

Histological studies on tissues of marine clam *Donax variabilis* collected from Porayar Coastal area, Nagapattinam District Tamil Nadu India

¹M. Thilagavathi*, and ²Dr. A. Christy Ponni

1. Research scholar P.G and Research Department of Zoology, TBML College, Porayar - 609 307, Tamil Nadu, India.
2. Head of the Department P.G and Research Department of Zoology, TBML College, Porayar - 609 307, Tamil Nadu, India.

ABSTRACT : *Donax variabilis* is a species of small edible saltwater clam in Tamil Nadu coastal region having good nutritional values. In the present study, the histological investigation of the different tissues (Mantle, gill, liver, heart and intestine) of *Donax variabilis* collected from Porayar coastal area, Nagapattinam District, Tamil Nadu India. Present work was carried out histological observation in the different tissues of marine clam *Donax variabilis* in mantle, gill, liver, heart and intestine.

Index Terms : Histology, *Donax variabilis*, Mantle, Gill, Liver, Heart and intestine.

I. INTRODUCTION

The techniques of specimen fixation, though simple in nature, are of the utmost importance in the preparation of meaningful microscopic slides. In the present study histological organization of the selected tissues of *Donax variabilis* were made for a better understanding of different organs like mantle, gill, liver, heart and intestine. Histology is that branch of anatomy that studies tissues of animals and plants. In its broader facet, the word microscopic anatomy is employed as if it were a equivalent word for anatomy, as a result of its subject material encompasses not solely the microscopic structure of tissues however conjointly that of the cell, organs, and organ systems. Inadequate or improper fixation, if not recognized as such, can often lead to misinterpretation of the sectioned material. The relatively impervious chitinous exoskeleton of shrimp does not allow for adequate fixative penetration by simple immersion, except in larvae and early post larvae. Also, certain shrimp tissues autolysis more rapidly than comparable tissue types in other animals. Hence, it is imperative that immersion within a fixative be immediately preceded by injection of the fixative into vital areas. The timing of fixation is of equal importance. Specimens should be fixed immediately following removal from the water. Additional care

should be exercised to limit the amount of handling stress that each specimen is subjected to prior to fixation. Stress mediated histopathology, due to excessive handling; hypoxia, etc. could be misinterpreted as being the state of the animal in its normal environment. Brusa¹ described *Paravortex panoepa* Brusa, (Grafillidae), a turbellarian species inhabiting the intestine lumen. Nevertheless, up to now, no study regarding the health status of *Donax variabilis* from a histological point of view has been carried out.

II. MATERIALS AND METHODS

For histological studies 20 specimens *Donax variabilis* collected from Nagapattinam marine South east coast of Tamil Nadu and were brought to the laboratory in large plastic troughs and acclimatized for one week. Healthy, *Donax variabilis* were sacrificed in the tissues of mantle, liver, gill, heart and intestine tissues were dissected, removed and fixed in 10% formalin on the spot. After 24 hours the fixed tissues were taken for histological technique followed by². For histological analysis section were cut at 5-6µm thickness and stained with Haematoxylin and Eosin. After stained the slides were examined under light microscope and photographed (Labomed).

III. RESULTS

Histology is that branch of anatomy that studies tissues of animals and plants. This textbook, however, discusses only animal, and more specifically human, tissues. In its broader aspect, the word histology is used as if it were a synonym for microscopic anatomy, because its subject matter encompasses not only the microscopic structure of tissues but also that of the cell, organs, and organ systems. The body is composed of cells, intercellular matrix, and a fluid substance, extracellular fluid (tissue fluid), which bathes these components. Extracellular fluid, which is derived from plasma of blood, carries nutrients, oxygen, and signaling molecules to cells of the body. Conversely, signaling molecules, waste products, and carbon dioxide released by cells of the body reach blood and lymph vessels by way of the extracellular fluid. Extracellular fluid and much of the intercellular matrix are not visible in routine histological preparations, yet their invisible presence must be appreciated by the student of histology.

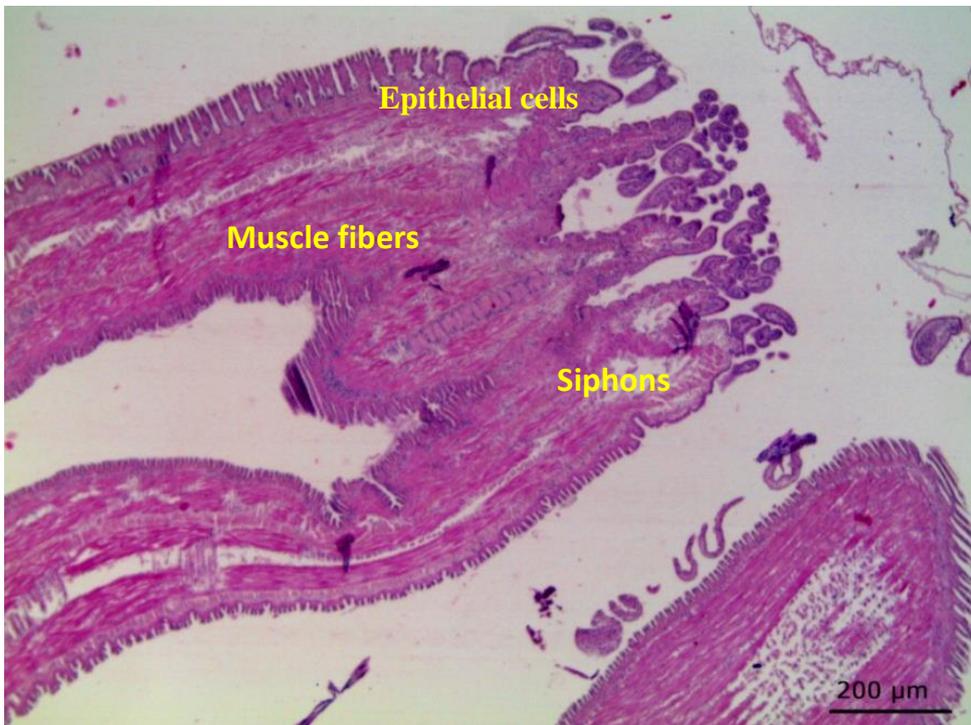


Figure 1. Structure of mantle in the marine *Donax variabilis*



Figure 2. Structure of the gill tissue in the marine *Donax variabilis*

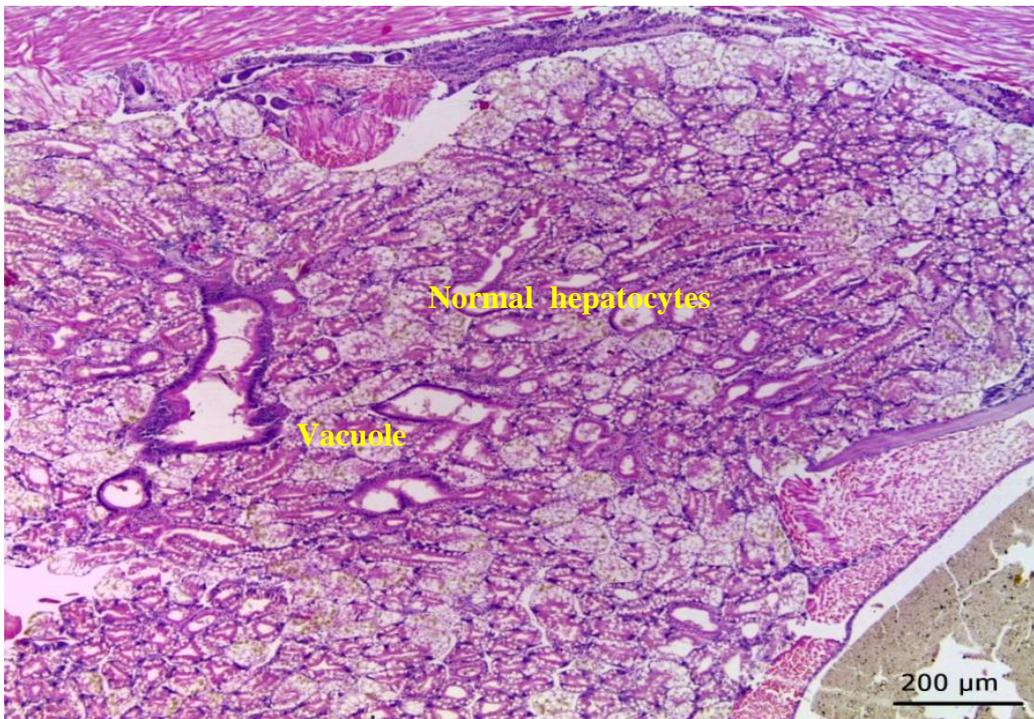


Figure 3. Structure of Liver (Hepato pancreas) tissue in the marine *Donax variabilis*

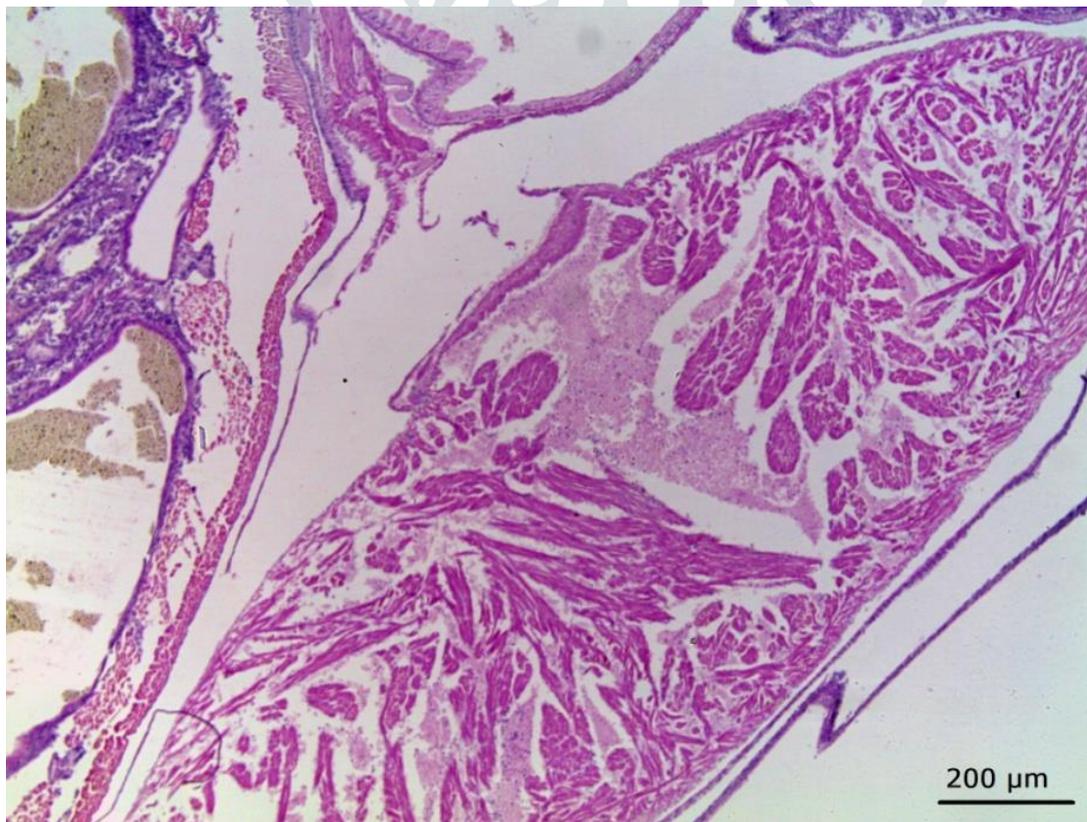


Figure 4. Structure of Foot tissue in the marine *Donax variabilis*.

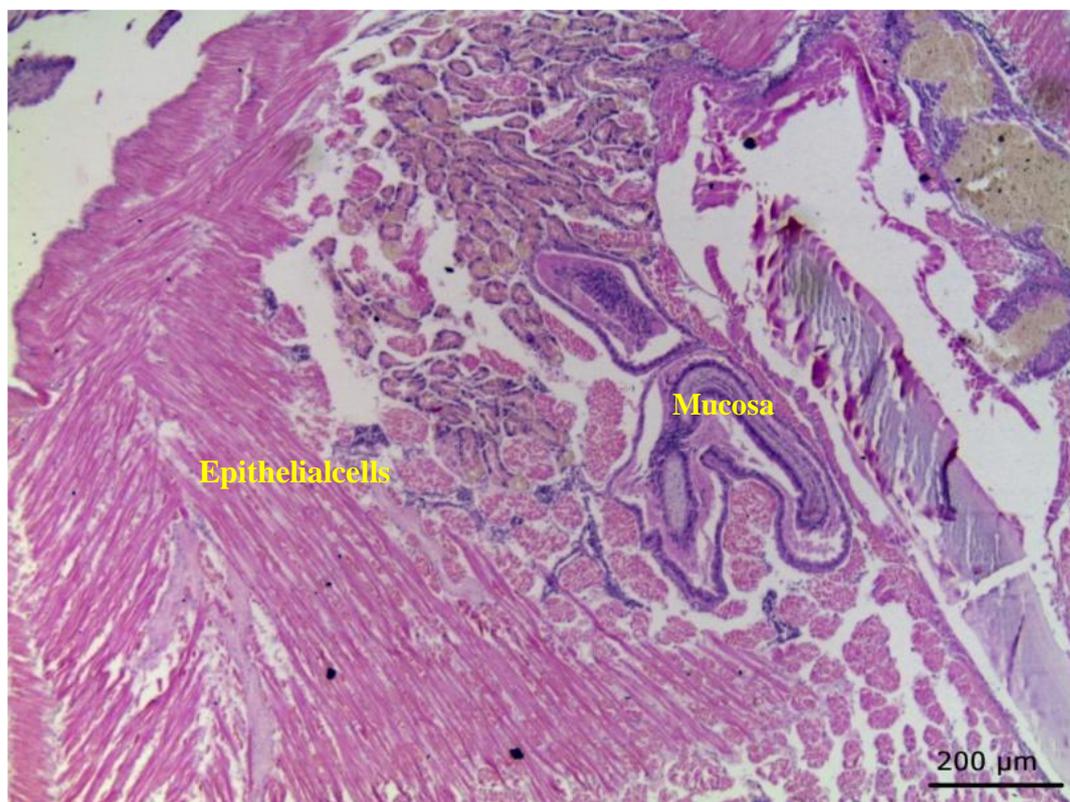


Figure 5. Structure of intestine tissue in the marine *Donax variabilis*

Mantle:

The mantle is composed mainly of a muscular and connective tissue network which encloses numerous haemolymph sinuses. The muscle bundles or the retractor muscle of the siphonal mantle and its lobes. Each cell contains a dark granular nucleus, a round, pink pyrenoid surrounded by a clear zone and a yellow orange accumulation body. Numerous iridophores are adjacent to the tubular structures containing the zooxanthellae in the upper regions of the mantle. They may be present in all three folds of young clams the inner fold also contains hyaline organs or eyes.

Gill:

In addition to the function of gas exchange during respiration, the gills also trap and transport food particles to the labial palps. A portion of the inner fold of the gill extends towards the mouth between each pair of palps. The gill of adult *Donax* clams differs from the gills of juvenile *Donax* clams and of other local clam species by being a more robust muscular organ with thicker more closely adjoining filaments. A portion of the inner fold of the gill extends towards the mouth between each pair of palps. The gill of adult *Donax* clams differs from the gills of juvenile *Donax* clams and of other local clam species by being a more robust muscular organ with thicker more closely adjoining filaments.

Liver:

Histological studies of liver contain hepatocytic cells, lipid droplets and glycogen granules. They consists of liver capillaries and secondary lysosomes are observed.

Heart :

The muscle bundles of the ventricle are much thicker than those of the auricles externally the ventricle is covered with cuboidal like epithelium flap valves are present between the auricles and the ventricle between the ventricle and the recurrent pericardial artery and nerve fibres are also present the internal surface of the pericardium is lined with on epithelium which is either cuboidal like or has flattened cytoplasm and prominent nuclei.

Intestine:

In the present study, Porospora-like gregarines seemed to have high specificity for the site of infection, since they occurred only in the connective tissue of the mantle.

IV. DISCUSSION

In filter feeding bivalves, the gill is involved in food sorting and respiration³. In a normal clam during feeding, the lateral cilia beat inwards in the beginning and draw water into the inhalent siphon and this water enters the vertical water tubes through the ostia. The structure and ciliary activities of gills, of the family Veneridae in general have been described by Ansell⁴. When the water is relatively clean, the gills are expanded and the upward-moving tracts are largely in operation. When there is lot of turbidity or suspended particles in the water, the gills are stimulated to contract, placing the principal filament (filament that lies between the folds) deep within folds⁵. The role of the ciliates is controversial, since they are common inhabitants of the bivalve gills^{6&7}.

In the present study, gravid specimens of *Donax variabilis* were found occupying a great part of the transverse section of the intestinal lumen with no evidence of direct physical damage. Its presence seemed to play a detrimental effect evidenced in the lower condition index of the infected *Donax*. Moreover, histology underestimates the actual number of turbellarians in a host because only a section of the intestinal tract is inspected. Therefore, the prevalence and mean intensities of infection observed in the

present study by histology were probably low, making the true values likely higher than those reported here. In similar study liver, muscle, testis and gonad were reported^{8&9}.

Turbellarians of the genus *Paravortex* are commonly reported obstructing the intestinal lumen, however without causing severe effects in bivalves^{10&11}. This effect could be due to direct feeding on the intestinal tissue or host's ingesta by the turbellarians^{12&13} pointed out that two entosymbiotic species of *Paravortex* migrate from the host's intestine (*P. scrobiculariae*) or stomach (*P. cardii*) into the digestive gland of the host, where they ingest the partly digested food of the host and some of the heterolysosomes being discharged from disintegrating cells in the digestive gland. In the present study, the cellular organization of body parts of *Donax Variabilis*, proves the same type of functional significance as encountered in other bivalves.

V. CONCLUSION

Histology is a fundamental subject to understand the functioning of the different organs and systems. It is, therefore, the essential basis for the study of physiology. Histological analysis of the gill, liver, Intestine and heart shows the cellular organization of body parts of *Donax variabilis*, proves the same type of functional significance as encountered in other bivalves.

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