

## SOME OBSERVATIONS ON THE BIOLOGY OF THE HOLOTHURIAN *HOLOTHURIA (METRIATYLA) SCABRA* (JAEGER)

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### ABSTRACT

Some aspects on the biology of commercially most important holothurian *Holothuria (Metriatyla) scabra* are presented. It subsists on the organic matter present in the mud or sand. An analysis of gut content revealed fine mud (75-125  $\mu$ ), sand particles (250-500  $\mu$ ), molluscan shells, debris and bits of algae. This species spawns in June and October. By external examination and by taking sections of the gonads, five maturity stages such as immature, maturing, early mature, late mature and spent have been fixed. The characteristics of different stages of maturity are presented in detail.

### INTRODUCTION

Information on the biology of holothurians is limited. This is particularly so concerning the Indian holothurians. Despite its economic importance, *Holothuria scabra* did not receive much attention, this is rather surprising. From India, some work has been done on the *Holothuria scabra* by Krishnaswamy and Krishnan (1967, 1970 a, 1970 b); Krishnan (1968) and Mary Bai (1971, 1978, 1980). Recently James *et al.* (1988) described induced spawning and rearing of the holothurian from Tuticorin.

Mortensen (1937) reported on the spawning of *H. scabra* on the Egyptian Coast of the Red Sea between April and June 1936. Hardy and Cowan (1980) reported the pearl-fish *Encheliophis vumricularis* from *H. scabra*.

Chopra (1932) and James and Mahadevan (1966) reported a pea-crab from *H. scabra*. James (1976) described an early juvenile of *H. scabra* from Palk Bay.

Since the information on the biology of the most important holothurian *H. scabra* is very scanty, this work was taken up to fill up the gaps in the knowledge of its life history.

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### MATERIALS AND METHODS

For the study of biology regular samples were collected from Tuticorin and Kilakarai in the Gulf of Mannar and from Tirupalakkudi and Rameswaram in Palk Bay. Samples were transported to laboratory. After recording length and weight, specimens were dissected; gut and gonads were carefully taken out for examination.

For gut content analysis, guts were preserved in 1% formalin. Gut contents were carefully removed and dried in oven at 65°C for 24 hrs. Gut contents were segregated into different size grades by passing through standard sieves of 90, 125, 250, 500, 700, 1003 and 1630  $\mu$  sizes. Each fraction was weighed and expressed as percent of total gut content weight. The amount of total organic carbon in the gut contents were estimated (Walkey and Black, 1932).

To determine the size frequency of *H. scabra*, the body length of each individuals was measured to the nearest 5 mm dorsally from mouth to anus by means of flexible tap allowing

## RESULTS AND DISCUSSION

### Food and feeding habits

The holothurian takes fine particles of sand and mud into their mouth by means of tentacles.

TABLE 1. *Maturity stages in Holothuria (Metriatyla) scabra (Jaeger)*

Maturity stages	Macroscopic feature	Microscopic feature
Undetermined sex		
I Immature	Single tuft of tubules, tubules short.	Sex indistinguishable.
II Maturing	Gonadial tubules elongated partly, yellow in colour.	Germinal cells are seen.
III Early Mature		
Male	Gonadial tubules large, yellow in colour, branched having small round saccules.	Some spermatozoa can be seen from a portion of the tubule.
Female	Gonadial tubules yellowish red, branched with round saccules.	Oocytes are growing and without modal size (Dia. 120 $\mu$ ).
IV Late Mature		
Male	Gonadial tubules long, pale yellow, having 2-3 ancillary branches, saccules more elongated.	Numerous spermatozoa are found, yellow in colour.
Female	Tubules pale red, elongated with swollen round saccules, having 2-3 ancillary branches.	Oocytes are polymodal in shape (Dia. 120-165 $\mu$ ).
V Spent		
Male	Number of tubules decreasing; tubules shortening pale yellow in colour.	Yellow coloured spermatozoa are present.
Female	Gonadial tubules shorter and wider, pale red in colour.	Few oocytes of dark yellow coloured cells (Dia. 152-197 $\mu$ ).

the animal to relax and resume its normal condition, and total weight to the nearest 5 g. The length of the holothurian was measured from the commercial landing centres, when the individuals are in turgid condition and the eviscerated individuals were eliminated. Nearly 1200 individuals of different sizes were measured.

For reproductive biology, the gonads were carefully removed, weighed and examined macroscopically. Sex was determined by microscopic examination, a part of gonad was fixed in 10% NBF for histological studies. In female, oocyte diameter were measured by using ocular micrometer.

In the case of *H. scabra*, the gut contents were analysed and observed mud, sand, shell debris, molluscan shells, bivalves and algae. The percentage of occurrence of different particles were sieved, weighed (Fig. 1). From this it is clear that the percentage of individuals feeding muddy particles were 9.07% in 90  $\mu$ ; 15.48% in 125  $\mu$ ; 42.08% in 250  $\mu$ ; 8.86% in 500  $\mu$ ; 14.15% in 710  $\mu$ ; 6.16% in 1003  $\mu$  and 4.2% in 1680  $\mu$ .

*H. scabra* takes muddy particles mostly with particle size of 125-250  $\mu$ . This shows that *H. scabra* prefers muddy substratum than the sandy bottom. The amount of organic matter estimated from the different regions of the gut viz. oesophagus, stomach and intestine are 2.06%; 2.26% and 1.7% respectively. This shows

that absorption takes place more in the stomach region than in the intestine. Tokuhica (1915) commented that the holothurian extract organic matter out of sand or mud taken together. Clark (1954) also noted that holothurian and the bottom animals generally extract organic matter out of sand or mud which pass through their intestine. *H. scabra* is not a continuous feeder, the oesophagus and stomach remains empty in most of the individuals, but the intestine is filled with sand or mud particles.

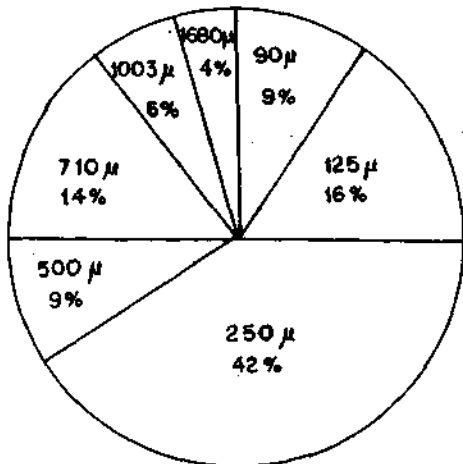


FIG. 1. Distribution (%) of particle size (μ) in the gut content of *Holothuria scabra*.

**Size frequency distribution**

The size frequency distribution for *H. scabra* shows a single mode (Fig. 2 a). The smallest individuals recorded was 90 mm long and the largest was 370 mm with an average 230 mm. Conand (1981) has observed similar

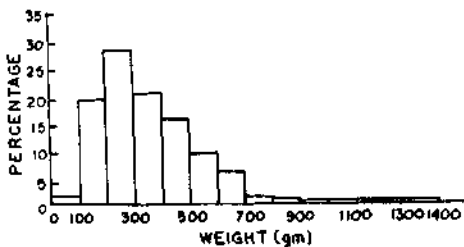


FIG. 2 a. Length frequency distribution of *Holothuria scabra*.

unimodal in the *Thelenota ananas* and *Microthele fuscogilva* and they reveal the phenomenon of 'one class in a locality' (Bakus, 1973). Tyler et al. (1987) have recorded the same structure in *Cherbonniera utriculus*.

The total weight of *H. scabra* ranged from 100 to 1400 g (Fig. 2 b). The weight depends on the amount of coelomic water and sediment in the alimentary canal.

**Reproductive biology**

**Gonads :** Gonads are yellow in colour, composed of single tuft of tubules, each of which generally has 2 to 3 branches attached to the left side of the dorsal mesentery. From this gonoduct proceeds anteriorly along the mesentery and opens externally on the mid-dorsal line.

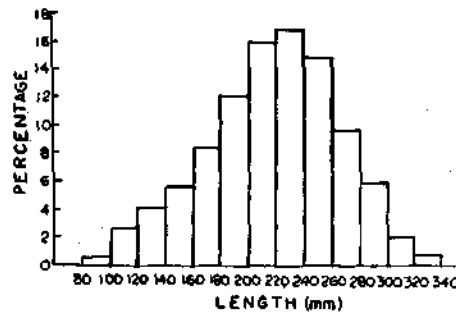


FIG. 2 b. Weight frequency distribution of *Holothuria scabra*.

**Maturity stages :** Five stages of maturity are recognised and they are presented in Table 1 and illustrated in Fig. 3. Stage I & II comprise

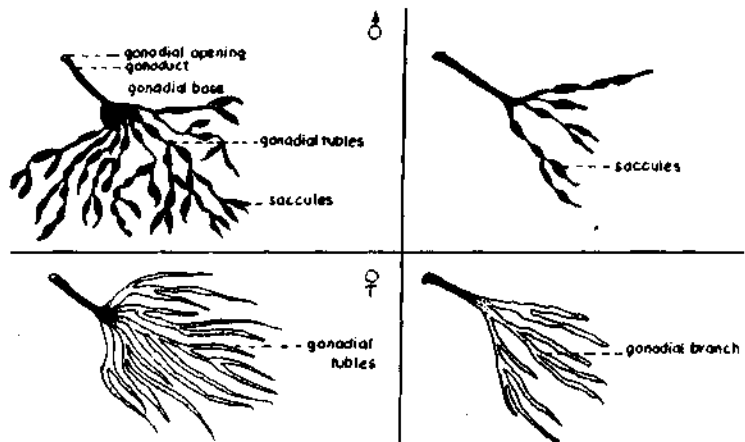


FIG. 3. Gonad structure of *Holothuria scabra*.

individuals of undetermined sex. Stage I corresponding to immature individuals and stage II to the maturing ones. Stage III corresponds to the early mature; the sexes can

therefore be distinguished by a microscopic examination. Stage IV becomes evident by the increased volume of the gonads and includes late mature. Stage V is the spent and the residual riped oocytes or spermatozoa may be observed.

The gonadial tubules are shorter and wider in females, whereas in males the tubules are longer having succules.

Tanaka (1958) who has studied the changes

in the maturity stages of *Stichopus japonicus*, observed five stages such as resting, recovery, growing, mature and shedding stage. Conand (1981, 1982) observed five stages in *Thelenota ananas*, *Microthele nobilis*, *M. fuscogilva* and *Actinopyga echinites* and described the stages such as immature, resting, growing, mature and post-spawning. Krishnamurthy and Krishnan (1967) have given an account of the reproductive cycle. Fish (1967) and Rutherford (1973) have also recorded five stages.

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