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HEAVY PREDATION ON ZEBRA MUSSELS MAY NOT ENHANCE GROWTH OF FRESHWATER DRUM IN WESTERN LAKE ERIE

Growth of freshwater drum (*Aplodinotus grunniens*) is not enhanced by consumption of zebra mussels (*Dreissena polymorpha*) as the staple food in the diet. The growth rate of freshwater drum in western Lake Erie was greater in 1927 than in the period of 1957 to 1978, following disappearance of a major food item, burrowing mayfly nymphs (*Hexagenia limbata*), in 1953. Zebra mussels invaded Lake Erie in the late 1980's and are now the dominant benthic macroinvertebrate in the western basin of the lake. Freshwater drum over 75-mm long are now feeding heavily on zebra mussels. We conducted a study to determine whether the growth of freshwater drum is being enhanced by predation on zebra mussels.

FOOD HABITS AND GROWTH OF DRUM EXAMINED

Freshwater drum ($n = 592$ females and 228 males, TL = 109 to 490 mm) were collected with a bottom trawl from 22 stations in western Lake Erie in 1990–91. We examined gut samples of female and male 3- to 6-year-old drum and calculated the mean volume (mL) of each food item. We compared growth of drum in the pre- (1988–89) and post-zebra mussel invasion periods. Because we had not collected drum in 1988–89, we read annuli on scales from fish collected in 1990–91 and back-calculated growth of fish that were 3–6 years old during the 1988–89 period.

FEMALES CONSUMED MORE ZEBRA MUSSELS THAN MALES

Consumption of zebra mussels by freshwater drum increased as drum grew older (Table). Dipterans dominated the food of

3- and 4-year-old females and all age groups of males. Fish were an important food item for drum age 4 and older of both sexes. Traces of zebra mussels were found in guts of 3- and 4-year-old males. Small uncrushed mussels (shell length <2 mm) composed a trace of the food in 5 of 60 4-year-old females less than 265-mm long. Crushed zebra mussels were found in 12 of 65 larger 4-year-old females (TL ≥ 265 mm). One large female (TL = 273 mm) consumed 21 mL of zebra mussels, 105 times as much as the average volume for a 4-year-old female (Table). Zebra mussels volumetrically dominated gut samples from 5- and 6-year-old females but composed less than one quarter of those of males of the same ages.

ZEBRA MUSSELS MAY NOT ENHANCE GROWTH OF DRUM

Growth of 3- and 4-year-old drum of both sexes increased in the postinvasion period while zebra mussels were a small proportion of the diet (Figure). The total lengths of 5-year-old females and 6-year-old males apparently did not change much as fish approached the minimum total length (265 mm) needed to crush shells. In contrast to the growth of 3- and 4-year-old drum, the mean total length of 6-year-old females, most of them capable of crushing and consuming zebra mussels, declined since 1989 when zebra mussels became a staple in the diet during the postinvasion period (Figure).

We believe that the impact of zebra mussels on growth of drum may be negative after mussels become a major food item. Shells from zebra mussels composed 67–94% of total food by dry weight, so the largest proportion of biomass consumed was very low in caloric content. This is in contrast to the relatively high caloric content of the diet (mainly

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non-molluscan invertebrates and small fish) prior to the introduction of zebra mussels.

Older freshwater drum that consumed large amounts of zebra mussels seemed to have reduced growth, suggesting that zebra mussels do not enhance the growth of drum as compared with food items prior to the zebra mussel infestation. Although they may represent an important supplementary food source, zebra mussels do not benefit drum when composing a staple in the diet. We do not recommend intentionally introducing freshwater drum into zebra mussel-infested habitats or enhancing stocks of drum for the purpose of controlling zebra mussels until comprehensive evaluations and environmental effects are carefully considered.

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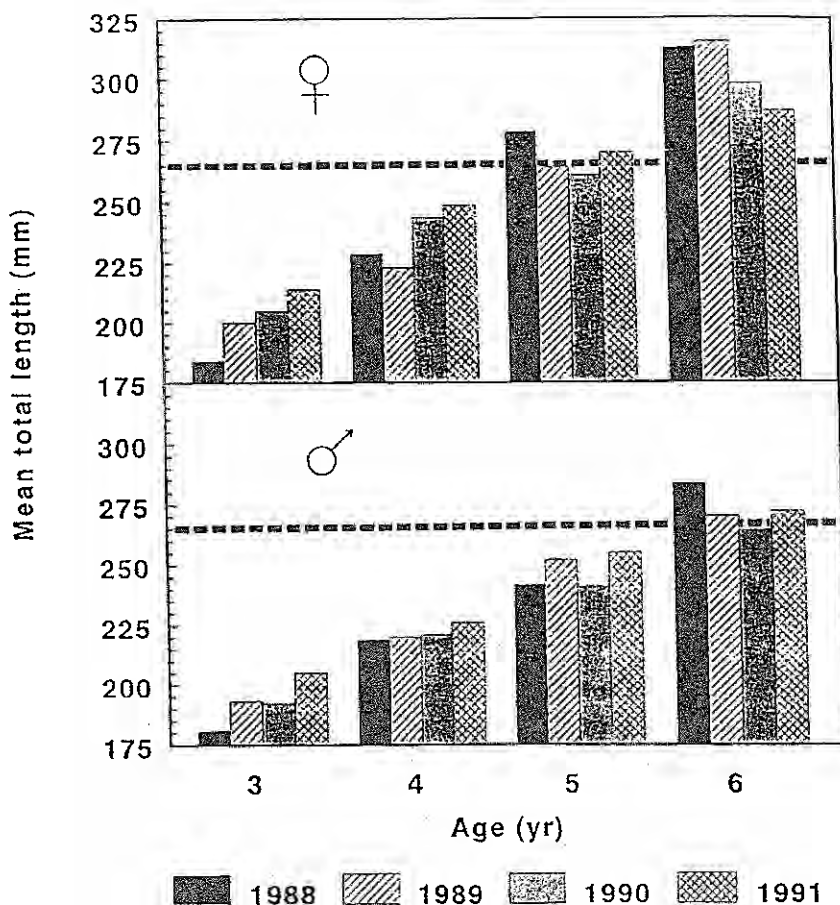


Figure. Back-calculated mean total lengths of freshwater drum females and males from western Lake Erie, 1988-1991. Dashed lines are the minimum total length (265-mm) of drum that can crush shells of zebra mussels.

Table. Mean total volume (mL) and percent composition (in parenthesis) of food in guts of freshwater drum by age groups and sex collected from western Lake Erie, 1990-1991.

Food items	Age (years)							
	3		4		5		6	
	♀	♂	♀	♂	♀	♂	♀	♂
Zebra mussels	0.01 (3.0)	t (0.1)	0.20 (23.3)	t (0.1)	0.43 (39.6)	0.17 (18.3)	1.09 (57.9)	0.35 (24.1)
Other mollusks	t (0.1)	-	-	t (t)	t (0.1)	t (t)	0.05 (2.8)	t (t)
Dipteran	0.21 (47.6)	0.29 (59.3)	0.27 (31.5)	0.31 (42.5)	0.26 (24.0)	0.38 (42.3)	0.15 (8.1)	0.90 (62.1)
Trichopterans	0.08 (17.7)	0.09 (17.6)	0.05 (6.3)	0.09 (13.0)	0.03 (2.4)	0.13 (14.2)	0.02 (1.1)	0.01 (0.7)
Amphipods	0.14 (30.9)	0.06 (12.8)	0.05 (6.1)	0.04 (5.7)	0.12 (11.0)	0.06 (6.6)	0.02 (0.8)	0.01 (0.5)
Fish	-	0.02 (3.8)	0.27 (31.2)	0.27 (37.6)	0.23 (21.8)	0.17 (18.3)	0.54 (28.7)	0.18 (10.2)
Miscellanea	t (0.7)	0.03 (6.4)	0.01 (1.6)	0.01 (1.1)	0.01 (1.1)	t (0.3)	0.01 (0.6)	0.03 (2.4)
Total	0.45	0.50	0.86	0.72	1.08	0.91	1.88	1.45