

DIVERSITY OF FISH FAUNA IN THE CATCHMENT AREA OF THE PRUT RIVER IN REPUBLIC OF MOLDOVA

BY

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Key words: fish fauna; Prut River; fish ecology; Shannon's index; fish diversity.

The paper presents the current state of the fish fauna diversity in the catchment area of the Prut River. Researches are focused on the lower Prut and the areas of confluence of small rivers with it demonstrated the occurrence of 37 fish species and subspecies. Three fish species (orfe, chop, little chop) are protected by the law and are listed in the Red Book of the Republic of Moldova. Comparative analysis of fish species diversity in the water bodies using Shannon's index demonstrated a large diversity in the middle and lower Prut. The ichthyologic studies conducted in the Prut River catchment area resulted in the identification of 44 fish species and subspecies belonging to 10 families.

Introduction

Currently the Republic of Moldova seeks integration in different European structures in the context of some conventions and agreements on aquatic resources, including with Romania, in relation to the border stretches along the rivers of Prut and Danube, at the level of intergovernmental agreements. An agreement between the governments of the former USSR and the Socialist Republic of Romania (Bucharest, 16 December 1971) resulted in building the Costești-Stânca water management scheme. At present, this structure secures water supply of the local business actors, safeguards around 100,000 ha of agricultural areas and many built-up areas on both banks of the Prut against floods.

However, the operation of the aforementioned scheme and other water management constructions on the river tributaries, water uptake for irrigation and urban needs, pollution with wastewaters, alteration of hydrological regime as a result of power station activity, as well as other human activities brought about negative changes in the fish fauna composition, ongoing replacement of valuable species with the species of slow growth rate and those of low economic value, modification of the reproduction conditions for the indigenous fish species.

The ichthyologic research being carried out up to present was quite irregular due to the restrictions related to the transboundary status of the Prut River (Попа, 1962, 1976; Bănărescu, 1964; Попа, Фрунза, Панас, 1985). This created a compelling need

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for the intensification of monitoring activities in relation to the fish fauna of the Prut River, including the Costești-Stânca Reservoir, the floodplain lakes of Manta and Beleu; the survey of the taxonomic structure of their fish fauna in the changed ecological conditions.

Material and methods

The ichthyologic research was conducted during the period of 1996-2002. The ichthyologic materials were collected and processed using conventional standard methods (Правдин, 1966).

Species diversity of the fish fauna of the Prut, its tributaries, the Costești-Stânca Reservoir was calculated for 23 ecosystems. Species determination of the fish individuals caught was performed according to Беpr (1948-1949), Bănărescu (1964), Пона (1976).

Results and discussions

The research performed on the middle Prut (the Criva-Corpaci stretch) resulted in finding 24 fish species and subspecies falling into 6 families, of which the most diverse were Cyprinidae – 15 species, followed by Percidae – 4 species, Cobitidae – 2 species, Esocidae, Siluridae and Gobiidae each being represented by a species. In terms of species ecology, the fish fauna of the stretch is attributed to the potamophilous-limnophilous assemblage.

Economic interest present nine species (northern pike, carp, asp, bream, zander, European catfish, silver carp, spotted silver carp, zante), or 37.5% of the species richness, but their relative amount is below 12.5%. Low economic value have 7 species (roach, golden carp, chub, undermouth, white-eye, white bream, perch), or 29.2%. A species (chop) – 4.2% – belongs to rare species, is protected by the law and listed in the Red Book of the R. of Moldova. The rest of species – 29.1% – are of no economic value.

Such species as burbot and Danube salmon were not identified at the stretch being studied, though, according to the literature on the topic, their occurrence is possible here (Пона, 1976).

The survey on the Costești-Stânca Reservoir demonstrated that it is populated by 26 fish species and subspecies belonging to 6 families, of which the Cyprinidae family is the most diverse (17 species and subspecies). Three species represent Percidae, 1 species – Cobitidae, 3 species – Gobiidae, 1 species – Esocidae and 1 sp. – Siluridae.

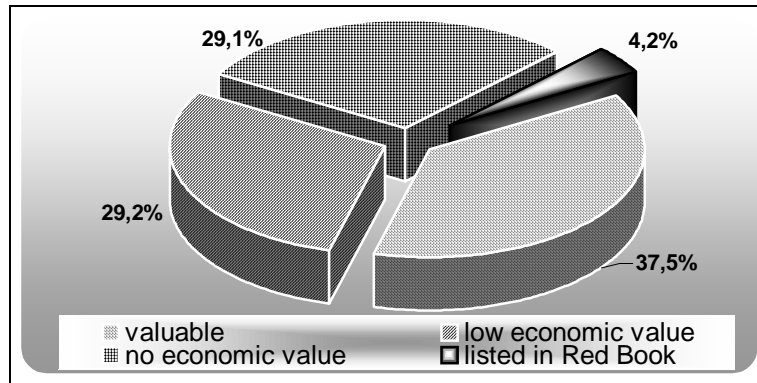


Fig. 1. Group distribution of fish species in the middle Prut.

Ten (38.8%) fish species and subspecies are of economic interest (northern pike, asp, Danube bream, zante, carp, silver carp, spotted silver carp, European catfish, grass carp, zander), 8 (30.8%) species are of low economic value (roach, rudd, chub, undermouth, white-eye, white bream, golden carp, perch), and 8 (30.8%) species are of no economic value (gudgeon, bleak, Amur bitterling, ruff, tube-nosed goby, monkey goby, big-headed goby and spiny loach). The most frequent species are bream, golden carp, and white-eye. Asp, zander, carp, zante and European catfish have lower occurrence. Silver carp and spotted silver carp are found in catches quite sporadically. The species predominant among the fish of low economic value are roach, perch, white-eye, and among the fish of no economic interest - bleak, gudgeon, Amur bitterling, ruff and tube-nosed goby.

The scientific research conducted in the main stream of the middle Prut (the Costești-Leușeni stretch) and its major tributaries (the rivers of Camenca, Glodeanca, Șovăț, Delia, Varșava, Obrej, Călmățui) unaffected by water management schemes demonstrated the occurrence of 30 fish species and subspecies which, systematically, fall into 6 families: Cyprinidae (20 species), Percidae (5 species), Gobiidae (2 species) and Esocidae, Cobitidae and Siluridae each represented by 1 species.

Among the fish individuals caught in the aforementioned stretch, 9, or 30% are of economic interest (asp, zante, carp, silver carp, catfish, bream, northern pike, zander, barbel), but their relative amount is rarely in excess of 19.1%. Also 9 species, or 30.0% are of low economic value (rudd, chub, saberfish, undermouth, white-eye, white bream, golden carp, perch, roach), with a higher proportion – 28.8%. Two species (chop and little chop), or 6.7% are protected by the law and are listed in the Red Book of the Republic of Moldova. Of no economic value are 10 species, or 33.3% of the total number of fish species found at this stretch (bleak, Amur bitterling, ruff, spiny loach, white-finned gudgeon, Dnestr long-whiskered gudgeon, tube-nosed goby, verkhovka, stone moroko, monkey goby), and their relative amount is 50.9%.

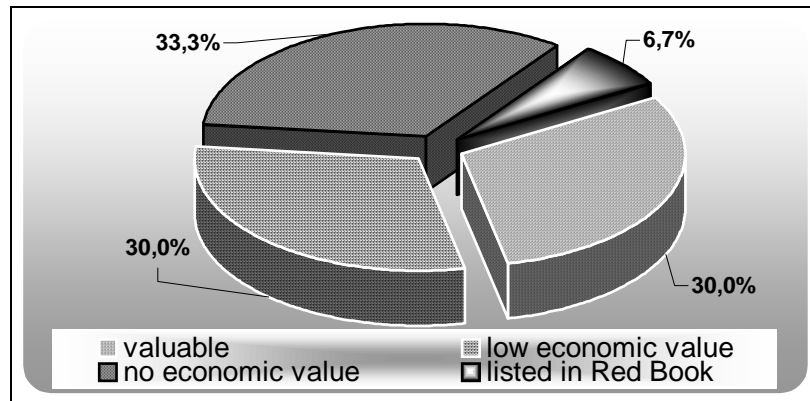


Fig. 2. Group distribution of fish species in the middle Prut (the Costești-Leușeni stretch).

The results of the research being mainly focused on the areas of confluence of small rivers with the lower Prut demonstrated the occurrence of 37 fish species and subspecies which belong to 10 families: Acipenseridae (1), Clupeidae (1), Esocidae (1), Cyprinidae (22), Siluridae (1), Percidae (5), Gobiidae (2), Gasterosteidae (1), Cobitidae (2), and Centrarchidae (1).

Out of the fish species found in the lower Prut, 10, or 27.0% are of economic interest (sterlet, pike, asp, bream, zante, silver carp, carp, European catfish, zander, barbel), but their relative amount is normally below 21.6%. Nine species, or 24.3% are of low economic value (roach, chub, undermouth, white-eye, golden carp, saberfish, rudd, perch, Caspian shad) with a quantitative proportion of 34.2%. Three species (orfe, chop, little chop), or 8.1% are protected by the law and are listed in the Red Book of the Republic of Moldova. Of no economic value are 15 species found at this stretch (verkhovka, white bream, bleak, Amur bitterling, Dnestr long-whiskered gudgeon, white-finned gudgeon, dace, stone moroko, ruff, nine-spined stickleback, tube-nosed goby, spiny loach, monkey goby, loach, common sunfish), and their relative amount comprises 43.1%.

Fish survey on the lakes of Belev and Manta demonstrated the occurrence of respectively, 27 and 23 fish species and subspecies. The fish fauna of lake Belev is dominated by golden carp (23.5%) and bleak (17.6%), followed by perch (10.7%) and Amur bitterling (5.2%). Among the species of economic value the most frequent are zander (4.2%) and carp (3.8%). In lakes Manta the dominants are the populations of golden carp (28.6%) and perch (21.5%) followed by bleak (12.2%) and roach (7.4%). Among the species of economic value, only zander (3.6%), carp (2.3%) and asp (1.6%) were found. In the springtime, during the reproduction period, the species composition and the frequencies of occurrence of some fish species changes.

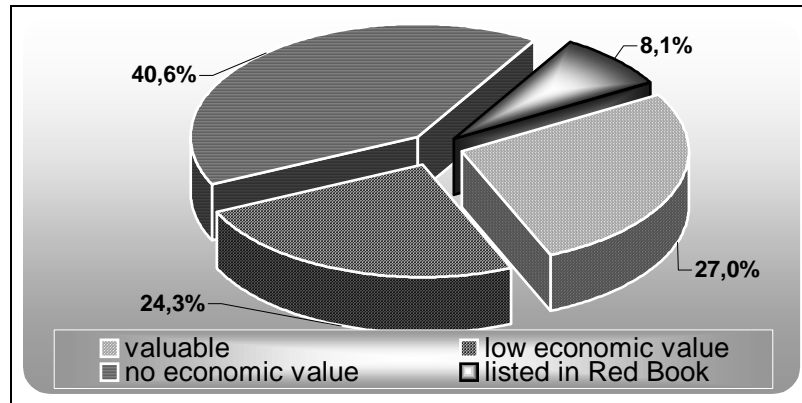


Fig. 3. Group distribution of fish species in the lower Prut, according to their economic value.

The taxonomic composition of fish fauna in small rivers is determined by the type of studied ecosystem. These rivers have highly variable water discharge and therefore are very vulnerable to the natural and human-induced factors, which influence them. In these conditions, the most of fish species do not resist the pressure of the mentioned factors. As a result, they occur in an ecosystem for a short term, when conditions are favorable to them. Such a taxonomic structure is characterized by high flexibility of species occurrence can be considered a feature of small rivers in the southern Moldova.

Comparative analysis of species diversity in the water bodies using Shannon's index demonstrated the following: the largest diversity was found in the middle and lower Prut ($I_{sh}=1,33..1,34$), and the lowest – in the Obrej, a tributary of the Prut ($I_{sh}=0,61$). This implies that the ecological conditions are most balanced in the main stream of the Prut River, which allows a bigger number of fish species to coexist and to develop normally as compared to the tributaries studied.

Thus, the ichthyologic research in the Prut catchment area uncovered the current state of its fish fauna which comprises 44 fish species and subspecies attributed to 10 families (tab. 1).

Table 1. The list of fish species of the Prut catchment area

Nr	Fish species	Species diversity
I. fam. Acipenseridae		
1.	Sterlet – <i>Acipenser ruthenus</i> (L)	R
II. fam. Clupeidae		
2.	Caspian shad – <i>Alosa caspia nordmanni</i> (Ant.)	F
III. fam. Esocidae		
3.	Northern pike - <i>Esox lucius</i> (L)	F
IV. fam. Cyprinidae		
4.	Roach – <i>Rutilus rutilus</i> (L)	N
5.	Heckel's roach – <i>Rutilus rutilus heckeli</i> (Nord)	N
6.	Dace – <i>Leuciscus leuciscus</i> (L)	F
7.	Chub – <i>Leuciscus cephalus</i> (L)	F
8.	Orfe – <i>Leuciscus idus</i> (L)	R
9.	Rudd – <i>Scardinius erythrophthalmus</i> (L)	N
10.	Grass carp – <i>Ctenopharyngodon idella</i> (Vall.)	R
11.	Asp - <i>Aspius aspius</i> (L)	F
12.	Verkhovka – <i>Leucaspis delineatus</i> (Heck)	N
13.	Undermouth – <i>Chondrostoma nasus</i> (L)	F
14.	Gudgeon – <i>Gobio gobio</i> (L)	F
15.	Dnestr long-whiskered gudgeon – <i>Gobio kessleri</i> (Dybow)	F
16.	White-finned gudgeon – <i>Gobio albipinatus belingi</i> (Fang)	F
17.	Brabel – <i>Barbus barbus</i> (L.)	F
18.	Bleak – <i>Alburnus alburnus</i> (L)	N
19.	White bream - <i>Blicca bjoerkna</i> (L)	N
20.	Bream – <i>Abramis brama danubii</i> (L)	F
21.	White-eye – <i>Abramis sapa</i> (Pallas)	F
22.	Zanthe – <i>Vimba vimba vimba</i> (Lin)	R
23.	Stone moroko – <i>Pseudorasbora parva</i>	N
24.	Amur bitterling – <i>Rhodeus sericeus amarus</i> (Bloch)	N
25.	Saberfish – <i>Pelecus culturatus</i> (L)	F
26.	Crucian carp – <i>Carassius carassius</i> (L)	R
27.	Golden carp – <i>Carassius auratus gibelio</i> (Bloch)	F
28.	Silver carp – <i>Hypophthalmichthys molitrix</i> (Vall.)	R
29.	Spotted silver carp – <i>Aristichthys nobilis</i> (Rich.)	R
30.	Carp – <i>Cyprinus carpio</i> (L)	R

Diversity of fish fauna in the catchment area (...)

Nr	Fish species	Species diversity
V. fam. Cobitididae		
31.	Spiny loach - <i>Cobitis taenia</i> (L)	N
32.	Loach - <i>Misgurnus fossilis</i> (L)	F
33.	Groundling - <i>Noemachilus barbatulus</i> (L)	R
VI. fam. Siluridae		
34.	European catfish - <i>Silurus glanis</i> (L)	R
VII. fam. Gasterosteidae		
35.	nine-spined stickleback – <i>Pungitius platigaster</i> (L)	N
VIII. fam. Percidae		
36.	Zander – <i>Stizostedion lucioperca</i> (L.)	F
37.	Perch – <i>Perca fluviatilis</i> (L)	M
38.	Chop - <i>Zingel zingel</i> (L)	R
39.	Little chop - <i>Zingel streberl</i> (Sieb)	U
40.	Ruff – <i>Gymnocephalus cernuus</i> (L)	N
IX. fam. Centrarchidae		
41.	Common sunfish – <i>Lepomis gibbosus</i> (L)	F
X. fam. Gobiidae		
42.	Tube-nosed goby – <i>Proterorhinus marmoratus</i> (Pall)	N
43.	Big-headed goby – <i>Neogobius kessleri</i> (Guen)	F
44.	Monkey goby – <i>Neogobius fluviatilis</i> (Pall)	F

Abbreviations: F – a species frequently occurring in catches; M – a species commonly occurring in catches; N – species numerous in catches; R – species rarely occurring in catches

Conclusions

1. The total number of 24 fish species and subspecies was found in the fauna of the middle Prut (the Criva-Corpaci stretch) and its tributaries. In terms of ecology, the fish fauna of the aforementioned stretch is attributed to the potamophilous-limnophilous assemblage.

2. The occurrence of 26 fish species and subspecies falling into 6 families was uncovered in the Costești-Stânca Reservoir. In terms of their ecology, the fish fauna of the reservoir has limnophilous-potamophilous features. Ten fish species and subspecies are of high economic value.

3. In the main stream of the Prut River downstream the Costești-Stânca Reservoir and its main tributaries, 30 fish species and subspecies belonging to 6 families were found. In terms of their ecology, the fish fauna of the aforementioned stretch is attributed to the potamophilous-limnophilous assemblage. Of economic interest 9, or

30% of fish species and subspecies. In the aforementioned stretch the highest frequency have the fish species of no economic value, such as bleak (13.6%), gudgeons (11.7%), and gobies (15.8%).

4. The results of the research focused on the lower Prut and the areas of confluence of small rivers with it demonstrated the occurrence of 37 fish species and subspecies (27%), and their relative amount is rarely in excess of 21.6%. Three fish species (orfe, chop, little chop), or 8.1% are protected by the law and are listed in the Red Book of the Republic of Moldova.

5. Fish survey on the lakes of Belev and Manta demonstrated the occurrence of respectively, 27 and 23 fish species and subspecies. The fish fauna of lake Belev is dominated by golden carp (23.5%) and bleak (17.6%), followed by perch (10.7%) and Amur bitterling (5.2%). Among the species of economic value, zander (3.6%), carp (2.3%) and asp (1.6%) were found to dominate.

6. Comparative analysis of fish species diversity in the water bodies using Shannon's index demonstrated the following: the largest diversity was found in the middle and lower Prut, and the lowest – in the Obrej, a tributary of the Prut. This implies that the ecological conditions are most balanced in the main stream thus allowing a bigger number of fish species to coexist and to develop normally as compared to the tributaries studied.

7. The ichthyologic studies conducted in the Prut River catchment area resulted in the identification of 44 fish species and subspecies belonging to 10 families.

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