ON *PSAMMOTHURIA GANAPATII* N. GEN. N. SP.,
AN INTERSTITIAL HOLOTHURIAN FROM THE
BEACH SANDS OF WALTAIR COAST AND
ITS AUTECOLOGY

BY G. CHANDRASEKHARA RAO*

(Department of Zoology, Andhra University, Waltair)

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**ABSTRACT**

The present paper deals with the description of a new interstitial holothurian, *Psammothuria ganapatii* n. gen. n. sp., collected from intertidal sands on the Waltair coast. The form differs markedly in structure from the hitherto known species. Preliminary observations on the autecology of the species such as its adaptation to the biotic and climatic factors of the environment, method of locomotion, feeding, etc., are given.

**INTRODUCTION**

AMONG echinoderms *Leptosynapta minuta* Becher (1906) is the only holothurian known to inhabit the interstitial environment. In the course of an investigation of interstitial fauna in the beach sands of Waltair coast during the years 1960–63, the author collected a few specimens of a tiny holothurian belonging to the family Synaptidae. The form differs markedly from the hitherto known species of the family Synaptidae in the number and structure of buccal tentacles. The structure of the dermal spicules is also peculiar. Hence it is described here as new to science.

The holothurians were collected by washing sand-samples with seawater with the addition of a few drops of concentrated magnesium chloride solution to counteract their thigmotactic activity. The forms were best observed in living condition. They were fixed in Bouin’s fluid and

* Present Address: Zoological Survey of India, 8, Lindsay Street, Calcutta-16.
preserved in 5% formalin containing 2% glycerine. The dermal spicules were lost in fixed specimens due to dissolution.

Genus: *Psammothuria* n. gen.

Type species: *Psammothuria ganapatii* n. sp.

This monotypic genus is characterised by the presence of eight buccal tentacles which are terminally bifurcated. Endoskeleton consists of calcareous spicules loosely embedded in the body-wall. The spicules are of two kinds, *viz.*, the C-shaped spicules distributed all over the trunk region and the bow-shaped spicules restricted to the tentacles.

*Psammothuria ganapatii* n. gen. n. sp. (Figs. 1–6)

*Description.*—Body cylindrical and vermiform, showing distinction into a dorsal and a ventral surface and with both ends slightly swollen. Body-column attains a length of 2.5–4.0 mm depending on the state of contraction and a maximum diameter of 0.5–0.6 mm. Body-wall is thin, smooth and transparent with pink spots all over the body, the ventral surface being slightly lighter in pigmentation.

Mouth is slightly oval in outline, encircled by a thin buccal membrane and somewhat disposed towards the ventral surface on the anterior extremity. Surrounding the mouth is a whorl of 8 buccal tentacles, equal in size and terminally bifurcated. The tentacles are dorsal and lateral in their disposition, leaving a gap on the ventromedian part of the oral hood. They attain a length of 0.4-0.6 mm. depending on the state of contraction and can partly be retracted into the mouth. Numerous minute elevations with ciliated pits occur on the inner surface of the tentacles which are adhesive in function.

The endoskeleton consists of two types of loosely scattered calcareous spicules with smooth surfaces and completely embedded in the body-wall. On the trunk region occur C-shaped spicules 110-130 μ long with a swollen proximal head end and a curved and narrower distal part with truncate tip. The bulk of these spicules are congregated posteriorly while the remaining are sparsely distributed over the rest of the body. The tentacles contain numerous bow-shaped spicules 70-90 μ long with a broad middle part and slightly tapering ends. These spicules are closely disposed and the majority of them are concentrated over the bifurcated parts of the tentacles. The calcareous ring encircling the oesophagus is not well-developed. It consists of 10 similar narrow and rectangular pieces which are contiguous.

The watervascular system consists of a ring canal encircling the buccal cavity and tentacular canals radiating from the ring canal. There is a single mid-dorsal polian vesicle which is stalked and pear-shaped (65 × 40 μ in size). A short stone canal is present lying in the dorsal mesentery. A madreporite is not conspicuous and the stone canal ends blindly in the body-cavity.

The alimentary canal is straight, consisting of mouth, buccal cavity, oesophagus and stomach followed by a long intestine terminating into anus at the posterior extremity. The stomach is not well set-off. A pair of fusiform glands of unknown function open into the oesophagus.

Five pairs of oval statocysts occur in a circle on the tentacular collar, each, statocyst enclosing a solitary statolith.

The gonads consisting of two small unbranched massive structures with short gonoducts are located on the anterior part of coelom, one on either side of dorsal mesentery. The method of reproduction is not known.

Remarks.—In the structure of buccal tentacles and dermal spicules, the present form fails to fit into any known genera of the family Synaptidae for
which reason it is assigned to a new genus. Among the genera of Synapta-
idae, *Psammothuria* n. gen. approaches *Rhabdomolgus* Keferstein in the
structure of the tentacles, but differs from it in the other detailed features of
organization. The new species approaches *Leptosynapta minuta* Becher
(1906) in morphological similarity and *Rhabdomolgus ruber* Keferstein
(1863) in the disposition of tentacles, statocysts and calcareous ring.

Material.—Seven specimens were collected by the author on 21-4-1962
from the washings of intertidal sand taken near half-tide level, Lawson's
Bay, Waltair, India.

Holotype has been deposited in the Museum of the Department of
Zoology, Andhra University, Waltair. Paratypes are in author's personal
collection.

The author has great pleasure in naming the new species in honour of
Prof. P. N. Ganapati, Head of the Department of Zoology, Andhra
University, Waltair, under whose valuable guidance and help the studies on
marine interstitial fauna were carried out.

Autecology.—The holothurians were collected in coarse and medium
sands mixed with a little detritus and fine shell gravel, at a depth of 15 cm.
below surface between low and half-tide levels of the intertidal. The
texture of the sands varied between 300 and 600 μ in mean diameter. The
temperature in the habitat varied from 24° C. to 30° C. The salinity of
interstitial water ranged between 20 and 33‰ while the dissolved oxygen
content measured 3-4 ml./l. The pH value of capillary water did not vary
much from that of the adjacent sea-water. The data indicate that the
species is able to withstand a fairly wide range of environmental variation.

The shape of body, method of locomotion, adhesive ability, static
organs, etc., are well adapted to life in the interstitial environment. The
vermiform and contractile body enables the animal to progress through
interstices in any direction with considerable ease. The holothurian moves
about very slowly on its ventral side with the contraction and expansion of
body and aided by the adhesive buccal tentacles. First the oral end is fully
extended when the tentacles gain a hold on the substratum and then the
trunk is drawn forward by longitudinal contraction. The progression some-
what resembles the looping motion in *Hydra*.

Correlated with the mode of life in the habitat, the holothurian exhibits
a positive thigmotaxis over its entire body surface, although the power of
adhesion is mainly confined to the tentacles. The intensive disposition of spicules and the consequent strengthening of the extreme parts of the body appears to be related with life in an environment subjected to constant dislocation of sand particles by wave action and against any damage likely to occur when the animal burrows between sand particles. The statocysts appear to act as effective geo-receptors for the movement of the animal in different directions.

The holothurian is omnivorous in diet ingesting quantities of detritus mixed with living and dead organic matter as it advances through the substratum. Fine particles of sand and dead remains of nematodes and copepods were found in the digestive tract of a single specimen.

In behaviour, the species is slow in movement and reactive to tactile, vibratile and photic stimuli. Due to any commotion in the habitat, the body-column is contracted and the animal firmly adheres to the substratum by the adhesive tentacles. Just as the majority of other interstitial species, the holothurian also exhibits a negative phototaxy and gradually moves away from areas of light intensity to shade. This response probably keeps the animal always at a depth from surface and avoids its exposure to wave action and getting washed into the sea. During the course of investigation, the holothurians were collected only from a single spot on the beach suggesting their gregarious habit, a feature frequently met with in other interstitial animals.

Other interstitial forms collected in the same biotope along with the holothurian are the following: the hydrozoan coelenterate Halammohydra octopodides Remane, the turbellarian Otoplana sp., the nematodes Anticoma arctica Steiner, Halalaimus longicollis Allgen, Dasynemella sp., Halichoanolaimus robustus (Bastian), Rhinema exquisita Timm, Rhynochonema cinctum Cobb and Theristus sp., the gastrotrichs Xenotrichula velox Remane and Tetranchyroderma sp., the archannelids Protodrilus indicus Aiyar and Alikunhi and Saccocirrus minor Aiyar and Alikunhi, the polychaete Petitia amphophthalma Siewing, the ostracod Xestoleberis sp., the copepods Arenopontia subterranea Kunz, Arenosetella sp., and Paramesochra wilsoni Krishnaswamy, the isopod Microcerberus predatoris (Gnanamuthu) and the acarine Copidognathus sp.

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