

Stream ecosystems in mountain grassland (West Carpathians)^{*}

11. Fish

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Abstract — The populations of *Salmo trutta m. fario* and *Cottus poecilopus* were investigated in four streams of the River Dunajec: Biała Woda, Czarna Woda, Kamionka, and Grajcarek. The settlement density of fish in the investigated streams was higher than in other streams of this river system. However, the growth rate was lower than the average in the basin, except for a few cases, while the length-weight relationship reached about 255 g in the trout and 90 g in *Cottus poecilopus* Heckel.

Key words: stream ecology, influence of pastoral economy, the West Carpathians, *Salmo trutta m. fario*, *Cottus poecilopus*, growth, weight.

1. Introduction

Fish of the Grajcarek stream and its tributaries, the Biała Woda, and Czarna Woda, and of the Kamionka stream were investigated in the years 1976—1978. The investigation was included in a general analysis of ichthyofauna of the River Dunajec upper basin in the current environmental conditions. A description of the investigated area was given by Kownacki (1982).

* The investigations were carried out within Project MR.II.3.

Table I. Number, dimensions, and weight of *Salmo trutta m. fario* L. and *Cottus poeciloymus* Heckel

Data	Biska Woda						Cesarka Woda						Kamionka						Grajcarek									
	I	II	III	IV	V	VI	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V		
Age	37	31	15	6	5	1	7	2	2	2	13	18	46	44	22	22	4	33	132	148	12	13	283	1100	1233	100	106	
Number of caught fish	622	522	244	100	88	17	225	50	75	425	600	767	733	367	357	67	67	283	1100	1233	100	106	283	1100	1233	100	106	
Number/ha	39	33	15	6	6	0.7	16	4	5	31	44	33	32	16	16	3	10	39	110	144	4	4	10	39	44	4	4	
Participation %	5.0	11.6	15.8	19.2	21.8	25.0	7	12	15.2	19.5	22	5	11.3	14.9	18.3	23.0	10.2	14.7	20.0	23.7	29.5	13.5	46.7	117.6	179.7	197.3	27.4	
Total length cm	4.2	10.4	14.5	17.8	19.0	22.9	6.2	10.4	13.7	17.9	20.5	4.3	10.1	13.3	16.8	21.3	9.0	13.5	17.7	21.8	27.4	13.5	46.7	117.6	179.7	197.3	27.4	
Fork length cm	1.0	13.6	42.9	74.3	103.6	171.8	6.0	31.1	55.5	112.7	151.2	1.9	19.5	48.0	90.1	168.1	13.5	46.7	117.6	179.7	197.3	13.5	46.7	117.6	179.7	197.3	27.4	
Weight g	67	4	31	5	5	1	6	18	3	2	2	200	600	100	50	60	16	16	60	114	87	81	60	500	950	725	675	50
Number of caught fish	1117	67	517	83	5	5	200	600	100	50	60	200	600	100	50	60	16	16	60	114	87	81	60	500	950	725	675	50
Number/ha	63	4	29	5	5	1	20	59	10	5	6	20	59	10	5	6	8	26	17	33	25	23	17	33	25	23	2	
Participation %	4.0	5.0	8.0	9.7	9.7	2.1	2.1	6.0	8.7	10.5	13.1	7.0	8.4	11.0	13.0	6.0	8.4	6.0	17	33	25	23	17	33	25	23	2	
Total length cm	3.0	4.0	7.0	8.6	9.1	2.0	2.0	5.0	7.8	9.0	11.4	7.0	8.4	11.0	13.0	6.0	8.4	6.0	17	33	25	23	17	33	25	23	2	
Body length cm	0.7	1.3	5.2	9.1	9.1	0.14	0.14	3.5	10.0	18.0	36.0	6.3	7.2	10.1	11.5	5.0	7.4	5.0	17	33	25	23	17	33	25	23	2	
Weight g	0.7	1.3	5.2	9.1	9.1	0.14	0.14	3.5	10.0	18.0	36.0	6.3	7.2	10.1	11.5	5.0	7.4	5.0	17	33	25	23	17	33	25	23	2	

2. Results and discussion

The catches carried out with electric current showed that all the investigated streams were settled by fish species characteristic for the upper parts of mountain streams, i.e., the stream trout (*Salmo trutta m. fario* L.) and *Cottus poecilopus* Heckel.

As compared with similar streams of the River Dunajec basin, the

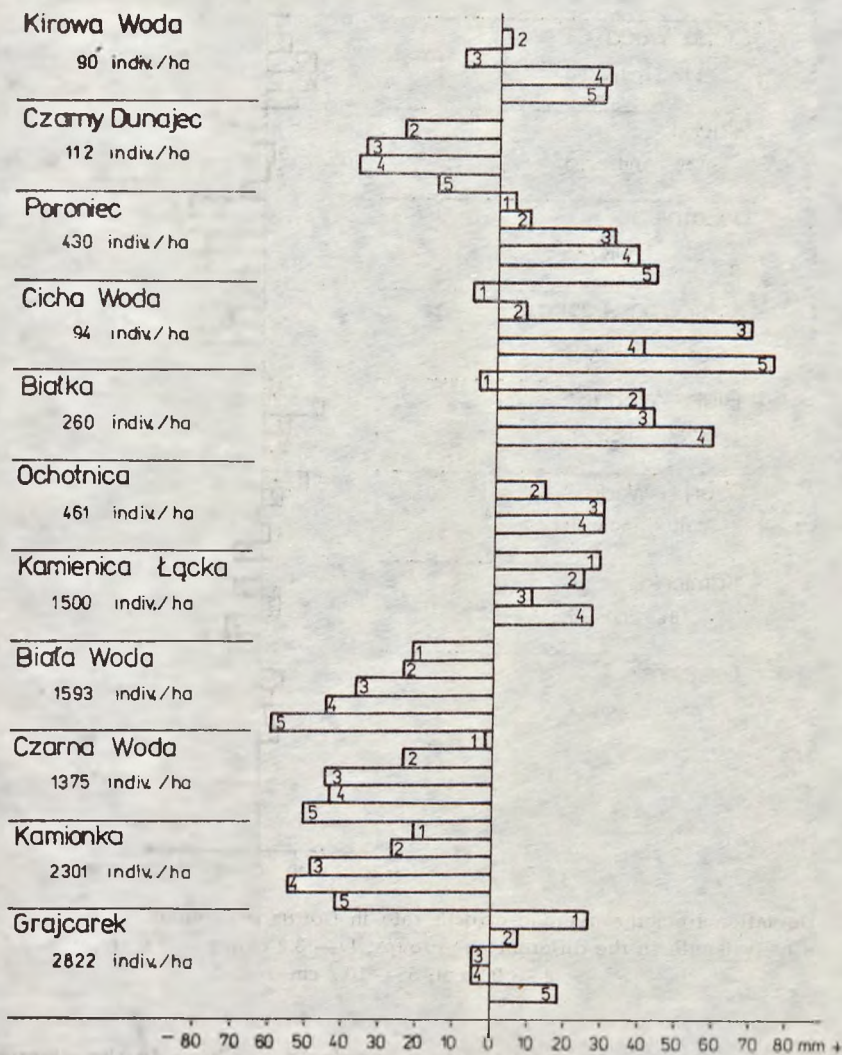


Fig. 1. Deviation from the average growth rate in *Salmo trutta m. fario*. 1—5 age-groups. Average for length in the different age groups: 1 — 6.4 cm; 2 — 12.8 cm; 3 — 18.2 cm; 4 — 22.3 cm; 5 — 25.6 cm

Kirowa Woda
400 indiv./ha

Czarny Dunajec
189 indiv./ha

Poroniec
1696 indiv./ha

Cicha Woda
517 indiv./ha

Białka
1480 indiv./ha

Ochoznica
630 indiv./ha

Kamienica Łącka
516 indiv./ha

Biała Woda
1784 indiv./ha

Czarna Woda
1010 indiv./ha

Kamionka
81 indiv./ha

Grajcarek
2900 indiv./ha

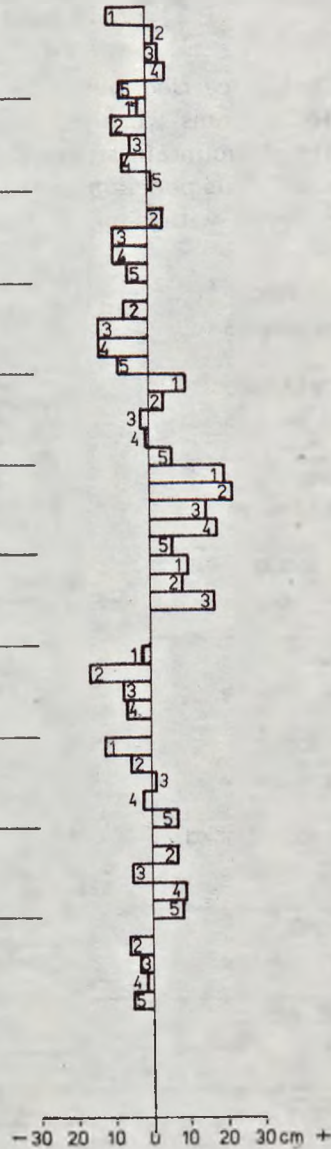


Fig. 2. Deviation from the average growth rate in *Cottus poecilopus*. 1—5 age-groups. Average body length in the different age-groups, 1 — 3.2 cm; 2 — 5.6 cm; 3 — 7.7 cm; 4 — 9.2 cm; 5 — 10.7 cm

numbers of representatives of the two species were high in the discussed streams (Starmach 1982). They reached the following values per 1 ha of water surface (Table I): in the Biała Woda stream 1493 trout and 1784 *Cottus poecilopus* specimens, the corresponding numbers in the

Table II. Fork length-weight relationship in *Salmo trutta m. fario* and body length-weight relationship in *Cottus poecilopus* Heckel

Stream	Log. W	
	<i>Salmo trutta m. fario</i>	<i>Cottus poecilopus</i>
Czarna Woda	-2.90813 + 3.915 Log. L	-2.16153 + 3.716 Log. L
Cicha Woda	-2.43230 + 3.434 Log. L	-2.22240 + 3.637 Log. L
Grajcarek	-1.37008 + 2.802 Log. L	-1.63238 + 2.997 Log. L
Biała	-1.70030 + 2.960 Log. L	-1.48164 + 2.779 Log. L
Kamionka	-3.22184 + 4.103 Log. L	-2.30146 + 3.646 Log. L
Ochoźnica	-3.22608 + 4.003 Log. L	-1.41388 + 2.597 Log. L
Kirowa Woda	-1.43320 + 2.722 Log. L	-3.53710 + 4.436 Log. L
Biała Woda	-1.29829 + 2.572 Log. L	-1.07730 + 2.281 Log. L
Czarny Dunajec	-0.69016 + 2.000 Log. L	-1.59264 + 2.668 Log. L
Kamionka Łączka	-0.90603 + 2.194 Log. L	-2.30912 + 3.391 Log. L
Pereniec	-0.97881 + 2.399 Log. L	-3.07928 + 4.278 Log. L

Czarna Woda stream being 1375 and 1010, in the Kamionka 2301 and 81, and in the Grajcarek 2822 and 2900.

The age structure of the caught fish is given in Table I. The table shows that the following age groups of trout prevailed: in the Biała Woda 1-, 2-, and 3-years old fish, in the Czarna Woda 4- and 5-years old, in the Kamionka 1- and 2-years old, and in the Grajcarek 2- and 3-years old. Among the representatives *Cottus poecilopus* the prevailing age-groups were: in the Biała Woda 1- and 2-years old fish, in the Czarna Woda 2-years old, and in the Grajcarek 3- and 4-years old.

The growth of specimens of the trout and *Cottus poecilopus* species settling the investigated streams are shown in figs 1 and 2 and in Table II. They present the deviations from the average growth of the two species, calculated for fish in all streams with similar ichthyofauna in the Dunajec basin. The deviations from average growth, presented in the graphs, show that besides the fish from the River Czarny Dunajec at Kojśówka, the specimens of trout from the Biała Woda and Kamionka belong to the poorest growing fish in the Dunajec basin. The population from the Grajcarek stream is characterized by growth exceeding the average value. The increment of *Cottus poecilopus* is also poorer than the average calculated for the River Dunajec, except for 5-years old fish from the Czarna Woda and 2-, 4- and 5-years old from the Kamionka stream.

Increases in body weight (Table I) calculated in relation to body length are presented in graphs 3 and 4. As compared with other two-species streams of the basin, trout from the Czarna Woda, Kamionka, and Grajcarek stream are among the heaviest fish there. Contrary to the above-quoted populations, trout from the Biała Woda, with the same length, reach a weight of 240 g and are therefore classified in the group of medium body weight fish. The other investigated species, *Cottus poecilopus*, also shows a variable length-weight relationship in the different

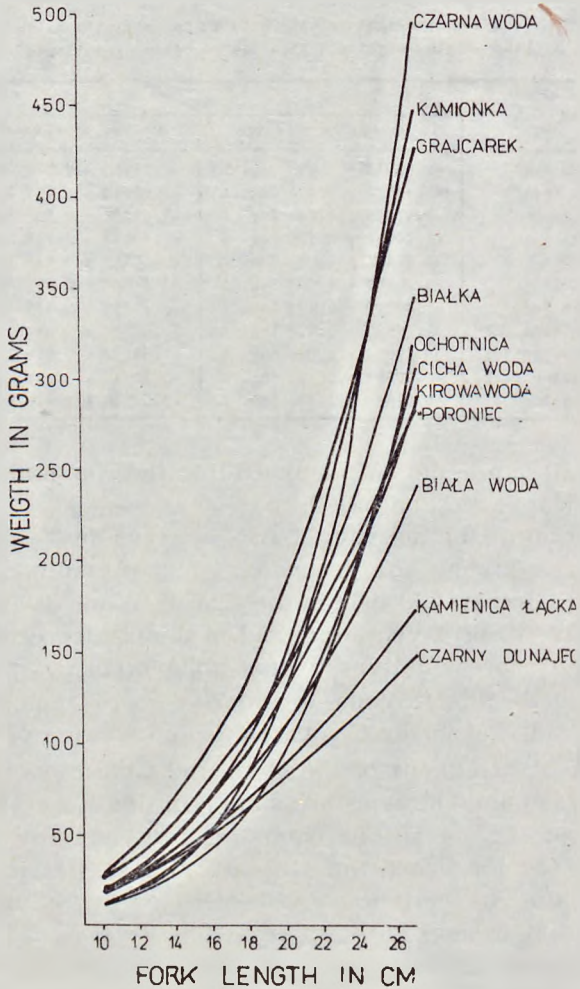


Fig. 3. Length-weight relationship *Salmo trutta m. fario*

streams. The representatives of this species from the Czarna Woda reach 125 g on the average at a length of 14 cm, and can be classified among the heaviest populations of *Cottus poecilopus* in the investigated basin, while the specimens from the Kamionka and Grajcarek reach 70—80 g, and those from the Biała Woda 34 g only. These results show that the variability range of *cottus gobio* body weight is fairly wide.

In recapitulating, trout from the streams of the Little Pieniny Mts (Małe Pieniny) have smaller body dimensions than the representatives of this species in other two-species streams of the River Dunajec basin. Contrary to body length the length-weight relationship in the investi-

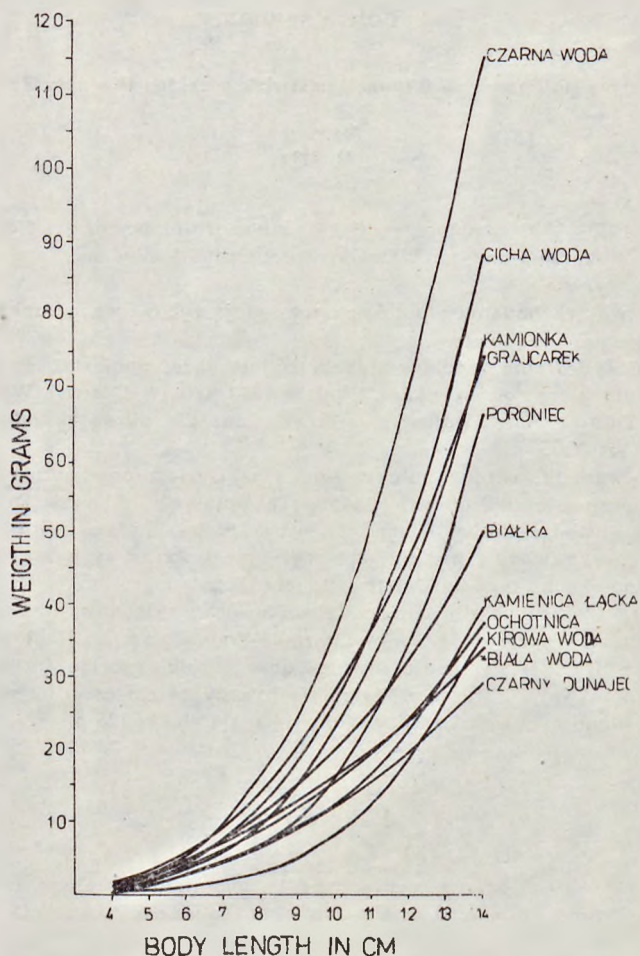


Fig. 4. Length-weight relationship *Cottus poecilopus*

gated fish was among the highest in the basin, except for the population of the Biała Woda stream.

The representatives of the other species living in the streams of the Little Pieniny Mts (Małe Pieniny), *Cottus poecilopus* Heckel, show a poorer growth rate than the populations in other streams of the basin, except for *Cottus poecilopus* from the Kamionka stream (fig. 2). Their length-weight relationship is also one of the highest in the streams of the River Dunajec upper basin.

3. Polish summary

Ekosystemy potokowe na terenach pastwisk górskich (Karpaty Zachodnie)

11. Ryby

W latach 1976—1978 zbadano populacje *Salmo trutta* m. *fario* i *Cottus poecilopus* w 4 potokach dorzecza Dunajca: Białej Wodzie, Czarnej Wodzie, Kamionce i Grajcar-ku. Badania te wykazały:

1. We wszystkich badanych potokach występują tylko dwa gatunki ryb — pstrąg potokowy i głowacz przęgopłetwy.

2. Gęstość zasiedlenia potoków (tabela I) jest duża, ponieważ w przeliczeniu na 1 ha wynosi dla pstrągów: w Białej Wodzie 1593 szt., w Czarnej Wodzie 1375 szt., w Kamionce 2301 szt. i w Grajcarcu 2822 szt. oraz dla głowaczy odpowiednio 1784, 1010, 81 i 2900 sztuk.

3. Tempo wzrostu pstrąga potokowego, z wyjątkiem populacji żyjącej w Grajcarcu, jest mniejsze niż w innych podobnych potokach dorzecza Dunajca (ryc. 1). Średni wzrost głowaczy natomiast (ryc. 2) jest w Białej Wodzie i Grajcarcu mniejszy, w Czarnej Wodzie równy, a w Kamionce wyższy niż wzrost tych ryb w innych dwugatunkowych potokach dorzecza Dunajca (tabela II).

4. Stosunek ciężaru do długości ciała waha się u pstrągów przy długości 27 cm od 240 g w Białej Wodzie do 495 g w Czarnej Wodzie (ryc. 3). U głowaczy podobnie jak u pstrągów (ryc. 4) występuje również duża rozbieżność ciężaru ciała ryb z poszczególnych potoków. Głowacze z Białej Wody przy 14 cm długości mają 35 g wagi, gdy tej samej długości ryby z Czarnej Wody osiągają ciężar 125 g.

4. References

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