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Description of a vector tissue in *Batracobdelloides moogi* Nesemann & Csányi, 1995 (Hirudinea: Glossiphoniidae Vaillant, 1850)

Aleksander Bielecki

With 4 figures

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During research on the reproductive system of *Batracobdelloides moogi*, a member of the Glossiphoniidae, a vector tissue has been discovered. This tissue has so far been known only in the leech family Piscicolidae. The presence (position and shape) or absence of the vector tissue may be a feature of taxonomic relevance.

1 Introduction

The Glossiphonid leech *Batracobdelloides moogi* Nesemann & Csányi, 1995 is a rare species that occurs sporadically in waters with no or little flow. It has been found only in the western parts of lowlands in Austria, Slovakia, Hungary (Nesemann and Csányi 1995) and Poland (Bielecki & al. 2000). In Poland some localities (Pawlowski 1936, 1968) attributed to *Batracobdella paludosa* (Carena, 1824) probably refer to *B. moogi* (Bielecki & al. 1999, 2000).

B. moogi is a periodical external parasite of pulmonate snails. It feeds mainly on *Planorbarius corneus*. Nesemann and Csányi (1995) state that in Kisbalaton this snail was attacked by leeches, ranging in number from one to seven individuals per prey snail.

B. moogi is more closely related to the Asiatic *Batracobdelloides reticulatus* (Kaburaki, 1921) than *to* the African *Batracobdelloides tricarinatus* (Blanchard, 1897). Morphological features indicate that this species belongs to the subfamily Haementeriinae. The description of *B. moogi* consists of the form of the body, its size, eye number and location, and the somite arrangement (Nesemann & Csányi 1995). During a study of the female reproductive system of this species, to our surpriseastonishment, we have discovered vector tissue (Sawyer 1986).

In most leeches the spermatophores are linked to the copulatory area, (e.g. in Piscolidae), or some other part of the body (e.g. in Glossiphonidae and Erpobdellidae). This is the so called hypodermic implantation. The route taken by the spermatozoa is best known in Piscicolidae. Spermatozoa, when leaving the spermatophore pass through the vector tissue to reach the oviducts and ovisacs, and ultimately the eggs located there. Probably they are directed there by chemotaxis.

The vector tissue has been created by simple hypertrophy of the walls of oviducts and in general presents a similar structure as the oviducts. Usually it has a vacuolare structure (Brumpt 1900, Grasse 1959, Lukin 1976, Sawyer 1986).

2 Material and methods

The material was collected from April till August 1999 in old riverbeds of San (tributary of Wistula) near Hurku and Medyka, in the vicinity of the city of Przemysl. Water temperature was in the range 16-20 °C, while pH in the range 7.0-8.2. According to Pawlowski (1936) the leeches were first killed in 10 % ethanol, than the mucus was washed off in 50 % ethanol. Finally they were preserved in 3 % aqueous solution of formol.

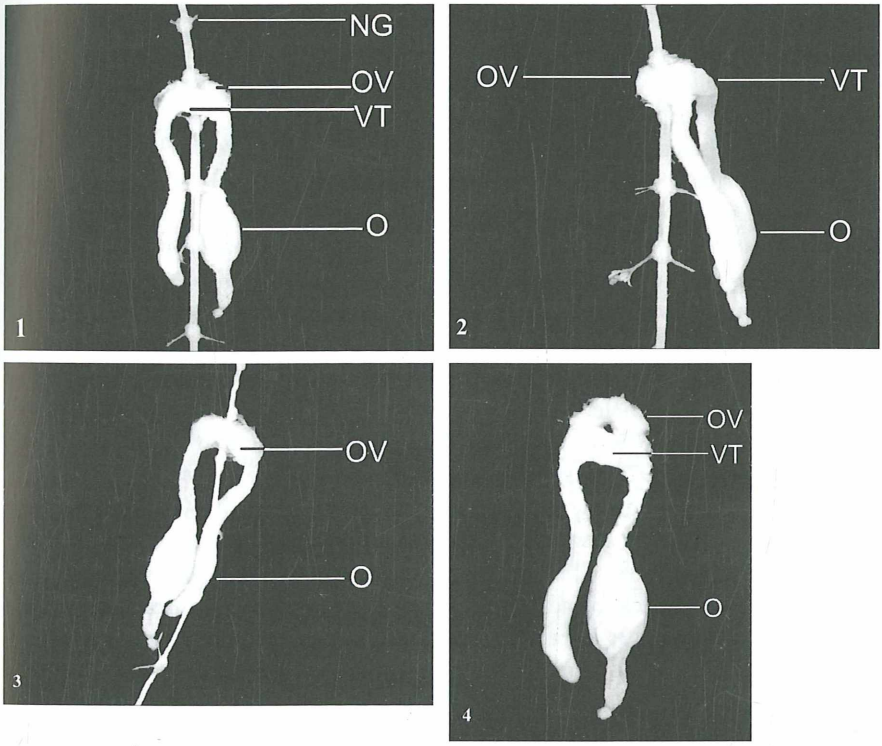
The dissection of leeches was done under a stereoscopic microscope on a Petri dish with paraffin partly covered with distilled water. The specimens of *B. moogi* were fixed (ventral side towards the paraffin) with entomological needles by inserting them in the suckers at both ends of the body. The body cover was cut with a scalpel from the dorsal side and spread apart. The parts covering the body were gently lifted with a forceps, while at the same time the dorsoventral muscles were removed with a needle. Afterwards, the body covers were fixed with entomological needles to paraffin on the dish. In order to uncover the reproductive system with the needles and forceps the alimentary tract, muscles, the structures of coelom (system of lacunae) and pieces of fat tissues were removed. In order to observe better the vector tissue in a few specimens, the reproductive system was uncovered by removing the female part of the reproductive system and taking a photograph. The interpretation of the structure of the reproductive system (ovisac, oviducts and vector tissue) was done by placing them on one plane and removing the nervous ganglion.

3 Results

When analysing the reproductive system of *B. moogi* in its female part the vector tissue (Figs 1–4), was found; it is only known in the species in the family Piscicolidae. In *B. moogi* normally (natural position) the vector tissue lies on

the oviducts in such a way that when observing it from the top one gets the impression that they are oviducts (Fig. 1). Since the oviducts are naturally positioned vertically in the first part and later on to the ovisacs and the vector tissue, they have the same width as the vector tissue. Being under the tissue they are difficult to discern.

The vector tissue is better seen in profile from the right side of the nervous ganglion (Fig. 2). After reversing the ovisac by 180° (in relation to the natural position - Fig. 1) the vector tissue is also invisible, because it is hidden behind the oviducts (Fig. 3). The vector tissue, as well as its whole connection to the ovisacs, is well visible when all the female reproductive structures (ovisac, oviducts and vector tissue) are placed in one plane and the nervous ganglion is removed for better view (Fig. 4).



Figs 1–4: *Batracobdelloides moogi*. Vector tissue (female part of the reproductive system). 1: In normal (natural) position; the vector tissue lies on the oviducts and an observer may get the impression that they are oviducts. 2: View from the side; in this position the vector tissue is easily seen on the right side of the nervous ganglion and left oviduct. 3: Ovisac reversed by 180°; the vector tissue is not visible, but visible are the right and left oviducts. 4: Well visible vector tissue and right and left oviducts; the

nervous ganglion is removed, while the oviducts and vector tissue are in one plane for easier determination. NG = nervous ganglion, O = ovisac, OV = oviduct, VT = vector tissue. Magnification: 1, 2, 3 = 150x; 4 = 340x

4 Discussion

In the family Piscicolidae the presence or lack of the vector tissue in the reproductive system is an important feature (in combination with other ones) at the genus (Sawyer 1986) and tribe levels (Epshtein 1968a, b, c, 1969, 1973, 1987, Epshtein & al. 1994, Bielecki 1997).

The vector tissue is not present in the reproductive system of such species like *Calliobdella lophii* Van Benneden & Hesse, 1863, *C. nodulifera* Malm, 1863 and *Cystobranchus mammillatus* (Malm, 1863). It is also lacking in the genera *Limnotrachelobdella* Epshtein and *Taimenobdella* Epshtein (Sawyer 1986, Bielecki 1997). If the vector tissue is present in the reproductive system than one should consider

1. Its position above (e.g. *Italobdella ciosi* Bielecki, 1997), below (*P. geometra* (L.) or simultaneously above and below the female reproductive aperture (*Caspiobdella fadejewi* Epshtein, 1968).
2. Adherence to, or permanent contact with the body covers (*P. elishebae* Bielecki, 1997) or lack of adherence to the covers of the internal ventral side of the body, loose position in the body, as a free structure not connected to these covers (*Bathybdella sawyeri* Burreson, 1981 and *Calliobdella vivida* (Verrill, 1872).
3. Connection to ovisac direct (*Myssidobdella borealis* Johansson, 1898, *Piscicola respirans* Troschel, 1850, *Baicalobdella torquata* (Grube, 1871), *Acanthobdella peledina* Grube, 1851) or indirect through conducting strands of vector tissue (*Piscicola pojmanskae* Bielecki, 1994).
4. Shape – spherical (*Piscicola fasciata* Kollar, 1842), elipsoidal (*Piscicola niewiadomskae* Bielecki, 1997) or similar to a rectangular plate (*Acipenserobdella volgensis* Zykoff, 1903 and *Piscicola brylinskae* Bielecki, 2000).

The vector tissue of *B. moogi* resembles to many species, depending on the above criteria. 1: Position below the female reproductive aperture, e.g. in the genus *Piscicola*; 2: Lack of adherence to the covers of the ventral side of the body, eg. *B. sawyeri*; 3: Direct connection to the ovisac, e.g. *M. borealis*; 4: Shape similar to the rectangular plate of *A. volgensis*.

It is possible that the vector tissue is present in other glossiphonid leeches. This could be especially the case of other species in the genus *Batracobdelloides* (*B. reticulatus* and *B. tricarinatus*). However, research on higher level relationships of leeches based on morphology and molecular gene sequences is not known in *Glossiphonia complanata* (L.), *Alboglossiphonia heteroclita* (L.), *Hemiclepsis marginata* (O. F. Mueller) and *Theromyzon pallens* Philip (Apakupakul & al. 1998).

Since in *B. moogi* in natural position of the ovisac the oviducts are located exactly under the vector tissue, so this tissue, lying on the oviducts, obscures them. Probably the vector tissue was interpreted as oviducts, resulting in its very late discovery.

The vector tissue is probably a plesiomorphic feature, because it is present in phylogenetically old species such as *A. peledina* and *P. livanowi*.

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Address of the author: Prof. Dr. Aleksander Bielecki, Warmia and Mazuri University, Department of Zoology, Pl-10-967 Olsztyn - Kortowo, Oczapowskiego Street 5, alekb@moskit.uwm.edu.pl

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