



# Peculiar Star Fish *Protoreaster linckii* (Echinodermata: Astroidea) from Tuticorin Coastal Water, Gulf of Mannar

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## Abstract

Starfish (*Protoreaster linckii*) was collected from Tuticorin coast. The species generally have 5 arms, but an unusual abnormal sea star, *Protoreaster linckii* was found with 6 arms. Furthermore, its length, weight, and arm's length were also measured and tabulated.

**Keywords:** Gulf of Manner; Sea star; Dorsal view; Irregular shape and arms; *Protoreaster linckii*

## Introduction

Starfish are a group of marine invertebrates that exist in ecosystems with sea grass, coral, rocky substratum, etc., from shallow areas to the deepest regions in the ocean. They typically have a central disc and five arms, though some species have a larger number of arms. The aboral or upper surface may be smooth, granular or spiny, and is covered with overlapping plates. Starfish have tube feet operated by hydraulic system and a mouth at the center of the oral or lower surface. The class Asteroidea is one among the various groups within the phylum Echinodermata, including nearly 1900 extant species grouped into 36 families, and approximately 370 extant genera. Asteroids occur at all depths from the intertidal to the abyssal and are present throughout all over the world's oceans, but are most diverse in the tropical Atlantic and Indo-Pacific regions [1-3].

Starfish are an essential part of marine food chains, eaten as larvae, and becoming voracious predators upon reaching adulthood, with their prey including mollusks and other marine organisms. Echinoderms are the notable sources of bioactive compounds from marine kingdom. They are subdivided in five classes, including *crinoids* (sea lilies and feather stars), *asteroids* (starfishes), *ophiuroids* (brittle stars), *echinoids* (sea urchins and sand dollars) and *holothuroideas* (sea cucumbers). For example, steroidal glycosides are the principal compound present in starfish and are responsible for its general toxicity. Over 500 polyhydroxylated steroid compounds were designated

from different starfish species [4]. These glycosides have many bioactivities like cytotoxic, haemolytic, antimicrobial, expectorant, antitussive, antiasthmatic, analgesic and other activities [5].

The sea star *Protoreaster lincki* has a gorgeous appearance is relatively larger in size and can grow up to 30 cm in total length, with five short triangular arms that have bright red or orange reticulate patterns on their dorsal sides. Starfish have an evolutionary history that spans five hundred million years, beginning in the Cambrian period, wherein the dominate species have always exhibited pentamersal symmetry. Starfish with five arms may evolve to have other number of arms. Above or below the normal arm count is considered as an abnormality. The present study concerns the occurrence of abnormality in *P. linckii* from the catch of Tharuvaikulam, Tuticorin coastal region, Gulf of Mannar, India.

## Materials and methods

### Study area

Starfishes were collected from trawl by catch landing at Tharuvaikulam fishing harbour (Latitude 8o89'N Longitude78o16'E), Gulf of Mannar, in December 2015 (Figure 1). Among the 85 specimens of *Protoreaster linckii* (Figure 2) collected, 84 specimens were found to be normal and only one was abnormal.



Figure 1: Dorsal view of four-armed *Protoreaster linckii*.



Figure 2: Oral view of four-armed *Protoreaster linckii*.

**Specimen collection**

Specimens were collected from Tuticorin landing center by standard method. Collected specimens were brought to the laboratory where they were washed under running tap water to remove the adhered mud and other particles. After remove all the unusual particles, it was measured, weighted and the reading were noted. Then the specimens were preserved in 10 % formalin for further work.

**Taxonomic rank**

Class: Asteroidea  
 Order : Valvatida  
 Family : Oreasteridae  
 Genus : *Protoreaster*

Species : *Protoreaster linckii* (Blainville, 1830)

**Results and Discussion**

Specimens (*Protoreaster linckii*) were collected from Bay of Bengal, Tuticorin coastal region, Tamil Nadu, South India (Figure 1). Among the various specimens collected, one had the abnormal arm numbers (6 arms) (Figure 2). The collected abnormal specimens (starfish) were measured and values were tabulated. The abnormal starfish was very different in length and size. Lengths of the arm R (from the mouth center to the tip of arm in mm), r (from mouth center to the end of inter radius) and arm breadth b (at the base of arm) of the sea stars were measured using calipers and weight of the specimen was measured by electronic machine (Tables 1 & 2). Echinoderms are efficient scavengers within their respective marine ecosystems and it plays an important role in maintaining the marine ecological functions in the sea.

**Table 1:** Normal and abnormal development of red knobbed star fish (Length of arm).

<i>Protoreaster linckii</i>	Total weight (g)	Total length (cm)	R (mm)					
			A	B	C	D	E	F
Normal	89.3	13.4	8.1	8.2	8.0	8.1	8.2	-
Abnormal	85.8	12.1	6.5	6.7	6.6	6.5	4.9	2.6

**Table 2:** Normal and abnormal development of red knobbed star fish (Arm breadth).

<i>Protoreaster linckii</i>	Total weight (g)	Total length (cm)	Br (mm)					
			A	B	C	D	E	F
Normal	89.3	13.4	2.2	2.4	2.4	2.3	2.4	-
Abnormal	85.8	12.1	2.1	2.2	1.7	2.0	1.5	1.6

The control of ray number is very precise in five-rayed species. Four or three arms formed during the metamorphosis is the result of teratological incomplete development, which is generally consistent with the observations on *Echinaster spinulosus* [6,7]. The present evidence points that ray number abnormalities in asteroids can be caused by high salinity during early development. The six and four armed starfish *A. indicus*,

*P.mamailatus* and *L. Multifora* were observed from Gulf of Mannar region [8]. Hence, further studies are needed to understand the reasons for causing abnormality and genetic diversity between normal and abnormal sea star. Similar to these cases is the occurrence of abnormal four-armed red-knobbed starfish *Protoreaster linckii* (Echinodermata: Asteroidea), Tuticorin coast, south-east coast of India [9].

It has been previously reported about the occurrence of abnormal starfish *Astropecten indicus* (Echinodermata: Astroidea) along Southeast coast of India [10]. Recent observations of the abnormal development of some star fish from Gulf of Mannar suggest that deviations from pentamerism are not a heritable character but are a consequence of environmental perturbations on the metamorphosis of larvae and/or abnormal regeneration of arms [11]. The possibility of the over exploitation of this species, along with its habitat destruction by coral mining, warrants the initiation of conservation and also the necessity to study its impacts on the ecosystem. The present report describes abnormality in this species that was observed for the first time on the Indian coast.

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