

A new checklist of Slovenian leeches (Hirudinea: Euhirudinea): In memory of Boris Sket (1936–2023)

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Abstract. The new (as of 2023) checklist of Slovenian leeches (Euhirudinea) contains 33 species, which is a 44% increase since the last published inventory in 2003. Notable new entries include *Placobdella costata* found parasitizing on the European pond turtle, the marine fish leech *Trachelobdella lubrica* from the Slovenian Adriatic coast, the semi-terrestrial *Haemopsis elegans*, the terrestrial *Xerobdella praealpina* – making Slovenia possibly the only country with confirmed occurrence of all three European land leeches – and a new, still undescribed highly troglomorphic cave leech from a deep Dinaric cave. The number of freshwater fish leeches (Piscicolidae) is underwhelmingly low: two. This, and several unresolved taxonomic questions in the family Erpobdellidae suggest that more faunistic and taxonomic work is needed and that the list of Slovenian leech species is far from concluded. The authors dedicate this contribution to their teacher, Prof. Boris Sket (1936–2023), a leading figure in biodiversity research in the Dinaric Karst, including leeches and cave life.

Key words: leeches, Hirudinea, cave, diversity, species number, new species, Slovenia

Izvleček. Pregled pijavk Slovenije (Hirudinea: Euhirudinea): V spomin Borisu Sketu (1936–2023)
– Posodobljeni (stanje 2023) seznam slovenskih pijavk (Euhirudinea) ima 33 vrst in za 44 % presega prejšnji pregled, objavljen leta 2003. Izmed novosti velja omeniti želvjo pijavko *Placobdella costata*, najdeno na močvirski sklednici, morsko ribjo pijavko *Trachelobdella lubrica* iz obrežnega pasu slovenske Obale, pretežno kopensko sorodnico konjske pijavke *Haemopsis elegans*, popolnoma kopensko pijavko *Xerobdella praealpina* – s katero je Slovenija postala domnevno edina država s potrjenimi najdbami vseh treh evropskih kopenskih pijavk iz rodu *Xerobdella* – in pa novo, še neopisano močno troglomorfno jamsko pijavko iz globokega brezna na Kočevskem. Z le dvema vrstama je zastopanost sladkovodnih ribjih pijavk (Piscicolidae) pod vsemi pričakovanji. Ta ugotovitev skupaj z nerešenimi taksonomskimi problemi v družini Erpobdellidae kaže, da bo potrebnega še precej favnističnega in taksonomskega dela ter da je seznam slovenskih pijavk vse prej kot zaključena zgodba. Avtorja posvečava pričujoči prispevek spominu na učitelja in mentorja profesorja Borisa Sketa (1936–2023), vodilnega raziskovalca biodiverzitete Dinarskega krasa, predvsem pijavk in podzemeljskega živalstva.

Ključne besede: pijavke, Hirudinea, jame, raznovrstnost, število vrst, nove vrste, Slovenija



Introduction

It is safe to say that without the pioneering work on the leech fauna of former Yugoslavia by Boris Sket much of the exceptional biodiversity of this area would have remained unknown till the present day. He established taxonomic standards that enabled reliable descriptions of these very morphologically plastic and variable animals, developed new sampling methods that opened a window into the depths of ancient Lake Ohrid and caves of the Dinaric Karst, and was the first to apply molecular taxonomic approaches to leeches. His landmark monograph was published fifty-five years ago (Sket 1968). Since then, many new species have been described and discovered, and the big Balkan country fell apart. Some of its constituent republics have become EU member states and need to update their faunistic inventories for legal and other reasons. In Slovenia, the northernmost of the former Yugoslavian republics, research on leeches continued after the disintegration. Some of these new additions to leech taxonomy and fauna have not yet been published at all and others are scattered in different kinds of publications, so the time seems right for a succinct overview. With this contribution we wish to honour the memory of Boris Sket, who taught and raised many of the currently active Slovenian zoologists, taxonomists and speleobiologists. He passed away on 7. 5. 2023.

This contribution is dealing with leeches in the narrow sense, referred to as the order Euhirudinea Lukin, 1956, or Hirudinida Siddall et al., 2001 (junior synonym, not valid). Newer phylogenies (e.g. Tessler et al. 2018) suggest that leeches as traditionally perceived and known under the name Hirudinea Lamarck, 1818 include two additional order-level lineages, the Acanthobdellida Livanow, 1905 and the Branchiobdellida Holt, 1965. Only the latter group has representatives living in Slovenian fresh waters as epibionts on crayfish. It will be the subject of a separate contribution.

The current Euhirudinea species count is at about 830 nominal species globally (Grosser et al. 2024). Biogeographically, the diversity is relatively evenly distributed with an apparent slight bias toward the Palearctic region (Sket & Trontelj 2008). Leeches inhabit a variety of habitats from marine via freshwater to terrestrial, and display a range of lifestyles from predatory via ecto- and endoparasitic to scavenger (Sawyer 1986). All these ecologies and lifestyles are represented within the small fraction of the global diversity of leeches inhabiting Slovenia.

The first comprehensive list of Slovenian leech species can be extracted from Sket's (1968) Yugoslavian overview – it counted 22 species, of which three were treated as form or subspecies. Three decades later, the list was augmented by merely a single marine species, *Pontobdella muricata*, and the number 23 seemed to be final (Sket 1996; 2003). Intentionally or not, our teacher and mentor offered the greatest possible motivation to carry on with the faunistic work by declaring that the work is finished (Sket 2003): »Iz Slovenije pa je znanih trenutno 23 vrst in ta številka se kaj bistveno ne more več spremeniti. – *There are currently 23 species known from Slovenia and this number cannot change substantially anymore.*«

Materials and methods

To compile the checklist, we updated data from Sket (1968; 1996) with data from literature published up to the present day (Trontelj et al. 1999; Trontelj 2000; Trontelj et al. 2004; Vamberger & Trontelj 2007; Jueg 2015; Kvist et al. 2023). In addition, readily available non-literature sources of documented biodiversity data were screened for new records, such as collections, molecular databases and photographic fora. No dedicated taxonomic work, neither on collections nor in the field, was performed as basis for the present checklist. Any taxonomic identifications that are not part of peer-reviewed publications were made by the first author on previous occasions.

The taxonomy is based on Neesemann & Neubert (1999) and incorporates subsequent additions and rearrangements as explained in the Comments to the checklist. The taxonomic sequence used follows Sket (1968) in order to ease comparison between the two checklists.

Results

The newly compiled checklist of leeches of Slovenia (Tab. 1) includes 33 species belonging to six families and 16 genera. It includes one new undescribed species and two species whose potential identity with an existing name-bearing type remains to be clarified.

Table 1. Leech (Euhirudinea) species recorded in Slovenia.

Tabela 1. V Sloveniji ugotovljene vrste pijavk (Euhirudinea).

Classification	Species	Source
Subclass Hirudinea		
Lamarck, 1818		
Order Euhirudinea		
Lukin, 1956		
Fam. Glossiphoniidae		
Vaillant, 1890		
<i>Alboglossiphonia</i> Lukin, 1976	<i>Alboglossiphonia heteroclita</i> (Linnaeus, 1761)	Sket (1968); listed as <i>Glossiphonia heteroclita</i> (Linnaeus, 1761)
	<i>Alboglossiphonia hyalina</i> (O.F. Müller, 1774)	Sket (1968); listed as <i>Glossiphonia heteroclita</i> forma <i>hyalina</i> (O.F. Müller, 1774)
	<i>Alboglossiphonia striata</i> (Apáthy, 1888)	Sket (1968); listed as <i>Glossiphonia heteroclita</i> forma <i>striata</i> (Apáthy, 1888)
<i>Glossiphonia</i> Johnson, 1816	<i>Glossiphonia complanata</i> (Linnaeus, 1758)	Sket (1968)
	<i>Glossiphonia concolor</i> (Apáthy, 1888)	Sket (1968); listed as <i>Glossiphonia complanata complanata</i> (Linnaeus, 1758) forma <i>concolor</i>
	<i>Glossiphonia nebulosa</i> (Kalbe, 1964)	Sket (1968); listed as <i>Glossiphonia complanata complanata</i> (Linnaeus, 1758) forma <i>nebulosa</i>

Classification	Species	Source
	<i>Glossiphonia paludosa</i> (Carena, 1824)	Sket (1992)
	<i>Glossiphonia slovacica</i> (Koželj, 1973)	Trontelj (2000)
<i>Helobdella</i> R. Blanchard, 1896	<i>Helobdella stagnalis</i> (Linnaeus, 1758)	Sket (1968)
<i>Theromyzon</i> Philippi, 1867	<i>Theromyzon tessulatum</i> (O.F. Müller, 1774)	Sket (1968)
<i>Hemiclepsis</i> Vejdovsky, 1884	<i>Hemiclepsis marginata</i> (O.F. Müller, 1774)	Sket (1968)
<i>Placobdella</i> R. Blanchard, 1893	<i>Placobdella costata</i> (Fr. Müller, 1846)	Vamberger & Trontelj (2007)
Fam. Piscicolidae		
Johnston, 1865		
<i>Pontobdella</i> Leach, 1815	<i>Pontobdella muricata</i> (Linnaeus, 1758)	Trontelj et al. (1999)
<i>Trachelobdella</i> Diesing, 1850	<i>Trachelobdella lubrica</i> (Grube, 1840)	This work: Piran, Fiesa (45.5259 lat, 13.5835 lon), littoral zone few meters from shore; 21. 9. 2001
<i>Cystobranchnus</i> Diesing, 1859	<i>Cystobranchnus respirans</i> (Troschel, 1850)	Sket (1968)
<i>Piscicola</i> Blainville, 1818	<i>Piscicola geometra</i> (Linnaeus, 1758)	Sket (1968)
Fam. Hirudinidae		
Whiteman, 1868		
<i>Hirudo</i> Linnaeus, 1758	<i>Hirudo medicinalis</i> Linnaeus, 1758	Sket (1968)
	<i>Hirudo verbana</i> Carena, 1820	Trontelj et al. (2004)
Fam. Haemopidae		
Richardson, 1969		
<i>Haemopsis</i> Savigny, 1822	<i>Haemopsis sanguisuga</i> (Linnaeus, 1758)	Sket (1968)
	<i>Haemopsis elegans</i> Moquin-Tandon, 1846	Kvist et al. (2023)
Fam. Xerobdellidae		
Moore, 1946		
<i>Xerobdella</i> Frauenfeld, 1868	<i>Xerobdella lecomtei</i> Frauenfeld, 1868	Sket (1968)
	<i>Xerobdella anulata</i> Autrum, 1958	Sket (1968)
	<i>Xerobdella praealpina</i> Minelli, 1971	Jueg (2015)
Fam. Erpobdellidae		
Moore, 1908		
<i>Erpobdella</i> Blainville, 1918	<i>Erpobdella octoculata</i> (Linnaeus, 1758)	Sket (1968)
	<i>Erpobdella verrucosa</i> (Örley, 1886)	Sket (1968); listed as <i>Erpobdella monostrata</i> (Gedroyc, 1916)
	<i>Erpobdella testacea</i> (Savigny, 1822)	Sket (1968)
	<i>Erpobdella nigricollis</i> (Brandes, 1900)	Sket (1968)
<i>Dina</i> R. Blanchard, 1892	<i>Dina lineata</i> (O. F. Müller, 1774)	(Ur. l. RS 2002); listed as <i>Dina lineata lineata</i>
	<i>Dina krasensis</i> (Sket, 1968)	Sket (1968); listed as <i>Trocheta bykowskii krasense</i> ssp. n
	<i>Dina</i> A cf. <i>punctata</i>	Sket (1968); listed as <i>Dina apathyi</i> (Gedroyc, 1916)

Classification	Species	Source
	<i>Dina</i> B cf. <i>punctata</i>	This work: Ljubjana, Sava River (46.0773 lat, 14.6512 lon), collected by P.T. on gravel bank; 30. 6. 2021
	<i>Dina</i> sp.n.	This work: Črnomelj, Čaganka Cave (45.5499 lat, 15.0822 lon, -400 m), on photo taken by Anže Tomšič, a caver from Caving Club Novo mesto; 12. 1. 2014
<i>Trocheta</i> Dutrochet, 1817	<i>Trocheta cylindrica</i> Örley, 1886	Sket (1968); listed as <i>Trocheta bykowskii</i> (?) <i>bykowskii</i> Gedroyć, 1913

Comments

Alboglossiphonia

The genus was established only after the work by Sket (1968). All three taxa from Central Europe that have thereafter been recognized as separate species (Trontelj 1997; Nesemann & Neubert 1999) had been reported by Sket (1968) for the territory of Slovenia.

Glossiphonia paludosa

The original mention (Sket 1992) is without locality and date but includes habitat – eutrophic ponds. On a second occasion, Sket (1996) lists presumably the same find under the obsolete generic assignment *Batracobdella paludosa* and includes 'NE Slovenia' as geographic descriptor. Only later it became known that under the name *G. paludosa* a second species with similar habitat and distribution, *Batracobdelloides moogi*, had been frequently addressed (Nesemann & Csanyi 1995). A third species, *Glossiphonia slovacā*, closely resembles *G. paludosa*. Thus the record could refer to any of these three species. However, *G. slovacā* is the least likely candidate as its habitat is in large rivers of the Danube Basin, such as the Sava near Brežice (Trontelj 2000). Until we obtain corroboration in the form of either a corresponding collection item or a field record from a pond in Northeast Slovenia, this will remain the vaguest taxon on the present checklist.

Cystobranchnus respirans

This freshwater fish leech is by some contemporary authors referred to by its synonym *Piscicola respirans* Troschel, 1850. However, available molecular phylogenies suggest that a couple of other valid piscicoline genera are more closely related to *Piscicola* sensu stricto, making the original classification non-monophyletic (Utevsky & Trontelj 2004; Cichocka et al. 2018). It therefore makes sense to keep the genus *Cystobranchnus* Dissinc, 1859, on the basis of its type species *C. respirans*.

Trachelobdella lubrica

No written sources documenting the occurrence of this globally distributed species in the Slovenian part of the Adriatic Sea are known to the authors. The closest known sites are the coastal waters around Venice (Mizzan 1994). The 2001 find in Slovenian coastal waters can be considered as expected. Two individuals were found in the first few meters of the littoral zone at Fiesa, Piran. The leeches were hidden in dense marine vegetation, detached from hosts. The sampling was carried out within a fieldwork class for Biology students of the Biotechnical Faculty of the University of Ljubljana.

Erpobdella verrucosa

Since the first listing for Slovenia under the name *Erpobdella monostrata* (Gedroyć, 1916) in Sket (1968), the name of this species was changed to the presumably correct combination *Erpobdella vilnensis* (Liskiewicz, 1925) and used by Trontelj et al. (1996), Nesemann & Neubert (1999) and several subsequent authors. Only recently, Košel (2020) discovered that priority has to be given to a much older description of this taxon from Budapest, and the valid new combination is *Erpobdella verrucosa* (Örley, 1886).

Dina lineata

The only authoritative source unambiguously referring to the occurrence of this species in Slovenia is the official national Red List (Ur. l. RS 2002). Although anonymized in the legislative document, the data have been provided by Boris Sket. The exact site of the corresponding discovery can only be reconstructed via a chronological examination of corresponding collection items – provided they still exist.

Dina cf. punctata

The material analyzed by Sket (1968) from western Slovenia and identified as *Dina apathy* does not belong to this species, as can be seen by drawing (No. 29 on page 183) of the male genital atrium. This is clearly of the *Dina*-type, while *D. apathy* has a *Trocheta*-type atrium (Nesemann & Neubert 1999; Grosser 2015). Although without locality data, *D. punctata* is listed in the national Red List (Ur. l. RS 2002). In Slovenia, there seem to be at least two species with *Dina*-like annulation and a colouration pattern consisting of light dots on dark background, matching the general description of *Dina punctata*. They are phylogenetically distinct from this Western European species (unpublished data) and may or may not be conspecific with one of several other European populations falsely attributed to *D. punctata* or, recently, described as separate species (Grosser et al. 2023 and references therein).

Dina sp.n.

This is the first markedly troglomorphic obligate cave leech from Slovenia, phylogenetically close to the *Dina absoloni* group. The first discoverers provided excellent photos (Fig. 1), based on which it could be unambiguously inferred that the find represents a hitherto undescribed species. Later, a specimen was obtained and deposited in the Zoological Collection of the Department of Biology (Biotechnical Faculty, University of Ljubljana, Slovenia) that will serve as holotype for the imminent description.



Figure 1. The first picture of *Dina* sp. n., taken on 12. 1. 2014 in the Čaganka Cave, southern Slovenia, at a depth of about 400 meters. The length of the leech on the picture is approx. 10 cm (photo: Anže Tomšič).

Slika 1. Prvi posnetek nove vrste pijavke, *Dina* sp. n., iz jame Čaganke na Kočevskem, na pribl. 400 metrih globine, z dne 12. 1. 2014. Dolžina pijavke na sliki je okrog 10 cm (foto: Anže Tomšič).

Discussion

Leeches are not as extensively studied and as popular with a wider number of naturalists as for example vertebrates or some groups of insects. It is therefore expected that the number on national and regional species lists will increase, both as a consequence of faunistic novelties and newly described species. In Slovenia, the number of known species has increased by 44% in the past two decades. With 33 species the Slovenian leech fauna is moderately diverse, when compared to the faunas of some nearby countries with recently published inventories: 50 species in Germany (Grosser et al. 2024), 47 species in Poland (Bielecki et al. 2011), 29 species in Montenegro (Grosser et al. 2015), 25 species in Bulgaria (Jueg 2010), 24 species in the Czech Republic (Košel 2014) and 21 species in Bosnia and Herzegovina (Dmitrović & Pešić 2020).

The known Slovenian leech fauna is comparatively poor in freshwater piscicolids, featuring only two species in contrast to 18 species in Germany (Grosser et al. 2024) or 21 species in Poland (Bielecki et al. 2011). The first major reason for this discrepancy is that the new approaches and expertise that gave rise to the great increase in freshwater piscicolid diversity (Bielecki 1997) have not yet been fully adopted by Slovenian researchers. The second and somewhat

hypothetical reason is that the mere extent of suitable fish leech habitats in Slovenia is not sufficient to support as many taxa as the lowland lakes and rivers of Central and Eastern Europe. Nevertheless, the diversity of freshwater fish leeches in Slovenia is expected to boost when more focus is put on this faunal segment.

A change in research focus is warranted also with respect to the expected arrival of invasive species. Several of them are already spreading across Europe, especially the self-fertilizing glossiphoniid *Helobdella europaea* (Ferreira et al. 2022) and the salifid *Barbronia weberi* (Sawyer 2020).

Finally, the updated national list of species can be seen as an incentive to revise the dated Red List of endangered leeches (Ur. l. RS 2002). Two of the newly added species appear to be exceedingly rare: *Xerobdella praealpina* and the undescribed *Dina* sp. n. from the Čaganka Cave. New data on their distribution, population status and ecology are needed just as much as appropriate legal measures. On the downside, the inclusion of *Glossiphonia slovacica* on the national Red List did not help preserve its sole known site. The last free-flowing stretch of the Sava River before the Slovenian-Croatian border is under threat by the imminent construction of the final hydro-powerplant in the Slovenian Lower-Sava chain (Hidroelektrarne na Spodnji Savi 2023).

Povzetek

Raziskanost favne in taksonomija pijavk bivše Jugoslavije sta doživela preporod v sodobnost z delom Borisa Sketa v drugi polovici prejšnjega stoletja. Že takrat je opozoril na izredno vrstno pestrost in visoko stopnjo endemizma, zlasti na območju Dinarskega krasa. Na ozemlju Republike Slovenije je odkril 22 vrst, tri med njimi je obravnaval kot podvrste (Sket 1968). Od tega mejnika dalje je odkrivanje novih vrst sprva naraščalo tako počasi, da je dobra tri desetletja kasneje kazalo, da je favnistično delo končano: »Iz Slovenije pa je znanih trenutno 23 vrst in ta številka se kaj bistveno ne more več spremeniti« (Sket 2003). Ali je Boris Sket s to izjavo namerno ali nenamerno izzval mlajše kolege, ne bomo nikoli izvedeli. Dejstvo pa je, da je pričujoči seznam, ki temelji na objavljenih virih in neobjavljenih podatkih iz podatkovnih zbirk, kar za 44 % daljši in šteje 33 vrst.

Od novosti velja omeniti želvjo pijavko *Placobdella costata*, najdeno na močvirski sklednici, morsko ribjo pijavko *Trachelobdella lubrica* iz obrežnega pasu slovenske Obale, pretežno kopensko sorodnico konjske pijavke *Haemopsis elegans*, ponovno odkrito »pozabljeno« vrsto medicinske pijavke *Hirudo verbana*, popolnoma kopensko pijavko *Xerobdella praealpina* – s katero je Slovenija postala domnevno edina država s potrjenimi najdbami vseh treh evropskih kopenskih pijavk iz rodu *Xerobdella* – in pa novo, še neopisano močno troglomorfno jamsko pijavko iz globokega brezna na Kočevskem. Nerazrešena ostaja taksonomska pripadnost dveh erpobdelidnih pijavk, katerih barvni vzorec na prvi pogled spominja na vrsto *Dina punctata*. S skorajšnjo gotovostjo lahko trdimo, da ne gre za to vrsto, pač pa za še neopisani ali pred kratkim opisani in premalo raziskani vrsti iz sorodstvene skupine *Dina/Trocheta*.

V primerjavi s srednjeevropskima državama z najbogatejšo favno pijavk, Nemčijo (50 vrst) in Poljsko (47 vrst), slovenski seznam zaostaja izključno na strani sladkovodnih ribjih pijavk. Ti sta pri nas dve, medtem ko jih je na Poljskem 21 vrst. K zaostanku verjetno več prispeva nizka pozornost, ki smo jo namenjali tej skupini, kot pa skromnejše omrežje naših površinskih voda. Najkasneje tukaj postane jasno, da je poznavanje slovenske favne pijavk še vedno nezadostno in da so potrebne obsežne dodatne biodiverzitetne

in taksonomske raziskave. Nezadostnost poznavanja pijavčje favne in splošno pomanjkanje zanimanja za vsestransko pomembno komponento biodiverzitete naših celinskih voda se kaže v zastarelem rdečem seznamu in v njegovem neupoštevanju. Zaradi redkosti je bila vanj vključena vrsta *Glossiphonia slovacca*, najdena le v prodiščih Save pri Čatežu. Vseeno vrsta ni bila deležna nikakršne obravnave pri presoji načrtov za izgradnjo HE Mokrice, ki bi vrsto verjetno izbrisala iz seznama slovenske favne.

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