

Zygmunt *CHEŁKOWSKI*, Bożena *CHEŁKOWSKA*, Oskar *ANTOSZEK*

Fish biology

**CYCLOSTOMES AND FISHES OF THE DRAINAGE BASIN OF THE
RIVER PŁOCICZNA**

KRAĞŁOUSTE I RYBY DORZECZA PŁOCICZNEJ

Department of Salmonid Fishes Management, Agricultural University of Szczecin, Poland

Studies on the occurrence of cyclostomes and fishes of the drainage area of the river Płociczna were carried out in 1996. The following parameters were defined: constancy of occurrence (*C*), domination index (*D*), and fractions of the biomass (*W*) represented by individual species. The results were confronted with the data from the river Płociczna published by the other authors within 1986-1994. A total of 1 cyclostome and 32 fish species was presently recorded to inhabit the drainage area of the river Płociczna. In this number there were 1 cyclostome and 7 fishes which are protected species. The part of the drainage area of the Płociczna under study, constitutes a section of the Drawieński National Park. The species occurring in that part, as well as in its buffer zone were discussed.

INTRODUCTION

The river Płociczna, one of the Pomeranian rivers is located in the western part of the Wałęckie Lake District and is a quaternary tributary of the Odra River (Fig. 1). Part of the drainage area of the Płociczna constitutes a section of the Drawieński National Park (Fig. 2). The first published information on the state of the fish fauna of the drainage area of the Płociczna were based on electrofishing performed in the frames of the conducted at that time inventory of the river (Chełkowski et al. 1987) as well as in the search for the salmon and its spawning grounds in the lower stretch of the Płociczna (Chełkowski 1987, 1988, 1989). On the other hand, the data on the cyclostomes and fishes of the river Drawa are much more complete



Fig. 1. Location of the Drawieński National Park in the Odra River system

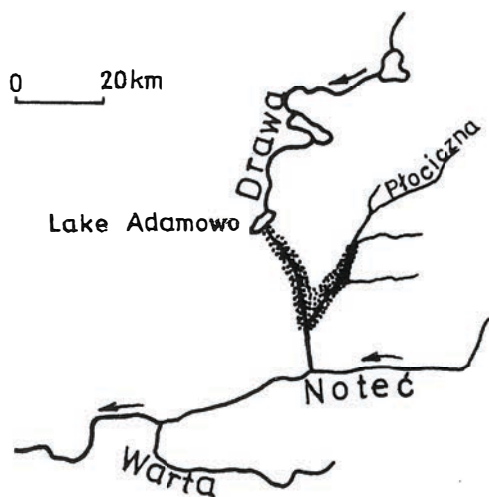


Fig. 2. Location of the Drawieński National Park in the drainage basins of the Drawa and Płociczna

(Chełkowski et al. 1996; Jaskowski 1962; Rembiszewski and Rolik 1975). These data, however, do not permit to “prepare the up-to-date list of the fishes and lampreys in the individual habitats groups” of the river Płociczna, which was intended to be covered by a protection plan of the newly established Drawieński National Park (Anonymous 1991, 1994). This prompted the present authors to undertake study aimed at qualitative and quantitative assessment of the cyclostomes and fishes inhabiting the drainage area of the river Płociczna, with particular emphasis on the waters flowing within the limits of the park and its buffer zone (Fig. 3). The present study on the fish-fauna covering only the lotic part of the drainage area of the Płociczna with exclusion of the numerous lakes occurring there were conducted in the summer of 1996.

The Płociczna has its sources on a wetland located in a valley, 109.7 m above the sea level, 3.5 km north of the village of Płociczno. The river derives its name from that village and it empties to the lower Drawa, 29 km from the mouth of the latter on the elevation of 40 m above the sea level. The river is 49 km

long. The average vertical drop rate is 1.4‰. The Płociczna flows through three lakes (Ostrowiec, Piaseczno, and Sitno). The shortest distance between inflow and outflow points of the river in the above-mentioned lakes is 6.5 km. Thus the ratio between the lotic and the lentic zones equals $(49.0:6.5)$ 7.5:1. The Płociczna receives four tributaries. Two left-bank ones—Cieszynka and Runica are the largest, in the respect of their lengths and also taking into consideration the area of their dra-

Table 1

Areas contributing to the drainage basin of the Płociczna

Tributary	Name of the area	km ²
lr*	from sources to Runica	84.0
l	Runica	127.2
lr	from Runica to Cieszynka	96.4
l	Cieszynka	121.6
lr	from Cieszynka to mouth	10.8
Drainage area of the Płociczna		440.0

*l—left-bank; r—right-bank

inage basins (Anonymous 1949) (Tab. 1). The stretch of the river, located below lake Ostrowieckie, has been defined as the lower Płociczna. The mid stretch has been delimited from the upper stretch by the river Runica emptying to the Płociczna. The assumption of such divisions leaves the three lakes within the mid stretch.

The Cieszynka starts its flow in a small valley located 93.3 m above the sea level, 1.5 km south east of the village of Mielęcin and after covering 25.2 km it empties to the lower Płociczna at the elevation of 56 m above sea level at the distance of 13.6 km from the merging point with the Drawa. The average vertical drop rate is 1.5‰. The Cieszynka flows through four lakes, and the ratio between the lotic and lentic zones is (25.2:8.5 km) 3:1. The area of the drainage basin of the Cieszynka is 121.6 km².

The second tributary of the Płociczna—the Runica flows out of a small lake on the elevation of 112.9 m above sea level, located 2.5 km south east of the village of Strzelin (6.5 km west of Tuczno) and it empties to the Płociczna at the elevation of 71.5 m above sea level. The length of the Runica measured in the course of its flow is 17.6 km and its average vertical drop rate is 2.4‰. The area of its drainage basin is 127.2 km². The Runica flows through three lakes and the ratio between the lotic and lentic zones is (17.6:5.1 km) 3.5:1.

The area of the drainage basin of the upper Płociczna—from the mouth of the Runica, including two small, tributaries: left-bank "Rzeczyca" and right-bank "without name"—is 84 km².

The Rzeczyca flows out of a wetland at the elevation of 109 m above sea level, located 3 km north east of a village by the same name. The river, after covering the distance of 11 km, empties to the Płociczna at the 43.5 km of the latter river stretch at the elevation of 95.2 m above sea level. The average vertical drop rate of the Rzeczyca is 1.3‰.

The watercourse "without name" starts from a wetland located in a valley at 90.7 m above sea level, 3 km north of the village of Lubie. It empties as a canal to the Płociczna at the 37.5 km of the latter river stretch at the elevation of 79.2 m above sea level. On its way this watercourse flows through two lakes. The length of the watercourse is 7.2 km including 2.1 km of the lakes. Consequently the ratio of the lotic to the lentic zone is (7.2:2.1 km) 3.4:1. The average vertical drop rate of the water course described is 1.6‰.

In addition to the above-mentioned tributaries a number of canals flowing out of lakes as well as irrigation ditches empties to the Płociczna. The latter ditches periodically dry out. The canals and ditches were not studied in the present survey.

The lower and mid Płociczna and their main tributaries the Cieszynka and the Runica flow through big forest complexes, with decisive majority of coniferous trees. Its channel has distinctly marked, sometimes steep banks, covered with roots of deciduous trees, mostly black alder *Alnus glutinosa* (L.). The river bed is flat, sandy, with small gravel-stone parts. Vascular aquatic vegetation is poor with the exception for exposed parts of the watercourses located amid fields and meadows of the upper Płociczna. For example the vegetation of the upper, left bank tributary of the Płociczna—the Rzeczyca, below the village by the same name, shows zonation pattern of the aquatic vegetation protruding above the surface, covering as much as 85% of the brook area. The upper Płociczna and its upper tributaries, as well as the upper stretches of the Cieszynka and Runica are regulated. The remaining parts of the drainage basin of the Płociczna are to some extent primeval.

The lower and mid Płociczna from the Runica mouth, the lower Cieszynka from its outflow from lake Dubie to Płociczna, and 1.7 km-long estuarial stretch of the Runica, emptying to the Płociczna are the parts of the Drawieński National Park. The buffer zone, constituting the enlarged protective area covers slightly larger area compared to the area of the Drawieński National Park, however, it is much smaller than the area of the drainage basin of the Płociczna. The area of the drainage basin of the Płociczna, covering 440 km² constitutes one of the largest drainage basins contributing to the Drawa system (Anonymous 1949). The national park covers 74.8 km² (17.0%) of the drainage basin of the Płociczna, while the park enlarged by its buffer zone—169.0 km² (38.4%) (Fig. 3).

MATERIAL AND METHODS

A total of 14 sampling sites (a-o) was set up in the drainage basin of the Płociczna and they were used only once for catching cyclostomes and fishes (Fig. 3). In this number 9 sites (a, b, c, d, e, f, g, h, l) were located in the lower and central part of the drainage basin within the limits of the Drawieński National Park, and the remaining 5 (i, j, k, m, o)—in the upper part of the drainage basin. On 10 of them (a, b, c, d, e, f, g, h, i, l) the catches were performed using a gasoline-operated electrofishing device with an attachment converting alternating current into direct current (220 V, 5-6 A). The catches were performed with one anode-linked dipnet from a boat passively floating downstream. Both the coastal zone and the mid-stream were penetrated at 500-m-long sampling sections (Backiel and Penczak 1989; Koszaliński et al. 1989; Penczak 1967, 1995; Witkowski et al. 1991). On the remaining 4 sites in the upper part of the drainage basin (j, k, m, o) the catches we-

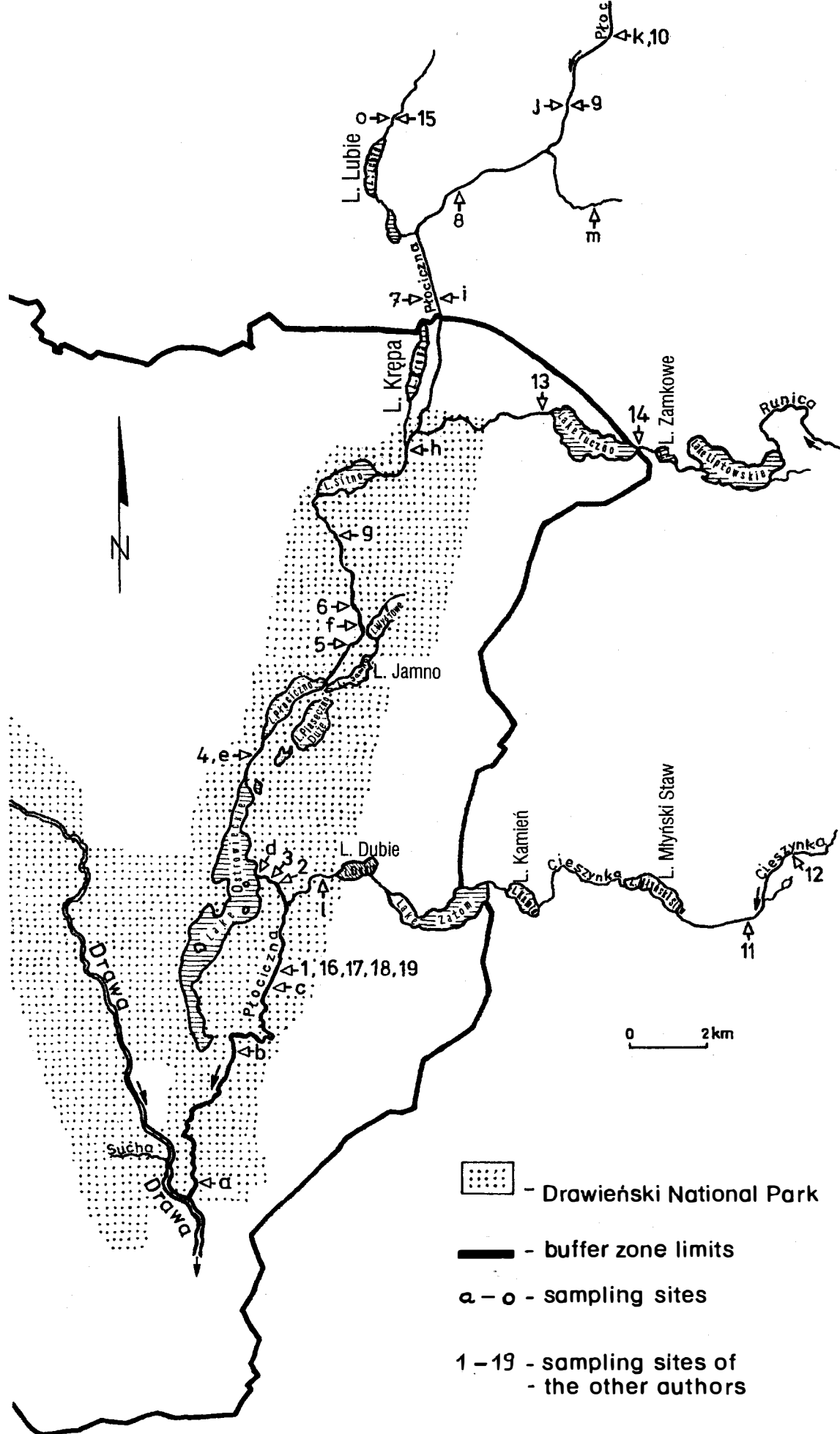


Fig. 3. Diagrammatic map of the drainage basin of the Płociczna showing the Drawieński National Park, its buffer zone and the sampling sites.

re performed with battery-operated impulse electrofishing device (IUP) with a single dip-net, on 100-m-long sections while wading in the upper part of a brook (Penczak et al. 1995). The total length of the sampling sites (stretches) was $(9 \times 500 \text{ m} + 5 \times 100 \text{ m})$ 5000 m. The timetable, location and the physiographic description of the catch sites in the drainage basin of the Płociczna are shown in Tab. 2. The material acquired was identified using four publications (Brylińska 1986; Gąsowska 1969; Rolik and Rembiszewski 1987; Staff 1950). The following data were recorded according to Brylińska (1986): number of specimens of each species (n), individual lengths in mm, and weights in g. In the case of the protected species (Anonymous 1995) and economically valuable ones, the specimens caught were counted, weighed, sampled for further studies, and finally released at places where catches ended. The abundance of the samples where those studies were conducted were given in the description of the species. The catches yielded specimens measuring 32-690 mm and weighing 0.5-2287 g. The shortest specimen was a common minnow (32 mm) and the longest one was an eel (690 mm). The lightest was a common minnow (0.5 g) and a barbel (2 287 g). While the material was processed, two basic biocoenotic parameters were taken into account: the domination structure on the individual sites and in the Płociczna drainage basin (D)¹ and the constancy of occurrence (C)² (Koszaliński et al. 1989; Kuszniarz et al. 1994; Witkowski et al. 1991, 1992). The cyclostomes and fishes acquired were also divided into ecological reproductive guilds (Balon 1964, 1975, 1981; Rolik and Rembiszewski 1987). In addition to that the combined weight of individual fish species and its fraction in the total biomass of all cyclostomes and fishes caught (W)³ were also presented here (Skóra and Włodek 1989; Skóra et al. 1994). The systematic arrangement of the species assumed in the present paper follows that of Rolik and Rembiszewski (1987) for the cyclostomes and that of Brylińska (1986) for the fishes. For the species more abundant than 7 ($n > 7$) the following data are given: arithmetic mean with standard deviation ($\bar{x} \pm \text{SD}$), variability factor (V), and the ranges of the length and weight. The collected and processed data of the studied fauna are shown in tables (Tabs. 3-6).

¹ $D = (n_i/N \times 100)$ where: n_i —number of specimens of the species “i” in the sample; N —number of all specimens in the sample

² $C = (N_a/N_n \times 100)$ where: N_a —number of sites where this species occurs; N_n —total number of sites

³ $W = (m_i/M \times 100)$ where: m_i —combined weight of all specimens of a given species acquired in the Płociczna; M —combined weight of all specimens acquired in the Płociczna

Table 2

Timetable, location, and description of the sampling sites of cyclostomes and fishes in the drainage basin of the Płociczna

No.	Date of catch	Location	Length of section [km]	Average width [m]	Average depth [m]	Speed of current [m/s]	Bottom description	Shape of channel	Aquatic vegetation	Bank vegetation	Neighboring land
Lower Płociczna, below lake Ostrowieckie											
1	23 Aug 96	a mouth section emptying to the Drawa*	0.5	12.0	0.7	0.3	s	w	poor	black alder	mixed forest
2	23 Aug 96	b below "Karolinka" bridge*	0.5	12.5	1.0	0.3	s	w	poor	black alder	mixed forest
3	22 Aug 96	c below old eel trap*	0.5	12.0	0.7	0.7	s g st	w	poor	black alder	mixed forest
4	20 Aug 96	d directly below lake Ostrowieckie*	0.5	10.0	0.5	1.0	s g st	w	poor	black alder	mixed forest
Mid Płociczna, below Runica mouth											
5	20 Aug 96	e below bridge at "Pustelnia"*	0.5	14.0	0.6	0.8	s	w	poor	black alder	mixed forest
6	21 Aug 96	f between bridges "Płycina" and "Miradz"*	0.5	12.0	0.6	0.5	s	w	poor	black alder	mixed forest
7	21 Aug 96	g below lake Sitno (below wooden bridge)*	0.5	14.0	0.5	0.4	s	w	poor	black alder	mixed forest
8	21 Aug 96	h directly below Runica mouth*	0.5	12.0	0.7	0.5	s	w	poor	black alder	mixed forest
Upper Płociczna											
9	26 Aug 96	i above bridge on route between Krępa-Jeziorki	0.5	3.6	0.45	0.5	s	w	poor	black alder	meadows
10	26 Aug 96	j below bridge in village of Płociczno	0.1	2.0	0.15	0.5	s	w	poor	black alder	meadows, fields
11	26 Aug 96	k 2.5 km above village of Płociczno	0.1	2.2	0.3	0.4	s	w	poor	black alder	meadows, fields
Płociczna – left-bank tributaries											
12	27 Aug 96	l lower Cieszynka below lake Dubie*	0.5	10.5	0.6	0.4	s g st	w	poor	black alder	mixed forest
13	26 Aug 96	m near village of Rzeczyca	0.08	2.0	0.6	0.3	s m	w	reach	open area	fields
Płociczna – left-bank tributaries											
14	26 Aug 96	o brook emptying to Lubie Lake	0.1	1.4	0.1	0.5	s	w	poor	mid-forest section	mixed forest

* section within the limits of the Drawieński National Park; a-o—location of the sites shown on Fig. 3; s—sand; g—gravel; st—stones; m—mud; w—well pronounced channel

Table 3

Results of catches of cyclostomes and fishes at 14 sites of the drainage basin of the Płociczna

Family—species	a	b	c	d	e	f	g	h	i	j		l	m	o	Total
Petromyzontidae															
<i>Lampetra planeri</i> (Bloch)	—	—	—	—	—	—	—	—	3	—	—	—	—	—	3
Salmonidae															
<i>Salmo trutta</i> m. <i>fario</i> L.	1	—	1	—	—	1	—	10	5	11	10	—	—	7	46
Thymallidae															
<i>Thymallus thymallus</i> (L.)	—	—	4	—	—	—	—	—	—	—	—	—	—	—	4
Esocidae															
<i>Esox lucius</i> L.	1	1	—	1	1	—	1	1	5	—	—	—	—	—	11
Cyprinidae															
<i>Rutilus rutilus</i> (L.)	11	14	3	33	98	165	41	12	8	—	—	63	—	—	448
<i>Leuciscus leuciscus</i> (L.)	9	9	8	38	9	10	—	3	—	—	—	—	—	—	86
<i>Leuciscus cephalus</i> (L.)	5	18	9	48	24	15	48	4	3	—	—	49	—	—	223
<i>Leuciscus idus</i> (L.)	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2
<i>Phoxinus phoxinus</i> (L.)	—	—	—	35	—	—	—	—	—	—	—	—	—	—	35
<i>Tinca tinca</i> (L.)	—	—	—	1	—	—	—	—	3	—	—	2	—	—	6
<i>Gobio gobio</i> (L.)	1	—	2	20	2	21	4	28	4	—	—	14	—	—	96
<i>Barbus barbus</i> (L.)	—	1	7	—	—	—	—	—	—	—	—	—	—	—	8
<i>Alburnus alburnus</i> (L.)	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
<i>Alburnoides bipunctatus</i> (Bloch)	—	53	23	—	—	—	—	2	—	—	—	—	—	—	78
<i>Blicca bjoerkna</i> (L.)	—	—	—	—	4	15	63	—	—	—	—	95	—	—	177
<i>Abramis brama</i> (L.)	2	19	—	1	17	4	—	—	—	—	—	—	—	—	43
<i>Vimba vimba</i> (L.)	—	—	—	6	3	—	—	—	—	—	—	—	—	—	9
<i>Rhodeus sericeus amarus</i> (Bloch)	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Cobitidae															
<i>Cobitis taenia</i> L.	—	—	—	26	—	—	—	—	—	—	—	—	—	—	26
<i>Misgurnus fossilis</i> (L.)	—	—	—	—	—	—	—	—	—	—	—	—	13	—	13
Anguillidae															
<i>Anguilla anguilla</i> (L.)	6	23	2	35	4	55	68	8	1	—	—	5	—	—	207
Gadidae															
<i>Lota lota</i> (L.)	10	4	2	—	—	6	—	—	—	—	—	1	—	—	24
Gasterosteidae															
<i>Gasterosteus aculeatus</i>	—	—	—	—	—	—	—	—	1	—	1	—	—	2	4
Percidae															
<i>Perca fluviatilis</i> L.	30	17	12	15	24	23	22	18	1	—	—	60	—	—	222
<i>Gymnocephalus cernuus</i> (L.)	—	—	—	—	—	—	4	31	—	—	—	—	—	—	35
Cottidae															
<i>Cottus gobio</i>	—	—	2	1	—	—	—	—	—	—	—	—	—	—	3
Total	76	161	75	261	187	316	251	117	34	11	11	289	13	9	1811

Table 4

Frequency of occurrence (*n*), domination (*D*), weight, and its fraction in the combined biomass (*W*) of the cyclostome and fish species acquired from the drainage basin of the Płociczna

No.	Species	Number of specimens	<i>D</i> -index [%]	Biomass [g]	<i>W</i> -index [%]
1	<i>Lampetra planeri</i> (Bloch)	3	0.17	8.6	0.009
2	<i>Salmo trutta</i> m. <i>fario</i> L.	46	2.54	2 132.0	2.271
3	<i>Thymallus thymallus</i> (L.)	4	0.22	134.0	0.143
4	<i>Esox lucius</i> L.	11	0.61	673.0	0.717
5	<i>Rutilus rutilus</i> (L.)	448	24.74	16 698.0	17.786
6	<i>Leuciscus leuciscus</i> (L.)	86	4.75	1 157.0	1.232
7	<i>Leuciscus cephalus</i> (L.)	223	12.31	20 817.0	22.173
8	<i>Leuciscus idus</i> (L.)	2	0.11	44.0	0.047
9	<i>Phoxinus phoxinus</i> (L.)	35	1.93	60.9	0.065
10	<i>Tinca tinca</i> (L.)	6	0.33	241.0	0.257
11	<i>Gobio gobio</i> (L.)	96	5.30	1 469.0	1.565
12	<i>Barbus barbus</i> (L.)	8	0.44	2 400.0	2.556
13	<i>Alburnus alburnus</i> (L.)	1	0.06	1.0	0.001
14	<i>Alburnoides bipunctatus</i> (Bloch)	78	4.30	353.0	0.376
15	<i>Blicca bjoerkna</i> (L.)	177	9.77	6 132.0	6.531
16	<i>Abramis brama</i> (L.)	43	2.37	2 470.0	2.631
17	<i>Vimba vimba</i> (L.)	9	0.50	1 401.0	1.492
18	<i>Rhodeus sericeus amarus</i> (Bloch)	1	0.06	1.0	0.001
19	<i>Cobitis taenia</i> L.	26	1.44	51.7	0.055
20	<i>Misgurnus fossilis</i> (L.)	13	0.72	75.8	0.081
21	<i>Anguilla anguilla</i> (L.)	207	11.43	28 772.0	30.646
22	<i>Lota lota</i> (L.)	24	1.32	2 067.0	2.202
23	<i>Gasterosteus aculeatus</i> L.	4	0.22	8.0	0.009
24	<i>Perca fluviatilis</i> L.	222	12.26	6 297.0	6.707
25	<i>Gymnocephalus cernuus</i> (L.)	35	1.93	403.0	0.429
26	<i>Cottus gobio</i> L.	3	0.17	17.2	0.018
Total		1 811	100.00	93 884.2	100.000

Domination of the cyclostome- and fish species at the sites of the drainage basin of the Płociczna

[illegible]

Table 6

Occurrence constancy index (*C*) and the domination index (*D*) of the cyclostome and fish species acquired from the drainage basin of the Płociczna in the respective ecological guilds

No.	Species	C %	D %	Ecological guild
1	<i>Anguilla anguilla</i> (L.)	71.4	11.43	pelagophilous
2	<i>Lota lota</i> (L.)	42.9	1.32	lithopelagophilous
3	<i>Lampetra planeri</i> (Bloch)	7.1	0.17	lithophilous (2.41%)
4	<i>Salmo trutta m. fario</i> L.	57.1	2.54	
5	<i>Thymallus thymallus</i> (L.)	7.1	0.22	
6	<i>Leuciscus cephalus</i> (L.)	71.4	12.31	
7	<i>Phoxinus phoxinus</i> (L.)	7.1	1.93	
8	<i>Barbus barbus</i> (L.)	14.3	0.44	
9	<i>Alburnoides bipunctatus</i> (Bloch)	21.4	4.30	
10	<i>Vimba vimba</i> (L.)	14.3	0.50	phytolithophilous (46.22%)
11	<i>Rutilus rutilus</i> (L.)	71.4	24.74	
12	<i>Leuciscus leuciscus</i> (L.)	50.0	4.75	
13	<i>Leuciscus idus</i> (L.)	7.1	0.11	
14	<i>Alburnus alburnus</i> (L.)	7.1	0.06	
15	<i>Abramis brama</i> (L.)	35.7	2.37	
16	<i>Perca fluviatilis</i> L.	71.4	12.26	
17	<i>Gymnocephalus cernuus</i> (L.)	14.3	1.93	phytophilous (12.87%)
18	<i>Esox lucius</i> L.	50.0	0.61	
19	<i>Tinca tinca</i> (L.)	21.4	0.33	
20	<i>Blicca bjoerkna</i> (L.)	28.6	9.77	
21	<i>Cobitis taenia</i> L.	7.1	1.44	
22	<i>Misgurnus fossilis</i> (L.)	7.1	0.72	ostracophilous
23	<i>Rhodeus sericeus amarus</i> (Bloch)	7.1	0.06	
24	<i>Gobio gobio</i> (L.)	64.3	5.30	psammophilous
25	<i>Cottus gobio</i> (L.)	14.3	0.17	speleophilous
26	<i>Gasterosteus aculeatus</i> L.	14.3	0.22	ariadnophilous

RESULTS

The catches conducted at fourteen sites of the drainage basin of the Płociczna yielded a total of 1 811 specimens of cyclostomes and fishes weighing jointly 93 884.2 g. In this number 3 specimens represented cyclostomes and 1808—fishes. There were 26 species present, representing 11 families (Tabs. 3, 4). As it is visible from the following statement the individual sites yielded between 9 and 316 specimens representing from 1 to 14 different species:

Site	Abundance	No. of species
a	76	10
b	161	11
c	75	12
d	261	14
e	187	11
f	316	11
g	251	8
h	117	10
i	34	11*
j	11	1
k	11	2
l	289	8
m	13	1
o	9	2

* one cyclostome and 10 fish species

Most of the specimens occurred at site “f”, while most of the species—at site “d”. The family Cyprinidae is represented in the studied material by 14 species, Cobitidae and Percidae—by 2, while Petromyzontidae, Salmonidae, Thymalidae, Esocidae, Anguillidae, Gadidae, Gasterosteidae, and Cottidae—by 1.

Most of the specimens represented family Cyprinidae ($n = 1213$; 66.98%), Percidae ($n = 257$; 14.19%), and Anguillidae ($n = 207$; 11.43%). Fewer specimens represented Salmonidae ($n = 46$; 2.54%), Cobitidae ($n = 39$; 2.15%), Gadidae ($n = 24$; 1.32%), and Esocidae ($n = 11$; 0.61%). Finally, very few specimens belonged to Thymalidae ($n = 4$; 0.22%), Gasterosteidae ($n = 4$; 0.22%), Cobitidae ($n = 3$; 0.17%), and Petromyzontidae ($n = 3$; 0.17%).

The description of the individual cyclostome and fish species acquired in the drainage basin of the Płociczna is given below.

Family Petromyzontidae

Brook lamprey—*Lampetra planeri* (Bloch)

Site: i	$D =$ at site 8.8%; in drainage basin 0.17%
$n = 3$	Total length: $\bar{x} = 126.3$; range 124–129 mm
$C = 7.1\%$	Weight: $\bar{x} = 2.9$; range 2.7–3.1 g
$W = 0.009\%$	

There were 3 live lamprey larvae at the transformation phase caught in the drainage basin of the Płociczna. They were acquired on 26 August 1996 in the upper Płociczna at site i'' on a 3.6-m-wide and 0.45-m-deep river stretch with hard, sandy bottom, and muddy coastal areas. The water temperature was 16°C and the flow was 0.5 m/s. The miomeres of the larvae were clearly visible (63-69; = \bar{x} 66). The dorsal part as well as the upper parts of the sides were dark-brown, shiny. The lower parts of the sides were shiny, light-brown (beige). The fins were milk-white. Gill openings were visible. Mouth openings of the larvae approximated a triangle and they were lacking the buccal funnel. The smallest specimen, 124-mm-long had no eyes. The second specimen, 126-mm-long had eyes, while the largest specimen, 129-mm-long had only left eye and weakly marked primordium of the right one. There were two dorsal fins, almost as high as in mature specimens. The first dorsal fin was connected with the second one. Analysing the above data it is possible to assume after Rolik and Rembiszewski (1987) that the larvae described represent the brook lamprey, *Lampetra planeri* (Bloch, 1784). The domination index of the lamprey larvae reached at this site a value of 8.8%, while in the drainage basin—0.17%. The occurrence constancy index reached 7.1% (Tabs. 5, 6). The three lampreys weighed 8.9 g and their share in the combined biomass of the cyclostomes and fishes studied was very low ($W = 0.009\%$).

Family Salmonidae

Brown trout stream morphotype—*Salmo trutta morpha fario* L.

Sites: a, c, f, h, i, j, k, o	$D =$ at sites 5.3%; in drainage basin 2.54%
$n = 46$	Fork length: $\bar{x} \pm m = 138.1 \pm 9.44$ mm; $V = 46.87$; range 35–286 mm
$C = 57.1\%$	Weight: $\bar{x} \pm m = 46.4 \pm 7.64$ g; $V = 112.96$; range: 5–280 g
$W = 2.271\%$	

There was a total of 46 fish caught from 8 sites of the drainage basin of the Płociczna. Representatives of *Salmo trutta* collected measured 55-286 mm and weighed 5-280 g. They were acquired mainly from five sites (h, i, j, k, o) located in the upper stretch of the drainage basin of the Płociczna. At these sites a total of 43 specimens was collected (93.5%), while at the remaining ones (a, c, f) only one at each site (6.5%). The coloration of the specimens suggested, they represented the brown trout stream morphotype, *Salmo trutta m. fario*. It cannot be excluded, however, that also the brown trout lake morphotype, *S. trutta m. lacustris* and the

migratory morphotype of the brown trout, *S. trutta* m. *trutta* were present in this material. These morphotypes are known to occur in the drainage area of the Płociczna (Chełkowski and Gancarczyk 1995, 1995a; Chełkowski 1987, 1988, 1989). The occurrence constancy of index for those fish reached a value of 57.1%. The domination index, on the other hand, widely ranged among individual sites between 0.3 to 100%, while in the entire drainage basin it reached a value of 2.54%. The combined weight of all acquired fishes of the genus *Salmo* was 2 132 g, while its share in the combined biomass was 2.27%.

Family Thymallidae

Grayling—*Thymallus thymallus* (L.)

Site: c	$D =$ at site 5.3%; in drainage basin 0.22%
$n = 4$	Standard length: $\bar{x} = 135$ mm; range 95–172 mm
$C = 7.1\%$	Weight: $\bar{x} = 33.5$; range 18–51 g
$W = 0.143\%$	

The grayling was a fish rarely occurring in the catches from the drainage basin of the Płociczna. Four fish of this species were present at one site only (“c”).

The occurrence constancy index of the grayling was 7.1% while the domination index was 5.3% at single site, while in the entire drainage basin—0.22%. The share the grayling in the combined biomass was very low ($W = 0.14\%$).

Family Esocidae

Pike—*Esox lucius* L.

Sites: a, b, d, e, g, h, i	$D =$ at sites 0.4–14.7%; in drainage basin 0.61%
$n = 11$	Standard length: $\bar{x} \pm m = 170.5 \pm 16.7$ mm; $V = 32.5$; range 116–308 mm
$C = 50\%$	Weight: $\bar{x} \pm m = 61.2 \pm 21.65$; $V = 117.37$; range 14–267 g
$W = 0.717\%$	

The pike occurred at 7 sites, 1–5 fish at each site. The catches yielded a total of 11 pike. The occurrence constancy index was relatively high ($C = 50\%$). The domination index for the entire drainage basin was 0.61% while it ranged from 4 to 14.7% between individual sites. The combined weight of the pike was 673 g and its share in the combined biomass was low ($W = 0.72\%$).

Family Cyprinidae

Roach—*Rutilus rutilus* (L.)

Sites: a, b, c, d, e, f, g, h, i, l	$D =$ at sites 4.0–52.2%; in drainage basin 24.74%
$n = 448$	Standard length: $\bar{x} \pm m = 120.0 \pm 1.03$; $V = 18.22$; range 52–178 mm
$C = 71.4\%$	Weight: $\bar{x} \pm m = 37.3 \pm 0.94$; $V = 53.28$; range 2–121 g
$W = 17.786\%$	

The roach was acquired from 10 sites. The occurrence constancy index reached a high value ($C = 71.4\%$). The catches yielded a total of 448 fish of this species, which gives the highest value of the domination index of 24.74%. At individual sites, however, this index ranged very widely (4–52%). Despite the quantitative domination of the roach in the catches in general, its share in the biomass was not the highest amounting to 17.79%. In the respect of the biomass, the roach was on the third place behind chub and the eel.

Dace—*Leuciscus leuciscus* L.

Sites: a, b, c, d, e, f, h	$D =$ at sites 2.6–14.6%; in drainage basin 4.75%
$n = 86$	Standard length: $\bar{x} \pm m = 94.7 \pm 3.01$; $V = 29.47$; range 49–151 mm
$C = 50\%$	Weight: $\bar{x} \pm m = 13.4 \pm 1.12$; $V = 10.39$; range 2–46 g
$W = 1.232\%$	

The dace occurred in the half of the sites studied ($n = 7$). This explains the high value of the occurrence constancy index ($C = 50\%$). The catches yielded a total of 86 dace. At site “d” the dace was quantitatively on the second place following the chub and reaching high level of domination ($D = 14.6\%$). The level of domination, however, was variable at individual sites (2.6–14.6%), reaching 4.75% for the entire drainage basin. The combined weight of the dace represented 1.23% of the combined biomass.

Chub—*Leuciscus cephalus* (L.)

Sites: a, b, c, d, e, f, g, h, i, l	$D =$ at sites 3.4–19.1%; in drainage basin 12.31%
$n = 223$	Standard length: $\bar{x} \pm m = 140.7 \pm 4.25$; $V = 45.14$; range 49–360 mm
$C = 71.4\%$	Weight: $\bar{x} \pm m = 93.0 \pm 8.54$; $V = 136.62$; range 2–905 g
$W = 22.173\%$	

The chub was a very abundant and a frequently encountered species in the drainage basin of the Płociczna. It was recorded at 10 sites what was reflected in a high occurrence constancy index amounting to 71.4%. Quantitatively the chub was on the second place after the roach. There were 223 chub collected which gives a high domination index ($D = 12.32\%$). Values of this index varied in a wide range between sites (3.4–19.1%). At site “d” the chub was the most abundant gaining the domination index of 18.4%. The highest value of the domination index occurred at site “g” (19.1%). The combined weight of the chub was 20 817 g. The chub represented a very high share in the combined biomass of the studied cyclostomes and fishes ($W = 22.17\%$) placing it on the second place after the eel.

Orfe—*Leuciscus idus* (L.)

Site: b	$D =$ at site 1.2%; in drainage basin 0.11%
$n = 2$	Standard length: $\bar{x} = 102$; range 89–115 mm
$C = 7.1\%$	Weight: $\bar{x} = 22$; range 11–33 g
$W = 0.047\%$	

The orfe was one of the fishes rarely occurring in the catches. There were only two orfe acquired at site “b” which is reflected in a low occurrence constancy index (7.1%). The domination index reached 1.2% at the site and 0.11% in the drainage basin. The orfe represented a very small fraction of the combined biomass (0.05%).

Common minnow—*Phoxinus phoxinus* (L.)

Site: d	$D =$ at site 1.4%; in drainage basin 1.93%
$n = 35$	Standard length: $n = 16$; $\bar{x} \pm m = 51.4 \pm 2.04$; $V = 15.83$; range 32–60 mm
$C = 7.1\%$	Weight: $n = 16$; $\bar{x} \pm m = 1.7 \pm 0.15$; $V = 35.29$; range 0.5–2.6 g; $n = 35$; $\bar{x} = 1.74$ g
$W = 0.065\%$	

The common minnow occurred at site “d”. The occurrence constancy index assumed low a value of 7.1%. A total of 35 specimens of the common minnow was acquired. Out of this number, 19 were released to the Płociczna and 16 were kept for further studies. The domination index at the site reached 13.4% and in the drainage basin—1.93%. The common minnow represented very small share of the combined biomass ($W = 0.07\%$).

Tench—*Tinca tinca* (L.)

Sites: d, i, l	$D =$ at sites 0.4–8.8%; in drainage basin 0.33%
$n = 6$	Standard length: $\bar{x} \pm m = 100.3 \pm 17.48$; $V = 42.68$; range 47–160 mm
$C = 21.4\%$	Weight: $\bar{x} \pm m = 40.2 \pm 17.75$; $V = 108.24$; range 2–117 g
$W = 0.257\%$	

The tench was not numerously represented in the material studied. There were only 6 specimens of this species in the catches. They were acquired from three sites located in the lower and in the upper stretch of the Płociczna and in the lower stretch of the Cieszyńska. The occurrence constancy index was 21.4%. The domination index at the sites where it occurred ranged from 0.4 to 8.8%, reaching 0.33% in the drainage basin. The share of the tench in the combined biomass was low ($W = 0.26\%$).

Gudgeon—*Gobio gobio* (L.)

Sites: a, c, d, e, f, g, h, i, l	$D =$ at sites 1.1–23.9%; in drainage basin 5.3%
$n = 96$	Standard length: $\bar{x} \pm m = 96.1 \pm 1.72$; $V = 17.53$; range 58–138 mm
$C = 64.3\%$	Weight: $\bar{x} \pm m = 15.3 \pm 0.79$; $V = 50.42$; range 3–35 g
$W = 1.565\%$	

The gudgeon occurred at 9 sampling sites. The occurrence constancy index was relatively high, assuming a value of 64.3%. In all, 96 gudgeon were acquired. The domination index varied between the sites within 1.1–23.9%. For the drainage basin it reached a value of 5.3%. The combined weight of the gudgeon represented 1.57% of the combined biomass.

Barbel—*Barbus barbus* (L.)

Sites: b, c	$D =$ at sites 0.6–9.7%; in drainage basin 0.44%
$n = 8$	Standard length: $\bar{x} \pm m = 156.6 \pm 56.96$; $V = 102.86$; range 91–555 mm
$C = 14.3\%$	Weight: $\bar{x} \pm m = 300.0 \pm 283.86$; $V = 267.63$; range 13–2287 g
$W = 2.556\%$	

The barbel in the drainage basin of the Płociczna is a rare species. Its presence was limited to two sites. There were 8 barbel collected altogether. In this number one from site “b” and 7 from site “c”. The occurrence constancy index reached 14.3%. The domination index on the sampling sites was within 0.6–9.7%, assuming a value of 0.44% for the entire drainage basin. The combined weight of the barbel represented 2.56% of the combined biomass.

Bleak—*Alburnus alburnus* (L.)

Site: d	$D =$ at site 0.4%; in drainage basin 0.06%
$n = 1$	Standard length: 53 mm
$C = 7.1\%$	Weight: 1 g
$W = 0.001\%$	

Only one bleak and was caught in the course of the catches in the drainage basin of the Płociczna, so they were rather rare components of the local ichthyofauna. The bleak was acquired from site “d”, located between lakes Ostrowieckie and Płociczno. The occurrence constancy index was low ($C = 7.1\%$), while the domination index at the site was 0.4%, assuming a value of 0.06% for the drainage basin. The weight of the bleak constituted a small fraction of the combined biomass ($W = 0.001\%$).

Schneider —*Alburnoides bipunctatus* (Bloch)

Sites: b, c, h	$D =$ at sites 1.7–32.9%; in drainage basin 4.3%
$n = 78$	Standard length: $n = 17$; $\bar{x} \pm m = 64.6 \pm 2.97$; $V = 18.91$; range 51–107 mm
$C = 21.4\%$	Weight: $n = 17$; $\bar{x} \pm m = 4.5 \pm 0.99$; $V = 90.06$; range: 2–20 g
$W = 0.376\%$	

The schneider occurred at three sampling sites. There were 53 specimens at site “b”, 23—at site “c”, and 2 specimens at site “h”. The catches yielded 78 fish of this species altogether. The occurrence constancy index was 21.4%. At sites “b” and “c” the schneider occurred as a quantitative dominant. The domination index at the former site was 32.9% while at the latter—30.7%. At the third site—“h”, there were fewer schneider, compared to the other fish species. Its domination index was 1.7%. The domination index for the drainage basin reached a value of 4.3.

White bream—*Blicca bjoerkna* (L.)

Sites: e, f, g, l	$D =$ at sites 2.2–32.9%; in drainage basin 9.77%
$n = 177$	Standard length: $\bar{x} \pm m = 107.1 \pm 1.93$; $V = 23.93$; range 56–182 mm
$C = 28.6\%$	Weight: $\bar{x} \pm m = 34.64 \pm 2.14$ g; $V = 82.26$; range 3–164 g
$W = 6.531\%$	

The white bream occurred at 4 sampling sites. Its occurrence constancy index was 28.6%. A total of 177 fish of this species was acquired. At site “l” the white bream was a quantitative dominant ($n = 95$). Also at site “g” the white bream was very abundant ($n = 63$), occupying the second place after the eel, however. On the remaining two sites “e” and “f” the white bream occurred much lower numbers

($n = 4$ and 15). The domination of the white bream at the sites of its occurrence ranged between 2.2 and 32.9%, assuming a value of 9.77% for the entire drainage area. The combined weight of the white bream in the present survey was high, amounting to 6 132 g and represented 6.53% of the combined biomass.

Common bream—*Abramis brama* (L.)

Sites: a, b, d, e, f	$D =$ at sites 0.4–11.8%; in drainage basin 2.37%
$n = 43$	Standard length: $\bar{x} \pm m = 115.0 \pm 8.79$; $V = 50.1$; range 52–220 mm
$C = 35.7\%$	Weight: $\bar{x} \pm m = 57.4 \pm 9.72$; $V = 110.92$; range 3–233 g
$W = 2.631\%$	

The common bream occurred at 5 sampling sites of the drainage area of the Płociczna. Its occurrence constancy index was 35.7%. The catches yielded 43 bream. The level of domination fluctuated between the sites within 0.4–11.8%, reaching 2.37% for the drainage basin. The combined weight on the bream represented 2.63% of the combined biomass.

Zanthe—*Vimba vimba* (L.)

Sites: d, e	$D =$ at sites 1.6–2.3%; in drainage basin 0.5%
$n = 9$	Standard length: $\bar{x} \pm m = 143.1 \pm 8.7$; $V = 39.84$; range 130–287 mm
$C = 14.3\%$	Weight: $\bar{x} \pm m = 155.7 \pm 45.23$; $V = 87.17$; range 38–385 g
$W = 1.492\%$	

Catches of the cyclostomes and fishes conducted in the drainage area of the Płociczna yielded 9 zanthe. They were acquired at two sites of the Płociczna located above and below lake Ostrowieckie. The occurrence constancy index reached a value of 14.3%. The domination index ranged between 1.6–2.3% between the sites, reaching 0.5% for the drainage area.

Bitterling—*Rhodeus sericeus amarus* (Bloch)

Site: f	$D =$ at site 0.3; in drainage basin 0.06%
$n = 1$	Standard length: 43 mm
$C = 7.1\%$	Weight: 1 g
$W = 0.001\%$	

Only one bitterling was collected in the drainage basin of the Płociczna. It was acquired at the mid Płociczna (between lakes Płociczno and Sitno) at site “f”. The occurrence constancy index reached a small value ($C = 7.1\%$). The domination index reached also a small value of 0.3% at the site, while on the drainage basin it

was 0.05%. The weight of the bitterling, similarly as the weight of the bleak, was the smallest in the group of the species analysed and it reached 1 g. The weight of the bitterling represents a small fraction of the combined biomass of the cyclostomes and fishes ($W = 0.001\%$).

Family Cobitidae

Spined loach—*Cobitis taenia* (L.)

Site: d	$D =$ at site 9.9%; in drainage basin 1.44%
$n = 26$	Standard length: $n = 10$; $\bar{x} \pm m = 62.1 \pm 4.68$; $V = 23.83$; range 45–85 mm
$C = 7.1\%$	Weight: $n = 10$; $\bar{x} \pm m = 2.0 \pm 0.42$; $V = 67.3$; range 0.6–4.1 g
$W = 0.055\%$	

The spined loach occurred at site “d” only, located on the river, directly above lake Ostrowieckie. A total of 26 specimens of this species was acquired. Out of this number 16 specimens were released back to the river, while 10 were kept for further study. The occurrence constancy index was low, amounting to 7.1%. The domination index at the site was 9.9%, while in the drainage basin—1.44%. The spined loach represented a small fraction of the analysed biomass ($W = 0.06\%$). The loach randomly selected for analysis ($n = 10$), reached length within 45–85 mm and the weight within 0.6–4.1 g.

Weather loach—*Misgurnus fossilis* (L.)

Sites: m	$D =$ at site 100%; in drainage basin 0.72%
$n = 13$	Standard length: $\bar{x} \pm m = 67.6 \pm 6.49$; $V = 34.61$; range 39–111 mm
$C = 7.1\%$	Weight: $\bar{x} \pm m = 5.8 \pm 1.94$; $V = 120.01$; range 0.7–19.3 g
$W = 0.081\%$	

In the upper left-bank tributary of the Płociczna—the Rzeczyca, the sampling was conducted on two stretches: below the village by the same name and next to a concrete bridge located at the same village. The first catch covered a section of 90 m and the other one—10 m. The first yielded neither cyclostomes nor fishes. The other one, however, yielded 13 weather loach. The above two sections were assumed to be one site. The occurrence constancy index reached a low value of 7.1% and the domination index was 100% at the site, while in the drainage basin—0.72%. The weather loach represented a very small fraction of the combined biomass ($W = 0.08\%$).

Family Anguillidae

European eel—*Anguilla anguilla* (L.)

Sites: a, b, c, d, e, f, g, h, i, l	$D =$ at sites 1.7–27.1%; in drainage basin 11.43%
$n = 207$	Total length: $n = 57$; $\bar{x} \pm m = 406.1 \pm 14.93$; $V = 27.76$; range 182–690 mm
$C = 71.4\%$	Weight: $n = 57$; $\bar{x} \pm m = 139.0 \pm 17.2$; $V = 93.41$; range 9–689 g
$W = 30.646\%$	

Eels were acquired at 10 sites. The occurrence constancy index reached a high value ($C = 71.4\%$). Quantitatively the eel was at the fourth place following the roach, chub, and the perch. The catches yielded 207 specimens altogether. At site “g” the eel was the quantitative dominant ($D = 27.1\%$) and it was abundant at sites “b” and “f”. On those two latter sites the eel was the second largest dominant. At site “b” the domination reached a value of 14.3%, while at the second—17.4%. The values of the domination index at all sites where it occurred were within 1.7–27.1%, while in the drainage area it assumed a value of 11.43%. The combined weight of the eels was the highest among the all species surveyed and it amounted to 28 772 g. It represented 30.65% of the combined biomass. The length range of the eels selected for further studies ($n = 57$) was within 182–690 mm while their weight range—within 9–689 g. The eels were caught between roots of the black alder growing on the river banks. Migration of the eel entering the Płociczna from the Szczecin Lagoon, through the lower Odra River, Warta, Noteć, and the Drawa is undisturbed. Also in the Płociczna itself there are no barriers making upstream migration difficult.

Family Gadidae

Burbot—*Lota lota* (L.)

Sites: a, b, c, e, f, l	$D =$ at sites 0.3–13.2%; in drainage basin 1.32%
$n = 24$	Standard length: $\bar{x} \pm m = 202.8 \pm 7.22$; $V = 17.43$; range 134–271 mm
$C = 42.9\%$	Weight: $\bar{x} \pm m = 86.1 \pm 9.18$; $V = 52.2$; range 24–189 g
$W = 2.202\%$	

The burbot was collected at 6 sampling sites. The occurrence constancy index reached a relatively high value of 42.9%. The catches yielded 24 burbot. The domination level at the sites was within 0.3–13.2%, while in the drainage area it was 1.32%. The combined weight of the burbot represents 2.2% of the combined biomass. The burbot similarly as the eel occurred between the roots of the black alder, growing in abundance on the river banks.

Family Gasterosteidae

Three-spined stickleback—*Gasterosteus aculeatus* L.

Sites: i, k, o	$D =$ at sites 3.0–22.2%; in drainage basin 0.22%
$n = 4$	Standard length: $\bar{x} = 48.5$ mm; range 44–56 mm
$C = 21.4\%$	Weight: $\bar{x} = 2$ g; range 1–3 g
$W = 0.009\%$	

The three-spined stickleback occurred at 3 sites. Two of them (“i” and “k”) were on the upper Płociczna, while the third—on an upper right-bank tributary (“o”). At this site the abundance of the fish was low. A total of 4 specimens was collected. The occurrence constancy index was 21.4% and the domination index ranged between 3.0 and 22.2% at the sites, assuming a value of 0.22% for the entire drainage basin. The stickleback represented a very small fraction of the combined biomass. It turned out, that the three-spined stickleback is very difficult to catch with an electrofishing device. Essentially the sampling had to be supplemented by a catch of a dip-net barring the brook below the electrofishing site.

Family Percidae

Perch—*Perca fluviatilis* L.

Sites: a, b, c, d, e, f, g, h, i, l	$D =$ at sites 3.0–39.5%; in drainage basin 12.26%
$n = 222$	Standard length: $\bar{x} \pm m = 107.8 \pm 1.79$; $V = 24.78$; range 51–205 mm
$C = 71.4\%$	Weight: $\bar{x} \pm m = 28.4 \pm 1.73$; $V = 90.82$; range 2–190 g
$W = 6.707\%$	

The perch was acquired at 10 sampling sites. Such high frequency gives a high occurrence constancy index amounting to 71.4%. Quantitatively, the perch was on the third place following the roach and chub. The catches yielded a total of 222 perch. The domination index of the individual sites fluctuated in a wide range of 3–39.5%. In the drainage basin it reached a value of 12.26%. The fraction of the perch in the combined biomass was high ($W = 6.71\%$) and was on the fourth place following the eel, chub, and the roach.

Ruffe—*Gymnocephalus cernuus* (L.)

Sites: g, h	$D =$ at sites 1.6–26.5%; in drainage basin 1.93%
$n = 35$	Standard length: $\bar{x} \pm m = 81.7 \pm 2.84$; $V = 20.56$; range 57–113 mm
$C = 14.3\%$	Weight: $\bar{x} \pm m = 11.5 \pm 1.21$; $V = 62.14$; range 4–29 g
$W = 0.429\%$	

The ruffe occurred at 2 sampling sites reaching a low occurrence constancy index ($C = 14.3\%$). The catches yielded 35 specimens of this species. At site “h”, the ruffe was a quantitative dominant among other 10 species present. At site “g” it was far less abundant. The level of domination on those two sites fluctuated in a relatively wide range of 1.6-26.5%. In the drainage basin it reached 1.93%. The ruffe represented a small share in the biomass of the studied fishes ($W = 0.43\%$).

Family Cottidae

Miller's thumb—*Cottus gobio* L.

Sites: c, d	$D =$ at sites 0.4–2.7%; in drainage basin 0.17%
$n = 3$	Total length: $\bar{x} = 74.7$; range 48–95 mm
$C = 14.3\%$	Weight: $\bar{x} = 5.7$; range 1.0–10.2 g
$W = 0.018\%$	

The Miller's thumb was a rare species. It was recorded at two sites only (“c”, “d”), so the occurrence constancy index was low ($C = 14.3\%$). There were 3 specimens of this species acquired altogether. The domination index was within 0.4–2.7% at the sites and it assumed a value of 0.17% in the drainage basin. The Miller's thumb's share in the biomass was very small ($W = 0.02\%$).

Recapitulation of the results

The highest values of the occurrence constancy index, above 71.4% were represented by four fish species: the roach, chub, eel, and the perch. Slightly lower values of this factor, which were higher, or equal to 50% were represented by four additional species: gudgeon (64.3%), stream morphotype of the brown trout (51.7%), pike and dace (50% each). Values of the occurrence constancy index of the remaining 18 species of cyclostomes and fishes occurring in the drainage basin of the Płociczna were lower and they ranged from 7.1 to 42.9%. In the latter range, their smallest values were represented by the brook lamprey, grayling, orfe, common minnow, bleak, bitterling, spined loach, and the weather loach (Tab. 6).

At the respective 14 sampling sites, a total of 8 fish species assumed domination. At site “a”—the perch (39.5%), sites “b” and “c”—the schneider (within 32.9–37.0%), site “d”—the chub (18.4%), sites “e”, “f”, “i”, “l”—the roach (within 21.8–52.4%), site “g”—the eel (27.1%), site “h”—the ruffe (26.5%), sites “j”, “k”, “o”—the brown trout stream morphotype (within 77.8–100%), site “m”—the weather loach (100%).

The second highest dominants were the following fish species: at sites “a” and “l”—the roach (14.5% and 21.8%), site “b” and “f”—eel (within 14.3–17.4%), sites “c”, “e”, and “i”—perch (within 12.8–20.8%), site “d”—dace (14.6%), site

“g”—white bream (25.1%), site “h”—gudgeon (23.9%), site “i”—brown trout stream morphotype and pike (14.7% each), and finally at sites “k” and “o”—the three-spined stickleback (within 9.1-22.2%). The domination pattern of the remaining cyclostome and fish species at the respective sites is presented at Tab. 5.

The values of the domination index for the respective cyclostome and fish species within the entire sampling season fluctuated in a wide range (0.06-24.74%). The leading species was the roach and its quantitative domination was at the level of 24.74%. A total of three fish species represented domination above 10%: the chub ($D = 12.32\%$), perch ($D = 12.26\%$), and the eel ($D = 11.43\%$). The lower values of the quantitative domination within 1-10% were represented by 10 additional fish species: the white bream ($D = 9.77\%$), gudgeon ($D = 5.3\%$), dace ($D = 4.75\%$), schneider ($D = 4.3\%$), brown trout stream morphotype ($D = 2.54\%$), common bream ($D = 2.37\%$), ruffe ($D = 1.93\%$), common minnow ($D = 1.93\%$), spined loach ($D = 1.44\%$), and the burbot ($D = 1.32\%$). The domination values of the remaining 12 cyclostome and fish species are substantially lower—below 1%. This group consists of the weather loach ($D = 0.72\%$), pike ($D = 0.61\%$), zante ($D = 0.5\%$), barbel ($D = 0.44\%$), tench ($D = 0.33\%$), three-spined stickleback ($D = 0.22\%$), grayling ($D = 0.25\%$), Miller's thumb and brook lamprey ($D = 0.17\%$ each), orfe ($D = 0.11\%$), bitterling and bleak ($D = 0.06\%$ each).

The first four species mentioned above dominated in the drainage basin of the Płociczna and their share was 60.74%. The second group of 10 species represented a fraction of 35.65%, while the third one, with 12 species represented 3.61% of all cyclostomes and fishes studied (Tab. 4).

The weight of the respective 26 cyclostome and fish species represented in the survey varied in wide limits from 1 to 28 772 g. The combined weight exceeding 10 kg was recorded for the eel (28 772 g), chub (20 817 g) and the roach (16 698 g). These three species weighed jointly 66 287 g which represents 70.61% of the combined biomass. Slightly smaller weight within 1-10 kg was recorded for the perch (6 297 g), white bream (6 132 g), common bream (2 470 g), barbel (2 400 g), brown trout stream morphotype (2 132 g), burbot (2 067 g), gudgeon (1 469 g), zante (1 401 g), and the dace (1 157 g). The combined weight of these nine fish species was 25 525 g, which constituted 27.19% of the combined biomass. The weights of the remaining 14 species were much lower: from 1 to 673 g. The combined weight of these species was 2 071 g which represented 2.2% of all collected cyclostomes and fishes (Tab. 4).

It is evident from the data presented, that the leading species in terms of numbers were the roach, followed by chub, perch and the eel. In the respect of weight the eel was on the first place following chub, roach, and the perch.

The drainage basin of the Płociczna was dominated by 8 lithophilous species (1 cyclostome and 7 fish species). The second most abundant in species group turned out to be the phytolithophilous reproductive guild with 7 species and phytophilous group with five fish species. The remaining ecological guilds: pelagophilous, lithopelagophilous, ostracophilous, psammophilous, speleophilous, arioadnophilous, are represented by single fish species. Taking into account the numbers of the fishes acquired, the dominant was the phytophilous group of fishes, known also as indifferent, represented by 46.22% of the specimens collected. Following the same criterion, the second most numerous was lithophilous group (22.41%) and phytophilous (12.87%). The remaining 6 ecological guilds was represented by smaller amounts of fishes (pelagophilous—11.43%, psammophilous—5.30%, lithopelagophilous—1.32%, ariadnophilous—0.22%, speleophilous—0.17%, and ostracophilous—0.06%). The most numerous populations were formed in the phytophilous guild—the roach (24.74%) and perch (12.26%). The lithophilous guild was represented by the chub (12.31%), the pelagophilous—by eel (11.43%) and the phytophilous—by the white bream (9.77%) (Tab. 6).

Four sampling sites of the drainage area of the upper Płociczna and one site of the mid stretch (h, i, j, k, o) were dominated by salmonid fishes of the genus *Salmo*, most probably the stream morphotype of the brown trout. Those values were as follows: at site “j”—100%, site “k”—90.9%, site “o”—77.8%, site “i”—14%, and site “h”—8.6%. In view of the above, the upper stretch of the drainage area of the Płociczna should be considered a major habitat of the salmonid fishes of the genus *Salmo*. Also on this section of the river at site “i”, the brook lamprey was encountered. Mid- and lower Płociczna is inhabited more intensively by fishes of the families: Cyprinidae, Anguillidae, Gadidae, and Percidae.

DISCUSSION

Information of the occurrence of the fish species in the drainage basin of the Płociczna were based on the studies conducted in the years: 1986 (Chełkowski et al. 1987), 1986, 1987, 1988 (Chełkowski 1987, 1988, 1989) and 1994 (Chełkowski, unpublished material). The studies covered 19 sampling sites, located as shown on Fig. 3 (data in Tab. 7). Most of those sites on the Płociczna are identical with the sites of the present survey. Fish fauna inventory at sites 1-15 represent test catches of the drainage basin. The inventory at sites 16-19 represents catches conducted at the spawning grounds of the salmon in the lower Płociczna. The authors listed above, recorded only the presence of individual species, while in 1987, 1988, and 1994—also the number of the acquired fishes of each species. In the first year there were 433 fishes, in the second—542, and 40 fishes in the third year. The sampling sites 1-10 and 16-19 represented the Płociczna, 11 and

12—the Cieszynka, 13 and 14—the Runica, and 15—the Rzeczyca. According to these studies there was a total of 24 fish species present in the entire drainage basin, in this number 24 in Płociczna, 1 in Cieszynka, 4 in Runica, and 2 in Rzeczyca. In addition to that also the lake morphotype of the brown trout, *Salmo trutta* m. *lacustris* L. (Chełkowski and Gancarczyk 1995, 1995a) is present in the drainage basin of the Płociczna. This information is confirmed by the others (Dębowski et al. 1996). Jaskowski (1962) reports about the presence of an eel trap in the lower Płociczna which is an evidence for the presence of the eel in the Płociczna. Abundant presence of the eel revealed in the present survey is the most recent confirmation of this fact.

In addition, the presence of two fish species more—the common whitefish, *Coregonus lavaretus* (L.) in lake Ostrowieckie and the cisco, *Coregonus albus* (L.) in lake Piaseczno was stated.

According to the above data, the ichthyofauna of the drainage area of the Płociczna consists of 27 fish species altogether. Among those fishes there were 7 species, that have not been recorded in the present survey: salmon, brown trout, lake morphotype of the brown trout, common whitefish, cisco, crucian carp, and stone loach. On the other hand a number of presently recorded fish species had not been previously found: brook lamprey, tench, bitterling, spined loach, weather loach, and ruffe. The remaining 20 fish species were present in both past and present studies (Tab. 8).

It is evident from the inventory of the spawning grounds, that the Atlantic salmon used to spawn in the lower Płociczna within 1976-1985 (Chełkowski et al. 1995; Głowaciński 1992). Control catches conducted in the lower Płociczna in the fall of 1987 confirmed that the Atlantic salmon was still present there. A total of 7 parr were collected at that time. As can be presumed a few salmon can possibly enter the lower Drawa for spawning and they may well occur at the spawning grounds of the Płociczna (Chełkowski et al. 1996). Based on the above we can expect the presence of the salmon in the Płociczna.

Single specimens of the stone loach occurred in the Płociczna at two sites, solely in the studies of 1986 (Chełkowski et al. 1987). In the present survey the stone loach did not occur, but its presence cannot be excluded.

It can be concluded that the drainage area of the Płociczna is inhabited by 1 cyclostome species and 32 fish species (Tab. 8).

The above-mentioned assemblage contains 8 species under protection: brook lamprey, Atlantic salmon, common minnow, schneider, bitterling, stone loach, spined loach, and weather loach (Anonymous 1995). The species listed above, rarely occur in the drainage area of the Płociczna which was evidenced by low values of the quantitative domination index. The highest domination index, above 1% is

represented by the schneider ($D = 4.3\%$), common minnow ($D = 1.93\%$), and the spined loach ($D = 1.44\%$). The values of the domination index for the remaining protected species are lower than 1% (0.06-0.72%). In the drainage basin of the Płociczna there may be another fish present: the rainbow trout, *Parasalmon mykiss* (Walbaum, 1792). A number of those fish had escaped from the fish farm at Człop using the waters of the Cieszynka, according to the testimony of some fishermen. This presumption, however, did not find confirmation in the catches.

The present material as well as the data of the other authors allow to list the cyclostome and fish species inhabiting the Płociczna and its tributaries, with consideration of the drainage area covered by the Drawieński National Park with its buffer zone. The river Płociczna is inhabited by 32 species, in this number 1 cyclostome and 31 fish species. The Cieszynka is inhabited by 9 species, Runica—by 6, Rzeczyca—by 3, and the upper right-bank tributary emptying to the Lubie Lake—by 2 species (Tab. 9). Part of the drainage basin of the Płociczna belonging to the Drawieński National Park with its buffer zone is inhabited by 30 species, out of 33 known to inhabit the entire drainage basin. The exception are: the brook lamprey, weather loach and the three-spined stickleback. It has to be emphasized that similar number of species is present in the lower and mid Płociczna within the limits of the Drawieński National Park. The assemblage of species inhabiting the Płociczna within the limits of the Drawieński National Park with its buffer zone includes 6 species of protected fishes (Atlantic salmon, common minnow, schneider, bitterling, stone loach, and spined loach), out of 8 protected species present in the entire drainage basin of the Płociczna. In the upper Płociczna there are 2 protected species: brook lamprey and the weather loach.

There is one cyclostome species and 26 fish species inhabiting the lower Drawa (Chełkowski et al. 1996). In this number 25 species occurs in the Płociczna: Atlantic salmon, brown trout, stream morphotype of the brown trout, grayling, pike, roach, dace, chub, orfe, common minnow, gudgeon, barbel, bleak, schneider, white bream, common bream, zante, bitterling, eel, burbot, three-spined stickleback, perch, ruffe, Miller's thumb. In the lower Drawa, in addition to that, there is also river lamprey, *Lampetra fluviatilis* (L.) and European catfish, *Silurus glanis* L. In the drainage basin of the Płociczna—brook lamprey, *Lampetra planeri* (Bloch), lake morphotype of the brown trout, *Salmo trutta* m. *lacustris*, common whitefish, *Coregonus lavaretus* (L.), cisco, *Coregonus albula* (L.), crucian carp, *Carassius carassius* (L.), spiny loach, *Cobitis taenia* L., stone loach, *Nemachilus barbatulus* (L.), and the weather loach, *Misgurnus fossilis* (L.). In total, the drainage basin of the Płociczna and the lower Drawa is inhabited currently by 35 species of cyclostomes and fishes, listed in Tab. 8.

Table 7

List of species occurring in the drainage basin of the Płociczna according to the other authors*

Family—species	Sites **	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		P	P	P	P	P	P	P	P	P	P	C	C	R	R	Z	P	P	P	P
Salmonidae																				
<i>Salmo salar</i> L.		+															+	7		
<i>Salmo trutta</i> m. <i>trutta</i> L.																	+	2	1	
<i>Salmo trutta</i> m. <i>fario</i> L.		+			+		+	+		+	+	+	+				+	8	40	3
Thymallidae																				
<i>Thymallus thymallus</i> (L.)																	+	2	6	
Esocidae																				
<i>Esox lucius</i> L.						+											+	+	4	24
Cyprinidae																				
<i>Rutilus rutilus</i> (L.)		+		+	+		+							+	+	+		1	2	
<i>Leuciscus leuciscus</i> (L.)		+			+		+										+	208	179	
<i>Leuciscus cephalus</i> (L.)		+		+	+	+	+										+	73	108	5
<i>Leuciscus idus</i> (L.)					+														4	
<i>Phoxinus phoxinus</i> (L.)							+												18	
<i>Gobio gobio</i> (L.)		+				+	+							+	+		+	29	20	5
<i>Barbus barbus</i> (L.)		+			+												+	13	53	
<i>Alburnus alburnus</i> (L.)					+		+													
<i>Alburnoides bipunctatus</i> (Bloch)																	+	22	48	23
<i>Blicca bjoerkna</i> (L.)					+		+													
<i>Abramis brama</i> (L.)		+			+		+												6	
<i>Vimba vimba</i> (L.)							+										+	16	1	
<i>Carassius carassius</i> (L.)		+																		
Cobitidae																				
<i>Nemachilus barbatulus</i> (L.)			+						+											
Anguillidae																				
<i>Anguilla anguilla</i> (L.)				+	+		+							+	+		+	6	13	
Gadidae																				
<i>Lota lota</i> (L.)		+				+	+										+	3	1	1
Gasterosteidae																				
<i>Gasterosteus aculeatus</i> L.											+									
Percidae																				
<i>Perca fluviatilis</i> L.				+	+									+	+			11	14	1
Cottidae																				
<i>Cottus gobio</i> L.		+															+	29	4	2
Total number of species: 24																				
Total number of specimens																		434	542	40

* Chełkowski 1987, 1988, 1989; Chełkowski et al. 1987.

** P—Płociczna; C—Cieszynka; R—Runica; Z—Rzeczycza.

+ confirmed occurrence of species.

Dates of catches: sites 1–15—June 1986; site 16—20 and 21 November 1986; site 17—10 and 11 December 1987; site 18—22 and 23 November 1988; site 19—22 November 1994.

Table 8

List of species currently occurring in the drainage basin of the Płociczna and lower Drawa

No.	Species	Płociczna drainage basin			Lower Drawa*	Total
		Present survey	Other data sources	Total		
	<i>Lampetra fluviatilis</i> (L.)	—	—	—	+	+
2	<i>Lampetra planeri</i> (Bloch)	+	—	+	—	+
3	<i>Salmo salar</i> L.	—	+	+	+	+
4	<i>Salmo trutta</i> m. <i>trutta</i> L.	—	+	+	+	+
5	<i>Salmo trutta</i> m. <i>fario</i>	+	+	+	+	+
6	<i>Salmo trutta</i> m. <i>lacustris</i> L.	—	+**	+	—	+
7	<i>Coregonus lavaretus</i> (L.)	—	+	+	—	+
8	<i>Coregonus albula</i> (L.)	—	+	+	—	+
9	<i>Thymallus thymallus</i> (L.)	+	+	+	+	+
10	<i>Esox lucius</i> L.	+	+	+	+	+
11	<i>Rutilus rutilus</i> (L.)	+	+	+	+	+
12	<i>Leuciscus leuciscus</i> (L.)	+	+	+	+	+
13	<i>Leuciscus cephalus</i> (L.)	+	+	+	+	+
14	<i>Leuciscus idus</i> (L.)	+	+	+	+	+
15	<i>Phoxinus phoxinus</i> (L.)	+	+	+	+	+
16	<i>Tinca tinca</i> (L.)	+	—	+	+	+
17	<i>Gobio gobio</i> (L.)	+	+	+	+	+
18	<i>Barbus barbus</i> (L.)	+	+	+	+	+
19	<i>Alburnus alburnus</i> (L.)	+	+	+	+	+
20	<i>Alburnoides bipunctatus</i> (Bloch)	+	+	+	+	+
21	<i>Blicca bjoerkna</i> (L.)	+	+	+	+	+
22	<i>Abramis brama</i> (L.)	+	+	+	+	+
23	<i>Vimba vimba</i> (L.)	+	+	+	+	+
24	<i>Carassius carassius</i> (L.)	—	+	+	—	+
25	<i>Rhodeus sericeus amarus</i> (Bloch)	+	—	+	+	+
26	<i>Nemachilus barbatulus</i> (L.)	—	+	+	—	+
27	<i>Cobitis taenia</i> L.	+	—	+	—	+
28	<i>Misgurnus fossilis</i> (L.)	+	—	+	—	+
29	<i>Silurus glanis</i> L.	—	—	—	+	+
30	<i>Anguilla anguilla</i> (L.)	+	+	+	+	+
31	<i>Lota lota</i> (L.)	+	+	+	+	+
32	<i>Gasterosteus aculeatus</i> L.	+	+	+	+	+
33	<i>Perca fluviatilis</i> L.	+	+	+	+	+
34	<i>Gymnocephalus cernuus</i> (L.)	+	—	+	+	+
35	<i>Cottus gobio</i> L.	+	+	+	+	+
Total No. of species		26	27	33	27	35

+ Occurrence of species.

* Chełkowski et al. 1996.

** Chełkowski and Gancarczyk 1995.

Table 9

Occurrence of the cyclostome and fish species in the areas contributing to the drainage basin of the Płociczna

No	Species	Płociczna		Cieszynka		Runica		Rzeczyca	Tributary of Lubie Lake
		DNP*	reminder	DNP*	reminder	DNP*	reminder		
1	<i>Lampetra planeri</i> (Bloch)		+						
2	<i>Salmo salar</i> L.	+							
3	<i>Salmo trutta</i> m. <i>trutta</i> L.	+							
4	<i>Salmo trutta</i> m. <i>fario</i> L.	+	+		+	+	+		+
5	<i>Salmo trutta</i> m. <i>lacustris</i> L.	+				+	+		
6	<i>Coregonus lavaretus</i> (L.)	+							
7	<i>Coregonus albula</i> (L.)	+							
8	<i>Thymallus thymallus</i> (L.)	+							
9	<i>Esox lucius</i> L.	+	+					+	
10	<i>Rutilus rutilus</i> (L.)	+	+	+			+	+	
11	<i>Leuciscus leuciscus</i> (L.)	+							
12	<i>Leuciscus cephalus</i> (L.)	+	+	+					
13	<i>Leuciscus idus</i> (L.)	+							
14	<i>Phoxinus phoxinus</i> (L.)	+							
15	<i>Tinca tinca</i> (L.)	+	+	+					
16	<i>Gobio gobio</i> (L.)	+	+	+			+		
17	<i>Barbus barbus</i> (L.)	+							
18	<i>Alburnus alburnus</i> (L.)	+							
19	<i>Alburnoides bipunctatus</i> (Bloch)	+							
20	<i>Blicca bjoerkna</i> (L.)	+		+					
21	<i>Abramis brama</i> (L.)	+							
22	<i>Vimba vimba</i> (L.)	+							
23	<i>Carassius carassius</i> (L.)	+							
24	<i>Rhodeus sericeus amarus</i> (Bloch)	+							
25	<i>Nemachilus barbatulus</i> (L.)	+							
26	<i>Cobitis taenia</i> L.	+							
27	<i>Misgurnus fossilis</i> (L.)							+	
28	<i>Anguilla anguilla</i> (L.)	+	+	+			+		
29	<i>Lota lota</i> (L.)	+		+					
30	<i>Gasterosteus aculeatus</i> L.		+						+
31	<i>Perca fluviatilis</i> L.	+	+	+			+		
32	<i>Gymnocephalus cernuus</i> (L.)	+							
33	<i>Cottus gobio</i> L.	+							
Total number of species		30	10	8	1	2	6	3	2

*Drawieński National Park.

The roach turned out to be the quantitative dominant for both the lower Drawa (after Chełkowski et al. 1996) and the Płociczna. The domination of the roach in the lower Drawa ($D = 56.16\%$) reached a value 2.3 times higher than this index in the Płociczna ($D = 24.74\%$).

CONCLUSIONS

1. A total of 1 cyclostome species and 32 fish species occurs currently in the drainage basin of the Płociczna (Tab. 8).
2. The highest occurrence constancy index has been recorded for the roach, chub, eel, and the perch (each species: $C = 64.3\%$), stream morphotype of the brown trout ($C = 57.1\%$), pike and dace ($C = 50\%$ each species). The values of the occurrence constancy indices of the remaining cyclostomes and fishes are lower (7.1-42.9%).
3. The roach turned out to be the leading species and its quantitative domination index reached a value of 24.74%. Domination index values above 10% were associated with the chub, perch, and the eel, while the values between 1 and 10% were calculated for the white bream, gudgeon, dace, schneider, stream morphotype of the brown trout, common bream, ruffe, common minnow, spiny loach, and the burbot. The remaining cyclostomes and fishes represent much lower (below 1%) values of the domination index.
4. The highest fraction of the combined biomass in the material studied is represented by the eel ($W = 30.65\%$), followed by chub ($W = 21.17\%$) and the roach ($W = 17.79\%$). The remaining species contributed in smaller extend (0.001-6.707%).
5. The drainage basin of the Płociczna is inhabited by 8 species of cyclostomes and fishes under protection: brook lamprey, Atlantic salmon, common minnow, schneider, bitterling, stone loach, spined loach, and weather loach.
6. Protected species occur rarely in the drainage basin of the Płociczna. Their quantitative domination index within the group of the studied fishes ranged from 0.06 to 4.3%.
7. Two of the protected species: the autochthonous Atlantic salmon and the bitterling are considered endangered and they are on a verge of extinction.
8. It is suggested to extend the protection also to the remaining part of the drainage basin of the Płociczna, which is not covered by the Drawieński National Park with its buffer zone.

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Zygmunt CHEŁKOWSKI, Bożena CHEŁKOWSKA, Oskar ANTOSZEK

KRĄGŁOUSTE I RYBY ZLEWNI PŁOCICZNEJ

STRESZCZENIE

Elektropołowy przeprowadzone w okresie letnim 1996 r. na 14 stanowiskach badawczych w dorzeczu Płocicznej dostarczyły 1811 krągłoustych i ryb należących do 26 gatunków wchodzących w skład 11 rodzin. Największa wartość stałości występowania (*C*) należy do płoci, klenia, węgorza i okonia (po 71,4%). Nieco mniejsze wartości tego wskaźnika należą do kielbia (64,3%), pstrąga potokowego (57,1%), szczupaka i jelca (po 50%). Wartości wskaźników stałości pozostałych osiemnastu występujących gatunków krągłoustych i ryb są już o wiele mniejsze (7,1-42,9%). Gatunkiem przewodnim okazała się płoć, a jej stopień ilościowej dominacji (*D*) osiąga wartość 24,74%. Licznie wystąpił także kleń (12,32%), okoń (12,26%) i węgorz (11,43%). Pozostałe występujące gatunki osiągały mniejsze wartości ilościowej dominacji (0,06-9,77%). Największy udział masy (*W*) należał do węgorza (30,65%), dalej do klenia (22,17%) i płoci (17,79%). Natomiast udział masy pozostałych występujących gatunków był już o wiele mniejszy (0,0002-6,7073%). Do uzyskanych wyników włączono badania wcześniejsze z lat 1986-1994. W rezultacie stwierdzono w dorzeczu Płocicznej występowanie 1 gatunku krągłoustych i 32 gatunki ryb (Tab. 7) z czego 8 gatunków podlega ochronie.

Received: 25 May 1997

Author's addresses:

Zygmunt Chełkowski, PhD DSc ProfTit
Department of Salmonid Fishes Management
Agricultural University of Szczecin
Kazimierza Królewicza 4, 71-550 Szczecin, Poland