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Hitch-hiking ophiuroids

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ABSTRACT: An ophiotrichid ophiuroid, *Ophiocnemis marmorata* (Lamarck, 1816), locally abundant on muddy sand in north-western Australia, has been found living epizoically on two species of rhizostome jellyfish at two localities. At Shark Bay, in May 1995, they were collected, with jellyfish, 450 km south of Exmouth Gulf, their previously known southern limit, and in May 1996, they were collected off the Kimberley coast. *O. marmorata* is widespread in tropical waters from east Africa to the Philippines and southern China but is not known from north-eastern Australia or the Pacific.

The ophiuroids cling to the mouth arms, below the bell, up to six on one jellyfish.

The epizoic association of *O. marmorata* with a rhizostome jellyfish was first recorded and illustrated in India by Pannikkar and Prasad (1954) and later in Madagascar by Cherbonnier and Guille (1978) and in Mozambique by Berggren (1994). Underwater photographs of *O. marmorata* on *Cephea cephea* (Forsskål 1775) are here presented for the first time.

The ophiuroids are presumed to colonise the jellyfish as they metamorphose from planktonic ophioplutei as many jellyfish were observed with ophiuroids on each occasion. Are they parasites, commensals or suspension feeders? Does the association provide a means of dispersal enabling *O. marmorata* to colonise new localities?

1 INTRODUCTION

Ophiocnemis marmorata (Lamarck, 1816) is an ophiotrichid ophiuroid normally found on soft substrates (fine sand to mud), intertidal (Clark 1938) to 250 m (Koehler 1922), in tropical waters from east Africa and Madagascar to the Philippines, southern China and north-western Australia (H.L. Clark 1938, 1946, Clark and Rowe 1971) but it has not been recorded from the Northern Territory, Queensland coasts (Rowe and Gates 1995) or the Pacific (Pawson 1995).

It is here reported epizoic on rhizostome jellyfish from two localities in Western Australia, one of which extends its range 450 km south of its previously known distribution.

O. marmorata has also been recorded from rhizostome jellyfish in India by Pannikkar and Prasad (1954) who observed and illustrated *O. marmorata* associated with a rhizostome jellyfish, *Rhopilema hispidum* Maas, at Palk Bay. They found up to 829 ophiuroids, from very young ones to adults (no measurements given) on one jellyfish 280 mm in diameter. They examined 10 further specimens carrying *O. marmorata* together with young fish, *Caranx kalla* Cuvier & Valenciennes, and on some a portunid crab, *Charybdis annulata* (Fabricius). Pannikkar and Prasad (1954) postulated that the ophiuroids probably fed on the remains of animals caught by the jellyfish and also suggested that the association may help to distribute *O. marmorata* over a wider area.

Cherbonnier and Guille (1978) found *O. marmorata* on unidentified rhizostome jellyfish in Madagascar but made no comment on the ecological relationship. More recently Berggren (1994) found *O. marmorata* on *Rhopilema nomadica* Galil at Inhaca Island Mozambique. On a jellyfish c 250 mm in diameter 20-50 ophiuroids were found on the bell, both dorsally and ventrally, along with 10-30 pontoniine shrimps *Periclimenes nomadophila* Berggren, 1994 and on some medusae a portunid crab, *Charybdis feriata* (Linnaeus) clinging to the mouth arms.

The association between *O. marmorata* and another two species of rhizostome jellyfish, *Cephea cephea* and cf *Netrostoma* sp. is here reported and illustrated by underwater photographs for the first time. It is also the first record of a jellyfish - ophiuroid association in Australian waters.

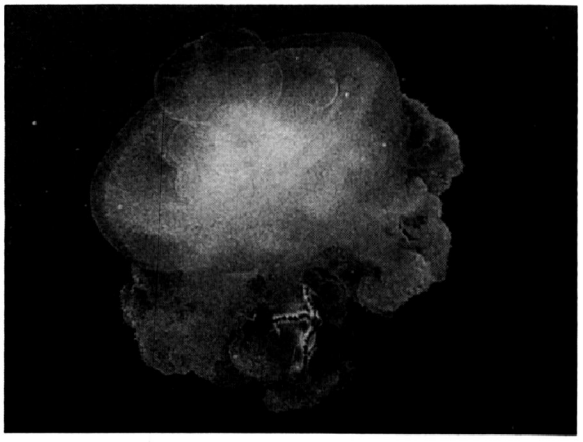

Fig. 1. *Ophiocnemis marmorata* on *Cephea cephea*, Shark Bay, Western Australia.

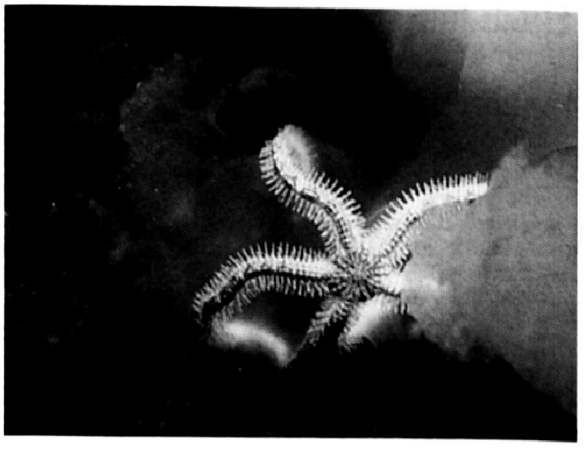

Fig. 2. *Ophiocnemis marmorata* on mouth arms of *Cephea cephea*, Shark Bay.

Questions are raised as to the method of colonisation, feeding by the ophiuroids and whether this facultative symbiosis results in colonisation of new localities.

2 MATERIAL EXAMINED

Ophiocnemis marmorata epizoic on rhizostome jellyfish, *Cephea cephea*: WAM 243-95 (3 spec., d.d. 7, 8 and 8.5 mm) from east of Quoin Bluff, Dorre Island, Shark Bay, Western Australia, c. 25°03'S, 113°07'E, coll. C. Bryce & L. Marsh, 12 May, 1995; WAM 226-95 (2 spec., d.d. 6 and 8 mm) from east of Castle Point, Dorre Island, 25°07'32"S, 113°6'58"E, coll. C. Bryce, 13 May 1995; on rhizostome jellyfish cf. *Netrostoma* sp: WAM 165-96 (2 spec. d.d. 7.5 and 8.5 mm) from Prince Frederick Harbour, Kimberley, Western Australia, 15°01'54"S, 125°21'24"E, coll. K.F. Kenneally, 27 May 1996.

Also specimens in the Western Australian Museum collection from fine sand, silty sand, muddy sand and mud substrates from 0-56 m, from Exmouth Gulf, Dampier Archipelago, N.E. of Cape Lambert, N. of Port Hedland, Broome, N.W. of Cape Leveque and Admiralty Gulf, Kimberley, Western Australia with d.d. from 3.5 to 24 mm.

Abbreviations: d.d. = disc diameter; WAM = Western Australian Museum

3 OBSERVATIONS

While making a marine faunal survey of the islands on the western side of Shark Bay, Western Australia, in May 1995 a small number of rhizostome jellyfish, *Cephea cephea*, were observed from the boat off the eastern side of Bernier and Dorre Islands. They attracted attention as this species had not previously been recorded from Shark Bay. Upon closer examination some of them were observed to have one or more ophiuroids under the bell clinging to the mouth arms. The jellyfish, with ophiuroids, were photographed under-water and two jellyfish, one with three *Ophiocnemis marmorata* and one with two specimens were collected. Several *C. cephea* with *O. marmorata* were also observed off the south end of Bernier Island (figs 1 & 2).

In May 1996 hundreds of related jellyfish, cf. *Netrostoma* sp. with up to six *O. marmorata* on each jellyfish were seen in Prince Frederick Harbour on the Kimberley coast. They were photographed from the surface and two of the ophiuroids were collected.

The Shark Bay specimens had a disc diameter (d.d.) of 6 to 8.5 mm and the Kimberley specimens had d.d. of 7.5 and 8.5 mm. The maximum d.d. of *O. marmorata* is 24 mm although few in the WAM collection have a d.d. over 20 mm, the epizoic specimens are thus c. one third of maximum size.

The ophiuroids cling with their arms spread widely over the mouth arms of the jellyfish (figs 1, 2).

4. DISCUSSION

In Madagascar 11 of the 12 specimens taken from jellyfish were similar in size to those from W.A. with a d.d. of 6.5 to 9 mm while one had a d.d. of 2 mm (Cherbonnier and Guille 1978). No measurements of the ophiuroids were given by Pannikkar and Prasad (1954) nor by Berggren (1994).

The limited number of ophiotrichids for which the mode of development is known have planktonic larvae (Hendler 1991) so it is likely that *O. marmorata* also has indirect development through a planktotrophic ophiopluteus larva which is postulated to attach to the jellyfish as it settles out of the plankton before metamorphosis. This takes place between 4 and > 40 days after fertilization in the few ophiotrichids whose development has been studied (Hendler 1991).The small size of one of the Madagascar specimens suggests that this is the method of colonisation.

Warner (1982) lists several feeding methods for related *Ophiothrix* spp which are microphagous suspension feeders, mostly with a podial filter, some with mucus covered spines, also probable arm loop capture of larger food items and surface deposit feeders. Emson and Mladenov (1992) found *Macrophiothrix variabilis* to be primarily a suspension feeder using tube feet extended from arms held into the water column but it was also seen to sweep the rock surface with the arms and to pick up pieces of carrion from the substrate by grasping with the arms. Hendler (1984) noted deposit feeding on the surface of a sponge (*Callyspongia vaginalis*) by its associate, *Ophiothrix lineata*, and suggested a brittlestar - sponge cleaning symbiosis. No *O. marmorata* were seen with arms extended and it is hypothesised that they sweep the surface arms of the host in search of food, at least during daylight. They may possibly adopt a filter feeding posture at night but there are unfortunately no observations to support this hypothesis.

Finally, is the association used as a means of dispersal, enabling *O. marmorata* to colonise new localities by rafting? Extensive collections of echinoderms have been made from Shark Bay but *O. marmorata* has never been collected there from the benthos. The nearest locality where it has been found is Exmouth Gulf, 450 km to the north. Will the rafted animals detach from their hosts and take up residence on the bottom where there is suitable substrate or does the epizoic lifestyle last for the life of the jellyfish? This may produce the same result in any case.

The facultative symbiosis between *Ophiocnemis marmorata* and rhizostome jellyfish is now shown to span the Indian Ocean and involve three or four genera of jellyfish (*Rhopilema, Cephea, Netrostoma* and an unidentified genus). Associated organisms (probably several species of juvenile fish, two species of crab (*Charybdis* spp) and one pontoniine shrimp) may or may not be confined to particular species of rhizostome jellyfish. Host specificity has not been demonstrated except perhaps for the shrimp, which has only been found on *R. nomadica*.

So far *O. marmorata* is the only ophiuroid found on a pelagic jellyfish. The widespread occurrence of this phenomenon, involving a single species of ophiuroid, suggests that there is a symbiotic relationship at some level with rafting as a secondary consequence. But why only *O. marmorata*? One can envisage competent ophioplutei of many species being swept out to sea where their only chance of settling is on some floating object, such as a jellyfish. Do other species settle but not survive?

Many ophiotrichids are associated with sedentary organisms such as sponges and gorgonians while *Ophiomaza cacaotica* is regarded as parasitic, taking food from the ambulacral grooves of its host crinoid (Clark 1976). Many ophiotrichids, both epizoic and free living species, including *O. marmorata*, have the lowermost arm spine on distal segments hooked, enabling them to cling more effectively to their substrate. *O. marmorata* has, in addition, ventral arm plates much wider than long which may allow the arms to flex dorso-ventrally more readily than other species, enhancing their ability to cling to the host as shown in fig. 2.

The limited observations of the relationship between *Ophiocnemis marmorata* and rhizostome jellyfish have produced more questions than answers but it is hoped that this brief account will stimulate further work.

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