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## A systematic review of the parasites (Plathelminthes: Trematoda) of the Wels catfish (*Silurus glanis* L., 1758)

N.E. Ibrahimova

The Wels catfish or sheatfish (*Silurus glanis* L., 1758) is one of the important commercial fishes. Its native range extends from Eastern Europe to Western Asia. Recently, the species range has expanded both to the west and south due to the introduction. In the water bodies of Azerbaijan, the Wels catfish exists at the southernmost border of its range. It was recorded from the Kura River and its basin. There is no survey of parasitological studies on the trematodes of the Wels catfish. The previous papers have not covered all systematic groups or all the areas where the fish is distributed. Based on the literature data, we prepared a systematic review of the Wels catfish trematodes within the catfish present-day range (native area plus the areas of introduction), including Azerbaijan. The list is given according to the system of parasitic organisms implemented in the Catalog of parasites of freshwater fishes of North Asia. We also took into account new studies in the trematode taxonomy. Each species is provided with the following data: synonyms, habitat in the fish body, collecting localities, geographic distribution within the catfish range, infection rates, and references. As a result, 33 trematode species were found in the Wels catfish. They belong to three orders (Aspidogastrea – 1 species, Strigeida – 16 species, and Plagiorchiida – 16 species), 15 families and 24 genera. Of these, 14 species are distributed in the waterbodies of Azerbaijan. The family Diplostomidae (9 species) dominates among the Wels catfish' trematode parasites. The most Wels catfish trematodes within its whole range are *Bucephalus polymorphus*, *Orientocreadium siluri* and *Diplostomum spathaceum*. We established that *Aspidogaster limacoides*, *Plagioporus skrjabini*, *Phyllodistomum petruschewskii* were recorded from Ukraine only, *Allocreadium siluri* and *Bolboforus confusus*, from Uzbekistan, and *Asymphyllodora kubanica*, *Bychowskycreadium bychowsky*, *Bychowskycreadium schiliani*, *Diplostomum mergi*, *Diplostomum chromatophorum*, and *Diplostomum paraspithaceum* from Azerbaijan.

**Key words:** trematodes, systematic list, Wels catfish parasites, infection rates, geographical distribution.

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The Wels catfish or sheatfish (*Silurus glanis* L., 1758) is one of the most important commercial predatory fishes. It ranks among the 20 largest freshwater fish species in the world (Stone, 2007). The Wels catfish native geographic range extends from Eastern Europe to Western Asia (Kinzelbach, 1992). Due to the introduction, the present-day area of the catfish distribution has expanded to the west and south and covered at least seven new countries (Elvira, 2001). In the water bodies of Azerbaijan, the Wels catfish exists at the southernmost border of its range; it occurs in the Kura River and its basin (lakes and the Shamkir, Mingachevir, Varvara, and Yenikend Water Reservoirs) (Mikailov, Ibrahimova, 2001). There are no parasitological surveys concerning the studies on the flukes (trematodes) of the Wels catfish. The previous papers have not covered all systematic groups or all the areas where the fish is distributed. Therefore, we considered it appropriate to summarize literature data and make a systematic survey of the Wels catfish trematodes within its range (native area plus the areas of introduction), including Azerbaijan.

We followed a system of parasitic organisms implemented in the Catalogue of parasites of the freshwater fishes of North Asia (Pugachev, 2003). We also took into consideration the modern research in trematode taxonomy (Gibson, 1996; Gibson et al., 2002; Jones et al., 2005). In addition, we used the data presented in the book "Identification guide to the parasites of freshwater fishes of the USSR" (Scarlato, 1987).

Based on the literature data, 33 species of trematode parasites were reported to invade the Wels catfish. All the species are listed below in systematic order. Each species is provided with the following data: synonyms, habitat in the fish body, collecting localities and geographic distribution within the catfish range, prevalence (PI) and intensity (II) of infection, literature sources.

**Phylum:** Plathelminthes Gegenbaur, 1859

**Class:** Trematoda Rudolphi, 1808

Class taxonomy after D. Gibson, 1996

**Order:** Aspidogastrea Faust, 1932

**Family:** Aspidogastridae Poche, 1907

**Genus:** *Aspidogaster* Baer, 1827

**Species:** *Aspidogaster limacoides* Deising, 1835

Habitat: intestine

Geographical distribution: rivers of the Black Sea, the Sea of Azov, and the Caspian Sea basins (Markevich, 1951).

**Order:** Strigeida La Rue, 1926

**Suprafamily:** Diplostomoidea Poirier, 1886

**Family:** Diplostomidae Poirier, 1886

**Genus:** *Posthodiplostomum* Dubois, 1936

Syn.: *Holostomum* Nitzsch, 1816 part.; *Diplostomum* Nordmann, 1832 part.; *Diplostomulum* Brandes, 1892 part.; *Neascus* Hughes, 1927; *Posthodiplostomum* Dubois, 1938). Synonymy after Sudarikov, 1971.

**Species:** *Posthodiplostomum cuticola* Nordmann, 1832

Syn.: *Holostomum cuticola* Nordmann, 1832; *Diplostomum cuticola* (Nordm., 1832) Diesing, 1850; *Diplostoma cuticola* Dies.-Cobbold, 1860; *Tetracotyle cuticola* (Nordm., 1832) Kowalewski, 1902; *Diplostomulum cuticola* (Nordm., 1832) Faust, 1917; *Neascus cuticola* (Nordm., 1832) Hughes, 1927; *Posthodiplostomum cuticola* (Nordm.) Dubois, 1937. Synonymy after Sudarikov, 1971.

Habitat: skin and subcutaneous tissue, muscles, brain.

Geographical distribution: Kazakhstan – Aral Sea (PL 20 %) (Agapova, 1966); Uzbekistan – Amu Darya mouth, Mashankul Lake and other Kungrad lakes (metacercaria PL 3.3 %), Aral Sea (Muynak, PL 5.5 %, II 1 ind.) (Osmanov, 1971); Azerbaijan – Shamkir Water Reservoir (PL 50 %, II 2–5 ind.), Kura mouth (PL 60 %, II 4–8 ind.) (Ibrahimova, Mursalov, 2000; Mikailov, Ibrahimova, 2001; Mikailov et al., 2001; Ibrahimova, 2003).

**Subfamily:** Diplostominae Poirier, 1886

**Genus:** *Diplostomum* Nordmann, 1832

Syn.: *Diplostomulum* Brandes, 1892; *Tetracotyle* de Filippi, 1854 part. Synonymy after Sudarikov, 1971.

Note. Species composition of the Genus *Diplostomum* is so far a subject of a lively discussion due to obvious contradictions of the opinions of many authors (see Niewiadomska, 1984, 1986; Shigin, 1986, 1987). I, like O. Pugachev (2003), hold with A. Shigin taxonomy (1976, 1986, 1993) solely in the sake of convenience and unified approach to the analyzed material.

**Species:** *Diplostomum chromatophorum* Braun, 1893

Syn.: *Diplostomum volvens* Nordmann, 1832 part.; *Tetracotyle volvens* (Nordmann, 1832) Matare, 1909 part.; *Diplostomum volvens* (Nordmann, 1832) Faust, 1918 part.; *Diplostomulum spathaceum* (Rud., 1819) Hughes, 1929; *Diplostomi spathacei* (Rud., 1819) = *Diplostomulum spathaceum* (Rud., 1819) Hughes, 1929 sensu Sudarikov, 1960 part.; *Diplostomum spathaceum* (Rud., 1819) sensu Shigin, 1965, 1968, Pugachev, 1983, 1984; *Diplostomum spathaceum* (Rud., 1819) Braun, 1893 sensu Sudarikov, 1971. Synonymy after Shigin, 1986 with additions.

Habitat: lens of the eye.

Geographical distribution: Azerbaijan – Lesser Kyzylagach Bay (PL 20 %) (Ibrahimov, 1977), Greater Kyzylagach Bay (PL 20 %, II 3–8 ind.) (Seyidli, 1992), Yenikend Water Reservoir (PL 11.1 %, II 2–3 ind.) (Ibrahimova, Mikailov, 2006; Ibrahimova, 2008a, 2008b, 2009, 2010).

**Species:** *Diplostomum mergi* Dubois, 1932

Syn.: *Diplostomum niedashui* Pan et Wang, 1963. Synonymy after Shigin, 1986.

Habitat: lens of the eye.

Geographical distribution: Azerbaijan – Yenikend Water Reservoir (PL 11.1 %, II 3–5 ind.) (Ibrahimova, Mikailov, 2006; Ibrahimova, 2008a, 2008b, 2009, 2010).

**Species:** *Diplostomum spathaceum* Rudolphi, 1819

Syn.: *Diplostomum macrostomum* Shigin, 1965; *Diplostomum erythrophthalmi* (Shigin, 1965) Shigin, 1969; *Diplostomum flexicaudum* (Cort et Brooks, 1928) Van Haitsma, 1931 part. Synonymy after Shigin, 1986.

Habitat: lens of the eye.

Geographical distribution: Kazakhstan – Aral Sea (PL 20 %), Syr Darya River (PL 24 %), Bilikol Lake (PL 8.8 %), Sarysu River (PL 28 %) (Agapova, 1966); Uzbekistan – Syr Darya River (PL 30,7 %; II 1 ind.), Amy Darya River and Sudochoye Lake (PL 20 %), Khozhakul Lake (PL 23.5 %), Aral Sea (Muynak – PL 13.3–55.5 %; II 1–13 ind.; Sorkul – PL 66.6 %; II 2–12 ind.; Zamansay – PL 14.8 %), Tomaruzyak (II 2–5 ind.), Korp (PL 20 %; II 1–8 ind.), Ordabay (PL 25 %; II 5 ind.), Karaten (PL 14.3 %; II 2 ind.), Kabanbay (PL 33 %; II 2–23 ind.), Akpitki (PL 21 %; II 1–9 ind.) (Osmanov, 1971). A high infection rates of the catfish by *D. spathaceum* metacercaria was registered in the Sarybas Water Reservoir in the Amy Darya estuary (PL 81.25 %) (Kurbanova et al., 2002). Turkey – Sapanca Lake (Soylu, 1990); Iran – Gilan Province (Javad et al., 2014; Khara, Sattari, 2016); Iraq – Zab River (Furhan, Shamall, 2017); Czech Republic and Slovak Republic (Moravec, 2001); Latvia – Alūksnes, Burtnieku, Cirma, Durbes, Juglas, Kāla, Lielaucis, Liepājas, Rāznas, Rušons, Sildu, Sīvers, Slokas, Usmas Lakes; Kegums Water Reservoir; Daugava, Līčupe, Ogre, Rītupe, Salaca Rivers; Gulf of Riga (Kirjušina, Vismanis, 2007); Azerbaijan – Kyzylagach Bay (PL 13.3 %, II 1–3 ind.) (Seyidli, 1992), Kura mouth (PL 26.6 %, II 2–4 ind.) (Ibrahimova, Mursalov, 2000; Mikailov, Ibrahimova, 2001; Mikailov et al., 2001; Ibrahimova, 2008a).

**Species:** *Diplostomum paraspathaceum* Shigin, 1965

Syn.: *Diplostomum huronense* (La Rue, 1927) Hughes, 1929; *Proalaria huronense* La Rue, 1927; *Diplostomum huronense* (La Rue, 1927) Hughes et Hall, 1929 part.; *Diplostomum spathaceum* (Rudolphi, 1819) Dubois et Rausch, 1950; *Diplostomum spathaceum* (Rudolphi, 1819) Braun, 1893; *Diplostomum paraspathaceum*. Synonymy after Shigin, 1965.

Habitat: lens of the eye.

Geographical distribution: Azerbaijan – Southern Caspian (PL 13.3 %) (Ibrahimov, 1977); Yenikend Water Reservoir (II 3 ind.) (Ibrahimova, Mikailov, 2006; Ibrahimova, 2008a, 2010).

**Species:** *Diplostomum paracaudum* Iles, 1959

Habitat: lens of the eye.

Geographical distribution: Azerbaijan – Varvara Water Reservoir (PL 28.6 %, II 2–5 ind.) (Kazieva, 1984); Yenikend Water Reservoir (II 2 ind.) (Ibrahimova, Mikailov, 2006; Ibrahimova, 2008a, 2008b, 2009, 2010).

**Genus:** *Hysteromorpha* Lutz, 1931

Syn.: *Holostomum* Nitzsch, 1816 part.; *Diplostomum* Nordmann, 1832 part.; *Tetracotyle* de Filippi, 1854 part.; *Diplostomulum* Brandes, 1892 part.; *Neascus* Hughes, 1927 part. Synonymy after Sudarikov, 1971.

**Species:** *Hysteromorpha triloba* Rudolphi, 1819

Syn.: *Holostomum musculicola* Waldenburg, 1860; *Diplostomum musculicola* (Waldenburg, 1860) Braun, 1892; *Tetracotyle musculicola* (Waldenburg, 1860) Braun, 1894; *T. musculorum* percae (Waldenburg, 1860) Matare, 1909; *Neascus musculicola* (Waldenburg, 1860) Hughes, 1928; *Diplostomulum corti* Hughes, 1929; *Diplostomum trilobum* (Rd., 1819) Ciurea, 1930; *Diplostomulum trilobum* (Rud., 1819) Ciurea, 1938. Synonymy after Sudarikov, 1971.

Habitat: musculature (predominantly back muscles), less common under the skin.

Geographical distribution: Uzbekistan – Amy Darya mouth, Mashankul Lake and other Kungrad lakes (PL 31.56 %; II 5–95 ind.), Akpitki (PL 6.2 %), Tomaruzyak (PL 13.3 %; II 1–142 ind.), Aral Sea (Muynak – PL 27.7 %; II 4–50 ind.) (Osmanov, 1971).

**Genus:** *Tylodelphys* Diesing, 1850

Syn.: *Diplostomum* Nordmann, 1832 part.; *Tetracotyle* de Filippi, 1854 part.; *Diplostomulum* Brandes, 1892 part.). Synonymy after Sudarikov, 1971.

**Species:** *Tylodelphys clavata* Nordmann, 1832

Syn.: *Diplostomum clavatum* Nordmann, 1832; *Diplostoma clavatum* Nordm., 1832 sensu Cobbold, 1860; *Tetracotyle clavata* sensu Matare, 1910; *Diplostomulum clavatum* (Nordmann, 1832) Hughes, 1929; *Tylodelphys conifera* (Mehlis, 1846) Dubois, 1937 sensu Kozicka et Niewiadomska, 1960. Synonymy after Sudarikov, 1971.

Habitat: vitreous humor of eye.

Geographical distribution: Uzbekistan – Aral Sea (Muynak – PL 22.2 %), Khozhakul Lake (Osmanov, 1971); Turkey – Sapanca and Siğirci Lakes (Soylu, 1990; Hafize, 2013); Czech Republic and Slovak Republic (Moravec, 2001).

**Genus:** *Bolboforus* Dubois, 1935

**Species:** *Bolboforus confusus* Krause, 1914

Habitat: muscles, under the skin (is recorded to be found in the vitreous humor of eye and in gills).

Geographical distribution: Uzbekistan – Amy Darya basin (Zhamansay), Aral Sea (Sorkul – PL 8.2 %; II 2 ind.) (Osmanov, 1971).

**Family:** Strigeidae Railliet, 1819

Family taxonomy after Sudarikov, 1984.

**Subfamily:** Cotylurinae Dubois, 1936

**Genus:** *Ichthyocotylurus* Odening, 1969

**Species:** *Ichthyocotylurus pileatus* Rudolphi, 1802

Syn.: *Festucaria pileata* Rudolphi, 1802; *Monostomum pileatum* (Rud.) Zeder, 1803; *Amphistoma pileatum* (Rud.) Rudolphi, 1819; *Holostomum pileatum* (Rud.) Blainville, 1828; *Cotylurus pileatus* (Rud.) Dubois, 1937; *Cotylurus medius* Dubois et Bausch, 1950; *Tetracotyle diminuta* Hughes, 1928). Synonymy after Sudarikov, 1984.

Habitat: swim bladder walls, heart region, kidneys, less common in the tissues of other organs.

Geographical distribution: Czech Republic (Gordon et al., 2009).

**Species:** *Ichthyocotylurus variegatus* Creplin, 1825

Syn.: *Amphistoma variegatum* Creplin, 1825; *Holostomum variegatum* (Creplin, 1825) Dujardin, 1845; *Holostomum variegatum* Duj. Ssensu Dujardin, 1850; *Holostoma variegatum* Duj. sensu Cobbold, 1860; *Strigea variegata* (Creplin, 1825) Lühe, 1909 part.; *Cotylurus variegatus* (Creplin, 1825) Szidat, 1928; *Cotylurus (Ichthyocotylurus) variegatus* (Creplin, 1825) sensu Odening, 1969 part.; *Cotylurus platycephalus* (Creplin, 1825) part.; *Cotylurus pileatus* (Rudolphi, 1802) part.; *Cotylurus cumulitestis* Dubois, 1962; *Tetracotyle variegata* (Creplin, 1825); *Tetracotyle ex Perca fluviatilis* Moulinie, 1856; *Tetracotyle typica* sensu Dujardin, 1858, *T. typica* de Filippi, 1854; *Tetracotyle percae fluviatilis* (Moulinie) Diesing, 1858; *Tetracotyle percae fluviatilis* (Moulinie) Linstow, 1877; *Tetracotyle percae* Zschokke, 1884; *Tetracotyle percae fluviatilis* Linstow, 1877. Synonymy after Sudarikov, 1984.

Habitat: swim bladder walls, gonads, kidneys, less common in the tissues of other organs.

Geographical distribution: not identified (Scarlato, 1987).

**Suprafamily:** Gymnophalloidea Odhner, 1905

**Family:** Bucephalidae Poche, 1907

**Genus:** *Bucephalus* Baer, 1827

**Species:** *Bucephalus polymorphus* Baer, 1827 (Fig. 1).

Syn.: *Gasterostomum fimbriatum* Siebold, 1848; *Gasterostomum laciniatum* Molin, 1859; *Bucephalus markewitschi* Koval, 1949.

Habitat: intestine.

Geographical distribution: Kazakhstan – Syr Darya (PL 2 %) (Agapova, 1966); Russia – Volga River near Samara (PL 13.2 %; II 9.5 ind.) (Kirillov et al., 2018); Turkey – Sapanca Lake (Soylu, 1990); Czech Republic and Slovak Republic (Moravec, 2001); Latvia – Burtnieku, Durbes, Juglas, Rāznas, Sildu, Sīvers, Slokas, Usmas Lakes; Kegums Water Reservoir; Daugava, Rītupe, Salaca Rivers (Kirjušina, Vismānis, 2007); Azerbaijan – coast of the Southern Caspian (PL 14.3 %) (Mikailov, 1975), Yenikend Water Reservoir (PL 11.1 %, II 2 ind.) (author's data).

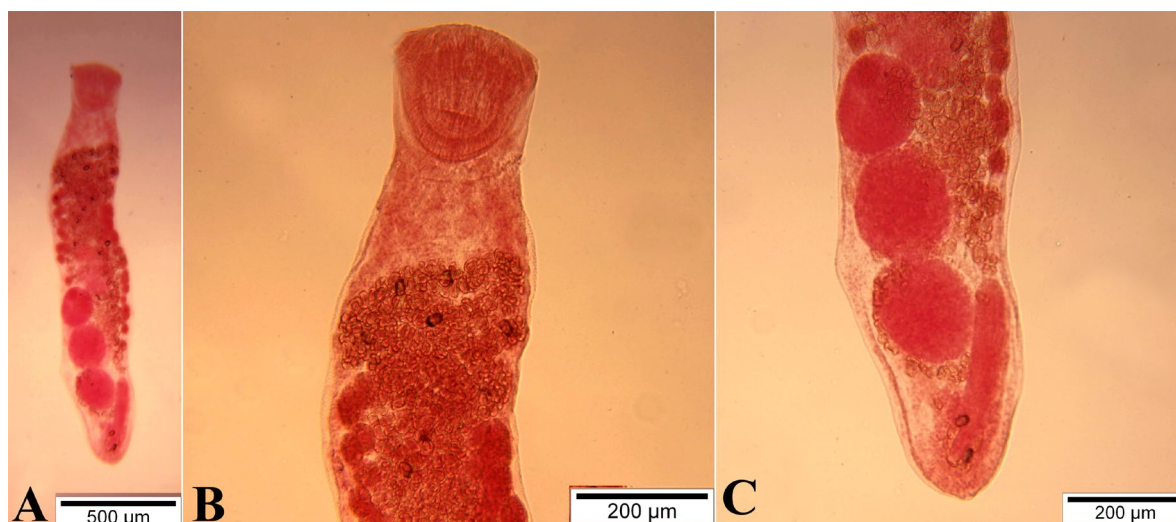
**Genus:** *Rhipidocotyle* Diesing, 1858

**Species:** *Rhipidocotyle campanula* Dujardin, 1845

Syn.: *Distoma campanula* Dujardin, 1845; *Gasterostomum illense* Ziegler, 1883; *Bucephalus polymorphus* in Lühe, 1909 part. sensu Koval, 1959; *Rhipidocotyle illense* (Ziegler, 1883) Vejnar, 1956 sensu Skrjabin et Guschanskaja, 1962. Synonymy after Bykhovskaya, Kulakova, 1987 with additions.

Habitat: adult individuals in the intestine, encysted metacercaria in the gills, fins, muscles, eyes, brain, subcutaneous tissue.

Geographical distribution: Uzbekistan – Aral Sea (PL 10 %), Amy Darya (PL 11.7 %; II 25–39 ind.) and Syr Darya basins (Osmanov, 1971); Russia – Volga River near Klimovka Vill. (PL 12.5 %; II 6–19 ind.) (Kirillov et al., 2018); Azerbaijan – coast the Southern Caspian (Mikailov, 1975), in the South Caspian Sea (PL 33.3 %) (Ibrahimov, 1977), and the Yenikend Water Reservoir (PL 27.8 %, II 2–5 ind.) (Ibrahimova, Mikailov, 2006; Ibrahimova, 2008a, 2008b, 2009, 2010).



**Fig. 1. Trematode *Bucephalus polymorphus*.** A – general view, B – enlarged anterior end with oral sucker, C – enlarged posterior end. Photo: N. Ibrahimova

**Suprafamily:** Hemiuroidea Looss, 1899

**Family:** Azygiidae Lühe, 1909

**Subfamily:** Azygiinae Lühe, 1909

**Genus:** *Azygia* Looss, 1899

**Species:** *Azygia lucii* Müller, 1776

Syn.: *Fasciola lucii* Müller, 1776; *Planaria lucii* (Müller, 1776) Goeze, 1782; *Distoma lucii* (Müller, 1776) Zeder, 1800; *Fasciola tereticollis* Rud., 1802; *Distoma tereticolle* (Rud., 1802) Rud., 1809; *Distoma rosaceum* Nordmann, 1832; *Azygia tereticollis* (Rud., 1802) Looss, 1899; *Azygia lucii johanseni* Pavlov, 1931). Synonymy after Skryabin, Gushanskaya, 1956.

Habitat: esophagus and stomach.

Geographical distribution: Serbia (Djikanovic et al., 2012); Czech Republic and Slovak Republic (Moravec, 2001); Georgia – Japana Lake, Poti area (Murvanidze et al., 2018).

**Family:** Bunocotylidae Dollfus, 1950

**Genus:** *Bunocotyle* Odhner, 1928

**Species:** *Bunocotyle cingulata* Odhner, 1928

Habitat: intestine.

Geographical distribution: Iran – Gilan, Anzali and Mazandaran Provinces (Sefidkare-Langeroudi, 1965; Mokhayer, 1976; Pazooki, Masoumian, 2012).

**Family:** Orientocreadiidae Skryabin et Kowal, 1960

**Genus:** *Orientocreadium* Tubangui, 1931

**Species:** *Orientocreadium siluri* Bychowsky et Dubinina, 1954

Habitat: intestine.

Geographical distribution: Uzbekistan – Aral Sea (PL 15.5 %; II 1–8 ind.), Amy Darya basin (Surkhan Darya, Vakhsk Rivers – PL 31.8 %), Zerafshan (PL 23.5 %; II 1–3 ind.), Amy Darya (PL 30.9–31 %; II 1–18 ind.), Syr Darya (PL 61.5 %; II 1–40 ind.) Rivers (Osmanov, 1971); Kazakhstan – Ural (PL 3.5 %), Syr Darya (PL 28 %) Rivers (Agapova, 1966); Russia – Saratov Water Reservoir (Mordovinskaya Pojma – PL 5.6 %) (Kirillov et al., 2018); Georgia – Tekhura River, Bebesiri Lake (Murvanidze et al., 2018); Iraq – Zab River (Furhan, Shamall, 2017); Iran – Gilan Province (PL 60.47 %; II 1–14 ind.) (Javad et al., 2014); Turkey – Sapanca Lake (Soylu, 1990). The species was found in Europe, in the basins of the Black Sea, the Sea of Azov, and the Caspian Sea (Rubanova, Rubanov, 2015; Kirillov et al., 2018); Azerbaijan – coast of the Southern Caspian (PL 33 %), water bodies in the Kura basin (PL 6 %, II 1–15 ind.) (Mikailov, 1975), Hajikabul Lake (PL 5.4 %, II 5–9 ind.) (Abdullayeva, 1971), in the South Caspian Sea (PL 13.3 %) (Ibrahimov, 1977).

**Order:** Plagiorchiida La Rue, 1957

**Suprafamily:** Allocreadioidea Looss, 1902

Note: K.I. Skryabin and V.P. Koval (1966) identified this suprafamily as Allocreadioidea Nicoll, 1934 (Skryabin, Koval, 1966).

**Family:** Allocreadiidae Looss, 1902

Note: K.I. Skryabin and V.P. Koval (1966) identified this family as Allocreadiidae Stossich, 1903 (Skryabin, Koval, 1966). D. Gibson (Gibson, 1996) does not admit the family Bunoderidae Nicoll, 1914 and concerns the genera *Bunodera*, *Crepidostomum*, and *Acrolichanus* as part of the family Allocreadiidae.

**Genus:** *Allocreadium* Looss, 1900

Syn.: *Creadium* Looss, 1899; *Macrolecithus* Hasegawa et Ozaki, 1926 part. Synonymy after Skryabin, Koval, 1966 with additions.

Note. The Genus taxonomy is so far a subject of discussions. For instance, the validity of some species (namely *A. baueri*, *A. papilligerum*, and *A. carparum*) needs confirmation.

**Species:** *Allocreadium siluri* Osmanov, 1967

Habitat: intestine.

Geographical distribution: Uzbekistan – Syr Darya mouth (PL 14.2 %; II 10 ind.) (Osmanov, 1971).

**Genus:** *Bychowskycreadium* Mikailov, 1967

Note. The genus *Bychowskycreadium* with two species was discovered and described from Lake Shilyan in Azerbaijan (Mikailov, 1975). In the Caspian Sea basin, this genus proved to be as rare as a close genus *Orientocreadium*. Further, *Bychowskycreadium* has not been registered in the Republic, since Shilyan Lake, the only known locality, was drained. Therefore, the genus was lost. Later on, *Bychowskycreadium* was synonymized with the genus *Allocreadium* (Scarlato, 1987), that we consider erroneous. In our opinion, *Bychowskycreadium* differs from both *Allocreadium* (a specialist cyprinids' parasite) and *Orientocreadium* by main morphological features. We tend to insist that *Bychowskycreadium* is a valid genus. For this reason, we list here both species, described by T.K. Mikailov, in the genus *Bychowskycreadium*.

**Species:** *Bychowskycreadium bychowsky* Mikailov, 1967 (Fig. 2A)

Habitat: intestine.

Geographical distribution: Azerbaijan – Shilyan Lake (PL 16 %; II 1–15 ind.) (Mikailov, 1975).

**Species:** *Bychowskycreadium schiliani* Mikailov, 1967 (Fig. 2B)

Habitat: intestine.

Geographical distribution: Azerbaijan – Shilyan Lake (PL 3.2 %; II 47 ind.) (Mikailov, 1975).

**Genus:** *Bunodera* Railliet, 1896

Syn.: *Bunoderina* Miller, 1936; *Allobunodera* Yamaguti, 1971. Synonymy after Gibson, 1996.

**Species:** *Bunodera luciopercae* Müller, 1776

Syn.: *Fasciola luciopercae* O.F. Müller, 1776; *F. percae cernuae* O.F. Müller, 1776; *Planaria lagena* Braun, 1788; *Fasciola percae* Gmelin, 1790; *F. percina* Schrank, 1790; *Bunodera nodulosa* (Frölich, 1791) Railliet, 1896; *Distoma nodulosus* Zeder, 1800; *Crossodera nodulosa* Cobbold, 1860; *Distomum nodulosum* (Zeder) Looss, 1894; *Bunodera nodulosa* (Looss, 1899). Synonymy after Skryabin, Koval, 1966.

Habitat: intestine.

Geographical distribution: water bodies of the Northern America and Western Europe; also in the basins of the White, Baltic, Black Seas, the Sea of Azov, the Caspian Sea, and the rivers of Siberia (Markevich, 1951). Russia – Volga River near Samara (PL 20.0 %; II 2–7 ind.) (Kirillov et al., 2018); Czech Republic and Slovak Republic (Moravec, 2001); Azerbaijan – water bodies of the Kura basin (PL 3.2 %, II 2 ind.) (Mikailov, 1975).

**Family:** Opecoelidae Ozaki, 1925

**Subfamily:** Plagoporinae Manter, 1947

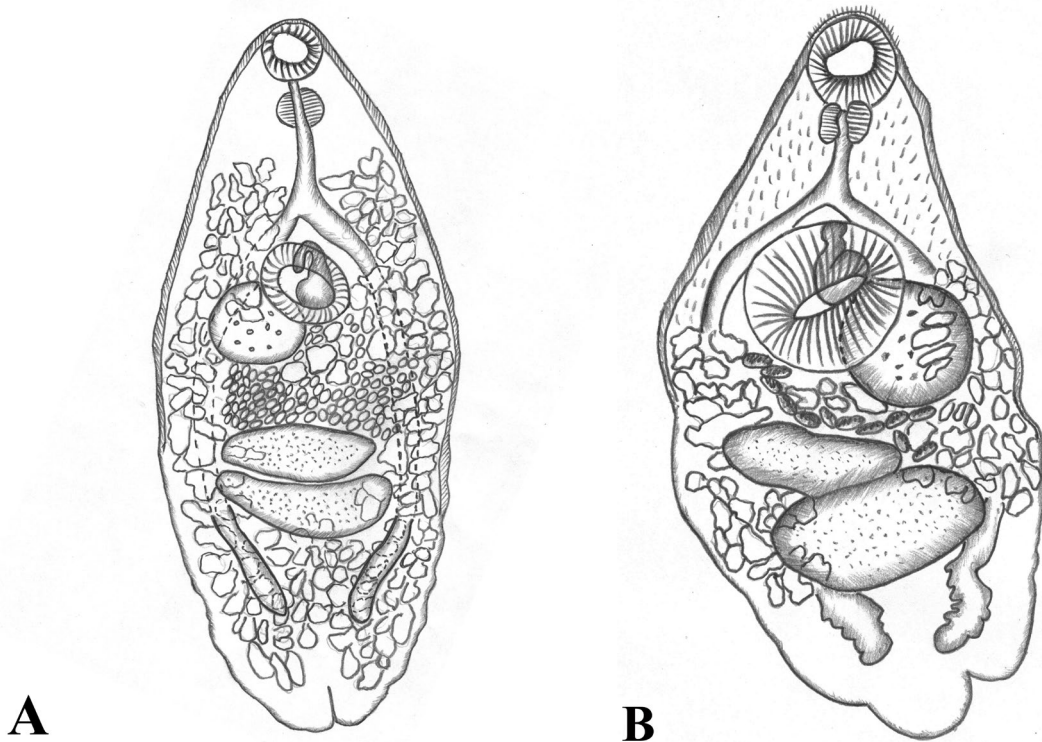
Genus: *Sphaerostomum* Stiles et Hassal, 1898

**Species:** *Sphaerostomum bramae* Müller, 1776

Syn.: *Fasciola bramae* Müller, 1776; *Sphaerostomum majus* Janiszewska, 1949. Synonymy after Bykhovskaya, Kulakova, 1987.

Habitat: intestine.

Geographical distribution: Czech Republic and Slovak Republic (Moravec, 2001).



**Fig. 2. Species of the Genus *Bychowskycreadium*. A – *B. bychowskyi*. B – *B. schiliani* (after Mikailov, 1975)**

**Family:** Opencolidae Ozaki, 1925

**Genus:** *Nicolla* Wisniewski, 1944

**Species:** *Nicolla skrjabini* Iwanitzky, 1928

Син: *Crowcrococum skrjabini* Iwanitzky, 1928

Habitat: intestine.

Geographical distribution: basins of the Baltic, Black and Caspian Seas (Scarlato, 1987). Russia – Saratov Water Reservoir (Mordovinskaya Pojma – PL 26.7 %) (Mineeva, 2016; Kirillov et al., 2018); Czech Republic and Slovak Republic (Moravec, 2001); Iran – Zarrin River (PL 39 %) (Yakhchali et al., 2012); Latvia – Daugava River, Kegums Water Reservoir (Kirjušina, Vismanis, 2007).

**Genus:** *Plagioporus* Stafford, 1904

**Species:** *Plagioporus skrjabini* Kowal, 1951

Habitat: intestine.

Geographical distribution: basins of the Danube and Dnieper Rivers (Scarlato, 1987).

**Suprefamily:** Plagiorchioidea Lühe, 1901

**Family:** Gorgoderidae Looss, 1899

**Subfamily:** Phyllodistominae Nybelin, 1926

**Genus:** *Phyllodistomum* Braun, 1899

Syn.: *Spathidium* Looss, 1899; *Catoptroides* Odhner, 1902; *Microlecithus* Ozaki, 1926; *Vitellarinus* Zmееv, 1936; *Gorgotrema* Dayal, 1938 part. Synonymy after Pigulevsky, 1953.

Note. The genus taxonomy is extremely confusing and requires careful research. Many features used as species diagnostic characteristics are highly variable due to different habitats in the host body and functioning of reproductive system (Kudinva, 1979, 1990, 1994; Pugachev, 2003).

**Species:** *Phyllodistomum folium* Olfers, 1816

Syn.: *Distomum folium* Olfers, 1816 nec *D. folium* Rud., 1819; *Phyllodistomum folium* (Olfers, 1816) Braun, 1899; *Ph. phoxini* Razmaschkin, 1974. Synonymy after Pigulevsky, 1953 and Bykhovskaya, Kulakova, 1987.

Habitat: ureters and urinary bladder.

Geographical distribution: Russia – Saratov Water Reservoir (PL 6.7 %; II 2 ind.) (Kirillov et al., 2018).

**Species:** *Phyllodistomum petruschewskii* Pigulevsky, 1953

Syn.: *Phyllodistomum pigulewskyi* Razmaschkin, 1974

Habitat: urinary bladder.

Geographical distribution: Ukraine – Southern Buh River (Scarlato, 1987).

**Species:** *Phyllodistomum simile* Nybelin, 1926

Syn.: *Distomum folium* Zschokke, 1884 part. nec *D. folium* Olfers, 1816; *Phyllodistomum folium* Lühe, 1909 part. Synonymy after Pigulevsky, 1953.

Habitat: ureters and urinary bladder.

Geographical distribution: basins of the White, Baltic, Black and Caspian Seas (Scarlato, 1987).

**Suprafamily:** Zoogonoidea Odhner, 1902

**Family:** Monorchidae Odhner, 1911

**Genus:** *Asymphylogora* Looss, 1899

**Species:** *Asymphylogora tincae* Modeer, 1790

Syn.: *Distoma tincae* Modeer, 1790; *Distomum perlatum* Nordmann, 1832; *Asymphylogora perlata* (Nordmann, 1832) Looss, 1899. Synonymy after Sobolev, 1955.

Habitat: intestine.

Geographical distribution: widely spread throughout *Tinca tinca* L., 1758 range (Scarlato, 1987).

**Species:** *Asymphylogora kubanica* Issaitschikoff, 1923

Habitat: intestine.

Geographical distribution: Azerbaijan – coast of the Southern Caspian (PL 28.6 %) (Mikailov, 1975).

**Suprafamily:** Schistosomatoidea Stiles et Hassall, 1898

**Family:** Clinostomidae Luhe, 1901

**Genus:** *Clinostomum* Leidy, 1856

**Species:** *Clinostomum complanatum* Rudolphi, 1819

Habitat: muscles under the skin and body cavity.

Geographical distribution: Uzbekistan – Aral Sea (PL 2.2–3.8 %; II 1–2 ind.), Amy Darya basin, Vakhsh River (PL 2.3 %) (Osmanov, 1971); Azerbaijan – coast of the Southern Caspian (PL 42 %, II 1–3 ind.) (Mikailov, 1975), Southern Caspian area (PL 6.7 %) (Ibrahimov, 1977).

**Suprafamily:** Opisthorchioidea Looss, 1899

**Family:** Heterophyidae Odhner, 1914

**Genus:** *Metagonimus* Katsurada, 1913

**Species:** *Metagonimus yokogawai* Katsurada, 1912

Habitat: scale and fins.

Geographical distribution: basins of the Black (Dnieper, Dniester, Danube Rivers) and Caspian Seas (Markevich, 1951); Czech Republic and Slovak Republic (Moravec, 2001).

**Genus:** *Pygidiopsis* Looss, 1907

**Species:** *Pygidiopsis geneta* Looss, 1907

Habitat: gills and muscles (superficial layers of the anterior half of the body).

Geographical distribution: basins of the Black Sea, Sea of Azov, and the Caspian Sea (Scarlato, 1987).

**Suprafamily:** Hemiuroidea Looss, 1899

**Family:** Hemiuroidea Looss, 1899

**Genus:** *Aphanurus* Looss, 1909

**Species:** *Aphanurus stossichi* Monticelli, 1891

Habitat: esophagus and stomach.

Geographical distribution: Iran – Gilan Province (Anzali) (Sefidkare-Langeroudi, 1965; Mokhayer, 1976; Pazooki, Masoumian, 2012).

The Wels catfish (*S. glanis*) trematode parasites belong to three orders, 15 families, 24 genera and 33 species. Two orders, Strigeida and Plagiorchiida include 16 species each, while the order Aspidogastridea is presented by one species only. The family Diplostomidae is the most species-rich (9 species).

The farther the host is located from the center of its native range, the more affected is its parasite fauna. In Azerbaijan, where the Wels catfish exists at the southernmost boundary of its range, the number of its trematode parasites declines to 14. Unlike the parasitic species infecting various hosts, the catfish specific trematodes occur throughout its entire range, regardless of proximity to the center. *Bucephalus polymorphus*, *Orientocreadium siluri*, and *Diplostomum supathaceum* are the most widespread catfish parasites; *Aspidogaster limacoides*, *Plagioporus skrjabini* and *Phyllodistomum petruschewskii* were recorded from Ukraine only, *Allocreadium siluri* and *Bolboforus confusus* from Uzbekistan, *Asymphylogora kubanica*, *Bychowscycreadium bychowsky*, *B. schiliani*, *Diplostomum mergi*, *D. chromatophorum* and *D. paraspathaceum* from Azerbaijan.

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## Систематичний огляд паразитів (Plathelminthes: Trematoda) європейського сома (*Silurus glanis* L., 1758)

Н.Е. Ібрагімова

Європейський, або звичайний сом (*Silurus glanis* L., 1758) є однією з важливих промислових риб. Його природний ареал простягається від Східної Європи до Західної Азії. Останнім часом ареал сома розширився завдяки інтродукції як на захід, так і на південь. Європейський сом в водоймах Азербайджану знаходиться на найпівденнішій межі свого ареалу і зустрічається в р. Кура та її басейні. Оглядових паразитологічних робіт, присвячених вивченню трематод європейського сома, немає. У дослідження були залучені не усі систематичні групи паразитів, або ж не були охоплені всі території, на яких поширена ця риба. З використанням літературних даних був підготовлений систематичний огляд трематод європейського сома в межах його ареалу (природний ареал і території, куди було здійснено інтродукцію), у тому числі території Азербайджану.

Для кожного виду вказуються місця виявлення, синоніми, локалізація, показники інвазії та автори, які виявили паразитів в межах ареалу європейського сома. У роботі використана система паразитичних організмів, опублікована в «Каталозі паразитів прісноводних риб Північної Азії». Крім того, автор врахував нові дослідження в області систематики трематод. Таким чином, у європейського, або звичайного сома було зареєстровано 33 види паразитів-трематод. Сосальники, виявлені в європейського сома, належать до 3 рядів (*Aspidogastrea* – 1 вид, *Strigeida* – 16 видів, *Plagiorchiida* – 16 видів), 15 родин, 24 родів. З них 14 видів поширені в водоймах Азербайджану. Домінуючою за кількістю видів трематод у сома є родина *Diplostomidae* (9 видів). Три види (*Bucephalus polymorphus*, *Orientocreadium siluri*, *Diplostomum spathaceum*) широко розповсюджені по всьому ареалу сома. Встановлено, що *Aspidogaster limacoides*, *Plagioporus skrjabini*, *Phyllodistomum petruschewskii* зустрічаються тільки в Україні, *Allocreadium siluri*, *Bolboforus confusus* – в Узбекистані, та *Asymphyllodora kubanica*, *Bychowkycreadium bychowsky*, *Bychowkycreadium schiliani*, *Diplostomum mergi*, *Diplostomum chromatophorum*, *Diplostomum paraspathaceum* – в Азербайджані.

**Ключові слова:** трематоди, систематичний список, паразити звичайного сома, показники інвазії, географічне поширення.

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**Систематический обзор паразитов (Plathelminthes: Trematoda) европейского сома (*Silurus glanis* L., 1758)  
Н.Э. Ибрагимова**

Европейский, или обыкновенный сом (*Silurus glanis* L., 1758) является одной из важных промысловых рыб. Его естественный ареал простирается от Восточной Европы до Западной Азии. В последнее время ареал сома расширился благодаря интродукции как на запад, так и на юг. Европейский сом в водоемах Азербайджана находится на самой южной границе своего ареала и встречается в р. Кура и её бассейне. Обзорных паразитологических работ, посвященных изучению трематод европейского сома, нет. Исследованиями были затронуты не все систематические группы паразитов, или же не были охвачены все территории, на которых распространена данная рыба. С использованием литературных данных был подготовлен систематический обзор трематод европейского сома в пределах его ареала (естественный ареал и территории, куда была осуществлена интродукция), в том числе территории Азербайджана. Для каждого вида указываются места обнаружения, синонимы, локализация, показатели инвазии и авторы, обнаружившие паразитов в пределах ареала европейского сома. В работе использована система паразитических организмов, опубликованная в «Каталоге паразитов пресноводных рыб Северной Азии». Кроме того, автор учел новые исследования в области систематики трематод. Таким образом, у европейского или обыкновенного сома было зарегистрировано 33 вида паразитов-трематод. Сосальщикообразные, обнаруженные у европейского сома, относятся к 3 отрядам (*Aspidogastrea* – 1 вид, *Strigeida* – 16 видов, *Plagiorchiida* – 16 видов), 15 семействам, 24 родам. Из них 14 видов распространены в водоемах Азербайджана. Преобладающим по числу видов трематод у сома является семейство *Diplostomidae* (9 видов). Три вида (*Bucephalus polymorphus*, *Orientocreadium siluri*, *Diplostomum spathaceum*) широко распространены по всему ареалу сома. Установлено, что *Aspidogaster limacoides*, *Plagioporus skrjabini*, *Phyllodistomum petruschewskii* встречаются только в Украине, *Allocreadium siluri*, *Bolboforus confusus* – в Узбекистане, и *Asymphyllodora kubanica*, *Bychowkycreadium bychowsky*, *Bychowkycreadium schiliani*, *Diplostomum mergi*, *Diplostomum chromatophorum*, *Diplostomum paraspathaceum* – в Азербайджане.

**Ключевые слова:** трематоды, систематический список, паразиты обыкновенного сома, показатели инвазии, географическое распространение.

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