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Abnormal Starfish, *Pentaceraster regulus* from Thondi, East Coast of India

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Abstract

Starfish *Pentaceraster regulus* was collected from Thondi coast, this species usually have 5 arms. An unusual, abnormal sea star, *P. regulus* was found with only 4 arms. Then it was length, weight arm's length were measured and tabulated.

Keywords: Abnormal sea star; *P. regulus*; Four arms; Thondi

Introduction

Starfish or sea star is familiar to every visitor at the shore. Sea stars or starfishes are the class Asteroidea of phylum Echinodermata consisting of 1890 species with 36 families and approximately 370 genera [1]. Starfish being common and conspicuous organisms, their beauty, more so their symmetry has attracted the attention of the naturalist since very early times. The aboral or upper surface may be smooth, granular or spiny, and is covered with overlapping plates. Many species are brightly colored in various shades of red or orange, while others are blue, grey or brown. They are free-living eleutherozoans and moving on the oral surface, with a flattened, flexible body in the form of a pentagonal or stellate disk or more often a disk continuous with five to many, usually five, ray-like extension called arms, each of which gonad and a pair of digestive glands, with open ambulacral grooves limited to the oral surface and provided with two or four rows of podia, with a radial canals located at the outer side of the ambulacral ossicles, and with an endoskeleton of separate calcareous pieces bound together by connective tissue and usually bearing external projecting knobs, tubercles, or spines.

The echinoderms comprise an important group of marine animals that include feather stars, starfish, brittle stars, sea urchins, sand dollar, sea cucumbers and crinoids. They move around with the use of thousands of tiny tube feet, many of which have suction cups at the ends. They are found in all oceans and at all depths, from the intertidal zone down to abyssal depths at least 6,000 m (20,000 ft) below the surface. With the exception of some pelagic holothuroids (*Rynkatropa pawsoni*) all echinoderms are benthic. In deep seas they constitute more than 90% of the benthic biomass [2].

Arms are usually five in numbers, above or below the normal arm count are abnormal. Abnormality is not an inheritable character but it is the outcome of environmental perturbations on the metamorphosis of larvae and/or abnormal regeneration of arms [3].

Most of the starfish normally have five arms; the starfish having either more than five arms or less than five arms are to be considered as abnormal. This is due to the environmental condition. Some time they lose their arms during any abnormal environment condition or during predation and become wounded. Wound is healed by regenerating the arms or by just covering the wound by growth of body wall. At the time of regeneration of the arms it may regenerate two arms instead of one arms or it just close the wound without growing the loosed arm. This process is done with respective to the availability of food and the environment conditions prevailing in the habitat. The present study produces the preliminary report on the abnormal *P. regulus* caught as by-catch from Thondi, southeast cost of India.

Study area

Thondi is a small village situated in the Palk Strait region of Tamil Nadu. The study area lies in the latitude of 9°44' N and longitude of 79°19' E. Thondi coast has a very minimal wave action. Turbidity of the seawater is moderately low and rich in nutrients hence, it serves as a treasure house for valuable marine resources like sea grass, seaweeds and invertebrates like echinoderms, coelenterates and shell fishes. The major occupation of the people is fishing. The present study was carried out at Thondi, South east coast of India (Figure 1).

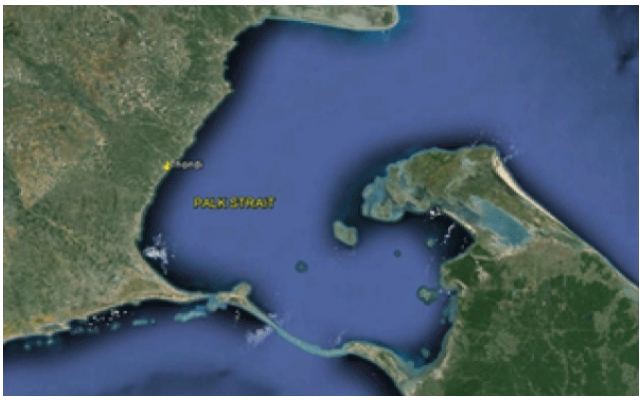

Figure 1: Study area

Materials and Methods

Specimens were collected from Thondi landing centre by standard method. Collected samples were immediately brought to the laboratory, where they were washed with tap water to remove the

adhered mud and other particles. Then it was measured, weighed and the readings were noted. Then the specimens were preserved in 5% formalin for further analysis.

Results

Specimens of *P. regulus* (Figure 2) were collected from Thondi coast. Among 285 collected specimens, one had the abnormal arm numbers (4 arms) (Figure 3 and 4). Immediately measurement was taken for the abnormal starfish. To know the difference, almost same sized animal was also measured with it. Lengths of the arm R (from the mouth center to the tip of arm in mm), r (from mouth center to the end of interradius) and arm breadth br (at the base of arm) of the sea stars were measured using calipers and weight of the specimen was taken by electronic balance (Table 1).

P. regulus	Total length (mm)	Total weight (gm)	A	B	C	D	E	r	br
Normal	14.6	78.4	6.7	6.6	6.7	6.6	6.6	3.2	3.4
Abnormal	14.5	65.3	6.2	6.3	6.2	6.3	-	3.9	4.0

Table 1: Shows the measurements of normal and abnormal starfish

r=measures from mouth center to the end of interradius.

br=arm breadth (at the base of arm)

Figure 2: Shows the normal starfish

Figure 3: Aboral view of 4 armed starfish

Figure 4: Oral view of 4 armed starfish

Discussion

P. regulus is a common sea star found in the sea grass, sandy and muddy intertidal region. The size and weight for the abnormal *A. indicus* was ranged from 35 to 17 mm and 3.0 to 5.0 gm respectively. Sea star *P. regulus* usually follows the rule of pentamerism so the inter-radial region has the L shape in normal animal. Each arm of asteroids was coded according to the Carpenter system i.e., the arm opposite the madreporite is arm A and one counts clockwise in alphabetical order [4,5]. In the case of four armed specimen the interradial region was V shape instead L.

All abnormal specimens did not follow the carpenter system but for the convenience, we recognized the arm C and D where the madreporite exist in-between it and arm opposite to madreporite as arm A. this specimen did not have arm A at its appropriate position and hence it was difficult to recognize its carpenter system. The large number of strictly pentamerous families of starfish support the interpretation that there is "rigid control" of pentamerism, so such

families can generate only five arms, sometimes, the irregular arm number also can be observed.

Hotchkiss reported that the changes of salinity also responsible for sea stars to have four rays [5] and the failure of the 4-rayed starfish to develop fifth rays after metamorphosis is consistent with the "synchronic hypothesis" that the pathway to form the rudiments of the five primary rays operates for only a short time, switches off and does not recur.

There are possibilities for the growth of two arms in the place of loss of single arm [6]. Hyman stated that if an arm is split vertically, a double outgrowth usually results producing a distally forked arm [7].

These abnormalities may also be due to the wound by accident and healing process. These observations on the general pattern of wound healing and morphogenesis of the regenerating sea star arm tend to corroborate those of some earlier workers [8-12] from the reviews and literatures, we deduce that sea star *P. regulus*, belonging to five rayed family Oreasteridae and have only five rays. Abnormal *P. regulus* was observed for the first time by us during the study period in southeast coast of India. Further study is needed to understand the reason behind the abnormality in sea stars.

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References

1. Mah CL, Blake DB (2012) Global diversity and phylogeny of the Asteroidea (Echinodermata). PLoS One 7: e35644.
2. Brusca RC, Wallerstein BR (1979) Zoogeographic patterns of idioteid isopods in the Northeast Pacific, with a review of shallow water zoogeography of the area. Bull. Biol. Soc. Wash. 3: 67-105.
3. Hotchkiss FHC (1979) Case studies in the teratology of starfish. Proceedings of the Academy of Natural Sciences of Philadelphia 131: 139-157.
4. Yamaguchi M (1977) Population structure, spawning, and growth of the coral reef asteroid Linckia laevigata (Linnaeus). Pacific Sci 31: 13-30.
5. Hotchkiss FHC (2000) Inferring the developmental basis of the sea star abnormality "double ambulacral groove" (Echinodermata: Asteroidea). Revista Chilena de Historia Natural Santiago 73: 579- 483.
6. King HD (1900) Further studies on regeneration in Asterias vulgaris. Arch Entw Atech Org 9: 724-737.
7. Hyman LH (1955) Echinodermata the coelomate Bilateria. In: The Invertebrates (4th edn.), McGraw Hill, New York.
8. King HD (1898) Regeneration in Asterias vulgaris. Archiv ffir Entwicklungsmech Organism 7: 351-363.
9. Schapiro J (1914) fiber regeneration phenomena of different types of starfish. Archives fiir development mechanics of organisms 38: 210-250.
10. Nusbaum J, Oxner M (1915) Zur Restitution bei dem Seestern Echinaster sepositus Lam. Zoolog Anz 46: 161-167.
11. Zirpolo G (1921) Ricerche sulla rigenerazione delle braccia di Asterina gibbosa Penn. Publicazioni della Stazione Zoologica di Napoli 3: 93-163.
12. Tartarin A (1953) Observations sur les mutilations, la regeneration, les neoformations, et l'anatomie de Coscinasterias tenuispina Lamarck. Rec. Trav. Sta. Mar. Endoume 10: 1-107.