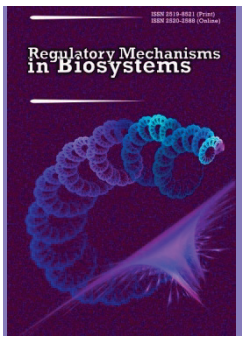

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A systematic review of tapeworms (Plathelminthes, Cestoda) of domestic ducks (*Anas platyrhynchos* dom.)

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Tapeworms of domestic ducks (*Anas platyrhynchos* dom.) causing helminthiasis and serious damage to the hosts, cause economic damage in the poultry industry. Helminthological research devoted to the study of the parasite fauna, including tapeworms of domestic ducks, has been carried out in many countries. But there is no review information on the study of the helminth fauna of domestic ducks. We take our own materials and literature data and summarise the information on cestode parasites of *Anas platyrhynchos* dom., which have been recorded in the world until 2020. Each species is provided with the following data: scientific name, authority and year, intermediate and auxiliary hosts, habitat in the host body, collecting localities and geographic distribution, prevalence and intensity of infection and literature sources. Based on our own research and analysis of literature data, it was revealed that hitherto there are 419 species of helminths (Trematoda – 213, Cestoda – 89, Nematoda – 79, Acanthocephala – 11) recorded parasitising domestic ducks. The tapeworms found in Azerbaijan belong to four families (Dilepididae – 3, Hymenolepididae – 68, Davaineidae – 13, Diphyllobothriidae – 5). In Azerbaijan, 11 out of 89 species of helminths have been found in domestic ducks. Six of them were also noted in the course of our helminthological studies. The cestoda *Diorchis inflata* was recorded the first time in domestic ducks in Azerbaijan. Most species of cestodes were found in the north-eastern regions of Azerbaijan (Shabran – 11 species, Khachmaz – 6 species) and the southern region (Astara – 4 species). All of these areas are located on the shores of the Caspian Sea and are located on the annual migration route of wild birds involved in the spread of cestodes, which are considered biohelminths. Six species (*Drepanidotaenia lanceolata*, *Hymenolepis apodemi*, *Hymenolepis diminuta*, *Ligula interrupta*, *Ligula intestinalis*, *Schistocephalus solidus*) of cestodes parasitize both birds and mammals (*D. lanceolata*, *H. diminuta* in humans).

Keywords: cestodes; domestic duck; fauna; systematic classification.

Introduction

Class Cestoda are endoparasitic tapeworms that spend their adult phase in the digestive system of their final hosts. Tapeworms of domestic ducks (*Anas platyrhynchos* dom.) causing helminthiasis and serious damage to the hosts, cause economic damage in the poultry industry. Helminthological studies devoted to the study of the parasite fauna, including tapeworms of domestic ducks, have been carried out in many countries (Czaplinski, 1956; Lapage, 1961; Spasskaya, 1966; McDonald, 1969; Smogorzhevskaya, 1976), as well as in Azerbaijan (Shakhtakhtinskaya, 1952, 1959; Shirinov, 1961; Vahidova, 1978; Vahidova et al., 1982). We have studied the species composition, ultrastructure of helminths parasitizing in domestic ducks in our country and developed disease control measures of birds in the last 10 years (Rzayev, 2013; Rzayev & Ibrahimova, 2015; Seyidbeyli & Rzayev, 2018; Seyidbeyli & Maharramov, 2018; Rzayev et al., 2020; Seyidbeyli et al., 2020). It should be noted that, along with the above, in general, there is no review information on the study of the helminth fauna of domestic ducks. There are only articles for some regions. Taking into account the relevance of the topic, on the basis of our own materials and extensive literature, the aim of the present review is to summarise the information on cestode parasites of *Anas platyrhynchos* dom., which have been recorded in the world until 2020.

The cestoda list is arranged follow the nomenclature and classification by Khalil et al. (2013), Olson et al. (2001), with updates by Kuchta et al. (2008) and Caira et al. (2014). We also took into account the classification adopted by the database of Fauna Europa (www.faunaeur.org). Each species is provided with the following data: scientific name, authority and year, intermediate and auxiliary hosts, habitat in the host body, collecting localities and geographic distribution, prevalence (PI) and intensity (II) of infection and literature sources.

Phylum: Platyhelminthes Gegenbaur, 1859
Class: Cestoda Rudolphi, 1808
Order: Cyclophyllidea Braun, 1900
Family: Dilepididae Fuhrmann, 1907

Genus: *Amoebotaenia* Cohn, 1899

Amoebotaenia cuneata Linstow, 1872
Intermediate hosts: earthworms
Habitat: small intestine
Distribution: Cosmopolitan. Russia – Moscow region (Petrochenko & Kotelnikov, 1976) and Egypt – Beni-Suef province (PL 1.18%, II 3–24 ind.) (El-Dakhly et al., 2020).

Genus: *Choanotaenia* Railliet, 1896

Choanotaenia infundibulum Bloch, 1779
Intermediate hosts: insects
Habitat: small intestine – jejunum
Distribution: Cosmopolitan. Egypt – Beni-Suef province (PL 0.59%, II 13 ind.) (El-Dakhly et al., 2020; McDonald, 1969; Lapage, 1961).

Genus: *Platyscolex* Spasskaya, 1962

Platyscolex ciliata (Fuhrmann, 1913) Spasskaya, 1962
Intermediate hosts: *Simocephalus exspinosus*, *Daphnia pulex*, *Moina*

rectirostris (Smogorzhevskaya, 1976).

Habitat: small intestine

Distribution: Holarctic. Bulgaria – northeastern part and Danube river (Marinova et al., 2013), USA and Mexico (PL 5.4%, II 1–4 ind.) (Farias & Canaris, 1986), Poland (Lapage, 1961), Kazakhstan, Georgia and Ukraine (PL 0.9%, II 1–320 ind.) (Ryzhikov, 1967; Smogorzhevskaya, 1976), India (Moghe, 1933).

Family: Hymenolepididae Ariola, 1899

Genus: *Aploparaksis* Clerc, 1903

Aploparaksis furcigera Rudolphi, 1819

Intermediate hosts: *Lumbriculus variegates*, *Limnodrilus* sp.

Habitat: small intestine, large intestine, ceca

Distribution: Holarctic. Russia – Yakutia, Kamchatka (Petrochenko & Kotelnikov, 1976; Ryzhikov, 1967; Spasskaya, 1966; Ryzhikov et al., 1974; Tolkacheva, 1971; Spassky, 1965), Slovakia (Hanzelova et al., 1995), Poland (Lapage, 1961; Czaplinski, 1956) and UK (PL 2.8%, II 1–9 ind.) (Owen, 1951).

Aploparaksis filum Goeze, 1782

Intermediate hosts: *Limnodrilus newaensis*

Habitat: small intestine, ceca

Distribution: Holarctic and Afrotropic. UK – Wales (Davtes, 1940; Lapage, 1961).

Genus: *Cladogynia* Baer, 1938

Cladogynia phoeniconaiadis Hudson, 1934

Intermediate hosts: unknown

Habitat: intestine

Distribution: Africa. Egypt – Damanhur city (PL 3.63%) (Abou Laila et al., 2011).

Genus: *Cloacotaenia* Wolffhügel, 1938

Cloacotaenia megalops Nitzsch, 1829

Intermediate hosts: *Cypris pubera*

Habitat: cloaca, distal end of large intestine

Distribution: Cosmopolitan. Russia – Novosibirsk, Omsk, Chelyabinsk, Kurgan regions; Kazakhstan, Uzbekistan, Ukraine (Petrochenko, Kotelnikov, 1976; Ryzhikov, 1967; Spasskaya, 1966), Bulgaria – around the River Danube (Marinova et al., 2013), USA and Mexico (PL 4.6%, II 1–3 ind.) (Farias & Canaris, 1986), Egypt (Alexander & McLaughlin, 1997), Poland (Bezubik, 1956; Lapage, 1961), Germany (Fuhrmann, 1908), North America (Ransom, 1909). Azerbaijan – Shabran region (PL 0.9%, II 6–18 ind.) (Shirinov, 1961). We also reported it in Shabran city (PL 0.24%, II 1–2 ind.).

Genus: *Dicranotaenia* Railliet, 1892

Dicranotaenia coronula (Dujardin, 1845) Railliet, 1892

Intermediate hosts: Ostracoda

Auxiliary hosts: molluscs – *Lymnaea ovata*, *L. palustris*, *L. vulgaris*

Habitat: small intestine – tends to occur posteriorly, ceca

Distribution: Holarctic, Neotropical and Australian Regions. Russia – Krasnoyarsk, Amur, Rostov regions, Siberia (Spassky, 1963; Spasskaya, 1966; Ryzhikov, 1967; Ryzhikov et al., 1974; Petrochenko & Kotelnikov, 1976), Ukraine – Dnepropetrovsk, Odessa, Nikolayevsk, Kiev, Khmelnichky, Volyn regions, areas around the Black Sea (PL 3.9%, II 1–552 ind.) (Smogorzhevskaya, 1976), Belarus (Kukar, 2012), Czech Republic and Slovakia (Barus et al., 1977; Hanzelova et al., 1995), Bulgaria – Danube and Rositsa rivers (Marinova et al., 2013), Bangladesh – Netrokona and Mymensingh districts (PL 66.7 ± 22.5%, II 12–110 ind.) (Islam, 1988; Anisuzzaman et al., 2005; Farjana et al., 2008; Yousuf et al., 2009), UK (PL 5.9%, II 4–19 ind.) (Owen, 1951; Soliman, 1955), Poland (Czaplinski, 1956), Germany (Fuhrmann, 1908), North America (Ransom, 1909). Azerbaijan – Khachmaz and Shabran regions (PL 3.6%, II 1–11 ind.) (Shakhtakhtinskaya, 1952, 1959; Shirinov, 1961; Vahidova, 1978; Vahidova et al., 1982).

Genus: *Diorchis* Clerc, 1903

Diorchis bulbodes Mayhew, 1929

Intermediate hosts: unknown

Habitat: small intestine

Distribution: Europe, Asia, North America. Ukraine – Nikolayev region (PL 0.02%, II 1 ind.) (Smogorzhevskaya, 1976), Russia – Omsk region (Spasskaya, 1966; Ryzhikov, 1967; Ryzhikov et al., 1974), Mexico and USA (PL 6.2%, II 1–10 ind.) (Farias & Canaris, 1986).

Diorchis donis Ajinov, 1960

Intermediate hosts: unknown

Habitat: intestine

Distribution: Europe. Russia – Rostov region (Spassky, 1963; Spasskaya, 1966).

Diorchis elisae (Skrjabin, 1914) Spassky et Freze, 1961

Intermediate hosts: *Cypridopsis vidua*, *Cyclocypris leavis*, *Diaptomus vulgaris*, *Dolerocypris fasciata*, *Notodromas onacha*, *Eucypris virens* (Spasskaya, 1966).

Habitat: small intestine

Distribution: Palaearctic. Russia (Spasskaya, 1966), Belarus (Petrochenko & Kotelnikov, 1976), Ukraine – Odessa, Nikolayev, Kiev, Khmelnitsky regions, Upper Dniester basin (PL 0.6%, II 1–126 ind.) (Smogorzhevskaya, 1976), Bulgaria – Nova Zagora, Stara Zagora city (Marinova et al., 2013), Poland (Czaplinski, 1956).

Diorchis formosensis Sugimoto, 1934

Intermediate hosts: unknown

Habitat: ceca, small intestine – duodenum

Distribution: China – Taiwan island (Sugimoto,1934; Schmelz, 1941).

Diorchis inflata (Rudolphi, 1819) Clerc, 1903

Intermediate hosts: *Cypridopsis vidua*, *Cyclocypris laevis*, *Diantomus vulgaris*.

Habitat: small intestine

Distribution: Slovakia (Hanzelova et al., 1995), Ukraine (Smogorzhevskaya, 1976), Russia (Ryzhikov, 1967). We reported this species for the first time in Azerbaijan – Shabran region Shabran city and Bilasuvar region Guneshli village (PL 0.83%, II 6–25 ind.).

Diorchis longiovum Schiller, 1953

Intermediate hosts: unknown

Habitat: small intestine

Distribution: Bangladesh – Netrokona and Mymensingh regions (PL 23.9%, II 3–64 ind.) (Farjana et al., 2008; Anisuzzaman et al., 2005).

Diorchis markewitschi Pastschenko, 1952

Intermediate hosts: unknown

Habitat: small intestine.

Distribution: Europe. Ukraine – Kiev region (PL 0.01%, II 2 ind.) (Petrochenko & Kotelnikov, 1976; Smogorzhevskaya, 1976).

Diorchis nyrocae Yamaguti, 1935

Intermediate hosts: *Cypridopsis vidua*, *Cyclocypris laevis* (Ostracoda)

Habitat: ceca, small intestine – middle region, large intestine

Distribution: Slovakia (Hanzelova et al., 1995).

Diorchis ransomi Schultz, 1940

Intermediate hosts: *Cyclocypris laevis*, *C. ovum*, *Cypridopsis vidua*, *Dolerocypris fasciata*, *Notodromas monacha*, *Diaptomus caeruleus*

Habitat: small intestine – middle region

Distribution: Palaearctic. Ukraine (PL 0.05%, II 1–13 ind.) (Smogorzhevskaya, 1976), Russia (Spassky, 1963; Spasskaya, 1966; Ryzhikov, 1967).

Diorchis spinata Mayhew, 1929

Intermediate hosts: unknown

Habitat: intestine

Distribution: Holarctic. Poland – River Danube, Dobrich (Marinova et al., 2013).

Diorchis sobolevi Spasskaya, 1950

Intermediate hosts: unknown

Habitat: small intestine

Distribution: Ukraine – Kiev region (Ryzhikov, 1967; Spasskaya, 1966).

Diorchis stefanskii Czaplinski, 1956

Intermediate hosts: *Cypridopsis vidua*, *C. ovum*, *Macrocyclops fuscus*, *Dolerocypris fasciata*, *Notodromas monacha*

Habıtat: small intestine – posterior region, large intestine

Distribution: Holarctic. Ukraine (PL 2.2%, II 1–160 ind.) (Smogorzhevskaya, 1976), Bulgaria (Marinova et al., 2013), Slovakia (Hanzelova et al., 1995), Poland (Czaplinski, 1956), Kazakhstan (Ryzhikov, 1967).

Genus: *Diploposthe* Jacobi, 1896

Diploposthe laevis Bloch, 1782

Intermediate hosts: *Acanthocyclops viridis*, *Macrocyclops albidus*, *M. fuscus*, *Mesocyclops leuckartii*, *Cypridopsis vidua*, *Heterocypris incongruens*

Habitat: small intestine

Distribution: Cosmopolitan. Bulgaria (Marinova et al., 2013), Poland (Bezubik, 1956; Lapage, 1961), North America (Ransom, 1909), Ukraine (PL 0.07%, II 2–9 ind.) (Smogorzhevskaya, 1976).

Genus: *Echinocotyle* Blanchard, 1891

Echinocotyle anatina Krabbe, 1869

Intermediate hosts: *Cyprinotus incongruens*, *Cypris ophthalmica*, *C. pubera*

Habitat: small intestine – posterior portion, large intestine

Distribution: Europe, Asia, Africa, North America. Russia – Rostov, Moscow, Novosibirsk and Saint Petersburg (Ryzhikov, 1967; Petrochenko & Kotelnikov, 1976), Georgia (Petrochenko & Kotelnikov, 1976), UK (Soliman, 1955), Poland (Czaplinski, 1956), North America (Ransom, 1909), China – Taiwan island (Sugimoto, 1934; Yamaguti & Mitunaga, 1943), Ukraine – Kiev, Lvov, Odessa, Donetsk (PL 1.2%, II 1–17 ind.) (Petrochenko & Kotelnikov, 1976; Smogorzhevskaya, 1976).

Echinocotyle echinocotyle Fuhrmann, 1907

Intermediate hosts: unknown

Habitat: small intestine – tends to occur in anterior half, ceca

Distribution: Europe (McDonald, 1969).

Echinocotyle rosseteri Blanchard, 1891

Intermediate hosts: *Cyclocypris cinerea*, *C. dispersa*, *C. globosa*, *Cypris opthalmica*.

Auxiliary hosts: molluscs – *Lymnaea ovata*, *L. ampla*, *L. peregra*, *L. stagnalis*

Habitat: small intestine – anterior region

Distribution: Holarctic, Indomalaya. Mexico and North America (Farias & Canaris, 1986; Ransom, 1909), Poland (Czaplinski, 1956).

Genus: *Echinolepis* Spasskii & Spasskaya, 1954

Echinolepis carioca Magalhaes, 1898

Intermediate hosts: insects

Habitat: small intestine

Distribution: Egypt – Beni-Suef province, Behera regions (Abou Laila et al., 2011; El-Dakhly et al., 2020), India – Assam region (PL 35.3%) (Borah et al., 2018), Nigeria – Gombe region (PL 1.3%) (Adang et al., 2014).

Genus: *Drepanidotaenia* Railliet, 1892

Drepanidotaenia lanceolata (Bloch, 1782) Railliet, 1892

Intermediate hosts: crustacean

Auxiliary hosts: mollusc – *Lymnaea auricularia*

Habitat: small intestine – posterior half

Distribution: Cosmopolitan. Belarus (Kukar, 2012), Czech Republic and Slovakia (Barus et al., 1977; Hanzelova et al., 1995), Bulgaria (Marinova et al., 2013), Bangladesh (Anisuzzaman et al., 2005; Farjana et al., 2008; Aleya et al., 2019), USA and Mexico (Farias & Canaris, 1986), India – Assam region (Borah et al., 2018), Poland (Czaplinski, 1956). Azerbaijan – Guba, Khachmaz, Astara, Shabran, Zagatala, Masally, Ujar and Yevlakh (PL 47%, II 2–14 ind.) (Shakhtakhtinskaya, 1952, 1959; Shirinov, 1961; Vahidova, 1978; Vahidova et al., 1982) and Bilasuvar region Chinarly village (PL 16.6%, II 2–3 ind.) (Aghayeva, 2018). We also reported this parasite in Azerbaijan – Nakhchivan AR in Kengerli region (PL 1.14%, II 1–2 ind.).

Drepanidotaenia przewalskii (Skrjabin, 1914) Lopep-Neyra, 1942

Intermediate hosts: *Eucyclops serrulatus*, *Mesocyclops crassus*, *M. leuckarti*.

Auxiliary hosts: mollusc – *Lymnaea auricularis*

Habitat: small intestine – anterior part of duodenum

Distribution: Russia – Bashkortostan (Spassky, 1963; Spasskaya, 1966), Belarus (Kukar, 2012).

Genus: *Fimbriaria* Froelich, 1802

Fimbriaria amurensis Kotelnikov, 1960

Intermediate hosts: *Eucyclops serrulatus*, *Mesocyclops crassus*, *M. leuckarti*, *Diaptomus sarsi*

Habitat: small intestine

Distribution: Russia – Khabarvsk and Amur basin (Spasskaya, 1966; Ryzhikov, 1967; McDonald, 1969), Kazakhstan (Petrochenko & Kotelnikov, 1976).

Fimbriaria fasciolaris Pallas, 1781 (Şək. 4.3)

Intermediate hosts: crustacean

Habitat: small intestine – anterior region

Distribution: Cosmopolitan. Russia – Bryansk, Kursk, Krasnoyarsk, Amur and Yaroslavl regions (Spasskaya, 1966; Ryzhikov, 1967; Ryzhikov et al., 1974), Tajikistan (PL 11.8%, II 1–43 ind.) (Borgarenko, 1981), Bulgaria – Rositsa River and Sofia (Marinova et al., 2013), Bangladesh (PL 16.2%, II 4–43 ind.) (Islam, 1988; Anisuzzaman et al., 2005; Farjana et al., 2008; Yousuf et al., 2009), USA and Mexico (PL 25.6%, II 1–20 ind.) (Farias & Canaris, 1986), India (PL 22,4%) (Borah et al., 2018), UK (Wales) (Owen, 1951). Azerbaijan – Shabran (PL 1.1%, II 1–2 ind.) (Shirinov, 1961). We also reported in Azerbaijan – Shabran (Qala-Alty village), Lankaran, Khachmaz regions (PL 6.5%, II 1–15 ind.), Nakhchivan AR – Babek region (PL 4.6%, II 1–2 ind.).

Fimbriaria kubanika Kotelnikov, 1965

Intermediate hosts: *Arctodiaptomus dentifer*, *Diaptomus mirus*, *Mesocyclops crassus*

Habitat: small intestine

Distribution: Ukraine – Chernigovsk, Zaparozhye, Dnepropetrovsk regions (Smogorzhevskaya, 1976), North Caucasus (Ryzhikov, 1967; Petrochenko & Kotelnikov, 1976).

Genus: *Fimbriarioides* Fuhrmann, 1932

Fimbriarioides intermedia Fuhrmann, 1913

Intermediate hosts: *Acanthocyclops viridis*, *Eucyclops serrulatus*, *Macrocyclops albidus*

Habitat: intestine

Distribution: Bangladesh (Anisuzzaman et al., 2005), Ukraine (PL 0.03%, II 3–15 ind.) (Ryzhikov, 1967; Smogorzhevskaya, 1976).

Genus: *Gastrotaenia* Wolffhügel, 1938

Gastrotaenia dogieli Gynezynskaja, 1944

Intermediate hosts: *Diatomus* sp., *Arctodiaptomus bacillifer*, *Arctodiaptomus calinus*

Habitat: gizzard – under lining

Distribution: Palaearctic. Kazakhstan, Russia – Southern Urals, Western Siberia (Ryzhikov, 1967; Petrochenko & Kotelnikov, 1976).

Genus: *Hymenolepis* Weinland, 1858

Hymenolepis angularostris Sugimoto, 1934

Intermediate hosts: unknown

Habitat: intestine

Distribution: China – Taiwan island (Sugimoto, 1934; McDonald, 1969).

Hymenolepis apodemi Makarikov, 2013

Intermediate hosts: unknown

Habitat: small intestine

Distribution: Egypt – Beni-Suef province (PL 0.78%, II 6–24 ind.) (El-Dakhly et al., 2020).

Hymenolepis cantaniana Polonio, 1860

Intermediate hosts: insects – *Ataenius cognatus*, *A. stercorator*, *Choeridium histeroides*

Habitat: small intestine

Distribution: Nigeria – Gombe city (Paul et al., 2015).

Hymenolepis diminuta Rudolphi, 1819
Intermediate hosts: Arthrapoda
Habitat: faeces, small intestine
Distribution: Cosmopolitan. Bangladesh – Sonarqaon province (Aleya et al., 2019).

Hymenolepis infrequens Sharma, 1943
Intermediate hosts: unknown
Habitat: small intestine
Distribution. Asia. Myanmar (Sharma, 1943; McDonald, 1969).

Hymenolepis sagitta (Rosseter 1906) Fuhrmann 1908
Intermediate hosts: unknown
Habıtat: intestine
Distribution: Poland (Czaplinski, 1956), North America (Ransom, 1909).

Hymenolepis tenerrima (Linstow 1882) Fuhrmann 1906
Intermediate hosts: *Herpetocypris reptans*
Habitat: large intestine
Distribution: North America (Ransom, 1909; McDonald, 1969).

Genus: *Lobatolepis* Yamaguti, 1959

Lobatolepis lobulata Mayhew, 1925
Intermediate hosts: unknown
Habitat: small intestine
Distribution: Asia. Bangladesh – Mymensingh district (Anisuzzaman et al., 2005).

Genus: *Microsomacanthus* Lopez-Neyra, 1942

Microsomacanthus abortiva (Linstow, 1904) Lopez -Neyra, 1942
Intermediate hosts: *Gammarus pulex*
Habitat: ceca, small intestine
Distribution: Bulgaria – İskar, Yantra rivers (Marinova et al, 2013), Ukraine (PL 0.1%, II 1–109 ind.) (Smogorzhevskaya, 1976), UK (PL 18.0%, II 13–23 ind.) (Soliman, 1955), Africa – Egypt and Nigeria (Alexander & McLaughlin, 1997), Bangladesh – Mymensingh district (Anisuzzaman et al., 2005).

Microsomacanthus arcuata Kowalewski, 1904
Intermediate hosts: unknown
Habitat: intestine
Distribution: Palaearctic. Bangladesh – Mymensingh district (McDonald, 1969; Anisuzzaman et al., 2005).

Microsomacanthus collaris Batsch, 1786
Intermediate hosts: crustacean
Auxiliary hosts: molluscs – *Lymnaea palustris*, *L. vulgaris*
Habitat: Small intestine – total length
Distribution: Cosmopolitan. Ukraine (PL 7.7%, II 1–1342 ind.) (Smogorzhevskaya, 1976), Russia – Far East, Eastern and Western Siberia, along the Volga River (Ryzhikov, 1967; Spasskaya, 1966; Ryzhikov et al., 1974), Tajikistan (PL. 0.95%, II 3–8 ind.) (Borgarenko, 1981), Georgia (Petrochenko & Kotelnikov, 1976), Belarus (Kukar, 2012), Bangladesh (PL 64%, II 2–840 ind.) (Islam, 1988), UK (PL 12.3%, II 9–13 ind.) (Soliman, 1955), India – Assam province (PL 35.8%) (Borah et al., 2018), North America (Ransom, 1909), China – Taiwan (Sugimoto, 1934). Azerbaijan – Astara, Shabran, Khachmaz regions (PL 26.6%, II 4–13 ind.) (Shakhtakhtinskaya, 1952, 1959; Shirinov, 1961; Vahidova, 1978; Vahidova et al., 1982).

Microsomacanthus compressa Linton, 1892
Intermediate hosts: *Cyclops strenuus*, *Macrocyclops albidus*, *Mesocyclops leuckarti*
Auxiliary hosts: molluscs – *Anisus spirorbis*, *Lymnaea corneus*, *L. ovata*, *L. palustris*, *L. peregra*, *L. stagnalis*, *Planorbis planorbis*, *Valvata cristata*, *Viviparus viviparus*
Habitat: small intestine – total length
Distribution: Holarctic. Russia (Spasskaya, 1966; Ryzhikov, 1967; Petrochenko & Kotelnikov, 1976), Tajikistan (PL 1.42%, II 7–35 ind.) (Borgarenko, 1981), Kazakhstan (Egizbaeva, 1971), Uzbekistan (Sultanov, 1963), Belarus (Kukar, 2012), Bulgaria – River Danube (Marinova et al., 2013), Poland (Bezubik, 1956; Czaplinski, 1956). Azerbaijan – Astara, Shabran, Gusar, Salyan, Khachmaz, Yevlakh, Ujar, Masally, Lankaran regions (PL 42.6%, II 1–111 ind.) (Shirinov, 1961; Vahidova, 1978).

Microsomacanthus fausti Tseng-Shen, 1932
Intermediate hosts: *Acanthocyclops viridis*, *Mesocyclops crassus*, *Mesocyclops leuckarti*, *Mesocyclops oithonoides*
Auxiliary hosts: molluscs – Planorbidae
Habıtat: small intestine, ceca
Distribution: Palaearctic. Bulgaria (Marinova et al., 2013), Ukraine – Zaporozhye region (PL 0.2%, II 1–72 ind.) (Smogorzhevskaya, 1976), Russia (Ryzhikov, 1967).

Microsomacanthus jamunicus (Sharma, 1943) Yamaguti, 1959
Intermediate hosts: unknown
Habitat: small intestine
Distribution: Asia. Myanmar (Sharma, 1943; McDonald, 1969).

Microsomacanthus microsoma Creplin, 1829
Intermediate hosts: *Eucyclops agilis*, *Eucyclops serrulatus*, *Gammarus locusta*
Auxiliary hosts: molluscs – *Lymnaea lagotus*, *L. peregra*, *Radix logotus*, *L. stagnalis*
Habıtat: small intestine
Distribution: Russia – Western Siberia, Far East (Spasskaya, 1966; Ryzhikov, 1967; Petrochenko & Kotelnikov, 1976), Belarus (Ryzhikov, 1967), Tajikistan (PL 4.74%, II 5–32 ind.) (Borgarenko, 1981), Uzbekistan – Tashkent and Bukhara provinces (Sultanov, 1963).

Microsomacanthus oidemiae Spassky et Jurpalova, 1964
Intermediate hosts: unknown
Habıtat: small intestine
Distribution: Tajikistan – Pyandjinsk region (PL 0.47%, II 5 ind.) (Borgarenko, 1981).

Microsomacanthus pachycephala von Linstow, 1872
Intermediate hosts: unknown
Habıtat: Small intestine
Distribution: Russia – Chelyabinsk (Ryzhikov, 1967).

Microsomacanthus paracompressa Czaplinski, 1956
Intermediate hosts: *Acanthocyclops bicuspidatus*, *A. viridis*, *Cyclops gigas*, *Eucyclops macruroides*, *E. serrulatus*, *Mesocyclops crassus*, *M. leuckarti*, *M. oithonoides*
Auxiliary hosts: molluscs – *Acroloxus lacustris*, *A. palustris*, *Amphipepla gluteosa*, *Lymnea ampla*, *L. auricularis*, *L. ovata*, *L. palustris*, *L. stagnalis*, *Planorbis planorbis*
Habıtat: small intestine
Distribution: Palaearctic. Belarus (Kukar, 2012), Bulgaria – River Danube and northern shores of the Black Sea (Marinova et al., 2013), Poland (Czaplinski, 1956; Shirinov, 1961), Ukraine – shores of the Black Sea (PL 0.5%, II 2–123 ind.) (Smogorzhevskaya, 1976), Tajikistan – Kanibadam poultry (PL 1.4%, II 4–22 ind.) (Borgarenko, 1981), Kazakhstan – Pavlodar (Egizbaeva, 1971). Azerbaijan – Shabran (PL 0.9%, II 4–16 ind.) (Shirinov, 1961; Vahidova, 1978).

Microsomacanthus paramicrosoma Gasowska, 1931
Intermediate hosts: *Acanthocyclops bicuspidatus*, *A. viridis*, *Eucyclops serrulatus*, *Macrocyclops albidus*, *Mesocyclops crassus*, *M. leuckarti*, *M. oithonoides*
Auxiliary hosts: molluscs – *Galba palustris*, *Planorbis planorbis*, *Lymnaea auricularia*, *L. ovata*, *L. palustris*, *L. peregra*, *L. stagnalis*
Habitat: small intestine – anterior and midregion
Distribution: Holarctic. Bulgaria – Danube river and surrounding swamps (Marinova et al., 2013), Poland (Czaplinski, 1956), Ukraine (PL 0.9%, II 4–3010 ind.) (Smogorzhevskaya, 1976), Russia – Khabarovsk, Amur regions (Ryzhikov et al., 1974; Shirinov, 1961), Tajikistan – Kanibadamsk Poultry (PL 3.3%, II 5–12 ind.) (Borgarenko, 1981), Kazakhstan – Pavlodar, Almaty (Egizbaeva, 1971). Azerbaijan – Shabran (port of Devechi) and Astara regions (PL 6.5%, II 4–27 ind.) (Vahidova, 1978; Vahidova et al., 1982). We also reported in Azerbaijan – Shabran region (Gala Alty village) (PL 4.35%, II 5–8 ind.).

Microsomacanthus parvula Kowalewski, 1904

Intermediate hosts: Hirudinea – *Erpobdella atomaria*, *E. octoculata*, *E. punctata*

Habitat: small intestine – generally in anterior half

Distribution: Holarctic. Bulgaria – Vratsa city (Marinova et al., 2013), Poland (Czaplinski, 1956), Germany (Fuhrmann, 1908), North America (Ransom, 1909), Japan (Uchida, 1991), Ukraine – Kharkiv, Odessa and Nikolaev regions (PL 1.2%, II 2–40 ind.) (Petrochenko & Kotelnikov, 1976), Russia (Ryzhikov, 1967).

Microsomacanthus rangdonensis Spasskiy, Dang Van-Ngy & Fürpalova, 1963

Intermediate hosts: unknown

Habitat: small intestine

Distribution: Asia. Vietnam (McDonald, 1969).

Microsomacanthus spiralibursata Czaplinski, 1956

Intermediate hosts: *Acanthocyclops viridis*, *Macrocyclops albidus*, *Mesocyclops leuckarti*

Auxiliary hosts: molluscs – *Lymnaea ovata*, *L. auricularia*, *L. stagnalis*.

Habıtat: small intestine – entire length

Distribution: Kazakhstan (Ryzhikov, 1967).

Microsomacanthus spiralicirrata Maksimova, 1963

Intermediate hosts: unknown

Habıtat: small intestine

Distribution: Kazakhstan – Aktobe region and shores of the Black Sea (Spasskaya, 1966; McDonald, 1969).

Microsomacanthus trichorhynchus Yoshida, 1910

Intermediate hosts: unknown

Habitat: small intestine – duodenum

Distribution: Russia – Rostov region and Japan (Spasskaya, 1966; McDonald, 1969).

Genus: *Retinometra* Spasskii, 1955

Retinometra giranensis Sugimoto, 1934

Intermediate hosts: unknown

Habıtat: small intestine

Distribution: Palaearctic. Russia – Rybinsk Reservoir and Tuva (Spasskaya, 1966).

Retinometra longicirrosa (Fuhrmann, 1906) Spassky, 1963

Intermediate hosts: *Acanthocyclops viridis*, *Cyclops strenuus*, *Eucyclops agilis*, *Eucyclops serrulatus*, *Mesocyclops leuckarti*, *Diaptomus coeruleus*, *Diaptomus sarsi*

Habıtat: small intestine

Distribution: Palaearctic, Indomalaya. Russia – Kalijsk, Kursk, Bryansk, Tula, Kursk, Yaroslavl and Ryazan, Omsk, Chelyabinsk regions, Bashkortostan, Western Siberia, mouth of the Volga River (Petrochenko & Kotelnikov, 1976; Ryzhikov et al., 1974), India (Southwell, 1930), France (Joyeux & Baer, 1936).

Retinometra meggitti Sharma, 1913

Intermediate hosts: unknown

Habitat: small intestine

Distribution: Asia. Myanmar (McDonald, 1969).

Retinometra oshimai (Sugimoto, 1934) Spasskii, 1963

Intermediate hosts: unknown

Habitat: small intestine

Distribution: Asia. China – Taiwan island (McDonald, 1969).

Retinometra pittalugai Lopez-Neyra, 1932

Intermediate hosts: unknown

Habıtat: small intestine

Distribution: Spain and Russia (Spasskaya, 1966; McDonald, 1969).

Retinometra rangoonica (Sharma, 1943) Spasskii, 1963

Intermediate hosts: unknown

Habıtat: small intestine

Distribution: Asia. Myanmar (McDonald, 1969).

Retinometra venusta (Rosseter, 1897)

Intermediate hosts: *Cyclocypris dispersa*, *C. laevis*, *Notodromas monacha*, *Acanthocyclops viridis*, *Eucyclops macruroides*, *Macrocyclops albidus*, *M. fuscus*

Habitat: small intestine – anterior region.

Distribution: Russia and North America (Ransom, 1909; Gower, 1939; Spasskaya, 1966).

Genus: *Sobolevicanthus* Spasskii & Spasskaya, 1954

Sobolevicanthus columbae Zeder, 1800

Intermediate hosts: unknown

Habıtat: small intestine

Distribution: Bangladesh – Sonargaon Upazila and Narayanganj (Aleya et al., 2019).

Sobolevicanthus gracilis Zeder, 1803

Intermediate hosts: crustacean

Auxiliary hosts: molluscs – *Lymnaea palustris*, *L. vulgaris*

Habıtat: small intestine – entire length.

Distribution: Holarctic, Indomalaya. Ukraine – Dnipropetrovsk, Odessa, Nikolayevsk, Kiev, Khmelnitsky, Volynsk (PL 5.9%, II 1–536 ind.) (Smogorzhevskaya, 1976), Bulgaria – River Rositsa (Marinova et al., 2013), USA and Mexico (Farias & Canaris, 1986), UK (Owen, 1951; Soliman, 1955), Poland (Czaplinski, 1956), France (Joyeux & Baeb, 1936), India (Southwell, 1930), China – Taiwan island (Sugimoto, 1934), Tajikistan – Pyandjinsk region (PL 10.4%, II 5–18 ind.) (Borgarenko, 1981), Russia – Krasnoyarsk, Amur (Ryzhikov, 1967; Ryzhikov et al., 1974). Azerbaijan – Shabran region (PL 1.8%, II 6–58 ind.) (Shirinov, 1961; Vahidova, 1978; Vahidova et al., 1982).

Sobolevicanthus krabbeella Hughes, 1940

Intermediate hosts: crustacean

Habıtat: small intestine, ceca

Distribution: Palaearctic. Russia – Southern Urals (Ryzhikov, 1967; McDonald, 1969).

Sobolevicanthus octacanthus Krabbe, 1869

Intermediate hosts: *Cyclops vicinus*, *Eucyclops serrulatus*, *Mesocyclops oithonoides*.

Habitat: small intestine – posterior region more generally

Distribution: Palaearctic. Ukraine – Odessa, Nikolayev regions and Black Sea coast (PL 0.4%, II 4–16 ind.) (Smogorzhevskaya, 1976), Russia (Ryzhikov, 1967).

Genus: *Tschertkovilepis* Spasskii & Spasskaya, 1954

Tschertkovilepis krabbei Kowalewski, 1895

Intermediate hosts: crustacean

Auxiliary hosts: mollusc – *Lymnaea auricularia*

Habıtat: small intestine

Distribution: Holarctic. Ukraine (Spasskaya, 1966; Smogorzhevskaya, 1976; Yuskiv & Melnychuk, 2020), Russia – Braynsk, Omsk, Amur, Kursk, Yaroslavl, Novosibirsk, Orlov, Saint Petersburg, Rybinsk Reservoir, Tatarstan (Spasskaya, 1966; Ryzhikov et al., 1974), Bulgaria (Marinova et al., 2013), France (Joyeux & Baeb, 1936), Poland (Bezubik, 1956; Czaplinski, 1956).

Tschertkovilepis setigera Frölich, 1789

Intermediate hosts: *Acanthocyclops bicuspidatus*, *Cyclops gigas*, *C. strenuus*, *Eucyclops serrulatus*, *E. speratus*, *Mesocyclops leuckarti*, *M. oithonoides*, *Diaptomus coeruleus*, *D. sarsi*.

Auxiliary hosts: molluscs – *Galba palustris*, *Lymnaea auricularia*, *L. ovata*, *L. palustris*, *L. stagnalis*, *Planorbarius corneus*, *Coretus corneus*

Habıtat: small intestine

Distribution: Palaearctic, Indomalaya. Ukraine – Odessa, Nikolayev, Kiev, Poltava regions (PL 1.4%, II 1–160 ind.) (Smogorzhevskaya, 1976; Yevstafyeva & Yeresko, 2018; Yevstafyeva et al., 2018; Yuskiv & Melnychuk 2020; Yevstafieva et al., 2020), Russia – Bashkortostan, Dagestan, Kaluga, Kursk, Ryazan, Bryansk, Yaroslavl, Omsk, Novosibirsk, Amur (Ryzhikov et al., 1974), Bulgaria – Pavlikeni, Veliko Tarnovo, Elena regions (Marinova et al., 2013), Poland (Czaplinski, 1956), China – Taiwan (Sugimoto,1934), Tajikistan (PL 0.47%, II 1 ind.) (Borgarenko, 1981), Uzbekistan (Sultanov, 1963), Turkmenistan (Kibakin, 1966). Azerbaijan – Astara, Khachmaz, Shabran, Lankaran regions (PL 17.7 %, II 1–42 ind.) (Shakhtakhtinskaya, 1952; Shirinov, 1961; Vahidova, 1978; Vahidova

et al., 1982). We reported in Jalilabad (PL 2.17%, II 12 ind.) and in Nakhchivan AR – Julfa, Ordubad, Sharur (PL 5.71%, II 3–7 ind.).

Genus: *Wardium* Mayhew, 1925

Wardium aequabilis Rudolphi, 1810
Intermediate hosts: *Cyclocypris laevis*, *Macrocyclons fuscus*
Habitat: small intestine – posterior portion, ceca
Distribution: Russia (Petrochenko & Kotelnikov, 1976; Ryzhikov, 1967; Spasskaya, 1966).

Wardium creplini Krabbe, 1869
Intermediate hosts: unknown
Habitat: small intestine
Distribution: Russia – Amur (Ryzhikov et al., 1974).

Family: Davaineidae Braun, 1900

Genus: *Baerfainia* Yamaguti, 1959

Baerfainia anoplocephaloides Baer & Fain 1955
Intermediate hosts: unknown
Habıtat: intestine
Distribution: Egypt – Damanhur city (PL 3.63%) (Abou Laila et al, 2011).

Genus: *Cotugnia* Diamare, 1893

Cotugnia digonopora Pasquale, 1890
Intermediate hosts: insects
Habıtat: small intestine
Distribution: Egypt – Beni-Suef province and Bangladesh – Dhaka (Aleya et al., 2019; El-Dakhly et al., 2020).

Cotugnia fastigata Meggitt, 1920
Intermediate hosts: insects
Habıtat: ıntestine
Distribution: Asia. Myanmar (Southwell, 1930).

Genus: *Raillietina* Fuhrmann, 1920

Raillietina anatina Fuhrmann, 1909
Intermediate hosts: insects
Habitat: intestine
Distribution: North America (Ransom, 1909), Italy (McDonald, 1969).

Raillietina birmanica Meggitt, 1926
Intermediate hosts: insects
Habitat: intestine
Distribution: Asia. Myanmar (McDonald, 1969; Sharma, 1943).

Raillietina bonini Megnin, 1899
Intermediate hosts: insects
Habıtat: intestine
Distribution: Bangladesh – Dhaka, Narayanganj (Aleya et al., 2019).

Raillietina cesticillus (Molin, 1858) Railliet, 1921
Intermediate hosts: insects
Habitat: small intestine – duodenum and jejunem
Distribution: Cosmopolitan. Egypt – Beni-Suef province (El-Dakhly et al., 2020), Bangladesh – Dhaka, Narayanganj (Aleya et al., 2019), India – Assam province (Borah et al., 2018).

Raillietina echinobothrida Megnin, 1881
Intermediate hosts: insects
Habitat: small intestine
Distribution: Cosmopolitan. Egypt – Beni-Suef province (El-Dakhly et al., 2020), Bangladesh – Dhaka, Narayanganj (Aleya et al., 2019), Nigeria – Gombe, İlorin (Paul et al., 2015; Ola-Fadunsin et al., 2016), India – Upper Assam (Borah et al., 2018), Tanzania (Rukambile et al., 2020).

Raillietina magninumida Jones, 1930
Intermediate hosts: insects
Habıtat: small intestine
Distribution: Nigeria – Gombe (Adang et al., 2014).

Raillietina microcotyle Skrjabin, 1914
Intermediate hosts: insects
Habitat: intestine
Distribution: Italy (McDonald, 1969).

Raillietina osakensis Iwata & Tamura, 1933
Intermediate hosts: insects
Habıtat: intestine
Distribution: Japan (Iwata & Tamura, 1933; McDonald, 1969).

Raillietina parviuncinata Meggitt & Po Saw, 1921
Intermediate hosts: insects
Habitat: intestine
Distribution: Asia. Myanmar (Southwell, 1930) and China (McDonald, 1969).

Raillietina tetragona (Molin, 1858)
Intermediate hosts: insects
Habıtat: cloaca, small intestine
Distribution: Egypt – Beni-Suef province (El-Dakhly et al., 2020), Nigeria – Gombe (Paul et al., 2015), Iran – Gilan province (Bahar et al., 2017), India – Upper Assam (Borah et al., 2018), Tanzania – Morogoro (Muhairwa et al., 2007; Rukambile et al., 2020).

Order: Diphyllobothriidea Kuchta, Scholz, Brabec, Bray, 2008

Family: Diphyllobothriidae Lühe, 1910

Genus: *Ligula* Bloch, 1782

Ligula colymbi Zeder, 1803
Intermediate hosts: *Acanthocyclops bicuspidatus*, *A. viridis*, *Cyclops strenuus*
Auxiliary hosts: pisces – *Barbus brachycephalus*, *Cobitis taenia*, *Gobio gobio*, *Leucaspius delineatus*, *Nemachilus kuschkewitschi*, *Nemachilus dorsalis*, *Nemachilus stoliczkai*, *N. strauchi*.
Habitat: small intestine
Distribution: Ukraine (Ryzhikov, 1967).

Ligula interrupta Rudolphi, 1810
Intermediate hosts: *Acanthocyclops bicuspidatus*, *A. vernalis*, *A. viridis*, *Cyclops furcifer*, *C. insignis*, *C. strenuus*, *Eucyclops serrulatus*, *Macrocyclops albidus*, *Diaptomus glacialis*.
Auxiliary hosts: pisces – *Abramis brama*, *Barbus lacerta*, *Carassius auratus*, *C. carassius*, *Cyprinus carpio*, *Gobio albipennatus*, *Leuciscus brandti*, *Rhodeus sericeus*, *Rutilus rutilus*.
Habitat: intestine
Distribution: Ukraine – Kiev and Crimea (PL 0.04%, II 1–2 ind.) (Ryzhikov, 1967; Petrochenko & Kotelnikov, 1976; Smogorzhevskaya, 1976).

Ligula intestinalis (Linnaeus, 1758) Gmelin, 1790
Intermediate hosts: *Acanthocyclops bicuspidatus*, *A. viridis*, *Cyclops strenuus*, *Eucyclops serrulatus*, *Mesocyclops leuckarti*, *M. oithonoides*, *Diaptomus glacialis*, *D. gracilis*, *D. sarsi*.
Auxiliary hosts: Pisces
Habitat: small intestine
Distribution: China – Taiwan (Sugimoto, 1934), Ukraine – Crimea, Dniester (PL 0.2%, II 1–27 ind.) (Petrochenko & Kotelnikov, 1976; Smogorzhevskaya, 1976), Russia – Altai (Petrochenko & Kotelnikov, 1976).

Genus: *Schistocephalus* Creplin, 1829

Schistocephalus pungitii Dubinina, 1959
Intermediate hosts: *Acanthocyclons bicuspidatus*, *A. gigas*, *A. viridis*, *Cyclops furcifer*, *C. strenuus*, *Macrocyclops albidus*, *M. fuscus*, *Diaptomus gracilis*
Auxiliary hosts: fish – *Pungitius pungitius*
Habitat: small intestine
Distribution: Europe, Asia, North America (McDonald, 1969).

Schistocephalus solidus Müller, 1776
Intermediate hosts: *Acanthocyclops bicuspidatus*, *A. eigas*, *Cyclops furcifer*, *C. strenuus*, *Eucyclops macrurus*, *E. macruroides*, *Macrocyclops albidus*, *M. fuscus*, *Mesocyclops leuckarti*.
Auxiliary hosts: pisces
Habitat: small intestine
Distribution: UK (Crompton & Nesheim, 1976), Poland (Bezubik, 1956), France (Joyeux & Baer, 1936), Russia (Ryzhikov, 1967).

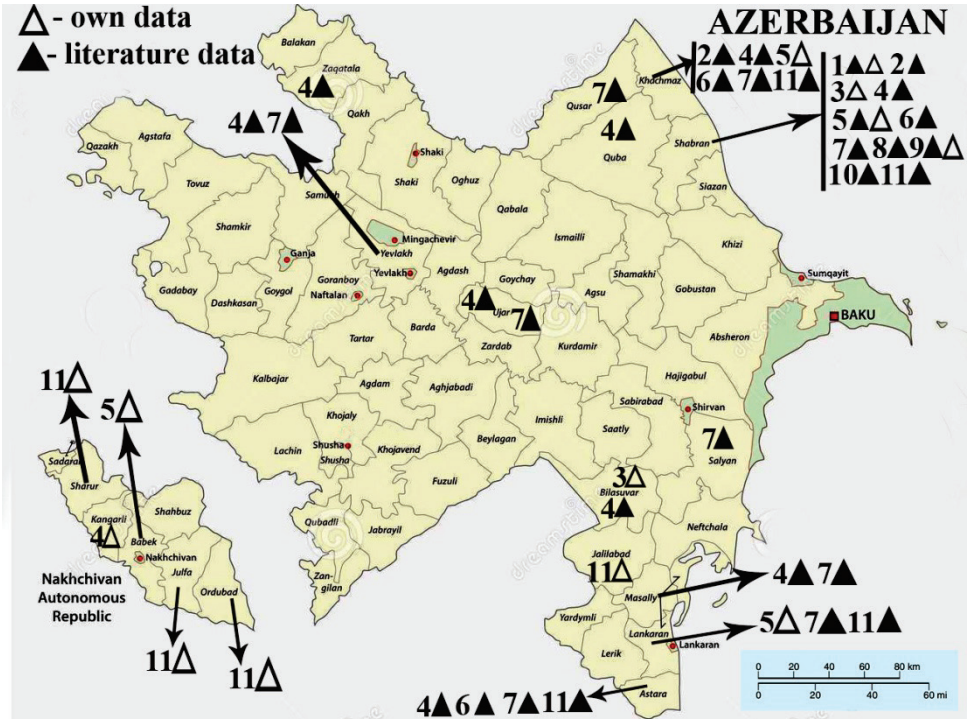

Fig. 1. Map of the areas of occurrence of cestodes in domestic ducks in Azerbaijan: *1 – Cloacotaenia megalops*, *2 – Dicranotaenia coronula*, *3 – Diorchis inflata*, *4 – Drepanidotaenia lanceolata*, *5 – Fimbriaria fasciolaris*, *6 – Microsomacanthus collaris*, *7 – Microsomacanthus compressa*, *8 – Microsomacanthus paracompressa*, *9 – Microsomacanthus paramicrosoma*, *10 – Sobolevicanthus gracilis*, *11 – Tschertkovilepis setigera*

Conclusion

Based on our own research and analysis of literature data, it was revealed that hitherto there are 419 species of helminths (Trematoda – 213, Cestoda – 89, Nematoda – 79, Acanthocephala – 11) in domestic ducks (*Anas platyrhynchos* dom.). The tapeworms found in Azerbaijan belong to four families (Dilepididae – 3, Hymenolepididae – 68, Davaineidae – 13, Diphyllobothriidae – 5). In Azerbaijan, 11 out of 89 species of helminths (*C. megalops*, *D. coronula*, *D. inflata*, *D. lanceolata*, *F. fasciolaris*, *M. collaris*, *M. compressa*, *M. paracompressa*, *M. paramicrosoma*, *S. gracilis*, *T. setigera*) are found in domestic ducks (Fig. 1). Six of them (*C. megalops*, *D. inflata*, *D. lanceolata*, *F. fasciolaris*, *M. paramicrosoma*, *T. setigera*) were also noted in the course of our helminthological studies. The cestoda *D. inflata* was recorded for the first time in domestic ducks in Azerbaijan. Most species of cestodes were found in the north-eastern regions of Azerbaijan (Shabran – 11 species, Khachmaz – 6 species) and southern region (Astara – 4 species). All of these areas are located on the shores of the Caspian Sea and are located on the annual migration route of wild birds involved in the spread of cestodes, which are considered biohelminths. Six species (*Drepanidotaenia lanceolata*, *Hymenolepis apodemi*, *H. diminuta*, *Ligula interrupta*, *L. intestinalis*, *Schistocephalus solidus*) of cestodes parasitize both birds and mammals (*D. lanceolata*, *H. diminuta* in humans). *D. lanceolata* is also recorded in Azerbaijan.

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