

DIET OVERLAP BETWEEN NATIVE YELLOW PERCH (*PERCA FLAVESCENS*) AND INVASIVE WHITE PERCH (*MORONE AMERICANA*) IN TWO MAJOR LAKE CHAMPLAIN TRIBUTARIES.

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Summary

White perch (*Morone americana*, Fig. 1) are not native to the Lake Champlain Basin, but have become established since their introduction in the 1980s. As efficient opportunistic feeders, white perch potentially compete for food with native fishes such as yellow perch (*Perca flavescens*, Fig. 2). Goals of this study were to determine if significant diet overlap exists between these two fishes and to document seasonal diet shifts in two major Lake Champlain tributaries. Yellow perch (n = 74) and white perch (n = 96) were sampled biweekly from each river from late May through August, and diet overlap was quantified using Schoener's Index of Proportional Overlap. Diet overlap between species in both rivers was generally not significant. Eggs were common in the diets of both fishes in the late spring; chironomids and other benthic invertebrates constituted the majority of the diets throughout the summer in both rivers. Habitats of the two species appeared to be distinct; yellow perch were found among vegetation whereas white perch were found in the deeper channel. Given data from these rivers as well as from Missisquoi Bay of Lake Champlain, we conclude that white perch may have little impact on the diet of adult yellow perch in the Lake Champlain Basin. Any significant diet overlap arises from similar temporal diet shifts apparently based upon opportunistic feeding strategies.

Purpose of the Study

A. Invasive white perch may be detrimental to native fishes such as yellow perch i. White perch in Eastern rivers:

- Feed predominantly on benthos rather than on drift, as do yellow perch (Bath and O'Connor 1985; Weisberg and Janicki 1990).
- Feed heavily on eggs of river spawning fishes including walleye, golden redbreast, white sucker, and common carp (Schaeffer and Margraf 1987).

ii. White perch in the Laurentian Great Lakes:

- Undergo similar ontogenetic shifts in diet that cause diet overlap with yellow perch (Parrish and Margraf 1991; Sierszen *et al.* 1996; Truempner and Lauer 2005).
- Experience similar temporal shifts in diet as yellow perch, which maintain diet overlap (Daney *et al.* 1991).
- Might prevent optimal foraging by yellow perch through efficient feeding, causing a reduction in yellow perch growth (Parrish and Margraf 1990; O'Gorman and Burnett 2001).

iii. White perch in Missisquoi Bay, Lake Champlain:

- Significantly overlap in diet with juvenile yellow perch (Gulka and Facey unpub.).
- Can experience similar temporal diet shifts as adult yellow perch, occasionally causing significant diet overlap (White and Facey 2006).

B. Objectives

- Assess diet overlap between white and yellow perch in the Winooski and Missisquoi Rivers (Fig. 3) throughout the summer.
- Combine diet overlap data from White and Facey (2006) from Missisquoi Bay to holistically understand white perch and yellow perch diet overlap in Lake Champlain.

Methods

A. In the Field

- We sampled fishes by angling on an approximately biweekly basis, supplemented by overnight sets of three hoop trap nets.
- Fishes were immediately killed by cranial concussion.
- Fishes were stored in ice to slow digestion.

B. In the Laboratory

- We measured total and standard lengths (TL and SL, cm) and weight (g).
- Stomachs were weighed (g) and then dissected; food items were identified to the lowest taxonomic group possible.
- We calculated percent composition for each food item in each stomach, and used the Schoener Index of Proportional Overlap (Schoener 1970) to statistically quantify diet overlap; values range from 0 (no overlap) to 1 (perfect overlap) with an accepted significance value of 0.60.

$$C_{xy} = 1 - 0.5 (\sum |P_{xy} - P_{yx}|)$$



Figure 1. The white perch (*Morone americana*) is invasive to the Lake Champlain Basin.



Figure 2. The yellow perch (*Perca flavescens*) is native to the Lake Champlain Basin.

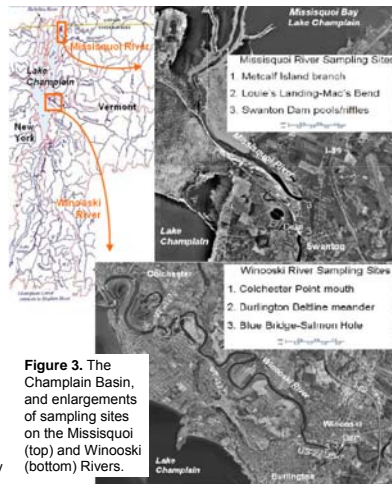


Figure 3. The Champlain Basin, and enlargements of sampling sites on the Missisquoi (top) and Winooski (bottom) Rivers.

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Results

- Eggs were common in diets of both fishes in both rivers in late spring; chironomids and other benthic invertebrates constituted the majority of the diets throughout the summer (Fig. 4).
- Diet overlap was generally not significant in either river; significant overlap (Schoener Index ≥ 0.60) occurred in one of four samples in each river (Tables 1a-b).

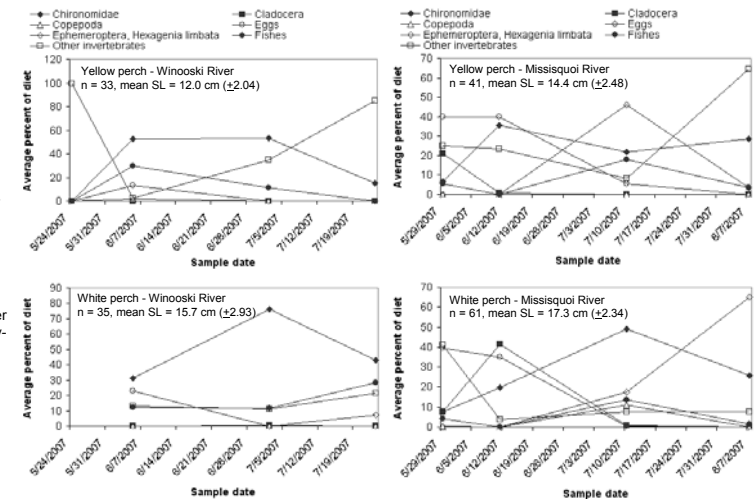


Figure 4. Temporal shifts in food use by yellow perch (top) and white perch (bottom) in the Winooski River (left) and Missisquoi River (right), late May-August, 2007.

Table 1. Summary of Schoener Index values by sample. Red indicates significant (≥ 0.60) diet overlap.

A) Winooski River

Sample Date	5-7 June	2 July	23-24 July
Schoener Overlap Index	0.57	0.67	0.32
n = yellow perch	12	11	10
n = white perch	6	22	7

B) Missisquoi River

Sample Date	29-30 May	11-12 June	10-11 July	7-8 August
Schoener Overlap Index	0.62	0.57	0.46	0.31
n = yellow perch	9	4	18	10
n = white perch	25	22	6	8

Discussion and Conclusions

- Diet overlap was generally not significant between white and yellow perch adults in the Winooski and Missisquoi Rivers (Table 1 a-b).
- Significant diet overlap occurred when both species focused on chironomids and juvenile fishes in the Winooski River (2 July, Fig. 4) and unidentified fish eggs and chironomids in the Missisquoi River (29-30 May, Fig. 4).
- Data are consistent with opportunistic feeding, as diets shifted regularly over time (Fig. 4).
- In summary, given white and yellow perch diet overlap data from Missisquoi Bay, the Winooski River and the Missisquoi River:
 - The degree of diet overlap among adults is related to similar temporal shifts in diet by both species.
 - The habitats of the two adult fishes appear well partitioned in both rivers, and thus spatial overlap appears minimal.
 - Future studies might investigate interactions between white perch and juvenile yellow perch, or other species, in the Lake Champlain Basin. The lower Missisquoi River includes rare, suitable walleye spawning habitat (Smith and Lytle 2003), and white perch have fed heavily on walleye eggs during spawning periods (Schaeffer and Margraf 1987).

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