

Aulodrilus pigueti Kowalewski, 1914 (Annelida: Clitellata) – a new record for the Polish fauna from the Oder River and remarks on other oligochaetes rarely noticed in Poland

by

Aleksandra Jabłońska^{1,*}, Agnieszka Szlauer-Łukaszewska², Aleksandra Bańkowska²

DOI: 10.1515/ohs-2015-0043

Category: Original research paper

Received: May 6, 2015

Accepted: June 29, 2015

¹Department of Invertebrate Zoology and Hydrobiology, University of Łódź, ul. Banacha 12/16, 90-237 Łódź, Poland

²Department of Invertebrate Zoology and Limnology, University of Szczecin, ul. Wąska 13, 71-415 Szczecin, Poland

Abstract

The cosmopolitan freshwater oligochaete *Aulodrilus pigueti* Kowalewski, 1914 (Naididae: Tubificinae) was recorded for the first time in Poland. The species was found at a few groyne field sites and in the main flow of the middle and lower course of the Oder River. Forty two other species of oligochaetes were found in the analyzed material, including rarely found in Poland *Aulodrilus japonicus* and *Bothrioneurum vej dovskyanum*, as well as alien species: *Branchiura sowerbyi* and *Quistadrilus multisetosus*.

Key words: Oligochaetes, faunistics, new data, freshwater fauna, Poland, river system

* Corresponding author: olapio@biol.uni.lodz.pl

Introduction

Fauna of oligochaetes in Poland is rather well studied, but extensive studies were conducted mainly in southern, central and north-western Poland (e.g. Kasprzak 1972; Dumnicka 2000; Jabłońska 2014). So far, 221 terrestrial and inland aquatic species have been reported from the country (Kahl & Pilipiuk 2004; Dumnicka & Koszałka 2005; Dumnicka & Poznańska 2006; Krodzewska 2007; Dumnicka 2009; Dumnicka et al. 2014). Among oligochaetes of the genus *Aulodrilus* Bretscher, 1899, three species were already identified in the Polish freshwaters: *Aulodrilus limnobius*, *A. pluriset*a and *A. japonicus*.

Aulodrilus pigueti was described by Kowalewski (1914a) from the pond in Dublany, Ukraine. This cosmopolitan species is known from various freshwater and sometimes slightly brackish habitats (Kasprzak 1981; Van Haaren & Soors 2013). It has been reported from 21 European countries, including those bordering Poland: Slovakia, Czech Republic, Lithuania, Belarus, Ukraine and Germany (Šporka 1996; Timm 2005; Schenková et al. 2010; Van Haaren & Soors 2013). The species has not been previously found within the current borders of Poland and is not included in the Polish checklists of invertebrates (Dumnicka & Rožen 1997, Kahl & Pilipiuk 2004).

Fauna of oligochaetes in the Oder River is not sufficiently investigated. Scarce information about species occurring in the river comes from papers by Hastrich (1994) and Schöll (2003). The compiled list of oligochaetes occurring in the Oder River includes 14 species as well as two additional genera and the family of Enchytraeidae. This short list represents all species so far recorded in that large European river, which probably is a gateway for invasive species (Gruszcza 1999).

The aim of this study is to complete the list of Polish oligochaetes with one species recorded for the first time in Poland, as well as to contribute to the knowledge about oligochaetes from the Oder River.

Study area

The investigation was conducted in the Oder – the second largest river in Poland and one of the major European waterways. Its total length is 854.3 km (741.9 km in the territory of Poland) and the

total drainage basin covers 118 861 km². The river is connected with other European river systems by artificial canals: Oder-Spree, Oder-Havel and Oder-Vistula (Bydgoszcz Canal). The Oder is characterized by a regulated course, which resulted in the length reduction. Additionally, since the 18th century stone groynes have been built to avoid destruction of the river banks by a strong water current and to improve shipping properties of the river (Rast et al. 2000). Slow current (or no current) zones, known as groyne fields developed between the groynes. The zones are connected with the main course of the river. There are also oxbow lakes along the river bed. These former meanders in some cases are also connected with the river. The Oder River may be divided into the upper, middle and lower course – the middle course starts in the place where the Nysa Kłodzka River discharges into the Oder, while the lower course starts at the Warta River mouth. The river flows to the north, and discharges into the Szczecin Lagoon and then the Baltic Sea.

In total, 30 sampling sites were distributed along the upper, middle and lower courses of the river. The study area stretches along the Oder course from the first site in Chałupki near the state border between Poland and the Czech Republic (49°55'18"N, 18°19'22"E) to the last one in Ognica near Szczecin (53°03'33"N, 14°21'14"E). The sampling sites are shown on the map in Fig. 1 and their characteristics are presented in Table 1.

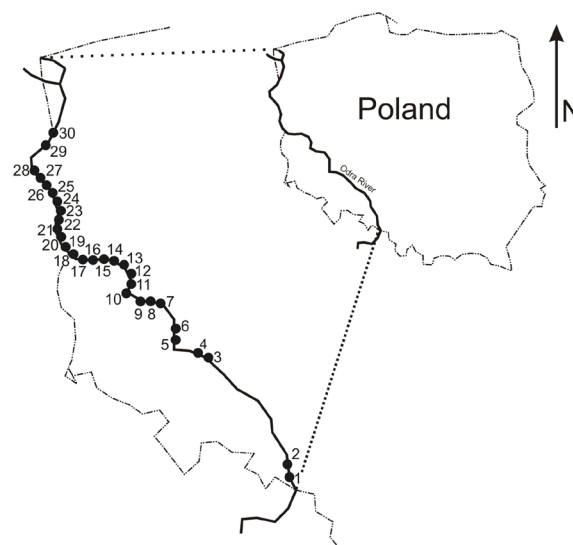


Figure 1

Sampling sites located on the Oder River

Table 1

List of sampling sites with their characteristics

	No.	sampling site	coordinates	characteristics
upper course	1	Chałupki	49°55'18"N 18°19'22"E	main course of the river, depth 0.4 m, sandy and muddy bottom with admixture of stones, steep river banks
	2	Krzyżanowice	49°58'57"N 18°16'07"E	main course of the river, depth 1.2 m, sandy and muddy bottom, steep river banks
middle course	3	Uraz	51°14'40"N 16°51'13"E	main course of the river, dammed zone, average depth 0.5 m, muddy bottom, gentle river banks
	4	Prężyce	51°14'22"N 16°49'17"E	oxbow lake connected with the river, average depth 0.8 m, sandy and muddy bottom, steep river banks
	5	Budków	51°28'55"N 16°28'18"E	oxbow lake connected with the river, average depth 0.7 m, muddy bottom, steep river banks
	6	Ścinawa	51°24'40"N 16°25'23"E	groyne field, average depth 0.5 m, muddy bottom with gravel and few stones, gentle river banks
	7	Głogów	51°39'33"N 16°04'50"E	groyne field, dammed zone, average depth 0.7 m, sandy and muddy bottom, gentle river banks
	8	Brzeg Głogowski	51°41'45"N 15°54'55"E	groyne field, average depth 0.7 m, sandy bottom with admixture of mud and stones, gentle river banks
	9	Bytom Odrzański	51°43'52"N 15°49'19"E	groyne field, average depth 0.5 m, sandy bottom with admixture of gravel or stones, steep river banks
	10	Nowa Sól	51°48'21"N 15°42'58"E	groyne field, depth 0.3 m, sandy and muddy bottom, steep river banks
	11	Bobrowniki	51°51'54"N 15°43'48"E	oxbow lake connected with the river, average depth 0.8 m, sandy bottom, steep river banks
	12	Tarnawa	51°57'54"N 15°43'90"E	oxbow lake connected with the river, average depth 0.8 m, muddy bottom, steep river banks
	13	Cigacice	52°02'01"N 15°37'07"E	groyne field, average depth 0.5 m, sandy and muddy bottom, gentle river banks
	14	Brody	52°03'40"N 15°26'04"E	groyne field, average depth 0.5 m, sandy and muddy bottom with few stones, gentle river banks
	15	Bródki	52°04'14"N 15°23'40"E	oxbow lake connected with the river, average depth 0.5 m, sandy and muddy bottom, steep river banks
	16	Krosno Odrzańskie	52°03'10"N 15°06'47"E	groyne field, average depth 0.8 m, sandy and muddy bottom, steep river banks
	17	Sarbia	52°02'26"N 14°59'22"E	oxbow lake connected with the river, average depth 0.5 m, sandy and muddy bottom, gentle river banks
	18	Połęcko	52°03'15"N 14°53'42"E	groyne field, average depth 0.7 m, sandy and muddy bottom with numerous stones, gentle river banks
	19	Rapice	52°07'00"N 14°43'52"E	groyne field, average depth 0.9 m, sandy and muddy bottom, steep river banks
	20	Urad	52°14'41"N 14°42'41"E	groyne field, average depth 0.8 m, sandy and muddy bottom with admixture of gravel, gentle river banks
	21	Ślubice	52°21'07"N 14°35'24"E	groyne field, average depth 0.8 m, sandy bottom with admixture of stones, steep river banks
	22	Górzycza	52°29'41"N 14°39'18"E	groyne field, average depth 0.8 m, muddy bottom with numerous stones, gentle river banks
lower course	23	Szumilowo	52°37'16"N 14°35'10"E	oxbow lake connected with the river, average depth 0.8 m, muddy bottom with gravel, gentle river banks
	24	Kaleńsko	52°38'14"N 14°32'43"E	groyne field, average depth 0.7 m, sandy and muddy bottom, gentle river banks
	25	Czelin	52°44'11"N 14°22'59"E	groyne field, average depth 0.6 m, sandy bottom with admixture of gravel, gentle river banks
	26	Stary Bleszyn	52°45'40"N 14°20'39"E	oxbow lake connected with the river, average depth 0.4 m, muddy bottom, gentle river banks
	27	Gozdowice	52°45'52"N 14°19'30"E	main course of the river, average depth 0.7 m, sandy and muddy bottom with few stones, steep river banks
	28	Stary Kostrzynek	52°49'48"N 14°08'39"E	oxbow lake connected with the river, depth 0.3 m, sandy and muddy bottom, gentle river banks
	29	Zatoń Dolna	53°00'42"N 14°16'35"E	main course of the river, average depth 0.7 m, sandy bottom with admixture of gravel and numerous stones, steep river banks
	30	Ognica	53°03'33"N 14°21'14"E	main course of the river, average depth 0.6 m, sandy bottom with few stones, steep river banks

Materials and methods

Samples were collected in June 2008, in May, August and October 2009 as well as in May, August and October 2010. In the upper course of the investigated river, the samples were collected from the main river bed by CIEP (Chief Inspectorate of Environmental Protection) according to the standard procedure (Bis 2007). In the middle and lower course of the Oder, the samples were collected from the main course, groyne fields and oxbow lakes with the use of a triangular drag net.

In total, 178 samples were collected, rinsed on site on a sieve with a mesh size of 0.25 mm and then fixed in 98% denatured ethanol. Oligochaete individuals

were selected from samples in a laboratory with the use of binoculars. Then microscope slides were prepared using whole specimens mounted in polyvinyl lactophenol. Species were identified with the use of identification keys by Kasprzak (1981), Timm (2009), as well as by Van Haaren & Soors (2013) under a magnification of 400× and 1000× using immersion.

Results

The studied material counted in total 2182 individuals of oligochaetes. A total of 43 oligochaete species were found in the studied material with representatives of Lumbriculidae

(1 species), Lumbricidae (1) and Naididae (41). Among Naididae, species of the four following subfamilies were recorded: Naidinae (19), Tubificinae (15), Pristininae (4) and Rhyacodrilinae (3). Representatives of Enchytraeidae as well as most of the juvenile Tubificinae and possibly some immature Rhyacodrilinae were not identified to the species level. *Ophidonais serpentina*, *Vejdovskyella*

intermedia, *Limnodrilus hoffmeisteri*, *Nais elinguis*, *N. pardalis* and *Quistadrilus multisetosus* were most abundant in the collected samples. Most species (39) were recorded in the middle course of the Oder, while in the upper course – 13 and in lower course – 26 species were found (Table 2). One species new to the Polish fauna and four species rarely found in Poland were recorded in that material.

Table 2

Oligochaetes of the Oder River recorded during the present study and their presence in relation to the type of bottom deposits

No.	Species	Upper course	Middle course	Lower course	mud	sand & mud	sand	mud with gravel or stones	sand & mud with gravel or stones	sand with gravel or stones
1	<i>Amphichaeta leydigi</i> Tauber, 1879			X		X				
2	<i>Aulodrilus japonicus</i> Yamaguchi, 1953		X			X		X	X	
3	<i>Aulodrilus pigueti</i> Kowalewski, 1914		X	X		X		X	X	X
4	<i>Aulodrilus pluriseti</i> (Piguet, 1906)		X		X	X		X	X	
5	<i>Bothrioneurum vejdoskyanum</i> Štolc, 1886	X						X		
6	<i>Branchiura sowerbyi</i> Beddard, 1892		X			X		X		
7	<i>Chaetogaster diaphanus</i> (Gruihuisen, 1828)		X	X				X	X	
8	<i>Dero digitata</i> (Müller, 1774)		X							X
9	<i>Dero obtusa</i> Udekem, 1855		X	X		X		X	X	X
10	<i>Eiseniella tetraedra</i> (Savigny, 1826)		X	X		X				
11	<i>Limnodrilus claparedeanus</i> Ratzel, 1868	X	X		X	X		X	X	X
12	<i>Limnodrilus hoffmeisteri</i> Claparède, 1862	X	X	X	X	X	X	X	X	X
13	<i>Limnodrilus profundicola</i> (Verrill, 1871)	X	X	X	X			X	X	X
14	<i>Limnodrilus udekemianus</i> Claparède, 1862		X	X		X		X	X	X
15	<i>Lumbriculus variegatus</i> (Müller, 1774)	X	X	X	X	X		X	X	X
16	<i>Nais alpina</i> Sperber, 1948		X					X		
17	<i>Nais barbata</i> Müller, 1774	X	X	X		X		X	X	
18	<i>Nais bretscheri</i> Michaelsen, 1899		X	X		X		X	X	
19	<i>Nais christinae</i> Kasprzak, 1973	X	X	X		X		X	X	X
20	<i>Nais communis</i> Piguet, 1906		X	X	X	X		X	X	X
21	<i>Nais elinguis</i> Müller, 1774		X	X	X	X		X	X	X
22	<i>Nais pardalis</i> Piguet, 1906		X	X		X		X	X	X
23	<i>Nais pseudobtusa</i> Piguet, 1906		X	X		X				X
24	<i>Nais simplex</i> Piguet, 1906			X						X
25	<i>Nais variabilis</i> Piguet, 1906		X	X		X	X	X	X	X
26	<i>Ophidonais serpentina</i> (Müller, 1774)	X	X	X		X	X	X	X	X
27	<i>Potamothenix hammoniensis</i> (Michaelsen, 1901)	X	X		X	X		X		
28	<i>Potamothenix moldaviensis</i> Vejdovský et Mrázek, 1903		X							X
29	<i>Pristina aequiseti</i> Bourne, 1891		X			X				
30	<i>Pristina bilobata</i> (Bretscher, 1903)		X	X		X				
31	<i>Pristina menoni</i> (Aiyer, 1930)		X						X	
32	<i>Pristina rosea</i> (Piguet, 1906)	X							X	
33	<i>Psammoryctides albicola</i> (Michaelsen, 1901)		X		X	X		X	X	
34	<i>Psammoryctides barbatus</i> (Grube, 1861)		X	X	X					X
35	<i>Quistadrilus multisetosus</i> (Smith, 1900)		X	X	X	X	X	X		X
36	<i>Rhyacodrilus coccineus</i> (Vejdovský, 1875)	X	X		X	X				
37	<i>Slavina appendiculata</i> (Udekem, 1855)		X		X	X				
38	<i>Spirosperma ferox</i> Eisen, 1879		X	X	X	X		X		X
38	<i>Stylaria lacustris</i> (Linnaeus, 1767)	X	X	X	X	X		X	X	X
40	<i>Uncinaxis uncinata</i> (Oersted, 1842)		X			X				
41	<i>Vejdovskyella intermedia</i> (Bretscher, 1896)		X	X		X			X	X
42	<i>Tubifex ignotus</i> (Štolc, 1886)		X			X				
43	<i>Tubifex tubifex</i> (Müller, 1774)	X	X	X	X	X			X	X

Family: Naididae

Subfamily: Tubificinae

***Aulodrilus pigueti* Kowalewski, 1914**

Material: 15 immature individuals collected from seven sampling sites (7, 9, 13, 14, 18, 24 and 27) situated in the middle and upper courses of the Oder; found in samples collected in August (4 individuals) and October 2009 (4) as well as in October 2010 (7).

Characteristics of the examined specimens: Oligochaetes with a length of 4-9 mm and 32-49 segments. In anterior dorsal bundles, 2-5 bifid and 1-4 hair chaetae were present, while in ventral bundles, 2-6 crotchets were observed. Oar-shaped pectinate chaetae were located in dorsal bundles from segment VII (Fig. 2). The body ended with an unsegmented tail.

The species is new to the Polish oligochaete fauna. It was found mostly in groyne fields (only one individual in the main course of the river) on sandy and muddy bottom, sometimes with admixture of gravel or stones. The coexisting taxa were as follows: *Lumbriculus variegatus*, *Nais christinae*, *N. pardalis*, *N. variabilis*, *Ophidonais serpentina*, *Stylaria lacustris*, *Limnodrilus udekemianus*, *Quistadrilus multisetosus*, immature Tubificinae and Enchytraeidae.

***Aulodrilus japonicus* Yamaguchi, 1953**

Material: Five immature individuals recorded from three sampling sites (14, 19, 22) in the middle course of the Oder; found in samples collected in October 2009 (1 individual), May (3) and October 2010 (1).

Characteristics of the examined specimens: Oligochaetes with a length of 10-17 mm. In anterior dorsal bundles, 4-8 hair chaetae and 6-10 crotchets, while 6-11 crotchets were present in ventral bundles. Characteristic tiny denticles of dorsal crotchets were clearly visible under a magnification of 1000×, using immersion (Fig. 3). Chloragogen tissue covered esophagus in segment X, intestine began in XI.

The species is rarely found in Poland. The individuals were collected from groyne fields with a bottom composed of sand and mud, as well as of mud with admixture of stones. The following coexisting taxa were observed: *Dero obtusa*, *Ophidonais serpentina*, *Stylaria lacustris*, *Pristina aequisetula*, *Branchiura sowerbyi*, *Limnodrilus claparedianus*, *L. hoffmeisteri*, *Potamothenix hammoniensis*, *Psammoryctides barbatus*, *Quistadrilus multisetosus*, *Spirosperma ferox*, *Tubifex tubifex* and immature Tubificinae.

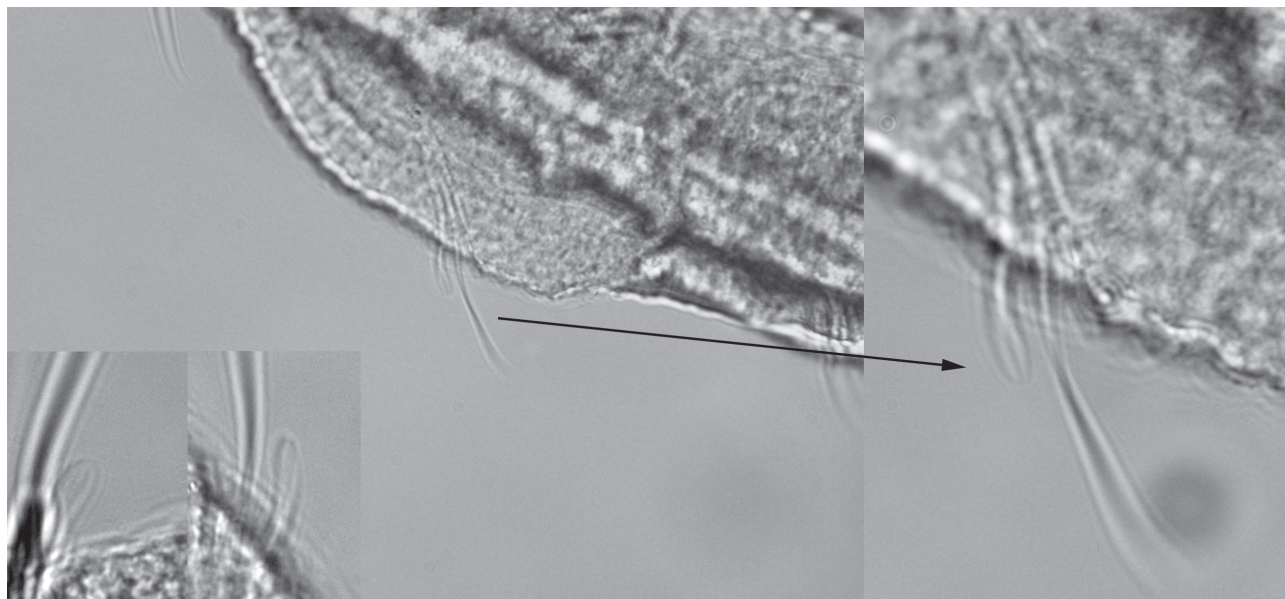
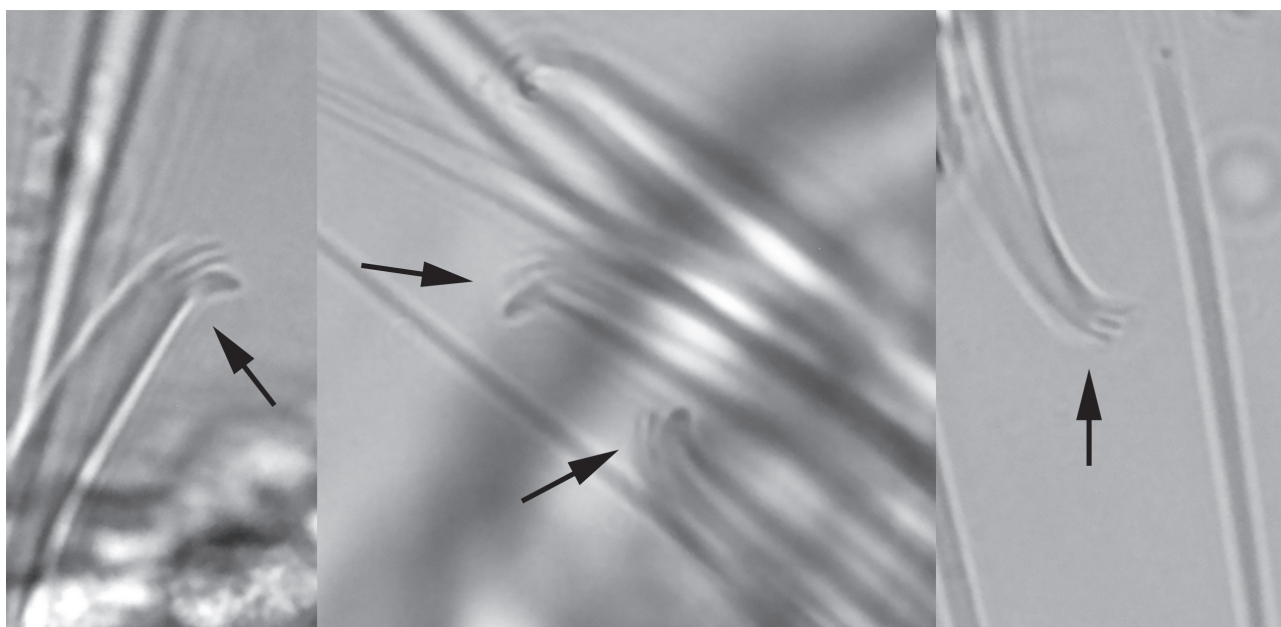


Figure 2

Oar-shaped pectinate chaetae in dorsal bundles of *Aulodrilus pigueti* (Photograph by A. Jabłońska)

**Figure 3**

Aulodrilus japonicus – crotchets of dorsal bundles (Photograph by A. Jabłońska)

***Quistadrilus multisetosus* (Smith, 1900)**

Material: A total of 65 individuals (11 mature) recorded from 10 sampling sites (5, 6, 7, 11, 12, 13, 14, 16, 23, 25) in the middle and lower courses of the Oder; found in samples collected in May (39 individuals), August (4) and October 2009 (8), as well as in October 2010 (14).

Characteristics of the examined specimens: Oligochaetes with a length of 10-15 mm. In anterior dorsal bundles, 7-14 thick hair and 2-3 thin pectinate chaetae and in anterior ventral bundles, 2-3 bifid chaetae were present, with the upper tooth longer than the lower one. In each posterior ventral bundle, one thick, slightly sigmoid bifid chaeta with the upper tooth shorter than the lower one. The body covered with small secretory papillae and one circle of large papillae per segment (Fig. 4).

Although rarely reported from Poland, this Nearctic species was frequently represented during the present study. Specimens were collected from groyne fields, oxbow lakes, and in one case – from the main river course. The following coexisting taxa were identified: *Eiseniella tetraedra*, *Lumbriculus variegatus*, *Dero obtusa*, *Nais christinae*, *Ophidonais serpentina*, *Stylaria lacustris*, *Aulodrilus japonicus*, *A. plurisetus*, *A. pigueti*, *Limnodrilus claparedeanus*,

L. hoffmeisteri, *Psammoryctides albicola*, *P. barbatus*, immature Tubificinae and Enchytraeidae.

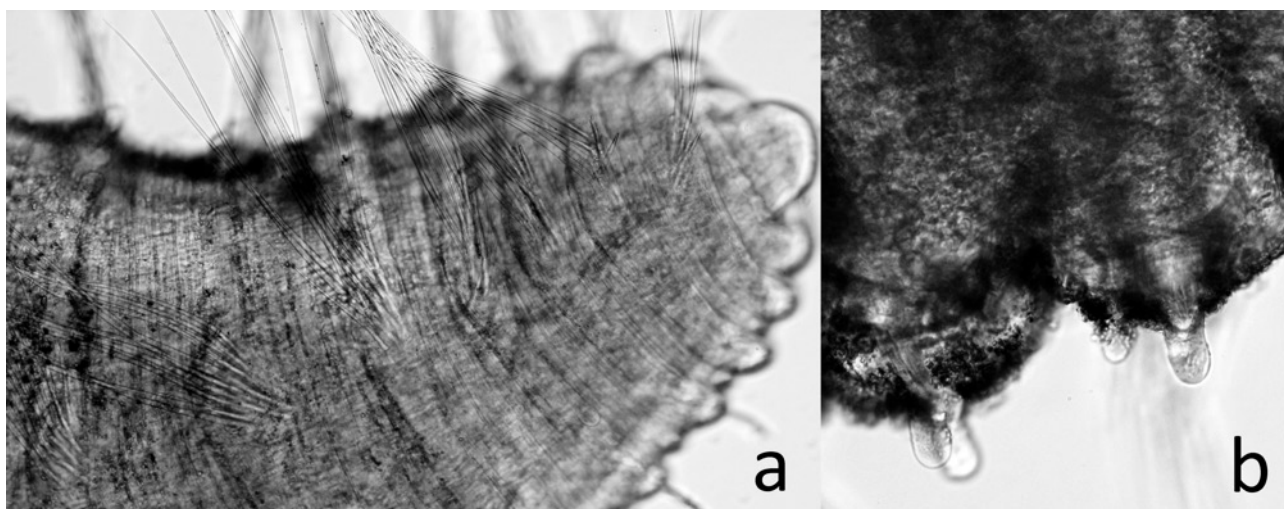
Subfamily: Rhyacodrilinae

***Bothrioneurum vej dovsky an um* Štolc, 1886**

Material: Seven mature individuals recorded from sampling site no. 1, in the upper course of the Oder; found in samples collected in June 2008.

Characteristics of the examined specimens: Oligochaetes with a length of 17-21 mm. In anterior dorsal and ventral bundles, 3-6 bifid chaetae, while in posterior segments – 2 bifid ones. Penial chaetae with the curved upper tooth and lower tooth transformed into small denticles present in IX segment, 5 per bundle. From 1 to 7 stalked spermatophores present in genital segments (Fig. 5). Sensory pit located dorsally in the prostomium.

Species rarely described from Poland. Specimens collected from the main river course of sandy and muddy bottom deposits with admixture of stones. The coexisting taxa: *Lumbriculus variegatus*, *Nais barbata*, *Ophidonais serpentina*, *Rhyacodrilus coccineus*, *Limnodrilus claparedeanus*, *L. hoffmeisteri*, *Potamothenix hammoniensis*, *Tubifex tubifex* and immature Tubificinae and possibly immature Rhyacodrilinae.

**Figure 4**

Quistadrilus multisetosus forebody (a) and its sensory papillae (b) (Photograph by A. Jabłońska)

**Figure 5**

Penial chaetae and stalked spermatophores in genital segments of *Bothrioneurum vejovskyanum* (Photograph by A. Jabłońska)

***Branchiura sowerbyi* Beddard, 1892**

Material: Two immature individuals recorded from two sampling sites – 19 and 20 in the middle course of the Oder. Found in samples collected in May and August 2010.

Characteristics of the examined specimens: Oligochaetes with a length of 25 and 27 mm. In dorsal bundles, 5-8 short hair chaetae, while 6-10 crotchets with an almost reduced upper tooth in dorsal and ventral bundles. Characteristic finger-like gills were present in the terminal part of the body (Fig. 6).

This species of Asian origin was rarely found in Poland. Specimens were collected from groyne fields with sandy and muddy bottom, in one case – with admixture of gravel. The coexisting taxa: *Dero obtusa*, *Ophidonais serpentina*, *Stylaria lacustris*, *Aulodrilus japonicus*, *Limnodrilus hoffmeisteri*, *Potamothrix hammoniensis*, *Spirosperma ferox*, *Tubifex tubifex* and immature Tubificinae.

Discussion

The total number of oligochaete species (43) identified during the present study is low, taking into account the fact that the Oder River system is the second largest in Poland and the sixth largest in

**Figure 6**

Branchiura sowerbyi – gills at the end of the body (Photograph by A. Jabłońska)

Europe (Dubicki & Błachuta 1999), characterized by great habitat heterogeneity. With oligochaetes reported from the Oder by Hastrich (1994) and Schöll (2003), the total list includes 45 species (species reported by the above authors and not found during the present study: *Chaetogaster limnaei* and *Criodrilus lacuum*). In comparison, Kownacki (1999) reported 51 species plus six Enchytraeidae representatives from the Vistula River, which is the largest river in Poland. The Oder being the western boundary of Poland, connected with the Mittelland Canal (an artificial waterway in Germany connecting European countries, from France to Poland and Czech Republic) and via Szczecin Lagoon with the Western Baltic Sea, is probably the easiest route for invasive, alien species to reach the Polish freshwater systems (Gruszka 1999; Szlauer-Lukaszewska & Grabowski 2012; Rachalewski et al. 2013), thus extensive research should be carried out in the river.

Aulodrilus pigueti is reported for the first time from Poland. It is a cosmopolitan species, often recorded from the tropical zone, known from numerous European countries, including those bordering Poland (Šporka 1996; Timm & Veldhuijzen van Zanten 2002; Timm 2005; Schenková et al. 2010). Fauna Europaea (Timm 2005) as well as a number of papers (e. g. Čekanovská 1962; Hrabě 1981) reported *Aulodrilus pigueti* also from Poland. However, that record is a misunderstanding derived from the paper by Kowalewski (1914b) who found the species in the Ukrainian town Dublany, which in the past was situated within the borders of Poland. The species was not reported from the contemporary territory of Poland (Dumnicka & Rožen 1997; Kahl & Pilipiuk 2004). Although *A. pigueti* is widely distributed, it is rarely noticed. It is mostly due to its very small size (Van Haaren & Soors 2013). In Slovakia, it was recorded from the Morava River from muddy substrate with admixture of sand and stones (Šporka 1996), while in the Czech Republic – from a small fishpond in the Czech-Moravian Highlands (Schenková et al. 2010).

Aulodrilus japonicus was recorded from Poland only by Krodzewska (2007), who found the species in two small, shallow fishponds located in the Silesian Upland. These ponds characterized by muddy bottom deposits with admixture of plant detritus, as well as by slightly acid, soft waters with moderate nutrient concentration. In comparison,

during the present study, *A. japonicus* occurred in a large river, in dammed areas of groyne fields with sandy and muddy bottom. Other studies showed great diversity of lotic environments inhabited by that species in Europe (e. g. Verdonchot 2001; Beier & Traunspurger 2003). *Aulodrilus japonicus* is rarely found but according to Timm (2009), it is probably common. One of its key features – the presence of small denticles in dorsal crotchets – is difficult to notice and it could be the cause of mistaken identification as *Aulodrilus plurisetus* (Krodzewska 2007; Timm 2009). Thus, specimens selected during the present study were observed under a magnification of 1000×, using immersion to ensure the correct identification.

Quistadrilus multisetosus is an apparently alien, Nearctic species introduced into large European rivers (Timm 2009). Fauna Europaea reports the species from Belarus, Germany, France, the Netherlands and Poland (Timm 2005), while Van Haaren & Soors (2013) consider the species as very common in the Netherlands and Belgium, and probably common in Germany. In Poland, this oligochaete was reported for the first time by Kasprzak (1971), who described it as a new species, *Peloscolex moszynskii*, from the Warta River, which is a tributary of the Oder. The species was also found by Jabłońska (2010) in the sandy and muddy bottom of a small urban stream – Dobrzyńka – in central Poland (the Oder River Basin). The findings of Jabłońska (2010) show that the species penetrates the tributaries of large rivers, but in Poland it is still recorded only from the Oder River Basin.

Bothrioneurum vejdoskyanum is a cosmopolitan, probably common species, which can be difficult to recognize when immature (Dumnicka & Poznańska 2006; Timm 2009; Van Haaren & Soors 2013). In Poland, it was recorded only from the Szczecin Lagoon and Lake Wicko by Legeżyński (1971), from the Silesian Upland by Kasprzak (1981), from Włocławek Dam Reservoir by Dumnicka & Poznańska (2006) and from the Częstochowa Upland by Dumnicka (2007). The above authors found the species in water reservoirs rich in plant detritus. In contrary, the present study reports *B. vejdoskyanum* from the main Oder River flow in its upper course, which is characterized by sandy and muddy bottom with stones. Schenková et al. (2006) found this species in the Rokytná River (not

significantly affected by human impact) in the Czech Republic, while Šporka & Mláka (2008) – in streams of the Danube Basin. On the other hand, Van Haaren & Soors (2013) reported the species mainly from springs in The Netherlands and Belgium, while Timm (2009) associate its occurrence with thermal pollution. Thus, the species is probably not closely associated with a specific habitat type.

Branchiura sowerbyi is an introduced species of Asian origin, nowadays considered as cosmopolitan (Timm 2009). Its occurrence is often connected with thermal pollution. Nevertheless, Van Haaren & Soors (2013), who reported the species as very common in The Netherlands and Belgium, were not able to confirm the above opinion. In Poland, *B. sowerbyi* was previously recorded from the artificially heated Konin Lakes and from the Szczecin Lagoon (Kasprzak 1981).

Concluding, the present study enriched the list of Polish terrestrial and freshwater oligochaetes, which currently includes 222 species. Additionally, the study contributed to the knowledge about the oligochaete distribution in the Oder River. So far, 45 species have been reported from that river, including 31 species found for the first time.

Acknowledgements

The research was financed by the grant no. N N304 327236 obtained from the Polish Ministry of Science and Higher Education.

References

- Beier S. & Traunspurger W. (2003). *Temporal dynamics of meiofauna communities in two small submountain carbonate streams with different grain size*. Hydrobiologia. 498: 107-131. DOI: 10.1023/A:1026258607551.
- Bis B. 2007. *Metodyka reprezentatywnego poboru prób siedliskowych (MHS) zespołów fauny dennej z różnych typów wód oraz standardowych procedur laboratoryjnych dla celów monitoringu ekologicznego rzek Polski zgodnego z założeniami Ramowej Dyrektywy Wodnej 2000/60/WE*. Opracowanie na zlecenie Głównego Inspektoratu Ochrony Środowiska. Łódź: EXALL (In Polish).
- Čekanovskaja O. V. (1962). *Vodnye maloščetinkovyje červi fauny SSSR*. Opred. fauny SSSR, Moskwa – Leningrad (In Russian).
- Dubicki A. & Błachuta J. (1999). *Structure and function of the Odra River's ecosystem*. Annual Report of Subproject 9 (Institute of Meteorology and Water Management, Wrocław). In: A. K. Meyer (Ed.) The International Odra Project (IOP), 2 Interim Report, Annual Report 1998 (pp. 239-255).
- Dumnicka E. (2000). *Studies on Oligochaeta taxocens in streams, interstitial and cave waters of southern Poland with remarks on Aphanoneura and Polychaeta distribution*. Acta Zoologica Cracoviensia. 43 (3-4): 339-392.
- Dumnicka E. (2007). *Distribution of Oligochaeta in various littoral habitats in the anthropogenic reservoirs*. Oceanological and Hydrobiological Studies. 36. Suppl. 4: 11-19.
- Dumnicka E. (2009). *New for Poland tubificid (Oligochaeta) species from karstic springs*. Polish Journal of Ecology. 57 (2): 395-401.
- Dumnicka E, Jabłońska-Barna I. & Rychter A. (2014). *The first record of a new alien species Limnodrilus cervix Brinkhurst, 1963 (Annelida, Clitellata) in the Vistula Lagoon (Southern Baltic Sea)*. Oceanologia. 56 (1): 151-158. DOI: 10.5697/oc.56-1.151.
- Dumnicka E. & Koszałka J. (2005). *The effect of drought on Oligochaeta communities in small woodland streams*. Biologia, Bratislava. 60 (2): 143-150.
- Dumnicka E. & Poznańska M. (2006). *Novel Polish recordings of rare aquatic Oligochaeta species*. Oceanological and Hydrobiological Studies. 35 (2). 111-120.
- Dumnicka E. & Rożen A. (1997). *Oligochaeta*. In: J. Razowski (Ed.) Checklist of animals of Poland. Vol. IV. (pp. 130-137). Kraków: Wydawnictwa Instytutu Systematyki i Ewolucji Zwierząt PAN.
- Gruska P. (1999). *The River Odra estuary as a gateway for alien species immigration to the Baltic Sea Basin*. Acta Hydrochimica et Hydrobiologica. 27 (5): 374-382. DOI: 10.1002/(SICI)1521-401X(199911)27:5<374::AID-AHEH374>3.0.CO;2-V.
- Hastrich A. (1994). *Makrozoobenthos in der mittleren und unteren Oder im Herbst 1992 und im historischen Vergleich*. Limnologica. 24 (4): 369-388 (In German).
- Hrabě S. (1981). *Vodní máloštětinatci (Oligochaeta) Československa*. Acta Universitatis Carolinae – Biologica. 1979: 1-167 (In Czech).
- Jabłońska A. (2010). *Aquatic oligochaetes (Oligochaeta aquatica) of Lodz agglomeration*. Unpublished doctoral dissertation. University of Łódź, Poland (In Polish).
- Jabłońska A. (2014). *Oligochaete communities of highly degraded urban streams in Poland, Central Europe*. North-Western Journal of Zoology. 10 (1): 74-82.
- Kahl K. & Pilipiuk I. (2004). *Skąposzczety (Oligochaeta)*. In: W. Bogdanowicz, E. Chudzińska, I. Pilipiuk & E. Skibińska (Eds.) Fauna Polski – charakterystyka i wykaz gatunków. (pp. 9-17)

- Warszawa: MiIZ PAN. (In Polish with English summary).
- Kasprzak K. (1971). *A new species of Tubificidae (Oligochaeta) found in Poland*. Bulletin of the Polish Academy of Sciences. II. 19: 261-267.
- Kasprzak K. (1972). *Materiały do znajomości skąposzczetów (Oligochaeta) Wielkopolski*. Fragmenta Faunistica. 18 (6): 99-119 (In Polish).
- Kasprzak K. (1981). *Skąposzczety wodne I. Klucze do oznaczania bezkręgowców Polski* Tom 4. PWN, Warszawa. (In Polish).
- Kowalewski M. (1914a). *Rodzaj Aulodrilus Bretscher 1899 i jego przedstawiciele*. Rozprawy Wydziału Matematyczno-Przyrodniczego Akademii Umiejętności. 14B [54B]: 107-135 (In Polish).
- Kowalewski M. (1914b). *Materyały do fauny polskich skąposzczetów wodnych (Oligochaeta aquatica)*. Sprawozdanie Komisji Fizyograficznej. 48: 107-113 (In Polish).
- Kownacki A. (1999). *Checklist of macroinvertebrates in the River Vistula*. Acta Hydrobiologica. 41 (1): 45-75.
- Krodziewska M. (2007). *The occurrence of rare in Europe and new to Poland species Aulodrilus japonicus Yamaguchi, 1953 (Oligochaeta, Tubificidae) in two fishponds*. Polish Journal of Ecology 55 (3). 615-619.
- Legeżyński P. (1971). *Skąposzczety wodne (Oligochaeta limnicola) wyspy Wolin*. Badania Fizyograficzne nad Polską Zachodnią. 24B: 83-106 (In Polish).
- Rachalewski M., Konopacka A., Grabowski M. & Bącela-Spychalska K. (2013). *Echinogammarus trichiatus (Martynov, 1932) – a new Ponto-Caspian amphipod invader in Poland with remarks on other alien amphipods from the Oder River*. Crustaceana. 86 (10): 1224-1233. DOI: 10.1163/15685403-00003228.
- Rast G., Obrdlík P. & Nieznański P. (2000). *Atlas obszarów zalewowych Odry. Oder-Auen-Atlas*. WWF Deutschland. 103 p. + Appendices.
- Schenková J., Helešic J. & Jarkovský J. 2006. *Seasonal dynamics of Bythonomus lemani and Bothrioneurum vejvodskyanum (Oligochaeta, Annelida) in relation to environmental variables*. Biologia. Bratislava. 61 (5): 517-523. DOI: 10.2478/s11756-006-0085-x.
- Schenková J., Pařil P., Petřivalská K. & Bojková J. (2010). *Aquatic oligochaetes (Annelida: Clitellata) of the Czech Republic: check-list, new records and ecological remarks*. Zootaxa. 2676: 29-44.
- Schöll F. (2003). *Makrozoobentos Odry 1998-2001*. Międzynarodowa Komisja Ochrony Odry przed Zanieczyszczeniem. Wrocław. (In Polish).
- Šporka F. (1996). *First record of Aulodrilus pigueti (Oligochaeta, Tubificidae) from the River Morava in Slovakia*. Biologia, Bratislava. 51 (5): 494.
- Šporka F. & Mláka M. (2008). *Distribution of Bothrioneurum vejvodskyanum Štolc, 1886 (Oligochaeta, Tubificidae) in streams of Slovakia (Danube basin)*. Lauterbornia. 62: 3-9.
- Szlauer-Lukaszewska A. & Grabowski M. 2012. *First record of Jaera istri Veuille, 1979 (Isopoda, Janiridae) in Poland: eastward invasion from the Mittelland Canal*. Crustaceana. 85 (11): 1333-1338. DOI:10.1163/156854012X651592.
- Timm T. (2005). *Fauna Europaea: Annelida: Oligochaeta (limnic)*. Fauna Europaea version 1.2, <http://www.faunaeur.org> (download 25.02.2015).
- Timm T. (2009). *A guide to the freshwater Oligochaeta and Polychaeta of Northern and Central Europe*. Lauterbornia. 66: 1-235.
- Timm T. & Veldhuijzen van Zanten H. H. (2002). *Freshwater Oligochaeta of North-West Europe*. World Biodiversity Database CD-ROM Series. UNESCO- Publishing.
- Van Haaren T. & Soors J. (2013). *Aquatic Oligochaeta of the Netherlands and Belgium*. Zeist: KNNV Publishing.
- Verdonschot P. F. M. (2001). *Hydrology and substrates: determinants and oligochaete distribution in lowland streams (The Netherlands)*. Hydrobiologia. 463: 249-262. DOI: 10.1023/A:1013132514610.