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A checklist of parasites recorded on sticklebacks (Actinopterygii: Gasterosteidae) from Poland

Jolanta Morozińska-Gogol *

Division of Ecology and Protection of the Sea, Pomeranian Pedagogical University, ul. Arciszewskiego 22 b, 76-200 Słupsk, Poland

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Abstract

Parasites of the three-spined stickleback, *Gasterosteus aculeatus* (L.), and the nine-spined stickleback, *Pungitius pungitius* (L.), from brackish and freshwater habitats in Poland are listed. The following list was compiled from published records and own long-term studies. Parasites are listed alphabetically in meaningful groups of parasites with notes about their location on the host and distribution in Poland with references. A total of 51 species (taxa) of parasites were recorded on *G. aculeatus* (3 Apicomplexa, 1 Microsporidia, 3 Peritrichia, 1 Myxozoa, 7 Digenea, 2 Monogenea, 10 Cestoda, 10 Nematoda, 7 Acanthocephala, 3 Copepoda, 1 Branchiura, 2 Hirudinea, 1 Bivalvia) and 16 parasites on *P. pungitius* (1 Apicomplexa, 1 Microsporidia, 2 Peritrichia, 4 Digenea, 1 Monogenea, 2 Cestoda, 2 Nematoda, 1 Copepoda, 1 Branchiura, 1 Bivalvia).

Keywords: Parasites; Sticklebacks; *Gasterosteus aculeatus*; *Pungitius pungitius*; Poland

1. Introduction

Sticklebacks are widely distributed in freshwater, brackish water and marine coastal areas of the northern hemisphere. The stocks of sticklebacks constituted a predominant fish population in the south Baltic waters [1,2], because of their exceptional resistance to the degradation of environment and their biology. Knowledge of parasite fauna of the sticklebacks seams to be important. Because of its abundance, wide dispersal in all waters and its omnivorous nature the stickleback has been one of the most extensively infected fish and sometimes a vector of parasites in the food chain [3,4].

The Polish literature contains very scant data on sticklebacks parasites. The first survey on parasites of sticklebacks in Poland was carried out in 1883 by Girdwoyń in *Parasites of our fish*. Parasites recorded on sticklebacks have included in *Catalogue of Parasitic Fauna of Poland: Part II. Parasites of Cyclostomes and Fishes* [5], but this publication is nearly 35 years old. The aim of this study was to survey the parasite fauna of stickleback in Poland and to complete database on the distribution of parasites affecting sticklebacks (Fig. 1).

2. Materials and methods

A checklist was prepared on basis of published data from 1883 to 2003 from various regions of Poland and own survey (published and unpublished). The sticklebacks were collected from 1992 to 1999, from the Baltic Sea: open sea water (Gdańsk Deep), coastal water—Middle Coast and Gulf of Gdańsk (included Puck Bay), mouth of Dead Vistula River, and also from freshwater localities: Baltic Coast–Oliwa ponds in Gdańsk and Pomeranian Lake District ponds in Słupsk.

The parasite taxonomy follows that of databases: Fauna Europaea (www.faunaeur.org/), European Register of Marine Species (www.erms.biol.soton.ac.uk/) and Systema Naturae 2000 (http://sn2000.taxonomy.nl/).

3. Results

3.1. A checklist of parasites of Gasterosteus aculeatus

Apicomplexa

1. *Goussia aculeati* (Jastrzębski, 1984) Jastrzębski, 1989; syn.: *Eimeria aculeati* Jastrzębski, 1984; location: intestine epithelium; distribution: Mazovian Lowland—carp pond in Żabieniec [6–8].

2. *Goussia(Goussia) gasterostei* (Thélohan, 1890); syn.: *Eimeria gasterostei* (Thélohan, 1890); *Coccidium gasterostei*

* Tel.: +48 59 8405420.
E-mail address: jolamorozinska@poczta.onet.pl.

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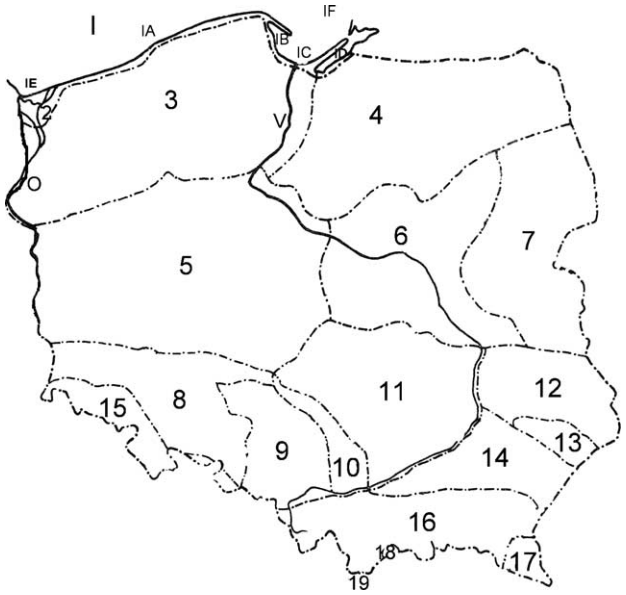

Fig. 1. Regions of Poland after [5]: 1– Baltic Sea; 1A– Middle Coast; 1B–Gulf of Gdańsk (included Puck Bay); 1C–mouth of the Dead Vistula; 1D–Vistula Lagoon; 1E–Szczecin Lagoon; 1F–Gdansk Deep; 2–Baltic Coast; 3–Pomeranian Lake District; 4–Masurian Lake District; 5–Wielkopolsko–Kujawska Lowland; 6–Mazovian Lowland; 7–Podlasie Lowland; 8–Lower Silesia; 9–Upper Silesia; 10–Krakowsko-Wielunska Upland; 11–Malopolska Upland; 12–Lubelska Upland; 13–Roztocze Upland; 14–Sandomierska Lowland; 15–Sudeten Mountains; 16–Beskidy Mountains; 17–Bieszczady Mountains; 18–Pieniny Mountains; 19–Tatry Mountains.

Thélohan, 1890; location: liver; distribution: Mazovian Lowland—carp pond in Żabieniec [7].

3. *Goussia zarnowskii* (Jastrzębski, 1982) Jastrzębski, 1989; syn.: *Eimeria zarnowskii* Jastrzębski, 1982; location: intestine; distribution: Mazovian Lowland—carp pond in Żabieniec [6,7,9,10].

Microsporidia

4. *Glugea anomala* Moniez, 1887; xenomas; location: connective tissue, skin, visceral organs; distribution: Gdańsk Deep [11], Gulf of Gdańsk [12,13], Middle Coast, mouth of Dead Vistula River [13], Pomeranian Lake District—ponds in Słupsk (Morozińska-Gogol, unpublished), Wielkopolsko-Kujawska Lowland-Lake Zbąszyń, Mazovian Lowland surroundings of Warsaw [5].

Peritrichia

5. *Trichodina domerguei domerguei* Wallengren, 1897; syn.: *Trichodina domerguei* f. *latispina* Dogiel, 1940; *Trichodina pediculus* f. *latispina* Stryjecka-Trembaczowska, 1953; location: skin, fins, gills; distribution: Middle Coast, mouth of Dead Vistula River [14], Gulf of Gdańsk [14–17], Vistula Lagoon [18], Baltic Coast–Oliwa ponds in Gdańsk [11], Pomeranian Lake District-Trzebiocha stream near Kościerzyna [19], ponds in Słupsk (Morozińska-Gogol, unpublished), Masurian Lake District [18], Mazovian Lowland surroundings of Warsaw, Lubelska Upland surroundings of Lublin [16]; remarks: ciliates [15] belonged to *T. domerguei domerguei* and *T. tenuidens* [20,21].

6. *Trichodina pediculus* Ehrenberg, 1838; location: gills; distribution: Lubelska Upland surroundings of Lublin [22].

7. *Trichodina tenuidens* Fauré-Fremiet, 1943; location: gills, gill operculum; distribution: Gulf of Gdańsk [14,15], Middle Coast, mouth of Dead Vistula River [14], Masurian Lake District–Lake Mamry [21].

Myxozoa

8. *Myxobilatus gasterostei* (Parisi, 1912); location: kidney; distribution: Poland [23].

Digenea

9. *Apatemon gracilis* (Rudolphi, 1819); metacercaria; syn.: *Apatemon annuligerum* (Nordman, 1832); *Tetracotyle annuligerum* (Nordmann, 1932); location: eyes; distribution: Gulf of Gdańsk [3,4,12], Middle Coast, and mouth of Dead Vistula River [3], Vistula Lagoon [4], Baltic Coast [24]–Oliwa ponds in Gdańsk [11], Pomeranian Lake District ponds in Słupsk (Morozińska-Gogol, unpublished).

10. *Brachyphallus crenatus* (Rudolphi, 1802); location: stomach, intestine; distribution: Baltic Coast, Vistula Lagoon [24], Gulf of Gdańsk [25].

11. *Diplostomum spathaceum* (Rudolphi, 1819); metacercaria; location: lens of eye; distribution: Gulf of Gdańsk [12,17,26], Baltic Coast–Oliwa ponds in Gdańsk [17], Pomeranian Lake District–Trzebiocha stream [19], Masurian Lake District–Lake Wigry [27].

12. *Diplostomum* spp.; metacercaria; location: lens of eye; distribution: Gdańsk Deep [11], Middle Coast, mouth of Dead Vistula River [13], Gulf of Gdańsk [4,13], Vistula Lagoon [4], Baltic Coast–Oliwa ponds in Gdańsk [11], Pomeranian Lake District ponds in Słupsk (Morozińska-Gogol, unpublished).

13. *Phyllodistomum folium* (Olfers, 1916); location: urinary tract; distribution: Baltic Coast–Oliwa ponds in Gdańsk [17], Middle Coast near Darłowo [13,28].

14. *Tetracotyle* sp.; cystae; location: body cavity near the eye; distribution: Gulf of Gdańsk, mouth of Dead Vistula River [17].

15. *Tylodelphys clavata* (Nordmann, 1832); metacercaria; location: vitreous organ of eye; distribution: various region of Poland [24], Vistula Lagoon [4], Pomeranian Lake District–Trzebiocha stream [19].

Monogenea

16. *Gyrodactylus arcuatus* Bychowsky, 1933; location: skin, caudal fin, gills; distribution: Gulf of Gdańsk [13,17], Baltic Coast–Oliwa ponds in Gdańsk [11], Middle Coast, mouth of Dead Vistula River [13], Pomeranian Lake District ponds in Słupsk (Morozińska-Gogol, unpublished).

17. *Gyrodactylus medius* Kathariner, 1894; location: gills, fins; distribution: Masurian Lake District [29].

Cestoda

18. *Bothriocephalus scorpii* (Müller, 1776); plerocercoid; location: intestine; distribution: Middle Coast, Gulf of Gdańsk [28].

19. *Bothriocephalus* sp.; plerocercoid; location: body cavity, liver, intestine; distribution: Baltic Coast [30].

20. *Diphyllobothrium ditremum* (Creplin, 1825); plerocercoid; location: liver, visceral organs, fat; distribution: Baltic Coast [30], Middle Coast, mouth of Dead Vistula River [28], Gulf of Gdańsk [4,28].

21. *Diphyllobothrium* sp.; plerocercoid; location: body cavity, liver, intestine; distribution: Baltic Coast [30].