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Loosing sea fan (*Echinogorgia reticulata* Esper, 1791) and the associated winged oyster (*Pteria tortirostris* Dunker, 1849)

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Abstract

Animal associations occupy a vital position in the terrestrial and aquatic environs and the marine ecosystem being diverse with many examples. A rare association is that of the sea fan *Echinogorgia reticulata* with the pterid winged oyster *Pteria tortirostris*. This unusual association was seen as a common behaviour on analysis of many samples. Rapid decline of sea fan populations due to trawling and other anthropogenic hazards has led to a dwindling population of this winged oyster. If the current situation leads to an accelerating decline of sea fans, the oysters have to adapt themselves to alternate hosts, probably leave a live host and look for a non-living substrate. This paper portrays the level of association of the winged oyster with its gorgonian hosts, alternate substrata chosen and destruction of sea fan beds.

Keywords: Sea fan, winged oyster, zooxanthellae, animal association, fishing

1. Introduction

Animal associations occupy a vital position in the terrestrial and aquatic environs and the marine ecosystem being diverse with many examples. Symbiosis is the motive behind these associations like zooxanthellae (symbiotic algae) on corals or on giant clams. Symbiotic associations in these animals have aided them to evolve positively in a competitive coral environment. Sea fans (gorgonians), an amazing group of animals belonging to coelenterates with bright colours are no exceptions. They form a part of the 'marine forests' created by the coral reefs. The characteristic feature of the sea fans is presence of zooxanthellae in the polyp. A second association with unknown function is also witnessed where, the winged oyster, *Pteria tortirostris*, belonging to the family Pterridae is found attached to the base or branchlets of the gorgonians [1]. The present study is attempted to understand the unknown association of the winged oysters to their gorgonian host.

2. Materials and methods

Gorgonians were collected from trash of bottom trawl nets and set crab nets. All the gorgonians were from less than 50m depth off Tuticorin coastal waters, Tamil Nadu, India (confirmed with the fishermen of the area of fishing operation and depth with echosounders). The size group of the collected oyster specimen varied from 1.9 to 3.2cm. The measurements were carried out using a vernier caliper to 0.1mm accuracy. Photographs were taken to justify the area of attachment for the oysters as it varied in some specimens.

3. Results and Discussion

Taxonomic position of the host sea fan

Kingdom	:	Animalia
Phylum	:	Coelenterata
Class	:	Anthozoa
Order	:	Alcyonacea
Family	:	Plexauridae
Genus	:	<i>Echinogorgia</i>
Species	:	<i>reticulata</i>

Gorgonian diversity and abundance is essential to evaluate the changes in the marine ecosystem [2].

Once a very common species along the Tuticorin coast inhabiting the reef areas, but today it is rare to see a good live specimen even during a scuba dive. Colours vary between red, brown and yellow. If the specimens are dried under the sun, they become white or dull cream in colour. *Echinogorgia reticulata* entangled in bottom set crab nets around the Vaan island and from the trawl nets operated at depths less than 50m along the Tuticorin coastal waters were collected. The sea fans were also collected from the crab nets (which is a modified bottom set gill net) operated at depths less than 10m to trap crabs and lobsters. More than 60% of *Pteria tortirostris* collected from this host were found attached to dead branchlets and distributed randomly on the "net-like" arrangement of the whole colony (Figure 1A). Only a few specimens were discovered attached to the main branch at the base.

Taxonomic position of the winged oyster

Kingdom	:	Animalia
Phylum	:	Mollusca
Class	:	Bivalvia
Order	:	Pteroida
Family	:	Pterridae
Genus	:	<i>Pteria</i>
Species	:	<i>tortirostris</i>

Winged oysters have the adaptation of attaching their byssus thread to hard substrate. Other than sea fans, attachment to dead corals or calcareous algae is witnessed. On comparison, association with gorgonians is more than their attachment to other substrata. The posterior wing is very long, which is a distinct character of this species. The byssus thread is small and stout. Shell colour is red to reddish brown with few faint paler radial lines (Figure 1B & 1C). This colour is same as the host's colour and makes it very difficult to identify its presence in the sea fan. The shell is designed at the antero-ventral margin to attach itself easily to the round base or the branchlets of the gorgonian host (Figure 1D).

The shell of winged oyster has evolved to attach to the sea fan for reasons unknown. There already exists a symbiotic association with the symbiotic algae zooxanthellae for the hosts. But in the marine environment, other than the algae, there are reef shrimps, ascidians and barnacles taking shelter on the sea fan and use them as substrata. Gorgonians have stinging cells and have the capacity to release metabolites to remove unwanted fouling. But the winged oysters, ascidians, reef shrimps have developed immunity to the stinging cells or the metabolites released by the sea fans. The reasons for attachment may be for certain advantages like (1) removing from surface-roving predators (the gorgonian providing extra protection); (2) exploitation of a niche hitherto unoccupied by bivalves; (3) removal of the animal from the sea bed and exclusive exploitation of potential food held in suspension; and (4) current stresses to attachment are avoided by modifications to the shell [3].

Most pteriid species are capable of producing pearls. *Pteria sterna* [4] and *Pteria penguin* [5] are being used for the production of quality pearls in tropical countries. *Pteria* are also reported as foulers on culture of pictada shells [6]. The problems the producers face is fouling on the shell, increasing the weight of the culture rafts and obstructing the feeding patterns by blocking the flow of water currents that bring in a lot of food. For certain species like *Pteria tortirostris* or *Pteria brevilata*, the adaptation to attach them to gorgonians

has been an edge over other family representatives. It is possible that the elongated shape may be an evolutionary change for perfect concealment against their predators. As individuals, the anterior end of *Pteria* is pointed well in adults. A new area where other organism would not venture is that on the gorgonians as they are able to produce metabolites and since the winged oyster is a fragile shell, predation is avoided. Anti-fouling substances prevent the growth of algae, fungi, bacteria and other potential settlers on the colonies [7].

In India, there are very rare reports of winged oysters attached to sea fans [8-10]. What is more important now is the status of gorgonians distributed in the coastal waters. Right from the day of introduction of bottom trawl nets, mass destruction of corals, pearl oyster beds and gorgonians have taken place in the past four decades. A decade back, the gorgonians were indiscriminately collected for their prostaglandin and along with them the winged oyster which had comparatively lower distribution. The presence of winged oysters attached to dead corals or coralline algae is an indicator that their habitat and host are disturbed. This alternate adaptation will lead to slow disappearance of the oysters. Thanks to the Ministry of Environment and Forests, Government of India, and the wildlife schedule act modified in 2001 that had led to strict banning of collection of hard or soft corals like the sea fans. Recent underwater surveys in the Tuticorin area have given promising recruitment of both corals and sea fans. Though this is a healthy sign, destructive nets still pose a major threat to the gorgonians and in turn to the winged oyster. If proper management strategies are not adapted by the managers or the stakeholders, there is every chance of losing the sea fans and the associated winged oyster altogether.

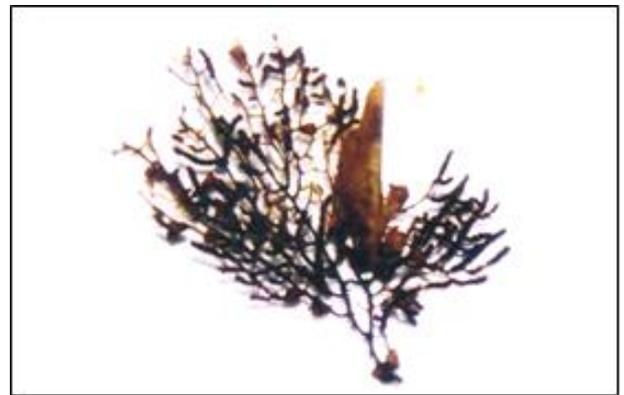


Fig 1A: *Pteria tortirostris* attached to the base of *Echinogorgia reticulata*

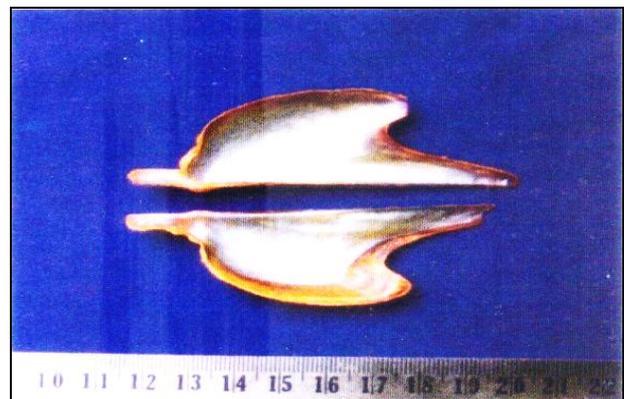


Fig 1B: *Pteria tortirostris* lateral view – inside



Fig 1C: *Pteria tortirostris* lateral view – outside



Fig 1D: Internal anatomy of *Pteria tortirostris* byssal gape

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