

NORTHERN ILLINOIS UNIVERSITY

**RAPID PREY CONSUMPTION AND DIGESTION BY THE LAKE ERIE
WATERSNAKE: IMPLICATIONS FOR AN INVASIVE PREY SPECIES**

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ABSTRACT

Exotic predators have significant impacts on native species populations, but a native predator can also have impacts on an invasive prey. The round goby (*Neogobius melanostomus*), a European invader, spread rapidly throughout the Great Lakes since introduction. The Lake Erie watersnake (*Nerodia sipedon insularum*) has since shifted from its diet to almost exclusively round gobies. I investigated the effects this shift may have on round goby populations by determining the rate of round goby consumption by watersnakes. Digestive rate trials were performed to determine time until an average size round goby was digested. Maximum prey consumption trials were performed to determine the amount of round goby biomass the snakes could consume under ideal conditions. Quadratic regression demonstrated that adult watersnakes are capable of digesting 90% of a round goby in 16.4 hours at 30°C and 20.1 hours at 25°C. Trials performed on sub-adults showed similar results. Maximum prey consumption trials indicated that watersnakes are capable of consuming 30% of their body mass in a five-day period.

Feeding frequency of free-ranging watersnakes was analyzed using loglinear analysis from census data. Loglinear analysis showed that females contained prey more often than males and that watersnakes more often contained prey early in the season than later. Using rates of consumption from the previous experiments, projected annual consumption of round gobies were determined. The numbers of round gobies consumed ranged from 246,000-1,389,176 or 3,905-22,053 kg of round gobies per year. A projection was performed using physiological data with a result of 24,616 kg of round gobies per year.

Prey size-snake size allometry was analyzed using quantile regression and analysis of covariance. I tested predictions that maximum prey size-snake size allometry was approximately one, the allometry for females exceeded that of males, and that the allometry differed between round gobies and native fish. Slope estimates from the quantile regression were not equal to one for the maximum prey size. Prey size-snake size allometry differed between males and females feeding on round gobies and, in females, between round gobies and native fish. Prey size-snake size allometries between round gobies and native fish were not conclusive.