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DISTRIBUTION OF FISH NUMBERS AND BIOMASS IN BARBEL REGION OF THE RIVER AND THE ADJOINING OLD RIVER-BEDS

ABSTRACT: In the meandering river of the barbel region, in the cross-section of river-bed, 3 zones can be distinguished: 1. concave bank – current, 2. convex bank, 3. the middle of the bed between those two with sandy beaches and islands, and the longitudinal section is the transition current zone. Part of the river-bed with repeated in a sequence four zones is differentiated not only from the hydrographical point of view, but also from the biological. The most abundant in ichthyofauna is the current zone (concave bank), then the zone at convex bank, whereas the other zones are exceptionally poor in ichthyofauna although it cannot be said that they are not productive. The dying out of species considered as indicatory for the barbel region is observed as a result of increasing pollution. The zones colonized by them remain unproductive or can be occupied by small roach.

1. INTRODUCTION

Many authors in various regions of the world have been studying the numbers of fish per surface unit in rivers, and especially in the small ones. These studies included also big, slowly running rivers, old river-beds, canals and even former peat pits. This problem in relation to lakes is well known.

Still, very few scientists (H u e t and T i m m e r m a n s 1963, H o l č i k 1966) have tried to determine the biomass per surface unit, and especially in big rivers with a considerably steep descent (barbel region). This is not due to the lack of interest in rivers of barbel region, but to the limited till not long ago possibilities of obtaining representative material in this type of river. It is impossible to use nets in these conditions, whereas angling, apart from the amount of time required, provide selective data as the anglers set to catch particular fish species. These studies require an electric fish gear and in case of deep rivers a boat with trained staff is indispensable.

The data on numbers and biomass of fish in Polish rivers, with the exception of small streams, have a general character in most cases or are for all rivers together (S t a n g e n-

berg 1965), or for large areas of the country (Kaj 1955 acc. to Backiel 1965 – Northern Poland, Solewski 1962 acc. to Backiel 1965 – Southern Poland). As a comparative material in Poland only the results of Backiel (1964) from the Drwęca river and some data of Solewski (1962, acc. to Backiel 1965) can be used.

An additional and new element of this work, apart from estimations of numbers and biomass of fish per 1 ha of river, is an attempt to asses these parameters in various zones of the cross-section of river-bed formed by the meandering river. Furthermore, there is an attempt to determine on a site the average mass of an individual, biomass of species and its numbers.

2. METHODS

The fish were caught from a boat using the electric fish gear with fully wave rectified current (Kędzior and Penczak 1972). The catches were made on the entire river, in places with high concentration of fish (site I–VII) and the method of successive removals was applied. In the river, on sites II and IV (Fig. 1, Tab. I), lead-in-net and guiding-barier nets were also applied, which prevented the escape of fish from the noise, and this in turn allowed to estimate the effectiveness of electro-fishing on these and other sites as about 95% of number and biomass (Penczak and Zalewski 1973).

In estimations of numbers and biomass the fry (up to 4 cm) are not taken into consideration. This is due to the negative selectivity of current as regards fry, difficulties in quick up to date identification of some cyprinid fishes, and the fact that the studies are permitted under the condition that live fish shall be released into the river.

The data for the distinguished, transitory zone of current and the zone between concave and convex bank are not given due to the very small number of fish there and the variable biomass values which are equal or almost equal zero, thus corresponding to the errors of the average for repeated catches in sites (zones) abundant in fish.

3. DESCRIPTION OF THE AREA

A part of the Pilica river with the adjoining and typologically differentiated old river-beds, upwards and downwards from the mouth of Czarna (158.0 km of the course of Pilica), has been chosen. Complex electric fishing, frequently repeated took place in July 16–28, 1971.

This part of the Pilica river is quite differentiated as regards the purity of waters, and this is due to the clean waters of the Czarna river. In July 1971, just before the mouth of this tributary BOD_5 was expressed by values 3.2 (July 12) and 5.4 (July 27), and below the Czarna this parameter decreased to 2.6. The oxygen consumption above the Czarna, at both given dates, was 7.0 and 6.3, and below the tributary it decreased to 5.4 (Report No. 11 on the purity of Pilica waters in 1971, Laboratory of Water and Sewage Investigations at the Presidium of the People's Province Council in Łódź).

The topography of the examined area is illustrated by the diagram (Fig. 1). In the studied part of the Pilica 5 different parts of the river bed have been chosen from the

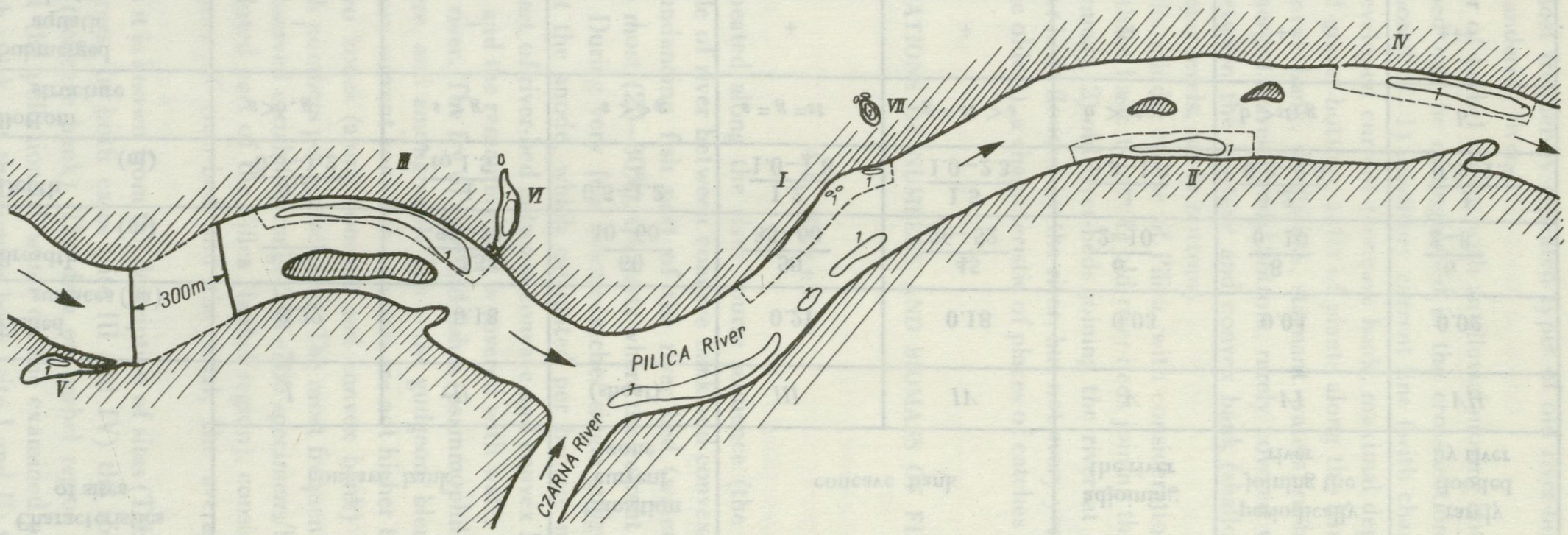

Fig. 1. Diagram of the examined part of the Pilica river with adjoining old river beds

Surface of river of a greater depth than 1 m are encircled by contour lines. Dotted line is for surfaces where several catches have been made. *I–VII* – sites

Tab. I. Characteristic of places of catches

Breadth of fishing belt in river – 20 m, *b* – bottom deposits, *s* – sand, *g* – gravel, *st* – stones + – small (poor), ++ – medium, +++ – large (strongly), in numerator-average, in denominator – variability range

Characteristics of sites	Sites							
	river					old river-bed		
	concave bank		transition current zone	concave bank		adjoining the river	periodically joining the river	rarely flooded by river
	I	*II*	(shoal)	*III*	*IV*	*V*	*VI*	*VII*
Fished surfaces (ha)	0.22	0.18		0.21	0.18	0.03	0.04	0.02
Breadth (m)	50	55 50–70	50 40–60	50 35–60	45 26–52	6 2–10	8 6–10	6 2–8
Depth (m)	0.7 0.3–1.2	1 to 1.5	0.5–1.2	1.2 1.0–1.8	1.5 1.0–2.3	1 0.2–1.3	1.2 0.2–2.0	1 0.3–1.5
Bottom structure	*s*>*b*, *g*	*s* > *g*	*s* >> *g*	*s* = *g* = *st*	*g* = *st* > *s*	*b* > *st*, *s*	*b* > *st*, *g*	*b*
Submerged aquatic plants	–	–	–	+	+	++	++	+++
Rushes	–	–	–	–	–	++	+	+
Height of banks (m)	0.5	to 1.0		1–1.5	to 2	0.5 to 1.0	0.2 to 0.5	0.5 0.2–1.0
Undercutting of banks	–	–		++	++	–	–	–
Forestation of banks	+	+++		+	–	++	++	++
Water flow	+	+	++	+++	+++	–	–	–

cross-section and the 3 most frequently repeated types of old river-beds typical for the valley of considerably meandering river.

In the meandering river of barbel region with an alluvial moving bottom a repeated in sequences part of river-bed can be distinguished in the cross-section and longitudinal section. This part is composed of: 1) transitory current line (with changing bed, void of vegetation), 2) strongly developed current (concave bank, maximal depths, sliding down banks, usually stony and gravel bottom, tufts of plants along the banks), 3) zone with slowly flowing water (convex bank, sandbanks, stagnant waters, rushes may be found next to plants with submerged leaves, sandy bottom, rarely covered with gravel or silt) and 4) the middle bed between the concave and convex bank (shallows, frequent sand islands emergent at low water levels, sandy bottom).

The old river-beds in the middle course of Pilica, with consideration to their contact with the river, belong to three basic types: 1) old river-beds joining the river even at low water levels (recently formed), 2) old river-beds joining the river at medium and high water levels and 3) old river-beds flooded by the river, but not every year, usually situated at he side of the valley (the oldest); a characteristic of places of catches is given in Table I.

4. ESTIMATIONS OF NUMBERS AND BIOMASS OF FISH

4.1. River

An analysis of the repeated along the river course sequence (the transition current zone, concave bank middle of river between concave bank and convex bank, and convex bank) shows that the abundancing fish part of the river bed (water along convex or concave bank) is 30% the most (20–30%). On parts where the current changes banks the fish were hardly caught. During very few electrocatches single gudgeons, daces, small hotuses were recorded at the anode, which calculated per hectare never exceeded 50 individuals. The middle part of river-bed between concave and convex bank, at low water level, is emergent in 50%, and the remaining part is covered with water below 1 m. This is also a barren zone of the river. The fry of cyprinid fishes (psammophilous dominate over lithophilous) is found there, and among adult fish – the gudgeon, bleak and single asps. Similarly as in the transitory current zone fish numbers are not higher than 50 individuals per hectare. In other two zones (along concave and convex bank) there are not any essential differences in fish numbers per surface unit. The most frequently caught number is about 600 ind./ha, at observed variability range 250–700 specimens/ha (Tab. II). In the examined, not much polluted part of the Pilica (barbel region), considering the proportions of all repeated zones of river-bed and the total, the average is about 300–400 fish/ha.

The data in table II, as it is known from the description of sites (Tab. I), are calculated per 1 ha from smaller areas. In both cases (site III and IV) the roach was the most abundant in the current (concave bank). The data on barbel region in Poland (P e n c z a k 1972a) show that the pollution of water on the examined part of the Pilica is already destroying the fish stock. At the convex bank (site I and II) the distribution of species is more differentiated in abundance.

Tab. II. Numbers of fish per 1 ha in different zones of river-bed and of old river-beds
Calculated after 2–5 electric fishings

Species and their symbols	Sites						
	river				old river-bed		
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
Esox lucius L. – *1*	45	55	34	22	366	450	266
Rutilus rutilus (L.) – *2*	131	33	144	303	1299	75	
Perca fluviatilis (L.) – *3*	72	28	53	94	167	125	67
Leuciscus leuciscus (L.) – *4*	162	17	53	17	33		
Leuciscus cephalus (L.) – *5*	32	50	38	22			
Gobio gobio (L.) – *6*	167		62	33			
Barbus barbus (L.) – *7*		28	24	72			
Lota lota (L.) – *8*	18	28	24	105	67		
Tinca tinca (L.) – *9*						100	
Leuciscus idus (L.) – *10*	14		19		100	25	
Ictalurus nebulosus (Le Sueur) – *11*						625	67
Misgurnus fossilis (L.) – *12*					666	500	533
Rhodeus sericeus amarus (Bloch) – *13*					33		
Abramis brama (L.) – *14*			5		133		
Carassius carassius (L.) – *15*							330
Scardinius erythrophthalmus (L.) – *16*							67
Cottus gobio L. – *17*	5			6			
Chondrostoma nasus (L.) – *18*	14			6			
Alburnus alburnus (L.) – *19*		6	110	6			
Alburnoides bipunctatus (Bloch) – *20*			38				
Lamperta planeri (Bloch) – *21*			5				
Anguilla anguilla (L.) – *22*				6			
Total	660	245	609	692	2864	1900	1330

The weight ratios in the fish stock of examined part of the Pilica, despite the increasing water pollution and strong reduction of cyprinid lithophilous species – hotus, extremely sensitive to sewage, still allow to call it the barbel region both from the hydrographical and biological point of view (Tab. III).
In deeper parts of the river, with stony or even gravel bottom, barbel and chub dominate in weight. The accompanying species (subdominants) are: pike, perch, roach, burbot, and on some sites – dace.

Tab. III. Biomass of fish in grammes per 1 ha in different zones of river and old river-beds
Calculated after 2–5 electric fishings

Species and their symbols	Sites						
	river				old river-bed		
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
Esox lucius L. – *1*	3353	9185	5376	2145	12155	31375	26640
Rutilus rutilus (L.) – *2*	2115	330	2624	4791	23144	1650	
Perca fluviatilis (L.) – *3*	1238	1430	1392	4345	2264	2625	9990
Leuciscus leuciscus (L.) – *4*	4590	297	1872	248	1832		
Leuciscus cephalus (L.) – *5*	1598	20285	25248	275			
Gobio gobio (L.) – *6*	1080		730	275			
Barbus barbus (L.) – *7*		16830	24624	109670			
Lota lota (L.) – *8*	360	1540	864	5335	333		
Tinca tinca (L.) – *9*						36625	
Leuciscus idus (L.) – *10*	405		10819		7992	450	
Ictalurus nebulosus (Le Sueur) – *11*						21250	3330
Misgurnus fossilis (L.) – *12*					23976	12500	27972
Rhodeus sericeus amarus (Bloch) – *13*					67		
Abramis brama (L.) – *14*			19		599		
Carassius carassius (L.) – *15*							19980
Scardinius erythrophthalmus (L.) – *16*							2664
Cottus gobio L. – *17*	23			55			
Chondrostoma nasus (L.) – *18*	608			2750			
Alburnus alburnus (L.) – *19*		88	725	55			
Alburnoides bipunctatus (Bloch) – *20*			168				
Lampetra planeri (Bloch) – *21*			96				
Anguilla anguilla (L.) – *22*				770			
Total	15370	49985	74557	130714	72362	106475	90576

4.2. Old river-beds

The most abundant populations, at values of constancy of occurrence 100%, are formed by pike, perch and thunder-fish. Other species are more sensitive to the different physico-chemical conditions in old river-beds.

In a strongly eutrophic old river-bed (site VII), apart from the mentioned eurytopic species, the crucian carp, and also common bullhead and rudd dominate. In recently formed old river-beds and joining the river, apart from limnophilous species, sometimes not very numerous rheophile populations can be found. The old river-beds joining, or periodically joining the river have such economically valuable fish as ide and bream.

An analysis of the biomass of fish caught in old river-beds confirms the above observations. Pike and thunder-fish are weight dominants and perch is a subdominant. In old river-beds, occasionally or rarely flooded by river, a considerable part of biomass falls per crucian carp (22%), in those periodically joining the river about 20% per tench, in those constantly joining the river about 32% per roach and about 10% per ide.

The quoted data show distinctly that the three types of examined old river beds in the Pilica valley of barbel region differ not only in their hydrographical structure but also in fish species found there in appropriate number and weight proportions.

5. DISCUSSION

The repeatedly used term „barbel region" is in the biological sense an empty name. It is used for its convenience as a commonly understood description for the hydrographical characteristic of a river. In some zones of the examined part of Pilica the barbel is a weight dominant and chub occurs, but the hotu is not found, although it was also originally a dominant species.

5.1. Numbers, biomass

A review of available literature shows that among streams the most abundant in fish are brooks and small trout rivers (Müller 1953, Larsen 1955, Backiel 1964, Solewski 1965, Libosvárský 1966 and others). These authors have found in the examined streams several hundreds to several thousands of fish per 1 ha. Quite abundant in fish are old river-beds of big rivers (Balon 1963, 1967), peat pits (Larsen 1961), not to say anything about lakes (Eschmeyer 1939, Ball 1948).

As a direct comparative material we have used the data on fish numbers per 1 ha in the river Semois (Huet and Timmermans 1963) and of the lower Hornad (Holčik 1966). The investigated sections of both rivers belong to the upper barbel region at average sloping from 0.62 to 0.73 °/oo. They are characterised and differ from the Pilica by greater percentage of stony bottom and smaller average breadth of the river-bed, over 10 m. Anyhow, the data on fish numbers in compared rivers do not differ much. In the Hornad there have been on the average 872 specimens per ha, in the Semois 337 (204–552) ind./ha, in the Pilica 300–400 ind./ha. However, the smallest number of fish

in the Pilica may be only apparent as it is the average of all zones of the river-bed, and the cited authors treated the river in the cross-section as a whole, and also the upper barbel region is more abundant in fish, especially in small fry.

The biomass of fish in streams and brooks is not so much higher than in other streams, as in case of numbers (Solewski 1965 – on the average 170 kg/ha; Libosvárský 1966 – 43–207.9 kg/ha). In the mentioned old river-beds the biomass values are within the range 50–200 kg/ha, max. about 800 kg/ha (Balon 1963, 1967).

Stangenberg (1965), having in mind bigger, profitable rivers, gives the average biomass of fish in Poland as 50 kg/ha. Kaj (1955, acc. to Backiel 1965) estimates the fish biomass in several rivers of Northern Poland as 24–123 kg/ha. Solewski (1962, acc. to Backiel 1965) gives data for the upper Vistula, upper San and Soła and Rogoźnik (7.7–375 kg/ha); the highest value 375 kg/ha is for the upper barbel region of the Silesian Vistula. The biomass in the Drwęca river, which is hydrographically close to the barbel region, is estimated by Backiel (1965) as about 200 kg/ha.

Against these data from Poland the results of present paper for the partly polluted stream from the lower barbel region are not very impressive, although they are above the average of Stangenberg (1965). The average for the chosen, repeated fragment of the river including all zones is 90–100 kg/ha, at estimated value of biomass in both barren zones (transition current zone, zone between concave and convex bank) per 10 kg/ha in each. In comparison with data from the Semois (Huet and Timmermans 1963, M = 102 kg/ha, from 51.5 to 146.2 kg/ha) and Hornad (Holčik 1966, M = 50 kg/ha) our results seem more reliable as far as the fishing methods are concerned. Undoubtedly, in case of the stream we have investigated, the result would have been much higher if not for the river pollution. It would have also increased slightly (about 5%) if to take into consideration the biomass of fry.

The examined here old river-beds have smaller numbers and weight of fish than in the old river-beds of the Danube (Balon 1963, 1967, M = 225 kg/ha, 12.8–805.4 kg/ha). However, in this case the results are greatly affected by poaching. And as far as the river in barbel region is due to its strong current a difficult one for primitive net catches, still the old river-beds are no obstacle, even for the most primitive equipment. Judging by the frequently observed water turbidity or pulled out plants and „direct" meetings the poachers are not such a rare phenomenon. The calculated biomass value for the examined old river-beds stays within the range 72.2–106.5 kg/ha and could be higher as there is plenty of plants and bottom fauna.

Our data as regards the average body weight of an individual on a river site are quite interesting when compared to the similarly obtained results by Huet and Timmermans (1963). The average body weight of barbel in the Semois is four times lower than in the Pilica [Semois (S) – 300 g, Pilica (P) – 1200 g], the values for chub are equal (200 g), dace is almost twice lighter (S – 60 g, P – 25 g), pike is eight times lighter (S – 995 g, P – 115 g), perch is ten times lighter (S – 600 g, P – 60 g), and roach is thirteen times lighter (S – 190 g, P – 15 g). These data explain more about the condition of fish in parts of river in barbel region. For example, the perch, which is considered in our waters as a stagnophilous fish, is heavier in a river with a quicker water flow than in the Pilica. Also interesting are the results of comparison of the average body weights of pike and perch in both rivers.

5.2. Cenology

The information obtained about the co-occurrence of species in environment contradict to some extent our statement that the „barbel region" is an empty name in the biological meaning of the word. Barbel, chub, hotu, which according to Huet (1959) are indicatory species for the barbel region, covered in the Semois 65–83% of biomass of all fish (Huet and Timmermans 1963), in the lower Hornad 90% (Holčik 1966), and in the Pilica only for the zones of concave and convex bank (50% of surface of the part of river-bed) 80% of biomass.

The analysis of fish numbers on 1 ha of the river also confirms the existence of „barbel region" only in the hydrographical sense. The three mentioned here indicatory species are in the Semois 85% of total fish number, in the Hornad 76% and in the Pilica only 13%.

In the light of all these data on the structure of fish groups in the rivers of barbel region an increasing process of dying out of indicatory species can be observed, and in case of greater pollution of accompanying species also (Penczak 1969, 1972a, 1972b). Furthermore, in trout rivers it has been observed that when due to sewage or other effects of civilization the stream trout leaves the area its place is not taken by any other species (unproductive areas), occassionally a slight percentage of taxons practically of no significance in fish farming. A similar phenomenon is observed also in rivers of barbel region (Penczak 1972a). The place of barbel, chub or hotu is taken by a very small percentage of small roach, but on the whole some river zones or their parts remain totally unproductive. Roach is found in all discussed here river zones, but its average body weight is such that they have no consumption value.

The grounds for the existence of qualitatively and quantitatively abundant fish population on site II, and mainly of chub, are the dense double row of willows with branches submerged in water, on which bottom fauna lives abundantly – a similar phenomenon is observed on the Nida (Penczak 1972b).

The material allowed also to say more about the indicatory species. For example, the dace, which is considered as a species typical only for flowing waters (Penczak 1969) can live also in new, joining the river, old river-beds. The psammophilous species are the only ecological group of fish still found only in the rivers of Central Poland.

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6. SUMMARY

The material for research has been obtained using an electric fishing gear with a fully wave rectified current and also load-in-net and guiding-barier nets, with which the chosen zones of the river were fenced off.

The section of the meandering Pilica river (barbel region) up and downstream from the mouth of Czarna river near Sulejów (158.0 km of the Pilica river) was investigated in July 16–28, 1971 making use of analyses determining the water pollution for the same period.

In estimations of numbers and biomass of fish the river bed was not treated as a whole. In the cross-section the following zones were distinguished: 1) concave bank – current line, 2) convex bank – zone with a less visible water flow, 3) middle zone of the river bed between the two mentioned zones with shallows, sandbanks and sand islands which in the longitudinal section is followed by 4) zone of current transition – shallow. These four zones were treated as a basic fragment repeated on the whole river course. The old river beds found in the examined part of river valley were also investigated and divided according to their connection with the river into: 1) old river beds joining the river (recently formed), 2) old river beds joining the river at mean water levels and 3) old river beds flooded by the river during floods, usually found at the valley edge (the oldest). The places of catches are described in Table I.

Taking into consideration the proportion and total of all 4 distinguished zones the average number of fish amounted to 300–400/ha. About 90% of all fish live only in two zones – concave and convex bank – where their mean number was estimated as 600/ha (Tab. II).

The weight ratios in the mentioned river zones are presented in Table III. Taking into consideration the entire fragment of the river bed the average biomass was estimated as 90–100 kg/ha.

In the old river beds the thunder-fish and pike are the outstanding populations as concerns numbers and weight. In old river beds of an eutrophic character (cut from the river), besides the two mentioned species, crucian carp, common bullhead, rudd and perch are the dominants or subdominants. In old river beds periodically joining the river considerable numbers of tench, bream and ide are found. In old river beds constantly joining the river the fish stock is qualitatively the most abundant and among them the rheophile species. The numbers and biomass of fish per ha in 3 types of old river beds are given in Table III.

The fact that in trout rivers due to activities of man the disappearing indicatory species (barbel region: barbel, chub and hotu) leave unproductive (empty) areas in the river, which frequently can not be populated by other species, has been confirmed. The roach appearing in these empty places in the barbel region is of very little economical significance.

7. POLISH SUMMARY (STRESZCZENIE)

Materiały do pracy zbierano przy użyciu agregatu na prąd dwupołówkowy wyprostowany, posługując się ponadto sieciami łownymi (żaki i skrzydlaki), którymi grodzono wybrane strefy rzeki.

Temat realizowano na odcinku meandrującej Pilicy (region brzany), w górę i w dół od ujścia Czarnej przed Sulejowem (158 km biegu Pilicy), w czasie od 16 do 28 lipca 1971 r., korzystając z wykonanych w tym samym terminie analiz określających stopień zanieczyszczenia wody.

Dokonując oceny liczebności ryb i biomasy, koryta rzeki nie traktowano jako całości. W profilu poprzecznym wyróżniono strefy: 1) brzeg wklęsły – linia nurtu, 2) strefa ze słabiej zaznaczonym przepływem wody – brzeg wypukły, 3) strefa koryta między wymienionymi wyżej strefami, z mieliznami, przykosami i wyspami piaszczystymi, po których w profilu wzdłużnym następuje strefa (4) przejścia nurtu – przemiał. Wyliczone cztery strefy traktowano jako fragment podstawowy, powtarzający się w całości wzdłuż biegu rzeki. Zbadano także starorzecza znajdujące się w badanym odcinku doliny rzeki dzieląc je pod względem połączenia z rzeką na: 1) starorzecza kontaktujące się z rzeką bez przerwy (niedawno powstałe), 2) starorzecza łączące się z rzeką przy średnich stanach wody i 3) starorzecza zalewane przez wody z rzeki podczas silnych powodzi, położone najczęściej na skraju doliny (najstarsze); charakterystyka miejsc połowu zawarta jest w tabeli I.

W badanym fragmencie rzeki, uwzględniając proporcjonalnie i łącznie wszystkie wyodrębnione 4 strefy, stwierdzono średnio około 300–400 ryb na ha. Około 90% wszystkich ryb bytuje tylko w dwóch strefach – brzeg wypukły i brzeg wklęsły, gdzie liczbę ich okreslono średnio na 600 osobn./ha (tab. II).

Stosunki wagowe w wymienionych strefach rzeki przedstawione są w tabeli III. Oceniając jak uprzednio cały fragment koryta, zawartą w nim biomasę oszacowano średnio na 90–100 kg/ha.

W starorzeczach najbogatsze liczbowo i wagowo populacje formują piskorz i szczupak. W starorzeczu o charakterze eutroficznym (odcięte od rzeki), obok wymienionych gatunków, rolę dominantów lub subdominantów spełniają karaś, sumik karłowaty, wzdręga i okoń. W starorzeczu kontaktującym się okresowo z rzeką spotykano znaczne ilości lina, leszcza i jazia. W starorzeczu na stałe połączonym

z rzeką stwierdzono najbogatszy jakościowo rybostan, a wsród nich gatunek reofilny. Liczbę i masę ryb na ha w 3 typach starorzeczy odczytać można z tabeli III.

Potwierdzono obserwowane w rzekach pstrągowych zjawisko, że w przypadku działalności człowieka ustępujące gatunki wskaźnikowe (region brzany: brzana, kleń i świnka) zostawiają nieproduktywne (puste) obszary w rzece, których często nie są w stanie zasiedlić inne gatunki. Wchodząca na te wolne miejsca płoć w regionie brzany nie ma większego użytkowego znaczenia w sensie konsumpcyjnym.

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