

We dedicate this work to
Mrs Professor Katarzyna Niewiadomska
and Mrs Professor Teresa Pojmańska

A checklist of leech species from Poland

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ABSTRACT. In this study 47 leech species from Poland are listed. They belong to two orders, two suborders, five families and 17 genera. The checklist also includes the information about hosts, distribution in Poland and references concerning the leech species discussed in this study.

Leeches (Hirudinida) are relative of oligochaetes, which are related to clitellates. Until last years [3,4] the division of class Hirudinea into three subclasses: Branchiobdellidea, Acanthobdellidea and Euhirudinea was accepted. Currently, more and more common is the classification, that has been proposed by Siddall et al. [5]. According to this classification the mentioned subclasses are monophyletic group of oligochaetes, which have the common ancestor with oligochaetes belonging to the order Lumbriculida [5]. As a consequence of the above, the leeches should not been classified as the class, but only by orders (Branchiobdellida, Acanthobdellida and Hirudinida, respectively) within the class Oligochaeta [5,6]. Thus, the names Oligochaeta and Clitellata seem to be synonyms. For distinction, often the names Oligochaeta *sensu stricto* for „traditional" Oligochaeta, and Oligochaeta *sensu lato* for both oligochaetes and leeches are used [7,8].

Till now there are approximately 680 leech species known worldwide, and about 480 of them are freshwater species [9]. By 1968, there were 23 leech species described in the Polish fauna. In 1997 Bielecki [10] introduced new detailed morphological and anatomical standards into the systematics of piscicolids (fish leeches) that gave rise to a manifold increase of the number of Polish species. Bogdanowicz et al. [2] has listed 44 leech species, occurring in Poland. At present the occurrence of 47 leech species in Poland is documented in this article (Table 1, Fig. 1).

Leeches exhibit varied feeding strategies, from ectocommensalism, through bloodfeeding, predation and to even scavenging. Phylogenetic reconstruction based on morphological and molecular data has shown that bloodfeeding had at least two origins in evolution of leeches, in turn the predation evolved in three different, independent paths [3,79,80].

Leeches are notorious for their bloodfeeding thanks to the medicinal leech *Hirudo medicinalis* (L.) (Fig. 2). However, the species feeding with blood of vertebrates are less numerous in comparison with predators [3,80]. For example, there are over 40 non-sanguivory species known in genus *Helobdella* [80], and approximately 40 species of predatory leeches in genus *Erpobdella* [81,80] (Figs. 3,4).

Table 1. List of leech species of Poland

Lp.	Leech	Prey categories	Locality	References
	Glossiphoniidae Vaillant, 1890			
1.	*Glossiphonia complanata* (Linnaeus, 1758)	predator (molluscs, insect larval forms, other leeches)	in whole Poland	3, 11, 12, 13, 14, 15,16, 17, 18
2.	*Glossiphonia concolor* (Apáthy, 1888)	predator (molluscs)	PLD, MLD, W-KL, PL, BF, K-WU, ML, Ś Mts, LU	3, 11, 12, 13, 14, 16, 18
3.	*Glossiphonia nebulosa* Kalbe, 1964		BC, MLD, ML	17, 18
4.	*Glossiphonia verrucata* (Fr. Müller, 1846) (=*Boreobdella*)		MLD, W-KL, US	11, 12, 13, 14, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26
5.	*Glossiphonia* (=*Batracobdella*) *paludosa* (Carena, 1824)	predator (amphibians)	PLD, MLD, W-KL, ML, PL, BF, US, K-WU, MU, SL	11, 12, 13, 14, 15, 16, 26, 27
6.	*Alboglossiphonia heteroclita* (Linnaeus, 1761)	predator (molluscs, insect larval forms)	in whole Poland but not found in mountain areas	11, 13, 14, 15, 16, 18
7.	*Alboglossiphonia hyalina* (O. F. Müller, 1774)	predator (molluscs)	BC, PLD, MLD,W-KL, PL, US, LS, ML, K-WU, MU	11, 13, 14, 16, 18, 28, 29
8.	*Alboglossiphonia papillosa* (Braun, 1805)		BC, PLD, MLD, W-KL, BF, US, LS,K-WU, MU	11, 13, 14, 16, 28, 29, 30
9.	*Alboglossiphonia striata* (Apáthy, 1888)		BC, PLD, MLD, US, LS, ML, K-WU, MU	11, 13, 14, 16, 18
10.	*Bartacobdelloides moogi* Nesemann and Csányi, 1995		MLD, ML, B Mts	16, 18, 27, 31
11.	*Hemiclepsis marginata* (O. F. Müller, 1774)	bloodsucker (amphibians tadpoles, fishes)	BC, PLD, MLD, W-KL, ML, PL, BF, US, LS, MU, LU, SL, WB Mts, ND, P Mts	3, 11, 14, 15, 16, 18, 32, 33
12.	*Theromyzon tessulatum* (O. F. Müller, 1774)	bloodsucker (Anseriformes)	BC, PLD, MLD, W-KL, ML, PL, BF, US, LS, MU, SL, WB Mts	11, 13, 14, 15, 16, 18, 28, 29,30, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42
13.	*Theromyzon maculosum* (Rathke, 1862)		MLD, PL	14,16, 26, 37, 38, 43, 44, 45
14.	*Helobdella stagnalis* (Linnaeus, 1758)	predator (oligochaetes, insect larval forms)	in whole Poland	11, 13, 14, 15, 16, 17, 18, 24, 32, 33
15.	*Placobdella costata* (Fr. Müller, 1846)	bloodsucker (reptiles, Anseriformes)	BC, PLD, MLD, W-KL, ML, PL, BF	3, 12, 13,14, 16, 37, 38, 43, 46, 47, 48
	Piscicolidae Johnston, 1865			
16.	*Piscicola geometra* (Linnaeus, 1758)	bloodsucker (fishes)	in whole Poland	10, 11, 12, 15, 17, 18, 49, 50, 51
17.	*Piscicola* (=*Cystobranchus*) *respirans* (Troschel, 1850)		Tatra and Sudeten Mts	10, 11, 12, 50, 52, 53, 54, 55, 56, 57
18.	*Piscicola* (=*Cystobranchus*) *fasciata* (Kollar, 1842)		MLD	10, 11, 12, 13, 21, 26, 58, 59, 60, 61
19.	*Piscicola pojmanskae* Bielecki, 1994		ML, LS	10, 17, 26, 62, 63
20.	*Piscicola borowieci* Bielecki, 1997		LS	10
21.	*Piscicola witkowskii* Bielecki, 1997		BC	10
22.	*Piscicola annae* Bielecki, 1997		PLD	10
23.	*Piscicola elishebae* Bielecki, 1997		W-KL	10
24.	*Piscicola niewiadomskae* Bielecki, 1997		MLD	10

25.	*Piscicola pomorskii* Bielecki, 1997		BC	10
26.	*Piscicola kusznierzi* Bielecki, 1997		PLD	10
27.	*Piscicola margaritae* Bielecki, 1997		LS	10
28.	*Piscicola jarai* Bielecki, 1997		W-KL	10
29.	*Piscicola wiktori* Bielecki, 1997		LS	10
30.	*Piscicola brylinskae* Bielecki, 2001		MLD	64
31.	*Italobdella epshteini* Bielecki, 1997		ML	10
32.	*Italobdella ciosi* Bielecki, 1997		MLD	10
33.	*Cystobranchus mammillatus* (Malm, 1863)		US, LS, ML	10, 11, 12, 26, 65, 66
34.	*Acipenserobdella volgensis* (Zykoff, 1903)		BC	10, 11, 12, 26, 67
35.	*Caspiobdella fadejewi* (Epshtein, 1961)		B Mts, MLD, PL	10, 12, 13, 68, 69, 70
36.	*Pawlowskiella stenosa* Bielecki, 1997		LS	10
	Hirudinidae Whitman, 1886			
37.	*Hirudo medicinalis* Linnaeus, 1758	bloodsucker (vertebrates)	BC, PLD, MLD, W-KL, ML, PL, BF, MU, LU, EB Mts	11, 12, 15, 17, 18, 26, 71
	Haemopidae Richardson, 1969			
38.	*Haemopis sanguisuga* (Linnaeus, 1758)	predator (small invertebrates and vertebrates)	BC, PLD, MLD, W-KL, ML, PL, BF	11, 12, 18
	Erpobdellidae Blanchard, 1894			
39.	*Erpobdella octoculata* (Linnaeus, 1758)	predator (oligochaetes, insect larval forms)	in whole Poland	11, 12, 15, 17, 18, 72, 73, 74
40.	*Erpobdella nigricollis* (Brandes, 1900)		in whole Poland	11, 12, 13, 15, 17, 18, 72, 75
41.	*Erpobdella testacea* (Savigny, 1822)		in whole Poland	11, 12, 15, 18, 32, 72, 76
42.	*Erpobdella vilnensis* Liskiewicz, 1934		WS Mts, ES Mts, Tatra Mts	11, 12, 13, 72, 75
43.	*Erpobdella monostriata* Lindelfeld et Pietruszyński, 1898		BC, PLD, MLD, ML, W-KL	11, 12, 15, 18, 37,72
44.	*Dina lineata* (O. F. Müller, 1774)		BC, PLD, MLD, W-KL, MD, BF, US, LS, TH, MU	11, 12, 13, 18, 26, 72
45.	*Dina stschegolewi* Lukin et Epstein, 1960		in whole Poland	11, 12, 18, 26, 72, 77
46.	*Dina apáthy* (Gedroyć, 1916)		PLD, MLD, W-KL, ML, BF	11, 12, 18, 26, 72
47.	*Trocheta bykowskii* Gedroyć, 1913	predator (Lumbricidae)	MLD, B Mts, WB Mts, ND	11, 12, 26, 78

Note: According to Lukin (1976) *Dina* species are included to subgenus *Dina* within genus *Erpobdella*. However, molecular studies by Siddall (2002) [81] have shown that distinguishing of the genera *Erpobdella*, *Dina*, *Trocheta* is unjustified, and these leeches should be included to one genus *Erpobdella*.

Leeches play a role of intermediate hosts for metazoan parasites: cestodes, trematodes (Monogenea and Digenea) and nematodes [82]. The leeches of families Glossiphoniidae and Erpobdellidae are the most significant vectors in expansion of the metazoan parasites. The larval forms of nematodes have been recorded inside Piscicolidae leeches (Figs. 5–9).

Numerous rhynchobdellid leeches are definitive hosts and vectors of blood parasites (Protozoa:

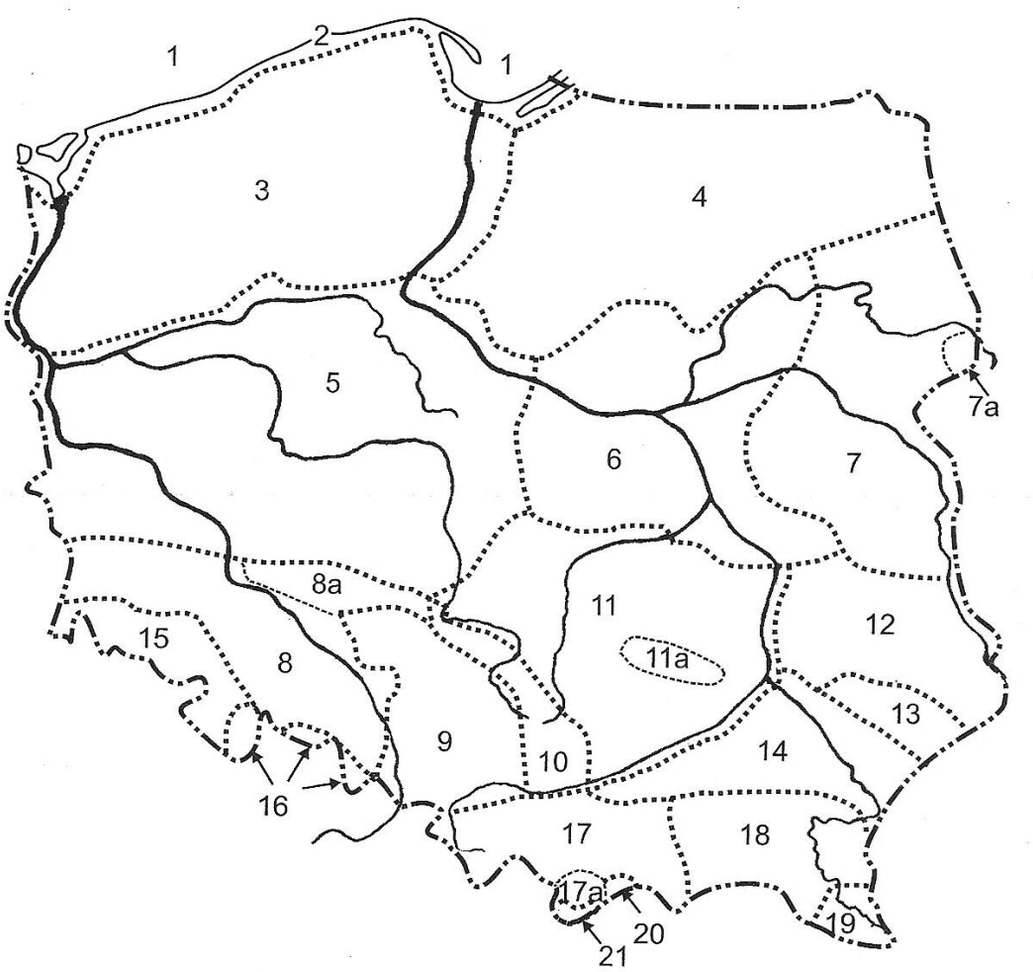

Fig. 1. Division of Poland into regions according to Prost [1] modificated by Bogdanowicz et al. [2]
1–Baltic Sea (BS); 2–Baltic Coast (BC); 3–Pomeranian Lake District (PLD); 4–Mazurian Lake District (MLD); 5–Wielkopolsko-Kujawska Lowland (W-KL); 6–Mazovian Lowland (ML); 7–Podlasie Lowland (PL); 7a–Białowieża Forest (BF); 8–Lower Silesia (LS); 8a–Trzebnickie Hills (TH); 9–Upper Silesia (US); 10–Krakowsko-Wieluńska Upland (K-WU); 11–Małopolska Upland (MU); 11a–Świętokrzyskie Mts (Ś Mts); 12–Lubelska Upland (LU); 13–Roztocze Upland (RU); 14–Sandomierska Lowland (SL); 15-Western Sudeten Mts (WS Mts); 16–Eastern Sudeten Mts (ES Mts); 17–Western Beskidy Mts (WB Mts); 17a–Nowotarska Dale (ND); 18–Eastern Beskidy Mts (EB Mts); 19–Bieszczady Mts (B Mts); 20–Pieniny Mts (P Mts); 21–Tatra Mts (T Mts)

Apicomplexa) in vertebrates [83–85]. This might indicate the ecological relationship, which could be a result of life history of blood parasites speciationed together with host-leeches. However, we do not know certainly about leeches of Hirudinidae family as well as Haemopidae family as potential vectors of parasitic diseases.

Family Piscicolidae (Fig. 10) is the most compact group of determined ectoparasites of various fishes, with the exception of a few species that presumably feed with blood of crustaceans and Octopoda [86–88]. In turn, Glossiphoniidae exhabits a mixed type of feeding (some genera are predatory forms and other – ectoparasites). Within Arhynchobdellida, leeches of order Erpobdelliformes are predators, and in order Hirudiniformes there are three families with predacious lifestyle: Cylicobdellidae, Semiscolecidae, Haemopidae.

The current classification of leeches presented in this study was proposed by Sawyer [3] (Table 2).

However, phylogenetic analyses based on morphological and molecular data have shown surprising results and suggested series of changes in classification of these animals on species level as well as higher-level relationship [79,80,89,90] (Table 3).

In this study the presence of rare species has been shown. Some of them: *Theromyzon maculosum* (Rathke, 1862) (Fig. 11), *Glossiphonia* (=*Batracobdella*) *paludosa* (Carena, 1824),

Fig. 2. *Hirudo medicinalis* sucking blood

Fig. 3. *Haemopis sanguisuga* attacking larval form of the *Dytiscus marginalis* (gift from Prof. E. Biesiadko)

Fig. 4. *Erpobdella nigricollis* devouring larval form of the Ephemeroptera (gift from K. Palińska, M.Sc.)

Glossiphonia (=*Boreobdella*) *verrucata* (Fr. Müller, 1846), *Piscicola* (=*Cystobranchus*) *fasciata* (Kollar, 1842), *Piscicola pojmanskae* Bielecki, 1994, *Acipenserobdella volgensis* (Zykoff, 1903), *Cystobranchus mammillatus* (Malm, 1863), *Dina apáthy* (Gedroyć, 1916), *D. lineata* (O.F. Müller, 1774), *D. stschegolewi* Lukin et Epstein, 1960,

Fig. 5. Parasite in body *Hemiclepsis marginata* (ventral view)

Fig. 6. Nematode on body *Glossiphonia* sp. (ventral view)

Trocheta bykowskii (Gedroyć, 1913) are listed on the Red List IUCN of Endangered Species in Poland [26]. One species, *Hirudo medicinalis* is strictly protected in Poland and delineated under appendix II of the Convention on International Trade in Endangered Species (CITES).

Erpobdella octoculata is the most common freshwater leech species of the lowlands of central Europe [93], although recent studies conducted in Pomerania (unpub. data, master's theses) have shown that another erpobdellid leech, *Erpobdella nigricollis*, is dominant in freshwaters. *E. octoculata* is the highly polymorphic species within which the five morphotypes are distinguished basing on differences in color pattern. There are following forms: *vulgaris*, *atomaria*, *typica*, *localis* and *pallida* [11]. The results of several examinations (including analyses of mitochondrial COI sequences and ribosomal ITS1/5,8S/ITS2) carried by Koperski

Fig. 7-8. Parasites in body *Albglossiphonia papillosa* (7. ventral view, 8. dorsal view)

et al. [73,74 in press) suggest to treat *E. octoculata* as one valid species with large morphological variability. Recently, very interesting data

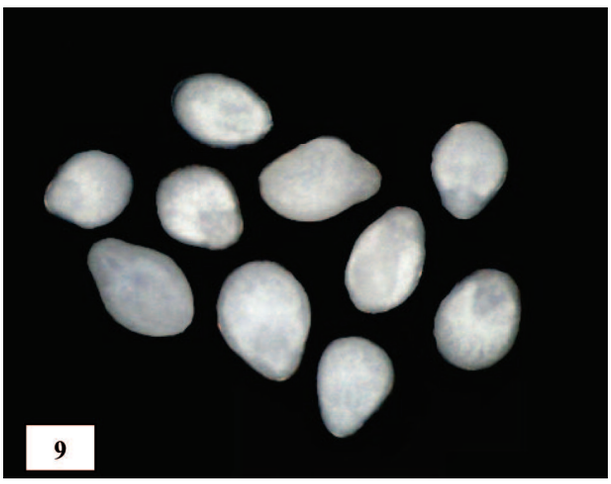

Fig. 9. Metacerkariae; *Apatemon* cf. *gracilis* or *Tetracotyle* cf. *typica* from body *G. complanata.* (Prof. K. Niewiadomska, pers.com.)

concerning the course of oogenesis in *E. octoculata* has show that in mature specimens there is no apical cell in ovary cords. The apical cell was found only in young specimens, as opposed to studies by [94,95] who have found this structure in adult specimens. Authors suggest that it might be related with the fact that in some populations leeches live only one season (semelparity), and in other populations – more seasons (iteroparity). Those different strategies could indicate the species independence of one form of nominative species [96].

Erpobdella testacea f. *grisea* Liskiewicz, 1925 the most probably is the species with limited distribution.

In Ukiel lake there were found very interesting specimens of genus *Glossiphonia*, which resemble, by the color pattern, *Glossiphonia complanata* cf. *maculosa* Sket, 1968.

In literature there are information about the occurrence *Cystobranchus pawlowskii* Sket, 1968 [=*Piscicola pawlowskii* (Sket, 1968)] in Poland [97,98]. However, after interpretation of material from Prof. Boris Sket, it was found out that *P. pawlowskii* should be treated as a species of genus *Acipenserobdella* Epshtein, 1968. Thus, there is need to describe a new species basing on specimens from Poland and other parts of Europe [99].

There is a probability, that in the future a new species will be recorded in Poland, as following: *Italobdella ciosi* Bielecki, 1994, *Hirudo orientalis* Utevsky et Trontelj, 2008, *Hirudo verbana* Carena, 1820, *Trocheta subvirdis* Dutrochet, 1817,

Fig. 10. *Italobdella ciosi*

Fig. 11. *Theromyzon maculosum*

Table 2. Classification of leeches based on Sawyer 1986 [3]. The number of genera in each family of Euhirudinea subclass is given in brackets.

Phylum:	Uniramia	
Subphylum:	Clitellata	
Class:	Hirudinea	
Subclass:	Branchiobdellidea	
	Acanthobdellidea	
	Euhirudinea	
Order:	Rhynchobdellida	
	Family:	Glossiphoniidae (23)
		Piscicolidae (41)
		Ozobranchidae (2)
Order:	Arhynchobdellida	
Suborder:	Hirudiniformes	
	Family:	Cylicobdellidae (6)
		Americobdellidae (1)
		Haemopidae (7)
		Hirudinidae (22)
		Haemadipsidae (17)
Suborder:	Erpobdelliformes	
	Family:	Erpobdellidae (7)
		Salifidae (5)

Table 3. Classification of leeches based on Borda and Siddall [80]; Sket and Trontelj [91]; Siciński [92]. The number of genera in each family of Hirudinea superorder is given in brackets.

Phylum:	Annelida	
Class:	Clitellata=Oligochaeta	
Subclass:	Hirudinida	
Superorder:	Acanthobdellida	
	Branchiobdellida	
	Hirudinea	
Order:	„Rhynchobdellida”	
	Family:	Glossiphoniidae (25)
		Piscicolidae (41)
		Ozobranchidae (2)
Order:	Arhynchobdellida	
Suborder:	Hirudiniformes (=Gnathobdellida)	
	Family:	Cylicobdellidae (6)
		Semiscolecidae (4)
		Haemopidae (3)
		Hirudinidae (19)
		Macrobdellidae (5)
		Haemadipsidae (17)
		Xerobdellidae (2)
Suborder:	Erpobdelliformes (=Pharyngobdellida)	
	Family:	Americobdellidae (1)
		Erpobdellidae (10)
		Salifidae (7)

Trocheta haskonis Grosser, 2000, *Trocheta pseudodina* Nesemann, 1990 and *Dina punctata* Johansson, 1827.

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