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Terrestrial Prey Items in the Diet of Largemouth Bass, *Micropterus salmoides*, in a Small North Temperate Lake

ABSTRACT

We examined the prevalence of terrestrial vertebrates (amphibians, reptiles, birds, and mammals) in the diet of largemouth bass (*Micropterus salmoides*) from a small, unexploited, kettle lake in Michigan's Upper Peninsula from 1983 to 2004. The stomach contents from 3,873 bass contained 80 terrestrial vertebrate prey items comprising 15 different species. Numerically, terrestrial vertebrates comprised only 0.03% of the total prey items, and the frequency of occurrence of terrestrial forms was 2.1%. However, in terms of biomass, terrestrial vertebrates represented the third largest prey category (12.3%).

Paul Lake is a small (1.5 ha), deep (max. depth 15 m), kettle lake located on the property of the University of Notre Dame Environmental Research Center (UNDERC; 46°32'N, 89°13'W) in Michigan's Upper Peninsula. The lake has not experienced any angling exploitation since the mid-1970s, and the largemouth bass (*Micropterus salmoides*) has been the only piscivorous fish species in the lake since that time (Leavitt et al. 1989).

Angling and electrofishing in the littoral zone were used to collect bass, which were sampled 185 times between 0800 and 1100 h and 1600 and 2000 h, twice monthly from May through August, 1983-2004. Stomach contents of 3,873 individual fish were removed by gastric lavage (Seaburg 1957) and preserved in 70% ethanol. The mean number of fish sampled on any given date was 24 and in any year was 162.

Adult largemouth bass foraged on a wide variety of prey types, including zooplankton (*Daphnia* spp.), benthic and terrestrial insects, fishes, herptofauna, birds, and small mammals. Eighty terrestrial vertebrate prey items, representing 15 species, were recovered (Table 1); thus, the frequency of occurrence of terrestrial vertebrates in bass diet was 2.1%. This accounted for only 0.03% of the prey items consumed but represented 12.3% of the total biomass (Table 2). Of these prey items, amphibians (frogs and newts) were the most common vertebrate prey type. Reptiles (turtles and snakes) and birds were rare in the diet.

Although the numbers of terrestrial vertebrate prey items in the largemouth bass diet was small, it represented a substantial source of terrigenous carbon for the aquatic ecosystem as measured by biomass. Carbon modeling analyses by Pace et al. (2004) and Carpenter et al. (2005) indicated that half of more of the secondary production in Paul Lake was supported by terrestrial subsidies. This work and our observations indicate that fish carbon is partially derived from the episodic utilization of terrestrial particulates from terrestrial sources, including vertebrate species.

Table 2. Percentage of biomass of prey categories in the diet of largemouth bass from Paul Lake, 1983-2004.

Prey category	Percent biomass
Benthic invertebrates	42.3[a]
Fish	35.8[b]
Terrestrial vertebrates	12.3
Terrestrial insects	9.7

[a] Odonate nymphs = 15.8% [b] YOY fish = 26.7%

Table 1. Terrestrial vertebrate species in the diet of largemouth bass in Paul Lake, 1983-2004.

Mammals	Amphibians
Napeozapus insignuis	*Rana clamitans*
Microtus pennsylvanicus	*Rana pipiens*
Tamias striatus	*Rana* spp. tadpoles
Sorex palustris	*Hyla crucifer*
Sorex sp.	*Notophthalmus virdescens*
Unknown remains	Others (bones)
Reptiles	Birds
Thamnophis sauritus	*Agelaius phoeniceus*
Chrysemys picta	*Dendroica* spp.
Storeria occipitomaculata	Unidentified spp.

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