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ANIMAL ASSOCIATIONS IN ECHINODERMS

ABSTRACT

Echinoderms being benthic organisms of limited movements give shelter to several organisms which live in association with them without harming them. They show association with other groups as well as among themselves. In extreme cases some of the associations can be termed as semi-parasitic. Observations made during the last 30 years in the field and the laboratory are presented in the paper.

Introduction

Information on animal associations on echinoderms is rather scanty and widely scattered. During the last 30 years, these associations in the laboratory and field in the Gulf of Manner and Palk Bay, Andaman and Nicobar Islands and also in the Lakshadweep were observed. Some information is published on the subject by H. L. Clark (1921), Mukerji (1932), Chopra (1931), Panikkar and Prasad (1952), Arnold (1953), Ganapati and Radhakrishna (1963), Jones and Sankarankutty (1960), Jones (1964), Jones and Mahadevan (1965), Nayar and Mahadevan (1965 a, 1965 b), Evangeline (1966), A. M. Clark (1967, 1976), Ganapati and Sastry (1972), Bakus (1973), Jones and Kumaran (1980) and Sastry (1985). In this paper the following associations are considered.

Holothuria scabra and *Pinnotheres deccanensis*

A pea-crab *Pinnotheres deccanensis* is found to live inside the cloaca of this *Holothuria scabra*. The crab was always found at the enlarged basal part of the respiratory tree. Only female crabs with eggs were collected. Particulars about males are not known. Probably they are free living. Very rarely two crabs

were also found in one specimen. One crab was removed and put in a trough along with a holothurian of the same species. First the crab moves about aimlessly on the surface of the holothurian until it comes to the cloacal region. Then it holds on to the skin of the holothurian near the cloaca with one of its chelipeds. After the crab has inserted a part of its body inside the holothurian it remains passive. When the holothurian lets off water the cloacal opening is kept wide open. During such times the crab slowly gains entry into the holothurian. It takes about two hours for the crab to enter completely into the body of the holothurian. The crab probably enters the holothurian for breeding purposes alone, because always only females with well developed eggs were collected. They may be guided towards the opening of the cloaca by the current of water since the eyes are highly reduced. Chopra (1931) has reported the occurrence of this crab inside the same species of holothurian from the Andamans. He has also reported a male specimen. This would have probably entered during the breeding season and it was accidentally collected at that time. Jones and Mahadevan (1965) have also described this association.

Holothuria arenicola and *Encheliophis gracilis*
Holothuria hilla and *Encheliophis vermicularis*

The carapid fishes live in the respiratory tubes of holothurians. Their habits were studied in the laboratory and the same are presented here. When the holothurians were kept in a trough of fresh sea water and when they were freely taking and letting out water the head of the fish was slightly seen through the cloaca of the holothurian. At that time when the holothurian is suddenly pressed, a result of pressure created the fish immediately comes out to swim. The swimming movements were weak. After coming out the fish began to swim aimlessly. After sometime it located the cloaca probably by the current of water and began to swim steadily with its head directed towards the opening of the cloaca. Then suddenly the fish reversed its body and entered the holothurian with its tail first so that the head is always kept near the cloacal opening to come out immediately in the event of any emergency.

The fish usually lives in the main tube of the respiratory tree and takes shelter in the holothurian. The fish is said to leave the holothurian in the night in search of food. At times the fishes damage the respiratory trees and enter the coelom. Mukerji (1932) gave an account of the fishes associated with holothurians from the Andamans. Arnold (1953) presented some observations on the habits of *Carapus acus*. Jones and Kumaran (1980) reported *Jordanicus gracilis*, *Carapus parvipinnis* and *Carapus homei* from *Bohadschia marmorata*.

Pentaceraster regulus and
Podarke angustifrons

This association seems to be common. The sea stars caught in the nets and cast ashore

open the ambulacral grooves widely due to exposure thus exposing the polychaetes. The polychaetes in such conditions remain at one place without moving. Usually only a single polychaete is found. In some specimens upto three polychaetes were found. The polychaetes very rarely come out of the ambulacral grooves and move on the oral side. They are never seen to come to the dorsal side probably because of large pedicellariae and also the dorsal side offers less protection to the worms. They are usually found at the distal end of the arm where the tubefeet are small. They lie between the tubefeet and the ambulacral spines. Most of the time the polychaete lies quiet in the ambulacral groove and it is doubtful whether it can move freely when the ambulacral grooves are closed. They show active movement when they come to the oral side. Even after getting on to the oral side soon or later, it disappears into the ambulacral grooves. The worm was seen to move both forwards and backwards. The polychaete gets shelter and also shares the food of the sea star. The polychaete may also serve to keep the ambulacral grooves clean. Jones (1964) reported this association earlier.

Ophiocnemis marmorata and
Rhopalonema hispidum

This association was observed near Mandapam on the Palk Bay side. Young specimens of *Ophiocnemis marmorata* were collected from large medusae (310 mm in disc diameter) *Rhopalonema hispidum* which were washed ashore near Mandapam during June to September. The disc diameter of the brittle stars ranged from 5-10 mm. Since the brittle stars do not have the powers of swimming they entangle, in the folds of the umbrella.

The mucus like secretion of the medusae aid the brittle stars to attach to the umbrella of the medusae. The brittle stars probably share food with the medusae. The association of the brittle stars with the medusae definitely aids in the dispersal of the species over a wide range. Large specimens with disc diameter 20 mm were collected from fishing trawlers operating off Tuticorin at a depth of 15-20 m. Panikkar and Prasad (1952) mentioned about this association from the Palk Bay.

that *Ophiomaza* is even parasitic. *Ophiomaza cacaotica* occurs on the feather star *Tropiometra carinata* (Fig. 1 a, b). It was somewhat common at Vedalai on the Gulf of Manner. *Gymnolophus obscura* was collected attached to the feather star *Comanthina schlegeli* collect from a depth of 15 m. Ophiuroid is the obvious party that is benefited by the association. They live with the oral side down on the disc of the sea feather. The five arms of the ophiuroid are coiled round the dorsal side of the sea feather. The movements of the sea feather are restricted

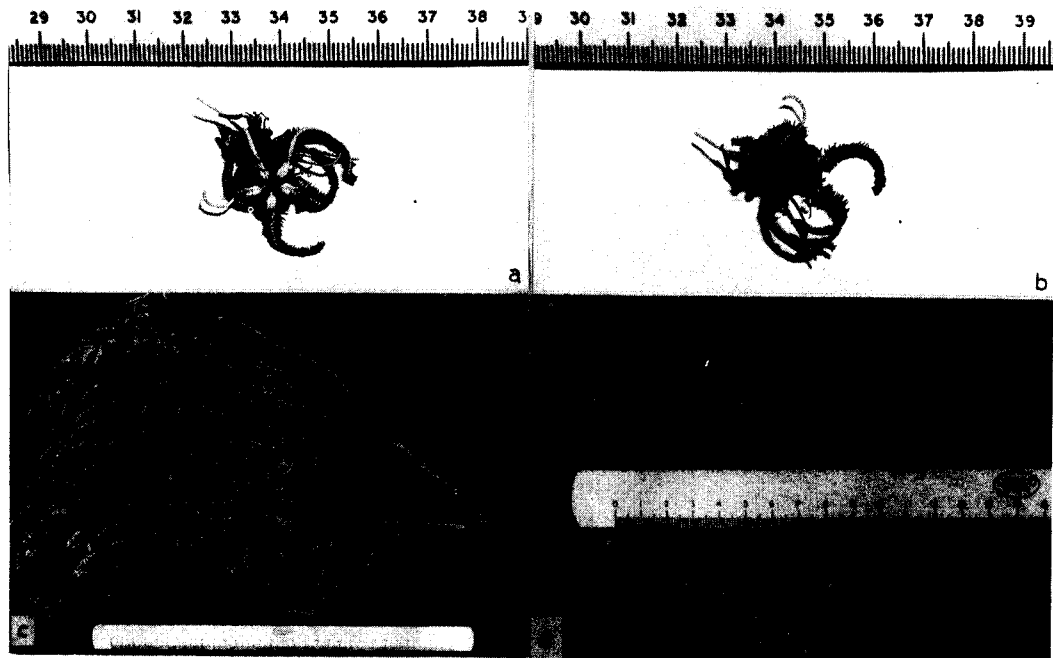


FIG. 1 a. *Ophiomaza cacaotica* on *Tropiometra carinata* - dorsal view, b. *O. cacaotica* on *T. carinata* showing the cirri of the feather star, c. Colony of *Subergorgia suberosa* with *Ophiothela danae* and d. *S. suberosa* with *O. danae* - enlarged view.

Ophiomaza cacaotica and *Tropiometra carinata*
Gymnolophus obscura and
Comanthina schlegeli

These two ophiuroids always live in association with sea feathers. They appear to be semiparasitic. A. M. Clark (1976) has noted

to a large extent by the brittle star. The ophiuroid gets shelter and probably shares food of the sea feather. The spines of the brittle star are smooth and pointed and so cannot attach to the sea feather. The only means of attachment for the brittle star is to curl round the arms of the sea feather. The crinoid gets a firm hold

on the stones by the cirri. The mouth of the brittle star is kept close to the mouth of the sea feather. The sea feather gathers plankton by creating currents along with its arms. Because of their agility the brittle stars avoid the excretory matter let off by the sea feathers. This association is not for protective colouration since in case of *Gymnolophus obscura* and *Comanthina schlegeli* the colour is contrasting, the former being black and the later light yellowish-white. *Ophiomaza cacaotica* and *Tropiometra carinata* are dark brown in colour. This association is reported here for the first time. There does not seem to be any host specificity since H. L. Clark (1921) recorded the same brittle star from *Capillaster sentosa* from Singapore and from *Heterometra reynaudii* from Palk Strait and Sri Lanka. He is of the opinion that this species occurs on any feather star of large size which can support them.

Actinopyga mauritiana and
Lissocarcinus orbicularis

A small crab *Lissocarcinus orbicularis* is found to live as commensal in the tentacles of *Actinopyga mauritiana* and also very rarely from *A. echinites*. Sometimes two or even three crabs were found in a single specimen. The tentacular collar is deep like a cup surrounding the tentacles. This offers excellent protection for the crab. The crab was never seen outside. They come out only when the holothurians are killed. The crab is brown with white patches and it is well camouflaged on *Actinopyga mauritiana* which is also brown with white patches. Both male and female crabs were collected unlike *Pinnotheres deccanensis*. This crab is reported from *Holothuria nigra* by Borradaile (1903). Sankarankutty and Thomas (1963) reported two specimens collected from the basal enlarged portion of the respiratory tree of the holothurian from Minicoy Island. Unfortunately they do not mention the name of the host. Bakus (1973) has also mentioned this association.

Ophiothela danae and *Subergorgia suberosa*

The genus *Ophiothela* is always associated with gorgonids. It is never collected in the free state. Large branches of the gorgonid are common in Tuticorin. Large number of *O. danae* are found to entwine the branches of the gorgonid (Fig. 1 c, d). The diameter of the disc of the ophiuroid is 2-3 mm and the length of the arm varies from 6-10 mm. All the specimens have six arms and they are uniformly yellow in colour. For each sq. cm one or two specimens are found. The ophiuroids are tightly coiled round the branches of the gorgonid. In the live condition probably limited movements are seen. The ophiuroids get suitable habitat to live and collect their own food from the surrounding water, without injuring the gorgonid in any way.

Stomopneustes variolaris and *Athanas dorsalis*

The occurrence of the aliphid shrimp *Athanas dorsalis* on the sea urchin *Stomopneustes variolaris* is very rare being collected from Vizhinjam near Trivandrum. The aliphid is jet black thereby completely merging with the dark colour of the sea urchin. The aliphid is always seen to move over the body of the sea urchin among the spines. It is difficult to separate the aliphid from the sea urchin. When it is separated and put in the same trough along with the sea urchin immediately it gets on to the sea urchin and move among the spines. The Aliphid gets a safe shelter among the spines since fishes and other organisms do not attack the aliphid. The black colour forms as a good protective colouration for the commensal. Sankarankutty (1962) reported a male specimen from the same sea urchin from Mandapam on the Gulf of Mannar side. Sastry (1981) collected this species from *Stomopneustes variolaris* from Camorta

(Nicobars) and he also states that the species described as *A. indicus* from *S. variolaris* from Visakhapatnam by Ganapati and Sastry (1972) refers to *A. dorsalis*.

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