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FOOD OF RUFFE (*GYMNOCEPHALUS CERNUUS* L.) AND GUDGEON (*GOBIO GOBIO* (L.)) IN WŁOCŁAWEK DAM RESERVOIR

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Studies on food composition of two unexploited species, ruffe and gudgeon, were carried out in 1982 and 1984 in Włocławek Dam Reservoir. Diet of both species was essen tially composed of *Chironomidae* larvae, *Cladocera* and *Copepoda*. Diet composition of ruffe and gudgeon suggests that the two species grazed mostly in shallow water, with ruffe penetrating the bottom, and gudgeon feeding in areas overgrown with submerged plants.

INTRODUCTION

Ruffe and gudgeon belong to fish species which are not exploited commercially. Studies on the biology of these fishes are important for fishery management as also for better understanding of the ecosystem functioning, this being due to position of these fishes in the trophic chain. Both species constitute prey organisms for predators, while their feeding behaviour may affect abundance of economically valuable fishes. Studies on feeding behaviour of ruffe and gudgeon were undertaken as part of complex studies on fish biology in Włocławek Dam Reservoir.

MATERIAL AND METHODS

Materials were collected in 1982 (since June till October) and 1984 (April, May, since August till October). Fishes were caught with fry sampling net, cast 10–15 m off-shore, at the same sampling stations (between 652 and 654 km of the Vistula River), possibly at the same time of the day.

Characteristics of the material is presented in Table 1. The fishes were divided into two body length classes: A – smaller than 50 mm, and B – bigger than 50 mm. The division was made when it was found that fishes with body length (lc) below 50 mm differed considerably as regards composition of their diet. Bigger fishes, which had intially been divided into three length classes, were characterized by similar food composition, so they were analysed jointly. No differences were observed with respect to food composition of the fishes caught at different sampling stations. Consequently, the whole reservoir was treated as one sampling station. It was also decided that the results obtained from too small number of individuals in the given length class or in the given sampling period should not be taken into account.

The materials were preserved in 4% formalin. Cladocera found in the fish food tracts were determined to genus, and *Chironomidae* larvae to species whenever possible. Other food components were determined to different taxonomic units, as possible.

Biomass of the food components was estimated basing on organism length and weight standards.

Food components were divided taking into account their share in the fish diet (by numbers and weight) into the following classes: eudominants (50.1–100%), dominants (10.1–50.0%), subdominants (5.1–10.0%), recedents (1.1–5.0%), subrecedents (less than 1.0%).

RESULTS

Diet composition.

Chironomidae larvae, Cladocera and *Copepoda*, periodically also *Chironomidae pupae*, constituted basic food items of both ruffe and gudgeon. These organisms were either eudominants or dominants in the diet of the two species, both with respect to their numbers and weight (Fig. 1 and 2). Chironomidae larvae were of significance mostly as regards percentage of their weight in the diet. These larvae were eudominants in ruffe diet throughout the whole period of studies, while they were eudominants or dominants in gudgeon diet.

Frequency of occurrence of *Chironomidae* in the food tracts of both fish species confirmed significance of this group in the fish diet. As regards ruffe, they were present in 80–100% cases (Tab. 2, 3), and in gudgeon – in 20 to 100% (Tab. 4 and 5). Generic names of *Chironomidae* larvae most frequently found are given in the

Table 1

Characteristics of the materials collected in Włocławek Dam Reservoir. Fish length classes: A – below 50 mm, B – above 50 mm, $\bar{x}$ – average body length in mm, $\bar{y}$ – average body weight in g, n – number of food tracts collected, % – percentage of empty food tracts

Year	Month	Length class	*Gobio gobio*				Length class	*Gymnocephalus cernuus*			
			$\bar{x}$	$\bar{y}$	n	%		$\bar{x}$	$\bar{y}$	n	%
1982	VI	A	26.7	0.2	10	60.0	A	27.1	0.5	4	–
		B	66.2	5.8	33	–	B	72.1	8.1	29	–
	VII	A	41.2	1.1	22	–	A	42.4	1.8	28	–
		B	67.7	4.8	21	9.5	B	69.1	8.0	13	–
	VIII	A	47.0	1.6	2	–	A	45.8	1.9	28	–
		B	74.7	7.2	51	29.4	B	66.6	6.7	12	–
	IX	A	44.5	1.1	1	–	A	48.0	2.6	2	–
		B	86.0	9.9	18	–	B	80.3	13.8	22	–
	X	B	80.4	8.4	8	–	–	–	–	–	–
		A			35		A			62	
		B			131		B			76	
1984	IV	A	46.0	1.1	4	–	A	–	–	–	–
		B	56.0	2.7	1	–	B	84.6	16.3	30	6.6
	V	A	46.9	2.0	8	12.5	A	–	–	–	–
		B	55.7	2.9	7	–	B	81.9	9.7	35	5.7
	VIII	A	48.0	2.0	14	21.4	A	43.8	2.6	13	7.7
		B	65.5	3.5	21	9.5	B	84.8	8.2	22	–
	IX	A	45.8	1.5	16	50.0	A	44.8	2.1	10	–
		B	56.1	2.8	19	57.4	B	78.3	13.1	25	4.0
	X	A	39.6	1.3	15	13.3	A	45.0	0.9	1	–
		B	59.1	3.4	20	5.0	B	67.0	4.6	3	–
		A			57					24	
		B			68					115	

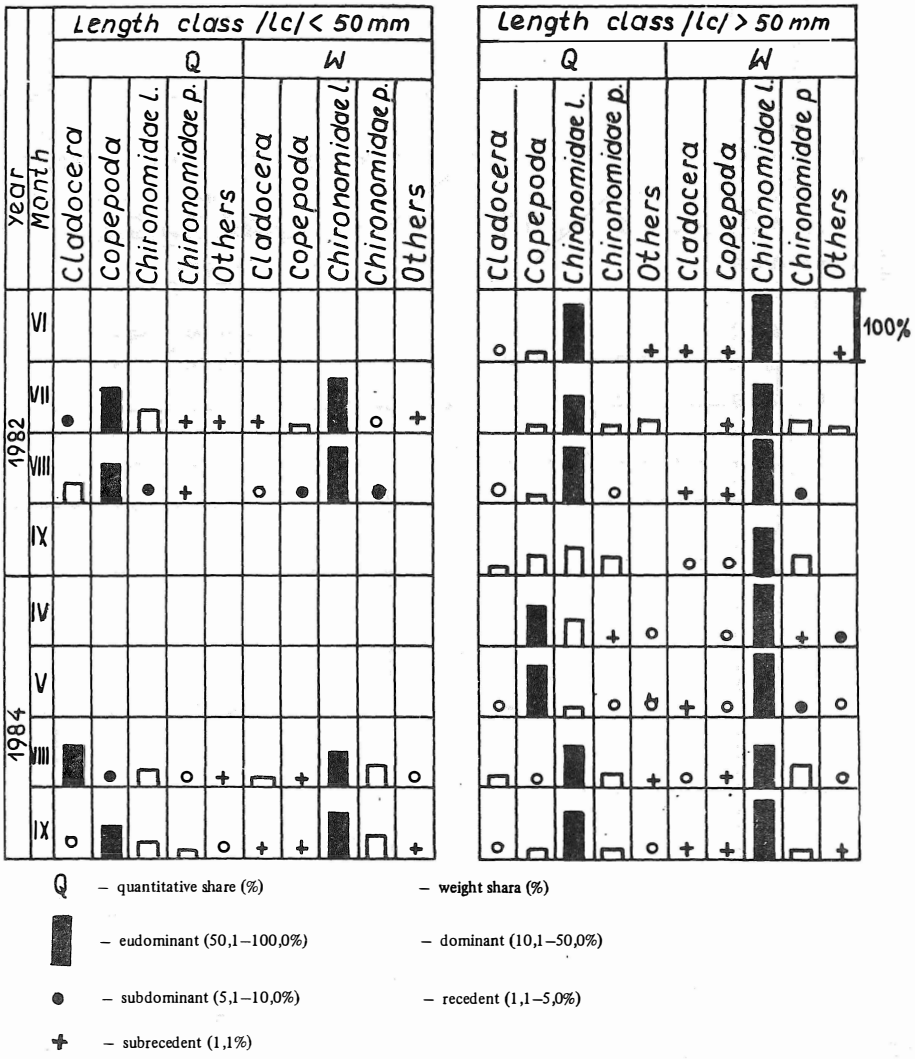

Fig. 1. Share of more important groups of invertebrates in the diet of ruffe from Włocławek Dam Reservoir

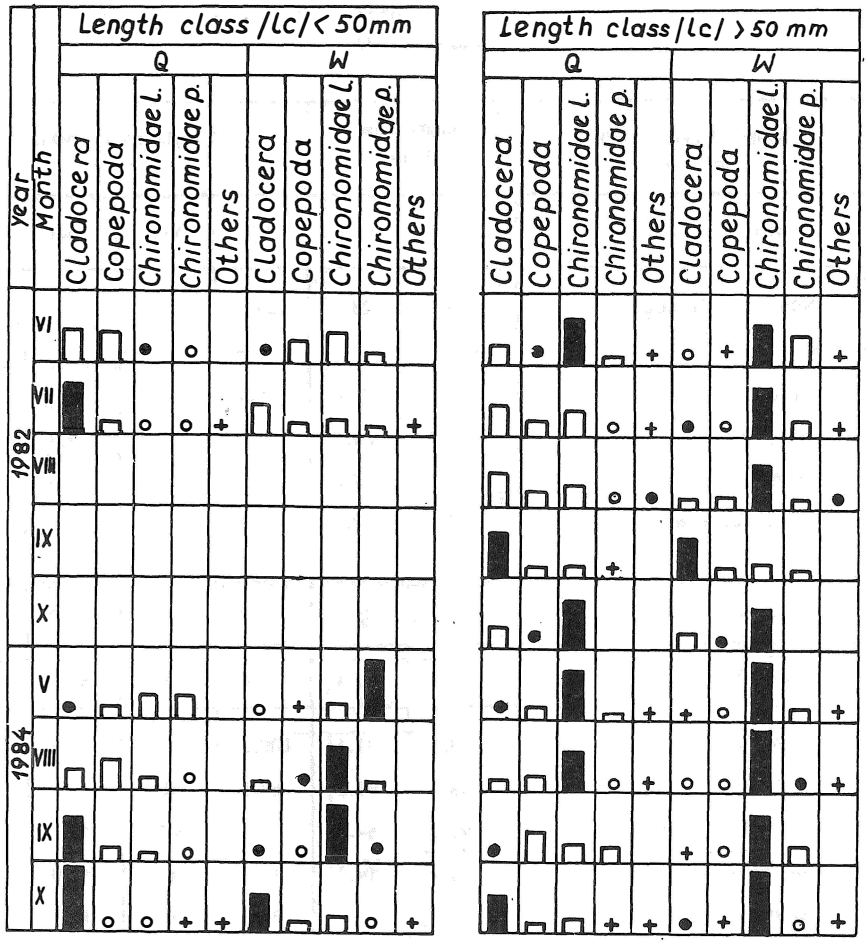

Fig. 2. Share of more important groups of invertebrates in the diet of gudgeon from Włocławek Dam Reservoir (denotations as in Fig. 1)

tables. The following larvae were found in the food tracts of both fish species: *Chronomus plumosus, Chironomus anthracinus, Glyptotendipes gripekoveni, Limnochironomus nervosus, Cricotopus silvestris, Cricotopus algaarum, Polypedilum nubeculosum, Cryptochironomus pararostratus*, and *Procladius sp.* Sporadically, larvae of *Endochironomus tendens, Limnochironomus tritomus, Microtendipes chloris, Psectrocladius psilopterus, Ablabesmyia sp.* and *Pelopira sp.* were also found. These were included into other *Chironomidae*, together with non-identified specimens.

As regards *Cladocera*, the following genera were most frequent in the fish diet: *Alona, Bosmina, Daphnia* and *Chydorus.* Moreover, *Leptodora kindti* and *Simocephalus sp.* were also found. The latter were included into non-idenfified *Cladocera.*

Table 2

Frequency of occurrence of more important food items in ruffe food tracts in 1982

Range of body length lc (mm)	Length class 50 mm		Length class 50 mm			
Month	VII	VIII	VI	VII	VIII	IX
Number of full tracts	28	28	29	13	12	22
Alona sp.	43.1	21.4	9.6	–	16.7	9.1
Bosmina sp.	31.2	64.3	1.3	–	8.3	11.4
Daphnia sp.	–	32.0	1.3	–	–	11.4
Other *Cladocera*	9.4	10.7	1.3	–	–	28.8
CLADOCERA	46.2	75.0	10.9	–	25.0	34.8
COPEPODA	72.1	71.4	33.6	13.3	82.8	32.6
Chirnonomus sp.	83.3	71.4	100.0	93.6	91.7	72.4
Glyptotendipes sp.	88.9	53.6	63.6	100.0	41.6	3.1
Limnochironomus sp.	91.0	64.3	51.1	60.0	41.6	3.1
Cricotopus sp.	66.9	14.3	18.0	36.7	50.0	–
Polypedilum sp.	63.2	–	34.2	56.7	16.7	3.1
Procladius sp.	38.4	10.7	–	38.8	–	3.1
Other *Chironomidae*	2.6	14.3	45.8	13.3	16.7	–
CHIRONOMIDAE L	100.0	85.0	100.0	100.0	100.0	81.8
Chironomidae p	13.4	17.9	–	73.1	65.0	75.8
Mollusca	3.5	–	–	8.3	–	–
Other invertebrates	3.5	–	13.8	15.4	–	–

Table 3

Frequency of occurrence of more important food items in ruffe food tracts in 1984

Range of body length lc (mm)	Length class 50 mm		Length class 50 mm			
Month	VIII	IX	IV	V	VIII	IX
Number of full tracts	12	10	28	33	22	24
Alona sp.	33.4	–	–	4.2	3.1	–
Bosmina sp.	8.3	–	–	14.8	14.6	–
Daphnia sp.	83.3	10.0	–	–	41.6	4.5
Other *Cladocera*	50.0	10.0	–	17.8	12.3	2.3
CLADOCERA	83.3	20.0	–	32.6	65.6	6.5
COPEPODA	50.0	70.0	76.6	64.5	33.4	21.6
Chironomus sp.	41.7	80.0	49.6	54.6	87.0	47.8
Glyptotendipes sp.	–	–	60.4	43.1	14.6	2.2
Limnochironomus sp.	25.0	–	38.2	10.7	15.6	–
Cricotopus sp.	16.7	–	9.7	2.4	9.1	–
Cryptochironomus sp.	41.7	–	–	–	78.1	52.6
Procladius sp.	–	–	3.0	–	41.7	78.7
Other *Chironomidae*	25.0	–	6.1	26.6	31.3	11.0
CHIRONOMIDAE L	100.0	80.0	94.2	95.2	100.0	100.0
Chironomidae p	66.7	60.0	9.7	43.8	96.8	93.5
Oligochaeta	25.0	40.0	32.1	55.1	41.7	50.0
Mollusca	–	–	7.1	6.1	–	–
Other invertebrates	8.3	30.0	39.3	15.1	4.5	22.6

From among *Copepoda, Cyclopidae* and their juvenile forms (copepodits) were most frequent. In 1984 all content of the food tracts was analysed, and remnants of *Oligochaeta (Limnodrilus hoffmeisteri* and *Limnodrilus claparedeanus)* were noted. Usually, however, it was not possible to count *Oligochaeta* numbers. Other invertebrates were infrequent. Apart from Mollusca (*Pisidium sp.*), *Hirudinea, Ostracoda, Asellus sp., Gammarus sp.*, and larvae of *Ephemeroptera, Chaoborus sp.*, and *Heleidae* were found sporadically. Also remnants of lower and higher aquatic vegetation were noted in the food tracts, as well as detritus, but their content was negligible.

Intensity of feeding.

Ruffe grazed more intensively than gudgeon, but intensity of grazing decreased with increasing fish length (Fig. 3). Filling of ruffe food tracts with food varied between 21 and 630 °/₀₀₀, the most frequent values being 100–250 °/₀₀₀. Food tracts of gudgeon were usually less filled with food – the respective indices were lower by 7 to 470 °/₀₀₀, being

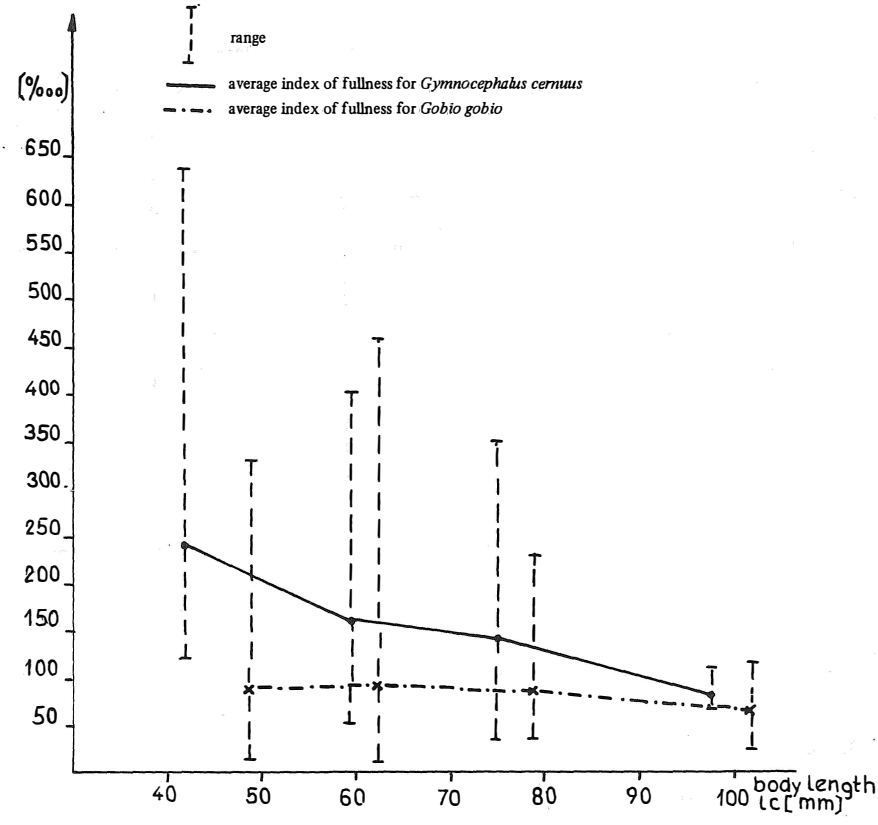

Fig. 3. Index of fillin of the food tracts of ruffe and gudgeon from Włocławek Dam Reservoir

Table 4

Frequency of occurrence of more important food items in gudgeon food tracts in 1982

Range of body length lc mm	Length class 50 mm		Length class 50 mm				
Month	VI	VII	VI	VII	VIII	IX	X
Number of full tracts	5	20	37	16	36	18	8
Alona sp.	40.0	90.0	27.0	66.0	68.1	100.0	25.0
Bosmina sp.	–	–	–	53.5	6.2	56.0	–
Chydorus sp.	20.0	35.0	13.0	13.9	17.4	49.7	12.5
Daphnia sp.	–	–	–	20.8	15.5	33.4	12.5
Other *Cladocera*	20.0	5.0	–	14.6	11.1	66.7	–
CLADOCERA	80.0	95.0	27.0	69.0	79.0	100.0	25.0
COPEPODA	60.0	55.0	23.9	70.2	34.5	9.4	25.0
Chironomus sp.	–	–	78.9	43.9	28.9	33.4	87.5
Glyptotendipes sp.	–	30.0	88.7	97.2	77.6	33.4	87.5
Limnochironomus sp.	20.0	55.0	62.0	72.9	73.5	36.7	75.0
Cricotopus sp.	–	55.0	24.1	12.5	60.2	–	25.0
Other *Chironomidae*	–	20.0	–	31.2	10.6	–	–
CHIRONOMIDAE L.	20.0	55.0	100.0	97.2	88.0	40.9	100.0
Chironomidae p.	20.0	30.0	71.3	63.2	48.0	20.8	12.5
Other invertebrates	–	–	2.7	25.0	5.5	–	–

usually within the range of 30–100‰. An attempt to determine the degree of intestine filling in time revealed that ruffe grazed more intensively in autumn than in summer. Specimens of body length below 50 mm were characterized by the following indices of intestine fillin with food: in 1984 – August 165‰, September 199.8‰, October 311‰. Specimens of body length 50.1–70.0 mm were characterized by the following indices: April 146‰, May 155‰, August 156‰, September 216‰, October 190‰. As regards gudgeon, respective indices were less variable. Individuals of body length below 50 mm were characterized by the following indices: 76‰ in August, 62‰ in September, and 55‰ in October, while those of body length 50.1–70.0 mm – by 79‰ in August, 87‰ in September, and 94‰ in October.

Intensity of feeding may be also reflected by the number of empty food tracts found in course of the studies. In 1982 no ruffe specimens were found with empty food tracts, and in 1984 there were only 6 such fishes, this representing only 2.2% of all food tracts examined. As regards gudgeon, 23 empty food tracts were found in 1982, and 28 in 1984, this being 13.8% and 22.4% of all individuals under study (Tab. 1). Empty food tracts were most frequent in August and September.

Size of consumed *Chironomidae larvae.*

Some fishes were used to analyse the relationship between size of *Chironomidae larvae* consumed and fish size. Along with increasing length of the fishes, maximal and average size of the larvae consumed also increased (Fig. 4). The longest larvae found in ruffe food tracts reached 15 mm. These were consumed by fishes of body length above 70 mm. The longest larvae of *Chironomidae* were eaten by gudgeon longer than 67 mm, and their length ranged between 10 and 13 mm. Independently of the fish size, the smallest larvae consumed by ruffe were 1–2 mm long, and by gudgeon 2–3 mm long.

Food convergence of ruffe and gudgeon.

Fishes smaller than 50 mm were not included in the analysis as their number was not sufficient to allow for comparisons. As regards fishes bigger than 50 mm, the highest convergence of ruffe and gudgeon diet was observed in July 1982 (92.4%) and September 1984 (91.7%). Both species fed at this time mainly on larvae and pupae of *Chironomidae.* In 1982 percentage of *Chironomidae larvae* in total weight of ruffe food amounted to 79.1%, and in gudgeon to 71,5%, while respective percentages for *Chironomidae pupae* amounted to 20.7% and 21.2%. In September 1984, larvae of *Chironomidae* represented 82.4% of total weight of ruffe food, and 74.1% of gudgeon food, the respective percentages for the pupae being 17.4% and 23.6%.

Table 5

Frequency of occurrence of more important food items in gudgeon food tracts in 1984

Range of body length lc (mm)	Length class 50 mm				Length class 50 mm			
Month	V	VIII	IX	X	V	VIII	IX	X
Number of full tracts	7	11	9	14	7	18	7	18
Alona sp.	–	45.4	22.2	78.6	–	25.0	32.2	55.5
Bosmina sp.	–	–	22.2	7.1	14.3	6.3	14.3	–
Chydorus sp.	14.3	45.4	11.1	–	–	9.3	7.2	5.5
Daphnia sp.	–	45.4	–	7.1	42.8	12.5	–	44.4
Other *Cladocera*	28.6	18.2	–	7.1	28.6	9.3	–	27.8
CLADOCERA	28.6	81.4	33.3	78.6	57.1	34.3	39.3	61.1
COPEPODA	42.8	100.0	44.4	21.4	71.4	31.3	64.3	50.0
Chironomus sp.	28.6	27.3	55.5	21.4	71.4	46.8	35.7	50.0
Glyptotendipes sp.	28.6	18.2	11.1	14.3	57.1	40.6	7.2	27.8
Limnochironomus sp.	–	36.4	–	–	57.1	9.3	–	11.1
Cricotopus sp.	14.3	90.9	11.1	14.3	85.7	50.0	25.0	33.3
Cryptochironomus sp.	14.3	63.6	22.2	7.1	28.6	25.0	32.3	33.3
Other Chironomidae	14.3	54.5	11.4	–	71.4	12.5	7.2	50.0
CHIRONOMIDAE L.	57.1	90.9	100.0	57.1	100.0	100.0	100.0	100.0
Chironomidae p	71.4	27.3	11.1	7.1	71.4	28.1	28.6	11.1
Oligochaeta	71.4	45.4	44.4	28.6	57.1	44.4	28.6	44.4
Other invertebrates	–	–	–	7.1	28.6	27.8	–	22.2

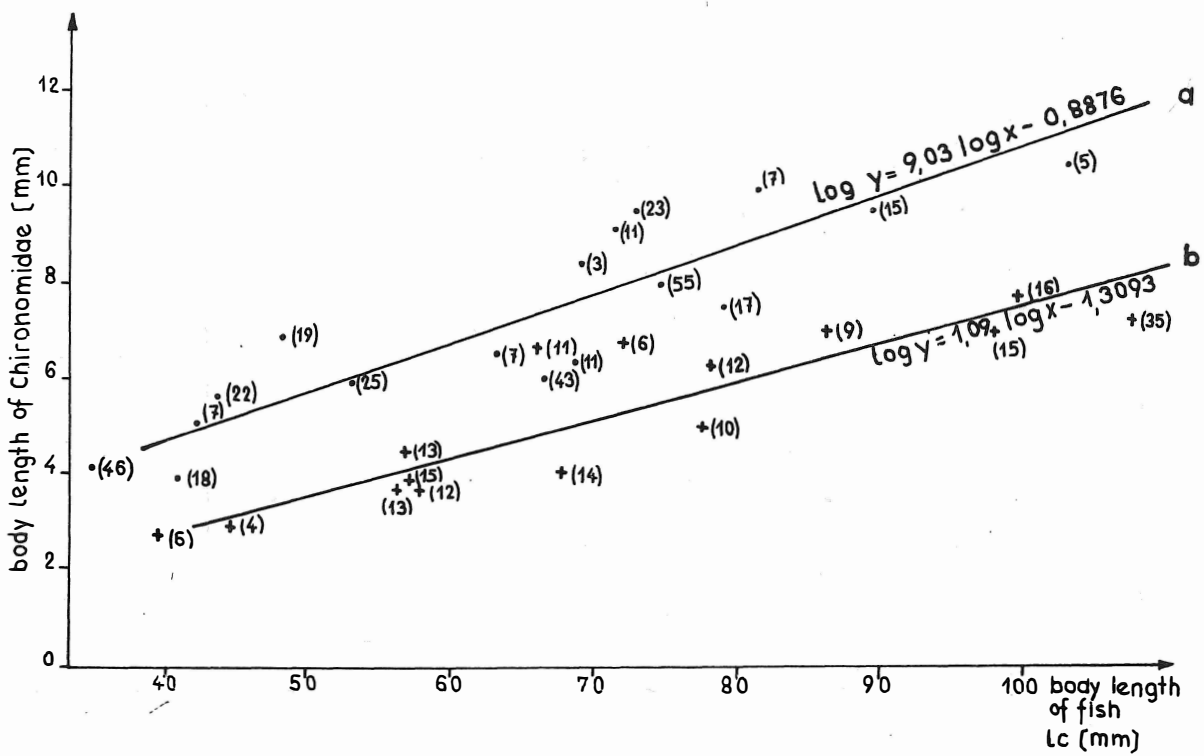

Fig. 4. Relationship between length of *Chironomidae* larvae consumed and fish size in Włocławek Dam Reservoir. (Numbers in parenthesis – number of larvae). a – *Gymnocephalus cernuus*, b – *Gobio gobio*

DISCUSSION

Ruffe and gudgeon are usually classified as typical benthophags, feeding mainly on insect larvae (Bogdanow 1959, Palla 1965, Kołonin 1977, Rolik 1967). Food of ruffer in Lake Kortowskie (Leszczyński 1963b) was composed in 94% (by weight) of *Chironomidae larvae*, the dominanting species being *Chironomus sp. – 46%, and Glyptotendipes* sp. – 21%. In Lake Tajty (Pliszka, Dziekońska 1953) *Chironomidae larvae* represented 90% of total weight of ruffe food in spring, in this 70% were *Chironomus sp.* In Lake Ilmień (Fiedorowa, Wietkasow 1974) larvae of *Chironomidae* were found in 100% of ruffe food tracts, the fishes being 1 to 4-years old. Younger specimens (0+) fed in 57% on these larvae, while *Entomostraca* were found in 83–100% of the food tracts. Tolg (1960) found that in Lake Balaton ruffe at the age 0+ (lc below 50 mm) fed mainly on *Entomostraca (Cyclopidae* and *Alona sp.*) which constituted 89% of the food weight, while *Chironomidae larvae* represented about 9% of the number of organisms consumed, and about 15% of their weight. However, these larvae were found in the food tracts of fishes as small as 10.5 mm in length.

Studies on feeding behaviour of gudgeon revealed that this fish fed mainly on insect larvae. Food of gudgeon in the Dnieper River (Smirnow, Aleksandrowa 1969) consisted of the larvae of *Chironomidae (Polypedilum sp.* and *Procladius sp.)* and *Ephemeroptera.* Gudgeon inhabiting catchment area of the rivers Czarna Staszewska and Kamienna in Swiętokrzyskie Mountains fed on the larvae of *Chironomidae, Trichoptera, Amphipoda* and *Isopoda.* It was also found that *Chironomidae larvae* were present in 83.3% of the analysed food tracts, *Cladocera* – in 59.5%, and algae in 81.8% (Skóra, Włodek 1971). Studies carried out in the River Vistula revealed that *Chironomidae larvae* were consumed by 83.3% of the fishes, zooplankton by 5.5%, phytoplankton by 22.2% (Pliszka et al. 1951). More detailed analyses of gudgeon diet in the lakes near Węgorzewo made by Leszczyński (1963a) revealed that diet of the fishes 23–104 mm long was more differentiated, *Cladocera* and big (more than 15 mm) *Chironomidae larvae* predominating, in this mostly *Cricotopus sp., Polypedilum sp.* and *Cryptochironomus sp.*

In Włocławek Reservoir diet of ruffe consisted mostly of *Chironomidae larvae.* The most frequent were larvae from the genus *Chironomus*, and organisms more or less related to submerged aquatic plants – *Glyptotendipes gripekoveni, Limnochironomus nervosus, Cricotopus silvestris*, and *Polypedilum nubeculosum.* As regards small ruffe (below 50 mm), *Copepoda were an important food item (with the exception of August 1984), as* well as *Cladocera* from the genera *Alona, Bosmina* and *Daphnia* (August 1982 and 1984) (Tab. 6). *Chironomidae larvae* constituted main food item of older fishes (longer than 50 mm). *Entomostraca* were present in ruffe food in spring 1984 (April, May – mainly *Copepoda*). Perodically, *Chironomidae pupae* were also important.

In 1982, small ruffe (less than 50 mm) consumed mostly *Entomostraca – Copepoda, Alona sp.* and *Chydorus sp.* (Tab. 7). Diet of older fishes was more diversified, but *Chironomidae larvae* represented the main food item (mostly *Glyptotendipes gripekoveni, Limnochironomus nervosus* and specimens from the genus *Chironomus*). In 1984, food of

Table 6

Relative importance of main food items in the diet of ruffe from Włocławek Dam Reservoir

Range of body length	Year	Month	*CLADOCERA*	*COPEPODA*	*CHIRONOMIDAE*	*CHIRONOMIDAE* P.
Length class 50 mm	1982	VII	319	5032	11 840	66
		VIII	3315	4127	7 480	179
	1984	VIII	6764	460	7 210	2501
		IX	24	4046	7 144	3102
Length class 50 mm	1982	VI	15	618	18 030	–
		VII	–	145	15 060	2814
		VIII	105	1010	17 100	819
		IX	567	1001	8 188	4010
	1984	IV	–	4895	12 698	13
		V	176	5115	10 101	403
		VIII	1378	147	12 060	5198
		IX	12	259	15 150	3235

Table 7

Relative importance of main food items in the diet of gudgeon from Włocławek Dam Reservoir

Range of body length	Year	Month	*CLADOCERA*	*COPEPODA*	*CHIRONOMIDAE*	*CHIRONOMIDAE P.*
Length class 50 mm	1982	VI	4 584	4 458	908	460
		VII	11 200	2 662	1 221	453
	1984	V	309	1 126	3 066	7 797
		VIII	3 639	4 490	8 717	396
		IX	2 191	1 385	9 270	114
		X	11 963	415	1 539	11
Length class 50 mm	1982	VI	621	177	11 770	3 700
		VII	3 650	1 495	9 632	1 687
		VIII	4 361	1 204	8 448	667
		IX	12 930	241	1 341	255
		X	1 385	370	12 980	–
	1984	V	582	1 406	14 340	1 906
		VIII	573	632	15 500	228
		IX	393	3 163	9 850	1 209
		X	4 442	690	10 840	57

both size classes of ruffe was similar. The fishes fed mainly on *Chironomidae larvae*. *Entomostraca* appeared only in late autumn – October. Periodically, *Chironomidae pupae* were also important (June 1982, May, September 1984).

Considerable food convergence noted periodically for ruffe and gudgeon (July 1982, September 1984) might suggest possible inter-species competition. However, detailed analyses of the diet composition did not support this suggestion. Notwithstanding the fact that ruffe and gudgeon fed in these periods mostly on *Chironomidae larvae* and *pupae*, in July 1982 ruffe consumed mainly *Chironomus sp.* and *Glyptotendipes sp.* (38.8 and 28.8% of the food weight respectively), while gudgeon ged on *Glyptotendipes sp.* and *Limnochironomus sp.* larvae (49.5 and 11.1% respectively). In September 1984, *Chironomus sp.* larvae represented 79.5% of total weight of ruffe food, while gudgeon consumed mostly *Glyptotendipes sp.*, *Limnochironomus sp.* and *Cricotopus sp. larvae*, which represented 52.3%, 13.4% and 4.2% of the food weight respectively. It should be noted that the two fish species fed on the same food resources (mainly *Chironomidae*) usually when the latter were generally most available. Abundance of bottom fauna differed considerably at particular sampling stations. Nevertheless, high numbers of *Chironomidae* were observed on some stations (station III – June 1982: 6251 indiv.m^{-2}, July 1984: 9520 indiv.m^{-2}) (data of the UMK in Toruń).

Food composition of ruffe and gudgeon suggests that the two fishes grazed in lake shore zone. High percentage of specimens from the genus *Chironomus*, as well as presence of *Oligochaeta* from the genus *Limnodrillus* in the food of ruffe suggests also that this fish penetrated bottom zone. Food of gudgeon was more diversified than of ruffe. Moreover, this species consumed more *Chironomidae larvae* inhabiting areas overgrown with aquatic vegetation. These facts suggest that gudgeon grazed mostly in the areas overgrown with plants.

SUMMARY

Feeding behaviour of ruffe and gudgeon was analysed basing on the samples collected in 1982 (June – October) and 1984 (April, May, August – October). Characteristics of the material collected is presented in Tab. 1. Totally, 291 gudgeon and 277 ruffes were collected.

Chironomidae larvae (Chironomus sp., Glyptotendipes sp., Limnochironomus sp.) represented basic food items of both ruffe and gudgeon. Periodically, *Cladocera (Daphnia sp., Alona sp., Bosmina sp., Chydorus sp.)* and *Copepoda* (especially in case of gudgeon of lc below 50 mm) as well as *Chironomidae pupae* (in the periods of their mass occurrence) were also important, depending on the fish size (Tab. 2–5, Fig. 1–2). It was found that size of *Chironomidae larvae* consumed increased along with increasing fish length (Fig. 4).

Intensity of ruffe feeding (expressed as an index of filling the food tracts) was higher than of gudgeon (Fig. 3).

Although the two fishes were characterized by considerable food convergence (July 1982 – 92.4%, September 1984 – 91.7%), no inter-species competition took place. This was due to the fact that the fishes consumed different species of *Chironomidae*. For instance, in September 1984 ruffe consumed larvae of *Chironomus sp.*, while gudgeon – larvae of *Glyptotendipes sp.* and *Limnochironomus sp.*

Ruffe diet contained high percentage of the larvae from the genus *Chironomus*, of *Oligochaeta* from the genus *Limnodrilus*. This suggests that the fish penetrated bottom areas. Diet of gudgeon was more diversified, and contained phytophilic larvae of *Chironomidae*, suggesting that this fish penetrated areas overgrown with aquatic vegetation.

Translated: Dr. M. Bnińska

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STRUKTURA POKARMU JAZGARZA (*GYMNOCEPHALUS CERNUUS* L.) I KIEŁBIA (*GOBIO GOBIO* (L.)) ZE ZBIORNIKA WŁOCŁAWSKIEGO

STRESZCZENIE

Pokarm jazgarza i kiełbia badano na okazach zebranych w 1982 r. (czerwiec – październik) i w 1984 r. (kwiecień, maj, sierpień – październik). Charakterystykę zebranego materiału przedstawiono w tab. 1. Ogółem przebadano 291 kiełbi i 277 jazgarzy.

Zasadniczymi składnikami pokarmu jazgarza i kiełbia są larwy *Chironomidae (Chironomus sp., Glyptotendipes sp., Limnochironomus sp.)*. Okresowo w zależności od klasy wielkości ważnymi komponentami są *Cladocera (Daphnia sp., Alona sp., Bosmina sp., Chydorus sp.)* i *Copepoda* (szczególnie u kiełbi poniżej 50 mm lc) oraz poczwarki *Chironomidae* w okresach ich masowego pojawu (tab. 2–5, rys. 1–2). Stwierdzono, że wraz ze wzrostem długości ciała ryb zjadane są przez nie larwy *Chironomidae* o wzrastających maksymalnych i średnich rozmiarach ciała (rys. 4).

Intensywność żerowania jazgarza mierzona wskaźnikiem napełnienia przewodów pokarmowych jest wyższa niż kiełbia (rys. 3).

Mimo dużej zbieżności pokarmowej (lipiec 1982 – 92,4%, wrzesień 1984 – 91,7%) nie można mówić o konkurencji międzygatunkowej, ponieważ występuje wyżerowywanie odmiennych gatunków *Cnironomidae* np.: wrzesień 1984 – jazgarz wyżerowywał larwy *Chironomus sp.*, a kiełb larwy *Glyptotendipes sp., Limnochironomus sp.*

Wysoki udział w pokarmie larw z rodzaju *Chironomus* oraz występowanie skąposzczetów rodzaju *Limnodrilus* świadczy o tym, że jazgarz penetruje w duym stopniu strefę przydenną. Wyższa różnorodność pokarmu kiełbia, korzystanie z bazy pokarmowej, jaką stanowią fitolfilne larwy *Chironomidae* sugeruje, że kiełb realizuje swe potrzeby energetyczne w strefie przyroślinnej.

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