ІХТІОПАРАЗИТОЛОГІЯ

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PARASITOPHAUNA OF COMMON BREAM (*ABRAMIS BRAMA L.*) FROM THE DNIPRO-BUG ESTUARY AREA

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The paper provides data from special researches within the Dnipro-Bug estuary area, the one of the most productive water areas in Ukraine. Our investigation was focused on the determination and study of the seasonal dynamics of common bream (*Abramis brama L.*) parasitophauna. The result of our researches makes possible to trace the timing of helminths infestation, as well as the timing of releasing. We calculated the prevalence of invermination (percentage of fishes in which helminths species were detected), intensity of invermination (minimum and maximum number of helminths specimens per infested fish), index number (average number of helminths species per infested fish). Of the total number of studied fishes, 95.7% were infested by helminths. A total of 30 species of helminths were identified, which belong to 4 classes: *Trematoda, Monodenoidea, Cestoidea, Nematoda*. It is established that the parasitophauna of common bream directly depends on the nature and type of the reservoir, its ecological conditions. Each typical water area, in our case, has its own specific parasitophauna, which depends on the hydrological regime and the presence or absence of final and intermediate hosts, i.e. the individual combination of abiotic and biotic factors. The most shared males and females of common bream infected with digenetic trematodes *(Trematoda)*, the total defeat of which was 75.1%. Of these, 43.5% fish specimens were infected with marita trematodes, and 62.7% – metacercaria. Monogenetic suckers were found in 80.6% specimens of common bream, tapeworms (*Cestoda*) in 82.0%, and nematodes *(Nematoda)* in 8.8% specimens of common bream.

Studies have shown a fairly high degree of common bream infestation with helminths. This fact, obviously, should be used like the additional reason for a decrease in the number of common bream populations from the Dnipro-Bug estuary area and, accordingly, a decrease in the catch volumes from one of the main industrial objects.

Keywords: common bream, Dnipro-Bug estuary area, fish, parasites, infestation, helminth fauna.

Formulation of the problem. The pressure of human economic activity on natural ecosystems during the last years has reached a level that exceeds their

capacity for self-recovery. These circumstances, leads to the gradual degradation of the biotic complex. The most difficult situation is observed in aquatic ecosystems, a certain static nature of which does not allow them to quickly adapt to the emerging changes [1, c. 406; 2, c. 438].

The situation is further aggravated by the fact that the agrarian and industrial-household complexes withdraw significant volumes of fresh water from circulation and instead discharge untreated or insufficiently purified water into the river system, which contains a list of components that are not characteristic of the hydroecosystem. It is has a serious destructive influence on the hydrobiocenoses. The growth of anthropogenic pressure on hydroecosystem negatively affects the living conditions, reproduction and feeding of hydrobionts. First of all it concern especially valuable anadromous and semi-anadromous commercial fish species. That's why occurs a decrease in the number of commercial fish stocks, increases the variability of their main biological indicators, and a redistribution of the ichthyofaunas structure is recorded [3, c. 145]. Over the past 25–30 years, there has been a sharp decline in productivity and a decrease in the species diversity of freshwater and brackish-water, anadromous and semi-anadromous fish species in most of all Ukrainian hydroecosystems [3, c. 146; 4, c. 24]. This led to the development of degradation processes within the entire estuarine hydroecosystem, which caused a sharp decline in productivity [3, c. 147-148; 5, c. 63, 5, 6]. At the same time, a particularly negative situation has developed in the Dnipro-Bug estuary area, where fish stocks have suffered the most among river systems. Due to the growing anthropogenic pressure, unsatisfactory conditions have been created for the natural reproduction and feeding of fish. The state of the most widespread commercial fish populations – common bream (*Abramis brama L.*) from inland waters of Central and Eastern Europa, is no exception. Contrary to this background, occurs the very critical ichthyopathological situation, because the resistance of fish to parasites is determined not only by their size, age, sex and physiological condition, but also depends on the state of the ecological environment.

Analysis of researches and publications. The qualitative and quantitative composition of parasitophauna, features of its vital activity and influence on commercial fish fauna ichthyofauna have been studied quite fully. They were provided in numerous modern data [6, c. 4; 7, c. 428-445; 8, c. 155-157], which in the complex provided important results for theory and practice.

Recently, the interest of scientists to determine the presence of a relationship between infection by various types of parasites and environmental factors if the hydroecosystem, as well as biological characteristics of the host fish, has increased significantly [8, c. 156; 9, p. 202; 10, c. 39-40].

Scientists pay much attention to the study of the parasites spread and the average intensity of infestation depending on the age of the fish [10, c. 42;

11, с. 389; 12, с. 64]. No less attention is paid to the influence of parasites on the physiological state of common bream (*Abramis brama L.*). In particular, studies have revealed changes in the proportions of various enzymes in the intestinal cavity, depending on the infestation degree of common bream by helminths [13, с. 44; 14, с. 239-240]. It has also been found that the muscles of common bream infested with *Lamblia intestinalis* contain less protein, fat, ash, calcium and phosphorus and have lower caloric content compared to healthy fish [15, с. 198]. In general, the infection of common bream with this helminth leads to a decrease mass and a deterioration biochemical quality of their muscles, in comparison with healthy fishes [15, с. 197; 16, с. 183].

Common bream is an important link in various aquatic ecosystems; its parasitophauna has undergone significant changes due to an increase in anthropogenic load [3, с. 113-114]. However, the question of the entire aggregate influence by parasites in relation to the state of common bream population from the Dnipro-Bug estuary area has not yet been studied. At the same time, the study of helminthic diseases of common bream makes it possible to better understand the biology of parasites, as well as way for developing preventive measures to epizootics process, which are annually recorded in the hydroecosystem from above-mentioned estuary area.

Setting objectives. An important characteristic for every group of fish, which is mostly neglected, is the level of its infestation with pathogens. Paying attention to this issue, special ichthyopathological studies were carried out, within the framework of which the common bream's infestation, from the Dnipro-Bug estuary area, was studied. The main emphasis in these studies was focused on the helminth fauna, which is the most value characteristic of benthophages, including inherent the common bream (*Abramis brama L.*).

Materials and methods of research. The research was guided by the principles of bioethics. The studies were carried out in accordance with the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes ETS No. 123 and approved by the Science Council of the Kherson State agrarian and economic University. Parasitofauna of common bream was studied in June – July from 2018 till 2019. Ichthyological material was obtained in areas of active common bream fishing within the waters of Oleshkivsky and Belozersky districts of Kherson region. A total of 445 common bream aged 3 + –8 + years were studied. Ichthyological samples were taken from industrial catches by randomization. Analysis of ichthyological material was performed by the method of biological analysis [17, с. 242-249].

Complete parasitological analysis was performed according to the method of Bykhovskaya-Pavlovskaya [18] on living material in the laboratory. Parasites found in fish were recorded, and then temporary and permanent drugs were prepared to identify species by morphological characteristics [19].

We calculated the prevalence of invermination (percentage of fishes in which helminths species were detected), intensity of invermination (minimum and maximum number of helminths specimens per infested fish), index number (average number of helminths species per infested fish).

Special ichthyopathological researches were aimed at studying the seasonal dynamics of the bream's helminth fauna, as a result of which it was possible to trace the timing of its invermination and release from parasites.

Research results. Studies have shown a complex epizootic situation in the bream population of the Dnipro-Bug estuary area**.** Of the total number of fish that were studied (n = 445 specimens), invermination were recorded in 426 specimens, that is, 95.7% common bream were parasite hosts. In total, 30 species of helminths from 4 classes were found in abovementioned fish: *Trematoda, Monodenoidea, Cestoidea, Nematoda* (Table 1).

The total invermination of common bream with digenetic trematodes was 75.1% and, in this group 43.5% of fish were infested with maritas and 62.7% with metacercariae.

Table 1. **Helminth fauna of common bream *(Abramis brama)* from the Dnipro-Bug estuary area**

Helminths species	Localization of helminths	Lower reach of Dnipro n = 220	Dnipro-Bug firth n = 225
		% of invermination	% invermination
1	2	3	4
1. *Dactylogyrus falcatus*	gills	1.6	32.0
2. *D. cornu*	-//-	16.6	8.0
3. *D. nanus*	-//-	0.8	-
4. *D. wunderi*	-//-	38.2	-
5. *D. auricularis*	-//-	13.3	-
6. *D. zandti*	-//-	0.8	-
7. *Diplozoon paradoxum*	-//-	57.5	48.0
8. *Aspidogaster limacoides*	stomach	5.0	-
9. *Phyllodistomum elongatum*	renal duct	0.8	4.0
10. *Sphaerostoma bramae*	stomach	4.1	-
11. *Asymphylodora imitans*	-//-	20.0	-
12. *A. kubanicum*	-//-	18.3	-
13. *Crowcrocoecum skrjabini*	-//-	10.8	-
14. *Bucephalus lawae sp.*	muscles	9.1	-
15. *Cotylurus pileatus*	heart, liver	5.8	-
16. *Diplostomulum spathaceum*	lens	3.3	-
17. *D. clavatum*	vitreous body	12.3	4.0
18. *Posthodiplostomum cuticola*	skins, fins	5.8	-

Table 1 (Continued)

1	2	3	4
19. *Hysteromorpha triloba*	muscles	5.8	20.0
20. *Opisthorchis felineus*	-//-	13.3	-
21. *Metagonimus yokogawai*	scale	9.1	-
22. *Trematoda lawae sp.*	muscles	29.1	-
23. *Caryophyllaeus laticeps*	stomach	71.6	84.0
24. *C. fennica*	-//-	1.6	8.0
25. *Ligula intestinalis*	cavitas abdominalis	7.5	12.0
26. *Digramma intevupta*	-//-	5.0	8.0
27. *Proteocephalus torulosus*	stomach	1.6	4.0
28. *Rhaphidascaris acus*	hepar	3.3	-
29. *Capillaria brevicapsula*	stomach	3.3	-
30. *Philometra ovata*	cavitas abdominalis	4.1	-

Monogenetic suckers were found in 80.6% specimens of common bream, tapeworms in 82.0% specimens of common bream, and nematodes in 8.8% of abovementioned fish species.

Analysis of the helminth fauna of common bream depending on the place of fishing revealed some differences in the degree of his infestation with some one specific class of helminths, which clearly reflect by the data in table 2.

Table 2. **Prevalence of common bream invermination**

Location	**Number of studied fish, spc.**	**% of invermination**	***Trematoda***			***Monodenoidea***	***Cestoidea***	***Nematoda***
			total	**maritas**	**metacercariae**			
Lower reach of Dnipro	220	91.4	85.8	51.6	70.8	82.5	81.6	10.8
Dnipro-Bug firth	225	100.0	24.0	4.0	24.0	40.0	92.0	-

The analysis of the obtained data showed that the prevalence of common bream invermination does not have significant differences. At the same time, it is high enough indicators for this fish species. Significant differences are observed in the species composition of helminths, which is explained, apparently, by differences in ecological characteristics of the studied hydroecosystem.

Thus, the composition of the helminth fauna in above-mentioned fish depends on a number of factors, namely on the physic and chemical parameters of the water area, the species composition of the organisms that inhabit it, and the density of their groups, and a number of other environmental factors. The

complex of hydrological and biological factors changes significantly in different seasons of the year. So, this affects the helminth fauna of common bream. Based on this, we studied and analysed the seasonal fluctuations of the invermination and the dependence of helminth fauna on the characteristics of the water area.

Thus, we have the valid reason to make the statement that the parasitofauna of common bream directly depends on the nature and type of the hydroecosystem. It's ecological conditions for the most part. Each typical water area, in our case, has its own specific parasitofauna, which depends on the hydrological regime and the presence or absence of final and intermediate hosts, i.e. the individual combination of abiotic and biotic factors. Even minor changes in the hydrological regime of reservoirs affects the freely existing fauna and through it, or directly – on the fauna of parasites.

The obtained materials clarify the qualitative and quantitative differences in the helminth fauna from the different parts of the Dnipro-Bug estuary area. There are differences both in the extent of common bream infestation with helminths of different groups and in the species composition of these parasites. The total invermination percentage of common bream from Lower reach of Dnipro, against the background of a more diverse species composition of helminths, is slightly lower than in the Dnipro-Bug firth.

Common bream from the floodplains in the Lower reach of Dnipro Lower Dnieper have a higher degree of invermination with different species of digenetic trematodes. Such a high incidence of fish from this part of the Dnipro is due primarily to the presence in this area of a rich and diverse fauna of invertebrates, which serve as intermediate and additional hosts for digenetic trematodes. Slow flow, relatively shallow depths, silted bottom and other factors contribute to the development and widespread distribution of larval forms of trematodes (70.8%). In addition, the prevalence of trematodes in common bream can be attributed to the presence of molluscs of the genus *Fagotia*, which are the main intermediate host of trematodes, and the complete absence of the latter in the estuary.

In the Dnipro-Bug firth, where the fauna of freshwater mollusks is poorer, the species composition of the trematodes is limited. Obviously, the composition of the helminth fauna of common bream within this area is affected by periodic salinization of water, which occurs from autumn to spring floods. The decrease in the extent of monogenean invasion is also associated with increased water mineralization in the Dnipro-Bug firth.

Stably high for bream, regardless by the place of capture, is affected by tapeworms, which is due to the presence of a large number of intermediate hosts – crustaceans, and the main hosts – fish-eating birds in the Lower reach of Dnipro and Dnipro-Bug firth.

The least represented was the fauna of nematodes. The extent of common bream infestation in the Lower reach of Dnipro did not exceed 10.8%, and fish

from the Dnipro-Bug firth did not have them at all. This is obviously facilitated by the high sensitivity of nematode larvae to high salt content.

Conclusions and prospects. Thus, the conducted ichthyopathological studies revealed a rather high degree of common bream population infestation from the Dnipro-Bug estuary area with helminthic parasites. This fact can obviously be an additional reason for the decrease in the number of common bream populations within the estuary hydroecosystem and, consequently, the decline in commercial catches this one of the main industrial objects of the Ukrainian fisheries.

ПАРАЗИТОФАУНА ЛЯЩА *ABRAMIS BRAMA* L. ДНІПРОВСЬКО-БУЗЬКОЇ ГИРЛОВОЇ ОБЛАСТІ

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В статті наводяться дані спеціальних досліджень, проведених нами в межах Дніпровсько-Бузької гирлової області, яка є одною із найбільш продуктивних акваторій України. Головний акцент у цих дослідженнях був зосереджений на визначенні на вивчення сезонної динаміки гельмінтофауни ляща, у результаті чого вдалося простежити за термінами зараження ляща гельмінтами, а також визначити терміни звільнення риб від паразитів. Ми розрахували поширеність інфекції (відсоток особин-господарів, у яких були виявлені види паразитів), інтенсивність зараження (мінімальна та максимальна кількість зразків паразита на одну інфіковану особину), індекс чисельності (середня кількість екземплярів паразитичних видів на одну досліджувану особину господаря). Із загальної кількості досліджених риб виявились 95,7% ураженими. Всього було виявлено 30 видів гельмінтів, які відносяться до 4 класів: *Trematoda*, *Monodenoidea*, *Cestoidea*, *Nematoda*. Встановлено, що паразитофауна ляща безпосередньо залежить від характеру і типу водойми, її екологічних умов. Кожному типові акваторії, у нашому випадку, відповідає своя специфічна паразитофауна, що залежить від гідрологічного режиму і від наявності або відсутності остаточних та проміжних хазяїв, тобто від індивідуальної комбінації абіотичних і біотичних факторів. Найчастіше зустрічалися самці і самиці ляща, заражені дигенетичними трематодами, загальне ураження якими склало 75,1%. З них у 43,5% риб знайдено маріти трематоди, у 62,7% – метацеркарії. Моногенетичні присисні знайдені у 80,6% особин ляща, стьожкові гельмінти – у 82,0%, нематоди – у 8,8% лящів.

Дослідження виявили досить високий ступінь зараженості стада ляща гельмінтопаразитами. Цей факт, очевидно, може бути додатковою причиною зменшення чисельності стада ляща в межах гирлової гідроекосистеми і, відповідно, падіння об'ємів вилову одного з основних промислових об'єктів.

Ключові слова: лящ, Дніпровсько-Бузька гирлова область, риба, парзити, ураженість, гельмінтофауна.

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