

Diving Ducks in the Great Lakes Switch Diets

Since zebra mussels (*Dreissena polymorpha*) invaded the Great Lakes in the late 1980's, there has been speculation about which waterfowl species in North America eat zebra mussels and the proportion of zebra mussels in the diets of waterfowl. In Europe, tufted ducks (*Aythya fuligula*), common pochards (*A. ferina*), and coots (*Fulica atra*) were reported to eat large quantities of zebra mussels. Waterfowl may make a significant contribution to the development of integrated pest management of zebra mussels in the United States.

Waterfowl Collected on Lakes St. Clair and Erie

We collected feeding waterfowl during winter and spring 1992 and again between fall and spring 1992–1993. We concentrated on collecting lesser scaup (*A. affinis*), common goldeneye (*Bucephala clangula*), bufflehead (*B. albeola*), redhead (*A. americana*) and canvasback (*A. valisineria*) because many of these diving duck species have traditionally eaten mollusks and are present in the habitats where zebra mussels are now abundant. We collected diving ducks at as many different locations (12–13) as possible in areas with the major waterfowl concentrations in the U.S. portion of the two lakes (Figure). Waterfowl were dissected in the field, and only waterfowl with food in their

esophagi or proventriculi (upper gastrointestinal [GI] tract) were used in the analysis.

Diving Ducks Are Eating Zebra Mussels

Diving ducks in Lake Erie and Lake St. Clair consume zebra mussels, although the magnitude of the shift from other foods to zebra mussels varies by species (Table 1). Of the ducks that we collected, 94% of the lesser scaup, 83% of the common goldeneye, 78% of the redhead, and 60% of the bufflehead had eaten zebra mussels. In contrast, only 1 of 11 canvasback (9%) had eaten zebra mussels.

Zebra mussels were the main prey in the diet of lesser scaup and common goldeneye (Table 2). Less than 25% of redheads, buffleheads, and canvasbacks had fed exclusively on zebra mussels. Redheads seemed to have ingested zebra mussels incidently while foraging on aboveground portions of pondweed (*Potamogeton* sp.); small zebra mussels were attached to the stems of vegetation in the redhead's upper GI tract. Two redheads, however, had eaten exclusively zebra mussels. Some bufflehead (47%) had eaten zebra mussels and other food, and some (40%) had eaten only other foods such as amphipods, isopods, and caddisflies. Most canvasbacks had consumed only wildcelery (*Vallisneria americana*) winterbuds. One

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canvasback, collected while dabbling along the shoreline during unusually low water levels, had eaten zebra mussels. Canvasbacks eat zebra mussels but seem to prefer wildcelery winterbuds when available.

The diet selection differed between lesser scaup in Lake Erie and lesser scaup in Lake St. Clair (Table 3). Lesser scaup in Lake Erie mainly ate zebra mussels and an occasional isopod or snail. In contrast, lesser scaup in Lake St. Clair more often consumed amphipods, isopods, and snails, and no lesser scaup ate solely zebra mussels. This between-lake difference may be attributed to the density and distribution of zebra mussels. In the U.S. portion of Lake St. Clair, zebra mussels occur in lower densities than in Lake Erie and are often attached to vegetation. In Lake St. Clair, lesser scaup may be more likely to encounter these other food items while foraging; may be forced to eat alternate foods because zebra mussels are relatively scarce; or may have difficulty in picking small, individual zebra mussels off of vegetation. In Lake Erie, zebra mussels often form dense mats that are easily located, and the mats probably harbor few other invertebrate species.

When Lake Erie is totally covered with ice, waterfowl are concentrated on hot-water discharges of power plants. Eight of 9 lesser scaup collected from a hot-water discharge on Lake Erie near Toledo, Ohio, had eaten exclusively gizzard shad, while only one had eaten zebra mussels. There were few zebra mussels in the hot-water discharge area.

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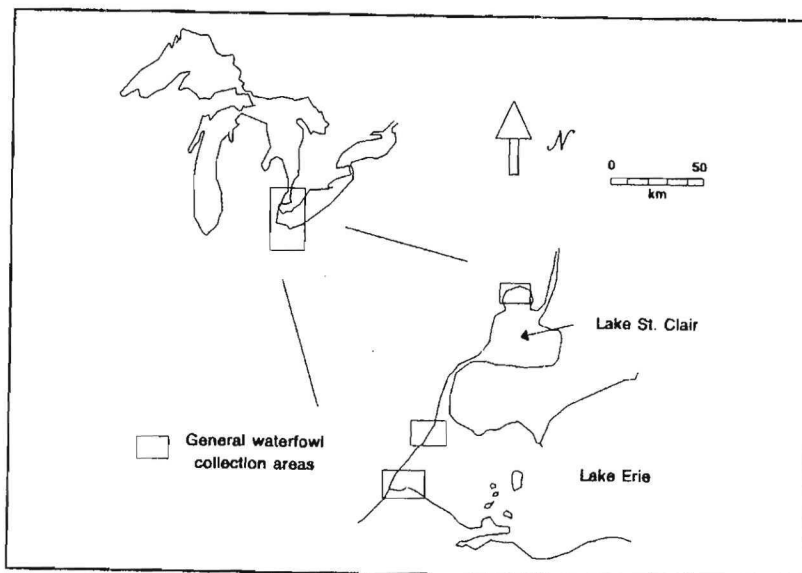


Figure. Areas in Lake St. Clair and the western end of Lake Erie where waterfowl were collected in fall and spring 1992–1993.

Table 1. Frequency of occurrence^a of zebra mussels (*Dreissena polymorpha*) in the upper gastrointestinal tracts of diving ducks in Lake Erie and Lake St. Clair during fall and spring 1992–93.

Species	<i>n</i> ^b	Percentage of ducks with zebra mussels
Lesser scaup	33	94
Common goldeneye	6	83
Redhead	9	78
Bufflehead	15	60
Canvasback	11	9

^a Number of ducks by species that ate zebra mussels divided by total number of ducks by species.

^b Number of ducks by species with food in the upper GI tract.

Table 2. Frequency of occurrence^a of zebra mussels (*Dreissena polymorpha*) and other foods in upper gastrointestinal tracts of diving ducks in Lake Erie and Lake St. Clair during fall and spring 1992–93.

Species	Percentage of ducks with		
	Only zebra mussels	Zebra mussels and other foods	Only other foods
Lesser scaup	73	21	6
Common goldeneye	67	17	17
Redhead	22	78	0
Bufflehead	13	47	40
Canvasback	9	0	91

^a Number of ducks by species with food in each of the categories divided by the total number of ducks, by species.

Table 3. Frequency of occurrence^a of zebra mussels (*Dreissena polymorpha*) and other foods in upper gastrointestinal tracts of lesser scaup (*Aythya affinis*) during fall and spring 1992–93.

Location	Percentage of ducks with		
	Only zebra mussels	Zebra mussels and other foods	Only other foods
Lake Erie	82	14	4
Lake St. Clair	0	80	20

^a Number of ducks by lake and by species with food in each of the categories divided by the total number of ducks, by lake and species.