

## Prace oryginalne

***Batracobdella algira* Moquin-Tandon, 1846 (Hirudinida: Glossiphoniidae) – morphometric analysis and internal morphology<sup>1</sup>****Raja Ben Ahmed<sup>1</sup>, Ewa Ropelewska<sup>2</sup>, Aleksander Bielecki<sup>2</sup>, Joanna Cichocka<sup>2</sup>**<sup>1</sup>Laboratoire de Biologie de la Reproduction et du Développement Animal, Département de Biologie Faculté des Sciences de Tunis Université, Tunis El Manar 2092, Tunisia<sup>2</sup>Department of Zoology, UWM, Oczapowskiego 5, 10-719 Olsztyn, Poland

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**ABSTRACT.** There has been very few papers on leeches of *Batracobdella algira*. The aim of the presently reported study was to provide the measurements and, for the first time, description and characteristics of the reproductive and digestive systems of *B. algira*. The material used in this study was collected from frogs, *Rana saharica* Boulenger, 1913, in April 1987 by H. Hotz in Béja in Tunisia (11 individuals) and by R. Ben Ahmed in 2008 from the skin of *Bufo mauritanicus* Schlegel, 1841 in Nabeul in Tunisia (18 individuals). The relative length of the specimens ranges between 1.48 and 4.07. The digestive system of leeches has a standard structure for the species from the family Glossiphoniidae. Male and female gonopores are separated by two annuli. Ovisacs are as long as 5 neurosoms. The characteristic features of the male reproductive system of *Batracobdella* are sperm ducts, which are twisted in a small area and placed near to atrium. This study will hopefully contribute to a better understanding of the host–parasite relation.

**Key words:** Hirudinida, *Batracobdella algira*, morphometry, digestive and reproductive systems, body form

**Introduction**

*Batracobdella algira* has hitherto been studied mainly by Moquin-Tandon [1], Lukin [2–4], Lukin and Epsthein [5], Shchegolev [6], and Grosser and Pesic [7].

*B. algira* represents “Rhynchobdellida” (leeches with a proboscis) of the family Glossiphoniidae Vaillant, 1890. Its preference for higher temperatures explains its natural habitat range confined to the southern areas of Palearctic [4]. It is characteristic for the Mediterranean rim [2,7]. *B. algira* occurs in Algeria, Tunisia, the Pyrenean Peninsula, Balearic Islands, Corsica, Sardinia, Bulgaria [7], and southern part of the Crimea Peninsula (Ukraine) [3,4,6].

*B. algira* feeds on amphibians representing the

genus *Speleomantes* Dubois, 1984, for example *Speleomantes supramontis* (Lanza, Nascetti et Bullini, 1986), for whom it is only confirmed ectoparasite [8]. The leeches were also found on *Hydromantes genei* (Temminck et Schlegel, 1838), *Rana saharica* Boulenger, 1913, *Rana ridibunda* Pallas, 1771 [4], *Discoglossus pictus* Blanchard, 1893 [4,9], and on *Bufo mauritanicus* Schlegel, 1841 [10]. *B. algira* are most often found on the host attached around the origin of legs (from the ventral side) and on natatorial membranes, and rarely on the ventral side of the head. Moreover, this leech was recorded on the eyes of *Bufo mauritanicus* [10].

The aim of the work was to make measurements in reference to the model of leech body form by Bielecki [11], and to describe the digestive and reproductive systems of *B. algira*.

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## Material and methods

The leeches, *B. algira*, were collected from frogs, *R. saharica* in April 1987 by H. Hotz in Béja in Tunisia (11 individuals). H. Hotz gave the material to Professor L. Berger and he gave it to Professor Andrzej Wiktor from the Museum of Nature in Wrocław, who handed the material over to Professor Aleksander Bielecki. Other specimens were collected by R. Ben Ahmed in 2008 in a dam of the Lebna River in Nabeul in Tunisia (18 individuals).

The collected specimens were relaxed in 10% ethanol prior to fixation, sacrificed in 50% ethanol and preserved in 70% ethanol. They were photographed and measured based on the generalized leech body form diagram proposed by Bielecki [11]. This generalized model shows the leech body as two ellipses, representing the oral sucker and the caudal sucker, with six trapezoids between them, representing the sequence of the body sections. The first and the second trapezoids represent the trachelosoma, while the remaining four trapezoids make up the urosoma (Fig. 1).

Subsequently the digestive and reproductive systems were dissected and studied in detail. Measurements of structures of the reproductive system were carried out in relation to neural system (one neurosomit was treated as an unit in measurements).

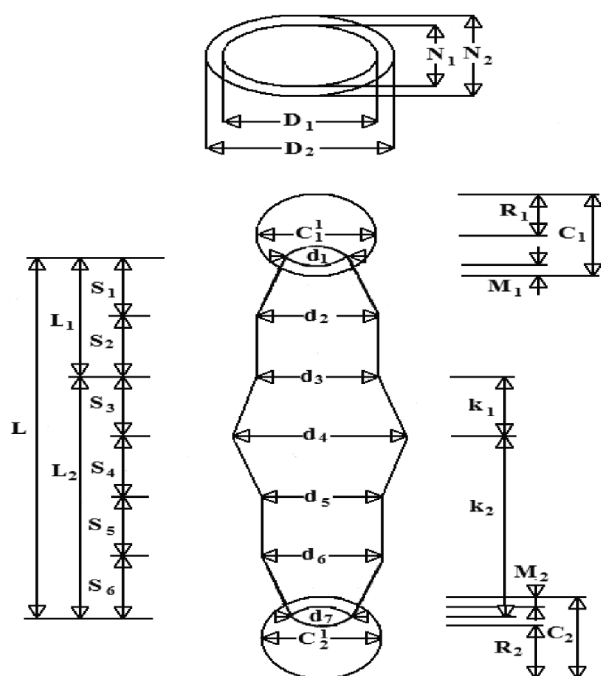


Fig. 1. The model of leech body form

## Results

The specimens of *B. algira* have elongate body, narrowing to the front, which are equipped with two suckers. The anterior sucker is small and it can be seen only on ventral view. Posterior sucker is distinctly bigger. There are many small papillae on the smoothly swelled dorsal side of the body, and there is a pair of eyes on the third annulus, which is well visible in young specimens (Figs. 2–5).



Fig. 2. *B. algira*, lateral view with posterior sucker (Photo Bielecki A.)



Fig. 3. *B. algira*, dorsal view with posterior sucker and one pair of eye (Photo Bielecki A.)



Fig. 4. *B. algira*, dorsal view (Photo Bielecki A.)

Table 1. The value of parameters (mm) for the largest individual, the smallest individual and average individual collected in 1987 and 2008 (orig.)

L	LENGTH (L <sub>1</sub> +L <sub>2</sub> )						WIDTH							
	L <sub>1</sub> TR			L <sub>2</sub> UR			TR		UR					
1987														
	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	d <sub>6</sub>	d <sub>7</sub>	
1.	14.6	2.5	1.8	4.2	1.5	2.2	2.4	1.3	2.0	3.2	4.0	3.8	3.2	1.3
2.	10.98	2.38	1.65	2.46	1.50	1.33	1.65	1.08	2.04	2.75	3.34	3.00	2.60	1.15
3.	6.1	2.0	0.5	0.6	0.8	1.1	1.1	0.5	1.4	1.4	1.5	1.4	1.3	0.6
2008														
1.	13.2	3.6	2.9	2.5	1.5	1.5	1.2	1.1	2.3	2.9	3.4	2.6	1.8	0.9
2.	8.2	2.2	1.4	1.5	1.2	1.1	0.9	1.1	2.6	3.1	3.6	3.2	2.6	1.6
3.	4.9	1.4	0.9	1.0	0.6	0.5	0.5	0.7	2.5	2.9	3.3	3.0	2.7	1.9

Explanations: TR–trachelosoma, UR–urosoma; 1. The value of parameters for the largest individual; 2. The average value of parameters; 3. The value of parameters for the smallest individual.

The relative body length of *B. algira* was determined based on measurements, and the biggest, medium and the smallest individuals were appoint (Fig. 1; Table 1).



Fig. 5. *B. algira* with young on the ventral side (Photo Bielecki A.)

Relative average body lengths (L/D<sub>2</sub>, where L – body length, D<sub>2</sub> – the biggest body width) of the biggest, medium and the smallest specimens of *B. algira* in 1987 were 3.65, 3.29 and 4.07, respectively, however, these values of biggest, medium and the smallest specimens of the leech in 2008 were 3.88, 2.28 and 1.48, respectively.

On basis of measurements of suckers diameter of leeches the relation of horizontal diameter to vertical diameter was counted. The shape of the oral and caudal suckers results from the relation of horizontal diameter to vertical diameter of each suckers. The quotient of two diameters which is one indicates a circular shape of sucker, though the smaller than one indicates a vertical elliptical sucker, and the bigger than one indicates a horizontal elliptical sucker (Table 2). The most of examined specimens have vertical-elliptical-shaped oral sucker and the same shaped caudal sucker.

In the digestive system of examined specimens of *B. algira* behind the proboscis there were 6 crop splanchnomers. The last splanchnomers were the

Table 2. Number of individuals with the definite shape of anterior and posterior sucker

RATIO C' <sub>1</sub> /C <sub>1</sub>	NUMBER OF INDYVIDUALS	PART OF INDIVIDUALS [%]
1	2	6.90
<1	1	3.45
>1	26	89.66
C' <sub>2</sub> /C <sub>2</sub>		
1	3	10.34
<1	21	72.41
>1	5	17.24

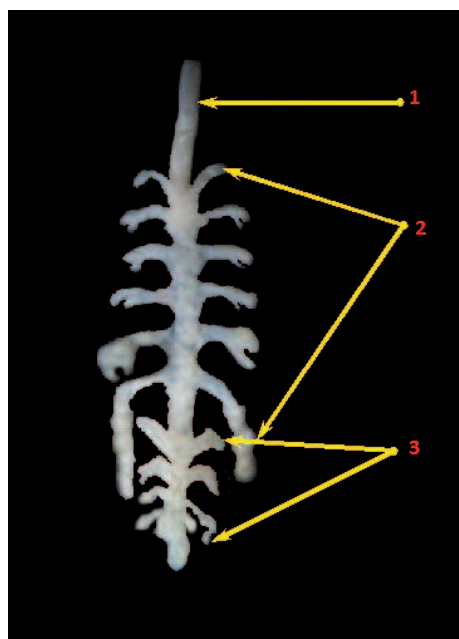


Fig. 6. Digestive system of *B. algira*: 1–proboscis, 2–crop splanchnomers, 3–intestine splanchnomers (Photo Bielecki A.)

longest and directed backwards. There were also 4 intestinal splanchnomers in the digestive system of the examined *B. algira*. (Fig. 6).

After removing the atrium and the oviduct the male and female gonopores were very well visible and they appeared to be separated by two annuli (Fig. 7). The ovaries of *B. algira* were as long as 5 neurosoms (Fig. 8). The sperm ducts are compacted in spherical structure within 1 somite and located near to atrium (Fig. 9).

The offspring located on ventral side of “nurse-leech” body have been regarded in eleven specimens of *B. algira* collected in April 2008. (Fig. 5).

## Discussion

The measurements of *B. algira* leeches were carried out on twenty-nine specimens. Although part of the collected material was stored by relatively long time (eleven individuals of *B. algira* were collected in 1987), the elements of the outer structure (eyes, annulations, gonopores) remained relatively unchanged. The relative body length of the specimens described in the study ranges between 1.48 and 4.07. The previous study, carried out by Moquin-Tandon in 1846 on the material coming from Algeria, revealed that the relative body length in relaxed leeches was ranged from 3.6 to 5.67. The relative length of leeches collected from the southern part of the Crimea Peninsula Lukin in 1958 and

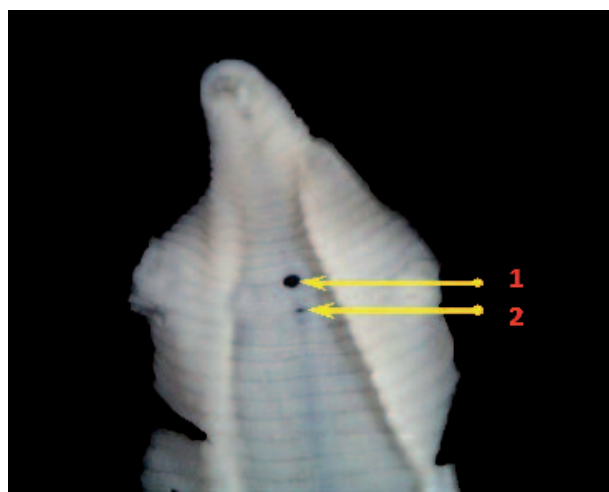


Fig. 7. Gonopores of *B. algira* (2 annuli between gonopores): 1–male gonopore, 2–female gonopore (Photo Bielecki A.)

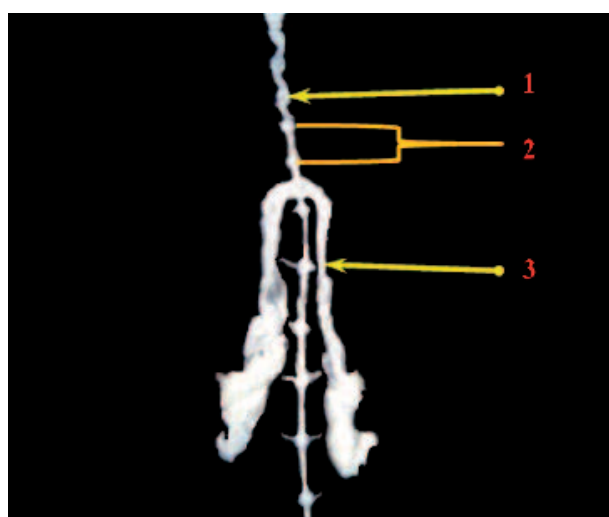


Fig. 8. Female reproductive system of *B. algira* (ovaries are 5 neurosoms length): 1–neural cord, 2–neurosoma, 3–ovary (Photo Bielecki A.)

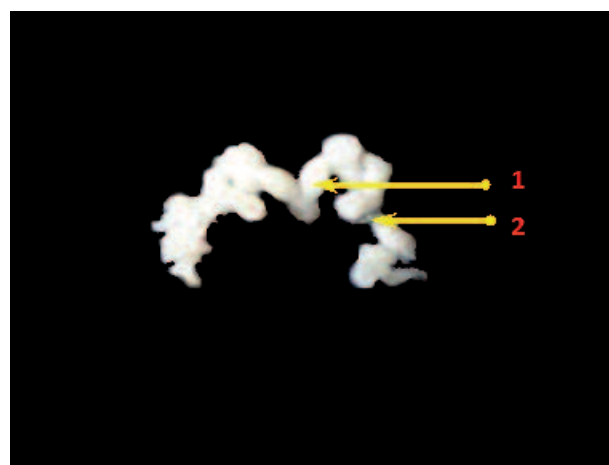


Fig. 9. Male reproductive system (atrium and sperm duct) of *B. algira*: 1–atrium, 2–sperm duct (Photo Bielecki A.)

Epshtein in 1960 ranged from 1.75 to 3.5 [4]. The presently reported measurements were similar to those mentioned above.

*B. algira* has a preference to warmer climates therefore its occurrence in Poland is unlikely [12], despite the presence of its potential host (*R. ridibunda*). Because of its natural range of occurrence, *B. algira* cannot be confused with other species of the family Glossiphoniidae. There are a lot of features which differentiate this species from two-eyed species of Glossiphoniidae, such as *Helobdella stagnalis* L. and *Placobdella costata* Muller, 1846. *H. stagnalis* has different color (whitish), flat dorsal side, on which there is a chitinous plate in anterior part, small caudal sucker (smaller than half of the biggest body width). Besides it has mixed way of feeding – predatory or semi-parasite [4]. In the second two-eyed species, *P. costata*, the dorsal side of body is covered by more numerous papillae and one row of papillae comes along the middle line of the dorsum, there is mouth pore in anterior part of sucker [4]. It feeds on blood of turtles – *Emys orbicularis* L. and *Clemmys caspica* Gmelin, 1774.

The published information about *B. algira* is rather scarce. It concerns the structure of crop splanchnomers which were observing through the covers of the body [4]. Lukin describes that they are wider on the ends of the body. The anterior ones are smaller and less visible than the others. The latter are the longest and directed to back. The male gonopores are located between 28 and 29 annulus, and female gonopores occur between 30 and 31 annulus. Distance between gonopores is 2–2.5 annuli [4]. This incomplete description induces the authors of the study to make more careful research.

The life cycle of *B. algira* has not been fully described. Reproduction starts in early spring, and leeches with offspring can be observed by the end of April [4,10].

This study provides additional information about the species that has not been adequately described. The features concerning digestive and reproductive systems of *B. algira* examined in this study recently are value by many authors in their investigations of other leech species on morphological and molecular levels [13–17]. However, the leech body form and life cycles have never been used in phylogenetic analyses. Moreover, these features will allow to better interpret the relationships in parasite-host system.

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