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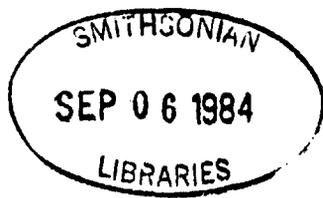
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BIOGEOGRAPHY AND ECOLOGY OF THE SEYCHELLES ISLANDS

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8. Marine caridean shrimps of the Seychelles

A.J. Bruce

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Although amongst the less conspicuous members of the tropical shallow water reef fauna, the shrimps are none the less abundant. The majority of species are of cryptic habits and remain concealed from view by day unless they are disturbed. Many species are to be found under loose blocks of dead coral on intertidal reef flats or in the honeycombed channels in old coral rock. Others occupy permanent or temporary burrows in the substrate, between coral colonies or on sea grass beds. Some are to be found buried in clean coral sand. Many of these shrimps may leave their temporary burrows at night in order to feed. Careful searching is needed to reveal the rich fauna present.

Much scope for further study of the Seychelle shrimp fauna still exists and many species must certainly remain to be discovered. Although about 129 shrimps are now known from this region, some 200 or more could well be expected to be present. Many well known tropical Indo-West Pacific species of wide distribution have yet to be reported from the Seychelles Islands.

Richters (1880) provides one of the first reports on the decapod crustaceans of the western Indian Ocean, and visited both Mauritius and the Seychelles Islands. However, his report did not include any reference to shrimps from the Seychelles Islands. Later, H.M.S. *Alert*, on its cruise from 1878-82, visited several localities including Mahé, Bird Island, Cerf and Providence Islands and several of the Amirante Islands. Seven species of shrimps were recorded – two pontoniine and five alpheids. The Percy Sladen Trust Expedition (1905, 1908) made many collections from Mahé, the Amirante, Coetivy, Farquhar and Providence Islands, that provided the first comprehensive account of the decapods of the western Indian Ocean, and upon which the majority of citations in this report are based. L.A. Borradaile published two accounts of caridean material from this expedition, both in 1917, one on the Pontoniinae and the other dealing with the Caridea excluding the Pontoniinae and the Alpheidae. The latter family was reported upon by H. Coutière in 1921. The Seychelle alpeid fauna is probably the best known in the western Indian Ocean as a result. In 1964, the author visited the Seychelle Islands aboard the R/V *Anton Bruun*, during the International Indian

Ocean Expedition, and reported upon the pontonine shrimps of islands visited (Bruce 1971, 1978). A period of several months was also spent on Mahé in 1966 and Aldabra and many of the other islands were frequently visited from 1970-74, aboard the F.R.V. *Manihine* of the East African Marine Fisheries Research Organization, Zanzibar, when opportunity was frequently taken to collect further material upon which a number of subsequent reports were based. These results were summarized in a paper by Bruce (1976).

The shrimps described in this report are principally those that are associated with the coral reef biotope, with which so many of the Seychelle islands are surrounded. They may be taken as typical of the western Indian Ocean fauna. A clear dominance is shown by two groups, the shrimps of the family Alpheidae and the subfamily Pontoniinae, with the Hippolytidae occurring as a much less important third group. The other families are only represented by small numbers of genera and species. Some of the shrimps obtained during the Sealark Expedition were obtained from deeper water, and as a result their precise ecology is not really known. Observation and collection by scuba divers in moderate depths has greatly increased knowledge of the habitats of many of these animals, but those occurring on heavily exposed reefs are still poorly known.

One of the most remarkable phenomena of the coral reef habitat is the incidence of commensalism amongst the various species found there. 'Commensalism' is the permanent obligatory association of one species with another, that does not involve any detrimental action between the species concerned. Some advantages must be gained by at least one member of the association and this may be protection or a guaranteed food supply. Many of these commensal associations exhibit a high degree of specificity between the partners and in many cases the association rate is very high. All three of the major groups of shrimps found on coral reefs show some occurrence of commensal species, although in some taxa further information is needed to assess its true extent. Although conspicuous in warm tropical waters and particularly on coral reefs, commensalism is comparatively rare in temperate waters. The details of the associations will certainly vary in the different cases, and, as yet, have been little studied. Undoubtedly a variety of mechanisms will be involved rather than a single simple process. The general biology of some of these species has been reviewed by Bruce (1975, 1975a, 1976 and in press).

Checklist of the Caridea (Decapoda Natantia) of the Seychelles Islands

FAMILY PASIPHAEIDAE

The species of this family are mainly pelagic and of glassy transparency. Most of them are found only in deep waters and are absent from the surface. The following genus is the only one that is well represented in superficial waters,

where its species are usually abundant in nocturnal plankton catches. They have been only rarely reported in the south western Indian Ocean.

Leptochela irrobusta Chacc. This species has not been previously recorded from the Seychelles Islands or the south western Indian Ocean. Twenty-one specimens that were collected from 3 km off Beau Vallon, Mahé, on 26 August 1976, were found to belong to this species, which is also known from the Persian Gulf to the Marshall Islands. The specimens were buried in the substrate (Bruce, unpubl.).

FAMILY PALAEMONIDAE

Subfamily Palaemoninae

This subfamily is poorly represented in the warm waters of tropical seas. Many species are found in tropical fresh water lakes, rivers and caves and on the rocky shores of temperate or cold seas. Some species, such as *Brachycarpus biunguiculatus* (Lucas) probably occur in the Seychelles Islands, but have yet to be collected and reported. *Leander urocaridella* Holthuis and *Leandrites cyrtorhynchus* Fujino are other species likely to occur.

Leander tenuicornis Say. There appear to be no reports of this common and widespread, circumtropical species from the Seychelles Islands in the literature, but specimens have been collected by Mr. N. Polunin and are deposited in the collections of the British Museum (Natural History).

Palaemon concinnus Dana. There have been no recent reports of this common and widespread Indo-West Pacific species from the Seychelles Islands since the records from Aldabra of Voeltzkow (1902) and Lenz (1910). The species range from the Gulf of Suez to the Fiji and Marshall Islands.

Palaemon debilis Dana, 1852. This species is common and widespread throughout the whole Indo-West Pacific region. It was first recorded from Aldabra by Borradaile (1917), where it may be found in land locked salt water pools with *Ligur uveae*. It also occurs in stream outflows in mangrove regions of Mahé, such as at Grande Anse (Bruce, unpubl.).

Subfamily Pontoniinae

Species of this family form one of the major groups that dominate the shallow water tropical reef habitat. Some 48 genera are now known in the Indo-West Pacific region, of which 20 are represented in the Seychelles Islands fauna. At present, 58 species are now known, but undoubtedly many remain to be discovered. Several of the common well known species are yet to be reported from this region. The species exhibit *par excellence* the phenomenon of commensalism with various other marine invertebrates. Of the Seychelles species, 44 are proven commensals, and a further 4 are probable commensals. Only 14 are considered to be truly free-living species, and the number may well prove to be lower due to uncertainty of the validity of some of the species concerned.

Pontoninae

Genus	Species	Free-living	Commensals
<i>Palaemonella</i>	3	3	-
<i>Vir</i>	1	-	1
<i>Eupontonia</i>	1	1	-
<i>Periclimenes</i>	22	10 (-3?)	12 (+3?)
<i>Stegopontonia</i>	1	-	1
<i>Periclimenaeus</i>	5	-	5
<i>Onycocaris</i>	1	-	1
<i>Anchistus</i>	2	-	2
<i>Platypontonia</i>	1	-	1
<i>Conchodytes</i>	3	-	3
<i>Philarius</i>	1	-	1
<i>Ischnopontonia</i>	1	-	1
<i>Fennera</i>	1	-	1
<i>Metapontonia</i>	1	-	1
<i>Platycaris</i>	1	-	1
<i>Paratypton</i>	1	-	1
<i>Harpiliopsis</i>	3	-	3
<i>Jocaste</i>	2	-	2
<i>Coralliocaris</i>	6	-	6
<i>Propontonia</i>	1	-	1
Totals	58	14	44

Palaemonella tenuipes Dana, 1852. Recorded on two occasions from Farquhar, on the outer reef flat at low water, and from shallow water in the central lagoon (Bruce 1971, 1974). A free-living species.

Palaemonella rotumana (Borradaile, 1898). First reported from Mahé by Kemp (1922), and subsequently from several localities on Mahé, Cerf Island and Praslin (Bruce 1971, 1972, 1976). One of the commonest and most widely distributed tropical shrimps. Found throughout the Indo-West Pacific and also the eastern Mediterranean Sea. Its bathymetric range also extends down to 69-70 fm.

Palaemonella sp. aff. *rotumana* Bruce, 1974. A single specimen has been referred to the taxon which may represent an undescribed species or an abnormal example of *P. rotumana*. It was found on Farquhar Island (Bruce 1974).

Vir orientalis (Dana, 1852). A single ovigerous female was found off Praslin, in association with *Pocillopora verrucosa* (Bruce 1976).

Eupontonia noctalbata Bruce, 1971. This species was first described from a single ovigerous female specimen from Anse Etoile, Mahé (Bruce 1971). It is probably a free-living species and has not yet been reported from any other localities.

Periclimenes lutescens auctorum. One of the larger common species of *Periclimenes*, found in association with a variety of corals of the genus *Acropora*,

throughout the Indo-West Pacific. A single ovigerous female was collected from *A. tubicinaria* at Baie St. Anne, Praslin (Bruce 1976).

Periclimenes elegans (Paulson, 1875). A single male example has been reported from the island of Farquhar (Bruce 1971). This species and *P. grandis*, may prove to be synonymous. Common on tropical reefs intertidally, they are active micro-predators.

Periclimenes ensifrons (Dana, 1852). A single example has been reported from Aldabra (Bruce 1971). The original description of this species is inadequate, and the specimens referred to this species may be synonymous with *P. elegans* and *P. grandis*. The second pereopods of these species show a variety of variations after autotomy.

Periclimenes grandis (Stimpson, 1860). This species was first recorded (as *P. vitiensis*) from Coetivy by Borradaile (1917), and was subsequently reported from Resource Island by Bruce (1971). (See notes on *P. elegans*).

Periclimenes tenuipes Borradaile, 1898. Two specimens from Mahé were recorded by Kemp (1922). The specimens are part of the Alluaud Collection and are now on the Museum National d'Histoire Naturelle, Paris. The species appears to be largely nocturnal and is often found in the vicinity of giant anemones.

Periclimenes brevicarpalis (Schenkel, 1902). This well known associate of giant anemones has been reported from two localities on Mahé and also from Cosmoledo (Bruce 1971, 1973).

Periclimenes spiniferus De Man, 1902. One of the commonest and most widely distributed pontonine shrimps, this species was first reported from Coetivy by Borradaile (1917) and from Mahé by Balss (1925). It has more recently been reported from Anse Royale, Mahé, Cerf Island and Aldabra (Bruce 1971, 1972a). It is a free-living species, probably a browser, but is commonly found in large numbers in live colonies of branching and other corals.

Periclimenes longirostris Borradaile, 1915. A single ovigerous female has been recorded from Farquhar Island, where it was dredged from 8 fm. (Bruce 1974). Also a free-living species, closely related to *P. grandis*.

Periclimenes soror Nobili, 1904. A species found mainly in association with shallow water asteroids, *P. soror* has been recorded from Aldabra, Cerf Island and Mahé, on *Protoreaster lincki*. The specimens referred to in Bruce (1975) from *P. horridus*, were also collected from Cerf Island and specimens from *Culcita schmiedeliana* from Baie Ternay, have also been examined (Bruce 1971, 1973).

Periclimenes ceratophthalmus Borradaile, 1915. This species has only been recorded from Farquhar Island, where five specimens were found on the crinoid *Stephanometra spicata* (Bruce 1974). The only other records of this species in the Indian Ocean are from the Maldive Islands and Kenya.

Periclimenes compressus Borradaile, 1915. A single specimen of this species, the only known example, was collected from Saya de Malha at a depth of 145 fm. The specimen has been recently redescribed (Bruce 1978) and is considered to be possibly an associate of gorgonians or alcyonarians.

Periclimentes seychellensis Borradaile, 1915. This free-living species was first described by Borradaile (1915) from specimens from Praslin. It has since been recorded from Port Victoria, Mahé and Farquhar Island (Bruce 1971, 1974). It is common amongst *Cymodocea* and *Sargassum* on the reefs and also in detached floating *Sargassum* at sea.

Periclimentes diversipes Kemp, 1922. A common and widespread associate of shallow water corals, this species has been reported from Port Victoria, Mahé and Baie St. Anne and Curieuse Bay, Praslin, on *Acropora*, *Pocillopora*, *Pavona* and *Porites* corals (Bruce 1976).

Periclimentes inornatus Kemp, 1922. This species has been found in association with the giant anemone *Radianthus ritteri* at Cerf Island, Mahé (Bruce 1976). This species is highly transparent and found in deeper water than *P. brevicarpalis*, which is conspicuously marked, and usually on *Stoichactis* spp.

Periclimentes tosaensis Kubo, 1951. This species is probably a coelenterate commensal but the host has not been identified. Two specimens were found in Boileau Bay, Mahé, at a depth of 23 fm. The only other records of this species are from Japan and the South China Sea (Bruce 1976).

Periclimentes imperator Bruce, 1967. A conspicuously marked and well known species, ranging from the Red Sea to Hawaii. This species has been reported once from Anse la Mouche, Mahé (Bruce 1973). The host was not identified but this shrimp is most commonly associated with the large red and white nudibranch *Hexabranchus marginatus*, or related species.

Periclimentes zanzibaricus Bruce, 1967. A common associate of diademnid urchins, this species, generally almost black in colour, has been reported from Port Victoria and Anse Royale, Mahé, on *Diadema setosum* and *Astropyga radiata* (Bruce 1971). Frequently found with *Athanas indicus*.

Periclimentes holthuisi Bruce, 1969. The specimen from the Amirante Islands, referred by Borradaile (1917) to *Urocaris ? longicaudata*, is preserved in the collections of the Zoology Museum, Cambridge, and corresponds to *P. holthuisi*. The species is a widespread associate of a variety of sublittoral coelenterates – corals, anemones and even jelly fish such as *Cassiopea* spp.

Periclimentes mahei Bruce, 1969. A small species, closely related to *P. diversipes*, first described from specimens found in association with the coral *Pocillopora* from North West Bay, Mahé (Bruce 1969). Also known from Remire Island, on *Acropora corymbosa* (Bruce 1971) and also from the Comoro Islands, on *Seriatopora*.

Periclimentes hirsutus Bruce, 1971. Eleven specimens were collected from Boileau Bay, Mahé, in association with the urchin *Astropyga radiata* at 23 fm. (Bruce 1976). The only other recorded occurrences of this species are from Zanzibar and Fiji. The Zanzibar specimens were found on the same host. In life the species is deep red in colour, with a narrow white lateral line.

Periclimentes pholeter Holthuis, 1973. One of the rare species of shrimp found inhabiting anchialine pools, this species has recently been recorded from Aldabra

(Wear & Holthuis 1977) where it occurs with *Ligur uveae*. The only other locality where it has been found is in the Sinai Peninsula.

Periclimenes difficilis Bruce, 1976. A small semi-transparent species, closely related to *P. mahei*, found in association with the coral *Porites nigrescens* at Baie St. Anne, Praslin (Bruce 1976). There have been no subsequent records of this species.

Stegopontonia commensalis Nobili, 1906. A single example was collected from a specimen of *Diadema*, at Anse Etoile, Mahé on 24 March 1966 (Bruce 1976). This species has not been subsequently reported from the Seychelles Islands. It has also been recorded from Mauritius and East Africa in the Indian Ocean, the Persian Gulf and as far east as Hawaii and the Tuamotu Islands. Always associated with diadematid sea urchins.

Periclimenaeus hecate (Nobili). A single pair of specimens have been collected from the ascidian *Diplosoma modestum* Michaelson, from the reef flat at Anse Royale, Mahé, 21 June 1966 (Bruce, unpubl.).

Periclimenaeus rhodope (Nobili, 1904). A pair of specimens were found on a sponge encrusting the coral *Stylophora erythraea* at Anse Etoile, Mahé, on 22 June 1966 (Bruce, unpubl.).

Periclimenaeus robustus Borradaile, 1915. This species is known only from the type material, a single specimen from the Amirante Islands, collected from 29–39 fm (Borradaile 1915). Probably an associate of sponges.

Periclimenaeus fimbriatus Borradaile, 1915. Part of the type material of this species was described from Providence Island, from a depth of 39–50 fm. Also known from the Maldives (Borradaile 1915) and from Tanganyika, where specimens were found in a large sponge (Bruce 1976).

Periclimenaeus manihinei Bruce, 1976. The only known specimen of this species was collected at Baie St. Anne, Praslin, in February 1972. The host was not identified, but this species is probably associated with colonial ascidians (Bruce 1976).

Onyccaris seychellensis Bruce, 1971. This species was first described from material from Anse Etoile, Mahé, found in the shallow water sponge *Adocia cineria* (Grant) (Bruce 1971), and has since been reported from Kisiti Island, Kenya, in *Haliclona* (Bruce 1976).

Anchistus miersi (De Man, 1888). First recorded from the Seychelles Islands in 1976, when two pairs in association with *Tridacna squamosa* from Curieuse Bay, Praslin, were reported by Bruce (1976). This species is common throughout the Indo-West Pacific region in association with giant clams.

Anchistus demani Kemp, 1922. A single specimen has been reported from Farquhar Island (Bruce 1974) in *Tridacna maxima* and two pairs from the same host from Aldabra (Bruce 1978). Moderately common in the Indian Ocean and extending in range eastwards to the Great Barrier Reef and Marshall Islands.

Platypontonia brevisrostris (Miers, 1884). This species was first described from an unidentified locality in the Seychelles Islands by Miers (1884). Subsequently

this species has been reported also from Farquhar Island, where specimens were obtained from the ostreid bivalve *Lopha cristigalli* (Bruce 1973). There have been no further records.

Conchodytes biunguiculatus Paulson, 1875. A pair of specimens of this species were collected from the bivalve *Pinna muricata* from Anse Etoile, Mahé, on 26 May 1966 (Bruce unpubl.). There have been no previous records of this species from the Seychelles Islands, but it has been reported from East Africa and Madagascar.

Conchodytes tridacnae Peters, 1852. First reported from the Seychelles Islands at Bird Island and subsequently from Farquhar Island and Aldabra (Bruce 1973, 1974, 1978), this species is associated with *Tridacna maxima*. Widespread throughout the Indo-West Pacific from the Red Sea to Hawaii.

Conchodytes meleagrinae Peters, 1852. Also common and widespread throughout the whole Indo-West Pacific region, generally in association with *Pinctada margaritifera* or other pearl oysters. First reported from Bird Island (1917) and subsequently from Anse La Mouche, Mahé (Bruce 1973), and from Aldabra, Farquhar, Resource and Anse Royale, Mahé (Bruce 1975).

Philarius gerrachei (Nobili, 1905). One of the less common shrimps associated with corals of the genus *Acropora*. First recorded from Remire Island, where a single male was found on *Acropora corymbosa* at 0.3 fm on a reef flat (Bruce 1976). Its range extends from the Red Sea to the Central Pacific Ocean.

Ischnopontonia lophos (Barnard, 1962). A coral associate showing a very high degree of host specificity and so far only recorded in association with the oculinid coral *Galaxea fascicularis*, a large colony of which may contain several male-female pairs, as well as other shrimps. First reported from Aldabra and Farquhar Islands, and Port Victoria, Mahé (Bruce 1966), with later records from Praslin (Bruce 1976) and Aldabra and Cerf Island, Mahé (Bruce 1978). Common and widespread, ranging from East Africa to the Great Barrier Reef.

Fennera chacei Holthuis, 1951. In the Seychelles Islands, known only from a single occurrence on Farquhar Island, where specimens were found on the coral *Pocillopora verrucosa*, in the central lagoon (Bruce 1974). Reported from a few other localities in the Indian Ocean and also from the Great Barrier Reef and Hawaii, and also from the Eastern Pacific region, including Mexico, Costa Rica, Panama and Colombia (Holthuis 1951). The type specimens were described from the Lecas Islands, Panama.

Metapontonia fungiacola Bruce, 1967. Recorded only once from the Seychelles Islands, this species has been reported from the central lagoon of Farquhar Island, on the faviid coral *Goniastrea pectinata* (Ehrenberg), at a depth of 1 fm (Bruce 1974). Otherwise known only from the type locality in the Comoro Islands and from southern Kenya.

Platycaris latirostris Holthuis, 1952. Reported from Aldabra and from Cerf Island and Victoria Harbour, Mahé, in association with the oculinid coral *Galaxea fascicularis* (Bruce 1978). Often found in the same host corals as *Ischnopon-*

tonia lophos and *Racilius compressus*. Recorded from several localities in the western Indian Ocean and from Indonesia.

Paratypton siebenrocki Balss, 1914. Reported from Farquhar Island (Bruce 1974) and Remire Island (Bruce 1978), in association with *Acropora variabilis* (Klunz.) and *A. massawensis* Marenzeller. This species has been reported from the Red Sea, Kenya, Tanganyika and Zanzibar, and Réunion in the west to the Marshall Islands in the east. It is found only in cysts in certain species of the genus *Acropora*.

Harpiliopsis beaupresii (Audouin, 1825). Kemp (1922) first recorded the presence of this species in the Seychelles Islands, with two specimens from Mahé, in the Alluud collection in the Museum National d'Histoire Naturelle, Paris. Subsequently recorded at Anse Etoile, Mahé (Bruce 1972), Farquhar Island (Bruce 1974), with further records from Farquhar and Mahé, and also Resource Island and Aldabra (Bruce 1978). This species is generally associated with corals of the genera *Stylophora*, *Pocillopora* and *Seriatopora*, and is abundant throughout the whole Indo-West Pacific, where these corals occur.

Harpiliopsis depressa (Stimpson, 1860). Recorded by Borradaile from Coetivy Island (Borradaile 1917), these specimens need re-examination to confirm that they do not belong to *H. spinigera*, which was not adequately distinguished at that time. Subsequently recorded from Anse Etoile, Mahé, Praslin and Aldabra Islands (Bruce 1972, 1976, 1978). Associated with *Stylophora erythraea* Marenzeller, *Pocillopora damicornis* (L.) and *P. verrucosa* (Ellis & Solander) and *Seriatopora angulata* Klunzinger in the Seychelles Islands. Common and widespread throughout the Indo-West Pacific and also Mexico, Costa Rica, Panama, Colombia and the Galapagos Islands (Holthuis 1951).

Harpiliopsis spinigera (Ortmann, 1890). The least common of the three *Harpiliopsis* species, first recorded from the Seychelles Islands from Farquhar Island as *Harpiliopsis* sp. (Bruce 1974). Subsequently reported from Astove, Aldabra, Remire and Praslin Islands (Bruce 1976, 1978), from *Stylophora palmata* (Blainville) and *S. pistillata* (Esper). The distribution of this species is not yet clear due to its confusion with *H. depressa*, which it closely resembles, but this extends from East Africa to Indonesia.

Jocaste japonica (Ortmann, 1890). First reported from the Seychelles Islands by Borradaile (1917) from Coetivy Island and subsequently from Remire Island and Praslin (Bruce 1976) and Aldabra (Bruce 1978). An abundant commensal of corals of the genus *Acropora* throughout the southern Indian Ocean and western Pacific Ocean as far east as Marshall Islands. Not yet reported from the Arabian Sea, Red Sea, Persian Gulf or Bay of Bengal.

Jocaste lucina (Nobili, 1901). Reported from Aldabra and Mahé by Bruce (1969) and later from Farquhar and Remire Islands (Bruce 1971, 1976) and again from Aldabra (Bruce 1978). Also associated with a variety of species of the coral genus *Acropora* and even more widely distributed than *J. japonica*, extending from the Red Sea to the Society Islands.

Coralliocaris macrophthalmalma (H. Milne-Edwards, 1837). Borradaile has reported a single example of this species from Saya de Malha from a depth of 26 fm but provided no details of his specimen (Borradaile 1917, Bruce 1972, Fig. 2b). Recently it has been pointed out that some specimens of *C. graminea* may show a close resemblance to *C. macrophthalmalma* (Bruce 1977). Other records of this rare species are from 'Mers d'Asie' and the Red Sea only.

Coralliocaris graminea (Dana, 1852). Miers (1844) first reported this species in the Seychelles Islands and there have been numerous subsequent reports of this common species, although it is possible that some of these may refer to the closely related *C. viridis* (Bruce 1974). Other records include Coetivy Island (Borradaile 1917), Mahé (Balss 1925, Taylor 1968, Bruce 1971, 1976) Remire Island and Praslin (Bruce 1976) and Aldabra (Bruce 1978).

The species is associated with corals of the species *Acropora* and is one of the commonest commensal shrimps, ranging from the Red Sea to Johnson, Wake and Palmyra Islands in the central Pacific Ocean.

Coralliocaris superba (Dana, 1852). This common and widely distributed coral commensal was only first recorded from the Seychelles Islands quite recently, with specimens from Praslin (Bruce 1976). It has been recorded from numerous other localities in the western Indian Ocean and ranges from the Red Sea to the Society Islands. It is also associated with corals of the genus *Acropora*, and is one of the most beautifully coloured of the pontoniine shrimps, with a porcelain white body, with small ocelli and golden appendages.

Coralliocaris nudirostris (Heller, 1861). Recorded once only, by Borradaile (1917). Sparsely recorded from the Red Sea to the Samoan Islands. Also an associate of *Acropora* corals.

Coralliocaris venusta Kemp, 1922. A single example of this species has been reported from Remire Island, on *Acropora convexa* (Bruce 1976). Sparsely recorded from the Red Sea to Samoa and the Great Barrier Reef.

Coralliocaris viridis Bruce, 1974. Six specimens of this species, 2 ♀ and 4 ovigerous females, were collected from a single colony of *Acropora nana* at Cerf Island, Mahé, on 25 March 1966 (Bruce, unpubl.). This species has not been previously recorded and is only known with certainty from Kenya; Ile Europa, Mozambique Channel; Ceylon and the southern Great Barrier Reef. Probably common and widespread. This host also represents a new host record.

Propontonia pellucida Bruce, 1969. First described from specimens collected from Remire Island (Bruce 1969) in association with the alcyonarian *Sarcophyton crassicaule*. This species has since been reported from Kenya and the Comoro Islands.

FAMILY GNATHOPHYLLIDAE

This small family, which is very closely related to the Pontoniinae, consists of a few marine species only, which are probably all associated, either as commensals

or as predators, with echinoderms. The species are often conspicuously coloured and several are of unusually wide geographical distribution, occurring in the Eastern Pacific and Atlantic regions.

Hymenocera picta Dana, 1852. This strikingly coloured predator of starfish was reported from the Seychelles Islands (as *H. latreillei*) by Guerin (1838), and from Coetivy by Borradaile (1917). It is widely distributed in shallow water from the Red Sea to the Tuamotu Islands, and also occurs in Panama.

Gnathophyllum americanum Guerin, 1857. This echinoderm predator, conspicuously banded with transverse yellow and black bars, is common on the reef flats of Mahé, and probably other islands and reefs. Its distribution is particularly extensive, occurring throughout the Indo-West Pacific region, and also in the Caribbean region. Borradaile's (1917) record is from the Chagos Islands.

Gnathophylloides mineri Schmitt, 1933. A male and two ovigerous females were collected from North Point, Glacis, Mahé on 29 July 1971 by N. Polunin (Bruce 1974). This species is normally found in association with sea urchins of the genus *Tripneustes*. It has been reported from Zanzibar and Hawaii, and also from the Caribbean region.

FAMILY ALPHEIDAE Bate, 1888

The Alpheidae, or snapper shrimps are amongst the most abundant of carideans found in shallow water on tropical reefs. About 350 species are known from the Indo-West Pacific region alone, and probably half of these are to be found in the coral reef biotope. They are abundant in both variety and numbers, in shallow water, on intertidal flats, sea-grass beds, and all regions of the coral reef.

A wide variety of niches are occupied by the various species, which exhibit numerous specialized adaptations. However, the niches of many of the species are still very poorly understood and remain to be clearly identified. Many species appear to be free-living animals while others live as 'commensals' of a wide variety of marine invertebrates, including sponges, hydroids, alcyonarians, corals, pennatulaceans and anemones, as well as echinoids, crinoids and ascidians. Some of the most interesting associations are those between pairs of *Alpheus* spp. and a number of species of goby. These have been studied in Baie Ternay and at Round Island, Mahé, by Polunin and Lubbock (1977), but few of the shrimps were definitely identified. Many coral reef species are to be found in burrows in soft or hard substrates and some occupy deep fissures in massive coral heads as well as the space between the branches of *Acropora*, *Pocillopora*, *Stylophora* and other corals. A wide variety occur in association with many other animals beneath dead corals, where their activities are hidden from view.

Many members of this family lack the sound producing snapper that gives rise to the popular name of the group. This mechanism is found only in the genera *Amphibetaeus*, *Metalpheus*, *Synalpheus*, *Alpheus* and *Racilius* in the Indo-West Pacific region. The function of the specialized chela is apparently defensive and

the sound produced may be only incidental to the defence of its burrow or other niche. Many species are quite small, and fully adult at only 1 cm. Some of the larger *Alpheus* spp. may reach a length of 10 cm. Although some 53 species are known at present from the Seychelles, there is little doubt that there must be many more yet to be identified. The Seychelles Islands alpheid fauna is at present under study and a further ten species can be added to the list of those already known (Banner, A.H., pers. commun.).

Alpheidae

	Species	Free-living	Commensal
<i>Athanas</i>	1	–	1
<i>Aretopsis</i>	1	–	1
<i>Alpheopsis</i>	2	2	–
<i>Metalpheus</i>	1	1	–
<i>Prionalpheus</i>	1	1	–
<i>Synalpheus</i>	10	5	5
<i>Alpheus</i>	36	31	5
<i>Racilius</i>	1	–	1
Totals	53	40	13

Athanas indicus (Coutière, 1903)c. Recorded by Coutière (1921) from Praslin reefs. This species is widely distributed and generally common where its hosts occur, from the Red Sea to the Tuamotu Islands. It occurs most commonly on *Echinometra* and *Stomopneustes* urchins, but is reported from several other genera.

Aretopsis amabilis De Man, 1910. Specimens have been reported from three localities on Mahé, where they were found in gastropod shells occupied by the hermit crabs *Dardanus megistos* and *D. sanguinolentus* (Bruce 1969). This species normally occurs in pairs in this situation, and has been sparsely recorded from the Red Sea to the Marshall Islands.

Alpheopsis equalis Coutière, 1896. Reported from Coetivy Island and the Amirante Bank, at depth of 25-80 fm (Coutière 1921, as *Arete equalis*). Sparsely recorded from the Red Sea to Hawaii and the Society Islands.

Alpheopsis idiocarpus Coutière, 1908. A single male specimen was collected from a depth of 50-78 fm off Providence Island, the type locality of the species. There have been no subsequent records.

Metalpheus paragracilis (Coutière, 1905). Material of this species has been reported from Coetivy Island (as *Alpheus paragracilis*) (Coutière 1921). Other records are from Jibouti, the Maldives and Laccadive Islands, Madagascar to Johnson and Wake Islands, and Hawaii.

Prionalpheus fissipes (Coutière, 1908). The holotype specimen from Provi-

dence Island is the only known example of this species (Coutière 1908, Banner & Banner 1971).

Synalpheus charon (Heller, 1861). Coutière notes the occurrence of this common and widespread species on Coetivy Island, but provides no detail (Coutière 1921). This species is usually an associate of pocilloporid corals, although Banner & Banner (1975) also report its occurrence in *Porites*. Its distribution extends from the Red Sea to Hawaii, and east to Ecuador and Colombia. It is conspicuous in life in its host corals on account of its uniform bright orange colouration.

Synalpheus coutierei Banner, 1953. Coutière (1921) reported this species from the Amirante Bank at three stations from 20-30 fm, under the name *S. biunguiculatus*. Banner (1953) considered that this material could not be referred to Stimpson's species and provided a new name for the Seychelles species, which has since been reported from Arno Atoll, Marshall Islands, Canton Island, Fiji and Samoa and from Hulule, Male Atoll, Maldivé and Laccadive Islands.

Synalpheus merospiniger Coutière, 1908. One ovigerous female has been reported from a depth of 20-44 fm in the Amirante Islands (Coutière 1921). This species is known only from the Seychelles Islands.

Synalpheus neomeris (De Man, 1888). Coutière (1921) recorded several lots of specimens from the Amirante Bank (Stns. 16, 18, 22; 16-280 fm) and from one station off Providence Island (56 fm) (as *S. gravieri*). This species is normally found in association with alcyonarians and its distribution extends from the Red Sea in the west as far east as Japan and the Great Barrier Reef.

Synalpheus neptunus (Dana, 1852). This species was collected by the H.M.S. *Alert's* expedition from D'Arros and Desnoeuf Islands. It was also reported from the Iles Glorieuses by Miers (1884). This species is otherwise known from the Philippines, Singapore and Australia. Type locality the Sulu Sea. The species is a common commensal of sponges.

Synalpheus nilandensis Coutière, 1905. One example has been recorded from a depth of 44 fm in the Seychelles Islands, without further details (Coutière 1921). Scattered occurrences are recorded from the Red Sea, to Hong Kong and Western Australia. Specimens have been reported in association with sponges and gorgonocephalids, while one report is from a pearl oyster in the Tuamotu Islands (Nobili 1907).

Synalpheus otiosus Coutière, 1908. A single male example has been reported from Coetivy Island (Coutière 1921). This species is known only from the Seychelles Islands.

Synalpheus pachymerus Coutière, 1921. Reported from Providence Island by Coutière (1921). Also reported from the Red Sea, Maldivé Island and Gilbert Islands.

Synalpheus paraneomeris Coutière, 1905. Recorded by Coutière (1921) from the Seychelles Islands, Coetivy Islands and Praslin Island. Also known from the Maldivé Islands, Indonesia to Japan, the Great Barrier Reef, east to the Hawaiian Islands.

Synalpheus streptodactylus Coutière, 1905. Numerous specimens were reported from 20-80 fm on the Amirante Bank and also from 58 fm off Providence Island (Coutière 1921). The commonest species of *Synalpheus* in the Seychelles Islands. Also known from the whole Indo-West Pacific region from the Red Sea to Hawaii. An associate of a wide variety of sponge hosts.

Alpheus alcyone De Man, 1902. Coutière (1921) tentatively refers to the presence of this species at a depth of 20-25 fm on the Amirante Bank. Known also from the Red Sea, Persian Gulf, Maldive Islands, Gulf of Thailand and Philippine Islands, east to Tonga and Samoa.

Alpheus amirantei Coutière, 1908. Two male specimens were recorded by Coutière (1921) from 20-80 fm on the Amirante Bank. Also recorded from Arno Atoll, Marshall Islands, Johnson Island and Hawaii.

Alpheus bradypus Coutière, 1905. Coutière (1921) notes the occurrence of this species on Coetivy Island, without details. Also known from Minikoi, Maldive Islands and from the Marshall and Caroline Islands, Tonga, Samoa; Cook, Society Islands and Canton Island.

Alpheus bucephalus Coutière, 1905. Reported from several stations on the Amirante Bank and the region of Providence Island, 20-75 fm, and from Coetivy Island (Coutière 1921). Recorded also from the Maldive Islands, Singapore and Indonesia as far away as the Hawaiian Islands.

Alpheus coetivensis Coutière, 1908. One male reported by Coutière (1921) from Coetivy Island. Also recorded from the Chagos Islands. As yet, there have been no other reports of this species.

Alpheus collumianus Stimpson, 1860. First recorded by Miers (1884) from Eagle Island, Amirante Islands, from material collected by H.M.S. *Alert*. Subsequently reported from several stations on the Amirante Bank, 20-85 fm and off Providence Island, 29-39 fm (Coutière 1921). also known from the Maldive and Laccadive Islands in the west, from Fiji, Japan and to Indonesia, Australia and east to the Ellice Islands.

Alpheus dasycheles Coutière, 1908. A pair of specimens were reported by Coutière (1921) at 37 fm from the Seychelles Islands. Also known from the Caroline Islands.

Alpheus diadema Dana, 1852. Reported from Coetivy Island (Coutière 1921, as *A. insignis*). common throughout the Indo-West Pacific region, from the Red Sea to Hawaii.

Alpheus edwardsii (Audouin, 1825). This species has been reported from the Seychelles Islands by Miers (1884) reporting on the specimens collected by H.M.S. *Alert*. A.H. & D.M. Banner (1972) consider this to be one of the commonest and most widely distributed of *Alpheus* species, probably absent only from the islands of the Central Pacific zone of the Indo-West Pacific region.

Alpheus frontalis Milne-Edwards, 1837. Reported from numerous localities by Coutière (1921) including Amirante Bank, 20-80 fm; Seychelles, 31 fm; Praslin reefs and Coetivy Island. Also known from the Red Sea, Mauritius, Maldive and

Laccadive Islands, Sri Lanka, Indonesia, Japan and east to Tahiti and the Tuamotu Islands.

Alpheus gracilis Hiller, 1861. Coutière (1908, 1921) records the occurrence of this species on Mahé and Coetivy Island, and also from Providence Island (Coutière 1921, as *A. gracilis* var. *Alluaudi*). Reported from several localities in the Red Sea, the Maldive Islands, Indonesia, Vietnam, and *A. gracilis* var. *simplex* is widespread in the western Pacific Ocean, east to Hawaii.

Alpheus hailstonei Coutière, 1905. Reported at two stations at 34 and 37 fm in the Seychelles Islands by Coutière (1921). Also recorded from the Maldive Islands, with varieties reported from Indonesia, Japan and Hawaii.

Alpheus hippothoe De Man, 1888. Recorded from the Amirante Bank at 20-25 fm by Coutière (1921). Also reported from the Red Sea to Fiji and Tonga.

Alpheus leviusculus Dana, 1852. Reported as *A. bouvieri* and *A. bastardi* by Coutière (1921) from Coetivy Island. Widely distributed from the Red Sea to Johnson, Wake and Palmyra Islands in the northern central Pacific Ocean, and also from the Galapagos islands in the eastern Pacific Ocean.

Alpheus lanceoloti Coutière, 1905. Coutière (1921) reported the occurrence of this species on the Amirante Bank at 25-80 fm. Also known from the Maldive Islands, Singapore, the Cook Islands and Hawaii.

Alpheus leptochirus Coutière, 1905. Reported from the Amirante Bank by Coutière (1921), from 25-80 fm. Also known from the Maldive Islands and from the Hawaiian Islands.

Alpheus lobidens De Haan, 1850. The burrows of this species, which lives in association with gobies, have been studied on Aldabra by Farrow (1971). Common and widely distributed, extending from the Red Sea to Hawaii.

Alpheus longecarinatus Hilgendorf. Coutière (1921) has recorded this species from the Amirante Bank at 20-25 fm and from Providence Island at 39 fm. Also known from Zanzibar, the type locality.

Alpheus lottini Guerin, 1830. Reported as *A. laevis* by Miers (1884) from Mahé and as *A. ventrosus* from Praslin and Coetivy Islands by Coutière (1921). A very common and widespread commensal of pocilloporid corals, ranging from the Red Sea to Hawaii. Also reported from New Zealand to the Gulf of California.

Alpheus malleodigitus (Bate, 1888). Reported from the Amirante Islands at 30 fm and Providence Island at 39 fm by Coutière (1921), as *A. phrygianus*. Also known from Jibouti and the Maldive Islands, east to Society Islands, but absent from Hawaii.

Alpheus microstylus (Bate, 1888). Reported from Coetivy Island by Coutière (1921). Reported also from the Red Sea, Madagascar and the Maldive Islands to the Marshall Islands.

Alpheus obesomanus Dana, 1852. First reported from the Seychelles Islands by Miers (1884) with material collected by H.M.S. *Alert*. Later reported from Coetivy Island, as *A. lutini* by Coutière (1921). Known also from East Africa to the Society Islands but not recorded from Hawaii. Usually found in pairs in

cavities in bases of coral colonies.

Alpheus pachychirus Stimpson, 1860. Reported from Coetivy Island by Coutière (1921), who notes that it is reported from algal tubes like *A. frontalis*. Known from the Red Sea, Chagos, Maldivé and Laccadive Islands, east to Tahiti. Not recorded from the Hawaiian Islands.

Alpheus paradentipes Coutière, 1905. Coutière (1921) recorded specimens of this species from the Amirante Bank, at 20-100 fm and at Providence Island at 58 fm. Also known from the Laccadive Islands, Indonesia and Hawaii, where it is found in sponges.

Alpheus paralcione Coutière, 1905. Recorded by Coutière from three stations on the Amirante Bank (20-80 fm) and from Mahé at 8 fm (Coutière 1921). The species ranges extensively from the Seychelles and Maldivé Islands to Hawaii.

Alpheus parvirostris Dana, 1852. Reported from Praslin and Coetivy Islands in the Seychelles group by Coutière (1921). Occurs extensively throughout the Indo-West Pacific region with the exception of the Hawaiian Islands. Frequently one of the abundant species.

Alpheus providencei. A single example has been described by Coutière (1921) from a depth of 50-78 fm off Providence Island. There appear to have been no subsequent records of this species.

Alpheus rapax Fabricius, 1798. Taylor (1968) records this species in burrows on Mahé, with a small bivalve commensal, *Eryana* sp. This species has also often been noted to associate with gobies, and is widely distributed from the Red Sea to Hawaii.

Alpheus seurati Coutière, 1905. First reported from the Gambier archipelago, and subsequently recorded from the Maldivé Islands and from the Amirante Bank at a depth of 20-25 fm and from Coetivy Island (Coutière 1921). It has also been reported from the Line Islands (Banner 1959).

Alpheus splendidus Coutière, 1897. Recorded in the Seychelles Islands and from Praslin reef (Coutière 1921). The type material of this species was obtained from Jibouti. Also known from the Red Sea, Singapore and Indonesia.

Alpheus spongiarum Coutière, 1897. Recorded (as *A. paraculeipes*) from the Amirante Bank at 20-30 fm by Coutière (1921). Also known from the Maldivé Islands, Ceylon, Indonesia and Vietnam. As its specific name implies, this species is associated with a variety of sponges.

Alpheus stanleyi Coutière, 1908. Coutière, (1921) recorded a single male example from the Amirante Bank at 30 fm. Also known from Singapore.

Alpheus strenuus Dana, 1852. Coutière (1921) recorded this species from the Amirante Bank at 25-80 fm. One of the commonest and most widely distributed snapper shrimps, found under dead corals on the reef flats throughout the Indo-West Pacific region and also extending into the East Pacific region at the Galapagos Islands but absent from Hawaii. This species is commensally found in association with annelids of the genus *Eurythoe* (Banner & Banner 1968).

Alpheus sulcatus Kingsley. Reported from Coetivy Island, without details, by

Coutière (1921). Widely distributed from East Africa to Tahiti and also occurring in California and the Congo.

Alpheus superciliaris Coutière, 1905. Reported from two stations on the Amirante Bank, at 20-44 fm and 160-209 fm by Coutière (1921). Originally described from the Maldive Islands, and also known from the Marshall Islands.

Racilius compressus Paulson, 1875. Common on all reefs in *Galaxea fascicularis*, often in association with *Ischnopontonia lophos* and *Platycaris latirostris* (Bruce 1978). The distribution of this species extends from the Red Sea to the Philippine Islands and the Great Barrier Reef.

FAMILY HIPPOLYTIDAE

The species of this family are second only to the Pontoniinae and Alpheidae in importance on the reef flat. As in these other taxa, both free-living and also commensal species occur in the coral reef habitat. Many of the free-living species are found in live coral colonies by day, but the associations are non-specific. Several of the larger free-living species are characteristic of the micro-habitat found beneath dead coral or beach rock slabs on the reef flats, where a small pool of water is retained at low tide. Several of the species of this family are small cryptically coloured forms found amongst the fronds of *Sargassum*, *Turbinaria*, other algae and the various sea grasses. A species such as the large *Lysmata amboinensis* De Man, almost certainly occurs in the Seychelles Islands but has yet to be recorded, as well as many of the smaller species.

Saron marmoratus (Olivier, 1811). Borradaile (1917) recorded this well known species from Coetivy and the Amirante Islands. This species is apparently free-living, but commonly found in live coral colonies. It is of widespread distribution, from the Red Sea to Hawaii and the Tuamotu Islands. One of the larger and best known of coral reef shrimps.

Saron neglectus De Man, 1902. Not previously recorded from the Seychelles Islands, two juvenile specimens of this species were collected by N. Polunin from Port Launay, Mahè, in 1971. The distribution of *S. neglectus* extends from the Red Sea to New Caledonia. The report of Borradaile (1917) of the occurrence of this species at Egmont reef, Seychelles Islands, actually refers to the Chagos Islands.

Ligur uveae (Borradaile, 1902). This species has been recorded only from Aldabra in the Seychelles Islands (Borradaile 1917). The only other records are from Indonesia, the Philippines and the Loyalty, Fijian and Ellice Islands (Wear & Holthuis 1977). It is an inhabitant of land locked, supratidal saltwater pools, and is one of the most unusual shrimps found in the Seychelles Islands. It occurs in association with *Periclimenes pholeter*.

Angasia armata (Paulson, 1875). Specimens have been reported from the Seychelles Islands by Borradaile (1917) but no details were provided. Its range extends from the Red Sea to Indonesia.

Thor amboinensis De Man, 1888. A common species occurring on various corals and anemones and other coelenterates in shallow reef waters (Bruce, unpubl.). Of widespread distribution in the Indo-West Pacific region and also occurring in the Atlantic Ocean.

Thor spinosus Boone, 1935. Specimens have been recorded from Port Glaud, Mahé, found in association with the hydrocoral *Millepora tenera*, on 7 April 1966 (Bruce 1976). Also known from Kenya to Wake and Christmas Islands, and Hawaii in the central Pacific Ocean. This species is probably an obligatory associate of *Millepora* spp.

Lysmata dentata (De Haan, 1841). Borradaile (1917) recorded the occurrence of this shrimp (as *L. affinis*) in the Seychelles Islands, but without giving a precise locality. It has also been recorded from the Chagos archipelago to Japan and Indonesia.

Hippolysmata vittata Stimpson, 1860. Specimens were reported from the Seychelles Islands at a depth of 34 fm by Borradaile (1917). The species ranges from the Persian Gulf to the Philippine Islands. *H. kukenthali* has been recorded as occurring in the Seychelles Islands at Egmont reef (Borradaile 1917) but this locality is situated in the Chagos archipelago not the Seychelles Islands.

FAMILY PROCESSIDAE

This family consists of only three genera, two of which occur in the Indo-West Pacific region and are represented in the Seychelles Islands fauna. These species are inconspicuous by day, when they are normally buried in soft substrate habitats, but are active at night. They are most unusual amongst caridean shrimps in that the chelae of the first pair of pereopods are of completely different shape, and, presumably, of function. Some species are apparently active predators at night, feeding upon alcyonarians and gorgonians (Criales, pers. commun.) Most of the species are small, about 2-3 cm in length, and semi-transparent or mottled with red and white.

Nikoides gurneyi Hayashi, 1975. A single ovigerous female of this species has been collected from off Beau Vallon, Mahé, at a depth of 35 ft, on 21 September 1976 (det. K.-I. Hayashi). This species has not been previously recorded from the Seychelles Islands, but is known from Zanzibar, Kenya and Indonesia.

Nikoides maldivensis Borradaile, 1915. A single specimen from the Amirante Islands was described as the holotype of this species by Borradaile (1917). It has also been found on Farquhar Island. It has only infrequently been reported in the scientific record but its range extends from Kenya to Hawaii (Hayashi 1975).

Nikoides sibogae De Man, 1918. One male and five ovigerous females were collected from 15 fm in Curieuse Bay, Praslin by the F.R.V. *Manihine* in 1972 (Hayashi 1975). The only other record from the Indian Ocean is from Zanzibar Channel at 29 fm. Also known from Singapore, Indonesia, Viet Nam, Japan to Bikini Atoll and Saipan.

Processa ? processa (Bate, 1888). Borradaile examined a specimen tentatively referred to Bate's species, but the specimen was destroyed while under examination and its identity has not been fully established (Borradaile 1917).

Processa australiensis Baker, 1907. Hayashi (1975) has recorded the occurrence of a single female specimen from 70 ft at Baie Ternay, Mahé. Known from Indonesia, Philippines, Singapore and southern Australia.

Processa japonica (De Haan, 1884). Two males and two ovigerous females were collected from 15 fm in Curieuse Bay by the F.R.V. *Manihine* in 1972 (Hayashi 1975). Also recorded from the Zanzibar Channel and Mocambique in the Indian Ocean, and from Indonesia and Japan.

FAMILY PANDALIDAE

This family is best represented amongst deep water habitats and is not conspicuous amongst coral reefs, where only a few species, not yet recorded from the Seychelles Islands, may be expected to occur. The single species recorded is from deep water. Numerous other species may also be expected in deep water around the Seychelles Islands.

Heterocarpus unicarinatus Borradaile, 1915. One specimen has been reported from 637-665 fm off Providence Island (Borradaile 1917). There have been no subsequent records of this species.

FAMILY THALASSOCARDIDIDAE Bate, 1888

This small family contains only a single genus, with three described species. Their ecology is uncertain. They are unusual amongst shallow water shrimps, in possessing well developed photophores, generally only found in deep sea carideans. They may be commonly found in coral colonies by day, but are also common in plankton catches off reefs at night and also occur in tuna stomach contents, well away from coral reefs.

Thalassocaris crinita (Dana, 1852). Borradaile mentions that specimens have been collected from the Seychelles Islands and from 80 fm in the Amirante Islands. The species is planktonic and was probably caught at a lesser depth. The species occurs sparsely throughout the Indian Ocean and its range extends from the Red Sea to Japan.

Discussion

1. *Caridean faunal composition.* The caridean fauna of the Seychelles Islands is clearly dominated by two taxa, the Pontoniinae, with 58 species and the Alpheidae, with 52 species. Both these taxa are abundant throughout most tropical waters, particularly in the Indo-West Pacific region, and are comparatively

sparsely represented in temperate waters. The next most abundant groups, the hippolytidae, with 8 species and the Processidae with 6, are comparatively well represented in colder waters. These four taxa account for 93% of the species reported from the Seychelles Islands. In more temperate waters, the Hippolytidae and Crangonidae are generally the dominant groups of shrimps present, with the Pandalidae also being better represented than in shallow tropical waters. In the British Isles, the marine benthic caridean fauna consists of some 55 species (Allen 1967) with 20 hippolytid, 15 crangonid and 6 pandalid species present. The Palaemoniinae are represented by 5 species, the Pontoniinae by one species only, and the Alpheidae by 3 species. Only a single species, *Leander tenuicornis*, is common to the two regions, a species of Indo-West Pacific and tropical Atlantic distribution, that is frequently found in masses of drifting *Sargassum* weed. Shrimps of the family Crangonidae have not yet been reported from the Seychelles Islands, but will undoubtedly be found to occur when suitable collection methods are employed.

2. *Faunistic richness/Comparative species abundance.* No precise figures for the numbers of species of decapod crustacea in general, or caridean shrimps in particular, are available for any tropical localities. Most tropical regions are as yet inadequately studied, and all the available lists of species must be considered as incomplete, and, in many cases, seriously deficient. The regions themselves vary considerably in geographical extent and in ecological diversity so that comparisons between different regions are difficult to establish.

Of the caridean fauna at present known from the Seychelles Islands, 118 species belong to three taxa, the Pontoniinae, Alpheidae and Hippolytidae. The fauna of the Indonesian archipelago is probably the best known in the Indo-West Pacific region, and 200 species belonging to these three taxa are recorded in the reports on these three groups (De Man 1911, Holthuis 1945, 1952). The Indonesian fauna was sampled over a prolonged period by the Siboga and Snellius Expeditions, whereas the main source of material from the Seychelles Islands was derived from the collections of the comparatively short Sealark Expedition. Sampling in deep water was more extensively carried out by the Siboga Expedition, so that deep water species are probably better represented in the Indonesian fauna. In addition, the Indonesian archipelago is of much greater geographical extent than the Seychelles Islands, with a greater variety of marine habitats. Fresh water influence is minimal in the coastal waters of the Seychelles Islands and extensive areas of shallow muddy or silty substrates are lacking. Consideration of these factors suggests that the fauna of the Seychelles Islands is of comparable richness to that of the Indonesian archipelago, an area often quoted as the region of maximal species diversification (Ekman 1953; Briggs 1974).

There is no doubt that further sampling would produce a significant increase in the number of caridean species known from the Seychelles Islands (and most other tropical localities). The number of pontoniine shrimps so far known (58

species) is probably less than half the number of species that can be expected. A well-developed tropical coral reef can be expected to support well over one hundred species of this subfamily and it is probable that other families are also similarly underestimated.

3. *Bathymetric distribution.* The caridean shrimps found in deep waters tend to be of widespread distribution. Few are recorded in the Seychelles fauna. The vast majority of species reported are from shallow water, either intertidal or from less than 20 fm depth. Of the 58 pontoniine species, only 4 are found in depths greater than 20 fm, whereas 9 of the Alpheidae may occur in these regions. The single pandalid shrimp, *Heterocarpus unicarinatus*, occurs at over 600 fm, and has not been recorded other than from the type locality.

4. *Commensalism and the Seychelles Islands caridean fauna.* One of the noteworthy differences in the biology of tropical, as opposed to temperate shallow water, shrimps is the prevalence in the former of the adoption of 'commensal' ways of life. In most cases where this phenomenon is involved, the mechanism of the arrangement is not at all well understood, and a variety of relationships are probably involved. The animals concerned live in permanent obligatory associations with specific host animals, apparently causing them little benefit or harm. The host animals involved belong primarily to five major taxa, the Porifera, Coelenterata, Mollusca, Echinodermata and the Ascidiacea. A few species of alpheid shrimp are also associated with fish hosts. The Alpheidae is also unusual in that it contains also the only Indo-West Pacific species of shrimp associated with hermit crabs (*Aretopsis amabilis*) and with annelids (*Alpheus strenuus*). Other shrimps are known to act as fish-cleaners, but these are not recorded yet from the Seychelles Islands.

Of the 133 species of caridean shrimp at present known from the Seychelles Islands, 60 species are known commensals (45.8%), and a further three species are probable commensals. The incidence of commensalism is highest in the subfamily Pontoniinae, where 45 species out of a total of 58 (74.1%) are known to be commensals. Three species, *Periclimenes compressus*, *P. tosaensis* and *Periclimenaeus manihinei*, are probably commensals also, but their hosts have not yet been identified. *Periclimenes tenuipes* may also be a facultative commensal of sea anemones. In the small family Gnathophyllidae, one species out of three (33.3%) is a commensal, associated with sea urchins. In the Alpheidae, 14 species out of 52 (26.9%) are known commensals, but it seems quite probable that several more species of this family, particularly those of the genus *Synalpheus*, will eventually prove to be commensals. Finally, two species out of the 8 hippolytid shrimps occurring (25%) are commensals. However, *Hippolytina dentata* may also be an associate of sponges.

5. *Host associations.* In the Seychelles Islands, the coelenterates are the most

favoured host animals of the commensal caridean shrimps, being hosts for 31 (52.5%) species. Next most favoured are the sponges with 9 (15.2%) species of associated shrimp, followed by the molluscs with 7 (11.6%) and the echinoderms with 6 (10.1%). Ascidians, annelids and decapod crustaceans are each host for one species only (1.69%). The distribution of host species is summarized in more detail in the following table.

Host animals	Ponton- iinae	Gnatho- phyll- idae	Alphe- idea	Hippoly- tidae	Total species	%
Porifera	4	0	5	(1?)	9 (+1)	15
Hydrozoa	0	0	0	1	1	1.6
Alcyonacea	1	0	1	0	2	3.2
Actinaria	3 (+1)	0	0	1	4	6.6
Scleractinaria	22	0	3	0	25	41.6
Annelida	0	0	1	0	1	1.6
Crustacea Decapoda	0	0	1	0	1	1.6
Gastropoda	1	0	0	0	1	1.6
Bivalvia	6	0	0	0	6	10.0
Crinoidea	1	0	0	0	1	1.6
Echinoidea	3	1	1	0	5	8.3
Asteroidea	1	0	0	0	1	1.6
Ascidacea	1	0	0	0	1	1.6
Pisces	0	0	3	0	3	5.0

6. *The zoogeography of the Seychelles Islands marine Caridea.* The majority of the caridean shrimps so far reported from the Seychelles Islands are well known typical Indo-West Pacific species. Of the 133 recorded species, 37 (27.8%) have a pan-Indo-Pacific distribution, ranging from the Red Sea to the Hawaiian or Tuamotu Islands and 94 species (70.6%) range into the western Pacific Ocean and its associated waters and 22 (16.5%) have not been recorded outside the western Indian Ocean. The distribution of two or three species is inadequately known.

The affinity of the Seychelles Islands fauna is clearly closest to that of the adjacent African coastlines and islands. The Red Sea is inhabited by 58 of the species (43.6%) known from the Seychelles Islands and a further 38 (28.5%) are known also from the East African coast line. Although 96 species (72.18%) of the Seychelles fauna occur on the East African and Red Sea coasts, a further 37 species (27.8%) have not been found there. Of these, 12 (9.0%) are not yet known outside the Seychelles Islands. These species are not necessarily endemic, and will probably be found to occur elsewhere in the Indo-West Pacific region in due course.

Of particular interest are some of the species which have distributional ranges extending beyond the boundaries of the Indo-West Pacific region. Several species

have extended their ranges into the Eastern Pacific region and may be found on Easter Island, the Galapagos Islands and also along the equatorial eastern shores of North, Central and South America. These include *Periclimenes soror*, *Fennera chacei*, *Harpiliopsis beaupresii*, *H. depressa*, *H. spinigera*, *Hymenocera picta*, *Gnathophyllum americanum*, *Synalpheus charon*, *Alpheus lottini*, *A. levusculus* and *A. strenuus*, all except two of which are known to have a commensal way of life (Bruce, 1979). In contrast, several species are to be found in tropical Atlantic waters, for example, *Gnathophylloides mineri* which occurs in the Caribbean region, and in colder waters, *Thor amboinensis* in the north west Atlantic Ocean, and the Sargassum shrimp, *Leander tenuicornis*, which has occurred in the south west of the British Isles. One species, *Palaemonella rotumana* now occurs in the western Mediterranean Sea, having recently migrated through the Suez Canal. The wide distribution of these species appears to be correlated with the possession of a highly specialized ecological niche as almost all are commensals. Only a single species appears to have a fully circumtropical distribution, *Alpheus sulcatus*, which in addition to occurring throughout the Indo-West Pacific region, also occurs in the East Pacific region in California and in the Atlantic Ocean, off the Congo.

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