Status and Trends of the Lake Huron Deepwater Demersal Fish Community, 2006

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Abstract

The U.S.G.S. Great Lakes Science Center has conducted trawl surveys to assess annual changes in the fish community of Lake Huron since 1973. Since 1992, surveys have been carried out using a 21 m wing trawl towed on-contour at depths ranging from 9 to 110 m on fixed transects. Sample sites include five ports in U.S. waters with less frequent sampling near Goderich, Ontario. The 2006 fall prey fish survey was carried out between October 17 and November 7, 2006 and sampled all five U.S. ports and Goderich, Ontario. The alewife population remained at low levels after collapsing in 2004 due to four consecutive years of poor recruitment. Adult and age-0 alewife density and biomass declined from 2005 levels and remain near the historical low observed in 2004. Density and biomass of adult rainbow smelt continued to decline from 2004 levels and juvenile rainbow smelt declined from the record-high abundance observed in 2005. Juvenile rainbow smelt abundance in 2006 is slightly higher than the long-term mean for the time series since 1992. Adult bloater abundance increased slightly showing some recruitment, but juvenile bloaters remained ubiquitous with abundance levels second to the record high for the time series observed in 2005. Abundances for most other prey species were similar to the low levels observed in 2005. We captured 15 wild age-0 lake trout in 2006; this represents the third consecutive year that substantial numbers of wild fish were captured in the survey. Benthic macroinvertebrates have been sampled during the fall survey since 2001 and the six-year time series shows a general declining trend. Density of benthic macroinvertebrates showed a slight increase from 2005 values due largely to increases in oligochaete and quagga mussel densities. However, macroinvertebrate densities remain about half of that observed in 2002. Prey biomass available to the bottom trawl decreased slightly from 2005 levels due to declines in alewife and rainbow smelt biomass. Total prey biomass remains near the all-time low observed in 2004. The prey available to salmonids during 2007 will be small rainbow smelt and small bloaters. Predators in Lake Huron will continue to face potential prey shortages.

Introduction

The Great Lakes Science Center (GLSC) has conducted annual bottom trawl surveys on Lake Huron since 1973. These surveys are used to examine relative abundance, size and age structure, and species composition of the prey fish community. Estimates of lake-wide (i.e., between 5- and 114-m depth contours) prey fish biomass available to the trawl are also generated. Sampling was conducted with a 12-m bottom trawl during 1973-1991, but in 1992 the gear was changed to a 21-m wing trawl to improve biomass estimates of pelagic prey species and to reduce apparent size selectivity. This report focuses on data collected during 1992-2006 using the 21-m wing trawl. Sampling was conducted annually during this time period, except during 2000 when sampling did not occur due to vessel breakdown and poor weather.

Methods

Trawl sampling is performed annually at five ports in U.S. waters: Detour, Hammond Bay, Alpena, Au Sable Point (Tawas), and Harbor Beach (Figure 1). At each port, 10-minute on-contour trawl tows are made on approximate 9 m depth intervals at fixed transects from 9 to 110 m in depth. The 27, 37, 46, 55, 64, and 73 m depths are common to all ports, but the number of shallower and deeper tows varies among ports due to variation in bathymetry and bottom composition. Sampling also occurred at Goderich, Ontario during 1998, 1999, 2003, 2004, 2005, and 2006 using the same trawling regime as U.S. ports (Figure 1).

Tow times and speeds were constant, but true time-on-bottom increases with depth, and catches C_i were standardized among tows using the formula:

$$C_i = N_i * \left(\frac{10}{t(0.004d + 0.8861)} \right)$$

where N_i is the number of fish of species i captured in a single tow, t is tow time (usually 10 minutes), and d is depth (m). Density (D_i) was calculated for each species by dividing C_i by area swept, expressed as number · Ha^{-1}.

Annual density by number (A_i) was defined as mean number · Ha^{-1} of each species:

$$A = \frac{\sum_{i=1}^{n} D_i}{n}$$

where D_i is the density of species i from each trawl tow, and n is total number of tows performed.

Variability associated with A was estimated using Relative Standard Error (RSE):

$$RSE_{\text{i}} = 100 \times \left(\frac{se}{A_i} \right)$$

where se represents the standard error of A (mean density).

For analysis of recruitment trends, mean density was apportioned into age-0 and adult fish based on length frequency data from all tows where a species was captured. We used 100 mm TL as a demarcation between age-0 and older fish for alewife *Alosa pseudoharengus*, 90 mm for rainbow smelt *Osmerus* *mordax*, and 120 mm for bloater *Coregonus hoyi* based on archived historical age data. Age structure of alewives was calculated by collecting otoliths from a stratified random sample of 10 fish per 10 mm length group for each port.

Swept area biomass estimates for Lakes Huron and Michigan (Madenjian et al. 2005) are now calculated in the same manner. In both lakes, they only consider those depth contours sampled by trawling (i.e., 5 to 114 m depth). The Lake Huron acoustic survey estimates lakewide biomass in deeper waters (see Schaeffer et al. 2007). In this report, lakewide biomass B_i of each major prey fish species $_i$ was calculated from trawl biomass per tow:

$$B_i = \sum_{s=0}^{s=110} \frac{W_{is} a_s}{n}$$

where B_i is biomass of species i, W_{is} represents mean biomass (g · m^{-2}) of each species within each depth stratum s, a_s represents the weighted area (m^2) of individual strata s, and n represents the number of depth strata. W_i was derived for each species i by calculating its total weight within each depth stratum and dividing by area swept by the trawl.

Benthic macroinvertebrate samples were collected at each U.S. port during 2001 through 2004 and all U.S. ports plus Goderich, ON in 2005 and 2006. Three replicate grabs were made with a Ponar dredge (484 cm^2 mouth) at 27 m, 46 m, and 73 m depths. Samples were washed onto 0.5 mm benthos sieves and preserved in 5% formalin. We calculated mean density of major invertebrate groups representing common prey types for fish.

The 2006 Survey

The 2006 survey was carried out during October 16-November 7. Forty-six of the forty-eight planned trawl tows were completed; trawling could not be carried out at the 27 m transect at Detour and the 27 m transect at Thunder Bay due to commercial fishing gear. Fifty-one benthic samples were collected. The lake remained stratified for all ports with a deep (30-40 m) thermocline present.

A total of 23 fish species were collected in the survey (Appendix I) and nine invertebrate taxa were found in benthic samples. Status and trends of common forage species are described below.

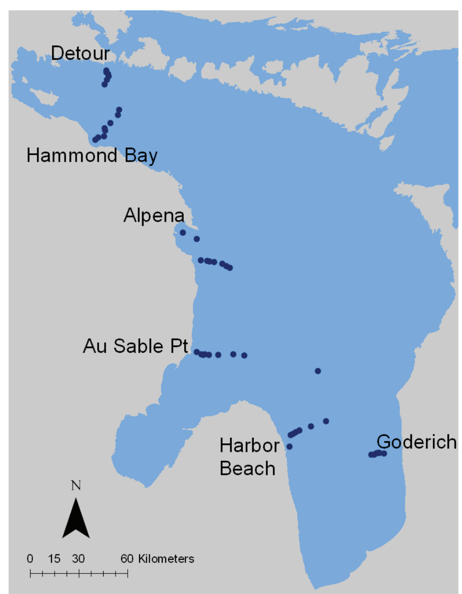

Figure 1. Sampling locations in Lake Huron, 2006.

Abundance, size, and age structure

Alewife- Similar to 2004 and 2005, alewives remain at low abundance in Lake Huron in 2006. Adult alewife density and biomass decreased slightly from the 2005 value and rivals the all-time low observed in 2004 (Figure 2). The RSE for adult alewife was about 40% in 2006, similar to values prior to 2004. The RSE value increased to 75% in 2004 and 85% in 2005 because of patchy alewife distributions in those years (Figure 2). Age-0 alewife abundance also declined in 2006, although density remains above the lows observed in 2004 and in the early 1990s (Figure 3).

Alewives were caught in thirty-nine of the forty-six completed trawl tows in 2006. Distribution of adult alewife catches was variable with 43% of all adult alewives collected from Alpena, and about 25% each at Goderich and Au Sable Point, and about 1% each at Hammond Bay, Detour, and Harbor Beach. Distribution of the age-0 alewife catch was also variable with approximately 75% of the total catch collected at Goderich, 10% from Hammond Bay, and less than 5% at Au Sable Point, Harbor Beach, Alpena, and Detour (Figure 4).

The alewife population collapse occurred during 2002-2004 and resulted from three consecutive years of poor recruitment. During 2002, alewives of all sizes and ages were abundant due to a series of strong year classes that occurred in 1998, 1999, 2001, and 2002 (Roseman et al. 2006). However, high mortality of all sizes during 2002-2004 caused almost complete mortality of the 2002 year class, and substantial reduction in abundance of older fish. During 2003, the few remaining adults produced the largest year class in the time series (Figure 3), but age-0 alewives experienced almost complete mortality resulting in record-low densities during 2004.

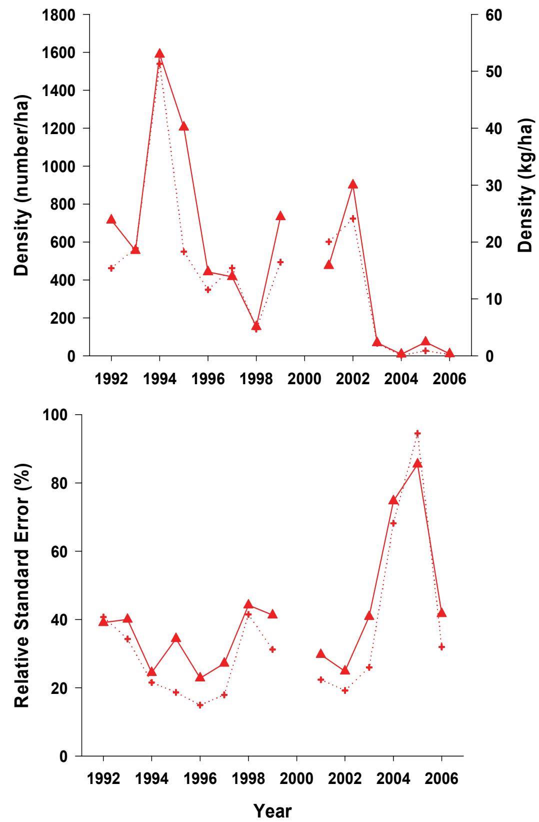

Figure 2. Density of adult alewives as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

Recent alewife size and age structure reflected these conditions. Since 2003, sizes of alewife were dominated by fish less than 100 mm TL, whereas age-1 through age-5 fish were rare (Figures 5 and 6). Recent year-classes either failed to survive (2003) or were present at low densities (2004, 2005, and 2006).

Currently, only low numbers of small alewives are available to predators.

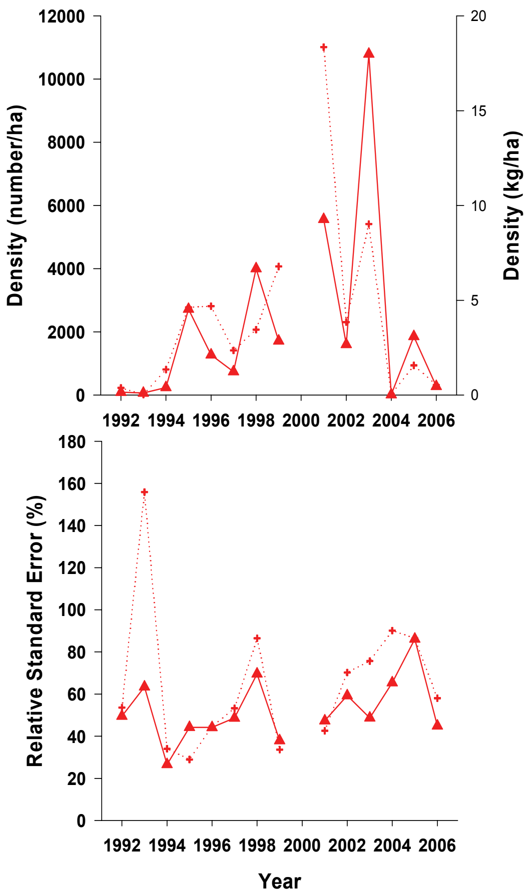

Figure 3. Density of age-0 alewives as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

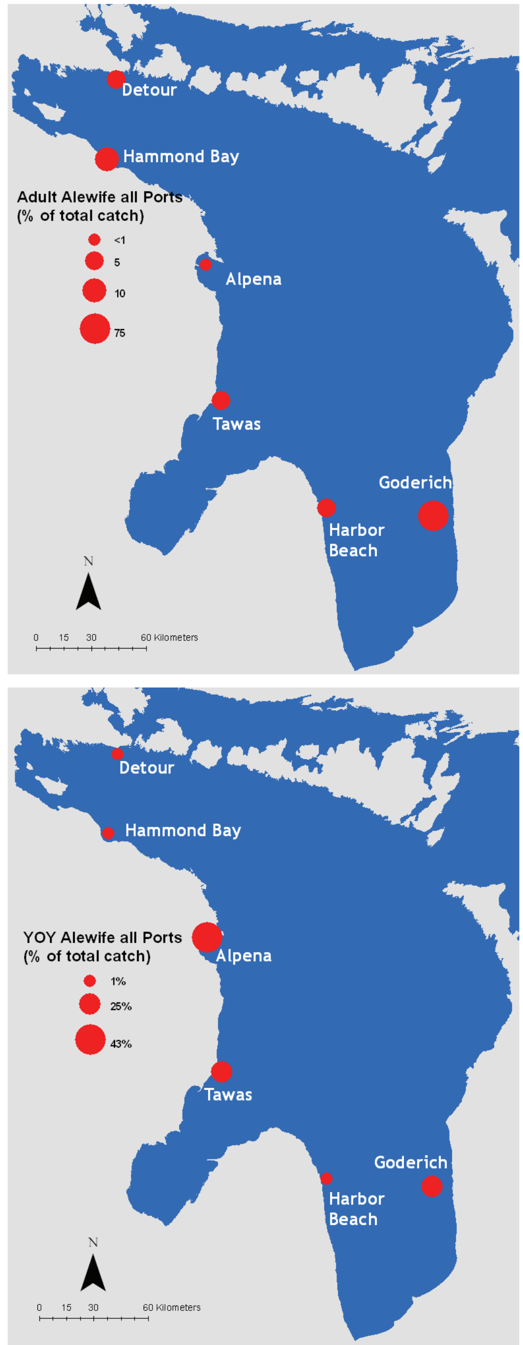

Figure 4. Distribution of catch (% of total number collected) for adult (top panel) and age-0 alewives collected with bottom trawls from sites in the main basin of Lake Huron, 2006.

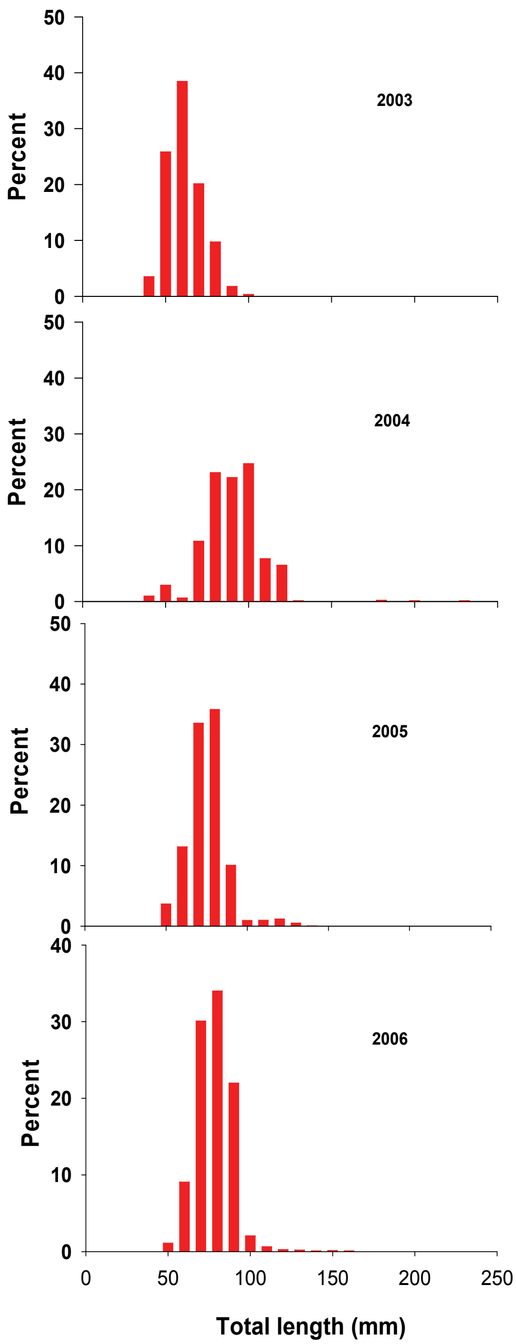

Figure 5. Size structure of Lake Huron alewives, 2003-2006. Percentages less than 1% are not visible.

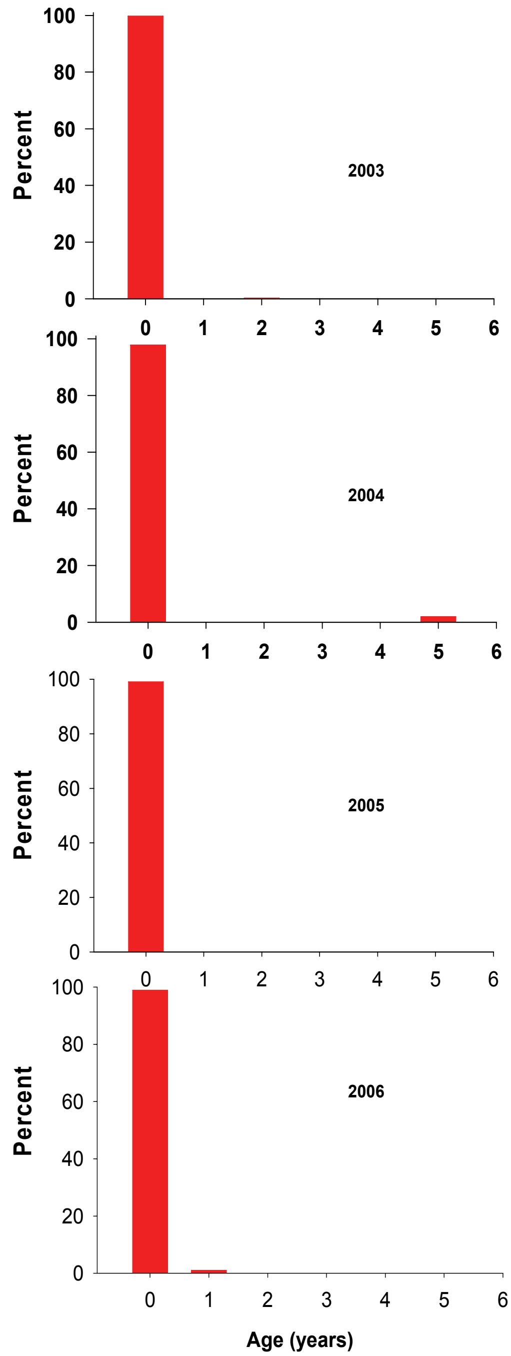

Figure 6. Age structure of Lake Huron alewives, 2003-2006. Percentages less than 1% are not visible.

Rainbow smelt- Adult rainbow smelt density showed a second year of decline despite record high levels of age-0 rainbow smelt in 2005 (Figures 7 and 8). Abundance of adult rainbow smelt in 2006 approached the low observed in 2003. In 2005, age-0 biomass was the highest on record since 1992 representing a doubling in density over 2004 estimates, but age-0 biomass declined by 85% by 2006 (Figure 8) and did not recruit to the adult stock. The RSE's for adult rainbow smelt in 2006 were between 20 and 25%, reflecting the relatively even spatial distribution of adult rainbow smelt observed in that year (Figure 7).

Similar to 2005, the rainbow smelt population was dominated by age-0 fish in 2006 with less than 10% of the population larger than 100 mm (Figure 9). The low abundance of adult fish in 2006 suggests that the large numbers of small rainbow smelt observed in 2005 did not translate into recruitment of larger rainbow smelt. In fact, the combined biomass for all age classes of rainbow smelt decreased by about 50% from 2005 to 2006 despite the record-high density of age-0 fish observed in 2005.

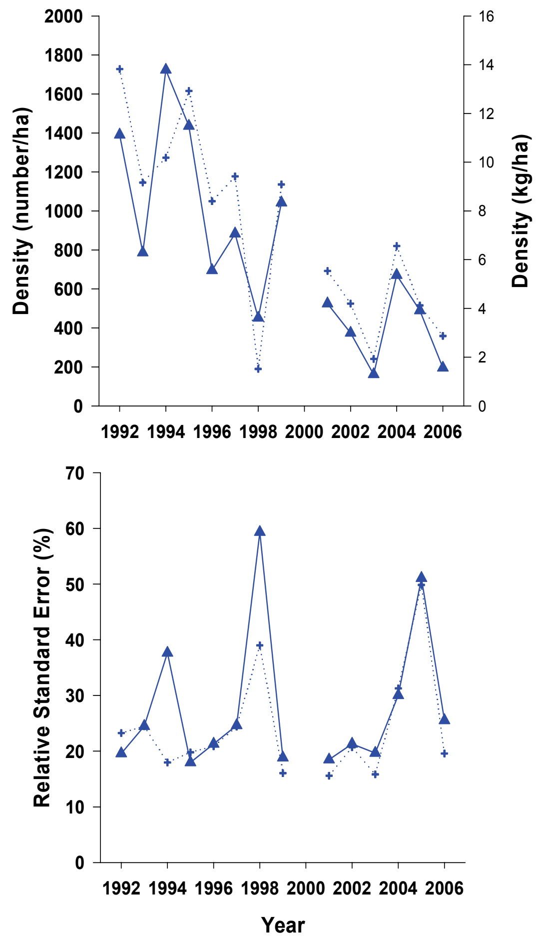

Figure 7. Density of adult rainbow smelt as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

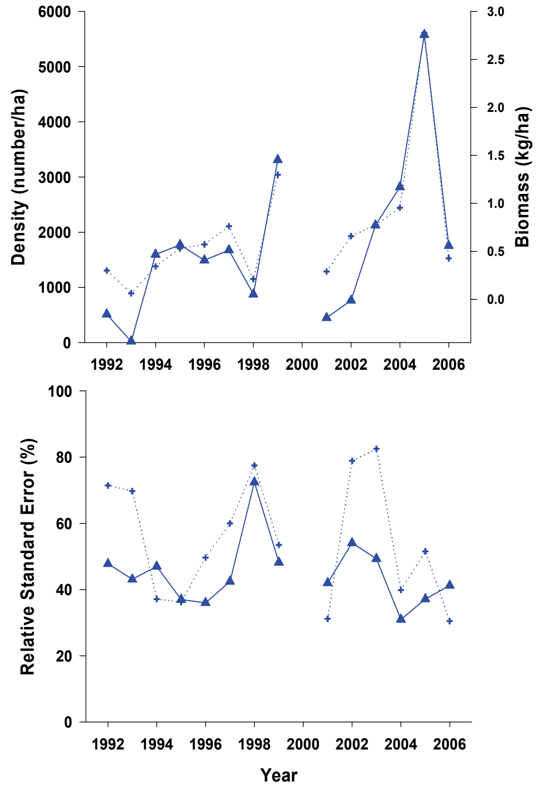

Figure 8. Density of age-0 rainbow smelt as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

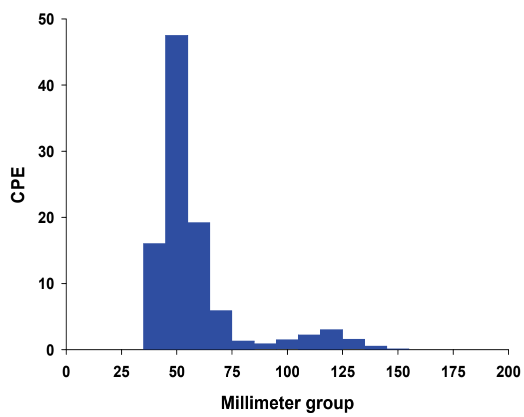

Figure 9. Length-frequency distribution of rainbow smelt collected in bottom trawls from Lake Huron during fall, 2006.

Bloater- Adult bloater density increased slightly from 2005 values to about the same level observed in 2004 (Figure 10) suggesting some recruitment occurred from the record high abundance of small bloater observed in 2005. Abundance of small bloater decreased by about 70% from the record-high levels observed in 2005, but densities remain above the long-term average observed since 1992 (Figure 11).

About 47% of bloaters captured during 2006 were less than 120 mm TL representing year-classes formed in 2005 and 2006. Abundance of larger bloater increased in response to the recruitment of some of the smaller fish observed in 2005 (Figure 12). Juvenile bloaters are pelagic and generally not susceptible to bottom trawls, so true year class strength may not be apparent until they become fully recruited to the trawl at age-3 or older (Wells 1968).

High densities of juveniles observed during 2003-2006 may represent a conservative estimate of the strength of these year classes. Nonetheless, juvenile bloater densities rarely exceeded 5 fish · Ha^{-1} during 1992-2002, but densities increased to approximately 60 fish · Ha^{-1} in 2003, 28 fish · Ha^{-1} in 2004, 320 fish · Ha^{-1} in 2005, and 105 fish · Ha^{-1} in 2006 (Figure 11).

The recurrence of higher-than-average densities of young fish suggests that adult bloater may be more abundant in the future, as seen with the modest increase observed in 2006 (Figure 10). RSE values for both adult and juvenile bloaters typically fluctuate between 30 and 40 %, and 2006 results were similar to most previous years (Figures 10 and 11). Although bloater catches vary, their distribution with depth varies little from year to year.

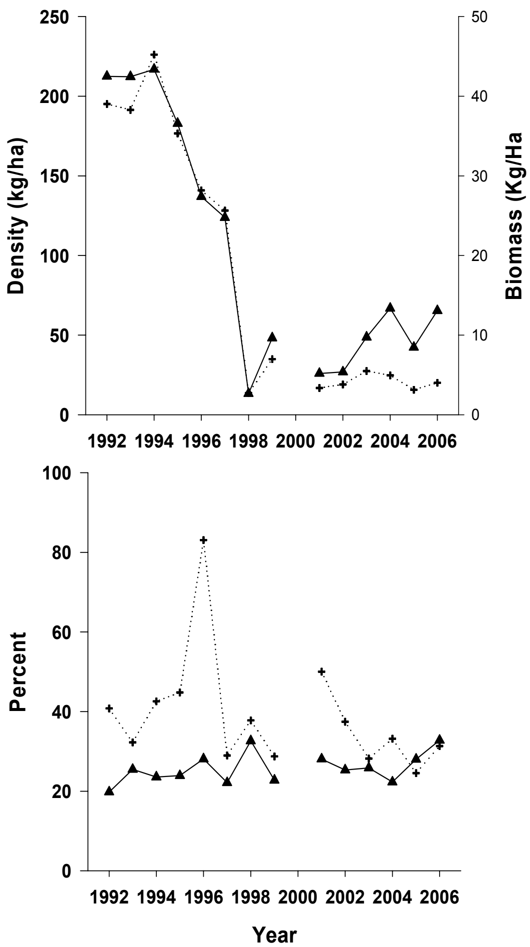

Figure 10. Density of adult bloaters as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

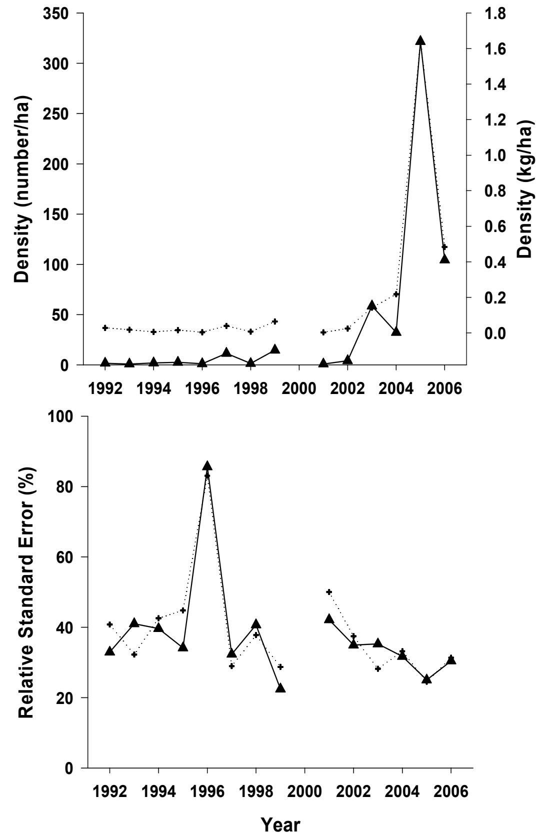

Figure 11. Density of juvenile bloaters as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

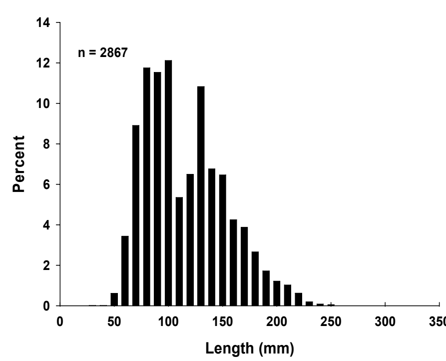

Figure 12. Length frequency distribution of bloaters collected in bottom trawls from Lake Huron, 2006.

<u>Sculpins, sticklebacks, and troutperch</u>- Sculpin abundance in Lake Huron has fluctuated widely since 1992 but has been depressed since 1998 (Figure 13). Deepwater sculpins *Myoxocephalus thompsonii* comprise most of the total sculpin catch, while slimy sculpins *Cottus cognatus* are only a minor component of the deepwater fish community and were seen in low numbers in 2006. Deepwater sculpin abundance increased only slightly from levels observed in 2005 and remains at low levels. RSE for deepwater sculpins remains at relatively high levels (40 to 60%) because deepwater sculpin distributions have become patchier during recent surveys. Deepwater sculpin lengths ranged between 50 and 130 mm TL in 2006 (Figure 14).

Density and biomass of ninespine sticklebacks *Pungitius pungitius* increased markedly over levels observed in 2005 (Figure 15). Ninespine stickleback abundance has varied considerably since 1992 and low densities have been observed previously (1992-94 and 1998-99). However, the recent trend since 2001 is downward, and indicates that sticklebacks will not contribute to the fish community as an alternative prey species.

Troutperch *Percopsis omiscomaycus* density and biomass also continue a five-year overall decline. Their overall abundance remains low for the time series (Figure 16). As with sticklebacks, troutperch will not be an important alternative prey species in 2006.

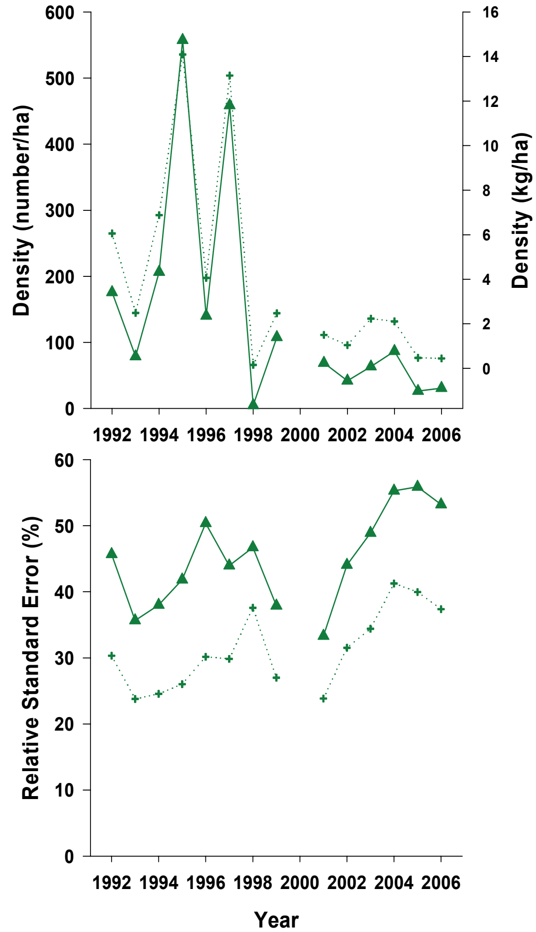

Figure 13. Density of deepwater sculpins as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2005.

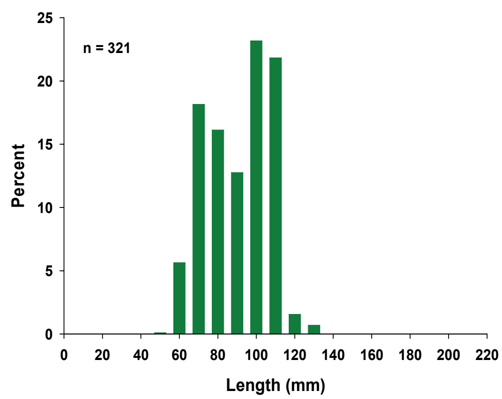

Figure 14. Length frequency distribution of deepwater sculpins collected in bottom trawls from Lake Huron, 2006.

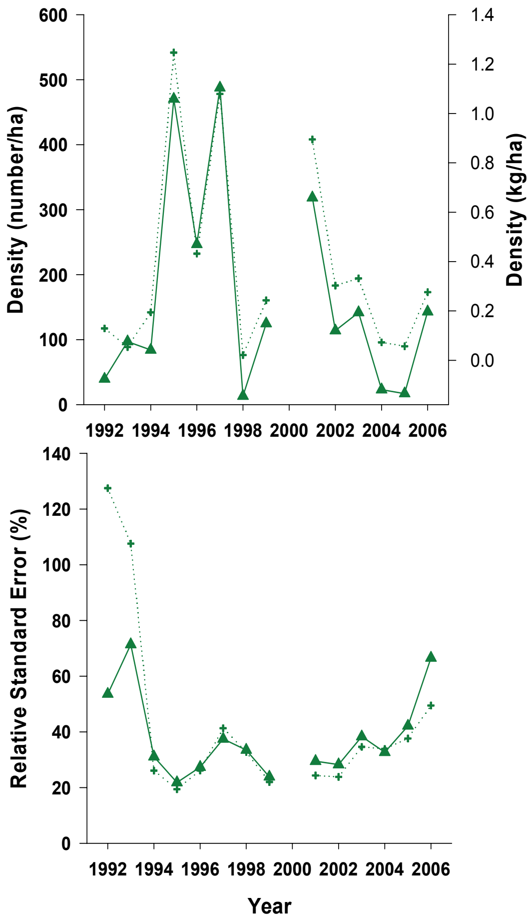

Figure 15. Density of ninespine sticklebacks as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

<u>Round gobies-</u> Round gobies *Neogobius melanostomus* were first encountered in the trawl survey during 1997 and increased in abundance steadily until 2003; however, their abundance declined in 2004 and has remained at below 40 fish · Ha^{-1} in 2005 and 2006. Numbers of round gobies decreased slightly in 2006 but biomass increased due to collection of larger fish (Figure 17).

As in previous years, we collected round gobies at depths up to 73 m, indicating that their distribution extends well offshore. Round gobies were collected at all ports except Detour where they remain absent from our samples. Several large (> 100 mm) male round gobies in breeding condition were collected at Goderich suggesting a prolonged breeding season, possibly into late fall, for round gobies in southern Lake Huron.

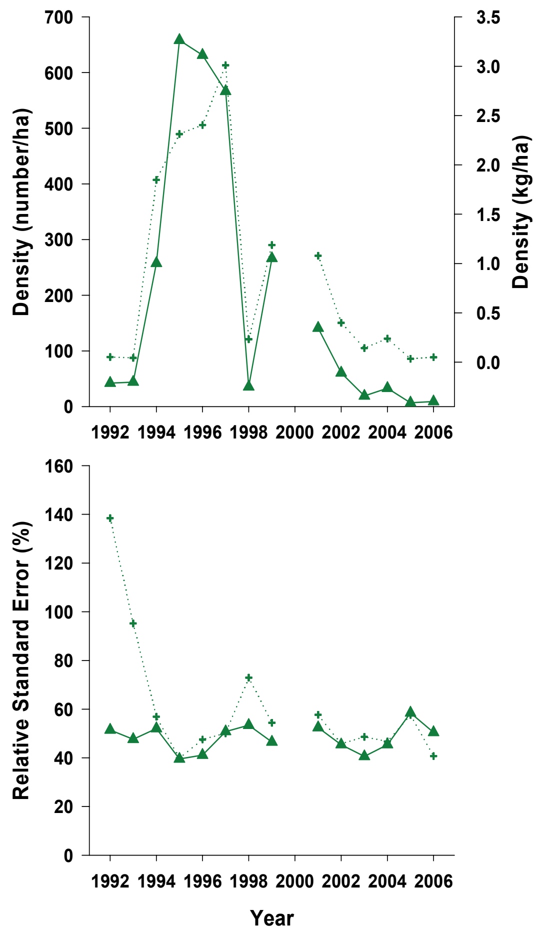

Figure 16. Density of troutperch as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

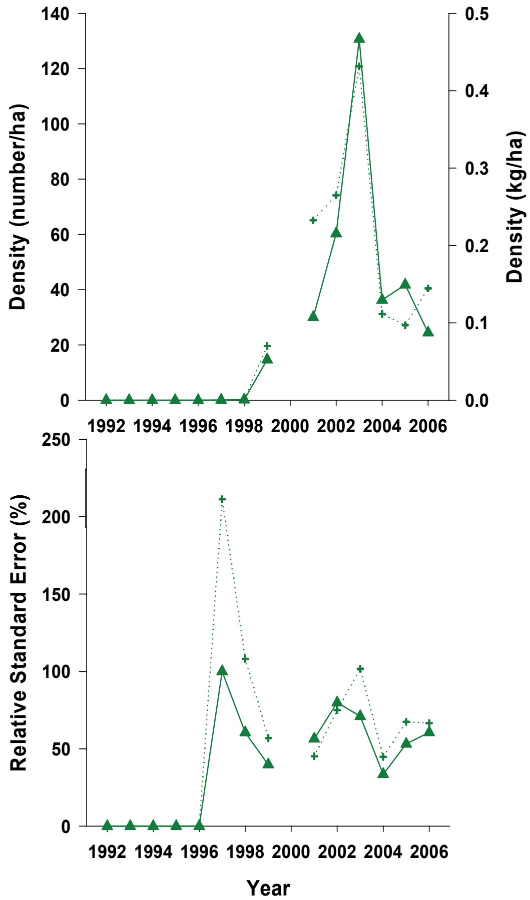

Figure 17. Density of round gobies as number (solid line) and weight (dotted line) of fish per hectare (top panel) and relative standard error (bottom panel) in Lake Huron, 1992-2006.

Lake trout- Collection of wild age-0 lake trout *Salvelinus namaycush* continued in 2006. These fish were identified as naturally-spawned because they lacked fin clips and were far smaller during October than even the smallest hatchery lake trout that were stocked earlier that year. Fifteen wild lake trout were collected at the 37 and 46 m sites at Detour in 2006 and wild yearling and older fish were collected from Hammond Bay and Harbor Beach suggesting that survival of wild fish is occurring. Overall lake-wide mean density of wild lake trout was low at about 0.32 fish · Ha^{-1} in 2006. Collections of stocked lake trout have declined in recent years (Figure 18).

Wild age-0 lake trout have been collected in mid-lake surveys of Six-Fathom Bank (Desorcie and Bowen 2003), and this is the third consecutive year that significant numbers of wild lake trout have been collected during this survey and the first year that catches of lake trout were dominated by wild fish (Figure 18). Collections of age-0 lake trout in recent years indicate that widespread reproduction is occurring in the main basin.

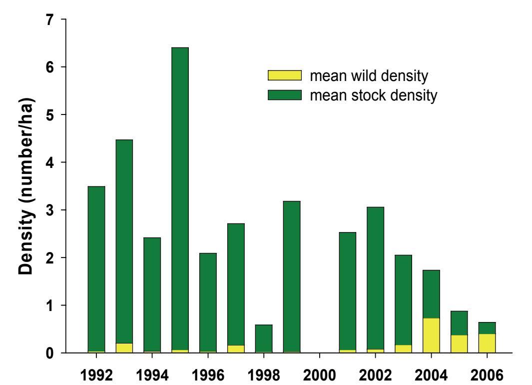

Figure 18. Density of wild and stocked lake trout collected in fall bottom trawls from Lake Huron 1992-2006.

Biomass Estimates- Total main basin prey biomass for the area between 5 and 114 m decreased from 56 kilotonnes in 2005 to 40 kilotonnes in 2006 (Figure 19). The decrease is due to the continued absence of alewives and declines in rainbow smelt biomass. Biomass of other species did not change appreciably, indicating that no species has begun to replace lost alewife production, at least in the offshore environment. The bulk of the remaining prey biomass is composed of bloaters which showed record-high juvenile abundance in 2005 and only a slight increase in biomass in 2006. These fish should contribute to an increase in overall biomass in future years as young fish continue to grow and move into the adult stock.

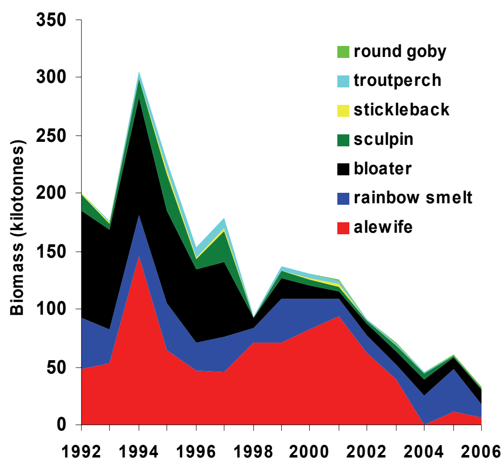

Figure 19. Prey fish community biomass (Kilotonnes) in main basin waters of Lake Huron, 1992-2006. No sampling occurred during 2000; biomass estimates for that year represent interpolated values.

Benthic Invertebrates- Density of benthic invertebrates was at an all-time low in 2005 and increased slightly in 2006 due to increases in oligochaete densities and recruitment of quagga mussel (*D. bugensis*) young-of-the-year (Figure 20). Densities of *Diporeia* spp., chironomids and sphaerid clams remained near levels observed in 2005.

Density of *Diporeia* spp. has shown a continuing decline in abundance since sampling began in 2001 and densities in 2005 and 2006 are the lowest observed, particularly at the 46 m depth stations (Figure 21). *Diporeia* spp. were not collected in samples taken at 27 m stations and were rare at 46 m sites.

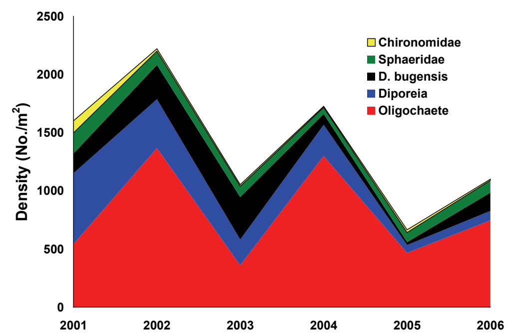

Figure 20. Mean density of benthic macroinvertebrates collected from five U.S. ports in western Lake Huron (2001-04) and five U.S. ports plus Goderich, ON (2005-06). Data include all depths pooled.

Overall mean quagga mussel density increased over 2004 and 2005 levels, but remains below the peak abundance observed in 2002 and 2003 although abundance at deeper stations is increasing (Figure 22).

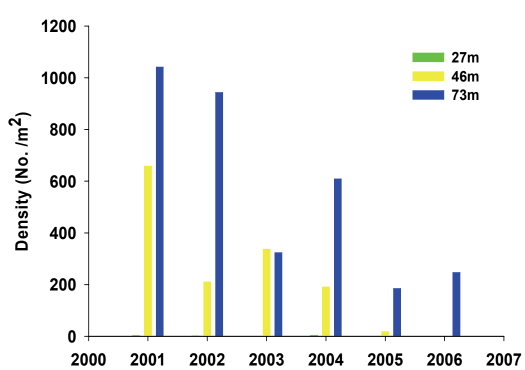

Figure 21. Mean density of *Diporeia* spp. at 27 m, 46 m, and 73 m depth strata determined from collections at five U.S. ports in western Lake Huron (2001-04) and five U.S. ports plus Goderich, ON (2005-06).

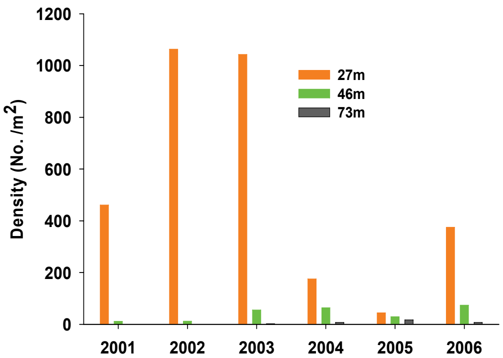

Figure 22. Mean density of quagga mussels *Dreissena bugensis* at three depth strata as determined from samples collected from five U.S. ports in western Lake Huron (2001-04) and five U.S. ports plus Goderich, ON (2005-06).

Discussion

The availability of prey fish in Lake Huron remains in a depressed state since the collapse of alewife populations in 2003. Collections made in 2006 showed a decrease in total prey biomass largely constituted by declines in alewife and rainbow smelt. Alewife density remains near the all-time low for the time series observed in 2004. Abundance of young bloater and juvenile rainbow smelt were at all-time highs for this survey in 2005, but recruitment of these small fish contributed little to lakewide biomass estimates in 2006. While these changes are consistent with fish community objectives for Lake Huron (DesJardine et al. 1995), prey availability, ecosystem stability, and sustainability of the Chinook salmon *Oncorhynchus tshawytscha* sport fishery remain as concerns for fisheries managers and stakeholders.

Prey availability for piscivores will likely be low during 2006 because no species has replaced alewife in either numbers or biomass. While alewives, rainbow smelt, and bloaters increased in density between 2004 and 2005, this increase amounted to about a 30% increase over 2004 values but overall prey biomass remained low compared to previous years and was even lower in 2006.

Rainbow smelt density and biomass increased in 2005 showing the strongest year-class produced in the fourteen year time series. However, rainbow smelt biomass declined in 2006 suggesting that recruitment of young fish from the record year-class observed in 2005 was minimal. The lake-wide population of rainbow smelt remains dominated by small fish. Similar to observations in 2005, most rainbow smelt collected in 2006 were less than 100 mm TL.

Density of juvenile bloater was at a record-high level in 2005 and remains well above the long-term average in 2006 indicating formation of consecutive strong year-classes. While length-frequency analysis shows that some recruitment is occurring, it has not translated into a substantial increase in bloater biomass. Other potential prey species such as deepwater sculpins, ninespine sticklebacks, and trout-perch remain in low abundance and contribute little to overall prey biomass in Lake Huron.

Declines in benthic macroinvertebrate abundance and increases in non-indigenous dreissenid mussels may be linked to declines in prey fish populations in Lake Huron. Trophic studies have shown that macroinvertebrates such as *Diporeia*, chironomids, and oligochaetes are important forage for various life stages of many fishes (Gordon 1961, McNickle et al. 2006). Growth and survival of fishes relying on macroinvertebrates as forage may be suppressed when invertebrate populations are low. Causes of recent observed declines in benthic invertebrates remain speculative, but most researchers agree that invasive species such as dreissenid mussels and round gobies add to the instability of benthic foodwebs and likely contribute to downward trends through competitive and predatory interactions (Nalepa et al. 2003, McNickle et al. 2006).

Our prey fish biomass estimate is conservative because the trawl does not sample the entire water column and pelagic individuals of any species are unlikely to be captured. For example, Argyle (1982) estimated that 20-30 % of forage fish were found in the pelagic zone (i.e., above the path of a bottom trawl) during day in Lake Huron, while Stockwell et al. (2006) suggest that bottom trawling provides biased estimates of adult cisco *Coregonus artedi* abundance in Lake Superior because many of the fish are pelagic and not susceptible to bottom trawls. Similarly, acoustic data collected during recent bottom trawling on Lake Huron suggest that up to 40% of identifiable targets may occur above the path of the trawl, but this varies considerably with depth (GLSC unpublished data). However, acoustic estimates and mid-water trawl surveys show fish in the pelagia are typically small (Warner et al. 2005, Schaeffer et al. 2006, 2007) and would likely contribute little to biomass estimates.

Moreover, biomass estimates assume that each tow is a representative sample from that depth stratum. This assumption was probably violated because trawls can only be made in areas with smooth substrates up to 110 m deep. These factors would all contribute to underestimation of true prey fish biomass. Catchability is also expected to vary with species, season, temperature, and water clarity, among other factors. Until research is conducted to estimate the catchability of different species to the Lake Huron fall bottom trawl survey, it should be noted that estimates of absolute abundance reported here are likely to be biased and should be interpreted with caution.

The continued depression of forage species biomass in the main basin of Lake Huron suggests that predators will continue to face potential prey shortages during 2007. Rainbow smelt and juvenile bloaters will be the only common pelagic prey. Rainbow smelt and bloater are utilized as prey of salmonids (Diana 1990, Rybicki and Clapp 1996, Madenjian et al. 1998), but there are likely to be low numbers of large-sized prey items needed to sustain growth of large salmonids, especially adult lake trout (Martin 1966, Madenjian et al. 1998). Managers and anglers should expect slow growth and low condition factors for salmonids during 2007.

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The 2006 research crew: From left, MMR J. Page, biologist E. Roseman, technician T. O'Brien, biologist J. French, Capt. E. Perry, biologist J. Schaeffer.

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Appendix I. List of species (common and scientific names) and mean densities (number/ha) collected during the 2006 Lake Huron fall bottom trawl survey.

Common name	**Scientific name**	**Density (No./ha)**
Rainbow smelt	*Osmerus mordax*	1950.11
Alewife	*Alosa pseudoharengus*	284.94
Bloater chub	*Coregonus hoyi*	194.26
Ninespine stickleback	*Pungitius pungitius*	143.12
Deepwater sculpin	*Myoxocephalus thompsonii*	30.81
Round goby	*Neogobius melanostomus*	24.42
Trout perch	*Percopsis omiscomaycus*	8.99
Yellow perch	*Perca flavescens*	6.13
Lake whitefish	*Coregonus clupeaformis*	4.82
Spottail shiner	*Notropis hudsonius*	2.17
Lake trout	*Salvelinus namaycush*	0.88
Longnose sucker	*Catostomus catostomus*	0.87
White bass	*Morone chrysops*	0.82
Emerald shiner	*Notropis atherinoides*	0.63
Mimic shiner	*Notropis volucellus*	0.61
Round whitefish	*Prosopium cylindraceum*	0.46
Slimy sculpin	*Cottus cognatus*	0.33
Gizzard shad	*Dorosoma cepedianum*	0.32
Common carp	*Cyprinus carpio*	0.26
Walleye	*Sander vitreum*	0.10
White perch	*Morone americanus*	0.11
Freshwater drum	*Aplodinotus grunniens*	0.07
Sea lamprey	*Petormyzon marinus*	0.03