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Short communications

Additional data on the anatomy of the accessory boring organ in Muricidae

A.I. MEDINSKAYA

A.N.Severtzov Institute of Animal Evolutionary Morphology and Ecology, Russian Academy of Sciences, Leninsky prospect 33, Moscow 117071, RUSSIA

Дополнительные данные по строению сверлящего органа Muricidae

А.И. Мединская

Институт эволюционной морфологии и экологии животных им. А.Н.Северцова РАН, Москва 117071, Ленинский проспект 33

The accessory boring organ was described for the first time by V.Fretter [1941], later by M.Carriker [1943]. In both papers it was named an "additional proboscis." Later Fretter [1946] described the accessory boring organ as the sucker, covered by glandular and ciliated epithelium, which is probably used to help to steady the predator's body on that of the prey during the boring process. The term "accessory boring organ" was probably introduced by Carriker [1955], who supposed that this structure has a chemical effect on the substance of the shell which, without dissolving it, nevertheless makes it easier for the radula to remove it by rasping. Subsequent experiments on the amputation and regeneration of the accessory boring organ confirmed this hypothesis [Carriker, 1959; Carriker, Van Zandt, 1972]. At present, the organ is described as a glandular pad lying within the more or less long sheath with bundles of longitudinal muscles fibers, blood vessels and nerves that enter the pad from its inner side [Fretter, Graham, 1962; Carriker, 1981].

The anatomy and histology of the accessory boring organ of 4 species of Muricidae from the Japan Sea is described in the present work: *Nucella heyseana* (Dunker, 1882), *Ocenebra inornata* (Recluz, 1851), *Ocenebra lumaria* (Yokoyama, 1926), and *Boreotrophon candelabrum* (Reeve, 1847). The anatomy of the accessory boring organ is rather uniform in the first three species and differs only in insignificant details, while that of *Boreotrophon candelabrum* differs considerably. In the literature, the anatomy of the accessory boring organ has been described only for its extended position. No hypotheses on the mechanism of evertion were proposed. I have studied the organ at all stages of its evertion. Therefore it seems reasonable to describe the possible mechanism of evertion.

The accessory boring organ of *N. heyseana, O. inornata,* and *O. lumaria* is formed by a pad situated in the moderately long sheath, diameter of the latter being approximately the same as that of the proboscis. The pad is formed by several layers of glandular cells. In completely everted position both free edges of the pad are turned inside to form a T-shaped inner cavity (Fig. 1 A). The pad is connected with the walls of the sheath by a small bundle formed by a single row of circular and a thin layer of longitudinal muscle fibers. The bundles of longitudinal muscle fibers running from the walls of the inner cavity of the boring organ approach the glandular cell layer. The accessory boring organ is lined with the cubic ciliated epithelium. At the entrance, the walls of the sheath are lined with the epithelium similar to that of the foot sole. Further the epithelium becomes lower and in the place of the appearance of the glandular cells is replaced by the ciliated one. On the top of the organ (in its everted position) the layer of glandular cells is most thick, and the pad forms a hemisphere, into which the bundles of muscle fibers and blood vessels, surrounded by the connective tissue, penetrate (Fig. 1 B-C, 2 A).

In an inverted position (Fig. 1D, 2B), the muscle fibers and the connective tissue surround the glandular pad. The blood vessels are numerous and highly coiled. The majority of them are situated at the base of inner cavity of the accessory boring organ.

Three consecutive stages of inversion of the boring organ of *N. heyseana* are presented on Fig. 1 (B-D). One may suppose that the evertion of the organ occurs in the way similar to that of the glove finger, so that the glandular pad, which in the everted state positions on the top of the organ, appears in the inverted position on the bottom of the sheath surrounded from inside by the muscle bundles and connective tissue. The evertion most probable occurs due to the hydrostatic pressure. This suggestion is confirmed by the presence of rather vast inner cavity of the organ and by the large number of blood vessels. The numerous longitudinal muscle fibers, which are situated inside the hemisphere of the pad, and the bundle connecting the pad with the wall of the sheath take part in the invertion of the organ.

The accessory boring organ of *B. candelabrum* has a somewhat different anatomy (Fig. 2 C). It has the form of the sac with the cone-shaped projection in the centre. The walls of the sac and the cone are formed by glandular cells. The tip of the cone is of small diameter and is situated in the outer opening of the sac. There is no sheath in this organ, and the glandular layer appears at the level of the foot sole. The glandular layer is thickest on the base of the organ, while in all the other species described, it is on the tip of everted organ. The inner cavity of the organ in *B. candelabrum* is practically completely absent. It can be traced only in the small area immediately under the base of the cone and is nearly completely filled with numerous longitudinal muscle fibers, that connect the base of the sac and the base of the cavity. The glandular layer, forming the bulk of the organ, is firmly attached to the walls along its entire length by muscle fibers. The large muscle bundles also pass deep inside the organ and terminate mainly in the glandular layer, some passing through the layer. The blood vessels are scarce.