LAKE ONTARIO FISH COMMUNITIES AND FISHERIES:

2012 ANNUAL REPORT OF THE LAKE ONTARIO MANAGEMENT UNIT

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Prepared for the
Great Lakes Fishery Commission
2013 Lower Lakes Committee Meetings
Niagara Falls, NY USA

March 26-28, 2013

Printed in Picton, Ontario, Canada

March 2013

Report ISSN 1201-8449

Please cite this report as follows:
Ontario Ministry of Natural Resources. 2013. Lake Ontario Fish Communities and Fisheries: 2012 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

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Lake Ontario Fish Communities and Fisheries: 2012 Annual Report of the Lake Ontario Management Unit

Foreword

The Lake Ontario Management Unit (LOMU) is pleased to release its Annual Report of assessment and management activities carried out during 2012.

Lake Ontario fisheries are managed by MNR in partnership with New York State within the Lake Ontario Committee under the Great Lakes Fishery Commission. Lake Ontario Fish Community Objectives provide bi-national fisheries management direction to protect and restore native species and to maintain sustainable fisheries. Our many partners include: New York Department of Environmental Conservation, Canadian Department of Fisheries and Oceans, the U.S. Fish and Wildlife Service and many other Ontario provincial ministries and conservation authorities and U.S. state and federal agencies and non-government partners.

Lake Ontario, the Bay of Quinte and the St. Lawrence River ecosystem has changed over the last two centuries in response to the pressures of industrial development, land settlement, and agricultural practices, fishing, pollution, loss of native species, and the introduction of new species. Fisheries monitoring, assessment and research programs help understand these changes and support informed management decisions that consider the ecological realities that shape the fishery, such as the natural capacity of the lake to produce fish, the decline or recovery of native species, the impact of non-native species, changes to fish habitat and climate change, along with social and economic objectives.

Management highlights from 2012 include the Bay of Quinte angler survey, volunteer angler diary programs for fall Walleye and open-water salmon and trout, Chinook Salmon mark and tag monitoring, Lake Ontario salmon and trout angler creel, Atlantic Salmon assessment and the ongoing delivery of the LOMU fisheries nearshore and offshore assessment programs including on Lake St. Francis. The MNR fish culture program produced and stocked more than 2 million salmon and trout into Lake Ontario. Fish culture also stocked Walleye into Hamilton Harbour, as part of a new restoration initiative, and participated in the development of a deepwater cisco program for the future.

The Management Unit in partnership with local clubs hosted four public information sessions in St. Catharines, Port Credit, Oshawa and Belleville. Special thanks to the St. Catharines Game and Fish Association, Port Credit Salmon and Trout Association, Metro East Anglers, Central Lake Ontario Sport Anglers and others for their help in organizing and advertising these events.

On January 1, 2013, three changes to the recreational fishing regulations came into effect for Zone 20:

1) reduced limits for Rainbow Trout,
2) an earlier season for Largemouth and Smallmouth Bass, and
3) an increase in the minimum size limit for Muskellunge.

Please refer to the 2013 Recreational Fishing Summary for details at: http://www.mnr.gov.on.ca/en/Business/LetsFish/Publication/STEL02_163615.html.

We express our sincere appreciation to the many partners and volunteers who contributed to the successful delivery of LOMU initiatives. Special thanks to the Aurora MNR District and Credit Valley Conservation for their leadership and operational excellence in the delivery of the Atlantic Salmon program on the Credit River and to the Ontario Federation of Anglers and Hunters, Trout Unlimited, and the many other partners committed to the Lake Ontario Atlantic Salmon restoration program. LOMU gratefully acknowledges the important contribution of the Lake Ontario Liaison Committee, the Fisheries Management Zone 20 Council (FMZ20) members, the Ringwood hatchery partnership with the Metro East Anglers, Credit River Anglers Association, Chinook net pen committee, Muskies Canada and the participants in the angler diary and assessment programs.

Our team of skilled and committed staff and partners delivered an exemplary program of field, laboratory and analytical work that will provide long-term benefits to the citizens of Ontario. We are pleased to share important information about the activities and findings of the Lake Ontario Management Unit from 2012.

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1. Status of Major Species

The following is an overview of the status of major species in Ontario waters of Lake Ontario for 2012. The overview draws largely upon information presented in the chapters and sections that follow in this report. The fish communities of Lake Ontario continue to respond to changes in the ecosystem attributed to the effects of dreissenid mussels and other stresses.

1.1 Chinook Salmon

Catch rates of Chinook Salmon in the boat angling fishery indicated high relative abundance in Lake Ontario (Section 3.2). Wild fish are contributing to the population. The percentage of wild Chinook Salmon (as opposed to stocked fish) ranged from 33-58% in Lake Ontario index gill nets and angler catches for the 2008-2011 year-classes (Section 3.2) based on mass fin-clipping of all stocked fish during 2008-2011. Growth and condition of Chinook Salmon was excellent. Lamprey marking on Chinook Salmon in the Credit River continued at very low levels (Section 2.7).

1.2 Rainbow Trout

Rainbow Trout abundance in Lake Ontario continued to increase in 2012; catch rates by Lake Ontario anglers were the highest since 1985 (Section 3.1). Increased angler catch rates of Rainbow Trout parallels those of Coho Salmon and Lake Trout (Section 3.1), and may be related to increased predation of salmon and trout on Round Goby in recent years. The spring run of wild Rainbow Trout at the Ganaraska River fishway continued at a high level, and close to that of 2011 (Section 2.1).

1.3 Atlantic Salmon

The presence of Atlantic Salmon in the Lake Ontario boat fishery remains low, however, catch rates over the past several years are amongst the highest on record. Stocked juveniles are growing and surviving well in the streams and good evidence of smolt production has been documented (Section 2.8 and Section 2.9). Returning adults have been observed in streams from 2008 through 2012 (Section 2.10). Efforts continue to improve access to upstream spawning habitat through the removal or modification of barriers and installation of fishways. The program is in the early stages and progress towards restoration of Atlantic Salmon, to date, has been encouraging (Section 8.2).

1.4 Lake Trout

There has been a modest increase in the abundance of adult Lake Trout in recent years but the abundance is still low compared to levels seen in early 1990s. The increase was likely due to improved early survival of stocked fish but early survival dropped sharply in the last three years (Section 2.2).

1.5 Lake Whitefish

Abundance of Lake Whitefish in assessment gill nets is very low (Section 2.2). Many strong year-classes produced in the late 1980s and early 1990s are aging and declining in both assessment gill nets (Section 2.2) and commercial gear (Section 4.2). Reproductive success was very low after the mid 1990s until a strong year-class was produced in 2003 (Section 2.3). Most of the commercial harvest is now composed of fish aged 5 to 11 years-old. Growth of these younger fish is slow and age-at-maturity is delayed by at about two years compared to the late 1980s and early 1990s. The condition of Lake Whitefish caught in summer assessment gill nets (Section 2.2) improved after the mid to late 1990s but condition of fish caught during the fall remained low (Section 4.2). Commercial Lake Whitefish harvest in 2012 was down 6% compared to 2011 despite an increase in fishing effort (Section 4.1 and 4.2).

1.6 Lake Herring (Cisco)

In Lake Ontario, Lake Herring spawning aggregations were historically abundant in many nearshore areas and embayments but today are believed to be restricted to the eastern basin. Spawning and juvenile Lake Herring are most reliably caught in assessments and by commercial fishermen only in the Bay of Quinte (Sections 2.3 and 4.3). Lake Herring are sporadically caught in the main lake basin in gill nets (Section 2.2) but the spawning origin of these fish is unknown.

1.7 Northern Pike

Northern Pike, while not abundant in the open waters of Lake Ontario are common in many embayment and nearshore areas (Sections 2.2, 2.3 and 2.4). Northern Pike are also common in the St. Lawrence River although their abundance trend shows a long-term decline (Section 2.6).

1.8 Muskellunge

The Muskellunge is an important native species and top predator in the St. Lawrence River ecosystem. A significant mortality event in the spring of 2005 and 2006, related to viral hemorrhagic septicaemia (VHS), has caused concern over the status of St. Lawrence River Muskellunge. In 2012, with the support of FMZ20 Council, MNR increased the harvestable minimum size of Muskellunge to 137 cm (54 inches) to address the concern over the abundance of large, mature fish. MNR is continuing to work with partners to identify and protect Muskellunge spawning and nursery habitats in the St. Lawrence River; a program that has been running for a total of fifteen years (Section 11.1).

1.9 American Eel

The total number of eel migrating upstream at the ladders, located at the Moses-Saunders Hydroelectric Dam on the St. Lawrence River, has been increasing since 2001; however, the number is still less than 8% of the migrations observed during the 1970s and 1980s. There were no eel stocked during 2011 or 2012 but initial survey results suggest that eels stocked in previous years are surviving well, growing quickly, and that they are dispersing from stocking sites. Some stocked eels are maturing into males and migrating at a small size; this has not been previously observed. During 2012, Ontario Power Generation (OPG) also conducted a pilot project to trap large yellow eels and release them below all barriers to downstream migration. Preliminary results of this project suggest that most of the transported eels do migrate towards the spawning grounds which should contribute to the global spawning stock. MNR and DFO are working with OPG to develop the second phase of their Eel Action Plan (see Section 8.3).

1.10 Smallmouth Bass

Assessment gill net and nearshore trapnet indices indicate that Smallmouth Bass remain at low to moderate abundance levels in the nearshore areas of Lake Ontario and the Bay of Quinte (Section 2.2 and Section 2.4). The Smallmouth Bass population in Lake St. Francis (St. Lawrence River) remains at a moderate level (Section 2.6).

1.11 Largemouth Bass

Assessment trapnet information indicates that Largemouth Bass abundance increased in the Bay of Quinte following increases in water transparency and submerged aquatic vegetation in the late 1990s. Their current level of abundance rivals or exceeds that of Walleye in Bay of Quinte nearshore areas during summer (Section 2.4). Largemouth Bass are moderately abundant in other embayment areas of Lake Ontario.

1.12 Panfish

Panfish, particularly Pumpkinseed, Bluegill and Black Crappie, increased after re-establishment of submerged aquatic macrophytes in the Bay of Quinte (Sections 2.2 and 2.3). These events were associated with dreissenid mussel-induced ecosystem change in the 1990s. Panfish are also common in other Lake Ontario embayments and nearshore areas (Section 2.4). Together, these panfish species now form a major component of the commercial fishery; second only to Yellow Perch in terms of landed value (Section 4.1).

1.13 Yellow Perch

Yellow Perch is one of the most common species in the nearshore areas. Current perch abundance in Lake Ontario proper is low to moderate compared to past levels (Section 2.2). Abundance is moderate in the Bay of Quinte (Sections 2.2 and 2.3). The Yellow Perch population in Lake St. Francis (St. Lawrence River) has decreased back to a moderate level after several years of high abundance (Section 2.6). Yellow Perch are currently the most valuable species in the commercial fishery (194,132 lb valued at $388,083). Yellow Perch commercial harvest declined in Lake Ontario but increased in the St. Lawrence River due to increased quota and fishing effort (Section 4.1).

1.14 Walleye

The eastern Lake Ontario/Bay of Quinte Walleye population is the basis of important and popular fisheries (Sections 3.5, 3.6 and 4.1). Walleye yield from the open-water recreational (60,803 lb) and commercial (30,918 lb) fisheries totaled 91,721 lb. Assessment gill net abundance indices (Section 2.2 and 2.3) for juvenile (age-1 to age-4) and mature Walleye indicate that the Walleye population has been very stable for more than a decade. Recruitment indices, based on young of year catch in bottom trawls (Section 2.3), indicate that above average (i.e., average for the last ten years) year-classes were produced in 2007, 2008 and 2011. The 2009, 2010 and 2012 year-classes are of moderate abundance. The 2008 year-class also appears strong at older ages in nearshore trap net surveys (Section 2.4) . Based on these recent recruitment levels, the Walleye population should remain stable, at least through the next few years. Current Walleye status meets and exceeds management target levels for this population. The Walleye population in Lake St. Francis (St. Lawrence River) decreased after several years of relatively high abundance but remains above the long-term average level.

1.15 Prey Fish

The abundance of Alewife in 2012 was very similar to the previous year, and close to the 10 year average. Rainbow Smelt were at record low levels (Section 2.5). Round Goby are a major prey fish.

1.16 Round Goby

Round Goby abundance appears to have peaked and declined in the Bay of Quinte. In Lake Ontario, abundance has remained high and in 2012 were observed as deep as 60 m in assessment gill nets (Sections 2.2 and 2.3).

2. Index Fishing Projects

2.1 Ganaraska Fishway Rainbow Trout Assessment

The number of Rainbow Trout, from Lake Ontario, that run up the Ganaraska River to spawn has been estimated from fish counts in the fishway at Port Hope since 1974. Prior to 1987 estimates of the Rainbow Trout run at the fishway were based completely on hand lift and visual counts. Since 1987 fish counts were made with a Pulsar Model 550 conductivity type fish counter. As electronic counts are biased low, estimates of fish missed by the counter were made using visual counts. The estimated run of Rainbow Trout was based on the difference between simultaneous visual and electronic counts. In years where no observations were made the run was estimated with virtual population analysis. The counter is generally operated between mid to late March and early May. In 2012, the fish counter was installed on March 12 and ran until May 6. In addition, we estimated 46 Rainbow Trout went through the fishway in March, prior to installation of the counter based on modelling the relationship of Rainbow Trout counts with maximum river temperature and stream flow. In May, a handful of Rainbow Trout may have gone through the fishway after counts were concluded. In 2012, the Rainbow Trout run in the Ganaraska River was estimated at 8,525 fish and is the second largest run in over a decade (Figure 2.1.1 and Table 2.1.1). Rainbow Trout were not biologically sampled at the Ganaraska River in 2012.

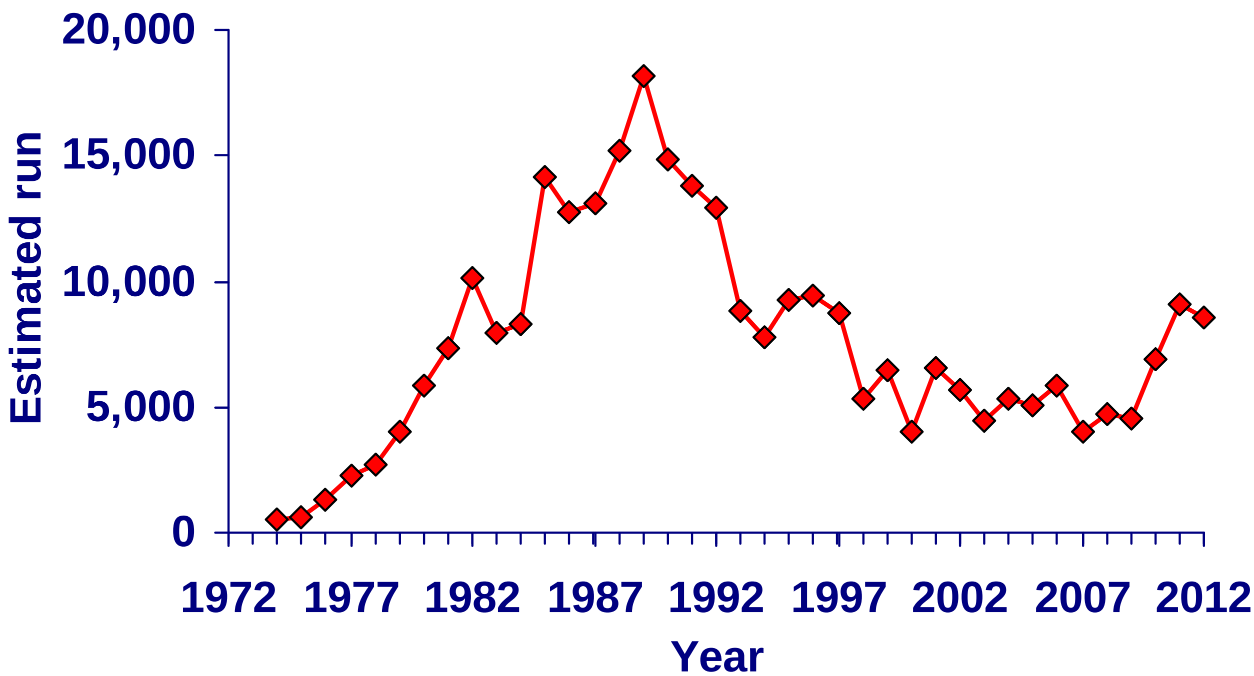


FIG. 2.1.1. Estimated run of Rainbow Trout (number of fish) at the Ganaraska River fishway at Port Hope, Ontario during spring 1974 to 2012. Estimates for 1980, 1982, 1984, 1986, 1992, and 2002 were interpolated from adjacent years with virtual population analysis.

TABLE 2.1.1. Observed count and estimated run of Rainbow Trout moving upstream at the Ganaraska River fishway at Port Hope, Ontario during spring, 1974-2012. Estimates for 1980, 1982, 1984, 1986, 1992, and 2002 were interpolated from adjacent years with virtual population analysis.

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		5,817
1981	7,306	7,306
1982		10,127
1983	7,907	7,907
1984		8,277
1985	14,188	14,188
1986		12,785
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		12,905
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		5,652
2003	3,897	4,494
2004	4,452	5,308
2005	4,417	5,055
2006	5,171	5,877
2007	3,641	4,057
2008	3,963	4,713
2009	3,290	4,502
2010	4,705	6,923
2011	6,313	9,058
2012	7,250	8,525

2.2 Eastern Lake Ontario and Bay of Quinte Fish Community Index Gill Netting

This gill netting program is used to monitor the abundance of a variety of warm, cool and cold-water fish species in the eastern Lake Ontario and Bay of Quinte. Data from the program are used to help manage local commercial and recreational fisheries as well as for detecting long-term change in the Lake Ontario ecosystem.

Gill netting areas are shown in Fig. 2.2.1 and the basic sampling design is summarized in Table 2.2.1. Included in the design are fixed, single-depth sites and depth-stratified sampling areas. Each site or area is visited from one to three times within a specified time-frame and using 2, 3 or 8 replicate gill net gangs.

Annual index gill netting field work occurs during summer months. Summer was chosen based on an understanding of water temperature stability, fish movement/migration patterns, fish growth patterns, and logistical considerations. The time-frames for completion of field work varies among sampling sites/areas (See Table 2.2.1) because the probability of encountering a wide range of water temperatures across the depth ranges sampled varies both seasonally and by geographic area.

Monofilament gill nets with standardized specifications are used (monofilament mesh replaced multifilament in 1992; only catches from 1992-present are tabulated below). Each gill net gang consists of a graded series of ten monofilament gill net panels of mesh sizes from 38 mm (1½ in) to 152 mm (6 in) stretched mesh at 13 mm (½ in) intervals, arranged in sequence. However, a standard gill net gang may consist of one of two possible configurations. Either, each of the ten mesh sizes (panels) is 15.2 m (50 ft) in length (total gang length is 152.4 m (500 ft)), or, the 38 mm (1½ in) mesh size (panel) is 4.6 m (15 ft) in length and the remaining mesh sizes are 15.2 m (50 ft) each in length (total gang length is

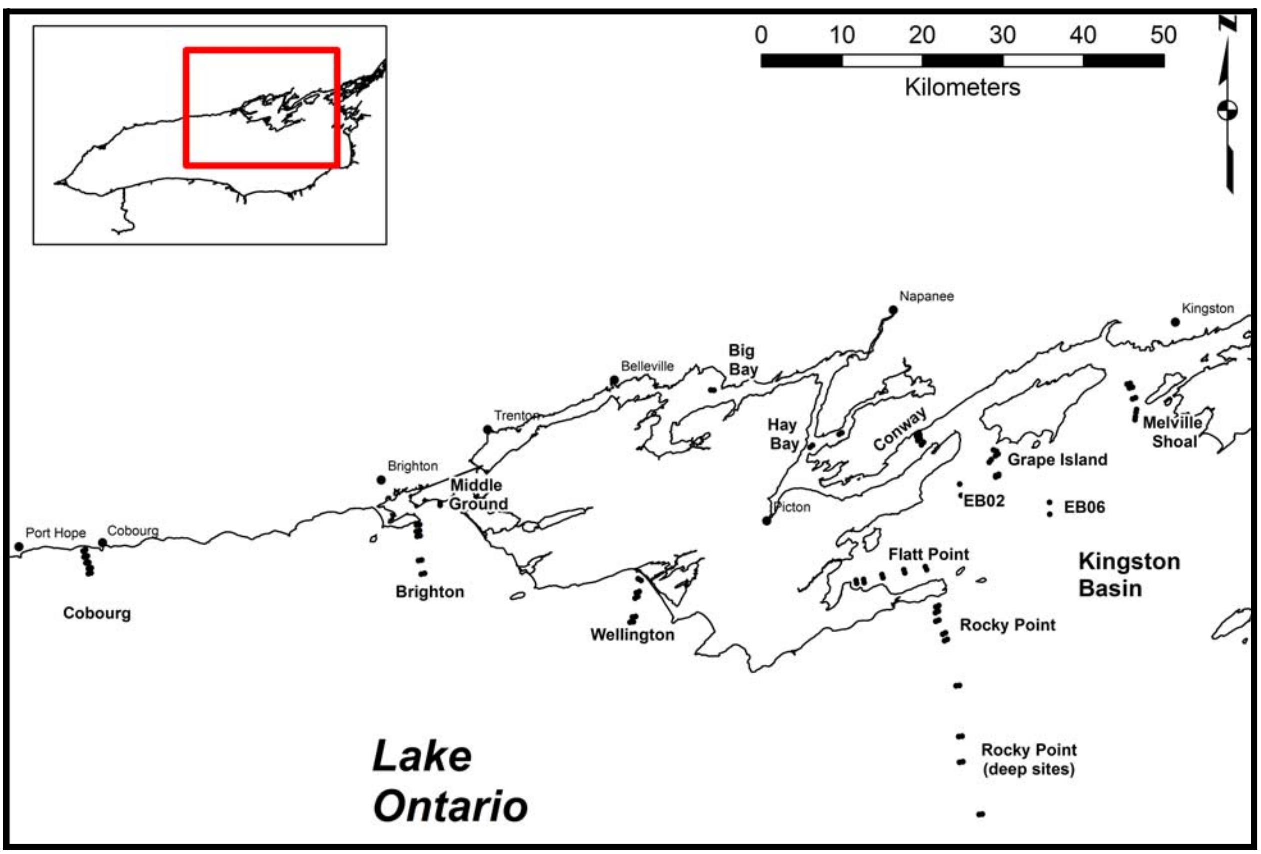


FIG. 2.2.1. Map of north eastern Lake Ontario. Shown are eastern Lake Ontario and Bay of Quinte fish community index gill netting sites.

TABLE. 2.2.1. Sampling design (2012) of the eastern Lake Ontario and Bay of Quinte fish community index gillnetting program including geographic and depth stratification, number of visits, number of replicate gillnet gangs set during each visit, and the time-frame for completion of visits.

						Replicates[3]		Site location (approx)					
Region name	Area Name (Area code)	Design	Site name	Depth (m)	Visits	465 feet	500 feet	Latitude (dec min)	Longitude (dec min)	Visits x Replicates	Time-frame	Start-up year	Number years[4]
Northeastern Lake Ontario	Cobourg (CB)	Depth stratified area	CB08	7.5	1	2		435701	781167	2	Aug 1-Sep 15	2010	3
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB13	12.5		2		435661	781157	2			
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB18	17.5		2		435622	781136	2			
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB23	22.5		2		435584	781109	2			
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB28	27.5		2		435549	781110	2			
Northeastern Lake Ontario	Brighton (BR)	Depth stratified area	BR08	7.5	1	2		435955	774058	2	Aug 1-Sep 15	1988	25
Northeastern Lake Ontario	Brighton	Depth stratified area	BR13	12.5		2		435911	774071	2			
Northeastern Lake Ontario	Brighton	Depth stratified area	BR18	17.5		2		435878	774053	2			
Northeastern Lake Ontario	Brighton	Depth stratified area	BR23	22.5		2		435777	774034	2			
Northeastern Lake Ontario	Brighton	Depth stratified area	BR28	27.5		2		435624	774004	2			
Northeastern Lake Ontario	Wellington (WE)	Depth stratified area	WE08	7.5	1	2		435622	772011	2	Aug 1-Sep 15	1988	25
Northeastern Lake Ontario	Wellington	Depth stratified area	WE13	12.5		2		435544	772027	2			
Northeastern Lake Ontario	Wellington	Depth stratified area	WE18	17.5		2		435515	772025	2			
Northeastern Lake Ontario	Wellington	Depth stratified area	WE23	22.5		2		435378	772050	2			
Northeastern Lake Ontario	Wellington	Depth stratified area	WE28	27.5		2		435348	772066	2			
Northeastern Lake Ontario	Rocky Point (RP)	Depth stratified area	RP08	7.5	1	2		435510	765220	2	Jul 21-Sep 15	1988	25
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP13	12.5		2		435460	765230	2			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP18	17.5		2		435415	765222	2			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP23	22.5		2		435328	765150	2			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP28	27.5		2		435285	765135	2			
Northeastern Lake Ontario (offshore)	Rocky Point	Depth stratified area	0060	60	1		3	434950	765029	3	Jul 1-Jul 31	1997	16
Northeastern Lake Ontario (offshore)	Rocky Point	Depth stratified area	0080	80			3	434633	765006	3			
Northeastern Lake Ontario (offshore)	Rocky Point	Depth stratified area	0100	100			3	434477	764998	3			
Northeastern Lake Ontario (offshore)	Rocky Point	Depth stratified area	0140	140			3	434122	764808	3			
Kingston Basin (nearshore)	Flatt Point (FP)	Depth stratified area	FP08	7.5	2	2		435665	765993	4	Jul 1-Jul 31	1986	27
Kingston Basin (nearshore)	Flatt Point	Depth stratified area	FP13	12.5		2		435659	765927	4			
Kingston Basin (nearshore)	Flatt Point	Depth stratified area	FP18	17.5		2		435688	765751	4			
Kingston Basin (nearshore)	Flatt Point	Depth stratified area	FP23	22.5		2		435726	765541	4			
Kingston Basin (nearshore)	Flatt Point	Depth stratified area	FP28	27.5		2		435754	765314	4			
Kingston Basin (nearshore)	Grape Island (GI)	Depth stratified area	GI08	7.5	2	2		440537	764712	4	Jul 1-Jul 31	1986	27
Kingston Basin (nearshore)	Grape Island	Depth stratified area	GI13	12.5		2		440523	764747	4			
Kingston Basin (nearshore)	Grape Island	Depth stratified area	GI18	17.5		2		440476	764710	4			
Kingston Basin (nearshore)	Grape Island	Depth stratified area	GI23	22.5		2		440405	764718	4			
Kingston Basin (nearshore)	Grape Island	Depth stratified area	GI28	27.5		2		440470	764796	4			
Kingston Basin (nearshore)	Melville Shoal (MS)	Depth stratified area	MS08	7.5	2	2		441030	763500	4	Jul 1-Jul 31	1986	27
Kingston Basin (nearshore)	Melville Shoal	Depth stratified area	MS13	12.5		2		441004	763470	4			
Kingston Basin (nearshore)	Melville Shoal	Depth stratified area	MS18	17.5		2		440940	763460	4			
Kingston Basin (nearshore)	Melville Shoal	Depth stratified area	MS23	22.5		2		440835	763424	4			
Kingston Basin (nearshore)	Melville Shoal	Depth stratified area	MS28	27.5		2		440792	763424	4			
Kinston Basin (offshore)	Eastern Basin (EB)	Fixed site	EB02	30	2		8	440330	765050	16	Last week Jun-Sep 15	1968	45
Kinston Basin (offshore)	Eastern Basin (EB)	Fixed site	EB06	30	2		8	440220	764210	16	Last week Jun-Sep 15	1968	45
Bay of Quinte	Conway (CO)[1]	Depth stratified area	CO08	7.5	2		2	440664	765463	4	Jul 21-Aug 21	1972	41
Bay of Quinte	Conway	Depth stratified area	CO13	12.5			2	440649	765452	4			
Bay of Quinte	Conway	Depth stratified area	CO20	20			2	440643	765453	4			
Bay of Quinte	Conway	Depth stratified area	CO30	30			2	440707	765458	4			
Bay of Quinte	Conway	Depth stratified area	CO45	45			2	440601	765402	4			
Bay of Quinte	Hay Bay (HB)[2]	Depth stratified area	HB08	7.5	2		2	440656	770156	4	Jul 21-Aug 21	1959	54
Bay of Quinte	Hay Bay	Depth stratified area	HB13	12.5			2	440575	770400	4			
Bay of Quinte	Big Bay (BB)	Fixed site	BB05	5	3		2	440920	771360	6	Jul 21-Aug 21	1972	41

Notes:

[1] changed from a fixed site where the gillnet gang was set perpendicular to shore across depth contours to a depth stratified area with five depths (sites) in 1992.

[2] changed from a fixed site where the gillnet was set parallel and close to shore to a depth stratified area with two depths (sites) in 1992.

[3] two types of gillnet effort or gangs are used; both types consist of a graded series of mesh sizes attached in series by size from 38-152 mm at 13 mm intervals; one type has 4.6 m (15 ft) of 38 mm mesh and 15.2 m (50 ft) of all nine other mesh sizes; the second type has 15.2 m (50 ft) of all ten mesh sizes.

[4] the basic sampling design of the program has been largely consistent since 1992.

141.7 m (465 ft)) (see Table 2.2.1). Note that use of the shorter 38 mm gill net panel is related to the processing time required to deal with large numbers of small fish (e.g., Alewife and Yellow Perch) caught in this small mesh size. Gill net gangs are connected in series (i.e., cork lines and lead lines attached), but are separated by a 15.2 m (50 ft) spacer to minimize "leading" of fish. The 152 mm (6 in) end of one gang is connected to the 38 mm (1 ½ in) gang of the adjoining gang. The entire gill net strap (all joined gangs) is set within 2.5 m of the site depth listed in Table 2.2.1. Gill net set duration ranges from 18-24 hr.

Species-specific gill net catch summaries are shown by geographic area/site in Tables 2.2.2-2.2.15. Catches were summed across the ten mesh sizes from 1½-6 inch. In the case where the

38 mm mesh size used was 4.6 m in length, the catch in this mesh was adjusted (i.e., multiplied by 15.2/4.6) prior to summing the ten mesh sizes. Therefore, all reported catches represent the total catch in a 152.4 m (500 ft) gang of gill net.

In 2012, gill netting occurred from 4-Jul to 6-Sep. Twenty-six different species and over eighteen thousand individual fish were caught in 2012. About 85% of the catch was alewife.

Selected biological information is also presented below for selected species including Lake Whitefish, Walleye, Round Goby, Lake Herring and Lake Trout.

Lake Ontario

Cobourg (Table 2.2.2)

Alewife dominate the catches at Cobourg but the salmonid fish community is also well represented at this location.

TABLE 2.2.2. Species-specific catch per gillnet set at **Cobourg, Lake Ontario**, 2010-2012. Annual catches are averages for 2 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 1-3 visits during summer. The total number of species caught and gillnets set each year are indicated.

	2010	2011	2012
Alewife	351.96	196.13	56.77
Coho salmon	-	-	0.10
Chinook salmon	0.68	2.05	1.82
Rainbow trout	0.51	0.25	0.80
Brown trout	0.13	0.65	0.50
Lake trout	0.37	0.05	-
Lake whitefish	-	0.05	-
Round whitefish	0.07	0.05	-
Rainbow smelt	-	0.33	-
White sucker	0.10	0.37	0.50
Greater redhorse	-	-	0.10
Smallmouth bass	-	0.05	-
Yellow perch	0.33	-	0.10
Walleye	0.03	-	0.40
Round goby	2.20	9.91	3.30
Freshwater drum	-	0.05	0.10
Total catch	356	210	65
Number of species	10	12	11
Number of sets	30	20	10

Middle Ground

Middle Ground was not sampled in 2012.

Northeast (Brighton, Wellington and Rocky Point) and Kingston Basin (Melville Shoal, Grape Island and Flatt Point) Nearshore Areas (Tables 2.2.3-2.2.8 inclusive)

Six depth-stratified sampling areas (Melville Shoal, Grape Island, Flat Point, Rocky Point, Wellington and Brighton) that employ a common and balanced sampling design are used here to provided a broad picture of the warm, cool and coldwater fish community inhabiting open-coastal waters out to about 30 m water depth. Results were summarized and presented graphically (Fig. 2.2.2) to illustrate abundance trends of the most abundant nearshore (Yellow Perch, Round Goby, Walleye, and Smallmouth Bass), offshore benthic (Lake Trout, Lake Whitefish, Round Whitefish and Burbot), and offshore pelagic (Alewife, Chinook Salmon, Brown Trout and Cisco) fish species.

Most species showed peak abundance levels in the early 1990s followed by dramatic abundance decline. Recent abundance trends varied among species in the nearshore zone but all species remain at moderate abundance levels. Offshore benthic species all remained at extremely low abundance levels. Offshore pelagic species showed increasing or steady abundance levels in recent years. Alewife, the most common species caught, has occurred at very high abundance levels the last few years.

Rocky Point—Deep Sites (Table 2.2.9)

Seven species have been captured at the Rocky Point deep sampling sites since 1997. Alewife and Lake Trout are the two most abundant species. Alewife abundance declined in 2012 from the high levels observed the previous several years. Lake Trout abundance was relatively stable from 1997-2002, declined significantly through 2004 and remained steady in the following years. Round Goby appeared for the first time in 2012 (at the 60 m site).

TABLE 2.2.3. Species-specific catch per gillnet set at **Brighton in northeastern Lake Ontario**, 1992-2012. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 1-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000											**2001-2010**		
	mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011	2012
Alewife	**34.82**	49.58	107.40	31.81	22.39	41.27	72.52	3.52	89.17	209.81	67.05	**69.45**	307.74	138.36
Gizzard shad	**0.44**	-	-	-	-	-	-	-	-	-	0.15	**0.02**	-	-
Coho salmon	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-	-
Chinook salmon	**0.74**	0.10	0.35	1.25	0.45	0.42	0.20	0.62	0.30	0.05	0.71	**0.44**	0.83	0.10
Brown trout	**0.12**	-	-	0.35	0.20	0.05	0.15	0.10	0.30	0.15	1.25	**0.26**	0.60	0.50
Lake trout	**5.22**	1.30	1.05	0.40	0.95	0.15	0.30	0.05	-	0.05	0.10	**0.44**	0.15	0.20
Lake whitefish	**0.42**	0.05	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Cisco (Lake herring)	**0.12**	-	-	0.05	-	0.10	0.10	0.05	0.25	0.05	-	**0.06**	0.05	-
Round whitefish	**1.19**	-	0.25	0.05	0.05	-	-	-	-	-	-	**0.04**	-	-
Rainbow smelt	**0.11**	-	-	-	-	-	-	-	-	-	0.10	**0.01**	0.22	-
Northern pike	**0.08**	-	-	0.05	-	0.10	-	0.20	0.05	0.05	-	**0.05**	0.05	-
White sucker	**0.41**	-	0.10	-	0.05	0.15	0.05	0.10	-	-	0.05	**0.05**	0.05	-
Lake chub	**-**	-	-	-	-	-	-	-	0.17	-	-	**0.02**	-	-
Common carp	**0.12**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Brown bullhead	**0.10**	0.52	0.20	0.85	0.27	0.35	-	0.25	0.22	0.05	-	**0.27**	-	-
Channel catfish	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
American eel	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	**0.05**	0.05	-	-	-	-	0.05	0.05	-	-	-	**0.02**	-	-
White perch	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	**0.88**	-	0.32	0.63	0.76	0.32	0.15	0.32	0.80	0.33	0.33	**0.39**	-	1.65
Pumpkinseed	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth bass	**0.00**	-	-	-	-	-	-	-	-	-	0.05	**0.01**	-	-
Yellow perch	**15.64**	-	0.50	0.50	0.33	1.16	2.99	1.57	4.83	0.17	0.17	**1.22**	-	1.98
Walleye	**0.44**	-	0.15	0.25	0.50	0.20	0.05	0.75	0.10	-	0.10	**0.21**	-	0.43
Round goby	**-**	-	-	0.17	0.17	4.45	1.98	0.63	1.70	1.32	0.99	**1.14**	1.21	2.31
Freshwater drum	**0.17**	-	-	0.15	0.10	-	0.05	0.05	-	-	-	**0.04**	-	-
Total catch	**61**	52	110	37	26	49	79	8	98	212	71	**74**	311	146
Number of species	**13**	6	9	15	12	12	12	14	11	10	12	**11**	9	8
Number of sets		20	20	20	20	20	20	20	20	20	20		20	10

TABLE 2.2.4. Species-specific catch per gillnet set at **Wellington in northeastern Lake Ontario**, 1992-2012. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 1-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000											**2001-2010**		
	mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011	2012
Alewife	**17.25**	20.85	50.58	62.26	38.23	83.22	137.33	1.54	79.05	447.66	215.85	**113.66**	475.42	140.74
Gizzard shad	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-
Chinook salmon	**0.33**	0.10	0.20	0.35	1.20	0.10	0.20	0.35	0.45	-	0.10	**0.31**	0.65	-
Rainbow trout	**-**	-	-	-	-	-	-	-	-	-	0.05	**0.01**	-	-
Brown trout	**0.11**	0.15	0.30	0.15	0.40	0.15	-	0.10	0.40	0.45	1.55	**0.37**	0.60	0.80
Lake trout	**7.58**	2.40	2.20	0.85	1.85	0.45	0.70	0.40	0.05	0.25	0.10	**0.93**	0.25	0.40
Lake whitefish	**0.61**	0.10	0.05	-	-	-	-	-	-	-	-	**0.02**	0.35	-
Cisco (Lake herring)	**0.11**	-	-	-	-	-	0.05	-	-	0.05	0.05	**0.02**	0.05	-
Round whitefish	**0.06**	-	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow smelt	**0.07**	-	-	-	-	-	-	-	0.05	0.10	0.17	**0.03**	0.05	0.10
Northern pike	**0.01**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	0.05	-
White sucker	**0.05**	-	-	-	0.17	-	-	0.05	-	-	-	**0.02**	-	-
Greater redhorse	**-**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Lake chub	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	**0.02**	-	-	-	-	0.05	-	-	-	-	-	**0.01**	-	-
Brown bullhead	**0.00**	0.05	0.10	-	0.05	0.15	-	-	-	-	-	**0.04**	-	-
Burbot	**0.23**	0.10	0.25	0.05	0.05	-	0.10	-	0.05	-	0.05	**0.07**	-	0.10
White perch	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	**0.35**	0.17	-	0.52	0.10	0.05	-	-	0.58	-	-	**0.14**	-	-
Smallmouth bass	**0.03**	-	-	-	-	-	-	-	-	-	-	-	0.05	-
Yellow perch	**31.00**	12.67	6.22	17.96	10.31	14.51	7.25	23.48	17.65	25.87	14.11	**15.00**	2.47	19.87
Walleye	**0.36**	-	0.10	0.20	0.25	0.20	0.10	0.10	-	-	0.05	**0.10**	0.05	-
Round goby	**-**	-	-	0.33	0.99	25.92	18.39	2.03	11.50	1.16	6.94	**6.73**	3.35	2.97
Freshwater drum	**0.25**	-	0.05	-	0.05	0.05	-	-	-	-	-	**0.02**	-	0.10
Total catch	**58**	37	60	83	54	125	164	28	110	476	239	**137**	483	10.00
Number of species	**11**	9	10	11	12	11	8	8	9	7	11	**10**	12	8
Number of sets		20	20	20	20	20	20	20	20	20	20		20	20

TABLE 2.2.5. Species-specific catch per gillnet set at **Rocky Point (nearshore sites only) in northeastern Lake Ontario**, 1992-2012. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 1-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000											**2001-2010**		
	mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011	2012
Alewife	**131.93**	105.42	141.61	86.90	155.51	293.30	142.82	135.36	231.74	176.68	662.38	**213.17**	530.40	127.84
Chinook salmon	**0.23**	-	0.10	0.25	0.55	0.15	0.27	0.10	0.15	-	0.70	**0.23**	0.20	-
Rainbow trout	-	-	-	-	-	-	0.05	-	-	-	-	**0.01**	-	-
Atlantic salmon	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-
Brown trout	**0.09**	-	1.20	0.05	0.25	0.25	0.45	0.10	0.50	-	0.80	**0.36**	1.55	1.10
Lake trout	**5.40**	1.67	0.80	0.10	0.60	-	0.47	0.05	0.25	0.05	0.32	**0.43**	1.35	4.10
Lake whitefish	**0.69**	0.05	-	0.30	0.10	0.05	0.10	0.05	0.25	0.45	-	**0.14**	0.10	0.30
Cisco (Lake herring)	**0.07**	-	-	-	-	-	-	-	-	-	-	-	0.05	-
Chub	-	0.17	-	-	-	-	-	-	-	-	-	**0.02**	-	-
Rainbow smelt	**0.03**	-	-	-	-	-	-	-	0.17	-	-	**0.02**	-	-
White sucker	**0.04**	0.05	-	-	-	-	-	0.05	-	-	-	**0.01**	-	-
Lake chub	**0.11**	-	0.17	-	-	-	-	0.05	-	-	-	**0.02**	-	-
Common carp	**0.01**	-	-	-	0.10	0.05	-	-	-	-	-	**0.02**	-	-
Brown bullhead	-	-	-	-	0.05	-	-	-	-	-	-	**0.01**	-	-
Channel catfish	-	-	-	-	-	-	-	-	-	0.05	-	**0.01**	-	-
Stonecat	**0.01**	0.70	0.17	0.05	-	0.10	0.05	0.27	-	-	-	**0.13**	-	-
Burbot	**0.28**	0.15	0.35	0.10	0.05	0.30	-	-	-	-	0.05	**0.10**	-	-
Rock bass	**0.31**	0.32	0.53	0.87	0.05	0.35	0.55	0.63	0.86	0.32	0.86	**0.53**	0.05	0.73
Smallmouth bass	**1.05**	0.70	0.65	0.67	0.80	0.42	0.42	0.52	0.55	0.15	0.50	**0.54**	0.20	0.53
Yellow perch	**0.06**	-	-	-	-	0.17	0.81	0.88	0.22	0.33	1.75	**0.42**	0.60	0.66
Walleye	**0.67**	-	0.25	0.10	0.80	1.60	0.65	0.85	0.65	0.15	0.45	**0.55**	0.10	0.20
Round goby	-	-	-	-	-	2.15	8.48	71.25	9.50	28.26	15.93	**13.56**	6.54	7.60
Freshwater drum	**0.19**	0.10	0.05	0.05	0.30	-	0.10	-	0.20	0.15	0.15	**0.11**	-	-
Total catch	**141**	109	146	89	159	299	155	210	245	207	684	**230**	541	143
Number of species	**10**	10	11	11	12	12	13	13	12	10	11	**12**	11	9
Number of sets		20	20	20	20	20	20	20	20	20	20		20	10

TABLE 2.2.6. Species-specific catch per gillnet set at **Flatt Point in the Kingston Basin of Lake Ontario**, 1992-2012. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000											**2001-2010**		
	mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011	2012
Lake sturgeon	**0.01**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Alewife	**78.18**	45.97	5.17	6.87	101.38	141.78	203.18	140.02	297.45	305.56	620.72	**186.81**	908.17	818.60
Chinook salmon	**0.16**	-	-	-	0.35	0.05	-	0.10	-	-	0.05	**0.06**	0.05	0.15
Rainbow trout	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15
Brown trout	**0.02**	0.10	-	-	-	-	0.10	-	0.10	0.05	0.10	**0.05**	0.55	0.55
Lake trout	**10.72**	2.47	0.75	1.25	0.98	0.88	0.30	1.22	0.92	2.07	1.00	**1.18**	1.95	0.60
Lake whitefish	**4.17**	4.60	2.72	0.85	2.80	0.55	0.20	1.30	0.75	0.15	0.25	**1.42**	0.25	0.95
Cisco (Lake herring)	**0.83**	-	-	0.10	-	0.05	-	-	-	-	-	**0.02**	-	0.05
Coregonus sp.	**0.00**	0.05	-	-	-	-	-	-	-	-	-	**0.01**	-	-
Rainbow smelt	**0.22**	-	-	-	-	-	0.05	-	0.05	-	0.10	**0.02**	-	-
Northern pike	**0.08**	0.10	-	-	0.05	0.15	0.05	0.05	0.25	0.15	0.10	**0.09**	0.10	0.10
White sucker	**0.98**	0.45	0.45	0.70	1.00	0.60	0.35	0.20	0.50	0.05	0.20	**0.45**	0.30	0.25
Brown bullhead	**0.05**	-	0.05	0.05	0.05	0.05	-	0.05	-	-	-	**0.03**	-	-
Stonecat	-	0.05	0.05	-	-	-	-	-	-	-	-	**0.01**	-	-
Burbot	**0.02**	0.10	-	-	-	-	-	-	-	-	-	**0.01**	-	-
White perch	**0.02**	-	-	0.10	-	-	-	-	-	-	-	**0.01**	-	-
Rock bass	**0.87**	0.53	0.05	0.05	0.22	-	0.70	0.25	0.27	0.05	-	**0.21**	0.73	0.52
Smallmouth bass	**0.06**	-	0.10	0.05	-	-	-	-	-	-	-	**0.02**	-	0.05
Yellow perch	**22.70**	5.24	5.02	8.62	41.35	29.83	51.51	20.53	5.77	5.06	12.17	**18.51**	9.58	2.32
Walleye	**0.10**	-	-	-	-	0.05	0.05	0.05	0.10	0.15	0.25	**0.07**	0.10	0.10
Round goby	-	-	-	-	0.99	4.96	12.26	8.18	1.70	0.50	2.81	**3.14**	1.49	3.97
Freshwater drum	**0.08**	-	-	-	-	-	-	-	-	-	-	-	0.05	-
Total catch	**119**	60	14	19	149	179	269	172	308	314	638	**212**	923	828
Number of species	**10**	11	9	11	10	11	11	11	11	10	11	**11**	12	13
Number of sets		20	20	20	20	20	20	20	20	20	20		20	20

TABLE 2.2.7. Species-specific catch per gillnet set at **Grape Island in the Kingston Basin of Lake Ontario**, 1992-2012. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Lake sturgeon	**0.01**	0.05	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Alewife	**116.14**	155.14	15.03	47.83	42.83	225.83	376.62	153.49	358.67	244.82	719.98	**234.02**	1,244.67	675.03
Chinook salmon	**0.02**	-	-	-	-	0.15	-	0.10	-	-	-	**0.03**	-	-
Brown trout	**0.02**	-	-	-	0.05	0.05	0.10	-	-	-	0.05	**0.03**	0.25	0.10
Lake trout	**6.56**	0.30	0.57	0.45	0.10	0.15	0.15	0.57	0.05	0.40	0.20	**0.29**	0.20	0.20
Lake whitefish	**2.86**	0.20	0.20	0.15	-	0.10	0.10	0.20	0.10	0.10	0.10	**0.13**	0.10	0.10
Cisco (Lake herring)	**0.08**	-	-	-	-	-	-	-	-	-	0.15	**0.02**	0.05	-
Rainbow smelt	**0.03**	-	-	-	-	-	-	-	-	0.05	-	**0.01**	-	-
Northern pike	-	-	-	-	-	-	-	0.05	-	-	-	**0.01**	-	-
White sucker	**0.04**	-	-	0.05	-	-	-	0.05	0.05	-	-	**0.02**	0.10	0.05
Silver redhorse	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-	-
Brown bullhead	-	-	-	0.15	0.17	-	0.05	-	-	-	-	**0.04**	-	-
Channel catfish	**0.02**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Stonecat	**0.04**	-	0.17	0.43	0.33	-	-	-	-	-	-	**0.09**	-	-
Burbot	**0.17**	-	0.10	0.05	-	-	-	-	-	-	-	**0.02**	-	-
Threespine stickleback	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**0.07**	-	-	0.10	0.10	0.05	-	-	-	-	-	**0.03**	-	-
Rock bass	**1.43**	1.01	0.05	0.72	0.33	0.17	0.37	0.93	1.01	0.43	0.35	**0.54**	0.05	0.80
Smallmouth bass	**0.68**	0.15	0.48	0.47	0.48	0.05	0.52	0.15	0.35	0.32	0.25	**0.32**	0.50	0.85
Yellow perch	**14.36**	3.54	19.72	18.54	45.07	12.18	18.13	15.82	7.44	6.98	6.91	**15.43**	4.61	0.98
Walleye	**2.90**	0.50	0.10	0.80	0.37	0.20	2.55	0.50	0.95	0.15	1.05	**0.72**	0.70	1.30
Round goby	-	-	-	1.32	49.22	4.51	8.35	7.97	1.09	-	1.65	**7.41**	1.16	1.42
Freshwater drum	**0.28**	0.05	-	0.20	-	-	0.05	-	0.05	-	0.05	**0.04**	-	-
Total catch	**146**	161	36	71	139	243	407	180	370	253	731	**259**	1,252	681
Number of species	**11**	9	9	16	11	11	11	11	10	8	11	**11**	11	10
Number of sets		20	20	20	20	20	20	20	20	20	20		20	20

TABLE 2.2.8. Species-specific catch per gillnet set at **Melville Shoal in the Kingston Basin of Lake Ontario**, 1992-2012. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Alewife	**71.63**	40.83	39.19	14.14	82.41	177.38	195.64	83.04	134.66	496.46	620.85	**188.46**	666.70	223.18
Gizzard shad	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-	-
Chinook salmon	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-	0.05	-	-	-	**0.01**	-	-
Brown trout	-	-	-	-	-	-	0.05	-	0.10	-	0.15	**0.03**	0.05	0.05
Lake trout	**3.54**	0.10	0.05	0.05	0.05	-	0.05	0.05	0.10	0.40	0.15	**0.10**	1.02	0.10
Lake whitefish	**1.59**	0.10	0.20	0.30	-	-	-	0.05	-	-	-	**0.07**	-	-
Cisco (Lake herring)	**0.04**	-	-	-	-	-	-	-	-	-	0.20	**0.02**	0.05	0.05
Coregonus sp.	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow smelt	**0.08**	-	-	-	-	-	-	-	0.17	-	0.05	**0.02**	-	-
Northern pike	**0.07**	0.10	0.10	0.05	-	-	-	-	-	0.10	0.10	**0.05**	-	-
White sucker	**0.03**	0.05	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Greater redhorse	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Moxostoma sp.	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	**0.02**	-	-	0.05	0.10	-	-	-	0.05	-	-	**0.02**	-	-
Channel catfish	**0.15**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-	-
Stonecat	**0.03**	0.33	0.43	-	-	0.50	-	-	-	-	-	**0.13**	-	-
Burbot	**0.10**	-	-	-	0.05	-	-	-	-	-	-	**0.01**	-	-
White perch	**0.20**	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	**1.88**	1.99	0.98	1.33	2.25	1.84	1.82	1.72	3.16	0.80	1.28	**1.72**	1.20	1.89
Pumpkinseed	-	0.17	-	-	-	-	-	-	-	-	-	**0.02**	-	-
Smallmouth bass	**0.53**	0.42	0.25	0.40	0.27	0.15	0.20	0.57	0.70	0.25	0.60	**0.38**	0.40	1.00
Yellow perch	**28.76**	12.57	26.57	20.20	49.72	16.14	44.66	38.74	18.75	9.75	25.97	**26.31**	10.38	8.82
Walleye	**8.73**	4.63	3.90	3.50	5.08	4.45	5.25	7.30	4.55	7.50	12.45	**5.86**	10.10	7.05
Round goby	-	-	-	-	9.02	9.80	5.34	4.84	2.18	1.16	0.50	**3.28**	0.71	1.16
Freshwater drum	**0.09**	0.05	-	0.05	-	-	-	0.22	-	-	0.10	**0.04**	0.05	-
Total catch	**118**	61	72	40	149	210	253	137	164	516	662	**227**	691	243
Number of species	**12**	12	9	12	9	7	8	10	10	8	12	**10**	10	9
Number of sets		20	20	20	20	20	20	20	20	20	20		20	20

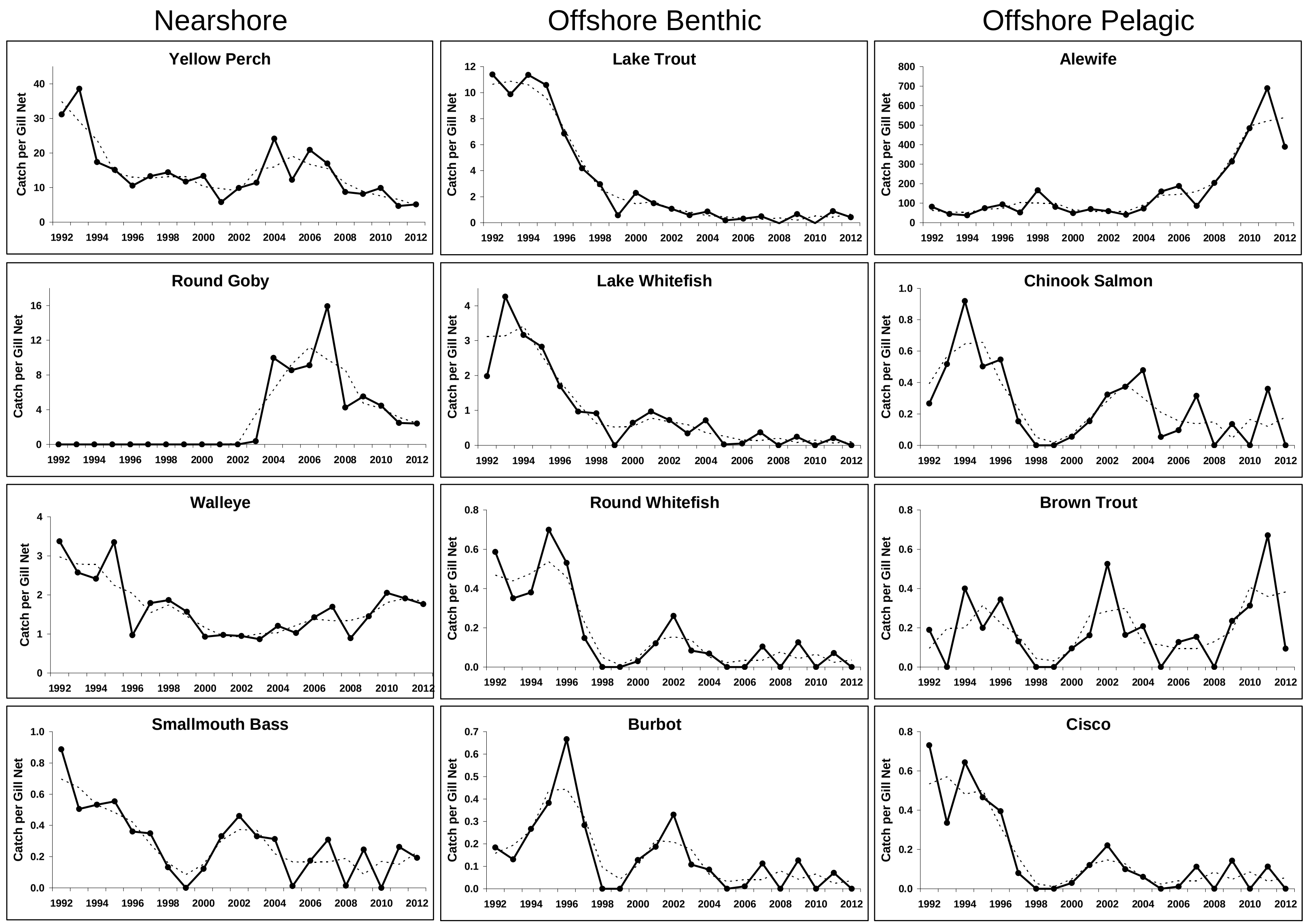


FIG. 2.2.2. Abundance trends for the most common nearshore, offshore benthic, and offshore pelagic species caught in gillnets at six depth-stratified transects (nearshore out to 30 m) in north eastern Lake Ontario (Melville Shoal, Grape Island, Flatt Point, Rocky Point, Wellington and Brighton; see Fig. 2.2.1). Annual catch per gillnet values are least-squared means corrected for observed water temperature (covariate). Dotted lines show 3-yr running averages (two years for first and last years graphed).

TABLE 2.2.9. Species-specific catch per gillnet set at **Rocky Point (deep sites only) in northeastern Lake Ontario**, 1997-2012 (no sampling in 2006, 2007 or 2010). Annual catches are averages for 2 or 3 gillnet gangs set at each of 4 depths (60, 80, 100 or 140 m) during each of 2 visits during early-summer. Mean catches for 1997-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1997-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Alewife	**4.69**	12.25	0.38	9.21	14.46	1.83	-	-	23.92	40.67	-	**14.67**	35.13	2.58
Lake trout	**5.05**	6.81	6.25	4.17	2.17	1.83	-	-	1.46	1.88	-	**3.51**	2.42	2.00
Lake whitefish	**0.50**	0.13	-	0.08	-	0.08	-	-	0.25	0.50	-	**0.15**	0.13	-
Cisco (Lake herring)	**0.13**	-	0.13	0.08	0.21	-	-	-	-	-	-	**0.06**	-	-
Rainbow smelt	**0.41**	-	0.19	-	-	-	-	-	0.08	0.08	-	**0.05**	0.08	-
Burbot	**0.09**	-	-	-	0.04	-	-	-	-	-	-	**0.01**	-	-
Round goby	**-**	-	-	-	-	-	-	-	-	-	-	**-**	-	0.08
Slimy sculpin	**0.08**	0.06	-	0.04	0.04	-	-	-	0.08	-	-	**0.03**	-	-
Total catch	**11**	19	7	14	17	4	-	-	26	43	-	**18**	38	5
Number of species	**6**	4	4	5	5	3	-	-	5	4	-	**3**	4	3
Number of sets		16	16	24	24	24	-	-	24	24	-		24	12

Kingston Basin—Deep Sites (EB02 and EB06; Table 2.2.10 and 2.2.11)

Two single-depth sites (EB02 and EB06) are used to monitor long-term trends in the deep water fish community the Kingston Basin. Results were summarized and presented graphically (Fig. 2.2.3) to illustrate abundance trends of the most abundant species (Alewife, Lake Trout, Lake Whitefish, Rainbow Smelt, Cisco, Round Goby, Burbot and Chinook Salmon). Alewife catches were variable with high catches in some years, 1998-1999 and 2010. Lake Trout, Lake Whitefish, Rainbow Smelt, and Cisco abundance declined throughout the 1990s and remained low during the years that followed except that Cisco

TABLE 2.2.10. Species-specific catch per gillnet set at **EB02 in the Kingston Basin of Lake Ontario**, 1992-2012. Annual catches are averages for 4-8 gillnet gangs set during each of 3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Sea lamprey	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Alewife	**40.00**	17.83	0.25	0.25	8.67	1.75	4.50	3.25	2.92	7.46	157.00	**20.39**	2.45	60.75
Chinook salmon	**0.05**	0.25	-	0.04	0.04	-	-	0.04	-	0.13	0.08	**0.06**	-	0.13
Rainbow trout	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-
Atlantic salmon	-	-	-	-	-	-	-	-	0.04	-	-	**0.00**	-	-
Brown trout	**0.02**	0.08	-	-	-	-	-	-	0.04	-	0.21	**0.03**	0.04	-
Lake trout	**20.57**	1.58	0.75	1.54	0.88	0.42	1.50	2.08	3.58	2.33	1.63	**1.63**	2.10	0.88
Lake whitefish	**3.76**	0.25	0.42	0.08	0.17	-	0.25	0.17	0.46	0.08	0.04	**0.19**	0.13	-
Cisco (Lake herring)	**0.20**	-	-	-	0.04	-	-	-	-	-	0.21	**0.03**	0.04	-
Rainbow smelt	**0.56**	-	-	-	0.04	0.04	0.08	0.04	-	0.17	0.17	**0.05**	-	-
Burbot	**0.05**	0.08	-	-	-	-	-	-	-	-	-	**0.01**	-	-
Trout-perch	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-	-	0.04	**0.00**	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-	0.04	-	**0.00**	-	-
Yellow perch	**0.09**	-	0.28	0.04	2.92	0.50	0.71	0.17	0.42	0.13	0.25	**0.54**	0.04	0.13
Walleye	**0.04**	-	-	-	0.04	-	-	-	0.04	-	-	**0.01**	-	-
Round goby	-	-	-	-	0.13	0.04	0.17	0.08	-	-	0.04	**0.05**	-	-
Freshwater drum	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin sp.	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Total catch	**65**	20	2	2	13	3	7	6	8	10	160	**23**	5	62
Number of species	**7**	6	4	5	9	5	6	7	7	7	10	**7**	7	4
Number of sets		12	12	24	24	24	24	24	24	24	24		24	16

TABLE 2.2.11. Species-specific catch per gillnet set at **EB06 in the Kingston Basin of Lake Ontario**, 1992-2012. Annual catches are averages for 4-8 gillnet gangs set during each of 3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Sea lamprey	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Alewife	**28.50**	15.67	0.58	0.79	2.79	1.88	2.46	6.44	11.25	1.29	75.88	**11.90**	17.96	13.19
Chinook salmon	**0.02**	-	-	-	-	0.08	-	-	0.04	-	-	**0.01**	0.08	0.19
Rainbow trout	-	-	-	-	-	-	-	0.04	-	-	-	**0.00**	-	-
Brown trout	-	-	0.08	-	-	0.04	-	0.08	0.04	0.04	0.04	**0.03**	-	0.13
Lake trout	**21.88**	1.58	2.33	2.04	2.79	2.04	2.46	2.63	3.38	2.96	4.96	**2.72**	3.29	4.44
Lake whitefish	**6.36**	0.58	0.42	0.25	2.54	0.29	0.33	0.42	1.79	0.46	0.92	**0.80**	0.92	0.75
Cisco (Lake herring)	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-	0.19
Rainbow smelt	**0.52**	-	-	-	-	-	0.04	-	-	0.04	-	**0.01**	0.04	0.06
Common carp	-	-	-	-	0.04	-	-	-	-	-	-	**0.00**	-	-
American eel	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	**0.13**	0.17	0.08	0.04	0.04	-	-	-	-	-	-	**0.03**	-	-
White perch	**0.01**	-	-	0.04	-	-	-	-	-	-	-	**0.00**	-	-
Yellow perch	-	-	-	0.04	-	-	-	-	0.21	-	-	**0.03**	-	-
Walleye	**0.01**	-	-	-	-	-	0.04	-	-	-	-	**0.00**	0.04	-
Round goby	-	-	-	-	-	0.04	0.13	0.26	-	-	0.08	**0.05**	0.17	-
Total catch	**57**	18	4	3	8	4	5	10	17	5	82	**16**	23	19
Number of species	**6**	4	5	6	5	6	6	6	6	5	5	**5**	7	7
Number of sets		12	12	24	24	24	24	24	24	24	24		24	16

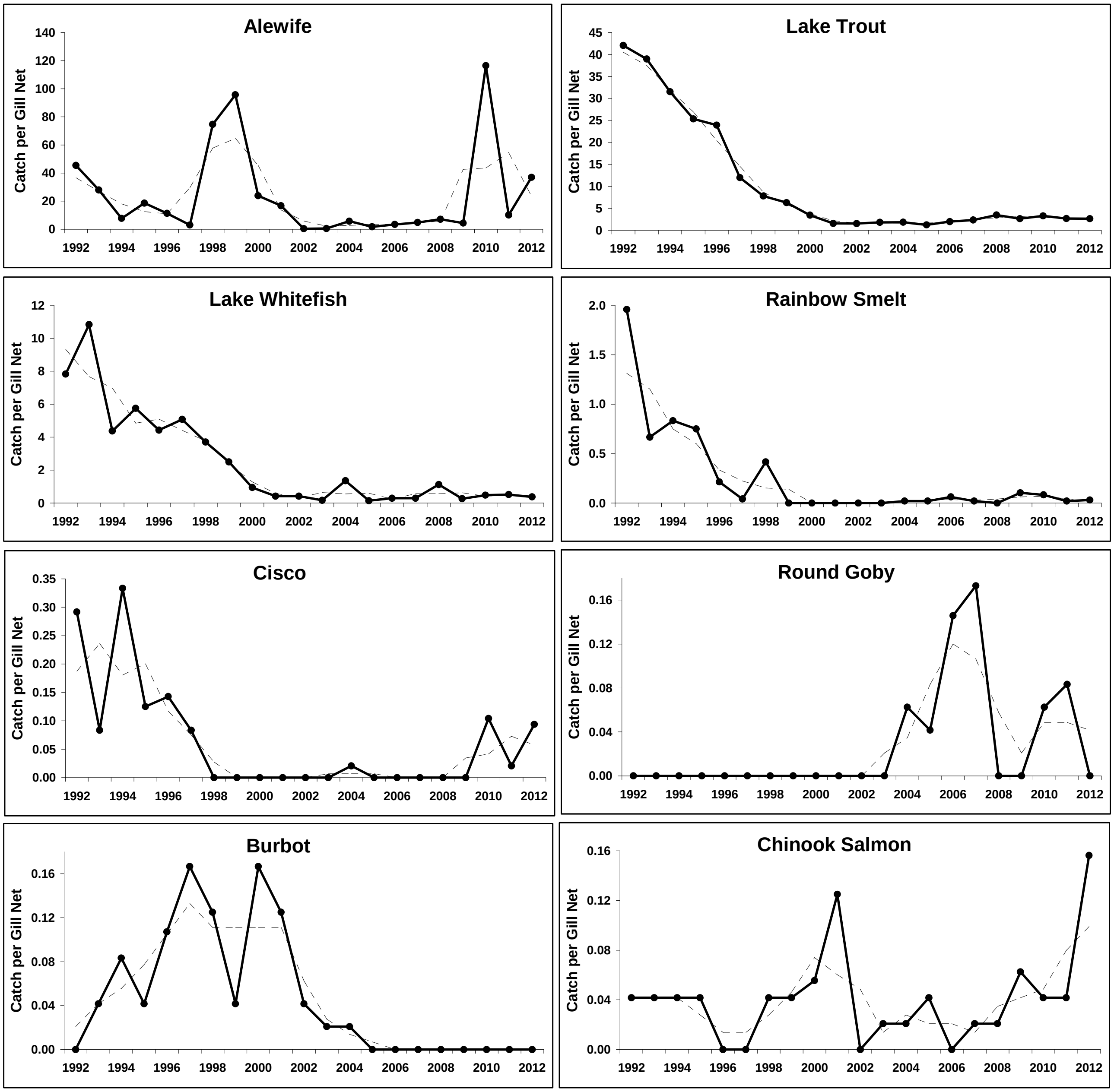


FIG. 2.2.3. Abundance trends (annual means) for the most common species caught in gill nets at the Kingston Basin deep sites, in eastern Lake Ontario (EB02 and EB06; see Fig. 2.2.1). Dotted lines show 3-yr running averages (two years for first and last years graphed).

has increased in the last three years. Burbot catches peaked in the late-1990s then declined to zero for the last seven years.

Bay of Quinte *(Conway, Hay Bay and Big Bay; Tables 2.2.12-2.2.14 inclusive)*

Three sites are used to monitor long-term trends in the Bay of Quinte fish community. Big Bay is a single-depth site; Hay Bay has two depths and Conway five depths. Average catch for the three sites are summarized graphically in Fig. 2.2.4 to illustrate abundance trends of the most abundant species from 1992-2012. Yellow Perch abundance peaked in 1998 then gradually declined. White Perch catches were high in 1992, declined through 2001, increased to a peak in 2006 then declined through 2011, and finally increased in 2012. Alewife abundance was high in the last three years. Walleye abundance declined from 1992-2000 but has remained very stable since. Freshwater Drum and Gizzard Shad catches show no significant trends. White Sucker abundance has declined gradually since 1992 but showed a slight increase in the last three years. Brown Bullhead abundance has declined precipitously to low levels. Bluegill and Pumpkinseed abundance increased in the late-1990s then declined through 2004. Thereafter, Bluegill catches increased but Pumpkinseed catches did not. Cisco catches increased in the late-1990s then declined. Round Goby, a recent invader to the Bay of Quinte area, peaked in abundance in 2004 then declined.

TABLE 2.2.12. Species-specific catch per gillnet set at **Conway in the Bay of Quinte**, 1993-2012. Annual catches are averages for 2-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1993-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1993-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Sea lamprey	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake sturgeon	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose gar	**0.00**	0.05	-	-	-	-	-	-	-	-	-	**0.01**	-	-
Alewife	**46.74**	8.25	2.90	6.00	16.20	69.45	11.55	19.35	71.00	74.95	175.35	**45.50**	176.44	112.70
Gizzard shad	**0.01**	-	-	-	0.05	-	-	0.20	0.10	-	-	**0.04**	0.10	-
Chinook salmon	**0.03**	0.05	-	0.05	0.10	-	-	0.10	0.10	0.10	0.05	**0.06**	0.15	-
Rainbow trout	-	-	-	-	-	0.05	-	-	-	-	-	**0.01**	-	-
Atlantic salmon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Brown trout	**0.29**	0.10	0.05	0.35	0.10	0.25	0.25	0.15	0.45	0.15	0.05	**0.19**	0.40	-
Lake trout	**2.02**	0.75	2.30	1.75	2.05	2.75	1.15	1.35	0.95	0.10	0.15	**1.33**	0.95	1.80
Lake whitefish	**0.96**	0.45	0.25	0.75	0.10	0.60	0.30	0.25	0.20	0.05	0.20	**0.32**	0.30	0.20
Cisco (Lake herring)	**0.19**	0.20	-	-	-	-	0.05	-	0.10	0.05	0.15	**0.06**	-	0.15
Coregonus sp.	**0.00**	-	-	-	0.05	-	-	-	-	-	-	**0.01**	-	-
Rainbow smelt	**0.08**	0.20	-	-	0.05	0.20	0.05	-	0.35	0.10	0.15	**0.11**	0.10	-
Northern pike	**0.04**	0.05	-	0.05	-	-	-	0.05	0.05	-	0.05	**0.03**	-	-
White sucker	**2.36**	3.30	2.60	2.15	1.05	0.60	0.45	1.45	0.55	0.30	0.20	**1.27**	0.05	0.05
Silver redhorse	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Moxostoma sp.	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	**0.04**	-	-	-	-	-	-	0.05	-	-	-	**0.01**	-	-
Brown bullhead	**0.05**	0.05	-	0.10	0.20	0.15	0.90	0.35	-	-	-	**0.18**	0.05	-
Channel catfish	**0.02**	0.05	0.05	-	-	0.05	-	-	-	-	-	**0.02**	-	-
Stonecat	-	0.05	0.05	-	-	-	-	-	-	-	-	**0.01**	-	-
Burbot	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-
Trout-perch	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**1.95**	-	0.05	0.85	2.65	-	0.85	1.25	1.15	0.15	0.05	**0.70**	0.50	0.30
White bass	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-
Rock bass	**2.19**	0.45	0.90	0.15	0.15	0.50	0.95	3.85	2.05	0.20	0.95	**1.02**	0.95	0.05
Pumpkinseed	**0.03**	0.05	0.05	0.05	-	-	-	0.05	-	-	-	**0.02**	-	-
Smallmouth bass	**0.31**	0.05	-	-	-	0.05	0.15	0.15	0.05	-	0.15	**0.06**	0.10	0.10
Yellow perch	**84.25**	65.50	77.50	48.65	33.15	28.00	57.25	18.20	26.10	11.60	16.25	**38.22**	25.75	11.40
Walleye	**8.23**	1.00	1.45	2.70	1.05	1.25	1.90	2.50	1.60	1.40	1.25	**1.61**	2.10	0.60
Round goby	-	-	1.00	11.00	31.05	0.80	0.15	0.10	0.25	-	0.05	**4.44**	-	0.05
Freshwater drum	**0.54**	0.05	0.10	0.15	0.65	0.50	1.20	1.35	0.75	0.40	0.75	**0.59**	3.25	0.10
Total catch	**150**	81	89	75	89	105	77	51	106	90	196	**96**	211	128
Number of species	**14**	19	14	15	16	15	15	18	17	13	16	**16**	16	12
Number of sets		20	20	20	20	20	20	20	20	20	20		20	20

TABLE 2.2.13. Species-specific catch per gillnet set at **Hay Bay in the Bay of Quinte**, 1992-2012. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 1-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Sea lamprey	-	-	-	-	-	-	-	-	0.13	-	-	**0.01**	-	-
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose gar	-	-	-	-	-	-	-	0.13	-	-	-	**0.01**	-	-
Alewife	**8.33**	19.25	8.13	-	1.25	0.25	7.50	3.75	0.13	9.75	28.75	**7.88**	12.00	5.38
Gizzard shad	**0.71**	-	0.25	-	-	-	0.50	0.13	0.13	-	-	**0.10**	-	0.38
Chinook salmon	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	0.13
Brown trout	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake trout	**0.12**	-	-	0.25	-	-	-	-	-	-	-	**0.03**	-	-
Lake whitefish	**0.06**	0.13	-	-	-	-	-	-	-	-	-	**0.01**	-	-
Cisco (Lake herring)	**3.79**	1.00	0.13	-	0.13	-	-	0.13	-	0.13	10.25	**1.18**	0.38	0.25
Coregonus sp.	**0.04**	-	-	-	-	-	-	-	0.13	-	-	**0.01**	-	-
Rainbow smelt	**0.19**	-	0.25	-	-	-	0.13	-	-	0.38	-	**0.08**	-	-
Northern pike	**1.00**	0.88	0.13	0.38	-	0.50	0.38	1.13	1.00	0.50	3.00	**0.79**	0.38	0.13
White sucker	**6.12**	5.63	2.88	2.25	6.13	1.50	1.75	1.38	2.50	4.25	8.75	**3.70**	2.25	2.75
River redhorse	-	-	-	-	-	-	-	0.13	-	-	-	**0.01**	-	-
Common carp	**0.23**	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail shiner	**0.01**	-	-	-	-	-	-	0.13	-	-	-	**0.01**	-	-
Brown bullhead	**0.94**	0.88	0.13	0.25	0.25	0.38	0.88	0.38	0.50	-	-	**0.36**	-	-
Channel catfish	**0.01**	-	-	0.13	0.13	-	-	-	-	-	-	**0.03**	-	-
Burbot	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**11.00**	0.50	5.38	8.38	14.50	0.13	30.13	16.25	20.75	9.38	1.75	**10.71**	4.00	7.88
White bass	-	-	-	-	-	-	-	-	-	-	-	-	-	0.13
Rock bass	**0.03**	-	-	-	-	-	-	-	0.13	-	-	**0.01**	-	-
Pumpkinseed	**0.86**	1.13	1.00	0.63	2.13	0.38	0.63	0.75	0.75	0.75	0.75	**0.89**	0.75	-
Bluegill	-	-	-	-	-	-	-	-	-	-	-	-	0.13	-
Smallmouth bass	**0.10**	0.13	0.13	-	-	-	-	-	-	-	-	**0.03**	-	-
Yellow perch	**154.09**	144.13	112.13	110.50	86.00	142.75	64.00	102.00	98.88	81.63	210.00	**115.20**	94.63	35.75
Walleye	**4.39**	2.50	3.75	2.75	2.13	0.88	1.75	2.50	1.13	2.75	2.00	**2.21**	1.50	1.25
Round goby	-	-	0.25	0.25	0.25	0.13	-	-	-	-	-	**0.09**	-	-
Freshwater drum	**1.08**	0.25	3.13	1.25	6.63	2.50	8.25	1.00	0.88	1.00	0.75	**2.56**	0.25	0.63
Total catch	**193**	176	138	127	120	149	116	130	127	111	266	**146**	116	55
Number of species	**14**	12	14	11	11	10	11	14	13	10	9	**12**	10	11
Number of sets		8	8	8	8	8	8	8	8	8	4		8	8

TABLE 2.2.14. Species-specific catch per gillnet set at **Big Bay in the Bay of Quinte**, 1992-2012. Annual catches are averages for 2 gillnet gangs set during each of 2-4 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Lake sturgeon	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose gar	**1.39**	1.00	1.00	0.17	1.00	1.50	3.00	0.33	2.50	3.77	6.50	**2.08**	2.33	3.83
Alewife	**0.70**	-	0.88	1.67	3.17	-	0.75	-	1.00	2.67	1.00	**1.11**	0.50	0.50
Gizzard shad	**7.23**	2.13	6.63	2.00	0.17	42.17	0.25	1.00	3.67	-	3.33	**6.13**	88.50	10.83
Lake whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	0.17
Northern pike	**0.68**	0.13	0.13	-	0.17	0.17	0.50	0.17	-	-	-	**0.13**	-	-
Mooneye	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-
White sucker	**7.30**	3.50	9.25	2.33	5.33	2.50	5.00	2.50	4.33	3.33	3.67	**4.18**	4.00	7.00
Silver redhorse	-	-	-	-	-	-	-	-	-	-	0.17	**0.02**	-	-
Moxostoma sp.	**0.04**	0.13	-	0.17	-	-	-	-	-	-	-	**0.03**	-	-
Common carp	**0.30**	-	-	0.17	0.17	-	-	-	-	-	-	**0.03**	-	-
Brown bullhead	**6.72**	6.75	5.50	1.83	2.33	0.83	2.00	0.83	0.67	0.67	-	**2.14**	0.17	0.50
Channel catfish	**0.37**	-	0.13	-	0.17	-	0.25	-	-	0.17	-	**0.07**	-	-
Burbot	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**90.12**	22.00	36.38	59.83	130.50	79.50	196.75	119.00	127.50	123.17	92.00	**98.66**	91.83	138.00
White bass	**0.08**	-	0.13	-	-	-	-	0.17	0.17	-	-	**0.05**	-	0.17
Rock bass	**0.26**	-	-	-	-	0.17	-	-	-	-	-	**0.02**	-	-
Pumpkinseed	**3.97**	17.00	8.25	0.83	4.33	0.33	3.25	0.50	1.00	0.67	0.17	**3.63**	0.83	1.00
Bluegill	**0.57**	7.13	3.75	0.50	0.33	2.50	6.50	5.33	3.17	5.55	6.67	**4.14**	6.83	1.17
Smallmouth bass	**1.11**	0.50	-	-	-	-	0.50	-	-	0.17	-	**0.12**	-	-
Largemouth bass	**0.02**	-	-	-	-	-	0.25	-	-	-	0.17	**0.04**	-	-
Black crappie	**0.11**	0.25	0.38	0.33	0.17	0.17	2.25	1.00	0.33	-	-	**0.49**	-	-
Yellow perch	**138.65**	190.63	182.88	115.33	109.67	103.00	119.00	16.50	63.00	129.54	43.17	**107.27**	47.17	17.67
Walleye	**16.88**	4.50	7.63	6.50	8.00	5.83	10.75	5.33	9.17	8.00	10.83	**7.65**	6.33	5.17
Round goby	-	-	-	0.33	0.33	0.50	-	-	-	-	-	**0.12**	-	-
Freshwater drum	**15.50**	21.25	7.38	7.33	7.33	9.50	19.75	11.33	6.50	8.67	4.83	**10.39**	5.50	3.33
Total catch	**292**	277	270	199	273	249	371	164	223	286	173	**248**	254	189
Number of species	**14**	14	15	15	16	14	16	13	13	12	12	**14**	11	12
Number of sets		8	8	6	6	6	4	6	6	6	6		6	6

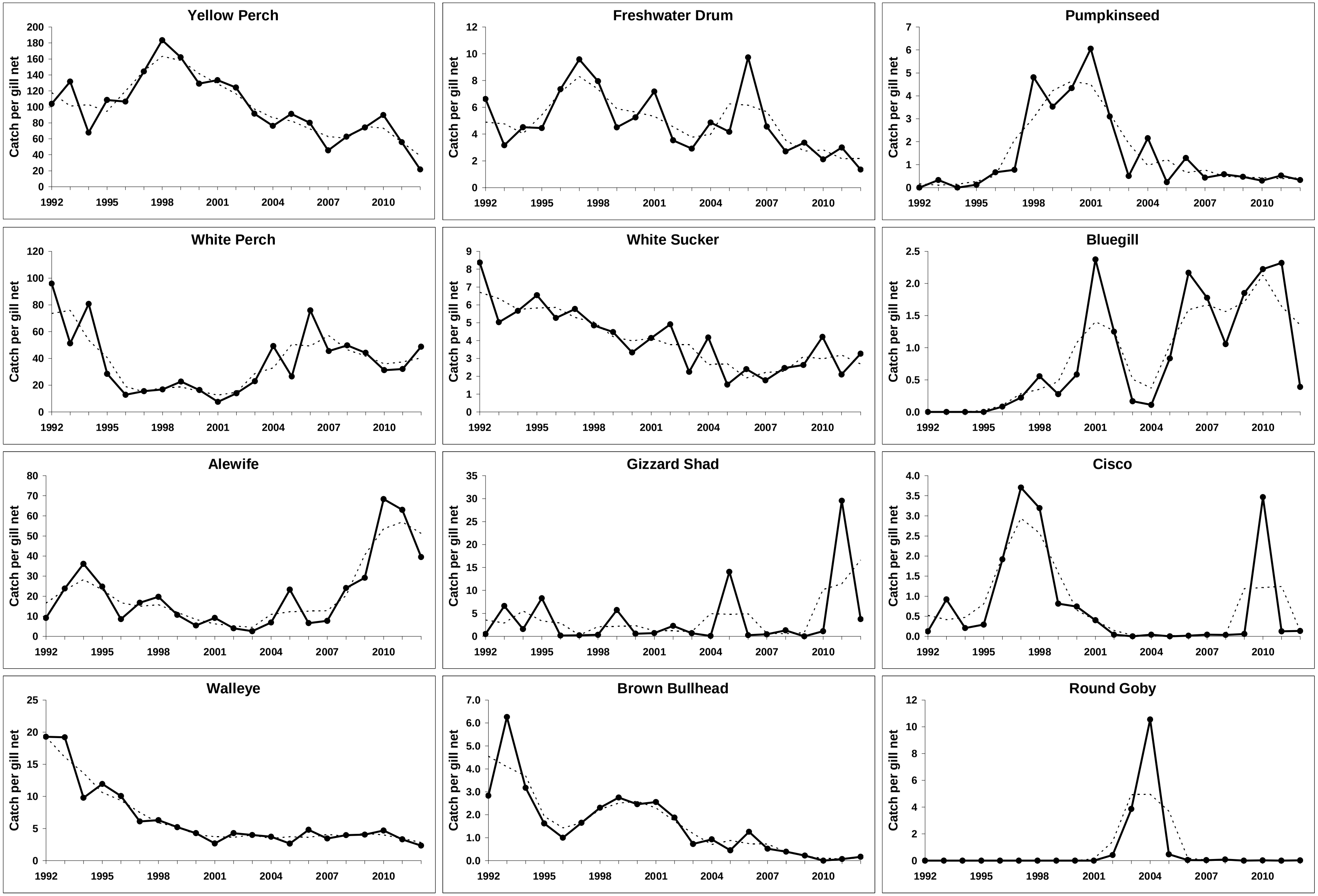


FIG. 2.2.4. Abundance trends (annual means) for the most common species caught in gillnets at three areas in the Bay of Quinte (Conway, Hay Bay and Big Bay; see Fig. 2.2.1). Dotted lines show 3-yr running averages (two years for first and last years graphed).

Species Highlights

Lake Whitefish

Forty-one Lake Whitefish were caught in the 2012 index gill nets (Table 2.2.15). Twenty-six (64%) of these were from the 2003-2005 year-classes.

Lake Whitefish mean fork length-at-age for the 2003 and 2005 year-classes is shown in Fig. 2.2.5. Lake Whitefish body condition is shown in Fig. 2.2.6.

Walleye

Two hundred and twenty-nine Walleye were caught in the 2012 index gill nets (Table 2.2.16). Forty-eight (91%) of 53 Walleye caught in the Bay of Quinte gill nets were age 1-4 years. In the Kingston Basin nearshore gill nets, 163 (97%) of 168 Walleye were age-5 or greater.

Lake Herring

Only ten Lake Herring were caught in the 2012 index gill nets (Table 2.2.17).

TABLE 2.2.15. Age distribution of **41 Lake Whitefish** sampled from summer index gillnets, by region, 2012. 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). Note that a GSI greater than approximately 0.25 indicates a mature female.

	Age / Year-class														
	2	4	5	6	7	8	9	10	14	17	19	20	21	22	Total
Region	2010	2008	2007	2006	2005	2004	2003	2002	1998	1995	1993	1992	1991	1990	
Bay of Quinte	1	1	1			2									5
Kingston Basin (deep)			1		1	2	4	2		1				1	12
Kingston Basin (nearshore)				1	5	5	5		1		1	1	1	1	21
Northeast				1	2										3
Total	1	1	2	2	8	9	9	2	1	1	1	1	1	2	41
Mean fork length (mm)	215	250	372	374	432	416	438	460	516	453	517	559	556	572	
Mean weight (g)	96	152	682	610	1004	847	994	1080	2099	1973	2202	2163	2122	2288	
Mean GSI (females)		0.048	0.334	0.150	0.420	0.331	0.451	0.509	0.596	0.615	0.576	0.587	0.600	0.612	
% mature (females)	0%	0%	50%	0%	86%	75%	100%	100%	100%	100%	100%	100%	100%	100%	

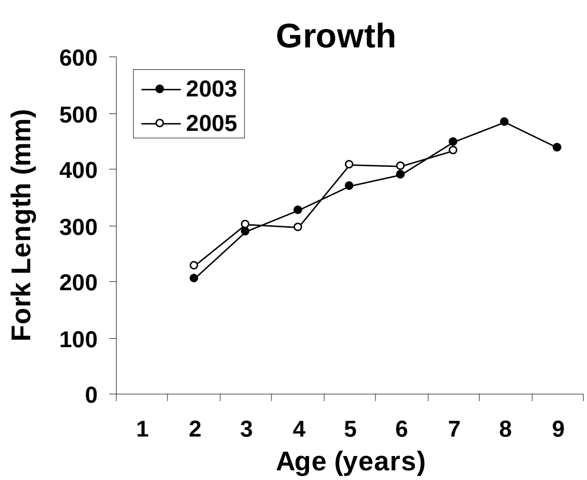


FIG. 2.2.5. Lake Whitefish mean fork length-at-age for the 2003 and 2005 year-classes.

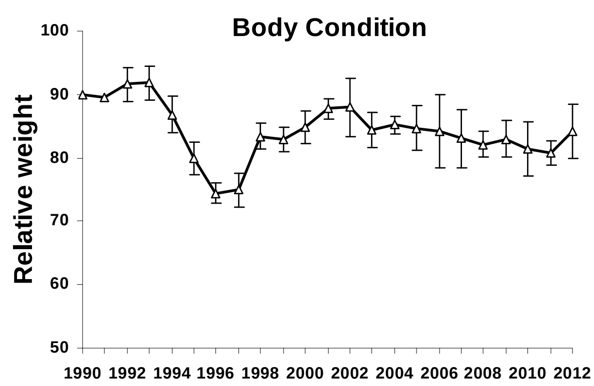


FIG. 2.2.6. Lake Whitefish relative weight (see Rennie and Verdon, 2008) for fish caught in summer index gillnets, 1990-2012.

Rennie, M.D. and R. Verdon. 2008. Development and evaluation of condition indices for the lake whitefish. N. Amer. J. Fish. Manage. 28:1270-1293.

TABLE 2.2.16. Age distribution of 229 Walleye sampled from summer index gillnets, by region, 2012. 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). Note that a GSI greater than approximately 0.25 indicates a mature female.

	Age / Year-class																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	23	24	Total
Region	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1989	1988	
Bay of Quinte	16	21	7	4			1	1	2		1													53
Kingston Basin (nearshore)				5	17	6	31	8	24	1	15	4	24	10	2	3	3	6	5	1	1	1	1	168
Northeast	1	1							1									1						4
Western	2							1			1													4
Total	19	22	7	9	17	6	32	10	27	1	17	4	24	10	2	3	3	7	5	1	1	1	1	229
Mean fork length (mm)	224	352	400	458	524	562	595	602	616	674	617	625	610	631	620	597	641	637	620	596	635	610	598	
Mean weight (g)	121	468	700	1162	1833	2384	2933	2963	3325	3648	3448	3239	3392	3435	3346	2910	3816	3347	3094	3546	3288	2986	3049	
Mean GSI (females)	0.051	0.138	0.184	0.290	0.343	0.396	0.406	0.424	0.402	0.460	0.462	0.489	0.445	0.410			0.490	0.402						
% mature (females)	0%	0%	0%	100%	100%	100%	94%	100%	94%	100%	100%	100%	100%	100%			100%	100%						

TABLE 2.2.17. Age distribution of 10 Lake Herring sampled from summer index gillnets, by region, 2012. Also shown are mean fork length and mean weight.

	Age/Yearclass						
	2	3	4	6	8	9	
Region	2010	2009	2008	2006	2004	2003	Total
Bay of Quinte	2	1	1		1		5
Kingston Basin (deep)			1			2	3
Kingston Basin (nearshore)			1	1			2
Total Count	2	1	3	1	1	2	10
Mean fork length (mm)	207	240	295	403	417	447	
Mean weight (g)	91	143	297	728	890	1183	

Lake Trout

The abundance of adult Lake Trout remains low, but there are signs of improvement in recent years (Fig. 2.2.7). The recent low levels were reached around the year 2002, after a period of decline that began in the early 1990s, and which was attributed to reduced stocking levels combined with a decline in early survival of the stocked fish. The recent increase in the abundance of adults appears to be due to increased early-life survival of stocked fish (Fig. 2.2.8) but early survival of the most recent year-classes (2008-2010) appears to be poor. The condition of adult fish remains high even though there was a slight decrease in 2012 (Fig. 2.2.9). Lamprey wounding rates have increased sharply (Fig. 2.2.10), and the number of A1 wounding rate in 2012 exceeded the target level of 2.0 wounds per 100 fish.

Lake Trout abundance and survival estimates are derived from catch rates in LOMU's Community Gillnet Index Program. Unusually warm temperatures encountered in 2010 and 2012 probably had a negative effect on the catch rates of Lake Trout—low catches of adults in the Kingston Basin were probably due to lack of suitable thermal habitat at our traditional gillnetting sites, as were catches of juvenile fish, which prefer cooler waters than adults.

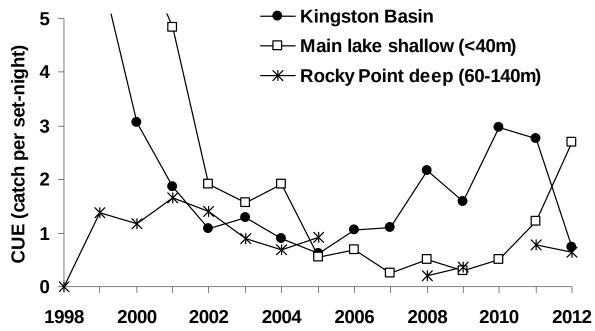


FIG. 2.2.7. Catch per unit effort (# fish per set-night) of adult lake trout in bottom-set gillnets in three areas of eastern Lake Ontario. Deep sets off Rocky Point were not fished in 2006, 2007, and 2010.

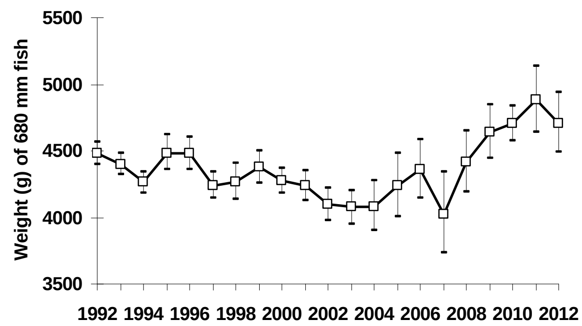


FIG. 2.2.9. Condition of adult lake trout expressed as the predicted weight of a 680 mm fish (fork length). The predictions are based on yearly length-weight regressions, and 95% confidence intervals for the predictions are shown.

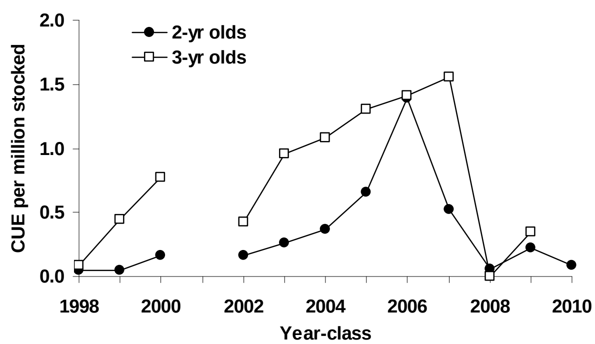


FIG. 2.2.8. Relative survival to ages 2 and 3. The survival index is the catch per unit effort of 2 and 3 year old fish, corrected for number originally stocked; age determination is based on year-specific fin clip information combined with the size of the fish.

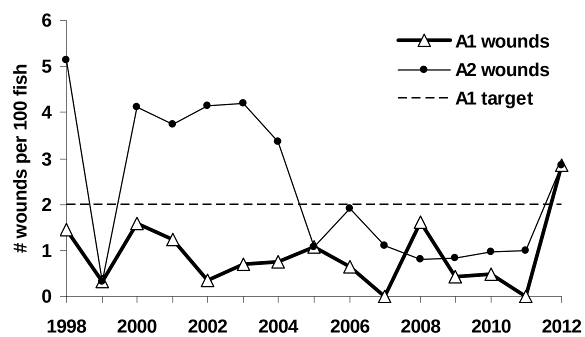


FIG. 2.2.10. Frequency of A1 (fresh) and A2 (partially healed) lamprey wounds observed on lake trout. The lamprey control target is 2.0 A1 wounds per 100 fish.

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

Bottom trawling has been used to monitor the relative abundance of small fish species and the young of large-bodied species in the fish community since the 1960s. After some initial experimentation with different trawl specifications, two trawl configurations (one for the Bay of Quinte and one for Lake Ontario) were routinely employed (see trawl specifications Table 2.3.1).

In the Kingston Basin of eastern Lake Ontario, six sites, ranging in depth from about 20 to 35 m, were visited about four times annually up until 1992 when three sites were dropped. Currently, three visits are made to each of three sites annually, and four replicate ½ mile trawls are made during each visit. After 1995, a deep water site was added, south of Rocky Point (visited twice annually with a trawling distance of 1 mile; 90 m water depth), to give a total of four Lake sites (Fig. 2.3.1). In the Bay of Quinte, six fixed-sites, ranging in depth from about 4 to 21 m, are visited annually on two or three occasions during mid to late-summer. Four replicate ¼ mile trawls are made during each visit to each site.

Species-specific catches in the 2012 trawling program are shown in Tables 2.3.2-2.3.11. Thirty species and over 50,000 fish were caught in 75 bottom trawls in 2012 (July 3-September 6). Round Goby (22%), Gizzard Shad (21%), Alewife (19%), White Perch (15%), Yellow Perch (10%), Spottail Shiner (6%), Rainbow Smelt (2%), Sunfish (2%), collectively made up 96% of the catch by number.

Lake Ontario

EB02 (Table 2.3.2)

Six species, Round Goby, Alewife, Rainbow Smelt, Lake Trout, Yellow Perch and Lake Whitefish were caught at EB02 in 2012. Catches of all species were low. A single young-of-the-year wild Lake Trout was caught (fork length 43 mm; weight 0.63 g). Also, a single young-of-the-year Lake Whitefish was also caught (fork length 88 mm; weight 6.61 g). Threespine Stickleback, having risen to high levels of abundance in the

TABLE 2.3.1. Bottom trawl specifications used in Eastern Lake Ontario and Bay of Quinte Fish Community sampling.

	3/4 Western (Poly) (Bay Trawl)	3/4 Yankee Standard No. 35 (Lake Trawl)
Head Rope Length (m)	14.24	12
Foot Rope Length (m)	19	17.5
Side Brail Height (m)	2	1.9
Mesh Size (front)	4" knotted black poly	3.5" knotted green nylon
Twine Type (middle)	3" knotted black poly	2.5" knotted nylon
Before Codend	2" knotted black poly	2" knotted nylon
	1.5" knotted black nylon	(chafing gear)
	1" knotted black nylon	
Codend Mesh Size	0.5" knotted white nylon	0.5" knotless white nylon
Remarks:	Fishing height 2.0 m	Fishing height 1.9 m
	FISHNET gear dimensions	FISHNET gear dimensions
	as per Casselman 92/06/08	as per Casselman 92/06/08
GRLEN:length of net	N/A	N/A
GRHT:funnel opening height	2.25 m	2.3 m
GRWID:intake width	6.8 m	9.9 m
GRCOL:1 wt,2 bl,3 gn	2	7 (discoloured)
GRMAT:1 nylon,2 ploypr.	2	1
GRYARN:1 mono,2 multi	2	2
GRKNOT:1 knotless,2 knots	2	2

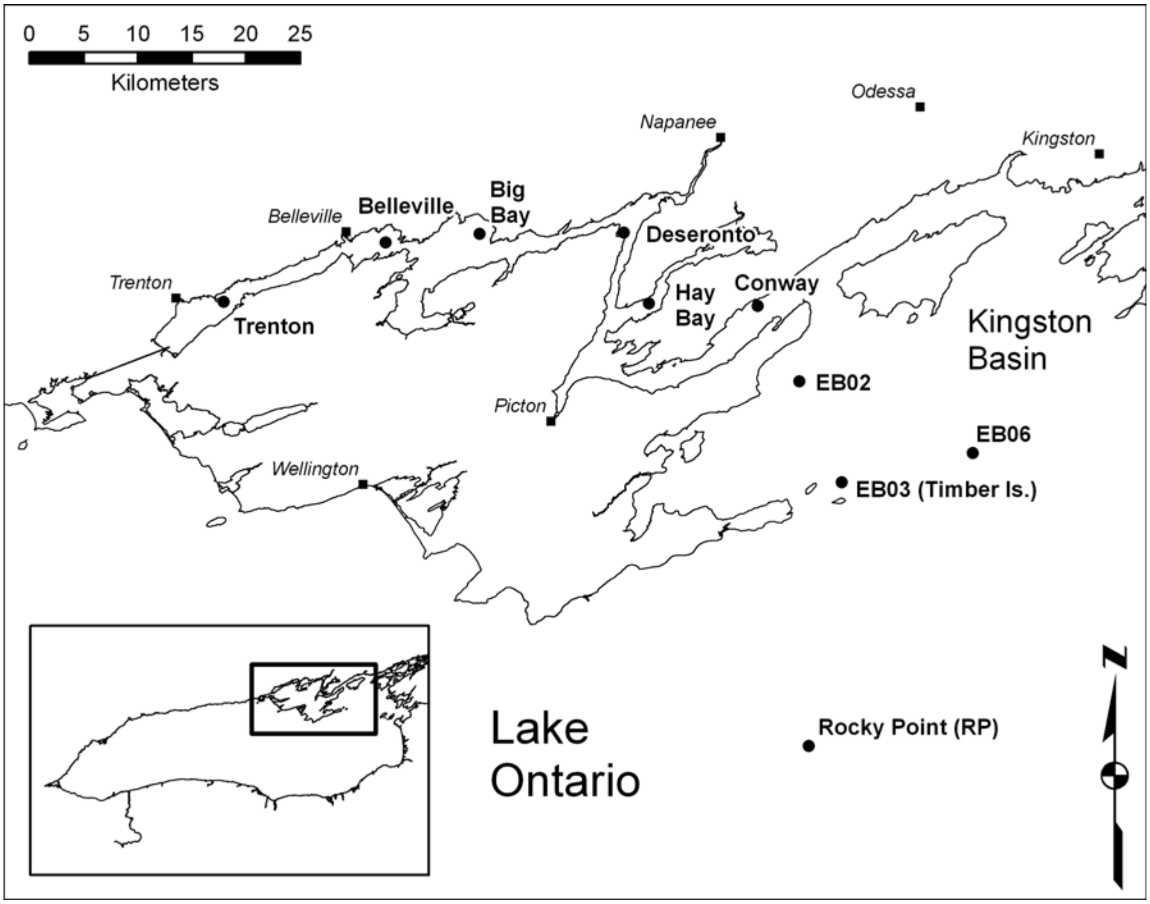


FIG. 2.3.1. Map of north eastern Lake Ontario. Shown are eastern Lake Ontario and Bay of Quinte fish community index bottom trawling site locations.

late 1990s, declined rapidly after 2003 and was absent in the EB02 catches for the last six years. Slimy Sculpin, another formally abundant species has also absent for six years.

EB03 (Table 2.3.3)

Seven species were caught at EB03 in 2012. The most abundant species were Round Goby, Alewife and Rainbow Smelt. Round Goby, having first appeared in the EB03 catches in 2004, now dominate the total catch. As was the case for EB02, Threespine Stickleback have been absent from the EB03 catches for six years.

EB06 (Table 2.3.4)

Five species Round Goby, Rainbow Smelt, Alewife, Lake Trout and Slimy Sculpin were caught at EB06 in 2012. A single young-of-the-year wild Lake Trout was caught (fork length 37 mm; weight 0.34 g).

Rocky Point (Table 2.3.5)

Only two trawls were made at Rocky Deep in July, 2012. One was likely not on bottom and was eliminated. Only two species were caught in the remaining trawl, Rainbow Smelt and Deepwater Sculpin.

Bay of Quinte

Conway (Table 2.3.6)

Nine species were caught at Conway in 2012. The most abundant species were Round Goby, Yellow Perch and Cisco (Lake Herring).

Hay Bay (Table 2.3.7)

Nineteen species, the most ever, were caught at

TABLE 2.3.2. Species-specific catch per trawl (12 min duration; 1/2 mile) by year in the fish community index bottom trawling program during summer at **EB02**, eastern Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year													
	1992-2000											**2001-2010**		
Species	**mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011	2012
Alewife	**1220.379**	203.397	20.917	19.500	27.100	0.000	0.417	11.000	0.667	72.429	464.097	**81.952**	1.667	24.288
Rainbow trout	**0.019**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Lake trout	**0.202**	0.000	0.083	0.083	0.000	0.583	0.167	0.583	0.500	0.000	0.167	**0.217**	0.000	0.333
Lake whitefish	**3.203**	0.167	0.000	0.583	0.400	0.250	0.000	0.167	0.000	0.250	0.000	**0.182**	0.000	0.083
Cisco	**0.362**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Coregonus sp.	**0.006**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Rainbow smelt	**440.950**	29.667	7.917	0.917	5.000	19.750	28.750	3.583	5.667	114.416	14.667	**23.033**	1.083	10.333
Emerald shiner	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Burbot	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Threespine stickleback	**13.395**	18.750	34.417	49.500	6.200	9.000	0.167	0.000	0.000	0.000	0.000	**11.803**	0.000	0.000
Trout-perch	**4.675**	0.250	0.000	0.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.042**	0.000	0.000
Yellow perch	**0.019**	0.000	0.000	0.000	0.700	0.333	0.083	0.000	0.000	0.000	0.083	**0.120**	0.000	0.167
Walleye	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	**0.008**	0.000	0.000
Johnny darter	**0.077**	0.000	0.000	0.000	0.400	0.000	0.000	0.000	0.000	0.000	0.000	**0.040**	0.000	0.000
Round goby	**0.000**	0.000	0.000	0.083	250.100	24.833	40.083	119.750	26.667	169.907	143.933	**77.536**	8.083	77.189
Sculpin sp.	**0.046**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Slimy sculpin	**2.084**	0.417	0.667	44.083	74.900	0.750	0.167	0.000	0.000	0.000	0.000	**12.098**	0.000	0.000
Total catch	**1685**	253	64	115	365	56	70	135	34	357	623	**207**	11	112
Number of species	**9**	6	5	8	8	7	7	5	4	4	6	**6**	3	6
Number of trawls		12	12	12	10	12	12	12	12	12	12		12	12

TABLE 2.3.3. Species-specific catch per trawl (12 min duration; 1/2 mile) by year in the fish community index bottom trawling program during summer at **EB03**, eastern Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year													
	1992-2000											**2001-2010**		
Species	**mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011	2012
Alewife	**704.463**	57.375	21.375	8.000	168.385	14.833	15.250	33.917	156.339	0.000	0.250	**47.572**	0.125	36.681
Gizzard shad	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	**0.025**	0.000	0.000
Chinook salmon	**0.014**	0.000	0.000	0.000	0.000	0.667	0.000	0.000	0.000	0.000	0.000	**0.067**	0.000	0.000
Lake trout	**0.847**	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.083	0.000	**0.033**	0.000	0.000
Lake whitefish	**14.412**	0.000	0.000	43.938	2.333	50.000	3.000	1.417	0.000	0.083	4.667	**10.544**	0.125	0.000
Cisco	**0.292**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.125	0.000
Rainbow smelt	**517.419**	20.000	207.511	109.245	1.917	25.667	20.625	21.500	0.250	11.583	217.947	**63.624**	30.750	3.429
White sucker	**0.093**	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.000	0.000	0.000	**0.008**	0.000	0.000
Common carp	**0.130**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Spottail shiner	**42.456**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.083	**0.033**	0.375	0.000
American eel	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Brook stickleback	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Threespine stickleback	**32.894**	67.375	680.287	459.421	2781.754	116.083	8.500	0.000	0.000	0.000	0.000	**411.342**	0.000	0.000
Trout-perch	**689.171**	175.000	592.212	56.298	255.161	3.417	3.750	0.417	0.000	0.000	0.000	**108.625**	0.125	0.000
White perch	**0.032**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Pumpkinseed	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	**0.008**	0.000	0.000
Smallmouth bass	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Largemouth bass	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	**0.008**	0.000	0.000
Yellow perch	**0.093**	0.000	0.000	0.625	0.083	0.000	0.500	0.167	0.125	0.000	0.000	**0.150**	0.000	0.000
Walleye	**0.236**	0.000	0.000	0.063	0.000	0.000	0.125	0.000	0.000	0.417	0.000	**0.060**	0.250	0.286
Johnny darter	**0.875**	0.000	0.000	9.875	32.833	0.167	0.000	0.000	0.000	0.000	0.000	**4.288**	0.000	0.000
Round goby	**0.000**	0.000	0.000	0.000	0.333	732.449	850.448	910.409	1100.409	2552.195	1079.944	**722.619**	2322.465	1025.553
Freshwater drum	**0.046**	0.000	0.000	0.000	0.083	0.000	0.125	0.000	0.125	0.000	0.000	**0.033**	0.000	0.286
Sculpin sp.	**0.194**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Mottled sculpin	**0.000**	0.000	0.000	0.688	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.069**	0.000	0.000
Slimy sculpin	**0.370**	0.000	0.250	6.750	10.833	0.083	0.000	0.000	0.000	0.000	0.000	**1.792**	0.000	0.000
Total catch	**2004**	320	1502	695	3254	943	902	968	1257	2565	1303	**1371**	2354	1066
Number of species	**10**	4	5	10	10	9	9	9	5	6	7	**7**	3	6
Number of trawls		8	8	16	12	12	8	12	8	12	12		8	7

TABLE 2.3.4. Species-specific catch per trawl (12 min duration; 1/2 mile) by year in the fish community index bottom trawling program during summer at **EB06**, eastern Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year												
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Alewife	**85.631**	5.583	0.250	0.083	1.250	0.417	8.000	0.917	0.667	10.833	1.083	**2.908**	0.667	0.625
Lake trout	**0.611**	0.083	0.083	0.083	0.083	0.000	0.000	0.000	0.000	0.000	0.000	**0.033**	0.000	0.125
Lake whitefish	**4.546**	0.000	0.167	0.167	0.250	0.000	0.000	0.083	0.000	0.000	0.083	**0.075**	0.000	0.000
Cisco	**0.028**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Rainbow smelt	**743.701**	21.417	6.750	0.250	25.083	142.583	23.917	0.583	1.000	3.500	73.167	**29.825**	18.917	112.946
Threespine stickleback	**7.722**	2.583	47.750	11.417	7.500	13.917	1.083	0.000	0.000	0.000	0.000	**8.425**	0.000	0.000
Trout-perch	**0.991**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Yellow perch	**0.019**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Johnny darter	**0.000**	0.000	0.000	0.000	0.333	0.000	0.000	0.000	0.000	0.000	0.000	**0.033**	0.000	0.000
Round goby	**0.000**	0.000	0.000	0.000	0.000	0.000	5.000	82.934	1.667	8.667	877.914	**97.618**	1.917	199.016
Sculpin sp.	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Slimy sculpin	**0.083**	0.083	0.000	3.583	399.183	15.750	0.250	0.000	0.000	0.500	1.500	**42.085**	0.000	0.125
Deepwater sculpin	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.167	**0.025**	0.000	0.000
Total catch	**843**	30	55	16	434	173	38	85	3	24	954	**181**	22	313
Number of species	**6**	5	5	6	7	4	5	4	3	5	6	**5**	3	5
Number of trawls		12	12	12	12	12	12	12	12	12	12		12	8

TABLE 2.3.5. Species-specific catch per trawl (24 min duration; 1mile) by year in the fish community index bottom trawling program during summer at **Rocky Point** (90 m water depth) Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year													
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Alewife	**4.125**	5.500	0.750	3.000	11.500	0.250		13.750	3.000	0.750		**4.813**	1.000	0.000
Lake trout	**0.125**	1.000	0.000	0.000	0.250	0.000		0.000	0.250	0.000		**0.188**	0.500	0.000
Lake whitefish	**0.188**	0.000	0.250	0.000	0.000	0.000		0.000	0.000	0.000		**0.031**	0.000	0.000
Rainbow smelt	**401.000**	159.500	75.250	8.250	22.750	11.000		4.500	14.500	13.500		**38.656**	11.000	11.000
Threespine stickleback	**0.000**	0.000	0.000	0.000	0.250	0.250		0.000	0.000	0.000		**0.063**	0.000	0.000
Slimy sculpin	**11.250**	0.500	0.250	4.500	191.500	28.500		49.500	17.750	10.000		**37.813**	4.500	0.000
Deepwater sculpin	**0.000**	0.000	0.000	0.000	0.000	0.250		1.500	0.500	0.250		**0.313**	15.000	3.000
Total catch	**417**	167	77	16	226	40		69	36	25		**82**	32	14
Number of species	**3**	5	5	6	7	4		4	3	5		**5**	3	5
Number of trawls		4	4	4	4	4		4	4	4			4	1

Hay Bay in 2012. The most abundant species were Alewife, Gizzard Shad, Spottail Shiner, Yellow Perch and White Perch.

Deseronto (Table 2.3.8)

Twenty species were caught at Deseronto in 2012. The most abundant species were Gizzard Shad, Alewife, White Perch and Yellow Perch. After nine years with no American Eel having been caught, a single Eel was caught in 2012.

Big Bay (Table 2.3.9)

Eighteen species were caught at Big Bay in 2012. The most abundant species were White Perch, Alewife, Yellow Perch and Spottail Shiner. Brown Bullhead catch remained very low. No American Eel have been caught in the last ten years.

Belleville (Table 2.3.10)

Seventeen species were caught at Belleville in 2012. Gizzard Shad, White Perch, Sunfish, Alewife and Yellow Perch were the most abundant species in the catch. Brown Bullhead catch remained low. No American Eel have been caught in the last 14 years.

TABLE 2.3.6. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Conway** (24 m depth), Bay of Quinte. Catches are the mean number of fish observed at each site for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year													
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Silver lamprey	**0.000**	0.000	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000	0.000
Alewife	**121.972**	0.000	0.000	2.250	1.917	0.417	9.667	0.083	214.622	1.583	0.333	**23.087**	375.352	0.125
Gizzard shad	**0.000**	0.000	0.000	0.000	0.000	0.000	1.167	0.000	0.000	0.000	0.000	**0.117**	0.000	0.000
Chinook salmon	**0.028**	0.000	0.000	0.000	0.000	0.167	0.083	0.000	0.000	0.000	0.000	**0.025**	0.000	0.000
Brown trout	**0.000**	0.000	0.125	0.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.029**	0.000	0.000
Lake trout	**0.014**	0.000	0.250	0.000	0.417	0.000	0.000	0.000	0.000	0.000	0.000	**0.067**	0.000	0.125
Lake whitefish	**13.208**	1.000	1.000	8.083	0.750	3.083	3.833	4.750	0.250	0.333	0.333	**2.342**	0.625	0.000
Cisco	**2.301**	0.000	0.250	3.000	0.083	7.667	4.500	2.000	0.167	0.000	6.333	**2.400**	8.250	23.500
Coregonus sp.	**0.000**	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000	0.000
Rainbow smelt	**112.713**	0.000	39.625	10.167	3.583	6.750	0.083	25.167	1.083	0.083	0.000	**8.654**	0.625	0.500
White sucker	**4.412**	134.836	28.750	6.667	7.417	4.750	3.167	11.250	0.500	0.000	0.167	**19.750**	0.500	1.375
Moxostoma sp.	**0.000**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
Spottail shiner	**0.000**	0.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.063**	0.000	0.000
American eel	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Burbot	**0.000**	0.000	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000	0.000
Threespine stickleback	**0.019**	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000	0.000
Trout-perch	**132.813**	139.443	58.234	53.667	43.333	12.250	0.500	1.000	13.000	0.083	0.000	**32.151**	0.500	0.000
White perch	**0.116**	0.000	0.000	0.000	0.000	0.000	3.000	0.000	0.000	0.250	0.167	**0.342**	5.500	0.250
White bass	**0.000**	0.000	0.000	0.000	0.000	0.000	0.833	0.000	0.000	0.000	0.000	**0.083**	1.125	0.000
Rock bass	**0.028**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Bluegill	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.125
Yellow perch	**12.597**	134.715	181.251	178.153	58.667	53.750	146.584	20.000	108.980	8.250	56.956	**94.731**	125.915	70.595
Walleye	**2.764**	1.250	0.000	0.250	1.000	0.083	0.417	0.417	0.083	0.000	0.333	**0.383**	0.375	0.000
Johnny darter	**0.306**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Round goby	**0.000**	0.000	0.500	282.241	79.167	127.225	40.833	173.211	89.723	80.768	146.979	**102.065**	261.710	203.885
Freshwater drum	**0.000**	0.125	0.000	0.250	0.000	0.083	0.500	0.000	0.083	0.000	0.000	**0.104**	0.000	0.000
Sculpin sp.	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Mottled sculpin	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Slimy sculpin	**0.079**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Total catch	**403**	412	310	545	197	216	215	238	428	91	212	**286**	780	300
Number of species	**9**	8	9	13	12	11	14	9	10	7	8	**10**	11	9
Number of trawls		8	8	8	8	8	8	8	8	8	8		8	8

Trenton (Table 2.3.11)

Twenty species were caught at Trenton in 2012. The most abundant species were White Perch, Yellow Perch, Spottail Shiner, Alewife and Gizzard Shad.

Species Trends (Fig. 2.3.2)

Bottom trawl results were summarized across the six Bay of Quinte sites and presented graphically to illustrate abundance trends for major species in Fig. 2.3.2. All species show significant abundance changes over the long-term. The most abundant species remain White Perch, Yellow Perch and Alewife with Alewife showing an increase in recent years. Most Centrarchid species are currently at moderate to high levels of abundance as are Gizzard Shad, Spottail Shiner, Round Goby, Logperch, and Cisco. Species currently at low abundance levels relative to past levels include Trout-perch, Brown Bullhead, Rainbow Smelt, White Sucker, Lake Whitefish, Johnny Darter and American Eel.

Species Highlights

Catches of age-0 fish in 2012 for selected species and locations are shown in Tables 2.3.12-2.3.15 for Lake Whitefish, Lake Herring, Yellow Perch and Walleye respectively.

No Age-0 Lake Whitefish was caught at Conway or Timber Island in 2012 (Table 2.3.12). Note however that water temperatures at Timber Island were very warm this year and not conducive to the presence of coldwater species. Except for the 2003 and 2005 year-classes, age-0 Lake Whitefish abundance has been low over the last decade. By way of contrast, Lake Whitefish abundance measured at older ages suggests less variation in

TABLE 2.3.7. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Hay Bay** (7 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year													
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Alewife	**204.149**	566.143	21.125	1.750	67.067	72.097	394.507	695.331	631.710	713.136	967.999	**413.086**	561.676	525.476
Gizzard shad	**10.153**	2.625	0.125	0.000	0.125	0.000	0.375	0.125	7.000	0.750	4.000	**1.513**	1.375	100.171
Lake whitefish	**0.019**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Cisco	**0.056**	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.100**	0.000	0.000
Rainbow smelt	**3.958**	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.375	0.000	0.000	**0.050**	0.000	0.000
Northern pike	**0.069**	0.000	0.000	0.125	0.000	0.000	0.000	0.125	0.000	0.125	0.000	**0.038**	0.000	0.000
White sucker	**3.579**	3.500	0.125	5.875	8.250	0.000	0.625	4.875	3.000	0.000	3.625	**2.988**	4.375	2.125
Common carp	**0.343**	0.250	0.000	0.000	0.000	0.875	0.000	0.000	0.750	0.125	0.000	**0.200**	0.000	0.125
Golden shiner	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125	0.000	**0.013**	0.000	0.375
Common shiner	**0.000**	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
Spottail shiner	**32.120**	63.513	54.000	53.250	64.375	79.119	133.960	188.595	47.750	46.500	53.375	**78.444**	47.750	69.750
Brown bullhead	**15.046**	32.750	15.750	8.000	10.375	10.500	15.000	8.875	0.750	3.500	2.500	**10.800**	0.250	1.750
Channel catfish	**0.028**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.125	0.000
American eel	**1.579**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Burbot	**0.023**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Trout-perch	**65.125**	5.750	2.750	3.750	77.500	1.750	3.000	59.500	6.625	3.750	4.375	**16.875**	22.875	1.125
White perch	**94.666**	9.250	132.573	14.750	495.340	24.625	504.187	27.500	163.757	167.704	54.875	**159.456**	73.281	57.750
White bass	**0.185**	0.000	0.000	1.750	0.125	0.125	1.375	1.375	0.875	0.500	2.000	**0.813**	9.500	0.250
Sunfish	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Rock bass	**0.028**	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.125	**0.025**	0.000	0.125
Pumpkinseed	**10.231**	19.625	11.875	0.750	4.625	1.125	44.500	11.375	8.625	0.250	13.250	**11.600**	0.875	2.500
Bluegill	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.125	3.625	0.125	0.250	**0.413**	0.125	0.375
Smallmouth bass	**0.000**	0.000	1.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.125**	0.000	0.000
Largemouth bass	**0.000**	0.250	1.750	0.000	0.000	0.000	0.000	0.000	0.375	1.375	2.125	**0.588**	1.000	1.250
Black crappie	**0.000**	0.000	0.000	0.000	0.000	1.375	0.875	0.000	0.000	0.000	0.000	**0.225**	0.500	0.000
Lepomis sp.	**0.000**	0.000	0.000	0.000	0.000	13.375	0.000	0.000	0.000	0.000	0.000	**1.338**	0.000	0.000
Yellow perch	**372.617**	726.620	856.879	119.203	551.884	278.670	580.861	906.704	138.067	146.065	206.695	**451.165**	14.125	61.500
Walleye	**7.333**	7.125	3.250	1.750	3.125	4.125	7.125	8.500	13.375	5.000	8.500	**6.188**	7.750	3.375
Johnny darter	**0.079**	0.000	1.750	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	**0.188**	0.000	0.000
Logperch	**0.046**	0.250	0.000	0.000	0.125	0.375	0.250	1.250	0.250	0.250	0.125	**0.288**	0.000	0.000
Brook silverside	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.875	**0.088**	0.000	0.375
Round goby	**0.000**	0.125	1.250	14.250	3.500	40.125	6.000	17.125	11.375	1.625	2.375	**9.775**	0.125	3.500
Freshwater drum	**2.773**	4.375	4.875	6.875	10.500	16.375	39.125	6.000	5.000	5.125	11.125	**10.938**	8.250	6.250
Slimy sculpin	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Total catch	**824**	1443	1109	232	1297	545	1732	1938	1043	1096	1338	**1177**	754	838
Number of species	**15**	16	15	13	15	15	17	17	18	18	18	**16**	17	19
Number of trawls		8	8	8	8	8	8	8	8	8	8		8	8

year-class strength over the same time-period. For example, the 2004 year-class figures prominently, relative to the 2003 and 2005 year-classes, in both index gill net surveys (Section 2.2) and the commercial harvest (Section 4.2).

Age-0 Lake Herring catches at Conway were high in 2012 (Table 2.3.13).

Age-0 catches of Yellow Perch were low to moderate (Table 2.3.14).

Age-0 Walleye catches were low to moderate (Table 2.3.15). Age-0, age-1, age-2 and age-3 Walleye were all common in the 2012 Bay of Quinte trawls (Table 2.3.16).

Round Goby first appeared in bottom trawl catches in the Bay of Quinte in 2001 and in the Kingston Basin of eastern Lake Ontario in 2003. The species was caught at all Bay of Quinte trawling sites by 2003, peaking in abundance, at each site, between 2003 and 2005. Catches have been quite variable since but remain high. Round Goby catches in the Kingston Basin remained high in 2012.

TABLE 2.3.8. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Deseronto** (5 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

						Year								
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Longnose gar	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Alewife	**120.590**	180.074	47.625	277.403	55.380	54.219	106.270	1037.631	217.123	16.250	447.062	**243.903**	1017.115	332.482
Gizzard shad	**54.324**	32.000	20.875	11.875	1.375	22.000	62.100	29.250	109.387	47.539	20.500	**35.690**	53.000	453.146
Rainbow smelt	**0.028**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Northern pike	**0.028**	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
White sucker	**1.028**	0.625	0.375	1.250	1.250	0.125	0.375	0.375	0.625	2.625	0.125	**0.775**	1.375	0.375
Lake chub	**0.000**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
Common carp	**0.278**	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.125	**0.025**	0.375	0.000
Emerald shiner	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	1.125
Spottail shiner	**29.194**	25.250	25.000	35.625	1.500	18.875	54.750	28.750	104.125	38.625	18.000	**35.050**	40.250	25.625
Brown bullhead	**24.250**	69.250	10.625	21.500	37.000	12.500	11.625	18.125	2.500	4.000	1.000	**18.813**	1.250	5.625
Channel catfish	**0.083**	0.000	0.000	0.000	0.125	0.250	0.125	0.000	0.000	0.000	0.000	**0.050**	0.000	0.000
Ictalurus sp.	**0.000**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
American eel	**0.861**	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.125
Trout-perch	**35.125**	4.750	7.500	0.125	4.500	6.000	12.375	18.375	550.279	226.843	1.750	**83.250**	58.875	4.250
White perch	**273.179**	10.250	194.882	306.265	3076.179	237.616	794.071	226.216	298.129	811.713	25.250	**598.057**	658.175	276.448
White bass	**0.403**	0.000	0.000	0.500	1.625	1.250	4.250	0.375	0.000	1.250	0.250	**0.950**	4.500	0.750
Sunfish	**0.125**	0.375	0.000	0.000	0.000	0.000	1.375	0.000	0.125	0.000	0.000	**0.188**	0.000	0.000
Rock bass	**0.014**	0.125	1.750	0.250	0.000	0.000	0.000	0.000	0.000	0.500	0.250	**0.288**	0.000	0.125
Pumpkinseed	**15.042**	118.095	17.500	67.500	19.500	14.750	15.500	19.125	11.500	30.500	11.000	**32.497**	26.000	3.750
Bluegill	**0.014**	0.500	0.125	4.500	0.000	0.125	0.875	0.375	0.000	0.250	1.250	**0.800**	2.750	3.875
Smallmouth bass	**0.500**	0.500	0.125	1.000	1.250	0.625	0.250	0.000	0.000	0.250	0.000	**0.400**	0.125	0.000
Largemouth bass	**0.083**	0.000	1.125	0.000	0.250	1.125	2.125	0.000	0.125	0.375	2.750	**0.788**	2.375	1.750
Black crappie	**0.028**	0.125	0.625	0.125	0.000	1.750	1.375	4.875	0.000	3.375	0.125	**1.238**	0.125	0.625
Lepomis sp.	**0.000**	0.000	0.000	0.000	0.000	483.734	0.000	1.000	0.250	0.000	1.875	**48.686**	0.000	0.000
Yellow perch	**320.934**	412.720	555.437	683.480	152.149	1031.209	638.509	1087.358	531.795	219.331	66.231	**537.822**	1466.894	126.899
Walleye	**17.486**	12.500	2.875	7.500	15.125	5.000	5.250	9.875	19.875	15.875	1.875	**9.575**	11.875	4.875
Johnny darter	**0.403**	0.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.063**	0.000	0.000
Logperch	**0.278**	1.000	0.125	0.375	0.000	3.625	0.125	0.750	2.875	23.625	0.250	**3.275**	2.875	0.000
Brook silverside	**0.306**	0.000	0.000	0.000	0.000	0.750	0.000	0.000	0.000	0.000	3.000	**0.375**	0.125	2.750
Round goby	**0.000**	1.250	11.500	16.125	20.625	117.305	4.625	4.250	4.500	2.750	1.625	**18.456**	1.625	13.875
Freshwater drum	**9.111**	16.500	1.875	15.375	15.625	8.250	22.000	24.000	10.125	11.500	0.875	**12.613**	7.375	7.125
Total catch	**904**	887	900	1451	3403	2021	1738	2511	1863	1457	605	**1684**	3357	1266
Number of species	**16**	21	19	19	16	22	20	17	16	19	21	**19**	20	20
Number of trawls		8	8	8	8	8	8	8	8	8	8		8	8

TABLE 2.3.9. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Big Bay** (5 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year													
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Longnose gar	**0.111**	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	**0.025**	0.000	0.000
Alewife	**33.495**	0.000	224.952	0.000	407.516	35.750	13.000	0.375	190.282	37.875	332.829	**124.258**	52.055	122.531
Gizzard shad	**228.179**	0.000	52.250	23.250	58.375	25.875	2.250	2.250	68.745	0.000	66.222	**29.922**	52.250	82.722
Rainbow smelt	**0.039**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Northern pike	**0.056**	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
White sucker	**4.031**	0.750	2.875	1.125	1.375	0.875	0.125	0.375	0.375	0.625	3.750	**1.225**	2.500	2.000
Moxostoma sp.	**0.007**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Common carp	**0.545**	0.250	0.000	0.500	0.375	0.250	0.875	0.125	0.375	0.000	1.000	**0.375**	1.375	0.375
Emerald shiner	**0.042**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Spottail shiner	**16.069**	12.125	63.625	8.875	20.250	56.250	18.625	15.375	10.625	19.500	37.625	**26.288**	53.750	92.750
Brown bullhead	**29.570**	16.375	32.625	38.000	23.750	12.125	54.625	9.750	8.750	3.000	4.750	**20.375**	4.250	1.875
Channel catfish	**0.151**	0.000	0.125	0.000	0.000	0.125	0.375	0.000	0.000	0.000	0.000	**0.063**	0.000	0.000
Ictalurus sp.	**0.000**	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.038**	0.000	0.000
American eel	**0.337**	0.125	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.025**	0.000	0.000
Trout-perch	**23.320**	1.375	9.125	5.000	3.125	21.625	21.000	14.000	65.875	67.750	45.625	**25.450**	86.750	40.875
White perch	**446.656**	18.250	793.237	145.125	1499.098	554.616	1252.318	363.567	456.729	1117.116	190.786	**639.084**	1552.354	240.107
White bass	**1.221**	0.000	2.125	0.000	0.250	2.625	3.875	0.250	0.750	8.250	0.375	**1.850**	2.375	0.375
Sunfish	**1.708**	50.000	0.000	0.000	0.000	0.000	25.250	0.000	9.750	0.000	0.000	**8.500**	0.000	0.000
Rock bass	**0.000**	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
Pumpkinseed	**18.612**	83.875	64.125	67.625	36.625	3.750	6.875	1.875	5.750	12.125	5.875	**28.850**	10.250	4.500
Bluegill	**1.930**	124.875	13.625	14.625	0.750	9.625	6.750	16.000	3.875	10.375	4.250	**20.475**	13.000	3.250
Smallmouth bass	**0.032**	0.125	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.038**	0.000	0.000
Largemouth bass	**0.000**	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.125	1.500	1.625	**0.375**	0.125	9.500
Black crappie	**0.356**	0.625	0.500	0.375	0.375	1.000	2.625	0.250	0.125	0.250	0.000	**0.613**	0.000	0.000
Lepomis sp.	**0.000**	0.000	66.625	0.000	0.000	1060.443	0.000	4.125	56.481	41.500	170.465	**139.964**	0.500	59.625
Yellow perch	**62.998**	381.125	153.463	107.650	200.266	90.623	99.395	33.750	660.643	197.790	184.258	**210.896**	435.501	121.076
Walleye	**10.485**	7.500	6.125	19.250	16.875	6.500	8.125	8.750	28.125	10.750	7.250	**11.925**	26.750	11.000
Johnny darter	**0.037**	1.250	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.150**	0.000	0.000
Logperch	**0.053**	0.125	0.000	0.250	0.000	0.000	0.125	0.250	3.250	2.250	0.000	**0.625**	0.125	0.000
Brook silverside	**0.069**	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.375	**0.050**	0.000	1.125
Round goby	**0.000**	0.000	0.125	1.375	15.750	9.500	4.750	50.423	1.125	0.625	0.375	**8.405**	0.750	1.625
Freshwater drum	**10.894**	21.750	24.375	9.000	15.625	125.520	178.465	139.361	14.625	11.625	51.500	**59.185**	15.750	31.500
Total catch	**891**	721	1511	442	2301	2017	1700	661	1586	1543	1109	**1359**	2310	827
Number of species	**18**	18	23	15	17	18	20	19	20	17	18	**19**	18	18
Number of trawls		8	8	8	8	8	8	8	8	8	8		8	8

TABLE 2.3.10. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Belleville** (5 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Sea lamprey	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Longnose gar	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.000	**0.600**	0.000	0.000
Alewife	**92.034**	0.250	82.375	0.125	11.500	13.875	9.750	0.125	34.875	78.782	59.821	**29.148**	128.250	24.750
Gizzard shad	**266.440**	99.204	234.375	46.029	581.893	50.571	88.327	73.318	326.992	321.441	500.849	**232.300**	920.843	708.013
Rainbow smelt	**0.111**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Northern pike	**0.111**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Mooneye	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
White sucker	**2.648**	0.375	0.375	0.500	0.125	0.000	0.750	0.250	0.250	0.125	0.625	**0.338**	0.125	0.000
Common carp	**0.319**	0.125	0.125	0.625	0.000	0.500	0.625	0.250	0.125	1.000	1.500	**0.488**	0.000	0.375
Spottail shiner	**71.584**	10.625	21.500	4.750	3.875	13.250	23.875	3.750	17.375	33.375	8.125	**14.050**	26.750	2.750
Brown bullhead	**17.824**	32.000	10.875	5.375	17.875	15.000	14.875	9.375	6.000	2.750	6.250	**12.038**	1.250	1.125
Channel catfish	**0.069**	0.000	0.125	0.125	0.000	0.375	0.000	0.000	0.000	0.000	0.000	**0.063**	0.000	0.250
American eel	**0.194**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Burbot	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Trout-perch	**78.532**	13.000	5.500	12.750	14.375	9.750	4.000	14.250	19.000	32.125	18.625	**14.338**	32.000	22.250
White perch	**306.900**	6.625	154.625	165.015	1930.129	476.087	880.660	338.969	845.077	1601.655	104.285	**650.313**	394.588	50.125
White bass	**1.509**	0.125	3.000	1.625	3.625	2.000	6.000	0.250	1.000	13.375	3.875	**3.488**	13.750	0.750
Sunfish	**4.472**	48.125	0.000	14.625	0.000	0.000	14.500	0.000	42.125	0.000	0.000	**11.938**	0.000	0.000
Rock bass	**0.236**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.125	0.000
Pumpkinseed	**26.422**	21.750	5.125	1.875	4.125	1.750	1.125	0.875	0.500	0.250	0.375	**3.775**	0.500	0.125
Bluegill	**13.431**	0.250	0.500	0.125	0.000	0.375	1.250	1.875	0.000	0.000	0.625	**0.500**	0.375	0.000
Smallmouth bass	**0.296**	0.125	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.025**	0.000	0.000
Largemouth bass	**0.157**	0.125	0.375	0.250	0.625	0.375	0.000	0.125	0.625	0.000	1.500	**0.400**	0.375	0.375
Black crappie	**3.389**	0.375	0.000	0.000	0.250	0.125	2.000	0.375	0.250	0.125	0.000	**0.350**	0.000	0.000
Lepomis sp.	**0.014**	0.000	88.375	0.000	2.375	409.720	0.250	5.125	9.000	17.875	293.990	**82.671**	13.375	30.625
Yellow perch	**116.494**	37.875	53.250	14.250	66.250	47.375	14.625	78.750	214.729	44.375	300.513	**87.199**	637.039	21.750
Walleye	**13.352**	5.375	0.750	8.500	2.625	2.000	2.750	8.625	18.125	3.500	10.375	**6.263**	8.750	3.500
Johnny darter	**1.481**	12.500	2.125	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**1.475**	0.000	0.000
Logperch	**0.347**	0.250	0.500	0.125	0.125	0.125	0.000	0.750	1.000	1.000	0.250	**0.413**	0.125	0.000
Brook silverside	**0.139**	0.000	0.500	0.000	0.000	0.000	1.250	0.000	0.000	0.000	8.500	**1.025**	0.125	2.000
Round goby	**0.000**	0.000	1.625	67.000	47.250	60.250	7.125	53.875	8.625	30.500	5.875	**28.213**	1.250	6.500
Freshwater drum	**23.412**	163.750	58.250	20.875	4.375	214.777	87.000	830.175	25.000	31.000	53.375	**148.858**	13.875	17.625
Sculpin sp.	**0.019**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Total catch	**1042**	453	724	365	2691	1318	1161	1421	1571	2213	1385	**1330**	2193	893
Number of species	**19**	20	22	20	17	19	19	19	19	17	20	**19**	19	17
Number of trawls		8	8	8	8	8	8	8	8	8	8		8	8

TABLE 2.3.11. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Trenton** (4 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year												
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011	2012
Alewife	**66.911**	149.297	98.611	174.137	8.625	508.870	126.639	24.500	8.750	112.375	26.875	**123.868**	49.500	86.637
Gizzard shad	**165.299**	4.125	6.375	22.250	0.000	30.375	23.375	1.375	38.500	5.750	84.234	**21.636**	25.625	70.000
Rainbow smelt	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Northern pike	**0.069**	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
Mooneye	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
White sucker	**3.000**	0.500	1.625	0.625	1.125	1.875	2.125	2.125	0.375	0.500	0.750	**1.163**	0.625	1.625
Minnow	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Common carp	**0.278**	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.125	**0.063**	0.125	0.000
Spottail shiner	**88.467**	217.425	60.875	60.875	1.250	24.500	41.750	0.000	76.000	148.410	120.061	**75.115**	158.481	189.570
Brown bullhead	**26.431**	10.625	3.500	4.250	1.125	8.750	3.750	4.500	1.375	0.875	1.500	**4.025**	2.375	3.875
Channel catfish	**0.236**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.125
American eel	**0.250**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000	0.000
Banded killifish	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125	**0.013**	0.000	0.000
Burbot	**0.000**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
Trout-perch	**27.139**	0.500	0.500	0.000	0.000	0.125	0.125	0.000	0.250	1.625	1.500	**0.463**	3.250	1.750
White perch	**321.116**	54.250	19.875	240.032	80.777	279.018	388.312	29.875	33.750	669.313	16.250	**181.145**	261.900	361.897
White bass	**0.403**	0.000	0.125	0.000	0.000	0.000	1.250	0.125	0.000	0.875	0.125	**0.250**	1.625	0.250
Sunfish	**13.764**	33.250	0.000	22.375	0.000	0.000	11.500	0.000	0.875	0.000	0.000	**6.800**	0.000	0.000
Rock bass	**0.889**	0.625	0.625	0.125	0.000	0.500	2.250	0.000	1.250	2.875	2.250	**1.050**	4.000	0.375
Pumpkinseed	**86.353**	84.750	32.250	88.887	56.794	46.750	20.000	77.522	143.790	66.250	62.250	**67.924**	67.062	40.125
Bluegill	**0.750**	1.125	0.500	1.500	0.875	0.375	3.875	5.250	2.625	0.625	5.125	**2.188**	11.875	1.000
Smallmouth bass	**0.556**	0.375	0.250	0.500	0.500	0.125	0.000	0.000	0.125	0.250	0.000	**0.213**	0.125	0.000
Largemouth bass	**2.236**	2.375	2.875	4.625	0.125	6.625	4.250	0.125	6.375	2.750	6.875	**3.700**	14.125	11.250
Black crappie	**1.681**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000	0.000
Lepomis sp.	**0.764**	0.000	64.796	0.000	0.000	59.750	10.250	0.000	17.000	0.625	7.125	**15.955**	24.875	6.500
Yellow perch	**317.772**	200.638	239.014	544.694	186.465	340.868	130.139	584.825	769.635	1095.367	335.295	**442.694**	1169.504	278.519
Walleye	**9.764**	9.625	3.625	10.500	1.500	1.875	0.750	4.750	7.375	6.125	2.125	**4.825**	8.000	9.000
Johnny darter	**5.458**	2.500	7.250	7.625	0.375	0.000	0.000	0.000	0.000	0.000	0.000	**1.775**	0.250	0.250
Logperch	**3.097**	2.000	0.000	15.250	4.250	52.750	0.625	5.625	23.375	32.375	6.875	**14.313**	24.375	4.625
Brook silverside	**0.000**	0.000	0.000	0.250	0.000	0.000	0.000	0.125	0.000	0.000	0.125	**0.050**	0.125	0.000
Round goby	**0.000**	0.000	0.000	2.875	8.500	13.125	5.250	0.750	12.375	34.125	7.375	**8.438**	18.750	12.125
Freshwater drum	**11.931**	6.750	3.625	2.000	0.375	4.125	4.875	9.500	1.500	4.875	1.375	**3.900**	2.125	1.125
Total catch	**1155**	781	547	1203	353	1381	781	751	1145	2186	688	**982**	1849	1081
Number of species	**20**	20	19	19	15	19	20	15	19	19	21	**19**	22	20
Number of trawls		8	8	8	8	8	8	8	8	8	8		8	8

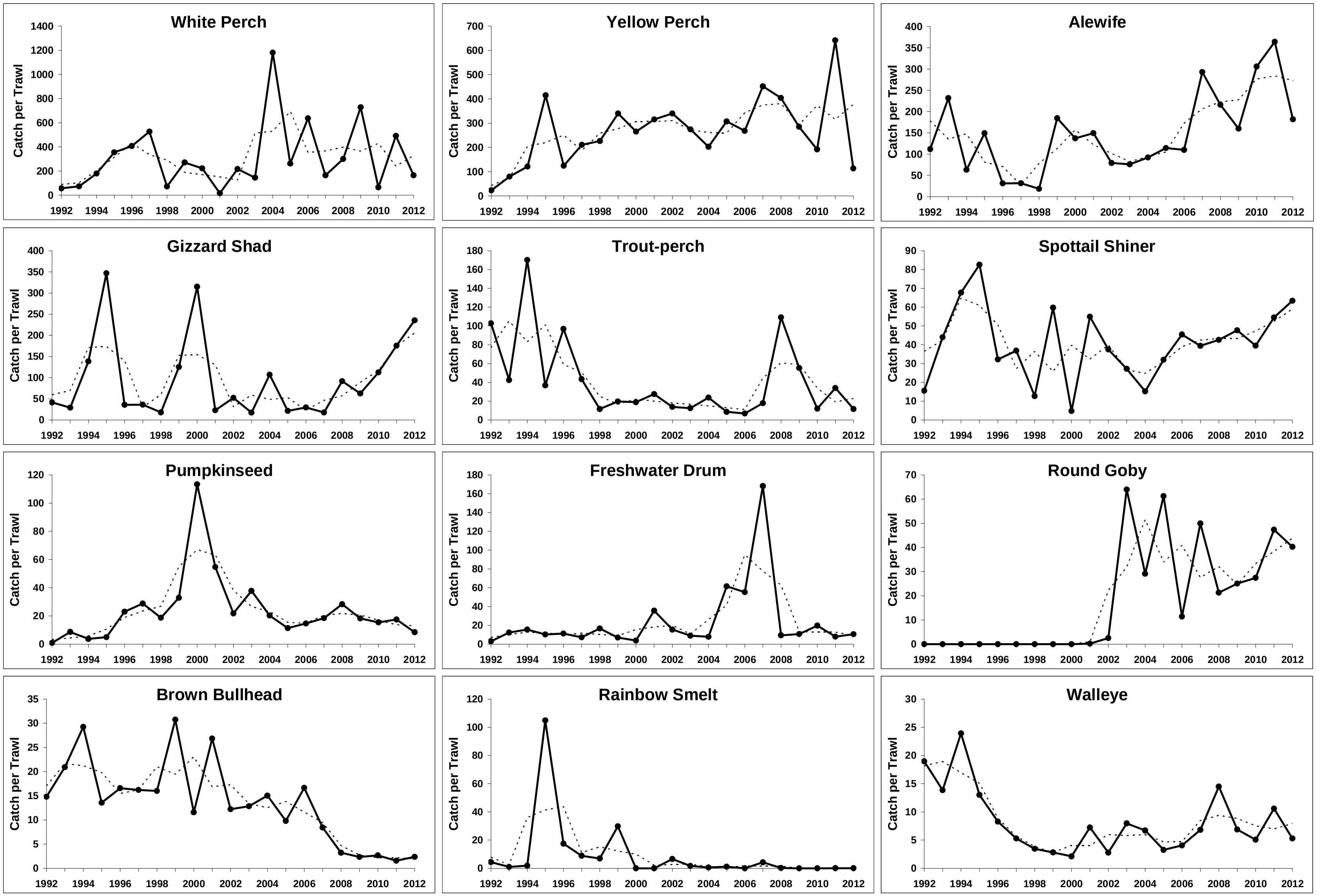


FIG. 2.3.2. Abundance trends (annual means) for the most common species caught in bottom trawls at six sites in the Bay of Quinte (Conway, Hay Bay, Deseronto, Big Bay, Belleville and Trenton; see Fig. 2.3.1). Values shown here are 3-yr running averages (two years for first and last years graphed).

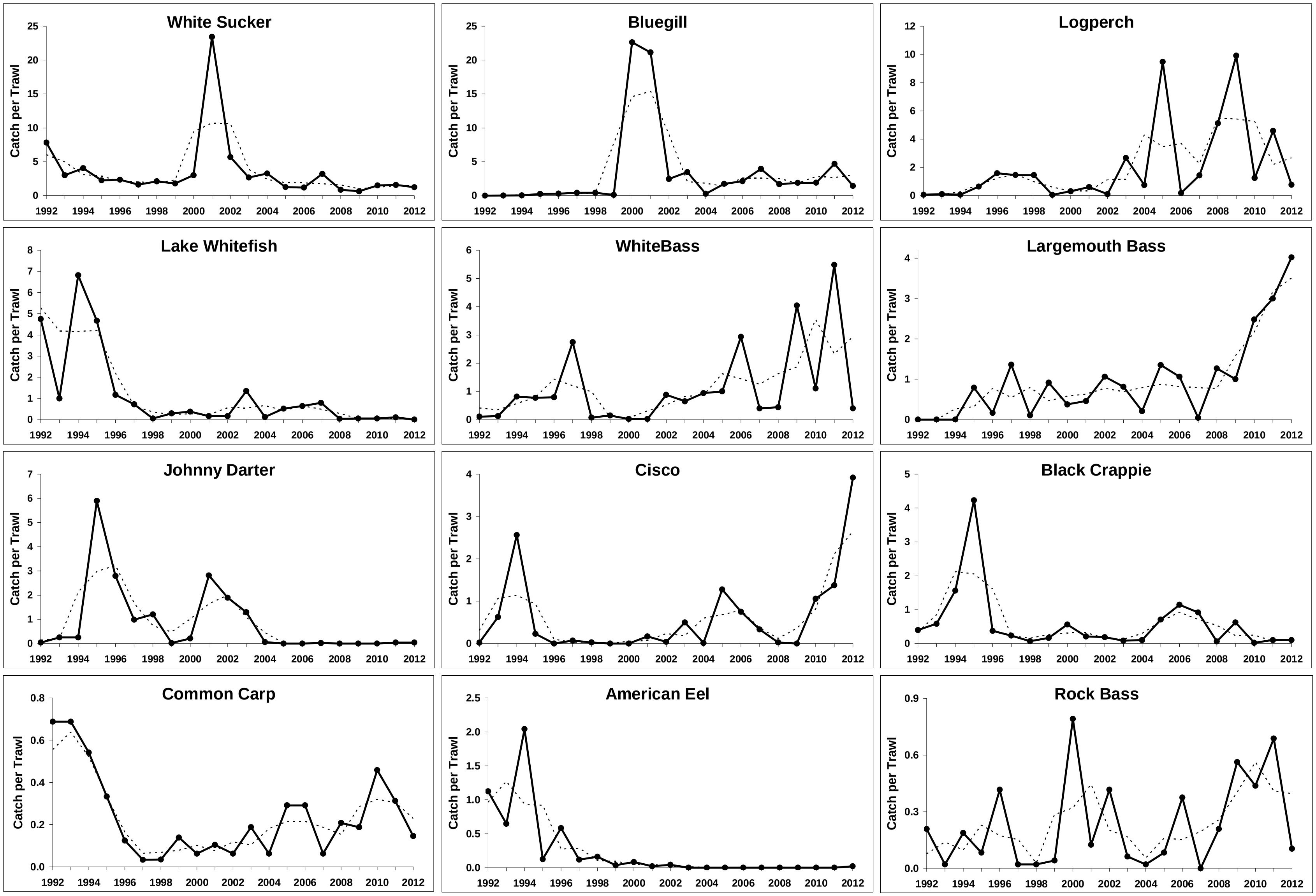


FIG. 2.3.2 (continued). Abundance trends for the most common species caught in bottom trawls at six sites in the Bay of Quinte (Conway, Hay Bay, Deseronto, Big Bay, Belleville and Trenton; see Fig. 2.3.1). Values shown here are 3-yr running averages (two years for first and last years graphed).

TABLE 2.3.12. 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, 1992-2012. 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
2005	2.8	12	49.8	12
2006	2.4	12	3.6	8
2007	0.8	12	0.3	12
2008	0.1	12	0.0	8
2009	0.3	12	0.1	12
2010	0.3	12	4.7	12
2011	0.1	8	0.0	8
2012	0.0	8	0.0	8

TABLE 2.3.13. Mean catch-per-trawl of **age-0 Lake Herring** at Conway in the lower Bay of Quinte, 1992-2012. Four replicate trawls on each of two to four visits during August and early September were made at the Conway site. Distances of each trawl drag was 1/4 mile.

	Conway	N
1992	0.0	8
1993	1.5	8
1994	7.7	8
1995	1.3	8
1996	0.0	8
1997	0.0	8
1998	0.1	8
1999	0.0	8
2000	0.0	8
2001	0.0	8
2002	0.1	8
2003	2.8	12
2004	0.1	12
2005	7.2	12
2006	4.5	12
2007	2.0	12
2008	0.2	12
2009	0.0	12
2010	6.33	12
2011	8.25	8
2012	23.25	8

TABLE 2.3.14. Mean catch-per-trawl of **age-0 Yellow Perch** at six Bay of Quinte sites, 1992-2012. Four replicate trawls on each of two to three visits during August and early September were made at each site. Distance of each trawl drag was 1/4 mile.

	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
2005	202.8	37.5	24.8	444.7	61.9	0.0	128.6	52
2006	3.8	3.5	51.7	532.8	306.0	0.2	149.7	52
2007	284.3	70.9	29.6	883.5	776.0	0.1	340.7	52
2008	123.8	153.4	114.5	263.6	12.4	0.0	111.3	52
2009	101.3	29.8	130.2	81.1	14.3	0.0	59.4	52
2010	216.8	280.3	167.0	34.6	148.8	0.0	141.2	52
2011	729.7	582.4	382.3	1216.8	4.8	1.7	486.3	53
2012	72.5	16.8	103.6	31.5	38.1	0.1	43.8	48

TABLE 2.3.15. Mean catch-per-trawl of **age-0 Walleye** at six Bay of Quinte sites, 1992-2012. Four replicate trawls on each of two to three visits during August and early September were made at each site. Distance of each trawl drag was 1/4 mile.

	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
2005	0.8	1.4	3.8	1.8	1.1	0.0	1.5	52
2006	0.0	1.0	3.0	2.8	5.9	0.3	2.1	52
2007	4.1	6.1	5.4	5.6	5.6	0.2	4.5	52
2008	5.5	17.6	20.5	14.6	12.4	0.0	11.8	52
2009	2.5	2.3	7.6	1.0	2.9	0.0	2.7	52
2010	1.4	4.6	4.5	1.0	3.6	0.0	2.5	52
2011	6.1	8.6	24.5	8.0	4.0	0.1	8.6	52
2012	6.4	2.5	7.1	0.3	0.1	0.0	2.7	48

TABLE 2.3.16. Age distribution of 194 **Walleye** sampled from summer bottom trawls, Bay of Quinte, 2012. Also shown are mean fork length and mean weight. Fish of less than 150 mm fork length (n = 66) were assigned an age of 0, fish between 150 and 290 mm (n = 89) were aged using scales; and those over 290 mm fork length (n = 39) were aged using otoliths.

	Age/Year-class						
	0	1	2	3	4	9	
	2012	2011	2010	2009	2008	2003	Total
Number	72	84	21	7	9	1	194
Mean fork length (mm)	125	237	370	426	437	540	
Mean weight (g)	20	139	554	862	933	1683	

2.4 Lake Ontario Nearshore Community Index Netting

The 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. Both upper and lower Bay of Quinte were sampled from 2002 -2005. In 2006, the NSCIN program was conducted on Hamilton Harbour and the Toronto waterfront area thanks to partnerships developed with the Department of Fisheries and Oceans Canada and the Toronto Region Conservation Authority. In 2007, NSCIN was conducted in five areas: Lake St. Francis (St. Lawrence River), the upper Bay of Quinte, East and West Lakes (two Lake Ontario embayments on the southwest side of Prince Edward County), and the Toronto Waterfront area. In 2008, NSCIN was conducted in five areas: Lake St. Francis (St. Lawrence River), the upper Bay of Quinte, Weller's Bay, Presqu'ile Bay, and Hamilton Harbour. In 2009, five areas were completed: upper Bay of Quinte, lower Bay of Quinte, Prince Edward Bay, North Channel/Kingston, and the Thousand Islands. In 2010, three areas were completed: Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte. In 2011, two areas were completed: upper and lower Bay of Quinte. In 2012, three areas were completed: Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte (Fig. 2.4.1).

The NSCIN program utilized 6-foot trap nets and was designed to evaluate the abundance and other biological attributes of fish species that inhabit the

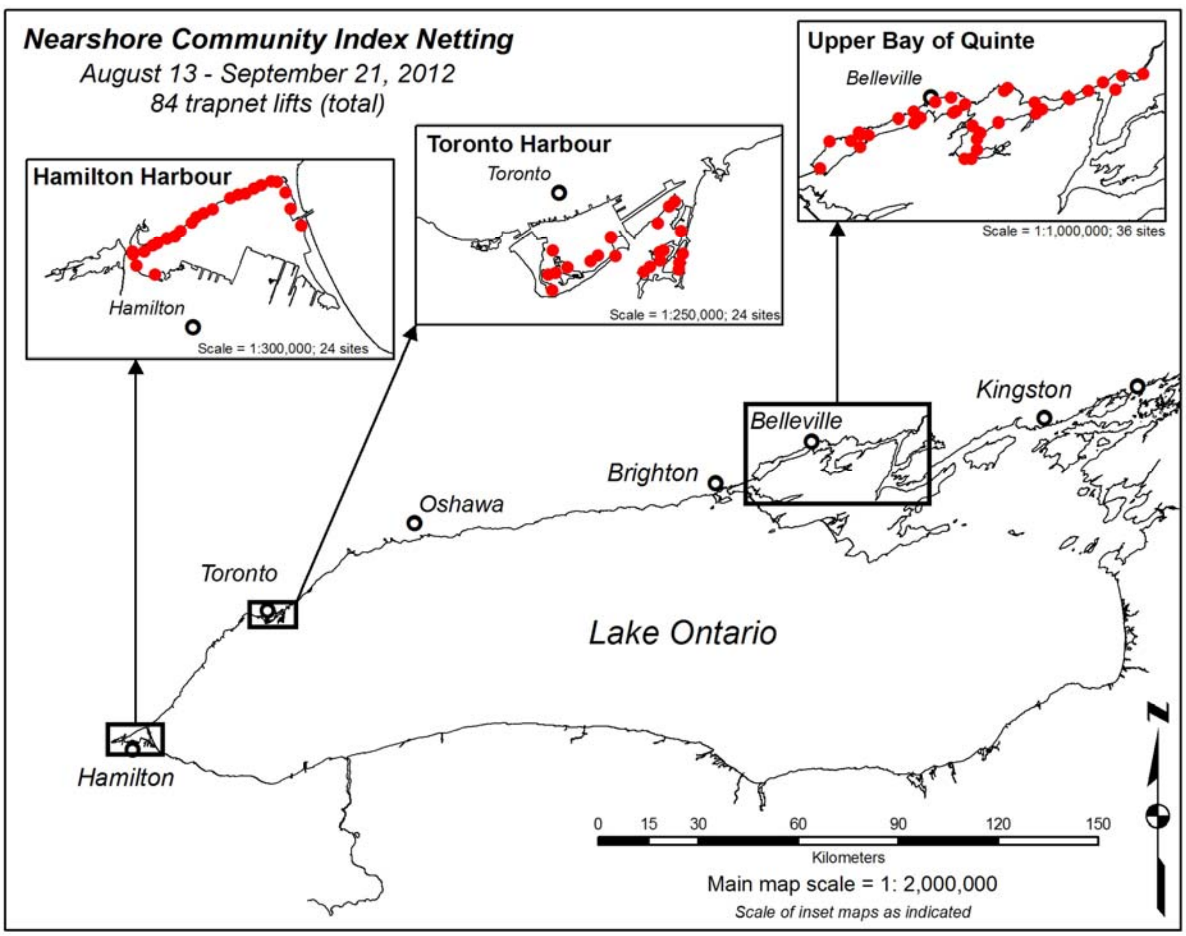


FIG. 2.4.1. Map of Lake Ontario indicating NSCIN trap net locations in Hamilton Harbour, the Toronto Waterfront and the upper Bay of Quinte, 2012 .

littoral area. Suitable trap net sites were chosen from randomly selected UTM grids that contained shoreline in the area netted.

Hamilton Harbour

Twenty-four trap net sites were sampled on Hamilton Harbour from 13 Aug to 23 Aug with water temperatures ranging from 20.5-23.1 ^{o}C (Table 2.4.1). More than 4,400 fish comprising 21 species were captured (Table 2.4.2). The most abundant species by number were Brown Bullhead (1,830), White Perch (1,678), Bluegill (346) and Channel Catfish (340). A single Rudd was captured.

The age distribution and mean length by age-class of selected species are shown in Tables 2.4.3 and Table 2.4.4. Abundance trends for all species are

TABLE 2.4.1. Survey information for the 2012 NSCIN trapnet program on Hamilton Harbour, the Toronto Waterfront and the upper Bay of Quinte.

	Hamilton Harbour	Toronto Waterfront	Upper Bay of Quinte
Survey dates	Aug 13-23	Sep 10-20	Sep 4-21
Water temperature (^{o}C)	20.5-23.1 ^{o}C	10.2-20.9 ^{o}C	16.9-23.6 ^{o}C
No. of trapnet lifts	24	24	36
No. sites by depth (m):			
Target (2-2.5 m)	16	13	17
> Target	6	8	14
< Target	2	3	5
No. sites by substrate:			
Hard	2	0	19
Soft	22	24	17
No. sites by cover:			
None	2	5	0
1-25%	11	10	4
25-75%	11	7	28
>75%	0	2	4

TABLE 2.4.2. Species-specific catch in the 2012 NSCIN trapnet program on Hamilton Harbour, the Toronto Waterfront and the upper Bay of Quinte. Statistics shown arithmetic and geometric mean catch-per-trapnet (CUE), percent relative standard error of mean log10(catch+1), % RSE = 100*SE/mean, and mean fork or total length (mm). A total of 29 species were caught.

	Hamilton Harbour				Toronto Waterfront				Upper Bay of Quinte			
	Arithmetic mean CUE	Geometric mean CUE	RSE (%)	Mean length (mm)	Arithmetic mean CUE	Geometric mean CUE	RSE (%)	Mean length (mm)	Arithmetic mean CUE	Geometric mean CUE	RSE (%)	Mean length (mm)
Longnose gar	0.667	0.424	31	803	0.042	0.029	100	680	2.083	0.588	32	773
Bowfin	1.167	0.915	16	625	0.417	0.257	39	614	0.500	0.318	28	590
Alewife	0.042	0.029	100	170	9.500	1.857	28	150				
Gizzard shad	2.125	1.427	17	173	1.083	0.594	29	212	0.333	0.207	36	161
Brown trout					0.083	0.047	100					
Northern pike	0.292	0.152	59	620	1.250	0.777	24	585	0.528	0.365	24	585
White sucker	0.292	0.175	49	343	1.125	0.484	38	359	0.722	0.441	25	400
Silver redhorse									0.472	0.213	41	518
Shorthead redhorse									0.083	0.051	72	393
Greater redhorse									0.278	0.151	46	557
River redhorse									0.083	0.051	72	500
Goldfish	0.875	0.576	24	310								
Common carp	1.208	0.855	19	564	3.667	1.560	21	658	0.472	0.286	31	607
Golden shiner									0.028	0.019	100	170
Rudd	0.042	0.029	100	360								
Brown bullhead	76.250	9.730	13	212	198.000	16.478	14	253	7.111	2.360	16	286
Channel catfish	14.167	2.004	29	449	0.083	0.059	69	640	0.306	0.212	31	558
American eel									0.028	0.019	100	740
White perch	69.917	16.840	10	166	0.917	0.288	52	222	3.583	1.209	22	218
White bass	0.292	0.181	47	237	0.042	0.029	100		0.083	0.051	72	240
Morone sp.	0.250	0.084	100	280								
Rock bass	1.167	0.768	23	158	4.750	2.554	15	172	1.083	0.522	26	185
Pumpkinseed	2.042	0.931	28	117	12.750	3.829	19	112	28.111	7.187	12	148
Bluegill	14.417	6.505	14	136	2.042	0.833	30	131	74.917	38.148	6	140
Smallmouth bass					0.083	0.059	69	290	0.139	0.092	49	382
Largemouth bass	0.250	0.189	36	288	5.000	1.316	28	202	2.722	1.270	19	239
Black crappie	0.583	0.404	29	174	1.125	0.705	25	186	4.778	2.449	13	214
Yellow perch	0.250	0.175	42	208	20.625	3.794	19	186	1.306	0.816	18	210
Walleye									1.444	0.891	18	464
Freshwater drum	0.333	0.172	56	369	0.625	0.400	31	628	2.194	0.826	26	472
Total CUE	187				263				133			
Number of species	21				20				25			
Number of nets	24				24				36			
Total catch	4,479				6,317				4,802			

presented in Table 2.4.5 and graphically for selected species in Fig. 2.4.2. Northern Pike and Brown Bullhead abundance was lower in 2012 than the high levels observed in prior years. Channel Catfish and White Perch abundance remained high in 2012. Pumpkinseed, Bluegill, Smallmouth Bass, Largemouth Bass, Black Crappie, and Yellow Perch all remain at low abundance. Walleye abundance declined steadily since 2006.

Toronto Waterfront

Twenty-four trap net sites were sampled on the Toronto Waterfront from 10 Sep to 20 Sep with water temperatures ranging from 10.2-20.9 ^{o}C (Table 2.4.1). Over 6,300 fish comprising 20 species were captured (Table 2.4.2). The most abundant species by number were Brown Bullhead (4,752), Yellow Perch (495), Pumpkinseed (306), Alewife (228), Largemouth Bass (120), and Rock Bass (114).

Northern Pike abundance remained high. Brown Bullhead, Largemouth Bass and Yellow Perch abundance was higher in 2012 than in prior years. Smallmouth Bass abundance remained low and no Walleye were caught (Table 2.4.5 and Fig. 2.4.2).

Upper Bay of Quinte

Thirty-six trap net sites were sampled on the upper Bay of Quinte from 4 Sep to 21 Sep with water temperatures ranging from 16.9-23.6 ^{o}C (Table 2.4.1). Over 4,800 fish comprising 25 species were captured (Table 2.4.2). The most abundant species by number were Bluegill (2,697), Pumpkinseed (1,012), Brown Bullhead (256), Black Crappie (172), White Perch (129), and Largemouth Bass (98). A single American Eel was caught in 2012. This Eel was caught on 19 Sep, was 701 mm total length and weighed 986 g.

Northern Pike abundance declined from 2001-2009, increased significantly in 2010, then declined to 2012. Brown Bullhead and Channel Catfish remained at low abundance. Pumpkinseed and Bluegill abundance remained high. The abundance of most other species was low in 2012 relative to prior years (Table 2.4.5 and Fig. 2.4.2).

Piscivore Biomass

Trophic structure is an indicator of general health of a fish community. A proportion of the fish community assemblage comprised of piscivores greater than 0.20 (biomass) reflects a healthy

Table 2.4.3. Age distribution of selected species caught in Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte, 2012.

	Year-class/Age										
	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
Species	0	1	2	3	4	5	6	7	8	9	10
Hamilton Harbour											
Northern Pike		2	3	3	6						
Pumpkinseed		7	17	5							
Bluegill			19	9	3						
Largemouth Bass	1	2	1							1	
Black Crappie		11	3								
Yellow Perch		3	1	2							
Toronto Waterfront											
Northern Pike	4	10	8	14	5	5					
Pumpkinseed		3	19	7							
Bluegill		4	6	7		4					
Smallmouth Bass		1			1						
Largemouth Bass	6	21	1					2			1
Black Crappie	2	5	11	3	1						
Yellow Perch		5	21	1	1	1					
Upper Bay of Quinte											
Northern Pike		6	12	8	4	3	2	1			
Pumpkinseed			2	8	12	5					
Bluegill			7	9	6	7	1	3			
Smallmouth Bass				1	2	1					
Largemouth Bass		17	10	3	1						
Black Crappie		25	7	3							
Yellow Perch			8	9	6	6					
Walleye			3	4	18	4				1	

Table 2.4.4. Mean fork length (mm) of selected species caught in Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte, 2012.

	Year-class/Age										
	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
Species	0	1	2	3	4	5	6	7	8	9	10
Hamilton Harbour											
Northern Pike		476	615	644	618						
Pumpkinseed		105	118	120							
Bluegill			128	139	157						
Largemouth Bass	149	192	328							410	
Black Crappie		158	222								
Yellow Perch		172	220	244							
Toronto Waterfront											
Northern Pike	276	526	563	636	672	636					
Pumpkinseed		96.7	121	121							
Bluegill		107	138	156		182					
Smallmouth Bass		193			371						
Largemouth Bass	137	201	177					368			431
Black Crappie	98.5	149	195	228	292						
Yellow Perch		152	193	220	248	278					
Upper Bay of Quinte											
Northern Pike		495	549	595	615	631	697	715			
Pumpkinseed			120	136	148	156					
Bluegill			112	140	149	156	177	175			
Smallmouth Bass				358	368	434					
Largemouth Bass		204	274	328	373						
Black Crappie		164	231	269							
Yellow Perch			185	192	212	232					
Walleye			408	442	465	516				504	

TABLE 2.4.5. Species-specific abundance trends (mean catch per trap net) in Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte. Annual total catch, number of net sets, and number of species are also indicated.

	Hamilton Harbour				Toronto Waterfront				Upper Bay of Quinte										
Species	2006	2008	2010	2012	2006	2007	2010	2012	2001	2002	2003	2004	2005	2007	2008	2009	2010	2011	2012
Longnose gar	0.47	0.71	0.28	0.67	0.17	-	-	0.04	0.25	0.33	1.14	1.94	0.39	2.92	0.36	0.44	1.56	0.50	2.08
Spotted gar	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bowfin	0.58	1.17	2.42	1.17	0.33	0.08	0.46	0.42	0.36	0.14	0.58	0.53	0.25	0.92	1.11	0.50	0.81	0.75	0.50
Alewife	-	-	-	0.04	3.79	4.58	0.42	9.50	-	-	-	-	-	-	-	-	-	-	-
Gizzard shad	3.42	0.50	2.38	2.13	2.71	0.42	0.04	1.08	1.11	1.44	2.00	0.06	20.42	0.39	1.00	0.06	0.64	0.14	0.33
Chinook salmon	-	-	-	-	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow trout	0.05	0.04	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-
Brown trout	-	-	-	-	0.04	-	-	0.08	-	-	-	-	-	-	-	-	-	-	-
Lake trout	0.05	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-
Lake whitefish	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-
Coregonus sp.	-	-	-	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern pike	1.11	1.08	1.08	0.29	1.17	0.83	1.38	1.25	1.03	0.58	0.86	0.69	0.64	0.44	0.33	0.28	0.83	0.78	0.53
Muskellunge	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-	-	-	-
Suckers	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-
White sucker	0.11	0.21	0.46	0.29	4.17	3.83	2.29	1.13	1.03	1.47	1.72	1.25	1.11	0.44	0.92	0.64	0.44	0.42	0.72
Bigmouth buffalo	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver redhorse	-	0.04	-	-	-	-	-	-	-	-	0.69	0.81	0.28	0.64	0.50	1.44	0.44	0.17	0.47
Shorthead redhorse	0.11	0.04	0.25	-	0.04	-	-	-	-	-	0.08	0.47	0.25	0.19	0.33	0.36	0.06	0.19	0.08
Greater redhorse	-	-	-	-	-	-	-	-	-	-	0.22	0.06	-	-	0.08	0.06	-	0.44	0.28
River redhorse	-	-	-	-	-	-	-	-	0.06	-	0.14	0.17	0.14	0.11	0.44	0.03	-	0.14	0.08
Moxostoma sp.	-	-	-	-	-	-	-	-	0.78	0.42	0.08	-	-	-	-	-	-	-	-
Minnow	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goldfish	0.32	0.92	2.71	0.88	0.04	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	4.47	3.92	2.20	1.21	1.58	2.50	4.75	3.67	0.08	0.11	0.28	0.08	0.11	0.19	0.22	0.19	0.33	0.22	0.47
Golden shiner	-	-	-	-	-	-	-	-	0.03	-	0.03	-	0.03	-	0.22	-	0.06	0.14	0.03
Rudd	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black bullhead	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brown bullhead	380.79	189.33	482.67	76.25	32.63	14.79	8.42	198.00	167.67	95.83	37.33	20.83	17.89	7.25	6.42	2.56	10.56	13.69	7.11
Channel catfish	34.84	15.92	8.00	14.17	0.04	-	0.17	0.08	2.17	2.17	1.50	1.33	1.72	0.72	0.81	0.28	0.53	0.58	0.31
American eel	-	-	-	-	-	-	-	-	0.44	0.14	-	0.03	0.06	-	-	-	-	0.11	0.03
White perch	48.42	34.88	84.38	69.92	0.04	-	0.25	0.92	2.19	2.89	7.69	3.67	2.75	4.61	4.31	3.86	1.69	3.75	3.58
White bass	2.00	1.75	1.46	0.29	0.33	-	0.04	0.04	0.06	0.14	0.11	0.11	0.19	0.03	0.14	-	-	0.17	0.08
Rock bass	0.58	1.08	1.48	1.17	0.33	1.13	2.58	4.75	0.92	0.67	0.64	0.58	0.50	4.83	3.97	3.89	2.44	4.50	1.08
Green sunfish	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumpkinseed	0.68	1.13	3.33	2.04	7.29	16.29	7.67	12.75	89.39	73.08	26.94	15.33	15.97	18.61	18.14	23.42	29.08	37.53	28.11
Bluegill	4.05	3.21	9.08	14.42	0.54	3.96	1.13	2.04	169.58	142.64	66.25	75.19	44.44	63.92	159.11	71.75	61.50	136.03	74.92
Smallmouth bass	0.11	-	0.13	-	0.04	0.04	0.08	0.08	0.94	1.67	0.36	1.64	1.11	0.11	0.92	0.56	0.44	0.47	0.14
Largemouth bass	0.26	0.17	0.33	0.25	1.08	1.25	1.38	5.00	2.47	6.11	7.92	6.08	2.75	4.53	5.39	4.33	4.25	10.39	2.72
Black crappie	2.32	0.17	0.42	0.58	0.83	0.42	0.13	1.13	9.81	15.00	10.22	16.11	8.11	12.92	17.33	10.03	7.53	8.64	4.78
Yellow perch	0.11	0.63	4.16	0.25	1.08	5.96	2.63	20.63	3.75	3.42	1.94	0.83	1.00	4.72	7.00	2.64	6.11	6.25	1.31
Walleye	1.05	0.17	0.04	-	0.38	0.08	-	-	3.17	2.47	2.22	2.56	2.14	1.61	2.50	1.75	2.53	2.36	1.44
Round goby	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Freshwater drum	1.37	1.71	1.24	0.33	1.08	1.29	0.83	0.63	6.36	3.31	3.81	2.14	4.36	1.25	1.17	1.89	1.97	1.67	2.19
Total Catch	488	259	609	187	60	57	35	263	464	354	175	153	127	131	233	131	134	230	133
Number of Nets	19	24	25	24	24	24	24	24	36	36	36	36	36	36	36	36	36	36	36
Number of Species	28	25	22	21	24	16	20	20	24	21	25	25	25	22	24	23	21	25	25

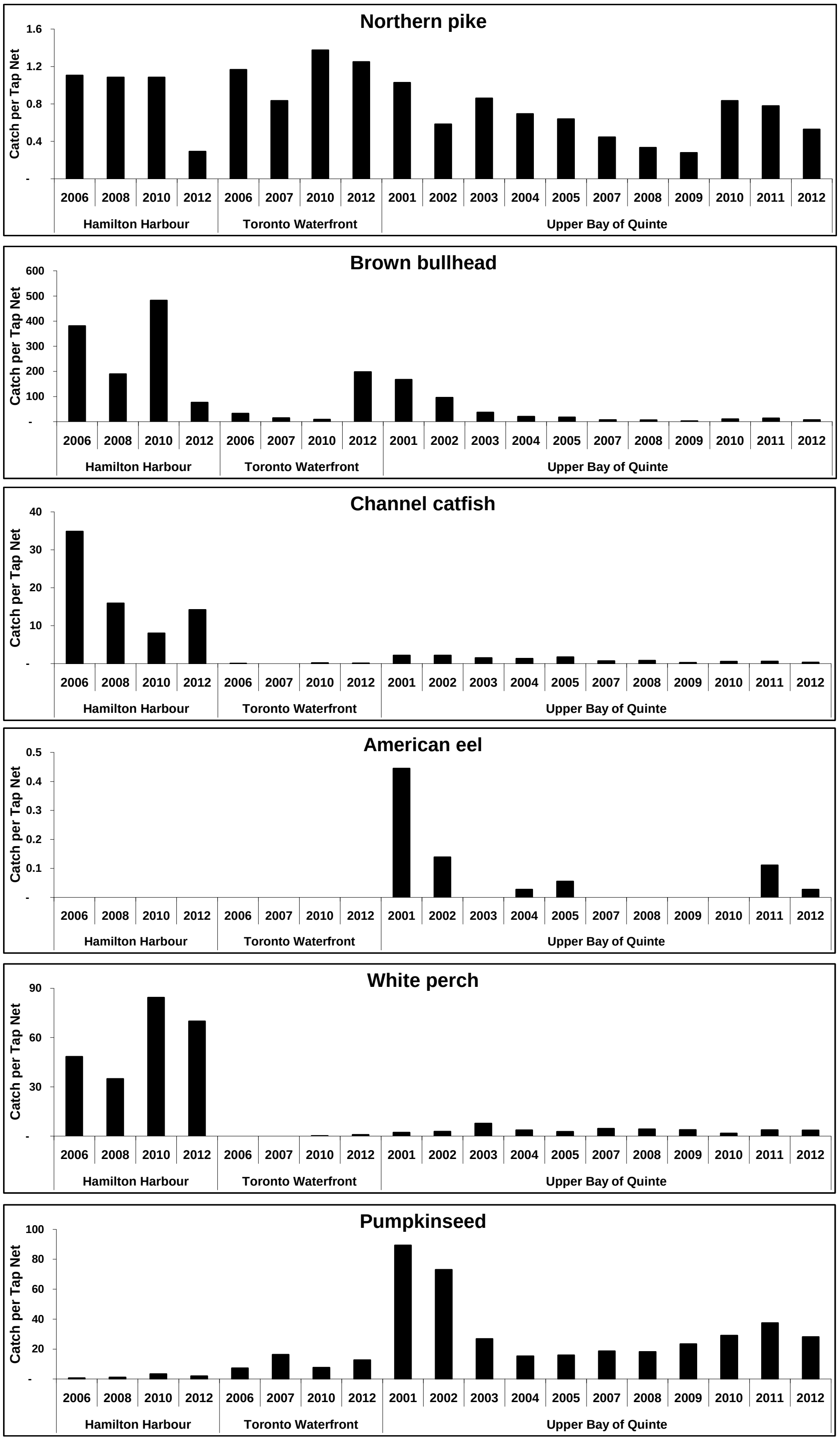


FIG. 2.4.2. Abundance trends for selected species caught in nearshore trap nets in Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte. Values shown are annual arithmetic means.

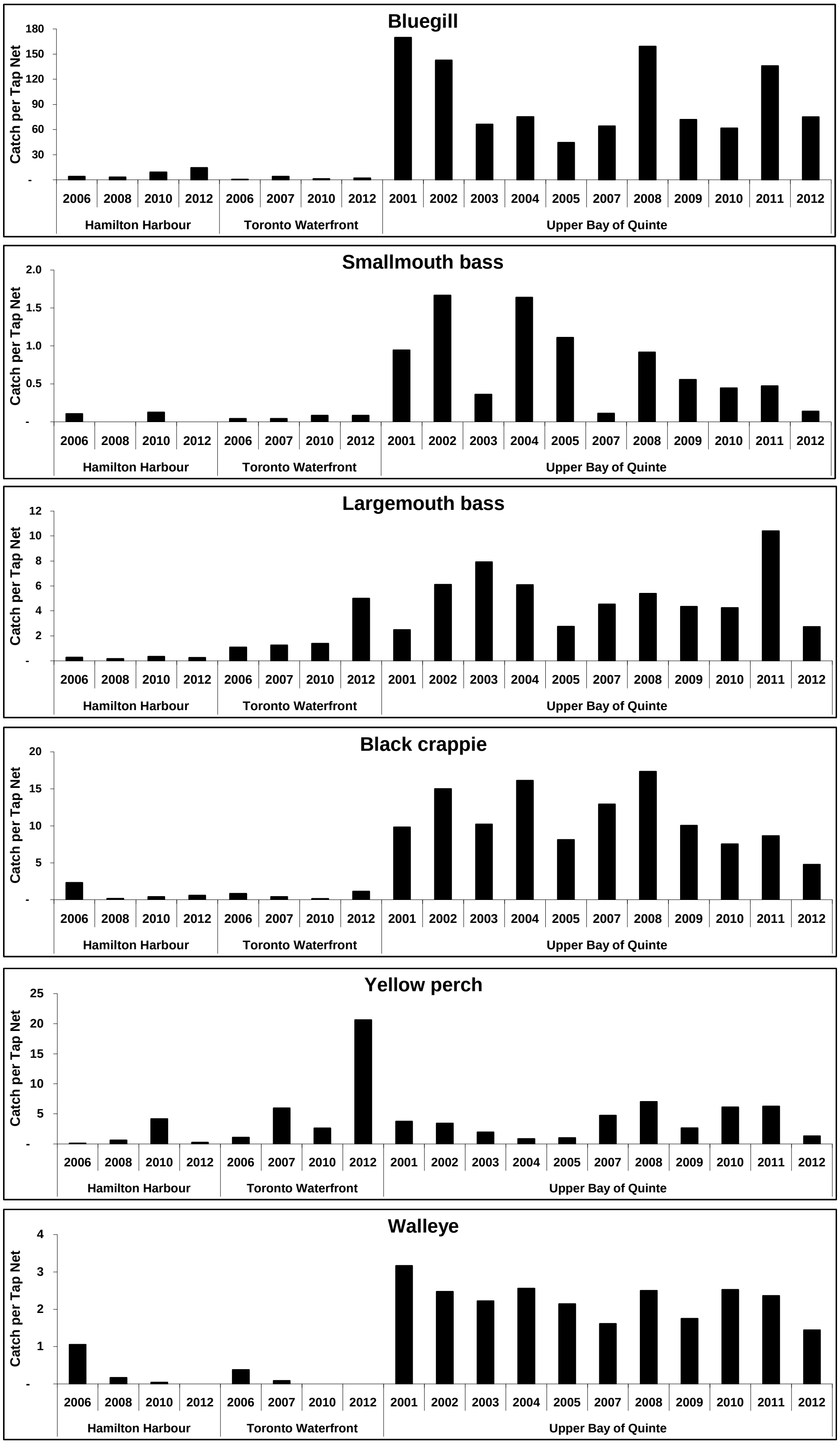
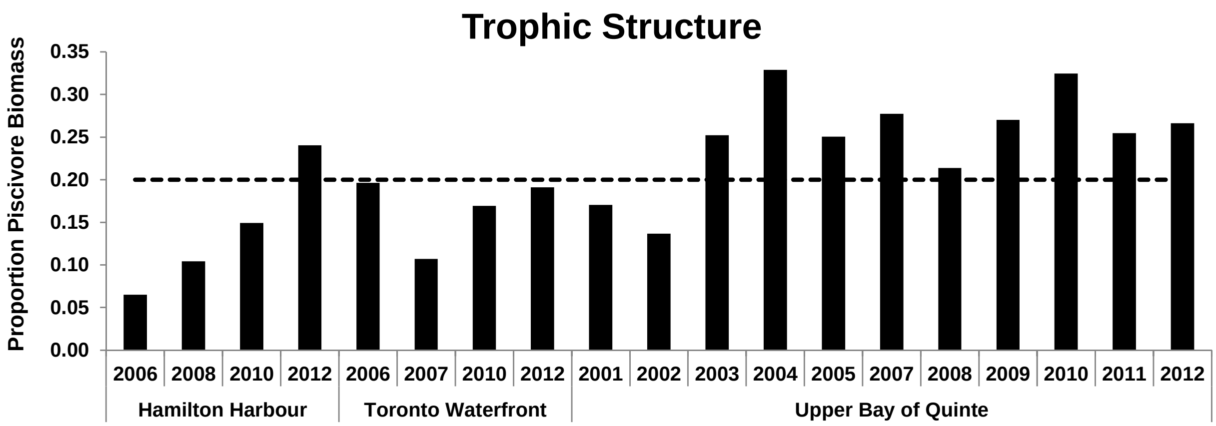


FIG. 2.4.2. (continued) Abundance trends for selected species caught in nearshore trap nets in Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte. Values shown are annual arithmetic means.

trophic structure. The proportion of piscivore biomass in 2012 was 0.24, 0.19 and 0.27 in Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte, respectively (Fig. 2.4.3).

FIG. 2.4.3. Proportion of total fish community biomass represented by piscivore species (PPB) in the nearshore trap net surveys in Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte. A PPB>0.20 is indicative of a balanced trophic structure (depicted by a dashed line). Piscivore species included Longnose Gar, Bowfin, Northern Pike, Smallmouth Bass, Largemouth Bass, and Walleye.



2.5 Lake-wide Hydroacoustic Assessment of Prey Fish

The status of prey fish in Lake Ontario is assessed in hydroacoustic surveys conducted jointly since 1991 by Ontario Ministry of Natural Resources (OMNR) and New York State of Department of Environmental Conservation (NYSDEC). The surveys are conducted in mid-summer and cover the entire lake. The 2012 survey was conducted during the period of July 16-28 aboard two vessels, OMNR's Ontario Explorer, and NYSDEC's Seth Green. Five north-south shore-to-shore transects in the main lake and one transect in the Kingston Basin were completed (Fig. 2.5.1). Acoustic data used to estimate population densities were collected using a Biosonics 120 kHz split-beam echosounder. Floating vertical gill nets were used to collect fish to ground-truth the acoustic information. Additionally, at three locations comparisons were conducted between down-looking and up-looking acoustics as part of an ongoing effort to address sampling issues arising from near-surface distribution of fish.

The 2012 Alewife population estimate was 191 million yearling-and-older fish (Fig. 2.5.2). This is very similar to the estimate from the previous year, and in line with the average level over the last 10 years. Using the average weight of gill net-caught fish, this numeric estimate translates into a biomass estimate of 5,577 MT, which is a 40% increase from the previous year. The increase is, however, almost entirely due to an increase in the average weight of the fish.

The Rainbow Smelt population estimate for 2012 was 63 million yearling-and-older fish (Fig. 2.5.3). This is the lowest estimate in the history of the survey. We did not capture sufficient number of smelt to reliably determine their average weight. Using data from the USGS/NYSDEC spring bottom trawls, leads to a biomass estimate of only 140 MT, with the caveat that the trawl catches contained very high proportion of early-season yearling fish, resulting in an unusually low average weight.

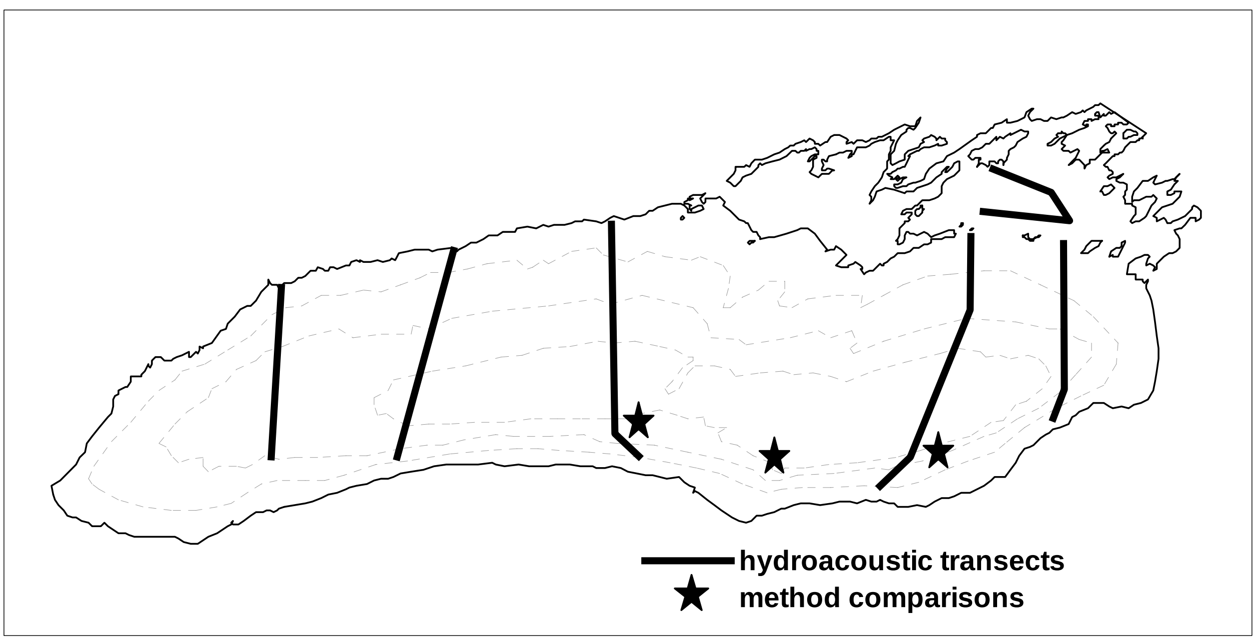


FIG. 2.5.1. The 2012 Lake Ontario hydroacoustic survey.

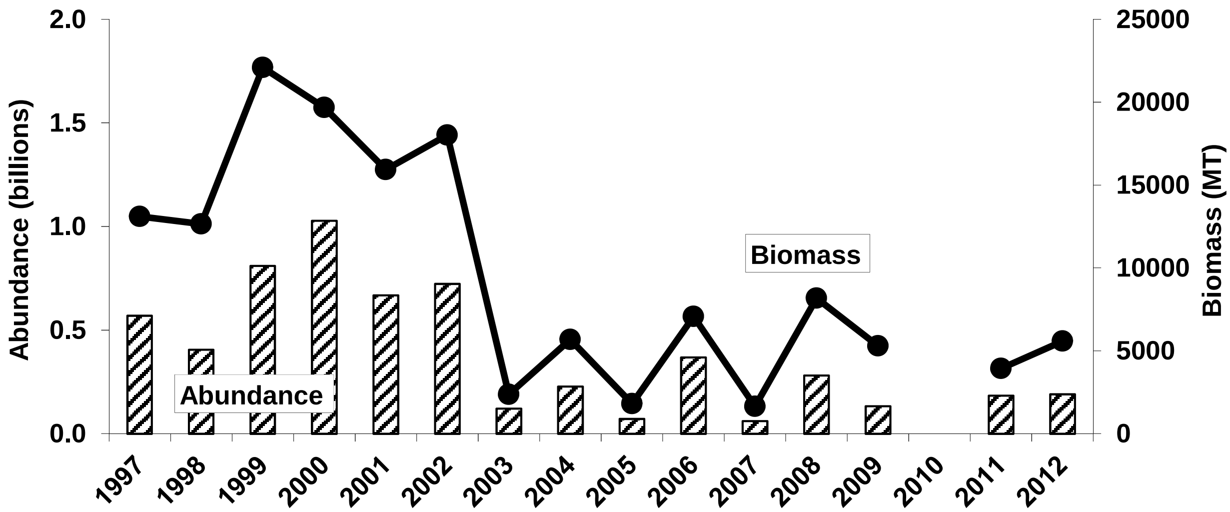


FIG. 2.5.2. Abundance and biomass of yearling-and-older Alewife. Abundance estimates were obtained directly from hydroacoustic surveys, biomass estimates were obtained by applying average weights to abundance estimates. Information on average weights normally comes from midwater trawls done during the surveys, however other sources were used for years 2002, 2004, 2005, 2008, 2009, and 2011. Average weights from vertical gillnets were used in 2012.

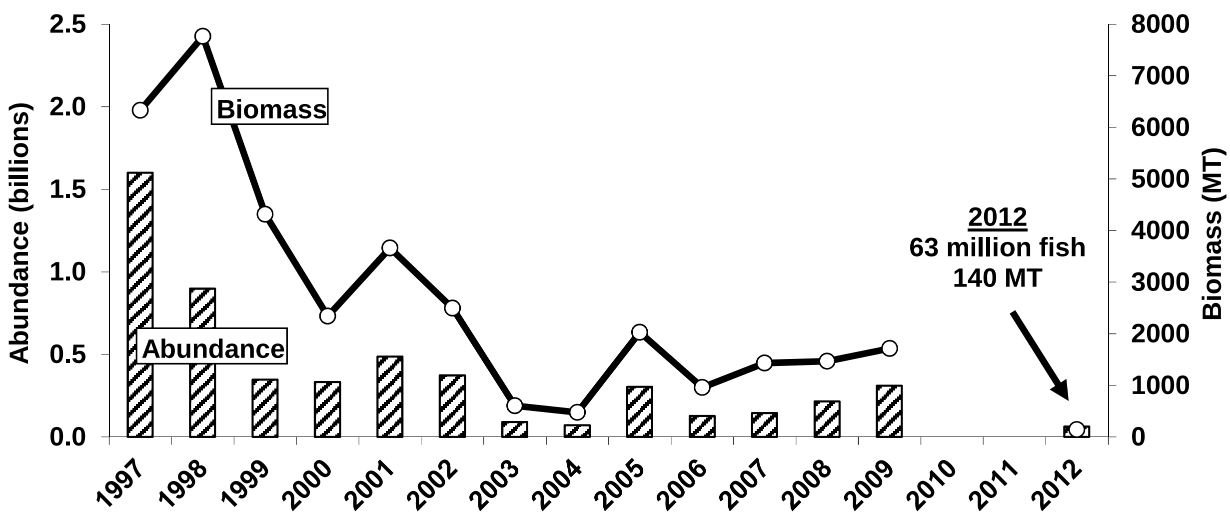


FIG. 2.5.3. Abundance and biomass of yearling-and older smelt. Abundance estimates were obtained directly from hydroacoustic surveys, biomass estimates were obtained by applying average weights to abundance estimates. Information on average weights normally comes from midwater trawls done during the surveys, however other sources were used for years 2002, 2004, 2005, 2008, and 2009. The 2012 average weights were obtained from spring bottom trawling surveys.

2.6 St. Lawrence River Fish Community Index Netting—Lake St. Francis

Every other year in early fall, the Lake Ontario Management Unit conducts an index gillnet survey in Lake St. Francis. The catches are used to estimate abundance, measure biological attributes, and to collect age structures, stomach contents and tissues for pathological and contaminant analysis. The survey is part of a larger effort to monitor changes in the fish communities in four distinct sections of the St. Lawrence River (Thousand Islands, Middle Corridor, Lake St. Lawrence, and Lake St. Francis), and it is coordinated with the New York State Department of Environmental Conservation (NYSDEC) to provide comprehensive assessment of fisheries resources in the St Lawrence River.

In 2012 the survey was conducted during the period of September 10-18. Thirty six sets were made, using standard multi-panel gillnets with monofilament meshes ranging from 11/2 to 6 inches at half-inch increments. The nets were fished for approximately 24 hours. The overall catch was 1,081 fish comprising 14 species (Table 2.6.1). The average number of fish per set was 30.0, down from the record high level in 2008, and similar to levels observed in the 1980s (Fig. 2.6.1). The dominant species in the catch continue to be Yellow Perch (68.7% of the catch), followed by Rock Bass (13.1%), Largemouth Bass (5.1%), Common White Sucker (3.9%), and Walleye (2.6%) (Fig. 2.6.2).

Species Highlights

Catches of Yellow Perch (Fig. 2.6.3) decreased from the record high levels seen in the previous two surveys (2008 and 2010), to a level observed in the 1980s. The proportion of large fish (≥220 mm total length) in the catch in 2012 was quite low (18%), which is similar to the proportion seen

TABLE 2.6.1. Summary of catches per standard gillnet set in the Lake St. Francis community index netting program, 1984-2012. All catches prior to 2002 were adjusted by a factor of 1.58 to be comparable to the new netting standard initiated in 2002. No survey was conducted in 1996.

	1984	1986	1988	1990	1992	1994	1998	2000	2002	2004	2006	2008	2010	2012
Lake Sturgeon	-	-	-	-	-	-	-	0.04	-	0.03	-	0.03	-	0.03
Longnose Gar	-	0.23	0.09	-	0.66	0.26	0.14	0.13	0.40	-	0.06	-	-	0.22
Bowfin	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-
Alewife	0.04	-	-	-	-	-	-	-	0.03	0.06	0.22	-	-	0.14
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	1.67	1.08	0.31	0.19
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	0.97	1.94	1.56	1.17
Moxostoma sp.	-	-	0.04	0.18	0.04	0.09	0.18	0.09	-	-	0.11	0.19	0.14	0.33
Common Carp	0.13	-	-	0.09	-	-	-	-	0.09	-	0.25	0.03	-	-
Golden Shiner	-	-	-	-	-	0.04	-	-	0.03	-	-	-	-	-
Creek Chub	-	-	-	-	-	-	0.09	-	-	-	-	-	-	-
Fallfish	-	-	-	0.09	-	-	-	-	-	-	-	-	-	-
Brown Bullhead	1.14	1.27	0.62	0.40	0.70	0.44	0.95	3.25	0.54	1.38	2.81	1.97	0.56	0.25
Rock Bass	3.52	3.48	2.81	1.36	2.15	2.11	2.58	1.85	2.26	2.17	5.69	7.89	7.03	3.94
Pumpkinseed	4.97	1.72	0.84	0.75	1.49	1.76	1.54	1.06	0.41	0.41	0.89	1.50	0.06	0.33
Bluegill	-	-	-	-	-	-	0.05	0.04	0.10	-	-	-	0.06	-
Smallmouth Bass	0.88	0.63	0.26	0.26	0.62	0.62	1.40	0.44	1.02	0.59	1.17	1.67	0.44	0.47
Largemouth Bass	0.04	-	0.09	0.09	-	0.04	0.09	0.13	0.20	-	0.61	0.31	0.33	1.53
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	16.36	31.03	30.83	20.64
Walleye	0.48	0.45	0.97	0.35	0.35	0.26	0.36	0.31	0.16	0.41	0.39	1.08	1.58	0.78
Freshwater Drum	-	-	-	-	-	-	-	-	0.04	-	-	0.03	-	-
All species	38.64	30.30	32.18	25.72	27.48	25.06	24.96	21.76	13.81	15.04	31.19	48.89	42.89	30.03
Count of species	13	10	14	13	11	13	13	14	16	11	14	13	12	14

in the 1990s, and which preceded a decade of population decline.

Northern Pike catches were the lowest since the start of index netting in 1984 (Fig. 2.6.4). A decline in abundance of small fish (<500 mm total length) was first observed in 1994, followed by a sharp decline in abundance of all sizes in 2002. This pattern is the opposite of the one observed in Yellow Perch, and it suggests a recruitment problem. Northern Pike catches since 2002 remained low, with few small fish, and the 2010-2012 catches suggest a further drop in abundance, down to less than one tenth of the 1980s levels.

Smallmouth Bass abundance was similar to the previous survey in 2010 (Fig. 2.6.5), generally below levels observed in the preceding decade.

Walleye catches fell from the record high in 2010, but remained above the long term series average (Fig. 2.6.5). Other conspicuous changes include an increase in catches of Largemouth Bass, and continued decrease in catches of Brown Bullhead.

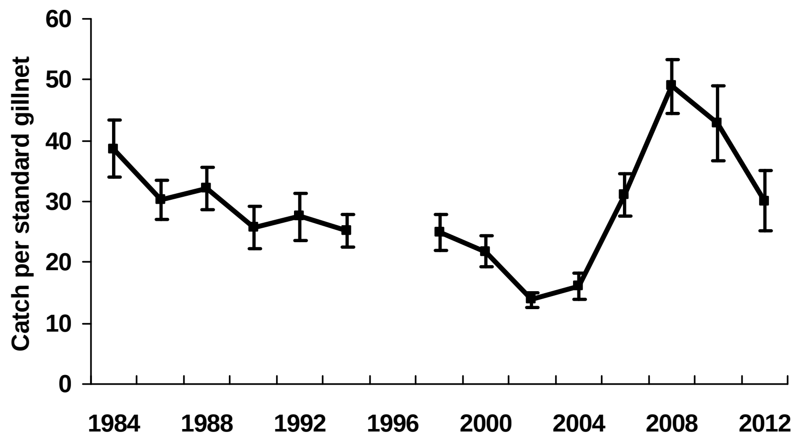


FIG. 2.6.1. Catches (± 1SE) of **all species** combined, Lake St. Francis, 1984-2012.

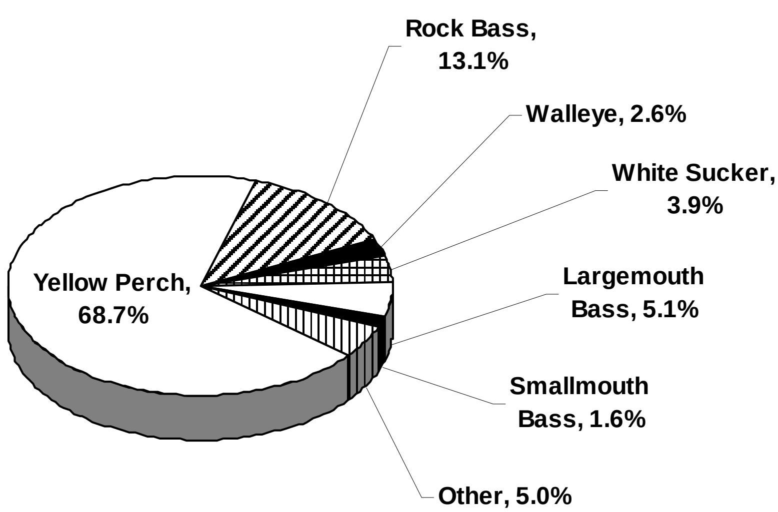


FIG. 2.6.2. Species composition in the 2012 Lake St. Francis community index netting program.

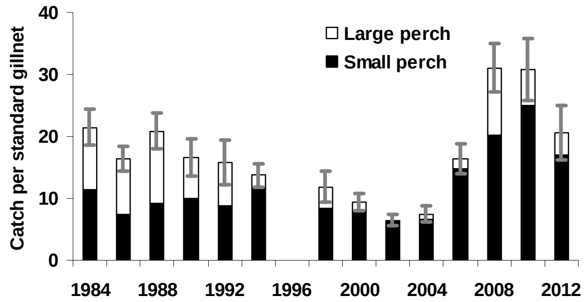


FIG. 2.6.3. Catches of small (<=220mm total length) and large (>220 mm total length) **Yellow Perch** in the Lake St. Francis community index netting program, 1984-2012. Error bars (± 1SE) apply to the total catch (small + large).

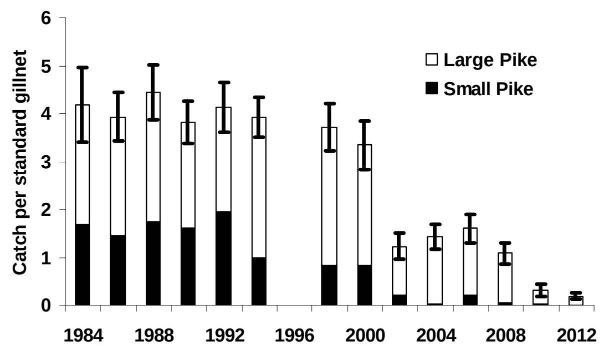


FIG. 2.6.4. Catches of small (<=500 mm total length) and large (>500 mm total length) **Northern Pike** in the Lake St. Francis community index netting program, 1984-2012. Error bars (± 1SE) apply to the total catch (small + large).

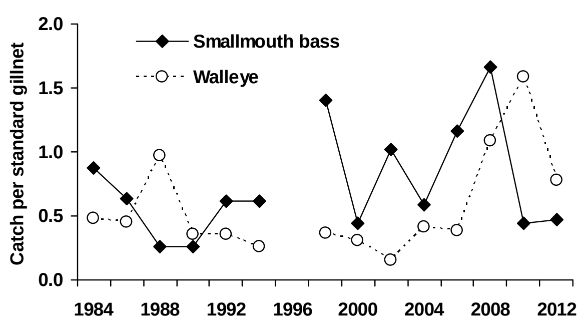


FIG. 2.6.5. Catches of **Smallmouth Bass** and **Walleye** in the Lake St. Francis community index netting program, 1984-2012.

2.7 Credit River Chinook Assessment

Growth, condition, and lamprey marking of Chinook Salmon were monitored during the fall spawning run at the beginning of October in the Credit River at the Kraft dam in Streetsville. Chinook Salmon were electrofished for spawn collection by the Normandale Fish Culture Station. LOMU staff measured the fork length, checked for fin clips and lamprey marks, and collected coded-wire tags from 491 Chinook Salmon; of these 334 were weighed, and otoliths were collected for age determination from 81 fish. In the past this sample has been selective towards larger fish, and so, to obtain a more representative length sample of the spawning run, another 200 fish were measured for fork length and checked for fin clips, prior to sorting for spawn collection and detailed sampling. Chinook Salmon were aged by counting annuli on sectioned otoliths. Length-at-age was calculated as a weighted mean based on the unsorted sample. The body condition was estimated for each sex based on the weight of a 900 mm fish based on a general linear model.

The size at age of Chinook Salmon in the Credit River in 2012 was similar to 2011, and indicated excellent growth in Lake Ontario for both males and females. The fork length of age-2 Chinook Salmon in 2012 (male - 831 mm, female - 812 mm) was the greatest observed since 2000, and the fork length of age-3 Chinook Salmon (male - 905 mm, female - 902 mm) was close to the highest observed in the last decade (Fig. 2.7.1). The condition (weight of a 900-mm fish) of Chinook Salmon in the Credit River in 2012 continued at a low state and for males was the lowest value observed in the 22 year data set. However, the condition of Chinook Salmon in Lake Ontario during August was high (Fig. 2.7.2), similar to the length at age results in the Credit. Over the past decade, the condition of Chinook Salmon in the Credit River and in Lake Ontario has been disconnected. Chinook Salmon condition in Credit River no longer provides an accurate assessment of the state of Lake Ontario, and so we are considering alternative approaches for monitoring predator growth and condition.

Fin clips and coded-wire tags indicated 87% of the Chinook Salmon in the Credit River were stocked and 78% of these were stocked in the Credit River. The majority of strays came from Bronte Creek, the nearest other stocking location (see Section 3.2 for details).

Almost all Chinook Salmon had no lamprey marks. Of the 491 fish examined, only three had one A2 mark, each.

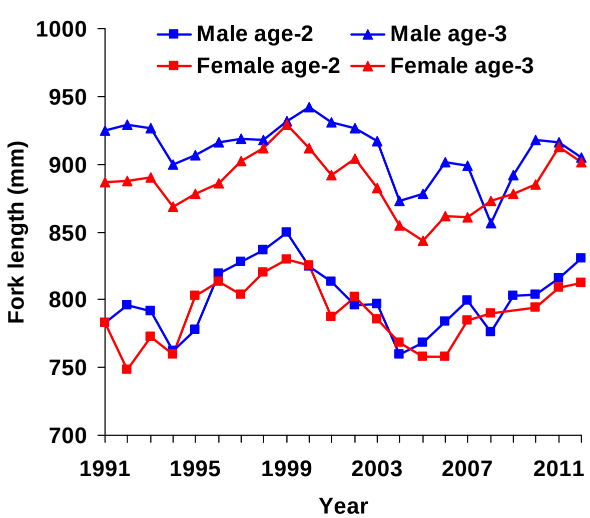


FIG. 2.7.1. Fork length of age-2 and age-3 Chinook Salmon by sex during the spawning run in the Credit River, 1991-2012.

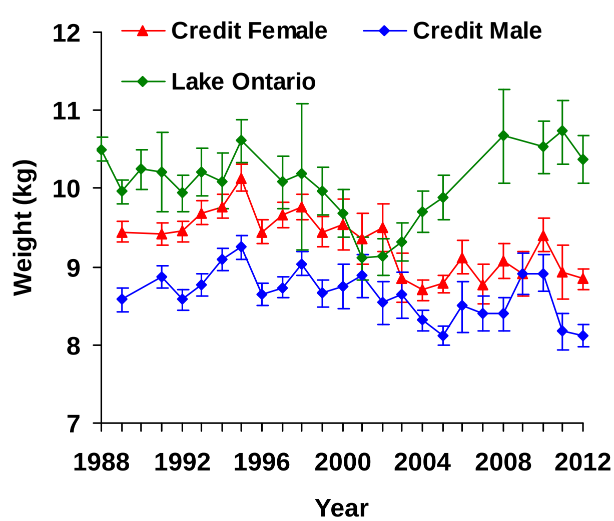


FIG. 2.7.2. Mean weight (+ 95%) of a 900 mm Chinook Salmon in Lake Ontario during August and the Credit River during the spawning run (approximately October 1), 1988-2012.

2.8 Juvenile Atlantic Salmon Parr Survey

In 2012, Atlantic Salmon spring fingerlings (approximately 1.5 g) were stocked in the Credit River and its tributaries (Section 7) to restore self-sustaining populations (Section 8.2). The purpose of this survey was to evaluate growth and survival of Atlantic Salmon parr stocked as spring fingerlings, and in conjunction with smolt surveys (Section 2.9), to evaluate the relative contribution of each reach to the smolt migration.

Atlantic Salmon populations were surveyed at five reaches in the Credit River and Black Creek (Table 2.8.1, Fig. 2.10.1). Atlantic Salmon parr were sampled in October 2012, after most of the year's growth was complete, and when fish size (>100 mm) indicates potential smolting. Atlantic Salmon were captured by electrofishing. For the most part, other species were released upon capture, and were not generally recorded. An exception was made at Black Creek where we counted all fish captured and collected all Brook Trout for sampling. At Black Creek we increased our fishing effort to allow us to make density estimates of salmon and trout (see LOMU 2009 Annual Report). Atlantic Salmon dominated the catch (35%) in Black Creek (Table 2.8.2), and the density (0.3 m^{-2}) was within the restoration target range (0.05-0.5 m^{-2})[1].

Sampling varied from past years with only marking sessions and no recapture sessions. Rather, the time was used to incorporate Passive Integrated Transponder (PIT) tagging into the program. Atlantic Salmon parr were PIT tagged (987) or marked (1,542) using blue or orange Visible Implant Elastomer (VIE) placed behind an eye or under the jaw according to stream reach and age group (Table 2.8.3). Thirty-one (26 age – 0 and five age-1 and older) recaptured Atlantic Salmon had been tagged or marked in 2012 at a nearby location (Table 2.8.3). Two of these fish had moved as much as 1 km in 1 week. Another 12 Atlantic Salmon were recaptured with VIE marks from 2011 (Table 2.8.3), and 11 of these were recaptured at the reach where marked. One recaptured fish from 2011 had moved upstream about 1 km.

Atlantic Salmon parr exhibited two distinct growth patterns in the Credit River (Table 2.8.4). Age-0 parr were smaller at Black Creek (90.5 mm mean fork length) and the West Credit (91.9 mm), and most were less than 100 mm and accordingly, most parr are not expected to smolt in 2013. At the remaining reaches in the Credit most age-0 parr were larger (105.3-113.4 mm), and most parr are expected to smolt in 2013.

[1]*Miller-Dodd, L., and S. Orsatti. 1995. An Atlantic Salmon Restoration Plan for Lake Ontario. Ontario Ministry of Natural Resources. Lake Ontario Assessment Internal Report LOA 95.08. Napanee.*

TABLE 2.8.1. Geo-coordinates (downstream end) and dimensions electrofishing sample sites in 2012. Brimstone was sampled on three days and Black Creek 6th Line on four days; the other sites were sampled on one day.

Reach	Latitude	Longitude	Sample length (m)	Stream width (m)
Meadow (Forks Prov. Park)	43° 48.76'	80° 00.87'	330	9.0
Stuck truck (Forks Prov. Park)	43° 48.63'	80° 00.37'	488	9.9
Brimstone (Forks Prov. Park)	43° 48.17'	79° 59.89'	538	12.1
West Credit Belfountain C.A.	43° 47.77'	80° 00.41'	285	9.8
Black Creek 6th Line	43° 37.82'	79° 56.88'	422	5.9

TABLE 2.8.2. Total catch from all sample days at Black Creek, and estimated number, density and biomass of Atlantic Salmon and Brook Trout.

Species	Age group	Catch	Estimated Number	Density (m^{-2})	Biomass ($g\ m^{-2}$)
Atlantic Salmon	0	522	1212	0.293	2.54
	1 & older	132	256	0.062	1.33
Brook Trout	0	3	7	0.002	0.01
	1 & older	112	213	0.051	2.87
White Sucker		168			
Blacknose Dace		358			
Longnose Dace		17			
Creek Chub		73			
Pumpkinseed		5			
Fantail Darter		64			
Johnny Darter		1			
Mottled Sculpin		393			

TABLE 2.8.3. Number of applied and recaptured PIT tags and VIE marks showing VIE colour and location by Atlantic Salmon age group in 2012.

Reach	Age 0				Age 1 and older				Total number
	Number of PIT	Number of VIE	VIE Colour	VIE Location	Number of PIT	Number of VIE	VIE Colour	VIE Location	
Applied:									
Meadow (Forks Prov. Park)	44	308	Blue	Left Jaw	15	12	Orange	Left eye	379
Stuck truck (Forks Prov. Park)	62	328	Blue	Left Jaw	23				413
Brimstone (Forks Prov. Park)	226	732	Blue	Left Jaw	57				1015
West Credit Belfountain C.A.	10	162	Orange	Right Jaw	15				187
Black Creek 6th Line	411				124				535
Total Applied	753	1,530			234	12			2529
Recaptured:									
Meadow (Forks Prov. Park)		1	Blue	Left Jaw					1
Stuck truck (Forks Prov. Park)		1	Blue	Left Jaw		1	Red	Right Jaw	2
Brimstone (Forks Prov. Park)	2	19	Blue	Left Jaw	3	6	Red	Right Jaw	30
Brimstone (Forks Prov. Park)						1	Red	Left Jaw	1
West Credit Belfountain C.A.									0
Black Creek 6th Line	3				2	4	Purple	Right Jaw	9
Total Recaptured	5	21			5	12			43

TABLE 2.8.4. Mean fork length and weight of Atlantic Salmon by location and age group in 2012.

Reach	Age 0		Age 1 and older		Expect to smolt in 2013
	Length (mm)	Weight (g)	Length (mm)	Weight (g)	
Meadow (Forks Prov. Park)	113.4	19.2	169.6	48.9	78%
Stuck truck (Forks Prov. Park)	106.3	19.2	160.5	46.5	63%
Brimstone (Forks Prov. Park)	105.3	19.5	156.4	44.2	61%
West Credit Belfountain C.A.	91.9	10.6	161.9	45.5	33%
Black Creek 6th Line	90.5	8.7	125.8	21.5	42%

2.9 Credit River Atlantic Salmon Smolt Survey

Monitoring Atlantic Salmon throughout their life cycle is critical to the success of the Lake Ontario Atlantic Salmon Restoration Program. This information is necessary to choose ‘best’ management strategies in the future. Collecting information while salmon are “out-migrating” to Lake Ontario is a critical fisheries reference point, because it represents the outcome of stream-life and allows biologists to compare stream and lake survival.

This is particularly important for the Restoration Program as it is implementing a stocking strategy that is exploring the use of three stocked life stages (spring fingerlings, fall fingerlings, and spring yearlings), and three strains (LeHave, Sebago, and Lac St. Jean). Assessing the relative contribution/survival of the strains and life stages will allow for the optimization of the stocking program. Selecting the best life stage and strain of Atlantic Salmon to stock will in turn improve the chances for restoration.

In 2012, the Lake Ontario Management Unit and Credit Valley Conservation conducted the second year of out-migrant sampling on the Credit River using a Rotary Screw Trap. This report will compare the attributes of out-migrating Atlantic Salmon in both years and provide an update on the out-migrant composition of the 2011 collections. The composition (life stage stocked and strain) of 2011’s catch was determined following DNA extraction from fin tissues and parentage assignment conducted at the Trent University Fisheries Genetic Lab.

2012 Fish Collections

Although the trap is designed to capture out-migrating salmonids, it also captures a variety of species. All species collected in the trap were tallied and bulk weights recorded. Data collected on Sea Lamprey were provided to Sea Lamprey Control—Fisheries and Oceans Canada. In 2012, 6500 fish were collected over an 82-day sampling period and representing 24 species (Table 2.9.1).

TABLE 2.9.1. List of species collected using Rotary Screw Trap, 2012.

Species	Catch
Chinook Salmon	1960
Rainbow Trout (YOY)	1763
Common Shiner	1064
Longnose Dace	537
Atlantic Salmon	338
Rainbow Trout	285
Pumpkinseed	126
Fathead Minnow	97
Blacknose Dace	72
Sea Lamprey	60
Golden Shiner	41
Rainbow Darter	29
Hornyhead Chub	28
Largemouth Bass	18
White Sucker	15
Coho Salmon	13
Creek Chub	13
Smallmouth Bass	11
River Chub	9
Minnow species	8
Bluntnose Minnow	5
Stonecat	3
Fantail Darter	2
Gizzard Shad	1
Brown Trout	1
Emerald Shiner	1
Total	6500

Atlantic Salmon Catches in 2011 and 2012

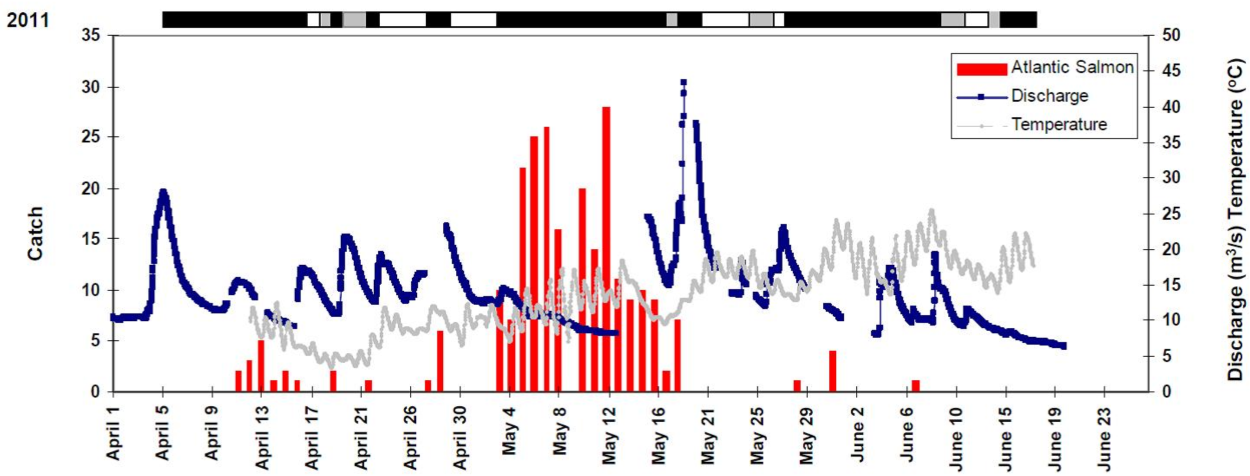
In both years’ biological data (e.g. length, weight, condition) and population data (e.g. abundance, run-timing) on Atlantic Salmon out-migrants were recorded. A proportion of the Atlantic Salmon catch was marked with VIE (Visible Implant Elastomer, Northwest Marine Technologies) and moved 5 km upstream to conduct a mark/ recapture study to obtain an estimate of the total number of out-migrating salmon. Marks were stratified weekly by colour and body location to gain insights on movement timing. Tissue was collected from the upper lobe of the caudal fin for genetic assignment (strain, life stage stocked, year stocked) and to provide an estimate of VIE tag loss.

Ideally sampling would commence before the beginning of out-migration and traps would be operated 24 hours per day 7 days per week with daily monitoring until catches dissipate. However, 2011 was a trial year needed to refine operations. The trap was installed on April 7 and removed on June 17 providing 51 sampling events. In 2012, additional staff were hired to allow for daily operations resulting in 82 sampling events between April 5 and June 26.

The two sampling periods also differed greatly with respect to air temperature and precipitation. 2011 was characterized as a wet and cool spring with mean daily air temperatures of 7.2 °C and total rainfall of 218.8 mm (April 15 to June 1) while 2012 was relatively warmer and dryer with a mean daily air temperature of 13.5°C and total rainfall of 83.4 mm. These conditions resulted in cooler water temperatures (mean 11.7°C) and higher river discharge (mean 14.7 m^3/sec) in 2011 and warmer water temperatures (mean 14.8 °C) and lower river discharge (7.2 m^3/sec) in 2012.

Despite these differences in water temperature and flow regime, the catch timing and peak timing of the out-migration changed little between years (Fig. 2.9.1). In 2011, 50% of the total catch of Atlantic Salmon was captured by May 8 with the highest catch occurring on May 12,while in 2012, 50% of the catch was captured by May 12 with the highest catch occurring on May 10.

More Atlantic Salmon were captured in 2012 than in 2011 (338 and 246 respectively) and more previously tagged fish (recaps) were encountered



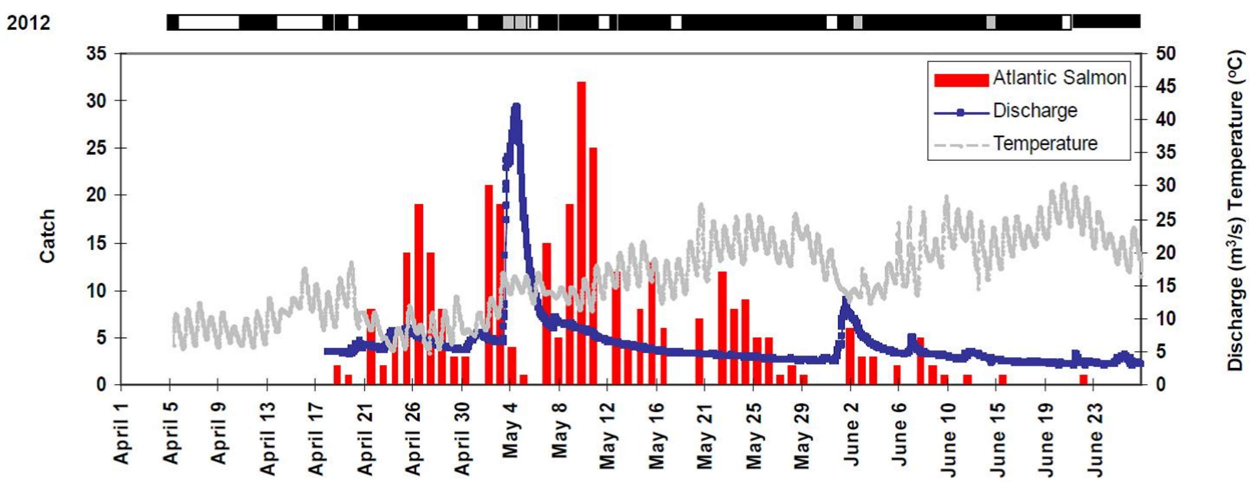


FIG. 2.9.1. Timing of catches of Atlantic Salmon (red bars) in 2011 (top graph) and 2012 (bottom graph) presented against discharge and water temperature profiles*. Note trap activity line at the top of each graph. Black denotes times when trap was fishing well, grey indicates days where operation was sub-optimal, and white indicates periods when the trap was not fishing. Y-axis have the same scale for visual comparison. ***Discharge data collected upstream of trap at Norval by Water Survey of Canada gauge (data incomplete). Water temperature collected on site with onsite temperature probes.***

in 2012 than in 2011 (30 and 11 respectively). This likely reflects the higher trap efficiency resulting from lower discharge (Fig. 2.9.1) and the addition of a crew member allowing more consistent sampling.

The sizes of out-migrating Atlantic Salmon captured at the rotary screw trap were similar between years (Fig. 2.9.2). The mean size of captured out-migrants was 157 cm and 168 cm in 2011 and 2012, respectively.

Composition of the 2011 Catch

Tissue was collected from the upper lobe of the caudal fin on all captured Atlantic Salmon for genetic assignment to determine the strain and stocked life stage. This is obtained through parentage assignment conducted at Trent University. Parentage was determined on 209 of the 228 samples submitted for analysis.

Genetic assessment indicated that all samples were LeHave strain Atlantic Salmon. This is expected as no Atlantic Salmon strains other than LeHave were stocked in the Credit River prior to the 2011 field season.

The parentage assignment indicated that the majority of the fish captured in the spring of 2011 were stocked as spring fingerlings and most of these fish were out-migrating as 1 year old smolts (stocked in 2010; Table 2.9.2).

Fewer Atlantic Salmon that were stocked at advanced life stages (fall fingerlings and spring yearlings) were captured with the gear. Only 25 of the 209 fish assessed were stocked as fall fingerlings and 29 fish as spring yearlings and unlike the spring fingerlings the majority of these fish were out migrating as 2 year old smolts (Table 2.9.2). When examining the size of the fish captured in 2011, the spring fingerlings were also larger on average than the size of the two advanced life stages (fall fingerlings and spring yearlings; Table 2.9.2).

The timing of out migration of the life stages was also examined to see if patterns exist. When catch was partitioned by life stage and smolt year, a difference was detected in the timing of the spring yearling out-migration. Spring yearlings that were smolting after 1 year were captured early in the sampling period (Fig. 2.9.3). This may indicate that spring yearlings that were out migrating as 1 year smolts were moving past the trap location prior to its installation. These fish were stocked in the Credit River at the beginning of March 2011 and could have moved downstream prior to trap deployment. This would result in an under representation of that life stage.

One trapping season is insufficient to interpret the relative success of the early stock life stage (spring fingerlings) when compared to the more advanced life stages. Samples collected from the

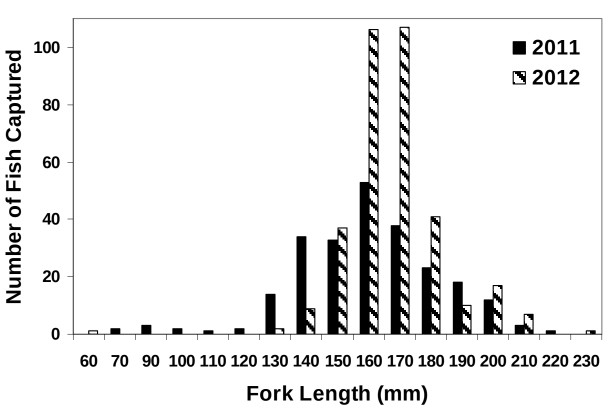


FIG. 2.9.2. Size distribution of Atlantic Salmon captured in the Rotary Screw trap in 2011 and 2012.

TABLE 2.9.2. Numbers of Atlantic Salmon captured in the Rotary Screw trap in 2011. Numbers are separated by fork length categories, smolting year and stocked life stage. Totals and mean size of groupings provided on the bottom of the table.

	Smolt Year 1			Smolt Year 2		
Fork Length (mm)	Spring Fingerling	Fall Fingerling	Spring Yearling	Spring Fingerling	Fall Fingerling	Spring Yearling
70	1	1				
90	1				1	
100	1		1			
110	1					
120	2					
130	7		1	1	5	
140	26		2		2	1
150	24	1		3	1	2
160	29		3	7	5	2
170	14	1		9	1	6
180	1	1		10	4	6
190				10	2	3
200				6		2
210				1		
220				1		
Total	107	4	7	48	21	22
Mean Length	149	142	142	178	154	174

2012 season are being assigned and further sampling is planned for 2013. Sampling will commence in mid March 2013 with hopes of capturing more spring yearlings.

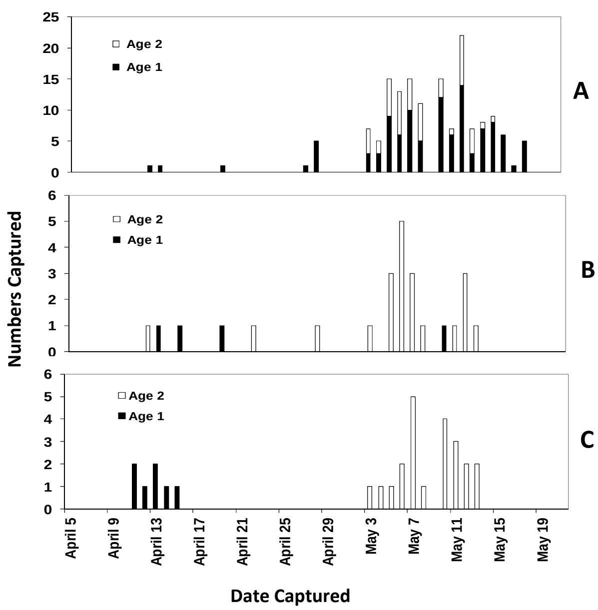


FIG. 2.9.3. Timing of Atlantic Salmon captured in the Rotary Screw Trap in 2011. Catch is separated by stocked life stage: (A) Spring Fingerling, (B) Fall Fingerling, and (C) Spring Yearling. The catch of each life stage is also separated into smolt age.

2.10 Credit River Fishway Atlantic Salmon Assessment

Management efforts are underway to restore Atlantic Salmon to Lake Ontario (Section 8.2). The Lake Ontario Atlantic Salmon Restoration Program was launched in 2006, and restoration efforts have been focused on a few high-quality coldwater streams. The Credit River was selected as one of three streams to restore a self-sustaining wild population of Atlantic Salmon. The Credit River is stocked annually with thousands of Atlantic Salmon (Section 7). After Atlantic Salmon smolts out-migrate to Lake Ontario they will spend at least a year, and likely several more years, feeding and growing until they mature and return to the Credit River to spawn. Fishways at Streetsville and Norval (Fig. 2.10.1) allow for the passage of fish around barriers to gain access to quality spawning habitat and provide an opportunity to count and sample returning adults.
The dam at Streetsville is the first barrier adult Atlantic Salmon face moving upstream on the Credit River, 15 km from Lake Ontario. A step-pool design fishway was constructed at this dam in 1981. This fishway is in place to provide selective passage for salmonids. However, a screen can be placed at the top of the fishway to stop fish from passing through, thereby providing an opportunity to monitor adults in the step pools and the channel below. Due to the step-pool design, only jumping fish are passed through the fishway. Continuing upstream from the dam at Streetsville, the next major obstacle to fish movement is the dam at Norval, 40 km by river from Lake Ontario. A Denil fishway was constructed in 2011 to facilitate fish movement beyond this dam. A cage lowered into the fishway structure enables monitoring of adult Atlantic Salmon, and other species, as they move upstream. This structure is capable of passing all species and sizes of fish.

Assessment of adult Atlantic Salmon moving up the Credit River through the two fishways occurred between June 20 and November 21, 2012. Monitoring of the fishway at Streetsville took place on most weekdays (and occasionally on weekends) from September 10 through November 3. The Streetsville fishway was

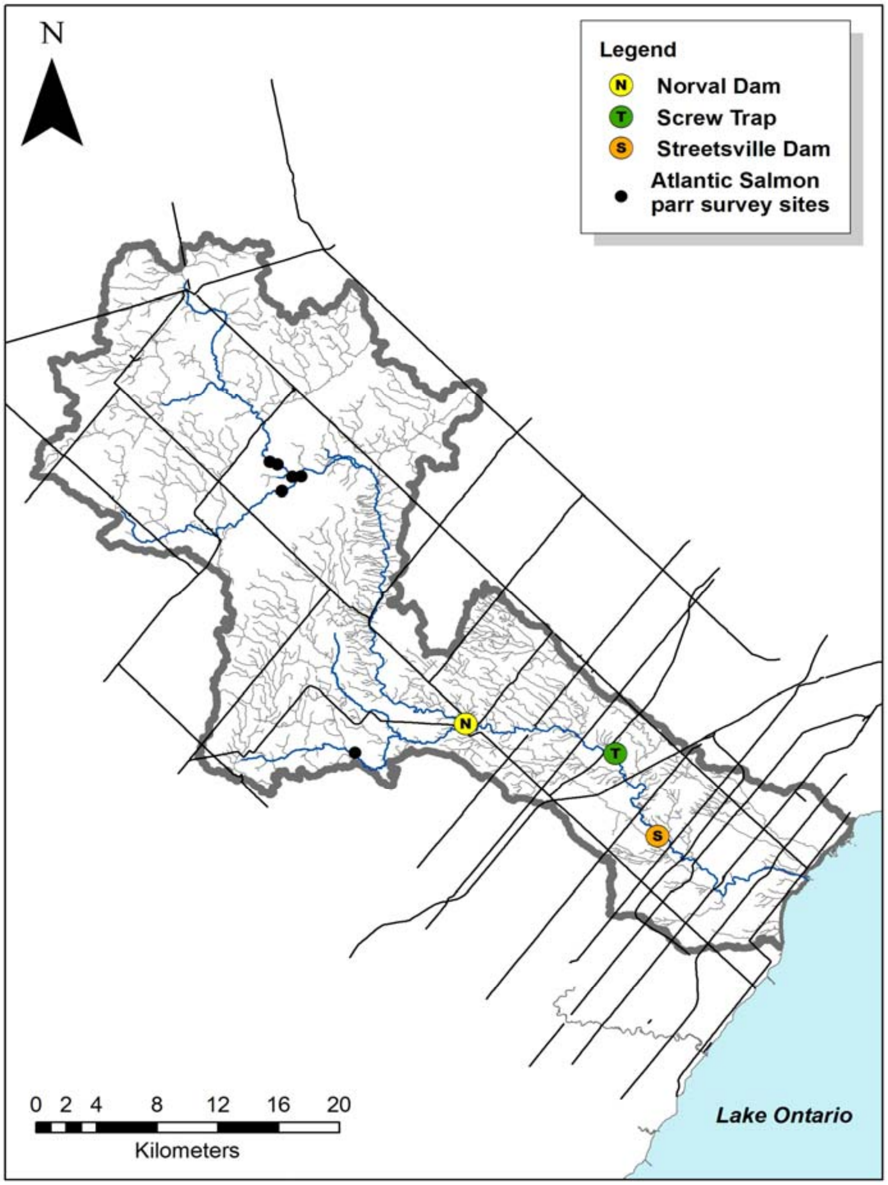


FIG. 2.10.1. Map of the Credit River, Lake Ontario showing locations of the fishways at Norval (N) and Streetsville (S) Dams, the smolt screw trap (T) site (Section 2.9), and Atlantic Salmon parr assessment survey sites ● (Section 2.8).

monitored on 30 occasions during that time. Along with other species (Table 2.10.1), two adult Atlantic Salmon were captured in the fishway.

The fishway at Norval was operated on most weekdays from June 20 until November 21. During that period, the fishway was operated on 87 occasions. Eighteen Atlantic Salmon were captured in the fishway, including one previously caught at the Streetsville fishway. An additional 21 species were also captured at Norval (Table 2.10.2). On the first day of operation, June 20, 3 of the 18 Atlantic Salmon were captured in the fishway pit during a training session. The presence of returning adults in the fishway on the first day of operation, suggest that some Atlantics may be returning prior to the operation of the fishway.

A total of 20 (including one recaptured) adult Atlantic Salmon were caught in the Credit River at Streetsville and Norval fishways in 2012. This is lower than the 29 (including two recaptures) adult Atlantic Salmon caught in the fishways in

TABLE 2.10.1. Numbers of fish caught by species (including recaptures) from fishway at Streetsville in 2012.

Species	Life Stage	Number Caught
Atlantic Salmon	*adult*	2
Brown Trout	*adult*	39
Rainbow Trout	*adult*	82
Coho Salmon	*adult*	389
Chinook Salmon	*adult*	2,165

2011 (Table 2.10.3). However, the number of Atlantic Salmon caught at the Norval fishway increased from 8 in 2011, to 18 in 2012. In contrast, the number of Atlantic Salmon captured in the Streetsville fishway declined from 21 in 2011, to two in 2012. While the Streetsville fishway was operated over a similar period, it is believed that the majority of salmon passed through before the trap screen was placed in the fishway. However, more than half (12/21) of the Atlantic Salmon caught in 2011 at Streetsville were captured in the first week of operation (September 8–14). This distinct peak in the Atlantic Salmon catch in early September, may not have been captured in 2012 as the peak may have occurred prior to September 10th.

We would like to recognize the Ministry of Natural Resources' Aurora District staff for their dedication and hard work in operating the fishways and data collection.

TABLE 2.10.2. Numbers of fish caught by species (includes recaptures) from the fishway at Norval in 2012.

Species	Life Stage	Number Caught
Atlantic Salmon	*adult*	18
	juvenile	16
Brown Trout	*adult*	23
	juvenile	4
Rainbow Trout	*adult*	13
	juvenile	42
Coho Salmon	*adult*	27
	juvenile	7
Chinook Salmon	*adult*	8
	juvenile	1
Common Shiner		4,551
Longnose Dace		252
Blacknose Dace		156
Creek Chub		72
River Chub		19
Hornyhead Chub		3
Fathead Minnow		20
Bluntnose Minnow		68
White Sucker		322
Northern Hog Sucker		44
Brown Bullhead		2
Rainbow Darter		1
Pumpkinseed		130
Rock Bass		1
Largemouth Bass		1

TABLE 2.10.3. Operational details and adult Atlantic Salmon catches at the Streetsville and Norval fishways, 2011-2012.

Year	Fishway	Operational Duration	Number of Days Operated	Adult Atlantic Salmon Captured (recaptures)
2011	Streetsville	Sept 8 - Nov 20	48	21
	Norval	Aug 23 - Nov 25	58	8 (2)
	Total		**106**	**29**
2012	Streetsville	Sept 10- Nov 3	30	2
	Norval	June 20 - Nov 21	87	18 (1)
	Total		**117**	**20**

3. Recreational Fishing Surveys

3.1 Western Lake Ontario Boat Angling Fishery

Stocking of Coho Salmon by New York State and Ontario in the late 1960s created an angling fishery for salmon and trout in Lake Ontario. Chinook Salmon, Rainbow Trout, Atlantic Salmon, Brown Trout, and Lake Trout were later stocked (see Section 7) creating a world-class fishery. Significant natural reproduction of Rainbow Trout and Chinook Salmon has further added to the quality of angling in Lake Ontario. OMNR has surveyed this fishery in most years since 1977. This survey provides the only statistics for this fishery, and catch rates are used to index the abundance of these salmon and trout. Moreover, this survey has provided a broad geographic and seasonal array of biological samples, and is our best source of Chinook Salmon fin clips and coded wire tags for the mass marking study (see Section 3.2).

This fishery was monitored at boat launch ramps during April to September from the Niagara River to Wellington (Fig 3.1.1). The survey design was similar to most previous surveys in the past 3 decades. The survey was stratified by month and spatially by six sectors. Fishing effort was monitored by counting boat trailers at all ramps on a weekly basis. Catch, harvest, and effort information were obtained through anglers interviews at selected high-effort ramps after fishing trips were completed. Interviews were limited to the Niagara and Hamilton sectors in April and May, as past surveys indicated effort was sparse elsewhere during these months. Estimated catch and harvest during the spring in other sectors was based on trailer counts and sampling from other years. Anglers were surveyed in all sectors during June to September. Fishery statistics for marina-based anglers were estimated based on the 2011 marina-based fishery scaled to the 2012 ramp-based fishery.

Angling statistics for the salmon and trout fishery in the Ontario waters of Lake Ontario for 1977 to 2012 are provided in Table 3.1.1. Angling effort in 2012 (509,060 rod-hrs) has not varied greatly since 1994 (Fig. 3.1.2). The catches of Chinook Salmon, Rainbow Trout, Coho Salmon, and Lake Trout in the boat angler fishery in Lake Ontario increased in 2012 to the highest levels since the mid 1990's (Table 3.1.1). Chinook Salmon dominated the catch (50,063), followed by

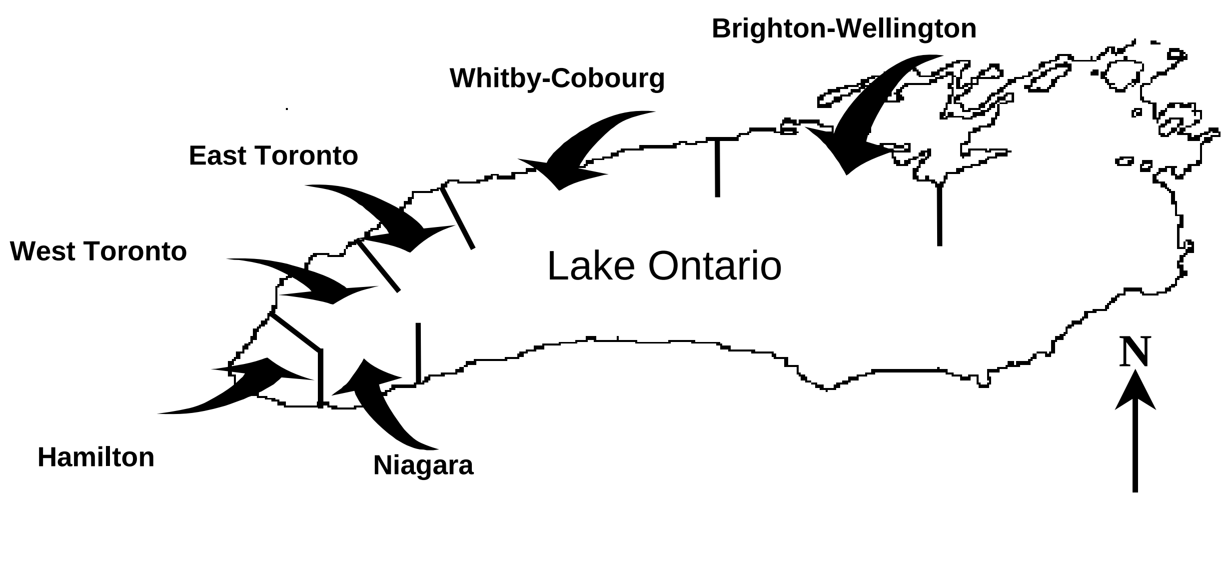


FIG. 3.1.1. Spatial stratification of OMNR angler surveys in Lake Ontario.

TABLE 3.1.1. Angling statistics for the salmon and trout fishery in the Ontario waters of Lake Ontario (excluding Kingston Basin), 1977 to 2012. Note that prior to 1998, rod-hr and angler-hr are equivalent measures of fishing effort; beginning in 1998 anglers had the option of using two rods per angler.

Year	Catch						Harvest						Effort	
	Chinook Salmon	Rainbow Trout	Coho Salmon	Atlantic Salmon	Brown Trout	Lake Trout	Chinook Salmon	Rainbow Trout	Coho Salmon	Atlantic Salmon	Brown Trout	Lake Trout	Rod-hr	Angler-hr
1977	4,047	N/A	72,718	-	N/A	N/A	3,972	N/A	72,586	-	N/A	N/A	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	3,432	7,032	42,147	125,322	83,530	22,239	569	4,108	25,305	1,157,073	
1986	268,877	100,824	43,294	1,843	2,831	24,775	157,675	73,377	29,200	187	1,471	9,013	1,363,082	
1987	155,796	62,565	27,380	455	2,905	21,225	108,024	44,977	12,262	124	1,399	8,391	1,215,219	
1988	112,289	96,008	27,983	1,382	5,542	9,307	74,606	73,561	16,180	140	3,100	3,012	1,233,013	
1989	103,796	52,545	15,082	721	3,029	11,868	71,025	35,230	11,315	491	1,548	3,856	1,010,516	
1990	94,786	84,229	15,906	1,628	2,817	12,201	60,701	67,529	10,516	162	1,040	2,832	1,112,047	
1991	99,841	57,281	17,643	471	7,151	41,277	66,079	38,712	14,574	68	3,119	6,843	1,082,287	
1992	69,959	26,742	3,222	2,516	4,010	7,891	50,182	18,381	1,826	413	1,761	2,997	1,012,822	
1993	111,852	51,733	6,845	1,238	2,174	6,332	64,444	28,738	4,643	288	1,208	3,434	836,572	
1994	66,031	25,227	2,254	203	3,983	13,623	38,170	14,382	1,517	129	2,251	5,443	601,325	
1995	34,791	15,998	1,525	168	1,929	10,603	20,387	9,743	765	139	1,068	3,937	498,743	
1997	43,566	7,077	2,777	35	1,003	10,427	23,890	3,979	1,453	19	619	2,113	508,297	
1998	40,723	25,075	3,541	480	1,204	1,831	25,841	16,766	2,257	316	508	540	473,105	440,653
1999	47,899	26,080	3,669	120	953	7,331	27,542	18,616	3,529	30	387	1,114	593,233	469,117
2000	46,612	9,405	2,095	20	1,502	4,638	27,352	5,284	1,228	12	527	857	588,006	453,065
2001	40,140	16,683	2,689	60	1,508	3,008	18,525	10,828	1,596	0	787	387	505,616	369,407
2002	29,699	10,876	1,702	0	555	445	15,054	7,341	1,442	0	247	94	500,372	366,549
2003	44,500	7,176	2,145	24	914	2,216	15,843	4,437	1,763	12	240	528	411,011	286,384
2004	42,298	4,583	1,288	29	570	2,290	17,263	3,570	1,177	5	135	364	366,349	259,584
2005	42,711	16,154	1,254	83	221	1,214	18,601	15,667	694	83	66	75	474,114	333,952
2008	43,584	25,169	2,310	114	1,522	1,397	11,880	20,730	1,843	14	957	38	521,586	340,255
2011	39,172	25,588	7,128	456	1,392	1,756	17,820	16,185	5,078	254	1,159	642	443,548	293,952
2012	50,063	40,603	18,110	340	926	8,004	19,032	26,616	12,419	48	626	585	509,060	319,576

Rainbow Trout (40,603) and Coho Salmon (18,110). Together they represented about 92% of the total catch. Catch rates for the time series from 1977-2012 shows shifts in salmon and trout populations and the quality of angling in Lake Ontario (Fig. 3.1.3). In 2012 the quality of salmon and trout angling was excellent in Lake Ontario and the combined catch rate for all species of salmon and trout was the highest since 1986.

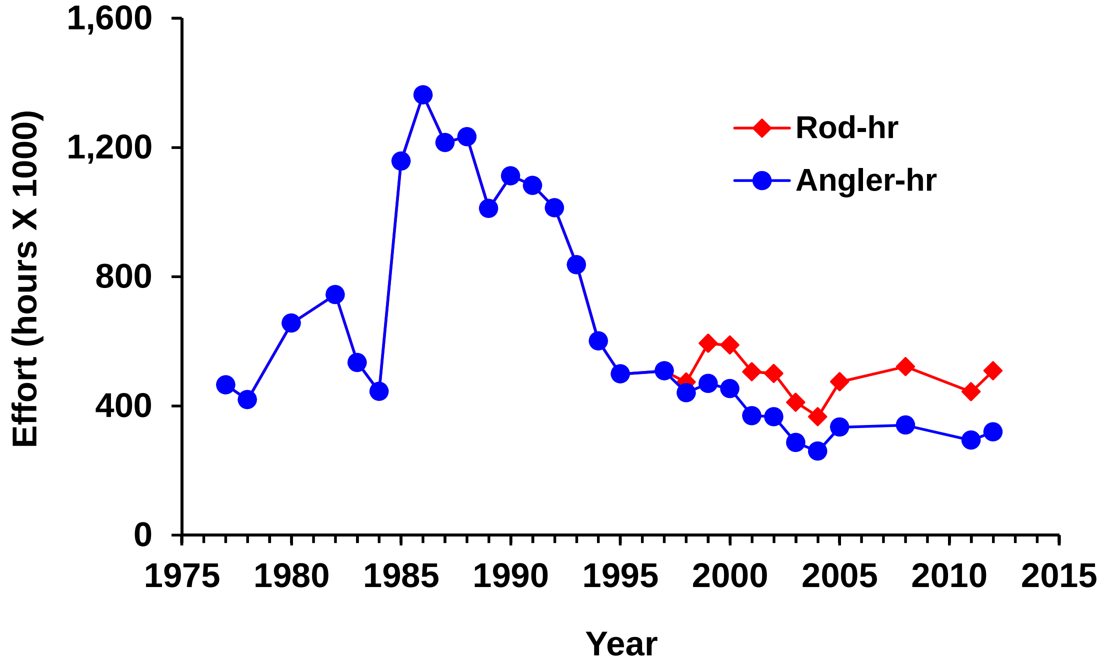


Fig. 3.1.2. The angler effort in the Ontario waters of Lake Ontario (excluding Kingston Basin), 1977 to 2012.

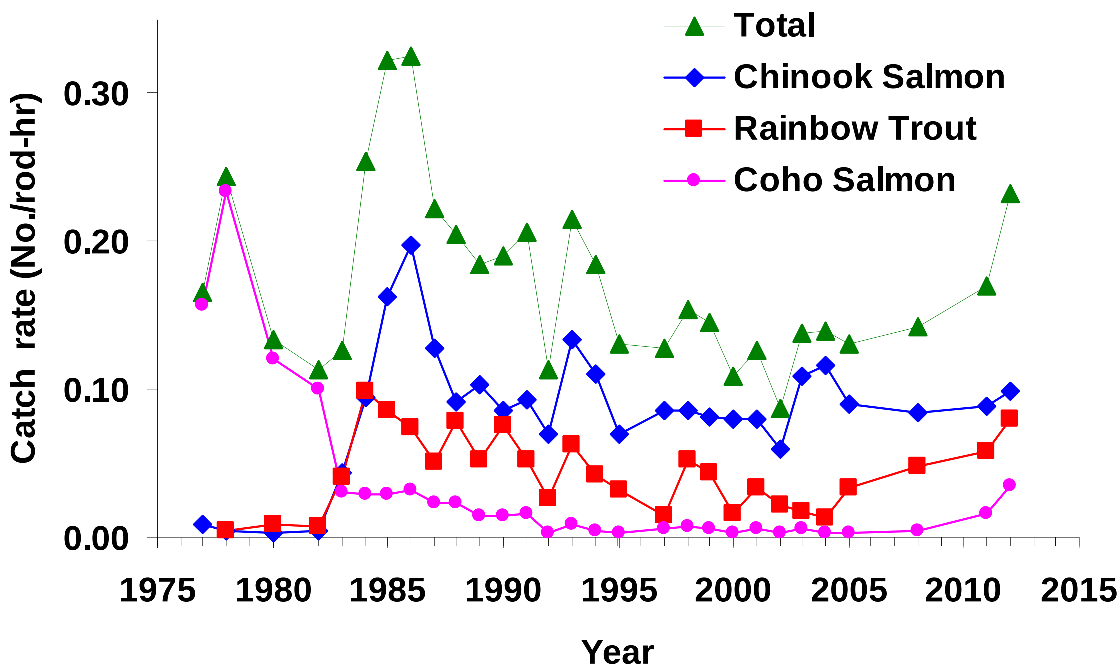


Fig. 3.1.3. The catch rate of salmon and trout in the Ontario waters of Lake Ontario (excluding Kingston Basin), 1977 to 2012.

3.2 Chinook Salmon Mark and Tag Monitoring

This is the third year of a joint assessment by NYSDEC and OMNR of Chinook Salmon fin clips and coded wire tags (CWTs) to determine their origin (stocked or wild), distribution, and movement. Detailed results from OMNR surveys are reported here. NYSDEC and OMNR will be reporting jointly when this project is completed. In 2008, NYSDEC acquired an AutoFish System from Northwest Marine Technology to apply fin clips and coded wire tags to fish stocked in Lake Ontario. NYSDEC and OMNR used this system to mark all Chinook salmon stocked into Lake Ontario from 2008 to 2011 with an adipose fin clip. In addition, some of these fish were tagged internally with a CWT in the nose to designate the agency and stocking location. Accordingly, all stocked Chinook salmon of ages 1 to 4 observed in Lake Ontario in 2012 should be marked.

Chinook Salmon fin clip and CWT results are reported here from five OMNR surveys: i) Western Lake Ontario Boat Angling Survey (Section 3.1), ii) Chinook Salmon Angling Tournament and Derby Sampling (reported here, only), iii) Lake Ontario Volunteer Angler Survey (Section 3.3), iv) Eastern Lake Ontario and Bay of Quinte Fish Community Index Gillnetting (Section 2.2), and v) Credit River Chinook Assessment (Section 2.7). Methods and detailed results from four of these surveys can be found in this Annual Report (Sections indicated in parenthesis). The gill nets effectively caught small Chinook Salmon, and complemented the angler programs that caught larger fish. The gill nets and angling program samples represent a mixed population of Chinook Salmon originating from widespread stocking and tributary spawning locations. The Credit River Chinook Assessment targeted fish returning to spawn only in the Credit River.

Angling Tournament and Derby Sampling was conducted alongside the Western Lake Ontario Angling Survey from April to August, 2012 at selected boat ramps and marinas. One sample was collected in partnership with the Toronto Zoo. Chinook Salmon were measured, weighed, and examined for fin clips and CWTs. A subsample of Chinook Salmon otoliths and noses were collected for age determination and for CWT extraction, respectively. Ages were obtained by counting annuli on 137 thin sectioned otoliths from Chinook Salmon. Age distributions on the remaining Chinook Salmon were obtained with monthly stratified age-length keys combining these and 159 known-age fish based on CWTs.

In the Angler Surveys a total of 877 Chinook Salmon aged 1-3 were sampled in 2012 (Table 3.2.1). During 2011 and 2012 volunteer anglers measured 4,061 Chinook Salmon from the 2008 to 2011 year classes (Table 3.2.1). The ages were based on the age-length keys from the Angler Surveys. The origin of stocked fish results from the angler diaries and the other programs were consistent.

TABLE 3.2.1. Catch of Chinook Salmon in index gill nets by fin clip and year class during 2008-2012, showing percent stocked origin.

Year		Gill Nets					Angler Surveys			Angler Diaries			Percent
class	Fin clip	2008	2009	2010	2011	2012	2010	2011	2012	2011	2012	Total	Stocked
2008	No clip	0	1	1	0	0	42	35	0	124	0	203	67%
	Adipose	3	2	1	1	0	53	76	0	281	0	417	
2009	No clip	-	2	12	1	1	56	106	147	315	355	995	53%
	Adipose	-	0	18	3	0	102	142	114	430	328	1137	
2010	No clip	-	-	7	43	1	3	72	263	465	515	1369	42%
	Adipose	-	-	3	14	0	0	48	176	326	412	979	
2011	No clip	-	-	-	3	4	-	3	61	-	195	266	63%
	Adipose	-	-	-	11	4	-	0	116	-	315	446	
Total		3	5	42	76	10	256	482	877	1941	2120	5812	

No age-4 Chinook Salmon were observed in 2012. The percent of stocked Chinook Salmon varied among the four year classes from 42% (2010 year class) to 67% (2008 year class, Table 3.2.1). This pattern is not correlated with numbers stocked; it is unclear if this pattern is related to variation in survival of stocked Chinook Salmon or in natural reproduction.

CWTs were retrieved from 225 Chinook Salmon in the angler surveys in western Lake Ontario (Table 3.2.2) and from a single fish in Kingston Basin gillnets (Section 2.2) that was stocked at Eighteenmile Creek. One clear pattern emerges from these data: younger Chinook Salmon (age 0 and 1) including those stocked in New York State use the north shore of Lake Ontario as nursery

TABLE 3.2.2. Number of angler-caught Chinook Salmon with coded wire tags in 2012 by stocking and capture locations (for a map of capture locations, see Section 3.1, Fig. 3.1.1).

		Capture Location					
Stocking year	Stocking location	Niagara	Hamilton	West Toronto	East Toronto	Whitby-Cobourg	Brighton-Wellington
2009	Salmon River	3		3	5	3	2
	Port Dalhousie	3	1			2	
	Burlington Canal					1	
	Bronte Creek	1					
	Credit River				1	2	
	Bluffer's Park					1	
	Bowmanville Creek				1		
2010	Sandy Creek	3	1		1	1	
	Salmon River	5		6	10	7	2
	Oswego River	1		1	2	3	1
	Little Sodus Bay			1	1		
	Sterling Creek			1		1	
	Sodus Bay	1		1	5	2	2
	Genesee River	4	1	2	4	2	1
	Oak Orchard Creek	4		4	2		1
	Eighteenmile Creek	6		3	4	3	
	Niagara River NY	4	1	2	2	2	2
	Niagara River ON	1		1	1	1	
	Port Dalhousie					1	
	Burlington Canal					1	
	Bronte Creek	2				1	
	Credit River			1	1		
	Bluffer's Park				1		
	Bowmanville Creek	1	1		1		1
2011	Salmon River				1		
	Oswego River		2	1		1	1
	Little Sodus Bay			1			
	Sodus Bay		1				
	Genesee River	2	2	2	4		2
	Sandy Creek			1		2	
	Oak Orchard Creek	2	1	3		2	5
	Eighteenmile Creek	1	3	7	3		4
	Niagara River NY	2	2	2		1	1
	Port Dalhousie			1	1		
	Burlington Canal			1			
	Bronte Creek		1				1

and juvenile habitat. Chinook Salmon stocked by Ontario show up along the Ontario shoreline in greater numbers at age 2 and 3, likely on their return to spawn.

Four hundred and ninety-one (491) Chinook Salmon were sampled in the Credit River as part of the spawn collection for Normandale Fish Culture Station. Most of these fish were age 1-3 and 87% had an adipose clip consistent with a small amount of natural reproduction in the Credit River during 2009-2011 (Table 3.2.3). Ninety-five (95) CWTs collected from these fish indicated that 78% were stocked in the Credit River (Table 3.2.4). Salmon usually imprint to the stream where they were raised or stocked, and so straying from other locations was higher than expected. Most strays came from Bronte Creek, but a small number of strays were observed from the south shore from Hamilton to Sterling Creek, NY, at the eastern end of Lake Ontario.

TABLE 3.2.3. The number of stocked and wild Chinook Salmon by year-class observed in the Credit River in 2012.

Year Class	Origin	Number	Percent Stocked
2009	Stocked	190	84%
	Wild	37	
2010	Stocked	206	89%
	Wild	26	
2011	Stocked	30	94%
	Wild	2	

TABLE 3.2.4. Number of Chinook Salmon observed with coded wire tags in the Credit River in 2012 by stocking location.

Year Class	Stocking Location	Number	Straying Rate
2009	Credit River	28	26%
	Bronte Creek	8	
	Burlington Canal	1	
	Port Dalhousie	1	
2010	Credit River	38	21%
	Bronte Creek	6	
	Niagara River NY	1	
	Niagara River ON	1	
	Oak Orchard Creek	1	
	Sterling Creek	1	
2011	Credit River	8	11%
	Bronte Creek	1	

3.3 Lake Ontario Volunteer Angler Diary Program

A Chinook Salmon mass-marking and tag monitoring study started in 2008 by NYSDEC and OMNR, to determine their origin (stocked or wild), distribution, and movement (Section 3.2). All Chinook Salmon stocked into Lake Ontario from 2008-2011 were marked with an adipose fin clip and a portion were also tagged with a coded-wire tag. Lake Ontario anglers have been contributing to the collection of data on these marked Chinook Salmon through a volunteer diary program. Since 2011, a volunteer dairy program, geared specifically to collect information on the marking rates of Chinook Salmon in the recreational fishery, has been conducted. Sampling occurred during the months of April to October from the Niagara River to Wellington; providing good temporal and spatial distribution of Chinook Salmon samples.

In 2012, 31 anglers participated in the program. Seventy-seven percent (24) of volunteer anglers were affiliated with an angling club, 16% (5) were anglers at large, and 7% (2) were charter boat operators. There was a large spatial distribution of participating anglers (Fig. 3.3.1). Anglers were asked to record location (nearest port), fork length (FL), disposition (kept or released), and examine for fin clips on every Chinook Salmon landed. In 2012, anglers made 645 angling trips and recorded marking data on 2236 Chinook Salmon (Table 3.3.1).

Reported catches of Chinook Salmon varied in length from 200 mm to 1175 mm FL; with the majority of fish over 700 mm FL (Fig. 3.3.2). Ages were obtained by converting fork lengths using monthly stratified age-length keys. Chinook Salmon origin (% stocked) was determined for the four year classes (2008-2011) from the 2011 and 2012 angler dairies (Table 3.3.2). The percentage of stocked Chinook Salmon varied among the four year classes from 43% (2010 year class) to 69% (2008 year class). It is unclear if this variable pattern is related to variation in survival of stocked Chinook Salmon or in natural reproduction. See Section 3.2 for further details on the origin of Chinook Salmon in Lake Ontario.

We would like to thank all those dedicated anglers and angling clubs who generously volunteered their time to collect marking information on Chinook Salmon for this program.

FIG. 3.3.1. Spatial distribution of anglers participating in the 2012 Lake Ontario Volunteer Angler Dairy Program.

TABLE 3.3.1. Annual angler participation and spatial distribution of Chinook Salmon captured in the Lake Ontario Volunteer Angler Diary Program, 2011-2012. See Section 3.1 (Fig. 3.1.1) for a map of the six defined areas.

Survey Year	Number Volunteer Anglers	Number of Trips	Chinook Salmon Captures							
			Niagara	Hamilton	West Toronto	East Toronto	Whitby-Cobourg	Brighton-Wellington	Undefined	Total
2011	26	626	757	19	370	120	309	635	47	2,257
2012	31	645	676	195	367	39	324	488	147	2,236
Total	57	1,271	1,433	214	737	159	633	1,123	194	4,493

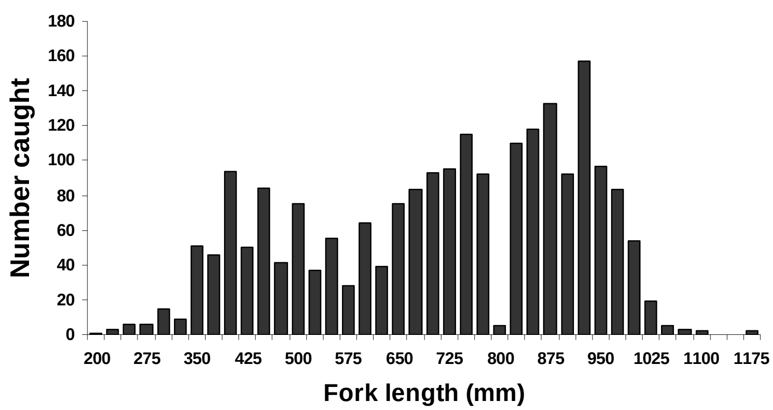


FIG. 3.3.2. Fork length distribution of Chinook Salmon caught in the 2012 Lake Ontario Volunteer Angler Dairy Program.

TABLE 3.3.2.Chinook Salmon origin from the 2011-2012 Lake Ontario Volunteer Angler Diary Program, showing percentage stocked by year class. Chinook Salmon with "No Clip" are wild and fish with an adipose fin clip (AD Clip) are stocked.

Sampling Year	2008 Year Class				2009 Year Class				2010 Year Class				2011 Year Class			
	Age	No Clip	AD Clip	% Stocked	Age	No Clip	AD Clip	% Stocked	Age	No Clip	AD Clip	% Stocked	Age	No Clip	AD Clip	% Stocked
2011	3	124	281	69%	2	315	430	58%	1	465	326	41%	0+	0	0	-
2012	4	0	0	-	3	355	328	48%	2	515	412	44%	1	195	315	62%
Total		124	281	69%		670	758	53%		980	738	43%		195	315	62%

3.4 Credit River Angling Survey

Located just west of Toronto, the Credit River travels through a densely populated area of southern Ontario. It is nearly 90 km long; from its northern head waters in Orangeville to its outflow into Lake Ontario at Port Credit (Fig. 3.4.1). The Credit River is an integral component of fisheries management on Lake Ontario. Anadromous salmon species that migrate up the Credit River to spawn are the main source for wild gamete collections by provincial and partnership fish hatcheries. Thousands of salmon and trout are stocked into the Credit River annually (see Section 7) to maintain a function as top predators on Alewife in Lake Ontario and to provide recreational angling opportunities in the lake and its tributaries. The Credit River has also been selected as a tributary to re-established self-sustaining populations of Atlantic Salmon (see Section 8.2).

OMNR conducted a roving angler survey on the lower Credit River from July 1 to November 30, 2012 to assess the shore, pier, and stream-based recreational fisheries. The sampling design had seasonal stratification to account for temporal variation in the fish community, length of day light hours, and day light savings time (Table 3.4.1). For the ease of scheduling and to randomize sampling effort, the lower Credit River was spatially stratified into nine areas from the Streetsville Dam to the mouth of Port Credit (Fig. 3.4.1). Anglers were interviewed during their fishing trips and asked a series of questions.

Over 800 anglers were interviewed by field staff throughout the survey. Anglers caught 19 different species (Table 3.4.2). Anglers generally did not travel great distances to participate in the recreational fishing opportunities on the lower Credit River. Average travel was 28 km (1-500

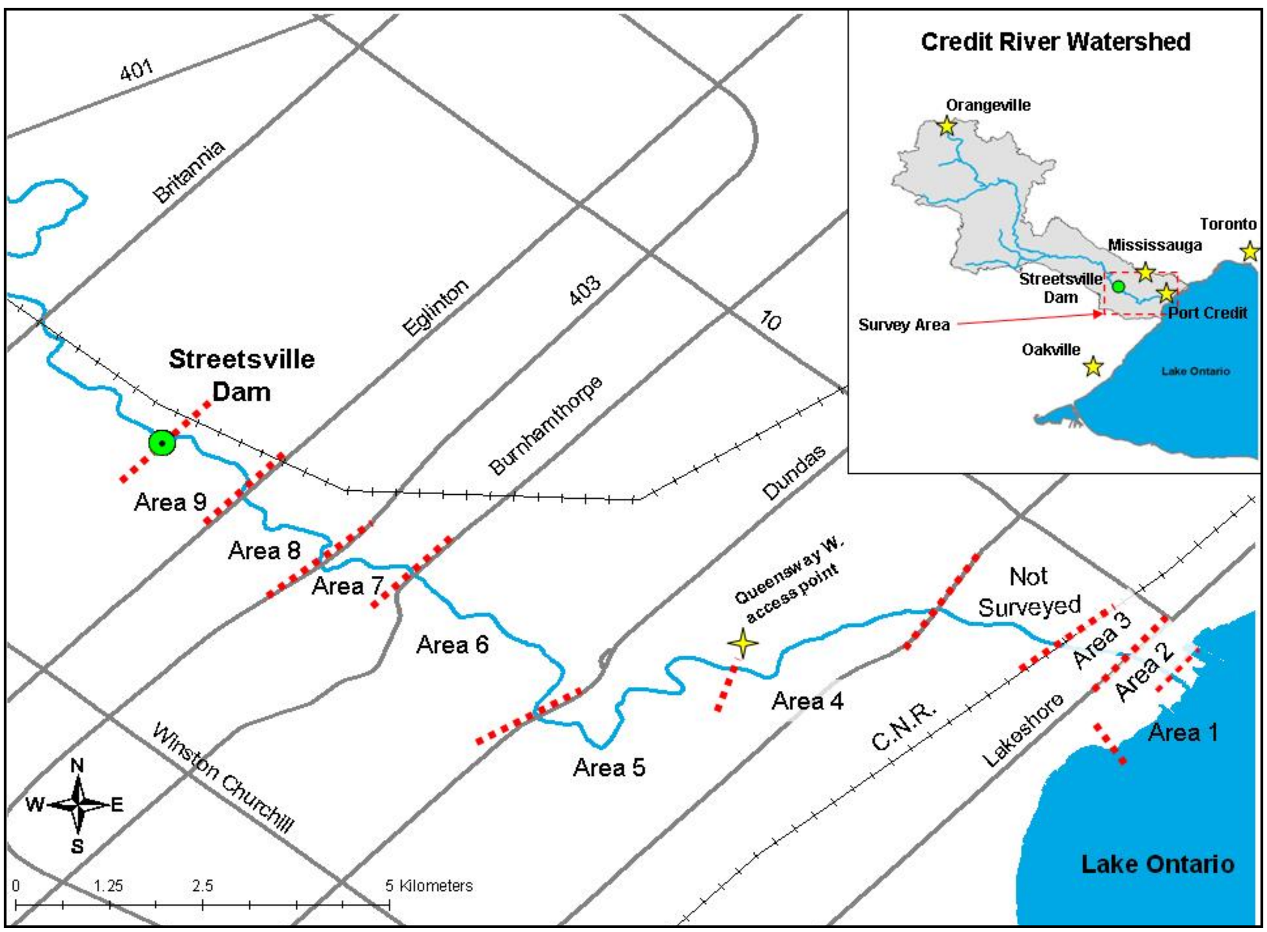


FIG. 3.4.1. Spatial stratification of the 2012 Credit River angler survey.

TABLE 3.4.1. Seasonal and spatial distribution of estimated angling effort on the lower Credit River, 2012.

	Angling Effort (angler hrs)				
Area	July 1- Aug 31	Sept 1 - Sept 30	Oct 3 - Nov 3	Nov 4 - Nov 30	Total
1	5,855	2,843	384	0	9,081
2	2,839	1,497	55	0	4,390
3	300	1,549	374	0	2,223
4	532	234	885	1,719	3,369
5	630	3,143	1,940	1,742	7,455
6	2,203	19,518	1,756	3,666	27,142
7	532	2,392	1,135	1,056	5,114
8	100	0	0	0	100
9	151	0	0	0	151
Total	13,141	31,174	6,528	8,182	59,025

km, n= 821) and 90% of all anglers traveled less than 50 km (Fig. 3.4.2). Estimated angling effort was 59,025 angler hours. Angling effort varied with seasonal changes in the fish community. Angling effort peaked in the month of September, where anglers fished for an estimated 31,174 angler hours, which represented over 50% of the total angling effort.

Anglers caught and harvested an estimated 17,247 and 2,624 fish, respectfully. There were distinct seasonal changes in angler catches. Warm-water fishes were most predominant in angler catches for the survey period of July 1 – Aug 31, with Smallmouth Bass being the most commonly captured species. Chinook Salmon and other unidentified salmon and trout species were the two largest components of angler catches during the month of September and represented 32% (5601 fish) of the estimated total catch for the entire survey. Rainbow Trout were the most commonly caught species during the months of October and November.

Anglers released 85% of their catch. The only salmon and trout species harvested were Chinook Salmon (794 fish, 30% of the estimated total harvest) and Rainbow Trout (302 fish, 12% of the estimated total harvest). All other salmon and trout species had 100% release rates. A total of 51 Atlantic Salmon were estimated to be captured by anglers, all of which were captured in September. There were anecdotal reports that anglers were commonly catching Atlantic Salmon in the spring, prior to the start of the angler survey. During the creel interviews, anglers were asked “How many Atlantic Salmon have you landed on the Credit River this year?” Out of 117 interviews conducted during the months of July and August, 26 Atlantic Salmon were reported landed since Jan 1, 2012.

We would like to acknowledge the hard work, dedication, and enthusiasm of the Ministry of Natural Resources’ Aurora District staff (Aaron Law, Robert McGowan, Scott McGill, and David Beilhartz) while carrying out the field work for this program.

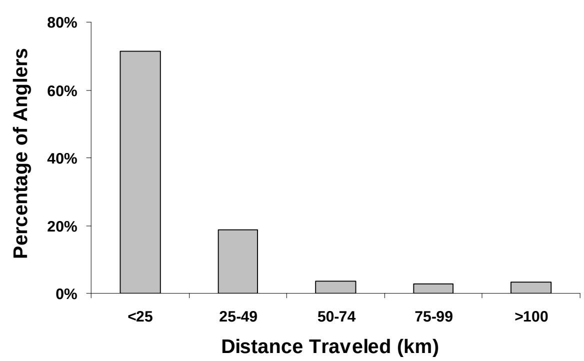


Fig. 3.4.2. Distance traveled (km) by anglers to fish the lower Credit River, 2012.

TABLE 3.4.2. Estimated angling statistics for the recreational fishery on the Credit River downstream from Streetsville Dam, 2012

	Jul 1 - Aug 31		Sep 1 - 31		Oct 1 - Nov 3		Nov 4 - 30		Total Survey Period			Targeted Angling Statistics		
Species	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Release Rate (%)	Effort (angler-hr)	Catch Rate (fish/ angler-hr)	Harvest Rate (fish/ angler-hr)
Coho salmon	0	0	23	0	77	0	0	0	100	0	100%	750	0.047	0.000
Chinook salmon	131	0	3,177	740	256	54	0	0	3,564	794	78%	10,851	0.308	0.073
Rainbow trout	0	0	204	48	979	26	2,803	228	3,985	302	92%	15,813	0.251	0.018
Brown trout	92	0	0	0	129	0	69	0	290	0	100%	1,728	0.164	0.000
Brook trout	0	0	51	0	0	0	0	0	51	0	100%	1,499	0.034	0.000
Atlantic salmon	0	0	51	0	0	0	0	0	51	0	100%	0	N/A	N/A
Unidentified Salmon/Trout	0	0	2,424	238	64	54	0	0	2,488	292	88%	18,021	0.138	0.016
Northern pike	92	0	0	0	0	0	0	0	92	0	100%	50	1.817	0.000
White sucker	59	59	1,602	15	0	0	160	0	1,820	74	96%	266	0.327	0.278
Carp	0	0	21	0	11	0	0	0	32	0	100%	1,216	0.027	0.000
River chub	59	59	0	0	0	0	0	0	59	59	0%	225	0.261	0.261
Common shiner	59	59	122	122	190	190	0	0	370	370	0%	292	1.269	1.269
Brown Bullhead	417	0	15	15	0	0	0	0	51	15	70%	20	0.753	0.753
Unidentified Catfish	36	0	0	0	6	0	0	0	423	0	100%	264	0.000	0.000
Rock bass	92	92	0	0	0	0	0	0	92	92	0%	0	N/A	N/A
Smallmouth bass	1,766	96	0	0	0	0	0	0	1,766	96	95%	819	2.075	0.118
Largemouth bass	59	59	0	0	0	0	0	0	59	59	0%	225	0.261	0.261
Yellow perch	71	0	171	30	0	0	0	0	242	30	88%	54	0.499	0.000
Round goby	545	289	83	0	0	0	0	0	628	289	54%	267	2.041	1.081
Freshwater drum	11	0	0	0	0	0	0	0	11	0	100%	34	0.331	0.000
Unknown species	476	0	568	152	0	0	29	0	1,073	152	86%	14,796	0.071	0.010
Total	3,962	711	8,513	1,361	1,712	324	3,061	228	17,247	2,624	85%	67,188	0.212	0.037

3.5 Bay of Quinte Open-water Angling Fishery

The Bay of Quinte open-water recreational angling fishery was monitored—for the first time since 2008—from May 5 (Walleye angling “opening-weekend” until November 30, 2012. A roving survey design was employed from Trenton in the upper Bay of Quinte to the upper gap to Lake Ontario in the lower Bay of Quinte (Fig. 3.5.1). Angling effort was measured using on-water fishing boat activity counts. Boat angler interviews provided information on catch/harvest rates and biological characteristics of the harvest. The survey consisted of sampling on 2 days per week (one week day and one weekend day). Sampling was stratified by geographic area (14 areas; Fig. 3.5.1), season (seven seasons: (1) May 5 and 6, (2) May 7 to Jun 3, (3) Jun 4 to Jun 23, (4) Jun 24 to July 29, (5) July 30 to September 3, (6) Sep 4 to Oct 14, and (7) Oct 15 to Nov 30), and day-type (week days and weekend days).

Over 2,486 anglers in 1,076 boats were interviewed by field crews during the survey (Table 3.5.1). Thirty-three percent of anglers interviewed were local, 55% were from Ontario (outside the local area), 5% were from the US, 6% were from elsewhere in Canada, and 1% was from elsewhere. Total angling effort was estimated to be 235,938 angler hours for all anglers. Anglers caught 19 different species (Table 3.5.2).

Table 3.5.1. Total estimated angling effort (angler hours), number of boats and anglers interviewed, number of anglers per boat, and number of rods per angler for the open-water recreational fishery on the Bay of Quinte, 2012. Note that the use of 2-lines is only permitted east of Glenora (survey areas 90 and 89; Fig. 3.5.1).

Total angling effort (hours)	235,938
Number of boats interviewed	1,076
Number of anglers interviewed	2,486
Anglers per boat	2.31
Rods per angler	1.09

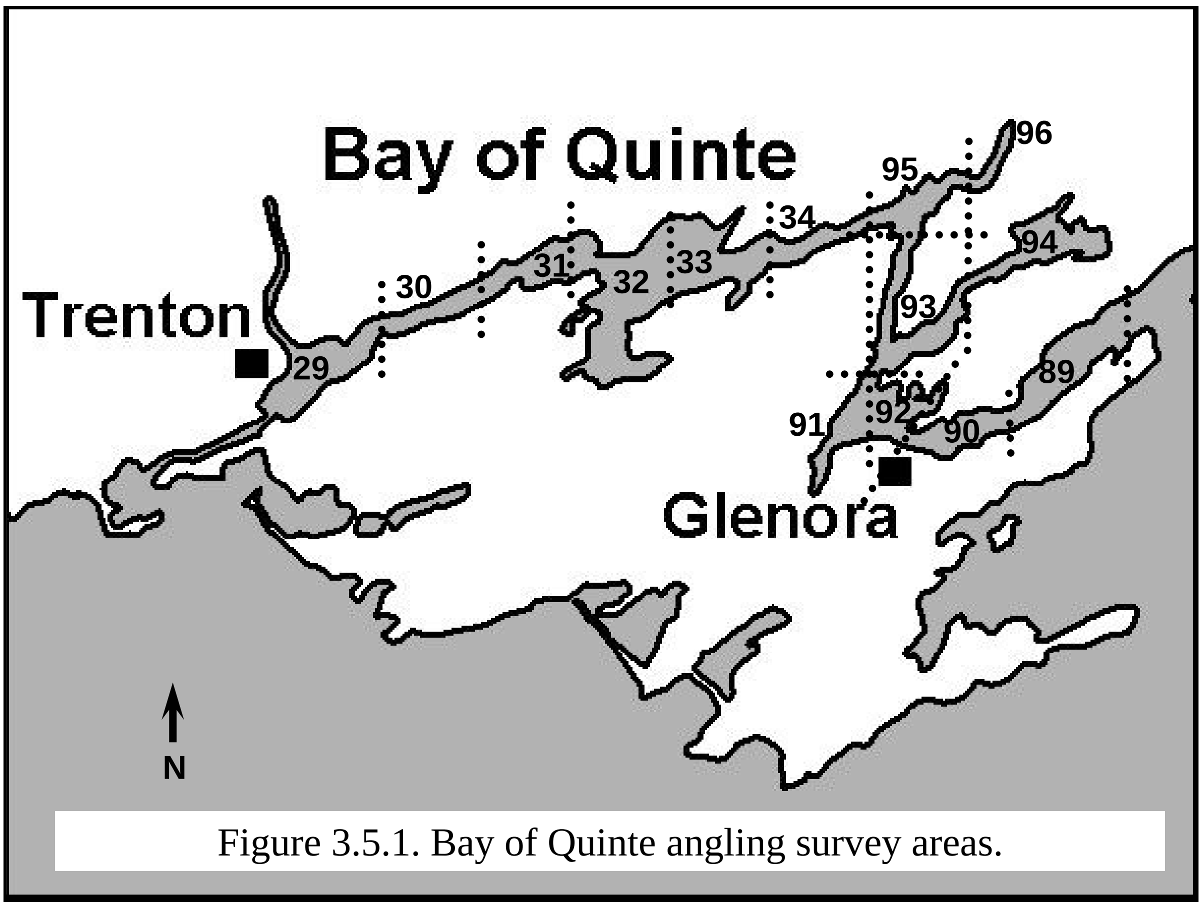


Figure 3.5.1. Bay of Quinte angling survey areas.

Angling effort was targeted primarily at Walleye (89%) and Largemouth Bass (16%). Fishing effort was 209,040 hours for anglers targeting Walleye, and 38,759 hours for anglers targeting Largemouth Bass (Table 3.5.2 and Table 3.5.3). Numbers of Walleye caught and harvested were 36,240 and 27,253 respectively. Numbers of Walleye caught and harvested per hour by anglers

Table 3.5.2. Species-specific targeted angling effort (angler hours), catch and harvest by all anglers, percent of fish kept, and the number of fish caught per angler hour (CUE) by anglers targeting that species for the open -water recreational fishery on the Bay of Quinte, 2012.

Species	Angling effort	Catch	Harvest	% kept	CUE
Longnose Gar	-	312	-	0	
Gizzard Shad	-	54	-	0	
Coho Salmon	-	12	-	0	
Rainbow Trout	-	27	-	0	
Lake Whitefish	595	-	-	0	0.000
Northern Pike	5,006	4,455	476	11	0.187
Brown Bullhead	-	389	86	22	
White Perch	498	15,280	1,404	9	2.426
White Bass	-	417	-	0	
Rock Bass	-	2,837	-	0	
Pumpkinseed	-	844	-	0	
Bluegill	417	3,614	132	4	1.233
Smallmouth Bass	1,013	1,171	515	44	0.299
Largemouth Bass	38,759	27,138	9,953	37	0.613
Black Crappie	-	310	92	30	
Sunfish	383	1,171	-	0	0.702
Yellow Perch	6,911	89,564	9,202	10	1.252
Walleye	209,040	36,240	27,253	75	0.173
Round Goby	-	1,454	1,366	94	
Freshwater Drum	201	10,132	84	1	0.103
Any species	133	-	-	0	0.000

Table 3.5.3. Angling statistics for Walleye and Largemouth Bass by season surveyed during the open-water recreational fishery on the Bay of Quinte, 2012. "Targeted" statistics refer to anglers targeting the indicated species (Walleye or Largemouth Bass).

	Season							
Angling Statisitic	May 5 - May 6	May 7 - Jun 3	Jun 4 - Jun 23	Jun 24 - Jul 29	Jul 30 - Sep 3	Sep 4 - Oct 14	Oct 15 - Nov 30	Total
Walleye:								
Catch by All Anglers	1,852	11,262	5,195	10,540	3,122	615	3,654	36,240
Catch by Targeted Anglers	1,852	11,262	5,195	10,540	3,091	615	3,654	36,208
Harvest by All Anglers	1,431	7,080	4,132	8,850	2,954	603	2,203	27,253
Harvest by Targeted Anglers	1,431	7,080	4,132	8,850	2,922	603	2,203	27,222
Targeted Effort (angler hours)	30,124	43,333	26,943	40,565	22,363	4,296	41,416	209,040
Targeted Effort (rod hours)	30,235	43,333	26,943	40,565	22,363	4,409	57,751	225,599
All Effort (angler hours)	30,630	44,102	26,943	48,767	36,394	7,660	41,441	235,937
Targeted CUE	0.0615	0.2599	0.1928	0.2598	0.1382	0.1432	0.0882	0.1732
All Anglers CUE	0.0604	0.2554	0.1928	0.2161	0.0858	0.0803	0.0882	0.1536
Targeted HUE	0.0475	0.1634	0.1533	0.2182	0.1307	0.1404	0.0532	0.1302
All Anglers HUE	0.0467	0.1605	0.1533	0.1815	0.0812	0.0788	0.0532	0.1155
Largemouth Bass:								
Catch by All Anglers	152	1,380	514	7,724	13,875	3,494	-	27,138
Catch by Targeted Anglers	-	-	-	7,514	12,751	3,494	-	23,759
Harvest by All Anglers	-	-	-	2,769	5,305	1,879	-	9,953
Harvest by Targeted Anglers	-	-	-	2,593	5,061	1,879	-	9,533
Targeted Effort (angler hours)	-	-	-	21,454	14,546	2,759	-	38,759
Targeted Effort (rod hours)	-	-	-	21,454	14,546	2,759	-	38,759
All Effort (angler hours)	30,630	44,102	26,943	48,767	36,394	49,101	-	235,937
Targeted CUE				0.3502	0.8766	1.2667		0.6130
All Anglers CUE	0.0050	0.0313	0.0191	0.1584	0.3812	0.0712		0.1150
Targeted HUE				0.1209	0.3479	0.6810		0.2459
All Anglers HUE	0.0000	0.0000	0.0000	0.0568	0.1458	0.0383		0.0422

targeting Walleye were 0.173 and 0.130 respectively. Numbers of Largemouth Bass caught and harvested were 27,138 and 9,953 respectively. Numbers of Largemouth Bass caught and harvested per hour by anglers targeting Largemouth Bass were 0.613 and 0.246 respectively. Anglers also caught 89,564 Yellow Perch, 27,138 Largemouth Bass, 15,280 White Perch, 10,132 Freshwater Drum, and 4,455 Northern Pike (Table 3.5.2).

The season and region pattern of Walleye angling effort is depicted in Table 3.5.4. Targeted Walleye angling is highest in May, generally lowest in September and early October, and high again in late October and November. Most Walleye angling effort occurs in the upper and middle regions of the Bay of Quinte but a spike in effort also occurs in the middle and lower Bay in late October and November (Table 3.5.4).

Open-water angling fishery trend statistics from 1957-2012 are shown in Table 3.5.5 and graphically from 1988-2012 in Fig. 3.5.2.

The size distribution of Walleye sampled and the age-distribution of Walleye harvested during the open-water recreational fishery are shown in Figs. 3.5.3 and 3.5.4.

Table 3.5.4. Targeted Walleye angling effort (angler hours) by season and region surveyed in the open-water recreational fishery on the Bay of Quinte, 2012 (regions include the survey areas indicated in Fig. 1 as follows: Upper = 29, 30, 31, 32, 33, 34; middle = 91, 92, 93, 94, 95, 96; lower = 89, 90).

	Region			
Season	Upper	Middle	Lower	Total
May 5 - Jun 3	26,460	46,447	550	73,457
Jun 4 - Jun 23	12,808	14,051	84	26,943
Jun 24 - Jul 29	18,290	21,996	280	40,565
Jul 30 - Sep 3	5,272	17,092	-	22,363
Sep 4 - Oct 14	1,479	2,704	113	4,296
Oct 15 - Nov 30	553	16,492	24,371	41,416
Total	64,861	118,782	25,397	209,040

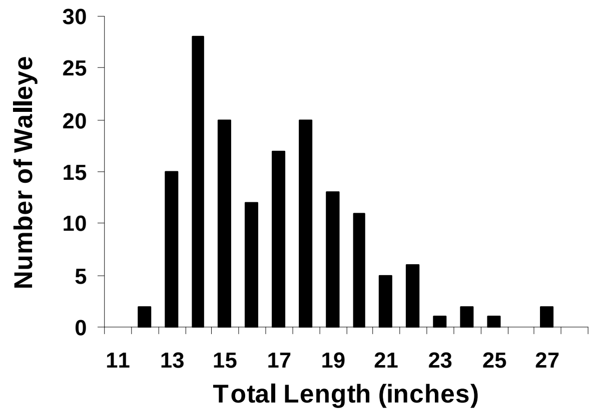


Figure 3.5.3. Size distribution of Walleye sampled during the open-water recreational fishery on the Bay of Quinte, 2012.

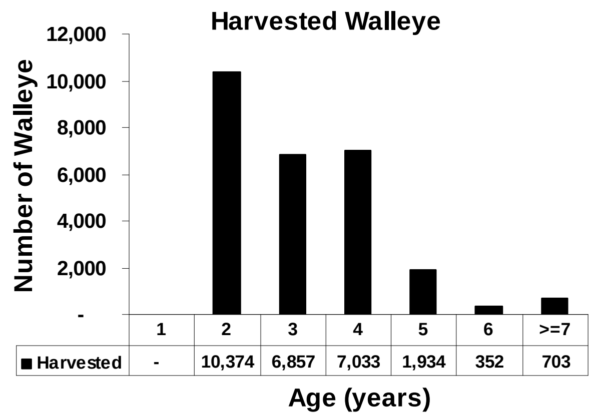


Figure 3.5.4. Age distribution of Walleye harvested during the open-water recreational fishery on the Bay of Quinte, 2012.

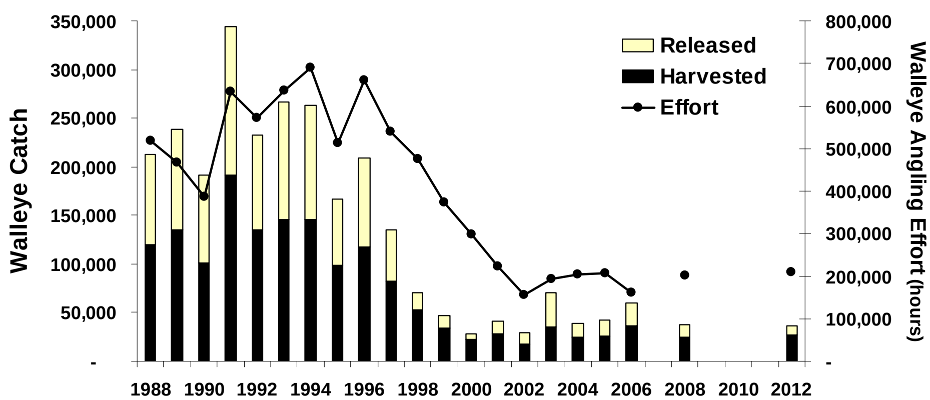


Figure 3.5.2. Trends in Walleye angling effort and catch (released and harvested), 1988-2012 for the open-water recreational fishery on the Bay of Quinte.

Table 3.5.5. Bay of Quinte open-water angling fishery statistics, 1957-2012, including angling effort (angler hours), both for all anglers and targeted Walleye anglers, Walleye catch and harvest rates (number of fish per hour by anglers targeting Walleye), Walleye catch and harvest (number of fish), and the mean weight (kg) of harvested Walleye.

	All anglers	Walleye Anglers			All Anglers		
			Catch	Harvest			Mean weight
	Total effort	Effort	rate	rate	Catch	Harvest	(kg)
1957		128,040		0.299		38,318	0.638
1958		105,219		0.155		16,274	0.818
1959		67,000		0.254		17,037	0.963
1960						10,467	0.939
1961						22,117	0.596
1962						9,767	0.795
1963						2,466	1.422
1976		64,096		0.064		4,089	
1979		114,637		0.132		15,133	0.631
1980		321,388		0.598		192,305	0.464
1981		319,401		0.508		162,140	0.741
1982		382,306		0.236		90,182	1.030
1984		451,581		0.227		102,379	0.912
1985		442,717		0.263		116,415	0.859
1986		554,213		0.232		128,341	0.933
1987		589,163		0.172		101,092	0.756
1988		518,404	0.411	0.231	213,144	119,608	0.785
1989		466,008	0.512	0.290	238,549	135,151	0.760
1990		385,656	0.497	0.263	191,496	101,422	0.710
1991		634,101	0.543	0.302	344,156	191,785	0.789
1992		571,079	0.407	0.236	232,179	135,040	0.952
1993	644,477	637,401	0.417	0.227	266,638	145,383	0.912
1994	693,731	689,543	0.378	0.209	262,760	145,642	0.763
1995	519,276	512,054	0.320	0.189	166,229	98,537	0.710
1996	665,436	660,005	0.317	0.179	209,280	117,931	0.781
1997	544,476	539,276	0.250	0.154	134,651	82,790	0.747
1998	481,553	475,678	0.148	0.111	70,527	52,844	0.670
1999	379,012	374,128	0.127	0.090	47,562	33,575	0.958
2000	309,259	296,841	0.094	0.077	28,065	22,811	0.939
2001	247,537	222,052	0.182	0.126	40,734	28,078	0.916
2002	177,092	154,570	0.186	0.113	29,459	17,903	0.915
2003	219,684	194,169	0.344	0.178	70,471	34,905	0.637
2004	241,700	203,082	0.193	0.119	39,251	24,277	0.870
2005	225,385	205,933	0.204	0.125	42,213	25,757	0.693
2006	180,907	161,190	0.372	0.225	59,966	36,329	0.700
2008	209,153	201,669	0.187	0.124	37,710	24,929	1.069
2012	235,937	209,040	0.173	0.130	36,240	27,253	1.012

3.6 Bay of Quinte Volunteer Walleye Angler Diary Program

A volunteer angler diary program was conducted during fall 2012 on the Bay of Quinte. The diary program focused on the popular fall recreational fishery for "trophy" Walleye on the middle and lower reaches of Bay of Quinte. To engage volunteer anglers, this program was first announced at the Central Lake Ontario Sport Anglers (CLOSA) club meeting in late-September, and then, shortly thereafter, advertised on the www.quintefishing.com web-site. Anglers that volunteered to participate in the program were given a personal diary and asked to record information about their daily fishing trips and catch (see Fig. 3.6.1). A total of 24 diaries were returned as of February 2012. We thank all volunteer anglers for participating in the program. A map showing the distribution of volunteer addresses of origin is shown in Fig. 3.6.2.

Objectives of the diary program were to:

1) engage and encourage angler involvement in monitoring the fishery;
2) characterize fall Walleye angling effort, catch, and harvest (including geographic distribution);
3) characterize the size distribution of Walleye caught and harvested;
4) characterize species catch composition;
5) examine the frequency of anglers using two rods (i.e., east of Glenora in the lower Bay); and
6) generally, provide supplemental information to data collected during the roving angler survey (see Section 3.5).

Two of the 24 returned diaries reported zero fishing trips. The number of fishing trips reported in each of the remaining 22 diaries ranged from one to 35 trips. Fishing trips were reported for 69

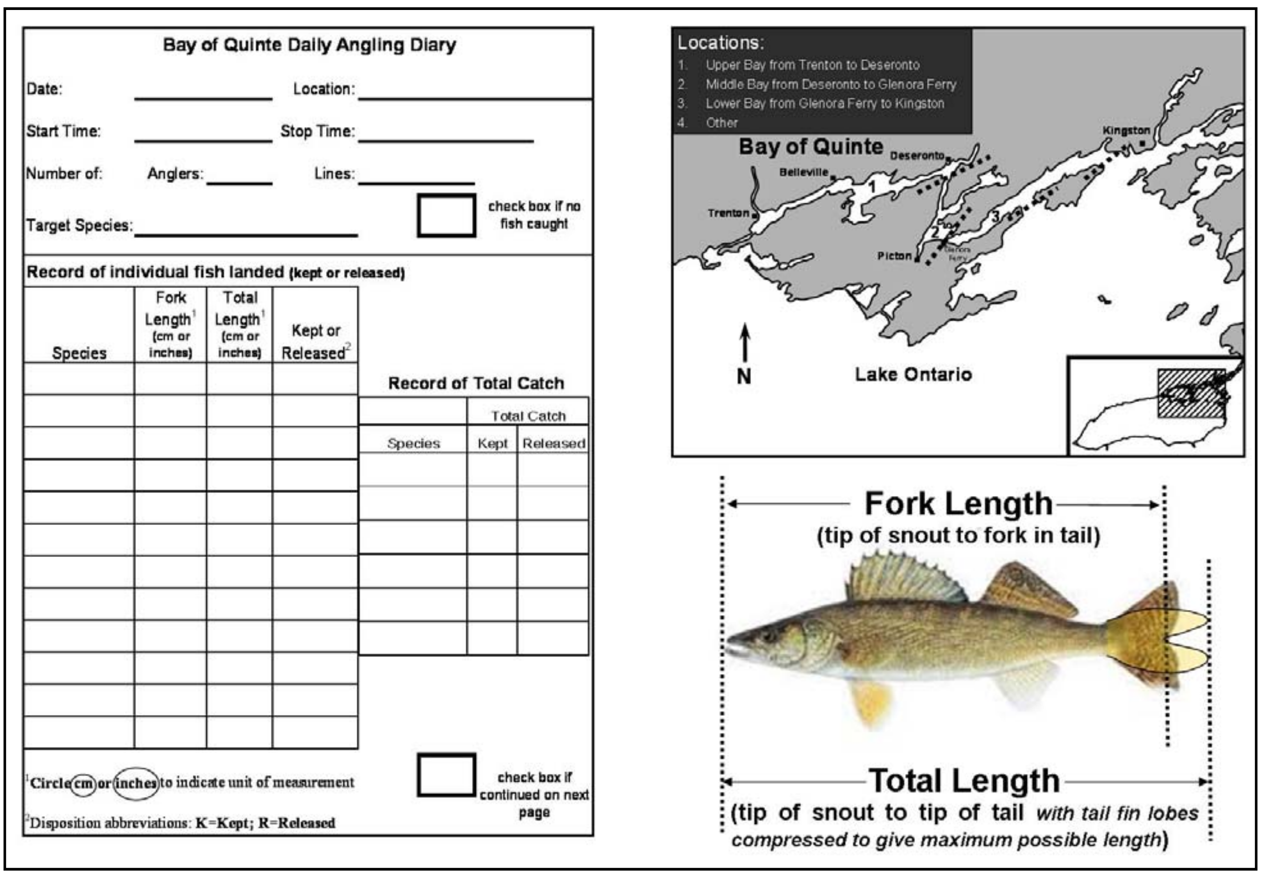


FIG. 3.6.1. Volunteer angler diary used to record information about daily fishing trips and catch.

out of a possible 84 calendar days from Sep 27 to Dec 19. There were from one to twelve volunteers fishing on each of the 69 days, and a total of 259 trip reports overall. For one trip, the target species was Largemouth Bass; this trip was excluded from further analysis here. All other trips were targeted at Walleye. Of the 258 trips, 244 (94%) were made on Locations 2 and 3 (see Fig. 3.6.1), the middle and lower reaches of the Bay of Quinte (Table 3.6.1). The overall average fishing trip duration was 6.6 hours, and the average number of anglers per boat trip was 3.3 anglers (Table 3.6.1). In Location 3, where two lines are permitted, most anglers used two lines (1.89 on average).

Fishing Effort

A total of 5,915 angler hours (7,609 rod hours) of fishing effort was reported by volunteer anglers. Fishing effort increased steadily from late Sep until late Nov and then declined rapidly (Fig. 3.6.3). Most (65%) fishing effort occurred in Nov. Nearly all fishing effort occurred in Locations 2 (66%; middle Bay) or 3 (32%; lower Bay) (Fig. 3.6.4).

Catch

At least ten species of fish and a total of 692 fish were reported caught by volunteer anglers. The number of Walleye caught was 544 (292 kept and 252 released; Table 3.6.2). The next most abundant species caught was Northern Pike (47) followed by Freshwater Drum (43).

Fishing Success

The overall fishing success for Walleye was 2.1 Walleye per boat trip or 0.102 fish per angler hour of fishing (Table 3.6.1). Sixty-four percent of all boat trips reported catching at least one Walleye ("skunk" rate 36%). Seasonal fishing success, for geographic Locations 2 and 3 combined, is shown in Fig. 3.4.5. Success was relatively stable from Sep through Nov then increased. Fishing success was higher in location 2 (middle Bay; 2.5 Walleye per boat trip or 0.098 fish per angler hour) than in Location 3 (lower Bay; 1.6 Walleye per boat trip or 0.086 fish per angler hour).

FIG. 3.6.2. Distribution of volunteer angler origin.

Table 3.6.1. Average fishing trip duration, number of anglers per trip, number of rods per angler, total number of trips, and fishing success reported by location during the Bay of Quinte volunteer Walleye angler diary program, 2012. Some anglers reported fishing on Locations 2 and 3 during the same trip. See Figure 3.6.1 for a map of fishing locations.

	Location					
Statistic	1	2	3	2 and 3	4	Overall
Average Trip Duration (hrs)	4.4	6.9	6.2	7.7	6.3	6.6
Average Number of Anglers	2.0	3.7	2.8	3.5	2.0	3.3
Average Number of Rods per Angler	1.00	1.00	1.89	1.46	2.00	1.35
Number of Trips	14	132	89	22	1	258
Fishing Success (Walleye per boat trip)	1.3	2.5	1.6	1.8	2.0	2.1
Fishing Success (Walleye per angler hour)	0.288	0.098	0.086	0.064	0.160	0.102

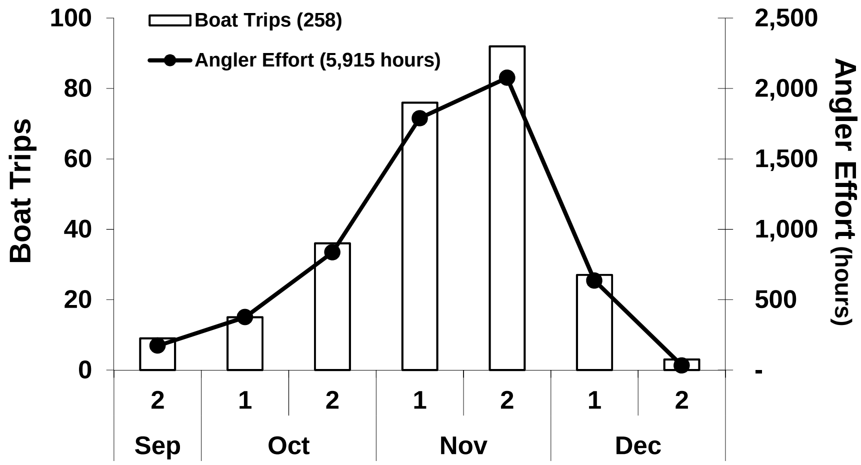


FIG. 3.6.3. Seasonal breakdown (summarized by first and second half of each month from the second half of Sep to the second half of Dec) of fishing effort (boat trips and angler hours) reported by volunteer Walleye anglers during fall 2012 on the Bay of Quinte.

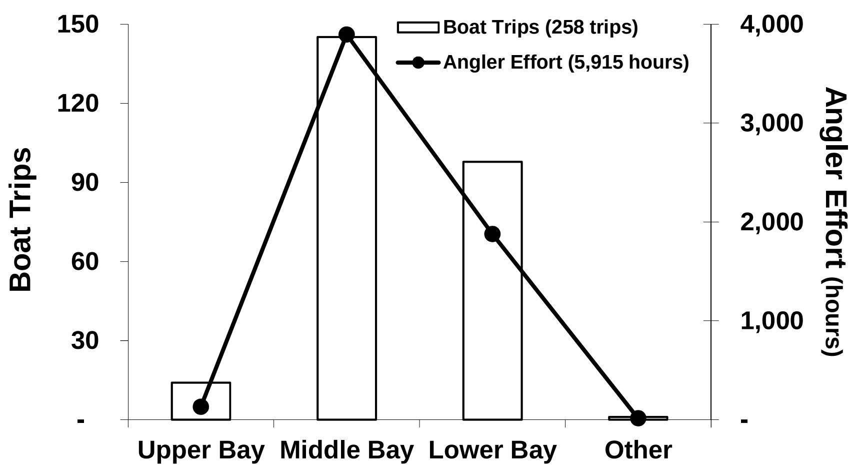


FIG. 3.6.4. Geographic breakdown of fishing effort (boat trips and angler hours) reported by volunteer Walleye anglers during fall 2012 on the Bay of Quinte (the “Other” category referred to a single trip just outside the “upper-gap” in the lower Bay of Quinte in Lake Ontario proper.

Length Distribution of harvested Walleye

Of the 544 Walleye caught, 292 (54%) were harvested and 252 (46%) were released. Harvested Walleye were smaller than released Walleye (Fig. 3.6.6). Mean total length of Walleye caught (harvested and released fish) increased steadily from October through late November and early December (Fig. 3.6.7).

TABLE 3.6.2. Number of fish, by species, reported caught (kept and released) by volunteer anglers during the fall Walleye diary program, 2012.

Species	Kept	Released	Total
Chinook salmon	-	1	1
Brown trout	1	-	1
Lake trout	-	1	1
Lake whitefish	-	1	1
Northern pike	1	47	48
Morone sp.	1	15	16
Largemouth bass	-	-	-
Yellow perch	4	32	36
Walleye	**292**	**252**	**544**
Freshwater drum	1	43	44
Total	300	392	692

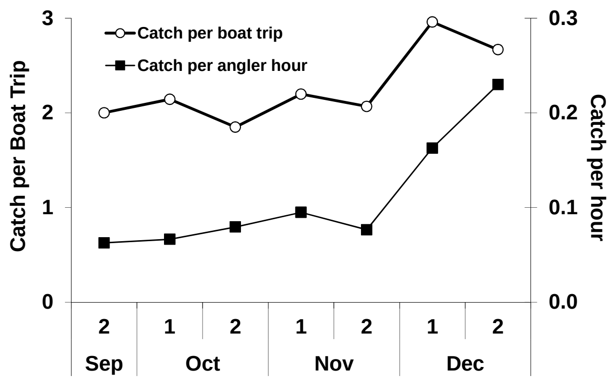


FIG. 3.6.5. Walleye fishing success in locations 2 and 3 combined (catch per boat trip and per angler hours) as reported by volunteer Walleye anglers during fall 2012 on the Bay of Quinte (summarized by first and second half of each month from the second half of Sep to the second half of Dec).

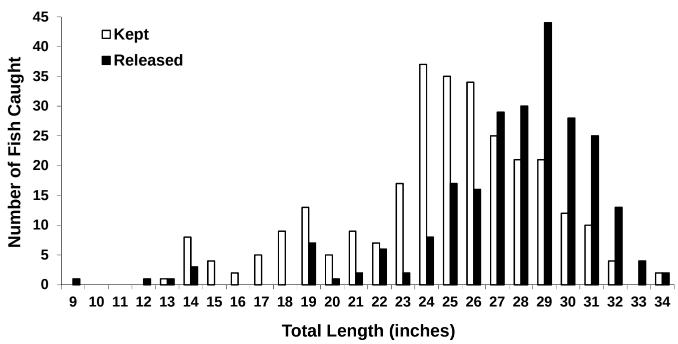


FIG. 3.6.6. Length distribution of Walleye caught (kept and released) by volunteer Walleye anglers during fall 2012 on the Bay of Quinte.

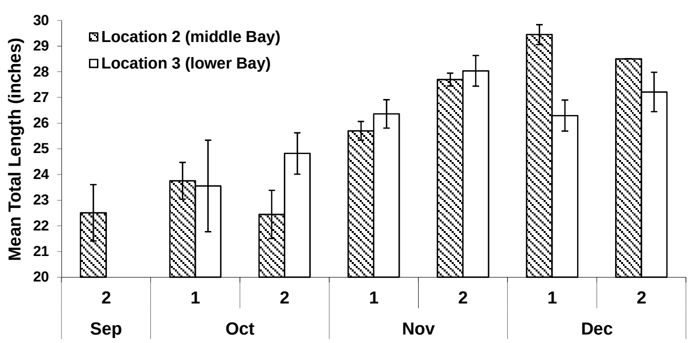


FIG. 3.6.7. Mean total length (mm) of Walleye caught by volunteer Walleye anglers during fall 2012 on the Bay of Quinte by location (summarized by first and second half of each month from the second half of Sep to the second half of Dec).

4. Commercial Fishery

4.1 Quota and Harvest Summary

Lake Ontario supports a 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 2012 were obtained from the commercial fish harvest information system (CFHIS) which is managed, in partnership, by the Ontario Commercial Fisheries Association (OCFA) and the Ontario Ministry of Natural Resources. Commercial quota, harvest and landed value statistics for Lake Ontario, the St. Lawrence River and East and West Lakes, for 2012, are shown in Tables 4.1.1 (base quota), 4.1.2 (issued quota), 4.1.3 (harvest) and 4.1.4 (landed value).

The total harvest of all species was 634,911 lb ($792,095) in 2012, down 46,798 lb (7%) from 2011. The harvest (landed value) for Lake Ontario, the St. Lawrence River, and East and West Lakes was 401,014 lb ($471,440), 180,929 lb ($261,786), and 52,968 lb ($55,044), respectively (Fig. 4.1.2 and Fig. 4.1.3). Yellow Perch was the dominant species in the harvest for both Lake Ontario and St. Lawrence River while sunfish was the dominant fish in East and West Lakes.

Major Fishery Trends

Harvest and landed value trends for Lake Ontario and the St. Lawrence River are shown in Fig. 4.1.4 and Fig. 4.1.5. Having declined in the early 2000s the harvest appears to have stabilized at about 400,000 lb ($450,000) and 150,000 lb ($175,000) for Lake Ontario (Fig. 4.1.4) and the St. Lawrence River (Fig. 4.1.5) respectively.

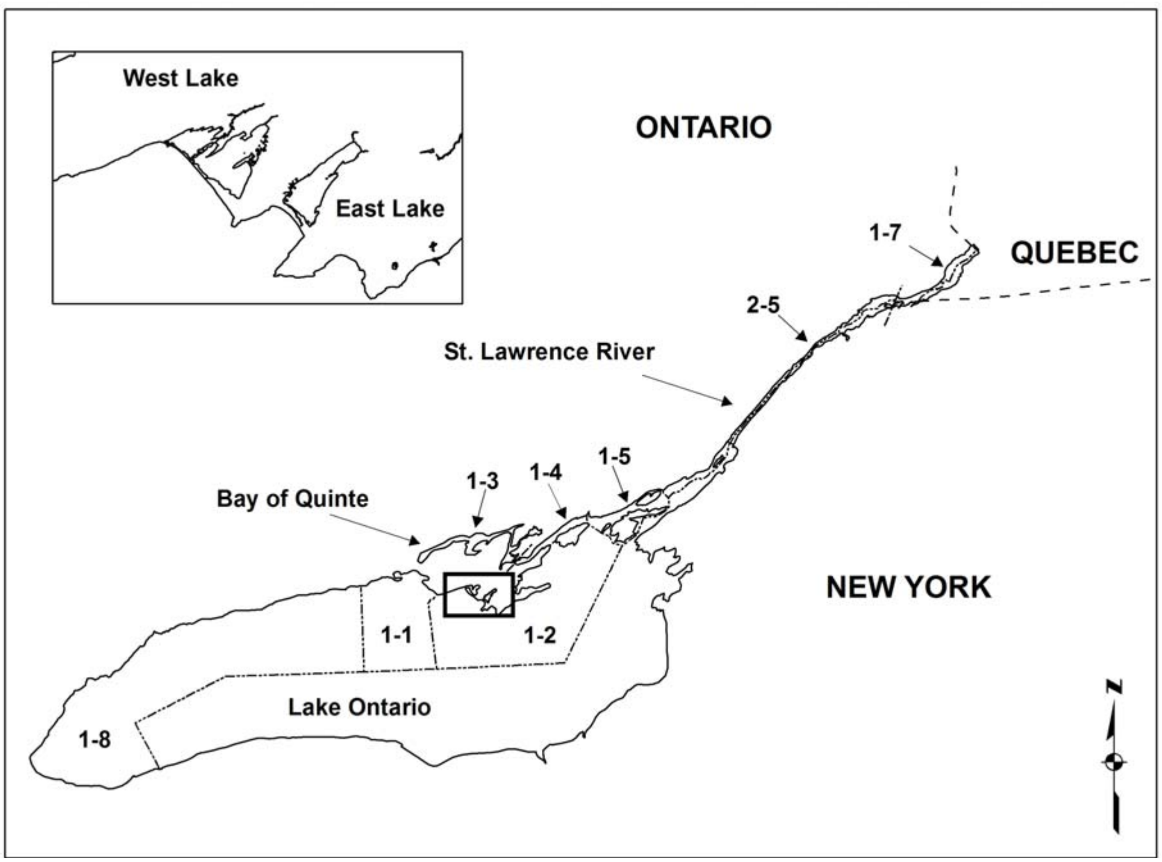


FIG. 4.1.1. Map of Lake Ontario and the St. Lawrence River showing commercial fishing quota zones in Canadian waters.

TABLE 4.1.1. Commercial fish **base quota** (lb), by quota zone, in the Canadian waters of Lake Ontario and the St. Lawrence River, East and West Lakes (two Lake Ontario embayments), 2012.

	Lake Ontario					St. Lawrence River			East Lake	West Lake	Base Quota by Waterbody		
Species	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	1	1	Lake Ontario	St. Lawrence River	Total
Black Crappie	4,540	3,000	14,824	800	2,800	14,170	17,590	4,840	3,100	9,850	25,964	36,600	75,514
Bowfin	0	0	0	0	500	0	0	0	0	0	500	0	500
Brown Bullhead	36,200	0	0	0	0	0	0	0	14,350	27,220	36,200	0	77,770
Lake Whitefish	7,275	76,023	13,675	20,313	208	0	0	0	0	0	117,494	0	117,494
Sunfish	28,130	0	0	0	0	0	0	0	14,600	18,080	28,130	0	60,810
Walleye	4,255	35,308	0	8,308	800	0	0	0	0	0	48,671	0	48,671
Yellow Perch	35,590	179,340	100,928	126,170	13,000	68,976	82,814	19,200	1,400	4,420	455,028	170,990	631,838
Total	115,990	293,671	129,427	155,591	17,308	83,146	100,404	24,040	33,450	59,570	711,987	207,590	1,012,597

TABLE 4.1.2. Commercial fish **issued quota** (lb), by quota zone, in the Canadian waters of Lake Ontario and the St. Lawrence River, East and West Lakes (two Lake Ontario embayments), 2012.

	Lake Ontario					St. Lawrence River			East Lake	West Lake	Issued Quota by Waterbody		
Species	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	1	1	Lake Ontario	St. Lawrence River	Total
Black Crappie	2,400	1,800	11,433	400	1,400	14,655	8,795	3,245	3,100	9,850	17,433	26,695	57,078
Bowfin	0	0	0	0	250	0	0	0	0	0	250	0	250
Brown Bullhead	18,100	0	0	0	0	0	0	0	14,350	27,220	18,100	0	59,670
Lake Whitefish	10,208	92,994	12,006	7,478	104	0	0	0	0	0	122,790	0	122,790
Sunfish	17,000	0	0	0	0	0	0	0	17,000	23,080	17,000	0	57,080
Walleye	1,751	8,356	0	40,794	400	0	0	0	0	0	51,301	0	51,301
Yellow Perch	19,176	95,437	85,828	108,339	6,500	67,786	41,407	28,200	1,400	4,420	315,280	137,393	458,493
Total	68,635	198,587	109,267	157,011	8,654	82,441	50,202	31,445	35,850	64,570	542,154	164,088	806,662

TABLE 4.1.3. Commercial **harvest** (lb), by quota zone, for fish species harvested from the Canadian waters of Lake Ontario and the St. Lawrence River, East and West Lakes (two Lake Ontario embayments), 2012.

	Lake Ontario					St. Lawrence River			East Lake	West Lake	Totals		
Species	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	1	1	Lake Ontario	St. Lawrence River	All Waterbodies
Black Crappie	78	0	5,944	4	0	7,568	1,455	892	28	1,999	6,026	9,915	17,968
Bowfin	0	16	1,088	4	0	753	1,784	85	134	341	1,108	2,622	4,205
Brown Bullhead	77	53	6,450	174	0	1,931	3,342	34,230	12	2,979	6,754	39,503	49,248
Common Carp	0	153	67	69	0	272	18	0	0	0	289	290	579
Freshwater Drum	0	611	14,975	13,067	0	0	0	0	0	11	28,653	0	28,664
Lake Herring (Cisco)	23	137	1,463	663	0	0	0	0	0	60	2,286	0	2,346
Lake Whitefish	5,045	62,158	5,218	949	0	0	0	0	0	0	73,370	0	73,370
Northern Pike	3,976	1,044	22,551	3,954	0	12,629	0	0	1,591	6,785	31,525	12,629	52,530
Rock Bass	1,234	764	7,450	2,286	0	1,248	1,690	65	2,123	2,159	11,734	3,003	19,019
Sunfish	3,802	3	62,047	663	0	10,548	7,324	4,381	12,972	17,512	66,515	22,253	119,252
Walleye	1,114	3,131	0	26,673	0	0	0	0	0	0	30,918	0	30,918
White Bass	0	562	23	1,929	0	0	0	0	0	21	2,514	0	2,535
White Perch	36	114	11,141	7,135	0	189	0	0	1	2,470	18,426	189	21,086
White Sucker	0	1,162	14,744	2,290	0	58	19	0	0	786	18,196	77	19,059
Yellow Perch	735	8,204	48,660	45,101	0	38,557	24,980	26,911	302	682	102,700	90,448	194,132
Total	16,120	78,112	201,821	104,961	0	73,753	40,612	66,564	17,163	35,805	401,014	180,929	634,911

TABLE 4.1.4. Commercial **harvest (lb), price per lb, and landed value** for fish species harvested from the Canadian waters of Lake Ontario and the St. Lawrence River, and the total for all waterbodies including East and West Lakes, 2012.

	Lake Ontario			St. Lawrence River			All Waterbodies		
Species	Harvest	Price per lb	Landed value	Harvest	Price per lb	Landed value	Harvest	Price per lb	Landed value
Black Crappie	6,026	$3.21	$19,355	9,915	$2.65	$26,255	17,968	$2.95	$53,036
Bowfin	1,108	$0.39	$432	2,622	$0.56	$1,480	4,205	$0.52	$2,168
Brown Bullhead	6,754	$0.24	$1,629	39,503	$0.49	$19,453	49,248	$0.43	$21,334
Common Carp	289	$0.13	$36	290	$0.25	$73	579	$0.17	$97
Freshwater Drum	28,653	$0.09	$2,556	0			28,664	$0.09	$2,558
Lake Herring (Cisco)	2,286	$0.23	$524	0			2,346	$0.23	$532
Lake Whitefish	73,370	$0.94	$69,201	0			73,370	$0.94	$69,201
Northern Pike	31,525	$0.24	$7,639	12,629	$0.26	$3,342	52,530	$0.24	$12,566
Rock Bass	11,734	$0.49	$5,765	3,003	$0.45	$1,360	19,019	$0.48	$9,217
Sunfish	66,515	$1.27	$84,293	22,253	$1.41	$31,274	119,252	$1.34	$159,384
Walleye	30,918	$2.33	$72,088	0			30,918	$2.33	$72,088
White Bass	2,514	$0.45	$1,122	0			2,535	$0.45	$1,142
White Perch	18,426	$0.45	$8,311	189	$0.50	$95	21,086	$0.47	$9,844
White Sucker	18,196	$0.09	$1,667	77	$0.10	$8	19,059	$0.09	$1,760
Yellow Perch	102,700	$1.92	$196,822	90,448	$1.97	$178,446	194,132	$1.94	$377,168
Total	401,014		$471,440	180,929		$261,786	634,911		$792,095

Major Species

For major species, commercial harvest relative to issued and base quota information, including annual trend, is shown in Fig. 4.1.6 to Fig. 4.1.17. Price-per-lb trends are also shown. Species-specific price-per-lb values are means across quota zones within a major waterbody (i.e., Lake Ontario and the St. Lawrence River).

Yellow Perch

Yellow Perch 2012 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.6. Overall, 31% (194,132 lb) of the Yellow Perch base quota was harvested in 2012. The highest Yellow Perch harvest came from quota zones 1-3, 1-4 and 1-5. Relatively small proportions of base quota were harvested in quota zones 1-1 and 1-2.

Trends in Yellow Perch quota (base), harvest and price-per-lb are shown Fig. 4.1.7. Quota has remained more or less constant since 2000 except in quota zone 1-7 where quota has increased significantly and allowed for increased harvest. All base quota is issued and harvested in quota zone 1-7. Harvest has declined significantly since the early 2000s in quota zone 1-2. Harvest decreased in quota zones 1-3, 1-4, and 1-5 but increased in quota zone 2-5 (Fig. 4.1.7). Yellow Perch price-per-lb has shown modest improvement in recent years.

Lake Whitefish

Lake Whitefish 2012 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.8. Overall, 62% (73,370 lb) of the Lake Whitefish base quota was harvested in 2012. The highest Lake Whitefish harvest came from quota zone 1-2. Lake Whitefish is managed as one fish population across quota zones. Therefore, quota can be transferred among quota zones. As a result, in 2012, issued quota was higher than base quota in quota zones 1-1 and 1-2 (Fig. 4.1.8). Relatively small proportions of base quota was harvested in quota zone 1-4.

Trends in Lake Whitefish quota (base), harvest and price-per-lb are shown Fig. 4.1.9. Quota has remained constant for the last four years (just under 120,000 lb for all quota zones combined).

Seasonal whitefish harvest and biological attributes (e.g., size and age structure) information are reported in Section 4.2. Lake Whitefish price-

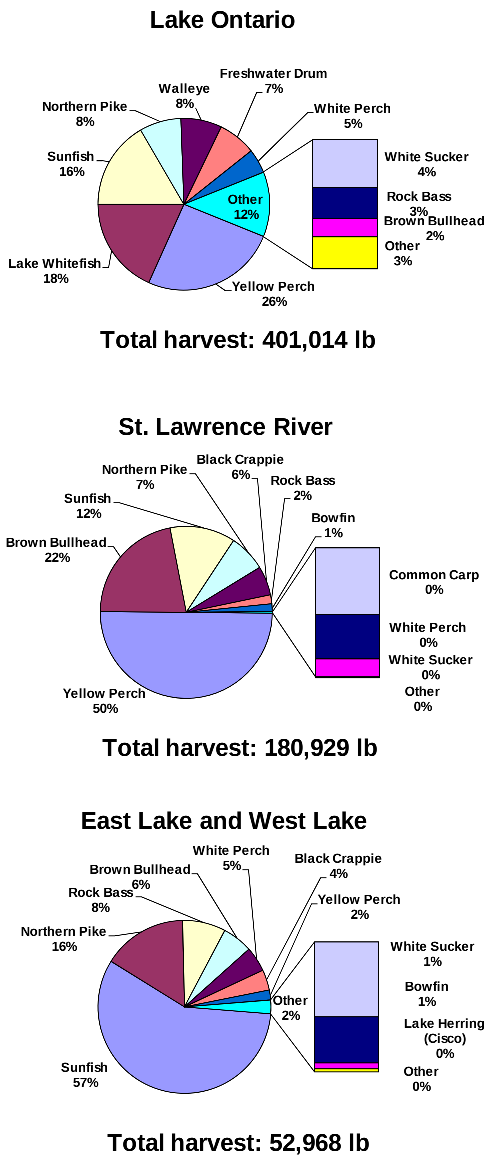


FIG. 4.1.2. Pie-charts showing breakdown of 2012 commercial harvest by species **(% by weight)** for Lake Ontario (quota zones 1-1, 1-2, 1-3, 1-4 and 1-8), the St. Lawrence River (quota zones 1-5, 2-5 and 1-7), and for East and West Lakes combined.

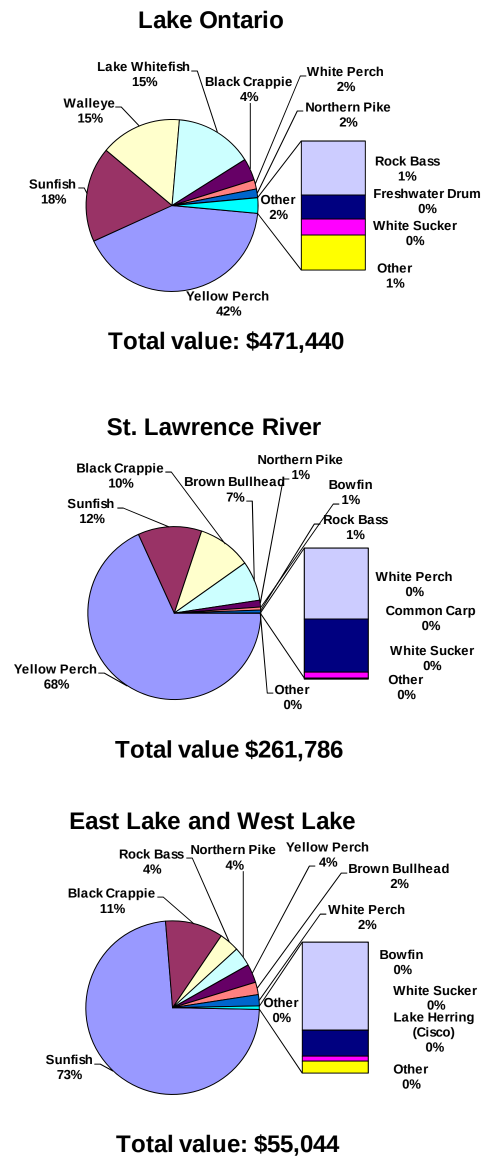


FIG. 4.1.3. Pie-charts showing breakdown of 2012 commercial harvest by species **(% by landed value)** for Lake Ontario (quota zones 1-1, 1-2, 1-3, 1-4 and 1-8), the St. Lawrence River (quota zones 1-5, 2-5 and 1-7), and for East and West Lakes combined.

per-lb is currently relatively high.

Walleye

Walleye 2012 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.10. Overall, 64% (30,918 lb) of the Walleye base quota was harvested in 2012. The highest Walleye harvest came from quota zone 1-4. Relatively small proportions of base quota were harvested in quota zones 1-1 and 1-2. Walleye (like Lake Whitefish) is managed as one fish population across quota zones. Therefore, quota can be transferred among quota zones. In 2012, this resulted in issued quota being considerably higher than base quota in quota zone 1-4 (Fig. 4.1.10).

Trends in Walleye quota (base), harvest and price-per-lb are shown Fig. 4.1.11. Quota has remained constant since the early 2000s (just under 50,000 lb for all quota zones combined).

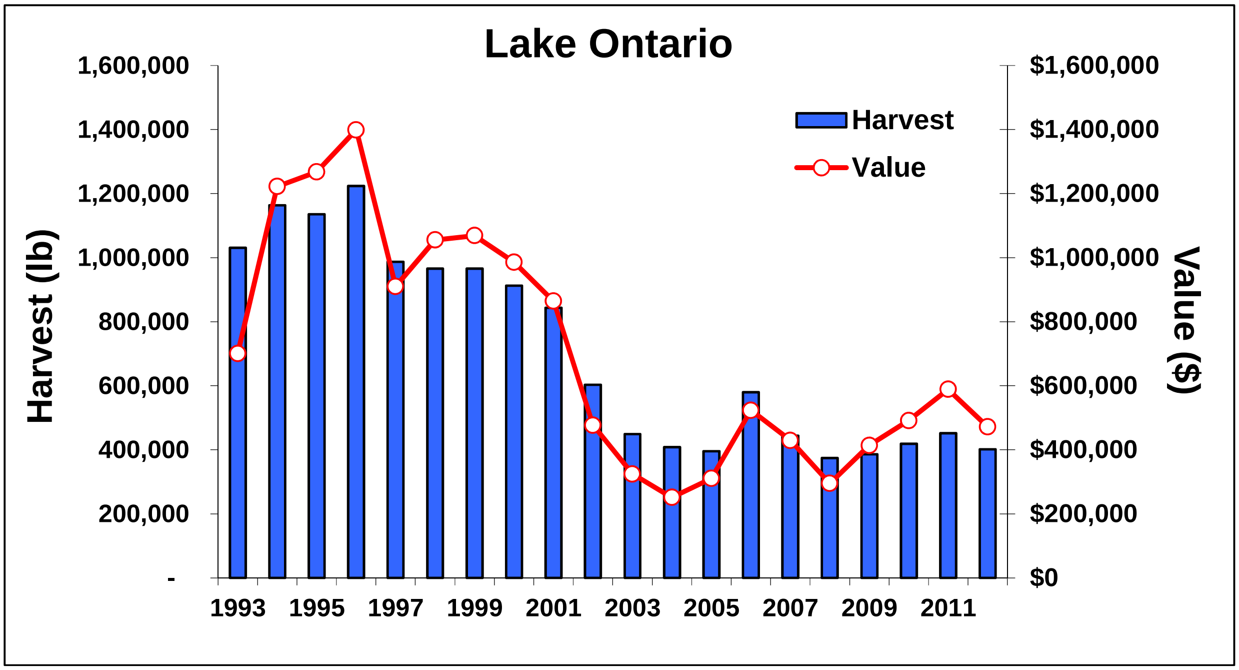


FIG. 4.1.4. Total commercial fishery harvest and value for **Lake Ontario** (Quota Zones 1-1, 1-2, 1-3 ,1-4 and 1-8) 1993-2012.

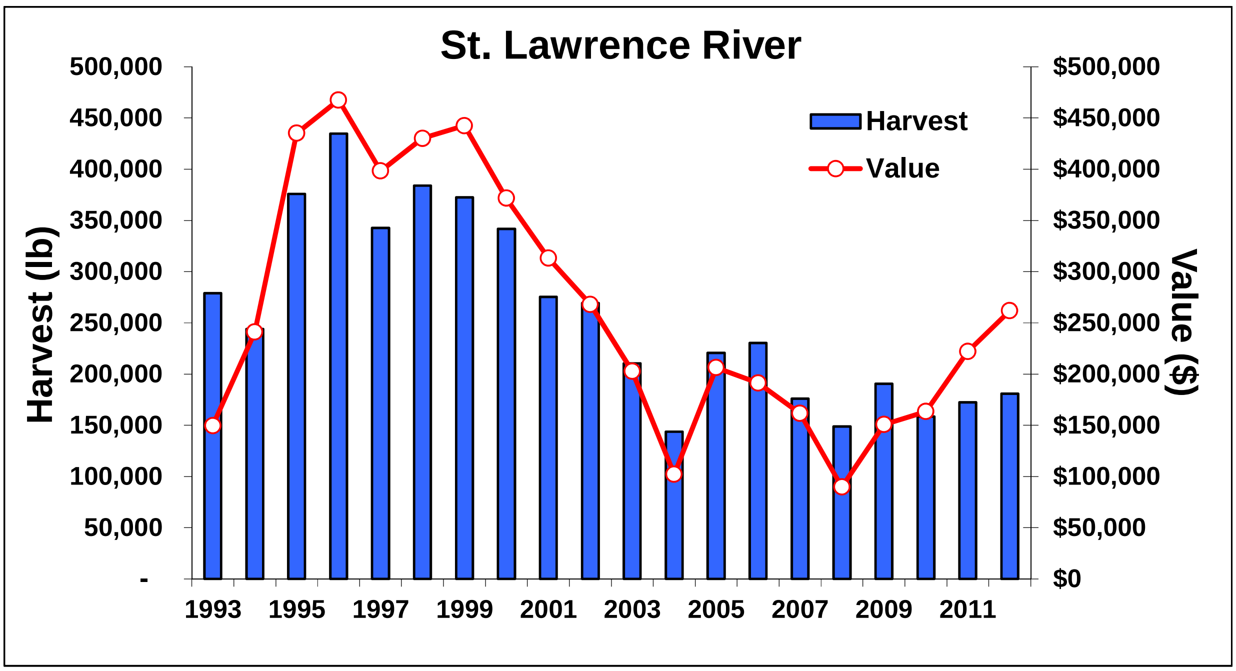


FIG. 4.1.5. Total commercial fishery harvest and value for the **St. Lawrence River** (Quota Zones 1-5, 2-5 and 1-7), 1993-2012.

Walleye price-per-lb is currently high.

Black Crappie

Black Crappie 2012 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.12. Overall, only 24% (17,968 lb) of the Black Crappie base quota was harvested in 2012. The highest Black Crappie harvest came from quota zones 1-3 and 1-5. Only a small proportion of base quota were harvested in all other quota zones .

Trends in Black Crappie quota (base), harvest and price-per-lb are shown Fig. 4.1.13. Harvest in

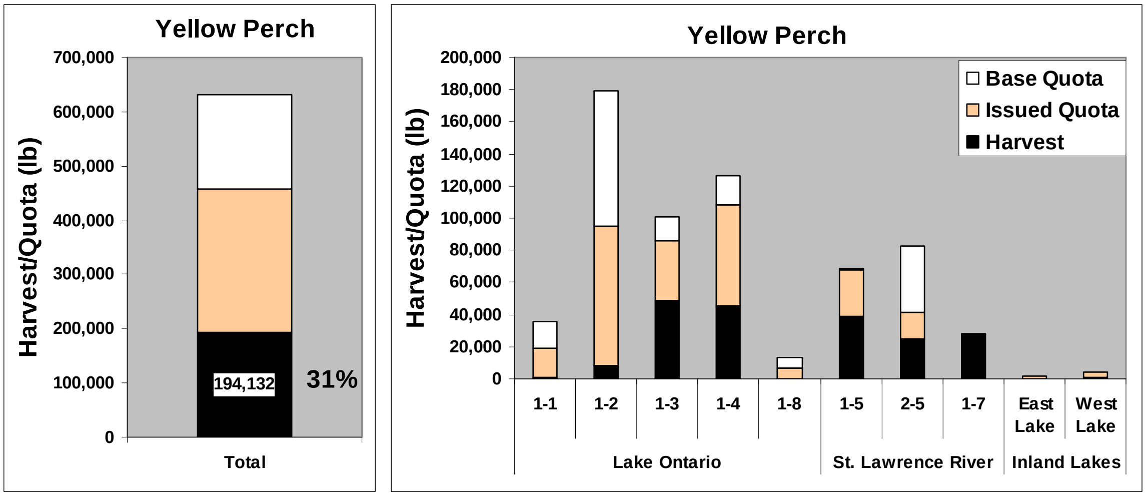


FIG. 4.1.6. **Yellow Perch** commercial harvest relative to issued and base quota (total for all quota zones combined; left panel) and by quota zone (right panel), 2012.

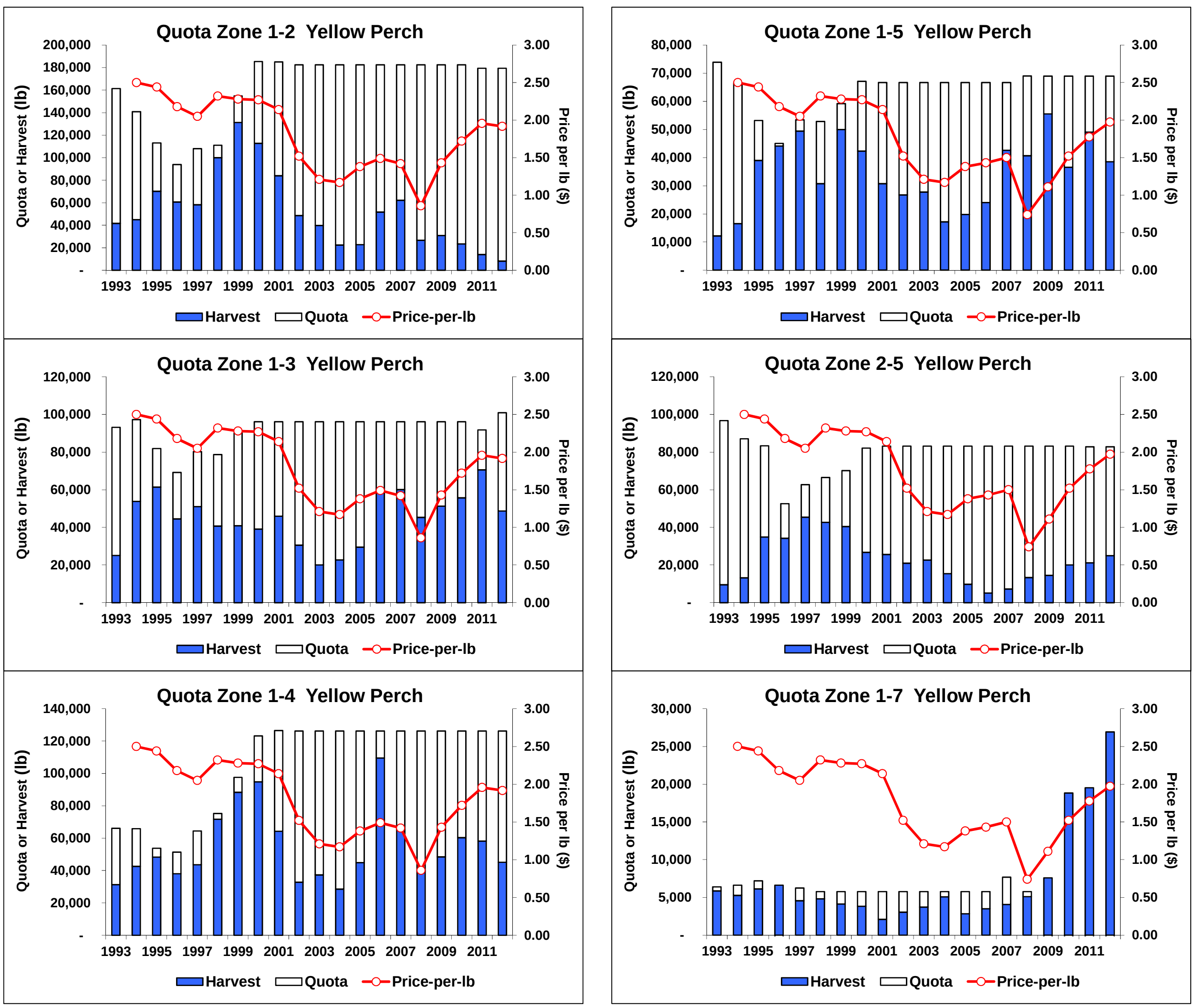


FIG. 4.1.7. Commercial base quota, harvest and price-per-lb for **Yellow Perch** in Quota Zones 1-2, 1-3, 1-4, 1-5, 2-5 and 1-7, 1993-2012.

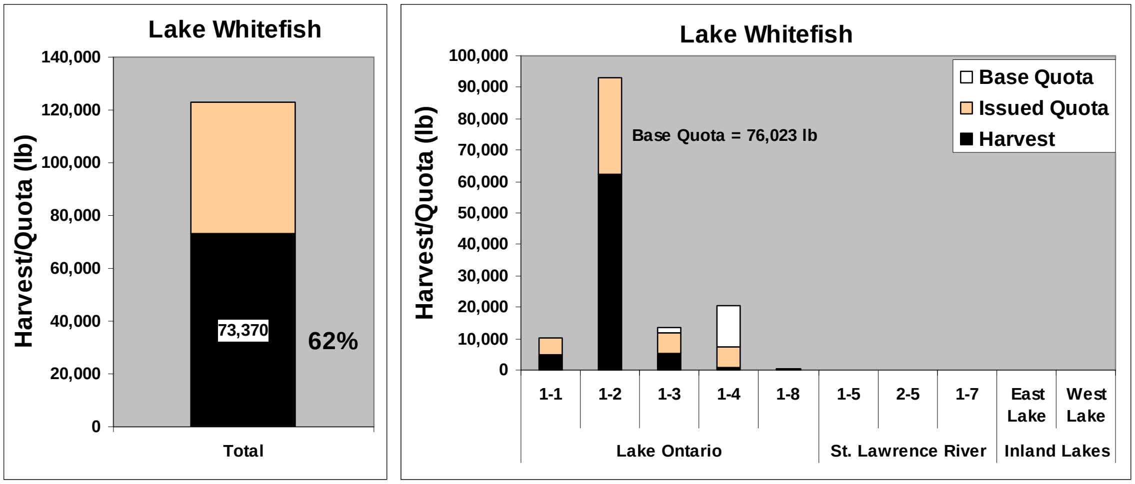


FIG. 4.1.8. **Lake Whitefish** commercial harvest relative to issued and base quota (total for all quota zones combined; left panel) and by quota zone (right panel), 2012.

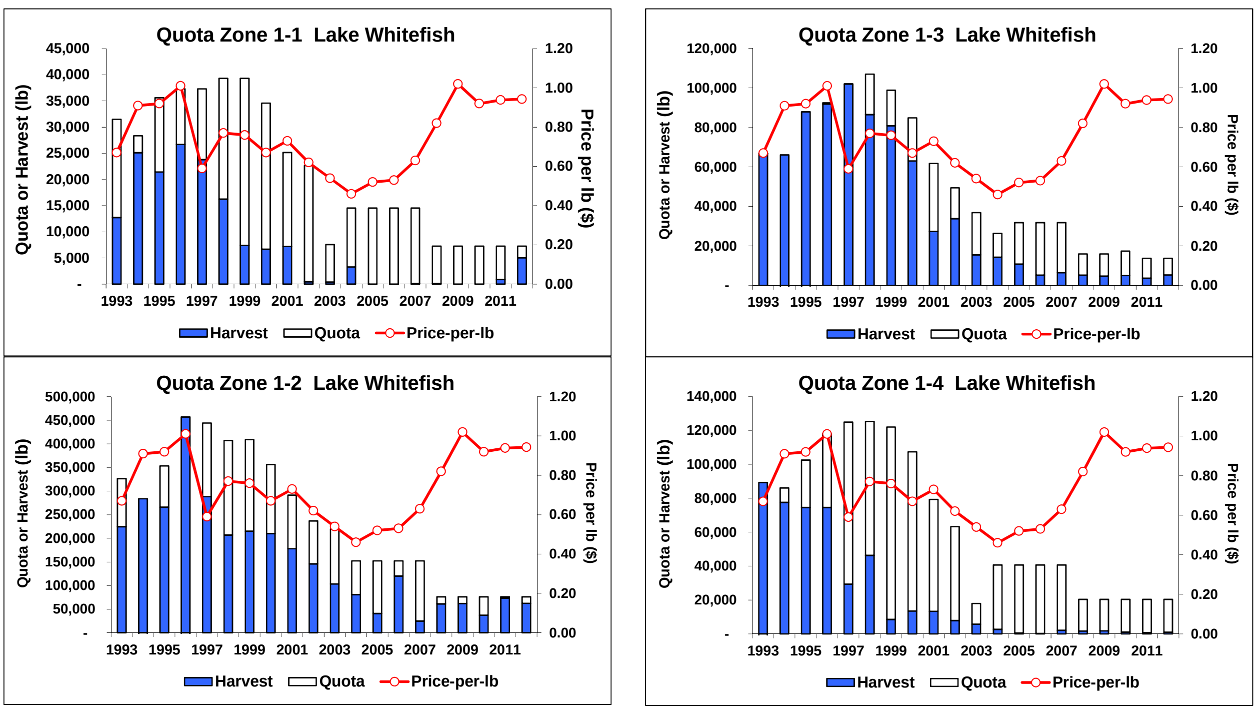


FIG. 4.1.9. Commercial base quota, harvest and price-per-lb for **Lake Whitefish** in Quota Zones 1-1, 1-2, 1-3 and 1-4, 1993-2012.

West Lake is currently low relative to past levels. Black Crappie price-per-lb is currently high.

Sunfish

Sunfish 2012 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.14. Only quota zones 1-1, East Lake and West Lake have quotas for Sunfish; quota is unlimited in the other zones. Most, if not all, of the quota in East and West Lakes is harvested. Most Sunfish harvest comes from quota zone 1-3, East Lake and West Lake.

Trends in Sunfish quota (base), harvest and price-per-lb are shown Fig. 4.1.15. Current harvest levels are relatively high in quota zones 1-1, 1-3, 1-4, East Lake and West Lake compared to past levels. Current harvest levels are relatively low in the St. Lawrence River quota zones (1-5, 2-5 and 1-7). Sunfish price-per-lb is currently high.

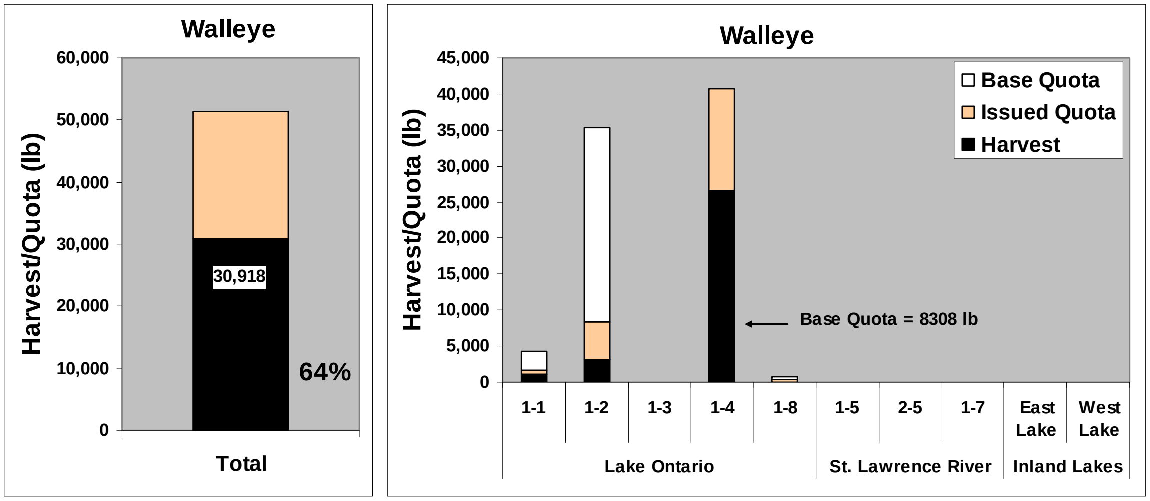


FIG. 4.1.10. **Walleye** commercial harvest relative to issued and base quota (total for all quota zones combined; left panel) and by quota zone (right panel), 2012.

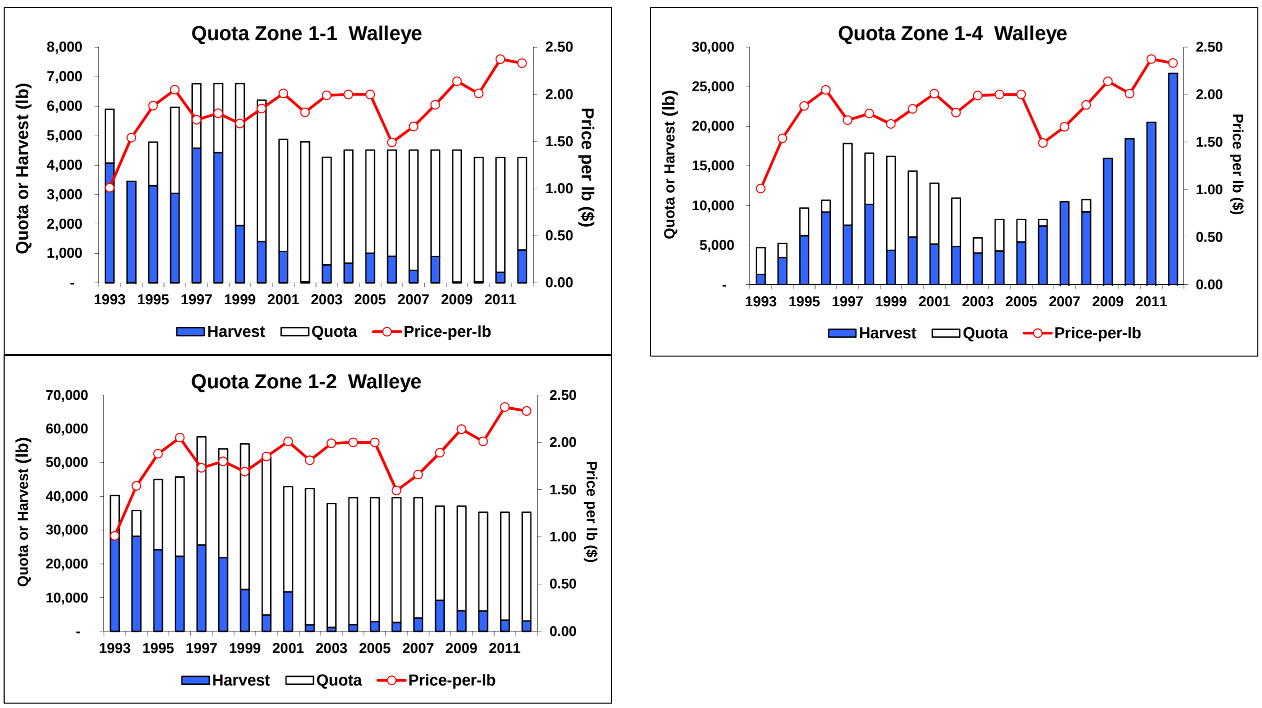


FIG. 4.1.11. Commercial base quota, harvest and price-per-lb for **Walleye** in Quota Zones 1-1, 1-2 and 1-4, 1993-2012.

Brown Bullhead

Brown Bullhead 2012 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.16. Only quota zones 1-1, East Lake and West Lake have quotas for Brown Bullhead; quota is unlimited in the other zones. In the quota zones with quota restrictions, only a very small proportion of the quota was actually harvested. Most Brown Bullhead harvest comes from quota zone 1-7.

Trends in Brown Bullhead quota (base), harvest and price-per-lb are shown Fig. 4.1.17. With the exception of quota zone 1-7, current harvest levels are extremely low relative to past levels.

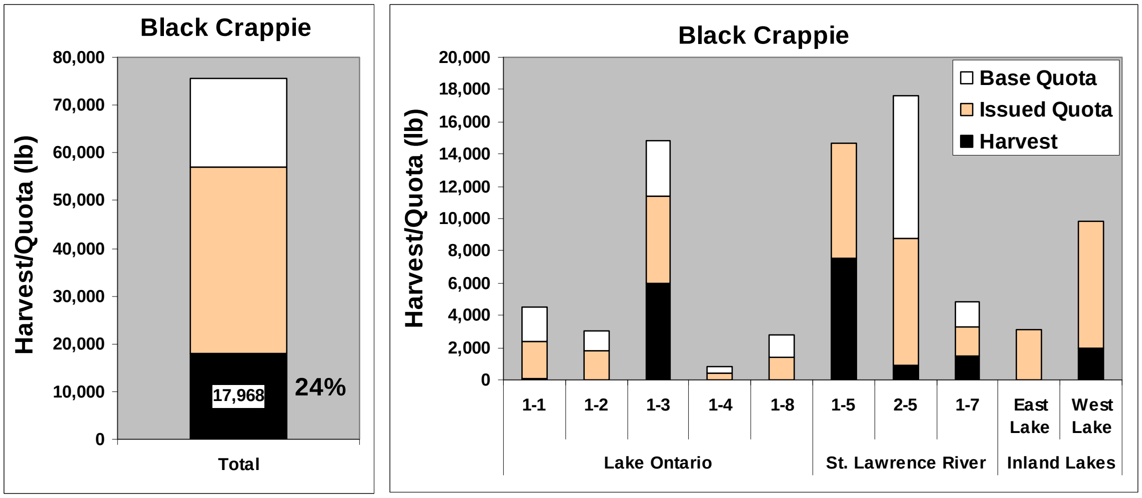


FIG. 4.1.12. **Black Crappie** commercial harvest relative to issued and base quota (total for all quota zones combined; left panel) and by quota zone (right panel), 2012.

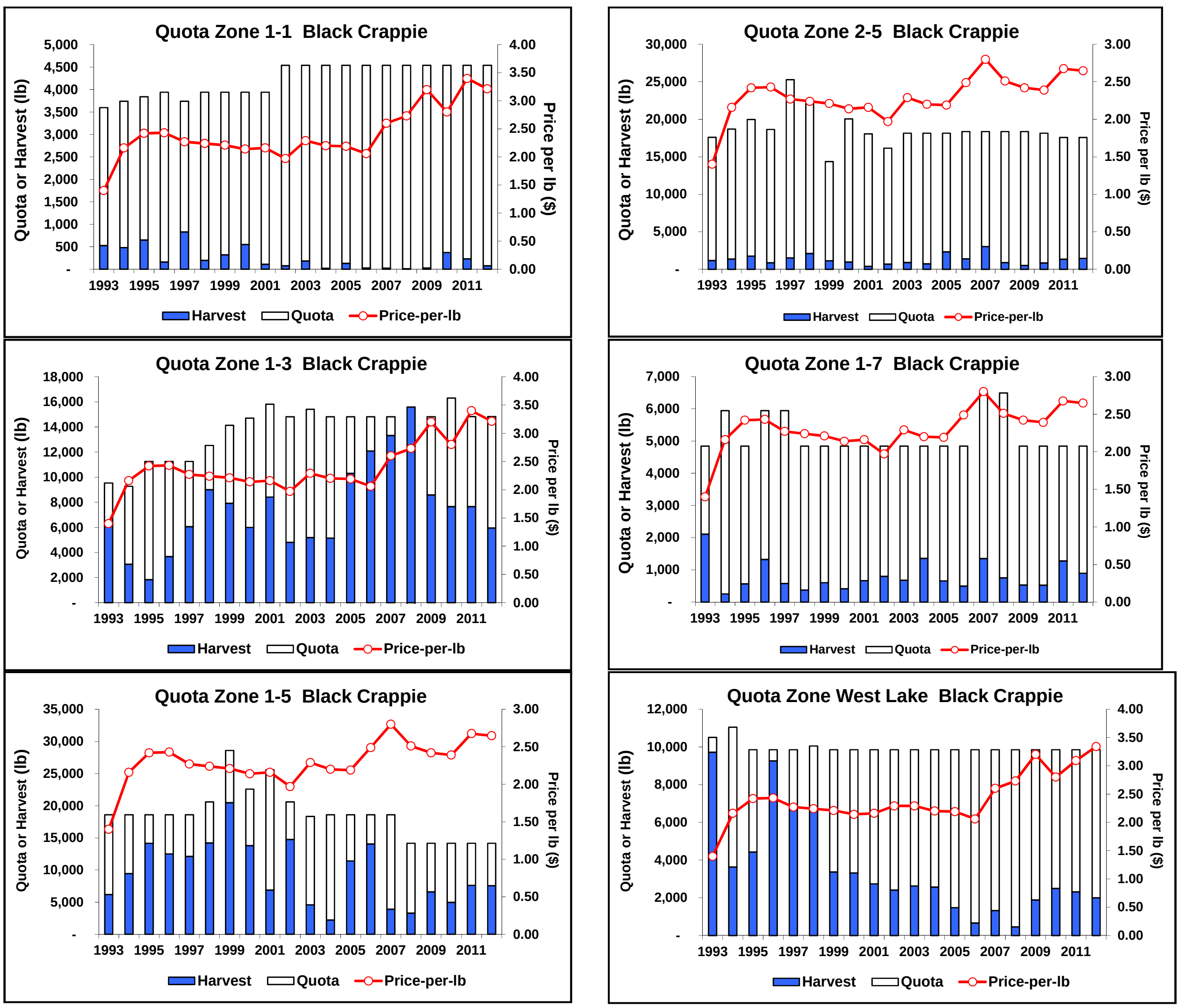


FIG. 4.1.13. Commercial base quota, harvest and price-per-lb for **Black Crappie** in Quota Zones 1-1, 1-3, 1-5, 2-5, 1-7 and West Lake, 1993-2012.

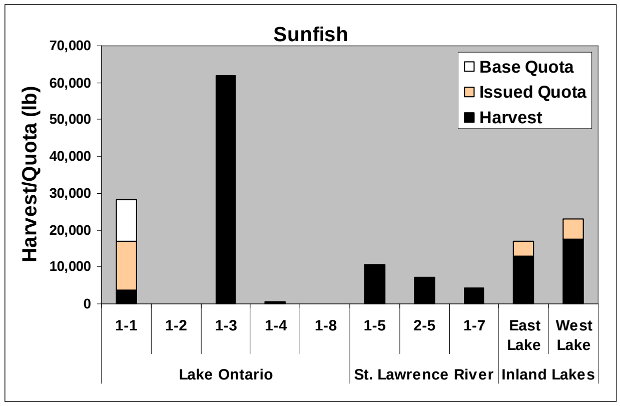


FIG. 4.1.14. **Sunfish** commercial harvest relative to issued and base quota for quota zones 1-1, East Lake and West Lake, 2012. The remaining quota zones have unlimited quota.

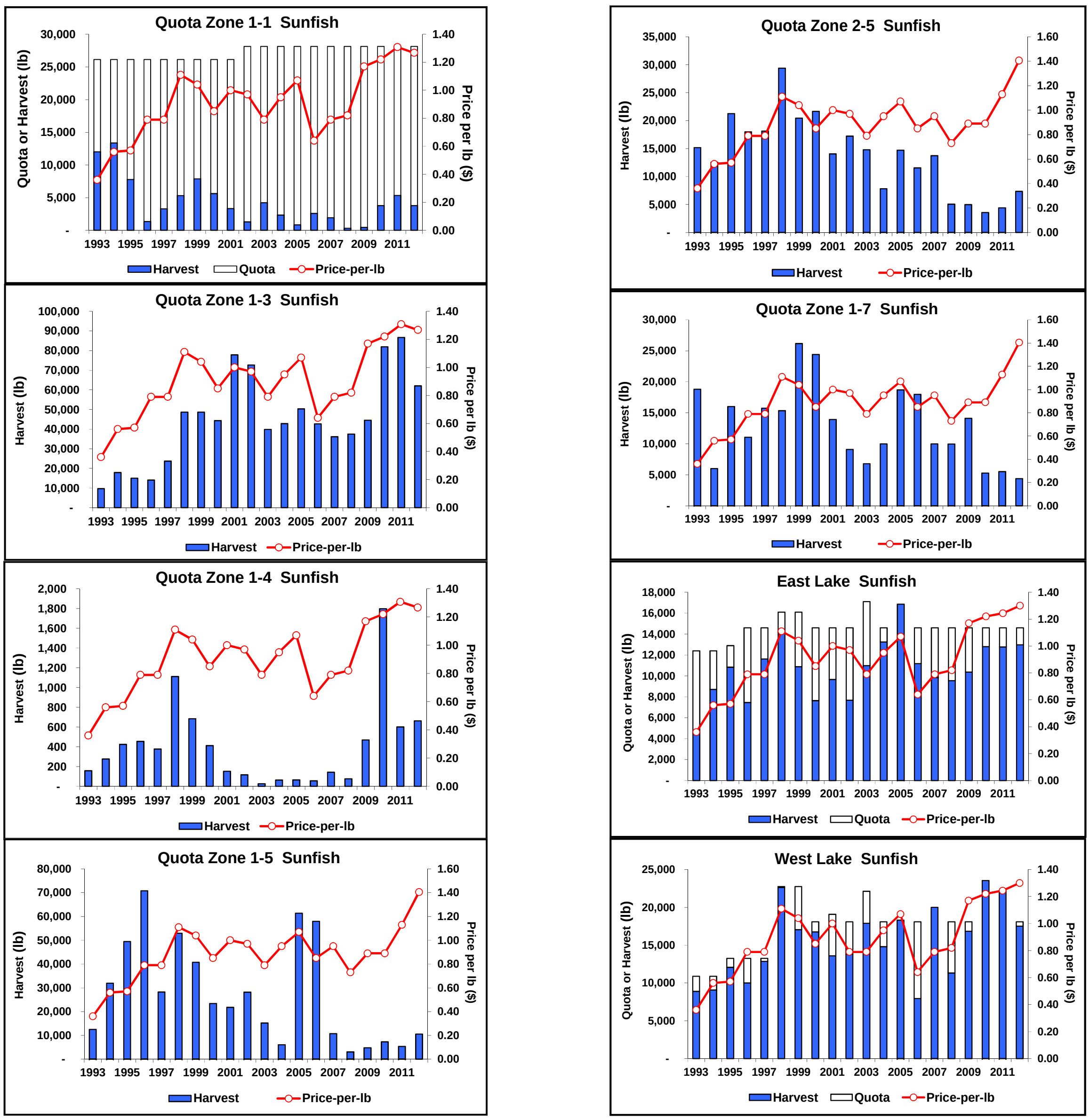


FIG. 4.1.15. Commercial base quota, harvest and price-per-lb for **Sunfish** in Quota Zones 1-1, 1-3, 1-4, 1-5, 2-5 and 1-7, East Lake and West Lake, 1993-2012.

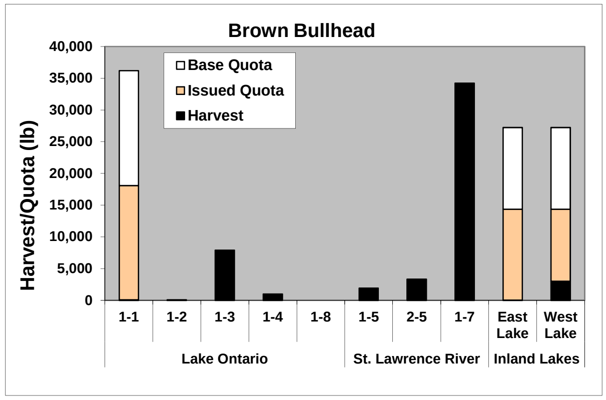


FIG. 4.1.16. **Brown Bullhead** commercial harvest relative to issued and base quota for quota zones 1-1, East Lake and West Lake, 2012. The remaining quota zones have unlimited quota.

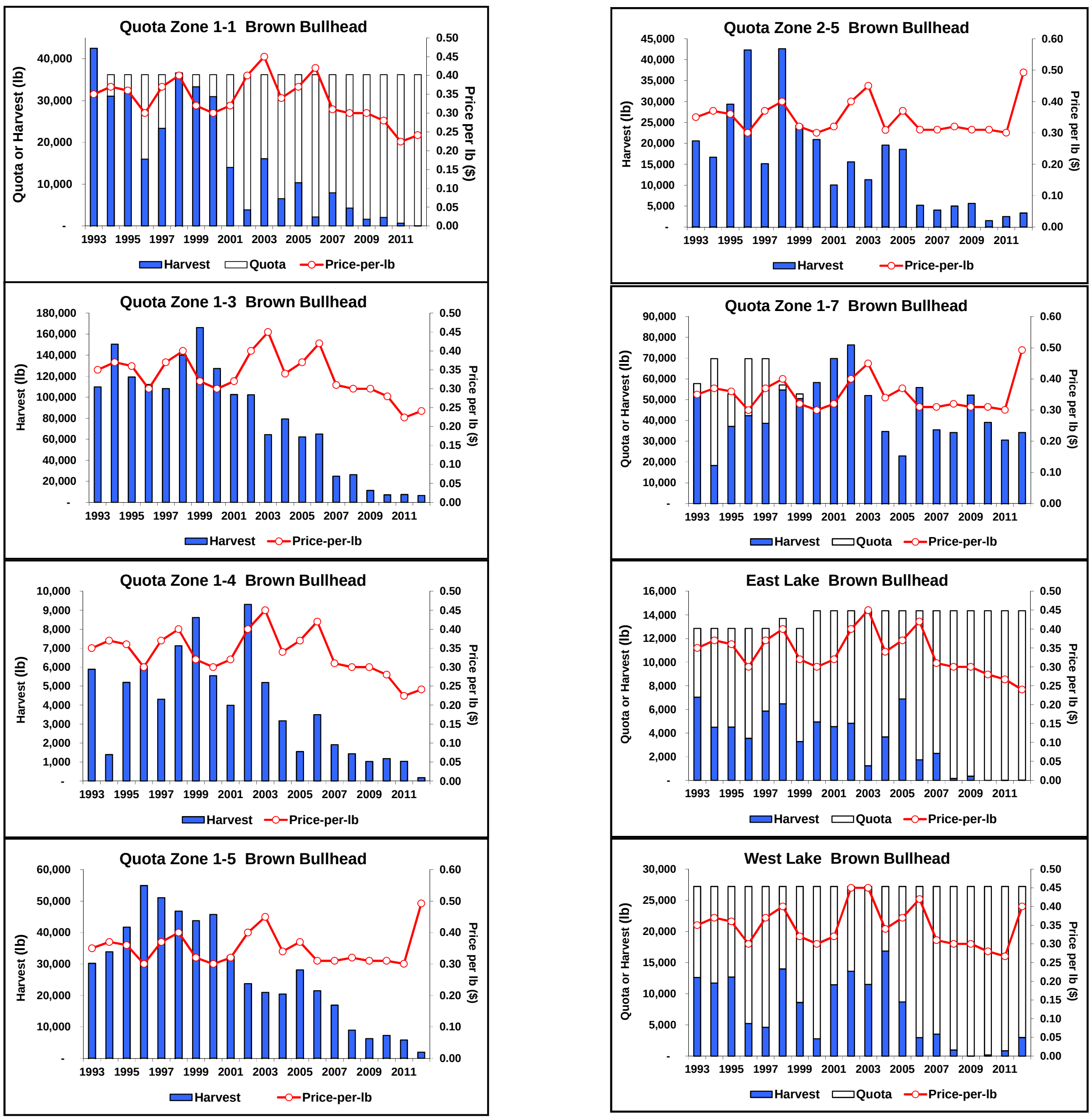


FIG. 4.1.17. Commercial base quota, harvest and price-per-lb for **Brown Bullhead** in Quota Zones 1-1, 1-3, 1-4, 1-5, 2-5 and 1-7, East Lake and West Lake, 1993-2012.

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 breakdown total harvest into size and age-specific harvest. Age-specific harvest data can then be used in catch-age modeling to estimate population size and mortality schedule.

Commercial Lake Whitefish harvest and fishing effort by gear type, month and quota zone for 2012 is reported in Table 4.2.1. Most of the harvest was taken in gillnets, 92% by weight; 8% of the harvest was taken in impoundment gear. Gillnet fishing during November in quota zone 1-2 accounted for 53% of the total harvest and 58% of the harvest in this gear type but only 28% of the total gillnet effort. Most impoundment gear harvest and effort occurred in October and November in quota zone 1-3 (Table 4.2.1).

Biological sampling focused on the November spawning-time gillnet fishery on the south shore of Prince Edward County (quota zone 1-2), and the October/November spawning-time impoundment gear fishery in the Bay of Quinte (quota zone 1-3). 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 for the lake (quota zone 1-2) and bay (quota zone 1-3) spawning stocks. Whitefish length and age distribution information is presented in (Fig. 4.2.1 and Fig. 4.2.2). In total, fork length was measured for 4,480 fish and age was interpreted using otoliths for 313 fish (Table 4.2.2, Fig. 4.2.1 and 4.2.2).

Lake Ontario Gillnet Fishery (quota zone 1-2)

The mean fork length and age of Lake Whitefish harvested during the gillnet fishery in quota zone 1-2 were 464 mm and 10.0 years respectively (Fig. 4.2.1). Fish ranged from ages 6-25 years. The most abundant age-classes in

TABLE 4.2.1. Lake Whitefish harvest (lb) and fishing effort (yards of gillnet or number of impoundment nets) by gear type, month and quota zone. Harvest and effort value in ***bold italic*** represent months and quota zones where whitefish biological samples were collected.

		Harvest (lb)				Effort (yards or number of nets)			
Gear type	Month	1-1	1-2	1-3	1-4	1-1	1-2	1-3	1-4
Gillnet	Jan				89				2,000
	Feb				33				1,630
	Mar		411		412		3,200		4,960
	Apr		1,434				14,480		
	May		367				4,460		
	Jun		5,270				27,220		
	Jul		2,379				21,640		
	Aug		8,810				29,200		
	Sep		3,796		53		13,200		480
	Oct	15	53		160	1,500	500		1,800
	Nov	4,993	***38,517***		65	12,300	***54,850***		1,020
	Dec		110				1,000		
Impoundment	Mar			71	4			169	3
	Apr		2	16	8		1	66	6
	May		327	17	63		5	68	5
	Jun		38				2		
	Sep			14				48	
	Oct			***2,345***				***367***	
	Nov			***2,753***				***422***	

TABLE 4.2.2. Age-specific vital statistics of **Lake Whitefish** sampled and harvested including number aged, number measured for length, and proportion by number of fish sampled, harvest by number and weight (kg), and mean weight (kg) and fork length (mm) of the harvest for quota zones 1-2 and 1-3, 2012

Quota zone 1-2 (Lake stock)								Quota zone 1-3 (Bay stock)							
	Sampled			Harvested					Sampled			Harvested			
Age (years)	Number aged	Number lengthed	Proportion	Number	Weight (kg)	Mean weight (kg)	Mean length (mm)	Age (years)	Number aged	Number lengthed	Proportion	Number	Weight (kg)	Mean weight (kg)	Mean length (mm)
1	-	-	0.000	-	-			1	-	-	0.000	-	-		
2	-	-	0.000	-	-			2	-	-	0.000	-	-		
3	-	-	0.000	-	-			3	-	-	0.000	-	-		
4	-	-	0.000	-	-			4	-	-	0.000	-	-		
5	-	-	0.000	-	-			5	13	54	0.089	204	175	0.855	418
6	4	97	0.025	631	486	0.771	416	6	19	78	0.129	294	287	0.975	417
7	38	912	0.236	5,931	4,914	0.828	422	7	27	109	0.178	408	413	1.012	432
8	35	836	0.216	5,438	5,616	1.033	452	8	18	73	0.120	275	295	1.073	430
9	23	558	0.144	3,632	4,412	1.215	476	9	15	60	0.099	225	264	1.169	435
10	18	432	0.112	2,811	3,225	1.147	469	10	21	86	0.141	323	375	1.162	474
11	16	382	0.099	2,487	2,896	1.165	474	11	2	8	0.013	30	25	0.845	486
12	1	33	0.008	212	279	1.315	478	12	3	13	0.021	48	67	1.394	518
13	0	12	0.003	75	108	1.441	507	13	3	12	0.020	46	73	1.580	492
14	1	36	0.009	232	342	1.473	515	14	5	18	0.030	68	82	1.200	431
15	4	103	0.027	668	1,037	1.552	502	15	3	12	0.020	46	58	1.256	495
16	0	5	0.001	35	58	1.663	527	16	1	3	0.004	10	15	1.531	490
17	5	112	0.029	729	1,218	1.671	526	17	2	7	0.012	27	31	1.159	549
18	5	130	0.034	844	1,301	1.541	523	18	2	7	0.012	28	34	1.222	517
19	1	32	0.008	210	342	1.626	543	19	1	3	0.004	10	11	1.141	487
20	4	99	0.026	644	909	1.413	513	20	3	10	0.017	39	72	1.835	559
21	1	28	0.007	185	339	1.832	546	21	4	16	0.027	61	107	1.754	543
22	1	13	0.003	86	180	2.090	568	22	3	13	0.022	50	100	2.000	561
23	0	7	0.002	48	104	2.144	565	23	6	23	0.038	87	173	2.000	542
24	2	39	0.010	256	399	1.560	525	24	0	1	0.002	5	9	2.000	518
25	0	2	0.001	13	30	2.298	601	25	-	-	0.000	-	-		
26	-	-	0.000	-	-			26	-	-	0.000	-	-		
27	-	-	0.000	-	-			27	-	-	0.000	-	-		
28	-	-	0.000	-	-			28	0	1	0.002	4	8	2.000	588
29	-	-	0.000	-	-			29	-	-	0.000	-	-		
30	-	-	0.000	-	-			30	-	-	0.000	-	-		
Total	162	3,870	1	25,167	28,195			Total	151	610	1	2,288	2,367		
Weighted mean						**1.120**		Weighted mean						**1.035**	

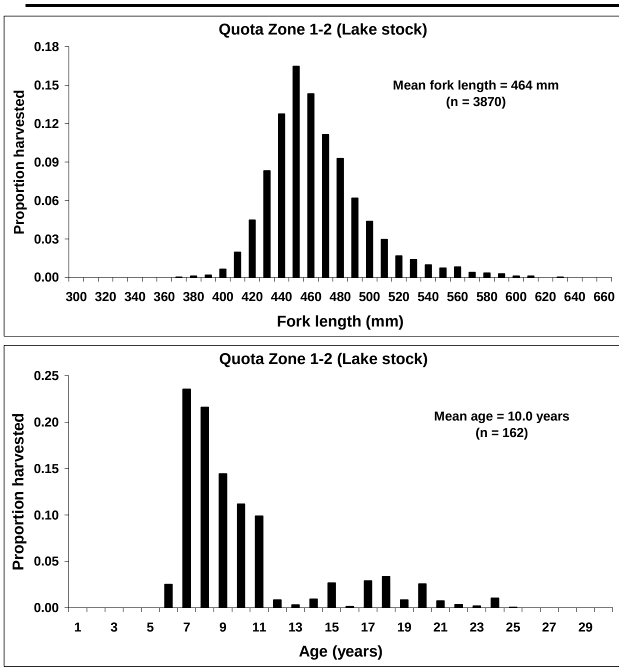


FIG. 4.2.1. Size and age distribution (by number) of **Lake Whitefish** sampled in quota zone 1-2 during the 2012 commercial catch sampling program.

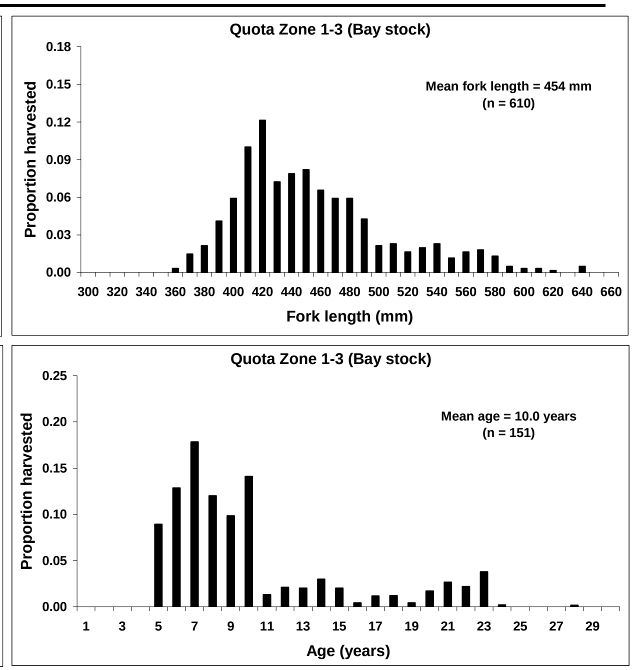


FIG. 4.2.2. Size and age distribution (by number) of **Lake Whitefish** sampled in quota zone 1-3 during the 2012 commercial catch sampling program.

the fishery were aged 7-11 years which together comprised 81% of the harvest by number (75% by weight).

Bay of Quinte November Impoundment Gear Fishery (quota zone 1-3)

Mean fork length and age were 454 mm and 10.0 years, respectively (Fig. 4.2.2). Fish ranged from ages 5 to 28 years. The most abundant age-classes in the fishery were aged 5-10 years which together comprised 76% of the harvest by number (76% by weight).

Condition

Lake Whitefish (Bay of Quinte and Lake Ontario spawning stocks; sexes combined) relative weight (see Rennie et al. 2008) is shown in Figure 4.2.3. Condition declined markedly in 1994 and has remained low, although the 2011 and 2012 data points were among the highest values since 1994.

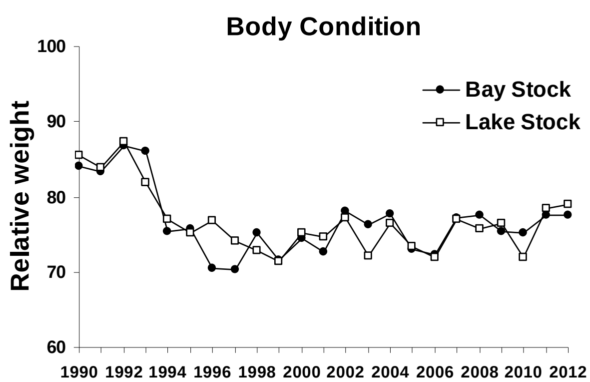


FIG. 4.2.3. **Lake Whitefish** (Lake Ontario and Bay of Quinte spawning stocks and sexes combined) relative weight (see [1]Rennie et al. 2008), 1990-2012.

[1]*Rennie, M.D. and R. Verdon. 2008. Development and evaluation of condition indices for the Lake Whitefish. N. Amer. J. Fish. Manage. 28:1270-1293.*

4.3 Lake Herring Commercial Catch Sampling

Fifty Lake Herring were obtained from the Bay of Quinte (Quota Zone 1-3) commercial trap net fishery in fall 2012. The mean length and weight of these fish were 323 mm and 420 g respectively (Fig. 4.3.1). A length vs. weight plot is shown in Fig. 4.3.2 and the age distribution of these Lake Herring is shown in Table 4.3.1.

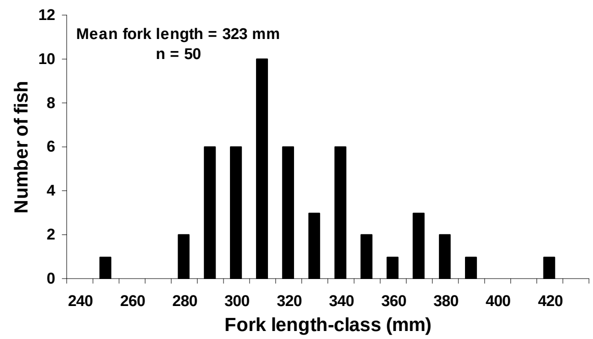


FIG. 4.3.1. Size distribution (by number) of **Lake Herring** sampled in quota zone 1-3 during the 2012 commercial catch sampling program.

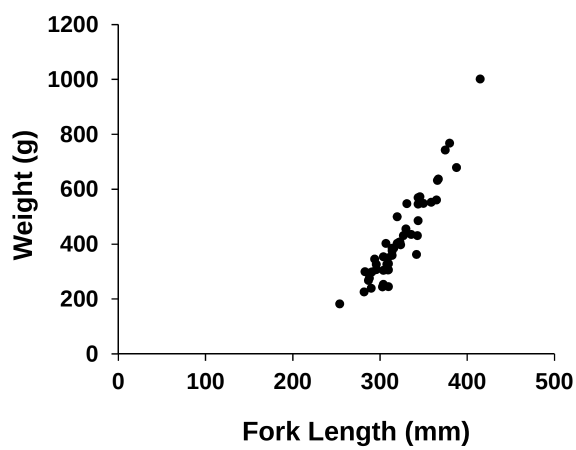


FIG. 4.3.2. Length vs. weight scatter plot of **Lake Herring** sampled in quota zone 1-3 during the 2012 commercial catch sampling program.

TABLE 4.3.1. Age distribution of 46 **Lake Herring** sampled from the Bay of Quinte commercial trap net fishery, 2012. Also shown are age-specific mean fork length and mean weight.

	Age/Yearclass										
	3	4	5	6	7	8	9	10	13	14	16
	2009	2008	2007	2006	2005	2004	2003	2002	1999	1998	1996
Count of Fish	3	12	10	9	5	1	1	2	1	1	1
Mean fork length (mm)	282	302	321	322	350	304	366	387	342	343	310
Mean weight (g)	271	342	412	407	515	253	632	777	362	430	245

5. Age and Growth Summary

Biological sampling of fish from Lake Ontario Management Unit field projects routinely involves collecting and archiving structures used for such purposes as age interpretation and validation, origin determination (e.g. stocked versus wild), life history characteristics and other features of fish growth. Coded wire tags, embedded in the nose of fish prior to stocking, are sometimes employed to uniquely identify individual fish (e.g., to determine stocking location and year, when recovered). In 2012, a total of 2,652 structures were processed and interpreted from 13 different fish species (Table 5.1) .

TABLE 5.1. Species-specific summary of age and growth structures interpreted for age (n = 2,652) to support Lake Ontario Management Unit assessment projects in 2012.

	Structure					
Species	Scales	Otoliths	Cleithra	Spines	Code Wire Tags	Total
Black Crappie	71					71
Bluegill	84					84
Brown Bullhead				63		63
Chinook Salmon		199			321	520
Lake Herring		60				60
Lake Trout					11	11
Lake Whitefish		382				382
Largemouth Bass	65					65
Northern Pike			58			58
Pumpkinseed	83					83
Rainbow Trout	105					105
Smallmouth Bass	66					66
Walleye	272	328				600
Yellow Perch	364	120				484
Total	1110	1089	58	63	332	2652

6. Contaminant Monitoring

The Lake Ontario Management Unit cooperates annually with several agencies to collect fish samples for contaminant testing. In 2012, 327 contaminant samples were collected for Ontario's Ministry of the Environment Sport Fish Monitoring program (Table 6.1). Samples were primarily collected using existing fisheries assessment programs on Lake Ontario, Bay of Quinte and the St. Lawrence River (i.e., Lake St. Francis).

A summary of the number of fish samples collected by species, for contaminant analysis by the Ministry of Environment, 2000-2012 is shown in Table 6.2.

In 2012, 48 Lake Whitefish samples were also collected for contaminant analysis from the Upper Bay of Quinte and the Northeastern Lake Ontario (Table 6.3).

TABLE 6.1. Number of fish samples collected, by region and species, for contaminant analysis by the Ministry of Environment, 2012.

Region	Block	Species	Total
Hamilton Harbour	3	Bluegill	20
		Brown Bullhead	20
		Channel Catfish	20
		Northern Pike	7
		Pumpkinseed	19
Toronto Waterfront Area	4a	Bluegill	20
		Northern Pike	20
Northwestern Lake Ontario	6	Chinook	20
		Rainbow Trout	1
Northeastern Lake Ontario	8	Brown Trout	20
		Chinook	1
		Lake Trout	18
		Rock Bass	5
		Walleye	4
		Yellow Perch	19
Upper Bay of Quinte	9	Brown Bullhead	14
Lake St. Francis	15	Largemouth Bass	20
		Northern Pike	7
		Pumpkinseed	12
		Smallmouth Bass	15
		Walleye	20
		Yellow Perch	25
Total			327

TABLE 6.2. Summary of the number of fish samples collected, by species, for contaminant analysis by the Ministry of Environment, 2000-2012.

	Year												
Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Black Crappie			20	20	3	20		20		20	29		
Bluegill		26		20	10	23			102	88		40	40
Brown Bullhead		40	44	40	25	30	33	40	68	63	56	81	34
Brown Trout	40	3	20		31		22	6	29	34	34	12	20
Channel Catfish	20	20	7	23		17				8		15	20
Chinook Salmon	40	3	16		48		29	1	36		39	1	21
Coho Salmon		1	3										
Common Carp				7									
Freshwater Drum			43		16		13	2	32	20	37		
Lake Trout			42		54		38	17	46	20	33	13	18
Lake Whitefish	20												
Largemouth Bass		4	25	28	20	9	8	89	26	40	28	55	20
Northern Pike		53	39	60	22	40	22	94	35	28	31	20	34
Pumpkinseed		60	25	57	8	11	23	78	92	105	19	43	31
Rainbow Trout	40	37	28	20	37	20	29	20	21	20	33		1
Rock Bass		36	30	38	11	21	27	30	20	40	42	80	5
Silver Redhorse							1						
Smallmouth Bass		20	87	22	21	28	35	23	39	40	31	58	15
Walleye		42	51	40	61	30	62	98	61	40	70	71	24
White Bass											20		
White Perch		40		40	40	14	21	20	35	20	7		
White Sucker							1						
Yellow Perch	20	60	66	58	75	40	86	90	60	91	80	20	44
Total	180	445	546	473	482	303	450	628	702	677	589	509	327

TABLE 6.3. Number of Lake whitefish samples collected, by region for contaminant analysis.

Region	Block	Species	Total
Northeastern Lake Ontario	8	Lake whitefish	21
Upper Bay of Quinte	9	Lake whitefish	27
Total			48

7. Stocking Program

In 2012, OMNR stocked about 2.4 million salmon and trout into Lake Ontario (Table 7.1). Figure 7.1 shows stocking trends in Ontario waters from 1968 to 2012. The New York State Department of Environmental Conservation (NYSDEC) also stocked 3.2 million salmon and trout into the lake in 2012.

About 610,000 Chinook Salmon spring fingerlings were stocked at various locations to provide put-grow-and-take fishing opportunities. All Chinook Salmon for the Lake Ontario program were produced at Normandale Fish Culture Station.

About 120,000 Chinook Salmon were held in pens at eight sites in Lake Ontario for a short period of time prior to stocking. This ongoing project is being done in partnership with local community groups. It is hoped that pen-imprinting will help improve returns of mature adults to these areas in the fall, thereby enhancing local nearshore and shore fishing opportunities.

TABLE 7.1. Fish stocked into Province of Ontario waters of Lake Ontario, 2012, and target for 2013.

Species	Life stage	2012*	2013
Atlantic Salmon	Eyed eggs	542,371	30,000
	Fry	455,470	400,000
	Fall fingerlings	171,445	150,000
	Spring yearlings	78,239	75,000
		705,154**	**625,000****
Brown Trout	Fall fingerlings	33,342	40,000
	Spring Yearlings	177,710	140,000
		211,052	**180,000**
Chinook Salmon	Spring fingerlings	**611,395**	540,000
Coho Salmon	Fall fingerlings	**18,144**	**80,000**
Lake Trout	Spring yearlings	**602,417**	**440,000**
Rainbow Trout	Fingerlings	-	15,000
	Spring yearlings	183,180	140,000
	Fall yearlings	12,322	0
		195,502	**155,000**
Walleye	Spring fingerlings	100,000	100,000
	Adults	151	-
		100,151	**100,000**
Stocking totals**		**2,443,815**	**1,495,000**

*includes fish reared and stocked by OMNR and its partners
**excluding eggs

From 2008 to 2011, all Chinook Salmon stocked were marked with an adipose fin clip. A sub-sample of fish were also given an internal coded wire tag. This was done using Northwest Marine Technology's AutoFish, a unique, highly automated clipping and tagging system. This marking program has been very helpful in determining levels of natural reproduction of Chinook Salmon in Lake Ontario and evaluate the effectiveness of our stocking program (see Section 3.2 for results). The study is being done cooperatively between New York and Ontario. Although Chinook Salmon were not marked in 2012, anglers will continue to see adipose-clipped Chinook Salmon in the fishery in 2012 and beyond.

Atlantic Salmon were stocked in support of an ongoing program to restore self-sustaining populations of this native species to the Lake Ontario basin (Section 8.2). Over 700,000 Atlantic Salmon of various life stages (excluding eggs) were released into current restoration streams in 2012: Credit River, Duffins Creek, Cobourg Brook and the Humber River. OMNR is working cooperatively with the Ontario Federation of Anglers and Hunters and a network of other partners to plan and deliver this phase of Atlantic Salmon restoration, including setting stocking targets to help meet program objectives. Atlantic Salmon are produced at both OMNR and partner facilities. Three Atlantic Salmon brood stocks from different source populations in Nova Scotia, Quebec and Maine are currently housed at OMNR's Harwood and Normandale Fish Culture Stations. Each individual brood fish can be identified by a number stored in a passive integrated transponder (PIT) tag and all have been genotyped to facilitate follow-up assessment on their progeny in the wild.

About half a million 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. Three

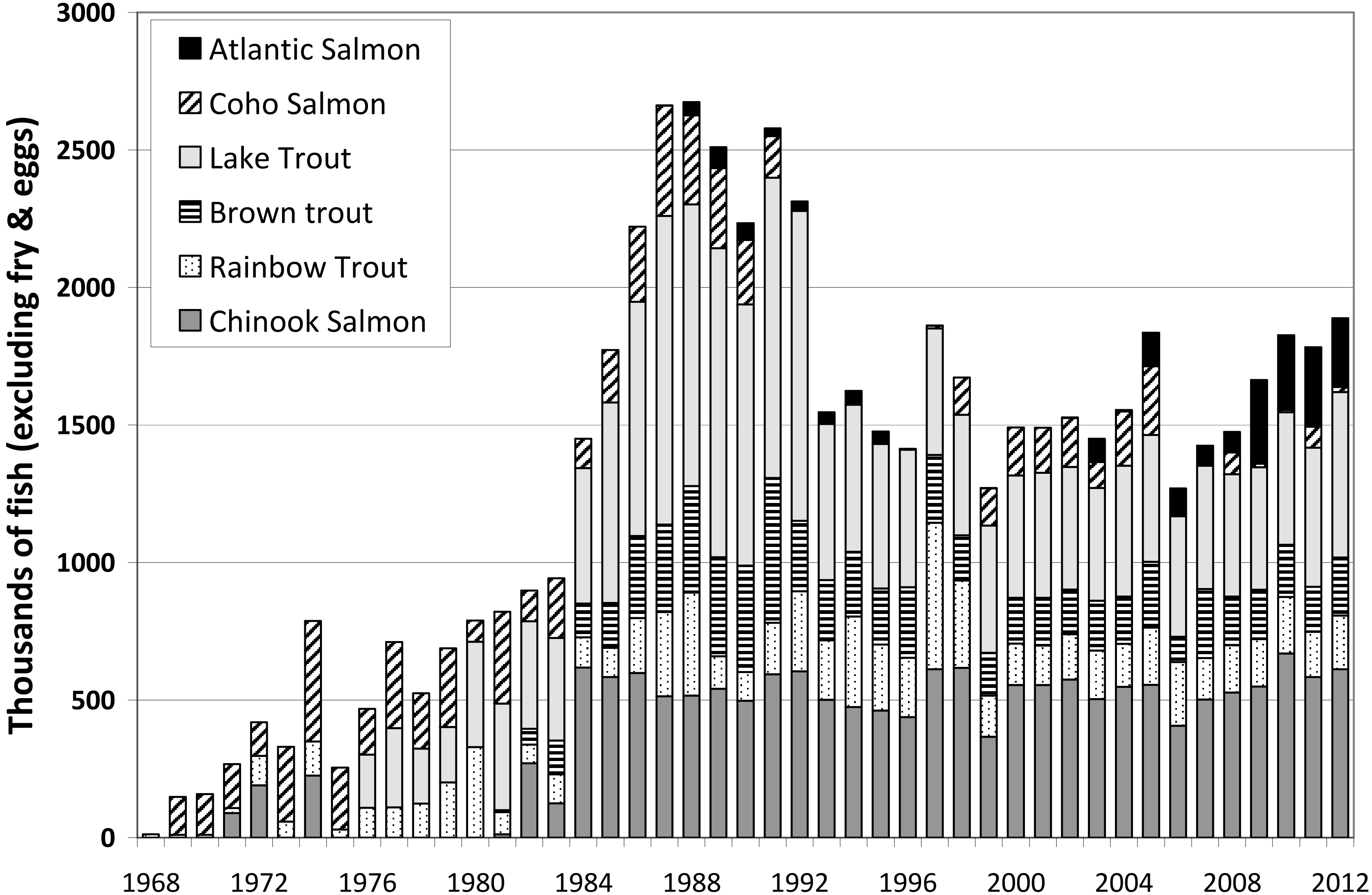


FIG. 7.1. Trends in salmon and trout stocking in Ontario waters of Lake Ontario, 1968-2012.

strains, originating from Seneca Lake, Slate Islands and Michipicoten Island, are stocked as part of our annual target. In 2012, we also stocked approximately 14,000 Lake Trout of Lake Simcoe origin. These fish were surplus to the Lake Simcoe management program. Increasing genetic variation in the Lake Trout population may increase prospects for successful rehabilitation of this native species to Lake Ontario. The Lake Simcoe fish were marked with coded-wire tags so they can be easily identified during follow-up assessment.

Rainbow Trout and Brown Trout were stocked at various locations to provide shore and boat fishing opportunities. A portion of the Rainbow Trout target is stocked into streams with a potential to establish wild populations. About 18,000 Coho Salmon fall fingerlings and 18,000 fall fingerling Rainbow Trout were produced by stocking partner Metro East Anglers, while the Credit River Anglers Association produced approximately 15,000 Rainbow Trout.

A unique opportunity presented itself in 2012, when some surplus Walleye became available. Approximately 100,000 summer fingerling Walleye were stocked into Hamilton Harbour, in an effort to 'jump-start' recovery of the fish community, which is currently dominated by Channel Catfish and Brown Bullhead. A small number of retired broodstock Walleye were also stocked later in the season, split evenly between Hamilton and Toronto Harbours. These small stocking events were done in anticipation of fish habitat improvements in Hamilton Harbour, as outlined in the Hamilton Harbour Fisheries Management Plan (Section 9.3).

The re-build of OMNR's Normandale Fish Culture Station is in the final stages. Through state-of-the-art design and equipment, this facility now has the capacity to produce more fish, while reducing the environmental footprint of the station on the surrounding watersheds. Normandale will be the provincial centre for two important Lake Ontario programs: Atlantic Salmon restoration and Chinook Salmon stocking. New brood lines of Atlantic salmon have been established at Normandale, and fry are in the early rearing production area of the facility.

OMNR remains committed to providing diverse fisheries in Lake Ontario and its tributaries, based on wild and stocked fish, as appropriate. Salmon and trout fisheries support valued boat, shore, pier and stream fisheries, as well as an active charter industry and a number of world-class fishing derbies. These fisheries contribute significantly to regional and local economies. OMNR is committed also to restoration of native species and supports efforts to maintain / restore healthy, stable Lake Ontario fish communities.

Detailed information about OMNR's 2012 stocking activities is found in Tables 7.2 to 7.8.

TABLE 7.2 . Atlantic Salmon stocked in the Province of Ontario waters of Lake Ontario, 2012.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
ATLANTIC SALMON - EYED EGGS								
Bronte Creek								
Various sites	1	2011	Harwood	Sebago/Harwood			None	**210,177**
Cobourg Brook								
Various sites	1	2011	Normandale	LaHave/Normandale			None	**140,834**
CREDIT RIVER								
Various sites	1	2011	Normandale	LaHave/Normandale			None	**144,023**
HUMBER RIVER								
Various sites	1	2011	Normandale	LaHave/Normandale			None	**47,337**
ATLANTIC SALMON - FRY								
COBOURG BROOK								
Cobourg Creek Ball Mill	5	2011	Fleming College	Sebago	5	1.3	None	17,000
Cobourg Creek upstream of Dale Rd. Bridge	5	2011	Fleming College	Sebago	5	1.3	None	17,000
Cobourg Creek upstream of Dale Rd. Bridge	5	2011	Fleming College	LaHave	4	0.9	None	18,000
Hie Property	5	2011	Normandale	LaHave/Normandale	5	1.3	None	26,479
								78,479
CREDIT RIVER								
15th sideroad Blackcreek	4	2011	Normandale	Sebago/Harwood	4	1.4	None	31,823
6th line Black Creek	4	2011	Normandale	Sebago/Harwood	4	1.4	None	32,172
Credit R Ellie's Ice Cream	5	2011	Normandale	Sebago/Harwood	5	1.6	None	31,970
Forks of Credit Dominion St	5	2011	Normandale	Sebago/Harwood	5	1.5	None	29,289
Forks of Credit Dominion St	5	2011	Normandale	LaHave/Normandale	5	1.7	None	24,091
Stuck Truck	5	2011	Normandale	LaHave/Normandale	5	1.5	None	24,086
Park Meadow	5	2011	Normandale	LaHave/Normandale	5	1.3	None	23,824
Belfountain	5	2011	Normandale	LaHave/Normandale	5	1.7	None	23,841
Grange Side Road	6	2011	Normandale	LaHave/Normandale	6	1.4	None	24,136
Credit River Anglers Association	5	2011	Fleming College	LaHave	4	1.6	None	5,000
								250,232
DUFFINS CREEK								
Sideline 32	5	2011	Harwood	Sebago/Harwood	4	1.3	None	22,717
Sideline 34 North	5	2011	Harwood	Sebago/Harwood	4	1.3	None	21,595
								44,312
HUMBER RIVER								
Humber River Castlederg Road Bridge	5	2011	Fleming College	Sebago	5	1.6	None	20,566
Humber River Innis Lake Rd at Bruce Trail Site	3	2011	Fleming College	Sebago	3	1.7	None	61,881
								82,447

Continued on next page

TABLE 7.2 (continued) Atlantic Salmon stocked in the Province of Ontario waters of Lake Ontario, 2012.

ATLANTIC SALMON - FALL FINGERLINGS

COBOURG BROOK								
Telephone Road	9	2011	Normandale	Sebago/Harwood	9	9.3	None	14,899
Stocked Danforth Road	10	2011	Normandale	LaHave/Normandale	9	7.4	None	18,351
								33,250
CREDIT RIVER								
Grange Side Road	10	2011	Normandale	LaHave/Normandale	9	6.9	None	31,022
Inglewood bridge	9	2011	Normandale	Sebago/Harwood	9	9.0	None	16,185
McLaren Road	9	2011	Normandale	Sebago/Harwood	9	8.8	None	21,497
Sligo Bridge	9	2011	Normandale	Sebago/Harwood	9	9.0	None	21,499
								90,203
DUFFINS CREEK								
Wixon Creek	10	2011	Normandale	LaHave/Normandale	9	6.6	None	23,392
Duffins Creek 5th Concession	10	2011	Fleming College	Sebago	10	22.0	None	24,600
								47,992

ATLANTIC SALMON - SPRING YEARLINGS

COBOURG BROOK								
Danforth Bridge	3	2010	Normandale	Sebago/Harwood	15	22.5	None	6,015
Danforth Bridge	3	2010	Normandale	Sebago/Harwood	15	22.2	None	5,444
Cobourg Creek Division Street	3	2010	Fleming College	LaHave	15	92.5	None	3,580
Cobourg Creek Hie Property	4	2010	Fleming College	LaHave	15	105.4	None	4,850
								19,889
CREDIT RIVER								
Inglewood	2	2010	Normandale	LaHave River	14	15.5	None	17,330
Terra Cotta	3	2010	Normandale	LaHave River	15	14.5	None	17,378
Inglewood	3	2010	Normandale	LaHave River	15	14.9	None	14,898
								29,175
DUFFINS CREEK								
East Duffins Cr. - 5th Conc.	3	2010	Fleming College	LaHave	15	88.1	None	8,177
5th Concession	3	2010	Normandale	Sebago/Harwood	15	21.7	None	5,743
5th concession. Stocked with record 28336	3	2010	Normandale	LaHave River	15	14.9	None	3,513
5th concession. Shared load with record 28335	3	2010	Normandale	Sebago/Harwood	15	23.0	None	11,742
								29,175

TOTAL - ATLANTIC SALMON EYED EGGS		**542,371**
TOTAL - ATLANTIC SALMON FRY		**455,470**
TOTAL - ATLANTIC SALMON FALL FINGERLINGS		**171,445**
TOTAL - ATLANTIC SALMON SPRING YEARLINGS		**78,239**
	Total - No Eggs	**705,154**
TOTAL - ATLANTIC SALMON		**1,247,525**

TABLE 7.3. Brown Trout stocked in the Province of Ontario waters of Lake Ontario, 2012.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				BROWN TROUT - FALL FINGERLINGS				
Athol Bay	10	2011	Ringwood*	Ganaraska/Tarentorus	10	24.4		10,000
Lower Duffins Creek	10	2011	Ringwood*	Ganaraska/Tarentorus	10	25.3		23,342
								33,342
				BROWN TROUT - SPRING YEARLINGS				
BRONTE CREEK								
Bronte Beach Park	4	2010	Chatsworth	Ganaraska/Tarentorus	15	34.0	ADIPO	**15,000**
DUFFINS CREEK								
401 Bridge	4	2010	Chatsworth	Ganaraska/Tarentorus	15	34.0	ADIPO	**12,000**
LAKE ONTARIO								
Fifty Point CA	4	2010	Chatsworth	Ganaraska/Tarentorus	15	29.8	ADIPO	25,000
Burlington Canal	4	2010	Chatsworth	Ganaraska/Tarentorus	15	29.8	ADIPO	10,019
Port Dalhousie East	4	2010	Chatsworth	Ganaraska/Tarentorus	15	32.7	ADIPO	10,021
Jordan Harbour	4	2010	Chatsworth	Ganaraska/Tarentorus	15	32.7	ADIPO	15,032
Athol Bay	4	2010	Chatsworth	Ganaraska/Tarentorus	15	33.4	ADIPO	18,008
Millhaven Wharf	4	2010	Chatsworth	Ganaraska/Tarentorus	15	33.4	ADIPO	11,606
Bluffer's Park	4	2010	Chatsworth	Ganaraska/Tarentorus	15	33.7	ADIPO	11,520
Oshawa Harbour	4	2010	Chatsworth	Ganaraska/Tarentorus	15	33.8	ADIPO	11,085
Lakefront Promenade	4	2010	Chatsworth	Ganaraska/Tarentorus	15	33.8	ADIPO	20,396
Ashbridge's Bay	4	2010	Chatsworth	Ganaraska/Tarentorus	15	33.7	ADIPO	18,023
								150,710
Total - Brown Trout Fall Fingerlings								**33,342**
Total - Brown Trout Spring Yearlings								**177,710**
TOTAL - BROWN TROUT								**211,052**

* following the hatchery name indicates a partnership hatchery

Ringwood - all fish at Ringwood FCS were produced by volunteers from Metro East Anglers

TABLE 7.4. Chinook Salmon stocked in the Province of Ontario waters of Lake Ontario, 2012.

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	5	2011	Normandale	Wild - Credit R.	6	6.9	none	12,499
Port Darlington	5	2011	Normandale*	Wild - Credit R.	5	9.4	none	12,500
								24,999
BRONTE CREEK								
2nd Side Road Bridge	4	2011	Normandale	Wild - Credit R.	5	5.69	none	26,920
5th Side Road Bridge	4	2011	Normandale	Wild - Credit R.	5	5.69	none	26,974
								53,894
CREDIT RIVER								
Eldorado Park	4	2011	Normandale	Wild - Credit R.	5	7.4	none	30,560
Huttonville	5	2011	Normandale	Wild - Credit R.	6	6.6	none	28,330
Norval Nashville North	5	2011	Normandale	Wild - Credit R.	6	6.1	none	28,343
Port Credit	5	2011	Normandale*	Wild - Credit R.	5	11.7	none	10,000
								97,233
DON RIVER								
Donalda Golf Club	5	2011	Normandale	Wild - Credit R.	6	6.5	none	**25,004**
HUMBER RIVER								
East Branch Islington	5	2011	Normandale	Wild - Credit R.	6	6.5	none	**24,483**
NIAGARA R.								
Queenston	4	2011	Normandale	Wild - Credit R.	5	6.6	none	**49,984**
LAKE ONTARIO								
Ashbridge's Bay	4	2011	Normandale	Wild - Credit R.	5	6.5	none	10,777
Bluffer's Park	5	2011	Normandale	Wild - Credit R.	6	6.9	none	17,507
Bluffer's Park	5	2011	Normandale*	Wild - Credit R.	6	8.9	none	17,500
Brighton	4	2011	Normandale*	Wild - Credit R.	5	11.3	none	12,499
Burlington Canal	4	2011	Normandale	Wild - Credit R.	5	5.8	none	43,126
Consecon Robinson Point	5	2011	Normandale	Wild - Credit R.	6	6.5	none	12,500
Jordan Harbour	4	2011	Normandale	Wild - Credit R.	5	6.9	none	27,207
Lakeport	5	2011	Normandale	Wild - Credit R.	6	6.5	none	15,000
Oshawa Harbour	5	2011	Normandale	Wild - Credit R.	6	6.9	none	12,521
Oshawa Harbour	5	2011	Normandale*	Wild - Credit R.	5	8.5	none	12,500
Port Dalhousie	5	2011	Normandale*	Wild - Credit R.	5	12.6	none	30,000
Port Dalhousie East	5	2011	Normandale	Wild - Credit R.	6	6.7	none	74,766
Wellington Channel	5	2011	Normandale	Wild - Credit R.	6	6.5	none	12,515
Wellington	5	2011	Normandale*	Wild - Credit R.	5	11.1	none	12,380
Whitby Harbour	5	2011	Normandale	Wild - Credit R.	6	6.9	none	12,500
Whitby Harbour	5	2011	Normandale*	Wild - Credit R.	5	10.4	none	12,500
								335,798
TOTAL - CHINOOK SALMON								**611,395**

* Pen-imprinted

TABLE 7.5. Coho salmon stocked in the Province of Ontario waters of Lake Ontario, 2012.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				COHO - FALL FINGERLINGS				
CREDIT RIVER								
Credit River at Norval	10	2011	Ringwood*	Credit R. (wild)	10	28.7	None	18,144
TOTAL - COHO SALMON								**18,144**

* following the hatchery name indicates a partnership hatchery

Ringwood - all fish at Ringwood FCS were produced by volunteers from Metro East Anglers

TABLE 7.6. Lake Trout stocked in the Province of Ontario waters of Lake Ontario, 2012.

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	4	2010	HARWOOD	Seneca Lake/Tarentorus	15	32.6	LPECT	19,007
Cobourg Harbour Pier	5	2010	HARWOOD	Seneca Lake/Tarentorus	15	37.3	LPECT	24,006
Fifty Point CA	4	2010	HARWOOD	Seneca Lake/Tarentorus	15	35.5	LPECT	41,408
Fifty Point CA	4	2010	HARWOOD	Slate Islands/Dorion	16	43.7	LPECT	11,009
Fifty Point CA	5	2010	CHATSWORTH	Lake Simcoe (Wild)	17	33.8	CWT/ADIPO	27,103
Fifty Point CA	5	2010	HARWOOD	Seneca Lake/Tarentorus	15	41.9	LPECT	20,570
North of Main Duck Sill	4	2010	HARWOOD	Michipicoten Island/Tarentorus	16	39.3	LPECT	55,579
North of Main Duck Sill	4	2010	HARWOOD	Seneca Lake/Tarentorus	15	33.3	LPECT	25,372
North of Main Duck Sill	4	2010	WHITE LAKE	Seneca Lake/Tarentorus	15	24.3	LPECT	13,086
North of Main Duck Sill	4	2010	HARWOOD	Slate Islands/Dorion	16	42.2	LPECT	9,763
North of Main Duck Sill	4	2010	WHITE LAKE	Slate Islands/Dorion	17	26.0	LPECT	88,500
South of Long Point	4	2010	HARWOOD	Seneca Lake/Tarentorus	15	41.2	LPECT	14,364
South of Long Point	4	2010	WHITE LAKE	Seneca Lake/Tarentorus	15	24.3	LPECT	148,408
								498,175
				LAKE TROUT - FALL FINGERLINGS				
LAKE ONTARIO								
Millhaven Warf	11	2011	White Lake	Slate Islands/Dorion	12*	12.2	RPADIPO	**104,242**
TOTAL - LAKE TROUT								**602,417**

* These fish were stocked earlier than normal due to a water supply issue at the hatchery.

TABLE 7.7. Rainbow Trout stocked in the Province of Ontario waters of Lake Ontario, 2012.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				RAINBOW TROUT - SPRING YEARLINGS				
BRONTE CREEK								
2nd Side Road Bridge	4	2011	Normandale	Ganaraska/Tarentorus	12	25.0		**12,000**
CREDIT RIVER								
Huttonville	4	2011	Normandale	Ganaraska/Tarentorus	12	25.7		12,035
Norval	5	2011	Harwood	Ganaraska/Tarentorus	11	34.3		11,984
Norval	5	2011	CRAAH*	Wild - Credit R.	13			3,500
Norval - Nashville North	4	2011	Normandale	Ganaraska/Tarentorus	12	25.3		12,035
								39,554
HUMBER RIVER								
East Branch Islington	5	2011	Harwood	Ganaraska/Tarentorus	11	34.3		3,546
King Vaughan Line	5	2011	Harwood	Ganaraska/Tarentorus	11	32.2		16,955
King Vaughan Line	4	2011	Normandale	Ganaraska/Tarentorus	12	23.1		11,511
								32,012
LAKE ONTARIO								
Glenora	4	2011	White Lake	Ganaraska/Tarentorus	12	15.5		7,500
Jordan Harbour	4	2011	Normandale	Ganaraska/Tarentorus	12	23.1		22,556
Millhaven Wharf	4	2011	White Lake	Ganaraska/Tarentorus	12	15.5		7,500
Port Dalhousie East	4	2011	Normandale	Ganaraska/Tarentorus	12	21.7		23,368
Waupoos	4	2011	White Lake	Ganaraska/Tarentorus	12	15.5		5,000
Wellington	11	2012	White Lake	Ganaraska/Tarentorus	7**	11.9		16,270
								82,194
ROUGE RIVER								
Little Rouge at Steeles	3	2011	Ringwood*	Ganaraska/Tarentorus	10	23.7		**17,420**
				RAINBOW TROUT - FALL YEARLINGS				
CREDIT RIVER								
Norval	10	2011	CRAAH*	Wild - Credit R.	18	28.5		**12,322**
Rainbow Trout Spring yearlings								**183,180**
Rainbow Trout Fall Yearlings								**12,322**
TOTAL - RAINBOW TROUT								**195,502**

* following the hatchery name indicates a partnership hatchery

** These fish were stocked earlier than normal due to a water supply issue at the hatchery.

CRAAH - Credit River Anglers Association Hatchery

Ringwood - all fish at Ringwood FCS were produced by volunteers from Metro East Anglers

TABLE 7.8. Walleye stocked in Hamilton Harbour and Toronto Harbour, Lake Ontario, 2012.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
			WALLEYE - SPRING FINGERLINGS					
Hamilton Harbour								
Pier 4 Park	7	2012	White Lake	Quinte	3	1.0	None	**100,000**
			WALLEYE ADULTS					
Hamilton Harbour	11	2001	White Lake	Quinte	11 yrs	1500	LP	74
Toronto Harbour	11	2001	White Lake	Quinte	11 yrs	1500	LP	77
								151
TOTAL - WALLEYE								**100,151**

8. Biodiversity and Species Rehabilitation

8.1. Introduction

OMNR works with many partners – government agencies, non-government organizations and interested individuals at local, provincial and national levels – to monitor, protect and restore the biological diversity of fish species in the Lake Ontario basin (including the lower Niagara River and the St. Lawrence River downstream to the Quebec-Ontario boarder). Native species restoration is the center piece of LOMU's efforts to restore the biodiversity.

A number of fish species have been lost or persist in low numbers in the Lake Ontario basin. Table 8.1.1 lists twenty-three fish species that formerly occurred or are currently 'rare' in the Lake Ontario basin. The Blackfin Cisco (note that there is debate about historic existence of Blackfin Cisco in Lake Ontario), the Lake Ontario Kiyi, Atlantic Salmon and Blue Pike (a subspecies of Walleye) are thought to be extinct. Three species, Lake Trout, Bloater, and Shortnose Cisco have been extirpated (i.e., local extinction) from the Lake Ontario basin. Four species, American Eel, Burbot, Deepwater Sculpin and Lake Sturgeon that were once very common in the basin are now considered to be rare. The remaining species on this list were either uncommon historically or their historic status is uncertain. In addition, we acknowledge that there may be other species, small cyprinids for example, that may have been present historically but were lost prior to their documentation of their presence in the basin.

The sections below describe the planning and efforts to restore Atlantic Salmon, American Eel, and Deepwater Cisco. Successful restoration of these native species would be a significant milestone in improving Ontario's biodiversity. Observations of rare fish species, other than those covered in detail below, in the Lake Ontario and its tributaries during 2012 included:

- Burbot: 1 specimen observed, at Wellington, see Section 2.2;
- Deepwater Sculpin: several captured in the Nearshore/Offshore food web study, see Section 10.2;
- American Eel: 3 specimens captured; 2 at Deseronto, Bay of Quinte, see Section 2.3 and 1 in the upper Bay of Quinte, see Section 2.4.
- River Redhorse: 3 specimens captured in the upper Bay of Quinte, see Section 2.4.

See also Section 11.1, muskellunge seining program on the St. Lawrence River for additional sightings or rare and endangered species.

8.2 Atlantic Salmon Restoration

Atlantic Salmon were extirpated from Lake Ontario by the late 1800s, primarily as a result of the loss of spawning and nursery habitat in streams. As a top predator, they played a key ecological role in the offshore fish community. They were a valued resource for aboriginal communities and early Ontario settlers. As such, Atlantic Salmon are recognized as an important part Ontario's natural and cultural heritage.

A unique partnership has been established to help bring back wild, self-sustaining populations of Atlantic Salmon to Lake Ontario. This partnership, launched in 2006, brings together the Ministry of Natural Resources and the Ontario Federation of Anglers and Hunters (OFAH) and a strong network of partners and sponsors. Program partners recognize the generous support of Phase I lead sponsor, Australia's Banrock Station Wines, and welcome Phase II lead sponsor, Ontario Power Generation. Many other sponsors, conservation organizations, corporations, community groups and individuals are contributing to the success of this program.

Funding and in-kind support from all partners have contributed to enhanced fish production, habitat rehabilitation and stewardship initiatives, a research and assessment program and public education and outreach activities.

Restoration efforts have been focused on three "best-bet" streams – the Credit River, Duffins Creek and Cobourg Brook. More recently, the Humber River has been added to the program.

TABLE 8.1.1. Status of ‘rare’ fishes in the Lake Ontario basin and their designation (as of February 15, 2013) under the Ontario Endangered Species Act (ESA) and the Canadian Species at Risk Act (SARA).

Name	**Status in Lake Ontario Basin**	**Species at Risk in Ontario List Designation**	**SARA Designation**
American Eel, *Anguilla rostrata*	Historically very abundant throughout the nearshore zone of the basin; now rare.	Endangered	No Status - proposed as Threatened pending public consultation
Atlantic Salmon (Lake Ontario population), *Salmo salar*	Historically abundant throughout Lake Ontario and major tributaries; Extirpated prior to 1900’s; restoration efforts underway.		No Status - Extinct
Bigmouth Buffalo, *Ictiobus cyprinellus*	Rare historic observations; one recent observation in Lake Ontario.		Special Concern
Black Redhorse, *Moxostoma duquesnei*	Historic abundance unclear; currently found at low abundance in Spencer Creek.	Threatened	No Status - proposed as Threatened pending public consultation
Blackfin cisco, *Coregonus nigripinnis*	Historically abundance in offshore pelagic zone is unclear; thought to have become extinct by 1900.		Threatened
Bloater, *Coregonus hoyi*	Historically abundant in offshore pelagic zone; extirpated; last recorded in 1983.		Not at Risk
Blue Pike, *Sander vitreus glaucus*	Historically abundant in western Lake Ontario and Niagara River; extinct prior to 1970’s.		No Status - Extinct
Bridle Shiner, *Notropis bifrenatus*	Historic abundance unclear; Currently at low abundance in upper St. Lawrence River and tributaries, as well as Napanee River and Bay of Quinte	Special Concern	Special Concern
Burbot, *Lota lota*	Abundant in the offshore zone up to the 1920; declined steadily to virtual extirpation by about 1950; now rare.		
Channel Darter, *Percina copelandi*	Historic abundance unclear but occurred in the upper St. Lawrence River; currently found at low abundance in Moira River (including the Skootamatta River) and Salmon River.	Threatened	Threatened
Cutlip Minnow, *Exoglossum maxillingua*	Historic abundance unclear; Currently at low abundance in St. Lawrence River and tributaries.	Threatened	Not at Risk
Deepwater Sculpin (Great Lakes population), *Myoxocephalus thompsonii*	Historically very abundant in offshore pelagic zone; currently rare.		Threatened
Grass Pickerel, *Esox americanus vermiculatus*	Historic abundance unclear; currently in low abundance in St. Lawrence River, Bay of Quinte, Lake Consecon, Wellers Bay.	Special Concern	Special Concern
Lake Chubsucker, *Erimyzon sucetta*	Present in wetlands that drain into the lower Niagara River. Not observed until 1949, may always have been rare.	Threatened	Endangered
Lake Ontario Kiyi, *Coregonus kiyi orientalis*	Historically abundant in offshore pelagic zone; extinct; last recorded in 1964.		No Status - Extinct
Lake Sturgeon (Great Lakes and Western St. Lawrence populations), *Acipenser fulvescens*	Common in the nearshore zone and large tributaries throughout the basin prior to 1900; now rare.	Threatened	No Status - proposed as Threatened pending public consultation
Lake Trout, *Salvelinus namaycush*	The most abundant piscivore in the offshore zone up to the 1920s; declined steadily to virtual extirpation by about 1950; Restoration efforts underway.		
Pugnose Shiner, *Notropis anogenus*	Historic abundance is unclear; currently at low abundance in Thousand Islands area of St. Lawrence River.	Endangered	Endangered
Redside Dace, *Clinostomus elongatus*	Historic abundance unclear, but occurred in tributaries from Oshawa to Hamilton; currently rare.	Endangered	Special Concern – proposed as Endangered pending public consultation
River Redhorse, *Moxostoma carinatum*	Historic abundance unclear; currently at low abundance in Bay of Quinte and Trent River.	Special Concern	Special Concern
Shortnose Cisco, *Coregonus reighardi*	Historically abundant in offshore pelagic zone; extirpated; last recorded in 1964.	Endangered	Endangered
Silver Shiner, *Notropis photogenis*	Historic abundance unclear; currently at low abundance in Bronte Creek.	Threatened	Special Concern – proposed as Threatened pending public consultation
Spotted Gar, *Lepisosteus oculatus*	Limited historic abundance in sheltered nearshore zone; two recent observations in Bay of Quinte and East Lake.	Threatened	Threatened

These systems offer good quality spawning and nursery habitat for Atlantic Salmon and community support is strong. Demonstrated success in these systems will pave the way for restoration of Atlantic Salmon to other suitable streams in future phases of the program.

Three broodstocks from different source populations in Nova Scotia, Quebec and Maine have been established and are currently housed at OMNR's Harwood Fish Culture Station. Production stocking of our new Sebago Lake (Maine) broodstock began in 2011. Not enough Lac St-Jean (Quebec) progeny were produced for stocking purposes in 2012, however production is on track for 2013. The performance of all three strains will be evaluated in the Lake Ontario environment.

We have designed a long-term study to compare the effectiveness of stocking spring fingerlings, fall fingerlings and spring yearlings for the purpose of restoration. Genetic profiles have been developed for each individual brood fish in the hatchery to help us track their progeny in the streams and in the lake.

Unlike traditional put-grow-and-take stocking, restoration stocking involves introducing large numbers of very young fish (spring fingerlings) so that the survivors are more likely to naturalize to stream conditions. More than 3.5 million Atlantic Salmon of various life stages, but consisting of primarily spring fingerlings (nearly 70% of all stocking events) have been stocked by OMNR and various partner hatcheries since the program began. Over 200 surviving adults have been sampled and are being analyzed for life-stage origins to evaluate stocking strategies. Measures continue to be taken to improve access to upstream spawning habitat through the removal or modification of barriers and installation of fishways. The completion of a fishway at Norval was a notable milestone in 2011. This fishway has a built-in trap which allows us to enumerate adult Atlantic Salmon (and other species) as they migrate upstream, as well as collect important biological data on individual fish (Section 2.10).

In 2013, we will proceed with implementation of another innovative assessment project - a 3-year project to install and operate a resistance board weir on Duffins Creek, made possible through a grant from the Great Lakes Fishery Commission. This specialized piece of fishing gear, never before tested on the Great Lakes, will allow us to more effectively monitor adult returns (of all species) to this restoration stream.

Monitoring of juveniles in the streams has been done to assess growth and survival of stocked fish, estimate smolt production (by life stage stocked), document timing of downstream migration and describe the environmental cues which trigger this downstream movement (Sections 2.8 and 2.9). These projects use conventional electro-fishing assessment, as well as a rotary screw trap, the only example of this technology currently being used on the Great Lakes.

Thousands of students from schools and outdoor education centers have participated in a classroom hatchery program designed to actively involve youth in local restoration efforts. And, thousands of staff, partner and volunteer hours have been logged on more than 100 stream habitat protection and enhancement projects.

Although the presence of Atlantic Salmon in the Lake Ontario boat fishery remains low, catch rates over the past several years have rivaled any previously observed by New York State, in more than 25 years of data collection (J. Lantry, pers. comm.). Catches in 2012 were lower than 2011, but still high relative to recent years. The number of staging Atlantic Salmon encountered by pier anglers at the mouth of the Credit River appears to be increasing. Angler interest in Atlantic Salmon is growing and responses to the experience of catching an Atlantic Salmon have generally been very positive.

To find out more about the program, meet our partners and discover volunteer opportunities, please visit *bringbackthesalmon.ca.*

8.3 American Eel Restoration

American Eel is identified as an Endangered species under Ontario's Endangered Species Act (ESA). In addition, the Committee on the Status of Endangered Wildlife in Canada recommended in May 2012 that American Eel be identified as a Threatened species under the Canadian Species at Risk Act. These designations have lead to additional efforts to protect American Eel in Ontario. Several actions were taken by MNR's partners and the Lake Ontario Management Unit during 2012 to address the low abundance of eel.

The Moses-Saunders Dam, located on the upper St. Lawrence River between Cornwall Ontario and Massena New York, is an impediment to migration of eels in this system. MNR and Ontario Power Generation (OPG) collaborated on the operation of an eel ladder to facilitate upstream migration in the Ontario portion of the dam (R.H. Saunders Hydroelectric Dam) from 1974 to 2007. Since that time OPG has assumed full responsibility for ladder operation. The Saunders eel ladder was opened on Jun 15 and closed on Oct 15, 2012 (122 days). During that time period a total of 25,963 eels successfully exited the eel ladder (Fig. 8.3.1). A second ladder (Moses ladder), located on the New York portion of the dam has been operated by New York Power Authority since 2006. The numbers of eels exiting the Moses ladder during 2012 was 23,209. The combined number (49,172 eels) was slightly lower than observed during 2011 but was the second largest observed since 1994 (163,518 eels), and continues the general trend of increasing numbers since 2001. However, the numbers migrating upstream last year are still less than 8% of the numbers of eel observed during the early years of the ladder's operation (Fig. 8.3.1, over 600,000 eels per year during the 1970s and 1980s).

The abundance of larger 'yellow' eels in the upper St. Lawrence River (USLR) and eastern Lake Ontario (ELO) was measured with three assessment programs during 2012. Bottom trawling in the Bay of Quinte has been conducted

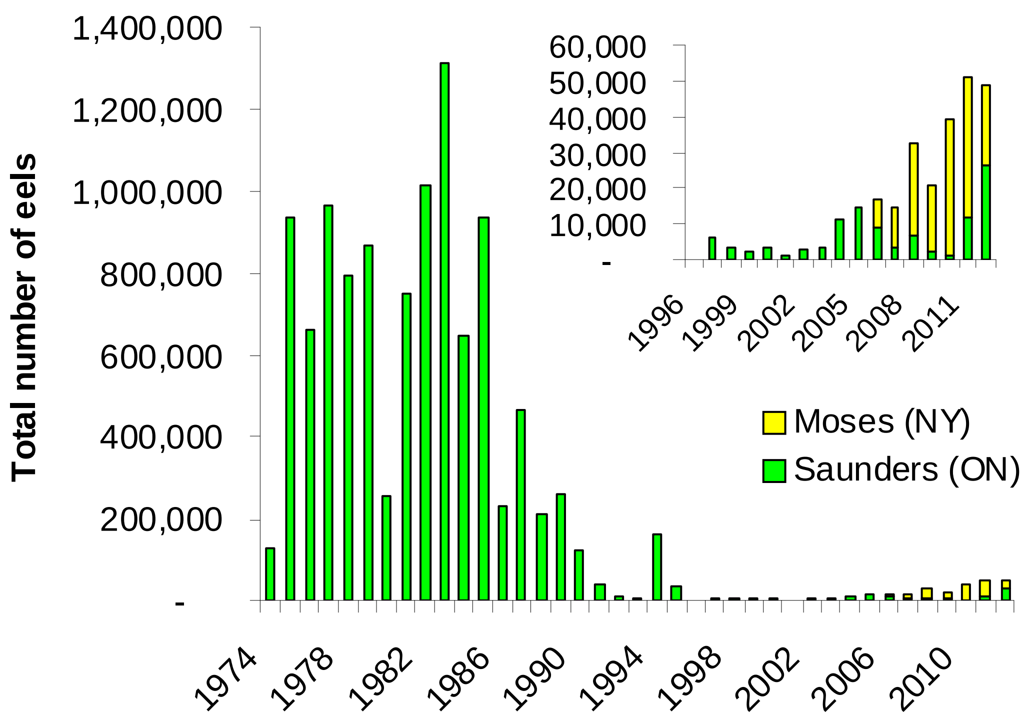


FIG. 8.3.1. Total number of eels ascending the eel ladder(s) at the Moses-Saunders Dam, Cornwall, Ontario for 1974-2012 (Kleinschmidt Associates et al., 2013). No counts are available for 1996.

since 1972 as part of the fish community index program (see Section 2.3). The average catch of American Eel in 372 trawls conducted between 1972 and 1996 was 1.68 eels per trawl. During 2012, 2 eels were caught in 48 trawls and no eels were captured in the 468 trawls conducted between 2003 and 2011. Nearshore trapnetting was conducted using the NSCIN fish community index protocol during 2012 (see Section 2.4). One eel was captured in 36 net sets in the Bay of Quinte, while no eels were observed in 24 nets set in Hamilton Harbour and 24 nets set in Toronto Harbour.

Quantitative electrofishing for American Eel was conducted during 2012 in the Mallorytown area (USLR) and Main Duck Island - Yorkshire Bar area (ELO) by Dr. J. Casselman and L. Marcogliese of Queens University. Eel abundance in the USLR was 20.932 ± 15.259 eels/hr during night-time surveys while in the ELO, 0.483 ± 0.574 eels/hr were captured during night-time surveys (Fig. 8.3.2). Based on the size of eels it appears most of the fish observed at both locations during 2012 originated from stocking programs, but these results need to be confirmed by examination of eel otoliths for fluorescent marks (which identify stocked eels). One hundred eels captured at USLR were examined and three individuals each had a single *Anguillicoloides crassus* parasite in its swimbladder. This parasite was first identified in eels from the USLR – ELO during 2011. The rate of occurrence observed during 2012 was the same as that observed during 2011. It is not known if the parasite has an impact on the American Eel survival, however scientists suspect that the reproductive output of eels with large infestations of the parasite may be negatively affected.

In 2006, Fisheries and Oceans (DFO), MNR and OPG developed an Action Plan for Offsetting Turbine Mortality of American Eel for the Saunders GS. In one component of the OPG plan, over 4 million glass eel were stocked into the USLR and Bay of Quinte during 2006 to 2010. All stocked eels were purchased from commercial fisheries in Nova Scotia and were marked with a fluorescent dye to distinguish them from naturally migrating eels. Prior to all stocking, health screening was conducted at the Atlantic Veterinary College, and the testing results for a wide variety of fish pathogens (including *Anguillicoloides crassus*) were all negative for

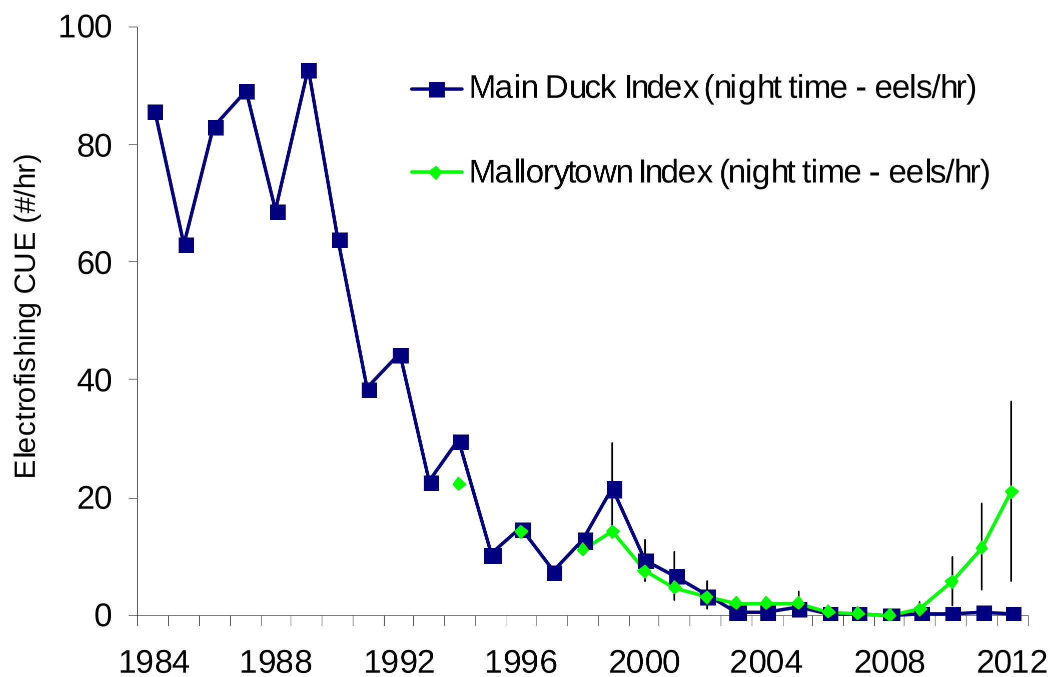


FIG. 8.3.2. Numbers of eel caught in the vicinity of Main Duck Island in eastern Lake Ontario and Mallorytown Landing in the upper St. Lawrence River per hour of night electrofishing (Casselman and Marcogliese, 2013).

stocked fish. As prescribed in the current Action Plan, eels were not stocked during 2011 and 2012.

DFO and OPG have collaborated to evaluate the effectiveness of stocking of eels. Results of boat electrofishing surveys suggest that the density and biomass of stocked eels continues to increase. Growth of individual eels at the upper St. Lawrence River stocking location continues to be rapid, while growth is now slowing in the Bay of Quinte stocking locations. The size of eels captured continues to grow, with a number of specimens captured in the spring that were larger than 650 mm. This indicates that there might be some eels that will continue to grow into the sizes originally reached by naturally recruiting female eels.

In a second component of the OPG Action Plan, MNR staff assisted in the capture, tagging and transport of large yellow eels from the USLR, ELO and Lake St. Francis (LSF) to Lac St. Louis (a section of the St. Lawrence River below all barriers to downstream migration). This study was initiated in 2008, and was undertaken by OPG as a pilot project to investigate the economics and practical feasibility of this alternative for mitigating turbine mortality at the Saunders GS during the downstream migration of mature silver eels. The project also involved local commercial fish harvesters, Akwesasne First Nation and Quebec MRNF.

During 2012, a total of 169 large eels (minimum size > 80 cm or approximately 2.5 lb) were taken by 11 license holders from April 16 to Jun 19 in the existing spring hoop and trap net fisheries in USLR and ELO (upstream of the Moses-Saunders Dam). Two licence holders in LSF captured 1,012 eels during the spring fishery. Eels from USLR-ELO were transported to holding facilities at the MNR's Glenora Research Station. In the case of eels from LSF, eels were transferred to a facility at Bainsville, Ontario. In order to make the program more efficient, passive integrated transponder (PIT) tags were not implanted in the eel as they had been in previous years.

In 2012, a total of 1,068 large yellow eels from LSF and the USLR-LO were released in Lac St. Louis immediately downstream of the Beauharnois GS. Another 7 eels collected from LSF were returned to LSF as a reference sample and 166 eels were used in telemetry studies in the St. Lawrence. During the release program, all the eels were observed to be in good health. The mortality rate during capture and holding was less than 1%.

To monitor the long-term survival, condition, maturation and migration of the transported yellow eels, biologists from Quebec MRNF attempted to recover eels, tagged during previous year's trap and transport, in the silver eel fishery in the St. Lawrence River estuary. During the fall of 2012, MRNF biologists detected 157 PIT tagged eels. Thirty-seven of the PIT tagged eels originated from OPG trap and transport project, and 120 PIT tagged eels were from other studies in the St. Lawrence watershed. Of the 37 trap and transport eels, one was from 2008; 6 were from 2009; 16 from 2010 and 14 from 2011. It should be noted that that no trap and transport eels were PIT tagged in 2012.

The 2012 trap and transport project continued to demonstrate that, where abundant, large yellow eels can be caught, held for brief periods, and transported successfully with limited mortality. Transported eels can be detected in the estuarial fishery. Lastly it appears that after 4 years 75% of the transported eels have migrated. One issue with this project is the numbers of eels captured and transported are not large enough to mitigate eel mortality in Saunders GS turbines.

MNR staff worked with OPG and DFO to develop a new five year American Eel Action Plan which will begin in 2013. Options approved in principle include conducting trap and transport activities, tail-water surveys and research into downstream passage options using behavioural guidance. The next Action Plan will be implemented using an adaptive management strategy, which will allow modifications to be made based upon findings that emerge.

8.4 Deepwater Cisco Restoration

Until the mid 1950's, Lake Ontario was home to a very diverse assemblage of deepwater ciscoes including Bloater (*Coregonus hoyi),* Kiyi (*C. kiyi*), Shortnose Cisco (*C. reighardi*) and possibly Blackfin Cisco (*C. nigripinnis*). Currently, only the shallow-water form of Lake Herring (*C. artedi*) remains in Lake Ontario. Re-establishing self-sustaining populations of deepwater cisco in Lake Ontario is the focus of a cooperative, international effort between the Ontario Ministry of Natural Resources (OMNR), the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Fish and Wildlife Service (USFWS), the U.S. Geological Survey (USGS) and the Great Lakes Fishery Commission. The Lake Ontario Committee's goal is to establish a self-sustaining population of deepwater cisco in Lake Ontario within 25 years. Objectives and associated strategies are specified in a draft strategic plan currently under review. The plan addresses sources of gametes, culture facilities, culture capacity, stocking, detection of wild fish, increasing our understanding of ecological consequences, research needs, and public education. Potential benefits of restoring deepwater cisco include restoring historical food web structures and function, increasing the diversity of the prey fish community, increasing resistance of the food web to new species invasions, increasing wild production of salmon and trout by reducing thiaminase impacts of a diet based on Alewife and Rainbow Smelt and supporting a small commercial fishery. Potential risks relate to the unpredictability of food web interactions in an evolving Lake Ontario ecosystem. Accepting some risk and uncertainty, doing the necessary science to increase understanding and minimize risk, and adapting management strategies accordingly are prerequisites for successful restoration of deepwater cisco in Lake Ontario.

FIG. 8.4.1. Deepwater cisco aged 19 months at the White Lake Fish Culture Station, November 2012.

Photo by Tim Drew, OMNR

The first stocking of deepwater cisco (*Coregonus hoyi*) into Lake Ontario took place in New York waters in early spring of 2012. This was a small batch of approximately 1,200 fish that was released near Oswego, NY in early November. Underwater video camera and hydroacoustics tracking of the stocked fish confirmed that they headed for very deep water; their natural habitat in the wild

During January and February of 2013, fertilized deepwater cisco eggs were obtained from Lake Michigan with the help of local commercial fisherman and personnel from the United States Fish and Wildlife Service. Eggs were transferred to quarantined facilities at the Ontario Ministry of Natural Resources, White Lake Fish Culture Station and the United States Geological Survey Laboratory at Tunison, New York. The White Lake facility received approximately 440,000 eggs and the Tunison laboratory received approximately 57,000 eggs. Eggs in both facilities are surviving well with 54-99% of the eggs from the most advanced batches successfully reaching the eyed-egg development stage. Also at White Lake there are 200 deepwater cisco from the 2011 egg collections which are slated for brood stock development (Fig. 8.4.1) and approximately 22,000 surviving deepwater cisco from the 2012 collection. Of these, 20,000 will be stocked into Lake Ontario in 2013 and 2,000 will be retained for brood stock development. The goal is to be able to stock 500,000 fish by 2015.

8.5 Lake Trout Restoration

Lake Trout were extirpated in Lake Ontario in the 1950s. The loss of this top predator and valued commercial species caused both ecological and economic damage. Rehabilitation of Lake Trout in Lake Ontario began in the 1970s with Sea Lamprey control, and stocking of hatchery fish. The first joint Canada/U.S. plan outlining the objectives and strategies for the rehabilitation efforts was formulated in 1983, and revisions in 1990 and 1997 were made to evaluate the methodology and the progress of rehabilitation. The current revision of the plan reaffirms the core strategies of stocking and protection of stocked fish (sea lamprey and harvest control), but it also identifies the early survival of stocked fish, and occurrence of wild fish as key issues. The recent years represented a setback on both counts.

The early survival of stocked fish is measured as the catch rate of 3-year old fish relative to numbers stocked. The survival decreased drastically in the 1990s, but began to improve again since the early 2000s (Section 2.2). In the last three years, however, catches of 3-year old Lake Trout have decreased again, suggesting decreased early survival.

The occurrence of wild Lake Trout is measured through catches of fish that do not bear hatchery marks - more than 90% of these fish have been shown to be naturally produced (stable isotope analysis). We estimated that during the period from 2004 to 2008 the proportion of wild Lake Trout in the population exceeded 10% (Fig. 8.5.1). In the last three years, however, the catches of unmarked fish have dropped off, suggesting an incidence of wild fish below 5%.

Both, the juvenile fish from which we assess early survival, and the wild fish, appear to prefer colder waters than the general Lake Trout population. In 2010, and especially in 2012 the nets in our standard assessment program were fishing waters that are warmer than usual, possibly under-representing the abundance of juvenile and wild fish. It is difficult to gauge the degree to which warm water temperatures contributed to the unfavourable results in two of the last three years.

On a positive note, in 2012, two young-of-the-year wild Lake Trout were captured in our bottom trawling program in the Kingston Basin for the first time (Section 2.3).

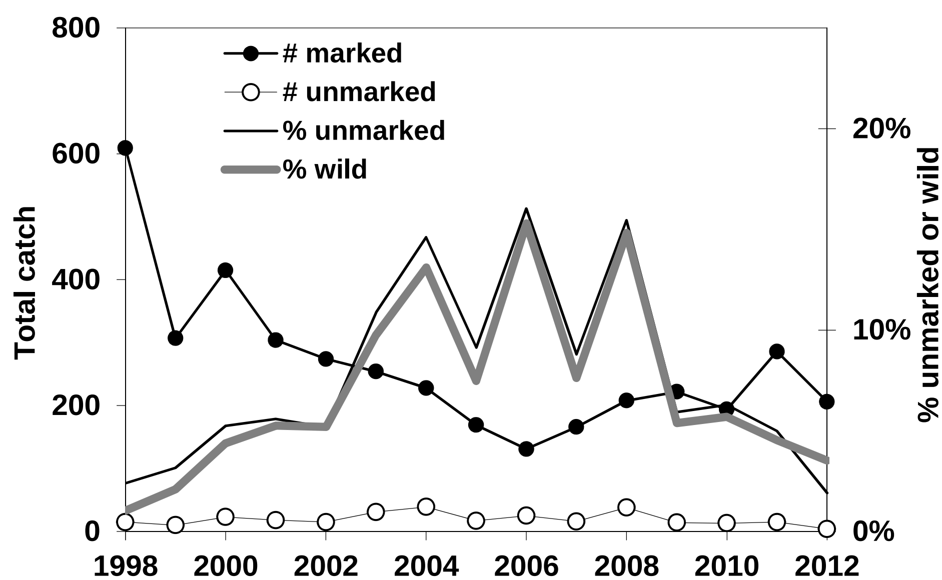


FIG. 8.5.1. Catches of marked and unmarked lake trout in the eastern Lake Ontario index gillnet program. The estimated proportion of wild fish is based on the results of stable isotope analysis, average values from 2003-2008 were applied to later years.

9. Management Planning

9.1 Fisheries Management Zone 20 Council (FMZ20)

Fisheries Management Zone 20 (FMZ20) Council provides recommendations to the Lake Ontario Manager regarding the recreational fishery. The two sub-councils (Eastern and Western) met six times in 2012.

The FMZ20 Council played a large role in the organization and success of four Lake Ontario Information Sessions. These presentations were held at Niagara-on-the-Lake, Port Credit, Oshawa, and Belleville in the spring of 2012 to provide the public with updates on the state of the Lake Ontario fishery.

The council also helped develop and communicate proposals to change regulations for Rainbow Trout, Muskellunge and Black Bass (largemouth and smallmouth). Thanks to their help, a new more restrictive size limit for muskellunge has been implemented along with a longer open season for bass angling and a new catch and possession for Rainbow Trout. Council input was also influential for the development of new fish community objectives for Lake Ontario. Members on the council continue to work on pen imprinting projects lake-wide and will be working toward the development of a stocking strategy for Lake Ontario this year.

9.2 Lake Ontario and St. Lawrence River Commercial Fishing Liaison Committee

The Lake Ontario and St. Lawrence River Commercial Fishery Liaison Committee (LOLC) is an appointed body consisting of Ontario Commercial Fishing License holders, the Ontario Commercial Fisheries' Association (OCFA), and MNR representatives. It provides advice and recommendations to the Lake Ontario Manager regarding their concerns and issues and in response to MNR's proposed management actions. The LOLC provides a unique forum for dialogue between the Lake Unit and the commercial industry. Management actions, performance of the 2011 fishery and a summary of the eel trap and transfer program were some topics presented to all licensed commercial fishers at the Annual General Meeting during March, 2012.

Although there are many small issues within a year, one issue took precedence in 2012. During spring 2012, the fishery was subject to complaints regarding turtle and fish mortalities in hoop nets. The Lake Unit implemented 24 hour net set durations in several locations thought to be turtle 'hotspots'. Over the course of the year, the Liaison committee met twice to discuss by-catch. A team of researchers from Carleton University participated in both meetings and demonstrated turtle exclusion devices. No proposed solutions were apparent by year-end so the Lake Unit removed the 24 hour net set duration conditions and added other conditions (such as a closure from May 20-June 20) in every management zone and on every 2013 license permitting hoopnets as a gear.

Other issues brought forward at the LOLC included increasing unfriendly interactions with anglers during the fall fishery in quota zone 1-4, contaminants, and disagreements with MNR's assessment of Lake Whitefish.

9.3 Fisheries Management Plans

(Available on-line at:
http://www.mnr.gov.on.ca/en/Business/
LetsFish/2ColumnSubPage/251350.html.)

Hamilton Harbour FMP

The Hamilton Harbour and Watershed Fisheries Management Plan was adopted in 2010. The purpose of the Plan is to guide the sustainable management and use of the fish resources of the harbour and watershed. Plan implementation is now on-going. Walleye were identified in the plan as one if the most important species for fish community restoration of Hamilton Harbour. We were encouraged by observations of natural reproduction of Walleye resulting from fish stocked in the 1990s. However, our recent trap netting surveys (Section 2.4) found fewer Walleye in the harbour. Natural reproduction of Walleye is expected to improve along with water quality when water quality objectives of the Remedial Action Plan are met 4 to 6 years from now. To jump-start Walleye restoration in the harbour OMNR stocked 100,000 Walleye summer fingerlings on July 5 and 6, 2012. The stocking coincides with water quality and habitat improvements, and may result in a more balanced fish community with increased angling opportunities. The Walleye were 35-45 days post-hatch and were 3-5 cm long (0.5 to 1.0 gram). They were released in good habitat near Pier 4 Park with the assistance of the Hamilton Parks Department. During fall 2012 Fisheries and Oceans Canada captured what appeared to be six of the stocked Walleye while conducting routine nearshore fish community electrofishing studies in the Harbour. The fish ranged in length from 15.9-19.6 cm in length (36 to 67 g), indicating good growth since the time of stocking, and bodes well for their future survival. In November 2012 OMNR stocked 74 surplus adult brood stock walleye into Hamilton Harbour. The fish ranged in size from 0.5 to 2.5 kg, and all fish have a left pectoral fin clip and a passive integrated transponder (PIT) tag inserted into the head.

10. Research Activities

10.1 Project Quinte

Project Quinte is a co-operative, multi-agency. research and monitoring project investigating ecosystem change on the Bay of Quinte, Lake Ontario. Early research efforts were published in a special issue of the Canadian Journal of Fisheries and Aquatic Sciences entitled Project Quinte: Point-Source Phosphorus Control and Ecosystem Response in the Bay of Quinte, Lake Ontario (Minns et al., 1986).

In 2011, Project Quinte published the first of two special issues in Aquatic Ecosystem Health & Management entitled "Ecosystem Health and Recovery of the Bay of Quinte, Lake Ontario". The issue consisted of 11 papers with a wide range of topics including: historical conditions, climate change, lower trophic levels, higher trophic levels, contaminants and management.

In 2012, the members of Project Quinte published the second special issue. This issue consisted of 10 articles that collectively further our understanding of ecological structures and processes in the Bay of Quinte, and also provide guidance and direction for the long-term sustainable management of this important ecosystem.

Minns, C.K., Hurley, D.A., Nichols K.H. (Eds.) . 1986. Project Quinte: point-source phosphorus control and ecosystem response in the Bay of Quinte, Lake Ontario. Can. Spec. Publi. Fish, Aquat. Sci. 86.

Aquatic Ecosystem Health and Management. 2011. Special Issue: Ecosystem Health and Recovery of the Bay of Quinte, Lake Ontario. Aquatic Ecosystem Health and Management 14(1):1-113.

Aquatic Ecosystem Health and Management. 2012. Special Issue: Ecosystem Health and Recovery of the Bay of Quinte, Lake Ontario: Part II. Aquatic Ecosystem Health and Management 15(4):369-483.

10.2 Linking Nearshore to Offshore Production in Lake Ontario

In anticipation of the 2013 bi-national intensive monitoring year, OMNR's Aquatic Research & Development Section (ARDS) and the Lake Ontario Management Unit (LOMU) developed a program to explore the flows and linkages between nearshore and offshore production. Nutrient and fisheries management programs initiated in the 1970s halted, and in many cases reversed, patterns of deteriorating water quality and loss of ecosystem services in Lake Ontario and elsewhere in the Great Lakes. However, invasion and proliferation of invasive species, including Zebra and Quagga Mussels, Spiny- and Fishhook water fleas, and Round Goby have significantly altered the structure and function of food webs in the Great Lakes. Resource management decisions, and ultimately the quality of the fisheries and other ecological and economic benefits of the Lakes require a comprehensive understanding of relationships between nutrient loading, fisheries production, and the effects of invasive species on food web structure.

In partnership with Fisheries and Oceans Canada, Cornell University, and the University of Windsor, OMNR designed a multi-trophic level (from plankton to fish), seasonal, nearshore-to-offshore survey to identify key food web components and their inter-relatedness. This pilot survey, running through the eastern (Kingston) basin and into the open lake, collected important data on species composition and abundance that supplemented existing long-term fisheries and limnology programs. Furthermore, this survey provided the opportunity to evaluate new gears, methods, and analyses that could be considered by lake-wide partners when undertaking the intensive 2013 study. The survey work required coordination of nearshore sampling using the small vessel *C R Wood* with offshore sampling using the large vessel *Ontario Explorer*. The logistics of safe and efficient deployment and retrieval of multiple survey gear, often simultaneously, during both day and night were determined. Vertical plankton nets and optical plankton counters confirmed patterns of low epilimnetic (upper water column) zooplankton relative to deeper layers, while vertical gillnets proved useful to obtain samples and describe the spatial distribution and demographics of alewife relative to their zooplankton prey. Traditional assessment tools such as index gillnets and bottom trawls provided physical samples for diet and tissue analyses which, when used in combination with fisheries hydroacoustics, revealed patterns in fish distribution and abundance. Stable isotopes were used to establish patterns in feeding and habitat preference that will allow us to link the different parts of the food web (e.g., see Fig. 10.2.1), ultimately illustrating dominant energy pathways that couple nutrient loading with fisheries production.

10.3 Bilge and Live Wells – Possible Refuges for Aquatic Invasive Species?

Investigators: Mike Yuille and Tim Johnson, Aquatic Research and Development Section

Aquatic invasive species (AIS) can cause significant ecosystem changes and are considered one of the most serious threats to biodiversity. The Laurentian Great Lakes are home to over 180 AIS including Spiny Waterflea (*Bythotrephes longimanus*), Round Goby (*Neogobius melanostomus*), and Zebra and Quagga Mussels (*Dreissena polymorpha and D. bugensis*, hereafter collectively referred to as dreissenid mussels). Controlling the spread of these aquatic invasive species has been one of the most challenging tasks faced by government and conservation agencies across jurisdictions.

The movement of recreational boats from lake to lake has been blamed for most of the spread of AIS into inland waters. Boaters can inadvertently introduce AIS via residual bilge water, live wells, boat trailers, and bait buckets. In hopes of eliminating this secondary spread of AIS, the Ontario Ministry of Natural Resources (OMNR) and Ontario Federation of Anglers and Hunters (OFAH) have provided the public with guidelines to effectively cleanse their boats and trailers between launches (available at: http://www.invadingspecies.com/stop-the-spread/boaters-anglers/). Using three common AIS found in the Great Lakes (amphipods, Spiny Waterfleas, and dreissenid mussels), our study tested whether the "five day drying" guideline was effective at killing AIS found in the standing water (i.e., live wells, bilge, etc) on recreational boats.

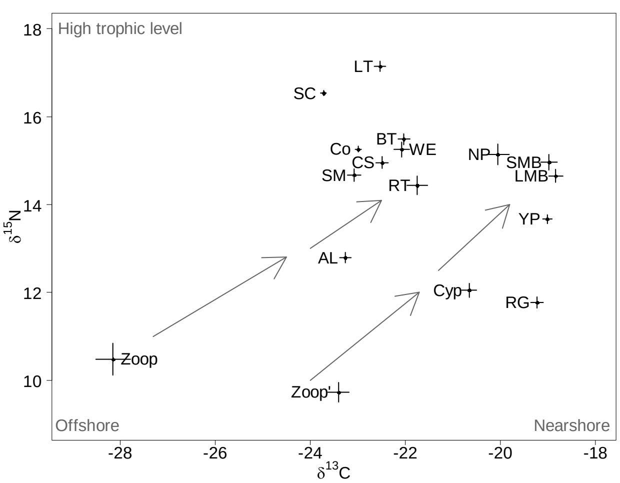


FIG. 10.2.1. Food web structure in offshore and nearshore Lake Ontario, as revealed by stable isotopes. Arrows indicate dominant flows from zooplankton to prey fish to predators. Zoop = offshore zooplankton, Zoop' = nearshore zooplankton, AL = Alewife, BT = Brown Trout, CS = Chinook Salmon, Co = Coho Salmon, Cyp = Cyprinids, LT = Lake Trout, LMB = Largemouth Bass, SMB = Smallmouth Bass, NP = Northern Pike, RT = Rainbow Trout, RG = Round Goby, SC=Sculpin, SM = Rainbow Smelt, WE = Walleye, YP = Yellow Perch.

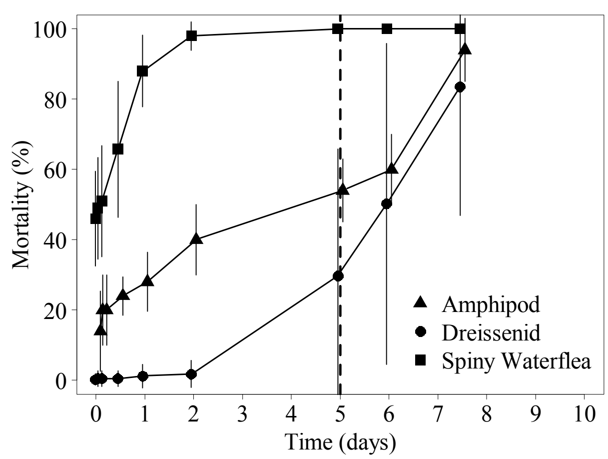


FIG. 10.3.1. Percent mortality of amphipods (▲), dreissenid mussels (●) and spiny waterfleas (■) from Lake Ontario over time. The dashed vertical line at five days represents current guideline for drying both boats and equipment to effectively remove AIS.

We found mortality increased over time for all three AIS (Fig. 10.3.1). Spiny Waterfleas had the highest mortality rate in our study, followed by amphipods, and then dreissenid mussels, which had the lowest mortality rate of the three AIS. Furthermore, we found that smaller amounts of standing water and greater sun exposure increased AIS mortality. After five days, all Spiny Waterfleas were dead, however amphipod mortality averaged 54 ± 9% (range 50-70%), whereas dreissenid mortality averaged 30 ± 36% (range 0-100%) (Fig. 10.3.1). Our study illustrates that five days of drying is not sufficient for killing all AIS attached to, or found on recreational boats and equipment. This emphasizes the necessity for boaters and anglers to follow all five guidelines to prevent the secondary spread of AIS in Ontario.

10.4 Compendium of Research on Aquatic Invasive Species in Ontario

Investigators: Carolina Taraborelli, Brittany Yuill and Tim Johnson, Aquatic Research and Development Section

We developed a compendium of research projects on aquatic invasive species (AIS) in Ontario to identify and describe current research, and through the process, identify gaps in knowledge, taxa, and/or geographic coverage. The compendium was developed by identifying and interviewing government, academic, industry, and private researchers with a history or identified expertise with AIS in Ontario, and comparing those results with patterns in published research in Ontario between 1990 and 2012. U.S. researchers who were working on AIS in adjacent jurisdictions (i.e., the Great Lakes border states) were contacted by email. We did not include projects whose primary purpose was monitoring, assessment, or control of AIS. 176 current research projects are occurring in 14 of the province's 20 Fishery Management Zones (FMZ), studying 22 individual species (Table 10.4.1). Over 49% of the research is focussed on invasive invertebrate species (e.g., *Bythotrephes* and dreissenid mussels), with another 32% concentrating on invasive fish (e.g. Round Goby and Sea Lamprey). Geographically, 72% of research is occurring in the Great Lakes, followed by inland FMZs in southern Ontario (17%). Forty percent of the research is categorized as "Impacts and adaptation" while only 3% focussed on "Policy development"; the remainder was evenly distributed among "Risk asssessment", "Early detection", "Dispersal", and "Control tools".

The literature review included 338 journal articles showing a trend of exponentially increasing publications over the past 20 years. Of the 133 articles published in the past 3 years (2010-2012), 18% dealt with *Bythotrephes*, 17% with dreissenids, 16% with Round Goby, and 10% with the Bloody Red Shrimp (*Hemimysis*). In the previous decade (2000-2009), most articles focussed on dreissenids (20%), Round Goby (16%), and Sea Lamprey (10%), while the 1990s showed a clear focus on dreissenids (59%), with less emphasis on Round Goby (11%) and *Bythotrephes* (6%). Consistent with the interview results, the vast majority of the published research occurred in the Great Lakes (81%), followed by southern FMZs (13%). More research is occurring in the northern regions now (10%) relative to what has been published in the past 20 years (1%). Overall, our results show a large number of research projects on AIS are currently underway in Ontario, that the bulk of that research occurs in the Great Lakes, and that impacts of "the usual suspects" (i.e., dreissenids, *Bythotrephes*, Round Goby) continue to dominate. Recently, research has expanded to include more and new taxa, more research in the north, and new disciplines such as "Risk assessment" and "Early detection" suggesting a shift to more proactive rather than reactive science needs.

10.5 Do all Lake Ontario Salmonid Species Behave Similarly?

Investigators: Mike Yuille and Tim Johnson, Aquatic Research and Development Section

A food web depicts the feeding relationships of organisms within an ecosystem—literally a map of who eats who. Traditionally, we have relied on stomach contents to establish feeding relationships, but stable isotopes of carbon and nitrogen have emerged as a cost-effective way to

TABLE 10.4.1. Number of research studies occurring in Ontario focussed on different aquatic invasive species, by region.

	Northwest	Northeast	South	Great Lakes	Province wide	Total
Fish						
Round goby			5	14	3	22
Sea lamprey				20		20
Asian carp			3	6		9
Other fish	1	2	1	13	1	18
Invertebrates						
Spiny water flea	8	5		11	1	25
Zebra & quagga mussels		1	8	13		22
Bloody red shrimp			6	8		14
Other invertebrates			2	14	1	17
Plants						
Phytoplankton				5		5
Phragmites				2		2
Other plants			2	8		10
All AIS			1	1	1	3
Total	9	8	28	115	7	167

characterise the average feeding response. Stable isotopes provide a time-integrated reflection of the assimilated prey, in other words, the average diet of the food actually used by the fish to grow. The carbon isotope indicates where the feeding occurs (e.g., nearshore vs. offshore, water-column vs lake bottom), while the nitrogen reflects the predator's position in the food web (e.g., from producers at the base, to top predators higher up).

In September 2012, we undertook a pilot study that provided creel clerks with a biopsy needle to obtain a tiny amount of tissue from angler caught fish. The approach was a simple and cost-effective way to obtain behavioural information on recreationally important fish species. During this pilot survey, 92 anglers allowed creel clerks to obtain samples from five fish species at three different creel sites on Lake Ontario. Angler samples were combined with samples of adult (>300 mm) salmonid species obtained from OMNR index sampling programs to provide a representation of the trophic footprint of each species. The trophic footprint, defined by the carbon and nitrogen isotopes, reflects the feeding specialization of the fish: a large footprint indicates a species with more diverse diet, while the amount of overlap among species indicates the potential for competition (i.e., both species obtaining food from the same general source).

Lake Trout have a tall and wide footprint suggesting they consume prey across multiple trophic levels ($\delta^{15}N$), from a wide range of habitats ($\delta^{13}C$) (Fig. 10.5.1). Lake Trout also show little overlap with other species, reinforcing their unique status as a top predator in the lake. Rainbow Trout also have a tall footprint, although they feed at lower trophic levels than Lake Trout (e.g., insects as well as small fish). Coho and Chinook Salmon show considerable overlap suggesting the two species utilise very similar habitats and prey items. The footprint of Brown Trout almost surrounds the footprint of Coho and Chinook, suggesting the three species share many resources, although Brown Trout feed over a larger spatial range.

While these data represent only a small portion of the Lake Ontario food web, they provide essential information surrounding the biology of several ecologically and recreationally important fish

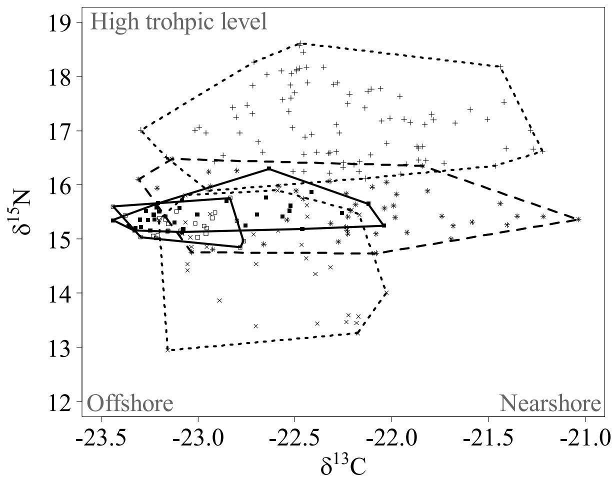


Fig. 10.5.1. $\delta^{15}N$ and $\delta^{13}C$ biplot depicting stable isotope niche overlap for Brown Trout (*), Chinook Salmon (■), Coho Salmon (□), Lake Trout (+) and Rainbow Trout (x).

species. This information will augment other studies conducted throughout Lake Ontario and help managers better understand species interactions, energy transfer, and nutrient fate in Great Lakes environments.

10.6 Assessing Fish Health in Lake Ontario using Morphological, Biochemical, and Nutritional Metrics

Brent Metcalfe, Aquatic Research and Development Section

In 2012, the Ontario Ministry of Natural Resources' Aquatic Research and Development Section (ARDS) coupled morphological measures (e.g., length, weight) with select biochemical and nutritional metrics (e.g., stable isotopes, lipid content, etc.) to identify indicators of fish health that could be used to compare species and/or locations within the Great Lakes. Fish samples had previously been collected at four locations in Lake Ontario, in spring, summer and fall seasons, over a three year period (2009-2011). Fish species of interest included Alewife (*Alosa pseudoharengus*), Rock Bass (*Ambloplites rupestris*), Yellow Perch (*Perca flavescens*), Round Goby (*Neogobius melanostomus*), and salmonids (*Oncorhynchus*, *Salmo*, and *Salvelinus* species). Fish were sampled for length, weight, and sex, and tissue samples for biochemical and nutritional analyses were collected and analyzed

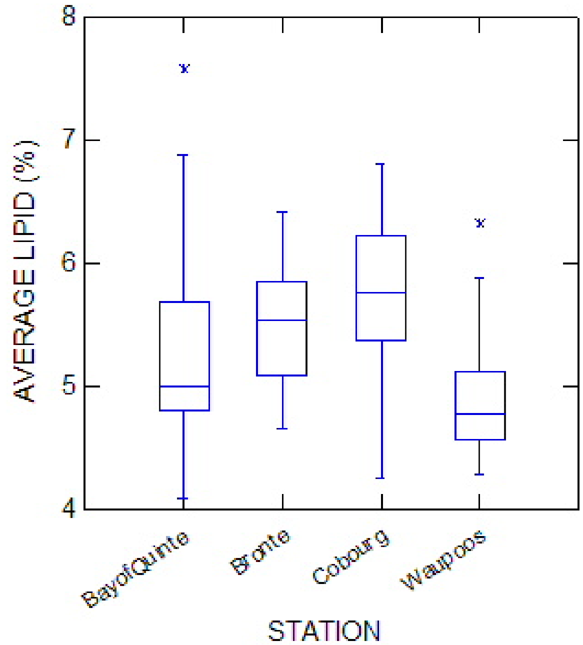


Fig. 10.6.1. Average lipid concentration (%) for Yellow Perch, collected at four sites on Lake Ontario, 2009-2011 (boxes indicate the range of 50% of values, whiskers indicate the range of 75% of values, horizontal line is the median value, and '*' are extreme values). Lipids have many biological functions (e.g., high energy storage molecules, cellular building blocks, etc.); fish displaying greater lipid concentrations are interpreted as being in better health.

for elemental concentration of carbon and nitrogen, stable isotopes of carbon and nitrogen, lipid concentration (Fig. 10.6.1), and energy density. Results were combined with more traditional length- and weight-based condition metrics such as Fulton's K and relative weight, and descriptions of fish health were developed. Few consistent patterns were seen when comparing metrics among species or sites, and while some metrics were highly correlated, this lack of coherence suggests these metrics should be used and interpreted with caution. Conclusions about fish health will also depend on the definition of "health" under consideration; as such, the metric(s) being used for its assessment must also be carefully selected. Investigations will continue in 2013 to learn more about how biochemical and nutritional metrics can be used to complement and enhance traditional morphology-based fisheries health metrics, and ultimately, become a reliable tool for fisheries managers wanting to assess the health of Great Lakes fish populations.

10.7 Assessing Methods for Monitoring Northern Pike and Muskrats in Relation to Water Levels Regulation

Lake Ontario Management Unit staff participated in the International Joint Commission's development of a new water levels/flows regulation plan for Lake Ontario and the St. Lawrence River. Part of the new approach includes using ecological indicators to adapt the plan to unpredicted changes, particularly in relation to climate change. In the Upper St. Lawrence River, two indicator species have been shown to respond to water level regulation, Northern Pike and Muskrat.

In August 2012, the Lake Ontario Management Unit conducted a small pilot project to assess the use of seining to capture YOY Northern Pike. Three study areas were chosen within eastern Lake Ontario's watershed based on their high catch rates of adult Northern Pike in the spring commercial hoop net fishery. The study areas included two bays within the Bay of Quinte (Hay Bay and Muscote Bay) and the eastern portion of West Lake. A total of 16 samples were taken from the three survey sites, capturing a total of 2,870 fish, representing 18 species. Yellow Perch dominated the catch in all three study areas making up 49% (1,392 fish) of the total catch. No Northern Pike were captured in any of the study areas. Phase 2 will explore the use of estimating year class strength using age of pike from various sources.

During the fall of 2012, LOMU contracted the Cataraqui, Central Lake Ontario, and Quinte Conservation Authorities to assess Muskrat activity during the winter of 2013. The Toronto and Region Conservation Authority directly participated in field work. In cooperation with MNR's Wildlife Research Scientist Dr. Jeff Bowman and the State University of New York's Dr. John Farrell, a survey protocol was developed based on previous research by Toner et al. (2010). In total, 23 coastal wetlands were selected along the north shore of Lake Ontario between Scarborough (Rouge Park) and Kingston. The selected wetlands include representative samples from three categories of coastal wetlands: open coast, drowned river mouth and beach barrier. Surveys will begin in 2013 and document house location as well a physical attributes of houses and surrounding habitat.

Toner J., Farrell J.M., Mead J.V. 2010. Muskrat abundance responses to water level regulation within freshwater coastal wetlands. Wetlands 30: 211-219.

11. Partnerships

11.1 St. Lawrence River Seine Netting Survey and Muskellunge Nursery Site Identification

Since 2005, Muskellunge seining program has been driven largely by the hard work and dedication of the members of Muskies Canada Inc. (MCI – Gananoque Chapter), who are to be commended for their efforts.

The St. Lawrence River is home to a prized Muskellunge (*Esox masquinongy*) fishery that attracts both Canadian and American anglers. Identification and subsequent protection of Muskellunge spawning and nursery habitats have been identified as key priorities to successfully manage this fishery (Update of the Strategic Plan for Management of the St. Lawrence River Muskellunge Population and Sport Fishery Phase III: 2003-2010).

Young Muskellunge travel only minimal distances during the first few months of life, so capture of these young fish is a useful way to confirm the location of productive spawning sites. Generally speaking, Muskellunge spawn in the shallow (<1.5 m) waters of protected embayments, in areas with appropriate densities and species of submergent aquatic vegetation. In the St. Lawrence River, muskellunge spawn from early May to mid June, with the greatest spawning activity occurring at water temperatures of 10-13ºC. Hatching occurs in approximately two weeks, and after a short period feeding on zooplankton, the young Muskellunge become entirely piscivorous. The shallow, near-shore spawning and nursery habitat of the Muskellunge makes seining a suitable survey method.

OMNR conducted an annual young-of-the-year (YOY) seining program from 1989-1995 in an effort to identify nursery sites within the Canadian waters of the St. Lawrence River. Efforts were discontinued until 2005 when a partnership between Muskies Canada Inc., Parks Canada and MNR was formed to resurrect the program. The 2012 seining program was the eighth conducted by the MCI-led team, and the fifteenth overall (Table 11.1.1).

A total of 657 seines have been done over 15 years of sampling, capturing 82,306 fishes. The nine-year break in the project (1996-2004) splits the data set into two distinct periods which span significant ecological events including the arrival of invasive species (i.e., dreissenid mussels and Round Goby). A thorough analysis and interpretation of the entire data set will be done and reported on in a separate document.

During the 2012 project, forty-five seine hauls were completed during the period of August 12-24. A total of 5,452 fishes (33 species) were captured. Two YOY Muskellunge were captured, thereby confirming the respective locations' suitability for spawning. One site was found in close proximity (<30 m) from two previously (2005, 2007) identified sites. This suggests that the general area is of good quality spawning habitat, and has been used consistently in recent years. The other 2012 capture location is a newly identified site; the two nearest previously known sites were identified in 1994 and are on average 750 m away.

Aside from its obvious importance to the understanding of Muskellunge ecology, this project provides important data on the diversity of small-bodied fish species. Five COSSARO (Committee on the Status of Species at Risk in Ontario) listed species were captured (Table 11.1.2).

The most abundant species captured during the 2012 project was Yellow Perch (*Perca flavescens*), Round Goby (*Neogobius melanostomus*) and Rock Bass (*Ambloplites rupestris*). These three species alone accounted for over seventy percent of the catch in 2012 (see Fig. 11.1.1).

TABLE 11.1.1. Summary of netting efforts made during the Muskellunge nursery site identification project. The most recent year (2012) is highlighted.

Year	Muskellunge Captured	Species Captured	Number of Seines	Total Fish Captured	Catch per Seine
1989	6	19	26	4,756	183
1990	16	16	58	3,842	66
1991	2	30	31	4,559	147
1992	11	32	21	4,151	198
1993	4	27	22	5,907	269
1994	6	21	15	3,102	207
1995	15	26	16	3,427	214
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2005	13	27	122	8,624	71
2006	2	27	55	4,874	89
2007	7	28	45	4,836	107
2008	8	36	57	6,558	115
2009	8	34	41	6,690	163
2010	5	33	53	7,083	134
2011	5	32	50	8,445	169
2012	2	33	45	5,452	121
Total	110	28*	657	82,306	125*

* Average for all project years.

TABLE 11.1.2. COSSARO-listed species captured during the 2012 seining project.

COSSARO-listed species	COSSARO Status
Bridle Shiner (*Notropis bifrenatus)*	Special Concern
Cutlips Minnow (*Exoglossum maxillingua)*	Threatened
Grass Pickerel (*Esox americanus vermiculatus)*	Special Concern
Pugnose Minnow (*Opsopoeodus emiliae)*	Threatened
Pugnose Shiner (*Notropis anogenus)*	Endangered

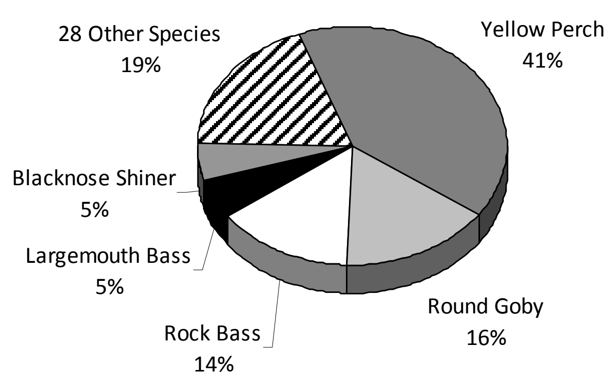

FIG. 11.1.1. Species abundance (as percentage of total catch) for the 2012 Muskellunge seining program. Total number of fish captured was 5,452.

11.2 Nearshore Fish Community Index Netting—Hamilton Harbour and Toronto Waterfront

Nearshore community index netting (NSCIN), a provincially standardized trap net program designed originally on inland lakes to evaluate littoral zone fish communities, was initiated on Lake Ontario in the Bay of Quinte from 2001-2005. In 2006, the NSCIN program was conducted on Hamilton Harbour and the Toronto Waterfront area with partnerships involving Ontario Ministry Natural Resources, Fisheries and Oceans Canada, and Toronto Region Conservation Authority. The Ministry of Natural Resources' Lake Ontario Management Unit (LOMU) provided equipment and expertise with the NSCIN program while partners provided experienced staff with local knowledge. The partnerships proved very successful.

The Canada-Ontario Agreement (COA) provided funding for the past six years (2007-2012) of NSCIN projects on a variety of nearshore and embayment location including Hamilton Harbour, the Toronto waterfront area, Presqu'ile Bay, Weller's Bay, West Lake, East Lake, Prince Edward Bay, upper and lower Bay of Quinte, Adolphus Reach and Kingston, Thousand Islands, and Lake St. Francis (see Section 2.4 for NSCIN projects completed in 2012). Partnerships are a key delivery mechanism for these field projects. Partnerships to date (2007, 2008, 2010 and 2012 field seasons) have included Fisheries and Oceans Canada (2008, 2010 and 2012), the Toronto Region Conservation Authority (2007, 2010 and 2012), the Raison Region Conservation Authority (2007 and 2008), and local commercial fishers (2007).

Some of the NSCIN project locations are Areas of Concern (AOCs) with ongoing Remedial Action Plans (RAP). Fisheries Management Plans (FMP) have been or are being prepared for these AOCs and NSCIN is one of the methods used for setting and evaluating the success of fish community targets. NSCIN projects on non-AOC areas provide the necessary "least-impacted" reference locations to help evaluate the status of fish communities/populations in AOC areas. Other important benefits of the NSCIN projects include commercial fish harvest management and a source of fish for MOEE Sport Fish Monitoring contaminant sampling.

11.3 Warings Creek Brook Trout Rehabilitation

Warings Creek is in Prince Edward County, the only extensive land base for FMZ 20. Management of Warings Creek's fisheries resource is lead by OMNR's Kingston Area team (Peterborough District). Past electrofishing surveys of Warings Creek failed to locate any remnants of a historical self-sustaining resident Brook Trout population. Following the Warings Creek Watershed Fisheries Management Plan, Brook Trout will be reintroduced in 2013, and stocked for 4 years. This report is for the first year of a study to follow the growth and survival of stocked Brook Trout, and determine the success of their natural reproduction. This study is being conducted jointly by the Kingston Area team and LOMU. Sampling in 2012 provided a baseline of the fish community before stocking, and a last check for the remnant Brook Trout population in the creek.

Four randomly selected sites were electrofished on November 2, 2012 (Table 11.3.1.) Electrofishing was conducted moving upstream to a block net at the upper end of the site to reduce escapement of fish. Mottled Sculpins dominated the catch at all four sites (mean = 52.3), along with a few Central Mudminnow (mean = 1.5; Table 11.3.2).

TABLE 11.3.1. Geo-coordinates (downstream end) and dimensions electrofishing sample in Warings Creek in 2012.

Site code	Latitude	Longitude	Sample length (m)	Stream width (m)
HAGU	43° 58.87'	77° 11.12'	46	3.0
HAG2	43° 58.84'	77° 11.50'	35	2.6
HAG3	43° 58.74'	77° 12.09'	52	2.2
WILC	43° 58.52'	77° 12.76'	48	2.4

TABLE 11.3.2. Catch of fish by site in single pass electrofishing surveys in Warings Creek in 2012.

Site code	Species	Catch	Mean weight (g)
HAGU	Central Mudminnow	4	4.5
	Mottled Sculpin	37	1.9
HAG2	Central Mudminnow	1	6.0
	Mottled Sculpin	34	2.5
HAG3	Central Mudminnow	1	6.0
	Mottled Sculpin	58	1.7
WILC	Mottled Sculpin	80	2.3

12. Staff 2012

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Jim Hoyle – Assessment Biologist
Ted Schaner – Assessment Biologist
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Marion Daniels – Management Biologist (Peterborough)
Shane Wood – A/Assessment Biologist, Project Management Biologist
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Tom Lawrence – Great Lakes Technician
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Science and Development Branch

Les Stanfield – Senior Research Biologist

13. Operational field and lab schedule, 2012 (SPA = Special Purpose Account; COA = Canada Ontario Agreement; OPG = Ontario Power Generation).

Field or lab project	Dates	Species assessed, monitored or stocked	Project Lead	Operational Lead	Funding source
Ganaraska Fishway Rainbow Trout Assessment (fish counter only)	Mar-Apr	Adult Rainbow Trout	Bowlby	Dewey	SPA
Credit River Atlantic Salmon Smolt Assessment*	Mar-Jun	Atlantic Salmon	Desjardins	n/a	COA
Chinook Salmon Parr Marking (fin clips)	Apr	Chinook Salmon	Daniels	n/a	SPA
Lake Trout Tug Stocking	Apr	Juvenile Lake Trout	Daniels	Chicoine	SPA
American Eel Trap and Transfer	Apr-Jun	American Eel	Mathers	Meadows	OPG
Chinook Salmon Mark/Tag Monitoring and Creel Survey	Apr-Sep	Salmon and Trout	Bowlby	Wood	SPA
Bay of Quinte Open Water Angling Survey	May-Nov	Walleye, Pike, Perch, Bass	Hoyle	Dewey/McNevin	SPA
Nearshore-Offshore Linkage Study	May-Oct	Multiple species	Drs. Stewart/Johnson	Jakobi/Metcalfe	COA
Station 81: Offshore Benthos and Zooplankton Survey	May-Oct	Lower food web	Dr. Johnson	Dewey	COA
Moses Saunders Eel Ladder Monitoring	May-Oct	Migrating American Eel	Mathers	n/a	OPG
Eastern Lake Ontario and Bay of Quinte Community Index Netting	Jun-Sep	Multiple species including Walleye and Lake Whitefish	Hoyle	Dewey	SPA
Credit River Atlantic Salmon Adult Assessment	Jun-Nov	Atlantic Salmon adults	Heaton/Daniels	Laws	COA
Lake-wide Hydroacoustic Assessment of Prey Fish	Jul	Alewife, Rainbow Smelt, *Mysis*	Schaner	Chicoine	COA
Adult Atlantic Salmon Assessment - Credit River & Cobourg Creek	Aug-Nov	Atlantic Salmon	Daniels	Aaron Law	COA
Hamilton Harbour Nearshore Community Index Netting	Aug	Multiple species including centrachids, Walleye and Pike	Hoyle	Dale	COA
Upper Bay of Quinte Nearshore Community Index Netting	Sep	Multiple species including centrachids, Walleye and Pike	Hoyle	Meadows	COA
Toronto Islands Nearshore Community Index Netting	Sep	Multiple species including centrachids, Walleye and Pike	Hoyle	McMillan	COA
St. Lawrence River Fish Community Index Netting - Lake St. Francis	Sep	Walleye, Yellow Perch, Northern Pike	Schaner	Dewey	COA
Credit River Chinook Assessment and Egg Collection	Oct	Mature Chinook Salmon	Bowlby	Meadows	SPA
Credit River Juvenile Atlantic Salmon Electrofishing	Oct	Atlantic Salmon	Bowlby	Jakobi	COA
Commercial Catch Sampling	Oct-Nov	Lake Whitefish	Hoyle	Dewey	SPA
Age and Growth	Year-round	Multiple species	Multiple	McNevin	SPA/COA

* Program delivered in partnership with Credit Valley Conservation.

14. Primary Publications of Glenora Fisheries Station Staff[1] in 2012

Brush, J.M., Fisk, A.T., Hussey, N.E., **Johnson, T.B.** 2012. Spatial and seasonal variability in the diet of round goby (*Neogobius melanostomus*): stable isotopes indicate that stomach contents over-estimate the importance of dreissenids. Can. J. Fish. Aquat. Sci. 69: 573-586.

Fitzsimons, J.D., Bowen, K., Brousseau, C., Dalton, A., MacVeigh, B., **Johnson, T.B.**, and **Yuille, M.J.** Round goby predation on *Hemimysis anomala*. 2012. J. Great Lakes Res. 38: 79-85.

Honeyfield, D.C., **Daniels**, **M.E.,** Brown, L.R., Arts, M.T., Walsh M., Brown, S.B. 2012. Survey of four essential nutrients and thiaminase activity in five Lake Ontario preyfish species. Journal of Great Lakes Research. 38:11-17.

Hoyle, J.A., **Bowlby, J.N.**, Brousseau C.M., **Johnson, T.B**., **Morrison, B.J**., Randall, R.G. 2012. Fish community structure in the Bay of Quinte, Lake Ontario: The influence of nutrient levels and invasive species, Aquatic Ecosystem Health & Management, 15:370-384.

Lumb, C.E., **Johnson, T.B.** 2012. Retrospective growth analysis of lake whitefish (*Coregonus clupeaformis*) in Lakes Erie and Ontario, 1954-2003. Advances in Limnology 63:429-454.

Randall, R.G., Brousseau, C.M., **Hoyle, J.A.** 2012. Effect of aquatic macrophyte cover and fetch on spatial variability in the biomass and growth of littoral fishes in bays of Prince Edward County, Lake Ontario. Aquatic Ecosystem Health & Management 15:385-396.

Rennie, M.D., Sprules, W.G., **Johnson, T.B.** 2012. Energy acquisition and allocation patterns of lake whitefish (*Coregonus clupeaformis*) are modified when dreissenids are present. Can. J. Fish. Aquat. Sci. 69: 41-59.

Rush, S.A., Paterson, G., **Johnson, T.B**., Drouillard, K.G., Haffner, G.D., Hebert, C.E., Arts, M.T., McGoldrick, D.J., Backus, S.M., Lantry, B.F., Lantry, J.R., **Schaner, T.**, and Fisk, A.T. 2012. Long term impacts of invasive species on a native top predator in a large lake system. Freshwat. Biol. 57: 2342-2355.

Stanfield, L. W. 2012. Reporting on the condition of stream fish communities in the Canadian tributaries of Lake Ontario, at various spatial scales. Journal of Great Lakes Research 38:196-205

Stanfield, L. W., and B. W. Kilgour. 2012. How proximity of land use disturbance modifies the effect of land cover on stream fish and in-stream habitat in a developed landscape. River Research and Applications. DOI: 10.1002/rra.2585.

Taraborelli, A.C., **Jakobi, N.J**., **Johnson, T.B**., Bowen, K., Boscarino, B. 2012. Distribution, abundance, and production of *Hemimysis anomala* in Lake Ontario. J. Great Lakes Res. 38:52-57.

Yuille, M.J., **Johnson, T.B**., Arnott, S.E., Campbell, L.M. 2012. *Hemimysis anomala* in Lake Ontario food webs: stable isotope analysis of nearshore communities. J. Great Lakes Res. 38: 86-92.

[1] Names of staff of the Glenora Fisheries Station are indicated in bold font.

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ISSN 1201-8449