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## PIKE'S FOOD FROM A RIVER AND A CARP POND

**Summary.** Alimentary tracts of 202 pikes originating from two different biotopes, a river and a carp pond, were analysed. Both in the river and the pond, in pike food, there dominated roach and perch. As far as the mass of pike's preys is concerned, among pikes originating from the river, there dominated crucian carp (57.9%), while in the mass originating from the pond, perch (53.9%) was the dominant. Weight coefficient of food differentiation between the studied habitats differed only slightly. A similar situation was found in case of the index indicating the filling of alimentary tract. A significant difference occurred in the values of the differentiation of food regarding the quantity. For pikes from the river, the coefficient value amounted to 4.24 and for pikes from the pond, it was 2.24. Studies have confirmed that regardless of the biotope in which pike occurred, roach and perch dominated in the food. On the other hand, the place of living exerted a significant influence on the quantitative coefficient of food differentiation.

**Key words:** pike, *Esox lucius* L., food, river, carp pond

### Introduction

Pike (*Esox lucius* L.) is one of the most characteristic and recognisable predator fish in Polish waters. The food of pikes occurring in different types of water has been studied by many authors (ANTOSIAK 1963, ZAŁACHOWSKI 1965, BIAŁOKOZ and KRZYWOSZ 1978, BREWIŃSKA-ZARAŚ and FRANKIEWICZ 1988, JARZYNOWA and MAZGAJ 1988, SZCZEPKOWSKI et al. 1998, SZYPUŁA 2002). In the adult stage, pike feeds on different fish species depending on the degree of their availability. According to ANTOSIAK (1963) and ZAŁACHOWSKI (1965), in the lakes of East Europe, in pike's diet, roach and perch were most frequently encountered. Sometimes, in pike's food, also other water vertebrates were found.

The presented work reports an attempt to define the food selectivity of pike originating from two different biotopes: a lowland river and an extensively utilized carp pond.

## Material and methods

Ichthyological material for studies consisted of 202 pikes; 102 individuals were caught in the river and 100 pieces originated from the carp pond. Pikes from the lowland river Postomia in the National Park "Ujście Warty" were caught in September 2003 by the method of electrofishing. Pikes from the "Gertruda" pond covering 18 ha were fished in 2006. In both cases, the fish were randomly selected from a whole fished batch on the given day. The fish were transported in ice to the laboratory and then, they were packed into foil bags (10 pcs in each bag) preventing water sublimation from fish tissues and then, they were deep frozen (at  $-28^{\circ}\text{C}$ ).

Body weight of pikes, their alimentary tracts and the particular components of food were determined exact to 0.1 g using electronic weight AXIS. After weighing the whole fish, from all individuals, the alimentary tracts were separated and weighed together with their contents. Stomachs were longitudinally slit in the tail direction so that the content remained intact. The food content was in different degree of digestion and it was subject, if it was possible, to species identification.

On the basis of pike alimentary tract investigation, the following parameters were calculated:

- quantitative participation (L) from the formula:

$$L = (1/1_x) \times 100$$

where:

- 1 – number of preys belonging to one species,
- $1_x$  – sum of all preys,

- weight participation (M) from the formula:

$$M = (m/m_x) \times 100$$

where:

- m – sum of the mass of all individuals of one species found in alimentary tracts of the caught fish,
- $m_x$  – total mass of food,

- index of alimentary tract filling (G) from the formula:

$$G = (g/g_x) \times 100$$

where:

- g – mass of food content,
- $g_x$  – mass of fish body,

- coefficient of food differentiation (A) from the formula:

$$A = (\sum x)^2 / (\sum x^2)$$

where:

- x – quantitative or weight participation of the particular components (%).

## Results

Studies of food content permitted to define the fish species occurring in pike diet. Data in Table 1 show that in the food of pike from the Postomia river, there occurred 12 fish species and from "Gertruda" pond – four fish species. Furthermore, in the Postomia river, forceps of striped crayfish and partially digested frog were found. Both in the river and in the pond, regarding the quantitative aspect in pike food, there dominated roach and perch, although their percentage participation in the pond was higher. From the point of view of the prey mass, in the river, there dominated crucian carp (57.9%), and in the pond, perch was the dominant (53.9%). Weight coefficient of food differentiation between the studied biotopes differed insignificantly, similarly as in case of the index of alimentary tract filling (Table 2). On the other hand, a significant difference in the values of the food differentiation coefficient from the quantitative point of view was found. The respective value from the river was 4.24 and from the pond 2.24.

Table 1. Qualitative (L) and weight (M) participation of pike's food from the Postomia river and "Gertruda" pond (%)

Tabela 1. Udział ilościowy (L) i wagowy (M) pokarmu szczupaka z rzeki Postomii i stawu „Gertruda” (%)

Species	Postomia river		"Gertruda" pond	
	L	M	L	M
Roach ( <i>Rutilus rutilus</i> L.)	35	15.8	50	20.8
Crucian carp ( <i>Carassius auratus gibelio</i> Bloch)	9	57.9	4	16.5
Tench ( <i>Tinca tinca</i> L.)	–	–	2	8.8
Perch ( <i>Perca fluviatilis</i> L.)	18	5.2	44	53.9
Three-spined stickbeack ( <i>Gasterosteus aculeatus</i> L.)	6	0.6	–	–
Rudd ( <i>Scardinius erythrophthalmus</i> L.)	4	1.5	–	–
Common bream ( <i>Abramis brama</i> L.)	4	0.7	–	–
Pike ( <i>Esox lucius</i> L.)	4	7.5	–	–
White bream ( <i>Abramis bjoerkna</i> L.)	2	1.13	–	–
Burbot ( <i>Lota lota</i> L.)	2	5.5	–	–
Spined loach ( <i>Cobitis taenia</i> L.)	1	0.05	–	–
Bleak ( <i>Alburnus alburnus</i> L.)	1	0.7	–	–
Gudgeon ( <i>Gobio gobio</i> L.)	1	0.07	–	–
Other (frog, nipper of crayfish)	3	1.3	–	–
Not identified	10	2.05	–	–

Table 2. Coefficient of food differentiation (A) and index of alimentary tract filling (G) of pikes from the Postomia river and "Gertruda" pond

Tabela 2. Współczynniki zróżnicowania pokarmu (A) oraz wypełnienia przewodu pokarmowego (G) szczupaków z rzeki Postomii i stawu „Gertruda”

Parameter	Postomia river	"Gertruda" pond
Coefficient of food differentiation (A) – mass	2.51	2.71
Coefficient of food differentiation (A) – quantitative	4.24	2.24
Index of alimentary tract filling (G)	18.24	20.0

## Discussion

Studies on food selectivity of adult pike showed that the exterior appearance and the features of preys do not decide about pike's choice. This thesis has been confirmed by study results of BIAŁOKOZ and KRZYWOSZ (1978). According to those authors, the decisive factor is pike's predilection for the consumption of a given species. However, as suspected by BACKIEL and HOROSZEWICZ (1990) and ZAŁACHOWSKI (2000), the selection strategy of pike is concentrated not only on the most numerous represented species in the given water reservoir, but it takes into consideration also other features of its preys, such as: life in herds, life mode, mobility, size, and/or degree of dorsum arching.

JARZYNOWA and MAZGAJ (1988), on the basis of studies carried out in the old river-bed of Tyśmienica found that the food spectrum of pike was similar to the ichthyofauna species structure occurring in the given reservoir.

In the alimentary tract of pikes from the Postomia river, 12 fish species were identified, while in the "Gertruda" pond, four species were found. For comparison purposes, in the old river-bed of Tyśmienica, six fish species were the preys of pike, while in the Dgal Wielki lake – nine fish species had become its preys. Next to the fish in the quoted lake, in the food of the studied predatory fish, also other vertebrates were found such as frogs and newts, as well as invertebrates, mainly *Chironomidae* (BIAŁOKOZ and KRZYWOSZ 1978).

Food consumption of pikes from the "Gertruda" pond with a high participation of perch and roach, the so-called small fry characterised by an accepted by predators body habit resulted most probably from the most numerous occurrence of the mentioned species in the studied pond ecosystem with a relatively not large area. This point of view is convergent with the results of similar works (ANTOSIAK 1963). According to that author, pike attacks primarily fish with dimensions ranging in the lower limit of pike's consumption possibility. Then, pike chooses also bigger individuals, but with a not too much arched dorsum (ZAŁACHOWSKI 1973). The latter feature is therefore very important as a protective signal against pike's attacks.

Pike is characterised, similarly as pikeperch and perch, by a relatively wide alimentary spectrum. In the studies by SZYPUŁA (2002), the calculated values of food differentiation coefficient in these three species (pike, pikeperch, perch) were the following: 2.88; 2.07 and 3.2, respectively. In the present studies, the weight coefficient of food differentiation reached similar values (Table 2) as the above quoted ones.

## Conclusions

On the basis of the presented studies, it can be stated that in the food of pikes obtained from the "Gertruda" pond and Postomia river, two species dominated: roach and perch. The place of living exerted an essential impact on the quantitative coefficient of food differentiation. It depended on the place where the fish were caught. In the pike food from the Postomia river, 12 species were identified and in the "Gertruda" pond – only four species were found.

## References

- ANTOSIAK B., 1963. Pokarm szczupaka (*Esox lucius* L.) w niektórych jeziorach okolic Węgorzewa. *Rocz. Nauk Roln. Ser. H* 82: 237-317.
- BACKIEL T., HOROSZEWICZ L., 1990. Wielkość i liczba ofiar ryb drapieżnych: próba wyjaśnienia przez symulacje. *Rocz. Nauk. Pol. Zw. Wędk.* 3: 147-162.
- BIAŁOKOZ W., KRZYWOSZ T., 1978. Racje pokarmowe i współczynnik pokarmowy szczupaka (*Esox lucius* L.) z jeziora Dgał Wielki. *Rocz. Nauk. Roln. Ser. H* 99: 7-22.
- BREWIŃSKA-ZARAŚ B., FRANKIEWICZ P., 1988. Pokarm ryb drapieżnych w rzece Widawce. *Acta Univ. Lodz. Folia Limnol.* 3: 117-134.
- JARZYNOWA B., MAZGAJ C., 1988. Pokarm szczupaka (*Esox lucius*) ze starorzeczy Tyśmienicy. *Rocz. Nauk. Pol. Zw. Wędk.* 1: 181-189.
- SZCZEPKOWSKI M., SZCZEPKOWSKA B., CHYBOWSKI Ł., 1998. Wybiórczość pokarmowa szczupaka względem troci jeziorowej, płoci i okonia w warunkach stawowych. *Kom. Ryb.* 42, 1: 6-7.
- SZYPUŁA J., 2002. The food and feeding of selected predacious fish species in lake Miedwie over 1977-2000. *Acta Sci. Pol. Piscar.* 1, 1: 77-90.
- ZALAChOWSKI W., 1965. Wzrost szczupaka z Jezior Legińskich. *Zesz. Nauk. WSR Olszt.* 20: 181-193.
- ZALAChOWSKI W., 1973. Szczupak. PWRiL, Warszawa.
- ZALAChOWSKI W., 2000. Szczupak. In: *Ryby słodkowodne Polski*. Ed. M. Brylińska. Wyd. Nauk. PWN, Warszawa: 362-368.

## POKARM SZCZUPAKA W RZECE I STAWIE KARPIOWYM

**Streszczenie.** W pracy poddano analizie 202 przewody pokarmowe szczupaków pochodzących z dwóch różnych biotopów: rzeki i stawu karpiego. Zarówno w rzece, jak i w stawie pod względem ilościowym w pokarmie szczupaka dominowały płoć i okoń. Pod względem masy ofiar u szczupaków z rzeki dominował karaś srebrzysty (57,9%), a u szczupaków ze stawu – okoń (53,9%). Wagowy współczynnik zróżnicowania pokarmu między badanymi środowiskami różnił się nieznacznie, podobnie jak w przypadku wskaźnika wypełnienia przewodu pokarmowego. Znacząca różnica wystąpiła w wartościach współczynnika zróżnicowania pokarmu pod względem ilościowym, który u szczupaków z rzeki wyniósł 4,24, a u szczupaków ze stawu – 2,24. Badania potwierdziły, że bez względu na biotop, w którym występuje szczupak, dominantami w jego pokarmie są płoć i okoń. Warunki pokarmowe mają istotny wpływ na ilościowy współczynnik zróżnicowania pokarmu.

**Słowa kluczowe:** szczupak, *Esox lucius* L., pokarm, rzeka, staw karpioy

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