

## Original papers

# The Polish collection of parasitic helminths (a report on realization of works concerning fusion of parasitic collections dispersed among different scientific institutions<sup>1</sup>)

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**ABSTRACT.** The paper presents the results of works on preparation of a proper museum collection of parasitic helminths gathered by the Polish scientists and dispersed in various scientific institutions. The collection composed of 11 author's collections and a special collection of available typical series of species described by the Polish authors has been deposited in the Museum of Natural History of Wrocław University. It includes almost 16.000 slides with 90 taxons of Monogenea, 251 Trematoda, 144 Cestoda, 43 Nematoda, 11 Acanthocephala, in total 486 nominal species and 53 taxons of genus level. Among them 12 species appear new for fauna of Poland; for 57 species new hosts in Polish territory have been recorded; two new species of Cestoda have been described in separate publications. A special paragraph contains a checklist of all species described by the Polish scientists with information whether they are available in any other collection. Detailed information about every deposited slide is given in the Database available online at <http://www.helminths.eu>

**Key words:** museum collection, parasitic helminths, Poland

## Introduction

The works undertaken in the frame of a project accepted by the former Ministry of Science and Higher Education have two main aims: (1) to assemble all available collections of parasitic helminths gathered by the Polish scientists (especially those who are no longer active) and, after checking the conservation condition of slides and the accuracy of their labels, to prepare the properly described museum collection; (2) to compile the internet Database of this collection comprising full information about the slides being deposited and available on-line. This task has been

performed by the authors of this article and both the aims have been accomplished. According to mutual agreements, the Polish Collection of Parasitic Helminths has been deposited in the Museum of Natural History of Wrocław University, while the Database of this collection is available on-line at <http://www.helminths.eu>.

## The origin and content of the collection

The whole collection, 15.596 slides, consists of 12 „author's collections” delivered by retired Polish scientists or, in the case of deceased scientists, by institutions in which they had worked. In each

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collection the slides are marked by the initials of their author. These collections are presented according to their institutional origin:

**W. Stefański Institute of Parasitology, Polish Academy of Sciences, Warsaw (IPPAS)**

1. Collection of prof. dr hab. **Wiesław Ślusarski (WS)** – 260 slides; digeneans of salmonid fishes caught down the Vistula river (from spring to the river mouth) and in Gulf of Gdańsk; also big collection of *Parafasciolopsis fasciolaemorpha*, the parasite of ungulates.

2. Collection of prof. dr hab. **Bożena Grabda-Kazubska (GK)** – 3283 slides; Monogenea and Digenea of fish from the lakes undergoing antropopression (heated lakes of Konin region, stocked Masurian lakes); parasites of amphibians and reptiles from various regions of Poland.

3. Collection of doc. dr hab. **Krystyna Rybicka (KR)** – 60 slides; cestodes of small mammals from Dziekanów near Warsaw.

4. Collection of prof. dr hab. **Teresa Pojmańska (P)** – 4365 slides; parasites of small mammals from two different ecosystems (Białowieża Forest, agriculture fields in Kujawsko-Wielkopolska Lowland); parasites of fish and birds from the lakes undergoing antropopression (heated lakes of Konin region, stocked Masurian lakes), parasites of fish from polycultures.

5. Collection of prof. dr hab. **Katarzyna Niewiadomska (N)** – 1512 slides; digeneans (mainly Strigeata) of fish and birds from different regions of Poland. In this collection there are also the groups of slides of other authors: digeneans from passerine birds, collected during their spring and autumn migration by mgr Jadwiga Machalska (IPPAN); Strigeata from passerine birds collected by dr Jerzy Okulewicz (Wrocław Medical University); Strigeata from predatory birds collected by prof. dr hab. Stefan Furmaga (Agricultural Academy of Lublin), cestodes of fish collected by dr Jadwiga Kozicka.

**Warsaw University of Life Sciences (SGGW): Department of Zoology**

6. Collection of prof. dr hab. **Teresa Sulgostowska** and dr **Wanda Korpaczewska (S)** – 2885 slides; Cestoda and Digenea of water fowls from 15 lakes of Warmia and Masuria, two reserves („Stawy Milickie” and Stońsk) and the heated lakes of Konin region. There are also included plentiful materials collected by the staff working under the supervision of prof. Wincenty Wiśniewski on the

Drużno Lake, as well as by students preparing master thesis.

**Medical University of Warsaw: Department of General Biology and Parasitology**

7. Collection of the staff of prof. **Bogdan Czaplinski (5/, 7/, 10/, 11/)** – 414 slides; cestodes of water fowls from the Pomeranian and Masurian lakes and other regions of Poland and abroad; also materials collected by students of prof. Wincenty Wiśniewski during the studies of parasite fauna of Drużno Lake.

**Agricultural University of Lublin: Division of Fish Diseases**

8. Collection of prof. dr hab. **Maria Prost (MP)** – 758 slides; monogeneans of freshwater fishes from various regions of Poland.

**West Pomeranian University of Technology, Division of Fish Diseases (former Agricultural Academy of Szczecin) and University of Szczecin: Zoological Division**

9. Collection of dr **Jadwiga Grabda (JG)** – 293 slides; parasites of musk-rats and bats from Bydgoszcz environment, parasites of marine fishes.

10. Collection of dr **Jadwiga Wierzbicka (JW)** – 1445 slides; parasites (mainly Digenea) of fish from Pomeranian and Masurian lakes and from Baltic seashore streams; parasites of marine fishes.

**University of Wrocław: Department of Parasitology, Institute of Genetics and Microbiology**

11. Collection of prof. dr hab. **Anna Okulewicz (O)** – 193 slides; parasitic nematodes from amphibians and passerine birds.

**Medical University of Wrocław, Department of Biology and Medical Parasitology**

12. Collection of dr **Jerzy Okulewicz (JO)** – 200 slides; big collection of the cestode *Dilepis undula* – parasite of passerine birds; mainly from Lower Silesia.

Among successfully gathered „author’s collections” we observe lack of some names of the Polish scientists who are known to have carried out faunistic studies of parasitic helminths. No materials of prof. Eugeniusz Żarnowski, prof. Bernard Bezubik, dr Adam Sołtys have been preserved in the Veterinary Division of Agricultural University of Lublin; of the prof. Furmaga collection only the slides with Strigeata digeneans have been remained, probably transmitted to prof. Niewiadomska for verification of their identification. Similar situation is in the Veterinary Division of SGGW – the second

place of prof. Żarnowski employment, and in the Department of Biology of Warsaw University – the second place of prof. Bezubik employment; single slides of dr Stanisław Ruszkowski dating on the interwar period were found in the materials of dr Jadwiga Grabda, who worked there before the World War II. In the IPPAN there are no materials of prof. Krystyna Kisielewska.

The whole collection deposited in the Museum of Natural History of Wrocław University includes 486 nominal species and 53 taxons of genus level (total 539 taxons), representing 5 higher taxons of helminths; three classes of the type Platyhelminthes (Monogenea, Trematoda and Cestoda), type Nematoda and type Acanthocephala (the detailed data about the number of species in each of these groups are given in the Table 1). The hosts of these parasites represent 60 species of fish, 18 amphibians, 4 reptiles, 94 birds and 17 mammals, totally 193

species of the vertebrates (mainly definitive, but also intermediate hosts) and 35 species of invertebrates (25 molluscs, 5 insects, 1 crustaceans, 4 oligochaetes) as the intermediate hosts. The collection comprises mainly the Polish fauna. However, materials of other countries found in some „author’s collections” have also been included.

### The collection of typical materials

Among the gathered material we have found slides with typical specimens or typical series of species specimens described by the Polish scientists. Some of them were designated by their authors as holotypes, paratypes or lectotypes, while the typical series were selected and designated as syntypes by the authors of this article. These slides have been separated into the distinct „collection of types”. It comprises the following species:

#### MONOGENEA

1. *Gyrodactylus luckiensis* Prost, 1981 – lectotype (MP0740);
2. *Gyrodactylus percnuri* Prost, 1975 – holotype (MP0741), paratypes (MP0742–MP0747);
3. *Gyrodactylus alburnensis* Prost, 1972 – syntypes (MP0753);
4. *Gyrodactylus euzeti* Prost, 1993 – syntypes (MP0569–MP0571);
5. *Gyrodactylus malmbergensis* Prost, 1974 – syntypes (MP0755).

#### TREMATODA

1. *Plagioporus stefanskii* Ślusarski, 1958 – syntypes (WS0035–WS0038);
2. *Aphanurus balticus* Ślusarski, 1957 – syntypes (WS0044);
3. *Excoithocaecum wisniewskii* Ślusarski, 1958 – syntypes (WS0167);
4. *Psilotrema pharyngeatum* J.Grabda, 1954 – syntypes (JG0229);
5. *Pleurogenes hepaticola* Grabda-Kazubska, 1973 – holotype (marked by black spot) and 2 paratypes (GK01423);
6. *Prosotocus mirabilis* B. Grabda, 1958 – syntypes (GK01501–GK01504);
7. *Euryhalmis zelleri* Grabda-Kazubska, 1980 – syntypes (GK01521);
8. *Astiotrema trituri* Grabda-Kazubska 1959 – lectotype (GK02670), paralectotypes (GK2671);
9. *Diplostomum pseudospathaceum* Niewiadomska, 1984 – syntypes (S002143–S002144).

#### CESTODA

1. *Aploparksis stefanskii* Czapliński, 1955 [= *Diorchis acuminatus* (Clerc, 1902)] – syntypes (07/1976–07/1979, 11/3776–11/3782, 11/3787);
2. *Diorchis danutae* Czapliński, 1956 – syntypes (07/0232, 07/0239, 07/0241–07/0245);
3. *Diorchis ovofurcatus* Czapliński, 1972 – holotype (07/1403), paratypes (07/1393, 07/1399–07/1402);
4. *Diorchis stefanskii* Czapliński, 1956 – syntypes (11/2549–11/2558);
5. *Fimbriaria czaplinskii* Grytner-Zięcina, 1994 – lectotype (05/0001), paralectotypes (07/0002–05/0007);
6. *Fimbriaria mergi* Grytner-Zięcina & Cielecka, 1995 – holotype (05/0020);
7. *Fimbriaria sarcinalis* Grytner-Zięcina & Cielecka, 1994 – syntypes (05/0024–05/0025, 05/0031);
8. *Fimbriaria teresae* Grytner-Zięcina & Cielecka, 1995 – holotype (05/0044), paratypes (05/0045–05/0046);
9. *Gastrotaenia paracygni* Czapliński & Rhyjikov, 1966 – holotype („male”) (11/3746D), allotype („female”) (11/3743G), allotype („hermaphroditic”) (11/3749A), other paratypes (11/3744, 11/3745, 11/3747);
10. *Hymenolepis paracompressa* Czapliński, 1956 [= *Microsomacanthus paracompressus* (Czapliński, 1956)] – syntypes (07/1423–07/1434);

11. *Hymenolepis spiralibursata* Czapliński, 1956 [= *Microsomacanthus spiralibursatus* (Czapliński, 1956)] – syntypes (07/1949–07/1955);
12. *Hymenolepis vistulae* Czapliński, 1960 [= *Microsomacanthus vistulae* (Czapliński, 1960)] – syntype (07/1850–07/1851);
13. *Microsomacanthus secundus* Cielecka & Zdzitowiecki, 1989 – holotype (11/4266), paratypes (11/4267–11/4270);
14. *Microsomacanthus shetlandicus* Cielecka & Zdzitowiecki, 1981 – holotype (11/4261), paratypes (11/4262–11/4265);
15. *Monosaccanthes streperae* Czapliński & Wilanowicz, 1969 [= *Anatinella streperae* (Czapliński & Wilanowicz, 1969)] – holotype (07/1998–07/1999, one specimen on two slides), paratypes (07/1993–07/1997, 07/2000–07/2001 (cysticeroids), 07/2002);
16. *Retinometra fulicatrae* Czaplińska & Czapliński, 1972 – syntypes (07/0517–07/0518, 07/1805–07/1819, 07/1823);
17. *Retinometra guberiana* Czapliński, 1965 – syntypes (07/0726–07/0735);
18. *Sobolevicanthus gracilissimus* Czapliński & Czaplińska, 1990 – holotype (07/0645), paratypes (07/0643, 07/0644, 07/0646–07/0647);
19. *Sobolevicanthus wisniewskii* Czapliński, 1956 – syntypes (07/1852–07/1871, 11/2567–11/2571);
20. *Pseudodiorchis campinosi* Rybicka, 1956 [= *Urocystis prolifer* Villot, 1880] – syntypes (KR0004–KR0006).

## The Database

The Database comprises information on many more helminth species than in the collection deposited in Museum because a big part of materials collected by the staff of prof. Bogdan Czapliński is still under study and remains available in the Medical University of Warsaw, Department of General Biology and Parasitology, 5 Chałubińskiego Street, 02-004 Warsaw. The total number of registered items is 21946. Beside the number of a slide, the full information comprises: parasite name and its taxonomic position, original mark given by the owner, name and taxonomic position of the host, location of parasite (host organ), locality (place of collection), the name of the person who collected, and who identified the material, and – if needed – some comments.

## Other collections

The collection deposited in the Museum of Natural History of Wrocław University does not include all the parasitological helminths collected by the Polish scientists. The scientists who are still active have their own collections in the institutions in which they work. According to our knowledge, the faunistic studies on parasitic helminths are still carried out in the following scientific centers: IPPAN (prof. K. Zdzitowiecki and his staff), Medical University of Warsaw (prof. B. Grytner-Zięcina et her staff), University of Szczecin (prof.

W. Piasecki, dr hab. M. Pilecka-Rapacz, dr I. Rząd), West Pomeranian University of Technology (dr hab. E. Sobocka, prof. K. Kavetska and her staff), University of Wrocław (prof. A. Okulewicz and her staff), Wrocław University of Environmental and Life Sciences (dr M. Popiołek, dr G. Zaleśny), University of Gdańsk (prof. J. Rokicki and his staff), Medical Faculty in the University of Warmia and Mazury in Olsztyn (prof. E. Dzika and her staff), Pomeranian Academy in Słupsk (dr. hab. J. Morozińska-Gogol), Museum and Institute of Zoology PAS (dr Gerard Kanarek), and perhaps some others. A big collection of prof. Krzysztof Zdzitowiecki, comprising the helminths of Antarctic vertebrates and Polish bats is deposited partially in the Institute and Museum of Zoology, Polish Academy of Science in Warsaw and in the British Museum of Natural History in London.

## Checklist of the species described by Polish authors

The „collection of types”, deposited in the Museum of Natural History of Wrocław University represents only a small part of species being described by the Polish scientists. The checklist presented below comprises some information about their availability (deposited in any other museum, or inherent in any collection). In the checklist some changing of the taxonomic position of several species are exhibited. The original name is always on the first place.

**MONOGENEA**

*Ancyrocephalus vistulensis* Siwak, 1931 [= *Thaparocleidus vistulensis* (Siwak, 1931)] – lack of specimens;  
*Dactylogyrus cabaleroi* Prost, 1960 – lack of specimens;  
*Dactylogyrus crassus* Kulwieć, 1927 – lack of specimens;  
*Dactylogyrus formosus* Kulwieć, 1927 – lack of specimens;  
*Dactylogyrus minutus* Kulwieć, 1927 – vouchers: Natural Museum of Wrocław University (NMWU), collection of B. Grabda-Kazubska (**GK**);  
*Dactylogyrus triapendixis* Wierzbicka & Gronet, 1997 – syntypes: NMWU;  
*Dactylogyrus vistulae* Prost, 1957 – lack of specimens;  
*Dactylogyrus wegeneri* Kulwieć, 1927 – lack of specimens;  
*Gypodactyurus alburnensis* Prost, 1972 – syntypes: NMWU;  
*Gyrodactylus euzeti* Prost, 1993 – syntypes: NMWU;  
*Gyrodactylus luckiensis* Prost, 1981 – lectotype: NMWU;  
*Gyrodactylus malMBERGENSIS* Prost, 1974 – syntypes: NMWU;  
*Gyrodactylogyrus percunuri* Prost, 1975 – holotype and paratypes: NMWU;  
*Gyrodactylus pomeraniae* Kuusela, Ziętara & Lumme, 2008 – holotype and paratypes: Zoological Museum of the University of Oulu, Denmark;  
*Gyrodactylus raabei* Prost, 1957 – lack of specimens;  
*Mymarothecithum viatorum* Boeger, Piasecki & Sobecka, 2002 – holotype and paratypes: Coleção Helminológica Fundação Instituto Oswaldo Cruz Rio de Janeiro Brasil, paratypes: Instituto de Paquias da Amazona (Brasin), United State National Parasite Collection Beltsville (USA), Harold Manter Laboratory (USA).

**DIGENEA**

*Acantharium tatrense* Zdzitowiecki, 1967 – holotype and paratypes: Institute and Zoological Museum of Polish Academy of Sciences (IZMPAN);  
*Amblosoma exile* Pojmańska, 1972 – holotype and paratypes: NMWU;  
*Aphanurus balticus* Ślusarski, 1957 – syntypes: NMWU;  
*Astiotrema trituri* B. Grabda, 1959 [= *Neoastiotrema trituri* (B. Grabda, 1959)] – lectotype and paratypes: NMWU;  
*Asymphyllodora demeli* Markowski, 1935 – lack of specimens;  
*Bilharzia polonica* Kowalewski, 1895 [= *Bilharziella polonica* (Kowalewski, 1895)] – vouchers NMWU;  
*Boreoscotia megavesicula* Bray & Zdzitowiecki, 2000 – typical material: British Museum of Natural History (BMNH);  
*Brachylecithum glareoli* Hildebrand, Okulewicz & Popiołek, 2007 – holotype: NMWU;  
*Cyclocoelum polonicum* Machalska, 1980 [= *Morishitium elongatus* (Harrah, 1921)] – vouchers: NMWU, collection of K. Niewiadomska (**N**);  
*Czosnowia joanne* Zdzitowiecki, 1967 [= *Postorchigenes joannae* (Zdzitowiecki, 1967)] – holotype and paratypes: IZMPAN;  
*Dicrocoelium pellucidus* Pojmańska, 1956 [= *Prosolecithus pellucidum* (Pojmańska, 1956)] – syntypes: NMWU;  
*Diplostomum numericum* Niewiadomska 1978 [= *Diplostomum gavium* (Guberlet, 1922)] – holotype and paratypes: NMWU;  
*Diplostomum pseudospathaceum* Niewiadomska, 1984 – syntypes: NMWU;  
*Discoverytrema gibsoni* Zdzitowiecki, 1990 – typical material: BMNH and/or IZMPAN;  
*Echinoparyphium pseudorecurvatum* Kiseliene & Grabda-Kazubska, 1990 – lack of specimens;  
*Euryhelmis zelleri* Grabda-Kazubska, 1980 – syntypes: NMWU;  
*Excoitocaecum wisniewskii* Ślusarski, 1958 [= *Nicolla wisniewskii* (Ślusarski, 1958)] – syntypes: NMWU;  
*Gigantobilharzia mazuriana* Khalifa, 1974 – lack of specimens;  
*Gorgodera loossi* Sinitzin, 1905 – lack of specimens;  
*Gorgodera pagenstecheri* Sinitzin, 1905 – NMWU; vouchers: collection of **GK**;  
*Gorgodera varsoviensis* Sinitzin, 1905 – NMWU; vouchers: collection of **GK**;  
*Helicometra pisanoae* Zdzitowiecki, 1988 – typical material: BMNH and/or IZMPAN;

- Hemiurus raabei* Ślusarski, 1958 [= *H. levinseli* Odhner, 1905] – lack of specimens;
- Ignavia ciconiae* Sulgostowska, 1964 – lack of specimens;
- Lecithaster micropsi* Zdzitowiecki, 1992 – typical material: BMNW and/or IZMPAN;
- Lecithodendrium mystacini* Zdzitowiecki, 1969 – holotype and paratypes: IZMPAN;
- Lecithodendrium whitei* Zdzitowiecki, 1994 – typical material: BMNW and/or IZMPAN;
- Lecithophyllum champsocephali* Zdzitowiecki, 1989 – typical material: BMNW and/or IZMPAN;
- Lepidapedon notogergianus* Zdzitowiecki, 1990 – typical material: BMNW and/or IZMPAN;
- Lepidapedon paralebouri* Zdzitowiecki, 1990 – typical material: BMNW and/or IZMPAN;
- Lepidapedon tertius* Zdzitowiecki, 1990 – typical material: BMNW and/or IZMPAN;
- Lepidapedon balgueriasi* Zdzitowiecki & Cielecka 1977 – typical material: BMNW and/or IZMPAN;
- Lepidapedon brai* Zdzitowiecki & Cielecka 1977 – typical material: BMNW and/or IZMPAN;
- Leucochloridium perturbatum* Pojmańska, 1969 [=European form of *L. actitis* McIntosh, 1932 ?] – holotype: NMWU;
- Leucochloridium soricis* Sołtys, 1952 [= *Pseudoleucochloridium soricis* (Sołtys, 1952)] – NMWU, vouchers: collection of **P**;
- Leucochloridium subtilis* Pojmańska, 1961 [= synonym of *L. perturbatum* Pojmańska, 1969] – syntypes: NMWU;
- Macvicaria muraenoleis* – typical material: BMNW and/or IZMPAN;
- Macvicaria ophthalmolyci* Zdzitowiecki, 1990 – typical material: BMNW and/or IZMPAN;
- Macvicaria scoria* Zdzitowiecki 1999 – typical material: BMNW and/or IZMPAN;
- Mesostephanus alopicis* Malczewski, 1964 [= *M. appendiculatus* (Ciurea, 1916)] – author's collection: W. Stefański Institute of Parasitology, PAS (IPPAN);
- Michajlovia migrata* Pojmańska, 1973 – syntypes: NMWU;
- Neolebularia terravaenensis* Zdzitowiecki, Pisano & Vacchi, 1993 – typical material: BMNW and/or IZMPAN;
- Neolepidapedon marcquariensis* Zdzitowiecki, 1993 – typical material: BMNW and/or IZMPAN;
- Neolepidapedon opisthobifurcatus* Zdzitowiecki, 1990 [= *Postlepidapedon opisthobifurcatus* (Zdzitowiecki, 1990)] – typical material: BMNW and/or IZMPAN;
- Neopelidapedoides subarcticus* Jeżewski, Zdzitowiecki & Laskowski, 2011 – typical material: BMNW and/or IZMPAN;
- Nudacotyle quartus* Zdzitowiecki, 1980 – typical material: IZMPAN;
- Opisthiolyphes soricis* Pojmańska, 1956 [= *Neoglyphe sobolevi* Shaldibin, 1953]] – NMWU, collection of **P**;
- Panopistus europaeus* Sołtys, 1952 [= *Brachylaima fulva* Dujardin, 1843] – NMWU, collection of **P**;
- Parabascus oppositus* Zdzitowiecki, 1969 – holotype and paratypes: IZMPAN;
- Parafasiolopsis fasciolaemorphae* Ejsmont, 1932 – NMWU, collection of W. Ślusarski (**WS**);
- Paralepidopedon withsoni* Zdzitowiecki & Cielecka 1977 – typical material: BMNW and/or IZMPAN;
- Paralepidopedon awii* – Zdzitowiecki & Cielecka 1977 – typical material: BMNW and/or IZMPAN;
- Plagioporus stefanskii* Ślusarski, 1958 – syntypes: NMWU;
- Plagiorchis opisthovitellinus* Sołtys, 1954 = *Rubenstrema opisthovitellinus* (Sołtys, 1954) – NMWU; vouchers: collection of **P**;
- Plagiorchis polonicus* Sołtys, 1954 – lack of specimens;
- Plagiorchis raabei* Furmaga, 1956 [= *P. elegans* Rudolphi, 1802] – lack of specimens;
- Plagiorchis stefanskii* Furmaga, 1956 [= *P. elegans* Rudolphi, 1802] – lack of specimens;
- Pleurogenes hepaticola* Grabda-Kazubska, 1973 – holotype and paratypes: NMWU;
- Prosotocus mirabilis* Grabda, 1958 – syntypes: NMWU;
- Prosthodendrium cryptolecithum* Zdzitowiecki, 1969 [= *Paralecithodendrium cryptolecithum* (Zdzitowiecki, 1969)] – holotype and paratypes: IZMPAN;
- Prosthodendrium ilei* Zdzitowiecki, 1969 [= *Paralecithodendrium ilei* (Zdzitowiecki, 1969)] – holotype and paratypes: IZMPAN;
- Prosthodendrium mirabile* Zdzitowiecki, 1968 [= *Paralecithodendrium mirabile* (Zdzitowiecki, 1968)] – holotype and paratypes: IZMPAN;
- Psilotornus confertus* Machalska, 1974 – syntypes: NMWU;

*Psilotrema pharyngeatum* J. Grabda, 1954 – syntypes: NMWU;  
*Sanguinicola intermedia* Ejsmont, 1925 – lack of specimens;  
*Sphaerostomum maius* Janiszewska, 1949 [= *S. bramae* (Müller, 1776)] – NMWU; vouchers: collections of **GK, JG, N, P, WJ**;  
*Sphaerostomum salmonis* Ślusarski, 1958 – lack of specimens;  
*Stenacron glacialis* Zdzitowiecki, 1989 – typical material: BMNW and/or IZMPAN;  
*Steringophorus arntzi* Zdzitowiecki, 1977 – typical material: BMNW and/or IZMPAN;  
*Steringophorus liparidi* Zdzitowiecki, 1997 – typical material: BMNW and/or IZMPAN;  
*Strigea raabei* Bezubik, 1958 [= *Cotylurus raabei* (Bezubik, 1958)] – NMWU vouchers: the collections of prof. Sulgostowska (**S**);  
*Travassodendrium raabei* Sołtys, 1959 [= *Paralecithodendrium raabei* (Sołtys, 1959)] – lack of specimens;  
*Tylodelphys podicipina* Kozicka & Niewiadomska, 1960 – syntypes: NMWU;  
*Whitegonimus ozoufae* Jeżewski, Zdzitowiecki & Laskowski 2009 – typical material: BMNW and/or IZMPAN.

#### CESTODA

*Andrya bialowiezensis* Sołtys, 1949 [= *Paranoplocephala macrocephala* (Douthitt, 19150)] – lack of specimens;  
*Aploparaksis parafilum* Gąsowska, 1932 – lack of specimens;  
*Aploparksis stefanskii* Czapliński, 1955 [= *Diorchis acuminata* (Clerc, 1902)] – syntypes: NMWU;  
*Anomotaenia parachelidonariae* Jaroń, 1967 [= *Hirudinicola parvirostris* (Krabbe, 1869)] – type specimens: the collection of Medical University of Warsaw;  
*Archigetes cryptobothrium* Wiśniewski, 1928 – lack of specimens;  
*Bothriocephalus antarcticus* Wojciechowska et al. 1995 – holotype and paratypes: IZMPAN;  
*Choanotaenia scythica* Korniyushin, Salamatin, Świdorski, 2002 – holotype and paratypes: Schmalhausen Institute of Zoology, Kyiv, Ukraine;  
*Caryophyllaeus brachycollis* Janiszewska, 1953 – lack of specimens;  
*Copesoma papillosum* Sinitzin, 1896 – lack of specimens, description very poor; should be treated as *nomen nudum*;  
*Dicranotaenia globosoides* Sołtys, 1954 [= *Pseudobothrialepis globosoides* (Sołtys, 1954)] – lack of specimens;  
*Dicranotaenia spiculigera* var. *varsoviensis* Sinitzin, 1896 [= *Dicranotaenia varsoviensis* (Sinitzin, 1896)] – lack of specimens;  
*Diorchis brevis* Rybicka 1957 – NMWU; vouchers: collections of **P** and **S**;  
*Diorchis danutae* Czapliński, 1956 – syntypes: NMWU;  
*Diorchis ovofurcatus* Czapliński, 1972 – holotype and paratypes: NMWU;  
*Diorchis spiralis* Szpotańska, 1931 [according to Czapliński & Aeschlimann 1987 it may be regarded as the synonym of *Diorchis thomasorum*] – lack of specimens;  
*Diorchis stefanskii* Czapliński, 1972 – syntypes: NMWU;  
*Diorchis thomasorum* Czapliński & Aeschlimann, 1987 – syntypes: South Australian Museum (Adelaide);  
*Drepanidotaenia bisacculina* Szpotańska, 1931 [= *Anatinella kazachstanica* (Maximova, 1963)] – lack of specimens;  
*Dubinolepis podicipina* Szymański, 1905 [= *Confluaria podicipina* (Szymański, 1905)] – lack of specimens;  
*Echinobothrium acanthocolle* Wojciechowska, 1991 – holotype and paratypes: IZMPAN;  
*Echinocotyle druznensis* Jarecka, 1958 – NMWU, vouchers: collection of **S**;  
*Fimbriaria czaplinskii* Grytner-Zięcina, 1994 – lectotype and paralectotypes: NMWU;  
*Fimbriaria mergi* Grytner-Zięcina & Cielecka, 1995 – holotype: NMWU;  
*Fimbriaria sarcinalis* Grytner-Zięcina & Cielecka 1994 – syntypes: NMWU;  
*Fimbriaria teresae* Grytner-Zięcina & Cielecka 1995 – holotype: NMWU;  
*Gastrotaenia paracygni* Czapliński & Rhyjikov, 1996 – holotypes: NMWU;  
*Hymenolepis arcuatus* Kowalewski, 1904 [= *Microsomanthus arcuatus* (Kowalewski 1904)] – lack of specimens;

- Hymenolepis asymmetrica* Janicki, 1904 [= *Rodentolepis asymmetrica* (Janicki, 1904)] – NMWU; vouchers: collection of **P**;
- Hymenolepis paracompressa* Czapliński, 1956 [= *Microsomacanthus paracompressus* (Czapliński, 1956)] – syntypes: NMWU;
- Hymenolepis paramicrosomus* Gąsowska, 1931 [= *Microsomacanthus paramicrosomus* (Gąsowska, 1931)] – syntypes: NMWU;
- Hymenolepis parvulus* Kowalewski, 1904 [= *Microsomacanthus parvulus* (Kowalewski 1904)] – NMWU, vouchers: collection of **S**;
- Hymenolepis spiralibursata* Czapliński, 1956 [= *Microsomacanthus spiralibursatus* (Czapliński, 1956)] – syntypes: NMWU;
- Hymenolepis stefanskii* Żarnowski, 1954 [= *Staphylocystoides stefanskii* (Żarnowski, 1954)] – NMWU, vouchers: collection of Krystyna Rybicka (**KR**);
- Hymenolepis tridontophora* Sołtys 1954 [= *Triodontolepis bifurca* Hamann, 1891)] – lack of specimens;
- Hymenolepis vistulae* Czapliński, 1960 [= *Microsomacanthus vistulae* (Czapliński, 1960)] – syntypes: NMWU;
- Hymenopelis multiglandularis* Baczyńska, 1914 [= *Echinocotyle multiglandularis* (Baczyńska, 1914)] – NMWU, vouchers: collection of **P**;
- Insectivorolepis infima* Żarnowski, 1955 [= *Soricinia infima* Żarnowski, 1955] – lack of specimens;
- Marsupiobothrium antarcticum* Wojciechowska, 1991 [= *Guidus antarcticum* (Wojciechowska, 1991)] – holotype: IZMPAN; paratypes: BMNH;
- Marsupiobothrium awii* Rocka & Zdzitowiecki, 1998 [= *Guidus awii* (Rocka & Zdzitowiecki, 1998)] – holotype: IZMPAN; paratypes: BMNH;
- Microsomacanthus baeri* Czapliński & Vaucher, 1977 [= *Microsomacanthus fausti* (Tseng Shen, 1932) sensu Spassky & Spasskaya, 1961, nec Tseng Shen, 1932] – lack of specimens;
- Microsomacanthus secundus* Cielecka & Zdzitowiecki, 1989 – holotype and paratypes: NMWU;
- Microsomacanthus shetlandicus* Cielecka & Zdzitowiecki, 1981 – holotype and paratypes: NMWU;
- Monosaccanthes streperae* Czapliński & Wilanowicz, 1969 [= *Anatinella streperae* (Czapliński & Wilanowicz, 1969)] – holotype and paratypes: NMWU;
- Oncobothrium antarcticum* Wojciechowska, 1990 – holotype: IZMPAN; paratypes: IZMPAN, BMNH;
- Paraglaridacris silesiacus* Janiszewska, 1950 [= *Archigetes brachyurus* Mrazek, 1908] – lack of specimens;
- Phyllobothrium arctowskii* Wojciechowska, 1991 [= *Anthocephalum arctowskii* (Wojciechowska, 1991)] – holotype and vouchers: IZMPAN; paratypes: BMNH;
- Phyllobothrium georgiense* Wojciechowska, 1991 [= *Anthocephalum georgiense* (Wojciechowska, 1991)] – holotype: MZPW; paratypes: BMNH;
- Phyllobothrium rakusai* Wojciechowska, 1991 [= *Anthocephalum rakusai* (Wojciechowska, 1991)] – holotype: IZMPAN; paratypes: BMNH;
- Phyllobothrium siedleckii* Wojciechowska, 1991 [= *Anthocephalum siedleckii* (Wojciechowska, 1991)] – holotype: IZMPAN; paratypes and vouchers: IZMPAN, BMNH;
- Pseudanthobothrium minutum* Wojciechowska, 1991 – syntypes: author's collection in IPPAN;
- Pseudanthobothrium notogeorgianum* Wojciechowska, 1990 – holotype: IZMPAN, paratypes: IZMPAN, BMNH;
- Pseudanthobothrium shetlandicum* Wojciechowska, 1990 [= *Notomegarhynchus shetlandicum* (Wojciechowska, 1990)] – holotype: IZMPAN, paratypes: IZMPAN and BMNH;
- Pseudodiorchis campinasi* Rybicka, 1958 [= *Urocystis prolifer* Villot, 1880]; syntypes: NMWU;
- Pseudodiorchis multispinosa* Żarnowski, 1955 [= *Urocystis prolifer* Villot, 1880] – lack of specimens;
- Ptilolepis philomelae* Okulewicz, 1991 [= *Emberizotaenia raymondi* (Gigon & Beuret, 1991)] – NMWU;
- Retinometra fulicatrae* Czapliński & Czaplińska 1972 – syntypes: NMWU;
- Retinometra guberiana* Czapliński, 1965 – syntypes: NMWU;
- Schistotaenia rufi* Sulgostowska & Korpaczewska, 1969 – lack of specimens;
- Sobolevicanthus dlouhyi* Czapliński & Vaucher, 1981 – syntypes: Geneva Museum of Natural History;
- Sobolevicanthus dobsoni* Czapliński, 1988 – syntypes: South Australian Museum (Adelaide);
- Sobolevicanthus gracilissimus* Czapliński & Czaplińska, 1990 – holotype and paratypes: NMWU;



*Sobolevicanthus spratti* Czaplinski, 1987 – holotype: U.S. National Museum, paratypes: South Australian Museum (Adelaide);

*Sobolevicanthus sprengi* Czaplinski, 1985 – holotype and paratypes: South Australian Museum (Adelaide);

*Sobolevicantjus wisniewskii* Czaplinski, 1956 – syntypes: NMWU;

*Soricinia tripartita* Żarnowski, 1955 [= *Ditestolepis tripartita* (Żarnowski, 1955)] – NMWU; vouchers: collection of **KR**;

*Spiniglans paralelodonariae* Jaroń, 1967 [= *Hirudinicola parvirostris* (Krabbe, 1869)] – type specimens: collection of Medical University of Warsaw;

*Spirometra janickii* Furmaga, 1953 – lack of specimens;

*Taenia krabbei* Kowalewski, 1895 [= *Tshertkovilepis krabbei* (Kowalewski, 1895)] – lack of specimens;

*Tatria biremis iuni* Korpaczewska & Sulgosowska, 1974 [= *Tatria iuni* Korpaczewska & Sulgosowska, 1974] – NMWU; vouchers: collection of **S**;

*Tatria biremis* Kowalewski, 1904 – NMWU, vouchers: the collection of **S**;

*Tatria minor* Korpaczewska & Sulgostowska, 1974 – NMWU; vouchers: the collection of **S**;

#### **NEMATODA**

*Angiostrongylus soricis* Sołtys, 1952 [= *Stefanskostrongylus soricis* (Sołtys, 1952)] – lack of specimens;

*Ascaris procyonis* Stefański & Żarnowski, 1951 [= *Baylisascaris procyonis* (Stefański & Żarnowski, 1951)] – lack of specimens;

*Capillaria cholidicola* Sołtys, 1952 [= *Calodium soricicola* (Yokogawa: Nishigori, 1940)] – lack of specimens;

*Capillaria polonica* Łukasiak & Strankowski, 1933 [= *Aonchotheca polonica* (Łukasiak & Strankowski, 1933)] – lack of specimens;

*Capillaria oesophagicola* Sołtys, 1952 [= *Eucoleus oesophagicola* (Sołtys, 1952)] – lack of specimens;

*Capillaria similis* Kowalewski, 1903 [= *Trichosoma similis* (Kowalewski, 1903)] – lack of specimens;

*Capillaria ventricola* Sołtys, 1952 [= *Aonchotaenia kutori* (Rukhladieva, 1946)] – lack of specimens;

*Molinstromylus daubentoni* Zdzitowiecki, 1970 – typical material: IZMPAN;

*Paranisakis weddelliensis* Rocka, 2002 – author's collection in IPPAN;

*Protospirura glareoli* Sołtys, 1949 [= *Mastophorus muris* (Gmelin, 1790)] – lack of specimens;

*Skrabinagia lyrataeformis* Drózdź, 1965 [= *Ostertagia lyrataeformis* (Drózdź, 1965)] – author's collection in IPPAN;

*Strongyloides spiralis* Grabda-Kazubska, 1978 – lack of specimens;

*Synhimanthus rhopalocephala* Sołtys, 1952 [= *Stammerinema rhopalocephalus* (Sołtys, 1952)] – lack of specimens;

*Trichosoma gallinum* Kowalewski, 1894 [synonym of *Aonchotheca caudinflata* (Molin, 1858)] – lack of specimens.

#### **ACANTHOCEPHALA**

*Andracantha baylisi* Zdzitowiecki, 1986 – typical material: IZMPAN;

*Apororhynchus silesiacus* Okulewicz & Maruszewski, 1980 – lack of specimens;

*Corynosoma arctocephali* Zdzitowiecki, 1984 – typical material: IZMPAN;

*Corynosoma begleuse* Laskowski, Jeżewski & Zdzitowiecki, 2008 – typical material: BMNW and/or IZMPAN;

*Corynosoma dolmari* Zdzitowiecki, 1983 – typical material: IZMPAN;

*Corynosoma evae* Zdzitowiecki, 1986 – typical material: IZMPAN;

*Corynosoma pseudohamanni* Zdzitowiecki, 1984 – typical material: IZMPAN;

*Corynosoma shackletoni* Zdzitowiecki, 1978 – typical material: IZMPAN;

*Echinorhynchus botniesis* Zdzitowiecki & Valtonen, 1987 – typical material: IZMPAN;

*Echinorhynchus nototaeniae* Zdzitowiecki, 1983 – typical material: IZMPAN;

*Metacanthocephalus dalmori* Zdzitowiecki, 1983 – typical material: IZMPAN;

*Metacanthocephalus johnsoni* Zdzitowiecki, 1983 – typical material: IZMPAN.

Table 1. The number of nominal species and taxons of genus level in the Polish Collection of Parasitic Helminths

Helminth group	No. of nominal species	No. of taxons of genus level	Total
<b>Monogenea</b>	<b>86</b>	<b>4</b>	<b>90</b>
<b>Trematoda:</b>	<b>221</b>	<b>30</b>	<b>251</b>
Aspidogastrea	1	0	1
Digenea	220	30	250
<b>Cestoda</b>	<b>126</b>	<b>18</b>	<b>144</b>
Gyrocotyloidea	1	0	1
Amphilinidea	1	0	1
Eucestoda	124	18	142
<b>Nematoda</b>	<b>43</b>	<b>0</b>	<b>43</b>
<b>Acanthocephala</b>	<b>10</b>	<b>1</b>	<b>11</b>
<b>Total</b>	<b>486</b>	<b>53</b>	<b>539</b>

### Analysis of the collected data – new information

#### The helminth species new for fauna of Poland

The comparison of our Database with the information comprised in several reviews and original publications (Grabda-Kazubska et Okulewicz 2005 [1], Pojmańska et al. 2007 [2], Dzika 2009 [3], Okulewicz 2011 [4], Hildebrand et al. 2011 [5], Rząd et al. 2011 [6,7] and some other) revealed, that as many as 11 helminth species were not so far recorded in Poland.

#### MONOGENA

*Dactylogyrus folkmarovae* Ergens, 1956  
(Dactylogyridae)

Host: *Rutilus rutilus* (L.) (Pisces)  
Locality: Lake Wąsoskie, Wielkopolsko-Kujawska Lowland  
Collected and identified: B. Grabda-Kazubska (GK collection)

*Dactylogyrus vranoviensis* Ergens, 1956  
(Dactylogyridae)

Host: *Leuciscus cephalus* (L.) (Pisces)  
Locality: Rebizanty, Lublin Highland  
Collected and identified: M. Prost (MP collection)

*Gyrodactylus aculeati* Malmberg, 1956  
(Gyrodactylidae)

Host: *Gasterosteus aculeatus* L. (Pisces)  
Locality: Rebizanty – river Tanew, Lublin Highland

Collected and identified: M. Prost (MP collection)

#### DIGENEA

##### *Asymphylogora progeneticum*

Sarkova & Bykhovskii, 1940 (Monorchiiidae)

Host: *Bithynia leachi* (Shepard) (Mollusca)

Locality – Kleszczewo, Masurian Lakeland

Collected and identified: B. Grabda-Kazubska (GK collection)

*Echinochasmus coronatus* (Mendheim, 1940)  
(Echinostomatidae)

Host: *Anas platyrhynchos* L. (Aves)

Locality: Lake Guber, Masurian Lakeland

Collected and identified: T. Sulgostowska (S collection)

*Hemiurus appendiculatus* (Rudolphi, 1802)  
(Hemiuridae)

Host: *Anguilla anguilla* (L.) (Pisces)

Locality: Milicz – ponds, Lower Silesia

Collected and identified: T. Sulgostowska (S collection)

*Stephanoprora pseudoechinata* (Olsson, 1876)  
(Echinostomatidae)

Host: *Larus ridibundus* (Aves);

Locality: Lake Arklity, Masurian Lakeland:

Collected and identified: T. Sulgostowska (S collection);

Host: *Sterna hirundo* (Aves);

locality: Górki Wschodnie, Baltic Seashore,

Collected: T Sulgostowska; identified:

K. Niewiadomska (N collection)

*Uvulifer denticulatus* (Rudolphi, 1819)  
(Diplostomidae)

Host: *Alcedo atthis* L. (Aves)

Locality: Lake Drużno, Baltic seashore Masurian Lakeland

Collected and identified: K. Niewiadomska (N collection)

#### CESTODA

*Bothriocephalus rugosus* (Batsch, 1786)  
(Bothriocephalidae)

Host: *Perca fluviatilis* L. (Pisces)

Locality: Lake Resko, Pomeranian Lakeland

Collected and identified: J. Wierzbicka (WJ collection)

*Monobothrium auriculatum* Kulakovskaya, 1961

Host: *Gobio gobio* (L.) (Pisces)

Collected and identified: J. Grabda

(JG collection)

#### NEMATODA

*Aonchotheca exilis* (Dujardin, 1845)

Hosts: *Turdus merula* L., *T. philomelos* Brehm

Table 2. Host-parasites relationships new for Poland

Parasite	Host	Collection
<b>Monogenea</b>		
<i>Dactylogyrus cornoides</i>	<i>Ballerus ballerus</i>	WJ
<i>Dactylogyrus cornu</i>	<i>Ballerus ballerus</i>	WJ
<i>Dactylogyrus difformis</i>	<i>Cyprinus carpio</i>	GK
<i>Dactylogyrus difformoides</i>	<i>Rutilus rutilus</i>	GK
<i>Dactylogyrus distinguendus</i>	<i>Rutilus rutilus</i>	GK
<i>Dactylogyrus extensus</i>	<i>Blicca bjoerka</i>	GK
<i>Dactylogyrus falcatus</i>	<i>Ballerus ballerus</i>	WJ
<i>Dactylogyrus fallax</i>	<i>Ballerus ballerus</i>	WJ
<i>Dactylogyrus sphyrna</i>	<i>Ballerus ballerus</i>	WJ
<i>Dactylogyrus wunderi</i>	<i>Rutilus rutilus</i>	GK
<i>Dactylogyrus zandti</i>	<i>Blicca bjoerkna</i>	GK
<i>Diplozoon gussevi</i>	<i>Scardinius erythrophthalmus</i>	GK
<i>Gyrodactylus shulmani</i>	<i>Abramis brama</i> , <i>Ballerus ballerus</i>	WJ
<b>Digenea</b>		
<i>Alaria alata</i> metacercaria	<i>Lacerta vivipara</i>	GK
<i>Allocreadium isoporum</i>	<i>Leuciscus cephalus</i> , <i>Leuciscus leuciscus</i>	WJ and JG, JG
<i>Apatemon gracilis</i>	<i>Anas platyrhynchos</i>	N
<i>Asymphylogora imitans</i>	<i>Tinca tinca</i>	JG
<i>Brachyphallus crenatus</i>	<i>Scophthalmus maximus</i>	WJ
<i>Bunodera lucopercae</i>	<i>Scophthalmus maximus</i>	WJ
<i>Conodiplostomum spathula</i>	<i>Buteo buteo</i>	S
<i>Cotylurus strigeoides</i>	<i>Aythya fuligula</i>	S
<i>Cyathocotyle prussica</i>	<i>Anas strepera</i> , <i>Larus argentatus</i> (?)	S, N
<i>Diplostomum paracaudum</i>	<i>Larus fuscus</i> <sup>1</sup>	S
<i>Diplostomum spathaceum</i>	<i>Larus argentatus</i>	N
<i>Gorgoderia varsovienis</i>	<i>Rana temporaria</i>	GK
<i>Gorgoderina vitelliloba</i>	<i>Rana esculenta</i>	GK
<i>Haplometra cylidracea</i>	<i>Rana esculenta</i>	GK
<i>Ichthyocotylurus erraticus</i>	<i>Larus canus</i>	S
<i>Ichthyocotylurus platycephalus</i>	<i>Sterna hirundo</i>	N
<i>Ichthyocotylurus variegatus</i>	<i>Larus fuscus</i> , <i>Sterna hirundo</i>	N
<i>Leptophallus nigrovenosus</i>	<i>Lacerta vivipara</i>	GK
<i>Leucochloridium holostomum</i>	<i>Turdus philomelos</i>	N
<i>Maritrema subdolum</i>	<i>Melanitta fusca</i>	S
<i>Paralepoderma cloacicola</i>	<i>Triturus vulgaris</i>	GK
<i>Phyllodistomum macrocotyle</i>	<i>Gymnocephalus cernuus</i> , <i>Leuciscus leuciscus</i>	GK, JG
<i>Prosthogonimus ovatus</i>	<i>Cygnus olor</i> , <i>Philomachus pugnax</i>	S
<i>Psilotrema similis</i>	<i>Fulica atra</i>	S
<i>Sphaerostomum bramae</i>	<i>Alburnus alburnus</i>	WJ
<i>Sphaerostomum globiporum</i>	<i>Leuciscus leuciscus</i>	JG
<i>Strigea strigis</i>	<i>Circus aeruginosus</i>	N
<i>Tylodelphys clavata</i>	<i>Ardea cinerea</i>	N
<i>Urogonimus macrostomus</i>	<i>Fringilla coelebs</i>	N

<b>Cestoda</b>		
<i>Archigetes sieboldi</i>	<i>Blicca bjoerkna</i>	WJ
<i>Caryophyllaeides fennica</i>	<i>Vimba vimba</i>	JG
<i>Eubothrium crassum</i>	<i>Salmo fario</i>	JG
<i>Ligula intestinalis</i> plerocercoid	<i>Perca fluviatilis</i> , <i>Larus marinus</i>	WJ, S
<i>Microsomacanthus paracompressus</i>	<i>Anas acuta</i>	S
<i>Nematotaenia dispar</i>	<i>Bufo viridis</i>	GK
<i>Ophiotaenia europaea</i>	<i>Natrix natrix</i>	GK
<i>Sobolevicanthus wisniewskii</i>	<i>Aythya fuligula</i>	S
<i>Tatria biremis</i>	<i>Podiceps cristatus</i>	S
<b>Acanthocephala</b>		
<i>Acanthocephalus anguillae</i>	<i>Noemacheilus barbatulus</i>	S
<i>Neoechinorhynchus rutili</i>	<i>Scophthalmus maximus</i>	WJ

<sup>1</sup> first record of the natural definitive host of this trematode

Locality: Wrocław, Lower Silesia  
 Collected: Jerzy Okulewicz; identified: Anna Okulewicz (O collection)

### Host-parasites relationships new in Poland

As much as 13 species of Monogenea, 30 Digenea, 9 Cestoda and 2 Acanthocephala were found in the host species in which they were not so far recorded in Poland (Table 2).

### Other new data

In the collected material for the first time the natural definitive host of *Diplostomum paracaudum* has been identified. The renewed identification of the collected cestodes representing the genus *Fimbriaria*, allowed to find the natural definitive hosts of the species *F. czaplinskii* Grytner Zięcina, 1994 [8]. One new species of *Microsomacanthus* cestode has been detected by Cielecka and Salamatin (submitted to press).

The further analysis of the collected data, which formally is beyond the task of this project, certainly will reveal several new facts, which will be subsequently published.

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