

Morphology of the protoconch, adult shell and radula of some species of endemic Baikalian Acroloxidae (Pulmonata, Basommatophora)

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ABSTRACT. At present 25 endemic species of Acroloxidae are known from Lake Baikal. Most of them are distinguished only by the shell shape. This communication focusses on adult shells, protoconchs, and radulae of Baikalian limpets, which were studied using SEM and light microscopy. Two types of the protoconch shape (horn and cap) were recognized; only *P. frolikhae* with pitted protoconch microsculpture differs from other 10 investigated species having reticulate protoconch. The radula pattern revealed a large intraspecific variation, and there are 2 types of radulae differing in the number and shape of the lateral teeth. It was shown that the shape of shell slopes is an important character for the species identification, and the shell indices can be additionally used. The taxonomic position of some species is discussed. A new species, *Gerstfeldtiancyclus roepstorfi*, is described, which was earlier erroneously identified as *G. renardii* by Starobogatov [1989].

Introduction

At present, more than 150 species and subspecies of gastropods are known from Lake Baikal [Sitnikova, 1994]. Twenty-six species of them belong to the family Acroloxidae. The only nonendemic species, *Acroloxus lacustris* (Linnaeus, 1758) or *A. lacustris* var. *baicalensis*, according to Kozhov [1936], or *A. baicalensis* according to Starobogatov [1989], is restricted to warm shallow bays of Lake Baikal but does not occur in the open littoral of Baikal.

The endemic freshwater limpets of Baikal have been studied for more than hundred years. Several authors [Gerstfeldt, 1859; Clessin, 1882; W. Dybowski, 1875, 1884; Lindholm, 1909] described together six species, which later were partly regarded to be synonyms, and the total number was reduced to three, because Kozhov [1936] recognized differences in the shell shape as insignificant. Baikalian limpets were named *Pseudancylostoma* by Lindholm [1909] and were considered as a taxonomically distinct unit. Later Hubendick [1969] found minor differences of the copulative organ and radula mor-

phology between *Acroloxus* and *Pseudancylostoma* and therefore regarded the latter as species of *Acroloxus*.

More recently the Baikalian acroloxids were reviewed, and the number of endemic species increased to 25 [Starobogatov, 1989; Sitnikova et al., 1993]. According to Starobogatov [1989], the shell characters of the well-known previously described species became characters of different genera. Starobogatov [1989] regarded all Baikalian acroloxids with a blunt apex located almost medially and behind the middle of the smooth shell as representatives of the new genus *Gerstfeldtiancyclus*. Acroloxidae with pointed horn-like apices, clearly shifted to the left side, and with smooth shells were separated as the genus *Pseudancylostoma* Lindholm, 1909. Those having distinct "radial" ribs, the anterior aperture margin bluntly rounded, and the posterior margin pointed were described as *Baicalancyclus* Starobogatov, 1989. Later, the morphology of copulative organs of 15 acroloxid species was studied by Kruglov and Starobogatov [1991b]. Based on this investigation, the authors subdivided the genera *Pseudancylostoma* and *Gerstfeldtiancyclus* into 2 subgenera each.

With exception for radula sketches of W. Dybowski [1875] and the copulative organ morphology and radula studies of Hubendick [1969] and Kruglov and Starobogatov [1991b], our knowledge is more or less restricted to the features of the adult shell. Hubendick [1969] very well illustrated the shells of some of the Baikalian species, but he did not pay much attention to the embryonic shell. It is known that the protoconch characters could be very useful for comparison of freshwater gastropod taxa [Riedel, 1993]. The protoconch morphology and radula characters of most newly described species remained unknown.

Using key published by Starobogatov [1989] for the species identification of the Baikalian acroloxids and, simultaneously, the "comparative method" of Izzatulaev and Starobogatov [1984], we found that these methods provide different results. Specimens identified by the "comparative method" did not agree with identification by the key based on shell