3D-Microanatomy of *Omalogyra atomus* (Gastropoda, Omalogyridae)

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**Introduction**

The family Omalogyridae includes a number of minute species shell diameter usually less than one millimetre, some of which have worldwide distribution. Despite its small size, soft part anatomy of the very common European member *Omalogyra atomus* (Philippi, 1841) has been investigated already in 1948 by Vera Fretter. Currently considered as a basal member of Heterobranchia, the exact systematic affinities of the Omalogyridae are still unclear. A reinvestigation of *O. atomus* shell shed light on the hypothesis of a possible progenetic origin of the Omalogyridae out of Architectonicoidea. Furthermore, direct comparison of the previous and the present results will enable evaluating the advantages of the modern methods applied.

![Image of natural habitat and living specimens](image1)

**Results**

Living animals (Fig. 2) can be found in tide pools (Fig. 1) and shallow water shore habitats. They are easily recognizable by their auburn, planispiral shell and the lack of tentacles which are functionally replaced by a pair of flat, semicircular head lobes. At the base of the latter sit a pair of relatively large eyes. The foot is small, bearing an operculum on its posterior upper end and containing two pedal glands (Fig. 4). The more prominent posterior pedal gland opens at the posterior third of the foot, the smaller anterior one opens into a bilobed depression directly underneath the mouth. The digestive system (Fig. 4) is quite simply organized: From the mouth the oral tube extends posteriorly, first narrowing then broadening into the wide buccal apparatus, from which a slightly serpentine oesophagus originates. The latter joins the antero-dorsal wall of the stomach, next to the off-branching of intestine and right digestive gland. The left and larger digestive gland emerges from the posterior stomach and extends into the coils of the visceral mass. The intestine, forming a straight tube, runs anteriorly and opens on the right body side. In contrast to the relatively simple gut, the reproductive system (Fig. 5) is highly complex (terminology after Fretter 1948). The ovary, which extends over the right side of the visceral mass, is connected by the oviduct. After a short distance this duct merges with the vas deferens, the latter continuing the posteriorly placed vesicula seminalis. The combined duct passes into the fertilization chamber, which is connected with the dorso-lateral albumen gland being continued by mucous and capsule gland. A second duct, the distal vas deferens, fuses with the duct from the female glands, thus forming the muscular hermaphroditic duct that opens on the right body side. The nervous system (Fig. 7) is characterized by a relatively concentrated visceral loop and head-foot ganglia and far posteriorly located buccal ganglia. Another striking feature in organization is the highly glandular nature of the mantle cavity epithelium (Fig. 6) and the complete lack of a gill. This latter is functionally replaced by prominent ciliary tracts at the right side.

![Image of nervous system](image3)

**Discussion**

The present data confirm most of the results obtained in the surprisingly accurate study by Fretter (1948). The main difference was found concerning the reproductive system. In the specimens studied at hand the female part of the hermaphroditic system is markedly pronounced whereas Fretter reported the predominance of the male portion. This difference may be due to protracted juvenile-ovariety.

Future comparative data on related species and genera with different ecology will show, whether the characteristics of minute animals can be ascribed to the minute size of the animals or can be considered an adaptation to the highly demanding habitat (tide pools). At least some of the features reflect the systematic (heterobranch) affinities of Omalogyridae. We hope to clear up the systematic position of Omalogyridae. They might represent a separate clade of early heterobranchs or a progenetic branch of a superclade Architectonicoidea.

**References**


**Material and methods**

After fixation and embedding in Spurr’s resin specimens of *Omalogyra atomus* were serially sectioned with a section thickness of 1.5 µm. One series was reconstructed by using every section after taking digital images with the software package Amira 3.11 (TGF Inc., USA). Reconstruction steps included automatic alignment and correction by hand, “segmentation” of structures by hand (mostly every 3rd section) with subsequent "interpolation” to clarify surface rendering by applying the “surfgen” module.