THE FOOD OF PERCH (*PERCA FLUVIATILIS* L.) IN A BIOMANIPULATED WATER SUPPLY RESERVOIR

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ABSTRACT

The food composition of perch (*Perca fluviatilis*, L.) was studied in a mesoeutrophic reservoir Hamry near the small town Hlinsko in the Bohemian - Moravian highlands (Czech Republic). Average depth of the reservoir is 2 m (7.5 m maximum). Fish were sampled with 100 m beach seine, fry seine and gillnets in 2011 and 2012. Food composition was evaluated using gravimetric methods. Zooplankton was dominant in 0+ (16 - 86 mm) and 1+ (52 - 81 mm) perch diet. In summer and autumn, cyprinid and perch fry dominated in adult 5-7+ (112 - 300 mm) fish while detritus dominated in spring. Benthic macroinvertebrates were recedent. While juvenile perch participate on undesirable reduction of zooplankton abundance by its feeding pressure on the other hand adult perch play an important role in fish stock management by consuming fish fry (even of its own species) that exactly feed on zooplankton and thus affects phytoplankton quantity and further the water quality.

Key words: perch, diet, reservoir

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INTRODUCTION

Perch is dominant fish species in water reservoirs after their initial filling. Together with bream and roach is perch called „acompanying fish species“, This species can, by their feeding pressure on zooplankton, impact the water quality development in the water supply reservoirs. While juvenile perch are almost strictly consumers of zooplankton (Adámek et al. 2004, Peterka and Matěna 2011), from the lenght of 150 mm (SL) perch start to feed on macrozoobenthos invertebrates (Dyk 1952) and fish (Tesch 1955). Beside eating another fish species also cannibalism was proved (Thorpe 1974) at older individuals. The aim of this study was to analyse the diet of perch in the Hamry Reservoir (Czech Republic) two years after a large-scale removal of cyprinids. Such a result would add support to fish removal from water supply reservoirs with the aim of improving long-term water quality and lowering treatment costs.

MATERIAL AND METHODS

Adult fish were samped by using 100 m long beach seine (maximum width in centre 4 m, mesh size 20 mm) and by Nordic gillnets. Younger fish were sampled by using 15 m long beach fry seine (maximum width in the centre 2 m, mesh size 4 mm). For sampling were chosen accesible sites along the shallow banks of the reservoir during the daytime April 2011 - September 2012. Three age groups (0+, 1+, 5+ - 7+) were selected for food analysis. Immediately after capture, fish were weighed (to the nearest 0.1 g), measured (standard length (SL) to the nearest 1 mm, dissected and the stomach contents separated. The stomach contents were weighed (to the nearest 0.1 g) and preserved in 4% formaldehyde for later laboratory analysis.

The basic bulk of the sample was separated from determinable taxa under the binocular microscope and taxa were then determineted . The proportion of total food intake represented by each category was evaluated using the indirect method of Hyslop (1980), using the following formula:

$\% W_i = 100 * (W_i / \Sigma W_i)$

where W_i is the weight of a particular food component and ΣW_i is the weight of all food components.

Food bulk weight was assessed to the nearest mg and presented as the index of gut fullness (IF) in $^{o}/_{oo}$ calculated as a ratio between food (w_i) and fish (W_i) weights using the formula:

$^{o}/_{oo}\ IF = 10^4 * (w_i / W_i)$

The percentage of each food item was compared separately using Mann-Whitney tests with Bonferroni correction of significance level to decrease the probability of committing a type I error in multiple testing (Sokal and Rohlf, 1995).

RESULTS AND DISCUSION

Group 0+, 168 fish, 4 captures

Cladocerans and copepods were dominant food items in this group (Fig. 1). Insects, molluscs and detritus were recedent food items. Index of fullness was in the range 139.3 205.6 ‰ (Fig. 2). Perch in this group consumed significantly more cladocerans and copepods than perch age groups 1+ and 5+ - 7+ ($P < 0.008$).

Group 1+, 47 fish, 1 capture

Cladocerans were dominant food items in this age group (Fig. 1). Other items were recedent. The average index of fullness was 197.4 ‰ (Fig. 2). Perch in this group consumed significantly less cladocerans than perch group 0+, more insects than perch 5+ - 7+ , less fish than perch group 5+ - 7+ ($P < 0.008$).

Group 5+ – 7+, 84 fish, 6 captures

Fish together with macrophytes made dominant food items. Fish eggs and detritus were detected in the food too. Insects, cladocerans and copepods were recedent (Fig. 1). Index of fullnes was in the range 25.8 – 289.3 ‰ (Fig. 2). Perch in this group consumed significantly less cladocerans than perch in the groups 0+ and 1+ and more fish than perch of group 1+ ($P < 0.008$).

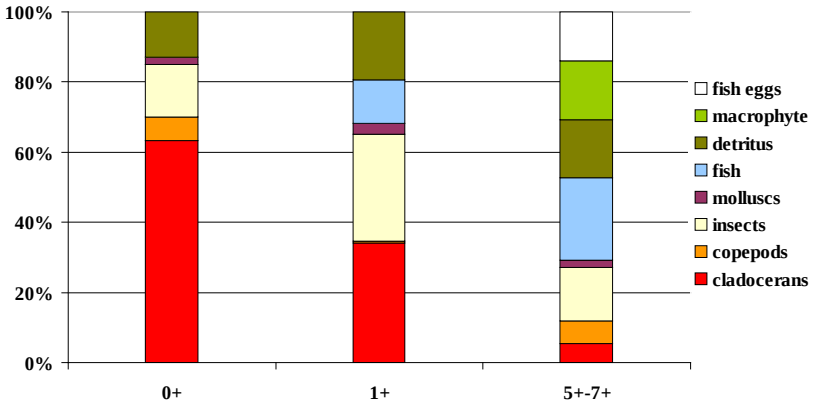

Fig. 1: Diet composition (in relative percentage biomass) three age groups of perch

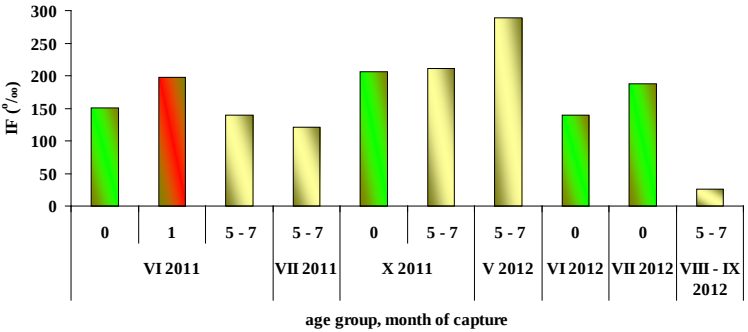

Fig. 2: Seasonal dynamics in the index of fullness three age groups of perch

Fish eggs and insects formed important part of diet at perchconsuming mainly macrophytes. These food items were attached tothe terrestrial vegetation. Perch probably consumed vegetation „by mistake“ during the feeding on diet of animal origin. The intake of invertebrates by this way was experimantally tested on artificial water plants by Boll et al. (2012) in the Vaeng lake (Denmark). Perch consumed invertebrates attached to the substrate commonly while substrate couldn´t be consumed due to its artificial structure.

Zooplankton as dominant food item of juvenile perch was documented for example by Adámek et al. (2004) in an experimental pond Vodňany or Peterka and Matěna (2011) in the Římov Reservoir. Water invertebrates were important food items at older perch (250 – 370 mm SL) in Ring Lake (Denmark Jacobsen 2002), Dieterich et all. (2004) – the Constanz Lake (Germany) According to Tesch (1955) became perch piscivorous from the lenght of 150 mm (SL) while cannibalism is not rare Thorpe (1974) . Perch diet depends on the richness of food resources, the abundance of perch and their competition pressure in the reservoir

CONCLUSION

This study verified that juvenile perch consume mainly zooplankton which can have (together with other factors) the unintentional effect on water quality in the reservoirs. On the other hand the presence of older perch (> 112 mm, standard lenght) is suitable for reduction of cyprinid fish fry.

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