

A checklist of helminth fauna of weatherfish, *Misgurnus fossilis* (Pisces, Cobitidae): state of the art, species list and perspectives of further studies

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Summary

The helminth fauna of weatherfish (*Misgurnus fossilis*) in natural range is reviewed. Several helminth species reported in weatherfish are discussed with reference to host specificity and their geographical distribution. The current list of helminth parasites of the weatherfish includes 37 species. Most (15) are digenetic trematodes, half of them being larval stages. Only one species of trematode – *Allocreadium transversale* is more specific parasite of weatherfish. Second largest group are Monogenea, with 10 species. Two of them (*Gyrodactylus strelkovi* and *G. misgurni*) are found only in the genus *Misgurnus*. Tapeworms (6 species) and Nematodes (6 species) are less numerous. No Acanthocephala, however, were ever found.

Key words: *Misgurnus fossilis*; helminth; parasites; geographical distribution

Information on parasites and parasitoses of fish species of no economic significance is still scanty, mainly due to their low abundance and difficulties in catching. Cobitids, including weatherfish, are among such fishes. The distribution of the weatherfish (*Misgurnus fossilis*) is limited to Europe except Great Britain, some Scandinavian countries, and the Pyrenean, Appeninic and Balkan Peninsulas. It is also absent from tributaries of rivers falling into the Mediterranean, Adriatic, Aegean and Arctic Seas (Kotusz, 2001). In many sites within its natural range it no longer exists. Industry and agriculture are regarded as the main reasons for its disappearance; they cause pollution and devastation of natural habitats (Kotusz, 2001). Diseases, including parasitoses, are also of great significance. However, the knowledge of weatherfish helminth fauna is still fragmentary; the latter pertains to both the species composition of parasites and to their geographical distribution. The parasites were rather unevenly studied and most data

come from former USSR or Russia, Ukraine, Czech Republic, Slovakia and Poland, whereas the other parts of Europe (e.g. in Austria, Hungary) were only "insularly" and accidentally studied (Bychovskaja-Pavlovskaja, 1962; Grabda, 1971; Ergens *et al.*, 1975; Kritscher, 1980, 1983, 1988; Prost, 1981; Kanev, 1984; Bauer, 1985, 1987; Movchan & Smirnov, 1988; Moravec, 2001; Popiołek, 2002; Zhokhov, 2002; Popiołek *et al.*, 2003).

The current list of helminth parasites of the weatherfish is quite long and includes 37 species (Table 1). Most (15) are digenetic trematodes, half of them being larval stages. Among seven trematode species found in the weatherfish as adults, three represent the genus *Sanguinicola* (*S. armata*, *S. inermis* and *S. intermedia*). These parasites are located in the blood vessels which results in their high pathogenicity. According to Niewiadomska (2003) these trematodes are non-specific parasites of the weatherfish (they occur mainly in *Tinca tinca*, *Cyprinus carpio* and *Carassius carassius*), they have been recorded from this host, among others, from Poland, the Czech Republic, Slovakia and Ukraine (Movchan & Smirnow, 1988; Moravec, 2001). Another two species of weatherfish parasites are members of the genus *Sphaerostomum*. Though *Sph. bramae* occurs mainly in the intestine of cyprinids, and in the weatherfish it has been noted accidentally and only in Russia and Ukraine, *Sph. globiporum* is included in the lists of weatherfish parasites and has been recorded from this host in Russia and Poland. According to Zhokhov (2002), for both these species the weatherfish is an atypical host. The only parasite specific for cobitids, including the weatherfish, is an intestinal species *Allocreadium transversale*. Because of the narrow host spectrum, the trematode has been recorded nearly everywhere where the weatherfish was dissected (see table). The presence of *Asymphydora macracetabulum* on the list of weatherfish parasites published in the key of Bychovskaja-Pavlovskaja (1962) appears to be an error. The localities of the parasite men-

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Table 1. List of helminths species recorded from weatherfish, indicating parasite stage and geographic distributions with reference.

Species of parasite	Stage	Distribution
Monogenea		
<i>Dactylogyrus extensus</i> Mueller et Van Cleave, 1932	Adl	Czech Republic (1), Ukraine (2)
<i>D. vastator</i> Nybelin, 1924	Adl	Poland (3)
<i>Ancyrocephalus cruciatus</i> (Wedl, 1857)	Adl	Czech Republic (1), Slovakia (1), Ukraine (2,16), Poland (3,4), Austria (5), former USSR (6)
* <i>Gyrodactylus cobitis</i> Bychowsky, 1933	Adl	Czech Republic (1), Slovakia (1), Ukraine (2), Poland (3)
* <i>G. elegans</i> Nordmann, 1832	Adl	Czech Republic (1), Slovakia (1)
<i>G. fossilis</i> Lupu et Roman, 1956	Adl	Czech Republic (1), Slovakia (1), former USSR (6)
<i>G. medius</i> Kathariner, 1893	Adl	Czech Republic (1)
<i>G. misgurni</i> Ling, 1962	Adl	Czech Republic (1), Slovakia (1), Ukraine (16), Poland (3), former USSR (6), Hungary (16)
<i>G. strelkovi</i> Ergens et Danilov, 1983	Adl	Former USSR (6)
<i>Diplozoon paradoxum</i> Nordmann, 1832	Adl, Larv	Ukraine (2), former USSR (7)
Cestoda		
* <i>Paracaryophyllaeus gotoi</i> (Motomura, 1927)	Adl	not specified or Russia (9)
* <i>Paraglaridacris limnodrili</i> (Yamaguti, 1934)	Adl	not specified (9)
<i>Caryophyllaeidae</i> gen. sp.	Adl	Slovakia (1)
<i>Proteocephalus</i> sp.	Adl	Poland (8)
<i>Neogryporhynchus cheilancristrotus</i> (Wedl, 1855)	Larv	Czech Republic (1), Slovakia (1,16), Ukraine (2), Poland (4,8), Hungary (16)
<i>Valipora campylancristrota</i> (Wedl, 1855)	Larv	Ukraine (2)
Digenea		
<i>Sanguinicola armata</i> Plehn, 1905	Adl	Czech Republic (1), Ukraine (2), former USSR (6), Poland (10)
<i>S. inermis</i> Plehn, 1905	Adl	Czech Republic (1)
<i>S. intermedia</i> Ejsmont, 1925	Adl	Czech Republic (1), Slovakia (1), Ukraine (2)
* <i>Asymphylodora macracetabulum</i> Belouss, 1953	Adl	former USSR (7)
<i>Allocreadium transversale</i> (Rudolphi, 1802)	Adl	Czech Republic (1), Slovakia (1), Ukraine (2,16), Poland (8, 11), former USSR (6, 7), Austria (12), Hungary (16)
<i>Sphaerostomum bramae</i> (Müller, 1776)	Adl	Ukraine (2), Poland (4), former USSR (7), Russia (13)
<i>Sph.. globiporum</i> (Rudolphi, 1802)	Adl	Poland (4), former USSR (6,7), Russia (13)
<i>Echinostomatidae</i> gen. sp.	Larv	Ukraine (2,16), Hungary (16)
<i>Diplostomum spathaceum</i> (Rudolphi, 1819)	Larv	Czech Republic (1), Slovakia (1)
<i>Diplostomum</i> sp.	Larv	Slovakia (1), Poland (8)
<i>Tylodelphys clavata</i> (Nordmann, 1832)	Larv	Czech Republic (1), Slovakia (1, 16), Ukraine (16), Hungary (16)
<i>T. craniaria</i> Diesing, 1858	Larv	Poland (10)
<i>Posthodiplostomum cuticola</i> (Nordmann, 1832)	Larv	Czech Republic (1), Slovakia (1), Ukraine (2), Poland (8), former USSR (6), Hungary (16)
<i>Clinostomum complanatum</i> (Rudolphi, 1814)	Larv	Ukraine (2)
<i>Metagonimus yokogawai</i> Katsurada, 1912	Larv	Slovakia (1)
Nematoda		
* <i>Dichelyne (Cucullanellus) minutus</i> (Rudolphi, 1819)	Adl	Poland (14)
<i>Pseudocapillaria tomentosa</i> (Dujardin, 1843)	Adl	Poland (8), not specified (15)
<i>Rhabdochona denudata</i> (Dujardin, 1845)	Adl	Poland (8), Ukraine (16), Hungary (16)
<i>Raphidascaris acus</i> (Bloch, 1779)	Larv	Slovakia (1), Ukraine (2), Poland (8)
<i>Spiroxys contortus</i> (Rudolphi, 1819)	Larv	not specified (15)
* <i>Hysterothylacium aducnum</i> (Rudolphi, 1802)	Larv	Ukraine (2)

* - Questionable host; Adl - adult stage; Larv – larval stage; (1) Moravec, 2001; (2) Movchan, & Smirnov, 1988; (3) Prost, 1981; (4) Grabda, 1971; (5) Kritscher, 1988; (6) Bauer, 1985; (7) Bychovskaja-Pavlovskaja, 1962; (8) Popiolek, 2002; (9) Pojmańska, 1991; (10) Niewiadomska, 2003; (11) Popiolek *et al.*, 2003; (12) Kritscher, 1983; (13) Zhokhov, 2002; (14) Grabda-Kazubska & Okulewicz, 2005; (15) Moravec 1994, (16) Ergens *et al.*, 1975.

tioned in this paper are incompatible with the weatherfish distribution range and have not been confirmed in a more recent publication by Bauer (1987). Besides, it is usually

Misgurnus anguillicaudatus that is mentioned as the host of *A. macracetabulum*, and attributing this role to *M. fossilis* is probably a mistake. The remaining trematodes re-

corded from the weatherfish occur there only as larvae (metacercarie), and the fish is their intermediate host. Metacercarie found in the weatherfish represent four families: Diplostomidae, Clinostomidae Heterophyidae and Echinostomatidae. Among them Diplostomatidae are the most numerous; their larvae are usually located in the skin (e.g. *Posthodiplostomum cuticola*), eyes (*Diplostomum spathaceum*, *Tylodelphys clavata*), muscles, brain (*T. cranaria*) or the vertebral canal of the fish, while their adult forms occur in fish-eating birds or, less often, mammals. While three of the above-mentioned metacercariae are regarded as parasites of a rather wide host spectrum and recorded from most countries, *T. cranaria* is a rare species, till now recorded only from lakes of northeast Poland and middle Odra River (Kozicka & Niewiadomska, 1960; Dąbrowska, 1970). Representatives of the last two families are metacercarie characteristic of numerous percids and cyprinids. They are located on the skin, fins or in the muscles and body cavity. *Metagonimus yokogawai* has been recorded from the weatherfish in the Slovakia, and *Clinostomum complanatum* only in Ukraine. Members of the last group – Echinostomatidae have been identified only to the family level.

The next most numerous group includes 10 species of monogeneans, among them both specific parasites of the weatherfish and accidentally found species. The genus *Gyrodactylus* is the most numerously represented monogenean taxon in the weatherfish. Among its six species, four are more or less specific: *G. misgurni* and *G. strelkovi* occur only on the fins and gills of the *M. fossilis* and *M. anguillicaudatus*. *G. fossilis* is found also in *Nemacheilus angorae* and *G. cobitis* also in *Cobitis taenia*. The specificity of the remaining two species (*G. elegans* and *G. medius*) is low, and their main hosts are numerous cyprinid species. Nevertheless, Harris *et al.* (2004) do not confirm occurrence of *G. cobitis* and *G. elegans* in weatherfish. The list of weatherfish parasites presented by Prost (1981) includes a sixth species, discovered in the weatherfish and specific to it - *G. luckiensis*. However, as a result of Ergens's (1986) revision the species turned out to be a synonym of *G. misgurni* and was consequently omitted from the present list. Another two monogeneans represent the genus *Dactylogyrus*. *D. extensus* has been repeatedly recorded from the weatherfish in the Czech Republic and Ukraina, but the single record of *D. vastator* from Poland (Prost, 1981) should be regarded as accidental, since the species occurs nearly exclusively in *Carassius* and farmed carp. The remaining monogeneans are: *Ancyrocephalus cruciatus* commonly found in the weatherfish, and *Diplozoon paradoxum*. The last species has been recorded from the weatherfish, both as adult stage and as larva (diporpa), till now only once, from Ukraine and former USSR.

Among the six tapeworms found in the weatherfish, two have been identified to the family level (Caryophyllaeidae gen. sp.) and genus level (*Proteocephalus* sp.). The only loaches-specific parasite, recorded from the weatherfish and spined loach (*Cobitis taenia*) is *Paracaryophyllaeus gotoi*, recorded from former USSR. Another two tape-

worms: *Paraglaridacris limnодrili* and in particular, the larval stage of *Neogryporhynchus cheilancristotus* are rather common parasites of cyprinids, but they have been recorded from the weatherfish on several occasions. The last tapeworm, the plerocercoid of *Valiopora campylan-cristota* (under the name *Ophiovalipora unilateralis*), has been recorded from the weatherfish only by Movchan & Smirnov (1988) in Ukraine. The record is, however, somewhat doubtful since it has never been confirmed. Also in the most recent paper by Scholz *et al.* (2004) on Cyclophyllidea neither the weatherfish nor any other cobitid are mentioned in the list of hosts of this tapeworm.

The group of six nematode species recorded from the weatherfish includes no host-specific parasites, and three of them occur only as larvae. *Raphidascaris acus* is most often found as an encysted third stage larva on the surface or inside the intestine, on internal organs, in the muscle or body cavity. This common nematode is a parasite of several dozen fishes of various families, and is also the most frequently recorded weatherfish nematode. Another parasite is the larval stage of *Spiroxys contortus*, which - like *R. acus* – is found as a cyst on the intestine wall or peritoneum of several cyprinids and predatory freshwater fishes. It has been recorded from the weatherfish in the catchment area of the Tisa River in Hungary (Moravec, 1994). The third species found in the weatherfish is the larva of *Hysterothylacium aducnum*, recorded only from Ukraine under the name *Contracaecum aduncum*. It appears that this record should be regarded as extremely accidental, since the role of main intermediate hosts for this nematode is attributed to marine fishes, and among its few freshwater hosts the weatherfish or other cobitids are not mentioned (Moravec, 1994). The remaining three nematode species recorded from the weatherfish as adult stages are located in the intestine. *Pseudocapillaria tomentosa* has a very wide range of hosts of various freshwater families, including Cobitidae. In the weatherfish it has been found only once, from Odra River basin in Poland (Popiółek, 2002). Information on finding *Dichelyne (Cucullanellus) minutus* at the weatherfish in Poland one laded from the monograph by Grabda-Kazubska & Okulewicz (2005). However authors did not give any nearer data as well as the source publication. In consideration of that hosts of this parasite are exclusively sea-fish (mostly Pleuronectidae) the above ascertainment can be found not certain. *Rhabdochona denudata* is a common parasite of cyprinids, especially the genera *Leuciscus* and *Rutilus*. In his monograph, Moravec (1994) mentions also cobitids as potential hosts of this parasite, which confirms the record in the weatherfish from tributaries of middle Odra River in Poland and from Tisa River basin in Ukraine and Hungary (Ergens *et al.*, 1975; Popiółek, 2002).

No Acanthocephala, however, were ever found.

Thirty-seven species of helminths hitherto recorded make the weatherfish the best studied species among all cobitids. However, the habitats occupied by the weatherfish, i.e. stagnant or slow-flowing and eutrophic water, characterised by rich and diversified invertebrate fauna, are very

specific. As a result, such habitats create an optimal environment for life and development of almost all groups of parasites, which makes the fish particularly endangered by permanent ichtyoparasitoses.

Comparison of the helminth fauna of the weatherfish in different parts of its distribution range revealed differences between local host populations. At some localities, composition of parasite species is unique and dominated by allo-geneic species, for which weatherfish is only an intermediate host. Such a situation may result either from the natural conditions or from progressive anthropopressure. This suggests that continuation, and especially geographical extension, of the studies would increase the knowledge of weatherfish parasites and parasitoses, and contribute to more efficient protection of the species.

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