

## **Trends in Lake Ontario Smallmouth Bass Sport Fishery, 1985-98**

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Abundance of smallmouth bass in New York waters of Lake Ontario's eastern basin, as measured by standardized assessment netting, has declined significantly since 1990 (Eckert 1998a). At the same time, comments and anecdotal observations from fishermen and local marina operators have suggested a decline in the sport fishery, culminating in what these people generally described as a disastrous 1997 fishing season. Concerns over the status of smallmouth bass, and other warm water fish species, prompted the New York State Department of Environmental Conservation (DEC) to undertake a series of new studies focused on the eastern basin in 1998, and to further examine all other sources of Lake Ontario data.

Questions have been raised concerning the role that lake-wide ecosystem changes may have played in the observed decline in smallmouth bass in the eastern basin. A number of ecosystem changes have been documented since the late 1980s including declines in plankton production linked to phosphorous reductions, increases in water clarity, reductions in alewife, and invasion by exotic species (Christie et al. 1987; EPA 1993; O'Gorman and Stewart 1999). If lake-wide ecosystem changes were a major factor in the decline of smallmouth bass in the eastern basin, then similar declines in bass populations in other areas of Lake Ontario, and their associated sport fisheries, might also be expected. This report examines trends in the open lake smallmouth bass sport fishery utilizing data collected in censuses of fishing boats conducted from 1985-98. Implemented primarily to monitor the open lake fishery for trout and salmon, these census efforts have also proved to be a valuable source of data on other species such as smallmouth bass. Unfortunately, coverage of the eastern basin is limited in these surveys, and only includes one site north of Stony Point (Association

Island Cut near Henderson, NY).

### **Methods**

Census methods and procedures have changed little throughout the 14 years sampled, and have been described in previous reports (Eckert 1998b). The census design takes advantage of the fact that boating access to New York waters of the western and central basins is limited and occurs mainly through comparatively narrow connecting channels associated with embayments and tributaries. Census agents located in small (18-20 ft) boats at the mouths of these channels are able to maintain a count of all boats returning from Lake Ontario while intercepting and interviewing a random sample.

The census covered all the important access channels from the Niagara River, at the extreme western end of New York's jurisdiction, to Association Island Cut in the northeast end near Henderson (approximately 190 miles of shoreline). Coverage of boat anglers returning to New York ports in Lake Ontario's western and central basins during the months censused was very complete. The only components missed were boats returning to port in the time period from one-half hour after sunset to less than two hours after sunrise (i.e., returns at night or very early morning), or boats returning to shoreline docks or to the small uncensused access channels. Both of these missed components were thought to be quite small, although no statistically valid estimates for them are available. Other more significant components of the Lake Ontario boat fishery which were not covered by this census program include boat fishing in embayments and tributaries, boats fishing from ports in the eastern outlet basin except for those which terminate their trip by returning through the

Association Island Cut, and boat fishing anywhere in Lake Ontario during the months of October through March. The term harvest is used throughout this report for fish that were actually kept by the anglers; the term released is used for fish brought along side or into the boat and then intentionally released; while the term catch is used for the sum of fish harvested plus fish intentionally released.

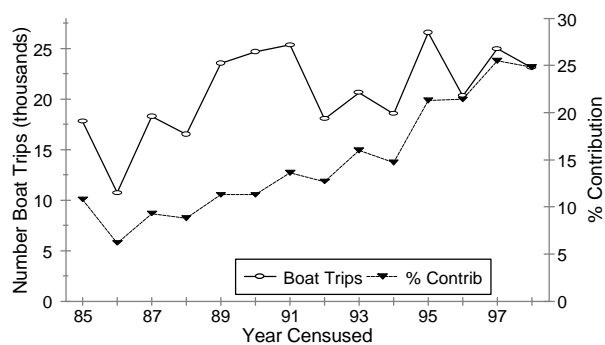
Geographic comparisons of effort, harvest, and catch data from the surveys have typically been made by dividing the entire censused shoreline into four roughly equal areas, and lumping the daily estimates for access channels within each area for the entire 6-month season. Since smallmouth bass populations, and their associated fisheries, appear to be more localized than the various species of trout and salmon, additional smaller geographic sites were chosen for analysis with the bass data. These geographic sites combined access channels which were physically closer to each other, and concentrated on specific shoreline areas with significant smallmouth bass fisheries. Analysis was limited to comparisons of harvest and catch rates using the boats interviewed throughout the season as a simple random sample. To facilitate comparisons with other studies such as the 1998 eastern basin angler census (McCullough and Einhouse 1998), harvest and catch rates at the nine localized sites are expressed as bass per boat angler hour. More detailed descriptions of the four broad geographic area, and the nine more localized smallmouth bass sites, are given in Table A1.

## Results

### Fishing Effort:

Fishing effort targeted at smallmouth bass from the opening day each year (third Saturday in June) through September 30 has averaged 20,654 boat trips, ranging from a low of 10,733 in 1986 to a high of 26,585 in 1995 (Figure 1, Table A2). Overall there has been a slight upward trend in the number of targeted smallmouth bass boat trips ( $P=0.033$ ) over the 14 years censused, with an average increase of 596 boat trips per year. Percent contribution of targeted bass trips to the open lake

boat fishery has increased even more, due largely to decreases in effort targeted at trout and salmon since 1991 (Eckert 1998b). Bass fishing effort measured as boat angler trips or boat angler hours (Table A2) has shown patterns similar to the number of boat trips, although trends in the data are not statistically significant at the 5% level. Number of anglers per targeted smallmouth bass boat trip has shown a small but statistically significant downward trend ( $P=0.044$ ).



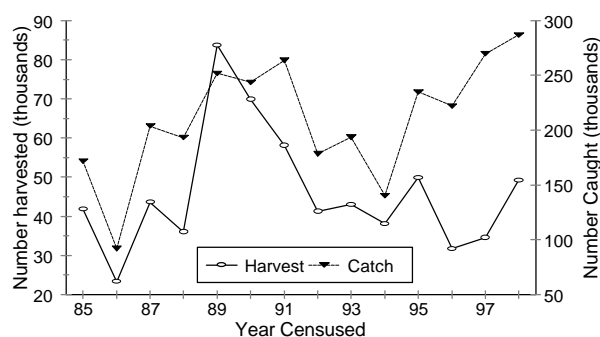
**Figure 1. Seasonal estimates of fishing boat trips targeted at smallmouth bass, and percent contribution to the open lake boat fishery.**

Monthly and geographic patterns of smallmouth bass fishing effort (Table A2) have varied from year to year, but without major trends. July and August are typically the peak months for bass fishing activity, averaging 37.1% and 31.2%, respectively, of the yearly totals. June effort estimates have averaged only 15.7% of the yearly totals, consistent with the fact that legal fishing does not begin until the third Saturday, while September has averaged 16.1%. Smallmouth bass fishing effort has since 1985 been highest in the east/central area, averaging 44.2% of the yearly totals, with the east area typically second in importance (average 28.4%). The number of targeted boat trips in the west and west/central areas have similar 14-year averages (12.0 and 15.4% respectively), but effort in the west/central area has increased significantly ( $P=0.0002$ ) over the years censused.

### Harvest and Catch:

Smallmouth bass has been the most commonly

harvested fish species in the fishing boat census since 1995, due largely to decreases in the trout and salmon fishery (Eckert 1998b). Harvest by all fishing boats has varied without any apparent trend, with a low of 23,316 recorded in 1986 and a high of 83,723 recorded in 1989 (Figure 2, Table A2). The 14-year average is 46,020 fish. Total smallmouth bass caught has ranged from a low of 92,213, also in 1986, to a high of 287,024 in 1998, with an average of 210,459 (Figure 2, Table A2). A regression line through the catch data does show a significant positive slope (increasing number caught) at the 5.1% level. The percentage of smallmouth bass caught that are harvested has varied from 12.8% to 33.2% (Table A2). The 14-year average has been 22.3%, and there has been a significant trend towards lower percent harvest ( $P=0.043$ ). No specific information exists on the age or size structure of the bass released, but comments by fishermen consistently state that most were fish below the 12 inch minimum size limit. The majority of the bass caught and harvested were captured by anglers specifically targeting smallmouth bass during the open season (Table A2; 14-year averages 86.4% and 91.4% respectively), and both relationships show statistically significant increases ( $P=0.0028$  and  $P=0.0018$  respectively) suggesting increasing specialization in the fishery.

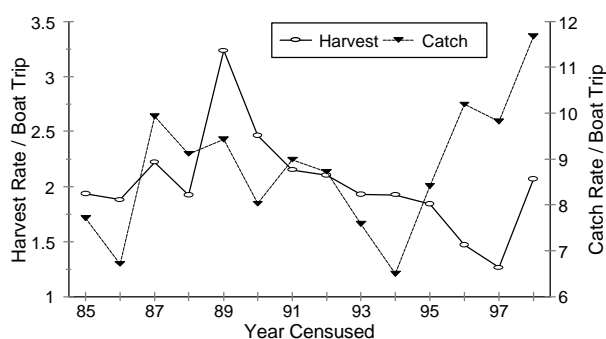


**Figure 2. Numbers of smallmouth bass harvested and caught in the open lake boat fishery.**

Harvest and catch rates among boats targeting smallmouth bass are probably the best measure of changes or variations in fishing quality. Both statistics show major variations between years, but no significant trends over the 14 years censused (harvest/boat trip,  $P=0.1392$ ; catch/boat trip,

$P=0.1213$ ). Seasonal rates of harvest per boat trip (opening day to Sept. 30) show one dramatic peak with 3.235 bass per boat trip in 1989, followed by an 8-year decline to a low of 1.263 bass per boat trip in 1997 (Figure 3, Table A2). Harvest rate rebounded to 2.066 bass per boat trip in 1998, a value essentially equal to the 14-year average of 2.028. Catch rates per boat trip show lows in 1986 and 1994 (6.713 and 6.498 bass per boat trip respectively), followed by a dramatic increase through 1998. The 1998 and 1996 catch rates (11.674 and 10.189 bass per boat trip respectively) were the first and second highest rates observed to date, while 1997 was the fourth highest.

**Figure 3. Smallmouth bass harvest and catch**



**rates per boat trip among boats targeting smallmouth bass in the open lake boat fishery.**

Harvest rate comparisons by month and geographic area show several consistent patterns, but no obvious, statistically significant trends (Table A2). Harvest rates are typically highest in the months of August and September, and the 14-year averages show a progressive increase in harvest rate per boat trip through the 4-month season (June 1.725 bass per boat trip, July 1.775, August 2.280, and September 2.355). Among the four geographic areas, 14-year average harvest rates are highest in the east area (2.891 bass per boat trip), followed by the east/central area (2.004), west area (1.392), and the west/central area (0.963). Harvest rates in the east geographic area have consistently been higher than the respective lake-wide rates (14 of 14 years), while harvest rates in the west/central area have consistently been less than the lake-wide rates. Harvest rates in the east/central and west

geographic areas show a mix of values above and below the respective lake-wide rates, commensurate with their 14-year averages (east/central area: 6 above, 7 below, 1 equal to; west area: 2 above, 12 below). None of the four geographic areas show a statistically significant trend in harvest rates at the 5% level, but the east area does show a significant downward trend at the 7.1% level. Harvest rates per boat trip in the east geographic area generally correlate well with the lake-wide harvest rates, the most obvious difference occurring in 1998 when the lake-wide harvest rate increased 63.6% compared to 1997, while the east area harvest rate increased only 17.1% compared to 1997. As a result, the 1998 smallmouth bass harvest rate per boat trip in the east area was only 7.2% above the lake-wide harvest rate, the smallest percent difference among the years censused.

Other measures of angling quality that have been routinely measured in the open lake boat fishery include the percentages of boats which fail to harvest or catch any bass or any other fish species, and the percentage of boats which harvest the daily bag limit of five bass per angler (Table A2). These parameters show an increase in the percentages of boats which failed to harvest any bass or other fish species in recent years, but a decrease in recent years in the percentages of boats which failed to catch any bass or other fish species. The percentage of boats harvesting the daily bag limit which has always been low over the 14 years censused (average 5.73%), was particularly low in 1996 and 1997 (3.5% and 2.8%), but rose to 7.1% in 1998 (third highest value observed).

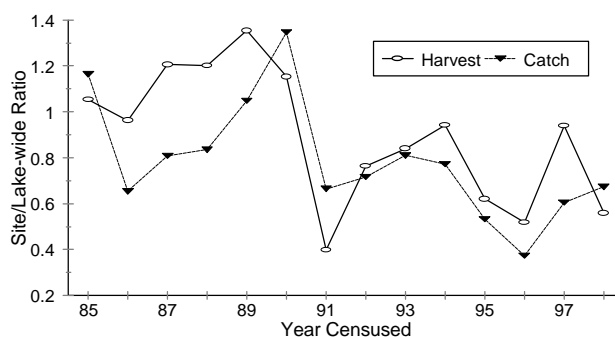
Comparisons Among Sites:

Harvest and catch rates per boat angler hour for the nine localized smallmouth bass sites (described in Table A1), plus the number of targeted trip interviews, are given in Table A3. Also included in Table A3 are calculated ratios between the site specific harvest or catch rates and the lake-wide rates (Table A2). Ratios above 1.0 indicate higher smallmouth bass harvest or catch rates at the specific site as compared to the lake-wide value, while ratios below 1.0 indicate poorer site specific

fishing. Data for the Point Breeze and Oswego sites are included in Table A3 and are briefly discussed, although numbers of boats interviewed at these two sites were considered too small for more detailed regression analyses.

Comparisons of harvest rates per angler hour among the nine localized sites (Table A3, Figures 4 and A1) show five sites with 14-year averages less than the lake-wide average rate (Niagara River, Point Breeze, Irondequoit, Oswego, and Henderson), and four sites with 14-years averages above the lake-wide rate (Pultneyville, Sodus/Port, Fair Haven, and Little Salmon). Most of the sites show considerable variation from year to year, with a mix of harvest rates above and below the respective lake-wide rates. Irondequoit is the only site that does not show this mix, and harvest rates at this site are consistently below the respective yearly lake-wide values. Regression analysis of the ratios between the yearly site specific harvest rates and the lake-wide rates show only one site with a statistically significant trend. This occurred at the Henderson site which showed a significant decline ( $P=0.0183$ ) in harvest rate relative to the respective lake-wide rates (Figure 4). From 1985-90, harvest rates per angler hour at the Henderson site were nearly equal to or greater than the lake-wide rates (6-year average ratio 1.155), but from 1991-98, harvest rates at Henderson were all below the lake-wide rates (8-year average ratio 0.698).

**Figure 4. Smallmouth bass harvest and catch rate**



**ratios between the Henderson site and the open lake boat fishery.**

Comparisons of catch rates per angler hour among the nine localized sites (Table A3, Figures 4 and

A2) show only three sites with 14-year averages less than the lake-wide average rate (Niagara River, Point Breeze, and Henderson), and two sites without a mix of catch rates above and below the respective lake-wide rates (Point Breeze with all ratios below 1.0, and Sodus/Port with all ratios above 1.0). Regression analysis of the ratios between the yearly site specific catch rates and the lake-wide rates show four sites with statistically significant trends. Three sites show downward trends in catch rates (Sodus/Port,  $P=0.0311$ , Little Salmon,  $P=0.0378$ , and Henderson,  $P=0.0326$ ), while one site (Irondequoit,  $P=0.0001$ ) shows an upward trend in catch rate. Although catch rate ratios at the Sodus/Port and Little Salmon sites show significant downward trends, ratios for the last seven years have remained fairly high with averages of 1.233 and 1.026 respectively (Table A3). At the Henderson site, catch rate ratios have been below 1.0 for 11 of the 14 years censused, with an average for the last seven years of 0.640.

### **Discussion**

The open lake boat fishery for smallmouth bass in New York waters of Lake Ontario, within the area and time censused, has shown an overall pattern of slow growth, increasing at an average rate of 596 fishing boat trips or approximately 3% per year. This is in direct contrast to the larger, open lake trout and salmon fishery which has declined significantly since 1990, and in contrast to comments from the public that the smallmouth bass fishery in eastern Lake Ontario has declined.

Angling quality as measured by harvest and catch rates has varied significantly over the 14 years censused, but without any apparent lake-wide pattern. Reasons for these variations are impossible to prove without additional data such as ages of bass harvested and released, but variations in bass year classes may be largely responsible. Large variations in year class strength are known to occur in the eastern basin which can dramatically influence smallmouth bass abundance (Chrisman and Eckert 1998). Similar variations in year class strength and subsequent bass abundance likely occur on a lake-

wide basis.

Analysis of harvest and catch rates by areas and sites show a number of statistically significant patterns and trends. However, the Henderson site was the only site to show a significant decline in harvest rates. The Henderson site also showed a significant downward trend in catch rate, and catch rates since 1991 have been well below the lake-wide estimates. The decline in the Henderson harvest and catch rate ratios between 1990-91 corresponds to the period when relative mortality of young smallmouth bass in the Eastern Basin increased significantly, presumably in response to double-crested cormorant predation (Lantry et al. 1998). These results suggest that ecosystem changes probably did not cause the decline in the Eastern Basin smallmouth bass fishery during the 1990s, since ecosystem changes would have affected other smallmouth bass fisheries at other sites in Lake Ontario too. Furthermore, in Lake Erie smallmouth bass densities, and the quality of the fishery, improved at a time when nutrient levels declined, dreissenid mussels exploded and water clarity improved (Ohio DNR 1998, Culligan et al. 1998).

### **References**

- Chrisman, J.R. and T.H. Eckert. 1998. Population trends among smallmouth bass in the eastern basin of Lake Ontario, 1976-97. Great Lakes Fishery Commission, Lake Ontario Committee Meeting, Niagara Falls, Ontario, March 24-25, 1998.
- Christie, W.J., K.A. Scott, P.G. Sly, and R.H. Stus. 1987. Recent changes in the aquatic food web of eastern Lake Ontario. *Can. J. Fish. Aquat. Sci.* 44(Suppl. 2): 37-52.
- Culligan, W.J., F.C. Cornelius, D.W. Einhouse, D.L. Zeller, R.C. Zimar, B.J. Beckwith and M.A. Wilkinson. 1998. 1998 Annual Report: Bureau of Fisheries, Lake Erie Unit, to the Lake Erie Committee and the Great Lakes Fishery Commission. February, 1998.
- Eckert, T.H. 1998a. Summary of 1976-97 warm

water assessment. Great Lakes Fishery Commission, Lake Ontario Committee Meeting, Niagara Falls, Ontario, March 24-25, 1998.

Eckert, T.H. 1998b. Lake Ontario fishing boat census 1997. Great Lakes Fishery Commission, Lake Ontario Committee Meeting, Niagara Falls, Ontario, March 24-25, 1998.

EPA. 1993. Lake Ontario: An ecosystem in transition. Report of the Lake Ontario pelagic community health indicator committee. U.S. Environmental Protection Agency. Contract No. 68-W9-0003. 65p.

Lantry, B.F., T.H. Eckert, C.P. Schneider and P. Sullivan. 1998. The relationship between the abundance of smallmouth bass and double-crested cormorants in the Eastern Basin of Lake Ontario.

NYSDEC Special Report - December 15, 1998.

McCullough, R.D. and D.W. Einhouse. 1998. Lake Ontario Eastern Basin creel survey, 1998. DEC Special Report - December 15, 1998.

Ohio DNR. 1998. Ohio's Lake Erie Fisheries 1997. Ohio Dept. Nat. Res., Div. of Wildlife. Federal Aid Project F-69-P.

O'Gorman, R. and T.J. Stewart. 1999. Ascent, dominance, and decline of the alewife in the Great Lakes: food web interactions and management strategies. *In* W.W. Taylor and P. Ferreri (eds.) Great Lakes Policy and Management: A Binational Perspective. Michigan State University Press: In press.

**Table A1. Descriptions of the four geographic areas (Roman numerals), and the nine localized smallmouth bass sites (Arabic numerals), used in analysis of smallmouth bass data from the 1985-98 DEC Lake Ontario fishing boat census.**

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I. West geographic area: Niagara River to Point Breeze. Access locations include Niagara State Park launch ramps (Youngstown), Roosevelt Beach, Wilson, Olcott, Green Harbor Marina, Golden Hills State Park, and Point Breeze.

1. Niagara River site (NR): Niagara State Park launch ramps, Wilson.
2. Point Breeze site (PB): Point Breeze, Eagle Creek Marina.

II. West/Central geographic area: Eagle Creek Marina, Sandy Creek, Braddocks Bay, Long Pond outlet, Genesee River, Irondequoit Bay.

3. Irondequoit site (IR): Genesee River, Irondequoit Bay.

III. East/Central geographic area: Bear Creek, Pultneyville, Hughes Marina, Sodus Bay, Port Bay, Blind Sodus Bay, Little Sodus Bay (Fair Haven), Sterling Creek, Wrights Landing at Oswego, Oswego Marina.

4. Pultneyville site (PV): Bear Creek, Pultneyville, Hughes Marina.
5. Sodus/Port site (SP): Sodus Bay, Port Bay.
6. Fair Haven site (FH): Blind Sodus Bay, Little Sodus Bay, Sterling Creek.
7. Oswego site (OS): Wrights Landing at Oswego, Oswego Marina.

IV. East geographic area: Sunset Bay, Catfish Creek, Dowie Dale Marina, Little Salmon River, Salmon River, Sandy Pond, Lakeview (North and South Sandy), Stony Creek, Association Island Cut.

8. Little Salmon site (LS): Catfish Creek, Dowie Dale Marina, Little Salmon River, Salmon River.
  9. Henderson site (HN): Stony Creek, Association Island Cut.
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**Table A2. Summary of statistics on effort, harvest, and catch, for smallmouth bass for the months of April - September in the 1985-98 DEC Lake Ontario fishing boat censuses.**

	Year Censused													
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
<b>Fishing effort for boats targeting smallmouth bass from opening day - September 30:</b>														
Fishing Boat Trips	17,795	10,733	18,270	16,516	23,527	24,670	25,347	18,056	20,655	18,558	26,585	20,339	24,980	23,129
Boat Angler Trips	42,955	25,227	42,311	37,174	57,037	58,914	58,830	42,262	46,642	42,933	59,571	43,800	57,983	53,221
Boat Angler Hours	181,487	89,752	151,109	117,332	206,969	186,799	201,142	143,451	160,415	139,075	207,650	150,717	185,960	185,303
Anglers/Boat Trip	2.41	2.35	2.32	2.25	2.42	2.39	2.32	2.34	2.26	2.31	2.24	2.15	2.32	2.30
Hours/Boat Trip	4.23	3.56	3.57	3.16	3.63	3.17	3.42	3.39	3.44	3.24	3.49	3.44	3.21	3.48
<b>Monthly estimates of fishing boat trips for boats targeting smallmouth bass from opening day - September 30:</b>														
June	3,058	1,517	1,288	2,477	4,293	4,664	6,697	2,119	2,693	2,327	5,177	2,116	3,694	4,699
July	5,921	5,088	9,123	6,975	7,199	9,463	10,067	5,632	7,462	7,656	8,951	6,625	8,394	6,757
August	6,117	3,219	4,434	4,180	7,056	7,509	5,159	6,438	7,642	6,060	7,244	7,353	9,963	7,743
September	2,699	910	3,425	2,884	4,980	3,033	3,424	3,867	2,858	2,516	5,214	4,245	2,928	3,930
<b>Estimates of fishing boat trips among four geographic areas for boats targeting smallmouth bass from opening day - September 30:</b>														
West	812	999	1,750	1,047	4,038	3,644	4,996	2,624	2,129	2,425	2,990	2,142	3,667	2,792
West/Central	1,533	901	1,889	2,019	4,323	2,915	3,268	3,628	3,189	3,322	4,312	4,931	5,649	3,765
East/Central	8,529	5,340	9,906	8,168	9,295	9,849	9,531	7,643	10,142	7,819	11,376	8,784	9,320	10,216
East	6,921	3,493	4,724	5,281	5,870	8,263	7,553	4,161	5,195	4,992	7,907	4,482	6,345	6,356
<b>Percentage of total fishing effort by boats targeting smallmouth bass from opening day - September 30:</b>														
Fishing Boat Trips	10.8%	6.2%	9.3%	8.8%	11.3%	11.3%	13.6%	12.7%	16.0%	14.7%	21.3%	21.4%	25.5%	24.8%
Boat Angler Trips	10.6%	5.5%	7.8%	7.0%	9.7%	9.5%	10.8%	10.3%	12.9%	12.0%	17.3%	16.5%	21.3%	20.8%
Boat Angler Hours	8.6%	3.4%	5.2%	4.1%	6.3%	5.3%	6.5%	6.0%	7.9%	7.2%	10.8%	10.1%	13.1%	13.9%
<b>April - September (6 month) estimates of smallmouth bass harvest and catch by all fishing boats:</b>														
Harvest	41,840	23,316	43,628	36,042	83,723	69,906	58,078	41,278	42,987	38,095	49,847	31,781	34,588	49,177
Catch	171,749	92,213	203,831	193,243	251,863	243,566	263,748	178,554	193,700	140,328	234,778	222,053	269,773	287,024
% Harvested	24.4%	25.3%	21.4%	18.7%	33.2%	28.7%	22.0%	23.1%	22.2%	27.1%	21.2%	14.3%	12.8%	17.1%
<b>Monthly estimates of smallmouth bass harvest by all fishing boats:</b>														
April	0	0	0	0	17	0	0	0	0	0	0	0	0	0
May	0	0	903	81	0	0	199	0	0	0	0	0	0	0
June	5,820	2,406	1,427	7,190	15,516	9,101	15,334	3,798	2,757	6,233	7,735	2,050	4,046	6,012
July	12,028	11,382	20,126	13,564	23,953	25,057	17,727	13,348	12,658	12,645	15,003	4,510	7,757	12,723
August	16,951	7,034	10,196	10,470	22,772	27,889	15,328	13,429	19,681	13,596	15,747	15,912	17,030	18,054
September	7,040	2,494	10,976	4,738	21,465	7,858	9,689	10,504	7,892	5,621	11,361	9,309	5,756	12,388

Table A2 - continued. Summary of statistics on effort, harvest, and catch, for smallmouth bass.

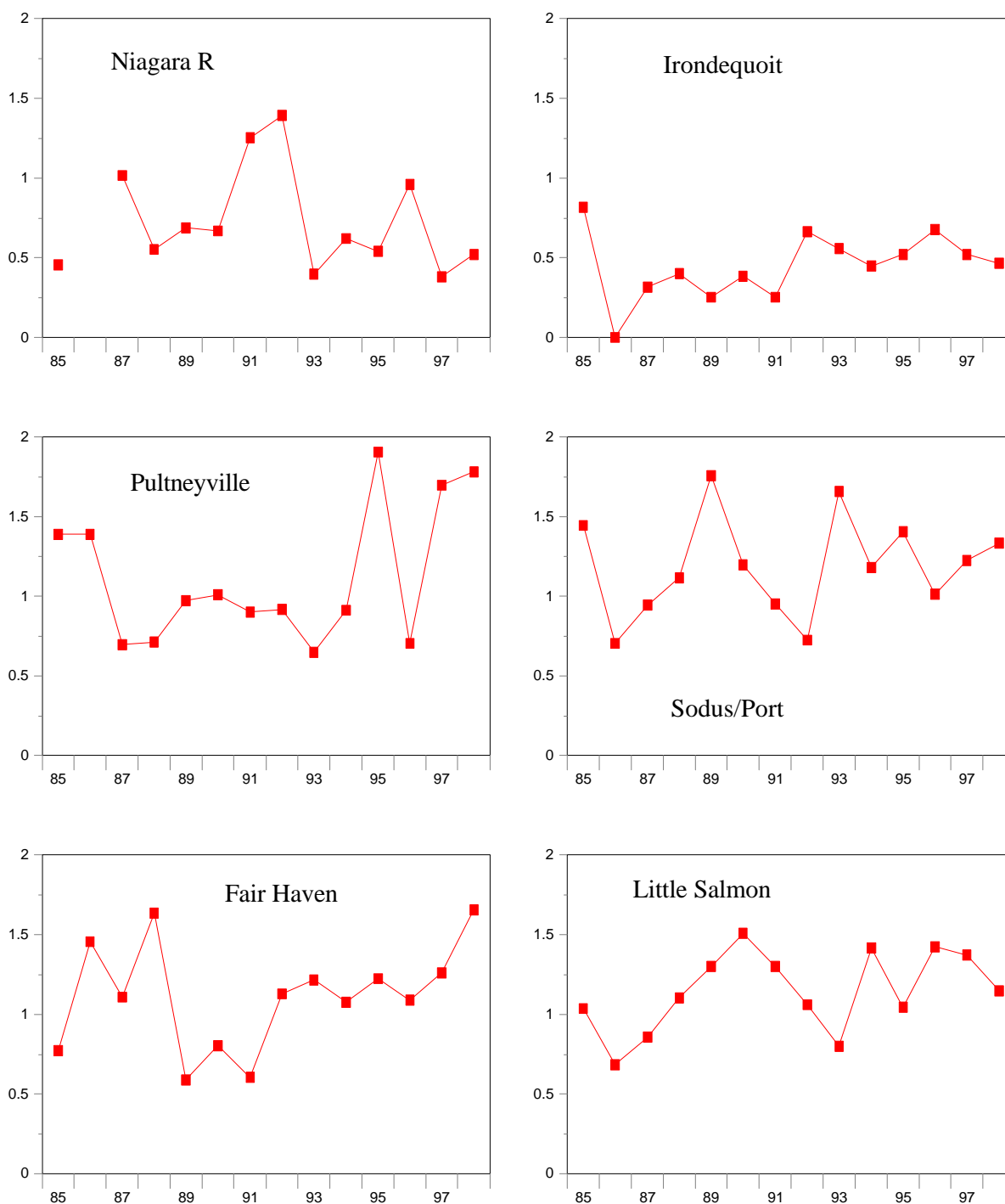
	Year Censused														
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
April - September estimates of smallmouth bass harvest among four geographic areas by all fishing boats:															
West	1,738	2,918	1,990	852	10,295	3,076	14,695	8,024	2,414	3,515	2,123	2,138	2,486	3,602	3,602
West/Central	2,814	541	1,809	3,647	4,171	4,466	1,779	6,061	3,298	3,346	4,145	4,388	3,143	3,473	3,473
East/Central	15,970	9,133	19,821	16,878	34,232	25,600	19,124	14,067	24,138	18,308	26,366	14,451	15,934	27,240	27,240
East	21,318	10,724	20,009	14,665	35,026	36,764	22,479	13,125	13,136	12,926	17,213	10,803	13,024	14,862	14,862
Percent of April - September harvest and catch by boats targeting smallmouth bass from opening day - September 30:															
Percent Harvest	82.2%	86.5%	93.0%	88.0%	90.9%	86.9%	93.9%	92.0%	92.7%	93.7%	98.1%	93.8%	91.2%	97.2%	97.2%
Percent Catch	79.9%	78.1%	89.0%	77.9%	88.1%	81.3%	86.4%	88.2%	80.8%	85.9%	95.2%	93.3%	90.9%	94.1%	94.1%
Smallmouth bass harvest and catch rates by boats targeting smallmouth bass from opening day - September 30:															
Har/Boat Trip	1.933	1.880	2.222	1.921	3.235	2.463	2.151	2.103	1.930	1.924	1.840	1.466	1.263	2.066	2.066
Catch/Boat Trip	7.713	6.713	9.931	9.111	9.426	8.027	8.986	8.722	7.581	6.498	8.409	10.189	9.820	11.674	11.674
Har/Angler Trip	0.801	0.800	0.959	0.853	1.334	1.031	0.927	0.898	0.854	0.832	0.821	0.681	0.544	0.898	0.898
Catch/Angler Trip	3.195	2.856	4.288	4.048	3.888	3.361	3.872	3.726	3.357	2.809	3.753	4.731	4.231	5.074	5.074
Har/Angler Hour	0.190	0.225	0.269	0.270	0.368	0.325	0.271	0.265	0.248	0.257	0.236	0.198	0.170	0.258	0.258
Catch/Angler Hour	0.756	0.803	1.201	1.283	1.071	1.060	1.132	1.098	0.976	0.867	1.077	1.375	1.319	1.457	1.457
Smallmouth bass harvest rates per boat trip for boats targeting smallmouth bass from opening day - September 30:															
June	1.770	1.510	1.076	2.653	3.458	1.738	2.266	1.414	0.935	2.649	1.485	0.962	0.970	1.258	1.258
July	1.654	1.877	2.140	1.632	2.945	2.457	1.694	2.339	1.663	1.397	1.634	0.656	0.907	1.854	1.854
August	2.333	2.000	2.276	2.306	3.080	2.978	2.697	1.901	2.281	2.244	2.122	2.001	1.501	2.196	2.196
September	1.825	2.086	2.801	1.433	3.680	2.320	2.449	2.471	2.622	2.090	2.155	2.056	1.842	3.140	3.140
Smallmouth bass harvest rates per boat trip among four geographic areas for boats targeting smallmouth bass from opening day - September 30:															
West	1.234	1.767	1.051	0.768	2.399	0.726	2.838	2.783	1.009	1.348	0.710	0.976	0.591	1.289	1.289
West/Central	1.478	0.416	0.706	1.572	0.785	1.383	0.407	1.510	1.032	0.986	0.887	0.864	0.559	0.894	0.894
East/Central	1.539	1.514	1.826	1.862	3.343	2.172	1.850	1.747	2.175	2.139	2.283	1.469	1.526	2.618	2.618
East	2.602	2.848	4.091	2.375	5.443	3.956	2.832	2.843	2.378	2.492	2.150	2.359	1.890	2.214	2.214
Angling quality parameters for boats targeting smallmouth bass from opening day - September 30:															
Percentage of boats with zero harvest of:															
Smallmouth Bass	54.0	60.0	51.9	57.7	51.1	56.0	61.1	60.5	61.8	62.8	64.6	68.2	72.4	64.9	64.9
Any Fish Species	48.3	55.1	49.7	56.2	49.3	53.8	59.3	59.8	61.6	62.4	63.4	67.3	71.5	64.1	64.1
Percentage of boats with zero catch of:															
Smallmouth Bass	27.2	38.4	23.3	26.7	25.4	25.9	29.8	20.9	28.3	26.2	30.7	23.0	25.4	21.4	21.4
Any Fish Species	18.1	30.0	18.7	23.3	19.8	21.3	25.7	18.8	23.8	23.0	26.7	21.4	21.5	19.9	19.9
Percentage of boats harvesting the daily bag limit of 5 smallmouth bass per angler:															
	2.7	4.0	6.6	4.8	10.4	7.8	6.8	5.4	5.6	6.8	5.9	3.5	2.8	7.1	7.1



Table A3 - continued. Site specific smallmouth bass harvest and catch rates.

Catch Rates Per Boat Angler Hour:		Site Specific Rates								
Year Censused	Lake-wide Rate	NR	PB	IR	PV	SP	FH	OS	LS	HN
1985	0.756	0.362		0.347	0.896	1.538	0.583	1.978	1.152	0.880
1986	0.803			0.513	1.547	0.988	1.011		0.963	0.525
1987	1.201	0.934		0.476	1.421	1.727	1.673	0.877	2.895	0.970
1988	1.283	0.353		0.599	2.118	1.958	1.443	1.018	1.840	1.070
1989	1.071	0.795		0.633	1.352	2.642	0.719	1.762	1.677	1.122
1990	1.060	1.251		0.892	1.190	1.620	0.534	0.865	1.817	1.428
1991	1.132	1.083	0.105	1.099	1.675	1.958	0.386	1.121	1.178	0.751
1992	1.098	1.980		1.304	1.532	1.388	0.668		0.782	0.785
1993	0.976	0.589		0.843	0.865	1.644	1.218	1.737	0.906	0.790
1994	0.867	0.902		0.901	1.037	1.120	0.774		1.190	0.669
1995	1.077	0.737		1.971	1.754	1.161	0.870	1.580	1.129	0.572
1996	1.375	0.978	0.069	2.556	1.002	1.472	1.514		1.344	0.513
1997	1.319	0.629	0.746	2.102	2.618	1.430	2.224		1.217	0.798
1998	1.457	0.645		2.383	3.197	1.686	2.454	1.417	1.778	0.980

Year Censused	Ratios of (Site Specific Catch Rate) / (Lake-wide Catch Rate)									
	NR	PB	IR	PV	SP	FH	OS	LS	HN	
1985	0.478		0.460	1.185	2.034	0.771	2.616	1.524	1.164	
1986			0.639	1.926	1.230	1.259		1.199	0.653	
1987	0.777		0.397	1.183	1.438	1.393	0.730	2.410	0.808	
1988	0.275		0.467	1.651	1.526	1.125	0.794	1.434	0.834	
1989	0.742		0.591	1.262	2.467	0.671	1.645	1.565	1.048	
1990	1.180		0.841	1.123	1.528	0.504	0.816	1.714	1.347	
1991	0.956	0.093	0.971	1.480	1.730	0.341	0.990	1.041	0.664	
1992	1.803		1.187	1.395	1.264	0.608		0.712	0.715	
1993	0.603		0.864	0.886	1.684	1.248	1.780	0.929	0.809	
1994	1.040		1.039	1.196	1.291	0.893		1.373	0.772	
1995	0.684		1.830	1.629	1.078	0.807	1.467	1.048	0.531	
1996	0.711	0.050	1.859	0.729	1.071	1.101		0.977	0.373	
1997	0.477	0.566	1.593	1.985	1.084	1.686		0.922	0.605	
1998	0.443		1.635	2.194	1.157	1.684	0.972	1.220	0.673	



**Figure A1.** Harvest rate ratios ( [site harvest rate per angler hour] / [lake-wide rate] ) for smallmouth bass, among boats targeting smallmouth bass during the open season in the months of June - September, from the 1985-98 DEC Lake Ontario fishing boat census. Year censused on X-axis, harvest rate ratio on Y-axis.

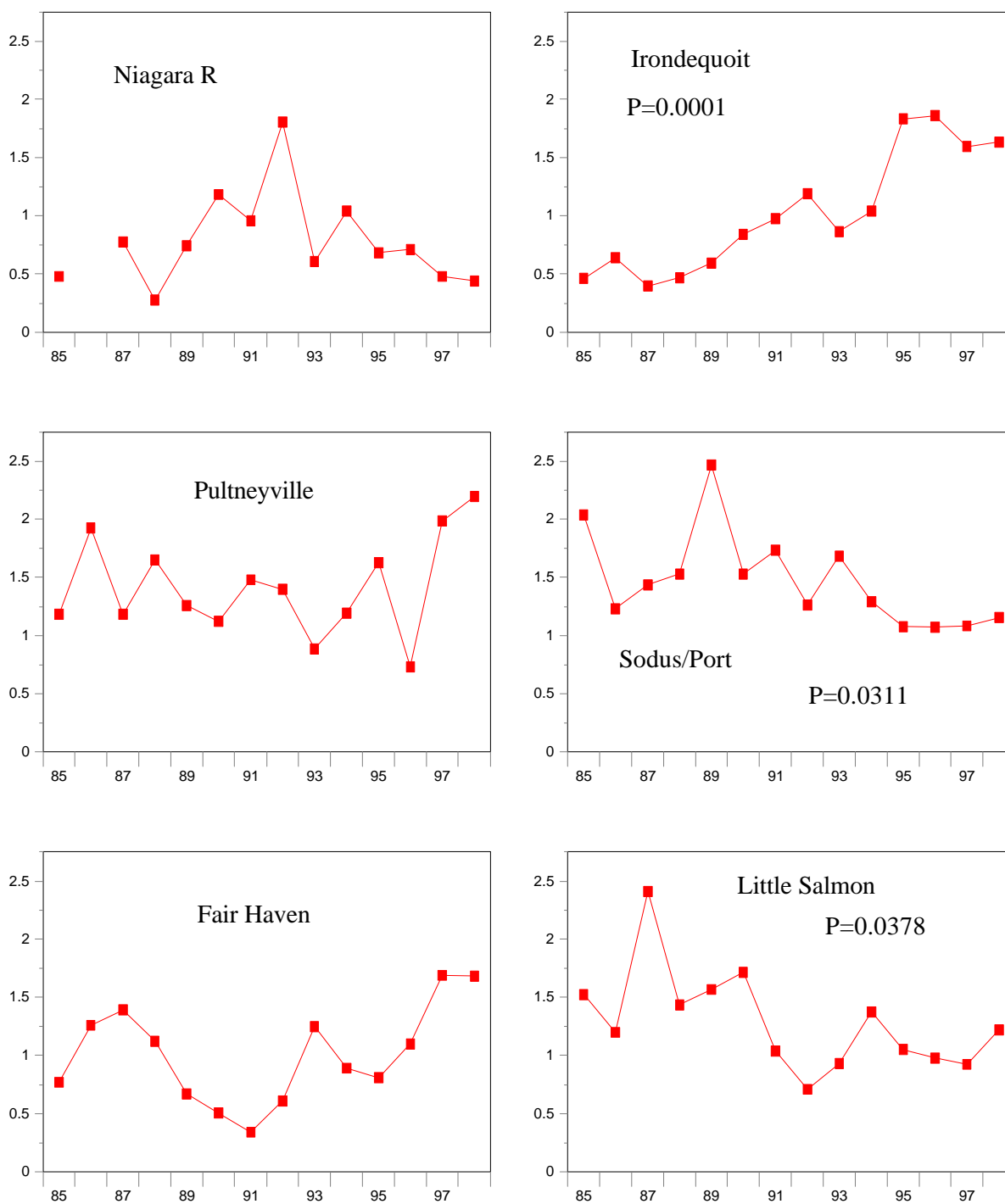


Figure A2. Catch rate ratios ( [site catch rate per angler hour] / [lake-wide rate] ) for smallmouth bass, among boats targeting smallmouth bass during the open season in the months of June - September, from the 1985-98 DEC Lake Ontario fishing boat census. Year censused on X-axis, catch rate ratio on Y-axis.