NEW DATA ABOUT RARE LEECH SPECIES –
THEROMYZON MACULOSUM (RATHKE, 1862) (HIRUDINIDA: GLOSSIPHONIIDAE)

Aleksander Bielecki, Katarzyna Palińska, Joanna Cichocka

Summary. Theromyzon maculosum is a relict and boreal leech species, which was believed to be
doubtful or non-existing for many years. Subsequent literature reports about this species are not
very numerous and found rarely. The newest research by the authors, conducted from 2006 to
2009 in the Suwalski Landscape Park in the Czarna Hańcza river, revealed formerly unknown
stands of this leech species. Moreover, results obtained from measurements according to the model
of leech body form indicate that the dimensions of T. maculosum are an important species feature.

Key words: Theromyzon maculosum, Glossiphoniidae, Hirudinida

INTRODUCTION

Theromyzon maculosum (Rathke, 1862) has been regarded as Protoclepsis maculosa by Livanow (1902) and as Theromyzon maculosa by Pawlowski [1936], and in spite of the fact that it was described over 140 years ago, for a long time it has been treated as a doubtful or even non-existent species [Blanchard 1894, Gedroyć 1915]. However, Pawlowski [1936] describes T. maculosum as a really existing species, though subsequent communications concerning this species are few and rarely encountered [Pawlowski 1968, Wilkialis 1970, Agapow 1988, Koperski 2003, Kołodziejezyk 2007].

T. maculosum parasitise on waterfowl and so far it has been collected from
wild green-headed mallards (Anas platyrhynchos), but also from objects covering
the bottom of water reservoirs [Pawlowski 1968]. In laboratory conditions
the leeches were fed with blood of goose [Wilkialis 1970]. Because of the small
number of specimens collected till now, T. maculosum is a poorly known spe-
cies. Descriptions of morphology and preliminary data relating to the biology of this species can be found in a work by Wilkialis [1970], who bred those leeches for some time in aquaria, and also in works by Pawlowski [1936]. However, in 1975 Wilkialis described in detail the morphology, biology and ecology of this species. Furthermore, the anatomy of *T. maculosum* has also been preliminarily studied [Oosthuizen and Davies 1993].

*T. maculosum* is a boreal, relict and type species for freshwaters of northern-east Europe (Russia, southern Scandinavia – mainly Sweden). It has been recorded also in the western and eastern regions of the Volga River of the former USSR, and in Lithuania (Okmiany Lake) and Latvia [Pawlowski 1936, Bielecki et al. 1999, Kołodziejczyk 2007]. This species is known also on both American continents [Bielecki et al. 1999, Kołodziejczyk 2007] and in Asia (Commander Islands and Loktak Lake in India), but data about the distribution of the leech in those places need to be checked [Pawlowski 1936, 1968, Bielecki et al. 1999]. So far, the largest number of stands of the leech species have been recorded in Poland. In the Masurian Lakeland *T. maculosum* was found in lakes Krzchowie and Necko, and also in a number of small water reservoirs on the frontier with Lithuania – Gałąduś, Hołny, Litygajno, Pelele, Białe and Puńsk, and in lakes Wigry and Śniardwy in the Suwalskie Lakeland. What is more, it was collected from a lateral tributary of Narew River in Podlasie, and also from the rivers Czarna Hańcza, Hołnianka, Łączanka, Marycha and Drawa [Pawlowski 1936, 1968, Wilkialis 1975, Agapow 1988]. The newest data relating to *T. maculosum* indicate stands of the leech in Lake Hańcza in the Suwalski Landscape Park [Koperski 2003].

The finding of a substantial number of specimens of *T. maculosum*, which was recorded so far only in single members, allows this “mysterious” species to be investigated better.

Despite the fact that the leech body form has been worked out for many species of Glossiphoniidae family, the body form of *T. maculosum* has not been known till now [Bielecki et al. 2004].

**MATERIAL AND METHODS**

The material collected by the authors come from the Suwalski Landscape Park. The studies on leeches were carried out in spring (May 2008 and 2009), summer (June 2006, July 2007 and August 2008) and autumn (October 2008) months. The leeches were collected on a stretch of the Czarna Hańcza river which passes through the Suwalski Landscape Park, and in the Turtulski Pond which was created as an effect of dumping-up of waters of the Czarna Hańcza river. In total, 44 adult and 4 juvenile specimens of *T. maculosum* were collected. All of the specimens were found on objects covering the bottom of water reservoirs and on water plants.
T. maculosum was measured basing on the parameters of the body form model of leeches created by Bielecki and Epshtein [1994, 1995] (Fig. 1). The model presents the leech body on a plane, as two ellipses (that represent suckers) and trapeziums situated between them (representing anterior body part – trachelosome – 2 trapeziums; posterior body part – urosome – 4 trapeziums). Besides, transverse sections through the trachelosome and urosome are considered as two ellipses.

The 19 body proportions indexes are: 1. Index describing L/D2 = relative body length.

Indexes describing anterior sucker: 2. $C_1^1/d_1 =$ ratio of horizontal diameter of sucker to trachelosome width at sucker junction; 3. $C_1^1/D_1 =$ ratio of horizontal diameter of sucker to greatest width of trachelosome; 4. $R_i/M_1 =$ ratio of dorsal part of sucker to its ventral part; 5. $C_1^1/C_1 =$ ratio of horizontal diameter of sucker to its vertical diameter.

Indexes describing anterior body part (trachelosome): 6. $L_1/D_1 =$ ratio of trachelosome length to its greatest width; 7. $D_1/N_1 =$ ratio of greatest trachelosome width to its greatest height; 8. $S_1/S_2 =$ index describing position of greatest width of trachelosome.

Indexes describing posterior body part (urosome): 9. $L_2/D_2 =$ ratio of urosome length to its greatest breadth; 10. $D_2/N_2 =$ ratio of greatest urosome width to its greatest height; 11. $K_1/K_2 =$ ratio describing position of greatest width of urosome.

Indexes describing posterior sucker: 12. $C_2^1/d_7 =$ ratio of horizontal diameter of sucker to urosome width at sucker junction; 13. $C_2^1/D_2 =$ ratio of horizontal...
diameter of sucker to greatest body height; 14. \( R_2/M_2 \) = ratio of dorsal part of sucker to its ventral part; 15. \( C_2/C_3 \) = ratio of horizontal diameter of sucker to its vertical diameter.

Indexes describing relations between urosome and trachelosome: 16. \( L_2/L_1 \) = ratio of urosome length to trachelosome length; 17. \( D_2/D_1 \) = ratio of greatest width of urosome to greatest width of trachelosome; 18. \( N_2/N_1 \) = ratio of greatest height of urosome to greatest height of trachelosome.

Index describing proportions of suckers: 19. \( C_2/C_1 \) = ratio of horizontal diameter of posterior sucker to horizontal diameter of anterior sucker.

RESULTS

The body shape and sizes of *T. maculosum* are illustrated in Figure 2. The data, including mean values of the 19 indexes which describe the body form of the species, are presented in Table 1.

Fig. 2. *Theromyzon maculosum*: A – juvenile, ventral view, B – juvenile, lateral view, C and D – adult, dorsal view
Table 1. Mean value of 19 body indexes in 14 leech species of Glossiphonidae family

<table>
<thead>
<tr>
<th>Species</th>
<th>L/D2</th>
<th>C11/D1</th>
<th>C11/D1</th>
<th>R1/M1</th>
<th>C11/C1</th>
<th>L1/D1</th>
<th>S1/S2</th>
<th>L2/D2</th>
<th>D2/N2</th>
<th>K1/K2</th>
<th>C12/C2</th>
<th>L2/L1</th>
<th>D2/D1</th>
<th>N2/N1</th>
<th>C12/C11</th>
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</thead>
<tbody>
<tr>
<td>Glossiphonia complanata (Linneaus, 1758)</td>
<td>1.1</td>
<td>2.0</td>
<td>0.2</td>
<td>0.7</td>
<td>1.1</td>
<td>0.6</td>
<td>1.7</td>
<td>1.3</td>
<td>0.7</td>
<td>2.0</td>
<td>0.4</td>
<td>2.5</td>
<td>0.3</td>
<td>0.7</td>
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</tr>
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<td>Glossiphonia cancolor (Apathy, 1883)</td>
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<td>1.7</td>
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<td>1.1</td>
<td>0.9</td>
<td>3.0</td>
<td>1.1</td>
<td>0.8</td>
<td>3.2</td>
<td>0.5</td>
<td>2.5</td>
<td>0.3</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Glossiphonia nebulosa Kalbe, 1964</td>
<td>1.7</td>
<td>0.6</td>
<td>0.3</td>
<td>2.8</td>
<td>0.7</td>
<td>0.9</td>
<td>0.9</td>
<td>1.0</td>
<td>1.1</td>
<td>2.8</td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>0.5</td>
<td>1.0</td>
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<td>Batracobdella paludosa (Carena, 1824)</td>
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<td>1.3</td>
<td>0.2</td>
<td>1.7</td>
<td>0.9</td>
<td>1.3</td>
<td>2.1</td>
<td>0.7</td>
<td>1.5</td>
<td>1.8</td>
<td>0.4</td>
<td>2.3</td>
<td>0.3</td>
<td>1.4</td>
<td>1.4</td>
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<tr>
<td>Batracobdelloides moogi Nenem and Csanyi, 1995</td>
<td>2.3</td>
<td>2.7</td>
<td>0.2</td>
<td>1.7</td>
<td>1.2</td>
<td>1.2</td>
<td>1.7</td>
<td>1.5</td>
<td>1.4</td>
<td>1.9</td>
<td>0.4</td>
<td>2.3</td>
<td>0.3</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Hemiclepsis marginata (O.F. Müller, 1774)</td>
<td>2.0</td>
<td>5.3</td>
<td>0.4</td>
<td>1.0</td>
<td>1.5</td>
<td>1.1</td>
<td>1.8</td>
<td>1.7</td>
<td>1.2</td>
<td>1.7</td>
<td>0.5</td>
<td>1.6</td>
<td>0.3</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Helobdella stagnalis (Linneus, 1758)</td>
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<td>0.3</td>
<td>0.7</td>
<td>1.5</td>
<td>1.2</td>
<td>1.7</td>
<td>1.0</td>
<td>1.1</td>
<td>2.1</td>
<td>0.7</td>
<td>0.9</td>
<td>0.4</td>
<td>1.0</td>
<td>1.3</td>
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<tr>
<td>Boreobdella verrucata (Fr. Müller, 1844)</td>
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<td>2.5</td>
<td>0.3</td>
<td>1.8</td>
<td>0.7</td>
<td>1.1</td>
<td>0.9</td>
<td>0.9</td>
<td>1.4</td>
<td>0.4</td>
<td>1.1</td>
<td>0.1</td>
<td>1.4</td>
<td>0.9</td>
<td>2.2</td>
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<tr>
<td>Alloclepsis papillosa (Carena, 1820)</td>
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<td>1.1</td>
<td>0.1</td>
<td>2.0</td>
<td>0.7</td>
<td>0.7</td>
<td>4.3</td>
<td>0.8</td>
<td>1.2</td>
<td>3.9</td>
<td>0.6</td>
<td>0.8</td>
<td>0.1</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td>Alloclepsis hyalina (O.F. Müller, 1774)</td>
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<td>0.7</td>
<td>0.8</td>
<td>5.0</td>
<td>0.9</td>
<td>1.1</td>
<td>4.4</td>
<td>0.4</td>
<td>0.8</td>
<td>0.1</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td>Alloclepsis hetroclita (Lukin, 1976)</td>
<td>1.3</td>
<td>1.6</td>
<td>0.2</td>
<td>0.5</td>
<td>0.7</td>
<td>0.7</td>
<td>1.1</td>
<td>1.0</td>
<td>0.9</td>
<td>1.3</td>
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<td>1.5</td>
<td>0.2</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td>Placobdella costata (Fr. Müller, 1846)</td>
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<td>4.2</td>
<td>0.4</td>
<td>0.6</td>
<td>1.5</td>
<td>0.8</td>
<td>1.7</td>
<td>1.1</td>
<td>1.0</td>
<td>1.9</td>
<td>0.4</td>
<td>2.5</td>
<td>0.3</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Theromyzon tessulatum (O.F. Müller, 1774)</td>
<td>1.5</td>
<td>4.3</td>
<td>0.4</td>
<td>0.5</td>
<td>1.5</td>
<td>1.0</td>
<td>1.7</td>
<td>1.4</td>
<td>0.9</td>
<td>2.0</td>
<td>0.4</td>
<td>3.3</td>
<td>0.3</td>
<td>1.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Theromyzon maculosum (Rathke, 1862) – adult</td>
<td>1.9</td>
<td>0.8</td>
<td>0.4</td>
<td>1.8</td>
<td>1.3</td>
<td>1.0</td>
<td>1.2</td>
<td>0.9</td>
<td>1.3</td>
<td>1.9</td>
<td>0.3</td>
<td>0.8</td>
<td>0.2</td>
<td>1.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Theromyzon maculosum (Rathke, 1862) – juvenile</td>
<td>1.9</td>
<td>0.9</td>
<td>0.5</td>
<td>2.0</td>
<td>1.4</td>
<td>0.7</td>
<td>1.1</td>
<td>0.7</td>
<td>1.4</td>
<td>1.2</td>
<td>0.2</td>
<td>1.1</td>
<td>0.5</td>
<td>1.4</td>
<td>0.8</td>
</tr>
</tbody>
</table>
The joining or tree clustering algorithm was chosen to interpret the similarity of body form of the 14 leech species of Glossiphoniidae family. When selecting distance measures, the city-block (Manhattan) distance was chosen that minimises the effect of more distant objects (in this case – morphotypes). Of amalgamation or linkage rules, the Ward method was used, because it tends to yield small clusters and with this low number of species this method gives a good resolution. The procedure made it possible to divide the morphotypes of the species into 2 polytypic clusters (Fig. 3):

I – cluster including the species of quite similar body form: A. hyalina, A. papillosa, H. marginata, B. moogi, B. paludosa and T. maculosum adult and juvenile.

I₁ – subcluster comprising two species from the genus Alboglossiphonia – A. papillosa and A. hyalina which are very similar to each other.

I₂ – subcluster comprising the following species characterised by similar body form: H. marginata, B. moogi and B. paludosa. It also includes T. maculosum, adult and juvenile.


II₁ – subcluster including B. verrucata and A. heteroclita.

II₂ – subcluster including G. nebulosa and H. stagnalis, also T. tessulatum and P. costata that have similar body form. Moreover, it includes G. complanata and G. concolor that are very similar and belong to one genus Glossiphonia.
**DISCUSSION**

*T. maculosum* is a boreal species, and the few studies concerning its distribution in Poland indicate that the leech lives only in the north-eastern region of this country [Pawłowski 1936, 1968, Wilkialis 1975, Koperski 2003]. One of stands of this leech species is in the Drawa river [Agapow 1988]. It seems to be possible, although unlikely, that *T. maculosum* formed a standing population there. Taking under consideration the facts that this species is devoted usually to northern regions, prefers relatively low water temperature, and that in the Drawa river a single specimen was found, one can suppose that the leech occurred accidentally there – brought with migrating waterfowl which are its hosts.

Till now in literature there are few records about finding single members of this species [Pawłowski 1936, 1968, Agapow 1988, Koperski 2003]. Only Wilkialis [1975] gives information about collecting 132 specimens of *T. maculosum* in the course of a long standing study. The finding of a relatively big number of specimens during the research in the Suwalski Landscape Park allowed to carry out detailed morphometric examinations and to use the measurements according to the model of leech body form. Aggregative cluster analysis, which was conducted on basis of these measurements, grouped *T. maculosum* (both adult and juvenile specimens) in one cluster (Fig. 3). It is extremely important information which indicates that the body form in this species is fairly stable in ontogenesis.

Uncommon observations of *T. maculosum* and few, increasingly reducing habitats which suit its preferences, caused that this species is found to be endangered. This resulted in placing the leech on the Red List of Threatened Animals in Poland with DD category – data deficient, indeterminate and poorly known [Jazdzewska and Wiedeńska 2002].

Because of many reasons, *T. maculosum* was treated as „enigmatic” species, and to date it does not lose its mysteriousness. Therefore, to protect this relict species and its habitats it is necessary to conduct detailed anatomic examinations and subsequent behavioural studies which will allow to better understand the biology of the leech.

**REFERENCES**


Słowa kluczowe: Theromyzon maculosum, Glossiphoniidae, Hirudinida

NOWE DANE O RZADKIM GATUNKU PIJAWKI
– THEROMYZON MACULOSUM (RATHKE, 1862)
(HIRUDINIDA: GLOSSIPHONIIDAE)