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ICHTHYOFAUNA AND ITS CONDITIONS IN THE LABOREC RIVER SYSTEM

ИХТИОФАУНА И ЕЕ УСЛОВИЯ В БАССЕЙНЕ РЕКИ ЛАБОРЕЦ

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Abstract

The qualitative and quantitative composition of the ichthyofauna of the Laborec River and its most important tributaries is given along with analyses of other environmental conditions important for the fish life. The results of our fish survey and the literary data show that a total of 50 fish species belonging to 13 families were ascertained in the Laborec River. Some changes in species occurrence were evidenced in the course of the years.

As concerns the other components of the hydrocoenosis, 61 species of algae and 1 species of filamentous bacteria were identified. Potamozooplankton was relatively abundant in the lower stretch of the river (17 species). Its quantitative composition markedly altered in the reach influenced by heated waters originating from the power station at the village of Vojany. The benthic fauna was represented by 22 groups of animals in the foot-hill zone, and by 9 groups in the lowland stretch of the river. Abundance and biomass are given of the separate groups of benthic animals in the localities studied. Water quality was evaluated by means of the species composition of the components of the hydrocoenosis; it varied between oligosaprobity and alpha-mesosaprobity, locally reaching the degree of polysaprobity. The results of the analyses of macroscopic ectoparasites and intestinal helminths are also included.

Introduction

In the paper presented a report is given on the survey of the ichthyofauna of the Laborec River and its tributaries (with the exception of the system of the Uh River), supplemented by the results of analyses of some further components of the biocoenosis, being of vital importance when evaluating living conditions for fish (potamoplankton, zoobenthos and parasitofauna).

The Laborec River is adversely affected by human activity. Below the town of Humenné, water pollution, construction of the man-made lake Zemplínska Šírava, pollution of the town of Michalovce, canalization of the river bed, construction of a water reservoir at the village of Vojany and an inlet containing heated waters markedly influenced the fish species diversity, the fish stock in general and the abundance of diverse species in the community (K i r k a & al. 1977, 1980 and 1981). The water of the river is polluted from the town of Humenné. Organic pollution of domestic origin is gradually combined with high contents of ammonia, nitrates, nitrites, formaldehyde, caprolactan, urotropine and mineral oils. As a result, the stretch of the river below the effluent from the Chemko chemical works in the village of Strážské up to the inlet emptying itself into the Lake Zemplínska šírava is most affected. Below the town of Michalovce, the oxygen indices of water are also very unsuitable. In the next reach of the river, up to the village of Vojany, the quality of waters improves but, from the inlet carrying heated waters from the energy centre at the

village of Vojany, the contamination of water increases again (B a l k o & K o k o r ď á k 1973, O b r d l í k 1975). Considering the living conditions for fish, the deterioration of water reaches its highest point through the increased water temperature. For instance, on July 19, 1979, the water temperature above the dam was 19.5 °C, in the outlet 31.8 °C, and at the village of Oborín (some 10 km downstream) 26.2 °C; on June 14, 1979, the water temperature increased even to 31.5 °C. The content of dissolved oxygen at the same place equalled 6.24 mg . l^{-1} and the saturation was 70.8 % (July 18, 1979). As regards the fish culture, the contamination with oil carbohydrates is of importance. Their concentration in heated waters reached 0.03 to 0.18 mg . l^{-1} (May 24, 1978) and 0.37 to 0.68 mg . l^{-1} (August 5, 1978) (K i r k a & al. 1980). Traces of phenols and mercury are also present. Through the occurrence of oil the organoleptic properties of the fish flesh are severely impaired.

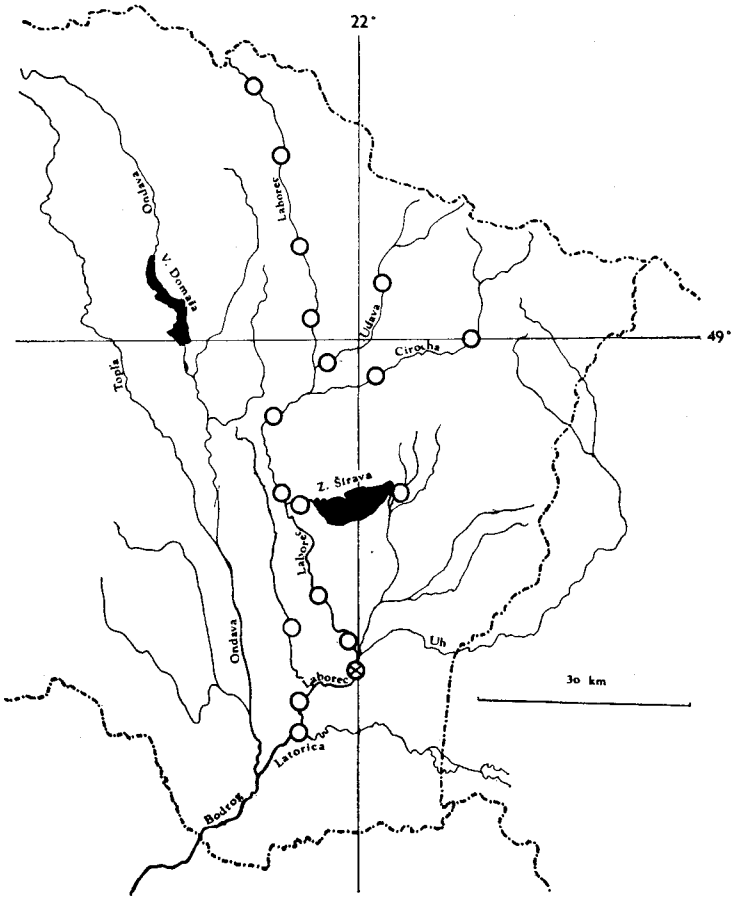

Fig. 1. A scheme of the Laborec River system with localities of sampling. The locality marked by an asterisk comprises five separate sampling sites: the river above the dam, below the dam, the channel carrying heated waters below the dam, swamps and the outlet from the swamps.

The first notes on the fishes living in the Laborec River were published by Kornhuber (1863), Wittmack (1875), Mocsáry (1875) and Chyzer (1882a, b, c). At the beginning of this century, Desző (1901) and Vutskits (1910), later on Vladykov (1931), and recently Weisz & Kux (1959) and Žitňan (1961–1962, 1971) made contributions to the knowledge of the ichthyofauna of the river. Our papers (Kirka & al. 1977, 1980 and 1981) describe changes which occurred in the course of the last twenty years. The list of parasites found in fishes from the Laborec River was summarized and completed by Ergens & al. (1975).

Study Area and Methods

The Laborec River belongs to the river system of the Tisa (the Danube River system). It drains the most eastern part of Czechoslovakia, the drainage area being 4,522.7 sq. km. The river rises in the mountain range of Nízke Beskydy at an elevation of 730 m a.s.l. The watercourse is 135 km long. In the spring area it flows through a flysh zone, the gradient averaging 7 per thousand. At the town of Humenné the stream leaves the highland to flow through the East Slovakian plain, the gradient being 0.7 per thousand, to meet the Latorica River at an elevation of 94 m a.s.l. The most important tributaries of the Laborec River are the streams Udava, Cirocha and Uh. The catchment area of the river is shown in Fig. 1.

The ichthyological survey was carried out in 22 localities through the years 1976, 1978 and 1979. Fish were caught by means of a fish shocker in 14 sections of the Laborec River, 2 sections of the Udava stream, and 2 sections of the Cirocha stream. In addition to this, one section each was fished in the Jovsanský stream at the lake Zemplínska šírava, in the Duša stream, in the outlet channel from the swamp at the village of Ižkovce, and in the swamp itself. Hydrobiological samples as well as fish parasites were taken contemporarily with fishes. The methods used are described in Kirka & al. (1980). The pollution degrees were determined according to Sládeček (1976).

Results

Microflora, Potamoplankton and Macrozoobenthos

In the foot-hill zone of the Laborec River, 61 species and varieties of algae and 1 species of filamentous bacteria were determined. In the foot-hill stretch of the river, communities of blue-green algae and diatoms were found, characteristic of clean waters. From the village of Krásny Brod, the composition of the diatom vegetation indicated moderate pollution. Below the town of Humenné, the river was polluted by both domestic and industrial wastes. The bottom of the river was covered by an almost continuous coating of bacterium *Sphaerotilus natans*; the pollution, however, did not affect the composition of diatoms. In the section below the village of Strážske, at the village of Zbudza, where the pollution by domestic and industrial wastes increased, a change was observed in the algal periphyton. Saprobial indices increased abruptly and reached the upper values of alpha-mesosaprobity (Záhumenský, in Kirka & al. 1977).

Sampling in the lowland zone of river (May 1978) revealed a relatively rich abundance of potamozooplankton, mainly the cladoceran *Daphnia hyalina*, in the profiles at the villages of Sliepkovce and Stretávka. Above the dam at the village of Vojany, the abundance of the zooplankton still increased, mainly through the high numbers of crustaceans *Daphnia hyalina* and *Eudiaptomus gracilis*. The whole community was practically destroyed in the profile some 300 m below the inlet of heated waters. Only sparse occurrence of some rotifers and copepods, and a total absence of *Daphnia hyalina* were observed, in spite of the fact that from the power station a relatively rich zooplankton, this cladoceran being a prevalent member of the community, was driven into the Laborec River. In the next section of the river, a new, mainly qualitative development of zooplankton occurred. In the profile at the village of Oborín, 17 species were ascertained of all three main taxonomic groups, *i.e., Rotatoria, Cladocera* and *Copepoda*, in July 1977 and June 1979.

On the basis of the zooplankton analyses, it is possible to deduce that the quality of water in the river section studied lies between oligosaprobity and betamesosaprobity or very good betamesosaprobity. This classification was confirmed by the mass occurrence of the diatom *Asterionella formosa* in the net plankton in all profiles above the village of Vojany. This species is regarded as indicator of the interstage between oligosaprobity and betamesosaprobity. However, according to the analyses of macrobenthos, this stretch of the river is classified in alphamesosaprobity, locally even in polysaprobity.

In the localities of the foot-hill zone in total 22 groups of benthic animals and their developmental stages were ascertained. The biomass fluctuated between 2.90 g . m^{-2} and 19.52 g . m^{-2}.

Considering the food base for fishes, the most important components of the macrobenthos were as follows: larvae of mayflies *(Ephemeroptera),* larvae of stone-flies *(Plecoptera),* larvae and nymphae of flies *(Diptera)* and caddis-flies *(Trichoptera),* next crustaceans of the order *Amphipoda* and oligochaets *(Oligochaeta).*

The biomass of macrobenthos in the locality of the Udava stream at the village of Udavské reached the value of 15.42 g . m^{-2} and in that at the village of Papín 19.33 g . m^{-2}, the abundance varying between 8 255 and 5 730 individuals . m^{-2}. In both localities, larvae and nymphae of caddis-flies *(Trichoptera),* larvae of mayflies *(Ephemeroptera)* and larvae of stone-flies *(Plecoptera)* were the most important components of the macrobenthos.

The reach of the Laborec River within the localities at the villages of Habura, Krásny Brod and Radvaň n. L. may be classified as having mean numbers of macrobenthos, whereas the reach at the village of Hankovce, below the town of Humenné, and at the village of Zbudza, as having low numbers of macrobenthos. The tributary, the Udava stream, is among the streams with average biomass.

In the Cirocha River, the highest biomass of macrobenthos was found in the locality at the village of Dlhá n. C., 10.39 g . m^{-2}, the abundance being 5 970 ind . m^{-2}. The most important macrobenthic animals, as far as the biomass is concerned, were larvae of *Ephemeroptera, Trichoptera* and *Chironomidae.* The total values found make it possible to classify the Ciro-

cha stream within the reaches investigated as having the mean value of the biomass.

In localities characterized by increased water pollution (below the town of Humenné), the species diversity was rapidly reduced. Dominant components were *Oligochaeta* and *Chironomidae*. The least biomass was recorded at the village of Zbudza, below the inlet from Chemko at the village of Strážske (2.90 g . m^{-2}).

In the lower part of the Laborec River, sampling was carried out in localities between the villages of Stretávka and Oborín. Macrobenthos consisted of 9 groups. The abundance of benthic animals varied between 117 and 72 707 ind . m^{-2}, the biomass between 0.16 and 730.43 g . m^{-2}. The highest values of the abundance and biomass were in oligochaetes, mainly in localities at the village of Sliepkovce and Stretávka, and above the dam at Vojany, where the biomass of oligochaetes fluctuated between 65.71 and 728.16 g . m^{-2}. The bulk of the biomass belonged to the species *Limnodrilus claparedeanus, L. hoffmeisteri, L. udekemianus* and *Tubifex tubifex*. Apart from the oligochaetes, only larvae of midges were present in all three localities. Larvae of beetles *(Coleoptera)* occurred in the locality at the village of Stretávka, and a bivalve, *Musculium lacustre,* was found in the locality above the dam at the village of Vojany. In the reach below the dam up to the inlet carrying heated waters, the number of benthic groups increased to 9, but their abundance and biomass dropped. The highest abundance was again recorded with oligochaetes *(Limnodrilus claparedeanus* and *L. udekemianus,* in the locality down the inlet even one specimen of *Branchiura sowerbyi* was found), their highest biomass equalling only 4.80 g . m^{-2}. The significant proportion of the biomass consisted of *Anodonta complanata,* their maximum biomass down the inlet carrying heated waters, was 87.91 g . m^{-2}, the abundance being 7.0 ind . m^{-2}. In the inlet itself the highest proportion was made up of leeches *(Hirudinea),* 6,80 g . m^{-2}, comprising the species *Hellobdella stagnalis, Glossiphonia complanata, G. heteroclita* and *Erpobdella octoculata.* The proportion of the other groups did not even reach 1 g . m^{-2}.

Macroscopic Ectoparasites and Intestinal Helminthofauna of Fishes

In the foot-hill zone of the Laborec River the total extensity of invasion by intestinal helminths equalled 34.5 % and 1.7 % by macroscopic ectoparasites. Of the nematodes, having the relatively highest extensity of occurrence in fishes, *Rhabdochona denudata* showed an intensity of occurrence of 5 individuals in *Leuciscus cephalus, R. hellichi* the intensity of 3 to 17 ind. in *Barbus barbus* and *B. meridionalis petenyi, R. ergensi* the intensity of 3 ind. in *Noemacheilus barbatulus,* and *Philometra abdominalis* the intensity of 1 ind. in *Gobio gobio.* Of acanthocephalans, *Pomphorhynchus laevis* showed an intensity of occurrence equalling 1 to 13 ind. in *Leuciscus cephalus, Barbus barbus, B. plebejus, Salmo trutta* m. *fario, Sabanejewia aurata* and *Phoxinus phoxinus.* Of the trematodes, the species *Allocreadium transversale* was found in *Sabanejewia aurata* and *Noemacheilus barbatulus,* and *Nicolla skrjabini* in *Alburnoides bipunctatus.* Of cestodes, *Caryophyllaeus brachycollis* showed the intensity of 1 ind. in *Leuciscus cephalus* and *Gobio gobio,* and *Caryophyllaeus laticeps* the intensity of 2 ind. in

Barbus barbus. Out of leeches, *Piscicola respirans* indicated the intensity of occurrence of 1 ind. in *Leuciscus leuciscus.*

In the lowland part of the catchment area of the Laborec River (between the villages Stretávka and Oborín), the total extensity of invasion by intestinal helminths equalled 30.4 %. The different systematic groups of intestinal helminths accounted for the mentioned extensity of invasion as follows: acanthocephalans, 20.7 %; cestodes, 8.5 %; nematodes, 3.6 %; trematodes, 2.4 %.

From the point of view of epizootology two species belonging to the acanthocephalans are important, *i.e., Acanthocephalus anguillae* and *Pomphorhynchus laevis.* They may both present a potential danger when new fish culture enterprises or water reservoirs are established in the drainage area of the Laborec River.

Contemporary Status of Ichthyofauna

The foot-hill zone of the Laborec River (up to the locality at the village of Zbudza) was inhabited by a total of 15 fish species (Kirka & al. 1977). Compared with the number of species found in 1958, four species were missing, *i.e., Sabanejewia aurata, Lota lota, Rhodeus sericeus amarus* and *Zingel streber*, and two species occurred as new, *Salmo trutta* m. *fario* and *Thymallus thymallus.* In the polluted stretch of the river, out of the 19 fish species formerly living below the town on Humenné (Weisz & Kux 1959) only four remained. Out of 17 fish species found in the river down the village of Strážske, only one species was taken, represented by one individual.

The fish community in the Udava stream comprised 12 species, that in the Cirocha stream 13 species. After the completion of the drinking water reservoir Starina the species *Salmo trutta* m. *fario, Leuciscus cephalus* and *Phoxinus phoxinus* will adapt to new lentic conditions. *Leuciscus cephalus* will probably be the dominant species.

In the foot-hill zone of the Laborec River, the average fish stock equals 10 967 individuals per ha, the biomas being 149.5 (50.3 to 667.5) kg per ha. In the polluted stretch, the fish stock consists of 131 individuals per ha, the biomas being 1.9 (0.1 to 3.7) kg per ha. The Udava stream supports 19 862 individuals per ha, the biomas being 421.4 (301.3 to 541.4) kg per ha, the Cirocha stream, 8 570 individuals, the biomass being 217.5 (111.9 to 323.0) kg per ha.

13 fish species were found in the channel below the outlet of the Zemplínska šírava reservoir. Of these, the highest proportion in terms of the biomass comprised *Carassius auratus, Rutilus rutilus, Perca fluviatilis, Anguilla anguilla* and *Abramis brama.* This fairly numerous fish community totally disappears in the subsequent reach of the channel. Below the outlet from the cleaning station, the living conditions for fishes are so bad that the first randomly caught juvenile of *Alburnus alburnus* was taken as far as in the reach at the village of Sliepkovce.

In the part of the river further downstream the quality of water improves; mainly the content of dissolved oxygen increases and the number of fish species approximates 11 units. Below the dam at the village of Vojany the aquatic environment and the fish community again substantially change. In the reach some 300 m long near the inlet of the channel with heated

waters, 23 fish species were taken, incl. *Salmo trutta* m. *fario* (below the dam). The main part of the biomass consisted of *Carassius auratus, Leuciscus cephalus, Esox lucius, Cyprinus carpio, Stizostedion lucioperca, Leuciscus idus, Aspius aspius, Abramis brama* and *Lota lota.* The organoleptic properties of the fish flesh are adversely affected by materials of oily origin. The fish community found at the village of Oborín, some 10 km down the river, was evidently poorer again. Twelve species were recorded only. The species *Abramis bjoerkna, Leuciscus cephalus* and *Carassius auratus* prevailed. A similar character is preserved as far as the confluence with the Latorica River.

In the Duša stream, a tributary of the Laborec River, two species were caught, *viz., Misgurnus fossilis* and *Cobitis taenia.* In the swamps near the village of Ižkovce the following fish species were found: *Carassius auratus,* this species being the most numerous, *Ictalurus nebulosus, Misgurnus fossilis, Leuciscus cephalus, Esox lucius, Tinca tinca, Rutilus rutilus* and *Scardinius erythrophthalmus.*

Discussion

In total, 39 fish species were ascertained in the catchment area of the Laborec River. The complete list of entries comprises 50 species (Tab. 1), out of them 28 species occur in the reservoir Zemplínska šírava (Žitňan 1971).

The first notes on the fish fauna of the Laborec River can be found in the paper by Kornhuber (1863), who registered *Esox lucius* and *Barbus barbus.* Next, Wittmack (1875) mentioned the occurrence of *Salmo trutta* m. *fario* (this record was taken from Hykeš 1921). Mocsáry (1875) recorded six species from the waters in the neighbourhood of the village of Sobrance and from the Laborec River itself. Chyzer (1882) noted three species, *Leuciscus cephalus, Chondrostoma nasus* and *Alburnus alburnus.* A further six species, *Thymallus thymallus, Umbra krameri, Phoxinus phoxinus, Gobio gobio, Cobitis taenia* and *Misgurnus fossilis,* taken into the collections of the Hungarian Museum of Natural History by Chyzer in 1881 and 1882, were confirmed by Mihályi (1954). The species *Cottus poecilopus,* mentioned by Hykeš (1921), was probably extracted from Chyzer (1882b). Dezső (1901) recorded *Chondrostoma nasus* (ex Hykeš 1921). Vutskits (1910, and Vutskits in Hykeš 1921) indicated the occurrence of 14 species. Vladykov (1931, Tab. on pp. 362—363) introduced 37 species and a further 9 species regarded as dubious: *Eudontomyzon danfordi, Barbus meridionalis petenyi, Gobio persa carpathorossicus* (syn. for *G. kessleri*), *G. uranoscopus frici, Chondrostoma nasus, Leucaspius delineatus, Sabanejewia aurata, Stizosteidon volgense* and *Cottus poecilopus.* Holčík & Hensel (1974) and Hensel (1979) redetermined *Gymnocephalus cernuus,* noted by Oliva (1953) from the Laborec River at Vojany, as *G. baloni* Holčík & Hensel 1974. Unfortunately, we succeded in catching in this locality only *G. schraetser,* mentioned also by Oliva (1956). Weisz & Kux (1959) found 30 species in the Laborec River. The species *Abramis sapa, Zingel streber* and *Cottus poecilopus* have not been registered since. Similarly, *Zingel zingel,* caught by Žitňan (1961—1962) at the village of Oborín, has not been found again.

Tab. 1. List of fish species of the Laborec River system

Taxon	Kornhuber (1863)	Wittmack (1875)	Mocsáry (1875)	Chyzer (1882a, c)	Dezső (1901)	Vutskits (1910)	Vladykov (1931)	Weisz & Kux (1969)	Žitňan (1961—1962)	Žitňan (1971)	Kirka & al. (1977, 80, 81)	Note
Acipenseridae												
Acipenser ruthenus L.							/					
Salmonidae												
Salmo trutta m. *fario* L.		*/	/				/				/	*Hykeš (1921)
Thymallidae												
Thymallus thymallus (L.)				*/			/				/	*Mihályi (1954)
Umbridae												
Umbra krameri W.				*/			/					*Mihályi (1954)
Esocidae												
Esox lucius L.	/					/	/	/	/	/	/	
Cyprinidae												
Rutilus rutilus (L.)							/	/	/	/	/	
Leuciscus leuciscus (L.)							/	/		/	/	
Leuciscus cephalus (L.)				/		/	/	/	/	/	/	
Leuciscus idus (L.)							/				/	
Phoxinus phoxinus (L.)			/	*/		°/	/	/		/	/	*Mihályi (1954) °Hykeš (1921)
Scardinius erythrophthalmus (L.)						*/	/		/	/	/	*Hykeš (1921)
Aspius aspius (L.)							/	/		/	/	
Tinca tinca (L.)							/			/	/	
Chondrostoma nasus (L.)				/	*/	*/	?	/		/	/	*Hykeš (1921)
Pelecus cultratus (L.)							/					
Gobio gobio (L.)			/	*/		/	/	/		/	/	*Mihályi (1954)
Gobio uranoscopus frici Vlad.							?	/			/	
Gobio kessleri Dyb.							?	/			/	
Gobio albipinnatus vladykovi Fang.								/	/		/	
Barbus barbus (L.)	/					/	/	/	/	/	/	
Barbus plebejus Bon.											/	
Barbus meridionalis petényi Heck.						*/	?	/	/	/	/	*Hykeš (1921)
Alburnus alburnus (L.)			/	/			/	/	/	/	/	
Alburnoides bipunctatus (Bloch)			/			/	/	/		/	/	
Abramis bjoerkna (L.)							/	/	/	/	/	

Tab. 1. Contd.

Taxon	Mocsáry (1875)	Chyzer (1882a, c)	Vutskits (1910)	Vladykov (1931)	Oliva (1953, 1956)	Weisz & Kux (1959)	Žitňan (1961, 1962)	Žitňan (1971)	Kirka & al. (1977, 80, 81)	Note
Abramis brama (L.)				/		/		/	/	
Abramis sapa (Pallas)				/		/			/	
Abramis ballerus (L.)									/	
Vimba vimba (L.)				/		/		/	/	
Rhodeus sericeus amarus (Bloch)			*/	/		/		/	/	*Hykeš (1921)
Carassius carassius (L.)	/			/		/		/		
Carassius auratus (L.)									/	
Cyprinus carpio L.				/			/	/	/	
Cobitidae										
Noemacheilus barbatulus (L.)				/		/		/	/	
Cobitis taenia L.		*/	°/	/				/	/	*Mihályi (1954) °Hykeš (1921)
Sabanejewia aurata (Fil.)				?		/			/	
Misgurnus fossilis (L.)		*/		/			/		/	*Mihályi (1954)
Siluridae										
Silurus glanis (L.)				/						
Ictaluridae										
Ictalurus nebulosus (Le Sueur)						/		/	/	
Anguillidae										
Anguilla anguilla (L.)								/	/	
Gadidae										
Lota lota (L.)				/		/		/	/	
Percidae										
Stizostedion lucioperca (L.)				/			/	/	/	
Perca fluviatilis L.			/	/		/		/	/	
Zingel zingel (L.)				/			/			
Zingel streber (Sieb.)			*/	/		/				*Vutskits (1918)
Gymnocephalus cernuus (L.)				/		/	/	/	/	*redetermined by Holčík & Hensel (1974) and *Hensel (1979)
Gymnocephalus baloni Holčík et Hensel					*/					
Gymnocephalus schraetser (L.)				/	*/	/	/		/	*Hensel (1979)
Cottidae										
Cottus gobio L.				/						
Cottus poecilopus H.		*/	*/	?		/				*Hykeš (1921)

A new species, so far not recorded, is *Barbus plebejus*. This species was regarded as hybrid of *B. meridionalis petenyi* x *B. barbus* (Weisz & Kux 1959). The other species is *Abramis ballerus;* this species occurs in the lower part of the river where an intensive fish survey has not yet been undertaken.

The last new species found is *Carassius auratus*. This fish species is characterised by a gynogenetic type of breeding which increases its reproductive effect and actual potency so that it became superior to all other fish species. Its high concentration below the dam indicates that expansion is still continuing. Apart from this, the species dominates in drains; a better quality of water than in the river itself, oxygen regime, thick growths of water vegetation, low density of fishes (above all of the carnivorous fishes), and a suitable food base are determining factors in increasing its population.

Summary

A survey is given of the conditions (morphology of the river, quality of water, food base, fish helminths) and occurrence of fishes in the Laborec River and its tributaries (except for the Uh River).

The list of fish species hitherto recorded in the river and in its neighbourhood totals 50. Of the fishes noted, the occurrence was not confirmed of the following species: *Acipenser ruthenus, Umbra krameri, Pelecus cultratus, Zingel zingel* and *Zingel streber*. On the other hand, three species, *i.e. Barbus plebejus, Abramis ballerus* and *Carassius auratus,* were found for the first time in the river catchment area.

Резюме

Центром тяжести статьи являются результаты исследований качественного и количественного состава ихтиофауны и некоторых других, с точки зрения жизни рыб важных, составляющих среды в реке Лаборец и ее самых важных притоков. На основании сравнения результатов исследований ихтиофауны с литературными данными можно сделать заключение, что до сих пор в исследуемых водотоках было найдено 50 видов рыб относящихся к 13 семействам, при чем, если сравнивать с предыдущими исследованиями, произошли определенные изменения видового состава. Из остальных составляющих гидроценоза было определено 61 видов водорослей, 1 вид волкнистых бактерий, сравнительно богатый потамозоопланктон в низменной части (17 видов), при чем было установлено, что видовая доминантность выразительно меняется на участке реки с измененным, выпускаемой из ТЭЦ Вояны теплой водой, режимом. Бентическая фауна состояла в подгорной части бассейна из 22 групп животных и в низменной части из 9 групп животных. Приводится численность и биомасса отдельных групп бентических животных из исследуемых мест. На основании видового состава исследуемых составляющих гидроузла была установлена степень загрязнения воды от олигосапробности до альфамезосапробности и в отдельных местах вплоть до полисапробности. Статья содержит также и результаты исследования инвадовости рыб макроскопическими эктопаразитами и кишечными гельминтами.

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Orlov, V. N. & Bulatova, N. Š., 1983: Sravnitel'naja citogenetika i kariosistematika mlekopitajuščich (Comparative Mammalian Cytogenetics and Karyosystematics). *Nauka, Moscow. 405 pp., 20 figs. Price Rbl 4.20;*

This book summarizes the chief results of comparative research into mammalian karyotypes over the last decade. The period which has elapsed since the publication of the last reviews of data on mammalian chromosome sets (Benirschke 1969, Chiarelli & Capanna 1973, Orlov 1974) has been characterized by the development and exploitation of various techniques of the differential staining of chromosomes. These new methods stimulated further intensive research into mammalian karyotypes, making it possible to obtain better results. This makes the book of Orlov and Bulatova an especially topical one.

The introductory chapters are devoted to basic data on the characteristics and morphology of the cell nucleus, metaphase chromosomes and chromatin. A further chapter deals with methods of making chromosome preparations and staining chromosomes, together with the basic principles of karyotype analysis. The next chapter is on chromosome rearrangement and evolutionary changes in the karyotype. Individual types of structural rearrangements are discussed, and numerous examples of their occurrence in mammals are given. The following chapter gives many examples of the importance of karyotype as a taxonomical character. The nature and significance of chromosomal polymorphism are considered, together with the role of chromosome changes as an isolating mechanisms in population divergence. The possibility of sympatric speciation through karyotype rearrangements is considered unlikely by the authors. Another chapter is devoted to comparative karyotype research and a reconstruction of the phylogenesis of various groups. There are interesting data on the karyological relations between the Palaearctic members of the *Microtinae* sub-family, established on the basis of G-banding technique. The question of the karyotypes of domestic mammals is briefly treated. The final chapter gives a review of the results of a comparative karyosystematic study of mammals of the Palaearctic region. A brief summary of the karyological data is given for each genus, and its position in the systematics of individual taxa evaluated.

One of the most valuable parts of the book is a supplement summarizing the karyotype characteristics of the world's mammals. For each species or subspecies it gives the diploid chromosomal number, number of autosomal arms, morphology of the sex chromosomes, any intraspecific variability, and the use of banding techniques. The review, which takes into account literature published up to 1982, includes 1870 species.

Among the book's shortcomings is a large number of printing errors, occurring especially in the names of taxa and authors. The nomenclature of certain species is dubious (as, *e.g., Sorex gemellus, Talpa mizura, Myotis oxygnathus, Mus poschiavinus, Microtus subarvalis*). The karyotype review occasionally omits data (as, *e.g.*, with *Tadarida teniotis*). Some of the general conclusions would seem to be too onesided, and are arguable.

But in spite of these minor shortcomings the book may in general be afforded a very positive reception. The work contains the basic information required in an introduction to the complex problem of the cytogenetics and karyosystematics of mammals. The review of the karyotypes of the world's mammals is indispensible for many workers concerned with various aspects of mammalian biology. It is therefore unfortunate that the edition is a fairly limited one.

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