Lake Erie Committee Meeting
March 30-31, 2005

Surveillance and Status of Fish Stocks in Western Lake Erie, 2004*

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Abstract

Each year since 1961, the Lake Erie Biological Station (LEBS) has conducted assessments of fish populations and diets, zooplankton, and benthos in western Lake Erie near East Harbor State Park, Ohio in both summer and autumn. The catches of major age-0 forage fishes (gizzard shad [*Dorosoma cepedianum*], alewife [*Alosa pseudoharengus*], emerald shiner [*Notropis atherinoides*], spottail shiner [*Notropis hudsonius*], and round goby [*Neogobius melanostomus*]) and of major age-0 spiny-rayed fishes (yellow perch [*Perca flavescens*], walleye [*Sander vitreus*], white perch [*Morone americana*], white bass [*Morone chrysops*], and freshwater drum [*Aplodinotus grunniens*]) in 2004 were lower than the 15-year means (1990-2004). Mean lengths of age-0 gizzard shad, alewives, emerald shiners, and spottail shiners were below their respective 20-year means. In contrast, mean lengths of spiny-rayed fish were similar to long-term means. Summer yellow perch diets in 2004 were dominated by benthic macroinvertebrates, whereas white perch consumed mostly zooplankton. Autumn diets for both yellow perch and white perch were composed predominantly of benthic macroinvertebrates, which consisted almost entirely of *Hexagenia sp.* nymphs. Summer diets of yellow perch consisted mostly of benthic macroinvertebrates and fish in 2000, 2001, and 2004. In contrast, zooplankton were the dominant food item in 2002 and 2003. Autumn diets of yellow perch have been composed principally of benthic macroinvertebrates and fish since 2000. Zooplankton have made up more than 50% of the summer diet of white perch for the last three years. During the same period, benthic macroinvertebrates have constituted an increasingly larger proportion of the autumn diet. *Dreissena sp.* made up the largest portion of the benthic community near East Harbor State Park (mean = 83%). *Dreissena sp.* abundance estimates were the highest ever recorded (7,273/m^2), an increase from 2003 abundance estimates of 4,073/m^2. Amphipoda were the next most abundant benthic taxon collected, making up 9% (770/m^2) of benthic macroinvertebrates collected. Bosminidae was the most abundant zooplankton taxon detected during summer sampling, making up 33% (5,524/m^3) of the total zooplankton population. Chydoridae, which was not detected in summer samples, was the most abundant zooplankton taxon detected in the autumn, making up 22% (3,786/m^3).

LEBS also collects samples from commercial trap nets in spring and autumn of each year in Ohio's portion of the western basin. The spring and autumn samples of yellow perch from commercial trap nets in 2004 were dominated by individuals from the 2001 year class. Lake whitefish (*Coregonus clupeaformis*) collected in autumn were represented by 19 age classes, and were dominated by age-4 males.

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Introduction

Since 1961, the U.S. Geological Survey, Lake Erie Biological Station (LEBS) has conducted annual trawl surveys during summer and autumn near East Harbor State Park, Ohio. The objectives of this activity are to determine relative abundance and growth of key young-of-year (age-0) fish species, composition of benthic invertebrates and zooplankton, and diets of yellow perch (*Perca flavescens*) and white perch (*Morone americana*). Relative abundance indices and growth data from these surveys provide information on potential recruitment of these important species. Abundances and composition of benthic invertebrates and changes in diet provide critical information on carrying capacity, expected growth, and condition of commercially important species. LEBS also collects fish samples from commercial trap nets in the western basin of Lake Erie. The objectives of this activity are to determine growth rates and age structures of commercially harvested species.

We report the results from the LEBS annual trawl surveys and assessments of benthic and zooplankton communities from 2004 in the western basin of Lake Erie, near East Harbor State Park, Ohio. For selected fish species, recruitment was evaluated by comparing the 2004 abundance values of age-0 individuals with long-term (15-year) average catches. We compare relative abundances and growth of young-of-year fish species, composition of benthic invertebrates and zooplankton, and diets of yellow perch and white perch with results from previous years. In addition, we report size and age data from fish specimens collected in 2004 from commercial trap net catches in western Lake Erie.

Methods

East Harbor Studies

Collection of fish - Trawl surveys were conducted during the summer and autumn in western Lake Erie near East Harbor State Park, Ohio. On consecutive days (weather permitting) duplicate 10-minute trawls were conducted at the 3, 4.5, and 6-m depth contours during the morning, afternoon, and night with a 7.9-m bottom trawl. Total sampling effort was six hours (36 tows) in each season. Fish caught in the trawls were identified to species. Round gobies (*Neogobius melanostomus*) caught in trawls were not categorized according to age in 2004. Forage species (e.g., alewife [*Alosa pseudoharengus*], gizzard shad [*Dorosoma cepedianum*], emerald shiner [*Notropis atherinoides*], spottail shiner [*Notropis hudsonius*], and trout-perch [*Percopsis omiscomaycus*]) were categorized as either age 0 or yearling-and-older. Spiny-rayed fish (e.g., yellow perch, white perch, walleye [*Sander vitreus*], and freshwater drum [*Aplodinotus grunniens*]) were categorized as age 0, yearling, and age 2 and older.

Young-of-year abundance and growth - Autumn indices are generally considered to be better indicators of potential recruitment than summer indices. For each species, recruitment was evaluated by comparing the autumn 2004 abundance values of age-0 individuals with 15-year average autumn catches. This index was calculated as the mean number caught per hectare swept by the bottom trawl. A subsample of fishes from each trawl sample was measured for total length to assess growth. Changes in growth were evaluated by comparing autumn mean lengths with the 20-year average of autumn mean lengths.

Yellow perch and white perch diets in 2004 - In each season, we removed stomachs and otoliths from a maximum of five yellow perch and five white perch, all age-2-and-older, at each of the three depths and for each time period. Stomachs were frozen in the field and transported to the laboratory. Prey items in stomachs were identified in the laboratory to the lowest reasonable taxonomic level, enumerated, and measured. Weights were calculated for individual invertebrates from length measurements and by appropriate length-weight regressions (Dumont, et al. 1975, Culver et al. 1985, G. Mittelbach, The Ohio State University, unpublished data). Data were analyzed as frequency of occurrence and mean percent weight (Wallace 1981) by species and by season. Ages of specimens were estimated by examining the otoliths under the microscope in the laboratory.

Benthic invertebrates - Samples of benthic macroinvertebrates were collected in both seasons during daylight (morning or afternoon) trawling sessions, using a standard Ponar dredge. Three replicate samples were taken from the 6-meter station during each season (n=12). Sediment and fine organic matter were removed and the remaining sample was preserved in 95% ethanol and Phloxin-B. Invertebrates collected were later sorted, identified to lowest reasonable taxonomic level, and enumerated in the laboratory. All samples were pooled to estimate relative abundance (mean number/m^2) and percent composition of benthic taxa collected.

Zooplankton - Zooplankton samples were collected by vertically towing a 0.5-m (153-μm mesh), conical plankton net at the 6-m station in both seasons. Three replicate samples were collected during morning, afternoon, and night trawling sessions, yielding a total of 18 samples per season. The 36 total samples were pooled by date and time, yielding six composite summer samples and six composite autumn samples. Zooplankton taxa were then identified to lowest reasonable taxonomic level and enumerated in the laboratory to estimate relative abundance (mean number/m^3) and percent composition.

Commercial Trap Net Studies

Samples of yellow perch, walleye, smallmouth bass (*Micropterus dolomieu*), and lake whitefish (*Coregonus clupeaformis*) were collected from commercial trap nets in western Lake Erie in spring and autumn 2004. Spring samples of yellow perch were collected on 21 and 28 April and on 4 and 13 May offshore of Cedar Point and Kelleys Island in western Lake Erie. Autumn samples of yellow perch were collected on 27 September, 5 October, and 9 November offshore of Kelleys Island. Lake whitefish samples were collected on 23 November and 3 December near Bono, Ohio. Spring samples of walleye and smallmouth bass were collected on 28 April offshore of Cedar Point. Sample sizes for walleye and smallmouth bass were purposefully kept small, because this year's sampling effort was meant as a pilot project.

Length and weight of each specimen were measured, and sex and maturity were determined by inspecting the gonads. Otoliths were removed, and ages of specimens were determined by examining the otoliths in the laboratory. Prior to 2004, ages for lake whitefish were determined from scales. Similarly, ages of yellow perch were determined from scales prior to 2003. We were not able to compare 2004 growth rates with those of previous years because we did not age specimens with both methods to create appropriate calibration curves. Summary statistics are presented below in order to provide insights into the current status of abundance, age, and growth of selected species.

Results and Discussion

East Harbor Studies

Young-of-year abundance and growth - Autumn 2004 abundances of primary forage species, which included alewife, gizzard shad, emerald shiner, and spottail shiner were considerably lower than their respective 15-year averages (Table 1). The exception was trout-perch, for which the 2004 catch per hectare was nearly 30% higher than the 15-year average. A cool spring and slow warming of water temperatures may have adversely influenced the hatch and/or larval development, resulting in lower catch rates of most species.

Autumn abundances for all spiny-rayed species were lower than the 15-year averages (Table 1). Numbers of age-0 yellow perch were well below the 15-year

Table 1. Autumn catch rates for age-0 fish from bottom trawling an area near East Harbor State Park, Ohio in western Lake Erie from 1990-2004. Catch rates are expressed as the mean number per hectare swept by the trawl. Also included are relative standard errors (100% X standard error of the mean number per hectare for a species divided by mean number per hectare).

	Number/hectare		Relative standard error	
Species	2004	15-year mean	2004	15-year mean
Alewife	1	70	56	18
Gizzard shad	20	187	39	12
Emerald shiner	119	1042	28	24
Spottail shiner	14	64	30	12
Trout-perch	105	82	31	12
Yellow perch	1	104	40	9
Walleye	1	14	43	12
White bass	1	9	100	15
White perch	480	1205	22	8
Freshwater drum	21	42	48	12

average. Abundance indices for walleye and white bass (*Morone chrysops*) were approximately 10% of the long-term means. In contrast, abundance indices for white perch and freshwater drum were 40-50% of their respective 15-year averages. Although the index for walleye was also less than that recorded in 2003, it was higher than the value of 0 recorded in 2002. Index values for white perch and freshwater drum, although higher than in 2003, were some of the lowest recorded in recent autumn surveys.

In 2004, catch rates for round goby were lower than in any year since 1996, the first year LEBS captured round gobies in trawls. Round goby had been the most abundant species in trawl samples, but catches have been steadily declining since 2000 (Figure 1).

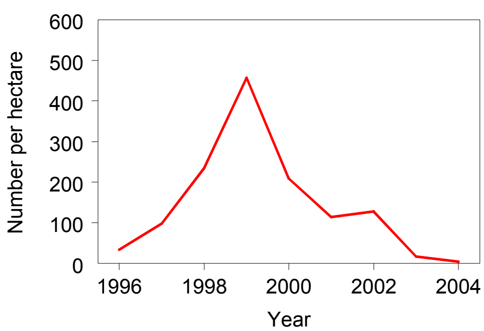

Figure 1. Autumn relative abundance indices for age-0 round gobies from the area near East Harbor State Park, Ohio in western Lake Erie. Index values are expressed as the number of fish caught per hectare swept by the trawl.

Growth of age-0 fish in 2004 was assessed from mean total length in autumn measurements (Table 2). The mean lengths for gizzard shad and alewife in autumn of 2004 were less than their respective long-term means, and represented one of the lowest growth rates in the last twenty years (Figure 2A). Similarly, the mean length of emerald shiner in 2004 was well below the long-term mean and was the lowest mean of the last twenty years (Figure 2B). In contrast, mean length of spottail shiner was near the long-term mean, and appears to be part of a trend of increasing size. Mean length of trout-perch for 2004 was nearly equal to that of the 20-year mean. The range of mean length for age-0 trout-perch is rather narrow and spans from 69 to 87 mm (Figure 2C). Total length measurements for round gobies were not obtained in 2003 and 2004.

Mean lengths of age-0 yellow perch and walleye in 2004 were similar to the long-term means, however, sample sizes were small and comparisons with long-term means may not be appropriate. (Table 2).

Autumn mean lengths of yellow perch over the past twenty years have remained relatively stable (Figure 3A). The growth of age-0 walleye was less variable during 1995-2004 than during 1985-1994. The autumn mean length for white perch in 2004 was identical to the long-term mean, with little deviation over the last 20 years (Figure 3B). In contrast, mean total length of white bass has been in decline since 1999. Mean length of freshwater drum was similar to the long-term mean, but it has varied considerably over the last five years.

Table 2. Autumn mean total lengths (mm) for age-0 fish from bottom trawl catches near East Harbor State Park, Ohio in western Lake Erie in 1985-2004. Sample sizes are in parentheses and SD = standard deviation.

Species	2004		20-year mean	
	Mean total length (N)	SD	Mean total length	SD
Alewife	85 (4)	8.7	104[a]	4.0
Gizzard shad	85 (93)	1.3	100	2.8
Emerald shiner	38 (100)	0.3	58	1.6
Spottail shiner	74 (100)	0.7	77[b]	1.4
Trout-perch	76 (100)	0.4	75	1.1
Yellow perch	81 (8)	4.3	83	1.0
Walleye	185(8)	3.5	182[c]	3.9
White perch	74 (100)	1.2	74[d]	1.6
Freshwater drum	102 (100)	1.4	103	2.5

[a] data for 1985-86 and 1999 are not available.

[b] data for 1985 are not available.

[c] data for 1995 are not available.

[d] data for 1996 are not available.

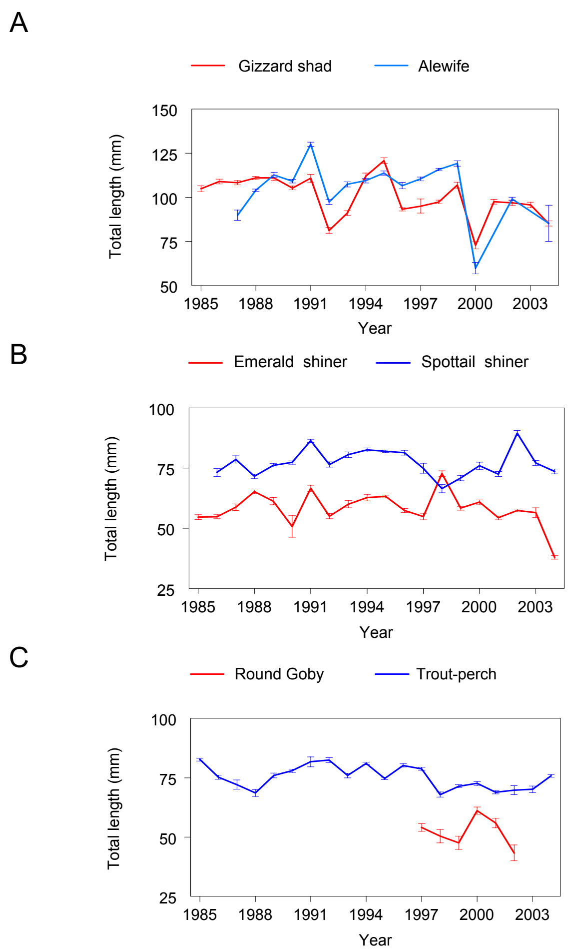

Figure 2. Mean lengths (mm) of age-0 gizzard shad, alewife, emerald shiner, spottail shiner, round goby, and trout-perch caught in bottom trawls near East Harbor State Park, Ohio in western Lake Erie,1985-2004. Error bars represent ± 1 standard deviation

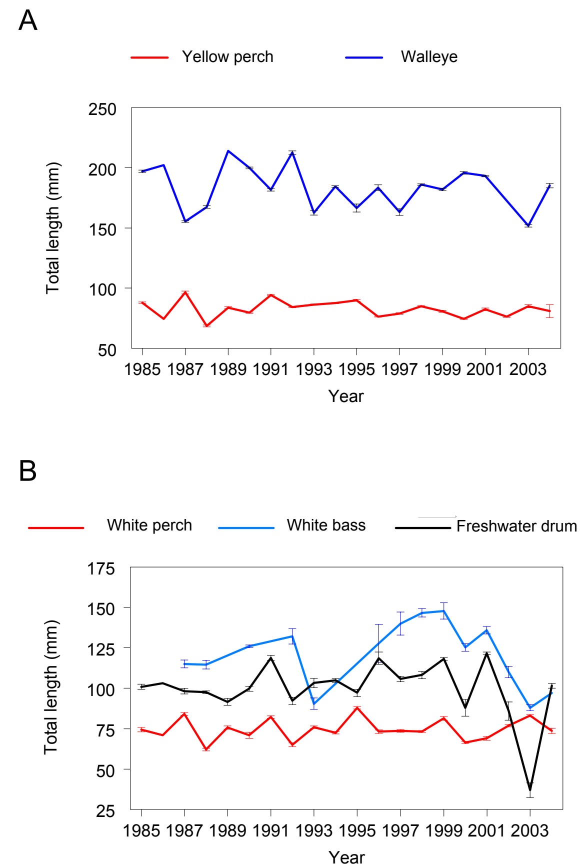

Figure 3. Mean lengths (mm) of age-0 yellow perch, walleye, white perch, white bass, and freshwater drum, caught in bottom trawls near East Harbor State Park, Ohio in western Lake Erie, 1985-2004. Error bars represent ±1 standard deviation.

Yellow perch and white perch diets in 2004 - Stomachs were collected from 109 yellow perch and 110 white perch during 2004. Sixty-eight percent of these stomachs contained food items. Yellow perch diets in summer were composed primarily of benthic macroinvertebrates (71% of the diet by mean percent weight), followed by fish (23%) and zooplankton (6%) (Table 3). *Hexagenia sp.* and *Dreissenia sp.* were the dominant prey items both by mean percent weight and percent frequency. The next most dominant invertebrate prey were Chironomidae. Zooplankton, which was exclusively *Daphnia sp.,* contributed only a small percentage of food consumed during summer. In summer, emerald shiner and white bass were the only fish species identified in yellow perch stomachs. The yellow perch diet in autumn was similar to the summer diet, in that benthic macroinvertebrates dominated (82%), while fish and zooplankton contributed the remaining 13% and 5%, respectively, by weight. *Hexagenia sp.* was the most dominant food item, both by mean percent weight and percent frequency. Other benthic macroinvertebrates included Amphipoda and *Dreissena sp.* Logperch (*Percina caprodes*) and round goby were the only two identified fish species in yellow perch stomachs in autumn, and each contributed 2% by weight of the total diet. White perch diets in summer included zooplankton (46% of the diet by weight), fish (41%), and benthic invertebrates 14% (Table 4). *Daphnia sp.*

Table 3. Diet of age-2 and older yellow perch collected during summer and autumn 2004 near East Harbor State Park, expressed as mean percent (%) weight of all prey items and percent frequency of occurrence (% Frequency).

	Summer (n=22)		**Autumn (n=43)**	
Prey Item	**Mean % Weight**	**% Frequency**	**Mean % Weight**	**% Frequency**
Bythotrephes longimanus	0.0	0.0	4.6	4.7
Daphnia sp.	6.0	9.1	0.1	2.3
Sididae	0.0	0.0	0.3	4.7
Total Zooplankton	**6.0**	**-**	**5.0**	**-**
Amphipoda	0.0	0.0	4.6	4.7
Chironomidae	16.7	18.1	0.0	0.0
Dreissena sp.	22.7	22.7	2.3	2.3
Hexagenia sp.	31.8	31.8	75.4	86.0
Total Benthos	**71.2**	**-**	**82.3**	**-**
Emerald shiner	1.8	4.5	0.0	0.0
Morone sp.	2.8	4.5	0.0	0.0
White bass	4.5	4.5	0.0	0.0
Log perch	0.0	0.0	2.3	2.3
Round goby	0.0	0.0	1.8	2.3
Unidentified fish	13.6	13.6	8.6	11.6
Total fish	**22.7**	**-**	**12.7**	**-**

Table 4. Diet of age-2 and older white perch collected during summer and autumn 2004 near East Harbor State Park, expressed as mean percent (%) weight of all prey items and percent frequency of occurrence (% Frequency).

	Summer (n=41)		**Autumn (n=44)**	
Prey Item	**Mean % Weight**	**% Frequency**	**Mean % Weight**	**% Frequency**
Bythotrephes longimanus	0.0	0.0	35.5	38.6
Leptodora kindtii	16.3	41.5	0.01	20.5
Bosmina sp.	0.6	43.9	0.01	27.3
Daphnia sp.	28.2	53.7	3.2	27.3
Chydoridae	0.0	0.0	0.01	4.5
Sididae	0.2	19.5	0.01	22.7
Copepoda	0.3	9.7	1.3	36.4
Total Zooplankton	**45.6**	**-**	**40.04**	**-**
Planariidae	0.1	2.4	0.0	0.0
Ostracoda	0.0	0.0	0.01	6.8
Amphipoda	5.9	12.2	9.8	18.2
Chironomidae	2.5	9.8	1.5	6.8
Dreissena sp.	2.6	7.3	2.3	2.3
Hexagenia sp.	2.5	7.3	29.2	40.9
Total benthos	**13.6**	**-**	**42.81**	**-**
Gizzard shad	12.0	12.2	0.0	0.0
Rainbow smelt	0.1	2.4	0.0	0.0
Emerald shiner	2.4	2.4	0.8	2.3
Morone sp.	0.4	2.4	0.0	0.0
White perch	0.0	0.0	0.3	2.3
Round goby	4.5	4.9	0.0	0.0
Unidentified fish	21.5	39.0	16.0	20.5
Total fish	**40.9**	**-**	**17.1**	**-**

represented nearly 30% of the prey consumed by weight, followed by *Leptodora kindtii* (16%), and then lesser taxa, such as *Bosmina sp.*, Copepoda, and Sididae. Benthic macroinvertebrates contributed only a small proportion to the summer diet. Amphipoda made up the largest part of benthos in the diets. Other benthic macroinvertebrates in the summer diet, included *Dreissena sp.*, *Hexagenia sp.,* Chironomidae, and Planariidae. Gizzard shad was the major species of fish eaten by white perch in the summer both by mean percent weight and percent frequency.

In autumn, white perch diet was composed primarily of benthic macroinvertebrates (43%), followed by zooplankton (40%), and fish (17%). White perch fed most heavily on *Bythotrephes longimanus* (36% weight). Although, Copepoda, *Daphnia sp., Bosmina sp.,* Sididae, and *Leptodora kindtii* each constituted a small proportion of the diet, they were frequently eaten by white perch (21-36% frequency). *Hexagenia sp.* made up the largest proportion of benthic macroinvertebrates and was the most frequently occurring. Other benthic macroinvertebrates in the autumn diet included Amphipoda, *Dreissena sp.*, Chironomidae larvae, and Ostracoda. Emerald shiner and white perch were the only identified taxa of fish consumed during autumn. We were not able to identify most fish consumed.

Yellow perch and white perch diet trends - Summer diet of yellow perch underwent major changes between 2000 and 2004 (Figure 4). The percent composition of zooplankton shifted from approximately 20% in 2000 to nearly zero in 2001, and increased to 80-90% in 2002-2003. In 2004 zooplankton consumption decreased to 6 %. Benthic macroinvertebrates co-dominated yellow perch diets in 2000 and 2001, after which zooplankton dominated the diet during the next two years. By 2004, benthic macroinvertebrates had replaced zooplankton as the principal food of yellow perch. Zooplankton were nearly absent from autumn diets in most years. Benthic macroinvertebrates dominated the stomach contents in autumn 2001, 2003, and 2004, whereas fish dominated in 2002. Fish and benthos made up approximately equal proportions in 2000. Additionally, yellow perch generally consumed proportionally more benthic macroinvertebrates during autumn than during summer.

Summer diets of white perch over the past five years (2000-2004) were mostly zooplankton, except in 2001 when zooplankton was almost absent and benthic macroinvertebrates dominated the diet (Figure 5). Fish have generally made up a larger proportion of the diet in autumn than in summer. Autumn diets shifted from predominantly fish (94%) in 2000 to predominantly benthic macroinvertebrates (particularly *Hexagenia* sp.), in 2004. Further, the greatest proportions of zooplankton and benthic macroinvertebrates in the diets occurred in 2003, during the summer and autumn, respectively.

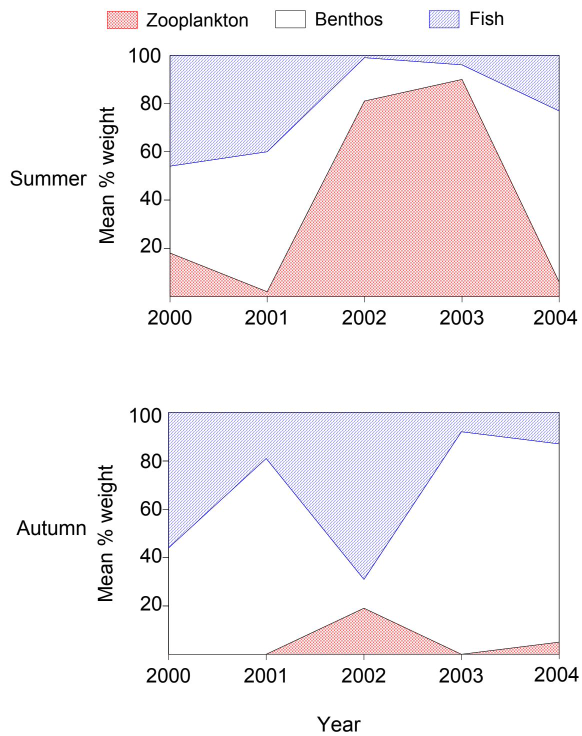

Figure 4. Contributions of zooplankton, benthos, and fish of yellow perch collected in Lake Erie near East Harbor State Park, Ohio. Stomachs were sampled in summer and autumn during 2000-2004.

Benthic invertebrates - *Dreissena sp.* made up the largest portion of the total benthic sample (Table 5). *Dreissena sp.* abundance increased from 4,073/m^2 in 2003 to 7,273/m^2 in 2004, continuing an increasing trend in density observed since 1999. However, percent composition estimates remained consistent from 2003 to 2004, with *Dreissena sp.* constituting 83% of the total benthic sample in both years. Amphipoda was the next most abundant taxon (9%). Other taxa (Trichoptera, Planaria, and Hirudinea) contributed less than 3% of the total benthic sample.

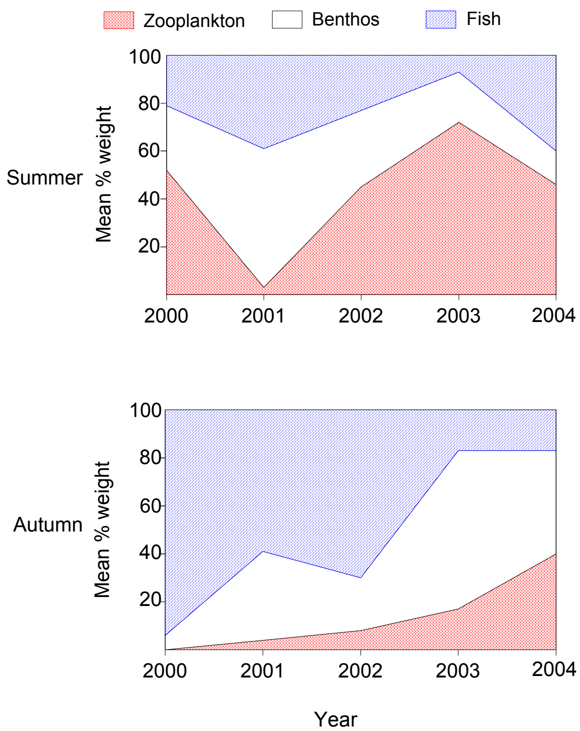

Figure 5. Contributions of zooplankton, benthos, and fish to the diet of white perch collected in Lake Erie near East Harbor State Park, Ohio. Stomachs were sampled in summer and autumn during 2000-2004.

Zooplankton - Bosminidae was the most abundant zooplankton collected during summer sampling (Table 6), followed by cyclopoid copepods. Chydoridae was the most abundant zooplankton collected during autumn sampling, followed closely by *Dreissena sp.* veligers and Bosminidae. Calanoid copepods, which were the largest portion of both summer (47%, 3,607/m^3) and autumn (51%, 2,519/m^3) zooplankton samples in 2003, were noticeably less abundant in 2004 samples, contributing 7% (1,197/m^3) to summer samples and 5% (934/m^3) to autumn samples.

Several species of zooplankton exhibited seasonal shifts in abundance that were greater than 10%. Chydoridae was not detected in summer samples, although it was the most abundant zooplankton taxon in autumn. Cyclopoid copepods decreased in abundance from summer to autumn, a seasonal abundance trend that has been observed since 2002. Bosminidae densities also exhibited a decreasing trend from summer to autumn. This contrasts with data from 2003 and 2002, in which Bosminidae densities increased from summer to autumn. *Dreissena sp.* veligers, absent from 2003 samples, were relatively abundant in 2004 and exhibited an increasing trend from summer to autumn.

Table 5. Composition of benthic macroinvertebrates offshore of East Harbor State Park, Ohio in 2004 (n = 12 samples), shown as number per square meter and percent composition.

Taxon	Mean Number/m²	Percent Composition
Dreissena sp.	7273	83%
Amphipoda	770	9%
Oligochaeta	282	3%
Ephemeroptera	206	2%
Chironomidae	128	1%
Nematoda	97	1%
Trichoptera	19	< 1%
Planaria	14	< 1%
Hirudinea	10	< 1%
Total	8799	100%

Table 6. Mean individuals/m³ and percent (%) composition of crustacean zooplankton taxa in western Lake Erie near East Harbor State Park, Ohio in 2004. Abbreviation: ND = taxon not detected in sample.

Zooplankton taxon	Summer (n = 6)		Autumn (n = 6)	
	Mean number/m³	**Mean % composition**	**Mean number/m³**	**Mean % composition**
Bosminidae	5524	33%	3487	20%
Cyclopoid copepods	5140	31%	2068	12%
Dreissena sp. veligers	770	5%	3668	21%
Daphnia retrocurva	2211	13%	2181	13%
Chydoridae	ND	ND	3786	22%
Calanoid copepods	1197	7%	934	5%
Sididae	1147	7%	305	2%
Copepod nauplii	418	3%	689	4%
Leptodora sp.	72	<1%	ND	ND
Moinidae	35	<1%	ND	ND
Holopedia sp.	10	<1%	ND	ND
Ostracoda	9	<1%	ND	ND
Daphnia galeata	ND	ND	36	<1%

Commercial Trap Net Studies

Yellow perch - Nine age classes were represented in the spring 2004 sample (n = 396), ranging from age 2 (2002 year class) to age 10 (1994 year class) (Table 7). The sample was dominated by age-3 individuals (47%) and age-5 individuals (23%). All individuals collected were sexually mature. Seven age classes were represented in the autumn 2004 sample (n = 397), ranging from age 1 (2003 year class) to age 8 (1996 year class) (Table 8). Again, the 2001 year class dominated, contributing 88% of the individuals in the sample. All but one of the individuals age 2 and older were sexually mature.

Lake whitefish **-** Nineteen age classes were represented in the autumn 2004 sample (n=185), ranging from age 3 (2001 year class) to age 23 (1981 year class) (Table 9). The sample was dominated by age-4 (2000 year class) individuals (45%). In particular, a large proportion (41%) of the sample was made up of males age 4. Approximately 71% of the individuals in the sample were ages 4 through 8. All individuals were sexually mature.

Walleye - Nine age groups were represented in the spring 2004 sample (n = 26), ranging from age 3 (2001 year class) to age 21 (1983 year class) (Table 10). The sample was dominated by age-5 (1999 year class) individuals, which contributed 27% of the sample. All individuals were sexually mature.

Smallmouth bass - Seven age classes were represented in the spring 2004 sample (n = 24), ranging from age 5 (1999 year class) to age 13 (1991 year class) (Table 11). The sample was dominated by age-6 individuals (1998 year class), which constituted approximately 37% of the sample. All individuals were sexually mature.

Table 7. Summary statistics for yellow perch collected from commercial trap net run catches from western Lake Erie during the spring, 2004. All specimens were mature.

			Number		Total length (mm)		Weight (g)	
Age	Year Class	Sex	n	% N	Mean	SD	Mean	SD
2	2002	F	1	0.3	222.0	*	143.0	*
3	2001	F	117	29.5	212.9	15.6	114.7	30.2
		M	69	17.4	198.8	10.0	87.8	15.1
4	2000	F	13	3.3	244.9	26.2	186.5	80.0
		M	15	3.8	218.9	17.3	119.4	30.4
5	1999	F	37	9.3	275.9	30.5	291.9	103.2
		M	51	12.9	231.4	15.1	147.4	36.9
6	1998	F	21	5.3	290.1	21.5	325.7	130.0
		M	38	9.6	238.9	14.3	162.8	30.1
7	1997	F	6	1.5	303.8	15.4	388.6	101.6
		M	11	2.8	240.5	15.7	170.2	37.2
8	1996	F	4	1.0	288.8	64.7	399.6	304.6
		M	10	2.5	241.2	19.1	165.2	37.6
9	1995	M	2	0.5	238.5	12.0	165.5	5.0
10	1994	M	1	0.3	240.0	*	178.5	*

Table 8. Summary statistics for yellow perch collected from commercial trap net catches from western Lake Erie during autumn, 2004.

			Number		Total length (mm)		Weight (g)		
Age	Year class	Sex	N	% N	Mean	SD	Mean	SD	% Mature
1	2003	F	5	1.3	159.2	25.8	45.9	28.2	20
		M	3	0.8	150.3	12.7	37.7	6.3	33.3
2	2002	F	2	0.5	183.0	7.1	71.3	6.0	100
		M	5	1.3	179.2	21.9	68.5	24.9	100
3	2001	F	166	41.8	215.0	17.3	116.1	26.4	100
		M	185	46.6	199.6	13.4	93.8 9	15.9	99.8
4	2000	F	4	1.0	255.5	32.3	207.9	99.0	100
		M	8	2.0	216.4	12.3	125.9	17.2	100
5	1999	F	3	0.8	251.0	48.5	214.5	139.3	100
		M	10	2.5	225.8	21.4	130.5	32.9	100
6	1998	F	1	0.3	240.0	*	154.5	*	100
		M	2	0.5	225.5	20.5	120.8	25.1	100
8	1996	M	3	0.8	212.3	20.5	101.0	6.6	100

Table 9. Summary statistics for lake whitefish collected from commercial trap net catches from western Lake Erie during the autumn, 2004. All specimens were mature.

			Number		**Total length (mm)**		**Weight (g)**	
Age	**Year class**	**Sex**	**n**	**% N**	**Mean**	**SD**	**Mean**	**SD**
3	2001	M	1	0.5	413.0	*	663.5	*
4	2000	F	8	4.3	455.9	17.3	1017.1	172.4
		M	75	40.5	442.0	23.0	835.1	146.9
5	1999	F	4	2.2	495.0	39.1	1348.4	356.0
		M	8	4.3	504.1	39.9	1200.4	253.8
6	1998	F	8	4.3	526.1	19.7	1617.8	171.3
		M	4	2.2	502.0	34.8	1289.5	161.8
7	1997	F	7	3.8	535.1	22.5	1610.6	197.3
		M	4	2.2	553.5	20.2	1581.6	125.6
8	1996	F	11	5.9	561.5	24.3	1776.5	324.9
		M	2	1.1	567.5	112.4	1599.0	459.6
9	1995	F	4	2.2	577.8	30.1	2208.9	508.5
		M	5	2.7	553.4	26.5	1616.9	413.0
10	1994	F	3	1.6	558.3	47.3	1874.8	500.3
		M	4	2.2	560.8	46.4	1776.3	347.0
11	1993	F	2	1.11	596.5	13.4	2571.8	246.4
		M	4	2.2	582.8	6.6	2174.6	198.3
12	1992	F	3	1.6	683.3	166.2	2199.8	165.2
		M	3	1.6	585.0	26.0	1788.0	421.9
13	1991	F	4	2.2	607.0	9.1	2433.3	124.3
		M	2	1.1	612.0	2.8	2215.0	14.1
14	1990	F	1	0.5	615.0	*	2673.0	*
		M	2	1.1	578.5	23.3	1927.0	182.4
15	1989	F	3	1.6	585.7	14.3	2023.8	217.9
17	1987	F	2	1.1	639.5	16.3	2621.8	247.8
18	1986	F	4	2.2	604.0	27.6	2363.5	459.3
19	1985	M	1	0.5	602.0	*	2283.0	*
20	1984	F	1	0.5	650.0	*	2598.0	*
		M	1	0.5	610.0	*	2553.0	*
21	1983	M	1	0.5	623.0	*	2664.5	*
23	1981	F	1	0.5	660.0	*	3118.0	*

Table 10. Summary statistics for walleye collected from commercial trap net catches from western Lake Erie during spring, 2004. All specimens were mature.

			Number		Total length (mm)		Weight (g)	
Age	**Class**	**Sex**	**N**	**% N**	**Mean**	**SD**	**Mean**	**SD**
3	2001	M	4	15.4	428.0	9.1	691.0	88.1
4	2000	F	1	3.8	500.0	*	1464.5	*
		M	1	3.8	500.0	*	947.0	*
5	1999	F	4	15.4	553.8	30.9	1765.5	491.2
		M	3	11.5	499.7	10.0	1095.2	39.6
7	1997	M	1	3.8	550.0	*	1789.5	*
8	1996	F	2	7.7	655.5	50.2	2476.3	258.4
		M	1	3.8	540.0	*	1713.5	*
10	1994	F	2	7.7	725.5	6.4	4071.5	608.8
		M	3	11.5	603.0	13.0	2052.8	244.3
11	1993	F	1	3.8	680.0	*	3179.0	*
19	1985	F	2	7.7	700.0	28.3	3620.3	1094.3
21	1983	F	1	3.8	700.0	*	2967.5	*

Table 11. Summary statistics for smallmouth bass collected from commercial trap net catches from western Lake Erie during spring, 2004. All specimens were mature.

			Number		Total length (mm)		Weight (g)	
Age	**Class**	**Sex**	**N**	**% N**	**Mean**	**SD**	**Mean**	**SD**
5	1999	F	1	4.2	365.0	*	907.0	*
6	1998	F	4	16.7	415.5	12.2	1443.6	258.7
		M	5	20.8	412.8	12.8	1327.3	181.3
8	1996	F	3	12.5	419.7	23.5	1485.0	113.6
		M	2	8.3	435.0	21.2	1516.3	259.9
9	1995	F	2	8.3	448.5	33.2	1826.0	306.9
		M	3	12.5	426.0	14.4	1480.7	107.8
10	1994	F	1	4.2	450.0	*	1583.0	*
11	1993	M	2	8.3	450.0	0	1641.5	133.6
13	1991	F	1	4.2	482.0	*	1557.0	*

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