

Fisheries Survey of Saratoga Lake

2007- 2008



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ABSTRACT: This survey was conducted at the request of the Saratoga Lake Protection and Improvement District to provide fisheries data associated with a herbicide treatment to control exotic Eurasian water milfoil (*Myriophyllum spicatum*). Night time boat electrofishing was conducted on the North East shoreline on 17 September and 3 October 2007 and the entire shoreline in May, June and October 2008. Comparisons between 2007 pre-treatment data and 2008 post-treatment data for the North East shore show no clear trends in catch per unit effort or shifts in species composition between these two years. Catch per unit effort (CPUE) data indicate that largemouth bass were most abundant in West shore (pre-treatment, 128.2/hr), North East shore (post-treatment, 117.4/hr), North East shore (pre-treatment 84.7/hr) and South shore (one year post treatment, 67.8/hr) samples respectively. General trends in CPUE indicate that fish abundance is lowest in the South and highest in North East shoreline sections.

INTRODUCTION

This study was conducted by the SUNY Cobleskill Department of Fisheries & Wildlife at the request of the Saratoga Lake Protection and Improvement District (SLPID), Ballston Spa, NY, to collect fisheries data associated with an application of herbicides aimed at controlling exotic Eurasian water milfoil (*Myriophyllum spicatum*) (EWM) in Saratoga Lake. Points of contact for SLPID were Dean Long (The LA Group) (518) 587-8100, dlong@thelagroup.com, and Joe Finn, Saratoga Lake Protection and Improvement District, (518) 378-6679, jfinn14@nycap.rr.com. Rob Fiorentino (rjfioren@gw.dec.state.ny.us) from the New York State Department of Environmental Conservation Department, Warrensburg was the principle biologist providing NYSDEC input and design for this survey.

Saratoga Lake, located in southeastern Saratoga County, is 3,762 acres and has a mean depth of 25 feet and maximum depth of 96 feet. The lake is considered eutrophic with an anoxic hypolimnion after summer stratification. The fishery is primarily a cool/warm water fishery dominated by largemouth bass, smallmouth bass, walleye, bluegill, yellow perch, pumpkinseed, chain pickerel, northern pike, bullhead, rock bass, and black crappie. Saratoga Lake has a history of exotic species introductions including Eurasian water milfoil and water chestnut (*Trapa natans*).

The goal of this survey was to establish baseline line fishery data in concert with a SONAR and RENOVATE herbicide treatment directed at control of EWM, applied in spring 2007 and 2008 as part of the Saratoga Lake Invasive Species Long-term Management Plan (ISLMP). Fisheries surveys have been conducted (and are planned) for each herbicide application location for both pre- and post treatment areas during 2007, 2008 and 2009.

MATERIAL & METHODS

This is the second year of this fisheries survey. Survey dates were 17 September and 3 October 2007 (Fall 2007 pre-treatment survey of North East Shoreline), 24 June (1-yr post treatment of Southern shoreline) and 25 June and 2 July (Summer 2008 pre-treatment survey of West shore). All surveys were done at night with a Smith-Root™ boat electrofisher. Each survey date started after dark and ended between midnight and 2am. Each survey track was contiguous, fishing in shallow (<4'), near shore water in consecutive, connecting electrofishing runs. Electrofishing effort (time in seconds) for each run was automatically recorded by the boat electrofisher. A geographic positioning system (GPS) unit was used to record latitude and longitude (UTM) coordinates for the start and endpoint of each electrofishing run. Survey endpoints and effort are recorded in Tables 1-4. Survey sites and the survey track are illustrated in Figures 1-4.

A 5000-watt generator coupled to a Type VI-A variable voltage pulsator provided power for the electrofisher. During all fish collections, 336-504 DC volts at 6-7.5 amps were used on all nights. Two netters located on each side of the bow captured fish in the field. Fish were netted in the DC field, then placed into a 75-gallon live well and processed at the end of the collection run. After processing, all fish were released in good condition at the end of each run.

Electrofishing surveys were made when littoral water temperatures were 10-18°C, as prescribed in the Percid Sampling Manual (Forney et al., 1994), with alternating game fish only (target 30 min) and all fish (usually 10-15 min) collections. During six all fish collections every effort was made to collect EVERY fish in the DC field, including game fish, non-gamefish and young of the year. During gamefish only collections, just gamefish and fish that appeared to be gamefish were targeted by the netters. Collected fish were identified and measured in maximum total length (millimeters) on a measuring board. Results of game fish and non-game fish are expressed in catch/hr in Table 5. These standard survey methods and electrofishing boat design are routinely used by the New York State Department of Environmental Conservation (NYSDEC) and were approved for this survey by a Region 5 NYSDEC biologist (Matt Presser) who accompanied us onboard the research vessel on 17 September 2007.

Survey Design

Figure 1. Map of Saratoga Lake adapted from Aquatic Control Technologies 2008 Report illustrating milfoil treatments and Fisheries Survey Lake Sections by Year

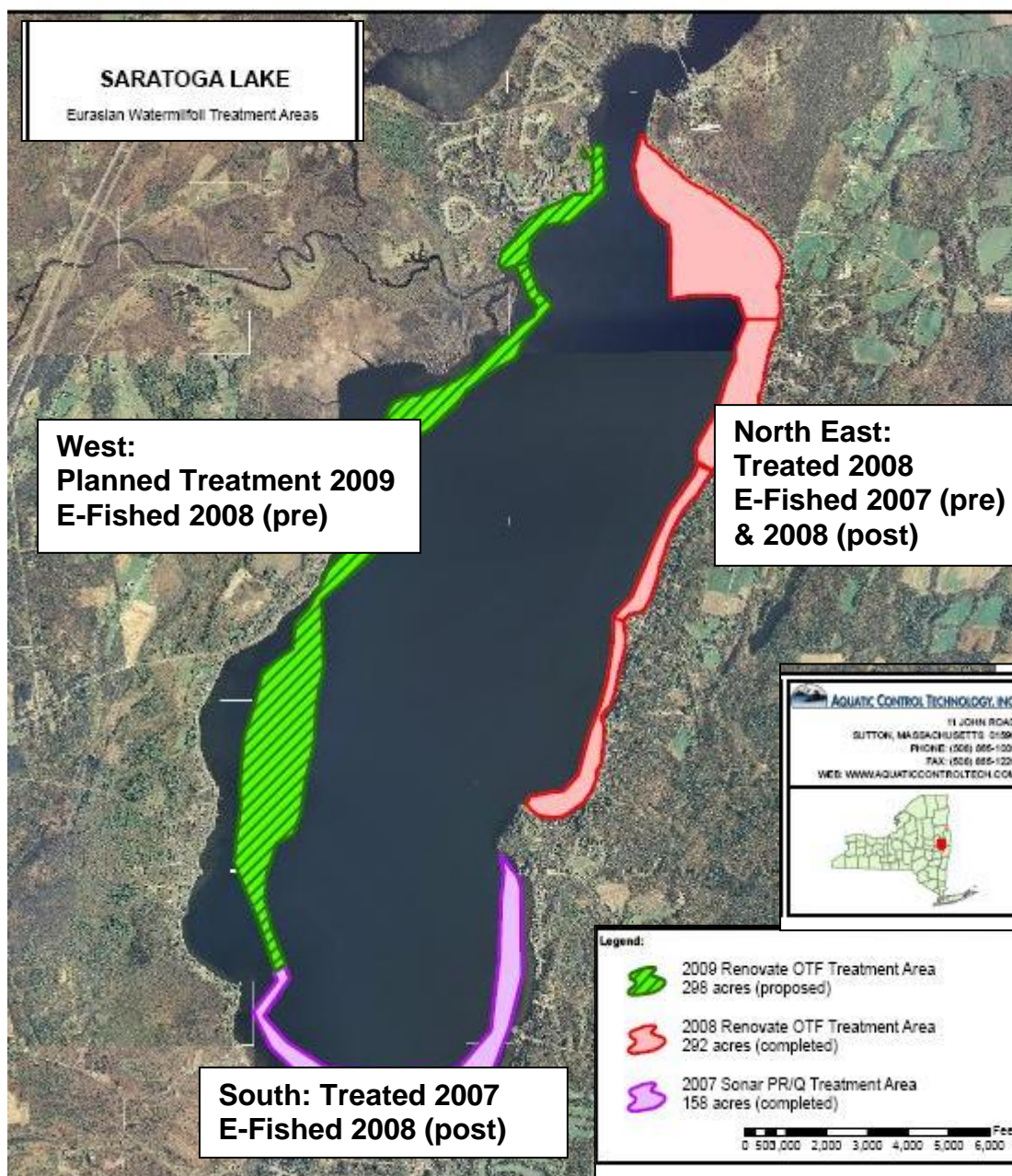


Table 1. Saratoga Lake North East Electrofishing Survey Site Descriptions on 17 September & 3 October 2007

Date/Site	Lake	Treatment	Start UTM (18T)		End UTM (18T)		Collection	All Fish (AF)		Game Fish Only (GFO)	
	Section	Year	Easting	Northing	Easting	Northing	Type	Seconds	Time (Hrs)	Seconds	Time (Hrs)
9.17.07-1AF	North East	2008 (1yr pre-)	602735	4762061	603027	4762382	All Fish	790	0.2194		
9.17.07-2AF	North East	2008 (1yr pre-)	603027	4762382	603451	4762633	All Fish	943	0.2619		
9.17.07-3AF	North East	2008 (1yr pre-)	603451	4762633	603602	4763283	All Fish	912	0.2533		
9.17.07-4AF	North East	2008 (1yr pre-)	603602	4763283	603756	4763906	All Fish	568	0.1578		
10.3.07-1GF	North East	2008 (1yr pre-)	603756	4763906	604042	4764478	Gamefish			1256	0.3489
10.3.07-2GF	North East	2008 (1yr pre-)	604042	4764478	604685	4765560	Gamefish			1127	0.3131
10.3.07-3AF	North East	2008 (1yr pre-)	604685	4765560	604749	4765933	All Fish	967	0.2686		
10.3.07-4GF	North East	2008 (1yr pre-)	604749	4765933	604127	4766782	Gamefish			1800	0.5000
10.3.07-5AF	North East	2008 (1yr pre-)	604127	4766782	603818	4767315	All Fish	821	0.2281		
Total Effort	North East	2008 (1yr pre-)						5001	1.3892	4183	1.1619

Figure 2. Saratoga Lake Electrofishing Boat Survey Track and Nine Collection Locations for North East Shore on 17 September and 3 October 2007.



Table 2. Saratoga Lake South Shore Boat Electro fishing Survey Site Descriptions on 24 June 2008

	Lake	Treatment	Start UTM (18T)		End UTM (18T)		Collection	All Fish (AF)		Game Fish Only (GFO)	
Date/Site	Section	Year	Easting	Northing	Easting	Northing	Type	Seconds	Time (Hrs)	Seconds	Time (Hrs)
6.24.08-1AF	South	2007 (1 yr post)	602958	4760958	602803	4760589	All Fish	619	0.1719		
6.24.08-2GF	South	2007 (1 yr post)	602803	4760589	602453	4760099	Gamefish			856	0.2378
6.24.08-3GF	South	2007 (1 yr post)	602453	4760099	601611	4760186	Gamefish			1054	0.2928
6.24.08-4AF	South	2007 (1 yr post)	601611	4760186	601164	4760480	All Fish	864	0.2400		
6.24.08-5GF	South	2007 (1 yr post)	601164	4760480	600984	4761042	Gamefish			889	0.2469
6.24.08-6GF	South	2007 (1 yr post)	600984	4761042	600649	4761382	Gamefish			654	0.1817
Total Effort	South	2007 (1 yr post)						1483	0.4119	3453	0.9592

Table 3. Saratoga Lake West Shore Electrofishing Collection Sites on 25 June and 2 July 2008

	Lake	Treatment	Start UTM (18T)		End UTM (18T)		Collection	All Fish (AF)		Game Fish Only (GFO)	
Date/Site	Section	Year	Easting	Northing	Easting	Northing	Type	Seconds	Time (Hrs)	Seconds	Time (Hrs)
6.25.08-1AF	West	2009 (1 yr pre)	601220	4763630	601584	4764100	All Fish	906	0.2517		
6.25.08-2GF	West	2009 (1 yr pre)	601584	4764100	601886	4764676	Gamefish			905	0.2514
6.25.08-3GF	West	2009 (1 yr pre)	601886	4764676	601792	4765370	Gamefish			910	0.2528
6.25.08-4AF	West	2009 (1 yr pre)	601792	4765370	602233	4765469	All Fish	713	0.1981		
6.25.08-5GF	West	2009 (1 yr pre)	602233	4765469	602876	4765807	Gamefish			1056	0.2933
6.25.08-6GF	West	2009 (1 yr pre)	602876	4765807	602946	4766180	Gamefish			527	0.1464
7.2.08-1GF	West	2009 (1 yr pre)	600625	4761401	600753	4762145	Gamefish			906	0.2517
7.2.08-2AF	West	2009 (1 yr pre)	600753	4762145	600775	4762625	All Fish	609	0.1692		
7.2.08-3GF	West	2009 (1 yr pre)	600775	4762625	600885	4763391	Gamefish			917	0.2547
7.2.08-4AF	West	2009 (1 yr pre)	603063	4766276	603329	4766626	All Fish	601	0.1669		
7.2.08-5GF	West	2009 (1 yr pre)	603391	4766668	603569	4767476	Gamefish			1106	0.3072
Total Effort	West	2009 (1 yr pre)						2829	0.7858	6327	1.7575

Figure 3. Saratoga Lake South and West Shore Electrofishing Sites and Seventeen Collection Locations on 24, 25 June and 2 July 2008.

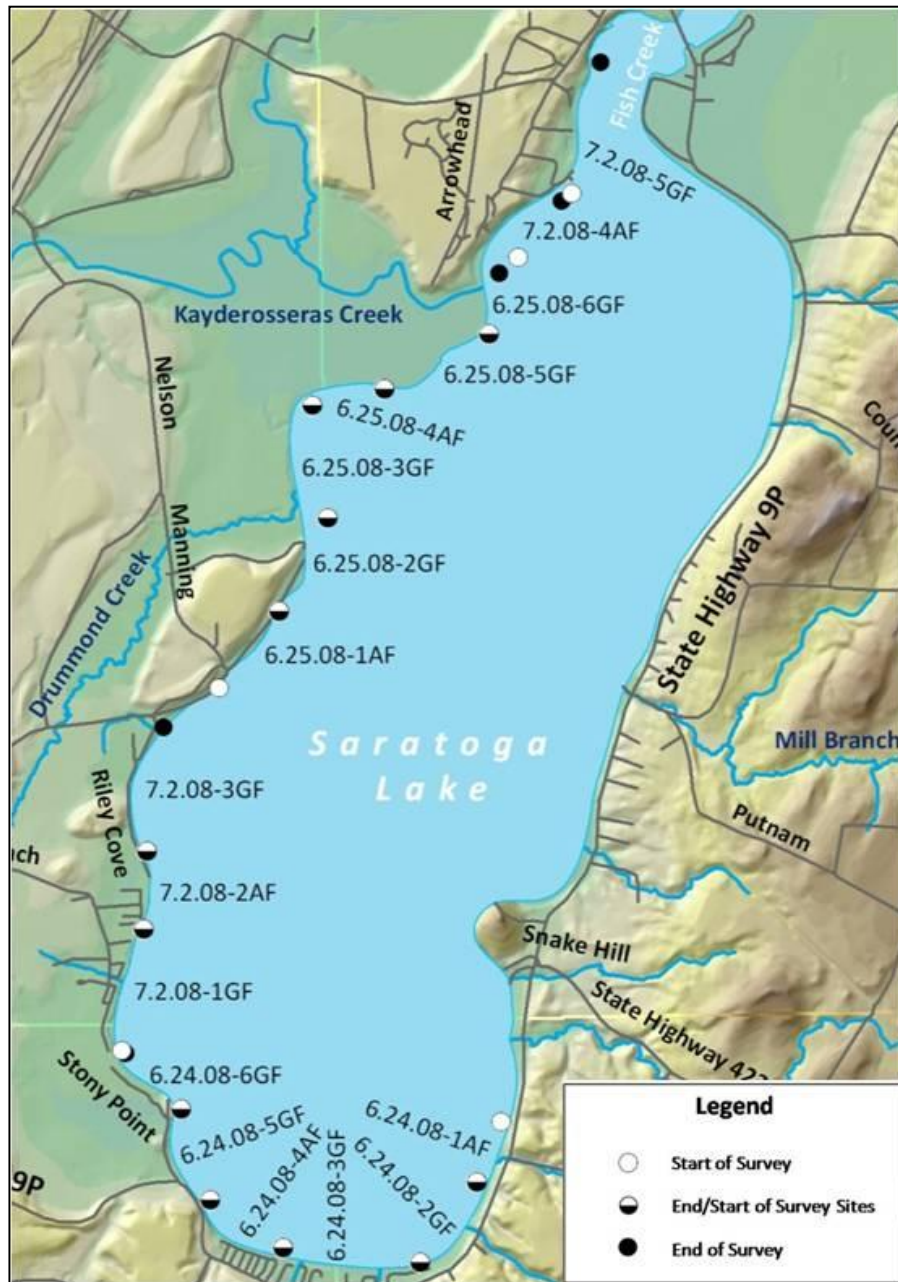
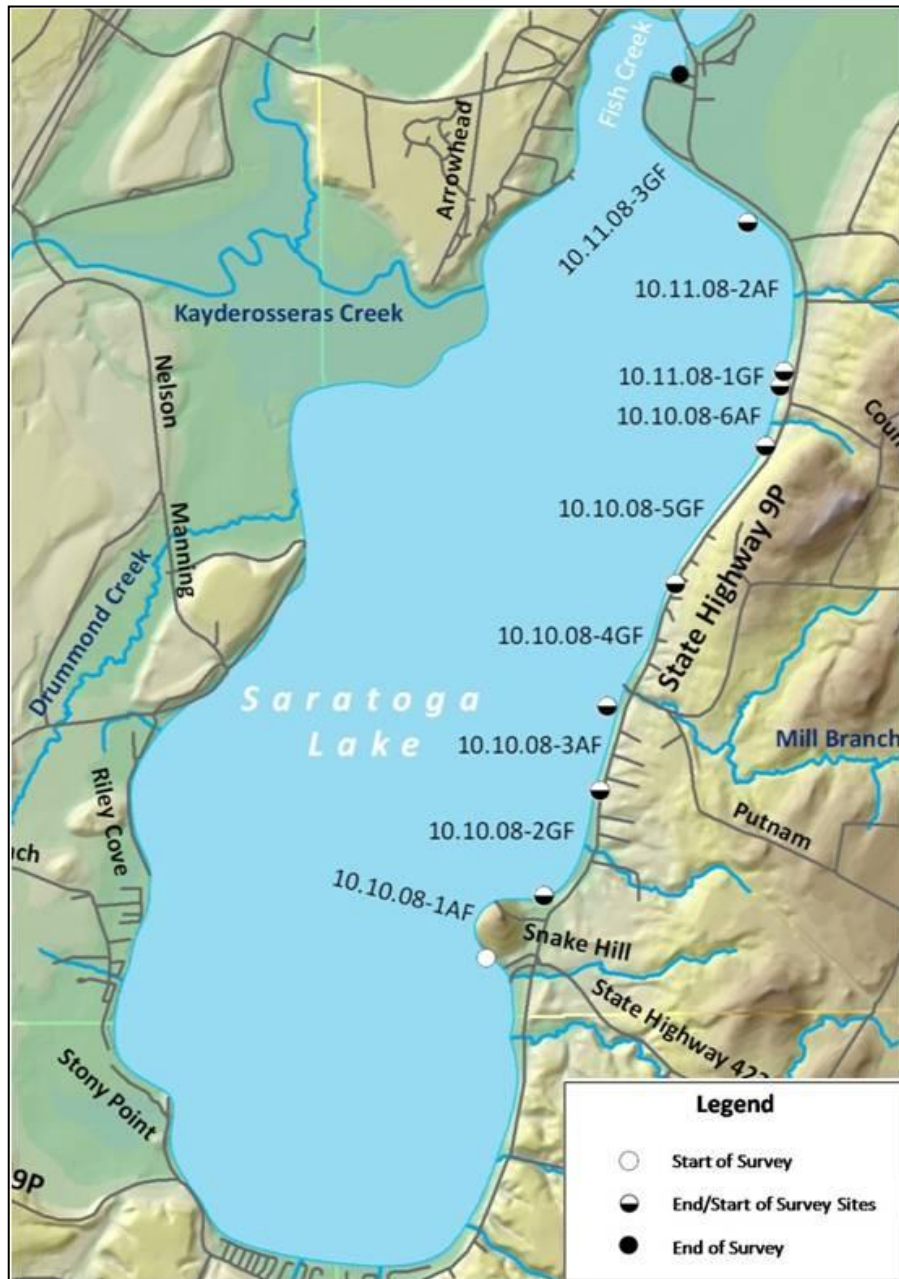


Table 4. Saratoga Lake North East Shore 10 & 11 October 2008 Electro fishing Survey Site Descriptions

Date/Site	Lake	Treatment	Start UTM (18T)		End UTM (18T)		Collection	All Fish (AF)		Game Fish Only (GFO)	
	Section	Year	Easting	Northing	Easting	Northing	Type	Seconds	Time (Hrs)	Seconds	Time (Hrs)
10.10.08-1AF	North East	2008 (5 mo.post)	602863	4761958	603209	4762343	All Fish	901	0.2503		
10.10.08-2GF	North East	2008 (5 mo.post)	603209	4762343	603557	4762992	Gamefish			1226	0.3406
10.10.08-3AF	North East	2008 (5 mo.post)	603557	4762992	603602	4763510	All Fish	902	0.2506		
10.10.08-4GF	North East	2008 (5 mo.post)	603602	4763510	604021	4764263	Gamefish			1211	0.3364
10.10.08-5GF	North East	2008 (5 mo.post)	604021	4764263	604575	4765108	Gamefish			1336	0.3711
10.10.08-6AF	North East	2008 (5 mo.post)	604575	4765108	604663	4765476	All Fish	602	0.1672		
10.11.08-1GF	North East	2008 (5 mo.post)	604663	4765476	604690	4765569	Gamefish			966	0.2683
10.11.08-2AF	North East	2008 (5 mo.post)	604690	4765569	604465	4766487	All Fish	906	0.2517		
10.11.08-3GF	North East	2008 (5 mo.post)	604465	4766487	604052	4767399	Gamefish			1698	0.4717
Total Effort	North East	2008 (5 mo.post)						3311	0.9197	6437	1.7881

Figure 4. Saratoga Lake North East Shoreline Electrofishing Locations on 10 & 11 October 2008.



RESULTS & DISCUSSION

Table 5. Saratoga North East Shore 17 Sept. & 3 Oct. 2007 (Pre-treatment)
Compared to 10 & 11 Oct. 2008 (One Year Post Treatment)

	All Fish		Game Fish		Species Total		AF or GFO CPUE (#/hr)		Relative Abundance (%)	
	1 yr pre	post	1 yr pre	post	1 yr pre	post	1 yr pre	post	1 yr pre	post
Species	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
banded killifish	15	35	0	0	15	35	10.8	38.1	0.7	2.0
black crappie	2	3	1	3	3	6	1.4	3.3	0.1	0.3
bluegill	1157	714	140	59	1297	773	832.9	776.3	60.0	43.3
bluntnose minnow	12	10	0	1	12	11	8.6	10.9	0.6	0.6
brown bullhead	7	8	12	3	19	11	5.0	8.7	0.9	0.6
chain pickerel	1	3	1	4	2	7	0.8	2.6	0.1	0.4
common carp	9	5	2	0	11	5	6.5	5.4	0.5	0.3
emerald shiner	1	8	0	0	1	8	0.7	8.7	0.0	0.4
golden shiner	0	11	1	6	1	17	0.0	12.0	0.0	1.0
largemouth bass	126	91	90	227	216	318	84.7	117.4	10.0	17.8
logperch	36	59	5	10	41	69	25.9	64.1	1.9	3.9
margined madtom	1	0	0	0	1	0	0.7	0.0	0.0	0.0
northern pike	1	1	0		1	1	0.4	0.4	0.0	0.1
pumpkinseed	135	87	6	0	141	87	97.2	94.6	6.5	4.9
redbreast sunfish	7	2	0	0	7	2	5.0	2.2	0.3	0.1
rockbass	152	107	28	20	180	127	109.4	116.3	8.3	7.1
smallmouth bass	62	49	1	10	63	59	24.7	21.8	2.9	3.3
spottail shiner	1	0	0	0	1	0	0.7	0.0	0.0	0.0
tessellated darter	2	14	0	1	2	15	1.4	15.2	0.1	0.8
walleye	10	1	2	6	12	7	4.7	2.6	0.6	0.4
white sucker	0	2	0	0	0	2	0.0	2.2	0.0	0.1
yellow bullhead	16	11	16	4	32	15	11.5	12.0	1.5	0.8
yellow perch	82	80	20	129	102	209	59.0	77.2	4.7	11.7
Total	1835	1301	325	483	2160	1784	1292.2	1391.9	100.0	100.0

Table 6. Saratoga West Shore Pre-treatment Electrofishing 25 June and 2 July 2008.

Species	Count			AF or GFO	Rel. Abundance
	All Fish	Game Fish	Species Total	CPUE fish/hr	% of total catch
banded killifish	3	4	7	3.8	0.6
black crappie	0	1	1	0.0	0.1
bluegill	276	43	319	351.2	27.2
brown bullhead	19	4	23	24.2	2.0
central mudminnow	2	0	2	2.5	0.2
chain pickerel	7	21	28	11.0	2.4
common carp	3	1	4	3.8	0.3
emerald shiner	0	0	0	0.0	0.0
Fallfish	0	1	1	0.0	0.1
golden shiner	12	12	24	15.3	2.0
largemouth bass	83	243	326	128.2	27.8
logperch	8	1	9	10.2	0.8
northern pike	0	1	1	0.4	0.1
pumpkinseed	96	20	116	122.2	9.9
redbreast sunfish	20	0	20	25.5	1.7
rockbass	11	7	18	14.0	1.5
smallmouth bass	2	11	13	5.1	1.1
tessellated darter	1	0	1	1.3	0.1
walleye	2	1	3	1.2	0.3
white sucker	1	2	3	1.3	0.3
yellow bullhead	10	1	11	12.7	0.9
yellow perch	77	164	241	94.8	20.6
Total	633	538	1171	828.5	100.0

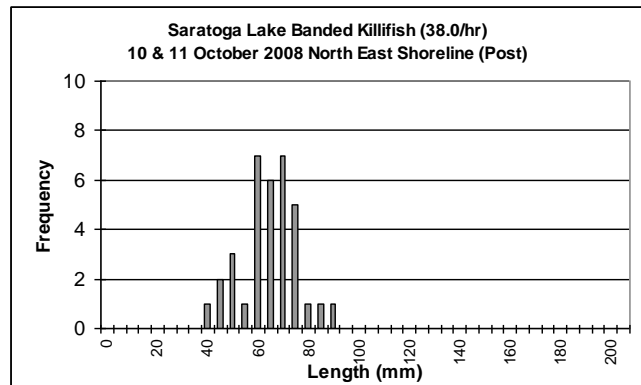
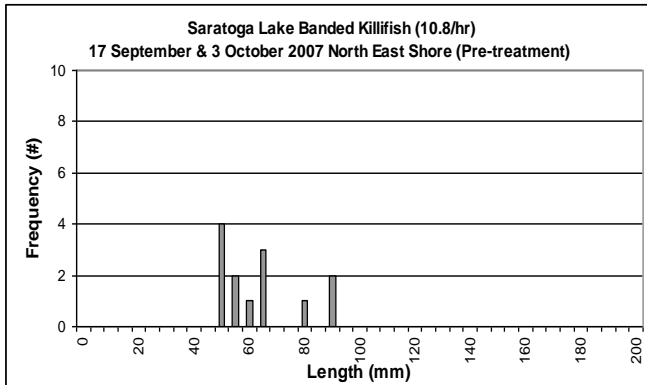
Table 7. Saratoga South Shore Electrofishing Results 24 June 2008 (1 yr. Post-treatment).

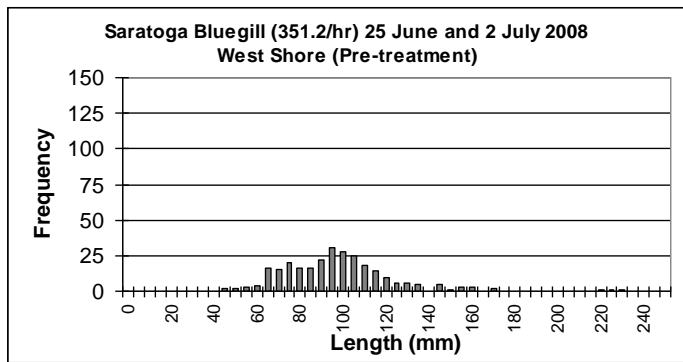
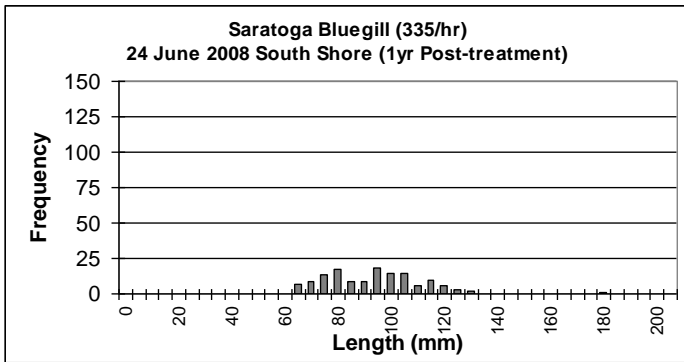
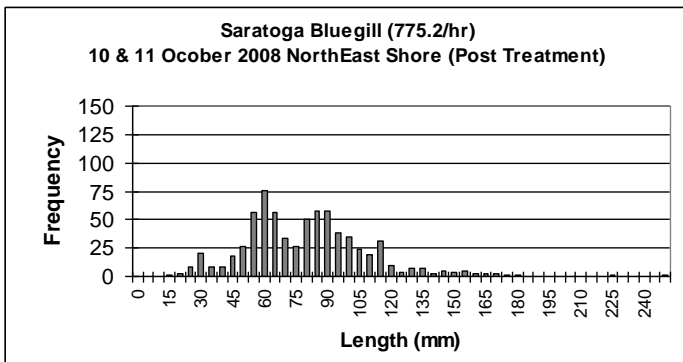
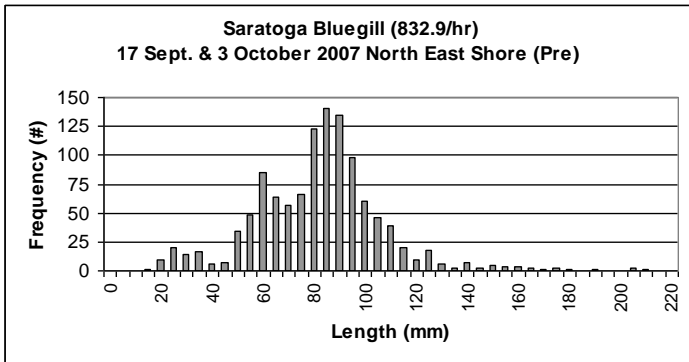
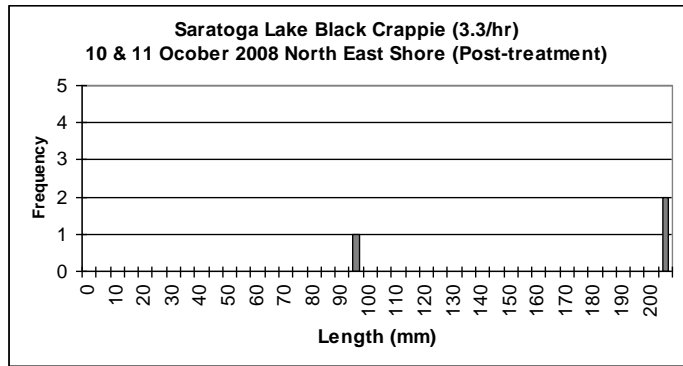
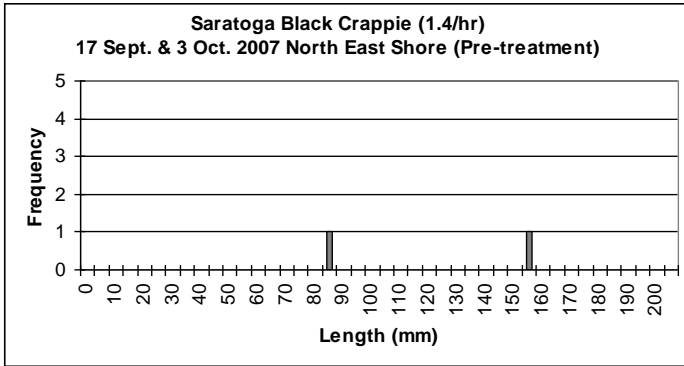
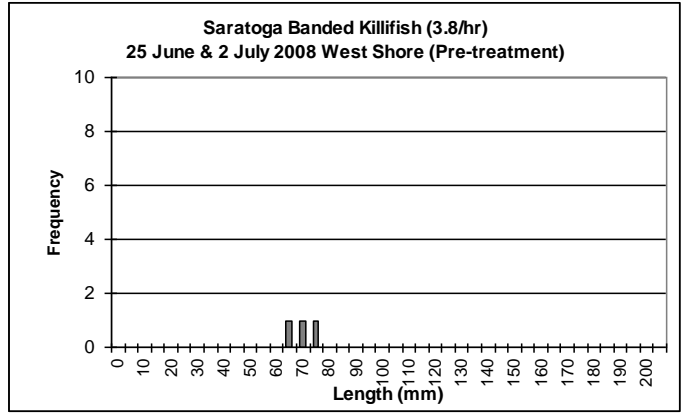
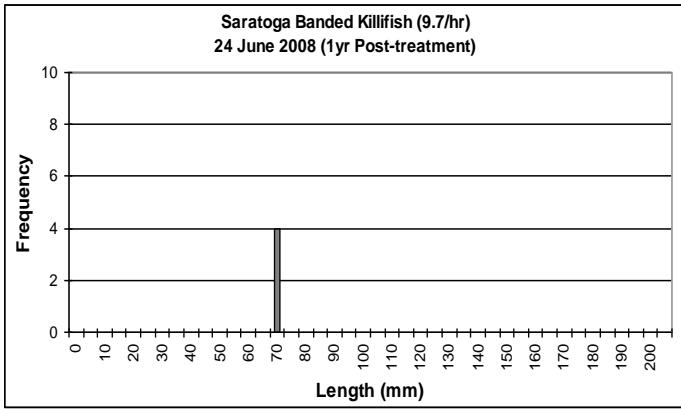
Species	Count			AF or GFO	Rel. Abundance
	All Fish	Game Fish	Species Total	CPUE fish/hr	% of total catch
banded killifish	4	8	12	9.7	1.6
black crappie	0	1	1	0.0	0.1
bluegill	138	49	187	335.0	25.4
bluntnose minnow	0	0	0	0.0	0.0
brown bullhead	23	4	27	55.8	3.7
central mudminnow	1	1	2	2.4	0.3
chain pickerel	1	3	4	2.9	0.5
common carp	0	1	1	0.0	0.1
emerald shiner	0	0	0	0.0	0.0
golden shiner	2	5	7	4.9	0.9
largemouth bass	31	62	93	67.8	12.6
logperch	3	2	5	7.3	0.7
northern pike	0	0	0	0.0	0.0
pumpkinseed	87	16	103	211.2	14.0
redbreast sunfish	0	0	0	0.0	0.0
rockbass	10	5	15	24.3	2.0
smallmouth bass	2	6	8	5.8	1.1
spottail shiner	0	0	0	0.0	0.0
tessellated darter	0	0	0	0.0	0.0
walleye	0	4	4	2.9	0.5
yellow bullhead	0	0	0	0.0	0.0
yellow perch	74	194	268	195.5	36.4
Total	376	361	737	925.5	100.0

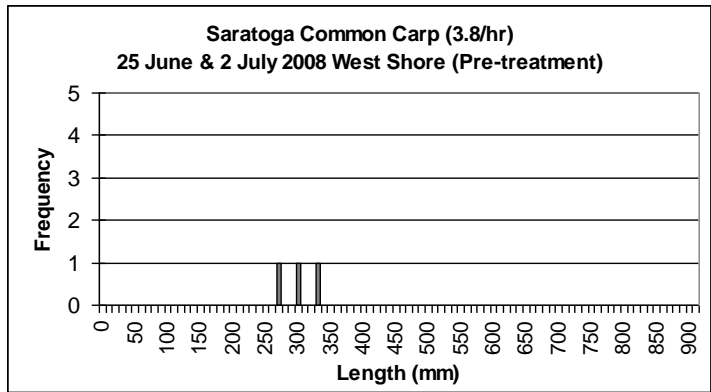
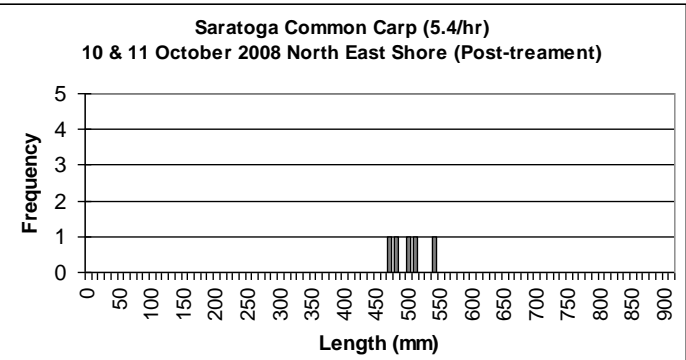
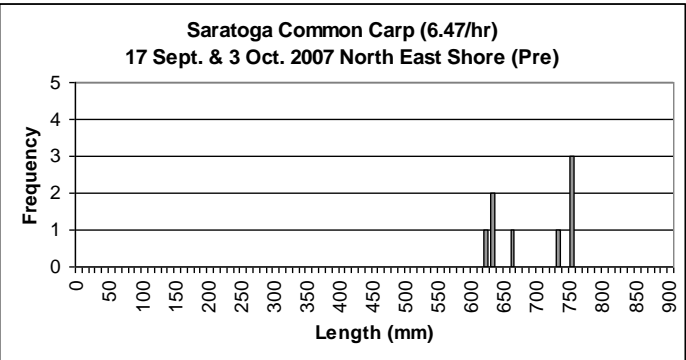
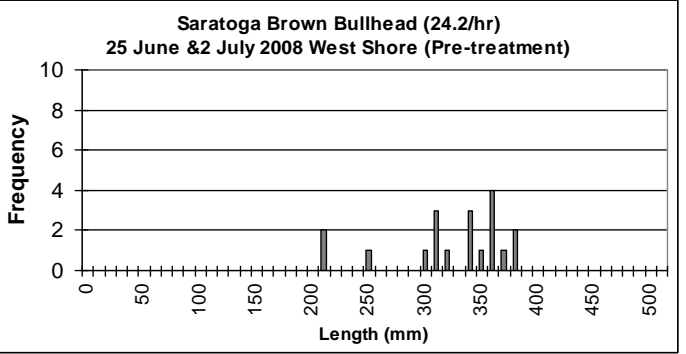
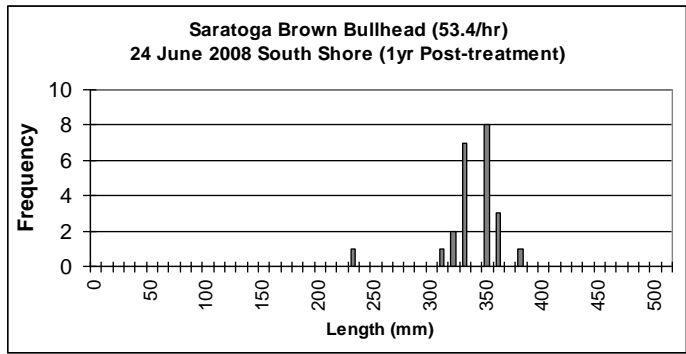
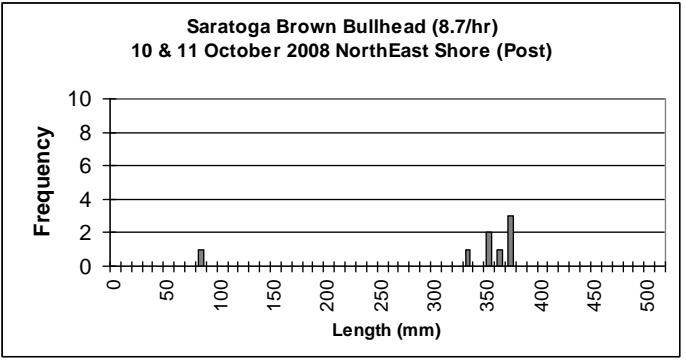
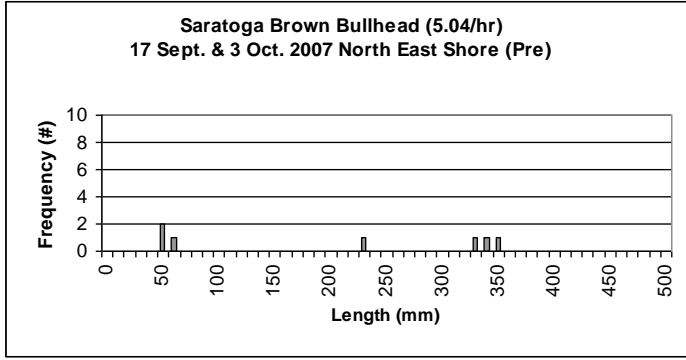
Table 8. Catch per Unit Effort (fish/hr) for all Saratoga Lake sites 2007-2008

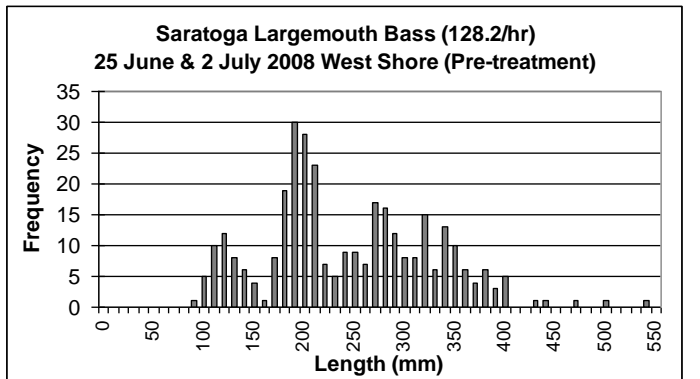
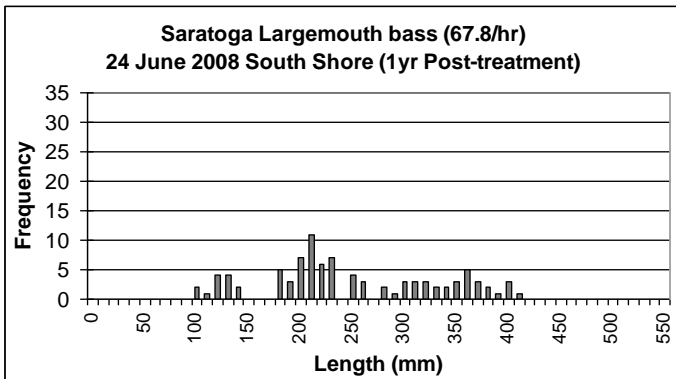
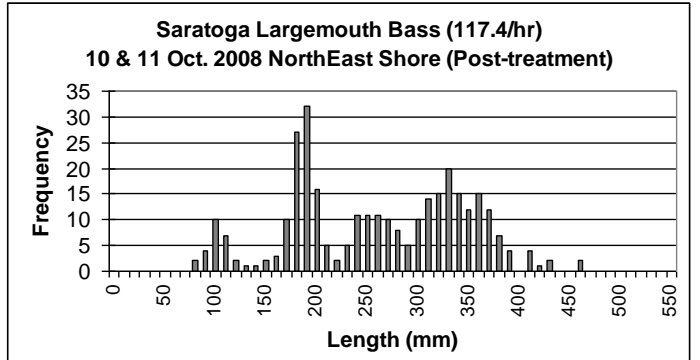
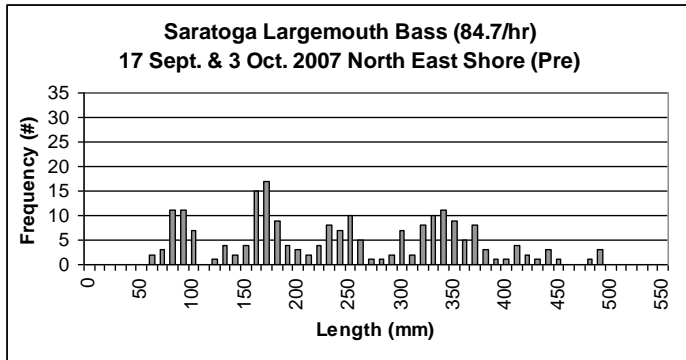
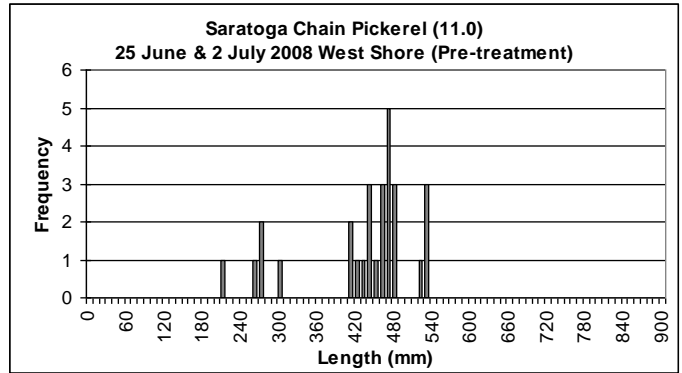
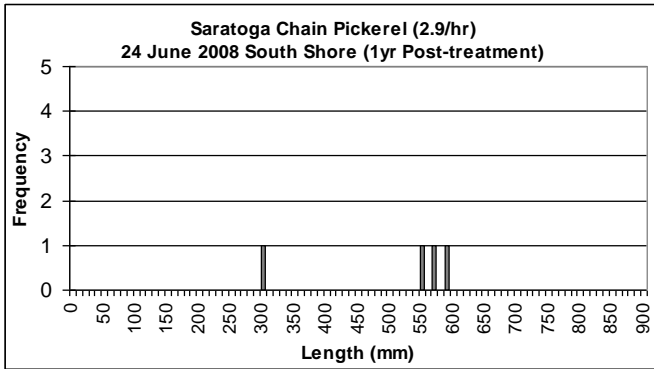
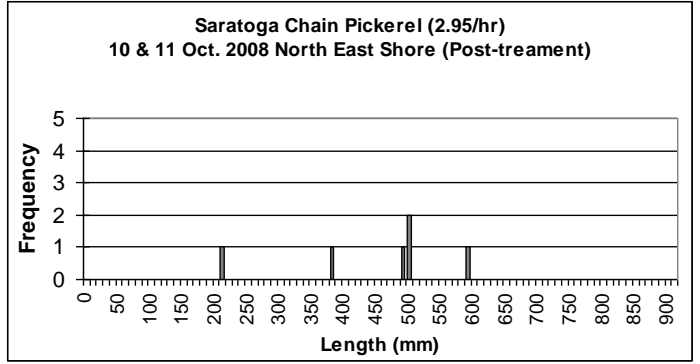
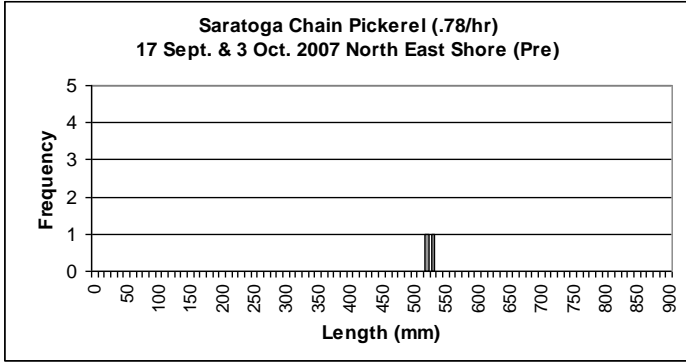
Species	All Fish OR Gamefish Only Catch/Unit Effort Comparison (fish/hour)			
	North East	North East	South	West
	Fall 2007 (1yr pre)	Fall 2008 (post)	June 2008 (1yr post)	June 2008 (1yr pre)
banded killifish	10.8	38.1	9.7	3.8
black crappie	1.4	3.3	0	0
bluegill	832.9	776.3	335	351.2
bluntnose minnow	8.6	10.9	0	0
brown bullhead	5	8.7	55.8	24.2
central mudminnow	0	0	2.4	2.5
chain pickerel	0.8	2.6	2.9	11
common carp	6.5	5.4	0	3.8
emerald shiner	0.7	8.7	0	0
fallfish	0	0	0	0
golden shiner	0	12	4.9	15.3
largemouth bass	84.7	117.4	67.8	128.2
logperch	25.9	64.1	7.3	10.2
marginated madtom	0.7	0	0	0
northern pike	0.4	0.4	0	0.4
pumpkinseed	97.2	94.6	211.2	122.2
redbreast sunfish	5	2.2	0	25.5
rockbass	109.4	116.3	24.3	14
smallmouth bass	24.7	21.8	5.8	5.1
spottail shiner	0.7	0	0	0
tessellated darter	1.4	15.2	0	1.3
walleye	4.7	2.6	2.9	1.2
white sucker	0	2.2	0	1.3
yellow bullhead	11.5	12	0	12.7
yellow perch	59	77.2	195.5	94.8
Total	1292.2	1391.9	925.5	828.7

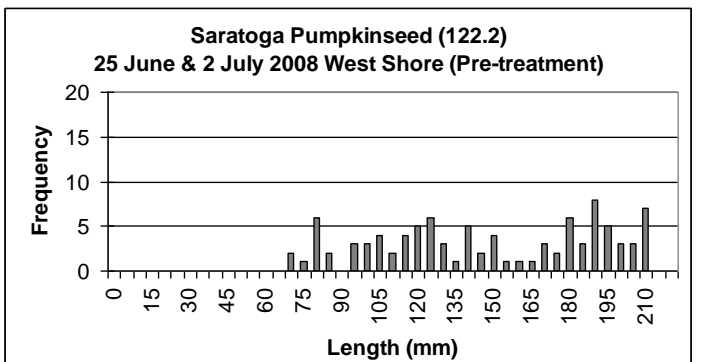
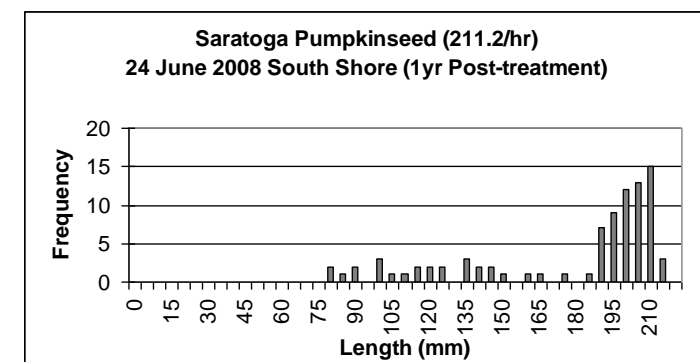
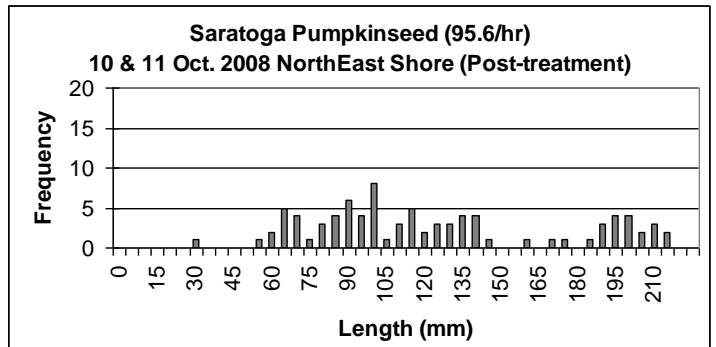
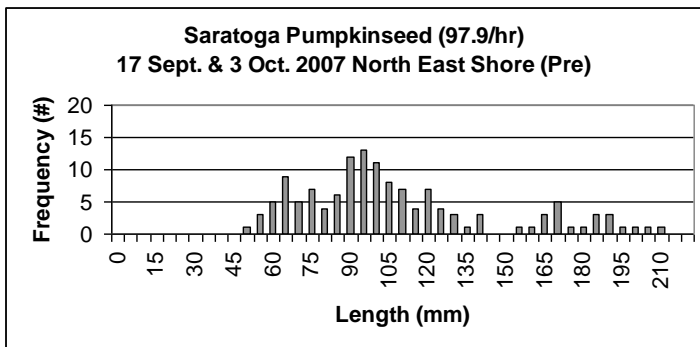
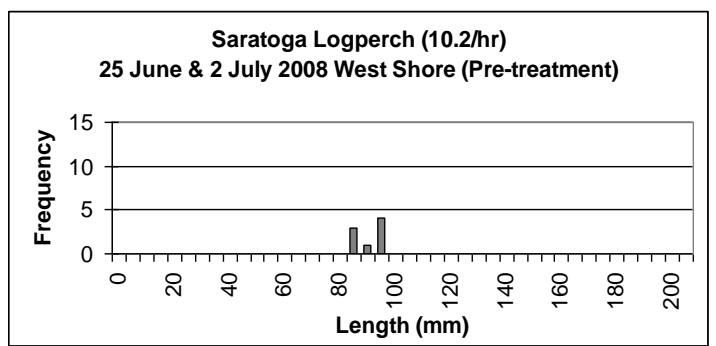
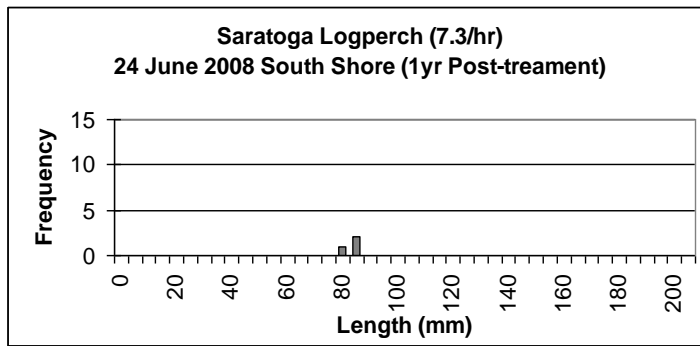
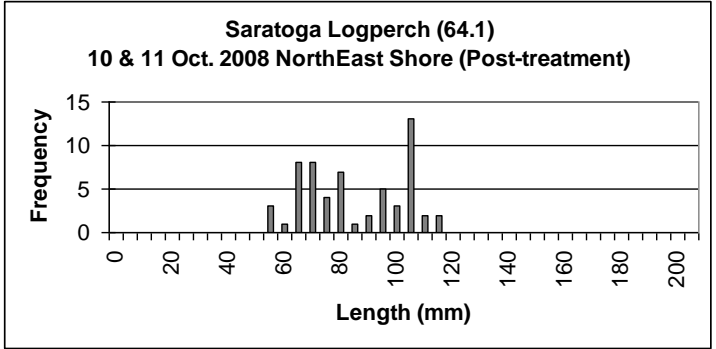
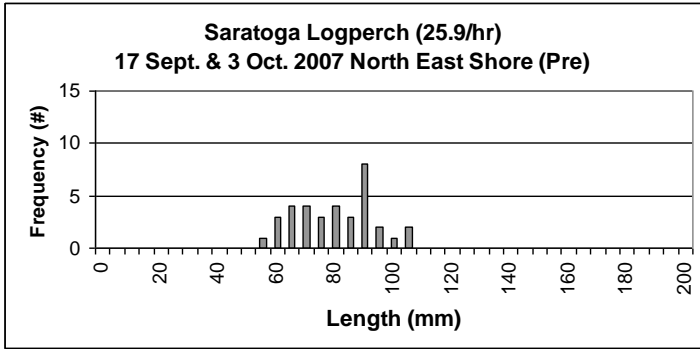
LENGTH FREQUENCY ANALYSIS

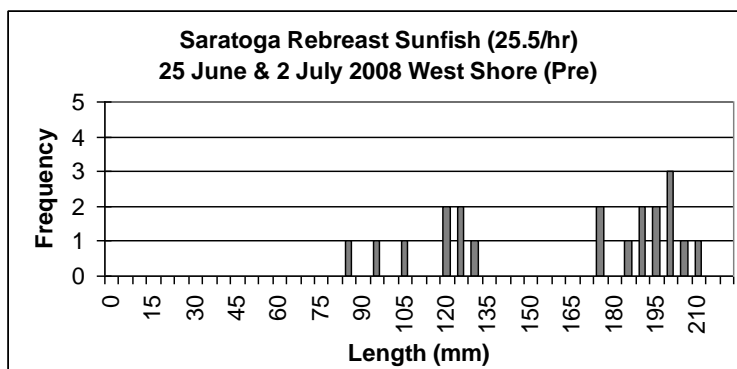
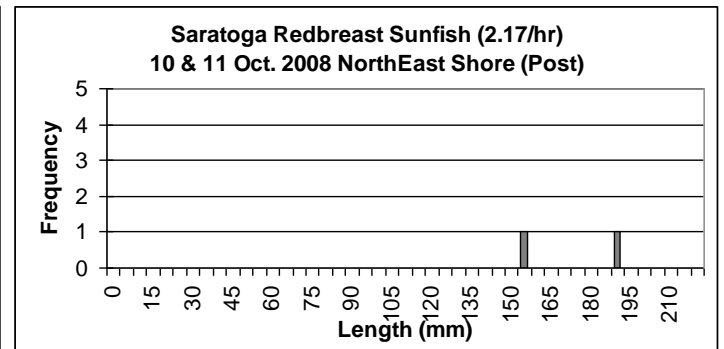
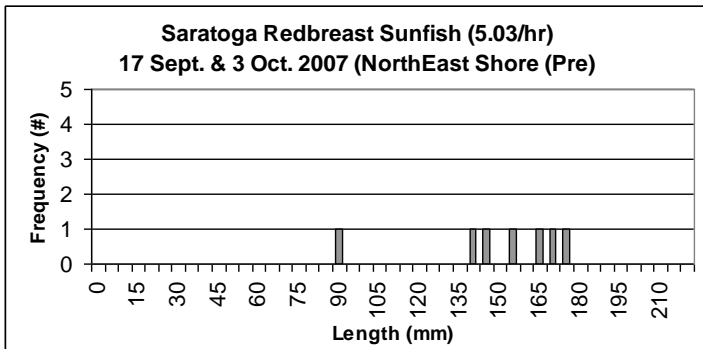
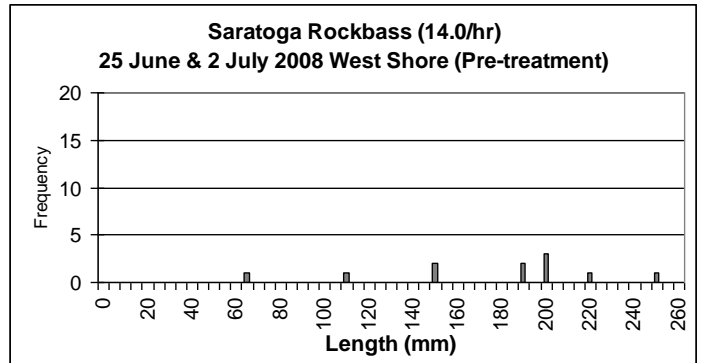
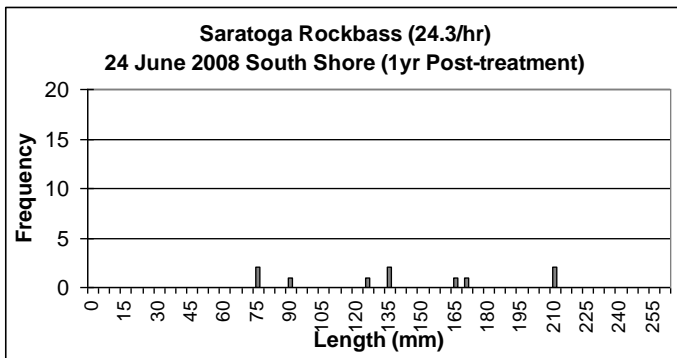
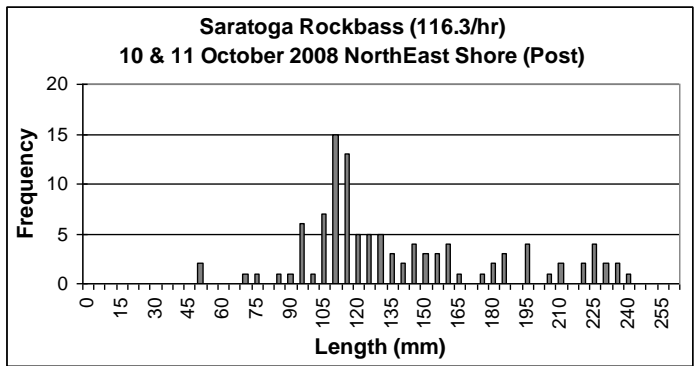
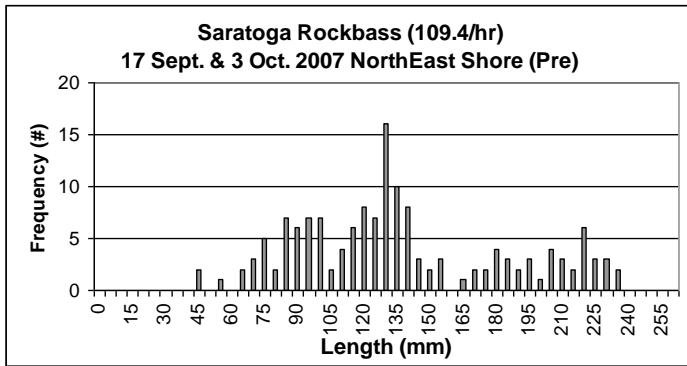


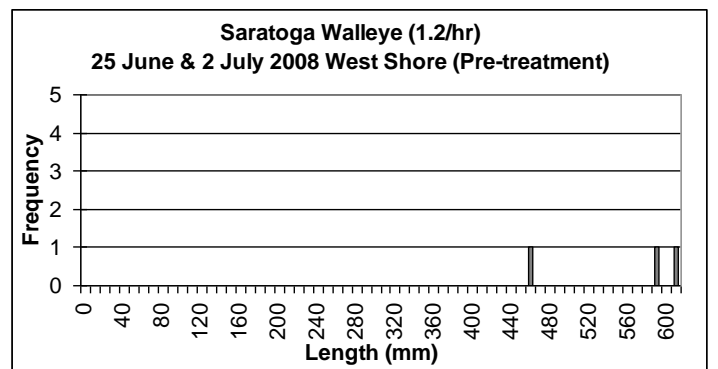
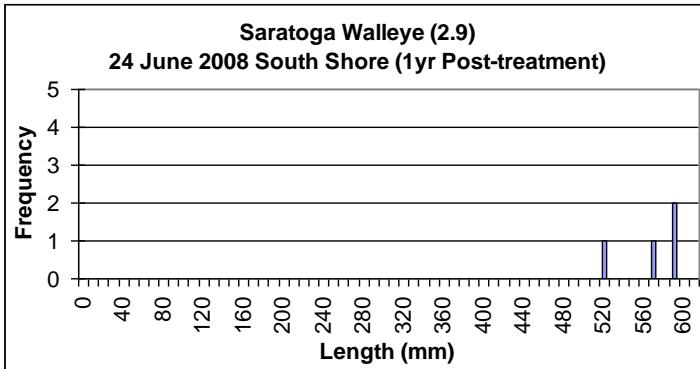
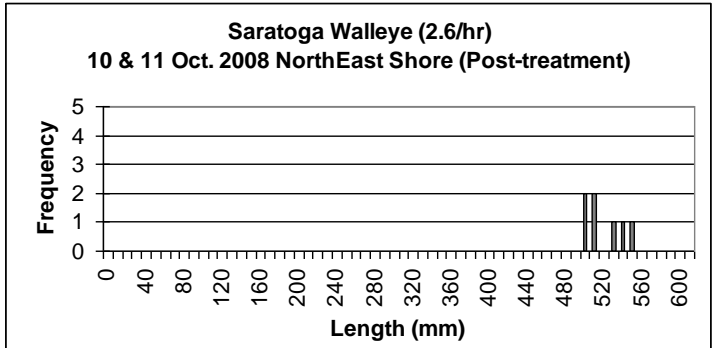
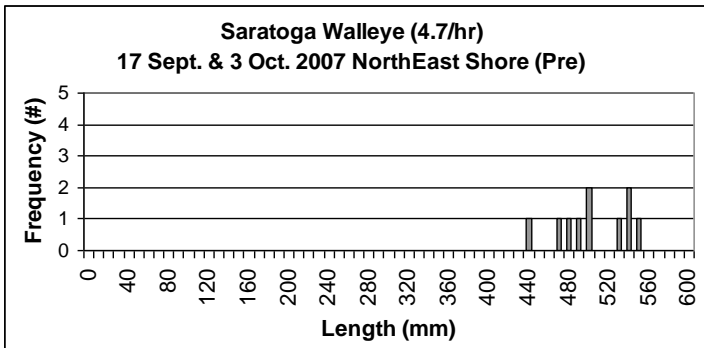
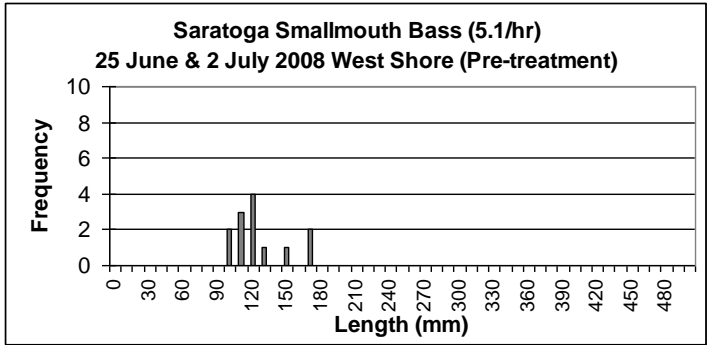
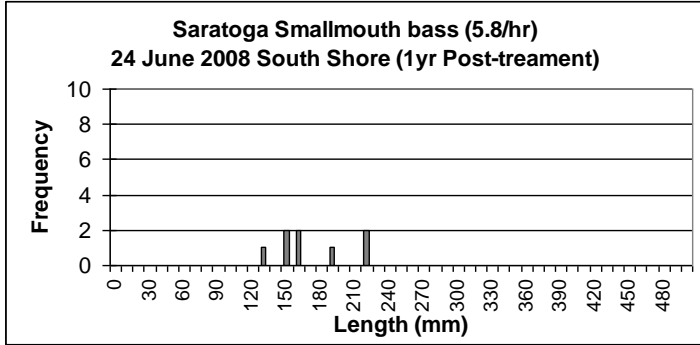
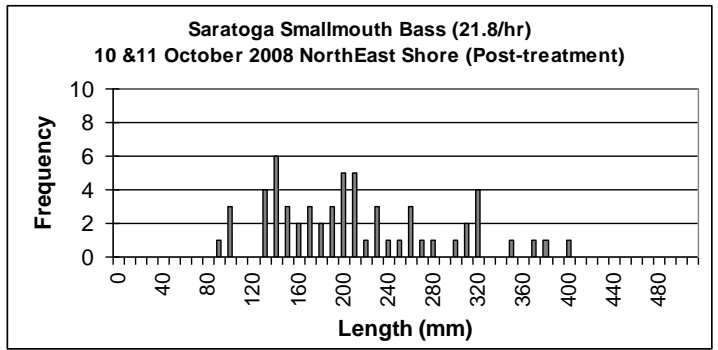
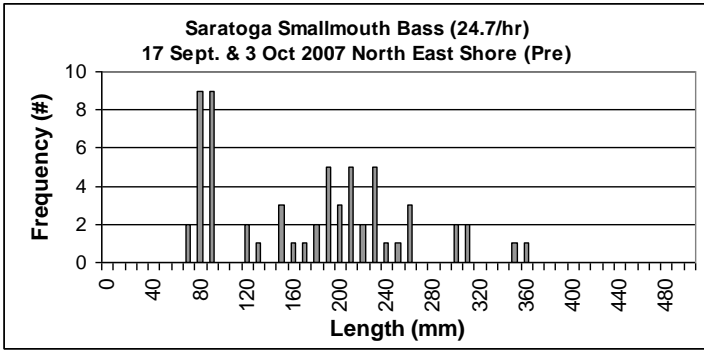












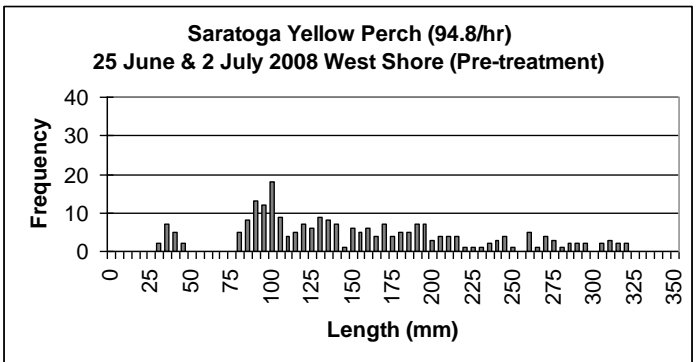
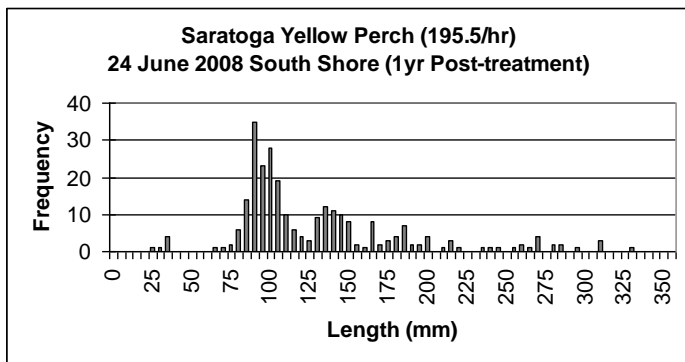
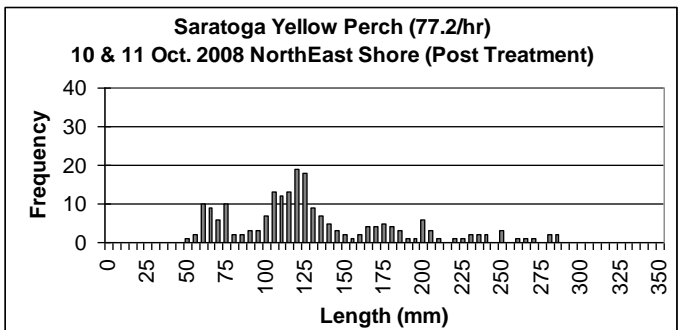
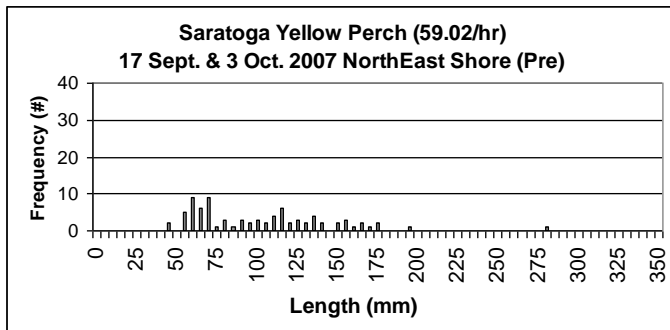
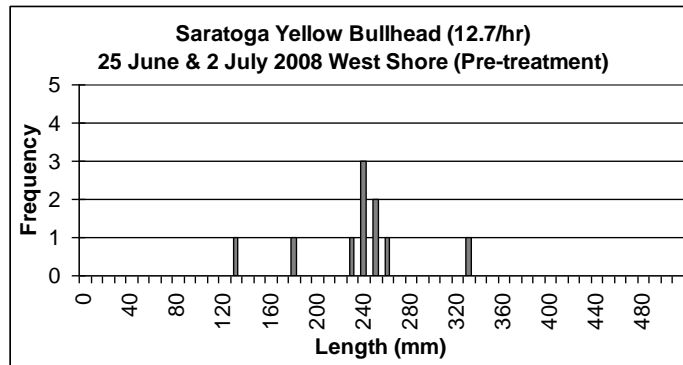
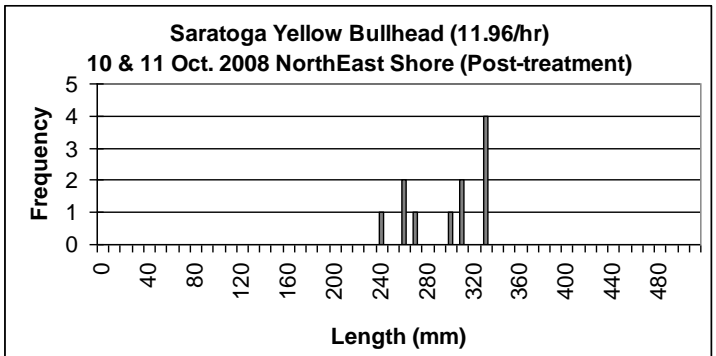
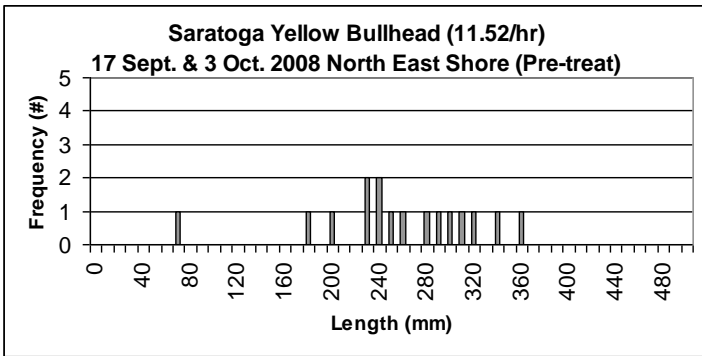


Table 9. NYSDEC & SUNY Cobleskill Electrofishing Boat Survey of Saratoga Lake Compared to DEC data from NYSDEC database (unpublished data).

Species	May 1993 NYS DEC		September 2007 SUNY Cobleskill	
	Number Collected	Size Range (mm)	Number Collected	Size Range (mm)
banded killifish	29	46-85	15	50-92
black crappie	29	194-310	3	85-151
bluegill	219	38-241	1297	19-209
bluntnose minnow	0	NA	12	NA
brown bullhead	21	193-400	19	55-358
chain pickerel	0	NA	2	522-537
common carp	1	476	11	615-758
common shiner	259	30-104	0	NA
emerald shiner	0	NA	1	NA
golden shiner	185	65-234	1	NA
largemouth bass	244	151-528	216	63-499
logperch	0	NA	41	59-107
marginated madtom	0	NA	1	NA
northern pike	8	466-619	1	NA
pumpkinseed	245	58-225	141	52-214
redbreast sunfish	1	209	7	93-176
rockbass	22	114-261	180	48-239
smallmouth bass	65	129-476	63	76-361
spottail shiner	0	NA	1	NA
tesselated darter	31	40-83	2	NA
walleye	18	303-542	12	442-556
white sucker	16	154-528	0	NA
yellow bullhead	0	NA	32	70-362
yellow perch	58	56-270	102	48-284
Total	1451		2160	

Analysis of the North East shore data (only section where pre- and post- data is available to compare) show no clear trend (deviation between years) in abundance or CPUE (Table 5). Most gamefish and panfish catch rates remained remarkably consistent between 2007 (NE shore pre-treatment) and 2008 (NE shore post treatment). Largemouth bass catch rates actually went up in 2008 (177.4/hr) compared to 2007 (84.7/hr) (Table 8). The southern shore (sampled one year post treatment) had the lowest catch of any area of the lake for both game fish and all fish (Table 8). This may be cause for concern, although this low catch rate could be due to a shallow, muddy habitat with little diversity and cannot be attributed to the herbicide treatment because no pre-treatment fishery data exists for this section.

Overall, Saratoga Lake is a highly productive fishery with great diversity of game and non-game fishes. All fish observed were in good condition and recovered from the stress of electrofishing well. Bluegill are very abundant in Saratoga Lake. Large and smallmouth bass are healthy and abundant. Modest numbers of walleye, northern pike and black crappie are present in Saratoga Lake but more electrofishing and/or gill netting is needed to better understand these fisheries.

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