *Phloedictyon* on *Rhizochalma* sp. The shrimps are also often found in association with *Thaumastocaris*, *Periclimenaeus* and occasionally with *Onyccaris*.

***Anchistus custos* (Forsskal)\***

Common in *Pinna muricata* L. and *P. bicolor* Chemnitz in the sheltered west coast bays of Zanzibar Island. Specimens obtained from Chukwani, Mazizini, Migombani, Murogo reef and Chapani Island. Several pairs also collected from the same hosts at Gazi, Kenya. Not recorded from Tanganyika.

***Anchistus demani* Kemp**

Recorded from Malindi by Bruce (in press, i) from *Tridacna maxima* (Röding). Other specimens obtained from tridacnids at Chukwani, Mazizini, Migombani and Bawi Island, along the Zanzibar west coast, with further specimens from Ras Iwatine and Kisiti Island, Kenya. Hosts include mainly *Tridacna maxima* and one record of *T. squamosa*. No records from Tanganyika.

***Anchistus miersi* (De Man)**

Recorded from Malindi by Bruce (in press, i) in *Tridacna squamosa* (Lam.). Also recorded from numerous localities off the west coast of Zanzibar Island, usually in association with *Tridacna squamosa*. Localities include Chumbe Island, Pange reef, Nyange reef, Chukwani, Mazizini, Migombani, Danzi reef and Murogo reef. In Kenya this species has been found at several localities also : Ras Iwatine, Shimoni, Wasin Channel and Wasin Island reef, and one pair was obtained from *T.*

*maxima* at Kisiti Island. A pair of specimens has also been collected from Maziwi Island, Tanganyika.

#### ***Anchistus pectinis* Kemp\***

Two small specimens have been collected from pectinid bivalves off the Zanzibar west coast at 18 m and 9 m off Chumbe Island and Mbwani. No specimens have been collected from Tanganyikan or Kenyan waters.

#### ***Cavicheles kempi* Holthuis\***

Specimens referable to this species have been collected from *Acropora* corals at Migombani, Zanzibar ; Maziwi Island, Tanganyika and Ras Iwatine, Kenya.

#### ***Conchodytes biunguiculatus* Paulson\***

Only three pairs of this species have been collected, all from *Pinna bicolor* Chemnitz. Two pairs were from the reef flat at Mazizini, Zanzibar, and the third from Nyali Beach, Mombasa, Kenya. Much less common than *Anchistus custos* in *Pinna* species.

#### ***Conchodytes meleagrinae* Peters**

Not recorded from Zanzibar, although many pearl oysters were examined. In Kenya, specimens were obtained from *Pinctada margaritifera* L. at Wasin Island, Jadini, and several lots from Ras Iwatine. Not recorded from Tanganyika.

#### ***Conchodytes tridacnae* Peters**

Relatively uncommon, much less frequent than *Anchistus demani* and *A. miersi* in tridacnid clams. One pair collected from Chukwani, Zanzibar and another from Pungu Tongoni, near Tanga, Tanganyika. Two pairs from Kenya, both from *T. maxima* from Jadini and Wasin Island.

#### ***Coralliocaris graminea* (Dana)**

Abundant on all coral reefs in *Acropora* corals. First reported from Zanzibar by Pfeffer (1889), from Change Is. reef. Recorded from Upanga reef, Dar es Salaam, Tanganyika, by Ortmann (1894) and then from numerous localities on Zanzibar and the Kenyan coast. In Tanganyika, specimens have been recorded from Pungu Nyama, Tanga and Maziwi Island. Closely related to *C. viridis*, to which many records of *C. graminea* may refer, (Bruce, 1974).

#### ***Coralliocaris nudirostris* (Heller)**

One specimen reported on a reef off the west coast of Zanzibar, north of Pange, from 0.5 m in an *Acropora coral*. Specimens have also been reported from Maziwi Island, Tanganyika, in *Acropora surculosa* (Dana) (Bruce 1973 c). Numerous

samples have been collected along the Kenya coastline from Tiwi, Mombasa Island, Kirwetu and Kikambala, where they are found in *Acropora* colonies on the outer edge of the fringing reef, suggesting that they prefer a more exposed niche than the lagoon inhabiting species. The Kirwetu specimens were found in *Acropora spicifera* (Dana).

### ***Coralliocaris superba* (Dana)**

An abundant associate of *Acropora* corals in the fringing lagoons of Kenya and on the sheltered west coast reefs of Zanzibar and also from Maziwi Island, Tanganyika. Identified host corals include *A. africana* (Brook), *A. variabilis* (Klunz.), *A. cf. pectinata* (Brook), *A. surculosa* (Dana), and *A. nasuta* (Dana).

***Coralliocaris* ? *venusta* Kemp,  $\alpha$  form**

***Coralliocaris* ? *venusta* Kemp,  $\beta$  form**

Two forms of *Coralliocaris* appear to occur in East African (and other) waters that agree with the description given by Kemp (1922) for *C. venusta*. No significant morphological differences have yet been detected and the forms are most readily separated in the field by their characteristic colour patterns, which are best developed in the adult females. Both forms are associated with corals of the genus *Acropora* and usually only a single pair is present in each host colony, although sometimes a few juveniles are also found. The male and female of a pair always have the same colour pattern, although it is less conspicuously developed in the smaller male specimens. The two forms appear to behave in the field as 'good species', although they may be collected from adjacent corals on the same reef, and are collected in approximately equal numbers. If the different colour patterns were due to polymorphism in a single species, the males and females of contrasting patterns should be found occasionally paired but these have not been found to occur. It is possible that the two forms may be associated with different *Acropora* host species, but insufficient numbers of the hosts have so far been specifically identified.

The  $\alpha$  form is characterised by the presence of conspicuous irregular patches of opalescent white particularly on the body, caudal fin and legs (Bruce, 1973c, fig. 5) which are not found in the  $\beta$  form. In his original description of this species, Kemp did not provide any information on the colour pattern of his material and it is not at the moment possible to refer one or other of these forms to *C. venusta* Kemp s.str.

Specimens of the  $\alpha$  form have been recorded from Malindi (Bruce, in press, i). Several specimens were collected without data on colour patterns localities include Pungume reef, Bawi Island and Mazizini, Zanzibar; Masiwi Island, Tanganyika; Jadini, Kenya. Specimens of the  $\alpha$  form have been collected from Kirwetu, Jadini and Bamburi, Kenya and the  $\beta$  form from Chumbe Island, Zanzibar; Mombasa Island, Wasin Island, Kirwetu, and Bamburi, Kenya.

$\alpha$  specimens from Kirwetu and Jadini were found in association with *Acropora subulata* (Dana) and *A. convexa* (Dana). Some  $\beta$  forms from Jadini were also found in colonies of *A. convexa* as well as a colony of *A. pectinata* (Brook).

**Coralliocaris viridis** Bruce

Originally described from specimens from Mombasa Island, Kenya, (Bruce, 1974, 1974c, fig. 1). Further specimens have since been obtained from the same locality and also from Kikambala, Shimoni and Wasin Island, Kenya. The host corals of the type specimens were *Acropora disticha* (Brook), *A. humilis* (Brook), *A. valida* (Dana) and *A. variabilis* (Klunz).

**Coralliocaris** sp.

Known only from the single ovigerous female collected from Mtwapa, Kenya, from an *Acropora* coral host. The species is closely related to *C. superba* but differs in the shape of the rostrum and colour pattern.

**Dasycaris ceratops** Holthuis\*

A single specimen was found in the pennatulacean *Sclerobelemnon burgheri* (Herklots), ten on *Virgularia gustaviana* (Herklots), eight on *Pteroides esperi* (Herklots) and ten on *Pteroides densum* Tixier-Durivault, all collected from Zanzibar Harbour at 20-22 m. No specimens have been collected on mainland Tanzanian or Kenyan waters.

**Dasycaris zanzibarica** Bruce

Originally described from specimens from Pungume reef and Change Island, Zanzibar, in association with the antipatharian *Cirripathes anguinis* (Dana). Further specimens have since been collected from the same host from Shangani and Bawi Islands, Zanzibar. No specimens have been found in Kenyan or Tanzanian waters, although the host has been frequently examined.

**Epipontonia spongicola** Bruce

Known only from the single holotype specimen collected from Wasin Channel, Kenya, in a *Reneira* sponge from 11 m. depth (Bruce, in press, f). No further specimens have been collected.

**Fennera chacei** Holthuis\*

Specimens have been collected from Mombasa Island, Ras Iwatine and Jadini, Kenya, in all cases from *Pocillopora* colonies at the reef edge at LWS tide level. The Jadini specimen was associated with *P. eydouxi* Milne-Edwards & Haime. No records from Tanzanian waters.

**Hamodactylus boshmai** Holthuis\*

Two specimens only were collected, one from Prison Island, Zanzibar, on the gorgonian *Coelogorgia palmosa* Milne-Edwards & Haime, from 8 m and the other from Mombasa Harbour entrance, at 26 m, on the gorgonian *Euplexaura braueri*

Kükenthal. The hosts of this shrimp have not been previously identified and there have been no previous reports of this species from the Indian Ocean.

#### **Hamodactylus noumeae** Bruce\*

Small numbers of this shrimp, which has not been previously reported in the Indian Ocean, have been found in association with large colonies of nephtheid alcyonarians at several localities including Maziwi Island, Tanganyika; Murogo reef, Zanzibar and Shimoni and Wasin Island, Kenya.

#### **Hamodactyloides incompletus** (Holthuis)

This species has been recorded once from Watamu, Kenya, in association with the hydroid *Millepora dichotoma* Forsskal (Bruce, in press, i) and two more specimens have been collected from Fungu Mapape, Zanzibar, from a colony of *M. intricata* Milne-Edwards & Haime, from 24 m.

#### **Harpiliopsis beaupresi** (Audouin)

Abundant on all coral reefs on *Stylophora*, *Pocillopora* and *Seriatopora* corals. Zanzibar records include the following localities: Mazizini, Nyange reef, Chukwani, Pange reef, Migombani, Bawi Is., Prison Is., and Mangapwani on the west coast, and Mwemba Is., on the east coast. In Tanganyika it is recorded from Mazwi Island and Pangani (36.5 m). In Kenya records are from Ras Iwatine, Tiwi, Mombasa Island, Jadini and Shimoni. The Jadini specimens were associated with *Stylophora pistillata* (Esper) and *Pocillopora eydouxi* Milne-Edwards & Haime. The Zanzibar specimens from Prison Island and some Mazizini specimens were associated with *Seriatopora hystrix* (Dana). This species and the next two species are often to be found in association in the same host colony. It has also been previously recorded from Watamu, Kenya (Bruce, in press, i). Specimens have been found infected by the bopyrid parasite *Mesophryxus ventralis* (Bruce, 1973, a).

#### **Harpiliopsis depressus** Stimpson

Similarly abundant on all coral reefs, also on *Stylophora*, *Pocillopora* and *Seriatopora* corals. Zanzibar localities include Mazizini, Nyange reef, Migombani and Murogo reef. In Tanganyika, from Maziwi Is., and in Kenya from Malindi (Bruce, in press, i), Ras Iwatine, Ras Kidomoni, Jadini, Tiwi, Shimoni and also Kanyika, in coral dredged from 13 m. Most of the other records are from shallow water fringing reefs or lagoons.

#### **Harpiliopsis spinigerus** (Ortmann)

Common, often in association with the two above species, in *Stylophora* and *Pocillopora* corals but no specimens have yet been collected from *Seriatopora*. Recorded from the following localities—Zanzibar: Mazizini, Bawi Is., Murogo reef; Kenya: Malindi (Bruce, 1971, i), Ras Iwatine, Mombasa Island and Jadini. The Jadini specimens were associated with *S. pistillata* (Esper) and *P. eydouxi* (Milne-Edwards & Haime).



***Ischnopontonia lophos* (Barnard)**

Common on all fringing and patch reefs and in most lagoons, in the coral *Galaxea fascicularis* (L.). Previously reported from several localities in central East Africa by Bruce (1966, b), including Mazizini, Chukwani and Pange, Chango and Kibandiko reefs, Zanzibar ; Mazivi Island, Tanganyika ; and Malindi, Kenya. Other specimens have since been obtained from Mangapwani, Zanzibar, and Ras Iwatine, Bamburi and Jadini, Kenya. Often found in association with *Platycaris latirostris* and *Racilius compressus*, and some specimens infected by bopyrid parasite *Hypophryxus pikei* (Bruce, 1968).

***Jocaste japonica* (Ortmann)**

Abundant on all coral reefs, on corals of the genus *Acropora*, often in association with the next species. Previously recorded from several East African localities ; Migombani and Nyange reef, Zanzibar ; Latham Is., Maziwi Is., Pangani ; Fungu Nyama, Tanga, Tanganyika (Bruce, 1969) and from Malindi (Bruce, in press, i). Other records now include Ras Iwatine, Kirwetu, Tiwi, Jadini, Mombasa Island and Wasin Is. Identified hosts include *A. squamosa* (Ehrenberg), *A. cf. pectinata* (Brook), *A. convexa* (Dana), *A. spinifera* (Dana) and *A. humilis* (Dana). Also reported in association *A. surculosa* (Dana) from Maziwi Island (Bruce, 1973, c).

***Jocaste lucina* (Nobili)**

Also abundant on all coral reefs, often in the same *Acropora* coral hosts with the above species. Previously recorded from several East African localities : Chukwani, Migombani and Pange reef, Zanzibar ; Tutia reef, Mafia and Maziwi Island, Tanganyika (Bruce, 1969) and Malindi, Kenya, (Bruce, in press, i). Subsequently recorded from Mazizini, Bawi Is., Fungu Chawamba, Murogo reef, on the west coast of Zanzibar and from Mwemba Is., on the east coast. Other records from Kirwetu, Ras Iwatine, Mombasa Island, Tiwi, Jadini, Shimoni and Wasin Island, Kenya. The only specifically identified host is *A. eurystoma* (Klunz.) from Jadini, Kenya.

***Metapontonia fungiacola* Bruce**

The occurrence of this species in central East African waters, in association with the faviid coral *Hydnophora microcones* Lam. at Jadini, Kenya, was first recorded by Bruce (1972, b). Other specimens have been collected from Maziwi Island, Tanganyika, in association with *Fungia* sp. and also from Howards Rocks, Wasin Is., in Kenya, in association with *Halomitra*, a new host record.

***Onycocaris amakusensis* Fujino & Miyake\***

A single ovigerous female collected from off Chumbe Is., Zanzibar from a sponge obtained from 18 m.

***Onycocaris callyspongia* Fujino & Miyake \***

One pair collected from the sponge *Haliclona* sp. from 8 m off Prison Is., Zanzibar and a pair and a male from sponges on the reef flat of Kunduchi, Tanganyika.

**Onycocaris seychellensis Bruce\***

One pair collected from a sponge, *Haliclona* sp., from 18 m at Kisiti Is., Kenya.

**Onycocaris zanzibarica Bruce**

Originally described on the basis of some damaged specimens, from off Chumbe Is., Zanzibar (Bruce, 1971, b). A further pair of specimens have since been obtained from Howards Rocks, Wasin Is., Kenya, from a sponge, *Raphidophlus* sp., collected from 7 m depth.

**Onycocaris sp.**

A pair of specimens of an undescribed species have been collected from Maziwi Island, Tanganyika, with an additional specimen from Ras Iwatine, Kenya. Both lots were from a depth of 1 m in lagoon waters in the sponge *Reneira mollita* (Laubenfels).

**Palaemonella crosnieri Bruce\***

A single male specimen has been collected from the reef flat at LWS tide level at Leven reef, Mombasa, and a male and an ovigerous female were collected together from the base of an *Acropora* colony encrusted with sponges, at a depth of 26 m in the approach to Mombasa Harbour.

**Palaemonella lata Kemp**

The occurrence of a pair of specimens at Makunduchi, Zanzibar, has been previously reported (Bruce, 1970). No further specimens have been obtained.

**Palaemonella pottsi (Borradaile)\***

A pair were collected on the crinoid *Comanthus parvicirrus* (J. Müller), from 9 m off Chapani Is., Zanzibar and a male was collected from a crinoid from 18 m off Port Jesus, Mombasa, Kenya. This species has not been previously recorded from the Indian Ocean.

**Palaemonella pusillus Bruce**

Known only from the single ovigerous female holotype specimen from Kisiti Island, Kenya, (Bruce, in press, c).

**Palaemonella rotumana (Borradaile)**

One of the commonest and most ubiquitous pontoninid shrimps. Previously reported from the following localities in East African waters:—Migombani, Bawi Is., Zanzibar Harbour, Mazizini, Chukwami, Pange and Nyange reefs and off Mweni, Fumba and Kwala Is., Zanzibar; Maziwi Island, Tanganyika. Most of the specimens were collected from shallow water or reef flat pools. The speci-

mens from Pange reef were infested by the bopyrid parasite *Metaphryxus intutus* (Bruce 1965). Additional localities now include the wreck of the S.S. 'Glasgow', in Zanzibar Harbour, Mangapwani, Fungu Mapape, Marumbi and Chango Is., on the east coast of Zanzibar. In Kenya from Ras Iwatine, Mombasa Island, Wasin Island, Shimoni, Kirwetu, Kikambala, Bamburi and Mombasa Harbour approach, at 26 m; and Mafia Is., Tanganyika.

***Palaemonella* aff. *rotumana* (Borradaile)**

The single male specimen, collected from 22 m off Shelly Beach, Mombasa, agrees precisely with the description given of a specimen previously reported from the island of Farquhar (Bruce, 1974, b) and reinforces the suggestion that a new species, closely related to *P. rotumana* (Borr.) *s. str.* may be represented.

***Palaemonella spinulata* Yokoya**

Specimens have been reported from Maziwi Is., Tanganyika, and from Ras Iwatine, Kenya (Bruce, in press, c). One further specimen has since been obtained from a depth of 10 m at Port Jesus, Mombasa. No specimens have been collected from Zanzibar.

***Palaemonella* sp.**

A single example, an ovigerous female, of an undescribed species, was collected from the exposed reef flat on the seaward side of Mombasa Island, Kenya. The species is closely related to *P. lata* Kemp, and differs particularly in its large size and the strong armament of the fourth thoracic sternite.

***Paranchistus ornatus* Holthuis \***

Moderately common and widespread on most reefs in East Africa in association with the fan-shell *Atrina vexillum* Börn. Recorded from the following localities Chukwani, Mazizini, Migombani, Bububu, Pange reef, Murogo reef and Bat Island, off the Zanzibar east coast, and from Bamburi, Ras Iwatine, Mombasa Old Harbour ; Flora Point, Kilindini, and Jadini, Kenya.

***Paratypton siebenrocki* Balss \***

Pairs of specimens have been collected from Chukwani reef, Zanzibar, from Maziwi Island, Tanganyika, and from Andromache reef, Mombasa, Kenya. All were found in galls in *Acropora* colonies, the Kenyan specimens from 14 m, the others from about 1 m.

***Periclimenaeus ardeae* Bruce \***

A pair collected from a specimen of the sponge *Asteropus simplex* (Carter), obtained from a depth of 126-140 m, off Ras Iwatine, Kenya. Previously known only from the type material from Australia. This is also the first Indian Ocean record of the host sponge (Pulitzer-Finali, in litt.).

**Periclimenaeus arabicus** (Calman)

Common in a variety of shallow water sponges, often in association with *Anchistioides willeyi*, *Thaumastocaris streptotus* and *Periclimenaeus uropodialis*. Recorded from the following localities : Zanzibar ; Prison Island, Fungu Chawamba, Bawi Is. ; Tanganyika : Kunduchi ; Kenya ; North Kenya Banks (82 m), Wasin Island, Wasin Channel, Mombasa Old Port. Hosts include *Callyspongia* sp., *Callyspongia fibrosa* (Ridley & Dendy) and *Acarus ternatus* (Ridley). Previously known only from the type material from the Gulf of Aden and from Jibuti.

**Periclimenaeus bidentatus** Bruce

Paratypes of this species were first reported by Bruce (1970, a), from off Bawi Is., Zanzibar. Further material has since been obtained from Mkokotoni Harbour (25.5-27.5 m), and the wreck of the S.S. 'Glasgow', in Zanzibar Harbour (4.5 m), in the sponge *Dysidea fragilis* (Montagu). An ovigerous female has also been collected from a sponge, *Liosina paradoxa* Thiele, on the reef front at Shelly Beach, Mombasa, Kenya, at 7 m.

**Periclimenaeus djiboutensis** Bruce\*

Two small specimens have been collected from the sponge *Spongia officinalis* var. *ceylonicus* Dendy on the reef flat at LWS tide at Mangapwani, Zanzibar. Otherwise known only from the type locality and Madagascar.

**Periclimenaeus fimbriatus** (Borradaile) \*

Twenty-two specimens, with three ovigerous females, were found in a sponge trawled from a depth 45 m in Pangani Bay, Tanganyika. This species is otherwise known only from the type specimens from the Maldives and Seychelle Islands.

**Periclimenaeus hehedactylus** Bruce

Known only from the pair of type specimens from 91.5 m off Makunduchi, Zanzibar, (Bruce, 1970, a). No specimens have been subsequently obtained.

**Periclimenaeus hecate** (Nobili)

Three specimens have been reported from Watamu, Kenya, in association with an ascidian, *Diplosoma* sp., probably *D. modestum* Michaelson (Bruce, in press, i). There have been no further records of this species, which is otherwise known only from the type material.

**Periclimenaeus leptodactylus** Fujino & Miyake \*

Several pairs of this shrimp have been collected from sponges on the reefs on the Zanzibar west coast. One pair, from Mazizini, Zanzibar, has been compared with the type material by T. Fujino and the identification confirmed. Other localities include Shangani, Grave Is., and off Chumbe Is., Zanzibar and from the Basin

Channel, Kenya. This species is otherwise known only from the type material and constitutes a new record for the Indian Ocean. Host sponges include *Desmacidon* sp.

***Periclimenaeus minutus* Holthuis \***

Four lots of specimens referable to this species have been collected from Mbwani and Fawatu reef, Zanzibar and from Pangani Bay, Tanganyika. All specimens were from trawled or dredged sponges from 9-36.5 m. This species is previously known only from the type material and it is a new record for the Indian Ocean.

***Periclimenaeus ornatus* Bruce**

Part of the type material for this species was collected from Pangani Bay, Tanganyika at 36.5-45.5 m (Bruce, 1970, a). One further lot of specimens has since been collected, from 9 m, off Pange reef, Zanzibar. The Pangani specimens were found in association with the specimens of *P. fimbriatus* (see above).

***Periclimenaeus quadridentatus* (Rathbun) \***

A pair of specimens of this species has been collected from 33 m off the reef front at Shelly Beach, Mombasa, Kenya. This species has not been previously recorded from the Indian Ocean. The host was a yellow sponge.

***Periclimenaeus robustus* Borradaile \***

A pair of specimens was collected from a sponge, *Asteropus simplex* (Carter), trawled from 119-141 m, off Ras Iwatine, Kenya, and are now provisionally referred to this species pending comparison with the type specimens. This species is previously known only from the type material from the Amirante Islands.

***Periclimenaeus rhodope* (Nobili)\***

One of the commonest *Periclimenaeus* species, found frequently in the small soft-walled colonies of *Haliclona* sponges amongst sea grasses on the reef flats. Recorded localities includes : Makunduchi, Chumbe Is. and Chwaka, Zanzibar ; Kunduchi, Tanganyika ; Shimoni, Ras Iwatine, Bamburi, Mombasa Island and Jadini, Kenya. Sometimes found in association with *Thaumastocaris streptotus*.

***Periclimenaeus trispinosus* Bruce**

Originally described from a pair collected from sponges from 25.5-27.5 m from Mkokotoni Harbour, Zanzibar, (Bruce, 1969, b), there have been no further records of this species.

***Periclimenaeus truncatus* (Rathbun)\***

A single specimen of this species was found in the sponge *Biemna fortis* (Top-sent), collected from 2 m on Nyange reef, Zanzibar. This species has not been previously recorded from the Indian Ocean.

**Periclimenaeus tuamotae Bruce \***

Specimens from a sponge from the sea grass flats at Kunduchi, Tanganyika, agree closely with the holotype, except that the supra-orbital spines are slightly less acute. A specimen from Howards Rocks, Wasin Island, Kenya, is also similar, but with a relatively much larger cornea. A female from 15 m at Port Jesus, Mombasa, Kenya, was found in the sponge *Acarnus ternatus* Ridley. This species has not been previously reported from the Indian Ocean, being known only from the type material from Mururoa.

**Periclimenaeus uropodialis \***

Moderately common in sponges, often with *P. arabicus* and *Thaumastocaris streptopus*. Recorded from Mkokotoni, Zanzibar; Ras Mkumbi, Mafia, Tanganyika and from Wasin Island, Wasin Channel and Mombasa Old Port, Kenya. Found in *Callyspongia* sp.

**Periclimenaeus usitatus Bruce**

No further specimens of this species have been found since the original material was reported from off Mafia Is., Tanganyika, from a sponge collected by trawl, at 20 m (Bruce, 1969, b).

**Periclimenaeus zanzibaricus Bruce**

Originally described from 15 specimens from a small black sponge, probably *Haliclona* sp., from Uroa, on the east coast of Zanzibar Island, (Bruce, 1969, b). Further specimens referable to this species have since been collected from Marumbi, Zanzibar and from Ras Iwatine and Mombasa Island, Kenya. The Ras Iwatine specimens were also from *Haliclona* sp.

**Periclimenaeus sp.**

A single specimen of an undescribed species was collected from a trawled sponge off the North Kenya Banks. The specimen closely resembles *P. truncatus* but has a dorsally toothless rostrum with a single robust ventral tooth.

**Periclimenaeus sp.**

A single specimen obtained from the sponge *Biemna fortis* (Topsent), collected from 2 m, off Nyange reef, Zanzibar. The species is related to *P. spinicauda* Bruce, but differs in the morphology of rostrum and orbit.

**Periclimenaeus sp.**

A single ovigerous female collected from a black sponge, *Spirastrella* sp., from 16 m off the reef front at Shelly Beach, Mombasa, Kenya. This species is most closely related to *P. lobiferus* and differs in many small morphological details.

**Periclimenaeus sp.**

Some specimens of a small species, closely related to *P. rhodope*, have been collected from sponges off Bawi Island, Chumbe Is., and Nyange reef, Zanzibar. Greatest depth recorded, 27.5-31 m.

**Periclimenes brevicarpalis (Schenkel)**

Common in sheltered bays and lagoons. Generally associated with giant anemones, particularly *Stoichactis* sp. First recorded in East Africa at Mkokotoni and Bawi Is., Zanzibar, by Lenz (1905) and subsequently from Zanzibar by Taramelli (1955). Recorded localities include Unguja Unguu, Migombani, Prison Is., Chukwani, Bat Is., Nyange reef, Zanzibar; Chile Bay, Mafia, Tanganyika; Leven reef, Ras Iwatine, Kirwetu, Wasin Is., Mombasa Old Port, Kikambala and Manda Is., Kenya. On several occasions small juveniles have been collected from small alcyonarians and on one occasion from the coral *Goniopora* sp., but no adults have been found on these hosts. The juveniles are highly transparent with a white dorsal eye stripe and the rudiments of eyespots on the uropods. Some of the adults specimens show feebly developed accessory spines on the dactyls of the ambulatory pereopods that are not normally present in this species. One male, from Wasin Island, was found on *Physobranchia* sp.

**Periclimenes ceratophthalmus Borradaile \***

A few specimens have been collected from the Old Port, and Port Jesus, Mombasa, in 0-10 m, in association with the crinoids *Lamprometra klunzingeri* (Hartlaub) and *Dichometra afra* (A. H. Clark). A pair were also obtained from a crinoid collected from 2 m, off Pungu Mapape, Zanzibar.

**Periclimenes commensalis Borradaile \***

Probably the commonest crinoid shrimp commensal in East African waters. Recorded from Shangani, Zanzibar Harbour, Fungu Mapape, Chapani Is. and Nyange reef, Zanzibar. In Kenya, reported from Wasin Is., Wasin Channel and Port Jesus, Mombasa. Identified hosts include *Capillaster multiradiatus* (L.), *Heterometra africana* (A. H. Clark), *Comanthis parvicirrus* (J. Müller) and *Comaster distinctus* (P. H. Carpenter). The greatest depth was from 25 m.

**Periclimenes consobrinus (De Man)**

Moderately common in some species of *Pocillopora* corals. Previously reported from Malindi by Bruce (In press, i), and a specimen infected by the bopyrid parasite *Orophryxus shiinoi* from the Old Port, Mombasa (Bruce, in press, a). Other specimens have been obtained from the following localities: Maziwi Is., Tanganyika; Ras Iwatine and Tiwi, Kenya. All specimens were from less than 2 m depth.

**Periclimenes diversipes Kemp**

A common associate of a wide variety of corals in shallow water bays or lagoons. Previously reported from Maziwi Is., Tanganyika (Bruce, 1972) and Malindi,

Kenya (Bruce, 1972, a ; In press, i). Other localities now include Nyange reef, Migombani, Chukwani, Mazizini, Pange reef, Mangapwani, Zanzibar and from Ras Iwatine and Kirwetu, Kenya. Recorded hosts include *Acropora*, *Pavona*, *Porites*, *Stylophora* spp. and a *Galaxea clavus* (Dana).

#### ***Periclimenes elegans* (Paulson)**

An abundant free-living predatory shrimp common on all reef flats with shallow pools. Collected from the following localities: Bawi Is., Makunduchi, Nyange, Pange, Fawatu reefs, Chukwani, Bat Is. and Marumbi, Zanzibar. From Kunduchi ; Fungu Nyama, Tanga ; Maziwi Is., Tanganyika and Leven reef and Andromache reef, Mombasa Island, Mombasa ; Nyali and Kikembala, Kenya. One specimen from the Musee Zoologique, Strasbourg, labelled ' *Anchistia spinigera* ' Ortmann. Typ. Dar es Salaam, has been examined and found referable to this species. The specimen is well preserved, although lacking one second pereopod. The carapace length is 3.8 mm and the rostral dentition is 8/5. The carpus of the second pereopod has two conspicuous distal spines with the upper subequal to the inner and the palm of the chela is finely tuberculate.

#### ***Periclimenes ensifrons* (Dana) \***

Several specimens have been provisionally referred to this species on account of the lack of spines on the carpus of the second pereopods. It seems probable that they are abnormal individuals of *P. elegans* or *P. grandis* and that all three species may be synonymous. Recorded localities include Chukwani, Mazizini, Bububu and Bawi Is., Zanzibar. No records from Tanganyika or Kenya.

#### ***Periclimenes galene* Holthuis**

Common on the ' fire weed ' hydroid *Aglaophenia cupressima* Lamoureux, in fringing lagoons and patch reefs, frequently with *Hippolyte commensalis* Kemp. Previously recorded from Malindi (Bruce, in press, i). Additional localities include Bawi Is., Zanzibar ; Maziwi Is., Tanganyika ; Ras Iwatine and Wasin Is., Kenya.

#### ***Periclimenes goniopora* Bruce**

Recently described from Ras Iwatine, Kenya (Bruce, in press, g) mainly in association with the coral *Goniopora stutchberryi* but also with *Lobophyllia* sp. Only known so far from Ras Iwatine and Shimoni, Kenya.

#### ***Periclimenes grandis* (Stimpson)**

Common on reef flats and in pools. Previously recorded from Malindi, (Bruce, in press, i) and Mazizini, Zanzibar. Parasitised by the bopyrid *Orophryxus shiinoi* (Bruce, 1971, c). Specimens collected from Mazizini, Chukwani, Zanzibar ; Pangani Bay and Mkoma Bay, Tanganyika ; Ras Iwatine, Mombasa Island, Mombasa Old Port, Likoni, Andromache reef, Kisiti Is., Kirwetu and Manda Is., Kenya. Very closely related to, and possibly synonymous with, *P. elegans*.



**Periclimenes hirsutus Bruce \***

Seven specimens collected from nine specimens of *Astropyga radiata* (Leske), trawled from 9 m of Mtoni, Zanzibar. Previously known only from the Seychelle Islands and Fiji.

**Periclimenes holthuisi Bruce**

This species has been previously reported from Zanzibar Harbour in association with the jelly fish *Cassiopea andromeda* Forsskal, (Bruce, 1971, e). Further specimens have since been obtained from Zanzibar Harbour on *Cassiopea* and one on an anemone, with others from Bawi Is., and Fungu Mapape, Zanzibar, also on *Cassiopea*. The latter lot was on two hosts, with 3 and 6 shrimps each, from 24 m depth.

**Periclimenes imperator Bruce**

Originally described from material from Chumbe Is., and Tumbatu Is., Zanzibar (Bruce, 1967) and subsequently reported from Malindi, Kenya (Bruce, in press, i) in association with *Bohadschia* sp. Recorded also from several localities in Kenya, Ras Iwatine, Bamburi, Nyali, almost always in association with the large dorid nudibranch *Hexabranchnus marginatus* Quoy & Gaimard. Two lots of juveniles from Bamburi were associated with the holothurian *Stichopus variegatus* Semper and one pair of adults from 25 m, off Nyange reef, Zanzibar, were found on the synaptid *Opheodosoma spectabilis* Fisher, and constitutes a new host record and which had not been previously recorded from the Indian Ocean. All other specimens were from shallow water in fringing lagoons or reef flats pools. Not recorded from Tanganyika.

**Periclimenes incertus Bruce \***

Moderately common on a variety of sponges. Collected from the following localities : Bububu, Chumbe Is., Kibweni, Bawi Is., Shangani, Zanzibar Harbour, Chango Is., Murugo reef, Nyange reef, Zanzibar ; Tanga Harbour, Tanganyika ; Kisiti Is., Port Jesus, Mombasa ; Kilindini Harbour, Mombasa ; Wasin Is., Kenya. Identified hosts include : *Petrosia testudinia* (Lam.), *Oceanapia* sp., *Dysidea fragilis* (Montagu), *Spirastrella vagabunda* Ridley, *Clathria* sp., *Desmopsamma* sp., and *Acarnus ternatus* Ridley. It is also particularly common on *Siphonochalina* spp., with *Gelastocaris paronae*. The *Thaumastocaris* and *Anchistioides* are found in the spongocoel but *P. obscurus* and *Gelastocaris* have only been noted on the exterior surface of the sponges. The greatest depth recorded was 47.5-49.5 m in the Zanzibar Channel.

**Periclimenes inornatus Kemp**

Previously recorded from Malindi, Kenya (Bruce, in press, i), this species is common on the giant anemone *Radianthus ritteri* (Kwietnoski) and has not been found in any other anemone. Collected from the following localities : Murugo reef, Zanzibar ; Ras Iwatine, Wasin Is., and Nyali, Kenya.

**Periclimentes jugalis** Holthuis \*

One ovigerous female and three juveniles were collected from a specimen of the alcyonarian *Morchellana dollfusi* Tixier-Durivault, collected from a depth of 20 m in Zanzibar Harbour. This species has not been previously reported from the Indian Ocean and its host was also unknown. The original record was from the Aru Is., Indonesia.

**Periclimentes kempi** Bruce

This species has been reported from Malindi, Kenya (Bruce, in press, i) in association with alcyonarians. Other material has been collected from Chukwani, Zanzibar, from *Sarcophyton elegans* Moser, from 2 m depth.

**Periclimentes lanipes** Kemp \*

Common on large gorgonocephalid basket stars. Collected from Fawatu reef, Prison Is., Mazizini, Chumbe Is., Murugo reef, Zanzibar Harbour, Bawi Is., and Chapani Is., Zanzibar; and from Wasin Is., Kenya. Only recorded in association with *Astroboa nudum* (Lyman). Up to about 30 specimens may be present on a single host. Greatest depth recorded 33-36.5 m.

**Periclimentes latipollex** Kemp \*

A single ovigerous female was collected by the R. V. *MANIHINE* from the North Kenya Banks at a depth of 155.5 m. This species is associated with gorgonian hosts (Bruce, 1971).

**Periclimentes lepidus** Bruce \*

Recently described from specimens from antipatharian hosts from Madagascar waters (Bruce, in press, j), a single specimen has since been collected from 30 m in the seaward approaches to Mombasa Harbour, Kenya. The host was not specifically identified, but several gorgonians and antipatharians were with the material collected.

**Periclimentes longirostris** (Borradaile)\*

A few specimens have been collected from the shallow reefs at Chukwani, Zanzibar. One specimen was infected by the bopyrid parasite *Orophryxus shiinoi*. Not recorded from Tanganyikan or Kenyan waters.

**Periclimentes lutescens** auct.

Common in small numbers on corals of the genus *Acropora* on all reefs. Previously recorded from Maziwi Is., Tanganyika (Bruce, 1973, c) and from Malindi, Kenya (Bruce, in press, i). Recorded from the following localities: Grave Is., Migombani, Mazizini, Chukwani, Chango Is., Murogo reef, Pange reef, Nyange reef and Mangapwani on the west coast, and Mwemba Is., on the east coast of

Zanzibar. Also from Tutia reef, Mafia, Tanganyika, and Ras Iwatine, Wasin Is., Jadini, Mombasa Old Port, Kirwetu, Shimoni, Bamburi, Howards Rocks, Wasin Channel, Kenya. One of the specimens from Bamburi was infected by the bopyrid parasite *Orophryxus shiinoi*. All specimens were from *Acropora* spp. Identified hosts include *A. convexa* (Dana), *A. squamosa* (Ehrenberg) and *A. surculosa* (Dana). Most specimens are from less than 5 m depth in fringing lagoons or on patch reefs. Frequently found in association with *Coralliocaris* and *Jocaste* spp.

#### **Periclimenes mahei Bruce \***

Several lots of specimens collected from corals on the Zanzibar west coast reefs, including the following localities: Mazizini, Bawi Is., Prison Is., and Murogo reef. Hosts include *Pocillopora*, *Seriatopora* and *Acropora* sp. One *Acropora* colony contained 26 specimens. All specimens were from shallow water, 1-2 m.

#### **Periclimenes nilandensis Borradaile \***

Apparently associated with a variety of gorgonian and antipatharian hosts off the edges of the coral reefs. Specimens have been collected from Bawi Is., Prison Is. and Zanzibar Harbour. Also from the approaches to Mombasa Harbour, Kenya. Greatest depth recorded from trawled specimens from 27.5-36.5 m. Often numerous, 28 specimens have been recorded from one colony of *Coelogorgia palmosa* Milne-Edwards & Haime (Telestidae).

#### **Periclimenes obscurus Kemp \***

This species appears to be associated with a variety of sponges. Specimens have been collected from Nyange reef, Mkokotoni, Kwale Is., Bububu, Fumba, Zanzibar Harbour and Bawi Is., Zanzibar; Maziwi Is., Pangani, Fungu Tongoni, Tanga and Tanga Harbour, Tanganyika and from Port Tudor, Mombasa, Kenya. Greatest depth recorded 51 m. Some specimens may also have been associated with *P. nilandensis* on gorgonian hosts.

#### **Periclimenes ornatus Bruce \***

A small pool at the edge of a deep channel in the fringing lagoon at Ras Iwatine, Kenya, with a dense bed of small anemones, has produced several lots of this shrimp. On one occasion some small juveniles of *P. brevicarpalis* were also obtained, but no adults were ever seen. New to the Indian Ocean fauna, previously known only from the type material from Hong Kong.

#### **Periclimenes petitthouarsi (Audouin)**

A free-living browsing species, often found in live or dead coral colonies in shallow waters. Previously recorded from Malindi, Kenya (Bruce, in press, i). Also collected from Chukwani, Unguja Ukuu, Marumbi, Fungu Chawamba, Mangapwani, Murogo reef and Fungu Mapape on the west coast and Chwaka on the east coast of Zanzibar Island. Also collected from Maziwi Is., Tanganyika

and Wasin Is., Shimoni, Kenya. Most specimens were collected from reef flat pools in 0.4 m of water. Three specimens were collected from a *Millepora* sp. colony at 24 m.

#### **Periclimenes psamathe (De Man)**

Previously recorded from East African waters only from Malindi, Kenya (Bruce, in press, i), but also figured as *P. aesopius* by Bruce (1966, figs. 3b, 4e, f) from a specimen from 36.5 m, off Bumbwini, Zanzibar Island. Other specimens collected from Prison Is., Bawi Is., and Zanzibar Harbour, from Mafia Is., Tanganyika and from Mombasa Harbour approach, Kenya. Identified hosts include *Coelogorgia palmosa* Milne-Edwards & Haime, *Antipathes* aff. *plana* Cooper and *Spongioderma chuni* Kukenthal, all new host records.

#### **Periclimenes seychellensis Borradaile**

Common in reef flat pools with algae and in *Sargassum*, *Turbinaria* and sea grass beds. Previously recorded from Malindi, Kenya (Bruce, in press, i). Also recorded from Chukwani, Mazizini, Bawi Is., Zanzibar; Fungu Tongoni, Tanga, Tanganyika, and from Ras Iwatine, Kenya. Some juvenile specimens were collected from floating *Sargassum* off Mazizini, Zanzibar Island.

#### **Periclimenes soror Nobili**

The distribution of this species has been recently reviewed (Bruce, in press, d). It was first reported from Andromache reef, Mombasa, Kenya, (Bruce, 1971) and has recently been reported from Malindi, Kenya (Bruce, in press, i). East African localities previously reported include Nyange reef and Pange reef, Chango Is., Migombani, Pawatu reef, Mazizini, Mangapwani, Danzi reef, Zanzibar Harbour, Pwakuu reef, on the east coast of Zanzibar Island. Also from Maziwi Is., Tanganyika and from Leven reef, Ras Iwatine, Kirwetu, Wasin Is., Shimoni, Jadini and Kikambala, Kenya. Subsequently reported from 30 m in the approach to Mombasa Harbour, Kenya, on *Choriaster granulatus* Lutken and from Nyali, Kenya on *Echinaster purpurescens* (Blainville), *Pentaceraster mammillatus* (Audouin), *P. tuberculatus* Muller & Troschel, *Culcita schmideliana* (Retzius) and *Acanthaster planci* (L.).

#### **Periclimenes spiniferus (De Man) \***

A few specimens of this species have been collected in East African waters, from Tutia reef, Mafia (1 ovig. ♀), Maziwi Is., (4 spms.) in Tanganyika and from Kikambala, Kenya (1 spm.). In general, the closely related species *P. petithouarsi* is dominant along the coastal reefs of Kenya and Tanganyika.

#### **Periclimenes tenuipes Borradaile \***

A few specimens only of this species have been collected, 1♂ from Bawi Is., and 1♂ and a pair from Pange reef, Zanzibar. The Pange specimens were found in small caves at 10 and 15 m. This species has also been observed by scuba divers at night off Port Jesus, Mombasa, Kenya, a locality where they have not been noticed by day.

**Periclimenes tenuis** Bruce

Originally described from specimens from Chumbe Is., Zanzibar, found in association with the crinoid *Tropiometra carinata* (Lam.) (Bruce, 1969, a). Further specimens have since been obtained from Chumbe Is., and also from Nyange reef and Zanzibar Harbour, at 22-25 m, in association with *Heterometra africana* (A. H. Clark), a new host record. This shrimp is known only from Zanzibar and Eylath on the northern Red Sea.

**Periclimenes ? toloensis** Bruce \*

Two specimens are tentatively referred to this species. They were collected from 18.3 and 23.8 m in the southern Zanzibar Channel by the F.R.V. *MANIHINE*. The 18.3 m specimens were possibly associated with a sponge.

**Periclimenes ungujaensis** Bruce

Originally described from one specimen from Unguja Ukuu, Zanzibar (Bruce, 1969, a), a further single specimen has since been collected from amongst *Cymodocea* on the seaward reef flat off Mombasa Island, Kenya.

**Periclimenes watamuae** Bruce

Recently described from specimens from the Marine Park at Watamu, Malindi, Kenya (Bruce, in press, i), there have been no other reports of this species.

**Periclimenes zanzibaricus** Bruce

Originally described from specimens collected on Fawatu reef, Pange reef and Mtoni, Zanzibar, on *Echinothrix calamaris* Pallas and *Astropyga radiata* (Leske) (Bruce, 1967), this species has also been recorded from Malindi, Kenya (Bruce, in press, i). Other localities now include Mazizini, Nyange reef and Chumbe Is., Zanzibar and Ras Iwatine, Andromache reef, Jadini, Mombasa Old Fort, Kikambala, Kenya. Most specimens have been collected from *Diadema* spp. and *Echinothrix calamaris*, collected from shallow water patch reefs and fringing lagoons.

**Periclimenes** sp.

Three specimens, generally resembling *P. alcocki* Kemp, have been collected by the F.R.V. *MANIHINE* from off Ras Ngomeni, Kenya, at 236-256 m depth. The specimens differ from Kemp's species in the morphology of the eye and rostrum. The type of host is unknown. The host of this species is also unknown.

**Periclimenes** sp.

Three specimens collected from the alcyonarian *Litophyton viridis* (May) from Pange reef on the Zanzibar west coast. Most closely related to *P. jugalis* but differing in rostrum, telson and first and second pereopods.

***Philarius gerlachei* (Nobili)**

A relatively uncommon commensal of *Acropora* corals. Reported from the following localities : Chukwani, Pange reef, Migombani, Bawi Is., and Tutia reef, Mafia, Tanganyika. This species has been previously reported from Maziwi Is., Tanganyika (Bruce, 1973, c) and Malindi (Bruce, in press, i). One specimen has also been obtained from Wasin Is., Kenya.

***Philarius imperialis* (Kubo) \***

Another relatively uncommon commensal of *Acropora* corals. This species has been collected at the following localities : Funga Chawamba, Murogo reef, Maziwi Is., Tanganyika ; Andromache reef and Kirwetu, Kenya. All specimens were from *Acropora* spp. and the greatest depth recorded was 12 m. Not previously recorded from the Indian Ocean.

***Platycaris latirostris* (Holthuis)**

Previously reported from Mazizini, Chukwani, Migombani, Pange and Nyange reefs, Zanzibar ; Tutia reef, Mafia, Maziwi Is., and Fungu Nyama, Tanganyika, generally in association with the oculinid coral *Galaxea fascicularis* (L.) and often in company with *Ischnopontonia lophos* and *Racilius compressus* (Bruce, 1966a). Also recorded from Malindi, Kenya (Bruce, in press, i). Subsequently recorded from Fungu Chawamba and Fawatu reefs, Zanzibar and from Bamburi, Ras Iwatine, Takaungu and Jadini, Kenya. The greatest depth recorded is 25.6 m.

***Pliopontonia furtivus* Bruce**

Originally described from a single ovigerous female from Ras Iwatine, Kenya, found in association with the corallimorph zoantharian *Rhodactis rhodostoma* (Ehrenberg), (Bruce, 1973). Two further lots of 4 and 10 specimens have since been obtained from the same host at the same locality. There have been no other records of this species from other localities.

***Pontonia anachoreta* Kemp \***

A single pair of specimens obtained from an unidentified ascidian from Ras Iwatine, Kenya, from 1 m depth in fringing lagoon. Previously known only from the type specimens from the Gulf of Aden.

***Pontonia katoi* Kubo \***

A pair of specimens collected from 18.5 m in the ascidian *Polycarpa cryptocarpa* (Sluiter), off Ras Mkumbe, Tanganyika. Not previously recorded from the Indian Ocean.

**Pontonia okai Kemp \***

A single specimen (damaged) obtained from an ascidian at 6 m on a bridge mooring chain, Port Tudor, Mombasa, Kenya. This species has been previously recorded only from Indonesia and Burma.

**Pontonia stylirostris Holthuis**

A single example obtained from trawl from 45.5 m by the F.R.V. *MANIHINE* near Mafia Is., Tanganyika. The specimen was found free in the catch and was not associated with an ascidian. Not previously recorded from the Indian Ocean and known only from the holotype, from between Missool and New Guinea.

**Pontonia sp.**

One specimen obtained from *Ascidia* sp., collected in Port Tudor, Mombasa, Kenya. The specimen is characterised by a very reduced rostrum, but is very similar otherwise to *P. okai* and may only represent an abnormal individual.

**Pontonides maldivensis (Borradaile)\***

Twenty-four specimens collected from *Dendrophyllia micracaantha* (Ehrenberg) at 22 m in the approaches to Mombasa Harbour, and seven more on the same host at 32 m at Shelly Beach, Mombasa, Kenya. Apparently, generally common on this host.

**Pontonides unciger Calman \***

Many specimens obtained from an antipatharian host from 26 m in the approaches to Mombasa Harbour, and also a single specimen from a different antipatharian from 30 m.

**Pontonides sp.**

A pair of specimens collected from a gorgonian from 26 m in the entrance to Mombasa Harbour.

**Pontoniopsis comanthi Borradaile \***

Recorded from Chukwani, Chumbe Is., Chango Is. and Zanzibar Harbour. Also from Shelly Beach, Mombasa and Wasin Is., Kenya. Hosts include *Tropiometra carinata* (Lam.). Greatest depth recorded, 22 m. Not previously reported from the Indian Ocean proper, but occurring in the Red Sea.

**Propontonia pellucida Bruce**

Previously reported from Malindi, Kenya (Bruce, in press, i). Also collected from Pange reef, Zanzibar, on *Sarcophyton trocheliophorum* Marenzeller and from

Ras Iwatine, Wasin Is., and Nyali, Kenya, in association with *Sarcophyton acutangulum* (Marenzeller). All records from shallow water patch reefs or fringing lagoons.

***Stegopontonia commensalis* Nobili \***

Three specimens only have been collected from *Diadema* urchins, from Kikambala and Ras Iwatine, Kenya, the latter pair of specimens from *D. setosum* Savigny, in 1 m depth in a fringing lagoon. The species is otherwise known in the Indian Ocean only from a single occurrence in Mauritius.

***Tectopontonia maziwiae* Bruce**

Known only from the holotype from Maziwi Is., Tanganyika (Bruce, 1973, c), there have been no subsequent records of this species. The host was *Acropora surculosa* (Dana).

***Thaumastocaris streptotus* Kemp \***

A common associate of a wide variety of sponges on most reefs. Recorded localities include : Zanzibar Harbour, Pange reef, Bawi Is., Pungume Is., Bat Is., Kwale Is., Kibweni, Fumba, Mkokotoni, Chango Is., Murogo reef, and also from Chwaka on the east coast of Zanzibar. In Tanganyika from Maziwi Is., and from Wasin Is., Shimoni, Howards Rocks, Wasin Channel ; Mwamba Cha ; Jadini, Andromache reef, Shelly Beach, Mombasa Harbour approach, Ras Iwatine and the North Kenya Banks in Kenya. The greatest depth recorded was 121-141 m off Ras Iwatine. This shrimp is particularly common on sponges of the genus *Siphonochalina* but also can be found in association with *Haliclona* and *Callyspongia*, often with *Periclimenaeus arabicus*, *P. uropodialis* and *Anchistioides* sp., and also in the sponges *Petrosia* sp., and *Acarnus ternatus* Ridley.

***Tuleariocaris holthuisi* Hipeau-Jacquotte \***

Three specimens collected by poison from a reef flat pool, at Ras Kidomoni, Mombasa, containing numerous specimens of *Echinometra mathaei* (de Blainville) and *Stomopneustes variolaris* (Lam.). No *Diadema* were present.

***Tuleariocaris zanzibarica* Bruce**

Originally described from specimens found in association with *Astropyga radiata* (Leske) and *Diadema setosum* (Leske) from Prison Island and Mtoni, Zanzibar (Bruce, 1967). Further records now include Mangapwani, Zanzibar and Andromache reef, Ras Iwatine, Wasin Is., Mombasa Old Port ; Port Reitz, Mombasa and Bamburi, Kenya, in association with *Diadema setosum*, *D. savigny* (Michelin) and *Echinothrix calamaris* (Pallas). All specimens were from shallow water.

***Typton bawii* Bruce**

Originally recorded from Bawi Is., Zanzibar, by Bruce (1972, d) with a single ovigerous female from 18-25 m. Further specimens have since been obtained



from the reef flats at Ras Iwatine and Shimoni, Kenya, and the host sponge has been identified as *Iotrochota baculifera* Ridley.

#### **Tyton wasini** Bruce

Known only from the type specimens collected from Wasin Channel, in a species of *Reniera* sponge from a depth of 6 m. (Bruce, in press, e). There have been no subsequent records of this species. The types were found in the same host colony as the holotype of *Epipontonia spongiocola*.

#### **Vir orientalis** (Dana)

This species has been previously recorded from Malindi (Bruce, in press, i). Other localities now include Pungume reef, Murogo reef, Zanzibar and Bamburi, Kenya. Although this species has been reported generally in association with *Pocillopora* spp., these new records were all found in association with *Acropora* colonies.

#### **Zenopontonia noverca** (Kemp)

Previously recorded in East African waters by Bruce (in press, b) from between Bat and Grave Is., Mazizini, Shangani and Zanzibar Harbour, Zanzibar. Not recorded from Tanganyika or Kenya. Specimens in shallow water from *Proto-reaster linckii* and in deep water from *Poraster superbis* (Möbius) and *Pentaceraster mammillatus* (Audouin) and *P. tuberculatus* Müller and Troschel. Greatest depth 25 m.

### THE 'COMMENSAL' ASSOCIATIONS OF THE EAST AFRICAN PONTONIINAE

The subfamily Pontoniinae is remarkable for the wide range of associations that have been developed with other marine invertebrates which have recently been reviewed by Bruce (in press, h). So far, in the Indo-West Pacific region no associations with vertebrates have been reported, and the cleaner relationship between fish and some species of *Periclimenes* in tropical American waters has not been observed (Limbaugh *et al*, 1971). Of the East African species collected only sixteen are considered to be free-living predatory or browsing species, (that is, almost 12 %), the remaining 88 % being involved in 'commensal' associations.

The associations of the East African species are summarised below, with the number of species concerned in brackets after the genus name.

#### COMMENSAL ASSOCIATIONS

**PORIFERA** : *Anchistioides* (3) ; *Epipontonia* (1) ; *Onyccaris* (5) ; *Periclimenaeus* (2) ; *Periclimenes* (2) ; *Tyton* (2) ; *Thaumastocaris* (1).

**SCYPHOZOA** : *Periclimenes* (1).

**HYDROIDA** : *Periclimenes* (1) ; *Hamodactyloides* (1).

- ANTIPATHARIA : *Dasycaris* (1) ; *Periclimenes* (3) ; *Pontonides* (1).  
 GORGONACEA : *Hamodactylus* (1) ; *Periclimenes* (2) ; *Pontonides* (1).  
 ALCYONACEA : *Hamodactylus* (1) ; *Periclimenes* (4) ; *Propontonia* (1).  
 PENNATULACEA : *Dasycaris* (1).  
 ACTINIARIA : *Periclimenes* (4) ; *Pliopontonia* (1).  
 SCLERACTINEA : *Anapontonia* (1) ; *Cavicheles* (1) ; *Coralliocaris* (7) ; *Fenera* (1) ; *Harpiliopsis* (3) ; *Ischnopontonia* (1) ; *Jocaste* (2) ; *Metapontonia* (1) ; *Paratypton* (1) ; *Philarius* (2) ; *Platycaris* (1) ; *Periclimenes* (5) ; *Pontonides* (1) ; *Tectopontonia* (1) ; *Vir* (1).  
 GASTROPODA : *Periclimenes* (1).  
 LAMELLIBRANCHIA : *Anchistus* (4) ; *Conchodytes* (3) ; *Paranchistus* (1).  
 HOLOTHUROIDEA : *Periclimenes* (1).  
 ECHINOIDEA : *Allopontonia* (1) ; *Periclimenes* (2) ; *Stegopontonia* (1) ; *Tuleariocaris* (2).  
 ASTEROIDEA : *Periclimenes* (1) ; *Zenopontonia* (1).  
 OPHIUROIDEA : *Periclimenes* (1).  
 CRINOIDEA : *Palaemonella* (1) ; *Periclimenes* (3) ; *Pontoniopsis* (1).  
 ASCIDIACEA : *Periclimenaeus* (1) ; *Pontonia* (5).  
 FREE-LIVING : *Palaemonella* (7) ; *Periclimenes* (9).

#### DISCUSSION

The above synopsis provides information on 134 species of pontoniid shrimp occurring in the central East African region of the western Indian Ocean. Of this number 67 represent new records to the region and 21 are new to the Indian Ocean fauna. These 134 species represent 36 different genera, out of a total of 45 genera known at present from the Indo-West Pacific region. The nine genera not yet recorded from the central East African region are : *Apopontonia*, *Dasella*, *Neoanchistus* and *Platyptontonia* ; and also *Araiopontonia*, *Chernocaris*, *Hamopontonia*, *Mesopontonia* and *Parapontonia*. The first four of these genera are already known from the Indian Ocean and may be expected to be found in due course. The five other genera are so far known only from the Far East or Western Pacific Ocean. Of the 36 genera found in central East African waters, seventeen are monospecific.

The fauna of Tanganyika is still inadequately studied for comparative purposes but the fauna of Zanzibar and Kenya have been more or less equally investigated. The Kenyan fauna is apparently richer than the Zanzibar fauna, but the difference is not large. The Zanzibar fauna is represented by 91 species of 28 genera and the Kenyan fauna by 100 species of 32 genera. There are 62 species of 24 genera that are common to both regions, leaving 29 species that are found in Zanzibar that have not so far been recorded in Kenya and 38 species found in Kenya that have not been so far recorded in Zanzibar. Further collecting would undoubtedly reduce the differences between these faunae, but many of the differences are due to the rarer species, particularly those recorded from the occurrence of a single specimen only. All 129 species considered, there is an overlap of 48 % only. If the rarer species are eliminated from consideration, i.e., those occurring once or twice only, then the close similarity of the Zanzibar and Kenyan fauna is more apparent, with an overlap of 67 % of the remaining 84 species.

The fauna of the central East African region may be conveniently compared with several extensive regions that have been studied. The fauna of the Indonesian-Philippine region has been described by Holthuis (1952); Madagascar by Bruce (in press, j) and the Seychelle Islands by Bruce (in press, k), and India and Ceylon by Kemp (1922, 1925). The richness of the East African fauna does not support the suggestion of Ekman (1967) that their distribution of many components of the Indo-West Pacific fauna has resulted by dispersal from a centre in the Malayasian-Indonesian region. The rest of the caridean fauna of East Africa, although little studied, also appears to be equally rich. The results are summarised in the following table (Table 1):

TABLE 1

Locality	Genera	Species	Authorities
Central East Africa .. ..	35	134	
Indonesia .. .. .	21	71	Holthuis, 1952, emend.
Madagascar .. .. .	20	61	Bruce, in press, j.
Seychelle Archipelago .. ..	18	50	Bruce, in press, k.
Australia .. .. .	17	49	Patton, 1966; McNeill, 1968. Bruce <i>et al.</i> , 1971.
India-Ceylon .. .. .	13	41	Kemp, 1922, 1925.

The fauna of Zanzibar Island itself, with 91 species of 28 genera represents a more restricted locality and can be more conveniently compared with the fauna of other restricted regions such as the Andaman Islands, reported by Kemp (1922) and of Singapore described by Johnson (1960). Johnson considered the Singapore caridean to be particularly depauperate. The results are summarised below:

TABLE 2

Locality	Genera	Species	Authorities
Zanzibar Island .. .. .	28	91	..
Mauritius .. .. .	15	36	pers. obs. (prelim.).
Singapore .. .. .	9	24	Johnson, 1960, emend.
Andaman Islands .. .. .	8	26	Kemp, 1922; Johnson, 1960.

The central East African pontoniinid shrimp fauna is the richest so far described but there is little to suggest that it is unusual in this respect. The Japanese region has a fauna of comparable abundance (Fujino, in litt.) and it is expected that most regions in the Indo-West Pacific with well developed coral reefs systems

will have a fauna of about one hundred species if adequate search is made, as most of the species appear to have a distribution extending throughout the whole of that region. The Hawaiian fauna, at the opposite end of the region and also depauperate in several respects, since it lacks corals of the *Acropora* genus and the wealth of associated shrimps, has been described by Castro (1971). Eight species of pontoniid shrimp are recorded, all except one of which are also present in East Africa.

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