Research Article

Ecological Significance of the Association between *Stomopneustes variolaris* (Echinoidea) and *Lumbrineris latreilli* (Polychaeta) from Visakhapatnam Coast, India

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The present study reports a new association between the sea urchin *Stomopneustes variolaris* (Lamarck, 1816) and the polychaete *Lumbrineris latreilli* (Audouin & Milne Edwards, 1834) based on the specimens collected intertidally at Bay of Bengal (Visakhapatnam, east coast of India). Out of 60 sea urchins collected, 10 (16.67%) were associated with the polychaete. The prevalence increased with the increasing sea urchin test diameter. All polychaetes were exclusively found between the spines, in the aboral region of the host. This association protects the polychaete from the predators during displacement from its natural habitat.

1. Introduction

Polychaetous annelids are the most abundant and cosmopolitan marine metazoans in the benthic environment [1]. Particularly in soft bottoms, they dominate in terms of species, abundance, and biomass [2]. Most of them are free living, crawling, burrowing, and tube-dwelling animals, but many live in symbiosis with other marine invertebrates [3], of which the echinoderms include a higher number of species harbouring polychaetes. The overall association of polychaetes with echinoderms is 53.8% [4].

Polychaetes are highly vulnerable to predators including fish and other invertebrates. Some of them are soft bodied animals, lack protective exoskeleton, and have poor displacement capacities [5, 6]. To protect themselves from predators they sometimes take shelter in other marine flora and fauna, with this often leading to the establishment of highly specific relationships that may lead to different kinds of symbiosis. Among the echinoderms, sea urchins have physical defenses (i.e., test, spines) and that makes them suitable to harbour and protect marine organisms such as molluscs, shrimps, crabs, polychaetes, copepods, and fish [7–9].

Stomopneustes variolaris (Lamarck, 1816) is a tropical, rock boring, Indo-Pacific echinoid found at the intertidal.

Lumbrineris latreilli (Audouin & Milne Edwards, 1834) is a free living, soft bottom dwelling, burrowing polychaete that lives in mucous lined burrows found in Visakhapatnam coast [10]. The present study reports for the first time an association between *S. variolaris* and *L. latreilli* in the intertidal region of Visakhapatnam. The significance of this association is also discussed.

2. Materials and Methods

Sea urchins were hand-collected in March and April 2013 from the rocky areas of the intertidal region of Visakhapatnam, 17°14'30" N and 83°16'25" E (east coast of India) during low tide, as part of a study on the intertidal fauna.

The collected sea urchins *S. variolaris* were transported to the laboratory alive. The spines of the sea urchins were removed. Their diameter was measured perpendicularly to oral-aboral axis using Vernier callipers. Polychaetes (Figures 1(a) and 1(b)) associated with the sea urchins were separated, fixed, and preserved in 70% ethanol. Later, their total length was measured from the tip prostomium to the end of pygidium using calibrated ocular micrometer under stereomicroscope and also the number of segments was

FIGURE 1: (a) Polychaete associated with *Stomopneustes variolaris*. (b) Polychaete *Lumbrineris latreilli*.

FIGURE 2: Anterior region of *Lumbrineris latreilli*.

counted. The maxillary apparatus of each individual was extracted after an anterodorsal incision and mounted on a slide to study the details of both maxillae and the mandibles under an optical microscope. Parapodium was separated from polychaete, placed on a slide with a drop of glycerol, and covered with a cover slip and the chaetae were observed under an Olympus compound microscope.

3. Results

3.1. Description of *Lumbrineris latreilli* (Figure 2). Polychaete colour is pale red or brown in live condition. Body is long, ranging from 60 mm to 64 mm (55–58 segments), gradually tapering towards the pygidium. The prostomium is blunt, conical, the length being slightly longer than width and has no eyes and appendages. Peristomium apodous consists of two rings of equal size. All the parapodia are uniramous. Parapodium in the anterior segments has a short, rounded prechaetal lobe and digitiform postchaetal lobe. Anterior parapodia have capillary chaetae and compound multidentate hooded hooks with long blades. The rest of the parapodia have few capillary chaetae and simple hooded hooks of similar sizes. Jaw apparatus is well developed and is of the labidognatha type. Maxillae II are almost as long as maxillae I and are connected to them with a ligament. The maxilla II has four teeth, maxilla III has two teeth and maxilla IV is unidentate with pointed tooth. Mandibles are compact and fused medially. Aciculae are yellow in color and straight.

FIGURE 3: Relationship between the size of *Stomopneustes variolaris* and its infestation prevalence by *Lumbrineris latreilli*.

3.2. Description of the Association. Among 60 specimens of *S. variolaris* collected of diameter ranging from 30 mm to 76 mm during the study period, only 10 (16.67%) of the sea urchins were found to be associated with *L. latreilli*. Each sea urchin was found to be associated with only one polychaete. In this study it was observed that sea urchins of diameter in the range of 50 mm to 70 mm were found to be associated with the polychaete *L. latreilli* of average length 60.4 ± 2.2 mm. The polychaete was found attached to the aboral side of the test of the sea urchin between the spines. Its presence could be noticed only when the sea urchin spines were removed. The percentage of prevalence was more as test size increases ($y = 2.156x - 0.8$, $R = 0.964$, $P = 0.02$) (Figure 3).

4. Discussion

Many polychaetes, including polynoids, syllids and hesionids live in either obligate or facultative association with echinoderms [3], to derive protection from predators and food from the host. They often prefer the oral surface from where they may easily access to the food collected by the host, while others prefer aboral surface feeding on the semi digested or digested matter released by the host [11]. Similar association and feeding pattern was observed in another polychaete *Hesione picta* (Muller, 1858), feeding on the undigested material released by the brittle star *Ophionereis reticulata*.

(Say, 1825). Two of them, like the amphinomid *Benthoscolex cubanus* (Hartman, 1942) or the polynoid *Gorekia crassikirris* (Willey, 1902), were even found inside the gut of irregular sea urchins [12].

In the present study, *Lumbrineris latreilli* was found attached to the test on the aboral side between the ambitus and the genital plates and, accordingly, the polychaete may feed on the undigested organic matter released by the sea urchin *S. variolaris*.

The present association is between a soft bottom burrower *L. latreilli* [13] and the rock boring sea urchin *S. variolaris*. Both are intertidal dwellers living in different habitats. The association of polychaete with sea urchin is due to its displacement from natural habitat during the upwelling [6, 14] and dredging operations [15]. *Lumbrineris* species are vulnerable to the direct effects of dredging and to the deposition of sediments mobilized during dredging [16, 17].

The principal benefit of the association, however, seems to be protective, as the host is shielding the polychaete from possible predators by means of the spines. Other marine organisms reported to be associated with sea urchin are shrimps [18, 19], crabs [9], and young of many fish species. Further, the polychaete colour which is brown camouflages with the colour of the test of the sea urchin precluding the recognition by the predators.

Another plausible reason might be that these worms have strong tendency to come from the soft bottom on to the algal zone for spawning as this behavior is beneficial for successful fertilization and larval dispersal [20]. During this time, they may seek shelter in sea urchins that also inhabit in this zone.

5. Conclusion

Lumbrineris latreilli is a benthic dweller feeding on the sediment, and its association with a rock boring sea urchin *S. variolaris* is to tide over unfavorable circumstances like upwelling and dredging. This association protects the polychaete from the predators during displacement from its natural habitat.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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