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40. CYCLIC ACTIVITY IN THE DIGESTIVE DIVERTICULA OF *SUNETTA SCRIPT A* IN ACCORDANCE WITH TIDES

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ABSTRACT

Feeding and digestion in bivalves are considered to be continous and simulatnsous. The tide influenced physiological changes in the digestive diverticula of *Sunetta scripts* on the basis of histological observation was studied. The shape of the disgestlve diverticula changes in accordanca with the tidal level. The niaximum pH value in the mantle cavity was recorded at high tide (7.46) when the animal was covered by the almost static tidal water, the constancy in the pH of the mantle cavity was due to the renewal of the water in the mantle cavity. At lowtida the pH gradually comes down to 6.87 du* to the exposure of the animal and the subsequent non-renewal of water in the mantle cavity.

INTRODUCTION

The effect of tidal cycle on the physiological state of the digestive diverticula of the bivalve molluscs is known since the work of Yonge (1926a). Though the overall function of digestive diverticula of bivalves remains a matter of controversy, this organ has been the subject of investigation for over 100 years. Feeding and digestion processes in bivalves are considered to be continuous and simultaneous (Yonge 1923. 1926 a, b; Owen 1966; Purchon 1968). Mansour (1946) and Mansour gek (1946) described the possibility of intracellular digestion in the lamellibranchs.

The rhythmic activity of the digestive diverticula in different bivalves has been studied by different authors. Some important works are by Morton (1956, 1969, 1970a, d, 1971, 1977), McQuiston (1969) and Langton and Gabbot (1974).

Perusal of the literature clearly shows that the information on the influence of tidal cycle on the function of digestive diverticula of bivalves is very meagre except a few like Shahul Hameed (1984) in *Crassostrea madrasensis* and *Anadara rhombea.* The present attempt is aimed at studying the tide influenced physiological changes in the digestive diverticula of *Sunetta scripta* on the basis of histological observations.

MATERIAL AND METHODS

The specimens of S. ^Crz/J^a were collected at the intertidal region near the mouth of Vellar estuary. The collections were carried out at **an hourly interval starting from low tide to** low tide extending over a period of 12 h. For every hour two specimens were collected. Immediately the pH of the mantle cavity was measured by using a BIOCHEM pm 79 model pH meter. Then digestive diverticula was dissected out and fixed in Aqueous Bouin's solution. The materials were brought to the laboratory and embedded in paraffin wax. 8-10(i sections were taken and stained in Delafield Haematokylin with Eosin as a coun-.g^g. jj^

RESULTS AND DISCUSSION

The maximum pH value (7.46) was recorded at hightide when the animal was covered by the almost static tidal water; the constancy in the pH of the mantle cavity was due to the renewal of the water in the mantle cavity. Similar observation was also reported by Morton (1970a) in C.erfu/a. At lowtide the pH gradually comes down to 6.87 due to the exposure of the animal and the subsequent non-renewal of water in the mantle cavity (Fig 1).

^ During lowtide the water in the mantle cavity is not replenished and the metabolic activity depletes the Oj and increases the CO2 level. As a result the pH value of this non-replenished water falls down. This phenomenon was also observed by Morton (1970a) in *C. edula.* Proceeding hightide replenishes the water due to which the PH increases again.

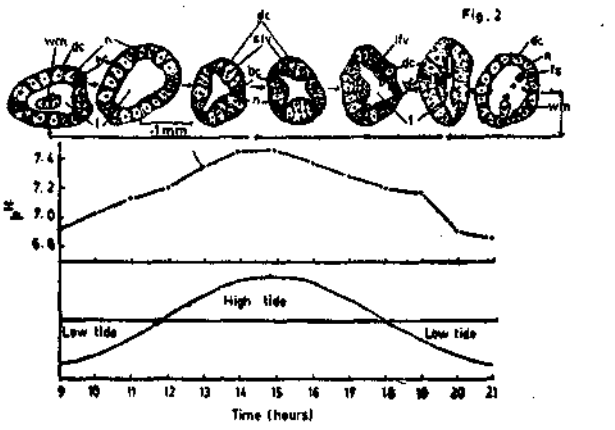

Fig. 1 Below: Mantle cavity pH in accordance with tidas. Above: Showing tha different siagss.of the d ge.tivediverticula; be — basiphii ceiis; do—digestiva cells fs-fr.gm.ntation spherule.; i-ium.n **lfv — large food vacuoles; n — nucleus; sfv-sm.ll food vacuoles; wm - waste material.**

Inspection of sectioned digestive diverticula of *S. scripta ftxed* at hourly intervals over the tidal cycle revealed that the structure of the tubule underwent rhythmic histological changes in accordance with the state of the tide,

Just before the hightide, the cells of digestive tubules were flattened (Fig 1). It showed two types of cells (a) the digestive cells; (b) the basophil cells (Sumner 1966a) or 'Young cells' (Yonge 1926) The. basophil cells stained much darker than the digestive cells; nuclei were located basally in the digestive cell and the lumen ^f the tubule was large. During hightide the digestive cells became swollen slightly and were ^^^^ cuboidal (or) columnar in form due to the absorption of food material arriving in the lumen ^f ^^^^ diverticula from the stomach (absorptive pj^gse). The number of nuclei in the 'nest of young cells' increased apparently. After hightide the lumen of the tubule reduced and the food materials were readily observed in vacuoles of the digestive cells Shahul Hameed 1984).

^^ lowtide the tubules were different in condition and the bulges at the base of the digestive cells projected into the haemocoel due ^o the breakdown of food materials in the digestive cells. The distal surface of the degistive cells became swollen and was loaded with indigestable wastes called

fragementation spherules. It has been reported by Morton {1969b) in *Dreissena* that the distal portion perhaps produce a fragmentation spherules and the proximal portion passes these into the haemocoel with food and waste materials.

At a later stage spherules were being budded off from the distal surfaces of the digestive cells in this case the nests of young cells had apparently oriented towards the lumen of the tubules. As a result the length of the digestive cells was mostly reduced and the orientation towards the lumen of the tubule was lost. Approximately 4 h after lowtide the digestive cells are reduced in length as well as in number and only few nuclei were seen. The basiphill cells could not be distinguished from digestive cells. The lubules were in the disintegration phase. Just before the high tide the tubules showed significant increase in the size and number of the digestive cells. The basiphil cells were recognisable in small groups with a few cells (regenerative phase).

The structure of the tubules essentially similar to that described in the early hjgh tide of the previous tidal cycle indicating the cyclic nature of the events.

In S. *scripta* the tidal cycle is related with the activity of digestive diverticula. Morton (1969a) opined that the animal when submerged by the tide the food is absorbed in the digestive diverticula during hightide and intracellular digestion takes place within the digestive cells.

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