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AN ATTEMPT TO EXPLAIN AFFINITIES BETWEEN *BLICCA BJOERKNA* (L.), *ABRAMIS BRAMA* (L.), AND *A. BALLERUS* (L.) ON THE GROUNDS OF THEIR PARASITIC FAUNA

PRÓBA WYJAŚNIENIA POKREWIEŃSTWA *BLICCA BJOERKNA* (L.), *ABRAMIS BRAMA* (L.) I *A. BALLERUS* (L.) NA PODSTAWIE ICH PARAZYTOFAUNY

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Various parasites found in three cyprinid fish species from the same reservoir were subject to a comparative analysis. The parasitic fauna studied was found to be very diversified, both quantitatively and qualitatively. The studies presented attempt to apply parasitologic data to explaining taxonomic bonds between the three fish species.

INTRODUCTION

The three species to be discussed are taxonomically very close indeed, but the generic affiliation of white bream – *Blicca bjoerkna* (L.) is still an open question. The species were originally described as *Cyprinus brama, C. ballerus,* and *C. bjoerkna,* respectively by Linnaeus (1758). Then Cuvier (1817) established the genus *Abramis* encompassing the species mentioned. From then on bream – *A. brama* (L.) has been ascribed to the genus *Abramis.* Heckel, in 1843, distinguished the genera: *Blicca,* a monospecific genus with *C. blicca* Gmel. (=*C. bjoerkna* L.), and *Ballerus* containing *C. ballerus* L. Some time later Heckel and Kner (1858) transferred blue bream – *A. ballerus* (L.) to the *Abramis,* while Smitt (1895) did the same with white bream. More recent authors (Berg, 1949, and others) ascribe the latter to the genus *Blicca;* Šutov (1969), however, re-transferres it to

the *Abramis* considering its teeth, spawning, crossing, fossil piocene *A. bliccoides* as well as the *Monogenoidea* parasites host specificity. The author mentioned made use of the parasitologic data collected from different regions of the Soviet Union by Gusev and Nagibina (from Byhovskij, 1962). According to Šutov, all the characters discussed by him indicate white bream to be more related to bream than to blue bream and *A. sapa* (Pall.).

In the light of the above-presented data it seemed purposeful to the present author to study and compare the *Monogenoidea* and other parasitic groups' representatives occurring in bream, blue bream, and white bream; the fishes had to be caught from the same reservoir to make sure that the materials studied were as homogenous as possible. The data on *Monogenoidea, Trematoda,* and the remaining groups were published in 1974, 1977, and 1978, respectively. The studies presented attempt to explain the taxonomic relations between the three fish species on the grounds of their parasitic fauna composition.

MATERIAL AND METHODS

The materials to be studied were collected each month, except for some winter months, from June 1969 through September 1971 in the Lake Dąbie. The lake is a rather large ad shallow water area connected with the lower section of the river Odra. The detailed description of the habitat is given by Wierzbicka (1977).

757 fish individuals: 233 breams, 295 blue breams, ad 229 white breams, were examided. Most *Trematoda* and *Nematoda* species found, some of the *Monogenoidea* and all the *Cestoda, Acanthocephala, Hirudinea,* and *Crustacea* were collected during three years. Some parasites were analysed basing either on the two-years collection or the September 1970 – September 1971 materials (Wierzbicka, 1974, 1977, 1978). Every month 10–16 (maximum 22) individuals of each fish species discussed were dissected, the fishes being generally of a similar age. The age ranged within 1+ – 10+, 1+ –9, and 1+ –12+ in bream, blues bream, and white bream, respectively.

The parasitologic dissection was performed on fresh fish following the generally accepted procedure. Detailed data on the methods applied in studying various groups of parasites are to be found in Wierzbicka (1974, 1977, 1978).

RESULTS

A total number of 51 parasitic species belonging to *Monogenoidea, Trematoda, Cestoda, Nematoda, Acanthocephala, Hirudinea,* and *Crustacea* were found in *Abramis brama* (L.), *A. ballerus* (L.), and *Blicca bjoerkna* (L.). Incidence and intensity of an individual parastite's invasion as well as infestation of the hosts discussed diverged widely.

15 *Monogenoidea* species belonging to three genera of gill parasites were revealed (Fig. 1). The species of the genera *Dactylogyrus* Diesing, 1850 and *Diplozoon* Nordmann, 1832 occurred exclusively in bream, blue bream or white bream. Only *Diplozoon paradoxum* Nordmann, 1832 was by accident found in white bream. 2 species of the

genus *Gyrodactylus* Nordmann, 1832 were recorded: *G. elegans* Nordmann, 1832, observed in three hosts, and *G. laevis* Malmberg, 1956 in blue bream and white bream.

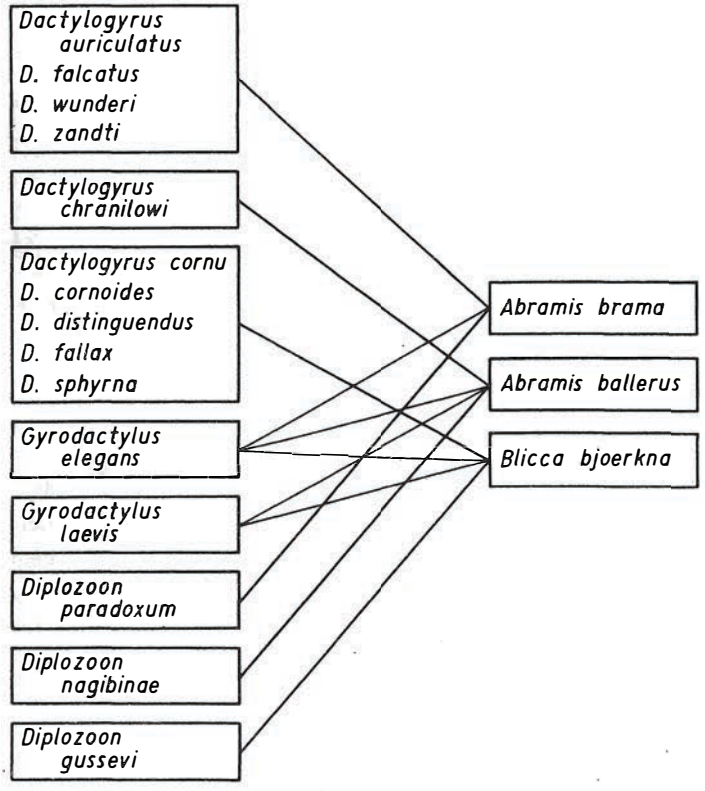

Fig. 1. Occurrence of *Monogenoidea* in *Abramis brama, A. ballerus,* and *Blicca bjoerkna* (from Wierzbicka, 1974)

Of the remaining groups, 20 trematode, 5 cestade, 4 nematode, 5 acanthocephalan hirudinean, and 3 crustacean species were noted. Most of them were those relatively very often observed in fishes under examination. Only some selected parasitic specie: those that may have a bearing on the taxonomic position of their hosts are discussed the present paper.

Intestinal trematodes *Palaeorchis incognitus* Szidat, 1943 and *Nicolla skrjab* (Ivanitzky, 1928) were noted mainly in blue bream (Fig. 2), white bream being infest to a very low degree and only one specimen of the two species each being found bream. On the contrary to those species, *Palaeorchis unicus* Szidat, 1943 occurred alm exclusively in white bream, whereas in blue bream only one this trematode was recorc and none in bream (Fig. 2).

* The complete lists of trematodes and cestodes + remaining groups found are given in the pres author's papers (1977 and 1978, respectively)

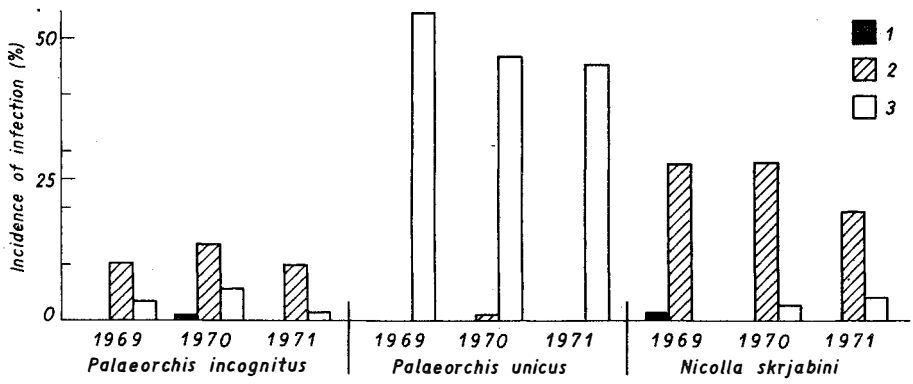

Fig. 2. Infestation of *Abramis brama* (1), *A. ballerus* (2), and *Blicca bjoerkna* (3) with trematodes *Palaeorchis incognitus, P. unicus,* and *Nicolla skrjabini*

Another intestinal trematode species, *Sphaerostomum bramae* (Müller, 1776) was most frequent and most abundant in white bream: the invasion incidence in this host ranged within 39.8–56.1% as compared to that in bream and blue bream (7.9–12.3%); only in 1970 bream showed the incidence of 24.7% (Fig. 3). Similarly, mean infestation intensity of the white bream population was decidedly higher over three subsequent years.

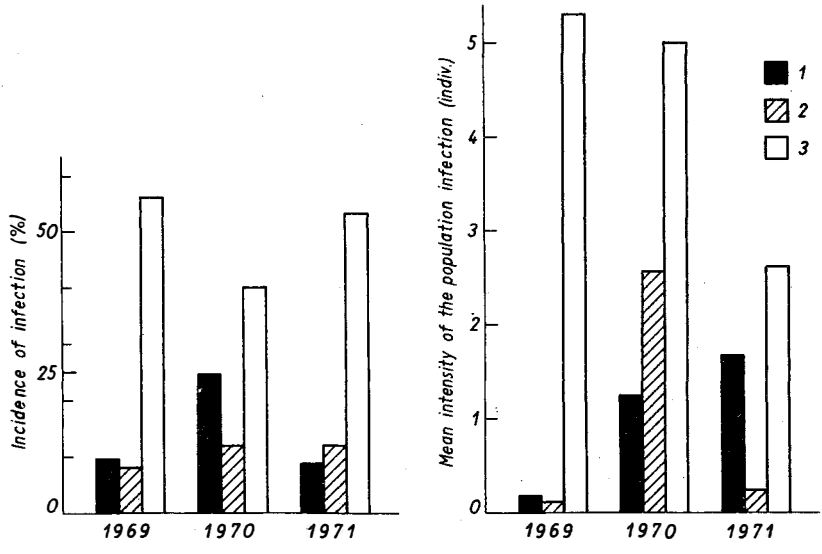

Fig. 3. Infestation of *Abramis brama* (1), *A. ballerus* (2), and *Blicca bjoerkna* (3) with trematode *Sphaerostomum bramae*

The cestode *Caryophyllaeus laticeps* (Pallas, 1781) was found chiefly in guts of bream (Fig. 4). The invasion incidence ranged within 53.4–67.6% as oppesed to the range of 3.5–19.7% noted for white bream. These parasites were only occasionally recorded in blue bream (1–1.7%). Number of *C. laticeps* found was also at its highest in bream; the mean infestation intensity of the population reached 8.66–14.9 individuals in one fish specimen dissected, 0.05–0.62 and 0.01–0.04 being the respective ranges for white bream and blue bream. On the contrary, the other species, *Proteocephalus torulosus* (Batsch, 1786) was very frequent and characteristic for blue bream (Fig. 4). In different years, it was revealed in 53.4–90.1% of the fishes examined. White bream contained these cestodes in only 1.5–3.8%, while bream on one occasion yielded three individuals of the parasite.

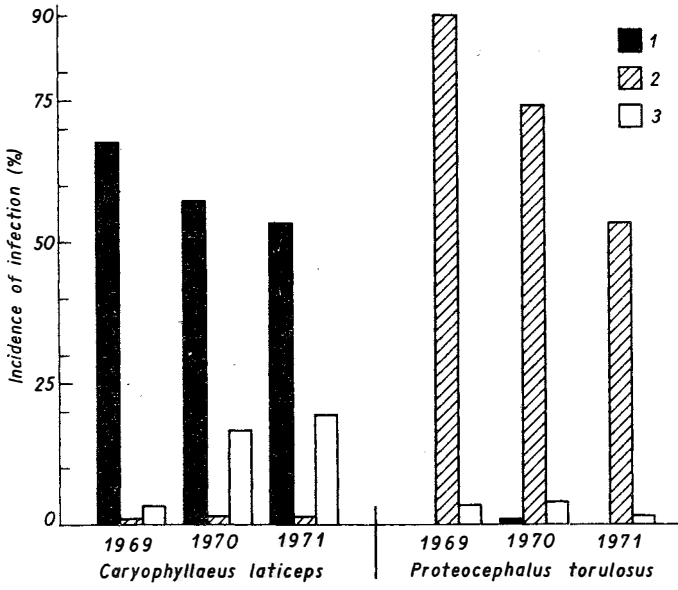

Fig. 4. Infestation of *Abramis brama* (1), *A. ballerus* (2), and *Blicca bjoerkna* (3) with cestodes *Caryophyllaeus laticeps* and *Proteocephalus torulosus*

Two nematode species found are worth paying attention to. *Philometra ovata* (Zeder, 1803) turned out to be typical of bream in the lake, very high invasion incidence being observed (Fig. 5). White bream housed this parasite only occasionally and blue bream never at all. The other species, *Thwaitia rischta* (Skrjabin, 1917) (=*Philometra rischta* Skrjabin, 1917) occurred exclusively in blue bream (Fig. 5).

Among the parasitic crustaceans, *Tracheliastes maculatus* Kollar, 1835 was frequently recorded in bream, displaying a high host specificity; it was an occasional parasite in blue bream and white bream (Fig. 6). Similarly *Ergasilus sieboldi* Nordmann, 1832 was found chiefly in bream. The invasion incidence in this host ranged within 36.2–46.5% over the

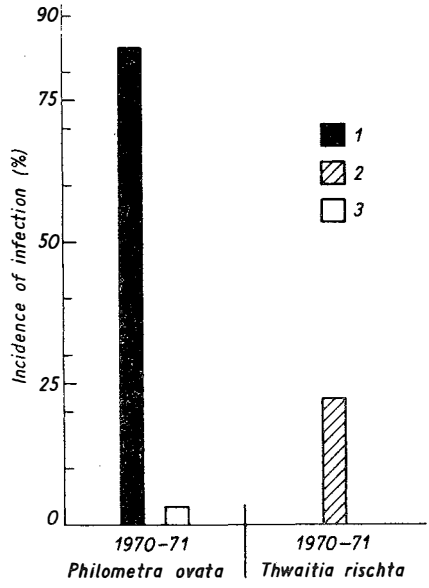

Fig. 5. Infestation of *Abramis brama* (1), *A. ballerus* (2), and *Blicca bjoerkna* (3) with nematodes *Philometra ovata* and *Thwaitia rischta*

period studied (Fig. 6), its level being lower (6.1–16%) and lowest (1.4–5.9%) in white bream and blue bream, respectively. The infestation intensity was decidedly at its highest in bream, showing a minimum in blue bream.

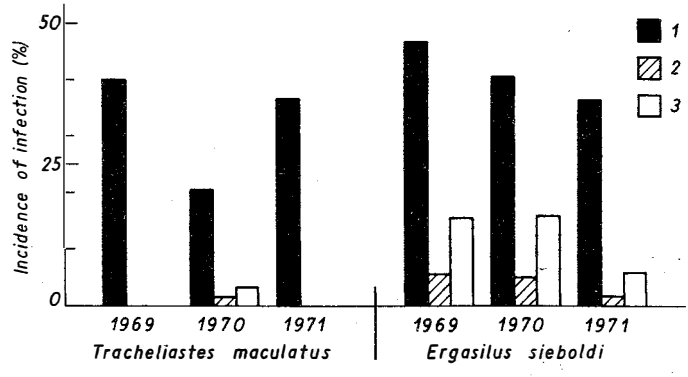

Fig. 6. Infestation of *Abramis brama* (1), *A. ballerus* (2), and *Blicca bjoerkna* (3) with crustaceans *Tracheliastes maculatus* and *Ergasilus sieboldi*

DISCUSSION

The parasitic fauna of the Lake Dąbie bream, blue bream and white bream was noteworthy for its species richness and various degree of infestation. The most diversified fauna of parasites was observed in white bream (41 species), bream and blue bream housing poorer faunas (36 and 30 species, respectively). Cosiderable variation was observed in infestation by parasites belonging to different taxa, the acanthocephalans – very rare in the reservoir studied – being an exception.

The greatest differences were found in infestation by the *Monogenoidea.* Each host had entirely different and specific parasites of the genera *Dactylogyrus* and *Diplozoon*; only those of the genus *Gyrodactylus* were common for the fishes studied. Such a high separateness of parasitic faunas of bream, blue bream, and white bream is related to the specificity of *Monogenoidea*, the fact stated by Bychowsky (1933), Prost (1957), and others.

Šutov (1969) in his ichthyologic investigations, while transferring white bream to the genus *Abramis,* among the others takes the parasitologic data into account. He quotes Bychowsky (1933) who regarded parasites of the genus *Dactylogyrus* as characteristic for host species and/or genera. Šutov also bases his considerations on data collected by Gusev and Nagibina (after Byhovskij, 1962) who sampled various ecologic habitats. According to that study, bream and white bream have as much as 8 *Dactylogyrus* species in common, while the parasitic species are different in blue bream as well as in *A. sapa.* Basing on these and other features Šutov assumes bream and white bream to be more closely related to each other than the remaining fishes of the genus *Abramis.* The present author's own studies on bream, blue bream, and white bream from the same reservoir revealed completely different species of the genera *Dactylogyrus* and *Diplozoon* typical of a particular host. These results point out to a significantly different taxonomic nature of the fishes studied.

Apart from *Monogenoidea,* also the crustaceans *Tracheliastes maculatus* found in bream were showing a high host specificity. Moreover, the nematodes: *Philometra ovata* and *Thwaitia rischta* infested almost exclusively bream and blue bream, respectively.

Marked differences were also revealed in bream, blue bream and white bream infestations with intestinal parasites. These differences concern *Trematoda* and *Cestoda* and are related to different biology and feeding niches of the fish species discussed. Blue bream is planktophagous (Kompowski, 1971; and others), while bream, from its second year of life on, feeds on benthic organisms (Brylińska and Bryliński, 1968; and others). White bream feeds on benthos in more shallow parts of the reservoir. Additionally, Filuk and Żmudziński (1965) observed a feeding selectivity in bream and white bream, which can also bear an effect on a different infestation in these fish species. For example, planktonic crustaceans *Cyclops strenuus* Fischer and *Diaptomus castor* (Jur.) (Wagner, 1917) act as intermediate hosts for *Proteocephalus torulosus,* so blue bream is to the highest extent exposed to infestation with this cestode. On the other hand, *Caryophyllaeus laticeps* has as its intermediate host an oligochaete, *Tubifex tubifex* Müll. (Sekutowicz,

1934) dwelling on a muddy bottom where bream feeds. Consequently, these parasites were recorded mainly in bream and occasionally in blue bream.

The differences observed in trematode metacercariae infestation of fishes result from their dwelling in somewhat different zones. The Lake Dąbie blue bream was usually infested to the lowest degree (Wierzbicka, 1977). This species, being pelagic, is hardly in any contact with the intermediate hosts (snails, bivalves) and has the least chance for a contact with cercariae. Certain differences in the bream and white bream infestations are also in a rather close connection with the intermediate host's habitats: for example, if the prosobranchs are the hosts, bream shows a stronger infestation (*Paracoenogonimus ovatus, Cotylurus platycephalus*); if, however, Pulmonata act as intermediate hosts, a higher invasion is found in white bream (*Posthodiplostomum cuticola*).

To summarize the results of studies on the occurrence of *Monogenoidea, Trematoda, Cestoda, Nematoda, Hirudinea,* and *Crustacea* it should be stated that the parasitic fauna of bream, blue bream, and white bream exhibits considerable variations, both qualitative and quantitative. A high degree of host specificity observed in the majority of *Monogenoidea* found indicates the equal taxonomic separateness of bream, white bream, and blue bream. Simultaneously, a considerable specificity of *Tracheliastes maculatus* in bream can corroborate the distinct nature of the fish species discussed. On the other hand, the differences in the parasitic fauna composition concerning, for instance, *Palaeorchis unicus, Proteocephalus torulosus, Philometra ovata, Thwaitia rischta,* as well as the intensity and incidence of invasions of most parasites found in bream, white bream and blue bream are related primarily to the different life histories of the species concerned, particularly to their different feeding habits. Consequently, the parasites are of a limited value as a tool for indicating the taxonomic relations between the fish species discussed. However, the diverse infestation with trematodes, cestodes, nematodes, hirudineans, and crustaceans, regardless of any ecologic, biological and other possible interactions, can also support the conclusion of the taxonomically distinct character of a host, the conclusion being drawn previously from the data on Monogenoidea. The differences observed are large enough to suggest that bream, blue bream, and white bream should be placed in different genera. The problem, however, calls for a detailed analysis of morphologic, physiologic, biologic, and other characters of the fish species under consideration. The statement as expressed above, based on the results given in the present paper, does not converge with Šutov's opinion (1969), ascribing bream blue bream, *A. sapa,* and white bream to the same genus.

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Translated: mgr Teresa Radziejewska

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Streszczenie

U leszcza *Abramis brama* (L.), rozpiórka *A. ballerus* (L.) i krąpia *Blicca bjoerkna* (L.) z jeziora Dąbie (przy ujściu Odry), w latach 1969–1971, znaleziono 51 gatunków pasożytów należących do *Monogenoidea, Trematoda, Cestoda, Nematoda, Acanthocephala, Hirudinea* i *Crustacea.* Analiza zarażenia badanych ryb pasożytami wszystkich grup systematycznych, z wyjątkiem *Acanthocephala,* które stwierdzano rzadko w jeziorze, wykazała duże zróżnicowanie. Największe różnice występowały w inwazji *Monogenoidea;* każdy żywiciel posiadał swoiste gatunki z rodzaju *Dactylogyrus* i *Diplozoon.* Z *Trematoda* wyraźne różnice zauważono w zarażeniu formami dorosłymi. Również nasilenie zarażenia metacerkariami badanych gatunków ryb było najczęściej odmienne. Niektóre *Cestoda, Nematoda* i *Crustacea* okazały się charakterystyczne dla leszcza lub rozpióra, natomiast takich

pasożytów nie stwierdzono u krąpia. Inne gatunki, z trzech wymienionych grup oraz *Hirudinea,* wykazywały różne nasilenie inwazji u omawianych ryb.

Wysoka specyficzność większości *Monogenoidea* w stosunku do badanych żywicieli, pochodzących z jednego zbiornika, wskazuje na jednakową odrębność systematyczną leszcza, krąpia i rozpióra. Również duża swoistość gatunkowa *Tracheliastes maculatus* Kollar, 1835 (*Crustacea*) może także świadczyć o odrębności omawianych ryb. Natomiast różnice w zarażeniu leszcza, rozpióra i krąpia pasożytami z grup *Trematoda, Cestoda, Nematoda, Hirudinea* i niektórych *Crustacea* wynikają często z odmiennej biologii tych ryb i mogą tylko w pewnym stopniu potwierdzać wniosek o odrębności systematycznej żywicieli. Zróżnicowanie zarażenia jest tak duże, że może sugerować odrębność rodzajową leszcza, rozpióra i krąpia; zagadnienie to wymaga jednak szczegółowych badań w zakresie innych dyscyplin.

Я. Вежбицка

ПОПЫТКА ВЫЯСНЕНИЯ РОДСТВА BLICCA BJOERKNA (L.) ABRAMIS BRAMA (L.) И A. BALLERUS (L.) НА ОСНОВЕ ИХ ПАРАЗИТОФАУНЫ

Р е з ю м е

У леща Abramis brama (L.), синца A. ballerus (L.) и густеры Blicca bjoerkna (L.) из оз. Домбе (в приустьевых участках Одры) в 1969-1971 гг. обнаружено 51 видов паразитов, относящихся к Monogenoidea, Trematoda, Cestoda, Nematoda, Acanthocephala, Hirudinea и Crustacea. Анализ заражённости исследуемых рыб паразитами всех систематических групп, за исключением Acanthocephala, которые редко встречались в озере, выявил большую разнородность. Наиболее заметные различия наблюдались при инвазии Monogenoidea; каждый хозяин имел специфические виды паразитов из рода Dactylogyrus и Diplozoon. Что касается трематод, то значительные различия отмечались в заражении взрослыми их формами. Интенсивность заражения исследуемых рыб метацеркариями также была различной. Некоторые Cestoda, Nematoda и Crustacea оказались характерными для леща или синца, в то время как у густеры эти паразиты (характерные) не были обнаружены. Другие виды из трёх перечисленных групп и Hirudinea у исследуемых рыб характеризовались различной интенсивностью инвазии.

Высокая специфичность большинства Monogenoidea по отношению к исследуемым рыбам, обитающим в одном водоёме, указывает на одинаковую систематическую обособленность леща, густеры и синца. Большая видовая специфичность Tracheliastes maculatus Kollar, 1835 (Crustacea) может также свидетельствовать о обособленности исследуемых рыб. Различия же в заражении леща,

синца и густеры паразитами из групп Trematoda, Cestoda, Nematoda, Hirudinea и некоторыми Crustacea часто вытекают из специфики биологии этих рыб и могут только в некоторой степени быть подтверждением вывода о систематическом различии хозяев. Неоднородность заражения является настолько тельной, что можно смело предполагать о родовом различии леща, синца и густеры. Однако эта проблема требует тщательных исследований в области других дисциплин.

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