LAKE ONTARIO MANAGEMENT UNIT

1996 ANNUAL REPORT

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July 1997

Editor's Note: This report does not constitute publication. Many of the results are preliminary findings. The information and findings should not be quoted without the consent of the individual authors. Individual authors should be contacted prior to any application of the data herein.

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Lake Ontario Management Unit
1996 Annual Report

Introduction

The Lake Ontario Management Unit (LOMU), is part of the Fish & Wildlife Branch, Natural Resource Management Division of the Ontario Ministry of Natural Resources (OMNR). The LOMU is OMNR's lead administrative unit for fisheries management on Lake Ontario and the St. Lawrence River.

The 1996 Annual Report documents result of LOMU fisheries assessment programs completed in 1996. Many fisheries assessment activities were curtailed in 1996 as part of a provincial expenditure reduction plan. Nonetheless, the report contains much of the key information used to manage Lake Ontario Fisheries. For more detailed information or copies of this report please contact:

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Acknowledgements

The contributions of all Lake Ontario Management Unit staff are gratefully acknowledged.

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Pelagic Planktivores

T. Schaner
C.P. Schneider[1]

Overview

Alewife (*Alosa pseudoharengus*) and rainbow smelt (*Osmerus mordax*) are the most abundant plankton feeding fish in Lake Ontario. Both species are preyed upon by large salmon and trout, and alewife are also important in the diet of walleye. The populations of alewife and smelt declined over the past decade, due to two factors. Firstly, the nutrient loading into the lake decreased as a result of better sewage treatment and land use practices in the watershed, which resulted in decreased primary productivity, and less plankton to support alewife and smelt. More recently this effect was compounded by the accidental introduction of zebra and quagga mussel, which tend to divert the energy flow from the pelagic to the benthic community, away from the pelagic feeding alewife and smelt. Secondly, the stocking of large salmonine predators had increased until the early 1990so. Alewife and smelt became squeezed between less plankton on which to feed, and high predation by salmon and trout.

Concern for declining numbers of prey fish has prompted management agencies around the lake to reduce stocking of salmonines starting in 1993. The objective was to reduce predatory pressure on alewife and smelt by one-half. Because some of the predators are long-lived, a reduction in prey demand can only be achieved gradually, and it remains to be seen whether the stocking cuts will allow the prey populations to persist.

The Ontario Ministry of Natural Resources (OMNR) in cooperation with the New York State of Environmental Conservation (NYSDEC), conducts annual hydroacoustic assessment of the pelagic prey species in Lake Ontario covering Canadian and U.S. waters. Most of the information presented in this chapter is based on these surveys. Additionally, the Biological Resources Division of the U.S. Geological Survey (USGS-BRD) cooperates with NYSDEC to conduct annual bottom trawling surveys of alewife and smelt in the U.S. waters. These latter surveys provide an independent assessment, and a historic context for the hydroacoustic data presented here.

Alewife

The hydroacoustic surveys conducted by OMNR/NYSDEC were started in 1991, and continued until 1994 using a 420 kHz dual beam sounder. There are no results available for 1995 due to equipment malfunctions. In 1996 we switched to a 120 kHz split-beam sounder. The comparability of the 1996 results with the earlier data series remains to be examined.

The abundance of alewife declined over the 1991-94 period, as evident from both summer and fall surveys (Fig. 1). The fall 1994 acoustic estimate of 3.3 billion alewife represents a four-fold decrease from 1991, while the summer 1994 acoustic estimate of 4.6 billion alewife represents a two-fold decrease over the same period. A similar pattern can also be seen in the catches of alewife in midwater trawls conducted during the fall surveys. Although these trawls were designed to document the age structure of the alewife population rather than their abundance, the catches declined three-fold during the same four year period (Fig. 1). No acoustic estimates were made in 1995 but the trawl catches from the fall survey suggest that abundance was high relative to 1994. In 1996 the acoustic estimates were at a level similar to 1994, and trawl catches also declined from the peak value in the previous year.

Year-class strength of alewife is determined not only by the production of young fish but also by their

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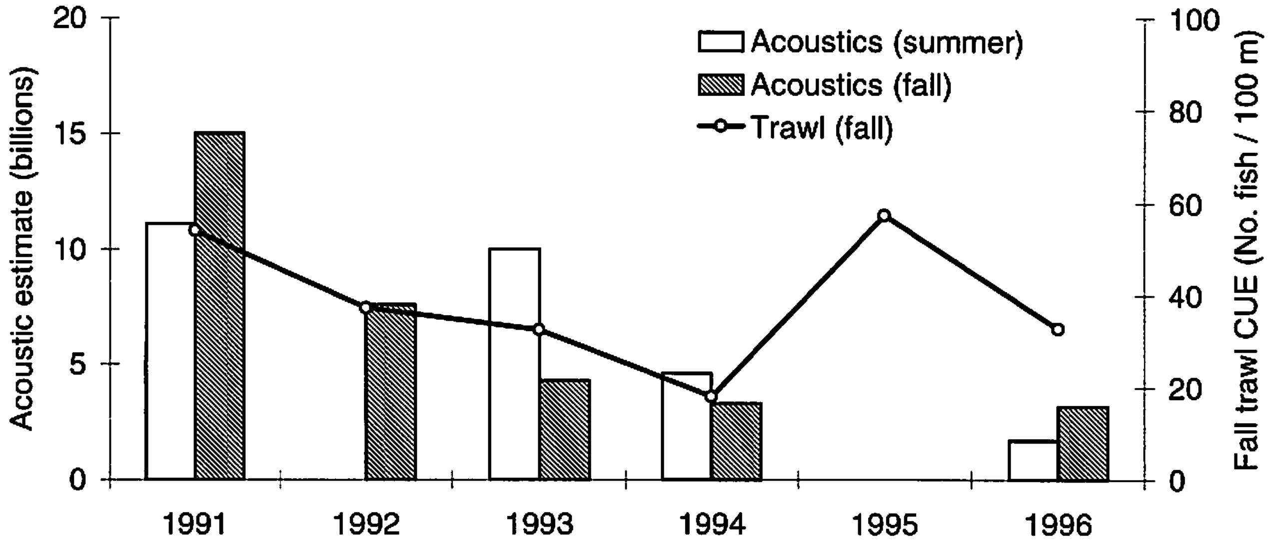

FIG. 1. Acoustic estimates of abundance, and midwater trawl indices of relative abundance (CUE) for alewife in Lake Ontario, 1991 to 1996. Acoustic estimates for summer 1992, and summer and fall 1993 are not available.

survival during the first and second years. Only two cohorts contributed significantly to the adult stock over the 1991-96 period. The 1991 and the 1995 cohorts first appeared in large numbers as young-of-the-year (YOY) fish in the fall trawl catches (Fig. 2), and their catches also remained strong through the following summer and fall. The other cohorts started weaker, and their survival varied: almost no YOY fish were caught in the fall of 1992, while in the remaining years, YOY fish were evident in moderate numbers in the fall of their first year, but their numbers dwindled by the following summer and fall. The catches of the latest year-class, the fish produced in 1996, were again moderate in the fall.

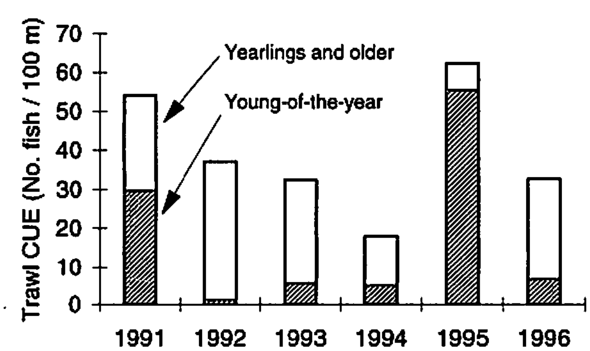

FIG. 2. Relative abundance (CUE) of young-of-the-year and older alewife in the fall in Lake Ontario, 1991 to 1996.

The decline in the numbers of alewife during the 1991-96 period represents a drop from the high abundances documented in the 1980s by bottom trawling surveys (O'Gorman *et al.* 1997). The bottom trawling surveys in fact indicate that the adult population in the spring of 1996 was the lowest since 1979. The recent strong 1995 year-class appears to be a sign of success, and will likely boost the adult population but it is the first good year-class since 1991. There can be no immediate expectation of increase in alewife population to former levels, and the possibility of further decline remains.

Smelt

During times of thermal stratification in summer and fall, smelt form a distinct layer of fish in colder water, separated from the concentrations of alewife in the warm water above. This separation, together with results of midwater trawling, is the basis for splitting the overall acoustic estimates of number of 'targets' into alewife and smelt population estimates. The lower limit of the smelt distribution is less distinct, and the estimates from this region are often confounded by large concentrations of plankton *Mysis relicta*. The estimates depend on the ability to distinguish between

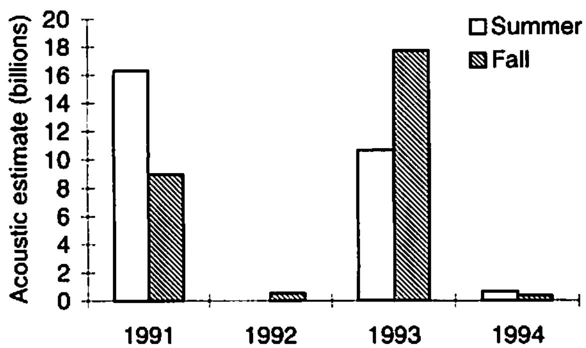

FIG. 3. Acoustic estimates of abundance for smelt in Lake Ontario, 1991 to 1994.

smelt and *Mysis*, a process which we are still reviewing. The following acoustic estimates must therefore be regarded as provisional.

The 1991-94 population estimates alternated between high and low values. This feature of the smelt population in Lake Ontario, due to alternating year-class strength, was previously documented in bottom trawling surveys (O'Gorman *et al.*, 1997). The acoustic estimates for the peak years (1991 and 1993) range between 9 and 17 billion fish, while the estimates for the alternate low years are all below 1 billion (Fig. 3). The fluctuations shown in these estimates are probably exaggerated, and should be reduced once the estimation process is refined.

Other Species

There have been noticeable changes in the incidence of other pelagic species in the midwater trawls made during the hydroacoustic surveys. Until 1993 threespine stickleback (*Gasterosteus aculeatus*) were seen in the trawls only as occasional individuals. Starting in 1993 their catches began to increase (Fig. 4), as we started to come upon large aggregations. In 1996 we were able to identify an aggregation of sticklebacks in the hydroacoustic data on at least one occasion. Emerald shiner (*Notropis atherinoides*) were also only occasionally captured in the trawls during the initial years of the surveys, but their catches increased suddenly in 1995-96 (Fig. 4). Both species still constitute only a very small fraction of the overall trawl catches, but their sudden increase in abundance in the past few years indicates that a shift in the balance of the pelagic community is occurring.

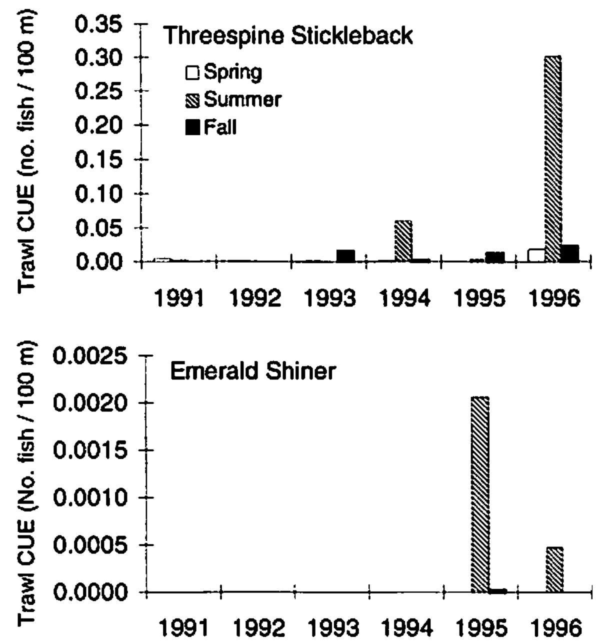

FIG. 4. Relative abundance (CUE) of threespine stickleback and emerald shiner in Lake Ontario, 1992 to 1996.

Reference

O'GORMAN, R., R.W. OWENS, C.P. SCHNEIDER, AND T.H. ECKERT. 1997. Status of major prey fish stocks in the U.S. waters of Lake Ontario, 1996. *In* 1996 Annual Report, Bureau of Fisheries and St. Lawrence River Unit to the Great Lakes Fishery Commission's Lake Ontario Committee, March 25-26, 1997.

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Pelagic Piscivores

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P. Mabee L. Stanfield

Overview

Salmon and trout are the most abundant pelagic piscivores in Lake Ontario. Changes in Lake Ontario over the past decade have resulted in a situation where the food consumption by salmon and trout (predator demand) likely exceeded the sustainable supply of their principal prey, alewife and smelt. In response to these changes the Ontario Ministry of Natural Resources (OMNR) and the New York Department of Environmental Conservation (NYDEC) reduced stocking, beginning in 1993, by approximately 50% from 1991 stocking levels. The purpose of the stocking reductions was to decrease predator demand by 45 to 50% by 1996. Chinook salmon and lake trout were the species with the greatest reductions. Due to the presence of fish stocked in earlier years, the reduction in predator demand lags behind the reductions in stocking. The stocking reductions in 1993 and 1994 reduced predator demand by 10% in 1994, 29% in 1995, and 50% in 1996. Public consultation to review fisheries management strategies (including stocking) in Lake Ontario began in fall 1996. The moderate increase in proposed stocking in 1997 (Table 1) is based on these consultations.

Several projects were not conducted during 1996 because of reductions in staffing and project funding. Many of the 1996 results are consistent with reductions in stocking of chinook salmon and lake trout. Stocking numbers provide a good indicator of recruitment to the pelagic piscivore community. In particular, we showed that year-class strength of chinook salmon was highly correlated with lakewide stocking of chinook salmon. Hence, the stocking reductions in 1993 and 1994 likely had the desired effect on chinook salmon year-class strength. However, year-class strength of chinook salmon was also negatively correlated with the stocking numbers three years previously. This is consistent with predation of older chinook salmon on the young-of-the-year. Therefore, the relationship between stocking and year-class strength may not be straight forward.

As terminal predators in the Lake Ontario food web, salmon and trout growth and production are dependent on an adequate supply of alewife and smelt. To monitor the status of prey species in relation to predator demand, indices of salmon and trout growth and condition are reported here for 1996. Chinook salmon growth increased in 1995 and 1996 after an all-time low in 1994. This result is consistent with a decline in predator abundance associated with stocking reductions, and also suggests a better predator-prey balance. Rainbow trout body condition was high in 1996, consistent with lower abundance of chinook salmon.

In 1996 OMNR discontinued dedicated surveys for lake trout, and incorporated their assessment into the general index surveys conducted annually in eastern Lake Ontario. In 1996 wild juvenile lake trout continued to be caught in all areas where surveys were conducted, suggesting that natural reproduction occurs lake-wide. Moreover, the presence of young-of-the-year in NYDEC and US Geological Survey bottom trawls in 1996 indicates four consecutive measurable year-classes of wild lake trout in Lake Ontario.

Results from Atlantic salmon restoration studies in 1995 and 1996 were preliminary. Mean fall densities of Atlantic salmon parr were higher than the target of 5 per 100 m^2 in some habitat types in the presence and absence of rainbow trout.

Stocking

In 1996 OMNR stocked 1,539,609 salmon and trout in Lake Ontario (Table 1). Lake trout and chinook salmon made up the bulk of the stocked fish. Over 438,000 fingerling chinook salmon were stocked at various western Lake Ontario locations in 1996 by OMNR. This level of stocking was about 3% below the target number of 450,000. A total of 215,894 rainbow trout were stocked in 1996, primarily, in western Lake Ontario. Most of the 255,757 brown trout were stocked in western Lake Ontario where the greatest number of shore and boat anglers target them. Similarly, most of the 499,257 lake trout were stocked in eastern Lake Ontario where the greatest number of historic spawning shoals are found. Most of the 130,628 Atlantic salmon were stocked as fry as part of a research study to evaluate the habitat in Lake Ontario streams and the ability of Atlantic salmon to compete with rainbow trout. As well, an unplanned stocking of 528,220 walleye fry took place in the Napanee River (Table 1) after an egg collection from the same location. Although, the number stocked may appear large, we expect the biological significance of these fry should to be slight since only a handful are likely to survive to be caught. The Bay of Quinte walleye population is supported by naturally producing fish, not by stocking.

Detailed information on stocking numbers and locations for 1996 by OMNR appears in Appendix A. NYDEC also stocked about 3.3 million salmon and trout into Lake Ontario (Eckert and Schneider 1997).

The stocking targets for 1997 (Table 1) were increased based on public consultation beginning in fall 1996. Accordingly, predator demand can be expected to increase slightly in Lake Ontario.

TABLE 1. Salmon, trout and walleye stocked into Province of Ontario waters of Lake Ontario, 1996; and the stocking target for 1997.

		Number Stocked	
Species	Age	1996	1997 Target
Atlantic Salmon	Fall Fingerling	4,394	-
	Advanced Fry	81,034	80,000
	Early Fry	45,200	80,000
	Subtotal	130,628	160,000
Brown Trout	Yearling	176,469	170,000
	Fall Fingerling	79,288	50,000
	Subtotal	255,757	220,000
Chinook Salmon	Spring Fingerling	438,073	600,000
Lake Trout	Yearling	464,809	460,000
	Fall Fingerling	34,448	-
	Subtotal	499,257	460,000
Rainbow Trout	Yearling	95,000	120,000
	Fall Fingerling	120,894	125,000
	Subtotal	215,894	245,000
TOTAL SALMON/TROUT		1,539,609	1,685,000
Walleye	Fry	528,220	-
TOTAL WALLEYE		528,220	-

Chinook Salmon Status

Abundance Trends

Year-class strength of chinook salmon in Lake Ontario was calculated as the least-square mean (Littell *et al.* 1991) angling catch-per-effort by year-class. Angling survey data were from Ontario (Hoyle *et al.* 1996) and New York (Ekert 1996) for 1985 to 1995. Year-class strength of chinook salmon from 1982 to 1994 was lowest in 1993 and 1994 (Fig. 1) as a result of stocking reductions in those years. Sixty percent of the variance in year-class strength was explained by a positive correlation with stocking levels in the same year (Fig. 2). This result was consistent with our past

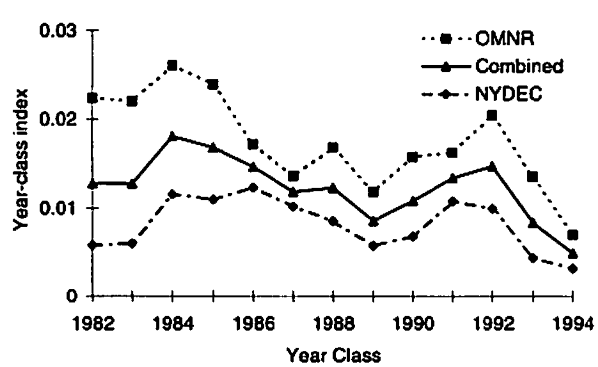

FIG. 1. Trends in year-class strength of chinook salmon in Lake Ontario based on angling survey data from OMNR, NYDEC, and combined, 1982 to 1994.

assumptions that chinook salmon abundance is directly related to stocking levels, and that natural reproduction of chinook salmon is low (Rawson *et al.* 1996). Another 23% of the variance in year-class strength of chinook salmon was explained by a negative relationship with the number of chinook salmon stocked three years previously (Fig. 3). Chinook salmon may show density-dependent population regulation through predation of young-of-the-year.

Growth Trends

The spawning run of chinook salmon was monitored in the Credit River at the Streetsville Dam. The length of male and female chinook salmon were collected for those fish selected by Ringwood Fish Culture Station for spawn collection. The length of male and female 3-yr-old chinook salmon declined sharply in 1994, followed by successive increases in 1995 and 1996 (Fig. 4). The decline in growth in 1994 was consistent with declines in alewife and smelt populations. The subsequent increase in growth in 1995 and 1996 was consistent with the stocking reductions in 1992 and 1993 and a time lag of 3 years for 3-yr-old fish. Apparently, the stocking reductions resulted in a better predator-prey balance and prevented further reductions in chinook salmon growth rates.

Rainbow Trout Status

Abundance Trends

Counts of spawning rainbow trout at the Ganaraska River fishway are used to index rainbow trout abundance trends. In 1996, the estimated spring "run" past the fishway count increased slightly from 1995 to 9,454 fish (Fig. 5). This run has been relatively constant since 1993. The spring run of rainbow trout peaked in 1989 when more than 18,000 returned to spawn. The recent decline in the number of rainbow trout passing the fishway is consistent with an increase in the size and age of first spawning, and the mortality associated with spending one more year in Lake Ontario before spawning. Apparently, channel improvements in the Ganaraska River during the early 1980s may have favoured larger fish.

Condition Trends

Body condition for the Ganaraska spawning population was determined as the least-square mean (Littell et al. 1991) weight after adjusting for length using analysis of covariance. In 1996, body condition

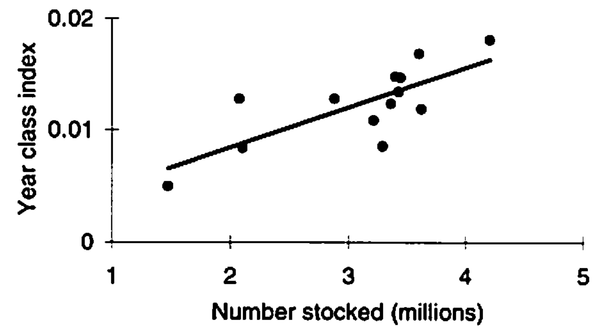

FIG. 2. Relationship between year-class strength of Chinook Salmon in Lake Ontario and number stocked.

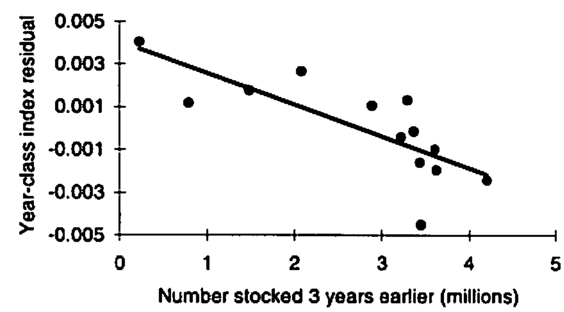

FIG. 3. Relationship between year-class strength of chinook salmon in Lake Ontario and 3-year-old chinook salmon (represented by number stocked three years earlier) after removing the effect of stocking that year-class.

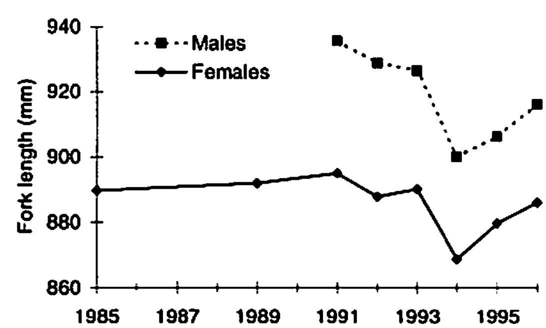

FIG. 4. Fork length of 3-year-old chinook salmon in the Credit River during spawning run in September and October.

was significantly higher for both female and male rainbow trout than all other years (Fig. 6). This is consistent with past observations by Bowlby *et al.* (1994) that condition of salmon and trout in Lake Ontario is inversely related to chinook salmon numbers.

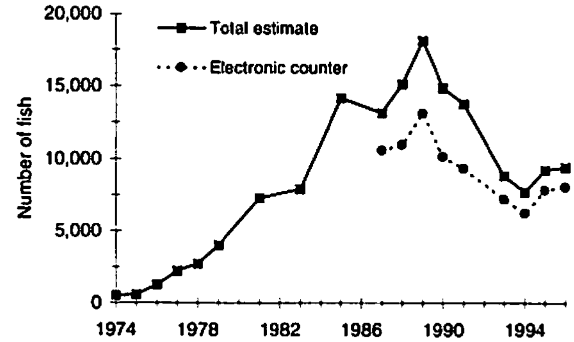

FIG. 5. Number of rainbow trout at the Ganaraska River fishway at Port Hope during April and May, 1974 to 1996.

Lake Trout Status

In 1996 OMNR discontinued dedicated surveys for lake trout, and incorporated their assessment into the fish community index netting conducted annually in eastern Lake Ontario. Considerable overlap between the two survey programs over the past several years, allows comparison between the two data series, and a shift to the fish community index netting survey as a means of monitoring the lake trout population. We will report on lake trout population trends based on the latter survey in future Annual Reports. Schneider *et al.* (1997) report on the status of lake trout rehabilitation and population trends in Lake Ontario in 1996.

Natural Reproduction

The occurrence of natural reproduction by lake trout has been documented in Lake Ontario since the late 1980s. However, in 1994 young wild lake trout began to show up in bottom trawl catches, indicating that successful reproduction and survival beyond the fry stages was occurring. The catches of wild juvenile lake trout continued in 1996 with 42 fish caught lake-wide, bringing the three-year total to 142 fish (Table 2). Most of the wild lake trout were caught in the U.S. waters, where a variety of bottom trawling surveys provide more opportunities for capture.

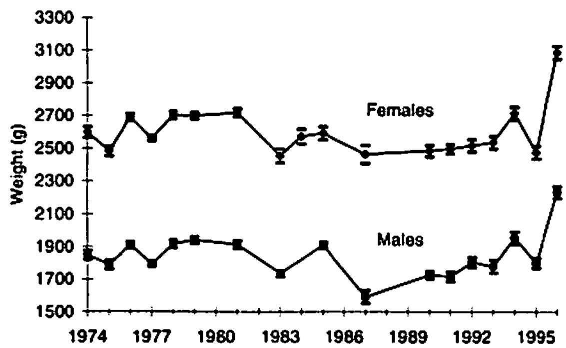

FIG. 6. Condition (mean weight, adjusted for length) of rainbow trout in April at the Ganaraska River fishway. Dashes above and below each line indicate plus and minus 2 standard errors.

Atlantic Salmon Restoration

In 1995, OMNR prepared "An Atlantic Salmon Restoration Plan for Lake Ontario" (Anonymous 1995). Technical experts and representatives of the major stakeholders reviewed the past Atlantic salmon program. The technical experts indicated that Atlantic salmon restoration in Lake Ontario was feasible but there were several concerns about Lake Ontario streams that warranted further research into potential limitations of restoration. Three major concerns were: i) the ability of juvenile Atlantic salmon to use woody cover (which predominates in Lake Ontario streams) versus boulders, ii) abundance of fine sediments (common in Lake Ontario streams), and iii) competition with rainbow trout. Public input suggested a research approach using fry stocking to evaluate these concerns, specific targets for years 5, 10, 15, and 20, and 5-year reviews of the program to determine if the targets were met. We are currently in the third year of the program with a review scheduled in 1998.

Results from 1995 and 1996 were preliminary as sample sizes were not yet adequate to make firm conclusions. Nevertheless, the results showed mean fall density of Atlantic salmon parr higher than the target of 5 per 100 m^2 in most categories except the combination of high fines and rainbow trout present.

TABLE 2. Catches of naturally produced lake trout in Lake Ontario, 1994 to 1996.

	No. of naturally produced lake trout					
	1994		1995		1996	
AGE	U.S.	Can.	U.S.	Can.	U.S.	Can.
0	3	-	28	-	2	-
1	5	3	28	1	9	-
2	-	-	2	1	26	1
3	-	-	-	-	-	4
Total	8	3	58	2	37	5

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Eastern Lake Ontario and Bay of Quinte

J. A. Hoyle

Overview

The Lake Ontario Management Unit uses annual summer index gillnetting and bottom trawling programs to detect long-term changes in the eastern Lake Ontario and Bay of Quinte fish communities. By providing trend-through-time indices of species population abundance, these programs also routinely deliver timely, stock-specific information for fisheries management. For the deep waters of Lake Ontario's Outlet Basin and the Bay of Quinte, the gillnetting program has run for over 30 years, the trawling program for 20 years (Casselman and Scott 1992; Hurley 1992). More recently, gillnetting operations were initiated in the nearshore waters of eastern Lake Ontario (Northeast, Fig. 1) as far west as Brighton. The latter studies initially focused on yellow perch, an important commercial species at the time, but expanded in 1986 to a wide range of depths, and thereby sampled a diverse assemblage of warm- and cold-water species (Hoyle 1992).

In 1992, fish community studies on eastern Lake Ontario underwent a major program overhaul to facilitate gear standardization, improve experimental design, eliminate sampling redundancies, and better coordinate programs, while preserving the continuity and integrity of the historic data series (Hoyle 1992; Casselman and Scott 1992). Also in 1992, multifilament gillnets were replaced with monofilament nets. Comparative netting studies have been completed but gear/species conversion factors have not been finalized. Hence, the trend-through-time gillnet results presented here have not been adjusted to reflect this gear change and must be interpreted accordingly.

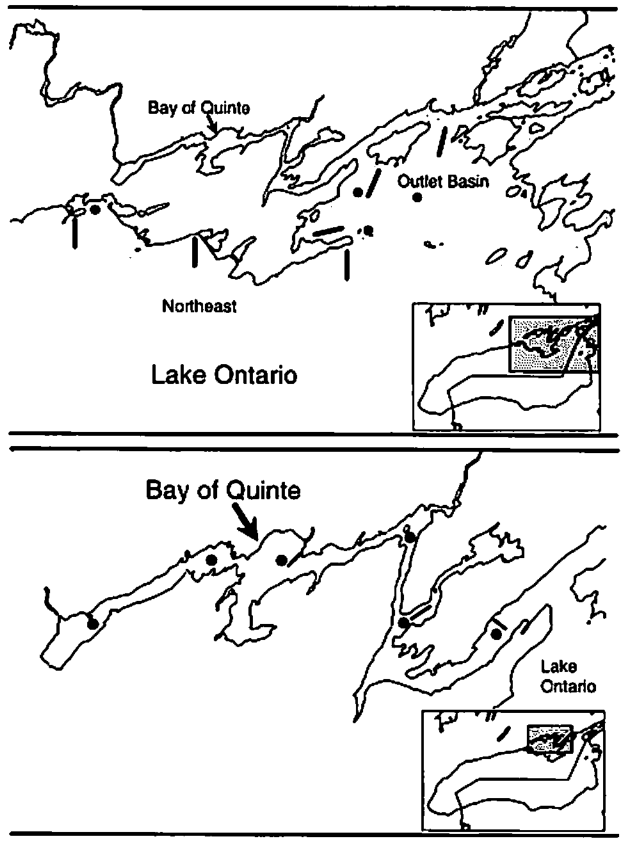

FIG. 1. Maps of eastern Lake Ontario (upper panel) and the Bay of Quinte (lower panel) showing fish community index gillnetting and trawling locations. Depth-stratified gillnetting locations are shown as bars; single depth gillnetting and trawling locations are represented by circles.

For a summary of standardized gillnet/trawl catch-per-unit-effort for 1996, organized by geographic area (Northeast, Outlet Basin, and the Bay of Quinte), see Appendix B. This chapter provides updated trends in abundance for several fish species of local management interest including lake whitefish, lake herring, smallmouth bass, yellow perch, and walleye.

An emerging feature of the gillnet catches of several Outlet Basin species is their dramatic declines in recent years. One possible explanation of these declining catches relates to large-scale community changes (e.g., fish distribution and abundance changes) associated with whole-lake ecosystem changes (e.g., increasing water clarity and declining productivity due to phosphorus control and the presence of zebra mussels). But a simple explanation for these observations may be that increases in water clarity alone has made these species less vulnerable to capture in our gillnets.

A highlight of the 1996 index netting program was the capture of a single deepwater sculpin in the Eastern Basin bottom trawls. This species, normally an inhabitant of very deep water, was once abundant in Lake Ontario but has not been observed since 1972.

Species Population Trends

Below, an update on the population status of lake whitefish, lake herring, smallmouth bass, yellow perch and walleye is provided. Population trends for some species are assessed in other, more targeted, programs and reported elsewhere. Alewife and smelt are assessed in a lake-wide hydroacoustic/mid-water trawling program (Chapter 1 in this report). The current status of salmon and trout inhabiting the open waters of Lake Ontario is reported in Chapter 2. Additional information for commercially important species can be found in Chapter 4.

Lake Whitefish

Lake whitefish are currently the most important commercial fish in Lake Ontario (Chapter 4 in this report). There are two large spawning stocks of lake whitefish in eastern Lake Ontario; one spawning in Lake Ontario proper along the south shore of Prince Edward County, the other spawning in the Bay of Quinte.

Young-of-the-year (YOY) whitefish are monitored in bottom trawls at Timber Island and Conway for lake and bay whitefish stocks, respectively (Fig. 2). Small year-classes were observed, sporadically, throughout the 1970s and early 1980s. Since the mid-1980s, moderate to large year-classes have frequently been produced, especially for the bay stock. Very large year-classes, associated with extremely cold over-wintering conditions, were observed for both lake whitefish stocks in 1994 (Hoyle and Bowlby 1995). Good year-classes were again produced in 1995, especially for the lake stock which had the third largest year-class on record. Poor year-classes of both stocks were produced in 1996.

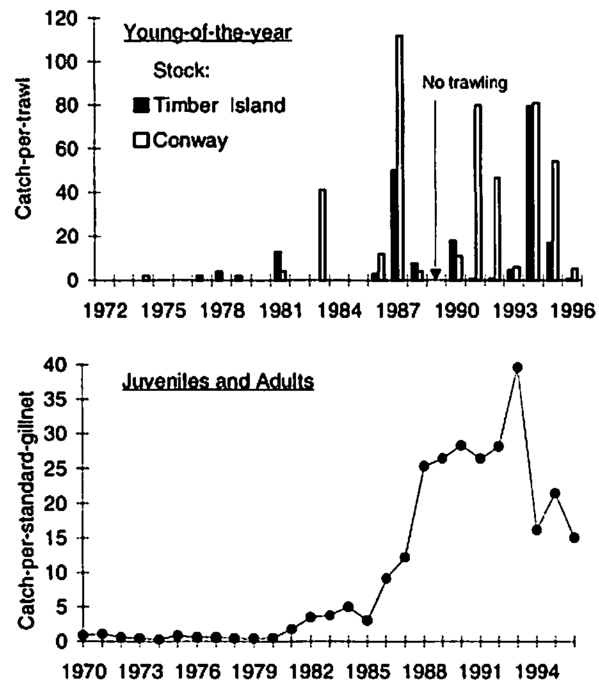

FIG. 2. Lake whitefish indices of abundance. Upper panel shows year-class strength of Lake Ontario and Bay of Quinte stocks as represented by YOY catch-per-trawl (adjusted to 12 min duration), at Timber Island and Conway, respectively, 1974 to 1996. No trawling was conducted in 1989. Lower panel shows catch-per-standard gillnet lift for juvenile and adult lake whitefish from deep-water gillnetting locations in the Outlet Basin, Lake Ontario, 1974 to 1996. Catches were calculated as the sum of the catch of eight gillnet panels (1 1/2" to 5" with 1/2" intervals), each of which were 50 ft in length. There were six netting locations prior to 1991, three in 1991 and two since 1991, therefore catches in later years were weighted based on the relative proportion of the catches at each site in previous years.

The two whitefish stocks intermix as adults during midsummer in the deep waters of the Outlet Basin, where their collective abundance is monitored in gillnets (Fig. 2). Catches for the last three years have been significantly lower than for the 1988 to 1993 time period. Larger catches of small whitefish were anticipated in 1996 as the strong 1994 and 1995 year-classes recruit to the gillnets but this was not realized.

Lake Herring

Historically, lake herring supported an important commercial fishery in Lake Ontario but this fishery collapsed during the 1940s. We anticipated that lake herring, like lake whitefish, would increase in

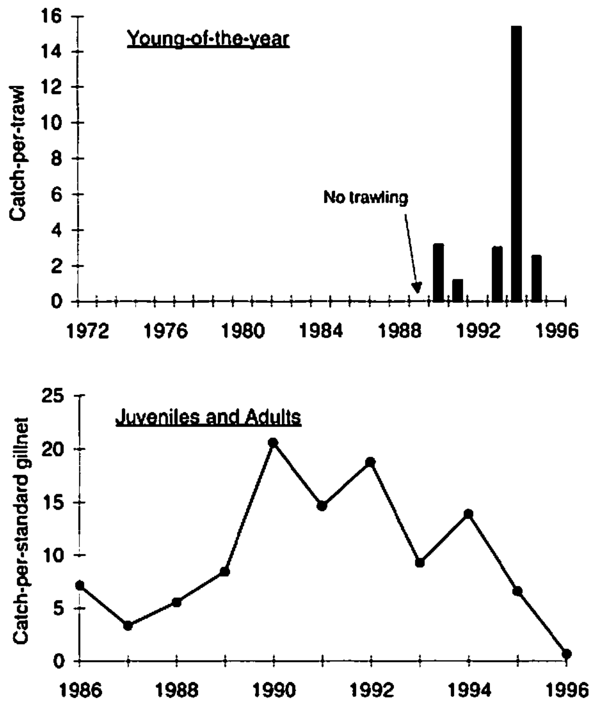

FIG. 3. Lake herring indices of abundance. Upper panel shows YOY catch-per-trawl (adjusted to 12 min duration), at Conway in the lower Bay of Quinte, 1982 to 1996. No trawling was conducted in 1989. Lower panel shows catch-per-standard gillnet lift for juvenile and adult lake herring from the Flatt Point gillnet location in the Outlet Basin, Lake Ontario, 1986 to 1996. Catches were calculated as the sum of the catch of eight gillnet panels (1 1/2" to 5" with 1/2" intervals), each of which were 50 ft in length.

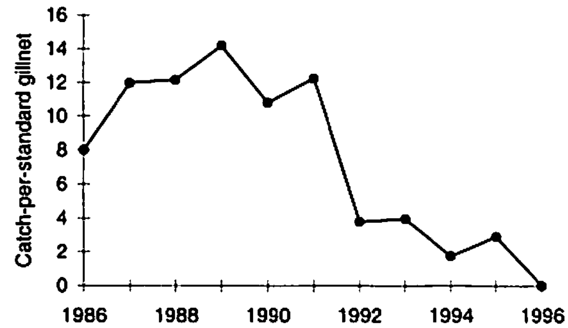

FIG. 4. Catch-per-standard gillnet lift for adult smallmouth bass from the Outlet Basin gillnet sampling locations, 1986 to 1996. A standard gillnet lift represents the sum of catches in eight mesh sizes (1 1/2" to 5 " at 1/2" intervals) with catches adjusted to represent 100 m of net for each mesh size. Outlet Basin includes nets set at Flatt Point, Grape Island and Melville Shoal.

abundance following declines in alewife and smelt in the late 1970s. To date, this has not happened.

Prior to 1990, lake herring had not been observed in bottom trawls. Small numbers have been observed in 1990, 1991 and 1993 at the Conway site in the lower Bay of Quinte (Fig. 3). In 1994, a significant number of YOY lake herring were caught, along with large numbers of YOY lake whitefish, at the Conway site. Relative to the large year-classes of lake whitefish observed since the mid-1980s, the 1994 lake herring year-class could be considered of moderate size. The 1995 year-class was small but similar in size to the 1990 and 1993 year-classes. No YOY lake herring were caught in 1996 (Fig. 3).

It appears that a locally strong year-class of lake herring was produced in 1987 (Hoyle and Bowlby 1995) but these did not show up in bottom trawling in the Outlet Basin (Fig. 3). Juvenile and adult lake herring catches have declined in gillnet catches at Flatt Point, Outlet Basin, following recruitment of the 1987 year-class to the gillnets in 1990 (Fig. 3).

Smallmouth Bass

Smallmouth bass populations, along with lake trout, provide an important recreational fishery in the Outlet Basin. Their abundance in gillnets has decreased dramatically after 1991 (Fig. 4). The reason for the decline is not clear. It is not uncommon for smallmouth bass populations to fluctuate greatly as a result of highly variable year-class strength. On the other hand, it appears more likely that this species has either changed its distribution pattern or is now avoiding our gillnets due to increased water clarity (see below).

Yellow Perch

Yellow perch are found throughout eastern Lake Ontario and the Bay of Quinte. Their abundance, which declined dramatically in the early 1980s after peaking at historically high levels, now remains at comparatively low levels.

In the Northeast, yellow perch abundance has been monitored in gillnets for many years at Middle Ground, and since 1988 at several additional sites (Fig. 5). Commercially marketable-sized yellow perch (>7.5 inches) are particularly scarce, even though large numbers of small fish have been observed in some years. Remarkably, no marketable-sized yellow perch were captured in the Middle Ground gillnets in 1996.

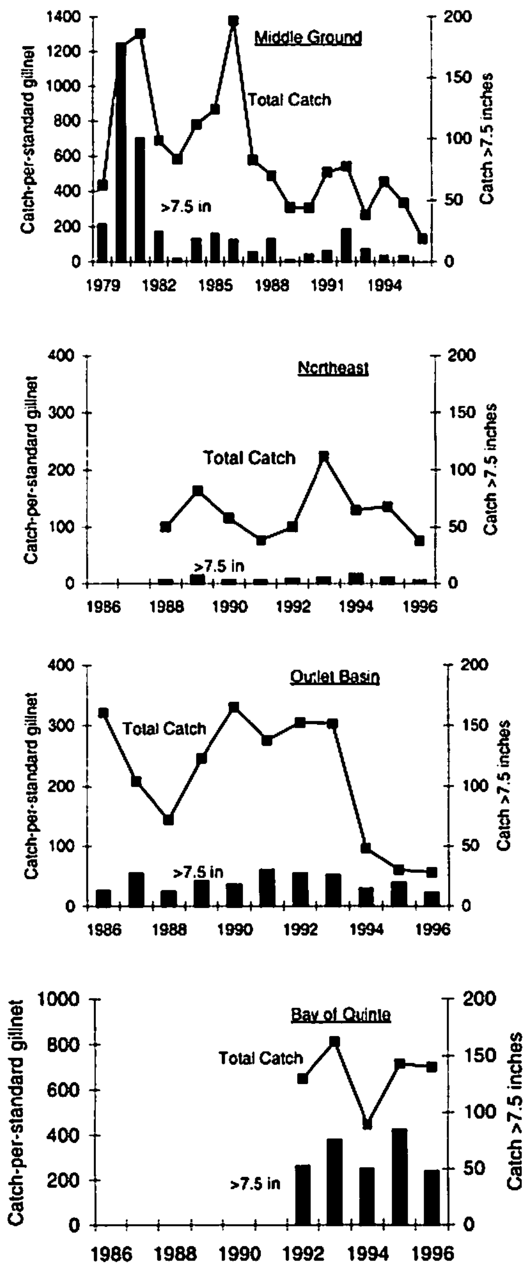

FIG. 5. Yellow perch indices of abundance for fish greater than 7.5 inches fork length (index of commercially marketable-sized fish) and for total catches. Upper panel, Middle Ground, 1979 to 1996; second panel, Northeast, 1988 to 1996; third panel, Outlet Basin 1986 to 1996; and Bay of Quinte 1992 to 1996.

Gillnet catches in the Outlet Basin have fallen dramatically in the last three years, mainly for small fish.

Largest catches of yellow perch now come from the Bay of Quinte (Fig. 5), and recruitment of YOY yellow perch has increased markedly in recent years (Fig. 6).

Walleye

Bay of Quinte walleye are the target of one of Lake Ontario's largest recreational fisheries (see Chapter 5 in this report). Adult walleye migrate to Lake Ontario immediately following spawning in the Bay of Quinte, and then move back into the bay in the fall to overwinter.

Walleye population size increased sharply in 1980, with recruitment of the 1978 year-class, and has remained relatively stable since the mid-1980s at about 1.5 million 2-yr-old and older fish. Young-of-the-year abundance in bottom trawls for 1995 and 1996 were the lowest observed since prior to 1984 (Fig. 7). Unless a good-sized year-class is produced in 1997, the open-water walleye fishery will likely be negatively impacted within two years due to lower walleye recruitment to the fishery.

Other Species

A highlight of the 1996 index netting program was the capture of a single deepwater sculpin in the Eastern Basin bottom trawls. This species, normally an inhabitant of very deep water, was once abundant in

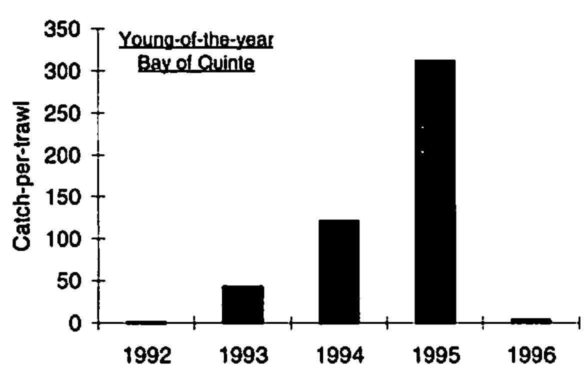

FIG. 6. Young-of-the-year yellow perch catch-per-trawl (6 min duration) at six Bay of Quinte sites, Trenton, Belleville, Big Bay, Deseronto, Hay Bay and Conway, 1992 to 1996.

Lake Ontario but has not been observed since 1972, and probably has not been abundant for over 50 years.

Follow-up netting in more suitable deep-water habitat off Rocky Point and Cobourg revealed two additional deepwater sculpin in bottom trawls and several slow growing and unusually deep-bodied lake herring captured in gillnets.

Water Clarity Trends

Catches of lake whitefish, lake herring, smallmouth bass, and yellow perch in Outlet Basin gillnets have all declined in recent years. The Outlet Basin gillnetting occurs in July. One explanation for the declining catches is that increasing water clarity (Millard et al. 1996) has made these species—and others—less vulnerable to our assessment gillnets. Summer water clarity appears to have changed most dramatically in July (Fig. 8). The effect of increasing water clarity on gillnet catches requires further attention in order to determine if declines in catches are a result of net avoidance or actual lower fish abundance.

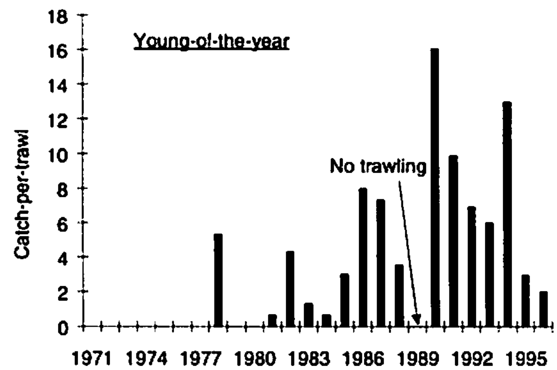

FIG. 7. Young-of-the-year walleye catch-per-trawl (6 min duration) at three Bay of Quinte sites, Big Bay, Hay Bay and Conway, 1978 to 1996 (no trawling was conducted in 1989).

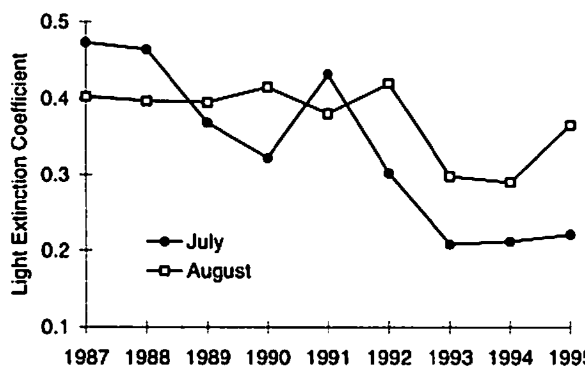

FIG. 8. Trends in summer water clarity in the Outlet Basin, Lake Ontario as measured by the light extinction coefficient. A lower light extinction coefficient indicates greater water clarity (E.S. Millard and O.E. Johannsson, Department of Fisheries and Oceans, Burlington, Ontario, unpublished data).

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4

Commercial Fisheries

J. A. Hoyle
R. Harvey

Overview

The commercial fishing industry on the Canadian waters of Lake Ontario harvests over $1,000,000 worth of fish annually. While small relative to the other Great Lakes, it is locally significant because it is confined mainly to the northeast corner of the lake.

Traditionally, this chapter updates the commercial harvest (weight and value) by species for Lake Ontario including the Bay of Quinte. For 1996, and in subsequent reports, the commercial harvest for the Canadian waters of the St. Lawrence River will also be reported.

Quota Management

The overall direction of commercial fish management on Lake Ontario is to support and assist the commercial fishing industry where consistent with the conservation and rehabilitation of fish stocks. In addition to protection of fish stocks, licence conditions attempt to reduce problems of incidental catch, and minimize conflicts with other resource users.

Decisions on commercial allocation are made on a *quota zone* basis (Fig. 1). Fish species for which direct harvest controls are necessary to meet fisheries management objectives are placed under quota management (Table 1). These species include

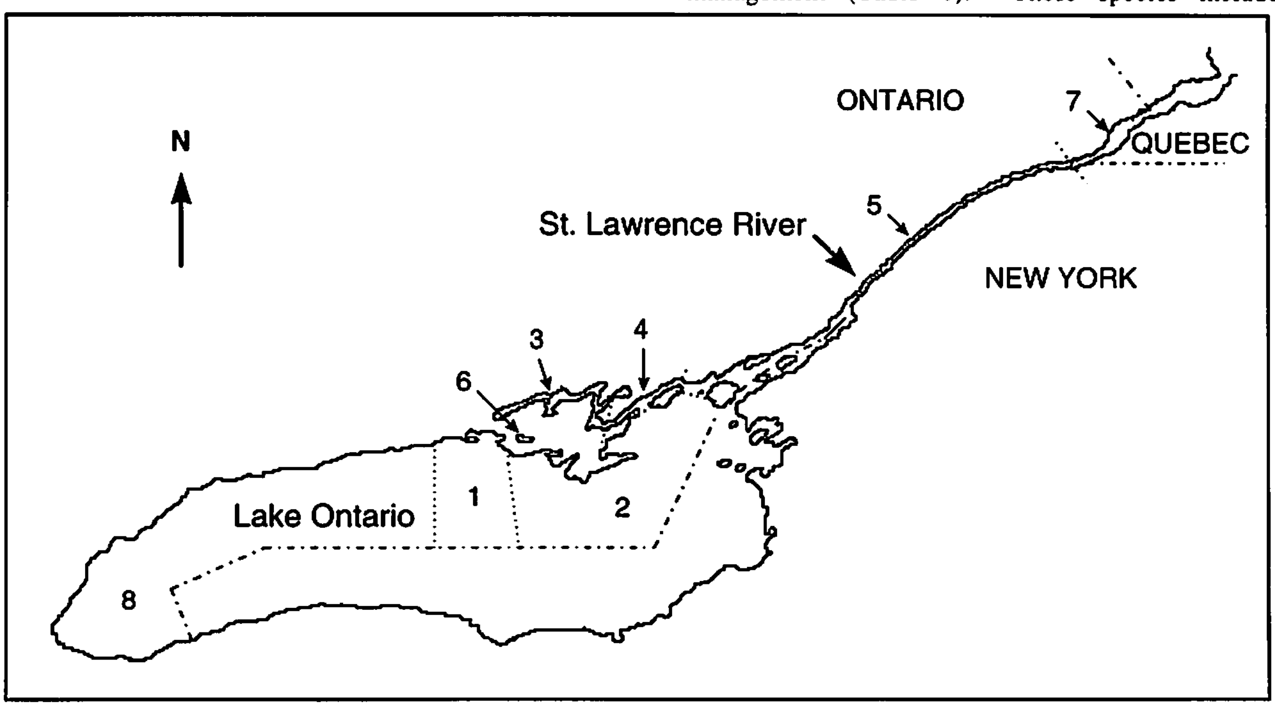

FIG. 1. Commercial fish quota zones on the Canadian waters of Lake Ontario and the St. Lawrence River. Quota zone 5 is further divided into two areas, Napanee and Brockville portions of the St. Lawrence River, for reporting purposes.

TABLE 1. Commercial harvest quotas (lb) for the Canadian waters of Lake Ontario, 1996. For Quota Zone 1, eel and black crappie include quota from Consecon Lake, Quota Zone 6. See Fig. 1 for a map of the quota zones. Quota for species such as bullheads and sunfish in Lake Ontario embayments (e.g., East Lake, West Lake, Wellers Bay) are not given here but their 1996 harvest totals are included in Table 2. St. Lawrence River harvest quotas are not provided here but will be updated in future Annual Reports.

	Quota (lb) by quota zone					
	1	2	3	4	8	Total
Lake whitefish	48,503	486,564	129,834	146,160	800	811,861
Lake herring	15,690	18,901	7,251	7,350	0	49,192
Round whitefish	10,000	0	0	0	0	10,000
Eel	39,445	233,080	56,924	30,886	3,600	363,935
Black crappie	4,240	16,449	11,251	800	2,400	35,140
Yellow perch	34,126	100,847	59,070	40,401	11,500	245,944
Walleye	6,131	48,637	0	11,231	300	66,299

premium commercial species (e.g., lake whitefish, american eel, black crappie, yellow perch), species with large allocations to other users (e.g., walleye), and species at low levels of abundance or requiring rehabilitation (e.g., lake herring). In addition, some species traditionally thought of as coarse fish, have harvest controls for only some areas within a quota zone (e.g., bullheads, sunfish, carp and channel catfish in embayments of Lake Ontario or the St. Lawrence River).

Changes to commercial fish licensing conditions in 1996 included: adjustments to quota (compare Table 1 in this report to Table 1 in Hoyle and Harvey (1996)), and a industry imposed minimum size limit on lake whitefish of 19 inches total length. A summary of commercial harvest licensing conditions for the St. Lawrence River will be provided in a future Annual Report.

Lake Ontario

Commercial Harvest Summary

The total harvest of all species was nearly 1.3 million lb (Table 2). The total landed value of the harvest was over $1.4 million, the highest level in ten years.

Lake whitefish was far and away the most important commercial species on Lake Ontario both in terms of harvest weight (650,287 lb) and total dollar value ($659,671). Yellow perch and eel harvest (149,061 and 84,598 lb, respectively) continued their decline of recent years (Hoyle and Harvey 1996) but, due to high prices, still are the second and third most valuable species ($324,533 and $220,446, respectively).

Biological Characteristics of the Harvest

Biological characteristics of the harvest were monitored for lake whitefish. Sampling activities focused on the fall (October/November) trapnet fishery in the Bay of Quinte (Quota Zone 3), and the November gillnet fishery on the south shore of Prince Edward County (Quota Zone 2). As such our survey covered the largest components of the total annual harvest for lake whitefish.

Lake whitefish harvest peaked in the early 1920s. From 1930 to the early 1960s the harvest was sustained at about 420,000 lb annually prior to crashing to insignificance in the 1970s (Christie 1973). Lake whitefish populations have recovered in recent years thanks to good recruitment of both major spawning stocks—Lake Ontario and Bay of Quinte spawning stocks (Casselman *et al.* 1996).

The 1996 lake whitefish harvest was 659,671 lb, representing 80% of the 822,304 lb quota. Over 50% of the total lake whitefish harvest comes from Quota Zone 2 during the lake whitefish spawning run in November and December. The main gear type used in

TABLE 2. Commercial fish harvest (lb) and value ($) for fish species in the Canadian waters of Lake Ontario, 1996.

	Commercial harvest (lb) by quota zone							Price	
Species	1	2	3	4	6	8	Total	per lb	Value
Bowfin	2,651	1,054	2,731	0	112	0	6,548	0.30	$1,957
Lake whitefish	27,799	457,995	89,428	75,065	0	0	650,287	1.01	$659,671
Lake herring	524	3,753	2,311	2,675	0	0	9,263	0.58	$5,332
Round whitefish	721	0	0	0	0	0	721	0.82	$590
Suckers	7	2,434	10,780	3,363	0	300	16,884	0.13	$2,218
Carp	249	3,611	17,326	87	124	5	21,401	0.08	$1,777
Brown bullhead	16,008	13,385	111,992	6,057	4,034	196	151,672	0.30	$45,002
Channel catfish	21	3,083	1,167	781	0	1,089	6,142	0.16	$991
Eel	5,709	52,869	19,062	6,839	119	0	84,598	2.61	$220,446
White perch	110	1,313	8,710	18,490	0	141	28,764	1.39	$39,987
White bass	2	21	487	1,045	0	11	1,567	1.25	$1,956
Rock bass	1,284	4,549	1,987	714	575	979	10,087	0.44	$4,482
Black crappie	161	9,939	3,675	88	192	39	14,094	2.43	$34,296
Sunfish	1,358	17,634	14,061	444	7,026	0	40,522	0.79	$31,968
Yellow perch	2,901	61,944	44,403	38,315	12	1,485	149,061	2.18	$324,533
Walleye	3,041	22,302	126	9,159	0	0	34,629	2.05	$71,154
Freshwater drum	863	22,640	15,980	16,518	0	27	56,028	0.17	$9,324
Total	63,409	678,526	344,227	179,639	12,194	4,273	1,282,268		$1,455,684

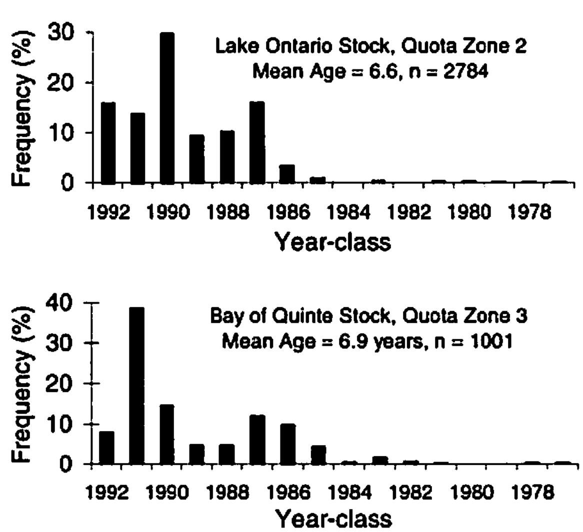

FIG. 2. Lake whitefish age distributions of the 1996 commercial harvest from Quota Zones 2 and 3 (sample size indicated).

this fishery is 4 1/2 inch gillnets. Although this gear results in a highly selective harvest, some observations on year-class strength are apparent (Fig. 2). The 1987 and 1990 were the largest two year-classes observed as young-of-the-year prior to 1994 (Lake Ontario stock, see Chapter 3 in this report), and provided nearly 50% of the 1996 Quota Zone 2 commercial harvest (Fig. 2). The 1994 year-class is strong and will enter this fishery in 1998.

The Quota Zone 3 fishery (October/November) is primarily a trapnet fishery and generally harvests both smaller fish and wider size range of fish than the Quota Zone 2 gillnet fishery. In 1996, the industry imposed a minimum size limit of 19 inches total length to limit the harvest of small fish. In previous years, lake whitefish have entered this fishery at age 3, with age 4 providing the largest component of the fishery. In 1996, age 5 (1991 year-class) was the dominant age-class in the fishery (Fig. 2). Therefore it would appear that the

TABLE 3. Commercial fish harvest (lb) and value ($) for fish species in the Canadian waters of the St. Lawrence River, 1996.

Species	Commercial harvest (lb) by quota zone			Total	Price per lb	Value
	5 (Napanee)	5 (Brockville)	7 (Cornwall)			
Bowfin	1,455	0	0	1,455	0.32	$471
Lake herring	10	0	0	10	1.28	$13
Suckers	1,189	4,029	3,233	8,451	0.64	$5,410
Carp	26,487	6,504	327	33,318	0.02	$512
Brown bullhead	58,373	41,111	42,334	141,818	0.28	$40,220
Channel catfish	678	0	0	678	0.12	$81
Eel	6,831	4,584	30,092	41,507	2.06	$85,490
White perch	9,172	7	0	9,179	0.87	$8,001
White bass	4	0	0	4	0.50	$2
Rock bass	2,437	730	0	3,167	0.48	$1,518
Black crappie	12,625	814	1,263	14,702	1.82	$26,807
Sunfish	76,661	17,304	11,267	105,232	0.64	$66,857
Yellow perch	45,357	33,522	6,604	85,483	1.92	$164,468
Freshwater drum	46	0	0	46	0.13	$6
Total	241,325	108,607	95,120	445,052		$399,856

self-imposed size limit may have had an impact on the age distribution of the harvest. However, the 1991 year-class was very strong when measured as young-of-the-year (Bay of Quinte stock, see Chapter 3 in this report), and this strong year-class could also account for the dominance of 5-yr-old fish in the fishery. The strong 1994 year-class of fish is also strong and will enter the fishery over the next couple of years.

St. Lawrence River

Commercial Harvest Summary

The total harvest of all species was 445,052 lb (Table 3). The total landed value of the harvest was $399,856.

Brown bullhead (141,818 lb), sunfish (105,232 lb), and yellow perch (85,483 lb) accounted for 75% of the total harvest. The most important species in terms of value were yellow perch ($164,468) and eel ($85,490).

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5

Recreational Fisheries

J. A. Hoyle

Overview

Surveys of recreational fisheries are used to monitor trends in fishing effort and catch. They are useful in gathering demographic, socioeconomic, and angler behavioral information valuable in resource management decision making. Fisheries managers rely on recreational fishing survey information to provide information on the status of fish populations, including the detection of changes in fish distribution and abundance and species composition. As such these surveys supplement information from other surveillance programs (see other chapters in this report).

There are two major recreational fisheries in Canadian waters of Lake Ontario: the Bay of Quinte walleye fishery, and the lake and tributary salmonine (salmon and trout) fishery.

Angler surveys have been conducted on the Bay of Quinte periodically since 1957 (Fig. 1). There is an ice fishery (from "ice-on" in December or January to the end of February) and an open-water (first Saturday in May to "ice-on". The ice fishery in the Bay of Quinte has been monitored biennially from 1982 to 1988 and annually since 1988. The open-water fishery has been monitored annually since 1979. Traditionally, walleye make up the bulk of the angling harvest. Fishing pressure was minimal on the Bay of Quinte when walleye populations were very low in the late 1960s and 1970s, and no angling surveys were conducted at that time. With the resurgence of walleye since 1978, a large sport fishery has developed. Results of the 1996 angler surveys on the Bay of Quinte indicated that total walleye angler effort and walleye harvest (1,089,614 rod-hours and 135,131 fish, respectively) were higher than for 1995.

Monitoring of the lake salmonine fishery is centered around western Lake Ontario, launch daily, boat fishery (Fig. 1). Surveys of this fishery began in 1977, and are restricted to anglers who trailer their boats to launch ramps. Early surveys were confined to specific fishing derbies and regions. Annual surveys (April to September, inclusive) were first implemented in 1987. In 1989, this launch daily boat fishery was estimated to represent 25% of the salmonine angling effort in Canadian waters of Lake Ontario and the lower reaches of its tributaries. In 1996, the launch daily boat fishery survey was completed only for the spring season, and the results are not presented here. Other components of the shore- and marina-based fisheries are sampled on an opportunistic basis but none was completed in 1996.

A summary of the 1996 survey results for the Bay of Quinte walleye is presented below.

Bay of Quinte Walleye Fishery

Bay of Quinte recreational angling surveys are conducted annually during the walleye angling season (January 1 to February 28 and first Saturday in May to December 31). Angling effort is measured using aerial counts during ice fishing surveys, and a combination of aerial counts and on-water counts during open-water surveys. On-ice and on-water angler interviews provide information on catch/harvest rates and biological characteristics of the harvest. In 1996, as in most recent years, the on-ice/on-water interviews component of the angler surveys consisted of index surveys based on the geographic (ice fishing survey) or seasonal (open-water survey) patterns of fishing effort and catch/harvest rates observed during full surveys. Full surveys are scheduled every five years. The last full surveys were completed in the summer of 1988, winter 1989, and winter and summer 1993). Ice angler interviews were conducted in areas where most fishing pressure occurred and where ice conditions permit. Results were then extrapolated to represent the whole Bay of Quinte. Open-water angler interviews were conducted in May, June, and July, and the results are extrapolated to represent the entire open-water walleye fishing season. Aerial counts, to estimate total angling effort, are conducted across all geographic areas, and in all seasons, every year. Detailed survey designs are reported by Hoyle (1995, 1996) for on-ice and on-water surveys, respectively.

Ice Fishery

Ice angling effort was estimated to be 459,344 rod-hours (Table 1) up nearly 50% form the previous 5-year average, thanks to excellent ice conditions (Fig. 2). An estimated 58,468 walleye were caught of which 20,972 were harvested (Table 1). Although catches were relatively high, the harvest and the harvest-per-unit-effort (HUE) of 0.078 walleye-per-rod-hour remain considerably lower than the previous 5-year averages (Fig. 3 and Fig. 4). The average walleye harvested during the ice fishery was 487 mm fork length and weighed 1.6 kg—small compared to previous years.

Open-water fishery

Open-water fishing effort was estimated to be 630,270 rod-hours, very similar to the previous 5-year average of just under 611,000 rod-hours (Table 1, Fig. 2). Walleye catch was estimated at 202,611 fish of which 114,159 were harvested. As was the case for the winter ice fishery, the open-water walleye harvest is considerably lower than the previous 5-year average (Fig. 3). Walleye angling success (0.181 walleye harvested-per-rod-hour in 1996) has been declining since 1991. Most of this annual decline in fishing success can be accounted for by the downward trends in the month of May. Counter to the overall angling trends, fishing success in June has increased from 0.128 walleye-per-rod-hour in 1988 to 0.181 in 1993, 0.217 in 1995, and finally to 0.232 in 1996. This increasing trend is likely the result of a decline in the number of alewife, the walleye's major prey, migrating to the Bay of Quinte in June to spawn.

The average walleye harvested during the open-water fishery was 401 mm fork length and weighed 0.8 kg.

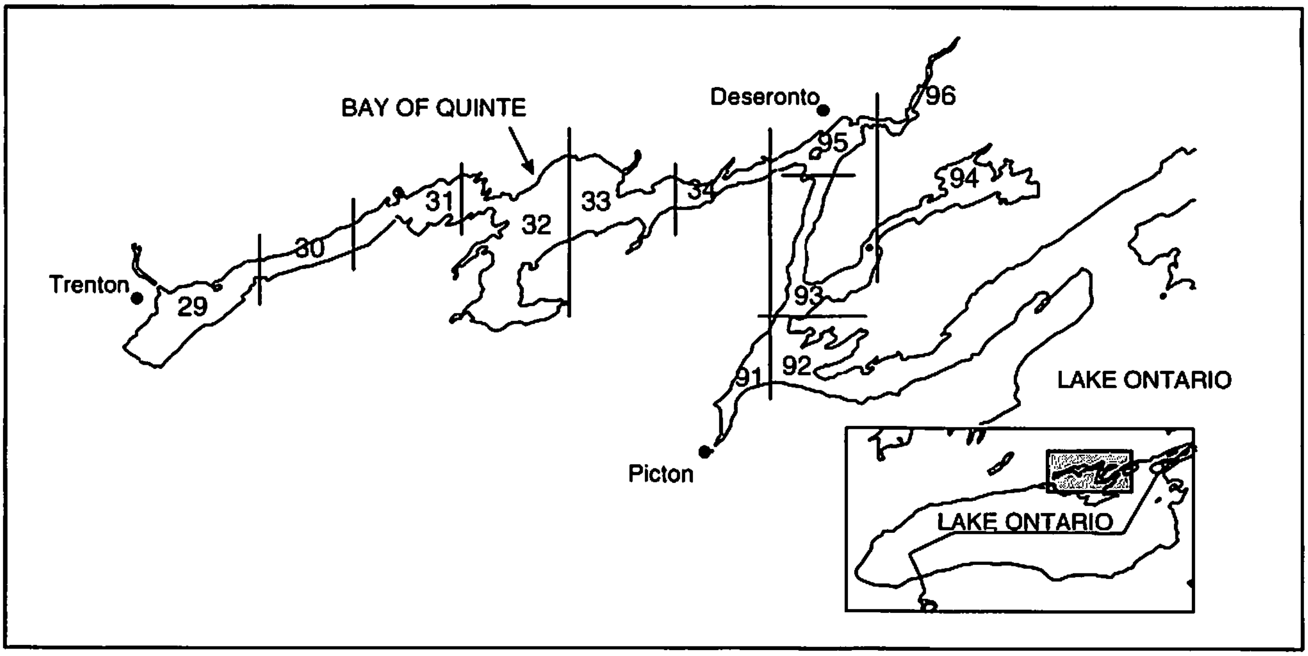

Fig. 1. Map of Bay of Quinte, eastern Lake Ontario, showing creel survey areas.

*TABLE 1. The seasonal distribution of angling effort and walleye catch and harvest for Bay of Quinte ice and open-water recreational fisheries, 1996. *Ice fishing walleye catch and harvest totals represent extrapolations from a partial geographic on-ice survey to the whole Bay of Quinte (note that aerial counts to determine fishing effort encompassed the whole Bay of Quinte), and are based on the geographic distribution of fishing success observed in 1993. **Open-water fishing effort and walleye catch and harvest for the fall season represent an extrapolation based on the seasonal pattern of fishing effort and success observed in 1993 and 1995 (August only).*

Season	Effort (rod-hours)	Catch	Harvest
Ice Fishery:			
Ice fishing total*	459,344	58,468	20,972
Open-water fishery:			
Opening weekend	100,135	11,998	9,175
May	257,712	88,346	52,215
June	90,550	38,936	21,027
July	54,843	40,194	16,985
August**	75,061	17,777	12,558
Fall**	51,969	5,360	2,199
Open-water total	630,270	202,611	114,159
Annual total	1,089,614	261,079	135,131

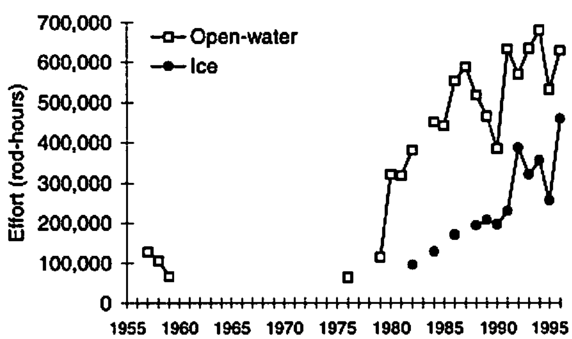

FIG. 2. Angling effort during the Bay of Quinte ice and open-water recreational fisheries, 1957 to 1996.

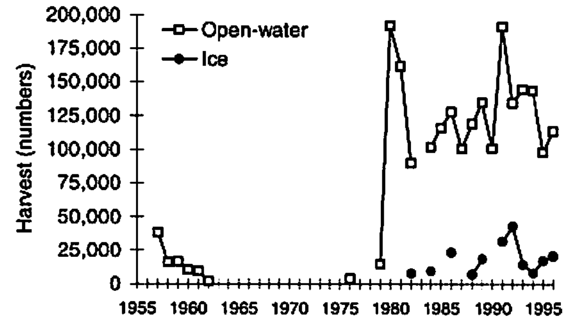

FIG. 3. Walleye harvest during the Bay of Quinte ice and open-water recreational fisheries, 1957 to 1996.

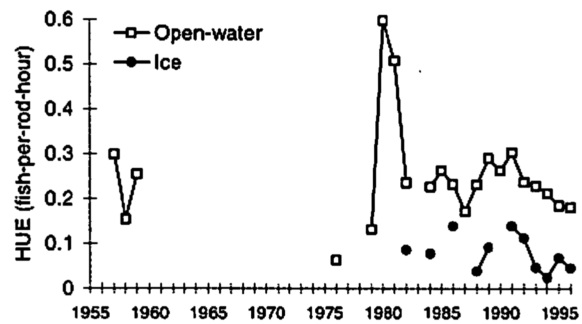

FIG. 4. Walleye harvest-per-unit-effort (HUE) during the Bay of Quinte ice and open-water recreational fisheries, 1957 to

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Appendices

Atlantic salmon stocked in the Province of Ontario waters of Lake Ontario, 1996.

Waterbody Name	Site Name	Month Stocked	Year Spawned	Hatchery/Source	Strain/Egg Source	Age (months)	Mean Wt. (g)	Marks	Number Stocked
ATLANTIC SALMON - EARLY FRY									
Bronte Cr.	Brontelow	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.2	None	7,600
Cobourg Cr.	Baltimore Hickerson	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.1	None	2,600
Credit R.	Silver Ed.Centre	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.2	None	8,000
Duffin Creek	Du6thCon	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.2	None	4,500
Ganaraska River	Cahydro	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.2	None	3,400
Wilmot Creek	Wm4thCon	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.2	None	10,000
	WmHwy2	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.2	None	3,500
	WmPisany	4	1995	White Lake/Normandale	LeHave/Normandale	4	0.1	None	5,600
WILMOT CREEK TOTAL									19,100
ATLANTIC SALMON - ADVANCED FRY									
Bowmanville Cr.	W. Bowmanville Ennisk	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	4,000
Credit River	Belfountain	5	1995	Ringwood/Normandale	LeHave/Normandale	5	0.82	None	10,540
	Black Cr. Scout Camp	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.44	None	5,990
	Black Limehouse	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	6,400
	Forks West Credit	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.63	None	19,004
CREDIT RIVER TOTAL									41,934
Duffin Creek	DuHwy7	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	3,300
Ganaraska River	Ca7thCon	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	6,100
	CaCascades	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	6,000
	Canomansl	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	4,000
GANARASKA RIVER TOTAL									16,100
Wilmot Creek	Wm35/115	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	8,000
	Wm5thCon	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	3,200
	WmNursbr	4	1995	Ringwood/Normandale	LeHave/Normandale	4	0.45	None	4,500
WILMOT CREEK TOTAL									15,700
ATLANTIC SALMON - FALL FINGERLINGS									
Credit River	Boston Mills Road	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	412
	Glen Williams	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	724
	Glen Williams B.	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	362
	Glen Williams C.	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	362
	Mississauga Rd.	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	362
	Terra Cotta Bridge	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	724
	Terra Cotta Winston	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	724
	Terra Cotta Inn	11	1995	Normandale	LeHave/Normandale	10	8.9	Ad	724
CREDIT RIVER TOTAL									4,394
TOTAL ATLANTIC SALMON EARLY FRY									45,200
TOTAL ATLANTIC SALMON ADVANCED FRY									81,034
TOTAL ATLANTIC SALMON FALL FINGERLINGS									4,394
TOTAL ATLANTIC SALMON									130,628

Brown trout stocked in the Province of Ontario Waters of Lake Ontario, 1996.

Waterbody Name	Site Name	Month Stocked	Year Spawned	Hatchery/ Source	Strain/Egg Source	Age	Mean Wt. (g)	Marks	Number Stocked
BROWN TROUT - FALL FINGERLINGS									
Lake Ontario	Port Dalhousie	12	1995	Normandale	Ganaraska/Normandale	10	8.2	Ad	22,317
Lake Ontario	Bluffer's Park	10	1995	Harwood	Ganaraska/Normandale	11	14.4	Ad	56,971
BROWN TROUT - YEARLINGS									
Bronte Cr.	Bronte Beach Park	4	1994	Harwood	Ganaraska/Normandale	17	43.6	RV	16,601
Duffin Cr.	Rotary Park	4	1994	White Lake	Ganaraska/Normandale	16	26.8	RV	15,921
Mimico Creek	Humber Bay Park West	4	1994	Harwood	Ganaraska/Normandale	17	44.9	RV	16,546
Lake Ontario	Ashbridge's Bay Ramp	4	1994	Harwood	Ganaraska/Normandale	17	43.6	RV	15,002
	Bluffer's Park	4	1994	Harwood	Ganaraska/Normandale	17	49.4	AdRV	4,890
	Burlington Canal	4	1994	Harwood	Ganaraska/Normandale	17	42.2	RV	15,252
	Collins Bay	4	1994	White Lake	Ganaraska/Normandale	16	26.8	RV	15,920
	Fifty Point CA	4	1994	Harwood	Ganaraska/Normandale	17	42.8	RV	15,211
	Millhaven	4	1994	White Lake	Ganaraska/Normandale	16	26.8	RV	15,920
	Port Dalhousie	3	1994	Ringwood	Ganaraska/Normandale	14	37.6	RV	45,206
LAKE ONTARIO TOTAL									127,401
TOTAL BROWN TROUT FINGERLINGS									79,288
TOTAL BROWN TROUT YEARLINGS									176,469
TOTAL BROWN TROUT									255,757

Chinook salmon stocked in the Province of Ontario Waters of Lake Ontario, 1996.

Waterbody Name	Site Name	Month Stocked	Year Spawned	Hatchery/Source	Strain/Egg Source	Age (Months)	Mean Wt. (g)	Marks	Number Stocked
CHINOOK SALMON - SPRING FINGERLINGS									
Bowmanville Creek	CLOCA Ramp	4	1995	Ringwood	Lake Ontario	5	3.9	None	24,927
Bronte Creek	2nd Side Rd Bridge	4	1995	Ringwood	Lake Ontario	5	4	None	24,134
Cobourg Creek	South of King St	4	1995	Ringwood	Lake Ontario	5	3.9	None	24,927
	South of King St	4	1995	S. S. Fleming Coll.	Lake Ontario	7	4.9	None	3,116
COBOURG CREEK TOTAL									28,043
Credit River	Eldorado Park	4	1995	Ringwood	Lake Ontario	5	3.9	None	48,308
	Norval	4	1995	Ringwood	Lake Ontario	5	3.7	None	49,733
CREDIT RIVER TOTAL									98,041
Lake Ontario	Barcovan Beach	4	1995	Ringwood	Lake Ontario	5	3.7	None	14,939
	Bluffer's Park	4	1995	Ringwood	Lake Ontario	5	3.8	None	49,544
	Burlington Canal	4	1995	Ringwood	Lake Ontario	5	3.7	None	49,874
	Port Dalhousie East	4	1995	Ringwood	Lake Ontario	5	3.6	None	99,540
	Wellington Channel	4	1995	Ringwood	Lake Ontario	5	3.7	None	24,899
	Whitby Harbour	4	1995	Ringwood	Lake Ontario	5	4	None	24,132
LAKE ONTARIO TOTAL									262,928
TOTAL CHINOOK SALMON									438,073

Lake trout stocked in the Province of Ontario waters of Lake Ontario, 1996.

Waterbody Name	Site Name	Month Stocked	Year Spawned	Hatchery/Source	Strain/Egg Source	Age (months)	Mean Wt. (g)	Marks	Number Stocked
LAKE TROUT FALL FINGERLINGS									
Lake Ontario	Cobourg Harbour Pier	10	1995	Harwood	Slate Island/Hills Lake	11	8.4	RV	23,479
	Cobourg Harbour Pier	10	1995	Harwood	Mishibishu/Tarentorous	11	12.7	RV	10,969
COBOURG HARBOUR TOTAL									34,448
LAKE TROUT - YEARLINGS									
Lake Ontario	Cobourg Harbour Pier	4	1994	Harwood	Slate Island/Dorion	17	29.0	AdCWT	123,767
Lake Ontario	N of Main Duck Sill	4	1994	Harwood	Michipicoten/Dorion	18	30.0	AdCWT	110,449
	N of Main Duck Sill	4	1994	Harwood	Seneca/Normandale	17	36.9	AdCWT	16,051
	N of Main Duck Sill	4	1994	Harwood	Mishibishu/Tarentorous	18	30.5	AdCWT	33,706
NORTH OF MAIN DUCK SILL TOTAL									160,206
Lake Ontario	S of Long Point	4	1994	Harwood	Michipicoten/Dorion	18	29.8	AdCWT	36,656
	S of Long Point	5	1994	Harwood	Mishibishu/Tarentorous	19	37.0	AdCWT	38,223
	S of Long Point	5	1994	Harwood	Michipicoten/Dorion	19	32.3	AdCWT	4,969
	S of Long Point	5	1994	Harwood	Slate/Dorion	18	34	AdCWT	43,718
SOUTH OF LONG POINT TOTAL									123,566
Lake Ontario	Scotch Bonnet Shoal	5	1994	Harwood	Seneca	18	42.1	AdCWT	14,911
	Scotch Bonnet Shoal	5	1994	Harwood	Slate Island/Dorion	18	38.6	AdCWT	42,359
SCOTCH BONNET SHOAL TOTAL									57,270
TOTAL LAKE TROUT FALL FINGERLINGS									34,448
TOTAL LAKE TROUT YEARLINGS									464,809
TOTAL LAKE TROUT									499,257

Rainbow trout stocked in the Province of Ontario waters of Lake Ontario, 1996.

Waterbody Name	Site Name	Month Stocked	Year Spawned	Hatchery/Source	Strain/Egg Source	Age Months	Mean Wt. (g)	Marks	Number Stocked
RAINBOW TROUT - FALL FINGERLINGS									
Bronte Cr.	5th Sideroad	10	1996	Normandale	Ganaraska/Normandale	5	3.7	Ad	10,000
	Lowville	10	1996	Normandale	Ganaraska/Normandale	5	3.7	Ad	10,000
	Lowville	11	1996	Blue Jay Creek	Ganaraska/Normandale	7	4.5	Ad	10,209
BRONTE CREEK TOTAL									30,209
Credit R.	Huttonville	11	1996	Normandale	Ganaraska/Normandale	6	3.1	Ad	10,000
	Norval	11	1996	Normandale	Ganaraska/Normandale	6	3.1	Ad	10,322
	Norval	11	1996	Blue Jay Creek	Ganaraska/Normandale	7	4.5	Ad	9,873
CREDIT RIVER TOTAL									30,195
Humber R.	E Branch Mill	10	1996	Normandale	Ganaraska/Normandale	5	3.7	Ad	5,000
	King Vaughan Line	10	1996	Normandale	Ganaraska/Normandale	5	3.7	Ad	9,800
HUMBER RIVER TOTAL									14,800
Rouge R.	Berczy Creek	10	1996	White Lake	Ganaraska/Normandale	7	7.5	Ad	5,250
	Bruce Creek	11	1996	Normandale	Ganaraska/Normandale	6	3.1	Ad	15,082
	Silver Springs Farm	10	1996	White Lake	Ganaraska/Normandale	7	7.5	Ad	5,250
ROUGE RIVER TOTAL									25,582
Ontario, L.	Port Dalhousie	10	1996	Normandale	Ganaraska/Normandale	5	3.7	Ad	20,108
RAINBOW TROUT - YEARLINGS									
Bronte Cr.	5th Sideroad	4	1995	Normandale	Ganaraska/Normandale	13	14.9	RV	10,000
	Lowville	4	1995	Normandale	Ganaraska/Normandale	13	15.3	RV	10,000
BRONTE CREEK TOTAL									20,000
Credit R.	Huttonville	4	1995	Normandale	Ganaraska/Normandale	13	15.3	RV	10,000
	Norval	4	1995	Normandale	Ganaraska/Normandale	13	15.3	RV	10,000
CREDIT RIVER TOTAL									20,000
Humber R.	E Branch Mill	4	1995	Normandale	Ganaraska/Normandale	13	16.0	RV	10,000
	King Vaughan Line	4	1995	Normandale	Ganaraska/Normandale	13	14.9	RV	10,000
HUMBER RIVER TOTAL									20,000
Rouge R.	Berczy Creek	4	1995	Normandale	Ganaraska/Normandale	13	16.0	RV	5,000
	Bruce Creek	5	1995	Normandale	Ganaraska/Normandale	14	16.0	RV	5,000
	Silver Springs Farm	4	1995	Normandale	Ganaraska/Normandale	13	16.0	RV	5,000
ROUGE RIVER TOTAL									
Ontario, L.	Port Dalhousie	4	1995	Normandale	Ganaraska/Normandale	13	14.9	RV	20,000
TOTAL RAINBOW TROUT FALL FINGERLINGS									120,894
TOTAL RAINBOW TROUT YEARLINGS									95,000
TOTAL RAINBOW TROUT									215,894

Walleye stocked in the Province of Ontario Waters of Lake Ontario, 1996.

Waterbody Name	Site Name	Month Stocked	Year Spawned	Hatchery/Source	Strain/Egg Source	Age (Months)	Mean Wt. (g)	Marks	Number Stocked
WALLEYE - FRY									
Napanee River	Springside Park	5	1996	White Lake	Napanee River	1	-	-	528,220
TOTAL WALLEYE									528,220

Species-specific catch-per-standard gillnet lift, Northeast Lake Ontario, 1996.

Species / Depth (m)	Brighton					Middle Ground	Rocky Point					Wellington				
	8	13	18	23	28	5	8	13	18	23	28	8	13	18	23	28
Longnose gar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alewife	98	109	750	884	163	0	2145	640	739	2735	1165	54	286	87	463	507
Gizzard shad	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0
Chinook salmon	0	0	0	3	0	0	0	0	0	0	0	0	11	25	0	0
Atlantic salmon	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
Lake trout	0	3	3	16	77	0	65	33	43	16	109	0	0	16	16	30
Lake whitefish	0	0	0	0	7	0	0	0	3	16	3	0	0	0	0	13
Lake herring	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Round whitefish	0	0	3	13	20	0	0	0	0	0	0	0	0	0	0	0
Smelt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern pike	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
White sucker	0	3	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Carp	0	10	0	0	0	7	0	0	0	0	0	0	0	0	0	0
Brown bullhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Channel catfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burbot	0	0	0	0	0	0	0	0	0	16	7	0	0	3	0	23
White perch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock bass	36	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Pumpkinseed sunfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bluegill sunfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Yellow perch	474	215	3	0	0	129	0	0	0	0	0	288	93	11	49	0
Walleye	3	3	0	0	0	50	0	3	0	3	0	7	7	0	0	0
Freshwater drum	10	0	0	0	0	13	0	0	0	0	0	0	30	0	0	0

Species-specific catch-per-standard gillnet lift, Outlet Basin Lake Ontario, 1996.

	Eastern Basin		Flatt Point					Grape Island					Melville Shoal				
Species / Depth (m)	30 (02)	30 (06)	8	13	18	23	28	8	13	18	23	28	8	13	18	23	28
Longnose gar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alewife	73	76	1217	54	22	76	174	391	22	152	0	50	1727	1036	808	1267	402
Gizzard shad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinook salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic salmon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake trout	140	170	53	43	161	105	112	26	26	77	72	79	3	0	7	16	95
Lake whitefish	35	25	0	0	63	47	7	13	0	13	0	20	0	0	0	60	17
Lake herring	2	0	0	0	0	3	0	0	0	0	3	7	0	0	0	0	0
Round whitefish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smelt	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern pike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
White sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown bullhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Channel catfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burbot	1	0	0	0	3	0	0	0	0	3	0	0	3	3	0	0	0
White perch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock bass	0	0	0	0	0	0	0	7	0	0	0	0	0	0	3	0	0
Pumpkinseed sunfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bluegill sunfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow perch	0	0	16	138	7	0	0	76	61	0	0	0	63	216	193	74	0
Walleye	0	0	0	0	0	0	0	3	3	0	0	0	66	13	10	0	0
Freshwater drum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species-specific catch-per-standard gillnet lift, Bay of Quinte, 1996.

	Big Bay	Hay Bay		Conway			
Species / Depth (m)	5	8	13	8	13	20	30
Longnose gar	5	0	0	0	0	0	0
Alewife	5	53	10	123	387	12	10
Gizzard shad	3	0	0	0	0	0	0
Chinook salmon	0	0	0	0	0	0	0
Atlantic salmon	0	0	0	0	0	0	0
Lake trout	0	0	5	0	0	30	72
Lake whitefish	0	0	0	0	0	0	43
Lake herring	0	25	51	0	0	0	0
Round whitefish	0	0	0	0	0	0	0
Smelt	0	0	0	0	0	0	0
Northern pike	3	10	5	0	0	0	0
White sucker	48	43	48	23	15	7	0
Carp	0	0	0	0	0	0	0
Brown bullhead	20	0	0	0	0	0	0
Channel catfish	2	0	0	0	0	0	0
Burbot	0	0	0	0	0	0	0
White perch	225	54	0	2	0	0	0
Rock bass	3	0	0	18	5	0	0
Pumpkinseed sunfish	13	0	0	0	0	0	0
Bluegill sunfish	2	0	0	0	0	0	0
Smallmouth bass	8	0	0	5	2	0	0
Yellow perch	1130	857	336	605	831	56	18
Walleye	112	30	8	191	74	3	3
Freshwater drum	140	8	0	5	0	0	0

Species-specific catch-per-trawl, Bay of Quinte and Outlet Basin Lake Ontario, 1996.

	Bay of Quinte						Outlet Basin		
	Trenton	Belleville	Big Bay	Deseronto	Hay Bay	Conway	EB02	EB03	EB06
Alewife	14	32	2	39	19	83	45	447	16
Gizzard shad	24	0	39	151	2	0	0	0	0
Lake trout	0	0	0	0	0	0	0	1	0
Lake whitefish	0	0	0	0	0	7	7	4	3
Rainbow smelt	0	0	0	0	0	105	352	170	662
Northern pike	0	0	0	0	1	0	0	0	0
White sucker	2	3	5	2	1	2	0	0	0
Carp	0	0	0	0	0	0	0	0	0
Spottail shiner	55	49	4	7	78	0	0	0	0
Brown bullhead	25	9	22	44	1	0	0	0	0
Channel catfish	0	0	0	0	0	0	0	0	0
Eel	0	0	1	1	2	0	0	0	0
Threespine stickleback	0	0	0	0	0	0	1	4	0
Trout-perch	29	119	27	10	250	147	6	106	1
White perch	322	714	1311	88	6	0	0	0	0
White bass	0	1	3	0	0	0	0	0	0
Rock bass	3	0	0	0	0	0	0	0	0
Pumpkinseed sunfish	79	10	15	33	0	0	0	0	0
Bluegill sunfish	1	0	0	0	0	0	0	0	0
Smallmouth bass	1	1	0	1	0	0	0	0	0
Largemouth bass	1	0	0	0	0	0	0	0	0
Black crappie	1	0	1	0	0	0	0	0	0
Yellow perch	123	191	63	224	145	3	0	0	0
Walleye	9	11	15	12	2	2	0	0	0
Johnny darter	9	6	0	0	1	1	0	0	0
Logperch	6	2	0	2	0	0	0	0	0
Freshwater drum	9	28	7	21	2	0	0	0	0
Slimy sculpin	0	0	0	0	0	0	3	2	0

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