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Novel Polish recordings of rare aquatic Oligochaeta species

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**Abstract**

Two oligochaete species from the family Tubificidae: *Peipsidrilus pusillus* and *Tubifex blanchardi*, not previously reported from Poland, were found in the limnic part of the Włocławek Dam Reservoir. *P. pusillus* is known from lakes in Northern Europe and from a brook in the Czech Republic, while *Tubifex blanchardi* is known from fresh- and brackish waters, primarily strongly polluted waters, in North Africa and Southern Europe. Remarks on the distribution of *Bothrioneurum vej dovskyanum*, a species rarely found in Poland, are also included.

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## INTRODUCTION

Faunistic surveys of oligochaete fauna in Polish lowland rivers started at the beginning of the XX century (Moszyński 1925), and have continued until the present (Szczepański 1953, Kasprzak 1976, Wiśniewski 1976). However, data concerning the occurrence of oligochaetes in the lower course of the Vistula and Włocławek Dam Reservoir (constructed on 675 km of its course) are scarce – only 16 species or genera have been reported from both sites together (Kownacki 1999, Żbikowski 2000). Among 216 oligochaete species found in Poland (Dumnicka, Rozen 1997; Bogdanowicz et al. 2004), approximately 150 are aquatic forms, or at least their presence in this environment has been documented. Nevertheless, the list of species living in Poland is still incomplete due to the poor extent of our knowledge of oligochaete fauna in some regions (mainly Eastern and Northern Poland). Additionally, there is an increasing probability of the appearance of invasive species, as has been found for other aquatic invertebrates in Poland (Konopacka 2004), and for oligochaetes in the Netherlands (Van Haaren 2002).

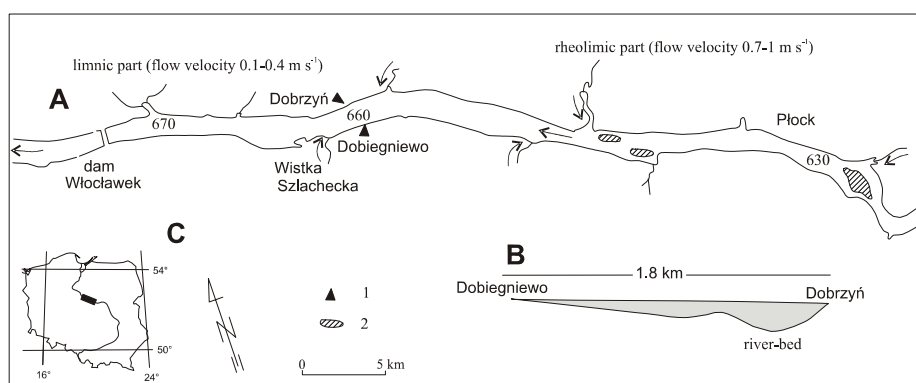
The species discussed here were collected during studies on the influence of water level fluctuations on the benthic fauna on the banks of the limnic part of Włocławek Dam Reservoir.

## MATERIAL AND METHODS AND STUDY AREA

Włocławek Dam Reservoir was created in the 1970s, after building the dam on the 675th km of the Vistula River course. It is the largest dam reservoir in Poland with respect to the surface area, and the second largest regarding volume. This reservoir is a shallow (average depth: 5.5 m), eutrophic and highly rheolimnic (Giziński 2000) water body, with a water retention time of 4-5 days. Details concerning the reservoir's morphometry and hydrology were reviewed by Głogowska (2000), hydrochemistry by Kentzer et al. (1999) and its hydrobiology was described by Giziński et al. (1989) as well as by contributors to the monograph edited by Giziński (2000). The monograph edited by Głogowska & Kentzer (2004) contains the latest data on the biocenosis of this reservoir.

The studied material was collected during investigations conducted on three transects situated as follows: 1 - at the level of the Dobiegniewo village (660th km of the Vistula River course, in the flood part of Włocławek Dam Reservoir), 2 - at the level of the Dobrzyń village (661th km of the Vistula River course, near the central water current of the Włocławek Dam Reservoir), 3 - in Wistka Szlachecka Bay (664<sup>th</sup> km of the Vistula River course) (Fig. 1). In each transect, samples were taken at depths of 1 m, 0.5 m, at the water line, and above this

line. Additionally, in transect No. 1, samples from the phytolittoral, located at a depth of 1 m, were collected. Transects differed in the type of bottom sediments: 1 – fine sand covered by a thin layer of mud, and partially overgrown by clumps of submersed macrophytes, 2 – gravel with the addition of clay and loam, 3 – sediments rich in organic matter of allo- and autochthonic origin, overgrown by aquatic vegetation of all types.



**Fig. 1.** The study area with the location of sampling sites.

A – Location of sampling sites in the Włocławek Reservoir (1 – sampling sites, 2 – sandy islands); B – Transverse profile through the reservoir at the height of Dobiegniewo – Dobrzyń; C – Location of the Włocławek Reservoir in Poland

Samples were taken at each site using a core sampler with a diameter of 5.2 cm, which was pushed to a depth of 29 cm into the sediment. Five cores were collected at each site, integrated into one sample, and sieved through a 0.5 x 0.5 mm mesh. Materials were then stored in the refrigerator (4°C) and successively sorted (with the unaided eye) for invertebrates. Specimens were preserved in Drogostajski preservative (1kg - KNO<sub>3</sub>, 0.5kg - NaCl, 0.5kg - NaNO<sub>3</sub>, 1.5 l - formalin 40%, 1 l - glycerin and 45 l – water). Only a fraction of the material (at least 80 individuals) was identified from nine samples taken from the phytolittoral, where oligochaetes were very numerous. 4950 specimens of Oligochaeta were found during the studies. Of these, 2676 individuals were collected at the Dobiegniewo station, 752 near Dobrzyń, and 1522 in the Wistka Szlachecka Bay. Material was identified to the lowest possible taxon (species or genus). Only juvenile specimens of species in the Tubificidae and Enchytraeidae, where the presence of genital organs is necessary for their classification, were determined to the family level.

Oligochaetes were identified according to Kasprzak (1981), Timm (1999), and Kathman and Brinkhurt (1999) keys, and their taxonomic status was adopted from Timm (2005).

## RESULTS AND DISCUSSION

### *Peipsidrilus pusillus* Timm 1977

Material examined: 3 mature specimens collected: 21 October 2002 (1), 27 November 2003 (1) and 20 July 2004 (1). Whole individuals mounted in Amman's lactophenol.

All specimens were collected in the limnic part of the Włocławek reservoir, at the level of the Dobięgniewo village, depth 1 m, bottom sandy with thin layer of mud. Samples were taken close to the clumps of submerged plants (mainly *Potamogeton* sp.) and nympehids (*Nuphar lutea* L.).

Comparative material: 2 specimens coll. in lake Peipsi, 1 June 1981, and 1 specimen coll. 6 June 1991. Whole individuals mounted in Canada balsam, leg. and det. by Tarmo Timm.

#### Characteristics:

Number of segments: 42 and 49 (counted in 2 complete specimens); exclusively bifid setae present in ventral and dorsal bundles; teeth of setae equal in posterior segments, whereas, in anterior ones, distal tooth slightly longer than proximal. Number of setae in a single bundle varied along the body length: in segment II – 2 setae were observed, their number increases up to segment VI, where 5-6 setae occurred, and decreased in posterior segments – in the posterior part of the body 2 – 3 setae were present in each bundle. Setae were absent in ventral bundles of X and XI segments (modified spermathecal setae were not observed).

Male ducts typically developed: sperm funnels almost oval, sperm ducts wide, having the same width along their whole length. Sperm ducts are about two times longer than the atrium in which they enter apically. Atria elongated, with ampullae about 1.5 wider than sperm ducts. Prostatic glands were not observed. Penes closed in penial sacs surrounded by a thick layer of muscles, forming stout "penial bulb". Cuticular penis sheaths well developed, their shape resembling mushrooms (Fig. 2). In the studied specimens cuticular "walls" of sheaths were thick and easily observed. Spermathecae were observed in 1 specimen. Ampullae thin-walled, a little longer than wide, sperm (forming a loose bunch) was present inside ampullae. Ectal ducts of spermathecae shorter than ampullae, with thick walls and narrow lumen.

#### Discussion:

The genus *Peipsidrilus* was described by Timm (1977) with *P. pusillus* as the type species. The diagnosis of this genus was completed by Finogenova (1982), who reported the presence of compact prostatic glands entering the

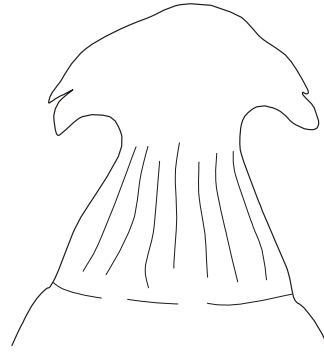
central part of the atrium for the first time. Until now the systematic position of this genus has been unclear: Hrabě (1981) interpreted it to belong to the subfamily Aulodrilinae, and Giani et al. (1984) classified it within Tubificinae. This species has some features characteristic for both above-mentioned sub-families.

Due to the unique shape of the cuticular penis sheath, *P. pusillus* can be easily determined. This anatomical feature is usually easily observed, even though other elements of the genital organs may be incompletely developed or poorly visible (Timm et al. 1996). A single modified spermathecal seta was observed by Timm (1977) in material from locus typicus, and in some specimens collected in Swedish lakes (Timm et al. 1996), but was absent in Czech (Hrabě 1981) and Polish material. Apart from the lack of spermathecal setae, the shape and dimensions of these taxonomically important elements of specimens from Włocławek Reservoir are very similar to those of specimens from the comparative material.

*Peipsidrilus pusillus* is known from Northern and Central Europe (Timm 1977, Finogenova 1982, Hrabě 1981, Timm et al. 1996), and usually occurs in low abundance in the samples. In the studied materials, only three mature specimens were found among 2676 individuals collected near Dobiegniewo; whereas, in the station situated near Dobrzyń, juvenile specimens which may belong to this species were observed.

In our material, specimens with genital organs developed to various degrees were found from July to November, in other materials - from June until October (Finogenova 1982, Timm et al. 1996). This suggests that the development of the genital organs, breeding period, and resorption of the genital organs is a long process.

This species lives primarily in lakes (Timm 1977, Finogenova 1982, Timm et al. 1996), but was also found in a brook flowing through the village Hamr na Jezeře near České Lipy, (Czech Republic) (Hrabě 1981). *P. pusillus* inhabits various kinds of fine sediments: muddy, sand, (Timm 1977) or clay sediments (Finogenova 1982, Timm et al. 1996), usually at a depth of 4 – 8.4 m. In Poland, the species was found for the first time in a shallow section (depth 1 m) of the phytolitoral in the dam reservoir.



**Fig. 2.** *Peipsidrilus pusillus* – cuticular penis sheath.

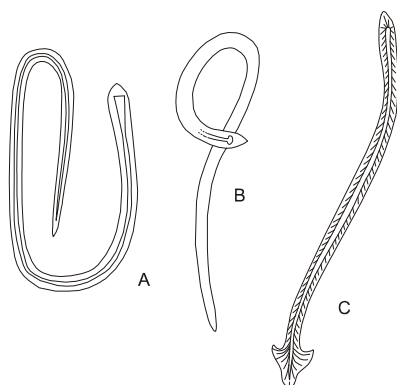
### *Tubifex blanchardi* Vejdovsky 1891

**Material examined:** 1 mature specimen, collected 20 July 2004 near the Dobiegniewo village, together with *P. pusillus*.

#### Characteristics:

The number of segments unknown (posterior segments missing). Only bifid setae present in ventral and dorsal bundles. In preclitellar segments, setae with distal tooth a little longer than proximal one; in clitellar segments, setal teeth of the same length; and in postclitellar segments, distal tooth a little shorter. Number of setae in dorsal and ventral bundles similar, 4 – 5 (6) in anterior segments and 2 - 3 in postclitellar ones.

Shape and arrangement of genital organs as in *Tubifex tubifex*. The studied specimen has well developed spermathecae containing long spermatozeugma (Fig. 3) with a rounded anterior part and tapering slightly toward the posterior end.



**Fig. 3.** Comparison of the shapes of spermatozeugma.

A – *Tubifex blanchardi* from Włocławek Reservoir

B – *Tubifex tubifex* (after Hrabě 1981)

C – *T. tubifex* (after Stephenson 1930)

#### Discussion:

*Tubifex blanchardi* was described from Algeria (Vejdovsky 1891), where it was found (together with *T. tubifex*) in freshwater pools and in a river with brackish water. For many years it was treated as one of the forms of *T. tubifex*, characterized by the absence of hair and pectinate setae. The changes in shape, number and dimensions of setae depending on environmental conditions were well known in the Tubificidae and Naididae, and the influence of environmental stress on chaetal changes in Tubificidae was confirmed by Chapman and Brinkhurst (1987). Nevertheless, the sympatric occurrence of *T. tubifex* and *T. blanchardi* in the

river Lambro induced Paoletti and her co-workers (1999) to study the enzymatic variability of the above-mentioned two forms or species. These studies established that *T. tubifex* and *T. blanchardi* are separate species, which can be found in the same location, as was stated also in Włocławek Reservoir. The spermatozeugma present in the studied specimen are similar to that drawn by

Hrabě (1981) for *T. tubifex*, but differ from the most frequently published drawing made by Stephenson (1930).

The geographic distribution of *T. blanchardi* is inexactly known, due to its being treated as a form of *T. tubifex*. Besides North Africa, this species is known from Korfu (Cernosvitov 1942) and Italy (Paoletti et al. 1999). The finding of *T. blanchardi* in Poland expands the geographical range of this species to the north.

### ***Bothrioneurum vej dovskyanum* Štolc 1888**

**Material examined:** 620 specimens collected in two sampling sites: Dobiegniewo (147) and in Wistka Szlachecka (473). Whole mounted individuals in Amman's lactophenol.

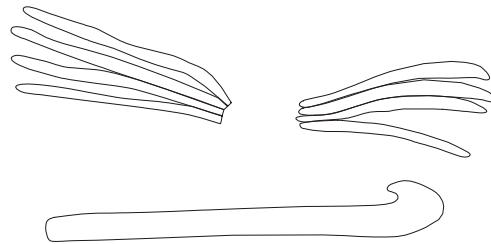
In Wistka Szlachecka, the specimens were found mainly above and at the water line (430 specimens), whereas, at a depth of 0.5 m and 1 m only 43 specimens were collected. In Dobiegniewo, *B. vej dovskyanum* was found almost exclusively at depths of 0.5 m and 1 m.

#### **Characteristics:**

Prostomium with small sensory pit located mid-dorsally. Walls and bottom of the pit formed by densely "packed" high cells. Only bifid setae present in dorsal and ventral bundles. In anterior segments, distal tooth of setae a little longer and thinner than proximal one; in posterior segments, teeth of the same length, or proximal tooth a little longer and bigger. The number of setae: 3-4 in anterior segments, and 2 (seldom – 3) in posterior ones. Big coelomocytes usually present in the coelom, and although in some cases they were easily observed (especially when they formed aggregates), in others it was difficult to confirm their presence. Only few specimens were mature and they typically had developed penial chaete (Fig. 4). Spermatophores attached to the body wall were not observed.

#### **Discussion**

Prior to these records, this species was known in Poland only from water bodies situated near the Baltic coast: Zalew Szczeciński and Wicko lake (Legeżyński 1971), and from fish ponds situated in Upper Silesia (Kasprzak 1981). This species probably lives in other regions as well, but it can easily be



**Fig. 4.** *Bothrioneurum vej dovskyanum* – shape and arrangement of the penial setae.

mistaken with juvenile specimens of other species having bifid setae only (e.g. genus *Limnodrilus*, *Pothamotrix moldaviensis* and *Rhyacodrilus falciformis*), especially in cases when the big coelomocytes (characteristic for this species and other representatives of the sub-family Rhyacodrilinae and absent in species from the sub-family Tubificinae), are not well visible. *B. vejdvskyjanum* reproduces primarily by architomy, and mature specimens could be found rarely. In Poland, this holarctic species was found in sediments rich in organic matter (Legeżyński 1971, Kasprzak 1981, our data); whereas, in North America it occurs mainly in sandy bottom sediments (Kathman, Brinkhurst 1999). Schenkova et al. (in press) found that habitat preferences were weakly marked for this species.

In addition to the rare species novel to Poland that are reported here, the oligochaete fauna of the shore of the limnic sector of the Włocławek Reservoir was composed of 25 species and 7 genera. Among these, taxa typical for lowland lakes and rivers as well as ubiquitous species such as *Potamothrix moldaviensis*, *P. hammoniensis*, *P. bavaricus*, *Limnodrilus hoffmeisteri*, *L. claparedeanus*, *L. profundicola*, *L. udekemianus*, *Psammoryctides barbatus*, *P. albicola*, *Ilyodrilus templetoni*, *Spirosperma ferox*, *Tubifex tubifex*, *T. ignotus*, *Rhyacodrilus coccineus*, *Stylaria lacustris*, *Uncinails uncinata*, *Nais variabilis*, *N. christinae*, *Ophidonais serpentina*, *Rhynchelmis limosella* and juvenile specimens from the genera *Stylodrilus* and *Lumbriculus* formed the majority of the oligochaete taxocene. Moreover, semi-aquatic or even soil taxa from the Enchytraeidae family were found: *Marionina riparia*, *Fridericia galba*, *Fridericia* spp., *Lumbricillus* spp., *Cognettia* spp., *Enchytraeus* spp. and *Henlea* spp. Additionally, the Eastern European species - *Tubifex newaensis* and *Paranais simplex*, as well as *Haemonais waldvogeli* – known from a small number of locations in Poland, were identified.

The density of oligochaetes varied depending on the character of the bottom sediments – the highest values were found in the phytolittoral – about 20 thous. ind. m<sup>-2</sup> (Table 1), the lowest values - above and at the water level, at Dobiegniewo and Dobrzyń – up to 100 ind m<sup>-2</sup>.

**Table 1**

Density [ind. m<sup>-2</sup>] of Oligochaeta in three transects in the side of the bank of the limnic part of the Włocławek Dam Reservoir

| station                     | Depth (m)           |      |      |       |                      |
|-----------------------------|---------------------|------|------|-------|----------------------|
|                             | a.w.l. <sup>a</sup> | 0    | 0.5  | 1     | 1 phyt. <sup>b</sup> |
| Dobiegniewo 2002/2003       | 100                 | 85   | 1855 | 2125  | 20627                |
| Dobiegniewo 2003/2004       | 23                  | 55   | 764  | 4837  | 22073                |
| Wistka Szlachecka 2002/2003 | 7297                | 8976 | 1926 | 2784  | -                    |
| Dobrzyń 2003/2004           | 0                   | 91   | 564  | 14909 | -                    |

<sup>a</sup>) a.w.l. – above water level; <sup>b</sup>) phyt. – phytolittoral

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**REFERENCES**

- Bogdanowicz W., Chudzicka E., Pilipiuk I., Skibińska E., (eds) 2004, *Fauna Polski. Charakterystyka i wykaz gatunków. Pierścienice (Annelida)*, Muz. Inst. Zool. PAN, 1: 1-19 (in Polish with Engl. summ.)
- Černosvitov L., 1942, *Oligochaeta from various parts of the world*, Proc. Zool. Soc. London, Ser.B, 111: 197-236
- Chapman P.M., Brinkhurst R.O., 1987, *Hair today, gone tomorrow: induced chaetal changes in tubificid oligochaetes*, Hydrobiologia, 155: 45-55
- Dumnicka E., Rożen A., 1997, *Oligochaeta – Skąposzczety* [in:] *Wykaz zwierząt Polski*, Razowski J. (ed.) Inst. Syst. i Ewol. Zwierząt PAN, Kraków, 4: 130-37 (in Polish with Engl. summ.)
- Finogenova N.P., 1982, *Revizija rodov Peipsidrilus Timm, 1977 i Umbadrilus Timm, 1978 (Tubificidae, Oligochaeta)* [in:] *Limnologičeskije issledovanija na zalive Onezhskogo ozera Bolshoje Onego*, Leningrad, Zoologičeskij Institut, pp. 199-203, (in Russian)
- Giani N., Martinez-Ansemil E., Brinkhurst R.O., 1984, *Revision du statut taxonomique des Aulodrilinae (Tubificidae, Oligochaeta)*, Bull. Soc. Hist. nat. Toulouse 120: 17-22 (in French with Engl. sum.)
- Giziński A., (ed.) 2000, *Hydrobiology of the Lower Vistula River between Wyszogród and Toruń. An assessment of the influence of the Włocławek Dam Reservoir on the structure and functions of the river ecosystem*, Acta Univ. Nicolai Copernici, Limnol. Papers, 21: 1-117
- Giziński A., Błędzki L., Kentzer A., Wiśniewski R., Żytkowicz R., 1989, *Hydrobiological characteristic of the lowland, rheolimnic Włocławek Reservoir on the Vistula River*. Ekol. Pol. 37: 359-404
- Głogowska B., 2000, *Part II: Geographical and hydrological profile of the study area*, Acta Univ. Nicolai Copernici, Limnol. Papers, 21: 11-22
- Głogowska B. Kentzer A., (eds.) 2004, *Hydrobiologia Toruńska: Monografia dorobku prac doktorskich Zakładu Hydrobiologii w latach 1978-2003*, Toruń, Wydawnictwo UMK, pp. 150, (in Polish)
- Hrabě S., 1981, *Vodni máloštetinatci (Oligochaeta) Československa*, Acta Univ. Carolinae, Biol., 1979: 1-167 (in Czech with Engl. summ.)
- Kasprzak K., 1976, *Badania nad skąposzczetami (Oligochaeta) dolnego biegu rzeki Welny*, Fragm. Faun., 20: 425-67 (in Polish with Engl. summ.)
- Kasprzak K., 1981, *Skąposzczety wodne. I*, Warszawa, PWN, pp. 226, (in Polish)
- Kathman R.D., Brinkhurst R.O., 1999, *Guide to the freshwater oligochaetes of North America*, USA, Aquat. Res. Center, Tennessee, pp. 264
- Kentzer A., Giziński A., Mieszczankin T., 1999, *Hydrochemistry of low Vistula river in the section Plock-Toruń during the period 1986-1995: The influence of the Włocławek Dam Reservoir on water quality*, Acta Univ. Nicolai Copernici, Limnol. Papers, 20: 13-24
- Konopacka A., 2004, *Inwazyjne skorupiaki obunogie (Crustacea, Amphipoda) w wodach Polski*, Przeg. Zool., 48: 141-62, (in Polish)
- Kownacki A., 1999, *Checklist of macroinvertebrates in the River Vistula*, Acta Hydrobiol., 41: 45-75
- Legeżyński P., 1971, *Skąposzczety wodne (Oligochaeta limicola) wyspy Wolin*, Bad. Fizj. Pol. Zach. Ser. B – Biologia, 24: 83-106 (in Polish with Engl. summ.)

- Moszyński A., 1925, *Contributions à l'étude de la faune des Oligochètes aquatiques (Oligochaeta limicola) de la Grande Pologne*, Bull. Soc. Amis Scie. Poznań, Ser. B, 1: 27-33, (in French)
- Paoletti A., Pagani M., Leoni B., 1999, *Enzymatic variability in sympatric species of Tubifex (Clitellata: Tubificidae)*, Hydrobiologia, 406: 83-86
- Schenkova J., Helešić J., Jarkovský J., 2006, *Seasonal dynamics of Bythonomus lemni and Bothrioneurum vej dovskyanum (Oligochaeta, Annelida) in relation to environmental variables – a preliminary study*, Biologia, in press
- Stephenson J., 1930, *The Oligochaeta*, Oxford Univ. Press, pp. 978
- Szcze pański A., 1953, *Analiza dynamiki populacji skąposzczetów dna Wisły pod Warszawą*, Pol. Arch. Hydrobiol., 1: 227-50 (in Polish with Engl. summ.)
- Timm T., 1977, *Peipsidrilus pusillus gen.n. sp.n. (Oligochaeta, Tubificidae)*, Eesti NSV Tead. Akad. Toim., Biol., 26: 279-83
- Timm T., 2005, *Fauna Europaea: Annelida: Oligochaeta (limnic)*, Fauna Europea version 1.2. <http://www.faunaeur.org>
- Timm T., Erséus Ch., Lundberg S., 1996, *New and unusual records of freshwater Oligochaeta from the Scandinavian Peninsula*, Nordic J. Freshw. Res., 72: 15-29
- Van Haaren T., 2002, *Eight species of aquatic Oligochaeta new for the Netherlands (Annelida)*, Nederlandse Faun. Mededel., 16: 39-56
- Vejdovsky F., 1891, *Note sur un Tubifex d'Algerie*, Mem. Soc. Zool. de France, 4: 596-603, (in French)
- Wiśniewski R. J., 1976, *Effect of heated waters on biocenosis of the moderately polluted Narew River. Oligochaeta*, Pol. Arch. Hydrobiol., 23: 527-38
- Żbikowski J., 2000, *Macrozoobenthos of the Vistula in the section from Wyszogród to Toruń*, Acta Univ. Nicolai Copernici, Limnol. Papers, 21: 75-84