LAKE ONTARIO FISH COMMUNITIES AND FISHERIES:

2004 ANNUAL REPORT OF THE LAKE ONTARIO MANAGEMENT UNIT

LAKE ONTARIO FISH COMMUNITIES AND FISHERIES:

2004 ANNUAL REPORT OF THE LAKE ONTARIO MANAGEMENT UNIT

Prepared for the
Lake Ontario Committee Meeting
Great Lakes Fishery Commission
Niagara Falls, Ontario
March 29-30, 2005

Printed in Picton, Ontario, Canada

March 2005

Report ISSN 1201-8449

Please cite this report as follows:
Ontario Ministry of Natural Resources. 2005. Lake Ontario Fish Communities and Fisheries: 2004 Annual Report of the Lake Ontario Management Unit. Ontario Ministry of Natural Resources, Picton, Ontario, Canada.

Report available on the following website:
http://www.glfc.org/lakecom/loc/mgmt_unit/index.html

TABLE OF CONTENTS

Lake Ontario Fish Communities and Fisheries: 2004 Annual Report of the Lake Ontario Management Unit

Foreword

Since 1997, the Lake Ontario Management Unit (LOMU) has operated as a Section within the Fish and Wildlife Branch of the Ontario Ministry of Natural Resources (OMNR). Beginning in 2005, LOMU will become a section of a newly formed Great Lakes Branch of OMNR.

Since 1990, MNR has been developing and updating its strategic directions every five years. Our last update, Beyond 2000, came out in that year. On February 7, 2005 OMNR released its new strategic directions, Our Sustainable Future. The new document reaffirms our vision of sustainable development and our mission of ecological sustainability, and it provides clear examples to illustrate these terms. In addition, the document provides some new areas of focus for OMNR. One of these is a formal Commitment to the Conservation of Biodiversity. Biodiversity is an essential factor for healthy, sustainable ecosystems which makes it a vital focus for our mission of ecological sustainability, and thus all that we do in MNR.

The LOMU works to achieve ecological sustainability on Lake Ontario, the St. Lawrence River and the Niagara River by implementing annual aquatic ecosystem and fisheries assessment, enforcement and management activities through a variety of delivery mechanisms. Partnerships and inter-agency collaboration have been key to ensuring effective and efficient implementation. The Unit also provides a Great Lakes Coordination function at the Peterborough office.

The LOMU coordinates and delivers projects that support the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA) in Lake Ontario and the upper St. Lawrence River. These projects focus on the Lake Ontario LaMP and the 'Areas of Concern' identified in the Great Lakes Water Quality Agreement. COA provides dedicated funding to support Ontario's efforts to protect biodiversity, restore fish and wildlife beneficial uses, and gain new understanding and knowledge about the ecological health in the Great Lakes ecosystem. The scale and diversity of challenges facing the Great Lakes environment requires a commitment to a delivery model based on collaboration, stewardship and partnership. A total of 38 COA projects in Lake Ontario and the St. Lawrence River were coordinated by the LOMU during 2004-05. Projects that LOMU delivered during 2004-05 included:

- Bay of Quinte nearshore fish community monitoring
- Walleye population estimation
- Development of a fish habitat management strategy for the Bay of Quinte
- Development of a fisheries management plan for Hamilton Harbour
- Offshore food web monitoring and modeling
- Surveillance of Asian carp in Toronto Fish Markets
- Round goby monitoring and impact assessment program in Bay of Quinte
- Atlantic salmon rehabilitation program
- Research that will contribute to lake whitefish rehabilitation
- Habitat evaluation in Lake Ontario tributaries and monitoring of tributary use by migratory salmonids
- Development of a monitoring program for the fish community of the nearshore areas of Lake Ontario adjacent to Hamilton Harbour and Toronto waterfront
- Development of a fisheries management plan for Lake St. Francis

- Development of a restoration plan for sturgeon in Lake St. Francis
- Monitoring of fish community status in Lake St. Francis

The Province of Ontario and New York State share the responsibility of managing the fish communities and fisheries. The Ministry of Natural Resources works collaboratively with numerous agencies both in Canada and the US to ensure the fish communities, fisheries and aquatic ecosystems of Lake Ontario and the St. Lawrence River are managed on sustainable basis. International cooperation is essential to the health of the Lake Ontario, Niagara and St. Lawrence River ecosystems and to the sustainable management of their fisheries. LOMU staff work closely with numerous Canadian and US agencies within the international committee structures of the Great Lakes Fishery Commission and International Joint Commission.

Preventing invasions of non-native species, controlling the spread of fish disease and restoring native species within these waterbodies are all matters of concern and priority for both New York and Ontario. Bi-national cooperation in fishery management for Lake Ontario is formalized within the GLFC Lake Ontario Committee (LOC). The OMNR Lake Ontario Manager is Chair of the LOC on a rotational basis with his/her counterpart from the New York State Department of Environmental Conservation (NYSDEC). In 2004, Steve LaPan from the NYSDEC was the LOC chair.

In 2004, LOMU became an official member of the Lake Ontario Lakewide Management Plan (LaMP) formed under the auspices of the Great Lakes Water Quality Agreement. Thus, LOMU is an active participant in the planning and implementation of annual work plans for Lake Ontario and in contributing to annual reports on progress within the LaMP. There are five Areas of Concern (AOC) on the Canadian shores of Lake Ontario and SLR, and LOMU staff participate actively in developing and implementing Remedial Action Plans for each AOC. In addition, LOMU staff played a significant role at the IJC State of the Lake Ecosystem Conference (SOLEC) in the fall of 2004.

This Annual Report provides a synopsis of the activities of LOMU supported by base and COA funding envelopes, and reports results on 2004 assessment and management projects. The report describes in detail the field programs, results and observations of the 2004 assessment program. In addition, the report summarizes enforcement and management activities, and provides brief abstracts of research activities that involve unit staff and resources.

The LOMU recognizes its many partners and sources of funding for special projects including OMNR Research, the Great Lakes Fishery Commission, Department of Fisheries and Oceans, the International Joint Commission and the Canada Ontario Agreement.

We are pleased to share the important information about the activities and findings of the Lake Ontario Management Unit from 2004.

Rob MacGregor
Lake Ontario Manager
705-755-1798

For more detailed information or copies of this report please contact:

Lake Ontario Management Unit
Ontario Ministry of Natural Resources
R.R. #4, 41 Hatchery Lane
Picton, Ontario K0K 2T0
Canada

Telephone: (613) 476-2400
FAX: (613) 476-7131
E-mail: linda.blake@mnr.gov.on.ca

1. Status of Major Species

The following is an overview of the status of major species in Ontario waters of Lake Ontario for 2004. The overview draws largely upon information presented in the chapters and sections that follow in this report.

1.1. Chinook Salmon

Catch rates in the boat angling fishery (see Section 3.1) indicated that Chinook salmon abundance in Lake Ontario was relatively stable from 1988-2004, despite stocking reductions in 1993 (see Section 8.1). Natural reproduction (see Section 2.5) and density dependent survival of young Chinook salmon may have contributed to the stability of these catch rates. Preliminary estimates of the origin of Chinook salmon in Lake Ontario suggest that 50% or more of the Chinook salmon entering Lake Ontario from 1998-2000 were wild, as opposed to stocked (see Section 9.2). Chinook salmon growth is difficult to assess because trends in length-at-age of fish in the Lake Ontario boat angler fishery and the Credit River spawning run are different (see Section 3.1). Nevertheless, further decline in the weight of Credit River spawning fish (see Section 2.9) raises questions regarding the adequacy of the prey fish community to support this top predator.

1.2. Rainbow Trout

Ganaraska River rainbow trout originate from wild reproduction. Rainbow trout counts at the fishway remained low in 2004 (see Section 2.1). The trend in counts at this fishway may indicate that wild adult returns to other Ontario tributaries are also low. The long-term rainbow trout harvest rate trend in the Lake Ontario boat fishery (see Section 3.1) is similar to the count trend at the Ganaraska fishway. Recent year-to-year variation in rainbow trout harvest rates appears to be related to spring temperature. The low rainbow trout harvest rate in 2004 was consistent with the low average air temperature in April 2004. Condition of rainbow trout in the Ganaraska River in 2004 remained similar to the long term average (see Section 2.1).

1.3. Lake Trout

The decline in survival of stocked fish has ceased in recent years, and it appears that the population of mature fish is about to stabilize, albeit at levels much lower than observed in the early 1990s. The condition of mature fish is relatively low, and the lamprey wounding rates are low and stable over the past decade (see Section 2.3).

1.4 Lake Whitefish

The abundance of lake whitefish age-1 and older remains low relative to that of the 1990s (see Section 2.3). The preponderance of old fish, comprised of many year-classes produced in the late-1980s and early 1990s, caught in assessment (see Section 2.3) and commercial gear (see Section 4.2) suggests that mortality of adult fish was not excessive but that recent recruitment levels were low. A strong year-class was produced in 2003 (see Section 2.4) yet fish from this year-class did not recruit to assessment gillnets in 2004 and only small numbers were caught in assessment bottom trawls. Catches of age-0 fish in assessment bottom trawls suggested that a very poor 2004 year-class was produced in the Bay of Quinte and a small to moderate-sized one was produced in Lake Ontario (see Section 2.4). The commercial lake whitefish fishery has declined significantly in recent years (see Section 4.1).

1.5 American Eel

The number of eel migrating upstream at the ladder, located at the R.H. Saunders Hydroelectric Dam on the St. Lawrence River, remains at a very low level (see Section 2.2). During April 2004, commercial eel quotas in Lake Ontario and the upper St. Lawrence River were set to zero, and regulations were amended to close the eel sport fishery in the Province of Ontario. Both actions were taken in response to the declining abundance of eel. Even with the closure of the commercial and sport fisheries, the abundance of large eel in the Lake Ontario/upper St. Lawrence River ecosystem is expected to remain low for the next decade as a result of the low rate of upstream migration. Ontario is continuing to work with management agencies in other jurisdictions, and

other stakeholders, including Ontario Power Generation, to encourage the safe passage of eels around hydro dams (see Section 8.3). Sustainable management practices throughout the range of this panmictic species (Labrador to the Caribbean) will be required to restore eel abundance.

1.6 Smallmouth Bass

The eastern Lake Ontario smallmouth bass population remains at low but stable abundance (see Section 2.3). Prior to the mid-1990s, the influence of summer water temperature on year-class strength was the major factor driving smallmouth bass abundance in eastern Lake Ontario. Since the mid-1990s, continued low abundance is not consistent with trends in summer water temperatures—another factor(s) must be exerting greater influence. In the Bay of Quinte, smallmouth bass abundance is low relative to other species (see Sections 2.3 and 2.7). In the St. Lawrence River, smallmouth abundance is currently slightly below the 20-yr average. Over the past ten years, smallmouth bass abundance has fluctuated considerably (see Section 2.8).

1.7 Largemouth Bass

Largemouth bass abundance increased in recent years in the Bay of Quinte; their abundance now rivals that of walleye in littoral zone areas during summer (see Section 2.7). A recreational fishery (see Section 3.2), including increased tournament angling, targeting largemouth bass has developed over the last several years.

1.8 Panfish

Panfish, particularly pumpkinseed, bluegill and black crappie, increased dramatically during the late-1990s in the Bay of Quinte (see Section 2.3). Most recently, their abundance appears to have peaked and possibly declined somewhat (see Section 2.7).

1.9 Yellow Perch

Yellow perch abundance was slightly higher this year in some areas of eastern Lake Ontario. In the Bay of Quinte, abundance is relatively high but declining (see Sections 2.3 and 2.7). Age-0 catches in Bay of Quinte bottom trawls were low suggesting a poor 2004 year-class (see Section 2.4). The commercial harvest of yellow perch has declined since the late-1990s (see Section 4.1).

In the St. Lawrence River, yellow perch are still dominant in the fish community; however, abundance has declined since the late-1980s (see Section 2.8). The decline was particularly precipitous for large yellow perch. Although the abundance of large perch remained low in 2004, it did increase marginally relative to 2002 estimates.

1.10 Walleye

While abundance remains considerably lower than during the early 1990s, the walleye population (e.g., age-3 and older; Fig. 1.10.1) has now been relatively stable since 2001. Recruitment indices (see Section 2.3, 2.4 and 2.7) indicate that a weak year-class was produced in 2002, a strong year-class was produced in 2003 and a moderate year-class was produced in 2004. Based on these three year-classes, and assuming no drastic change in the mortality of older fish, the population of age-3 and older fish will continue to hover around 400,000 fish until at least 2007 (Fig. 1.10.1).

Age-3 walleye represented the bulk of the Bay of Quinte recreational fishery in 2004 (see Section 3.2). This 2001 year-class will “grow” into the restricted slot-size in 2005. Age-3 fish will be uncommon in the 2005 recreational fishery but the strong 2003 year-class (age-2 fish) should be plentiful.

1.11 Prey Fish

The 2004 population estimates for alewife and smelt have not been completed.

1.12 Invasive Species

The distribution of the round goby in the Canadian waters of Lake Ontario in 2004 remained very similar to previous years. High densities of goby are observed in western Lake Ontario between the Niagara River and Hamilton, and in eastern Lake Ontario west of Brighton, including the Bay of Quinte. Limited anecdotal information suggests that goby are less common in the Toronto area, and no sightings have been reported from central Lake Ontario (Oshawa to Brighton).

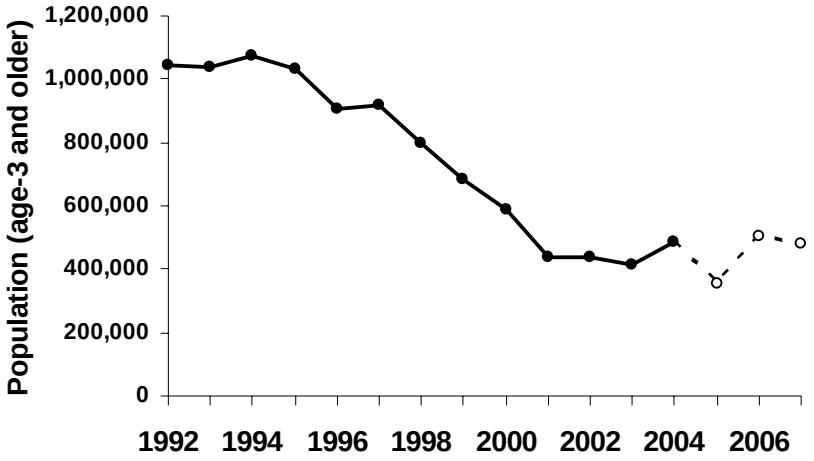

FIG. 1.10.1. Eastern Lake Ontario and Bay of Quinte walleye population (age-3 and older), 1992-2004, and projected population to 2007.

2. Index Fishing Projects

2.1 Ganaraska Fishway Rainbow Trout Assessment

The fishway on the Ganaraska River at Port Hope has been in operation since 1974. Rainbow trout are counted and sampled for length, weight and age during the spring spawning run (Fig. 2.1.1). In 2004, the spring run was estimated at 5,308 rainbow trout (Table. 2.1.1).

The body condition of rainbow trout in Lake Ontario was determined as the estimated weight of a 635 mm (25 in) fish at the Ganaraska River. In 2004, this weight was 3,037 g and 3,193 g for males and females, respectively. These weights are similar to the long term average for the study (Table 2.1.2).

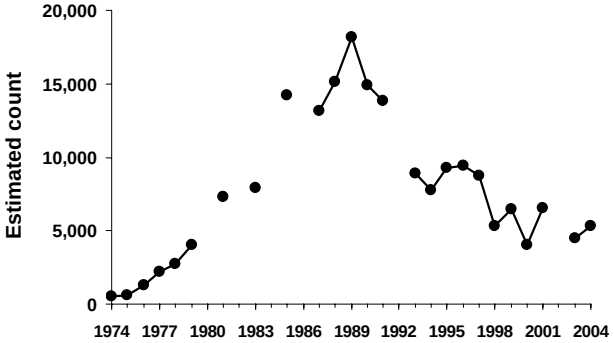

FIG. 2.1.1. Estimated upstream counts of rainbow trout at the Ganaraska River fishway, Port Hope, Ontario during April and May, 1974-2004.

TABLE 2.1.1 Observed and estimated upstream counts of rainbow trout at the Ganaraska River fishway at Port Hope, Ontario during April and May, 1974-2004.

	Upstream count	
Year	Observed	Estimated
1974	527	527
1975	591	591
1976	1,281	1,281
1977	2,237	2,237
1978	2,724	2,724
1979	4,004	4,004
1980		
1981	7,306	7,306
1982		
1983	7,907	7,907
1984		
1985	14,188	14,188
1986		
1987	10,603	13,144
1988	10,983	15,154
1989	13,121	18,169
1990	10,184	14,888
1991	9,366	13,804
1992		
1993	7,233	8,860
1994	6,249	7,749
1995	7,859	9,262
1996	8,084	9,454
1997	7,696	8,768
1998	3,808	5,288
1999	5,706	6,442
2000	3,382	4,050
2001	5,365	6,527
2002		
2003	3,897	4,494
2004	4,452	5,308

TABLE 2.1.2. Estimated weight of a 635 mm (25 in) rainbow trout at the Ganaraska River fishway at Port Hope, Ontario during April, 1974-2004.

	Male		Female	
Year	Sample size	Weight (g)	Sample size	Weight (g)
1974	173	3,066	231	3,210
1975	183	2,968	279	3,067
1976	411	3,169	588	3,324
1977	635	2,975	979	3,164
1978	255	3,181	512	3,340
1979	344	3,219	626	3,335
1981	252	3,174	468	3,359
1983	308	2,878	132	3,033
1985	410	3,170	154	3,205
1987	66	2,642	74	3,046
1990	259	2,868	197	3,071
1991	126	2,850	289	3,086
1992	138	2,997	165	3,113
1993	84	2,952	166	3,135
1994	109	3,246	178	3,356
1995	147	2,987	155	3,061
1997	140	3,144	127	3,270
1998	96	3,034	222	3,195
1999	173	3,062	290	3,226
2000	121	3,120	226	3,242
2001	295	2,919	290	3,041
2003	92	3,034	144	3,152
2004	139	3,037	242	3,193
Average		3,030		3,184

The repeat spawner rate is an estimate of survival for Ganaraska rainbow trout (Table 2.1.3). The survival of Ganaraska rainbow trout was much lower in the 1970s (Fig. 2.1.2) when sea lamprey marking was higher.

In 2004, lamprey marks on rainbow trout in the Ganaraska River were more than 3 times higher than the average for 1990-2003 (Table 2.1.4). The marking rate in 2004 was similar to levels in the 1970s (Fig. 2.1.3). A high incidence of B1 marks in 2004 indicates very recent attacks (Table 2.1.5). It is unclear if this increase in lamprey marking is a local event or more widespread throughout Lake Ontario.

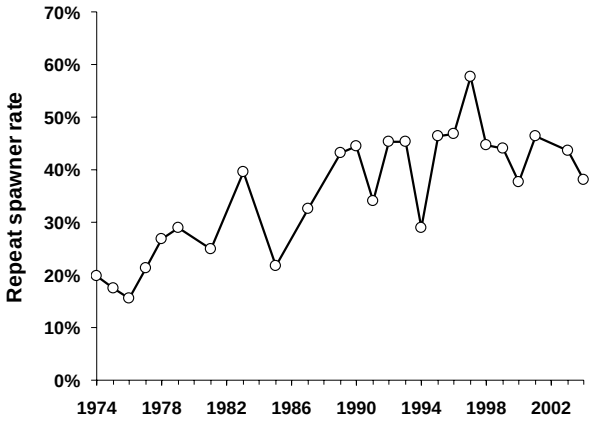

FIG. 2.1.2. The repeat spawner rate for rainbow trout (sexes combined) in April at the Ganaraska River fishway, in Port Hope, Ontario, 1974-2004.

TABLE 2.1.3. The repeat spawner rate of rainbow trout in April, 1974-2004, at the Ganaraska River fishway, in Port Hope, Ontario.

Year	Male		Female	
	Repeat spawner	Sample size	Repeat spawner	Sample size
1974	19.4%	36	20.0%	50
1975	16.7%	30	18.2%	55
1976	17.4%	46	13.5%	52
1977	22.9%	48	19.6%	56
1978	29.4%	34	24.3%	74
1979	31.6%	38	26.1%	69
1981	28.9%	38	20.8%	72
1983	44.1%	34	35.0%	60
1985	21.6%	37	21.7%	69
1987	22.0%	41	43.1%	58
1989	25.0%	8	61.5%	13
1990	37.9%	58	51.0%	49
1991	37.5%	32	30.7%	75
1992	40.0%	45	50.8%	59
1993	33.3%	39	57.1%	63
1994	22.0%	41	35.9%	64
1995	47.3%	55	45.5%	44
1996	50.0%	36	43.8%	64
1997	57.1%	49	58.1%	43
1998	40.0%	25	49.3%	75
1999	40.5%	37	47.6%	42
2000	26.7%	30	48.6%	70
2001	45.8%	48	47.1%	51
2003	33.3%	42	53.7%	54
2004	24.2%	33	51.9%	77

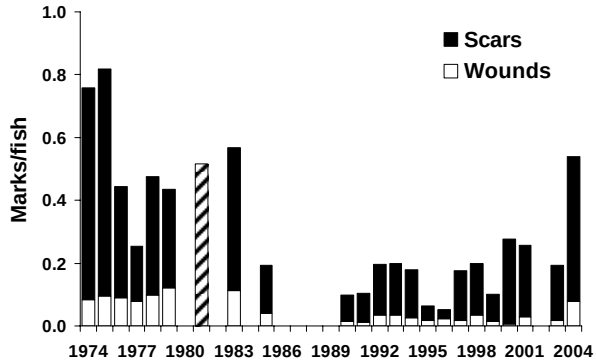

FIG. 2.1.3. Lamprey mark trends on rainbow trout in April, 1974-2004, at the Ganaraska River fishway, in Port Hope, Ontario. Since 1990, A1 and A2 marks[1] were called wounds and the remainder of marks were called scars to fit with historical classification. Scars and wounds were combined in 1981. [1]King, E. L., Jr. and T. A. Edsall. 1979. Illustrated field guide for the classification of sea lamprey attack marks on great lakes lake trout. G.L.F.C. Special Publication 79-1.

TABLE 2.1.4. Lamprey marks on rainbow trout in April, 1974-2004, at the Ganaraska River fishway, in Port Hope, Ontario. Since 1990, A1 and A2 marks[1] were called wounds and the remainder of marks were called scars to fit with historical classification.

Year	Wounds/fish	Scars/fish	Marks/fish	% with wounds	% with scars	% with marks	N
1974	0.083	0.676	0.759	7.0	33.2	36.8	527
1975	0.095	0.725	0.820	8.0	37.2	40.2	599
1976	0.090	0.355	0.445	6.6	23.3	28.1	1280
1977	0.076	0.178	0.254	6.4	13.5	18.2	2242
1978	0.097	0.380	0.476	8.1	28.4	33.7	2722
1979	0.122	0.312	0.434	10.3	22.8	29.8	3926
1981			0.516			36.2	5489
1983	0.113	0.456	0.569	9.7	33.4	38.8	833
1985	0.040	0.154	0.193	3.7	11.5	14.5	1256
1990	0.015	0.083	0.098	1.5	6.6	8.1	470
1991	0.012	0.091	0.103	1.2	7.4	8.4	419
1992	0.035	0.162	0.197	2.9	14.3	16.5	315
1993	0.034	0.165	0.199	3.1	15.3	17.2	261
1994	0.027	0.153	0.179	2.7	13.6	15.3	301
1995	0.017	0.046	0.063	1.7	4.3	5.9	303
1996	0.023	0.030	0.053	2.3	3.0	5.3	397
1997	0.017	0.158	0.175	1.7	12.7	13.7	291
1998	0.035	0.165	0.200	3.2	13.2	15.3	340
1999	0.015	0.086	0.101	1.5	7.5	8.6	477
2000	0.005	0.272	0.278	0.5	23.2	23.5	371
2001	0.028	0.229	0.257	2.5	17.8	18.8	608
2003	0.017	0.176	0.193	1.7	14.3	15.1	238
2004	0.079	0.459	0.538	6.9	33.7	37.5	392

TABLE 2.1.5. Classification of lamprey marks[1] on rainbow trout in April, 1974-2004, at the Ganaraska River fishway, in Port Hope, Ontario.

	Marks/fish							
Year	A1	A2	A3	A4	B1	B2	B3	B4
1990	0.000	0.015	0.009	0.009	0.000	0.002	0.017	0.051
1991	0.000	0.012	0.012	0.002	0.029	0.007	0.017	0.019
1992	0.013	0.022	0.025	0.019	0.079	0.006	0.010	0.022
1993	0.011	0.023	0.019	0.023	0.061	0.000	0.008	0.054
1994	0.007	0.020	0.010	0.007	0.076	0.010	0.010	0.043
1995	0.007	0.010	0.017	0.003	0.000	0.000	0.020	0.007
1996	0.013	0.010	0.003	0.003	0.005	0.013	0.000	0.008
1997	0.003	0.014	0.021	0.000	0.000	0.021	0.017	0.086
1998	0.012	0.024	0.012	0.041	0.012	0.003	0.015	0.079
1999	0.000	0.013	0.013	0.021	0.010	0.023	0.013	0.107
2000	0.000	0.005	0.027	0.056	0.000	0.003	0.003	0.183
2001	0.002	0.026	0.021	0.069	0.000	0.000	0.002	0.127
2003	0.000	0.013	0.021	0.029	0.000	0.008	0.004	0.105
2004	0.020	0.059	0.092	0.064	0.171	0.005	0.031	0.094

2.2. R.H. Saunders Hydroelectric Dam Eel Ladder Monitoring

American eel spawn in the Sargasso Sea. A portion of the juvenile population migrates up the St. Lawrence River and into Lake Ontario. Eel reside in Lake Ontario and the upper St. Lawrence River (LO-SLR) for several years before migrating back to the sea. Eel populations show evidence of decline in many areas of eastern Canada and particularly in LO-SLR. This decline prompted the closure of the American eel commercial and sport fisheries in LO-SLR during 2004. The decline has been attributed to habitat loss and deterioration (e.g. dams), over-fishing, mortality in hydro-electric generating turbines, and environmental change in the northern Atlantic Ocean.

TABLE 2.2.1. The numbers of eel observed in the trap at the top of the eel ladder located at the R.H. Saunders Hydroelectric Dam during 2004. The water temperature at the bottom of the ladder is also provided.

Date	Number of eels	Water temperature (ºC)
02-Jun-04	0	8.0
09-Jun-04	7	13.3
16-Jun-04	13	16.3
23-Jun-04	1	16.0
30-Jun-04	0	15.5
07-Jul-04	2	18.0
14-Jul-04	37	20.0
21-Jul-04	59	21.0
28-Jul-04	93	21.0
04-Aug-04	37	21.0
11-Aug-04	25	20.5
18-Aug-04	8	20.0
25-Aug-04	20	19.0
01-Sep-04	19	21.0
09-Sep-04	61	19.5
15-Sep-04	335	19.5
22-Sep-04	652	17.0
29-Sep-04	185	16.5
06-Oct-04	44	14.0
13-Oct-04	59	11.0
20-Oct-04	12	11.0

An eel ladder was installed at the R.H. Saunders Hydroelectric Dam at Cornwall in 1974 to assist with upstream eel migration. In this section, we provide estimates for the total number of eel ascending the ladder and update the eel recruitment index for 2004.

Eel Ladder Operation

The eel ladder was opened on June 1 and closed on October 20 (143 days). Weekly counts of eel migration activity were obtained by placing a net at the top of the ladder (Table 2.2.1). A sub-sample of 231 eels were collected and sampled for biological characteristics.

It is estimated that 11,385 American eel migrated upstream during the entire period of operation. The average sized eel migrating up the ladder remained high during 2004 (average length 456 mm, range 279-625 mm, Fig. 2.2.1). The eel recruitment index was 53.5 eels/day, based on the 31-day peak migration period occurring from July 11 to August 10. There was also a second migration peak of 273.8 eels per day observed during the 2004 season, occurring from September 5 to October 5. The early migration peak was used to calculate the migration index, as the summer period is the one consistently reported in the past. According to the eel ladder migration index, eel abundance is still very low (53.5 eels/day) but similar to the indices observed since 1996; abundance is now approximately three orders of magnitude lower than in the 1980s (Fig. 2.2.2).

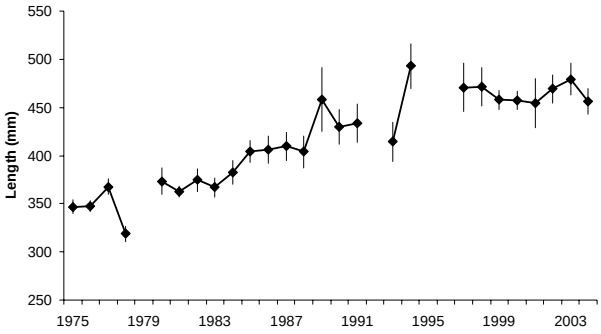

FIG. 2.2.1. Length (error bars are 95% confidence limits) of eel migrating upstream through the eel ladder located at the R.H. Saunders Hydroelectric Dam, 1975-2004.

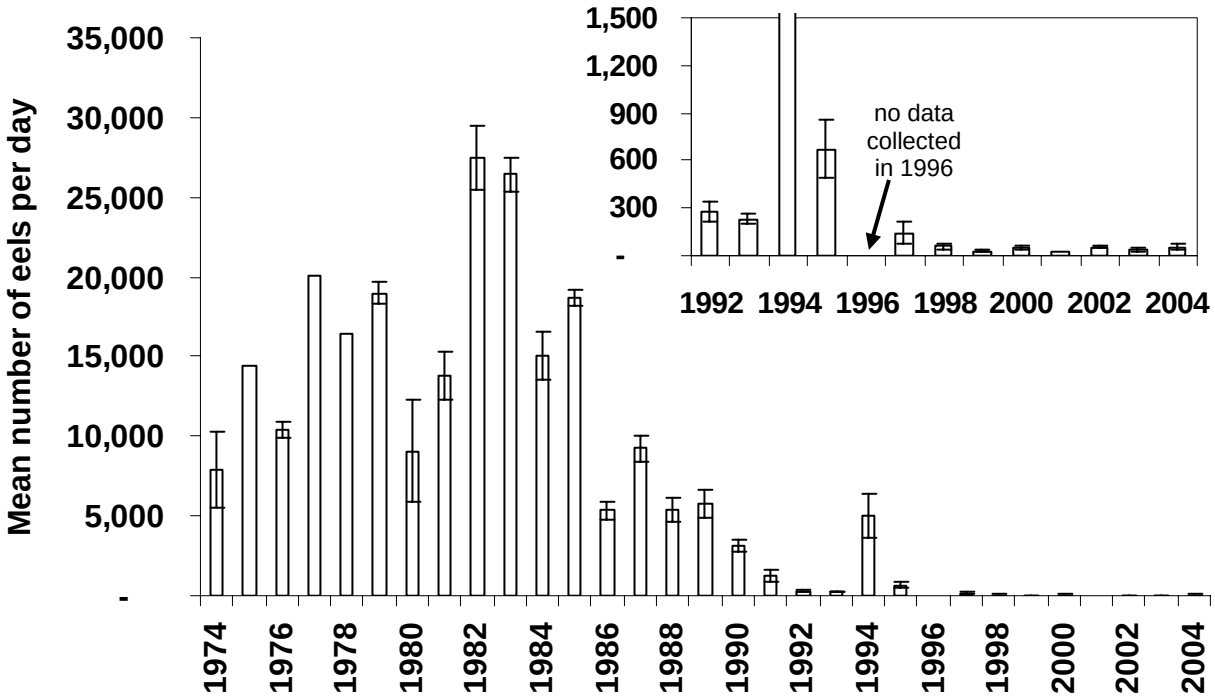

FIG. 2.2.2. Mean number of eels ascending the eel ladder per day at the R.H. Saunders Hydroelectric Dam, Cornwall, Ontario during a 31-day peak migration period, 1975-2004. Vertical bars represent the 95% confidence intervals. No counts were available for 1996.

2.3 Eastern Lake Ontario and Bay of Quinte Fish Community Index Gillnetting

Bottom set gillnets have been used at fixed index netting sites (Fig. 1) in eastern Lake Ontario (ranging in depth from 2.5-140 m) and the Bay of Quinte (ranging in depth from 5-45 m) annually beginning with the Hay Bay site in the Bay of Quinte in 1958. Gillnets are multi-paneled with mesh sizes ranging from 1½-6 inch stretched mesh. Monofilament mesh replaced multifilament in 1992. The gillnetting program is used to monitor the abundance of a variety of fish species in the eastern Lake Ontario and Bay of Quinte fish community.

Species-specific catches in the 2004 gillnetting program are shown for several regions in eastern Lake Ontario and the Bay of Quinte in Tables 2.3.1-2.3.6. Each gillnet catch was standardized to represent the total number of fish in 100 m of each mesh size and summed across ten mesh sizes from 1½-6 inch . Age distribution and other biological attribute data for walleye, lake whitefish and smallmouth bass are shown in Tables 2.3.7-2.3.9 respectively.

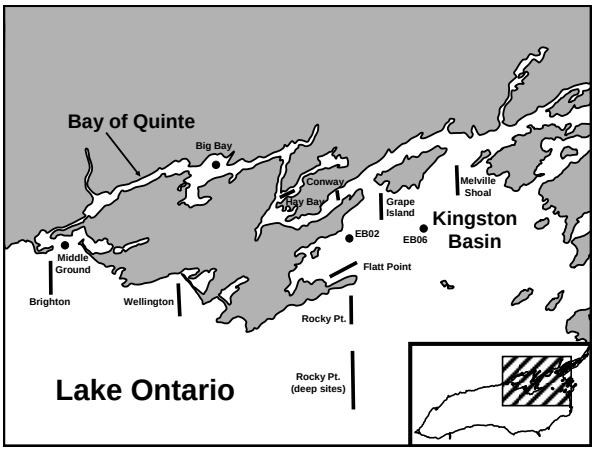

FIG. 2.3.1. Eastern Lake Ontario and Bay of Quinte fish community index gillnetting locations. Circles represent single depth sites; lines represent depth-stratified sampling areas.

Middle Ground

The most abundant species in gillnets at the Middle Ground site were yellow perch, freshwater drum, white sucker, rock bass, carp and walleye (Table 2.3.1). Of these species, yellow perch, freshwater

TABLE 2.3.1. Species-specific catch per gillnet set at Middle Ground, 1992-2004. Shown are the average catches in 1 to 3 gillnet gangs set at a single depth during each of 2 to 3 visits to a single site (Middle Ground). The total number of sets each year is indicated.

	Year													
Species	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Longnose gar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.1
Alewife	30.9	5.5	76.1	90.2	0.0	10.9	0.0	0.0	0.0	5.4	5.4	0.0	0.0	17.3
Gizzard shad	0.0	0.0	0.0	6.6	13.2	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8
Brown trout	0.0	0.0	0.0	0.0	0.0	3.3	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.5
Lake trout	21.9	0.0	0.0	3.3	0.0	26.3	0.0	0.0	1.6	0.0	0.0	0.0	0.0	4.1
Northern pike	4.4	1.1	1.6	0.0	6.6	3.3	0.0	3.3	0.0	0.0	0.0	3.3	0.0	1.8
White sucker	3.3	2.2	0.0	13.2	19.7	9.9	6.6	23.0	8.2	9.9	20.2	0.0	13.7	10.0
Common carp	0.0	1.1	0.0	0.0	6.6	0.0	19.7	6.6	0.0	3.3	0.0	4.9	3.3	3.5
Brown bullhead	4.4	2.2	1.6	32.9	0.0	0.0	52.6	13.2	3.3	13.2	3.3	14.2	1.6	11.0
White perch	1.1	2.2	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Rock bass	0.0	3.3	3.3	10.9	3.3	3.3	6.6	32.6	27.2	7.1	1.6	3.3	4.9	8.3
Pumpkinseed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	0.0	0.0	0.0	0.0	0.0	0.8
Bluegill	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.3
Smallmouth bass	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.2
Largemouth bass	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Yellow perch	539.8	267.5	455.0	332.7	129.4	281.6	1013.2	419.9	423.7	285.4	400.7	170.1	448.2	397.5
Walleye	19.0	23.0	25.7	16.4	50.3	3.3	0.0	6.6	0.0	1.6	3.3	6.6	3.3	12.2
Freshwater drum	0.0	1.1	0.0	9.9	13.2	0.0	13.2	0.0	3.3	0.0	1.6	0.0	19.7	4.8
Total catch	625.9	309.2	565.0	516.0	242.3	345.1	1118.4	522.6	467.3	325.9	436.2	204.0	496.4	474.9
Number of sets	6	6	4	2	2	2	1	2	4	4	4	4	4	

drum and white sucker were more abundant in 2004 than their long-term averages while rock bass, carp and walleye were less abundant.

Northeast

The five most abundant species in Northeastern Lake Ontario gillnets were alewife, yellow perch, lake trout, Chinook salmon and walleye (Table 2.3.2). Of these species, alewife, Chinook salmon and walleye were more abundant in 2004 than their long-term average while lake trout and yellow perch were less abundant. The cold-water benthic species, lake trout, lake whitefish and round whitefish, declined markedly over the 1992-2004 time-period. Round gobies, caught for the first time in 2003, increased in abundance in 2004.

Rocky Point (deep sites)

Five species were caught in Rocky Point Lake Ontario deep gillnets, alewife, lake trout, lake herring, burbot and slimy sculpin (Table 2.3.3). Lake whitefish and rainbow smelt were caught in previous years at low abundance but none was caught in 2004.

Kingston Basin (nearshore sites)

The five most abundant species in the Kingston Basin, Lake Ontario nearshore gillnets were alewife, yellow perch, lake trout, walleye and lake whitefish (Table 2.3.4). Alewife and yellow perch catches were higher in 2004. Round gobies, caught for the first time in 2003, increased dramatically in 2004.

Kingston Basin (deep sites)

The three most abundant species in the Kingston Basin, Lake Ontario deep gillnets were lake trout, alewife and lake whitefish (Table 2.3.5). Catches of all species generally declined precipitously over the 1992-2004 time-period.

Bay of Quinte

The five most abundant species in Bay of Quinte gillnets were yellow perch, white perch, round goby, alewife, and freshwater drum (Table 2.3.6). Of these species, white perch, round goby, alewife and drum were more abundant in 2004 than 2003 while yellow perch were less abundant. Round goby has increased exponentially since its arrival in the late-1990s.

TABLE 2.3.2. Species-specific catch per gillnet set in Northeastern Lake Ontario, 1992-2004. Shown are the average catches in 1 to 3 gillnet gangs set at each of 5 depths during each of 2 to 3 visits to each of 3 sites (Brighton, Wellington and Rocky Point). The total number of sets each year is indicated.

	Year													
Species	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Alewife	218.6	130.8	338.7	439.2	721.6	337.3	897.1	550.8	561.9	385.6	657.0	396.9	474.0	470.0
Gizzard shad	0.1	5.1	0.8	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Chinook salmon	1.5	5.5	8.3	3.3	2.6	0.9	1.4	0.6	0.1	0.4	1.4	4.1	4.8	2.7
Brown trout	0.5	0.3	3.0	0.2	0.0	0.7	0.5	0.2	0.6	0.3	3.3	1.2	1.9	1.0
Lake trout	80.7	37.3	69.4	60.9	28.5	29.2	28.2	7.9	29.0	11.8	8.9	3.0	7.5	30.9
Lake whitefish	5.0	9.5	4.8	7.7	2.9	3.4	0.7	0.0	1.7	0.4	0.1	0.8	0.2	2.9
Cisco (Lake herring)	1.3	1.3	1.2	1.1	0.0	0.0	0.7	0.2	0.0	0.0	0.0	0.1	0.0	0.5
Round whitefish	5.9	5.2	2.0	6.8	2.4	0.9	0.5	0.2	0.0	0.0	0.5	0.1	0.1	1.9
Chub	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Rainbow smelt	2.5	0.9	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Northern pike	0.1	0.4	0.7	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
White sucker	1.8	1.1	3.8	1.1	0.2	0.4	0.0	0.2	0.1	0.1	0.2	0.0	0.5	0.7
Greater redhorse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Lake chub	1.2	0.8	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.4	0.0	0.0	0.2
Common carp	0.4	0.4	0.7	0.0	0.7	0.2	0.2	0.0	0.1	0.0	0.0	0.1	0.2	0.2
Brown bullhead	0.0	0.1	0.0	0.0	0.0	0.2	0.5	0.2	0.7	1.2	0.7	1.9	0.8	0.5
Channel catfish	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stonecat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	1.5	0.4	0.1	0.0	0.2
Burbot	0.6	1.4	1.3	2.0	3.3	1.1	0.9	0.0	1.1	0.7	1.3	0.3	0.2	1.1
White perch	0.1	0.0	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rock bass	1.5	2.2	2.5	3.3	2.4	1.7	9.7	4.2	2.1	1.1	1.9	4.4	2.0	3.0
Pumpkinseed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Smallmouth bass	6.1	4.0	4.4	2.0	0.2	0.4	1.8	4.9	0.3	1.5	1.4	1.5	1.7	2.3
Yellow perch	100.4	224.4	97.6	135.7	75.6	76.4	49.9	47.2	50.0	27.8	14.7	40.5	23.3	74.1
Walleye	4.9	6.7	5.6	2.9	1.8	1.8	3.2	2.4	0.6	0.0	1.1	1.2	3.4	2.7
Round goby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.5	0.3
Freshwater drum	1.1	1.9	3.0	0.4	2.6	1.6	0.5	1.5	0.3	0.2	0.2	0.4	1.0	1.1
Total catch	434.1	439.2	548.3	669.5	844.7	456.3	997.4	620.6	648.9	433.1	693.5	457.9	524.2	597.5
Number of sets	90	90	40	30	30	30	29	35	46	60	60	60	60	

TABLE 2.3.3. Species-specific catch per gillnet set at Rocky Point Lake Ontario deep sites (60-140 m), 1997-2004. Shown are the average catches in 2 to 3 gillnet gangs set at each of 4 depths during each of 2 visits to Rocky Point. The total number of sets each year is indicated.

	Year								
Species	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Alewife	30.3	88.0	7.6	0.8	80.6	2.5	60.6	95.1	45.7
Lake trout	36.5	34.5	42.5	29.6	44.8	41.1	27.4	14.3	33.8
Lake whitefish	0.0	8.6	5.1	0.4	0.8	0.0	0.5	0.0	1.9
Cisco (Lake herring)	0.0	2.1	0.5	0.8	0.0	0.8	0.5	1.4	0.8
Rainbow smelt	3.9	3.3	3.5	0.8	0.0	1.2	0.0	0.0	1.6
Burbot	1.3	0.4	1.0	0.0	0.0	0.0	0.0	0.3	0.4
Slimy sculpin	0.0	1.6	0.0	0.4	0.4	0.0	0.3	0.3	0.4
Total catch	72.1	138.6	60.2	32.9	126.6	45.6	89.4	111.3	84.6
Number of sets	15	16	13	16	16	16	24	24	

TABLE 2.3.4. Species-specific catch per gillnet set in the Kingston Basin Lake Ontario (nearshore sites), 1992 to 2004. Shown are the average catches in 1 to 3 gillnet gangs set at each of 5 depths during each of 2 to 3 visits to each of 3 sites (Flatt Point, Grape Island and Melville Shoal). The total number of sets each year is indicated.

	Year													
Species	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Lake sturgeon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1	0.0	0.2	0.0	0.1
Alewife	838.4	469.6	186.0	538.4	508.6	351.9	1329.3	552.3	392.3	530.6	130.3	151.0	497.0	498.1
Gizzard shad	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chinook salmon	0.3	1.9	0.0	0.9	0.0	0.0	0.7	0.2	0.3	0.0	0.0	0.0	0.8	0.4
Brown trout	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.0	0.0	0.1	0.1
Lake trout	66.5	82.5	97.3	76.0	57.7	24.7	15.7	3.4	3.3	6.3	3.0	3.8	2.5	34.1
Lake whitefish	20.5	42.6	34.6	27.1	15.1	8.4	15.9	1.4	4.8	10.7	6.8	2.9	6.1	15.2
Cisco (Lake herring)	6.9	3.7	7.1	2.6	0.7	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0	1.6
Round whitefish	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coregonus sp.	0.0	0.1	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Rainbow smelt	3.5	0.5	0.5	1.7	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.5
Northern pike	0.8	0.4	0.3	0.4	0.2	0.0	0.5	0.0	0.1	0.4	0.2	0.1	0.1	0.3
White sucker	5.6	6.0	0.5	1.8	0.0	0.9	4.8	0.3	1.5	1.1	1.0	1.8	2.2	2.1
Silver sedhorse	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Greater redhorse	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moxostoma sp.	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.1
Common carp	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1
Brown bullhead	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.1	0.0	0.1	0.4	0.5	0.2
Channel catfish	1.0	0.1	0.0	0.2	0.0	1.0	0.5	0.5	0.1	0.0	0.0	0.2	0.0	0.3
Stonecat	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.8	1.4	0.9	0.7	0.4
Burbot	0.1	0.4	0.2	0.7	0.9	1.6	1.4	0.3	0.1	0.2	0.2	0.1	0.1	0.5
Threespine stickleback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
White perch	1.9	2.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.5
Rock bass	10.9	11.2	5.4	3.7	0.7	10.6	15.5	15.6	8.1	7.7	2.4	4.6	6.1	7.9
Pumpkinseed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Smallmouth bass	3.7	3.9	1.3	2.9	0.0	3.2	4.2	4.5	1.1	1.2	1.8	2.0	1.6	2.4
Yellow perch	319.0	306.6	96.2	60.7	58.2	97.7	147.0	118.4	117.8	46.8	112.5	103.9	298.5	144.9
Walleye	38.3	33.9	18.3	38.8	6.6	21.1	26.1	34.3	13.8	11.3	8.8	9.4	11.9	21.0
Round goby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	129.9	10.2
Freshwater drum	1.6	0.6	1.2	1.3	0.0	1.1	1.4	0.8	0.5	0.2	0.0	0.5	0.0	0.7
Total catch	1319.4	967.8	449.7	757.5	649.4	522.7	1564.1	734.3	544.7	618.3	268.5	285.6	958.6	741.6
Number of sets	86	88	40	30	29	29	29	41	48	60	60	60	60	

Walleye

The age distribution of walleye (Table 2.3.7) showed a broad range of age-classes from age-1 to age-22. Generally speaking, during the summer index gillnetting program young walleye were found in the Bay of Quinte (e.g., age-1 to age-5 fish comprised 87% of the Bay of Quinte walleye catch) while older walleye were present in eastern Lake Ontario (e.g., age-6 and older fish comprised 91% of the catch in the Kingston Basin catch). Age-1 (2003 year-class) fish were very common while age-2 fish (2002 year-class) were relatively uncommon in all geographic areas. Age-3 fish (2001 year-class) were common in the Bay of Quinte but not in Lake Ontario. Most female walleye (70%) were maturing at age-3 (2001 year-class) while no age-2 fish were maturing. This suggests that the age-3 fish would spawn the following spring, for the first time, at age-4.

Lake Whitefish

The age distribution of lake whitefish (Table 2.3.8) was skewed in favor of old fish—no fish less than age-5 were caught in Lake Ontario and 87% were older than age-8. Only 20% of age-6 female lake whitefish were mature. After age-6 all female lake whitefish were mature.

Smallmouth Bass

Only a small number of smallmouth bass were sampled for biological attributes (Table 2.3.9). Six of 18 were age-1, perhaps suggesting a relatively large year-class (2003 year-class). Female smallmouth bass appear to mature at age-4 or 5.

TABLE 2.3.5. Species-specific catch per gillnet set in the Kingston Basin Lake Ontario (deep sites), 1992 to 2004. Shown are the average catches in 4 to 8 gillnet gangs set at a single depth during each of 3 visits to each of 2 sites (EB02 and EB06). The total number of sets each year is indicated.

	Year													
Species	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Sea lamprey	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lake sturgeon	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alewife	298.8	183.7	50.7	122.5	60.0	20.0	491.2	629.4	157.3	110.2	2.7	3.4	37.7	166.8
Chinook salmon	0.3	0.3	0.3	0.3	0.0	0.0	0.3	0.3	0.4	0.8	0.0	0.1	0.1	0.2
Brown trout	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.1
Lake trout	276.6	244.5	207.5	166.9	147.8	78.9	51.3	41.4	22.7	10.4	10.1	11.8	12.1	98.6
Lake whitefish	51.5	71.3	28.8	37.8	26.6	33.4	24.4	16.4	6.2	2.7	2.7	1.1	8.9	24.0
Cisco (Lake herring)	1.9	0.5	2.2	0.8	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6
Rainbow smelt	12.9	4.4	5.5	4.9	1.6	0.3	2.7	0.0	0.0	0.0	0.0	0.0	0.1	2.5
American eel	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burbot	0.0	0.3	0.5	0.3	0.8	1.1	0.8	0.3	1.1	0.8	0.3	0.1	0.1	0.5
Trout-perch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
White perch	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Yellow perch	1.4	0.0	0.0	0.0	0.0	0.5	0.0	0.3	0.5	0.0	0.9	0.3	9.6	1.0
Walleye	0.0	0.0	0.5	0.3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Round goby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Freshwater drum	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Slimy sculpin	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total catch	644.7	505.2	296.1	334.4	237.9	136.0	571.3	688.0	188.4	125.3	17.1	17.0	69.4	294.7
Number of sets	24	24	24	24	24	24	24	24	36	24	24	48	48	

Lake Trout

The abundance of mature lake trout has stabilized in the Kingston Basin and eastern main lake, but a continued slight decline was observed at the deep stations off Rocky point (Tables 2.3.2, 2.3.3, 2.3.4, and 2.3.5). The increase in mean size of mature fish (characteristic of populations with declining recruitment) has been reversed in the last two years. All preceding observations suggest that the population decline observed since the early 1990s has ceased. Survival of stocked fish continues to be low, but appears to have remained stable over the past five or more years. The condition of large lake trout remained stable over the last three years, but low relative to values observed over the past decade. Lamprey wounding rates in 2004 were low, remaining stable over the last decade (Fig, 2.3.2).

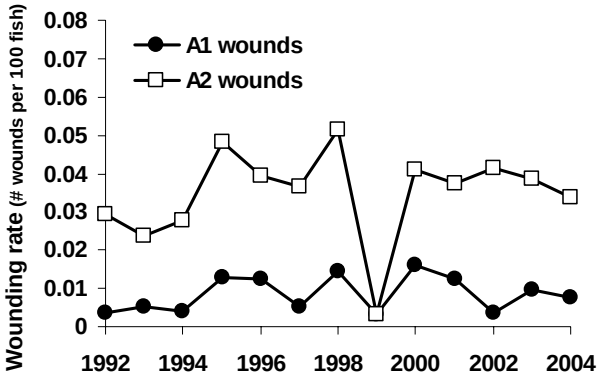

FIG. 2.3.2. Lamprey A1 and A2 wounding rates (# wounds per 100 fish) observed on lake trout caught in the eastern Lake Ontario in the gillnet index program.

TABLE 2.3.6. Species-specific catch per gillnet set in the Bay of Quinte, 1992 to 2004. Shown are the average catches in 1 to 3 gillnet gangs set at each of 1 to 5 depths during each of 2 to 4 visits to each of 3 sites (Big Bay, Hay Bay and Conway). The total number of sets each year is indicated.

	Year													
Species	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Lake sturgeon	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longnose gar	0.9	5.5	0.2	3.8	0.7	1.4	0.0	5.9	0.6	1.6	1.5	0.2	1.2	1.8
Alewife	315.6	248.5	347.2	224.5	85.5	183.8	121.7	8.5	54.9	58.3	23.8	25.2	68.3	135.8
Gizzard shad	1.8	34.1	5.3	27.4	0.5	1.2	1.8	22.7	2.5	3.1	10.1	2.3	0.4	8.7
Chinook salmon	0.2	0.9	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.2	0.0	0.2	0.4	0.2
Atlantic salmon	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Brown trout	6.6	4.7	1.3	1.6	0.0	0.8	0.2	0.2	0.0	0.4	0.2	1.4	0.4	1.4
Lake trout	22.3	8.8	7.1	4.1	15.3	9.1	5.0	0.6	5.3	2.7	8.4	7.2	7.9	8.0
Lake whitefish	8.0	6.6	2.6	0.0	6.1	2.1	7.2	2.1	1.2	1.8	0.9	2.9	0.4	3.2
Cisco (Lake herring)	1.1	4.7	1.5	1.9	10.8	21.6	23.2	0.8	4.5	2.2	0.2	0.0	0.2	5.6
Coregonus sp.	0.0	0.0	0.0	0.3	0.0	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.1
Rainbow smelt	1.3	0.6	1.6	0.8	0.0	0.6	1.8	1.1	0.0	0.7	0.4	0.0	0.2	0.7
Northern pike	2.7	4.1	6.8	1.9	2.6	1.2	0.9	1.3	1.6	1.6	0.4	0.8	0.2	2.0
Mooneye	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
White sucker	33.1	30.1	30.9	36.0	26.1	29.6	20.6	23.8	22.0	25.4	27.2	14.5	19.7	26.1
Silver sedhorse	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moxostoma sp.	0.0	0.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.1
Common carp	1.5	2.5	1.3	0.0	0.0	1.2	0.4	0.0	0.2	0.0	0.0	0.2	0.2	0.6
Spottail shiner	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brown bullhead	6.4	32.6	11.5	7.1	2.8	4.3	10.1	10.6	6.8	11.3	8.2	2.9	3.9	9.1
Channel catfish	0.5	3.3	1.1	0.3	0.2	0.6	0.7	0.4	0.2	0.2	0.4	0.2	0.4	0.7
Stonecat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0
Burbot	0.0	2.2	0.0	0.3	0.0	0.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Trout-perch	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
White perch	221.7	282.9	276.0	130.8	40.2	49.5	65.3	101.0	43.0	32.9	61.2	85.7	184.2	121.1
White bass	0.5	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1
Rock bass	14.8	24.7	4.6	8.2	3.8	8.8	11.2	11.0	5.1	1.6	3.3	0.6	0.6	7.6
Pumpkinseed	0.0	6.6	0.0	0.5	1.9	3.1	21.3	18.3	11.7	26.7	13.7	2.1	8.3	8.8
Bluegill	0.0	0.0	0.0	0.0	0.2	0.8	2.2	1.1	1.4	10.4	5.5	0.6	0.4	1.7
Smallmouth bass	2.9	3.8	0.5	0.8	2.1	7.4	3.7	4.5	1.6	1.1	0.2	0.0	0.0	2.2
Largemouth bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Black crappie	0.4	1.1	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.4	0.5	0.4	0.2	0.3
Yellow perch	725.1	948.1	513.0	747.0	547.5	624.8	667.1	896.6	752.5	728.8	714.5	493.2	388.7	672.9
Walleye (Yellow pickerel)	84.2	131.9	54.5	77.4	60.2	32.9	31.4	29.5	24.5	13.9	21.9	22.3	16.6	46.2
Round goby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	43.3	120.9	12.9
Freshwater drum	16.6	17.5	15.9	17.5	21.9	19.5	12.9	13.2	15.8	31.6	15.7	11.0	21.3	17.7
Total catch	1468.4	1806.6	1282.9	1293.3	828.2	1006.5	1010.8	1153.9	955.6	957.4	922.5	717.3	845.2	1096.0
Number of sets	36	21	36	24	28	32	30	31	32	36	36	34	34	

TABLE 2.2.7. TABLE 2.3.7. Age distribution of 222 walleye sampled from summer index gillnets, by region, 2004. Also shown are mean fork length, mean weight, mean GSI (females), and percent mature (females). GSI = gonadal somatic index calculated for females only as log10(gonad weight + 1)/log10(weight).

	Age																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
Bay of Quinte	24	7	34	4	7	0	1	1	2	3	1	0	0	1	0	1	1	0	0	0	0	0	87
Kingston Basin (nearshore)	4	0	2	2	1	3	3	3	5	12	3	9	14	12	9	4	7	2	4	2	1	0	102
Middle Ground	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Northeast	10	0	2	0	1	0	0	0	2	3	3	1	2	0	3	1	1	1	0	0	0	1	31
Total	39	7	39	6	9	3	4	4	9	18	7	10	16	13	12	6	9	3	4	2	1	1	222
Mean fork length (mm)	216	370	422	489	510	536	593	582	603	611	638	641	654	635	682	666	637	619	669	652	642	602	
Mean weight (g)	108	560	891	1380	1691	2137	2738	2546	3011	3211	3607	3601	3880	3554	4280	3804	3346	3022	3542	4004	3118	2935	
GSI (females)	0.07	0.13	0.19	0.31	0.31		0.42	0.43	0.40	0.41	0.40	0.45	0.45	0.48	0.45	0.47	0.48		0.46	0.51			
% Mature (females)	0%	0%	70%	100%	71%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%			

TABLE 2.3.8. Age distribution of 124 lake whitefish sampled from summer index gillnets, by region, 2004. Also shown are mean fork length, mean weight, mean GSI (females), and percent mature (females). GSI = gonadal somatic index calculated for females only as log10(gonad weight + 1)/log10(weight). A GSI greater than approximately 0.25 indicates a mature female.

	Age																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
Bay of Quinte	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Kingston Basin (nearshore)	0	0	0	0	1	5	0	2	8	5	4	6	12	8	0	1	3	0	0	0	0	0	55
Kingston Basin (offshore)	0	0	0	0	2	3	1	2	8	9	8	10	11	4	2	0	2	0	1	1	1	0	65
Northeast	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	1	0	0	4	9	1	5	16	14	12	16	23	12	2	1	5	0	1	1	1	0	124
Mean fork length (mm)		196			359	367	470	446	464	474	499	501	499	511	521	562	544		592	525	532		
Mean weight (g)					532	580	1330	1080	1278	1353	1563	1538	1663	1696	1876	2560	1965						
GSI (females)		0.00			0.15	0.27	0.62	0.59	0.54	0.54	0.56	0.57	0.60	0.58			0.34		0.66	0.54			
% Mature (females)		0%			0%	20%	100%	100%	100%	100%	100%	100%	100%	100%			100%		100%	100%			

TABLE 2.3.9. Age distribution of 18 smallmouth bass sampled from summer index gillnets, by region, 2004. Also shown are mean fork length, mean weight, mean GSI (females), and percent mature (females). GSI = gonadal somatic index calculated for females only as log10 (gonad weight + 1)/log10(weight).

	Age											
	1	2	3	4	5	6	7	8	9	10	11	Total
Kingston Basin (nearshore)	3	0	2	2	0	0	0	1	0	0	0	8
Middle Ground	0	0	0	0	0	1	0	0	0	0	0	1
Northeast	3	0	1	0	0	1	1	2	0	0	1	9
Total	6	0	3	2	0	2	1	3	0	0	1	18
Mean fork length (mm)	137		233	303		386	395	418			464	
Mean weight (g)	41		220	520		1259	1314	1442			2007	
GSI (females)			0.10	0.36		0.46	0.52	0.55			0.50	
% Mature (females)	0%		0%	50%		100%	100%	100%			100%	

2.4 Eastern Lake Ontario and Bay of Quinte Fish Community Index Trawling

Bottom trawling at fixed index netting sites (Fig. 1) in eastern Lake Ontario (ranging in depth from 21-100 m) and the Bay of Quinte (ranging in depth from 4 to 23 m) has occurred annually since 1972 (except 1989). Typically, ½ mile trawl drags using a three-quarter "Yankee Standard" No. 35 bottom trawl are made at Lake Ontario sites while ¼ mile drags using a three-quarter "Western" bottom trawl are made at Bay of Quinte sites. Bottom trawling is used primarily to monitor the abundance of small fish species and the young (e.g. age-0) of larger species.

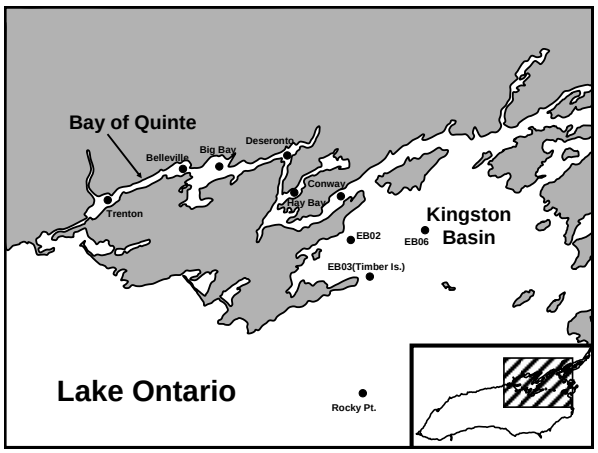

FIG. 4.2.1. Eastern Lake Ontario and Bay of Quinte fish community index bottom trawling site locations.

Species-specific catches in the 2004 trawling program are shown in Table 2.4.1. The five most

TABLE 2.4.1. Species-specific catches by site in the 2004 fish community index bottom trawling program in the Bay of Quinte and eastern Lake Ontario. Catches are the total number of fish (all ages) observed for the number of trawls indicated. Trawls distances were 1/4 mile in the Bay of Quinte and 1/2 mile in Lake Ontario. Approximate site depths are indicated in brackets.

	Bay of Quinte					Lake Ontario					
Species	Trenton (4 m)	Belleville (5 m)	Big Bay (6 m)	Deseronto (5 m)	Hay Bay (7)	Conway (23 m)	EB02 (30 m)	EB03 (21 m)	EB06 (30 m)	Rocky Point (100 m)	Total
Silver lamprey	0	0	0	0	0	1	0	0	0	0	1
Alewife	69	92	3260	443	537	23	257	2021	15	46	6763
Gizzard shad	0	4720	467	11	1	0	0	0	0	0	5199
Lake trout	0	0	0	0	0	5	0	0	1	1	7
Lake whitefish	0	0	0	0	0	9	4	28	3	0	44
Cisco (Lake herring)	0	0	0	0	0	1	0	0	0	0	1
Rainbow smelt	0	0	0	0	0	43	50	23	301	91	508
White sucker	9	1	11	10	66	89	0	0	0	0	186
Common carp	0	0	3	0	0	0	0	0	0	0	3
Spottail shiner	10	31	162	12	515	0	0	0	0	0	730
Brown bullhead	9	143	190	296	83	0	0	0	0	0	721
Channel catfish	0	0	0	1	0	0	0	0	0	0	1
Burbot	0	0	0	0	0	1	0	0	0	0	1
Threespine stickleback	0	0	0	0	0	0	62	33381	90	1	33534
Trout-perch	0	115	25	36	620	520	0	3062	0	0	4378
White perch	646	15441	11993	24609	3963	0	0	0	0	0	56652
White bass	0	29	2	13	1	0	0	0	0	0	45
Rock bass	0	0	0	0	1	0	0	0	0	0	1
Pumpkinseed	454	33	293	156	37	0	0	0	0	0	973
Bluegill	7	0	6	0	0	0	0	0	0	0	13
Smallmouth bass	4	0	0	10	0	0	0	0	0	0	14
Largemouth bass	1	5	2	2	0	0	0	0	0	0	10
Black crappie	0	2	3	0	0	0	0	0	0	0	5
Lepomis sp.	0	19	0	0	0	0	0	0	0	0	19
Yellow perch	1492	530	1602	1217	4422	704	7	1	0	0	9975
Walleye	12	21	135	121	25	12	0	0	0	0	326
Johnny darter	3	0	0	0	0	0	4	394	4	0	405
Logperch	34	1	0	0	1	0	0	0	0	0	36
Round goby	68	371	126	165	28	1015	2421	4	0	0	4198
Freshwater drum	3	35	125	125	84	0	0	1	0	0	373
Slimy sculpin	0	0	0	0	0	0	749	130	4757	771	6407
Total	2821	21589	18405	27228	10384	2422	3555	39045	5171	910	131529
Number of trawls	8	8	8	8	8	12	10	12	12	4	90

abundant species in eastern Lake Ontario trawls were threespine stickleback, slimy sculpin, trout-perch, round goby and alewife, and in Bay of Quinte trawls were white perch, yellow perch, gizzard shad, alewife, and round goby. Catches of age-0 fish in 2004 for selected common species are shown in Table 2.4.2. Age-0 catch trends for lake whitefish, yellow perch and walleye are shown in Tables 2.4.3, 2.4.4 and 2.4.5, respectively. Age-0 lake whitefish catches were low in 2003—none was caught at Conway but small numbers were present at Timber Island. Age-0 catches of yellow perch were low while walleye were low in all areas except Big Bay.

TABLE 2.4.2. Species-specific young-of-the-year catches by site, for selected species, in the 2004 fish community index bottom trawling program in the Bay of Quinte and eastern Lake Ontario. Catches are the total number of fish observed for the number of trawls indicated. Trawls distances were 1/4 mile in the Bay of Quinte and 1/2 mile in Lake Ontario. Approximate site depths are indicated. [1]Includes pumpkinseed and bluegill.

	Bay of Quinte					Lake Ontario					
Species	Trenton (4 m)	Belleville (5 m)	Big Bay (6 m)	Deseronto (5 m)	Hay Bay (7 m)	Conway (23 m)	EB02 (30 m)	EB03 (21 m)	EB06 (30 m)	Rocky Point (100 m)	Total
Alewife	58	92	3260	440	534	1	49	559	6	1	5000
Gizzard shad	0	4720	467	11	1	0	0	0	0	0	5199
Lake whitefish	0	0	0	0	0	0	4	25	0	0	29
Cisco (Lake herring)	0	0	0	0	0	1	0	0	0	0	1
Rainbow smelt	0	0	0	0	0	5	0	0	0	0	5
White perch	579	15197	11488	23714	2564	0	0	0	0	0	53541
Lepomis sp. [1]	0	19	0	0	0	0	0	0	0	0	19
Yellow perch	0	7	36	67	144	0	0	0	0	0	254
Walleye	0	5	91	11	7	0	0	0	0	0	114
Round goby	6	165	9	82	5	0	11	0	0	0	278
Freshwater drum	0	5	68	33	0	0	0	0	0	0	106
Slimy sculpin	0	0	0	0	0	0	247	11	11	0	269
Total	643	20210	15418	24357	3254	7	311	595	17	1	64814
Number of trawls	8	8	8	8	8	12	10	12	12	4	90

TABLE 2.4.3. Mean catch-per-trawl of age-0 lake whitefish at two sites, Conway in the lower Bay of Quinte and EB03 near Timber Island in eastern Lake Ontario, 1992-2004. Four replicate trawls on each of two to four visits during August and early September were made at each site. Distances of each trawl drag were 1/4 mile for Conway and 1/2 mile for EB03.

	Conway	N	EB03 (Timber Island)	N
1992	23.4	8	0.9	12
1993	3.1	8	4.7	12
1994	40.5	8	79.7	8
1995	27.1	8	17.1	8
1996	2.6	8	0.8	8
1997	5.1	8	6.0	8
1998	0.4	8	0.0	8
1999	0.0	8	0.0	8
2000	0.4	8	0.0	8
2001	0.1	8	0.0	8
2002	0.1	8	0.0	8
2003	8.1	12	44.9	16
2004	0.0	12	2.1	12

TABLE 2.4.4. Mean catch-per-trawl of age-0 yellow perch at six Bay of Quinte sites, 1992-2003. Four replicate trawls on each of two visits during August and early September were made at each site, except that three visits were made to Conway in 2003 and 2004.

	Trenton	Belleville	Big Bay	Deseronto	Hay Bay	Conway	Mean	Number of trawls
1992	3.1	1.3	0.4	0.1	0.5	0.0	0.9	48
1993	203.7	14.0	0.4	36.3	1.6	0.3	42.7	48
1994	526.6	50.6	10.3	101.5	29.3	6.9	120.8	48
1995	730.4	101.1	9.5	764.5	268.9	0.0	312.4	48
1996	2.6	2.9	4.3	2.5	8.5	0.1	3.5	48
1997	302.0	4.0	36.0	135.0	526.0	0.0	167.2	48
1998	13.1	14.0	11.5	0.1	2.9	0.0	7.0	48
1999	24.5	7.0	4.9	638.7	900.3	0.0	262.6	48
2000	0.0	5.8	5.4	0.8	6.0	0.3	3.0	48
2001	158.0	27.6	16.8	71.8	127.0	0.0	66.9	48
2002	0.0	0.3	9.2	141.8	241.1	0.0	65.4	48
2003	228.5	3.8	0.9	9.2	1.6	0.5	40.8	52
2004	0.0	0.9	4.5	8.4	18.0	0.0	5.3	52

TABLE 2.4.5. Mean catch-per-trawl of age-0 walleye at six Bay of Quinte sites, 1992-2003. Four replicate trawls on each of two visits during August and early September were made at each site, except that three visits were made to Conway in 2003 and 2004.

	Trenton	Belleville	Big Bay	Deseronto	Hay Bay	Conway	Mean	Number of trawls
1992	6.8	12.4	14.0	37.9	6.1	0.8	13.0	48
1993	8.8	16.0	5.0	11.3	1.1	11.9	9.0	48
1994	17.0	21.0	15.0	23.8	11.5	12.5	16.8	48
1995	14.1	8.3	2.6	8.3	5.5	0.9	6.6	48
1996	4.3	7.6	4.9	1.1	0.0	1.1	3.2	48
1997	2.8	7.6	6.1	0.3	0.1	0.0	2.8	48
1998	0.1	0.4	0.6	0.1	0.0	0.0	0.2	48
1999	1.1	0.4	0.4	1.4	9.1	0.1	2.1	48
2000	0.0	3.8	1.0	0.0	0.1	0.0	0.8	48
2001	9.5	4.5	4.8	6.8	3.3	0.1	4.8	48
2002	0.0	0.0	1.1	0.1	0.0	0.0	0.2	48
2003	10.3	8.3	16.8	1.9	0.4	0.0	6.3	52
2004	0.0	0.6	11.4	1.4	0.9	0.0	2.4	52

2.5 Juvenile Salmonid Stream Assessment

Rainbow trout were the most abundant species in this survey followed closely by longnose dace and blacknose dace (Table 2.5.1). The mean density of YOY rainbow trout and year class strength was lower in 2004 than in the previous three years (Fig. 2.5.1). Chinook salmon and coho salmon continued with greater natural reproduction since 1995 (Fig. 2.5.2).

Atlantic salmon fry stocked by OMNR in Barnum House Creek in 2004 continued to show a higher density and biomass than YOY rainbow trout (Table 2.5.2). Atlantic salmon were also observed in the Little Rouge River where they were stocked by the Metro East Anglers.

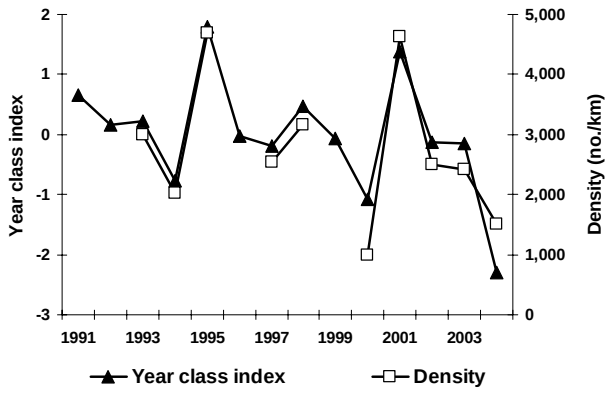

FIG. 2.5.1. Density of young-of-the-year and year class strength of rainbow trout in Ontario tributaries of Lake Ontario, 1991 to 2004. Year-class strength was calculated as the least-square mean density of juvenile rainbow trout by year class for ages 0 to 2, and then, standardized with a mean of 0 and standard deviation of 1.

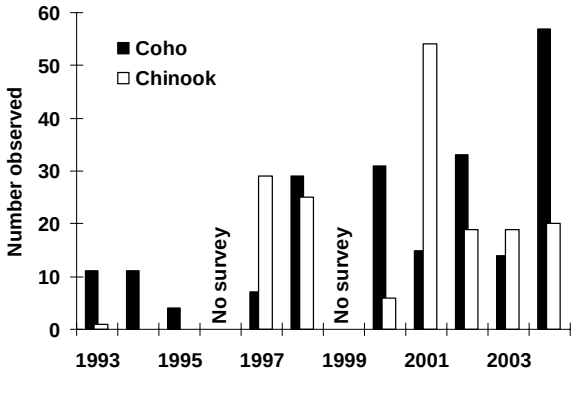

FIG. 2.5.2. Number of young-of-the-year coho and chinook salmon observed during summer surveys of Lake Ontario tributaries in Ontario, 1993 to 2004. No surveys were conducted in 1996 and 1999. Only the numbers from the first pass of multiple pass efforts are included here.

TABEL 2.5.1. Catch by species of fish in Lake Ontario tributaries during electrofishing surveys in 2004. For salmon and trout: YOY = young-of-the-year, 1+ = yearlings and older.

Stream	Site	Number of efforts	Lamprey	Sea Lamprey	Coho Salmon		Chinook Salmon	Rainbow Trout		Atlantic Salmon		Brown Trout		Brook Trout		Central Mudminnow	Common White Sucker	Northern Hog Sucker	Goldfish	Hornyhead Chub	Common Shiner	Bluntnose Minnow	Blacknose Dace	Longnose Dace	Creek Chub	Brown Bullhead	Stonecat	Brook Sticklebck	Rock Bass	Pumpkinseed	Longear Sunfish	Largemouth Bass	Yellow Perch	Rainbow Darter	Fantail Darter	Johnny Darter	Logperch	Mottled Sculpin	Slimy Sculpin
					YOY		YOY	YOY	1+	YOY	1+	YOY	1+	YOY	1+																									
Ancaster Cr.	AN01	1						6															2																
Sixteen Mile Cr.	OA02	1						41	51														22		2								7	8			11		
Silver Cr.	SI01	1															7	3					34	1	64								5	5					
Limestone Cr.	LI01	1		1	29			35	34					5	20		7						14	5	4									14					
Silver Cr.	BC04	1							1				1					4			1		138	77	1			1					9	33	1		4		
Little Rouge R.	LR05	1						9	9		1	1	3										68	16	1				2				4		3		4		7
Duffin Cr.	DU01	3						56	4								1						115	530	2		18						67		2				2
Brougham Cr.	DU03	1			6			58	7					3	4		41						52	8	18					5									8
Duffin Cr.	DU02	1						6	10				2				12				2		90	80	11		1			1			13		2				
Lynde Cr.	LD02	1						9	5												4		154	84	63								9		8				
Lynde Cr.	LD03	1		7				4	3						18								12														2		18
Oshawa Cr.	OH03	1		17				7	7			1	3				15					1	37	1													30		
Oshawa Cr.	OH02	1						5									2						91		38														
Farewell Cr.	FW01	1		17				38	14				1				52						145	16	30	2		2		2	10			1		31		30		
Bowmanville Cr.	BW02	1			5			45	9			13	8				1																						45
Bowmanville Cr.	BW03	1						23	4			15	1	3			3						12		6												16		
Bowmanville Cr.	BW07	1					1	46	31								2						55	79						1									
Soper Cr.	SO02	1		3	14		1	19	19			2	9																			1						13
Wilmot Cr.	WM02	1					4	92	16			2	3																										13
Orono Cr.	OR01	3					7	46	13			4	2																									25	
Graham Cr.	GR02	3						4	8								34		1		120	50	96	118	56		1		17	1			5		19		1		
Graham Cr.	GR04	1						8	1														9	3	8								4		15				18
Ganaraska R.	GN04	1			1			30	23			7	16																										44
Ganaraska R.	GN08	1						10	3			4	2	15	17																								
Ganaraska R.	GN07	1					6	91	17			6	3				1			1			53	63	2										12				2
Port Britain Cr.	PB01	1		3	1			7	6					5	20								7								1								51
Ganaraska R.	GN06	1						19	21											11	2	2	162	175	6										7				1
Gage Cr.	GA02	1						46	21								5					10	25	1	5														30
Cobourg Br.	CO12	1		5				59	32					2	1								5														10		
Cobourg Br.	CO03	1		4				24	12								12						74	44	28												31		
Cobourg Br.	CO09	1	1					74	23			11	2	1			1						2	6													39		
Barnum House Cr.	BR01	1			1			36	15	68	6				2	1																							
Shelter Valley Cr.	SE03	1					3	49	35			2					4						7	2				1					5		5		19		
Shelter Valley Cr.	SE02	3						63	30				2	6	9								1														13		
Colborne Cr.	CL01	1						2	1								1						18	1	6														
Proctors Cr.	BT01	1						19	26						2		4						25	3	11												4		
Smithfield Cr.	SM01	1						6	14								15							6	25				2	2			1		9	34	7		
Grand Total			1	57	57		22	1092	525	68	7	68	58	40	93	1	220	7	1	12	129	63	1525	1319	387	2	20	4	21	12	10	1	2	129	60	114	34	246	252

TABEL 2.5.2. Estimated density (No./m) and biomass (g/m2) by species of salmon and trout in Lake Ontario tributaries during electrofishing surveys in 2004. The abundance of young-of-the-year (YOY) salmonids was estimated for each species at each site using: N = catch + catch /(1/(1-0.2617*(mean weight)0.27116)-1). For yearlings and older salmonids the population size was estimated according to Jones and Stockwell (1995)1. YOY = young-of-the-year, 1+ = yearlings and older. UTM is at the upstream end of site (+5m). See Table 2.5.1 for stream name.

SITE	UTM	Date	Site width	Site length	Coho Salmon		Chinook Salmon		Rainbow Trout				Atlantic Salmon				Brown Trout				Brook Trout				All	
					YOY		YOY		YOY		1+		YOY		1+		YOY		1+		YOY		1+		All	
			(m)	(m)	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2	No./m	g/m^2
AN01	17 58379 478794	August 30	3.3	53.3	0	0	0	0	0.25	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.55
OA02	17 58626 481825	August 30	6.4	49.0	0	0	0	0	2.35	1.14	1.79	5.55	0	0	0	0	0	0	0	0	0	0	0	0	4.13	6.69
SI01	17 58700 483307	August 30	5.9	53.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
LI01	17 58725 481145	August 30	3.8	51.6	1.32	2.07	0	0	2.00	1.36	1.07	4.77	0	0	0	0	0	0	0	0	0.28	0.21	0.59	6.87	5.27	15.28
BC04	17 59029 483232	August 31	6.3	42.0	0	0	0	0	0	0	0.02	0.15	0	0	0	0	0	0	0.02	1.18	0	0	0	0	0.05	1.33
LR05	17 63890 486732	August 31	3.0	47.7	0	0	0	0	0.55	0.51	0.26	2.54	0	0	0.02	0.09	0.05	0.10	0.07	0.77	0	0	0	0	0.95	4.01
DU01	17 64838 486008	September 14	8.6	46.7	0	0	0	0	1.66	1.30	0.02	0.13	0	0	0	0	0	0	0	0	0	0	0	0	1.68	1.44
DU03	17 65482 486321	August 31	3.3	61.7	0.22	0.47	0	0	2.51	2.81	0.15	2.04	0	0	0	0	0	0	0	0	0.13	0.13	0.08	1.07	3.10	6.53
DU02	17 65583 486064	August 31	7.0	44.0	0	0	0	0	0.35	0.22	0.32	1.70	0	0	0	0	0	0	0.05	1.28	0	0	0	0	0.71	3.20
LD02	17 66241 487268	September 1	4.6	52.0	0	0	0	0	0.44	0.45	0.12	0.82	0	0	0	0	0	0	0	0	0	0	0	0	0.56	1.27
LD03	17 66332 486570	September 1	4.9	43.0	0	0	0	0	0.26	0.17	0.08	0.39	0	0	0	0	0	0	0	0	0	0	0.63	4.14	0.97	4.71
OH03	17 66948 486824	August 18	4.3	50.0	0	0	0	0	0.41	0.25	0.19	1.08	0	0	0	0	0.05	0.06	0.07	4.39	0	0	0	0	0.72	5.77
OH02	17 67123 487308	August 18	1.5	47.3	0	0	0	0	0.27	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.27	0.75
FW01	17 67675 486681	August 25	4.3	55.3	0	0	0	0	1.68	2.02	0.37	3.45	0	0	0	0	0	0	0.02	0.21	0	0	0	0	2.07	5.67
BW02	17 68123 487354	August 19	5.3	49.5	0.23	0.28	0	0	3.07	0.91	0.25	1.10	0	0	0	0	0.77	0.39	0.22	2.27	0	0	0	0	4.54	4.95
BW03	17 68252 487482	August 25	3.9	54.1	0	0	0	0	1.13	1.10	0.09	0.75	0	0	0	0	0.64	1.03	0.02	0.17	0.15	0.15	0	0	2.03	3.20
BW07	17 68390 486610	August 19	8.2	40.0	0	0	0.06	0.04	3.15	1.31	1.25	3.95	0	0	0	0	0	0	0	0	0	0	0	0	4.46	5.31
SO02	17 68612 487041	August 25	5.1	48.7	0.65	0.89	0.05	0.04	1.06	0.74	0.59	2.61	0	0	0	0	0.10	0.09	0.25	9.54	0	0	0	0	2.71	13.92
WM02	17 69089 486868	August 26	6.2	50.7	0	0	0.17	0.22	5.41	2.19	0.47	1.25	0	0	0	0	0.09	0.08	0.07	0.36	0	0	0	0	6.22	4.10
OR01	17 69102 486927	September 15	3.3	50.5	0	0	0.23	0.43	0.78	0.95	0.27	2.14	0	0	0	0	0.09	0.17	0.04	1.53	0	0	0	0	1.43	5.22
GR02	17 69472 486554	September 8	5.3	49.7	0	0	0	0	0.08	0.15	0.13	1.12	0	0	0	0	0	0	0	0	0	0	0	0	0.21	1.27
GR04	17 69922 487135	September 1	3.9	45.0	0	0	0	0	0.48	0.43	0.02	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0.51	0.63
GN04	17 69978 487708	August 24	5.2	50.7	0.04	0.06	0	0	1.76	0.86	0.70	3.89	0	0	0	0	0.36	0.28	0.47	8.85	0	0	0	0	3.33	13.93
GN08	17 70120 487839	August 24	3.2	51.9	0	0	0	0	0.62	0.37	0.07	0.77	0	0	0	0	0.21	0.22	0.04	0.31	0.83	0.75	0.49	5.75	2.26	8.16
GN07	17 70949 487505	August 23	12.0	59.0	0	0	0.23	0.13	4.45	1.05	0.43	0.67	0	0	0	0	0.26	0.10	0.06	1.05	0	0	0	0	5.43	2.98
PB01	17 70959 487156	August 24	3.9	62.0	0.04	0.07	0	0	0.32	0.25	0.13	0.81	0	0	0	0	0	0	0	0	0.21	0.23	0.49	6.08	1.18	7.44
GN06	17 71673 487338	August 23	15.7	49.0	0	0	0	0	1.13	0.20	0.66	0.97	0	0	0	0	0	0	0	0	0	0	0	0	1.78	1.17
GA02	17 71938 487611	September 1	2.6	40.6	0	0	0	0	3.00	4.51	0.79	10.42	0	0	0	0	0	0	0	0	0	0	0	0	3.79	14.93
CO12	17 72260 487798	August 26	2.9	53.5	0	0	0	0	3.58	2.23	0.97	6.29	0	0	0	0	0	0	0	0	0.10	0.13	0.02	0.40	4.66	9.06
CO03	17 72378 487382	August 26	5.1	56.6	0	0	0	0	1.18	0.75	0.30	1.20	0	0	0	0	0	0	0	0	0	0	0	0	1.48	1.94
CO09	17 72732 487758	August 20	5.3	45.2	0	0	0	0	4.03	3.89	0.79	6.15	0	0	0	0	0.53	0.81	0.05	1.00	0.05	0.05	0	0	5.45	11.90
BR01	17 73662 487572	August 20	4.7	54.4	0.05	0.04	0	0	2.35	0.65	0.40	1.31	3.55	2.26	0.14	0.32	0	0	0	0	0	0	0.04	0.50	6.54	5.08
SE03	17 74024 487321	August 17	7.3	65.6	0	0	0.11	0.09	2.15	0.84	0.87	2.04	0	0	0	0	0.08	0.05	0	0	0	0	0	0	3.20	3.02
SE02	18 26038 488106	September 7	5.1	68.5	0	0	0	0	1.58	0.61	0.60	2.15	0	0	0	0	0	0	0.02	0.29	0.09	0.04	0.11	1.15	2.39	4.24
CL01	18 26394 487646	August 17	3.4	42.5	0	0	0	0	0.15	0.09	0.02	0.21	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.30
BT01	18 28019 488056	August 16	4.7	57.5	0	0	0	0	1.01	0.50	0.71	2.75	0	0	0	0	0	0	0	0	0	0	0.04	0.23	1.76	3.47
SM01	18 28596 487954	August 16	3.3	49.0	0	0	0	0	0.30	0.48	0.41	5.60	0	0	0	0	0	0	0	0	0	0	0	0	0.71	6.08
Average					0.07	0.10	0.02	0.03	1.50	0.99	0.41	2.19	0.10	0.06	0.00	0.01	0.09	0.09	0.04	0.90	0.05	0.05	0.07	0.71	2.35	5.12

[1] Jones, M.L. and J.D. Stockwell. 1995. A rapid assessment procedure for the numeration of salmonine populations in streams. N. Amer. J. Fish. Man. 15:551-562.

2.6. Lake-wide Hydroacoustic Assessment of Prey Fish

The status of prey fish in Lake Ontario is assessed in summer hydroacoustic surveys conducted jointly since 1991 by Ontario Ministry of Natural Resources (OMNR) and New York State Department of Environmental Conservation (NYSDEC). The surveys are done in mid-summer, and cover the entire lake. The 2004 survey consisted of six shore-to-shore north-south transects in the main lake, and one U-shaped transect in the Kingston Basin. Hydroacoustic data used to estimate population densities were collected using a Biosonics 120kHz split-beam echosounder, and thirteen midwater trawls were made to obtain samples of prey fish to measure additional biological parameters.

Processing and analysis of the acoustic data from the 2004 survey has not yet been completed, and population estimates for alewife and smelt in 2004 are not available at this time. Results from midwater trawls that accompany the acoustic data collection suggest that the alewife population was dominated by 3-year and older fish, while the smelt population was dominated by yearlings. The overall catches of smelt were low, suggesting low abundance. The body condition of alewife, which was very poor in 2003, rebounded in 2004 to levels typically seen over the past decade (Fig. 2.6.1) .

Threespine sticklebacks are not currently assessed from the acoustic data, but midwater trawls conducted during the hydroacoustic surveys provide some information on their population trends. The catches of sticklebacks in 2004 were above average values observed since the mid-1990s when this species first came into prominence (Fig. 2.6.2)

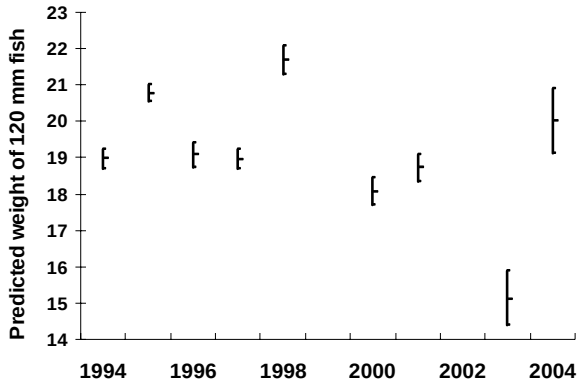

FIG. 2.6.1. Predicted weights of 120mm (fork length) alewife calculated from length-weight regressions of fish larger than 100 mm captured with mid-water trawls in summer surveys.

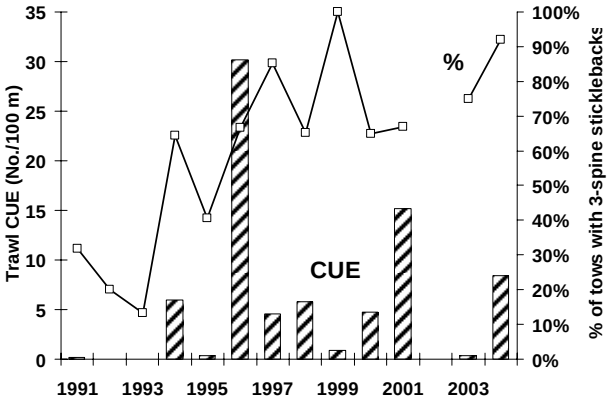

FIG. 2.6.2 Catches of threespine sticklebacks in midwater trawl conducted during summer hydroacoustic surveys. Bars represent yearly catch per unit effort; line shows percentage of tows that contained sticklebacks.

2.7 Bay of Quinte Nearshore Community Index Netting

The provincially standardized nearshore community index netting program (NSCIN) was initiated on the upper Bay of Quinte (Trenton to Deseronto) in 2001, and was expanded to include the lower Bay of Quinte (Deseronto to Lake Ontario) in 2002. The NSCIN program utilized 6-foot trapnets and was designed to evaluate the abundance and other biological attributes of fish species that inhabit the littoral area. Suitable trapnet sites were chosen from randomly selected UTM grids containing shoreline on the Bay of Quinte.

In 2004, 72 trapnet sites were sampled from September 7 to October 5 in a variety of nearshore habitat types and with water temperatures ranging from 17.0 to 22.1 ^{o}C (Table 2.7.1). Nearly 8,800 fish comprising 26 species were captured (Table 2.7.2).

TABLE 2.7.1. Survey information for the 2004 NSCIN trapnet program on the Bay of Quinte.

	Upper Bay	Lower Bay
Survey dates	Sep 7 to Sep 30	Sep 13 to Oct 5
Water temperature (^{o}C)	Mean = 19.5 (range = 17.0-22.1)	Mean = 19.0 (range = 17.5-21.0)
No. of trapnet lifts	36	36
No. sites by depth (m):		
Target (2-2.5 m)	14	19
> Target (max)	22 (3.5 m)	15 (3.5 m)
< Target (min)	0	2 (1.7 m)
No. sites by substrate:		
Hard	27 (38%)	23 (32%)
Soft	9 (13%)	13 (18%)
No. sites by cover:		
None	1 (1%)	3 (4%)
1-25%	13 (18%)	8 (11%)
25-75%	14 (19%)	23 (32%)
>75%	8 (11%)	2 (3%)

TABLE 2.7.2. Species-specific catch in the 2004 NSCIN trapnet program on the Bay of Quinte. Statistics shown include total catch, arithmetic mean catch-per-trapnet (number and weight) and percent relative standard error of the mean log10(catch by number + 1). %RSE = 100*SE/Mean.

	Upper Bay				Lower Bay				Total Bay of Quinte			
	Number			Weight	Number			Weight	Number			Weight
Species	Total	Mean	RSE (%)	Mean (kg)	Total	Mean	RSE (%)	Mean (kg)	Total	Mean	RSE (%)	Mean (kg)
Bluegill	2707	75.19	11	5.4	299	8.31	20	0.6	3006	41.75	11	3.0
Brown bullhead	750	20.83	8	5.9	1254	34.83	11	9.9	2004	27.83	7	7.9
Pumpkinseed	552	15.33	11	1.1	660	18.33	15	1.3	1212	16.83	9	1.2
Black crappie	580	16.11	10	3.5	155	4.31	16	1.0	735	10.21	9	2.2
Largemouth bass	219	6.08	17	1.9	124	3.44	16	1.2	343	4.76	12	1.5
Walleye	92	2.56	16	4.1	202	5.61	13	8.8	294	4.08	10	6.5
Freshwater drum	77	2.14	16	2.3	190	5.28	16	6.1	267	3.71	12	4.2
White perch	132	3.67	15	0.6	84	2.33	24	0.4	216	3.00	13	0.5
White sucker	45	1.25	16	1.2	92	2.56	13	2.4	137	1.90	10	1.8
Channel catfish	48	1.33	22	4.4	43	1.19	20	3.9	91	1.26	14	4.1
Yellow perch	30	0.83	29	0.1	60	1.67	37	0.2	90	1.25	23	0.2
Smallmouth bass	59	1.64	31	1.3	25	0.69	36	0.7	84	1.17	23	1.0
Longnose gar	70	1.94	37	2.3	2	0.06	70	0.1	72	1.00	36	1.2
Rock bass	21	0.58	25	0.1	34	0.94	27	0.1	55	0.76	18	0.1
Northern pike	25	0.69	20	1.1	28	0.78	20	1.3	53	0.74	14	1.2
Bowfin	19	0.53	30	1.1	12	0.33	43	0.7	31	0.43	25	0.9
Silver sedhorse	29	0.81	27	1.5	2	0.06	100	0.1	31	0.43	27	0.8
Shorthead redhorse	17	0.47	29	0.5	0	0.00		0.0	17	0.24	31	0.2
Common carp	3	0.08	72	0.5	8	0.22	39	1.8	11	0.15	35	1.1
Gizzard shad	2	0.06	70	0.1	7	0.19	39	0.3	9	0.13	34	0.2
White bass	4	0.11	48	0.0	4	0.11	58	0.0	8	0.11	37	0.0
River redhorse	6	0.17	51	0.4	0	0.00		0.0	6	0.08	52	0.2
Golden shiner	0	0.00		0.0	3	0.08	72	0.0	3	0.04	72	0.0
American eel	1	0.03	100	0.1	2	0.06	70	0.2	3	0.04	57	0.1
Greater redhorse	2	0.06	70	0.1	0	0.00		0.0	2	0.03	70	0.1
Lake trout	1	0.03	100	0.1	0	0.00		0.0	1	0.01	100	0.0
Total Catch	5491				3290				8781			

The five most abundant species by number were bluegill (3006), brown bullhead (2004), pumpkinseed (1212), black crappie (735) and largemouth bass (343). The five most abundant species by weight were brown bullhead, walleye, freshwater drum, channel catfish and bluegill. The centrarchid family of fish (bluegill, pumpkinseed, black crappie, largemouth bass, rock bass and smallmouth bass) comprised a total of 62% by number and 23% by weight of the catch. Mean length and weight statistics for all fish species caught in the 2004 NSCIN trapnet program on the Bay of Quinte are shown in Table 2.7.3.

TABLE 2.7.3. Mean fork length and weight statisitics for fish species caught in the 2004 NSCIN trapnet program on the Bay of Quinte.

	Total Catch	Mean Fork Length (mm)	N	Mean Weight (g)
Longnose gar	72	731	72	1.104
Bowfin	31	565	31	2.084
Gizzard shad	9	423	9	1.799
Lake trout	1	570	1	2.386
Northern pike	53	619	53	1.651
White sucker	137	424	136	0.943
Silver sedhorse	31	470	31	1.980
Shorthead redhorse	17	411	17	1.146
Greater redhorse	2	560	2	2.914
River redhorse	6	448	5	1.793
Common carp	11	714	11	8.108
Golden shiner	3	147	3	0.103
Brown bullhead	2004	270	975	0.283
Channel catfish	91	567	87	3.269
American eel	3	1033	3	2.770
White perch	216	192	215	0.151
White bass	8	230	8	0.297
Rock bass	55	168	55	0.114
Pumpkinseed	1212	140	619	0.073
Bluegill	3006	144	597	0.076
Smallmouth bass	84	352	84	0.909
Largemouth bass	343	245	328	0.311
Black crappie	735	223	533	0.221
Yellow perch	90	202	69	0.122
Walleye	294	512	294	1.644
Freshwater drum	267	440	223	1.136

Walleye

The age distribution of walleye (Table 2.7.4) showed a broad range of ages from 1 to16 years. However, fish were generally younger in the upper Bay (e.g., age-1 to age-5 fish comprised 74% of the catch) while more older walleye were present in the lower Bay of Quinte (e.g., age-1 to age-5 fish comprised only 48% of the catch). Age-3 (2001 year-class) fish were very common in all geographic areas and comprised 38% of the overall walleye catch. Age-2 (2002 year-class) and age-6 fish (1998 year-class) were relatively uncommon.

Trends

A summary of species-specific NSCIN trapnet catches for 2001-2004 is shown in Table 2.7.5. Of note is the overall decline in total fish abundance—especially for the dominant species including brown bullhead, pumpkinseed, bluegill and yellow perch.

TABLE 2.7.4. Age distribution of 170 walleye sampled from late-summer NSCIN trapnets, by region in the Bay of Quinte, 2004. Also shown are mean fork length, mean weight, mean GSI (females), and percent mature (females). GSI = gonadal somatic index calculated for females only as log10(gonad weight + 1)/log10(weight).

	Age																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Upper Bay of Quinte	3	2	30	8	3	0	5	2	0	3	3	1	2	0	0	0	62
Lower Bay of Quinte	2	2	35	6	7	2	12	7	5	12	5	5	5	1	1	1	108
Total	5	4	65	14	10	2	17	9	5	15	8	6	7	1	1	1	170
Mean fork length (mm)	266	424	449	501	528	528	561	583	583	608	569	620	612	546	600	552	
Mean weight (g)	205	928	1049	1482	1724	2034	1977	2490	2180	2622	2156	2791	2538	1732	2180	1873	
GSI (females)	0.04		0.36	0.45	0.50	0.54	0.52	0.57	0.57	0.57	0.54	0.60	0.60				
% Mature (females)	0%		78%	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%				

TABLE 2.7.5. Species-specific NSCIN trapnet catches in the upper and lower Bay of Quinte, 2001-2004. No netting was completed in the lower Bay of Quinte in 2001. The numbers of trapnet sets are indicated.

	Upper Bay				Lower Bay			Total		
Species	2001	2002	2003	2004	2002	2003	2004	2002	2003	2004
Longnose gar	9	12	41	70	13	16	2	25	57	72
Bowfin	13	5	21	19	24	36	12	29	57	31
Gizzard shad	40	52	72	2	27	18	7	79	90	9
Lake trout	0	0	0	1	0	0	0	0	0	1
Northern pike	37	21	31	25	42	36	28	63	67	53
Mooneye	1	0	0	0	0	0	0	0	0	0
White sucker	37	53	62	45	107	141	92	160	203	137
Silver sedhorse	0	0	25	29	0	3	2	0	28	31
Shorthead redhorse	0	0	3	17	0	0	0	0	3	17
Greater redhorse	0	0	8	2	0	0	0	0	8	2
River redhorse	2	0	5	6	0	0	0	0	5	6
Moxostoma sp.	23	15	3	0	0	0	0	15	3	0
Goldfish	0	0	0	0	1	0	0	1	0	0
Common carp	3	4	10	3	12	11	8	16	21	11
Golden shiner	1	0	1	0	3	1	3	3	2	3
Rudd	0	0	0	0	1	0	0	1	0	0
Brown bullhead	6036	3450	1344	750	2501	2844	1254	5951	4188	2004
Channel catfish	78	78	54	48	41	50	43	119	104	91
American eel	16	5	0	1	6	6	2	11	6	3
White perch	79	104	277	132	39	270	84	143	547	216
White bass	2	5	4	4	1	6	4	6	10	8
Rock bass	33	24	23	21	51	149	34	75	172	55
Pumpkinseed	3218	2631	970	552	4087	745	660	6718	1715	1212
Bluegill	6105	5135	2385	2707	453	253	299	5588	2638	3006
Smallmouth bass	34	60	13	59	28	38	25	88	51	84
Largemouth bass	89	220	285	219	181	92	124	401	377	343
Black crappie	353	540	368	580	209	187	155	749	555	735
Yellow perch	135	123	70	30	117	50	60	240	120	90
Walleye	114	89	80	92	164	295	202	253	375	294
Freshwater drum	229	119	137	77	186	252	190	305	389	267
Effort (Number of net sets)	36	36	36	36	36	36	36	72	72	72

2.8. St. Lawrence River Fish Community Index Netting - Lake St. Francis

Over 70 species of fish have been observed in Lake St. Francis during the course of various fisheries research and monitoring projects. Species that support significant fisheries in Lake St. Francis include: yellow perch, northern pike, walleye, smallmouth bass, brown bullhead and sunfish. Other less abundant, but important, fish species include walleye, lake sturgeon, and muskellunge.

Fisheries assessment activities on the St. Lawrence River have included standardized fall gillnetting, creel surveys, and monitoring eel migration over the ladder at the R. H. Saunders Hydroelectric Dam in Cornwall (see Section 2.2). The fall gillnetting program is designed to detect long-term changes in the fish communities and was established in four distinct sections of the river; Thousand Islands, Middle Corridor, Lake St. Lawrence, and Lake St. Francis. These programs have been coordinated with the New York State Department of Environmental Conservation (NYSDEC) assessment programs to provide 'river-wide' coverage of fisheries resources.

In order to monitor trends in fish abundance through time, the Lake Ontario Management Unit conducts index gillnet surveys in Lake St. Francis. These projects occur every two years, generally in the early

TABLE 2.8.1. Species-specific catch-per-standard-gillnet lift. Lake St. Francis, 1984-2004. All catches prior to 2001 have been adjusted by a factor of 1.58 to be comparable to the new netting standard initiated in 2002.

	1984	1986	1988	1990	1992	1994	1998	2000	2002	2004
Lake Sturgeon	-	-	-	-	-	-	-	0.04	-	0.03
Longnose Gar	-	0.23	0.09	-	0.66	0.26	0.14	0.13	0.4	-
Bowfin	0.04	-	-	-	-	-	-	-	-	-
Alewife	0.04	-	-	-	-	-	-	-	0.03	0.06
Salvelinus sp.	-	-	0.04	-	-	-	-	-	-	
Northern Pike	4.18	3.93	4.44	3.82	4.13	3.91	3.71	3.34	1.23	1.45
Muskellunge	-	-	0.04	-	-	-	-	-	-	0.03
White Sucker	1.71	2.17	1.01	1.71	1.41	1.67	1.99	1.63	0.74	1.06
Moxostoma sp.	-	-	0.04	0.18	0.04	0.09	0.18	0.09	-	-
Common Carp	0.13	-	-	0.09	-	-	-	-	0.09	-
Golden Shiner	-	-	-	-	-	0.04	-	-	0.03	-
Creek Chub	-	-	-	-	-	-	0.09	-	-	-
Fallfish	-	-	-	0.09	-	-	-	-	-	-
Brown Bullhead	1.14	1.27	0.62	0.4	0.7	0.44	0.95	3.25	0.54	1.38
Rock Bass	3.52	3.48	2.81	1.36	2.15	2.11	2.58	1.85	2.26	2.17
Pumpkinseed	4.97	1.72	0.84	0.75	1.49	1.76	1.54	1.06	0.41	0.41
Bluegill	-	-	-	-	-	-	0.05	0.04	0.1	-
Smallmouth Bass	0.88	0.63	0.26	0.26	0.62	0.62	1.4	0.44	1.02	0.59
Largemouth Bass	0.04	-	0.09	0.09	-	0.04	0.09	0.13	0.2	-
Black Crappie	0.04	0.09	0.04	0.04	0.09	0.13	-	0.09	0.07	-
Yellow Perch	21.45	16.32	20.88	16.57	15.83	13.72	11.89	9.36	6.49	7.45
Walleye	0.48	0.45	0.97	0.35	0.35	0.26	0.36	0.31	0.16	0.41
Freshwater Drum	-	-	-	-	-	-	-	-	0.04	-
All species	38.6	30.3	32.2	25.7	27.5	25.1	25	21.8	13.8	15
# Species Captured	13	10	14	13	11	13	13	14	16	11
Number of nets set	36	35	36	36	36	36	35	36	36	36

fall (September–October). Nets are set for approximately 24 hrs, and the same locations are used each year so that data are comparable through time. In addition to estimating abundance, age interpretation structures and other biological data are collected for some species (e.g., sex, stomach contents, pathology).

The 2004 netting in Lake St. Francis was conducted September 13–30 using standard methods. This program maintained the database established in 1984 and represents the tenth biennial netting project in Lake St. Francis (no netting in 1996).

The overall catch from 36 gillnet sets in the 2004 Lake St. Francis project was 578 fish comprising 11 species (a complete summary of standardized gillnet catch-per-unit-effort is listed in Table 2.8.1). The average number of fish captured per net set during 2004 was 15, all species combined. This is slightly more than the average for 2002 (13.8); however, overall species abundance has declined during the 20 years that Lake St. Francis has been surveyed. The average number of fish caught per net in 1984 was 38.6 (Fig. 2.8.1).

As was the case in 2002, average catches were higher in mono-filament nets than in multi-filament nets. For this reason, a correction factor of 1.58 was applied to multi-filament net catches so that all gear would be comparable.

The abundance of all species combined has declined over the survey period. Fish abundance declined throughout the early 1990s; abundance for many species has reached a new equilibrium that is consistently lower than that observed in the 1980s.

Yellow perch

Although still prominent in the fish community, yellow perch abundance has declined somewhat since the mid-1990s. Of particular concern is the dramatic decline of large yellow perch in recent years. Large yellow perch had figured prominently in the local fishery (Fig. 2.8.2). Overall perch abundance (all sizes) is lower than historical levels; however, this should be expected in light of decreased environmental productivity. Decreased growth and increased mortality from a variety of causes appear to be implicated in the reduced abundance in large yellow perch. In response to this decline, and concern expressed by local anglers and citizens, MNR recently changed fishing regulations

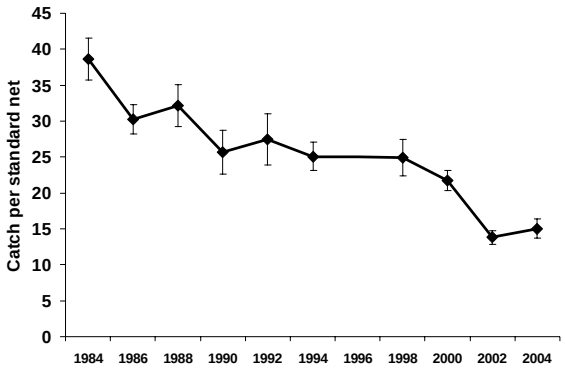

FIG. 2.8.1 Catch per standard gillnet. Lake St. Francis, 1984-2004, all species. No data are available for 1996.

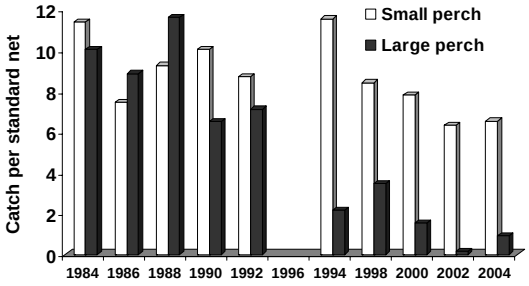

FIG. 2.8.2. Yellow perch abundance, 1984-2004, Lake St. Francis. Note decreased abundance of larger fish (>220mm).

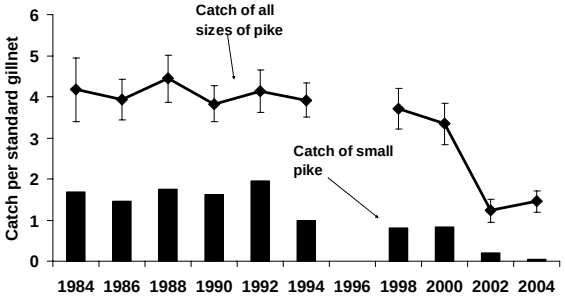

FIG. 2.8.3. Northern pike abundance, 1984-2004, Lake St. Francis. Recent decline in abundance evident, particularly small pike (<500mm).

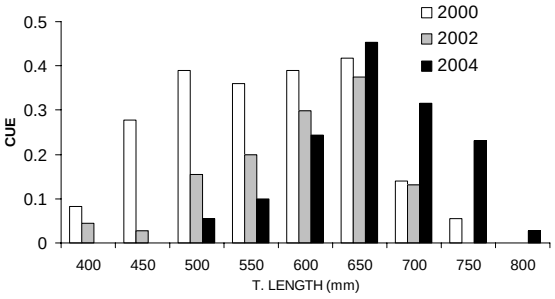

FIG. 2.8.4. Catch per standard gillnet of northern pike by 50 mm total length size classes, 2000-2004, Lake St. Francis.

concerning Lake St. Francis yellow perch (see Section 8.2).

Northern Pike

Catch rates (CUEs) for northern pike during the 1984–2000 period were remarkably stable, and distributed fairly evenly between large and small (<500mm) fish. Since 2000, there has been a significant decline in pike abundance (Fig. 2.8.3). The last two index years (2002 and 2004) have caught far fewer pike than previous years and in particular fewer small fish. Larger pike, however, made up a larger portion of the catch in 2004 than in recent years (Fig. 2.8.4).

Smallmouth Bass and Walleye

Smallmouth bass and walleye are popular game fish with anglers, but are not particularly abundant in the index gillnet catches. Based on data collected during the index gillnet program, smallmouth abundance is currently slightly below the 20-year average (Fig. 2.8.5). No dominant factor regulating smallmouth bass abundance has been determined. Walleye abundance in 2004 was equal to the 20-year average determined by the index program (Fig. 2.8.6). It should be noted that few walleye or smallmouth bass are caught in index gillnets in any given year, and interpretation of these limited data sets should be done cautiously.

Other Species

Pumpkinseed were observed at the lowest abundance since inception of the netting program. Rock bass abundance has been relatively stable (Fig. 2.8.7). Bluegill and black crappie continue to occur in low numbers, with some recent minor increases. Brown bullhead abundance is still high, following a year of very high catches in 2000. White sucker abundance is up slightly in 2004 compared to 2002, but is still low relative to the long-term trend (Fig. 2.8.8).

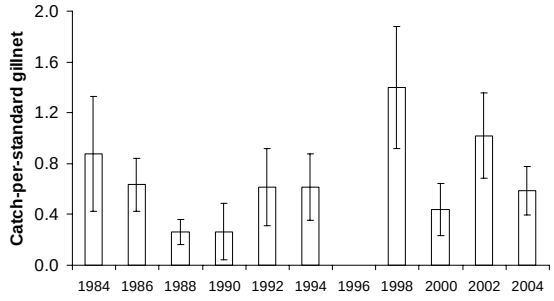

FIG. 2.8.5. Catch per standard gillnet of smallmouth bass, 1984-2004, Lake St. Francis.

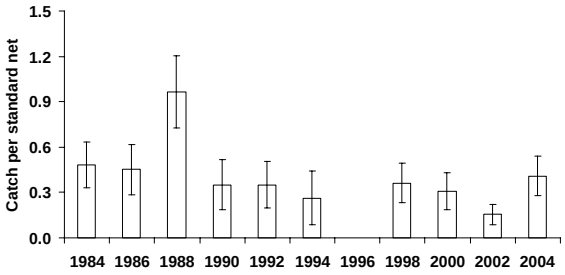

FIG. 2.8.6. Catch per standard gillnet of walleye, 1984-2004, Lake St. Francis.

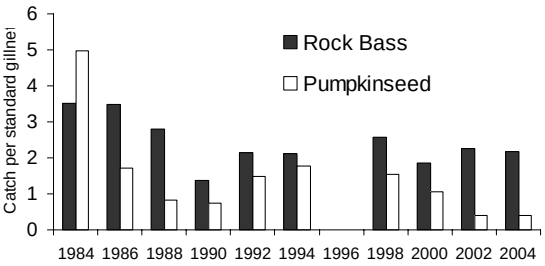

FIG. 2.8.7. Catch per standard gillnet of rock bass and pumpkinseed sunfish, 1984-2004, Lake St. Francis.

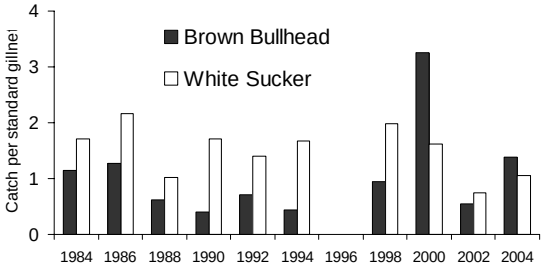

FIG. 2.8.8. Catch per standard gillnet of brown bullhead and white sucker, 1984-2004, Lake St. Francis.

2.9 Credit River Chinook Assessment

Chinook salmon growth and condition were monitored during the fall spawning run in the Credit River at the Reid Milling dam in Streetsville. Chinook salmon were electrofished in the Credit River for spawn collection by the Ringwood Fish Culture Station. LOMU crews measured fish for length and weight, and collected otoliths. The body condition of Chinook salmon in the Credit River was determined as the estimated weight of a 900 mm fish. Age was determined from otoliths in 2003 and 2004. Length-at-age of Chinook salmon in the Credit River continued to decline in 2003 and 2004 (Fig. 3.1.2), but this trend differed from Chinook salmon caught by anglers in Lake Ontario (see Section 3.1 for length of Chinook salmon in Lake Ontario.)

Mean condition (weight of a 900 mm fish) of Chinook salmon in the Credit River declined to the lowest mean weight observed in the past 16-yrs (Fig. 2.9.1). Pair-wise contrasts of condition in 2004 with other years indicated that condition of males was significantly lower than all previous years. Condition of females in 2004 was significantly lower than all previous year except 2003.

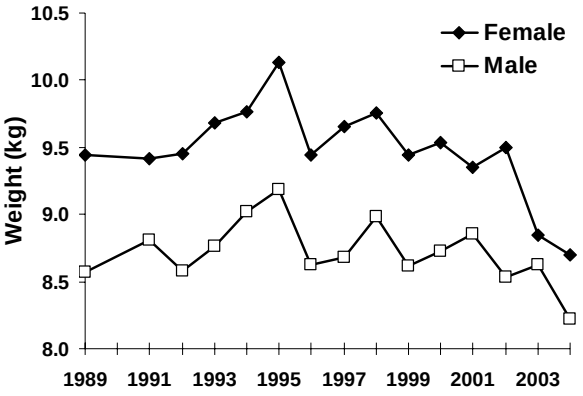

FIG. 2.9.1. Mean weight of a 900 mm Chinook salmon in the Credit River, 1974-2004, during the spawning run (approximately October 1).

3. Recreational Fishing Surveys

3.1 Western Lake Ontario Boat Fishery

The portion of the salmon and trout fishery that launches boats from ramps (launch daily fishery) in western Lake Ontario has been monitored in most years since 1977. The sampling design was based on seasonal stratification by month from April-September, and spatial stratification into six sectors from the Niagara River to Wellington. Anglers were interviewed at selected high-effort ramps after fishing was completed. Boat trailers were counted to estimate effort at all ramps from the Niagara River to Wellington, and these counts were used to 'scale-up' effort, catch, and harvest, accordingly. Estimates for the total fishery were made using the ratio of effort, catch, and harvest between launch daily and marina based fisheries in 1995.

During 2004, Chinook salmon dominated the catch and harvest in the boat angler fishery in Lake Ontario, followed by rainbow trout (Table 3.1.1). Together they represented about 90% of the catch and harvest. Declines in catch over the past decade have paralleled a decline in effort. The effort of launch daily anglers and all boat anglers was estimated at 163,695 and 276,896 angler-hours, respectively. This is the lowest effort in all of the years surveyed since 1977 (Table 3.1.2), and continues a long term gradual decline, despite good catch rates of Chinook salmon (Fig. 3.1.1).

Catch rates for the time series from 1977-2004 show major shifts in the salmon and trout population and the quality of angling in Lake Ontario (Fig. 3.1.1). Coho salmon was the dominant salmonid in Lake Ontario during the 1970s. Catch rates of rainbow trout and Chinook salmon increased as more were stocked in the 1980s but only Chinook salmon has maintained high catch rates in recent years.

The length-at-age of Chinook salmon harvested in the Lake Ontario boat angler fishery increased in 2004 (Fig. 3.1.2). By way of contrast, length-at-age of Chinook salmon sampled during the Credit River spawning run declined (Fig 3.1.2). Wild Chinook salmon are longer-at-age than stocked fish (see Section 9.2), and the production of wild fish appears to have increased after 1995 (see Section 2.5). Thus, year-to-year variation in length-at-age as well as differences between fish angled in Lake Ontario and those sampled during the spawning run may be related, in part, to the differential contribution of wild and stocked fish to the Chinook salmon population.

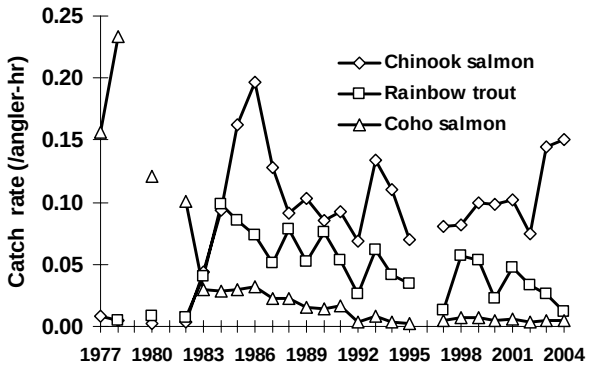

FIG. 3.1.1. The catch rate of chinook salmon in the western Lake Ontario salmonid boat fishery (Ontario portion), 1978-2004.

TABLE 3.1.1. Angling statistics for salmonid boat fisheries in western Lake Ontario (Ontario portion) during April -September 2004.

	Launch Daily Anglers					All Boat Anglers				
Species	Catch	Harvest	Catch rate (fish/angler-hour)	Harvest rate (fish/angler-hour)	Release Rate (%)	Catch	Harvest	Catch rate (fish/anger-hour)	Harvest rate (fish/anger-hour)	Release Rate (%)
Chinook salmon	28,697	10,951	0.1510	0.0576	62	42,997	18,182	0.1553	0.0657	58
Rainbow trout	2,290	1,260	0.0121	0.0066	45	4,908	3,480	0.0177	0.0126	29
Coho salmon	808	450	0.0043	0.0024	44	1,048	875	0.0038	0.0032	16
Brown trout	523	113	0.0028	0.0006	78	570	154	0.0021	0.0006	73
Lake trout	1,939	348	0.0102	0.0018	82	2,300	444	0.0083	0.0016	81
Atlantic salmon	29	5	0.0002	0.0000	81	50	8	0.0002	0.0000	84
Unidentified salmonine	921	202	0.0048	0.0011	78	1,625	354	0.0059	0.0013	78
Total salmonines	35,209	13,328	0.1853	0.0701	62	53,498	23,497	0.1932	0.0849	56

TABLE 3.1.2. Catch statistcs for the salmonid fishery in the Western Lake Ontario Boat Fishery, 1977-2004.

	Catch					Harvest					
Year	Chinook salmon	Rainbow trout	Coho salmon	Brown trout	Lake trout	Chinook salmon	Rainbow trout	Coho salmon	Brown trout	Lake trout	Effort (angler-hr)
1977	4,047	NA	72,718	NA	NA	3,972	NA	72,586	NA	NA	465,137
1978	1,928	2,109	97,924	450	72	1,892	2,096	97,746	450	72	418,895
1980	1,774	5,769	79,326	86	317	1,774	5,756	79,129	86	273	656,086
1982	2,730	5,435	74,854	129	1,512	2,447	4,126	66,998	129	1,172	744,802
1983	23,303	21,774	16,049	1,566	4,627	17,083	17,190	13,546	1,190	3,537	534,473
1984	41,764	43,774	12,867	5,224	9,259	32,906	35,627	10,458	3,991	6,242	444,448
1985	187,686	98,471	34,203	7,032	42,147	125,322	83,530	22,239	4,108	25,305	1,157,073
1986	268,877	100,824	43,294	2,831	24,775	157,675	73,377	29,200	1,471	9,013	1,363,082
1987	155,796	62,565	27,380	2,905	21,225	108,024	44,977	12,262	1,399	8,391	1,215,219
1988	112,289	96,008	27,983	5,542	9,307	74,606	73,561	16,180	3,100	3,012	1,233,013
1989	103,796	52,545	15,082	3,029	11,868	71,025	35,230	11,315	1,548	3,856	1,010,516
1990	94,786	84,229	15,906	2,817	12,201	60,701	67,529	10,516	1,040	2,832	1,112,047
1991	99,841	57,281	17,643	7,151	41,277	66,079	38,712	14,574	3,119	6,843	1,082,287
1992	69,959	26,742	3,222	4,010	7,891	50,182	18,381	1,826	1,761	2,997	1,012,822
1993	111,852	51,733	6,845	2,174	6,332	64,444	28,738	4,643	1,208	3,434	836,572
1994	66,031	25,227	2,254	3,983	13,623	38,170	14,382	1,517	2,251	5,443	601,325
1995	35,783	17,345	1,366	1,911	9,965	21,055	10,625	745	1,049	4,025	512,738
1997	43,032	7,011	2,620	1,820	17,075	23,655	3,985	1,474	1,035	2,322	531,072
1998	38,845	26,815	3,173	1,561	1,712	23,363	16,976	1,682	829	667	473,843
1999	49,843	26,539	3,305	904	5,366	28,925	18,463	3,211	428	1,408	499,159
2000	47,536	11,171	2,354	1,560	3,183	28,430	5,884	1,304	537	789	484,727
2001	41,227	19,095	2,506	1,840	2,874	19,624	11,393	1,582	1,002	357	404,368
2002	30,313	13,503	1,568	639	567	15,840	8,756	1,382	277	117	405,730
2003	50,290	9,137	1,784	931	2,244	17,659	4,928	1,297	311	480	346,766
2004	42,997	4,908	1,048	570	2,300	18,182	3,480	875	154	444	276,896

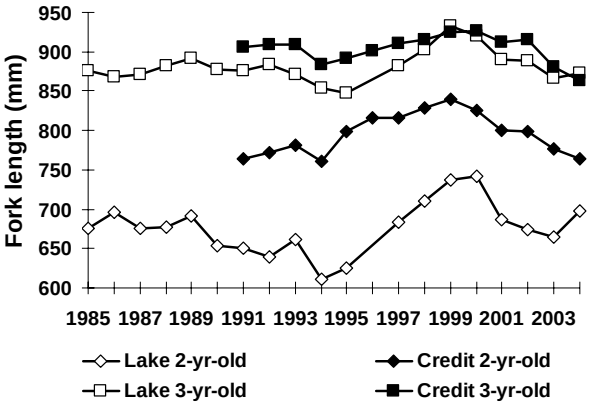

FIG. 3.1.2. Fork length of Chinook salmon in the Lake Ontario during summer, 1985-2004, and the Credit River during spawning run in September and October, 1991-2003.

3.2 Bay of Quinte Recreational Fishery

Recreational angling surveys were conducted on the Bay of Quinte, from Trenton to just east of Glenora, during the walleye angling season. The ice fishery was surveyed from late-December to February 29 and the open-water boat fishery was surveyed from the first Saturday in May to December 31. Angling effort was measured using aerial counts during the ice fishing survey, and a combination of aerial counts and on-water counts during the open-water survey. On-ice and on-water angler interviews provide information on catch/harvest rates and biological characteristics of the harvest.

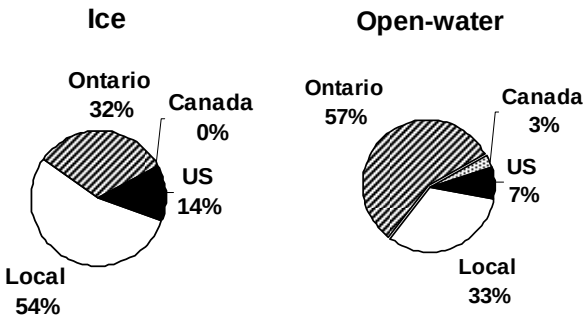

FIG. 3.2.1. Origin of anglers participating in the Bay of Quinte ice and open-water fisheries, 2004.

Ice fishery

Eight hundred and seventy anglers were interviewed by field crews during the ice fishery. Fifty-four percent of anglers interviewed were local, 32% were from Ontario (outside the local area), and 14% were from the US (Fig. 3.2.1). Eight different species were observed during the ice fishery (Table 3.2.1). All angling effort was targeted at walleye (Table 3.2.2). Fishing effort in 2004 (79,767 angler hours) was the highest since 2000. Numbers of walleye caught and harvested were 8,413 and 4,075 respectively. Walleye fishing success (number of walleye caught and harvest per hour were 0.105 and 0.051 respectively) was much higher than the previous year. The numbers of walleye caught, harvested and released, by size-class, are shown in Fig. 3.2.2.

Open-water fishery

Over 3,000 anglers (1,432 boats) were interviewed by field crews during the open-water fishery. Thirty-three percent of anglers interviewed were local, 7% were from Ontario (outside the local area), 7% were from the US and 3% were from elsewhere in Canada (Fig. 3.2.1). Eighteen different species were caught during the open-water fishing season (Table 3.2.1). Angling effort was targeted primarily at walleye (Table 3.2.3). Fishing effort in 2004 (241,700 angler hours for all anglers and 203,082 hours for anglers targeting walleye) was higher than the previous two years. Numbers of walleye caught and harvested were 39,252 and 24,277 respectively. Walleye fishing success (number of walleye caught and harvest per hour by anglers targeting walleye were 0.193 and 0.119 respectively) declined compared to the previous year but was still better than the 1998-2002 time-period. Over 80% of harvested walleye were age-3 (Table 3.2.4) from the 2001 year-class. Other species caught included over 70,000 yellow perch and about 24,000 each of largemouth bass and white perch (Table 3.2.1). The numbers of walleye caught, harvested and released, by size-class, are shown in Fig. 3.2.3. The vast majority of walleye harvested were less than 480 mm (19 in) total length.

TABLE 3.2.1. Numbers of fish caught during Bay of Quinte ice and open-water fisheries, 2004. Sunfish include pumpkinseed and bluegill.

	Ice-fishery	Open-water fishery
Gizzard shad	41	-
Rainbow trout	-	6
Lake whitefish	16	12
Lake herring	10	-
Northern pike	229	7,834
White sucker	-	32
Common carp	-	34
Brown bullhead	-	2,464
Channel catfish	8	1,270
White perch	-	24,033
White bass	-	46
Rock bass	-	2,010
Sunfish	-	9,224
Smallmouth bass	-	6,092
Largemouth bass	-	24,232
Black crappie	-	423
Yellow perch	21,044	70,369
Walleye	8,413	39,251
Round goby	-	16,597
Freshwater drum	85	10,412
Total catch	29,806	214,341

TABLE 3.2.2. Summary of fishing effort (virtually all fishing effort is targeted at walleye), numbers of fish harvested and caught, and walleye angling success (CUE and HUE are the numbers of walleye caught and harvested, respectively, per hour) during the Bay of Quinte ice fishery (first ice formation to February 28), 1993-2004.

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Fishing Effort (angler hours):												
Total All Anglers	271,088	300,049	215,518	392,602	220,263	117,602	140,363	139,047	77,074	37,129	16,237	79,767
Number of Walleye:												
Caught	21,326	31,060	28,939	58,468	42,315	11,167	23,293	9,949	982	2,601	321	8,413
Harvested	14,816	8,557	17,445	20,972	22,631	6,089	15,285	9,240	938	2,468	70	4,075
Walleye Angling Success:												
CUE	0.079	0.104	0.134	0.149	0.192	0.095	0.166	0.072	0.013	0.070	0.020	0.105
HUE	0.055	0.029	0.081	0.053	0.103	0.052	0.109	0.066	0.012	0.066	0.004	0.051

TABLE 3.2.3. Summary of fishing effort (expressed in angler hours separately for all anglers and those targeting walleye), numbers of fish harvested and caught, and walleye angling success (CUE and HUE are the numbers of walleye caught and harvested, respectively, per hour by anglers targeting walleye) during the Bay of Quinte open-water recreational fishery (first Saturday in May, opening day of walleye season, to November 30), 1993-2004. [1]The number of smallmouth and largemouth bass are for the last Saturday in June (opening day of bass season) to November 30, and are only available for the past three years.

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Fishing Effort (angler hours):												
Total All Anglers	644,477	693,731	519,276	665,436	544,476	481,553	379,012	309,259	247,537	177,092	219,684	241,700
Anglers Targeting Walleye	637,401	689,543	512,054	660,005	539,276	475,678	374,128	296,841	222,052	154,570	194,168	203,082
Number of Fish Harvested:												
Northern Pike	2,279	1,717	375	1,228	1,501	1,539	1,413	2,561	1,658	7,084	818	1,356
Smallmouth Bass[1]									778	519	704	1,075
Largemouth Bass[1]									4,890	2,340	4,333	6,808
Yellow Perch	8,205	5,226	14,587	33,609	31,462	41,313	35,102	17,630	7,768	3,876	4,588	3,440
Walleye	145,383	145,642	98,537	117,931	82,790	52,844	33,575	22,811	28,078	17,903	34,905	24,277
Number of Fish Caught:												
Northern Pike	10,318	11,691	2,964	5,884	7,912	7,950	11,577	15,809	10,835	7,084	5,134	7,834
Smallmouth Bass[1]									6,347	2,884	3,453	4,052
Largemouth Bass[1]									19,675	11,387	15,002	22,946
Yellow Perch	141,424	80,699	102,433	298,677	402,216	620,849	391,708	260,029	143,530	104,071	125,129	70,369
Walleye	266,638	262,760	166,229	209,280	134,651	70,527	47,562	28,024	40,734	29,459	70,471	39,251
Walleye Angling Success												
CUE	0.417	0.378	0.320	0.317	0.250	0.148	0.127	0.094	0.182	0.186	0.344	0.193
HUE	0.227	0.209	0.189	0.179	0.154	0.111	0.090	0.077	0.126	0.113	0.178	0.119

TABLE 3.2.4. Age-specific walleye harvest during the Bay of Quinte open-water recreational fishery, 1993-2004.

	Age						
Year	2	3	4	5	6	7+	Total
1993	25,311	51,389	42,373	10,474	6,184	9,653	145,383
1994	14,816	74,746	29,598	15,192	5,907	5,383	145,642
1995	2,493	51,808	28,592	8,527	2,136	4,982	98,537
1996	4,986	36,636	35,628	23,451	8,185	9,044	117,931
1997	22,536	35,639	10,206	8,908	3,270	2,231	82,790
1998	2,733	15,793	24,296	4,859	2,126	3,037	52,844
1999	2,763	8,500	8,925	7,225	2,550	3,613	33,575
2000	2,570	10,924	2,249	2,249	2,570	2,249	22,811
2001	14,649	2,442	6,453	1,395	1,570	1,570	28,078
2002	5,182	11,072	236	236	-	1,178	17,903
2003	18,422	8,034	4,017	139	-	4,294	34,905
2004	629	20,503	1,006	377	126	1,635	24,277

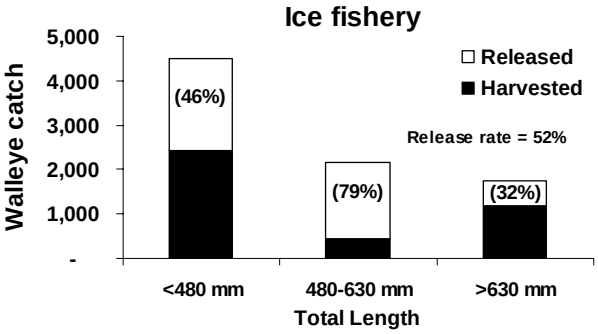

FIG. 3.2.2. Walleye catch (harvested and released) by size-category during the ice fishery on the Bay of Quinte, 2004. Percentages shown are walleye release rates, overall and by size-category.

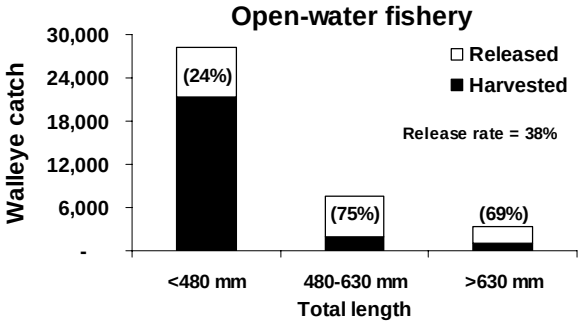

FIG. 3.2.3. Walleye catch (harvested and released) by size-category during the open-water fishery on the Bay of Quinte, 2004. Percentages shown are walleye release rates, overall and by size-category.

4. Commercial Fishery

4.1 Quota and Harvest Summary

Lake Ontario supports a locally important commercial fish industry. The commercial harvest comes primarily from the Canadian waters of Lake Ontario east of Brighton (including the Bay of Quinte) and the St. Lawrence River (Fig. 4.1.1). Commercial harvest statistics for 2004 were obtained from the Ontario Commercial Fisheries Association (OCFA) which, in partnership with the Ontario Ministry of Natural Resources, manages the Province of Ontario's commercial harvest database. Commercial quota and harvest statistics for 2004 are shown in Tables 4.1.1 and 4.1.2 respectively.

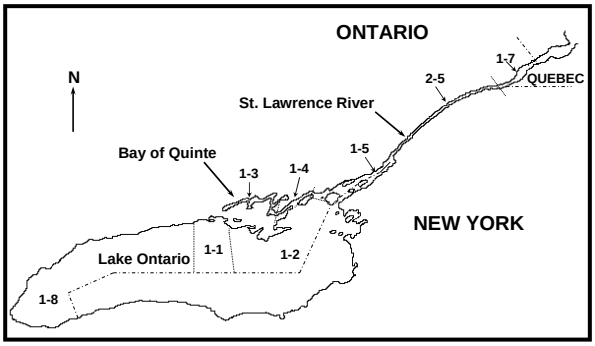

FIG. 4.1.1. Map of Lake Ontario and the St. Lawrence River showing commercial fishing quota zones in Canadian waters.

Lake Ontario

The total harvest of all species was 404,236 lb (249,444) in 2004, and has declined nearly 70% since 1996 (Fig. 4.1.2, Table 4.1.3).

Lake whitefish
Lake whitefish harvest was 101,161 lb, 42% of the quota. The annual lake whitefish harvest has declined 84% since 1996.

Eel
As of spring 2004, commercial eel quotas were reduced to zero for Lake Ontario and the upper St. Lawrence River.

Yellow perch
Yellow perch harvest was 75,404 lb, 17% of the quota. Yellow perch harvest had increased significantly from 1996 to 1999 but declined by over 72% between 1999 and 2004.

Walleye
Walleye harvest was 6,897 lb, 13% of the quota.

Other species
Commercial harvest of brown bullhead and rock bass declined in 2004, that of black crappie, white perch, freshwater drum, and suckers increased, and that of sunfish was virtually unchanged.

St. Lawrence River

The total harvest of all species was 143,845 lb ($102,646) in 2004, and has declined 62% since 1998 (Fig. 4.1.3, Table 4.1.4).

TABLE 4.1.1. Commercial harvest quotas (lb) for the Canadian waters of Lake Ontario and the St. Lawrence River, 2004. See Fig. 1 for a map of the quota zones.

	Quota by quota zone (lb)								Quota by waterbody (lb)	
	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	Lake Ontario	St. Lawrence River
Alewife							600		-	600
Black crappie	4,540	2,500	14,810	800	2,800	18,590	18,365	4,840	25,450	41,795
Bowfin					500				500	-
Brown bullhead	36,200								36,200	-
Common carp			1,000						1,000	-
Freshwater drum									-	-
Lake whitefish	14,545	152,032	31,718	40,615	416				239,326	-
Lepomis	28,130								28,130	-
Walleye	4,510	36,440		11,217	800				52,967	-
Yellow perch	35,586	182,507	96,128	126,168	13,000	66,677	83,173	7,260	453,389	157,110
Total	123,511	373,479	143,656	178,800	17,516	85,267	102,138	12,100	836,962	199,505

TABLE 4.1.2. Commercial harvest (lb) and value ($) for fish species in the Canadian waters of Lake Ontario and the St. Lawrence River, 2004. See Fig. 1 for a map of the quota zones.

										Harvest (lb) and value by waterbody			
										Lake Ontario		St. Lawrence River	
Species	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	Price per lb	Harvest (lb)	Value	Harvest (lb)	Value
American eel			4	306					$ 3.95	309	$ 1,222	-	$ -
Black crappie	22	14	5,133	4	7	2,223	727	1,356	$ 2.20	5,179	$ 11,394	4,306	$ 9,473
Bowfin	788		3,799	3	3	1,254			$ 0.30	4,593	$ 1,378	1,254	$ 376
Brown bullhead	6,547	1,013	79,350	3,166	707	20,439	19,581	34,700	$ 0.34	90,784	$ 30,867	74,720	$ 25,405
Channel catfish					21				$ 0.43	21	$ 9	-	$ -
Common carp		3,338	2,686	5,747	760	481			$ 0.18	12,531	$ 2,256	481	$ 87
Freshwater drum	10	1,777	20,601	8,924	85				$ 0.09	31,397	$ 2,826	-	$ -
Lake herring	2	132	481	308					$ 0.25	923	$ 231	-	$ -
Lake whitefish	3,300	80,949	14,178	2,734					$ 0.46	101,161	$ 46,534	-	$ -
Rock bass	1,399	715	3,260	407	38	459	222		$ 0.46	5,818	$ 2,676	682	$ 313
Round goby				8						8	$ -	-	$ -
Suckers		174	10,634	164	453	10		92	$ 0.10	11,425	$ 1,143	102	$ 10
Sunfish	2,341	151	42,790	63		6,090	7,827	9,985	$ 0.95	45,343	$ 43,076	23,902	$ 22,707
Walleye	672	1,992		4,226	8				$ 2.00	6,897	$ 13,794	-	$ -
White bass	1	5	3	112	74				$ 0.73	195	$ 142	-	$ -
White perch	8	137	8,337	3,729	37	749			$ 0.30	12,249	$ 3,675	749	$ 225
Yellow perch	1,366	22,479	22,701	28,572	286	17,178	15,406	5,065	$ 1.17	75,404	$ 88,222	37,650	$ 44,050
Total	16,453	112,875	213,956	58,472	2,479	48,883	43,763	51,199		404,236	$ 249,444	143,845	$ 102,646

TABLE 4.1.3. Commercial harvest (lb; 1960-2004) and landed value ($; 1985-2004) trends for the Canadian waters of Lake Ontario, including the Bay of Quinte.

	Harvest (lb)	Value ($)		Harvest (lb)	Value ($)
1960	1,834,000		1983	2,263,000	
1961	2,026,000		1984	2,050,000	
1962	1,620,000		1985	1,497,000	$ 906,879
1963	1,847,000		1986	1,759,000	$ 1,577,086
1964	1,814,000		1987	756,000	$ 993,609
1965	2,226,000		1988	1,190,000	$ 896,481
1966	1,347,000		1989	1,211,000	$ 989,563
1967	1,617,000		1990	1,165,000	$ 907,409
1968	1,829,000		1991	1,210,000	$ 1,003,909
1969	2,130,000		1992	1,191,000	$ 1,039,892
1970	2,798,000		1993	1,103,000	$ 746,892
1971	2,804,000		1994	1,243,097	$ 1,277,262
1972	2,455,000		1995	1,218,508	$ 1,322,557
1973	2,279,000		1996	1,284,022	$ 1,456,736
1974	2,299,000		1997	1,078,250	$ 996,383
1975	2,664,000		1998	973,006	$ 1,059,212
1976	2,935,000		1999	964,743	$ 1,067,904
1977	2,456,000		2000	914,014	$ 990,544
1978	2,469,000		2001	840,557	$ 861,978
1979	2,042,000		2002	602,338	$ 475,262
1980	1,982,000		2003	447,633	$ 324,320
1981	2,387,000		2004	404,236	$ 249,444
1982	1,999,000				

TABLE 4.1.4. Commercial harvest (lb; 1988-2004) and landed value ($; 1989-1994 and 1996-20042004) trends for the Canadian waters of the St. Lawrence River.

	Harvest (lb)	Value ($)
1988	318,000	
1989	273,800	$ 217,000
1990	305,100	$ 237,000
1991	247,600	$ 328,100
1992	292,700	$ 257,300
1993	237,000	$ 171,900
1994	262,240	$ 257,900
1995	375,763	
1996	445,052	$ 399,856
1997	353,838	$ 397,494
1998	378,729	$ 424,111
1999	368,035	$ 438,581
2000	341,672	$ 407,647
2001	272,523	$ 352,551
2002	266,817	$ 241,817
2003	211,254	$ 203,710
2004	143,845	$ 102,646

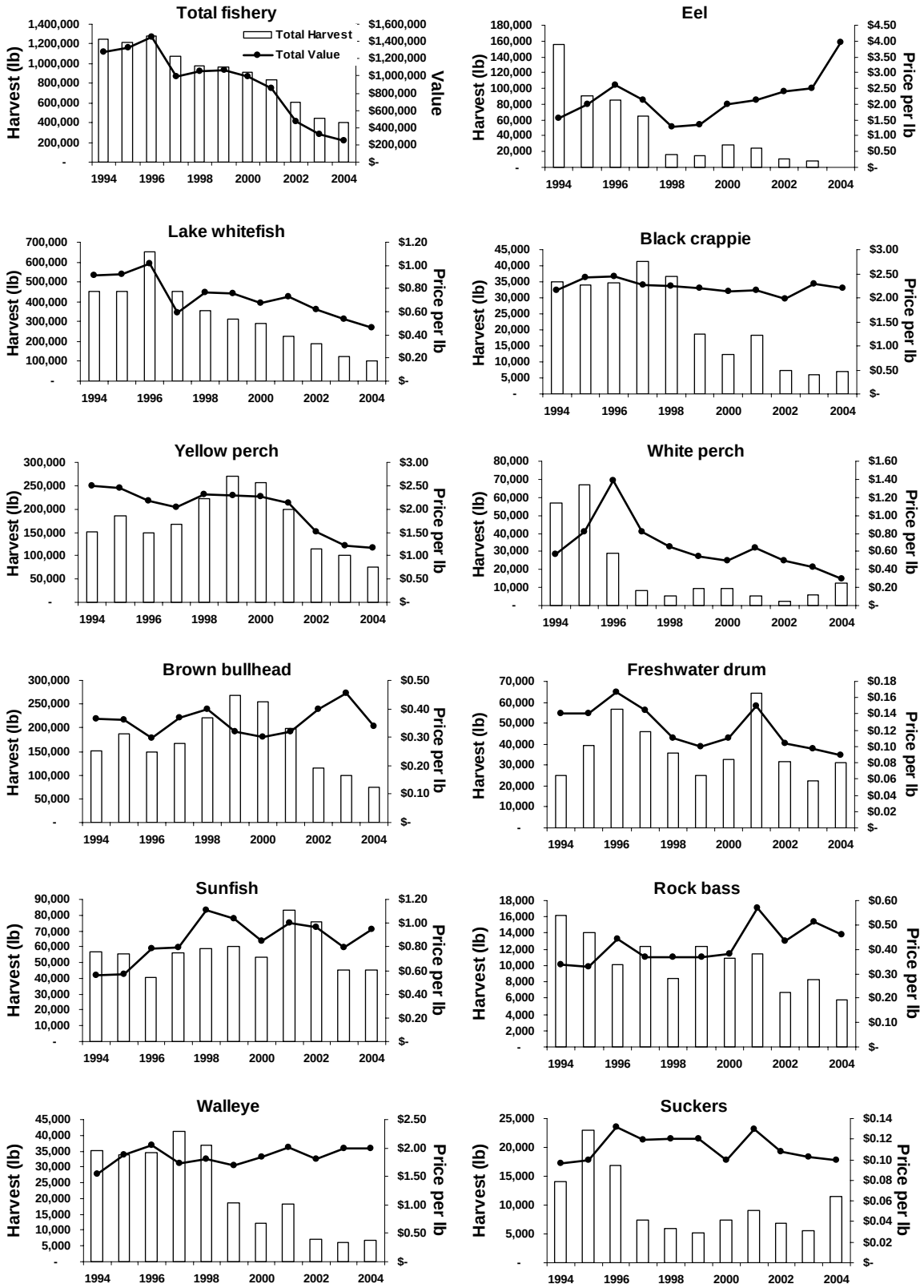

FIG. 4.1.2. Harvest (bars) and value (lines) trends for several common species and the total for all species in the commercial fishery on Lake Ontario, 1994-2004.

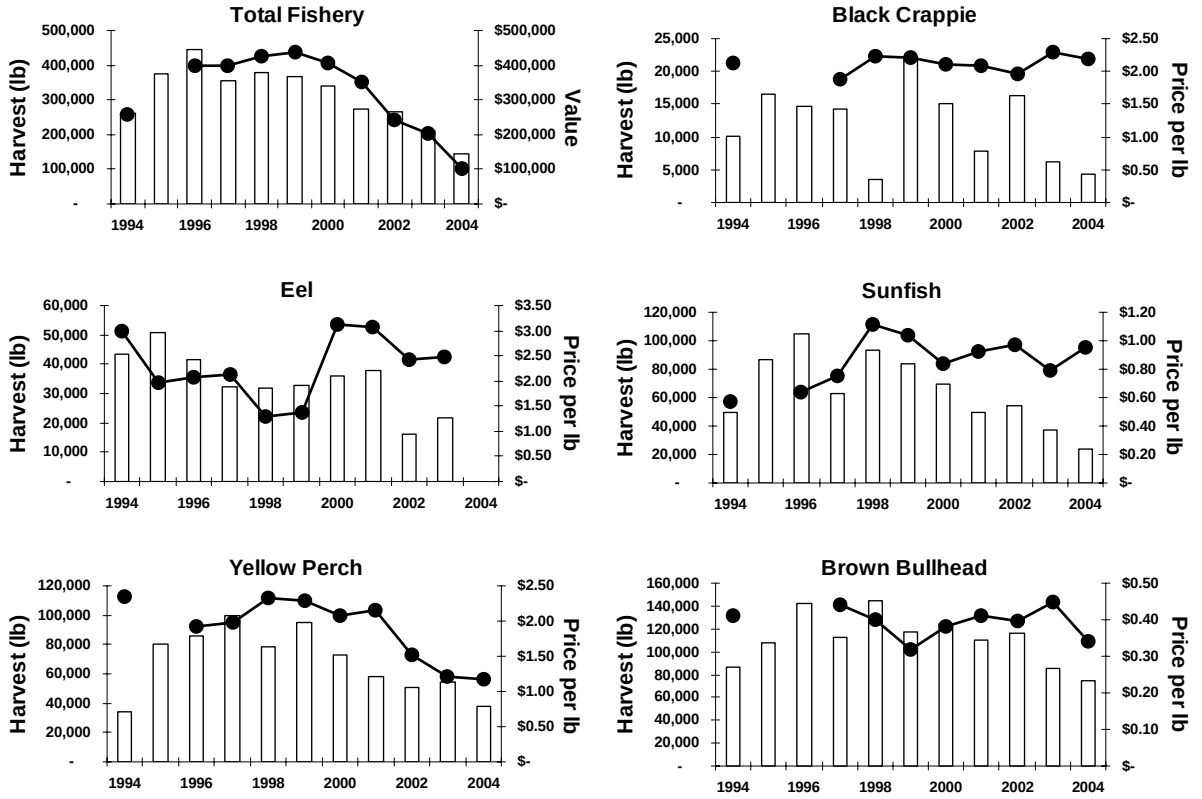

FIG. 4.1.3. Harvest (bars) and value (lines) trends for several common species and the total for all species in the commercial fishery on the St. Lawrence River, 1994-2004.

Eel

As of spring 2004, commercial fishing of American eel is no longer allowed in the Province of Ontario.

Yellow perch

Yellow perch harvest was 37,650 lb, 24% of the quota.

Other species

Commercial harvest of black crappie, sunfish and brown bullhead declined in 2004.

4.2 Lake Whitefish Commercial Catch Sampling

Sampling of commercially harvested lake whitefish for biological attribute information occurs annually. While total lake whitefish harvest can be determined from commercial fish Daily Catch Reports (DCRs; see section 4.1), biological sampling of the catch is necessary to break-down total harvest into age-specific harvest. Age-specific harvest data can then be used in catch-age modelling to estimate population size and mortality schedule.

Biological sampling generally focuses on the largest components of the commercial lake whitefish fishery. For many years the largest components of the fishery were the November spawning-time gillnet fishery on the south shore of Prince Edward County (commercial fishing Quota Zone 1-2) and the October/November spawning-time impoundment gear fishery in the Bay of Quinte (QZ 1-3). Consequently, age-specific harvest from these two components of the fishery is reported here. A limited amount of biological sampling also took place during a small impoundment gear fishery (April/May); also in QZ 1-2.

In 2004, considerable lake whitefish harvest occurred during summer in QZ 1-2 as part of an experimental "test-netting" program designed to examine the feasibility of harvesting lake whitefish with limited incidental catch at times of the year other than the spawning period (see Section 8.6).

The lake whitefish sampling design involves obtaining large numbers of length tally measurements and a smaller length-stratified sub-sample for more detailed biological sampling (Table 4.2.1). In total, fork length was measured for 3,595 fish and age was interpreted (otoliths) for 458 fish.

Lake Ontario Spawning Stock (QZ 1-2)

Mean fork length and age were 498 mm and 11.1 years, respectively (Fig. 4.2.1). Fish ranged from ages 5 to 18 years. Age-12 (1992 year-class) and age-9 (1995 year-class) fish were the most abundant.

TABLE 4.2.1. Number of lake whitefish sampled for length and age, by quota zone and month, in the 2004 commercial catch sampling program.

Quota Zone	Month	Lengthed	Aged
1-2	4	636	152
	5	36	-
	11	1,552	140
1-3	10	790	-
	11	581	166
Total		**3,595**	**458**

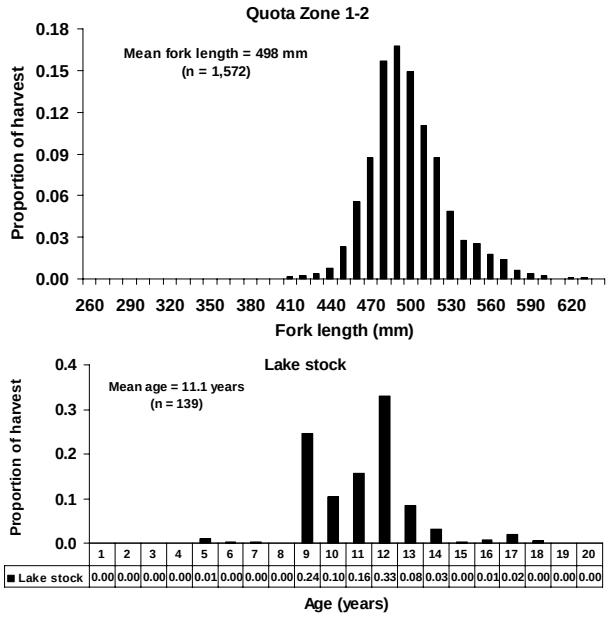

FIG. 4.2.1. Size and age distribution (by number) of lake whitefish sampled in Quota Zone 1-2 during the 2004 commercial catch sampling program.

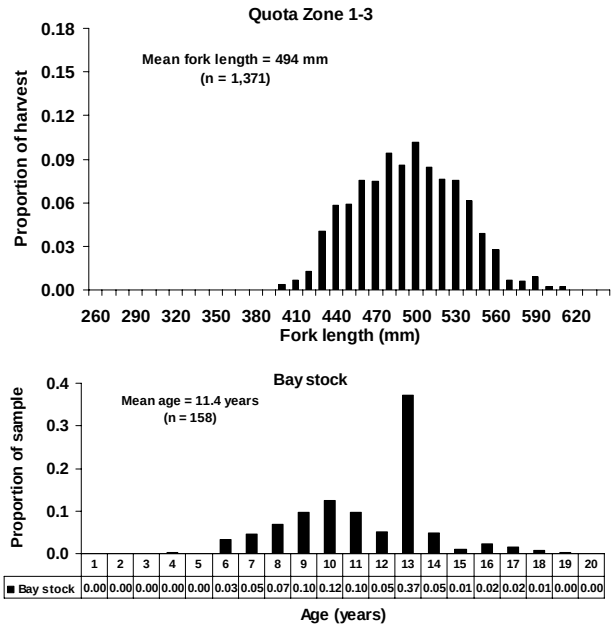

FIG. 4.2.2. Size and age distribution (by number) of lake whitefish sampled in Quota Zone 1-3 during the 2003 commercial catch sampling program.

Fish age-9 to 13 comprised over 90% of the harvest. Mean age of the commercial lake whitefish harvest increased steadily after 1995 as the strong early-1990s year-classes "moved through" the fishery, and as age at first recruitment to the fishery increased over the same time-period (Table 4.2.2).

Bay of Quinte Spawning Stock (QZ 1-3)

Mean fork length and age were 494 mm and 11.4 years, respectively (Fig. 4.2.2). Fish ranged from ages 6 to 19 years. Age-13 fish were the most abundant. This represents the eleventh consecutive year that the 1991 year-class was the most abundant year-class in the Quota Zone 1-3 commercial harvest. Similar to the Lake Ontario commercial harvest, mean age of the commercial lake whitefish harvest in the Bay of Quinte increased steadily after 1995 as the 1991 year-class "moved through" the fishery, and as age at first recruitment to the fishery increased over the same time-period (Table 4.2.3).

TABLE 4.2.2. Age distribution (proportion by number) of lake whitefish harvested in Quota Zone 1-2, 1993-2004.

Age	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.000	0.071	0.015	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000
4	0.050	0.206	0.093	0.158	0.001	0.030	0.000	0.000	0.000	0.000	0.001	0.001
5	0.282	0.193	0.220	0.136	0.075	0.066	0.000	0.001	0.002	0.000	0.019	0.000
6	0.342	0.246	0.197	0.296	0.179	0.247	0.067	0.020	0.054	0.008	0.010	0.033
7	0.249	0.220	0.212	0.093	0.270	0.205	0.238	0.156	0.093	0.163	0.044	0.046
8	0.068	0.014	0.222	0.102	0.096	0.090	0.238	0.267	0.166	0.096	0.122	0.070
9	0.000	0.006	0.028	0.159	0.140	0.060	0.067	0.253	0.292	0.132	0.194	0.097
10	0.000	0.003	0.002	0.034	0.133	0.108	0.076	0.105	0.219	0.338	0.084	0.125
11	0.000	0.004	0.000	0.009	0.094	0.060	0.067	0.063	0.070	0.134	0.037	0.096
12	0.008	0.004	0.000	0.000	0.003	0.060	0.210	0.033	0.034	0.074	0.369	0.052
13	0.000	0.007	0.001	0.003	0.000	0.030	0.029	0.070	0.018	0.024	0.035	0.371
14	0.000	0.002	0.006	0.000	0.000	0.018	0.000	0.013	0.031	0.012	0.032	0.049
15	0.000	0.003	0.000	0.003	0.002	0.006	0.000	0.018	0.020	0.011	0.021	0.010
16	0.000	0.000	0.004	0.003	0.001	0.006	0.000	0.000	0.000	0.007	0.005	0.024
17	0.000	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.021	0.016
18	0.000	0.021	0.000	0.001	0.004	0.006	0.010	0.000	0.000	0.000	0.000	0.007
19	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.003
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.005	0.000
Mean	6.0	5.9	6.4	6.6	7.9	8.1	9.1	9.2	9.3	9.7	10.6	11.4

TABLE 4.2.3. Age distribution (proportion by number) of lake whitefish harvested in Quota Zone 1-3, 1993-2004.

Age	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.014	0.293	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.093	0.232	0.617	0.079	0.000	0.000	0.039	0.012	0.000	0.000	0.000	0.000
5	0.106	0.069	0.161	0.385	0.104	0.088	0.070	0.010	0.000	0.000	0.000	0.011
6	0.306	0.122	0.016	0.145	0.527	0.140	0.109	0.055	0.101	0.017	0.000	0.002
7	0.237	0.115	0.040	0.047	0.075	0.390	0.101	0.179	0.150	0.094	0.016	0.003
8	0.119	0.093	0.053	0.047	0.087	0.081	0.450	0.172	0.068	0.133	0.076	0.001
9	0.057	0.031	0.066	0.119	0.058	0.015	0.062	0.409	0.178	0.141	0.118	0.245
10	0.014	0.009	0.028	0.097	0.057	0.037	0.008	0.051	0.448	0.176	0.137	0.103
11	0.027	0.031	0.013	0.044	0.058	0.074	0.031	0.000	0.000	0.314	0.376	0.156
12	0.013	0.004	0.000	0.004	0.015	0.096	0.023	0.011	0.005	0.027	0.186	0.329
13	0.014	0.001	0.002	0.017	0.010	0.066	0.054	0.021	0.033	0.013	0.045	0.084
14	0.000	0.000	0.000	0.006	0.000	0.015	0.031	0.068	0.004	0.014	0.010	0.031
15	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.008	0.032	0.009	0.003
16	0.000	0.000	0.002	0.000	0.009	0.000	0.000	0.001	0.000	0.039	0.013	0.008
17	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.008	0.000	0.000	0.013	0.020
18	0.000	0.000	0.000	0.003	0.000	0.000	0.016	0.001	0.004	0.000	0.000	0.005
19	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mean	6.7	5.2	5.2	6.9	7.1	8.2	8.3	8.8	9.0	10.1	10.8	11.1

5. Age & Growth Summary

Biological sampling of fish from Lake Ontario Management Unit field projects routinely involves collection and archival of structures used for such purposes as age interpretation, origin determination (e.g. stocked versus wild), life history characteristics and other features of fish growth. In 2004, a total of 4,875 structures were processed for these purposes (Table 5.1).

TABLE 5.1. Species-specific summary of structures interpreted for age in support of Lake Ontario Management Unit field projects, 2004.

Species	Age structure	Field Project	Approx. sample size
Lake whitefish	otoliths	2004 Commercial Catch	449
		2004 Fish Community Index Gillnetting	124
		2004 Commercial Test-Netting	157
Walleye	otoliths	2004 Community Index	222
		2004 NSCIN	170
	scales	2004 Bay of Quinte Open-water Creel	193
Yellow perch	scales	2004 Fish Community Index Gillnetting	324
Smallmouth bass	scales	2004 Fish Community Index Gillnetting	18
Multi-species (sunfish, bass, crappie)	scales	2004 NSCIN	580
Multi-species (yellow perch, bass, pike)	scales/spines	2004 Lake St. Francis Gillnetting	200
Lake trout	coded wire tags	2004 Community Index Netting & Commercial Test Netting	150
	otoliths	Multi-year Community Index (isotope study)	400
Rainbow trout	scales	2004 Ganaraska Fishway Monitoring & Western Basin Creel	200
		Multi-year Ganaraska Fishway Monitoring & Western Basin Creel	1,500
Chinook salmon	otoliths	Multi-year Western Basin Creel & Credit River Chinook Assessment	188

6. Contaminant Monitoring

Lake Ontario Management Unit cooperates annually with several agencies to collect fish samples for contaminant testing. In 2004, most (n = 482) contaminant samples collected were for the Ministry of the Environment and Energy's (MOEE) Sport fish Monitoring program (Table 6.1). Samples were obtained from existing fisheries assessment programs on Lake Ontario, Bay of Quinte, St. Lawrence River and the Ganaraska River. In addition, fish samples are supplied to LOMU for MOEE by the Port Whitby Sport Fishing Association and local commercial fisherman.

Nineteen lake trout were collected from the Kingston Basin during August fish community index gillnetting operations for the Department of Fisheries and Oceans' (DFO) Contaminant Surveillance program.

TABLE 6.1. Number of fish samples collected for contaminant analysis by the Ministry of Environment and Energy (MOEE), 2004.

Species	Lower Niagara River	Northwestern Lake Ontario	Ganaraska River	Northeastern Lake Ontario	Middle Bay of Quinte	Lower Bay of Quinte/Eastern Lake Ontario	Lake St. Francis	Total
Black crappie					3			3
Bluegill					10			10
Brown bullhead					20	5		25
Brown trout	19			9		3		31
Chinook salmon	5	20		15		8		48
Freshwater drum					13	3		16
Lake trout	17			20		17		54
Largemouth bass					20			20
Northern pike						2	20	22
Pumpkinseed					5		3	8
Rainbow trout	17		20					37
Rock bass				2	9			11
Smallmouth bass					5		16	21
White perch					20	20		40
Yellow perch				15	20	20	20	75
Walleye				9	20	20	12	61
Total	**58**	**20**	**20**	**70**	**145**	**98**	**71**	**482**

7. Enforcement Update

The Lake Ontario Management Unit Enforcement Program was involved with a number of important issues for MNR that supported management actions including invasive species work.

A key management undertaking for LOMU was the closure of the American eel commercial fishery. Early in 2004, a science based decision was made to close the commercial fishery for American eel. On April 5th, 2004 commercial licences were amended to set the quota for this species at zero (see Sections 1.5, 2.2, 4.1, 8.2 and 8.3) .

On May 8th 2004, Ontario Regulation 664/98 was amended and the buying and selling of live Asian carp (grass, bighead, black and silver), 28 species of snakehead, round goby and tubenose goby) became illegal. At the time, approximately six wholesalers in the GTA were annually importing approximately 1.6 million lbs of live Asian Carp. The other species are imported by garden and aquaria outlets. Until the Ontario fishery Regulations are amended (2005) these species can still be imported live but cannot be sold live. LOMU enforcement staff has conducted numerous retail and wholesale market inspections to ensure that companies are in compliance with this new legislation. LOMU enforcement staff currently has five outstanding investigations ongoing in relation to Asian Carp.

Other amendments to O. Reg 664 removed the exception allowing the sale of yellow perch harvested within three counties on Lake St. Francis. Investigative work by Kemptville District assisted by LOMU enforcement program supported the management decision to remove this exception making it illegal to sell any fish caught by angling in the Province of Ontario (see Section 8.2).

LOMU enforcement staff increased efforts to monitor walleye harvesting efforts by the Mohawks of the Bay of Quinte. LOMU enforcement staff conducted uniform inspections of members engaged in harvesting walleye on the Bay of Quinte. Inspections focused on: ensuring that all engaged in harvesting had the right to do so; and the collection of harvest information. As a result of these inspections, one local resident was charged and convicted of fisheries violations.

LOMU staff met on two occasions with Chief R. Donald Maracle and elected council members to present and discuss information. A presentation was given outlining MNR approach to managing contaminants (see Section 11).

A summary of enforcement contacts, warning and charges is presented in Table 7.1.

TABLE 7.1. Summary of enforcement contacts, warnings and charges, 2004.

	Contacts				
Activity	Resident	Non-resident	Total	Warnings	Charges
Sport fish enforcement	4,038	459	4,497	77	108
Commercial fish enforcement	396	6	402	18	2
Wildlife enforcement	138	-	138	3	13
Investigations	31	2	33	-	1

8. Management Activities

8.1 Stocking

In 2004, OMNR stocked about 2 million salmon and trout into Lake Ontario (Table 8.1). Just under 550,000 Chinook salmon spring fingerlings were stocked at various locations to provide put-grow-and-take fishing opportunities.

About 20,000 Chinook salmon were held in pens at two embayment sites in eastern Lake Ontario for a short period of time prior to stocking. This project was done in partnership with a local community group to determine whether these fish would successfully imprint on the embayments. It is hoped that pen-imprinting will help improve returns of mature adults to this area in the fall, thereby enhancing local nearshore and shore fishing opportunities. Follow-up monitoring is planned.

About 143,000 Coho salmon fall fingerlings and spring yearlings were stocked into the Credit River. As a result of a surplus of Coho salmon fall fingerlings, about 55,000 were stocked into the Humber River and Bronte Creek.

OMNR stocked about 212,000 Atlantic salmon spring fingerlings in support of an ongoing program to restore self-sustaining populations of this native species to the Lake Ontario watershed. Partners stocked out about 30,000 Atlantic salmon fry, as well as about 5,000 spring fingerlings.

About 475,000 lake trout yearlings were also stocked as part of an established, long-term rehabilitation program. Lake trout stocking is focused in eastern Lake Ontario where most of the historic spawning shoals are found.

About 111,000 rainbow trout yearlings were stocked by OMNR. In addition, local community groups reared about 171,000 rainbow trout fry, 40,000 fall fingerlings and 5,000 yearlings. About 172,000 brown trout yearlings were stocked at various locations to provide shore and boat fishing opportunities.

Detailed information about OMNR's 2004 stocking activities is found in Appendix C. Fig. 8.1 shows trends in salmon and trout stocking in Ontario waters of Lake Ontario, 1968-2004.

The New York State Department of Environmental Conservation (NYSDEC) also stocked 3.6 million salmon and trout into Lake Ontario in 2004.

TABLE 8.1.1. Salmon and trout stocked into Province of Ontario waters of Lake Ontario, 2004, and target for 2005.

		Number Stocked	
Species		**2004**	**2005**
Atlantic salmon	Fry	25,300	
	Spring fingerlings	217,804	200,000
	Fall fingerlings	5,000	
	Adults	338	
		248,442	**200,000**
Brown trout	Spring yearlings	**171,821**	**165,000**
Chinook salmon	Spring fingerlings	**548,372**	**540,000**
Coho salmon	Fall fingerlings	145,658	75,000
	Spring yearlings	51,813	75,000
		197,471	**150,000**
Lake trout	Spring yearlings	**474,837**	**440,000**
Rainbow trout	Fry	170,712	
	Fall fingerlings	40,000	
	Spring yearlings	116,549	140,000
		327,261	**140,000**
Salmon & trout total		**1,968,204**	**1,635,000**

8.2 Fishing Regulation Changes

Recreational Fishing

The exception that previously allowed the sale of angler-caught perch taken from the waters of Division 12A (Lake St. Francis) has been revoked. It is now uniformly illegal for anglers to sell their catch throughout the province of Ontario.

A proposal has been made by MNR to change the bag and possession limits for yellow perch in Divisions 11 (St. Lawrence R.) and 12A to 50 and 25 for Sport and Conservation licence holders, respectively. These changes are expected to be in place early in 2005.

In the spring of 2004, regulations were proposed to close the eel sport fishery in the Province of Ontario.

Commercial Fishing

As of spring 2004, commercial eel quotas were reduced to zero for Lake Ontario and the upper St. Lawrence River.

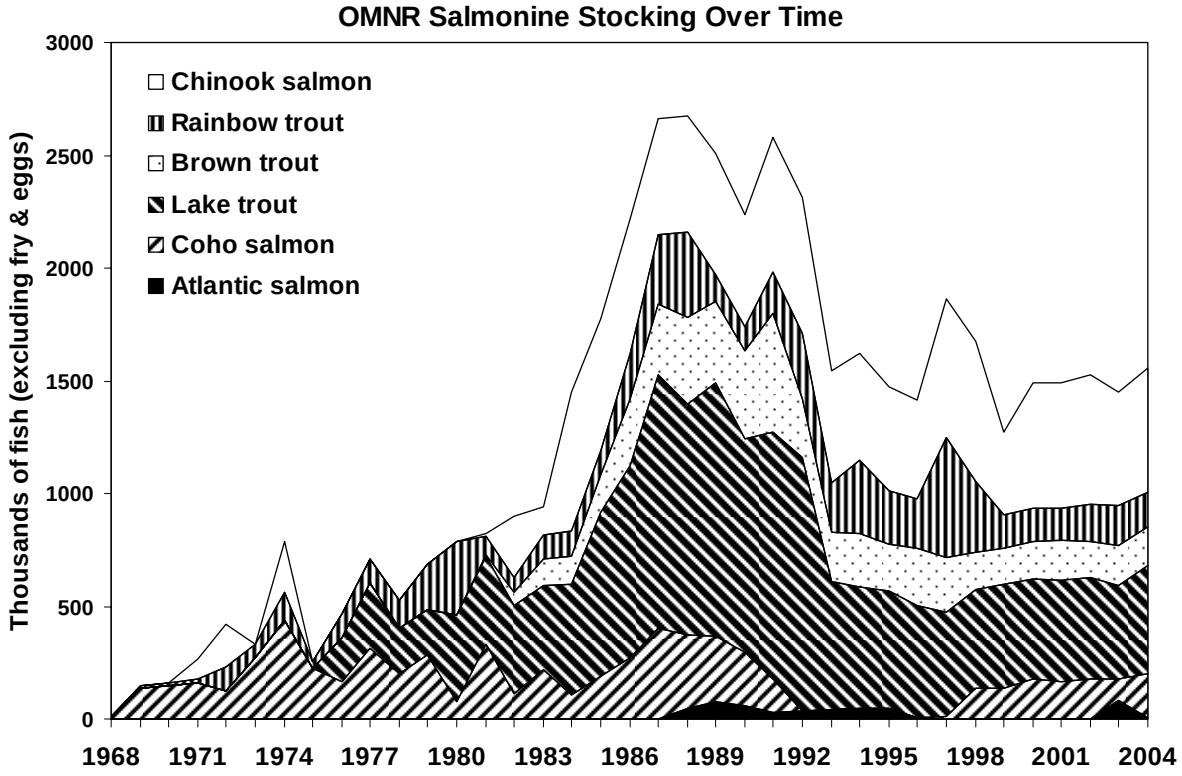

FIG. 8.1.1. Trends in salmon and trout stocking in Ontario water of Lake Ontario, 1968-2004.

8.3 Native Species Restoration

Atlantic Salmon Restoration Program

The Atlantic salmon was an important member of the original Lake Ontario fish community. Atlantic salmon provided a valued resource for First Nations communities and early European settlers. This species was extirpated from Lake Ontario in the late 1800s, primarily as a result of the loss of spawning and nursery habitat in the streams.

A plan to investigate the feasibility of restoring self-sustaining Atlantic salmon populations to Lake Ontario was revised by OMNR in 1995. Benchmarks for the first 5-yrs of the program have been met. Research has demonstrated that habitat conditions in the streams are suitable for juvenile Atlantics. OMNR is committed to working towards the restoration of Atlantic salmon, as part of the "Ontario Biodiversity Strategy". In the next phase of the program, a formal recovery plan will be developed for Atlantic salmon, following the approach prescribed under the new federal Species at Risk Act (SARA). This species is recognized as part of Ontario's natural heritage.

Some of the key elements of the recovery plan will include:

1)Assessing the rate of adult return and spawning success. This will require higher levels of stocking than in earlier phases of the program. A long-term production plan will be developed, with consideration of the management objectives that have been set for Lake Ontario as a whole. A project is underway to evaluate the characteristics of different strains of Atlantic salmon.

2)The program is at a logical point to move into a phase which combines both research and recovery efforts. These efforts will be focused on a small set of "best-bet" streams.

3)Thiamine deficiency, which results from a diet of alewife or smelt, is considered a serious challenge to Atlantic salmon restoration. Both of these non-native prey fish contain thiaminase, an enzyme that breaks down thiamine (Vitamin B-1). Thiamine deficiency results in low reproductive success in salmonines, particularly Atlantic salmon. A project is underway to help assess the magnitude of this problem in Lake Ontario and identify possible solutions.

4)The public and non-government organizations can play an important role in the Atlantic salmon

restoration program. An action plan will be developed to ensure that the public is informed and involved.

5)The role of angler-harvest during restoration will be addressed. There are concerns over the possible effects of even limited harvest on a recovering population.

Deepwater Cisco

Deepwater ciscoes once dominated the deepwater fish community in Lake Ontario. However, this species complex has been rare in the lake since the late 1950s. Current ecological conditions have moved in a direction that may favour a restoration endeavour: food resources are present (*Mysis* spp.), non-native competitors have declined in abundance, deepwater fishing is rare, and contaminant loads are declining.

The current objectives of the restoration program are:

1)To identify potential impediments to the development of a hatchery program to rear ciscoes for release as fry (i.e. collection of gametes, strain identification, fish health issues, culture);

2)To assess the distribution, growth, survival and the diet of ciscoes produced for stocking once released into a natural environment (Lake Ontario); and

3)To assess the genetics of offspring that survive to the stage of assessment collection in the natural environment (Lake Ontario).

The Lake Ontario Management Unit (LOMU) is collaborating with agencies and institutions to realize these objectives. Collaborators include: the Great Lakes Fisheries Commission (GLFC), New York State Department of Environmental Conservation, (NYSDEC), the United States Geological Survey (USGS), Laval University, Quebec, and the Chippewa Ottawa Resource Authority (CORA).

In August of 2004 the steering committee comprised of representatives from the aforementioned collaborating agencies met in Kingston, ON. Planning for gamete collection commenced soon after. The plan was to collect gametes from Whitefish Bay, Lake Superior during early 2005.

American Eel

The number of eel migrating upstream at the ladder, located at the R.H. Saunders Hydroelectric Dam on the St. Lawrence River, remains at a very low level (see Section 2.2). The low levels of upstream eel migration suggest that the abundance of large eel in the upper St. Lawrence River and Lake Ontario will remain low for at least the next decade. Actions taken by the Lake Ontario Management Unit to address the declining abundance of eel include:

1)during April 2004, commercial eel quotas in Lake Ontario and the upper St. Lawrence River were set to zero;

2)regulations were made to close the eel sport fishery throughout Ontario;

3)continued operation of the eel ladder at the R.H. Saunders Hydroelectric Dam;

4)participated in the development of a management plan for American eel in Canadian waters in cooperation with the Department of Fisheries and Oceans Canada and the Province of Quebec;

5)leading, along with Quebec, the development of management plans to improve passage of eel around hydroelectric generating facilities in the St. Lawrence River; and

6)contributed to publication of the proceeding of the American Fisheries Society eel symposium held during August 2003.

8.4 Bay of Quinte Fisheries Advisory Committee (BQFAC)

The Bay of Quinte Fisheries Advisory Committee was formed in May 2003, as a direct result of input received from public meetings concerning the status of the walleye population in the Bay of Quinte and eastern Lake Ontario. The 10-member committee was selected to be representative of both local and provincial interests in the fisheries of the Bay of Quinte. Their mandate was to provide input and advice, and to develop and make recommendations to MNR about the sustainable management of fish communities and fisheries in the Bay of Quinte and eastern Lake Ontario so they may continue to provide social and economic benefits to the local region as well as to the province. The committee was also to play a role in promoting fishing in the area, and in supporting/enhancing communications with local stakeholders.

The committee met five times in 2004 and, as in the first year of its operation, heard presentations from both MNR and local stakeholders with respect to fisheries issues in the Bay of Quinte. Based on the content of the presentations and discussions with stakeholders and the general public, the committee submitted several recommendations to the Minister of Natural resources including:

1)American eel should receive an immediate

designation of vulnerable, threatened or endangered by the Committee on the Status of Species-at-Risk in Ontario (COSSARO).

2)MNR should review the walleye slot size regulation for the Bay of Quinte and furthermore recommend the removal of the slot limit if it has not proven to significantly benefit the walleye population.

The BQFAC will be participating in the development of a fisheries management plan (FMP; see Section 8.5). Through their involvement in the FMP, the committee hopes to continue to develop and make recommendation to MNR about the sustainable management of fish communities and fisheries in the region.

8.5 Fisheries Management Plans

Bay of Quinte Fisheries Management Plan (BQFMP)

The Ministry, along with multi-agency government, and stakeholder partners, is undertaking the development of a Fisheries Management Plan for the Bay of Quinte (BQFMP). The plan will focus on the promotion of sustainable use of the fish communities in the Bay of Quinte and the improvement of communications between government agencies and stakeholders by providing a framework for the coordinated and cooperative management of the Bay. The Bay of Quinte is a very dynamic ecosystem so the BQFMP will be developed so as to have the capacity to respond to environmental changes.

In 2004, Steering and Planning & Development Committees were being assembled for the FMP. A communications plan has been drafted to govern the FMP, and the MNR and its partners are in the process of retaining the services of an independent consulting professional to develop a public consultation framework that will allow the FMP team to engage in appropriate and meaningful consultation with stakeholders and the general public around the Bay of Quinte.

Lake St. Francis Fisheries Management Plan

A Fisheries Management Plan (FMP) is currently being developed for Lake St. Francis. The FMP will outline values and concerns expressed by the public, MNR, and other agencies, groups, and stakeholders. The FMP will take into account the various input gathered during public consultations, and develop management strategies that will help guide fisheries management over the next five years.

In 2004, a Steering Committee was being assembled for the FMP, and initial public consultation planning began. The consultation will occur in March 2005. Concurrently with FMP development, a Fish Habitat Management Plan (FHMP) was being written by the Raisin Region Conservation Authority. The FHMP will form an important component of the FMP, and overall management of Lake St. Francis. The FHMP is being developed in order to address concerns identified by the International Joint Commission (IJC) at the Cornwall Area of Concern (AOC).

Hamilton Harbour Fisheries Management Plan

The MNR and Royal Botanical Gardens are developing a Fisheries Management Plan for Hamilton Harbour (HHFMP) in partnership with the federal and municipal governments, Hamilton and Halton Region Conservation Authorities, several regional conservation groups and a number of local stakeholders. The HHFMP will provide direction for the management of the fisheries resource in Hamilton Harbour for a period of five years. The development of the HHFMP will be based on a sound understanding and inventory of background biological and physical conditions and input received from the public during consultation.

In 2004, a Steering Committee was assembled, and planning began for public consultation. The first round of public consultation is scheduled to take place in late spring 2005. The HHFMP will guide future fish and fisheries projects within Hamilton Harbour and its contributing watersheds. The HHFMP will also support the Remedial Action Plan (RAP) for Hamilton Harbour which was initiated in 1989 as part of the Hamilton Harbour Area of Concern (AOC) designated by the International Joint Commission pursuant to the Great Lakes Water Quality Agreement.

8.6 Lake Whitefish Commercial Test Netting

The Ontario Living Legacies Program (OLL) funded a 10-week lake whitefish commercial test netting program in 2003. In 2004, this program was extended to encompass 26 weeks beginning in early April and lasting through to late October. The project provided information about expanded fishing opportunities for a fishery that has been in existence since the 1800s. This partnership between the

Ontario Commercial Fisheries Association (OCFA), fisherman from eastern Lake Ontario, and the Lake Ontario Management Unit (LOMU) had three primary objectives:

1)To gain an understanding of the temporal and spatial distribution of lake whitefish and therefore assess commercial fishing opportunities outside the spawning season currently fished (see Section 4.2);
2)To gather information on the incidental catch rates for lake trout, walleye and other fish species when targeting whitefish outside of the spawning season fishery; and
3)To compare the efficiency of OMNR community index gear to that deployed by commercial fishers.

The test netting fishery used approximately 79 km (86,310 yd) of 140 mm (4 ½ inch) mesh gillnet and harvested 12,337 kg (27,198 lbs) of lake whitefish. Quota Zones 1-2 and 1-4 were sampled by fishermen actively searching out congregations of fish throughout the duration of the program. These data provided indications of geographical distribution of whitefish within the Quota Zones. The majority of effort and harvest occurred in Quota Zone 1-2 (Table 8.6.1).

Whitefish catches were highest in May and July, and incidental lake trout catch was relatively low at these times (range = 3-13% by number; Fig. 8.6.1). During other time periods, whitefish catches were low and lake trout incidental catch rates were much higher. The average incidental catch rate of lake trout in QZ 1-2 for the duration of the study was 11% (by number). The value of lake whitefish remained at $0.50 per lb (round weight) for the duration of the test netting program.

TABLE 8.6.1. Effort and harvest of lake whitefish by Quota Zone during the commercial test netting program in 2004.

Quota zone	Gillnet effort (yds)	Total harvest (lb)
1-2	77,800	26,663
1-4	8,510	535
Total	86,310	27,198

Technicians sampled 5,591 fish representing 19 species during the course of the program. In total, fork length was measured for 5,351 fish and age was interpreted (otoliths) for 156 fish. Mean fork length and age of whitefish sampled from Quota Zone 1-2 were 498 mm and 11.3 years, respectively. Age 9 (1995 year-class) fish were the most abundant (Fig. 8.6.2.). The mean fork length and age of whitefish sampled from Quota Zone 1-4 were 497 mm and 11.2 years respectively. Age 13 (1991 year-class) fish were the most abundant (Fig. 8.6.3.).

Differences in catchability of commercial fishing gear and provincial index gear were assessed in the field in 2004. These data are currently being analyzed.

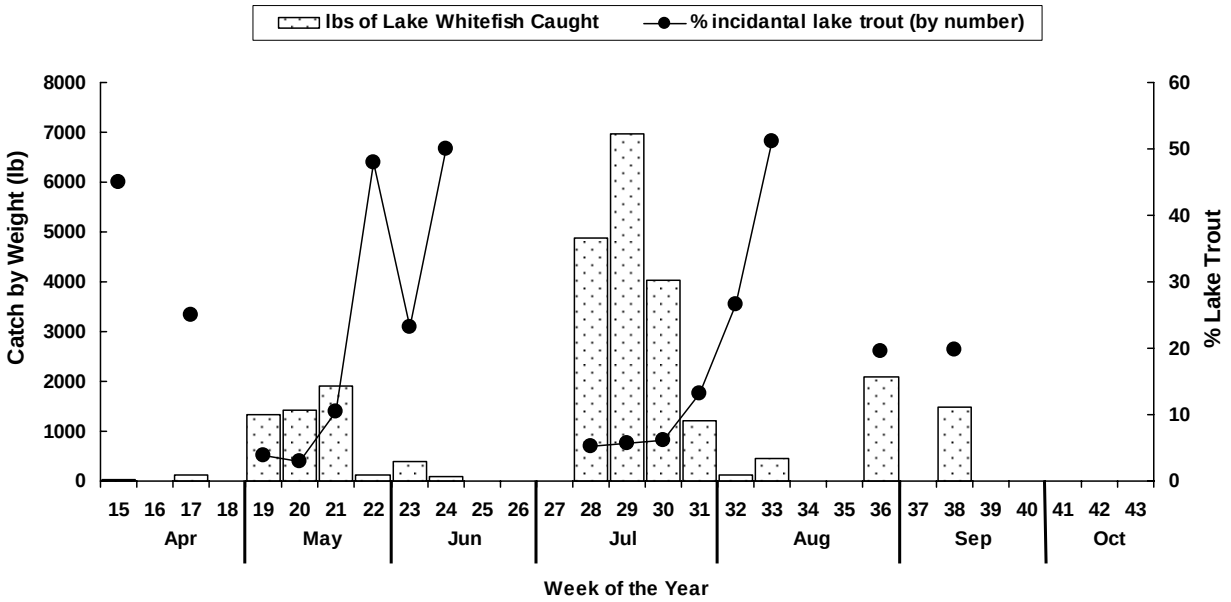

FIG. 8.6.1. Harvest (bars) of lake whitefish and percent incidental catch of lake trout (by number, lines) for Quota Zone 1-2 during the commercial test netting program (April-October), 2004.

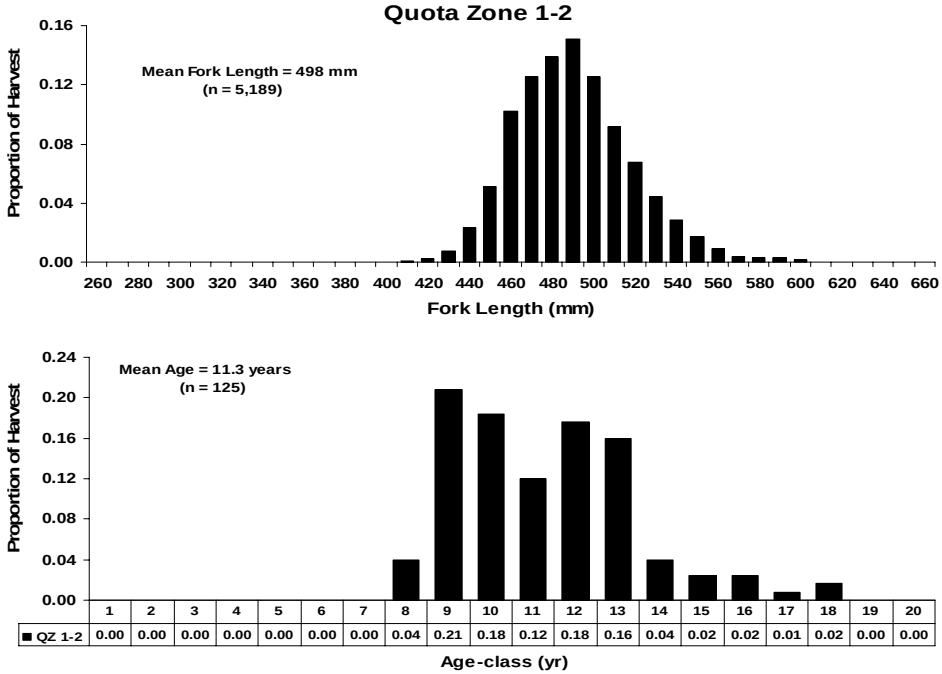

FIG. 8.6.2. Size and age distribution (by number) of lake whitefish sampled in Quota Zone 1-2 during the 2004 commercial test netting program.

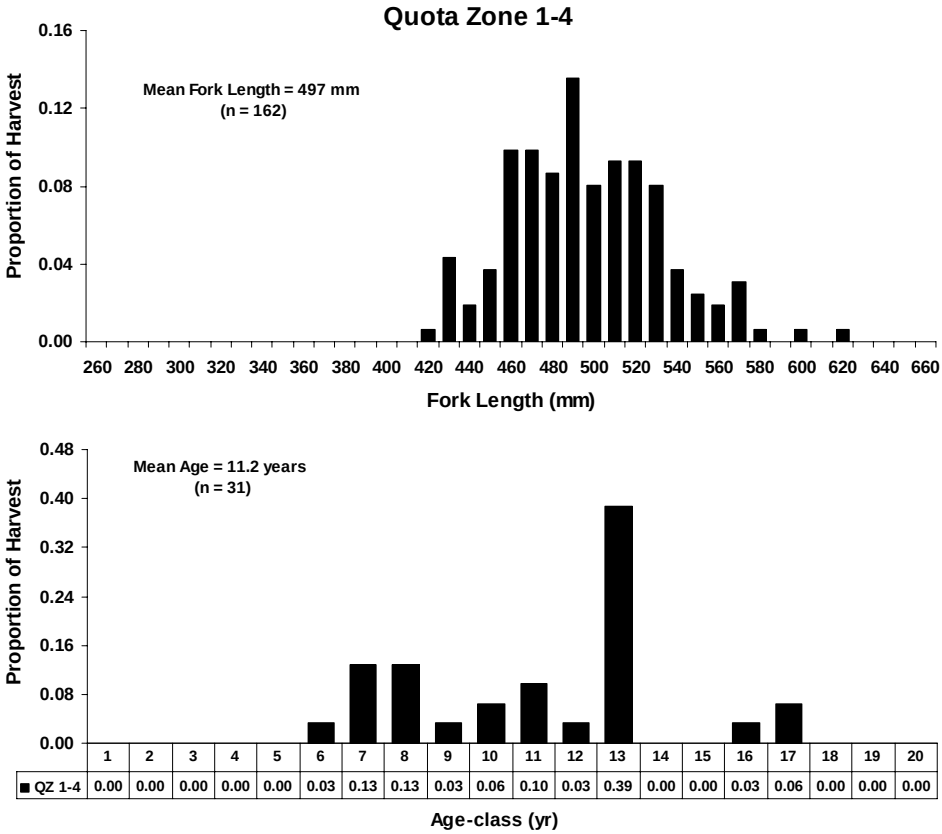

FIG. 8.6.3. Size and age distribution (by number) of lake whitefish sampled in Quota Zone 1-4 during the 2004 commercial test netting program.

8.7 Assessment of Needs, Impediments and Opportunities for Enhanced Surveillance of the Western Lake Ontario Fish Community and Fisheries In Support Of COA (Paine Report)

For Lake Ontario, the 1987 revision of the Great Lakes Water Quality agreement (GLWQA) established two important planning and implementation processes: the Lake Ontario Lakewide Management Plan (LaMP) and Remedial Action Plans (RAPs). Both planning processes identify beneficial use impairments, determine their causes and recommend and implement actions to restore benefits. The LaMP focuses on lakewide problems while the RAPs focus on seven smaller embayments and river systems, four of which are located in the Province of Ontario. To help Canada meet their commitments under the GLWQA (including LaMPs and RAPs) an updated Canada-Ontario Agreement Respecting Great Lakes Ecosystems (COA) was established in 2002 among Federal and Provincial Ministries. COA recognizes the importance of binational Fish Community Objectives (FCOs) developed under the auspices of the Great Lakes Fishery Commission (GLFC) and the Joint Strategic Plan for the Management of Great Lakes Fisheries as important to meeting the goals and objectives of the GLWQA.

In 2003, the The Lake Ontario Management Unit (LOMU) of the Ontario Ministry of Natural Resources (OMNR) commissioned a report to assess the needs, impediments and opportunities for enhanced surveillance and monitoring of the western Lake Ontario fish community and fisheries in support of (COA).

The terms of reference for this exercise were to:

1)determine the fish and fisheries management information needs specific to the broad-scale management initiatives contained in COA;
2)evaluate the current assessment program to determine if it can meet those needs;
3)confirm or refute the current deficiencies in the program already recognized by the Ontario Ministry of Natural Resources;
4)identify barriers and opportunities for the implementation of improved or additional assessment programs; and
5)recommend priorities for additions or improvements to the current assessment program to meet the needs.

The terms of reference focused on COA as an umbrella guiding document, but it is important to note that the management information needs of COA encompass the Lake Ontario Management Unit (LOMU) management information needs. As such, this document provides direction and insight into activities necessary to support ongoing LOMU fish and fisheries management information needs.

The approach used was to interview a number of persons who were knowledgeable about fish and/or fisheries management or were knowledgeable about subject matter related to fish or fisheries. The intent was to gain the perspectives, insights and comments of those interviewed in order to complete the tasks. Copies of the report will be available from LOMU in 2005.

8.8 Salmon and Trout Management Review

We are currently reviewing the bi-national objectives that have been set for managing Lake Ontario's offshore fish communities and fisheries. The Ontario Ministry of Natural Resources (OMNR) and the New York State Department of Environmental Conservation (NYSDEC) share responsibility for managing Lake Ontario. OMNR is committed to working with all stakeholders and interested members of the public to help sustain exciting and diverse fisheries in Lake Ontario, as well as a healthy aquatic environment. We wish to continue to support the social, cultural and economic benefits of Lake Ontario that are valued by local residents and businesses.

In the summer of 2004, we distributed a survey to over 600 individuals with an interest in Lake Ontario. The survey package included a series of backgrounders describing the status of Ontario fish communities and fisheries. The survey was designed to seek input from stakeholders and to help us understand their values, ideas and concerns. Over 250 completed surveys were returned. The survey data are currently being worked up by Cornell University (Ithaca, New York). The results will be carefully considered as we shape the plan for managing Lake Ontario's fisheries in the future.

Lake Ontario has experienced a period of significant ecological change in recent years, which creates a unique set of challenges for fisheries managers. Any changes in fisheries management direction will be made using the best scientific information available and will reflect input received from stakeholders and the public.

9. Research Activities

9.1 Response of Walleye to *Dreissena* spp. in Lake Ontario

Investigators: J. N. Bowlby and J. A. Hoyle, Lake Ontario Management Unit

Walleye populations declined in several North American lakes including Lake Ontario after the invasion of dreissenids, zebra mussels (*Dreissena polymorpha*) and quagga mussels (*D. bugensis*), collectively. Chu et al.[1] (2004) suggested dreissenids reduced the habitat suitability for walleye in the Bay of Quinte in the mid-1990s, resulting in walleye decline. However, the walleye life stage that was most impacted was not identified by these authors. We are considering hypotheses for increased mortality, after dreissenid mussel invasion, at various walleye life stages.

Walleye trawl and gillnet catch data, and population estimation data were used to estimate total mortality and stock recruitment relationships for walleye in the Bay of Quinte and eastern Lake Ontario. Both data sources are available in past Lake Ontario Management Unit Annual Reports (http://www.glfc.org/lakecom/loc/mgmt_unit/index.html).

Annual total mortality of adult walleye before and after dreissenid invasion was remarkably similar (33.9% for 1985-1991, 33.2% for 1996-2002). Also, the relation between young-of-the-year walleye (age-4 months) caught in trawls and recruitment at age 2-years was not significantly different before and after dreissenid invasion (Fig. 9.9.1). However, the Ricker stock-recruitment relationships between the number of walleye eggs and the number of age-2 recruits differed significantly before and after dreissenid invasion (Fig. 9.9.2). In Lake Ontario, dreissenid mussels appear to have impacted walleye survival prior to age-4 months—survival of juvenile and adult walleye was not impacted.

[1] Chu, C. C. K. Minns, J. E. Moore, and E. S. Millard. 2004. Impact of oligotrophication, temperature, and water levels on walleye habitat in the Bay of Quinte, Lake Ontario. Transactions of the American Fisheries Society 133:868–879.

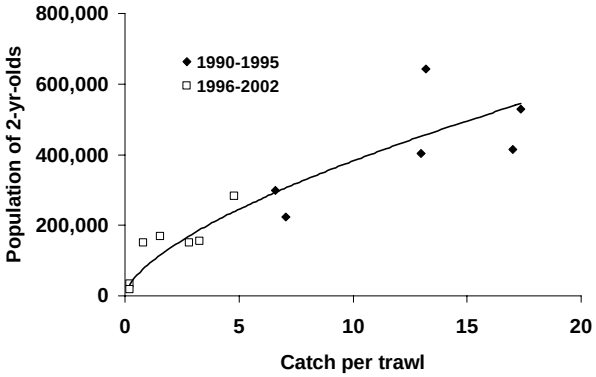

FIG. 9.1.1. The relationship between young-of-the-year walleye (age-4 months) in index trawls in the Bay of Quinte and age-2 years recruits for year classes 1990-2002. The time periods denote pre- and post-dreissenid invasion.

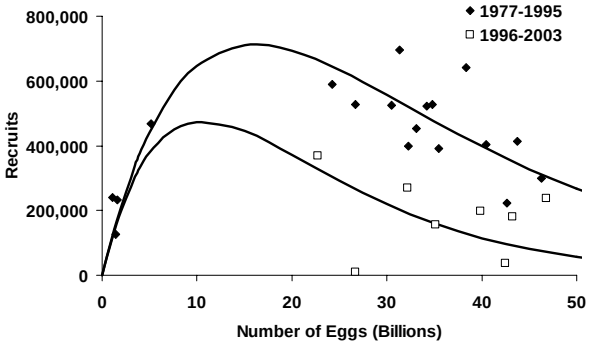

FIG. 9.1.2. The relationship between number of eggs produced by adult walleye in the Bay of Quinte and age-2 recruits for year classes 1977-2003. The time periods denote pre- and post-dreissenid invasion.

9.2 Chinook Salmon Origin

The Biology and Interactions of Hatchery and Wild Chinook Salmon in Lake Ontario

Investigators: J. N. Bowlby, Lake Ontario Management Unit, M. R. Gross, University of Toronto, and W. P. Patterson, University of Saskatchewan.

Chinook salmon were introduced to Lake Ontario in 1969. However, natural reproduction was sporadic until about 1995. Our project proposes to analyze the Lake Ontario Management Unit's archive of scales and otoliths available for both hatchery and wild-origin Chinook salmon. This collection spans over 20-yrs of fisheries surveys in Lake Ontario. The purpose of this study is to answer the following questions:

1) How have the proportions of hatchery vs. wild-origin fish changed over the years 1983-2004?
2) What is the survivorship of hatchery fish over time, compared with that of wild-origin fish?
3) Are the proportions of wild fish related to meteorological and lake environment variables over those years?
4) Is the success of wild-origin Chinook since 1995 related to dietary differences?

The Gross[1] Lab at the University of Toronto has developed a scale analysis technique that differentiates Chinook salmon of wild and hatchery origin in Lake Ontario. Otoliths would be aged by Lake Ontario Management Unit, and stable isotope analyses would be conducted at the Patterson[2] Lab at the University of Saskatchewan.

In partnership with the Gross Lab and Lake Ontario Management Unit, the Canada-Ontario Agreement funded the analysis of 120 Chinook salmon scale samples collected in 2001 by OMNR angler surveys in Lake Ontario.

We estimated that 52.5% of the 120 individuals were of wild origin, and the remainder was of hatchery origin. The proportion of wild fish did not differ significantly between the 1998-2000 year classes (Table 9.2.1). It is apparent that wild Chinook salmon are a significant component of the Lake Ontario ecosystem.

Wild origin Chinook salmon were significantly longer (49 mm longer; ANOVA: F=6.795, p=0.0122) than hatchery fish (Figure 9.2.1). This result was unexpected, but may lead to a better understanding of the life history and behaviour of young Chinook salmon in Lake Ontario.

In 2005 -2006, another 2000 Chinook salmon will be analyzed.

[1]Dr. Mart R. Gross, Professor, Department of Zoology, University of Toronto

[2]Dr. William Patterson, Department of Geological Sciences, University of Saskatchewan

TABLE 9.2.1. The origin of Chinook salmon in Lake Ontario for the 1998-2000 year classes.

	Year class			
Origin	1998	1999	2000	Combined
Wild	55.9%	52.2%	50.0%	52.5%
Hatchery	44.1%	47.8%	50.0%	47.8%
N	34	46	40	120

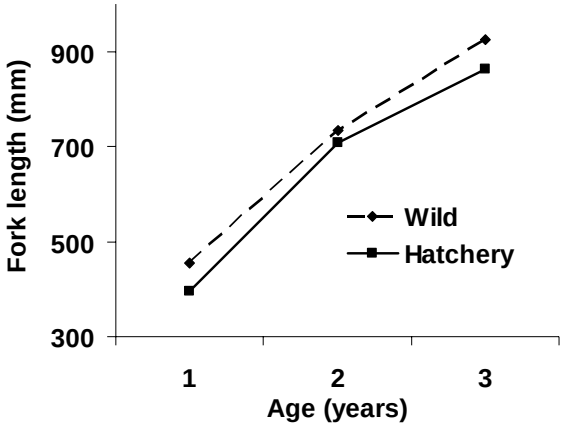

FIG. 9.2.1. The mean length-at-age of Chinook salmon sampled during angler surveys in Lake Ontario, 2001.

9.3 Offshore Food Web

Effects of Exotic Species on the Potential for Lake Ontario to Support A Re-introduced Bloater Population

Investigators: T. J. Stewart, Lake Ontario Management Unit and University of Toronto, W.G. Sprules, University of Toronto, and C.K. Minns, Fisheries and Oceans Canada.

The bloater used to be common in Lake Ontario but by all evidence has disappeared. There is management interest in re-introducing this species (see Section 8.3), but since it disappeared the food web has changed remarkably due to a variety of management actions and invasive species. This study will quantify trophic relationships within the Lake Ontario pelagic food web and evaluate the persistence of key species and trophic groups, including bloater. The objectives of the project are to:

1) determine the diet, and annual biomass, production and consumption of major trophic groups in the Lake Ontario pelagic food web (major fish species, macroinvertebrates, benthos, zooplankton, phytoplankton) for 1987-1991 and 2001-2005, two time periods when extensive field observations are available; and
2) use these field observations to quantify trophic interactions within the food web to assess the persistence of key species and trophic groups, including bloater.

We will obtain estimates of the biomass concentration of major species/functional groups from a variety of field studies by others and ourselves. Annual production and consumption (and associated parameters) by the trophic groups will be determined using a combination of bioenergetic growth models, particle-size models, mercury mass balance models and food web simulations. The research will directly support a number of fisheries initiatives by providing both a conceptual framework for, and an assessment of trophic interactions in, the Lake Ontario offshore food web. It will help determine opportunities and impediments for the re-establishment of native fish species and enhance our understanding of interactions among fisheries management activities and species invasions.

To date, samples of alewife, smelt, three-spine stickleback, slimy sclupin, and round goby have been collected from offshore Lake Ontario and are being processed to describe prey-fish diets. Tissue samples of Chinook salmon and alewife have been collected and are being processed for energy density, Hg body-burden, and growth to parameterize bioenergetic and Hg mass balance models. Lake Ontario thermal profile data from 1960-2003 have been implemented in ArcGis. A spatial model of the offshore thermal structure is under development to stratify Lake Ontario to facilitate model parameterization and determine spatial variation in zooplankton production rates. We thank the United States Geological Survey (USGS), New York State Department of Environmental Conservation (NYDEC) and the Department of Fisheries and Oceans for the provision of fish and fish-tissue samples. We gratefully acknowledge funding support from the Great Lakes Fish and Wildlife Restoration Act (Food Habits Study) and the Great Lakes Fishery Commission.

9.4 Larval Whitefish Feeding and Growth

A larval lake whitefish feeding and growth study was re-established in 2003 and continued in 2004 to augment similar work conducted annually from 1991-1996 (excluding 1994) in the Bay of Quinte and eastern Lake Ontario. The objective of these studies was to assess larval lake whitefish diet and growth relative to zooplankton community structure.

The 2004 larval whitefish feeding and growth study was conducted on 20 days from April 6-May 13 at four nursery areas (Table 9.4.1). Water temperature ranged from 1.9 to 17.8 ^{o}C over the duration of the study. A total of 1601 larval whitefish were caught in 56 tows and 815 min of sampling effort. A total of 925 lengths, 220 stomachs, 124 otolith samples, and 525 genetic samples were collected from the larval fish. Fifty-two zooplankton samples were also taken.

Lengths and otoliths collected during this study will be used by an MSc Candidate (Colette Ward, University of Guelph) to construct and compare growth chronologies of larvae hatched in each nursery area. Similar analyses will be performed for archived samples collected between 1991 and 2004 (excluding 1994 and 1997-2002). Preliminary analyses will be presented at the Canadian Conference for Fisheries Research in Windsor, January 6-9 2005. Funds for this research were made possible by the Canada Ontario Agreement.

TABLE 9.4.1. Summary of sampling, effort and catch statistics obtained during the 2004 larval lake whitefish feeding and growth study in the Bay of Quinte (Trident Point, Sherman's Point and Indian Point) and eastern Lake Ontario (Petticoat Point).

Area	Date	Water Temperature (^{O}C)	Number of larval tows	Total effort (min)	Number of larval whitefish caught	Number Lengthed	Mean length (mm)	Number of stomach samples	Number of otolith samples	Number of zooplankton samples	Number of genetic samples
Trident Point	06-Apr	1.9	3	45.0	24	24	14.1	0	0	2	0
	20-Apr	8.4	3	45.0	44	29	16.0	19	10	2	0
	30-Apr	11.6	2	30.0	0	0		0	0	2	0
	06-May	11.9	2	26.0	1	1	25.8	0	1	2	0
Shermans Point	08-Apr	3.4	3	39.0	106	100	14.5	20	10	4	70
	15-Apr	5.9	3	45.0	165	100	14.3	20	10	4	70
	22-Apr	9.5	3	45.0	232	100	15.2	20	10	4	70
	27-Apr	10.4	3	45.0	129	100	16.6	20	10	4	70
	04-May	12.4	3	45.0	31	31	19.2	21	10	2	0
	10-May	13.1	3	45.0	38	38	24.1	20	10	4	0
	13-May	17.8	2	30.0	0	0		0	0	4	0
Indian Point	14-Apr	2.1	3	45.0	22	22	14.5	0	0	2	0
	21-Apr	5.2	3	45.0	10	10	15.1	0	10	2	0
	26-Apr	4.7	3	42.0	210	100	15.0	20	10	2	85
	05-May	8.5	3	45.0	253	100	16.3	20	10	2	70
	12-May	12.9	3	45.0	266	100	18.4	20	10	2	70
Petticoat Cove	07-Apr	3.7	3	45.0	9	9	13.5	0	0	2	0
	28-Apr	8.2	3	33.0	58	58	14.6	20	10	2	20
	07-May	9.2	3	45.0	3	3	18.0	0	3	2	0
	11-May	11.6	2	30.0	0	0		0	0	2	0
Totals	20		56	815	1601	925		220	124	52	525

9.5 Lake Whitefish Genetics

In 2004, 525 larval lake whitefish samples were collected in eastern Lake Ontario from April 8-May 12. Also in fall 2004, 200 spawning adult lake whitefish were collected from November 3-17. The larval and adult fish were measured for length and weight, and an adipose fin was collected for the purposes of multilocus analysis of microsatellite DNA. This analysis was done to determine the genetic stock structure of the lake whitefish inhabiting eastern lake Ontario. A poster presentation titled "Cryptic Stock Structure of Lake Whitefish in Eastern Lake Ontario" will be presented at the 2005 meeting of the Canadian Conference for Fisheries Research held in Windsor, Ontario, Jan. 6-9.

9.6 Bay of Quinte Ecosystem Modelling (ECOPATH)

The Lake Ontario Management Unit (LOMU) participated in an ecosystem modelling project designed to compute energy flows among biota in the Bay of Quinte for key time-stanzas and to compare these trends to those found for Oneida Lake, New York. This endeavour involves the collaboration of the Ontario Ministry of Natural Resources Assessment (i.e. LOMU), OMNR Research, the Department of Fisheries and Oceans (DFO), the University of Waterloo, Cornell University, the University of Syracuse, University of Toledo, and the Great Lakes Fisheries Commission (GLFC).

Ecosystem modelling will be done using ECOPATH with ECOSIM (Christensen *et* al. 2004[1]), which is a holistic model with two base components: 1) construction of balances matrices detailing fauna biomass, production, and consumption in a static ecosystem, and 2) a simulation tool that employs the balanced ecosystem matrices to predict the effects of manipulations or changes to the ecosystem (e.g. invasion of a non-native species).

Workshop V was held in November at the Royal Botanical Gardens in Burlington, Ontario. LOMU representatives supplied data pertaining to the diets, biomass, life-history, and the fisheries for a variety of species in the Bay of Quinte. LOMU representatives also participated in a walleye sub-group formed by the larger ECOPATH group. LOMU has also supplied documentation pertaining to its work on the ECOPATH project which will be incorporated into a Canadian Technical Report of Fisheries and Aquatic Sciences in the near future. Quinte-Oneida Workshop VI will be held at a location yet to be decided in June of 2005.

[1] Christensen, V, C.J. Walters and D. Pauly. 2004. Ecopath with Ecosim: a User's Guide. To be published as Fisheries Centre Research Reports, Volume 12 (4), University of British Columbia, Vancouver. 154 p. (available online at www.ecopath.org and www.fisheries.ubc.ca).

9.7 Trophic role of the round goby (*Neogobius melanostomus*) in the Bay of Quinte

A two-year study designed to quantify the impact of round goby on the Bay of Quinte ecosystem was started in 2004 in partnership with Dr. Michael Fox of Trent University. A graduate student, Ms. A.C. Tarborelli, will estimate goby densities, quantify life-cycle parameters and the diet of the gobies, as well as the consumption of gobies by fish predators. The Lake Ontario Management Unit collected predator stomach samples in spring, summer and fall of 2004, and preliminary results of the diet analysis are shown in Table 9.7.1.

One more field season remains to be completed, and the results of the study will become available in 2006. We anticipate that the information from this study will allow us to fully parameterize the round goby component of the Bay of Quinte ECOPATH model (see Section 9.7).

TABLE 9.7.1. Proportions of predator stomachs with round gobies, Bay of Quinte, 2004. Preliminary data courtesy of A.C. Taraborelli, Trent University. Not to be cited without permission

	Proportion of stomachs containing gobies		
Predator species	Spring	Summer	Fall
Longnose gar	0.35	n/a	n/a
Bowfin	0.33	0.00	1.00
Northern pike	0.50	0.40	0.33
Channel catfish	0.50	n/a	0.25
Smallmouth bass	0.57	0.23	0.88
Largemouth bass	0.75	0.48	0.20
Yellow perch	0.65	n/a	0.69
Walleye	0.03	0.12	0.18
Freshwater drum	0.11	1.00	0.50

10. Partnerships

10.1 Western Lake Ontario Inshore Assessment Initiative

Recent recommendations for the renewed surveillance and assessment of the western Lake Ontario fish community and fisheries have been presented (i.e. Paine 2004[1]; see Section 8.7) in support of the Canada-Ontario agreement (COA) respecting the Great Lakes Basin ecosystems. Although fish community assessment programs do exist in western Lake Ontario, efforts have greatly decreased since 1996. The Lake Ontario Management Unit (LOMU) recognized the need to assess fish community and fisheries data both for the nearshore and offshore ecosystems of the western basin. As a result, in 2004 LOMU initiated a partnership with the Toronto Region Conservation Authority to gain access to their historical nearshore assessment database. The objectives of this partnership are: 1) to formulate indices of biological integrity for the Western Basin and Lake Ontario as a whole, and 2) to create a comprehensive database for the nearshore areas of the Western Basin of Lake Ontario.

Data shared to date include species-specific catch information gained through extensive electro-fishing of sites along the Toronto Waterfront from 1988-2003 for specific project, habitat assessment, and Remedial Action Plan (RAP) purposes. Prior to 1996, electro-fishing was carried out during summer using a Smith-Root SR 18 electro-fishing boat and adhering to the Ontario Ministry of Natural Resources (OMNR) Electro-fishing Guidelines. Beginning in 1996, the Department of Fisheries and Oceans, Great Lakes Laboratory for Fisheries and Aquatic Sciences (GLLFAS) protocol was used for all habitat projects.

Two general types of habitat were sampled; open-coasts and sheltered embayments. Open-coasts consist of natural and man made shorelines exposed to the open lake. They are generally characterized by relatively colder water temperatures, hypolimnetic up-welling, and are exposed to extensive wind and wave action. Sheltered embayments have been formed by natural and man-made processes. They are generally characterized by relatively warmer water conditions, higher densities of vegetation, and

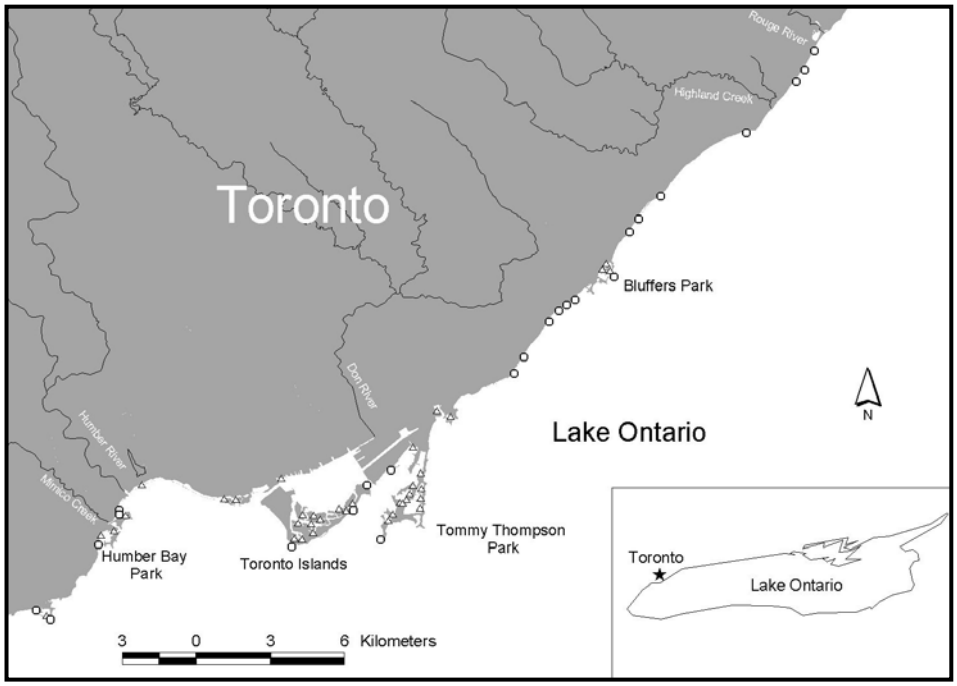

FIG. 10.1.1. Western Lake Ontario, Toronto waterfront electro-fishing sampling sites as sampled by the Toronto Region Conservation Authority (TRCA) from1988-2003. Symbols used are Δ= embayment and ° = open coast.

reduced hydrologic exchange with the open lake. Thirty-six (36) unique embayment sites were sampled from 1988 to 2003 and twenty-three (23) unique open-coast-sites were sampled from 1989 to 2003 (Fig. 10.1.1).

Forty seven (47) different species were caught at sheltered embayments and forty one (41) at open-coasts (Table 10.1.1). Species that showed an overall increase in abundance in embayments since the late 1990s include: sticklebacks, salmon and trout, catfishes, and northern pike. Species that showed an overall decrease in abundance in embayments since the late 1990s included: panfish and basses, minnows, rainbow smelt, suckers, and yellow perch. Catches of walleye were very sparse over the time-series. Clupeids (alewife and gizzard shad) have shown large variation in abundance since 1998 with an overall decrease in abundance (Fig. 10.1.1). In the open-coast habitat the species that showed reduced abundance since the late 1990s included: panfish and basses, rainbow smelt, salmon and trout, minnows, and clupeids, which have been on the decline since 1995. However, sticklebacks showed a marked increase in abundance starting in 2000 (Fig. 10.1.1). Catches of walleye and yellow perch were diminutive over the time series and no yellow perch were observed in 2002 or 2003. Reduced abundances of clupeids and smelt concurrent with increases in stickleback abundance through the late 1990s and early 2000s corroborate results gained from lake-wide hydroacoustic assessments of prey fish (see section 2.6).

The Canada Ontario Agreement (COA) funded this partnership in 2004. It is the goal of LOMU that further partnering with other groups through 2005-2006 will allow for the completion of a comprehensive metadatabase that will describe the fish communities for all of western Lake Ontario.

[1] Paine, J. R. 2004. Assessment of the needs, impediments and opportunities for enhanced surveillance of the western Lake Ontario fish community and fisheries in support of the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystems. Internal Report to the Lake Ontario Management Unit. Ontario Ministry of Natural Resources, Picton, Ontario, Canada.

TABLE 10.1.1. Groups and species of fish captured during electro-fishing events by the Toronto Region Conservation Authority at embayments and open-coast sites, 1988-2003.

		Habitat Type	
Group	**Species**	**Embayments**	**Open Coast**
American Eel	American eel	√	√
Bowfin	Bowfin	√	
Brook Silverside	Brook silverside	√	
Catfishes	Brown bullhead	√	√
Clupeids	Alewife	√	√
	Gizzard shad	√	√
Common Carp	Common carp	√	√
Coregonids	Lake chub	√	√
	Lake whitefish	√	
Darters	*Darter* sp.	√	
	Iowa darter	√	
	Johnny darter	√	√
	Log perch	√	√
Freshwater drum	Freshwater drum	√	√
Longnose gar	Longnose gar	√	√
Minnows	*Minnow* sp.		√
	Blacknose dace		√
	Bluntnose minnow	√	√
	Common shiner	√	√
	Creek chub	√	
	Emerald shiner	√	√
	Fathead minnow	√	
	Longnose dace		√
	Golden shiner	√	
	Goldfish	√	√
	Spottail shiner	√	√
Northern pike	Northern pike	√	√
Panfish and Basses	Black crappie	√	√
	Bluegill	√	
	Largemouth bass	√	√
	Pumpkinseed	√	√
	Rock bass	√	√
	Smallmouth bass	√	√
Rainbow smelt	Rainbow smelt	√	√
Gobies	Roung goby		√
Salmon and Trout	Brown trout	√	√
	Chinook salmon	√	√
	Coho salmon		√
	Lake trout	√	√
	Rainbow trout	√	√
	Salmo sp.	√	
Sculpins	Mottled sculpin	√	√
Sticklebacks	Brook stickleback	√	√
	Stickleback sp.	√	√
	Threespine stickleback	√	√
Suckers	Shorthead redhorse	√	√
	White sucker	√	√
Temperate Basses	White bass	√	√
	White perch	√	√
Trout-perch	Trout-perch	√	√
Walleye	Walleye	√	√
Yellow perch	Yellow perch	√	√
	Total	47	42

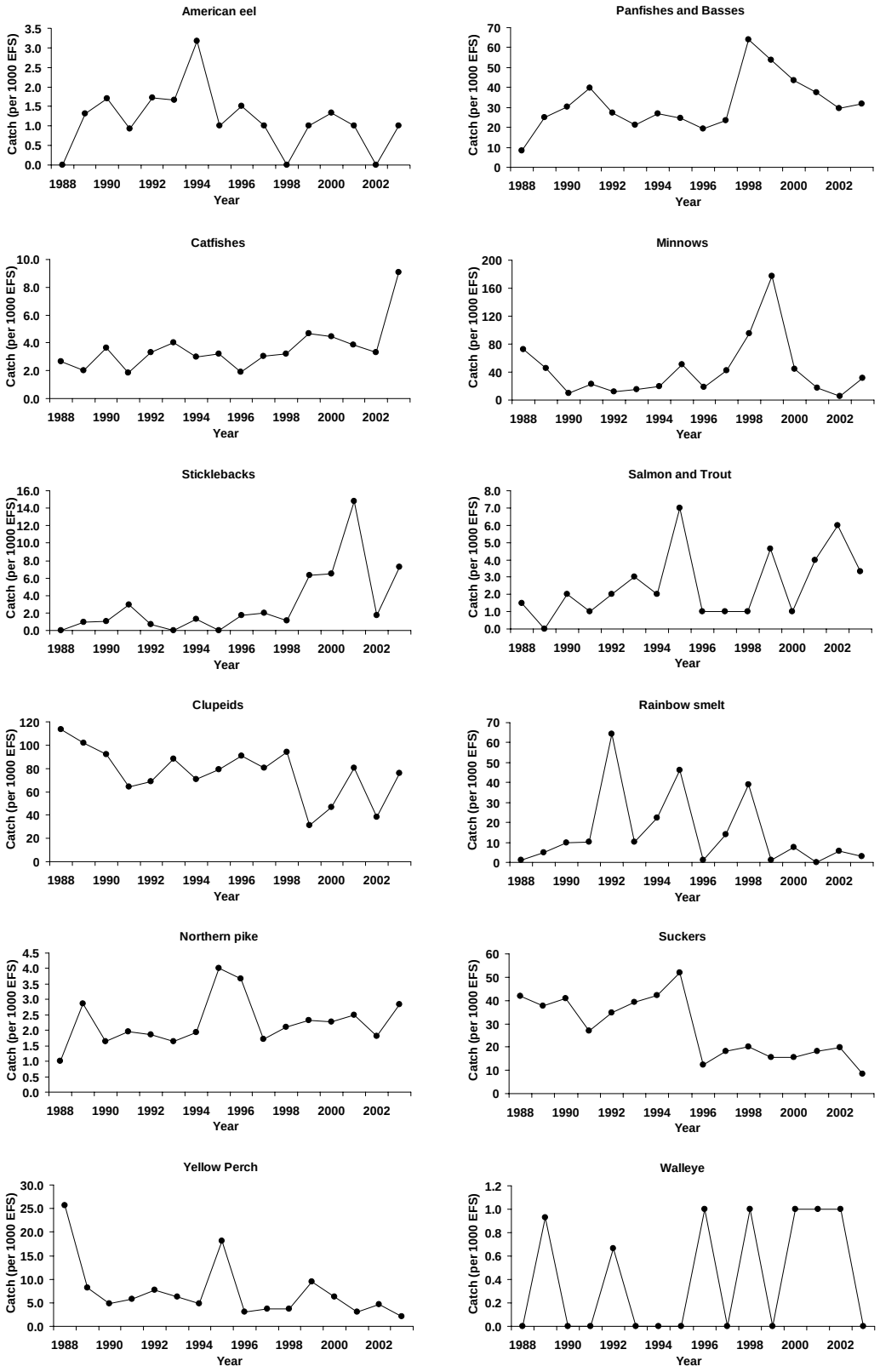

FIG. 10.1.2. Trends of average summer catch per one thousand electrofishing seconds (EFS) from sheltered embayment sites across the Toronto Waterfront for several common species from 1988-2003.

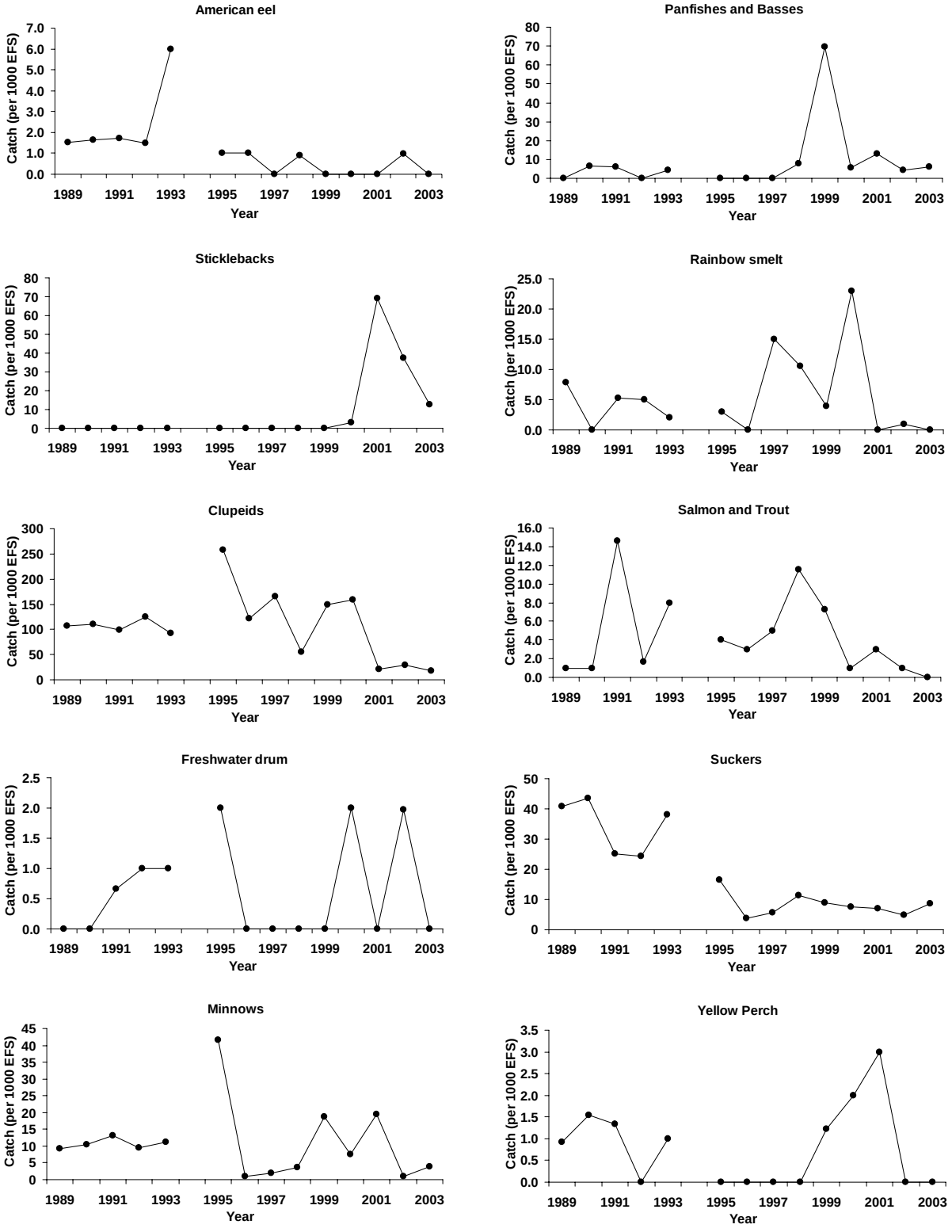

FIG. 10.1.3. Trends of average summer catch per one thousand electrofishing seconds (EFS) from open-coast sites across the Toronto Waterfront for several common species from 1989-2003.

11. Communications

Lake Ontario Management Unit staff use a variety of formal and informal ways to communicate with the public, stakeholders, partners, the media, and other resource management agencies. Good communications strategies are important to effectively convey results of fisheries assessment, management and enforcement programs. Seeking input from client groups through formal consultation processes helps us to understand their values, ideas and concerns. Staff also interact with clients on a day-to-day basis through phone calls, site visits and contacts made in the field or during enforcement patrols. Staff actively participate on a variety of bi-national and inter-agency committees to share information and expertise, and to develop solutions to problems of common concern in the Great Lakes Basin. A strong network of communications outside and within OMNR is critical to making sound resource management decisions (e.g. setting sport fishing regulations, commercial fishing quotas, stocking levels, fisheries management objectives).

Table 11.1 summarizes some of the major communications initiatives undertaken by the unit in 2004. In addition to the items listed in the table, LOMU staff responded to a broad range of questions and information requests from the public, stakeholders, the media and other agencies. Staff also provided support to senior managers by developing a variety of communications and briefing materials relating to the management of Lake Ontario fisheries and fish communities.

TABLE 11.1 Lake Ontario Management Unit communications initiatives, 2004.

Communications plans

- Bay of Quinte Fisheries Management Plan (drafted)
- Lake Ontario Salmon & Trout Management Review (began implementation)
- Lake St. Francis Fisheries Management Plan (in approvals)
- Regulation Changes for Yellow Perch in Lake St Francis and the St Lawrence River Communications Plan (approved and implemented)

News releases

- February 16, 2004 – McGuinty government supports Quinte fisheries review
- March 2, 2004—Conservations Officers Arrest Man Wanted by Police
- April 2, 2004 - McGuinty government protects vanishing American eel
- November 24, 2004 – New fishing regulations changed to ensure conservation - yellow perch to be protected in eastern Ontario

Fact sheets / brochures / articles

- Brochures highlighting native species restoration in Lake Ontario: Atlantic salmon and lake trout (in progress)
- Revision of the Lake Ontario Lakewide Management Plan (LaMP) information binder (ongoing)
- April 2, 2004 - Protecting The Vanishing American Eel

Websites / web products developed

- Lake Ontario Management Unit annual reports (access to reports in PDF format provided through the Great Lakes Fishery Commission website)
- Lake Ontario stocking history (access to data provided through the Great Lakes Fishery Commission website)
- Salmon & Trout Management Review webpage (MNR website)

Media contacts

- Inquiries about salmon & trout management survey and Lake Ontario issues (from The Niagara Outdoorsman, The St. Catharines Standard, The Niagara Fall Review)
- Atlantic salmon restoration program (interview, Saturday Night Magazine)
- Various inquires about fish and fishing in the Bay of Quinte
- Various inquires about status of American eel

Papers / reports

- *"Using a landscape approach to predict the distribution and density patterns of juvenile salmonines in the Lake Ontario basin"* (by L. Stanfield, S. Gibson, J. Borwick)
- Lake Ontario assessment program review completed (March)
- *"New Asian Carp Genus (Hypothalmichthys) in Lake Erie"* (published in AFS Fisheries Magazine by B.J. Morrison, J. Casselman, J. Johnson and D. Noakes)
- Lake Ontario Fish Communities and Fisheries: 2004 Annual Report of the Lake Ontario Management Unit (all staff)
- *"Resurgence and decline of lake whitefish (Coregonus clupeaformis) stocks in eastern Lake Ontario, 1972 to 1999"* (by Hoyle et al - contribution to book "State of Lake Ontario—Past, Present and Future" edited by M. Munawar)
- *"Bay of Quinte Fish and Fisheries 2003"* (by J. Hoyle - chapter contribution to the 2003 Project Quinte Annual Report)
- *"Lake Ontario Salmon & Trout Stakeholder Survey"* (in progress, co-authored by T. Brown from Cornell University NY and M. Daniels)

Papers presented

- *"Lake Whitefish Status in Lake Ontario with Observations on a Die-off "* (presented by J. Hoyle at the Lake Whitefish Natural Mortality Workshop hosted by GLFC in Ann Arbor MI)
- Various presentations by LOMU staff at the Lake Ontario Committee annual meeting (hosted by GLFC in Niagara Falls NY)
- 2004 Conference on Great Lakes Research (hosted by the International Association for Great Lakes Research in Waterloo ON)
    - *"A Comparison of Parametric Versus Non-Parametric Statistical Techniques for Estimating Year-Class Strength in Fish Populations"* by J. Dietrich, J.N. Bowlby and B.J. Morrison (presented by B.J. Morrison)
    - *"Density-dependent Survival of Stocked Chinook Salmon in Lake Ontario"* (presented by J.N. Bowlby)
    - *"Use of Stable Isotope Ratios to determine Origin of Lake Trout"* by T. Schaner, R. O'Gorman, B. Lantry and B. Patterson (presented by T. Schaner)
- *"Status of Lake Ontario fish populations"* (presented by B.J. Morrison at the State of the Lakes Ecosystem Conference (SOLEC) hosted by USEPA and EC in Toronto ON)
- "*State of Lake Ontario Report"* (presented by B.J. Morrison at the GLFC annual meeting in Rochcester NY)
- *"The Great Lakes Law Enforcement Committee and Joint Strategic Plan?"* (presented by B.J. Morrison and J. Finster to the Great Lakes Law Enforcement Committee, Toronto ON)
- "Lake St. Francis: changes in the fish community" (presented by C. Lake at Lake Sturgeon Workshop for Lake St. Francis and Surrounding Waters in Cornwall ON)

Workshops / conferences hosted

- Catch-at-Age Analysis Workshop (co-hosted by CLC Technical Committee and the Lake Ontario Management Unit in Detroit, fall 2004).
- Lake Ontario lake trout management planning session (hosted by the Lake Ontario Technical Committee in Niagara Falls NY)
- Ecopath Workshop (hosted by Cornell University, Shackleton Point NY)
- Lake Ontario LaMP workshop – changing the status of "Beneficial Use Indicator" for "Degradation of Fish Populations" (co-hosted by the Lake Ontario Management Unit and U.S. Environmental Protection Agency in Toronto ON).
- Invasive species outreach session – exchange of information & ideas (hosted by the Lake Ontario Management Unit, with participation by MNR's invasive species and marketing groups, the Toronto & Region RAP Team, Toronto & Region Conservation Authority, Ontario Federation of Anglers and Hunters)

- Workshop on lake sturgeon (*Acipenser fulvescens*) in Lake St. Francis & surrounding waters (September 22 & 23, 2004, hosted by OMNR and Ontario Power Generation in Cornwall, Ontario)
- Technical workshop aimed at investigating methods for providing safe downstream passage for the American eel (*Anguilla rostrata*) past hydroelectric facilities on the St. Lawrence River, February 15 to 18, 2005, hosted by OMNR, Ontario Power Generation, Fisheries and Oceans Canada, Quebec Faune and Hydro Quebec in Cornwall, Ontario)

Workshops / conferences attended

- Black Bay Walleye Restoration Workshop (hosted by the Upper Great Lakes Management Unit in Sault Ste. Marie ON)
- Canada-Ontario Agreement (COA) Forum & Workshop (hosted by MNR in Peterborough ON)
- Cormorant Symposium (hosted by American Ornithological Union in Quebec City PQ)
- Durham Region Coastal Wetland Monitoring Project workshop
- Early Mortality Syndrome Workshop (hosted by GLFC in Ann Arbor MI)
- Environmental Technical Working Group meeting (hosted by IJC in Syracuse NY)
- Great Lakes Hydroacoustics Working Group Workshop (hosted by Cornell University in Shackleton Point NY)
- Human Dimensions of Great Lakes Fishery Management Workshop (hosted by GLFC in Ann Arbor MI)
- International Association for Great Lakes Research (IAGLR) annual conference (Waterloo ON)
- Lake Ontario Committee annual meeting (hosted by GLFC in Grand Island NY)
- Lake Sturgeon – Workshop for Lake St. Francis and Surrounding Waters (Cornwall, ON)
- Natural Mortality Workshop (hosted by CORA and GLFC in Ann Arbor MI)
- Quinte-Oneida Workshops (hosted by Cornell Biological Field Station in Bridgeport NY and the Canada Centre for Inland Waters in Burlington ON)
- Species-at-Risk Workshop / Recovery Planning Training (hosted by MNR in Peterborough ON)
- State of the Lakes Ecosystem Conference (SOLEC) 2004 (hosted by the U.S. Environmental Protection Agency and Environment Canada in Toronto ON)
- Water Levels Workshop (hosted by IJC in Syracuse NY)
- 12th Annual International Conference on the St. Lawrence River Ecosystem (hosted by the St. Lawrence River Institute of Environmental Sciences)

Committee / task group membership

- Atlantic Salmon Recovery Team
- Atlantic Salmon Strain Evaluation Steering & Technical Committees
- Bay of Quinte Fisheries Advisory Committee (BQFAC)
- Bi-national committees, under the Great Lakes Fishery Commission (GLFC)
    - Council of Lakes Committee (CLC)
    - Council of Lakes Technical Committee
        - Basin-wide Tagging Task Group
    - Great Lakes Hydroacoustics Working Group
    - Lake Ontario Committee (LOC)
    - Lake Ontario Technical Committee (LOTC)
    - Law Enforcement Committee
- Canada-Ontario Agreement (COA) – Lake Ontario Technical Team
- Code of Professionalism Working Group
- Commercial Fish Harvest Information System Development and Implementation Teams
- Divisional and Branch Health and Safety Teams
- Fish Habitat Advisory Committee
- Fish Habitat Advisory Compliance Working Group
- Fish Stocking Information System Development Team

- FISHNET III Development Team
- Great Lakes Assessment Modeling Review Team
- Great Lakes Vessel Design and Construction Committee
- Inter-agency committees:
    - Bay of Quinte Restoration Council – Remedial Action Plan (RAP)
    - American eel Steering Committee Relating to Passage and Associated Habitat Issues in the St. Lawrence River (co-chaired by Ontario and Quebec)
    - Canadian Eel Working Group
    - Eel Management Committee
    - Hamilton Harbor Remedial Action Plan (RAP) Team
    - Hamilton Harbour Bay Area Implementation Team (BAIT)
    - Hamilton Harbour Fisheries Management Plan Steering Committee
    - Lake Ontario Lake-wide Management Plan Working Group
    - Management Committee - Lake Ontario Lake-wide Management Plan (LaMP)
    - Provincial contaminants / food safety team
    - St. Lawrence River Restoration Council – Remedial Action Plan (RAP)
    - Thiamine Deficiency Complex Implementation Committee
    - Toronto & Region Remedial Action Plan (RAP) Team
    - Watershed / fisheries management planning teams – various
- IT&IM Working Group / Review Team
- Lake Ontario Commercial Fish Liaison Committee (LOCFLC)
- Small Vessel Safety Policy Committee
- Southern Region Fishing Division Boundary Committee
- Southern Region Integrated Wind Power Team
- Southern Region Walleye Management Review Group
- Sport Fishing Regulatory Tool Kit Teams – various

Presentations to client groups

- *Lake Ontario Fisheries Management* (presented by J. Borwick at the Wilmot Creek Fisheries Management Plan open house)
- *Salmon & Trout in Western Lake Ontario* (presented by J.N. Bowlby to the Port Whitby Sport Fishing Association, Strait Line Anglers Club, Floatfishing Conservation Group and Metro East Anglers)
- *Salmon & Trout Management Review* (presented by M. Daniels to the Port Whitby Sport Fishing Association, Floatfishing Conservation Group, Central Lake Ontario Sport Anglers and Metro East Anglers)
- Quinte Conservation Authority children's education program (J. Dietrich)
- Presentations to the Bay of Quinte Fisheries Advisory Committee:
    - Walleye slot-size review (B.J. Morrison, J. Hoyle, T. Schaner, J.N. Bowlby)
    - Walleye status (including population model, stock-recruitment relationships) (B.J. Morrison, J. Hoyle, T. Schaner, J.N. Bowlby)
    - Fisheries management planning for the Bay of Quinte (P. Edwards)
    - LOMU assessment program review (B.J. Morrison)
    - Lake Ontario enforcement program (D. Humber)
- Presentations to the Lake Ontario Commercial Fish Liaison Committee:
    - Licence conditions review - perch (P. Edwards)
    - Lake whitefish test-netting project (J. Dietrich)
- Presentations to the Mohawks of the Bay of Quinte:
    - Contaminants and status of fish communities in the Bay of Quinte
- Presentations to the Toronto & Region RAP Team
    - Invasive species impacts on Lake Ontario (presented by M. Daniels)
    - Invasive species surveillance in Toronto fish markets (presented by M. Daniels)

Client contacts

Angler-interviews

- 2004 Bay of Quinte winter creel – 1,355 anglers interviewed
- 2004 Bay of Quinte summer creel – 3,870 boat anglers interviewed
- 2004 Lake Ontario western basin creel – 2,916 boat anglers interviewed

Enforcement contacts

- sport fish enforcement – 4,497 contacts
- commercial fish enforcement – 402 contacts
- wildlife enforcement – 138 contacts
- investigations– 33 contacts

Client liaison and partnerships

- Atlantic salmon fry stocking (numerous volunteers and local school groups).
- Chinook pen-imprinting project (with Central Lake Ontario Sport Anglers) (ongoing).
- Collection of fish for contaminant sampling (with Port Whitby Sport Fishing Association).
- Community hatcheries (various).
- Lake whitefish test-netting project (with eastern Lake Ontario commercial fishermen).
- Proposal to export carp to France (D. Payne, various provincial and federal agencies, local industries).
- Review of yellow perch regulations on the upper St. Lawrence River
    - 7 meetings held to get input about proposed changes from The Mohawk Nation of Akwesasne, local MPPs, OFAH - main office and Zone F, local angling groups, local commercial fishermen, local restaurant owners
- Salmon & Trout Management Review - stakeholder consultation
    - 600+ survey packages sent out, including a set of backgrounders about Lake Ontario fish communities, fisheries and issues
- Tag returns by Lake Ontario anglers (walleye, Atlantic salmon).
- *Heterosporis* spp. Assessment in Lake Ontario Fishes (with R. Penney OMNR-Fish Health and Lake Ontario commercial fishers).
- Tours of Glenora Fisheries Station.

Appendix A:
Lake Ontario Management Unit Staff, 2004

PETERBOROUGH

300 Water Street, 5th Floor North, Peterborough, ON K9J 3C7
Tel: 705-755-1798 Fax: 705-755-1900

Robert MacGregor – Lake Manager
Bev Ritchie – Inter-Agency Liaison, Great Lakes Coordinator
Marion Daniels – Management Biologist

Unclassified Staff:
Michelle Weller – A/Section Secretary
Jason Borwick – Management Biologist
Patricia Edwards – Management Biologist

GLENORA

R.R.#4, 41 Hatchery Lane, Picton, ON KOK 2TO
Tel: 613-476-2400 Fax: 613-476-7131

Linda Blake – Administrative Assistant
Alastair Mathers – Lake Ontario COA Coordinator
Bruce Morrison – Assessment Supervisor
Tom Stewart – Project Coordinator
Jim Bowlby – Assessment Biologist
Jim Hoyle – Assessment Biologist
Ted Schaner – Assessment Biologist
Dawn Walsh – Operations Supervisor
Kelly Sarley – Database Technician, Computer Operator
Dale Dewey – Operations Coordinator
Wayne Miller – Senior Technician, Base Operations
Charles Wood – Senior Marine and Fisheries Technician
Dave Goodfellow – Great Lakes Technician
Tom Lawrence – Great Lakes Technician
Steve McNevin – Great Lakes Technician
Derrick Humber – Enforcement Supervisor
Darren Bishop – Lake Unit Conservation Officer
Matthew Orok – Lake Unit Conservation Officer
Gord Rooney – Lake Unit Conservation Officer

Unclassified Staff:
Yvonne Murphy – Data Evaluation Clerk
Colin Lake – A/Management Biologist
Jason Dietrich – Special Project Biologist
Tim Dale – Great Lakes Fisheries Technician
Randy Gurnsey – Great Lakes Fisheries Technician
Tony McCambridge – Great Lakes Fisheries Technician
Rob Slapkauskas – Great Lakes Fisheries Technician
Ted Allan – Great Lakes Fisheries Technician
Ed Dowling – Great Lakes Fisheries Technician
Glen Hales – Great Lakes Fisheries Technician

Zach Richmond – Great Lakes Fisheries Technician
Tyson Scholz – Great Lakes Fisheries Technician
Stephen Wickens – Great Lakes Fisheries Technician
Alan McIntosh – Boat Captain
Lorne Daines – Student Fisheries Technician
Stefanie Gauley – Student Fisheries Technician
Carla Hilts – Student Fisheries Technician
Michael Zylstra – Student Fisheries Technician
Edwin Van Den Oetelaar – Commercial Fish Assistant (DCO)

DARLINGTON PROVINCIAL PARK

R.R.#2, 1600 Darlington Park Road, Bowmanville, ON L1C 3K3
Tel: 905-436-2083 Fax: 905-436-7873

Kevin Hoare – Lake Unit Conservation Officer
Bill Ingham – Lake Unit Conservation Officer

AQUATIC RESEARCH AND DEVELOPMENT SECTION – GLENORA

Dr. John Casselman – Research Scientist
Les Stanfield – Research Biologist
Laurie Allin – Research Technician

Unclassified Staff:
Suzanne Gouveia – Research Biologist
Rob Slapkauskas – Research Technician
Soultana Macridis – Student Research Assistant
Vicki Lee – Research Technician

Appendix B. Lake Ontario Management Unit Operational Staff Field and Lab Schedule, 2004.

Field or Lab Project	Dates	Species assessed monitored or stocked	Length of data series (yrs)	Lead Biologist	Funding Source
Ganaraska Fishway - Rainbow Trout Assessment	March 29 - April 22	Adult rainbow trout	31	Bowlby	COA
Larval Whitefish Trawls	April 5 - May 18	Larval lake whitefish	7	Hoyle	COA
Lake Trout Tug Stocking	April 13 - May 12	Juvenile lake trout	n/a	Daniels	OLL/BASE
Bay of Quinte Open Water Creel	May 1 - Nov 21	Walleye, yellow perch, smallmouth bass, largemouth bass, sunfishes, northern pike and round goby	28	Hoyle	BASE
Whitefish Commercial Catch Sampling	April 26 - May 4 Oct 18 - Nov 26	Lake whitefish	18	Hoyle	BASE
Western Basin Salmonid Creel	April 2 - Sept 27	Chinook salmon, rainbow trout, coho salmon, brown trout, lake trout and atlantic salmon	28	Bowlby	BASE
Juvenile Atlantic Salmon Stocking	May 10 - 14	Juvenile atlantic salmon	n/a	Daniels	COA
Goby Predators - Trapnetting	May 19 - June 18 Oct 12 - Nov 12	diets of walleye, yellow perch, smallmouth bass, largemouth bass and northern pike for presence of round gobies	1	Schaner	COA
Moses Saunders Eel Ladder Monitoring	May 31 - Oct 27	Juvenile american eel	31	Mathers	COA/BASE
Eastern Lake Ontario and Bay of Quinte Community Index Netting	June 28 - Sept 10	Various warm, cool and cold water species in Eastern Lake Ontario and the Bay of Quinte	46	Hoyle	BASE
Cormorant Pellet Collections - Bay of Quinte & Lake Ontario	May - 2 days July/August/Sept/Oct 1 day each month	cormorant diet	2	Mathers	COA
Lake Whitefish Test Netting - Partnership with OCFA/MNR	April 5 - Oct 22	Lake Whitefish and incidentally caught fish (lake trout, walleye and smallmouth bass)	2	Morrison	Controlled pressure
Juvenile Salmonid Stream Assessment	Aug 16 - Sept 17	Wild juvenile rainbow trout, chinook salmon, coho salmon, brown trout, brook trout, various minnows, darters and sculpin	12	Bowlby	COA
Lake Ontario Hydroacoustics	July 26 - Aug 6	Alewife, rainbow smelt and three-spine stickleback	13	Schaner	COA
Bay of Quinte Nearshore Community Index Netting	Sept 7 - Oct 8	Various warm and cool water species, specifically sunfishes, brown bullhead, freshwater drum, largemouth bass, smallmouth bass, walleye and yellow perch	4	Hoyle	COA
St. Lawrence River Indexing Netting - Lake St. Francis	Sept 13 - Oct 8	Warm and cool water species specifically northern pike, white sucker, brown bullhead, sunfishes, smallmouth bass, largemouth bass, yellow perch and walleye	21	Lake	COA
Credit River Chinook Assessment and Egg Collection	Sept 28 - Oct 7	Adult chinook salmon	31	Bowlby	COA
Age and Growth	July 5 - March 31	Walleye, lake whitefish, large/smallmouth bass, yellow perch, lake trout, rainbow trout, northern pike, sunfishes, crappie and freshwater drum	n/a	Hoyle/Bowlby/ Schaner/Mathers/ Morrison	COA/BASE
Bay of Quinte On-Ice Creel	Dec 20 - Feb 28	Walleye	23	Hoyle	BASE

Appendix C. Atlantic salmon stocked in the Province of Ontario waters of Lake Ontario, 2004.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (g)	MARKS	NUMBER STOCKED
ATLANTIC SALMON - DELAYED FRY								
CREDIT RIVER								
West Credit Belfountain	4	2003	Partnership	LaHave/Normandale	3		None	22,300
	6	2003	Partnership	LaHave/Normandale	3	0.2	None	3,000
								25,300
ATLANTIC SALMON - ADVANCED FRY								
BARNUM HOUSE CREEK								
Middle	5	2003	Ringwood	LaHave/Normandale	6	1.4	None	40,009
Upper	5	2003	Ringwood	LaHave/Normandale	6	1.4	None	40,049
								80,058
CREDIT RIVER								
Black Cr Limehouse	5	2003	Ringwood	LaHave/Normandale	6	1.4	None	44,216
Forks of the Credit Park	5	2003	Ringwood	LaHave/Normandale	6	1.4	None	43,995
West Credit Belfountain	5	2003	Ringwood	LaHave/Normandale	6	1.4	None	43,970
	6	2003	Partnership	LaHave/Normandale	5	4.2	None	5,565
								137,746
ATLANTIC SALMON - YEARLINGS								
DUFFIN CREEK								
East Duffin Cr Hwy 7	10	2003	Partnership	LaHave/Normandale	10	3.0	None	2,500
West Duffin Cr Hwy 7	10	2003	Partnership	LaHave/Normandale	10	3.0	None	2,500
								5,000
ATLANTIC SALMON - ADULTS								
CREDIT RIVER								
West Credit Belfountain	5	1998	Normandale	LaHave/Normandale	72	3000.0	Floy Tag	**86**
LAKE ONTARIO								
Plaus Park	12	2001	Normandale	LaHave/Normandale	36	998.0	None	195
	12	1999	Normandale	LaHave/Normandale	61	3723.0	None	57
								252
TOTAL - ATLANTIC SALMON DELAYED FRY								**25,300**
TOTAL - ATLANTIC SALMON ADVANCED FRY								**217,804**
TOTAL - ATLANTIC SALMON YEARLINGS								**5,000**
TOTAL - ATLANTIC SALMON ADULTS								**338**
TOTAL - ATLANTIC SALMON								**248,442**

Appendix C. Brown trout stocked in the Province of Ontario waters of Lake Ontario , 2004.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (g)	MARKS	NUMBER STOCKED
BROWN TROUT - SPRING YEARLINGS								
BRONTE CREEK								
Bronte Beach Park	4	2002	Normandale	Ganaraska/Normandale	16	30.9	Ad	**15,033**
DUFFIN CREEK								
401 Bridge	5	2002	Harwood	Ganaraska/Normandale	18	55.8	Ad	**10,301**
LAKE ONTARIO								
Ashbridge's Bay Ramp	3	2002	Harwood	Ganaraska/Normandale	16	48.1	Ad	6,978
	5	2002	Harwood	Ganaraska/Normandale	18	57.2	Ad	8,634
Bluffer's Park	3	2002	Harwood	Ganaraska/Normandale	16	47.3	Ad	6,553
	5	2002	Harwood	Ganaraska/Normandale	18	55.6	Ad	9,454
Burlington Canal	5	2002	Normandale	Ganaraska/Normandale	17	33.3	Ad	11,879
Fifty Point CA	5	2002	Normandale	Ganaraska/Normandale	17	33.3	Ad	11,880
Humber Bay Park	4	2002	Normandale	Ganaraska/Normandale	16	31.2	Ad	9,948
Jordan Harbour	4	2002	Normandale	Ganaraska/Normandale	16	31.1	Ad	10,000
Lakeport	4	2002	Harwood	Ganaraska/Normandale	17	50.1	Ad	10,877
	5	2002	Harwood	Ganaraska/Normandale	18	70.3	Ad	1,920
Millhaven Wharf	5	2002	Harwood	Ganaraska/Normandale	18	57.2	Ad	22,547
Oshawa Harbour	4	2002	Harwood	Ganaraska/Normandale	17	50.4	Ad	11,091
Port Dalhousie East	4	2002	Normandale	Ganaraska/Normandale	16	31.1	Ad	24,726
								146,487
TOTAL - BROWN TROUT								**171,821**

Appendix C. Chinook salmon stocked in the Province of Ontario waters of Lake Ontario, 2004.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (g)	MARKS	NUMBER STOCKED
CHINOOK - SPRING FINGERLINGS								
BOWMANVILLE CREEK								
CLOCA Ramp	4	2003	Ringwood	Wild - Credit R.	5	4.2	None	25,000
	4	2003	Partnership	Wild - Cobourg Br.	6	3.2	None	1,800
								26,800
BRONTE CREEK								
2nd Side Road Bridge	4	2003	Ringwood	Wild - Credit R.	5	3.3	None	25,000
5th Side Road Bridge	4	2003	Ringwood	Wild - Credit R.	5	3.3	None	25,000
								50,000
CREDIT RIVER								
Eldorado Park	4	2003	Ringwood	Wild - Credit R.	5	3.9	None	28,000
Huttonville	4	2003	Ringwood	Wild - Credit R.	5	4.2	None	28,000
Norval	4	2003	Ringwood	Wild - Credit R.	5	3.2	None	29,000
								85,000
DON RIVER								
Donalda Golf Club	4	2003	Ringwood	Wild - Credit R.	5	4.0	None	**14,998**
HIGHLAND CREEK								
Colonel Danforth Park	4	2003	Ringwood	Wild - Credit R.	5	3.9	None	**15,000**
HUMBER RIVER								
East Branch Islington	4	2003	Ringwood	Wild - Credit R.	5	4.0	None	**15,000**
LAKE ONTARIO								
Ashbridge's Bay Ramp	5	2003	Ringwood	Wild - Credit R.	6	4.3	None	10,000
Barcovan	5	2003	Ringwood*	Wild - Credit R.	6	5.0	RV	10,004
Beacon Inn	5	2003	Ringwood	Wild - Credit R.	6	4.6	None	31,590
Bluffer's Park	4	2003	Ringwood	Wild - Credit R.	5	4.1	None	35,000
Burlington Canal	4	2003	Ringwood	Wild - Credit R.	5	4.1	None	49,998
Consecon Robinson Pt	5	2003	Ringwood	Wild - Credit R.	6	5.5	LV	14,990
Lakeport	4	2003	Ringwood	Wild - Credit R.	5	4.2	None	15,000
Oshawa Harbour	4	2003	Ringwood	Wild - Credit R.	5	3.3	None	25,000
Port Dalhousie East	5	2003	Ringwood	Wild - Credit R.	6	4.5	None	100,000
Wellington Channel	5	2003	Ringwood	Wild - Credit R.	6	5.5	LV	14,989
	5	2003	Ringwood*	Wild - Credit R.	6	5.4	RV	10,003
Whitby Harbour	4	2003	Ringwood	Wild - Credit R.	5	3.3	None	25,000
								341,574
TOTAL - CHINOOK SALMON								**548,372**

* - Pen-Imprinted

Appendix C. Coho salmon stocked in the Province of Ontario waters of Lake Ontario, 2004.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (g)	MARKS	NUMBER STOCKED
			COHO - FALL FINGERLINGS					
BRONTE CREEK								
Lowville Park	10	2003	Ringwood	Wild - Salmon R.	10	22.0	AdRV	**13,615**
CREDIT RIVER								
Eldorado Park	10	2003	Ringwood	Wild - Credit R.	10	19.9	RV	45,599
Norval Nashville North	10	2003	Ringwood	Wild - Credit R.	10	19.6	RV	45,599
								91,198
HUMBER RIVER								
East Branch Islington	10	2003	Ringwood	Wild - Salmon R.	10	21.4	AdRV	**40,845**
			COHO - SPRING YEARLINGS					
CREDIT RIVER								
Eldorado Park	3	2002	Ringwood	Wild - Credit R.	15	20.1	Ad	14,221
	3	2002	Ringwood	Wild - Salmon R.	15	20.4	RV	4,418
Huttonville	3	2002	Ringwood	Wild - Credit R.	15	20.6	Ad	14,535
Norval	3	2002	Ringwood	Wild - Salmon R.	15	19.4	RV	18,639
								51,813
TOTAL - COHO FALL FINGERLINGS								**145,658**
TOTAL - COHO SPRING YEARLINGS								**51,813**
TOTAL - COHO SALMON								**197,471**

Appendix C. Lake trout stocked in the Province of Ontario waters of Lake Ontario, 2004.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (g)	MARKS	NUMBER STOCKED
LAKE TROUT - SPRING YEARLINGS								
LAKE ONTARIO								
Cobourg Harbour Pier	3	2002	Harwood	Seneca Lake/Harwood	15	26.7	AdLP	25,446
	4	2002	Harwood	Seneca Lake/Harwood	16	29.1	AdLP	20,277
Fifty Point CA	3	2002	Harwood	Seneca Lake/Harwood	15	28.3	AdLP	33,371
	3	2002	Harwood	Slate Islands/Dorion	15	29.5	AdLP	9,197
	4	2002	Harwood	Slate Islands/Dorion	16	35.1	AdLP	5,995
	4	2002	Harwood	Seneca Lake/Harwood	16	29.6	AdLP	13,492
	5	2002	Harwood	Seneca Lake/Harwood	17	33.1	AdLP	13,167
North of Main Duck Sill	4	2002	Harwood	Slate Islands/Dorion	16	35.4	AdLP	43,354
	4	2002	Harwood	Mishibishu Lakes/Tarentorus	17	36.3	AdLP	33,826
	4	2002	Harwood	Michipicoten Island/Dorion	17	41.1	AdLP	30,157
	5	2002	Harwood	Seneca Lake/Harwood	17	33.0	AdLP	7,496
	5	2002	Harwood	Slate Islands/Dorion	17	37.6	AdLP	14,396
	5	2002	Harwood	Mishibishu Lakes/Tarentorus	18	35.4	AdLP	17,877
	5	2002	Harwood	Michipicoten Island/Dorion	18	39.3	AdLP	15,072
Pigeon Island	5	2002	Harwood	Seneca Lake/Harwood	17	38.2	AdLP	13,625
South of Long Point	4	2002	Harwood	Seneca Lake/Harwood	16	30.0	AdLP	64,561
	4	2002	Harwood	Michipicoten Island/Dorion	17	41.3	AdLP	14,686
	4	2002	Harwood	Mishibishu Lakes/Tarentorus	17	35.3	AdLP	11,592
	5	2002	Harwood	Seneca Lake/Harwood	17	33.4	AdLP	87,250
TOTAL - LAKE TROUT								**474,837**

Appendix C. Rainbow trout stocked in the Province of Ontario waters of Lake Ontario, 2004.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (g)	MARKS	NUMBER STOCKED
RAINBOW TROUT - FRY								
CREDIT RIVER								
Papermill Dam	6	2004	Partnership	Wild - Credit R.	2	0.2	None	69,000
West Branch 8th Line	6	2004	Partnership	Wild - Credit R.	2	0.2	None	15,000
West Branch 9th Line	6	2004	Partnership	Wild - Credit R.	2	0.2	None	16,000
West Branch Hwy 7	6	2004	Partnership	Wild - Credit R.	2	0.2	None	8,000
								108,000
LAKE ONTARIO								
Millhaven Wharf	7	2004	Partnership	Ganaraska/Normandale	2		None	**16,500**
ROUGE RIVER								
Berczy Cr	6	2004	Partnership	Wild - Rouge R.	1	0.2	None	5,000
Bruce Cr	6	2004	Partnership	Wild - Rouge R.	1	0.2	None	5,000
Little Rouge R Hwy 48	6	2004	Partnership	Wild - Rouge R.	1	0.2	None	7,456
Little Rouge R McCowan	6	2004	Partnership	Wild - Rouge R.	1	0.2	None	10,000
Morningside Cr	6	2004	Partnership	Wild - Rouge R.	1	0.2	None	5,000
Robinson Cr	6	2004	Partnership	Wild - Rouge R.	1	0.2	None	8,756
Rouge A Edward Ave	6	2004	Partnership	Wild - Rouge R.	1	0.2	None	5,000
								46,212
RAINBOW TROUT - FALL FINGERLINGS								
ROUGE RIVER								
Berczy Cr	10	2004	Partnership	Wild - Rouge R.	4	1.0	None	8,000
Bruce Cr	10	2004	Partnership	Wild - Rouge R.	4	1.0	None	8,000
Little Rouge R Hwy 48	10	2004	Partnership	Wild - Rouge R.	4	1.0	None	8,000
Little Rouge R McCowan	10	2004	Partnership	Wild - Rouge R.	4	1.0	None	8,000
Silver Spring Farms	10	2004	Partnership	Wild - Rouge R.	4	1.0	None	8,000
								40,000
RAINBOW TROUT - SPRING YEARLINGS								
BRONTE CREEK								
5th Side Road Bridge	4	2003	Normandale	Ganaraska/Normandale	13	17.4	RV	9,184
Lowville Park	4	2003	Normandale	Ganaraska/Normandale	13	17.4	RV	9,184
								18,368
CREDIT RIVER								
Huttonville	4	2003	Normandale	Ganaraska/Normandale	13	16.9	RV	9,147
Norval	4	2003	Normandale	Ganaraska/Normandale	13	16.9	RV	9,148
								18,295
HUMBER RIVER								
East Branch Islington	4	2003	Normandale	Ganaraska/Normandale	13	17.1	RV	11,099
King Vaughan Line	4	2003	Normandale	Ganaraska/Normandale	13	18.6	RV	11,266
								22,365
LAKE ONTARIO								
Glenora	5	2003	Harwood	Ganaraska/Normandale	15	31.1	RV	6,487
Jordan Harbour	4	2003	Normandale	Ganaraska/Normandale	13	17.1	RV	19,300
Millhaven Wharf	5	2003	Harwood	Ganaraska/Normandale	15	29.2	RV	6,144
North of Main Duck Sill	4	2003	Harwood	Ganaraska/Normandale	14	28.0	RV	4,252
Port Dalhousie East	4	2003	Normandale	Ganaraska/Normandale	13	17.6	RV	16,438
								52,621
ROUGE RIVER								
Bruce Cr	5	2003	Partnership	Wild - Rouge R.	12	10.0	Ad	**4,900**
TOTAL - RAINBOW TROUT FRY								**170,712**
TOTAL - RAINBOW TROUT FALL FINGLERLINGS								**40,000**
TOTAL - RAINBOW TROUT SPRING YEARLINGS								**116,549**
TOTAL - RAINBOW TROUT								**327,261**

Appendix C. Walleye stocked in the Province of Ontario waters of Lake Ontario, 2004.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				WALLEYE - FINGERLINGS				
ST. LAWRENCE RIVER								
Gananoque River	7	2004	Partnership	Wild - Napanee R.	3		None	**10,000**
TOTAL - WALLEYE								**10,000**