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The Trematods Cercaria Of Mollusk (Gastropoda, Pulmonata) In Uzbekistan Ponds

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Abstract: ***It was studied some peculiarities of trematods cercaria' fauna producing by gastropoda mollusks - Lymnaeidae Rafinesque, 1815, Planorbidae Rafinesque, 1815, Physidae Fitziger, 1833 and Melanoididae Müller, 1774. In ponds of Syrdarya, Amudarya river (within Uzbekistan) and Zarafshan, natural infestation by trematods cercaria has been marked in 15 species of mollusks, Lymnaea (8 species), Planorbis (1 species), Gyraulus (2 species), Anisus (2 species), Physa (1 species), Costatella (1 species) and Melanoides (1 species). Total 27 species of cercaria were found belongs to trematods of 11 families - Fasciolidae, Echinostomidae, Philophthalmidae, Paramphistomidae, Gastrothylacidae, Notocotylidae, Plagiorchidae, Sanguinicolidae, Strigeidae, Diplostomidae, Schistosomatidae and Bilharziellidae.***

Key words: mollusks, cercaria, fauna, biology, Syrdarya, Amudarya, Zarafshan, Uzbekistan.

1. INTRODUCTION

Gasteropod mollusks settled throughout the earth, assimilated the most various habitats: from spring streams to hot wells, from permanent ponds to ephemeral, from fresh waters to saltish. Prevalence and environmental diversity played key role in their formation as first intermediate hosts of trematoda – parasites of animal and human. Unique complication life cycles of trematoda related with change of intermediate hosts and generations (Ginecinskaya, 1968; Azimov, 1975, 1986; Combes et al., 1994; Galaktionov, Dobrovolskiy, 1987, 1998; Pinto et al., 2010, Akramova, 2011; Shakarboev et al., 2012, Shakarbaev et al., 2013). In this context, there has an emphasis of mollusks in transmission of trematodosis. The cercaria developing in mollusks of researching river ponds studied insufficiently (Butenko, 1967; Nasimov, 1967; Shakhurina, Tukhmanyants, 1971; Azimov, Kabilov, 1977), and having data sufficiently outdated, which is confirmed by recently researches cercaria fauna producing by mollusks of exploring region (Akramova, 2011; Shakarbaev et al., 2013).

The purpose of given research was identification of species diversity of cercaria developing in mollusks in ponds of Syrdarya, Amudarya and Zarafshan rivers (within Uzbekistan) and assessment of cercaria importance in emergence of trematodosis of animals and cercariosis of human.

2. MATERIAL AND METHODS

The research carried out in spring-summer and autumn periods of 2000 - 2020 in deltaic and bottomland ponds of Syrdarya, Zarafshan and Amudarya territorial covering all regions of Uzbekistan. It was surveyed natural ponds as well as artificial ponds and reservoirs. Collected and surveyed 55745 examples of gastropoda mollusks by known methods of hydrobiology (Zhadin, 1952; Starobogatov, 1970; Kruglov, 2005). Larval stages of trematods were surveyed by using of parasitological methods (Ginecinskaya, 1968). Stationary researches of mollusk infestation carried out in bottomland ponds area of Amudarya river - Kashkadarya, Surkhandarya; Syrdarya - Narin, Karadarya, Chirchik, Ahangaran; Zarafshan, its inflow – Akdarya, Karadarya; reservoir «Tuyabugiz» (Tashkent province) and in source of Nurabad district of Samarkand province (fig. 1). To identify of mollusks infested by trematods larva seat them one by one into the small glass with water and have observed of release from them mature cercaria. Cercaria measurement carried out in objects fixed by hot 10% formalin. Cercaria definition carried out on methods suggested by authors (Zdun, 1961; Ginecinskaya, 1968; Azimov, 1975; Frolova, 1975; Chernogorenko, 1983; Combes et al., 1994; Baer, Voronin, 2007; Mukherjee, 2007).

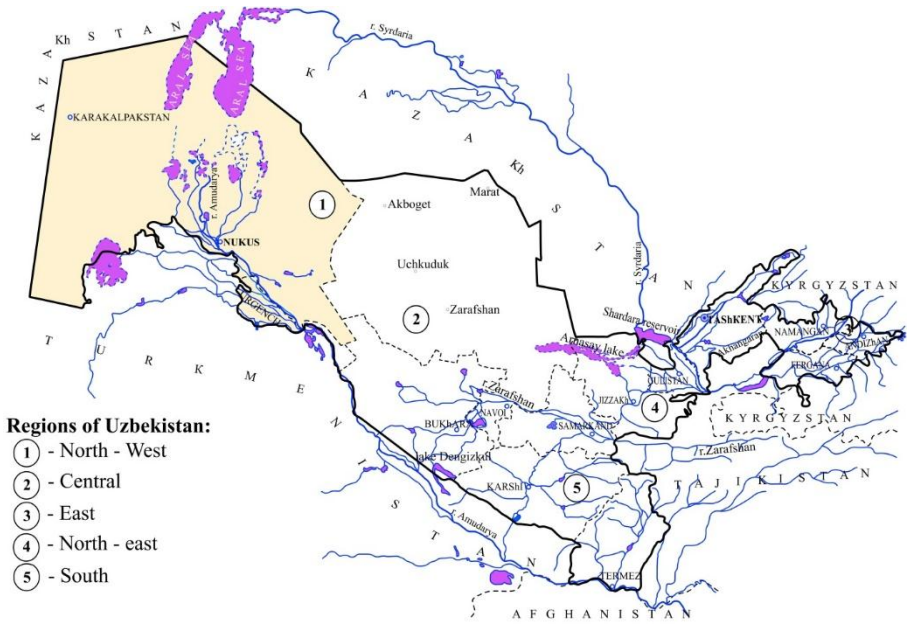

Figure 1. Location of material collection of researched region.

The features of cercaria biology (daily rhythm of cercaria release from mollusk-host, their taxis, duration of life) have been studied in laboratory conditions by water temperature +25+30^{0}C.

3. RESULTS AND DISCUSSION

We identified that mollusks of Pulmonata subclass in ponds of researching rivers represented of 16 species; 8 species from them belongs to family Lymnaeidae, 5 species - Planorbidae, 2 species - Physidae. Melanoididae family represented by one endemic species - Melanoides kainarensis Starobogatov et Izzatullaev, 1980 (fig. 2).

Spread of freshwater mollusks irregularly on ponds of surveyed areas. The most species focused in ponds of Syrdarya and Tashkent and partially in Jizzak province, where coastal and water vegetation well developed.

The most widely represented in ponds of surveyed area mollusks of Lymnaeidae family – 8 species. They are populating ponds of all types and meet even in brackish water lakes. Sometimes density of their population reaches 110-130 examples to $1m^2$.

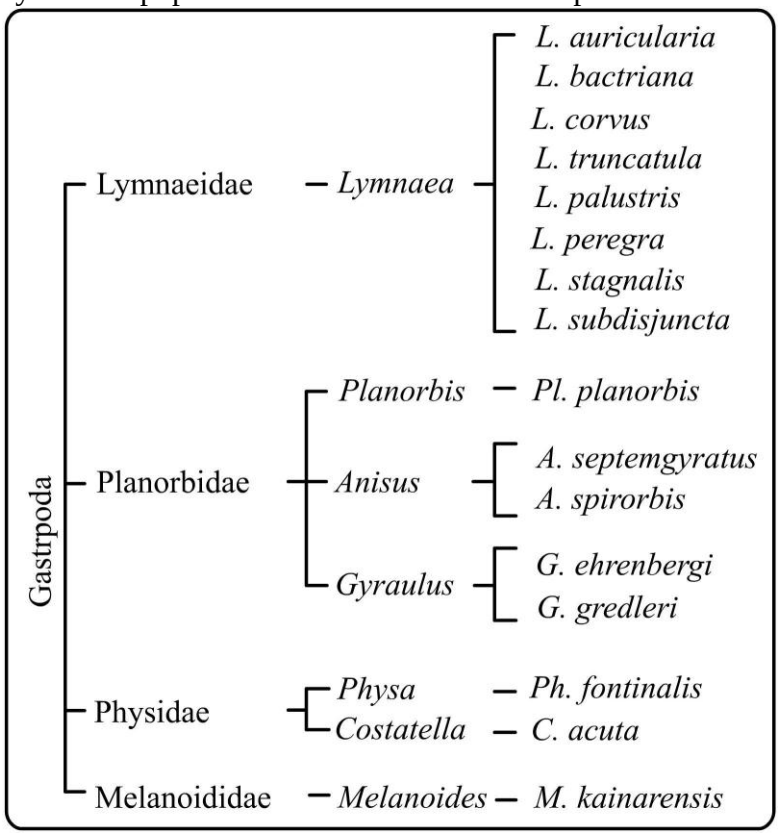

Figure 2. Specific composition of mollusks in ponds of Uzbekistan.

The Planorbidae family has been represented in surveyed area by 5 species belongs to genus of Planorbis, Gyraulus and Anisus. These species prefer places with clean water, estuary and stream, bottomland ponds. In such kind of ponds, sometimes density of their population exceeds 35-50 examples to $1м^2$.

There are two species have been marked from Physidae family – Ph. fontinalis and Costatella acuta, which is enough wide spread. The density of Physidae population is 80-100 examples to $1м^2$ in some places.

The Melanoididae family is characterized as the least species diversity in fresh water biocenosis of Uzbekistan. We have been found one species M. kainarensis only in hot source of Samarkand province. Before, the given species described as a new from that source (Starobogatov, Izzatullaev, 1980).

In researched ponds in section of regions we have been marked 27 species of cercaria in infested mollusks belongs to 12 families of trematods (table, fig. 3), taxonomy which has been considered according to researches (Ginecinskaya, 1968; Azimov et al., 2011; Akramova, 2011).

Table. Registered cercaria of trematods in ponds mollusks of Uzbekistan

№	Cercaria species	Host		Regions*				
		Intermediate	Final	1	2	3	4	5
1	Fasciola hepatica	L. truncatula	Mammals	+	+	+		+
2	F. gigantica	L. auricularia	Mammals	+			+	+
3	Calicophoron	Pl. planorbis,	Mammals		+		+	+

	calicophorum	A. septemgyratus, A. spirorbis						
4	C. erschovi	Pl. planorbis, G. ehrenbergi, G. gredleri	Mammals				+	
5	Gastrothylax crumenifer	Pl. planorbis, G. ehrenbergi, A. spirorbis	Mammals	+				
6	Liorchis scotiae	Pl. planorbis, A. spirorbis	Mammals	+				
7	Notocotylus attenuatus	L. auricularia, L. bactriana, L. corvus, Pl. planorbis	Birds	+	+	+	+	+
8	Notocotylus seineti	L. auricularia	Birds			+		
9	Echinostoma revolutum	L. auricularia, L. corvus, L. stagnalis, Pl. planorbis, A. septemgyratus	Birds	+	+	+	+	+
10	Echinoparyphium aconiatum	L. auricularia, L. corvus, L. stagnalis, Pl. planorbis	Birds	+			+	
11	E. recurvatum	L. auricularia	Birds	+	+		+	
12	Hypoderaeum conoideum	L. auricularia, L. corvus, L. stagnalis, L. subdisjuncta	Birds	+	+		+	+
13	Philophthalmus lucipetus	M. kainarensis	Birds				+	
14	Opisthioglyphe ranae	L. bactriana, L. stagnalis	Amphibia	+	+		+	
15	Skrjabinoeces similis	Pl. planorbis	Amphibia		+	+	+	
16	Pneumonoeces variatus	Pl. planorbis	Amphibia			+		
17	Haplometra cylindracea	L. stagnalis	Amphibia		+		+	
18	Sanguinicola inermis	L. auricularia, L. peregra	Pisces	+	+	+	+	+
19	Trichobilharzia ocellata	L. auricularia, L. stagnalis, M. kainarensis	Birds	+	+	+	+	+
20	Bilharziella polonica	Pl. planorbis, A. septemgyratus	Birds	+	+		+	+
21	Dendritobilharzia loossi	A. spirorbis	Birds				+	

22	Gigantobilharzia acotylea	A. septemgyratus, Ph. fontinalis	Birds				+	
23	Apatemon gracilis	L. auricularia, L. palustris, L. stagnalis	Birds		+		+	
24	Cotylurus cornutus	L. auricularia, L. truncatula, L. stagnalis	Birds	+	+	+	+	
25	Diplostomum spathaceum	L. auricularia, L. stagnalis	Birds	+	+		+	+
26	D. helveticum	L. auricularia, L. stagnalis	Birds	+			+	
27	Schistosoma turkestanicum	L. auricularia	Mammals	+			+	
TOTAL:				17	15	9	22	10

* - Regions: 1-North-west, 2-Central, 3-Eastern, 4-North-east, 5-Southern.

Cercaria producing by mollusks of Lymnaeidae family represented of 17 species, Planorbidae – 11 species, Melanoididae – 2 species and Physidae – one species. In other areas (upper and lower) stream of Syrdarya river ponds as shown before (Butenko, 1967; Shakhurina, Tuhmanyans, 1971), has been marked 7 and 9 species, accordingly.

According to diversity of cercaria fauna separate species of mollusks special place occupy L. auricularia and Pl. planorbis which has registered 14 and 10 species of larva accordingly.

Admittedly, cercaria – is aquatic (with a small exception) free moving larva of trematods developing in mollusks characterizing extremely large morphological diversity. Essentially, larvae image is reflection of morpho-biological diversity of mature trematods – parasites of human and vertebrates animal. (Ginecinskaya, 1968).

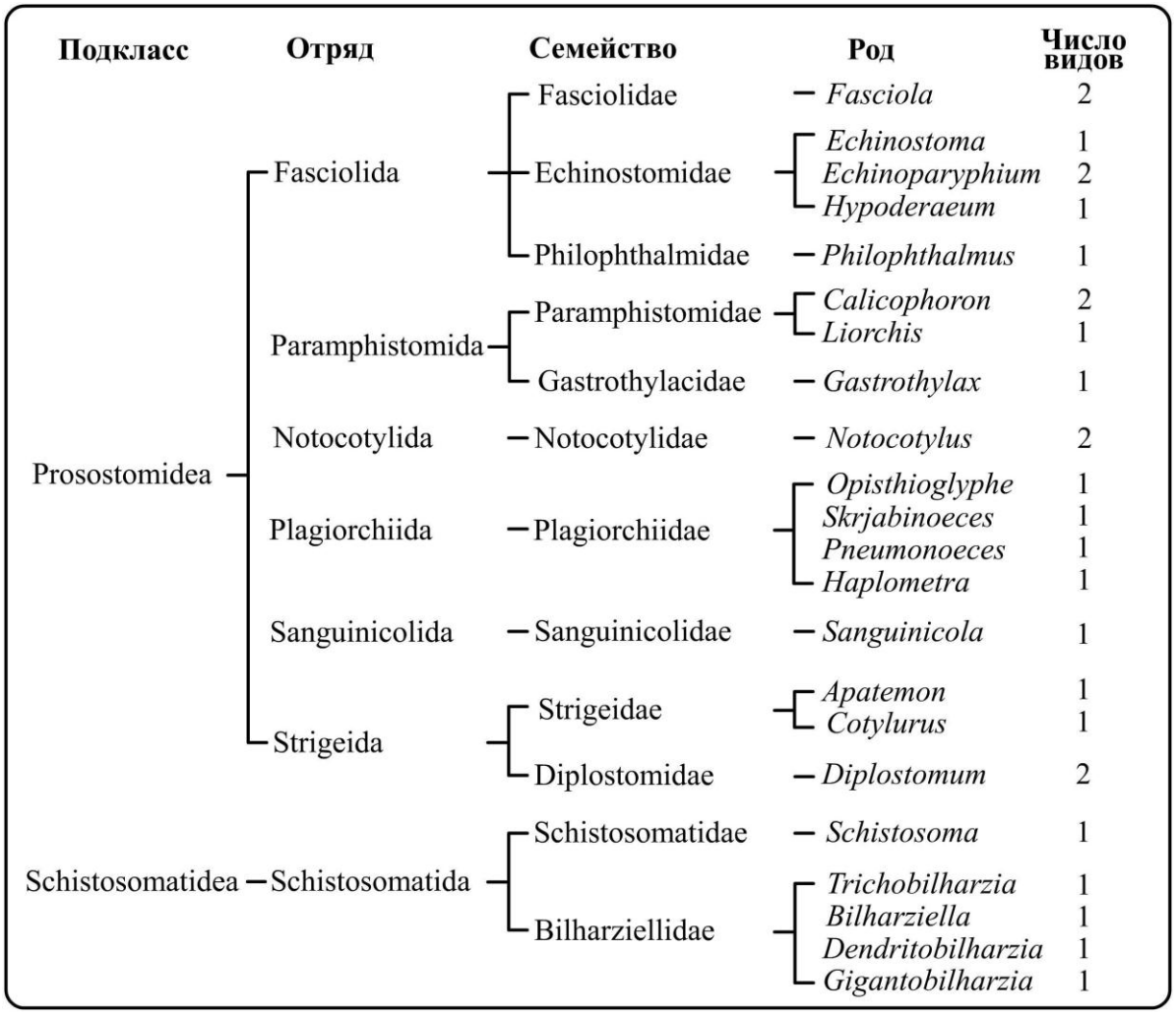

Figure 3. Taxonomic diversity of cercaria

The results of our researches show that cercaria release from mollusk – hosts is in correlative dependence from ambient factors. The most intensive cercaria releases are happened as a rule in bright solar days, when water temperature raised up to 25-30^{0}C at noon.

Cercaria emission occurs irregularly within twenty-four hours. It subordinated curtain regularities – daily rhythms. So, mollusks auricularia produced cercaria Sch. turkestanicum on the average about 6900 examples per day. The most intensive release 700-1200 has been marked in day hours (between 12 a.m. - 5 p.m.). Cercaria release in night hours has not been registered. (Fig. 4).

From mollusks Pl. planorbis emission of cercaria B. polonica occurred at temperature 25-30ºC. Average numbers of released cercaria were 9000 examples per day. In the morning hours - 50-315 examples, day hours - 1200-2500 examples, night hours - 112-1308 examples. (Fig. 5). The nature of daily rhythms of cercaria Sch. turkestanicum and B. polonica emission depends on ambient factors, which stimulate or slow down release processes of larva from host organism. (Markevich, Chernogorenko, 1976).

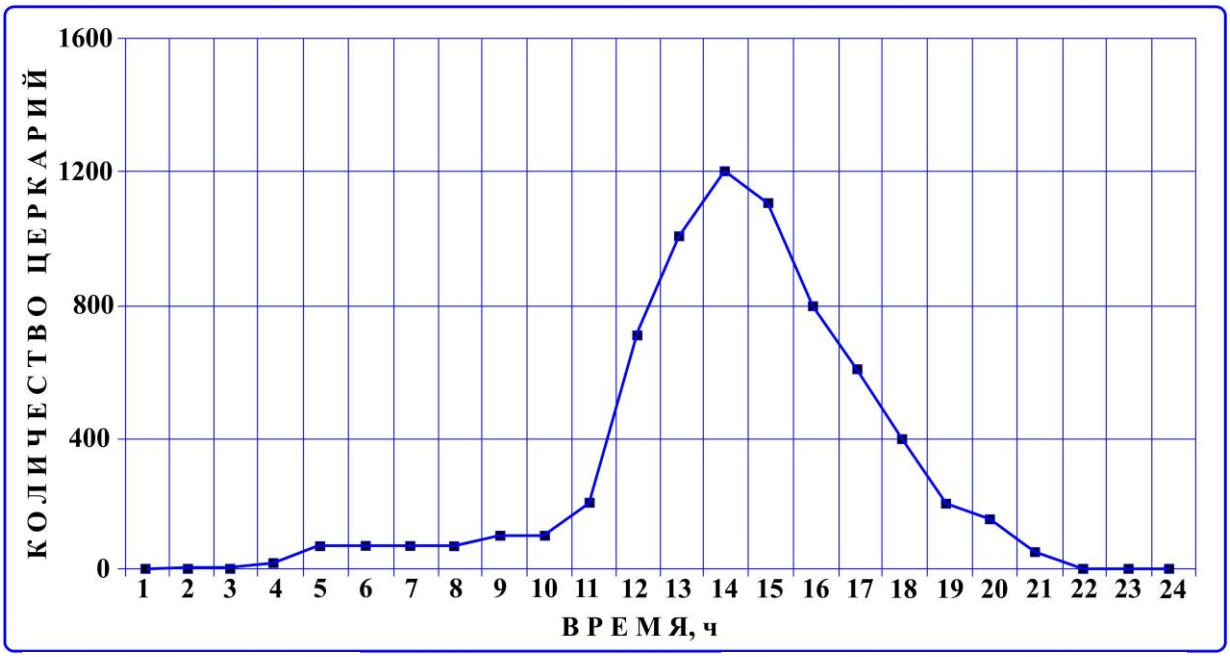

Figure 4. Daily rhythm of Schistosoma turkestanicum cercaria release from L. Auricularia mollusk at temperature 25-30°C (original)

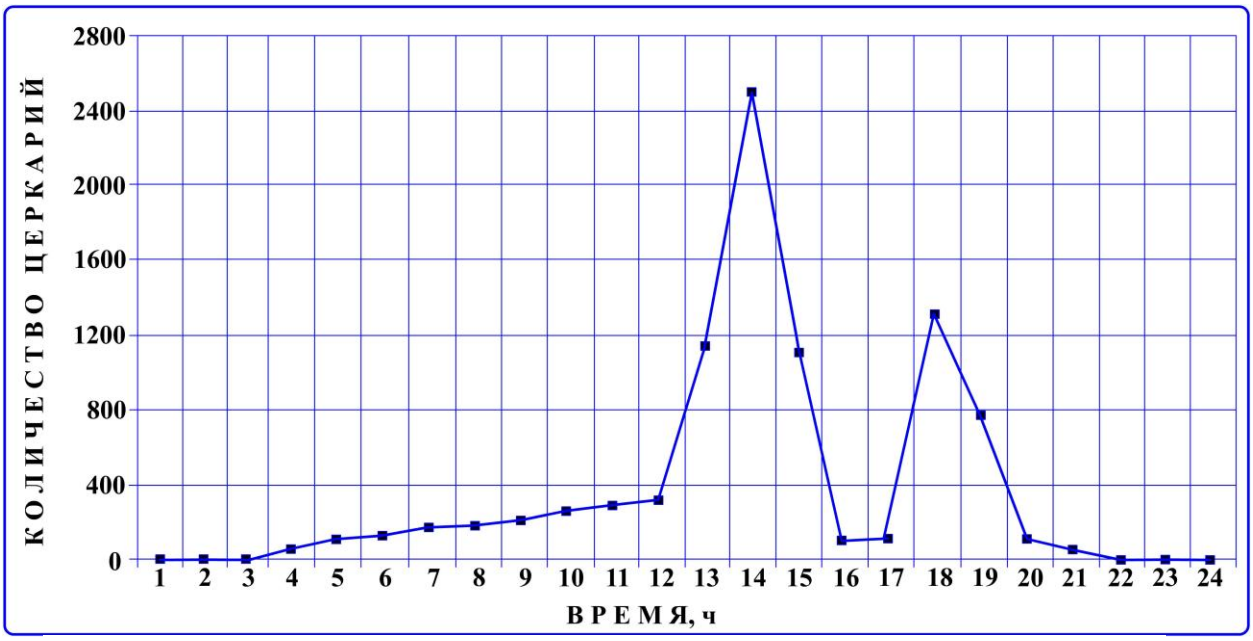

Figure 5. Daily rhythm of Bilharziella poionica cercaria release from mollusk Planorbis planorbis (original)

Daily rhythm of cercaria release is violated by changing of lighting rate. Cercaria has not been released in optimum temperature and in conditions of permanent dark, however, in spite of night time at candlelight has been marked release of cercaria, but their quantity was insignificant.

Intensity of cercaria release considering trematods also related to nature of their taxis. Taxis are playing key role in emission of cercaria from mollusk-hosts should be considered as drawn adaptation to implementation of cercaria contact with definitive host (Azimov, Dadaev, 1977; Akramova, Shakarboev, 2005).

Synchronously development of helminthes and their hosts contribute a contact of

partners and provide circulation of invasion in biocenosis. Our identified cercaria on nature of search and infestation (second intermediate and definite) of hosts may divide into the next three groups.

Cercaria of first group encystate in the environment, final hosts are infesting by swallow of adolescaria fixed in water substratum. Cercaria families: Fasciolidae, Paramphistomidae, Philophthalmidae and Notocotylidae are concerned to this group.

Cercaria of second group are characterizing that they penetrate into the body (second intermediate hosts) – of insects, fishes, amphibia et al and become metacercarias. Final hosts are infested by eating of second intermediate hosts infested by metacercarias. This numerous group is typical for Plagiorchidae, Echinostomidae, Diplostomidae and Strigeidae families.

Third group of cercaria fundamentally differ from the previous groups. Released cercaria from mollusk-host attacks and actively penetrate into the blood vessel of final host through its covers. The group of particularized trematods assimilated new ecological niche (blood vessel), cold-blooded animals (fishes, reptiles) and warm-blooded animals (birds and mammals) are concerned to this group. The representatives of this original group in our material are - Sanguinicolidae, Bilharziellidae and Schistosomatidae families.

4. CONCLUSION

Species diversity of cercaria producing by mollusks in researching ponds of Uzbekistan includes 27 species belongs to 22 genus, 15 families and 7 classes. Cercaria have been registered in 15 species of mollusks: Lymnaeidae – 8 species, Planorbidae – 5, Physidae – 1 and Melanoididae – 1. Infestation of indicated mollusks has been variated 0.1-12.6 %. Cercaria of Trichobilharzia ocellata, Bilharziella polonica, Gigantobilharzia acotylea, Dendritobilharzia loossi, (Bilharziellidae) and Schistosoma turkestanicum (Schistosomatidae) species may cause human cercariosis.

The hearths of corresponding cercaria groups in different type of reservoirs carry steady character. Potential risk of human and animal infestation by separate trematods is very high. In this connection it deserves special attention a permanent monitoring of mollusks invasion of water biocenosis by trematods cercaria in order to work out and to improve preventive system of dominant trematodosis of animals and human cercariosis.

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