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Reproduction peculiarities of three species of Clausiliidae (Gastropoda, Stylommatophora)

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ABSTRACT. The copulation has been studied in three Clausiliidae species [*Cochlodina laminata* (Montagu, 1803), *Laciniaria plicata* (Draparnaud, 1801), *Bulgarica cana* (Held, 1836)] from the Tula Region. All the observed snails exchanged the spermatophores. Each snail acted as a functional male and female in sequence, changing its role during the copulation. Spermatophore structure of these species is described. *Cochlodina laminata* reproduces during the entire warm season and deposits eggs on the fourth day after copulation at room temperature.

Introduction

The general distribution pattern and different colonization abilities of Clausiliidae species may result from different breeding biology. Therefore, the studies in this field are of certain interest. In Eastern Europe, no investigations of breeding biology on Clausiliidae species were carried out under natural conditions.

Immediate proof of a species reproduction taking place is mating (if oviposition takes place). The mating of Clausiliidae is difficult to observe because it occurs at night or during a short period. In some clausiliids, authors failed to find copulating molluscs at all [Holyoak, Seddon, 1988]. Sperm in these snails is transferred by means of spermatophores [Likharev, 1962] that are thought to dissolve quickly after mating [Holyoak, Seddon, 1988]. Of all East European species of Clausiliidae, the structure of spermatophore is known only for *Cochlodina laminata* [Steenberg, 1914]. Though in some species mating is observed not infrequently [Piechocki, 1982; Holyoak, Seddon, 1988], the structure of their spermatophores is still unknown.

The purpose of this work was the investigation of reproductive organs and spermatophore structure during the copulation in some clausiliids, that could clarify some hypotheses on the functional morphology in Clausiliidae.

Abbreviations in figures:
AG — albumen gland. DSt — diverticle of spermatheca. HD — hermaphrodite duct. P — penis. PR — penial retractor. Pro — prostate. RS — reservoir of spermatheca. SM — sperm mass. SP — spermatophore. RSS — spermathecal stalk retractor. V — vagina. Ut — uterus.

Descriptions and discussion

Four pairs of copulating Clausiliidae species were collected. Copulating molluscs were killed by alcohol or boiling water as soon as they were discovered, therefore no observations on the copulation process were available.

The distal male genital tract of the studied species is a simple tube, with the penial retractor in *Laciniaria plicata* and *Bulgarica cana* being reduced. The distal female tract is simple as well (without any additional organs). Spermatheca consists of a short stalk with retractor, diverticle and reservoir. The spermatophore is transferred during copulation into diverticle. In *Laciniaria plicata* and *Bulgarica cana* the diverticle is somewhat rudimentary [Likharev, 1962].

Alongside with the description of spermatophores I find it necessary to give the description of functional male and female that may shed light on some aspects of functional morphology of the species.

Cochlodina laminata (Montagu, 1803)
(Figs. 1, 2)

Two pairs were collected. One copulating pair was collected on August 7, 2001 from Pushkino village, Alexin District. It was killed by alcohol.

The spermatophore is fusiform, of orange-yellowish colour, with rounded anterior and thin, acute posterior end, with longitudinal row of bristles on one side, without any openings.

The functional female. Prostate is strongly expanded. Uterus is voluminous, with thickened walls. In the reservoir of spermatheca a partly dissolved spermatophore was found (in its cavity there was a softened amorphous mass, the bristle row was absent, walls were softened). In the spermathecal stalk there is an intact spermatophore whose posterior end