

GILL HISTOLOGY OF *PATELLA* LINNEAUS, 1758 (MOLLUSCA: GASTROPODA)

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Abstract

The gill structure was studied in representative species of genus *Patella*, using histology. Secondary gill consisted a single layer of wavy lamellae covered with cuboidal end interspersed columnar epithelium. Hemocytes and nephrocytes were commonly observed. This normal morphological characteristics are to be a reference point for further research in natural and aquacultured specimens of this genus.

Keywords : *Mollusca, Gastropods, Rocky Shores.*

Introduction - Genus *Patella*, known as limpet, is a widespread gastropod on the rocky shores and is characterized by a cone-shaped shell. These organisms become more important as serving an alternative food with increasing human populations in the world. The respiration in gastropods is generally achieved by gills located within the mantle cavity and regarded as a pallial organ [1]. In the *Patellidae*, however, the respiratory organ have lost ctenidial structure and become monobranchiate body [2-3]. The respiratory current is created by a complete ring of single layer of secondary pallial gills [1]. The external effects, before progressing into the visceral body, are first initiated on the gills as they are the first contact point with water except the thick shells and the foot of the animal. The main purpose of this study is to define the normal structure of the *Patella* gills and to provide a basis to interpret more efficient results in further research on natural or cultured populations of these organisms.

Materials and Methods - Specimens of *Patella caerulea* and *P. rustica* were collected from Antalya Bay (between 36°53'04.26 N-36°36'25.22 N and 31°46'31.30 E-30°42'03.62 E) on Southwestern coast of Turkey. Gills were dissected and fixed in Bouin's solution. Samples were taken through graded alcohol, cleared in xylene and embedded in wax. Sections were stained by Ehrlich's hematoxyline [4], examined by light microscopy and photographed at 3X digital zoom.

Results - The monobranchial structure extends along the pallial groove. The gill has long slender tubules which are anchored to the body surface by the mantle border and shows no ramification. Two gill folds face each other along the sagittal plane.

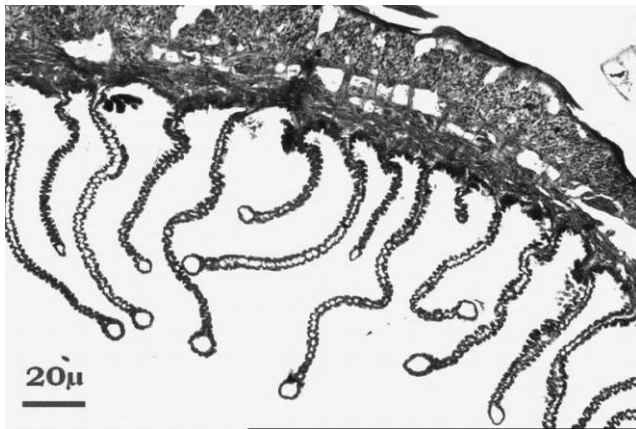


Fig. 1. Light micrograph showing general organization of pallial gills of *Patella*.

The tubules afferent openings are clearly seen in oblique sections (Fig 1). The lamellae have wavy borders. The epithelium covering the external face of the gill folds is made up by a single layer of large, cuboidal cells, but some columnar cell groups are scattered among them with a puff-like appearance forming bursicles (Fig. 2a). Epithelial cells, with very thin cuticle layer, are mostly equipped with cilia. None chitonous support for the filaments has been observed. But thin muscle stripes are attached to each lamella separately. Vascular channels are divided into hemocoelic spaces by trabecula. Large number of hemocytes and some nephrocytes, cells of vascular system, are commonly observed within the vascular spaces of the gill folds (Fig. 2b).

Discussion - Pallial structures have been evolved into secondary gills in limpets [5], although ctenidium is well developed in other Patellogastropods [6]. The wavy border of each gill filament have increased the contact surface with sea water. The free movement was achieved by muscle fibres under control of pallial nerves as no skeletal rod exist in Patellacea [2]. Hemocytes are the best characterized cells in hemocoelic areas of the *Patella* gills. They have been described to play mediating role in immune function in mollusks [7-9].

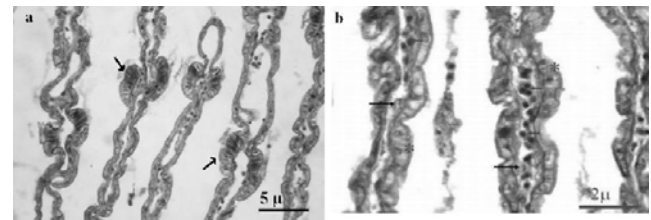


Fig. 2. Histological micrograph of gill lamellae of *Patella*; a) Puffs of columnar epithelia. b) Hemocytes (thick arrow) and nephrocytes (long arrow) within vascular spaces covered by cuboidal epithelia (*).

Histological observations of the respiratory organ is means to assess the adequacy of the environment. The increase in the industrialization and world population presents antropologic effect on natural populations. Once the anatomic and physiological characteristics of normality is known, they establish a reference point for further research to challenge with unnatural effects as well as to achieve a good management for development of aquaculture of alternative organisms.

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References

- 1 - Purchon, R.D., 1977. The Biology of The Mollusca, 2nd. Edit. Pergamon Press, Oxford.
- 2 - Yonge C.M. 1947. The Pallial organs in the Aspidobranch Gastropoda and their Evolution throughout the Mollusca. Series B. *Biol. Sci.*, 232 (591):443-518.
- 3 - Cretella, M., Scillitani G., Toscano, F., Turella, P. and Picariello. O. 1991. Comparative Morphology of soft parts of *Patella* L., 1758 from the bay of Naples (Gastropoda: Patellidae). *Boll. Malac.*, 26:205-210.
- 4 - Drury, R.A. and Wallington, E.A. 1973. Carleton's Histological Technique, Fourth Edition. Oxford University Press, London, 432p.
- 5 - Villers C.J.D.E., Hodgson A.N. 1987. The structure of the Secondary Gills of *Siphonaria capensis* (Gastropoda:Pulmonata). *J. Mollus. Stud.*, 53: 129-138.
- 6 - Sasaki T., Okutani T. And Fujikura K. 2006. Anatomy of *Bathyaemaea secunda* Okutani, Fujikura & Sasaki, 1993. (Patellogastropoda:Acmaeidae). *J. Mollus. Stud.*, 72: 295-309.
- 7 - Cheng, T.C., Sullivan J.T. 1984. Effects of heavy metals on phagocytosis by Molluscan hemocytes. *Marine. Env. Res.*, 14: 305-315.
- 8 - Van Der Knapp, W.P.W., Adema, C.M. and Sminia, T. 1993. Invertebrate blood cells: morphological and functional aspects of the hemocytes in the pond snail *Lymnaea stagnalis*. *Comp. Haematol. Int.*, 3:20-26.
- 9 - Brachere E., Mialhe E., Noel D., Boulo V., M, A. and Rodriguez I. 1995. Knowledge and research aspects in marine mollusc and crustacean immunology. *Aquaculture*. 137:17-32