Cazenovia Lake Fisheries Survey 2012

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Introduction

Cazenovia Lake is a 471 hectare (1,165 acres) mesotrophic lake located in the Town of Cazenovia, Madison County. It has a maximum depth of 14 m (46 ft) and a mean depth of 6.9 m (22.6 ft) (Coastal Environmental Services 1992). This was the first Department of Environmental Conservation (DEC) electrofishing survey done on Cazenovia Lake, and only the second DEC gill netting survey, with the first one being done in 1955. Surveys were not routinely done in the past because of limited public access to the lake. Access has improved in recent years with the creation of McNitt State Park where carry-in water craft and ice fishing access are available. In addition, car-top and ice access is available from the Department of Transportation (DOT) parking area off Route 20, and there is public access for trailered watercraft from the Village owned Lakeside Park boat launch by advance purchase of a launch permit.

Besides improved access, the lake has also received aquatic herbicide applications of Tryclopyr (trade name Renovate$^{@}$) in 2009, 2010 and 2012 to control the invasive aquatic plant, Eurasian watermilfoil (*Myriophyllum spicatum*). To see pre-and post-treatment aquatic plant communities' reports view http://townofcazenovia.org/content/Generic/View/28 .

The main objectives of this survey were to obtain general biological fisheries data on Cazenovia Lake, and to determine if DEC walleye stocking should be reinitiated on the lake. Walleye were stocked periodically by the DEC from 1961 to 1978; stocking was discontinued because of access problems. Unfortunately, no DEC survey was done prior to the 2009 aquatic herbicide treatment, to compare pre-and-post treatment fish communities.

Methods

Electrofishing

Cazenovia Lake was electrofished over the two nights of May 9th and 10th, 2012. Ten sites (Figure 1) covering approximately 11.9 km (7.4 miles) of the 15.3 km (9.5 miles) of shoreline (78%) were fished for a total of 6.7 hours of on-time. The surface water temperature was below the suggested 59^{o}F minimum in the Centrarchid Sampling Plan (Green 1989) (and was 57.5^{o}F and 55.1^{o}F, respectively, Table 1. A Smith-Root model SR-18 electrofishing boat was operated with the boat hull as negative and two six-dropper umbrella arrays, extended six feet in front of the boat, as anodes. Direct current half-wave (60 pulses per second) with 4.5 amps was used. Shocking started half an hour before sunset and sampling was conducted along the shoreline in 0.61 to 1.5 meters (2 to 5 feet) of water. The crew consisted of a driver and two netters. Four 15 minute all-fish runs and six gamefish-only runs were conducted. Gamefish-only runs had on-times ranging from 15 to 90 minutes. During the all-fish runs attempts were made to collect every fish that was shocked, while during the gamefish runs largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), walleye (*Sander vitreum*), and chain pickerel (*Esox niger*), were the target species.

Collected fish were identified to species, and lengths and weights were taken. For selected species, scale samples were collected from five individual fish per 10 mm size increment.

Gill netting

Eight standard gill nets were set over two nights, July 9th and10th, 2012 (Figure 2). The standard gill net is 1.8 m(6 ft) deep with 7.6 m (25 ft) panels of 3.8, 5.1, 6.4,7.6, 8.9, 10.2 cm (1.5, 2.0, 2.5, 3.0, 3.5 and 4 inch) monofilament netting. Nets were set on bottom perpendicular to shore, to cover a depth range from 3 m (10 ft) to 10.7 m (35 ft). Gill nets were set around 1500 and lifted around 0900 hours for soak times that ranged from 18.5 to 18.9 hours.

A temperature and dissolved oxygen (DO) profile was done on 10 July with an YSI meter (Table 1). The lake was stratified with a surface temperature of 78°F, and at 7.6 m (25 ft) the temperature was 56.3° F. DO levels from the surface to 7.6 m ranged from 8.5 parts per million (ppm) to 4.6 ppm. From 9.1 m (30 ft) to 13.7 m (45 ft) DO was $\leq$1.0 ppm (Figure 3).

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Ten yellow perch (*Perca flavescens*) and largemouth bass were collected for Toxic Substance Monitoring Program (TSMP) sampling and were sent to Hale Creek Field Station. Lengths, weights, and scale samples were taken; additionally, fish were sexed, tagged, and placed in individual plastic bags and frozen. Results from this testing are not expected to be available until sometime in the 2014/15 fiscal year.

Results and Discussion

Overall 1,281 fish were caught, representing 17 species (Table 2). Though different sampling methods were used, this is the same number of species found by Kirby and Ringler (2007), and more than the ten species found by Coastal Environmental Services (1992, Table 3). Largemouth bass were the most numerous with 484 caught (38% of the total catch), followed by yellow perch (190 caught, 15% of catch), and bluegill (*Lepomis macrochirus*), and pumpkinseed sunfish (*L.gibbosus*) (155 and 151 caught, respectively, 12% of the catch each). Fifty-two walleye and 50 smallmouth bass were also caught (4% of catch each).

Largemouth bass

Largemouth bass electrofishing catch per unit effort (CPUE) ranged from 20 to 380 fish per hour (fish/h), with an average of 62/h for all size largemouth bass (standard deviation, STD, 62.1). For largemouth bass $\geq$10 inches, the average catch was 46/h (STD 25.6). A spring night time electrofishing catch of >13/h, for ten inch or larger largemouth bass suggests a high bass population density (Green 1989). Largemouth bass CPUE per gill net (fish/net) ranged from 1 to 27, with a mean of 8.75/net (8.8 STD).

Largemouth bass in the 12 to 14 inch size range accounted for 63% of the total catch (Figure 4). The resulting proportional stock density (PSD), the percentage of the sample of stock size bass (≥8inches) that are ≥12 inches, was 87.3. A PSD of 40 to 70 would represent a balanced population. A PSD of >70 would indicate an “unbalanced” population with a high percentage of bass that are > 12 inches. This high PSD suggests reproduction may be limited and exploitation is low (Green 1989). Though many of the largemouth bass were over 12 inches, few were of preferred length, 15 inches (Table 4). The Relative Stock Density of bass ≥15 inches

(RSD_{15}) was 6.3. As noted, Cazenovia Lake has not been surveyed by the DEC since 1955, but fortunately a two hour night time electrofishing survey was conducted by Cornell University, in May of 1997(unpublished summary report found in file), allowing some limited comparisons. Largemouth bass PSD was 68.3 and RSD_{15} was 9.8, showing a more balanced largemouth bass population with a slightly larger RSD_{15}.

A largemouth bass die off did occur in August of 2010 (see http://www.dec.ny.gov/outdoor/70528.html) and there were reports of anglers catching fewer “large” bass in 2011. A biologist, who regularly fishes the lake and keeps a detailed personal fishing diary, also recorded fewer 15 to17 inch bass in his 2011 catch. Whether the reduced number of large bass in both the diary and our sampling events are a reflection of the 2010 bass die off, lower year class(es) abundance, behavioral differences of larger bass, or a combination of these factors, cannot be determined. As a side note, the length frequency distribution of legal sized largemouth bass ($\geq$12inches) from our electrofishing survey was almost identical to the angler diary length frequency for legal bass in 2011 (Figure 5). The close correlation between these two sampling methods is consistent with Green’s (1986) findings.

Largemouth bass were in good condition with a mean relative weight (Wr) of 99.5 (STD 11.5). Mean length at age was below the NYS mean, with the mean age to reach legal size (12 inches) age 5 in Cazenovia Lake; the NYS mean is age 4 (Green 1989, Figure 6). Age five bass was the most frequent (2007 year class) followed by age 6 (2006 year class). Age two bass were the third most abundant year class, and they would have been spawned during the second year of herbicide treatment (Figure 7).

Yellow perch

The yellow perch electrofishing CPUE was 52/h, while gill net catch ranged from one to 35/net, with a mean of 17.3/net (STD 12.0). An electrofishing catch of >50 fish/h would suggest that perch abundance is high; however, the gill net catch falls within the intermediate range between low (<5/net) and high (>25/net) abundance (Forney et al 1994). So, the perch population was likely moderately to highly abundant.

Yellow perch were on the thin side with a mean Wr of 84.2 (STD 10.9). A mean Wr of 90 to 110 is usually considered within a normal population range. Although thin, the vast majority of yellow perch in our sample were of quality size (Figure 8). Perch PSD was 90.6 and RSD_{10} was 85.6 indicating the population has a considerable proportion of “keeper” size fish. Of the stock size yellow perch collected, 34% (55) were of memorable size, which is 12 inches or larger (Table 4). Mean yellow perch length at age was slightly below the NYS average for age two to five fish and slightly above average for age six fish (Figure 9). The yellow perch catch was dominated by age 8 and 9 fish which made up 67% of the catch (Figure 10). Young perch are likely not as vulnerable to the gill nets and thus were underrepresented in the total sample.

Bluegill

Bluegill electrofishing CPUE was 92/h while gill net catch rates ranged from one to 17/net, with a mean of 7.9/net (STD 4.8). Bluegill in the eight to nine inch size range made up the bulk of the catch (Figure 11). The resulting PSD was 80.1 and RSD_8 was 59.6. A PSD of 20 to 60 would represent a balanced bluegill population. A PSD of >60 would indicate an unbalanced population with a higher percentage of bluegill >6inches. This high PSD suggests reproduction may be limited and exploitation is low (Green 1989). Though many of the bluegills were of preferred size (8 inches), no bluegills sampled were of memorable or trophy size (Table

4). This may indicate an overabundant bluegill population or a high harvest rate of memorable or trophy sized bluegills. Bluegills were also on the thin side with a mean Wr of 88 (STD 9.8), also suggesting an overabundant population. Bluegill mean length at age was below the NYS mean length for age two and three fish, and above mean growth for older aged fish (Figure 12). Age six bluegills were the most abundant age-class in the sample (Figure 13). As with yellow perch, young bluegill are not as vulnerable to gill nets and thus are likely underrepresented in the total sample.

Pumpkinseed

Pumpkinseed electrofishing CPUE was 89 fish/h. Gill net catch rates ranged from three to 20/net, with a mean of 7.8/net (STD 5.5). As with bluegills, the bulk of the catch was comprised of larger pumpkinseeds (Figure 14). The PSD was 67.6 and RSD_8 was 45.1. 64 (42%) of the pumpkinseeds were of preferred size, 8 inches or larger (Table 4). Mean Wr was 90.8 (STD 13.2). Mean length at age was higher than the NYS average length for all ages of pumpkinseeds except age 4 (Figure 15). Age seven fish were the most abundant age-class followed closely by age six (Figure 16).

Black crappie

Black crappie (*Pomoxis nigromaculatus*), were poorly represented in the electrofishing survey with only one being caught. However, gill net catches ranged from three to 20/net, with a mean of 7.8/net (STD 5.6). Crappies in the ten and 11 inch size ranges were most frequently caught (Figure 17). PSD was 97 and RSD_{10}, quality size, was 91. Eight of the crappies (13%) were of memorable size, which is 12 inches or larger (Table 4). Crappies were in good condition with a mean Wr of 94.6 (STD 5.5). Growth was good with mean length at age above the NYS mean (Figure 18). Age four fish were absent from our sample, but it would appear that crappie would reach legal size (9 inches) somewhere between ages four and five. Five and six year-old crappie were the most frequently collected ages (Figure 19).

Walleye

Only two walleye were caught while electrofishing for a CPUE of 0.15/h. However, gill net catch rates ranged from zero to 18/net, with a mean of 6.25/net (STD 6.2). An electrofishing catch of 8 walleye/h or less would suggest low abundance, but a gillnet catch of 5/net or greater generally suggests high abundance (Forney et al 1994). If we also look at growth rates of walleye, the mean length at age 4 for Cazenovia fish is 17 inches (424 mm) a mean length of 18 inches (457mm) would suggest low abundance while a mean length of 15 inches (380mm) would suggest high abundance (Forney et al 1994). Mean Wr was 91.4 (STD 7.0) which is on the low end of the normal population range. PSD was 25 and RSD_{20} was 11.5. This low PSD was a result of the majority of our catch being thirteen inches or smaller, 39 of 52 (75%) (Figure 20). Walleye ages ranged from two to eleven, but the majority (73%) were two year olds (Figure 21). Mean length at age was consistent with the NYS mean (Figure 22). Although the electrofishing CPUE is conflicting, the other three indices suggest a moderate to abundant walleye population is present in Cazenovia Lake. However, given that the majority of sample was comprised of a single, young age class it is premature to categorize the population density at this time.

Smallmouth bass

Smallmouth bass electrofishing CPUE was 5.9/h, suggesting a moderate population level (Green 1989). The gillnet catch of 1.4/net is average for this species. Smallmouth were in good condition with a mean Wr of 103.2 (STD 9.0). Thirteen to 15 inch smallmouth bass were the most frequently collected size range (Figure 23). The PSD was 84 and RSD_{12} was 69. Two smallmouth bass were of memorable size (≥17inches). Mean length at age of older fish was slightly below the NYS mean and slightly above for younger fish (Figure 24). Age four fish were absent from our sample and age 6 and 7 were the most abundant (Figure 25).

Chain pickerel

The chain pickerel electrofishing catch rate was 2.7/h, and the gill net catch rate was 0.75/net. The electrofishing catch rate for pickerel >381mm (15 inches) was 2.5/h. Pickerel lengths ranged from 14 to 23 inches (Figure 26). Chain pickerel appear to comprise a minor component of the Cazenovia Lake fish community.

Recommendations

One of the objectives for doing the survey was to determine if walleye stocking should be undertaken on Cazenovia Lake. The lake was stocked periodically with walleye, by the DEC, from 1961 to 1978; stocking was discontinued because of access problems. However, after 1978 some walleye were stocked by the Nelson Sportsman's Club, with the last stocking taking place in 1989. The gill net catch of 6.25 walleye per net was very unexpected, as a gill net catch rate of 5 walleye per net generally indicates high abundance (Forney et al 1994). Walleye ages ranged from two to eleven years. Given the time frame since the last known stocking, these walleye were either wild (hatched in the lake) or from multiple illegal stockings. A few anglers we spoke with during the gill netting survey did mention that they had heard another angler "bragging" about stocking walleye that he had caught while fishing Oneida Lake into Cazenovia Lake. However, given the number captured during our sampling efforts, it is highly unlikely that one individual angler could be responsible for all these walleye.

Cazenovia Lake also has a large abundance of potential walleye predators. Research conducted by Cornell University indicated that low survival of stocked walleye was observed in lakes with electrofishing catch rates of >5 fish/h of largemouth bass and *esocids* >381mm (15 inches, Jackson et. al. 2003). The average combined electrofishing catch rate for largemouth bass and chain pickerel >381mm was 5.5 fish/h, indicating that we would expect survival of stocked fingerling walleye to be low.

Due to the high gill net catch rate of walleye and, to a lesser extent, the high density of other predators, the Department is not prepared to stock walleye in Cazenovia Lake at this time. Additional sampling in the near future is recommended to determine whether walleye are naturally reproducing. A fall of 2013 night time electrofishing survey looking for young of the year walleye, and a spring trawling survey in 2014 looking for recently hatched walleye fry are recommended. The relatively high abundance of Age 2 walleye in this survey, whether from an unauthorized stocking or natural reproduction, provides hope that a walleye stocking program could be successful if undertaken in the future.

Based on the abundance and other population characteristic of the species sampled, there appears to be no need to change any sportfish regulations at this time.

References

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Table 1. 2012 Water Chemistry Cazenovia Lake (Madison County)

Date	Air temp (F)	Secchi Disk (ft)	Depth (ft)	Water Temp (F)	DO (ppm)	pH	Alkalinity	Conductivity (uhms)
5/9/2012			0	57.5	10.7	8.6	119.7	752
5/10/2012	48		0	55.1	10.7	8.9	85.5	755
7/9/2012	84	18	0	76.3	8.3		51.3	
7/10/2012	79	20	0	78.0	8.3	8.7		304
			5	77.6	8.5			
			10	76.2	8.0			
			15	75.8	7.9			
			20	68.7	7.3			
			25	56.3	4.6			
			30	52.8	1.0			
			35	51.9	0.2			
			40	51.9	0.1			
			45	51.9	0.1			

Table 2. Number of fish collected in 2012 during electrofishing and gill netting surveys on Cazenovia Lake (Madison County).

Species	Scientific name	Electrofishing	Gill netting	Sum	Sum percent
Chain Pickerel	*Esox niger*	18	6	24	2%
Golden shiner	*Notemigonus crysoleucas*	5	0	5	0%
Spottail Shiner	*Notropis hudsnius*	4	0	4	0%
Spotfin Shiner	*Notropis spilopterus*	13	0	13	1%
White Sucker	*Catostomus commersoni*	6	13	19	1%
Yellow Bullhead	*Ameirus natalis*	2	2	4	0%
Brown Bullhead	*Ameirus nebulosis*	6	2	8	1%
Banded Killifish	*Fundulus diaphanus*	11	0	11	1%
Rock Bass	*Ambloplities rupestris*	23	21	44	3%
Pumpkinseed	*Lepomis gibbosus*	89	62	151	12%
Bluegill	*Lepomis macrochirus*	92	63	155	12%
Smallmouth Bass	*Micropterus dolomieu*	39	11	50	4%
Largemouth Bass	*Micropterus salmoides*	415	69	484	38%
Black Crappie	*Pomoxis nigromaculatus*	1	62	63	5%
Tessellated Darter	*Etheostoma olmstedi*	4	0	4	0%
Yellow Perch	*Perco flavescens*	52	138	190	15%
Walleye	*Sander vitreum*	2	50	52	4%
	Total	**782**	**499**	**1,281**	

Table 3. Fish Species Captured in Cazenovia Lake

Species	Scientific name	1990-1991	2006	2012
Chain Pickerel	*Esox niger*		X	X
Redfin Pickerel	*Esox americanus*	X		
Golden Shiner	*Notemigonus crysoleucas*	X	X	X
Spottail Shiner	*Notropis hudsnius*			X
Spotfin Shiner	*Notropis spilopterus*			X
Mimic shiner	*Notropis volucellus*		X	
Bluntnose minnow	*Pimephales notatus*		X	
White Sucker	*Catostomus commersoni*		X	X
Yellow Bullhead	*Ameirus natalis*			X
Brown Bullhead	*Ameirus nebulosis*	X	X	X
Margined madtom	*Noturus gyrinus*		X	
Banded Killifish	*Fundulus diaphanus*		X	X
Rock Bass	*Amboplities rupestris*	X	X	X
Pumpkinseed	*Lepomis gibbosus*	X	X	X
Bluegill	*Lepomis macrochirus*	X	X	X
Smallmouth Bass	*Micropterus dolomieu*		X	X
Largemouth Bass	*Micropterus salmoides*	X	X	X
Black Crappie	*Pomoxis nigromaculatus*	X	X	X
Tessellated Darter	*Etheostoma olmstedi*		X	X
Yellow Perch	*Perco flavescens*	X	X	X
Walleye	*Sander vitreum*			X
Alewife	*Alosa psuedohangus*	X		
Three spine stickleback	*Gasterosteus aculeatus*		X	
	Number of Species	**10**	**17**	**17**

Sources: Coastal Environmental Services, 1992
Kirby and Ringler, 2007

Table 4. Number of fish collected of stock, quality, preferred, memorable and trophy lengths in 2012 during electrofishing and gill netting surveys on Cazenovia Lake (Madison County).

	FREQ	Stock	Quality	Preferred	Memorable	Trophy
Bluegill	155	141 (3)	113(6)	84 (8)	0 (10)	0 (12)
Pumpkinseed	151	142 (3)	96 (6)	64 (8)	0 (10)	0 (12)
Smallmouth bass	50	49 (7)	41 (11)	30 (14)	2 (17)	0 (20)
Largemouth bass	484	395 (8)	345 (12)	25 (15)	0 (20)	0 (25)
Black crappie	63	63 (5)	61 (8)	57 (10)	8 (12)	0 (15)
Yellow perch	190	160 (5)	145 (8)	137 (10)	55 (12)	0 (15)
Walleye	52	52 (10)	13 (15)	6 (20)	0 (25)	0 (30)

*Number in ( ) is length in inches for stock, quality, preferred, memorable and trophy for species.

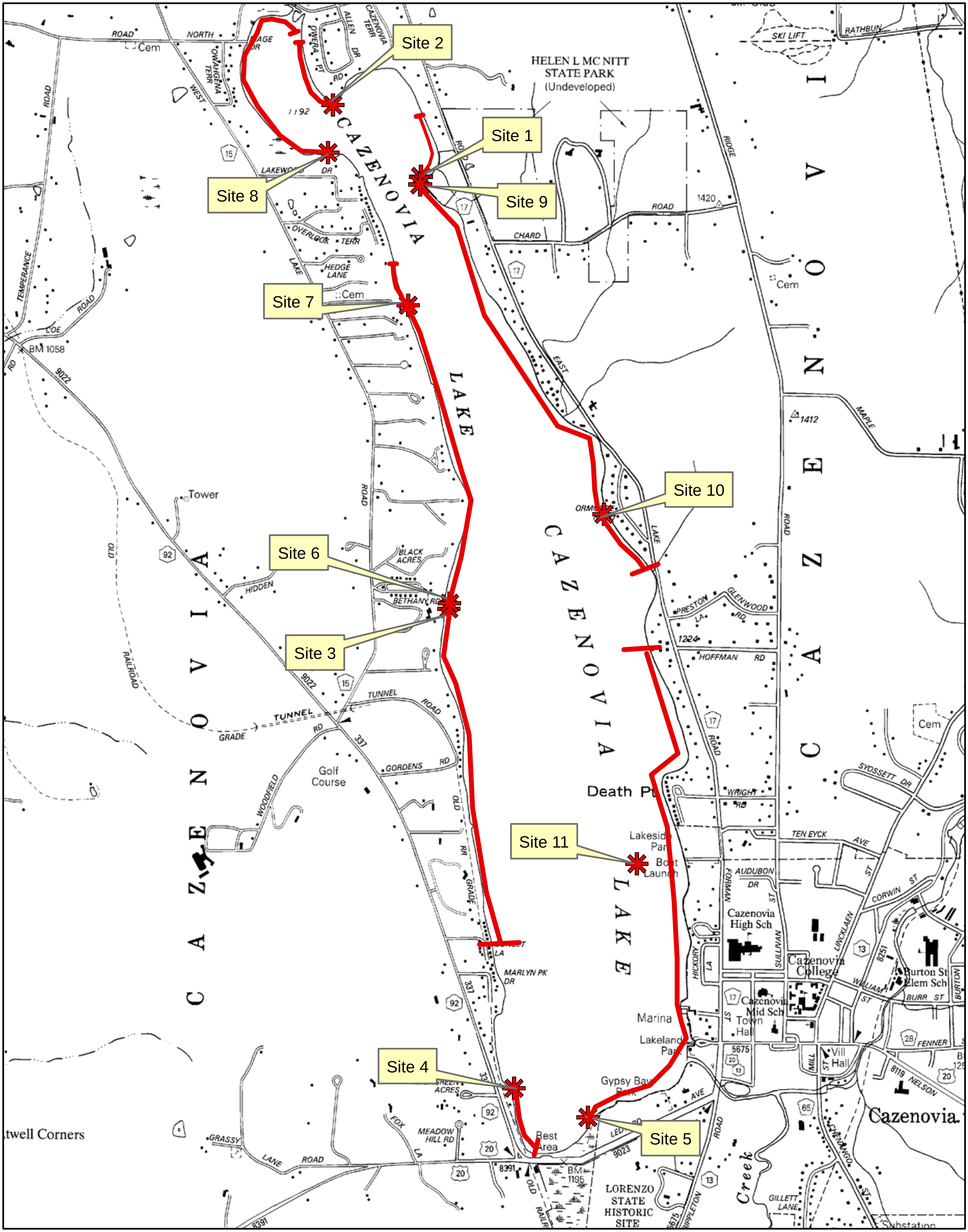


Figure 1. 2012 Cazenovia Lake electrofishing sample sites.

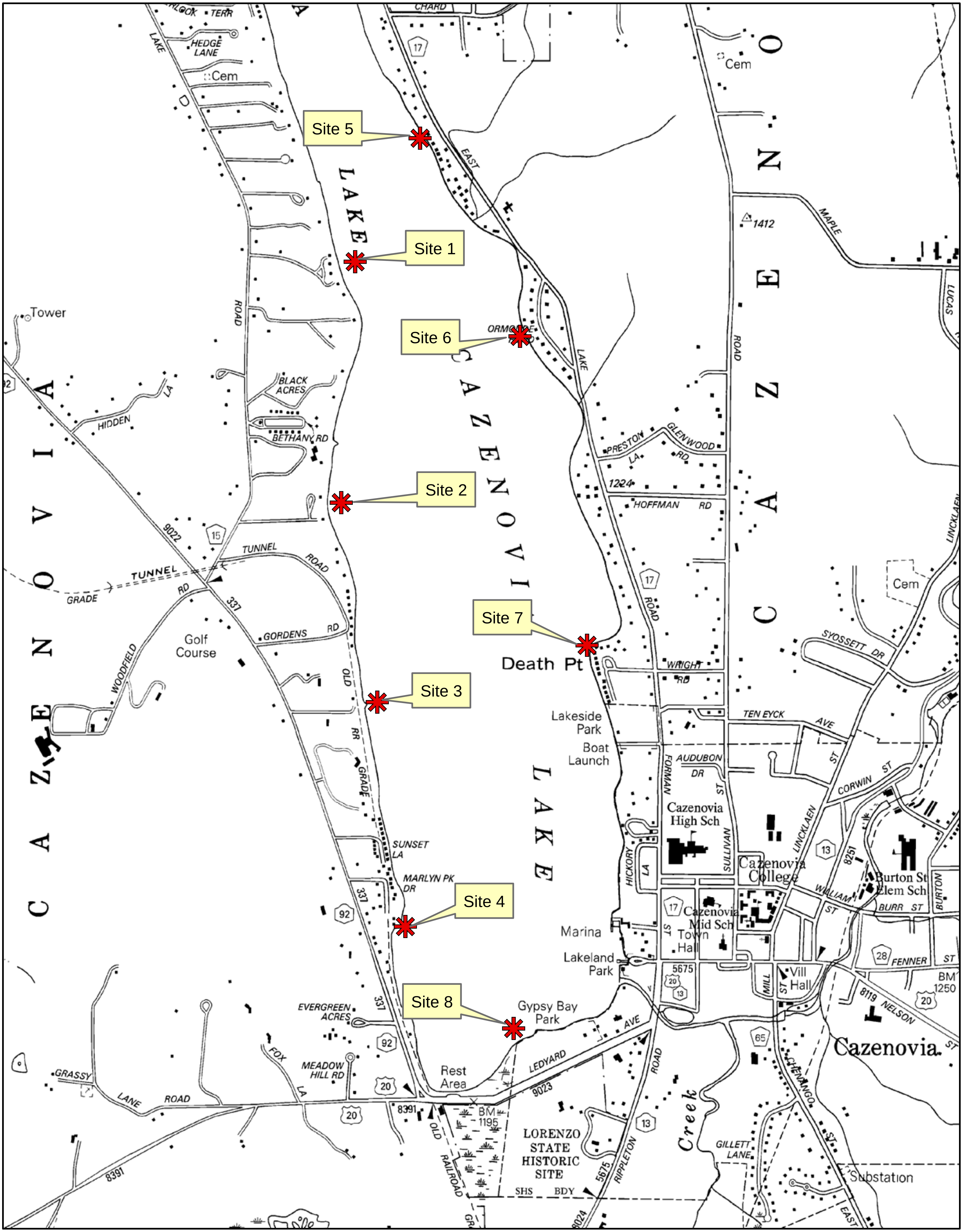


Figure 2. 2012 Cazenovia Lake gill netting sample sites.

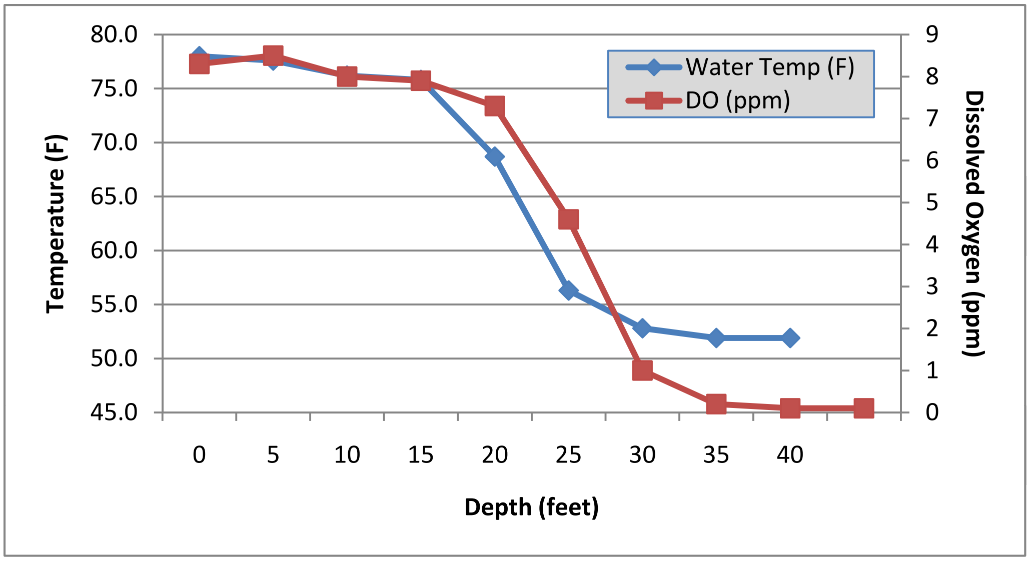
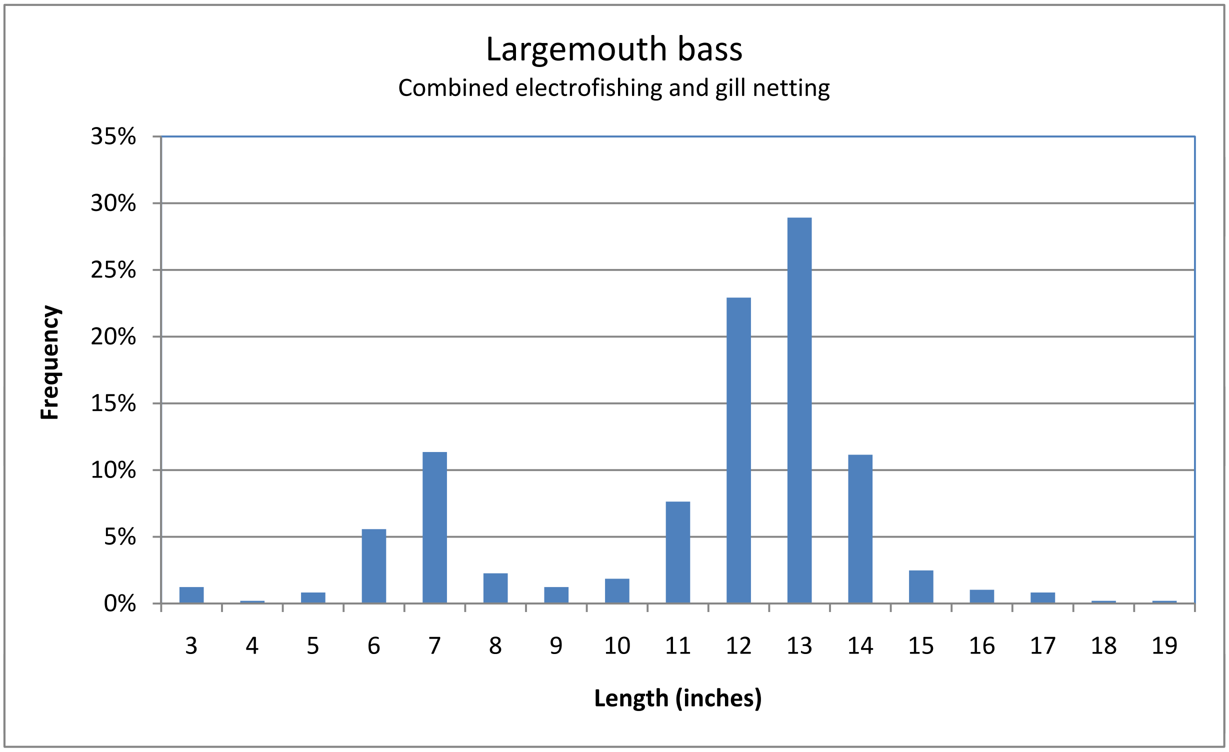


Figure 3. Cazenovia Lake temperature and dissolved oxygen profile July 2012.



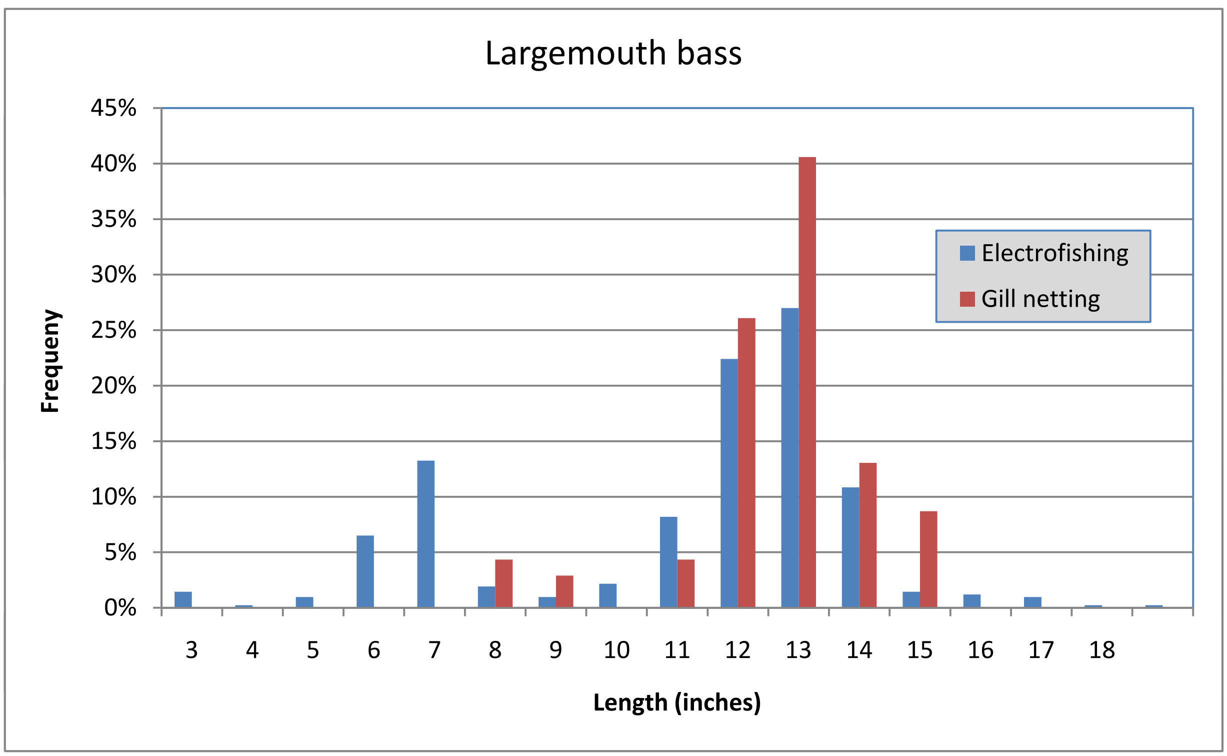


Figure 4. Length frequency distributions of largemouth bass sampled in Cazenovia Lake 2012.

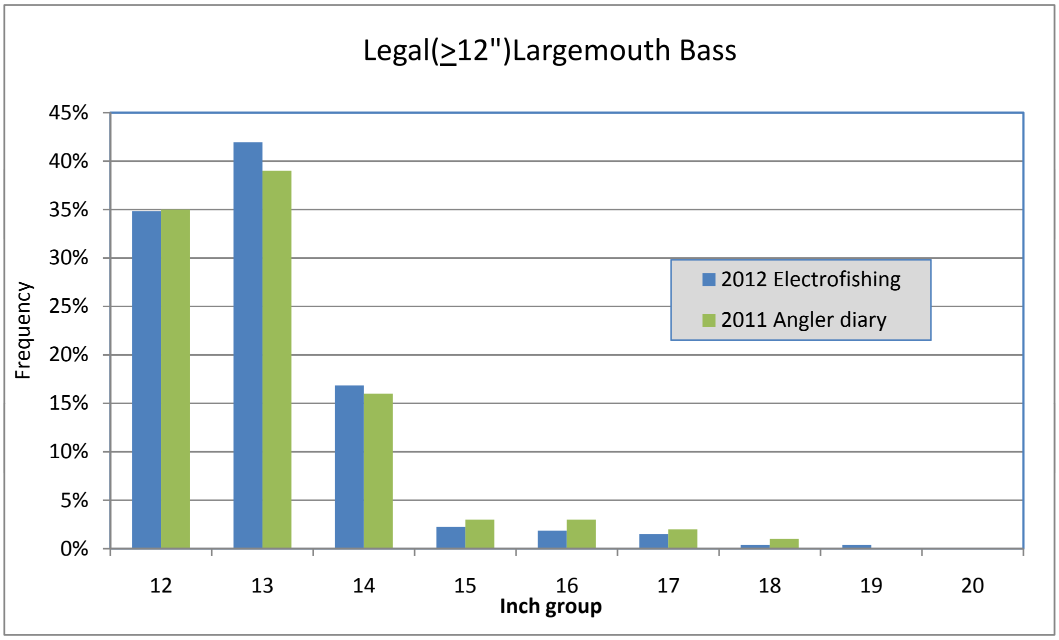


Figure 5. Length frequency distributions of largemouth bass ≥12 inches sampled in Cazenovia Lake 2012 electrofishing and 2011 angler diary.

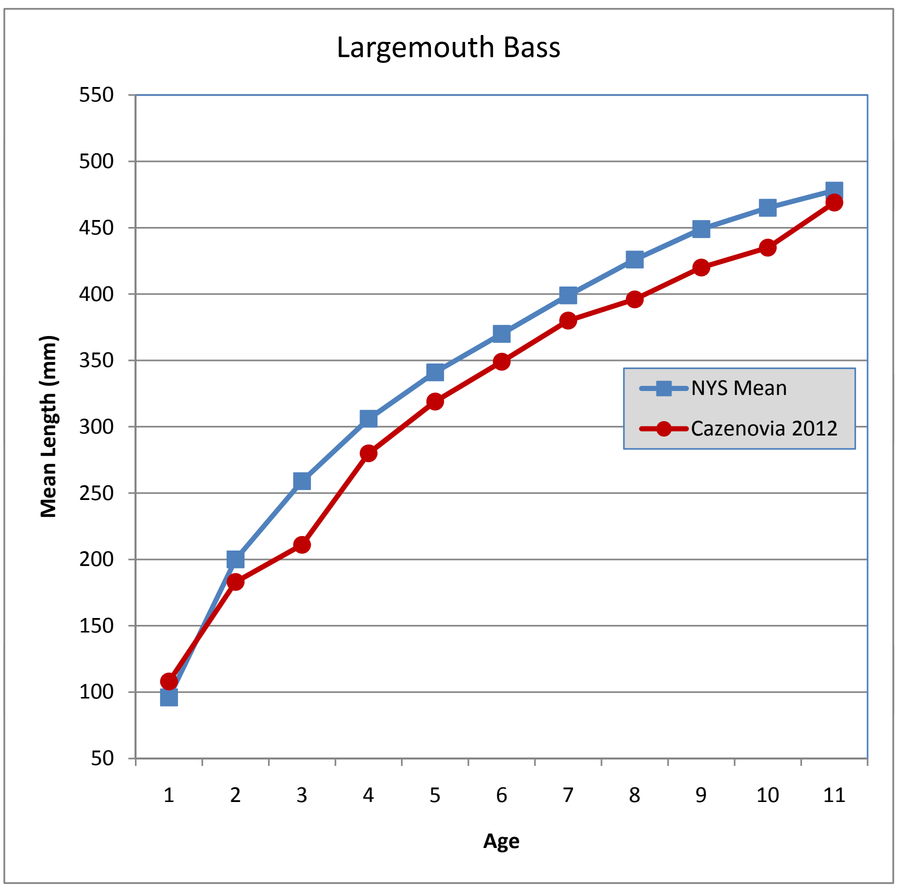
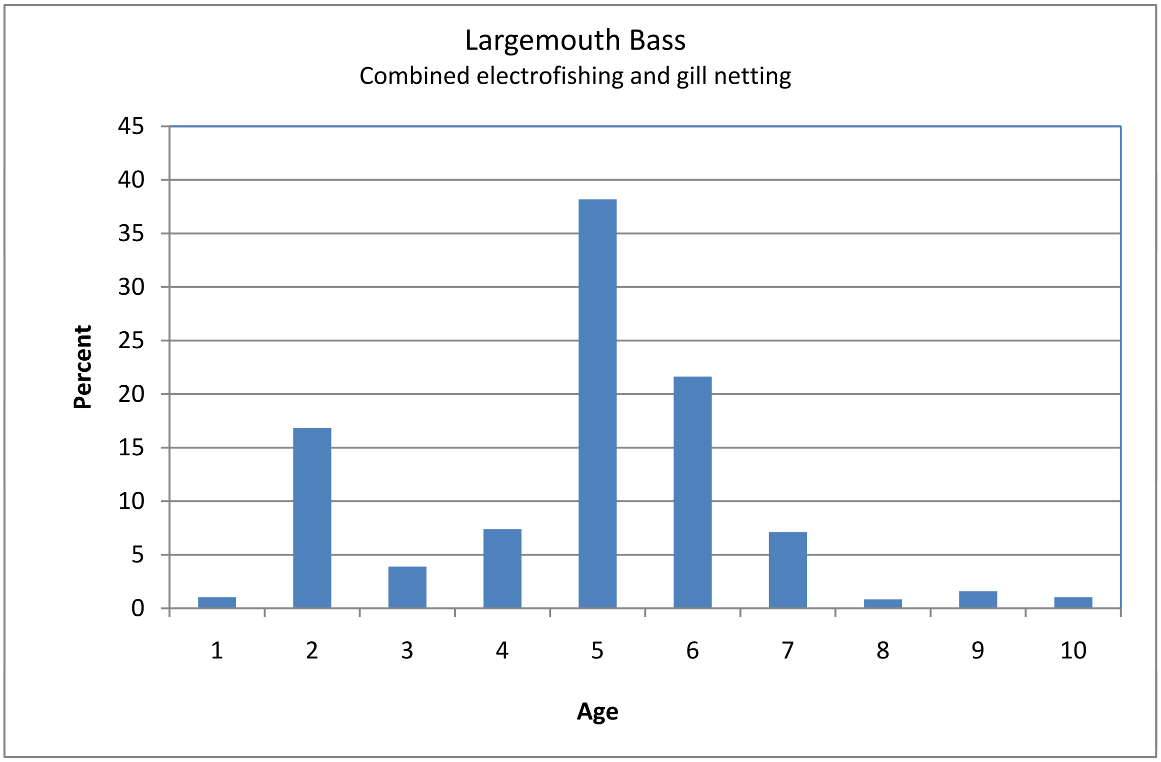


Figure 6. Cazenovia Lake largemouth bass mean lengths (mm) at age and the New York State mean growth rate (Green 1989)



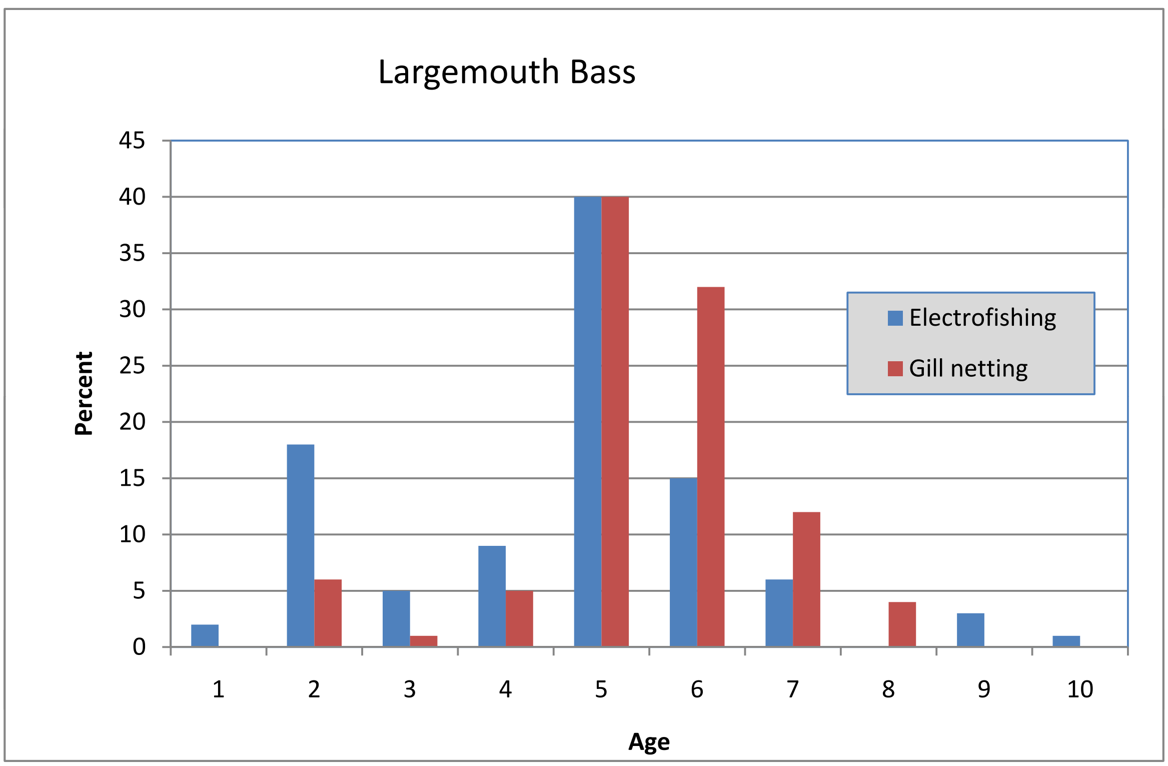
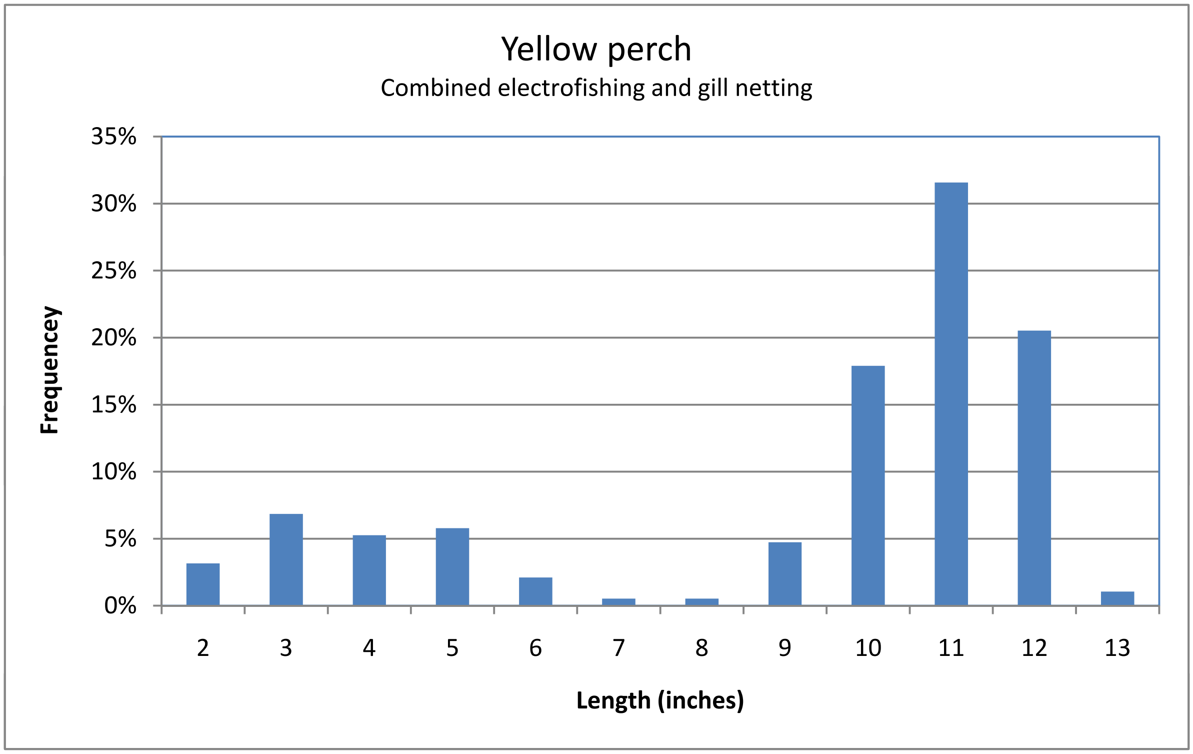


Figure 7. Age frequency distributions of largemouth bass sampled in Cazenovia Lake 2012.



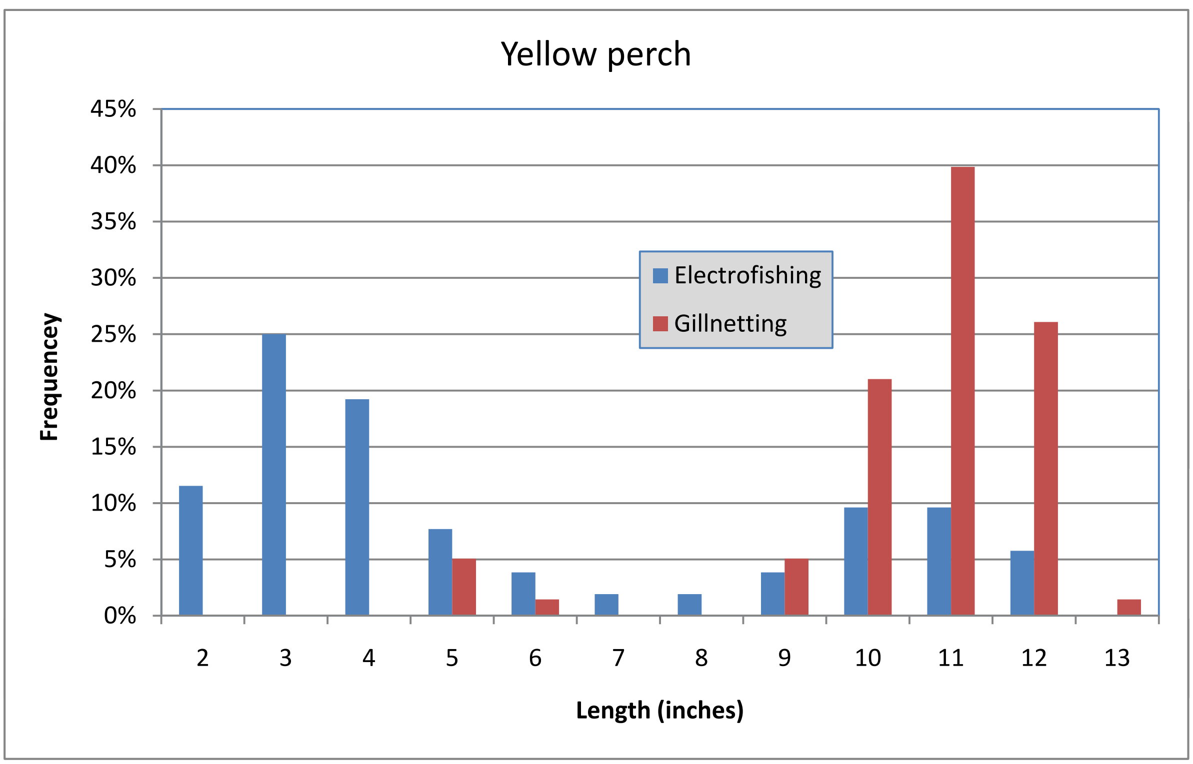


Figure 8. Length frequency distributions of yellow perch sampled in Cazenovia Lake 2012.

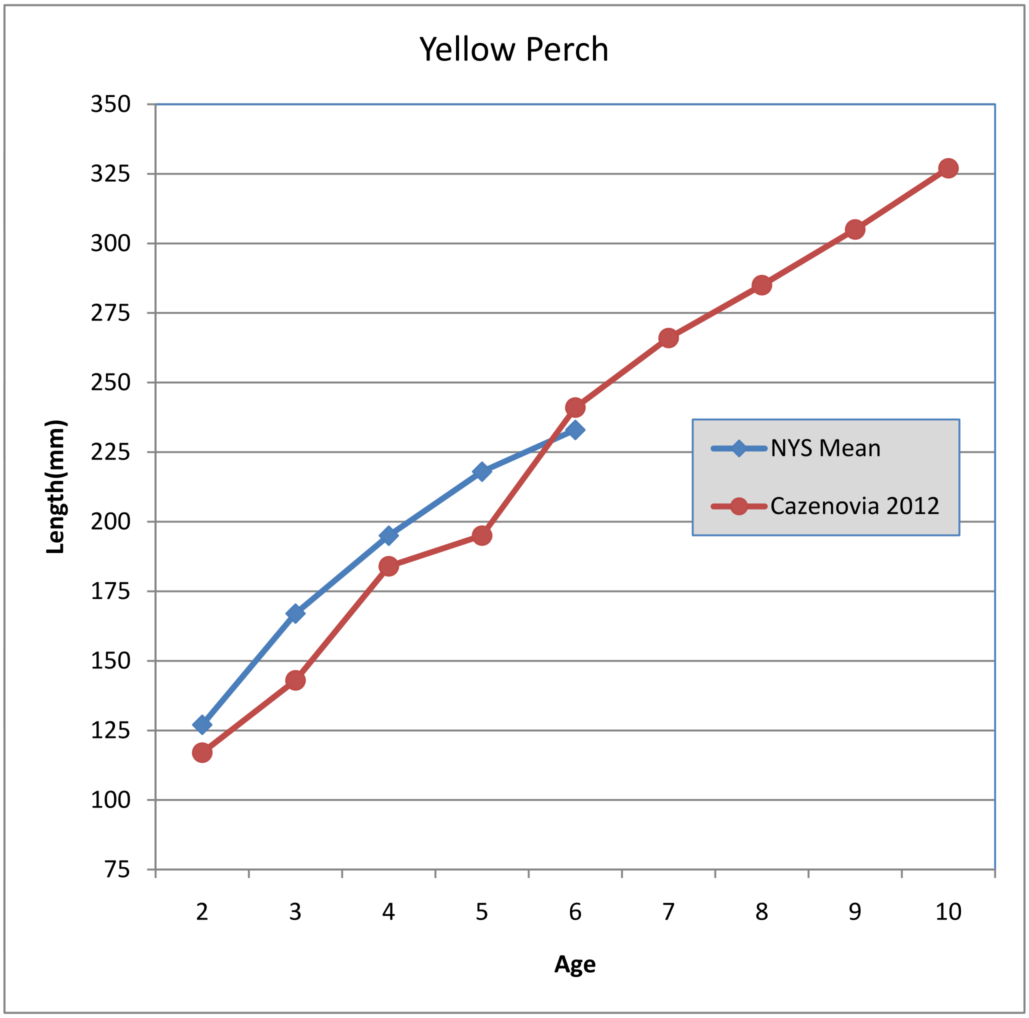
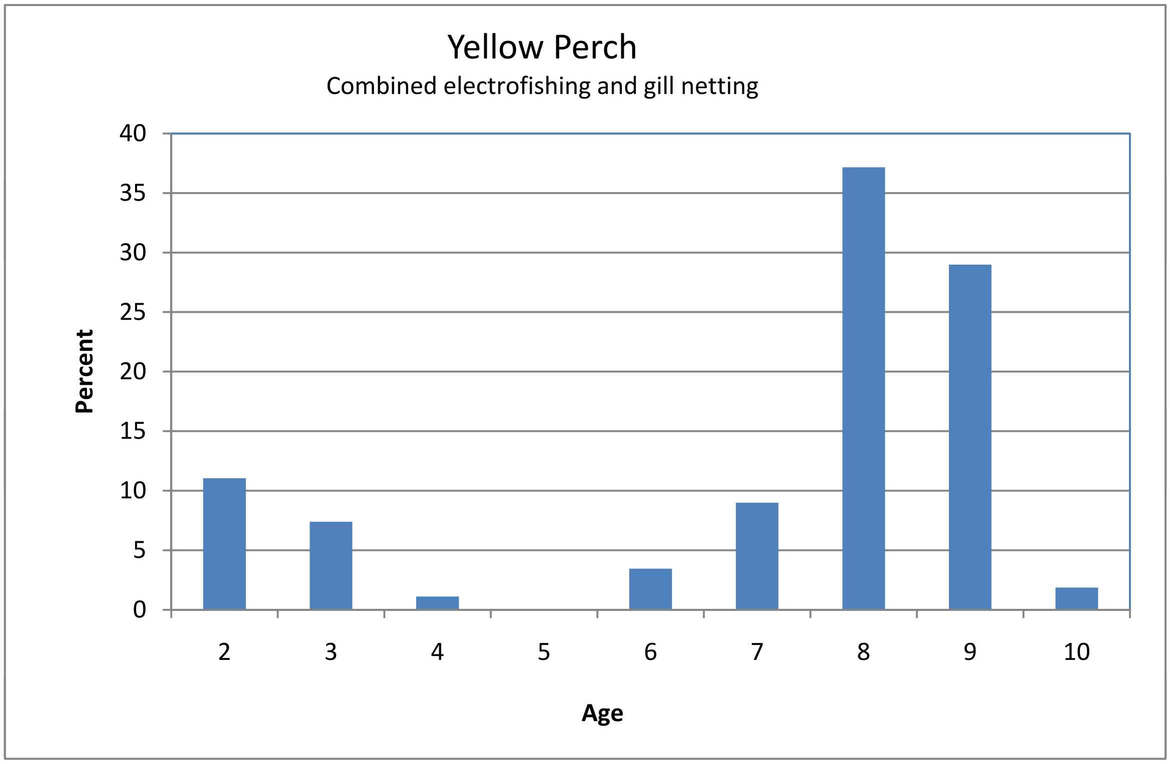


Figure 9. Cazenovia Lake yellow perch mean lengths (mm) at age and the New York State mean growth rate (Green et al. 1993)



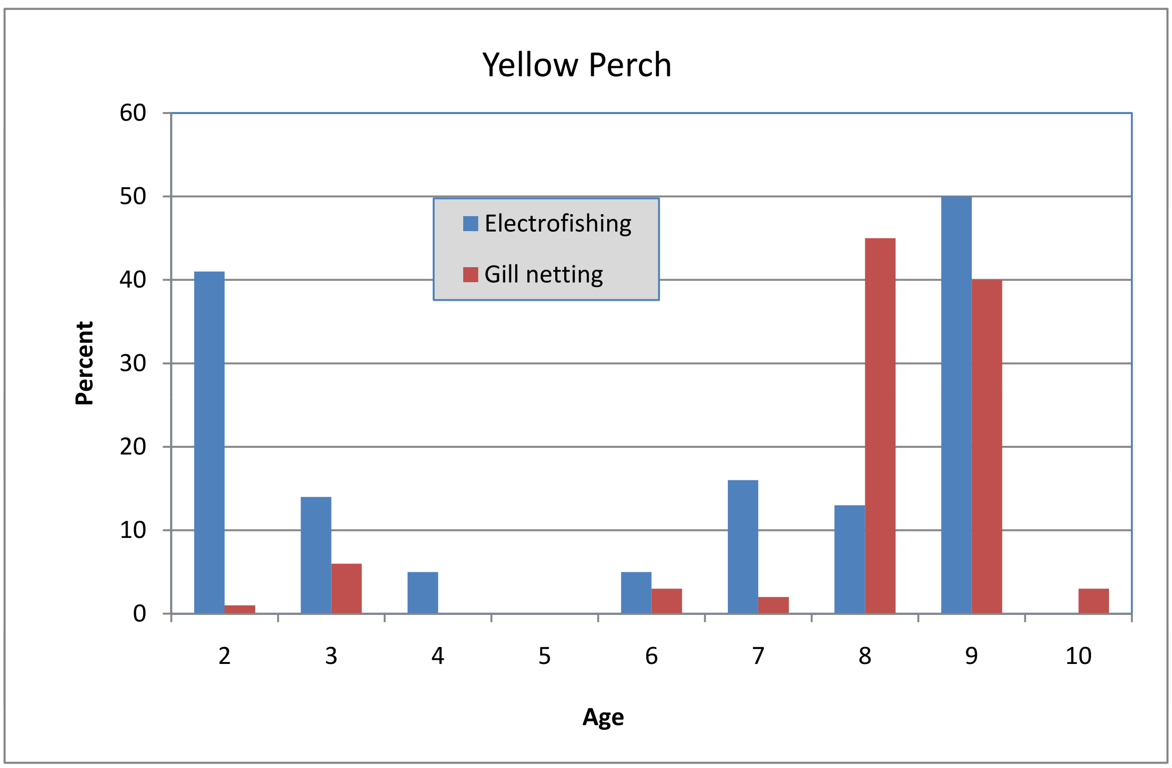
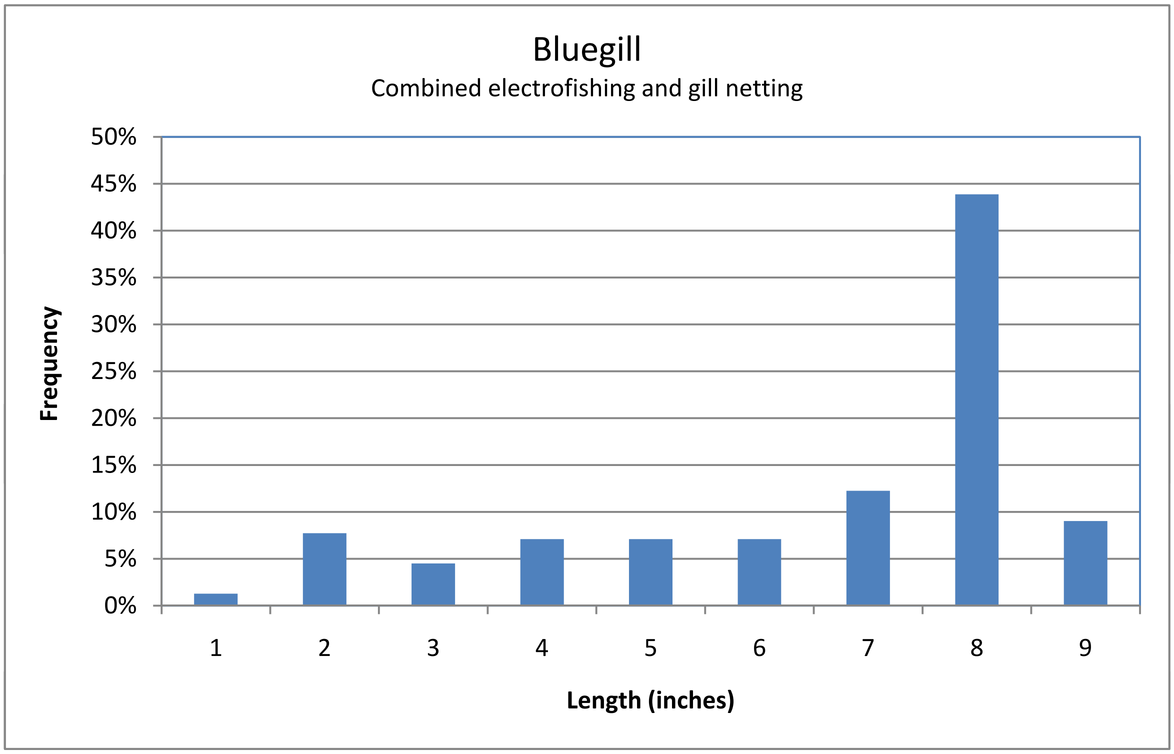


Figure 10. Age frequency distributions of yellow perch sampled in Cazenovia Lake 2012.



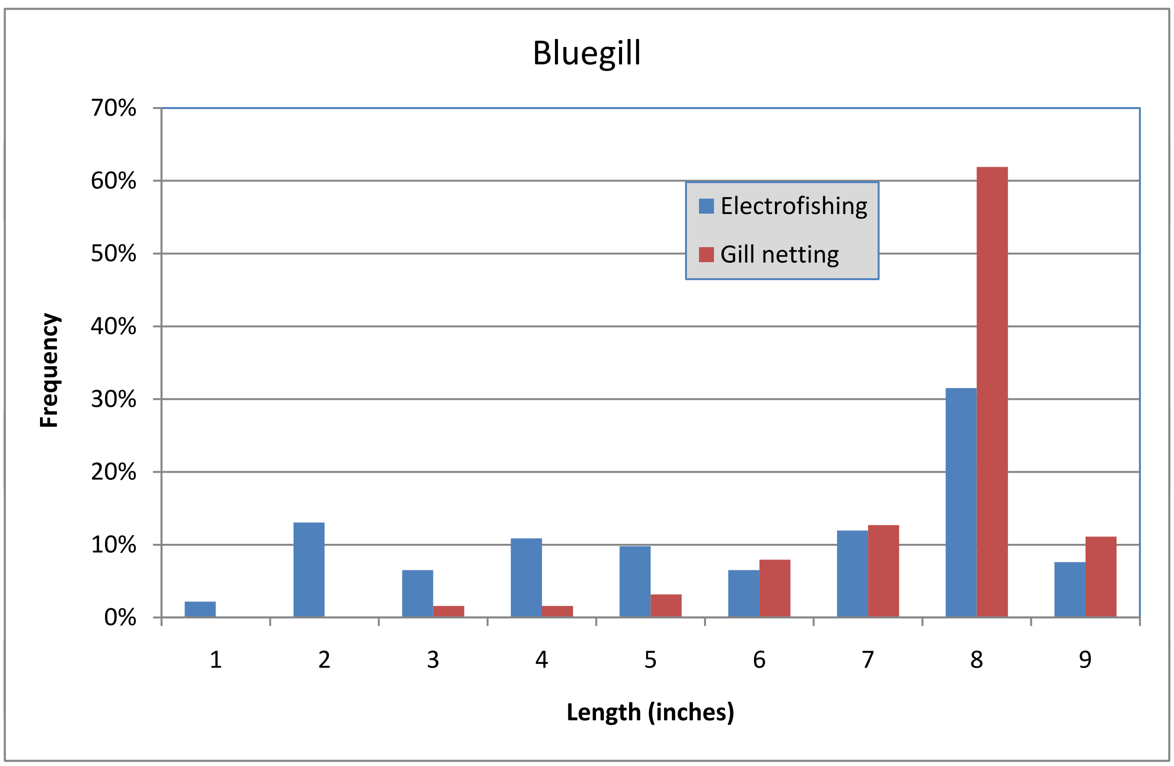


Figure 11. Length frequency distributions of bluegill sampled in Cazenovia Lake 2012.

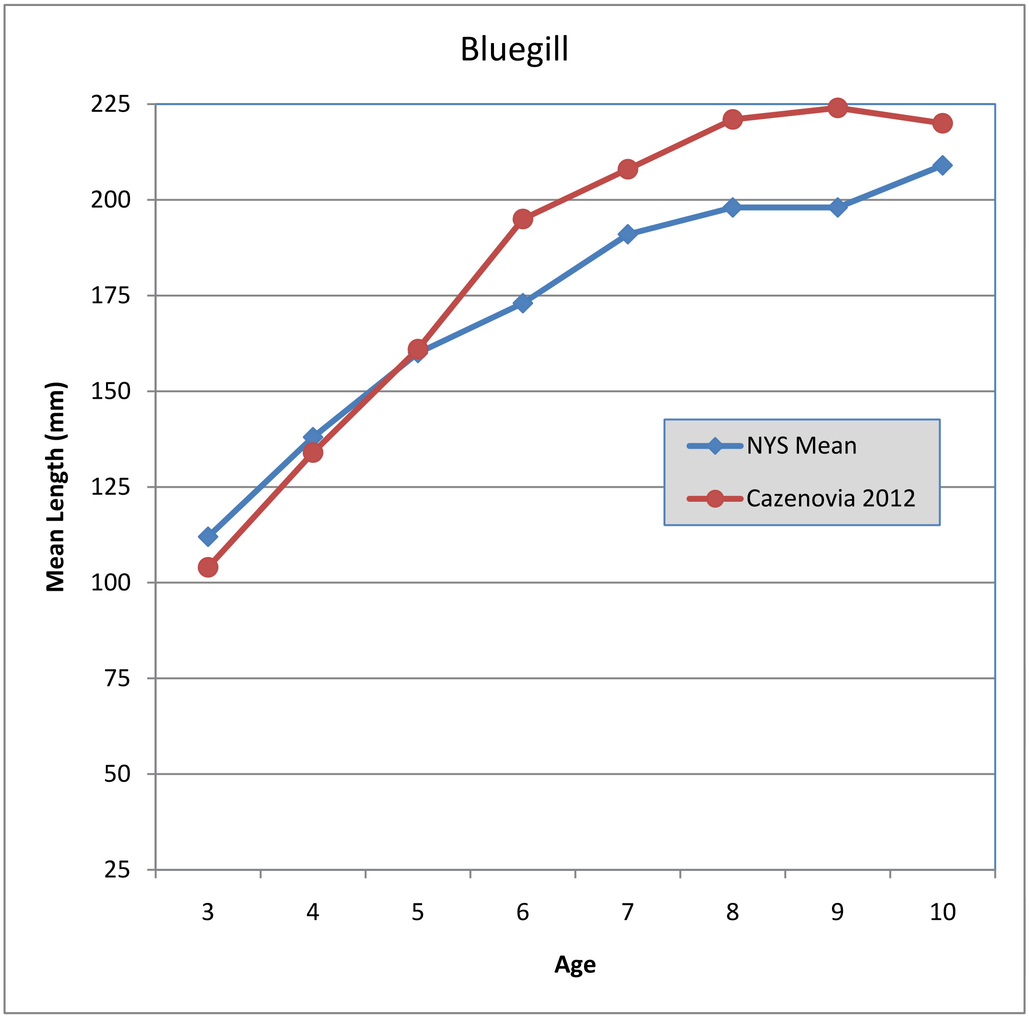
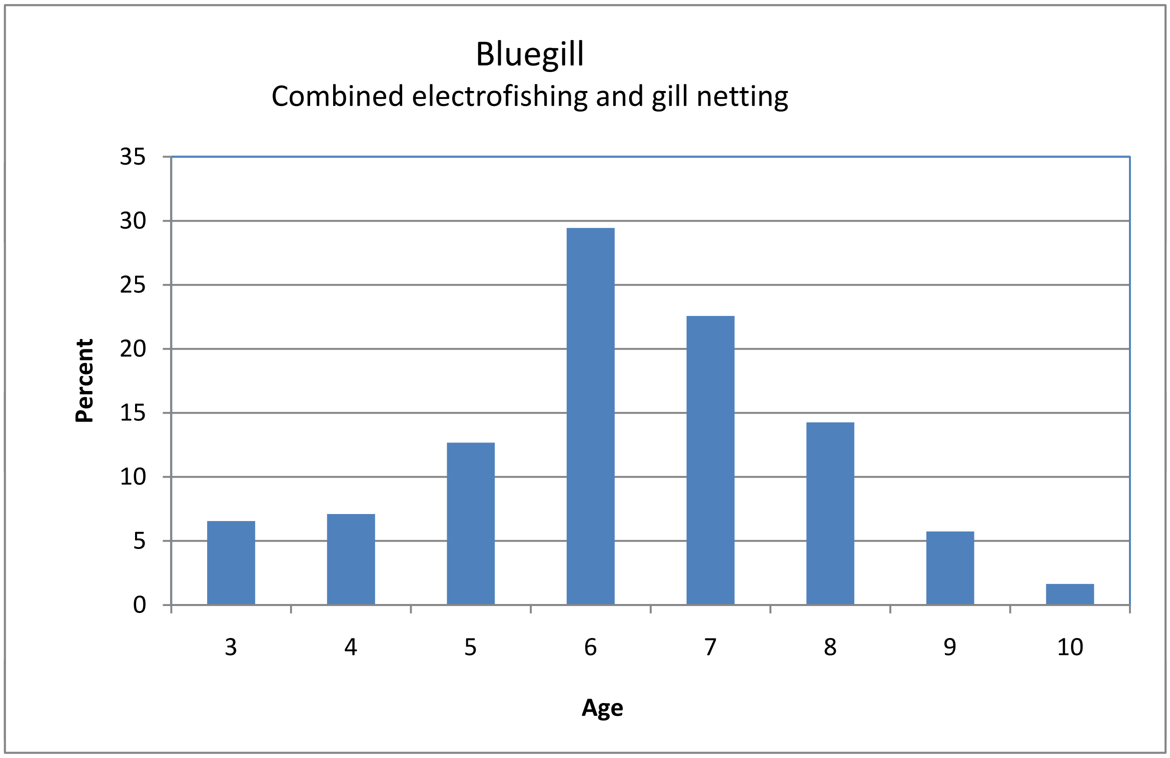


Figure 12. Cazenovia Lake bluegill mean lengths (mm) at age and the New York State mean growth rate (Green 1989).



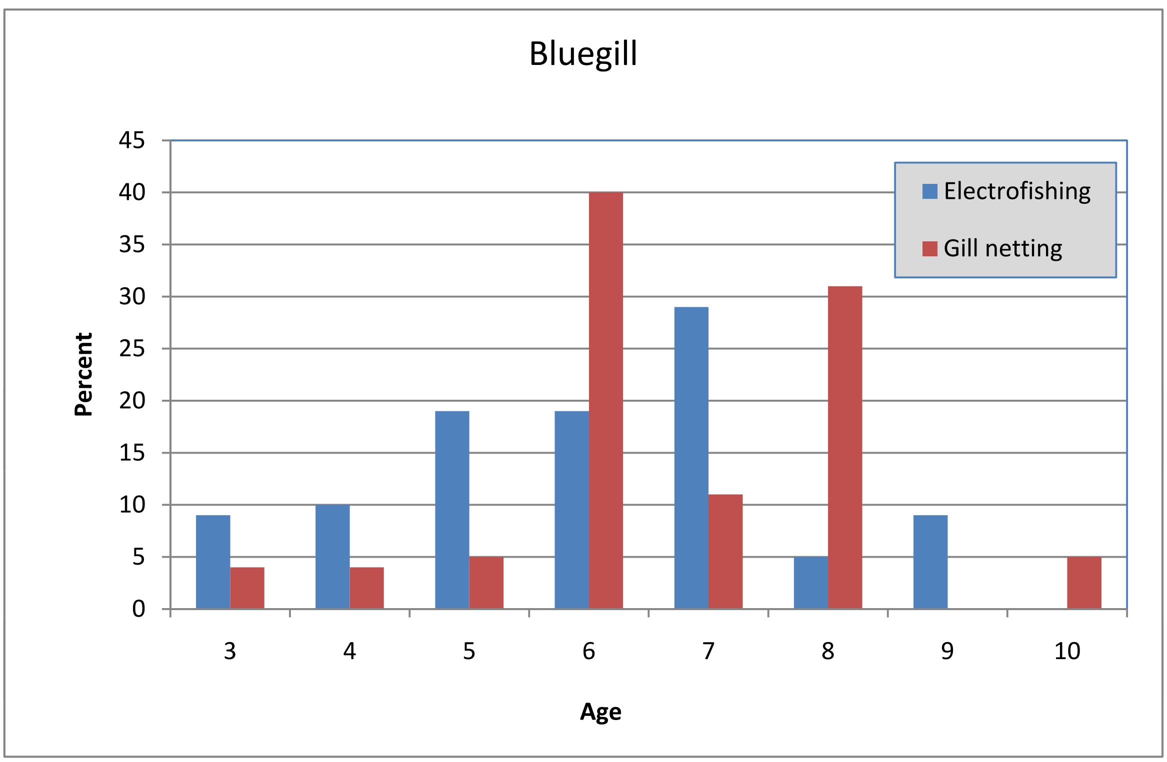
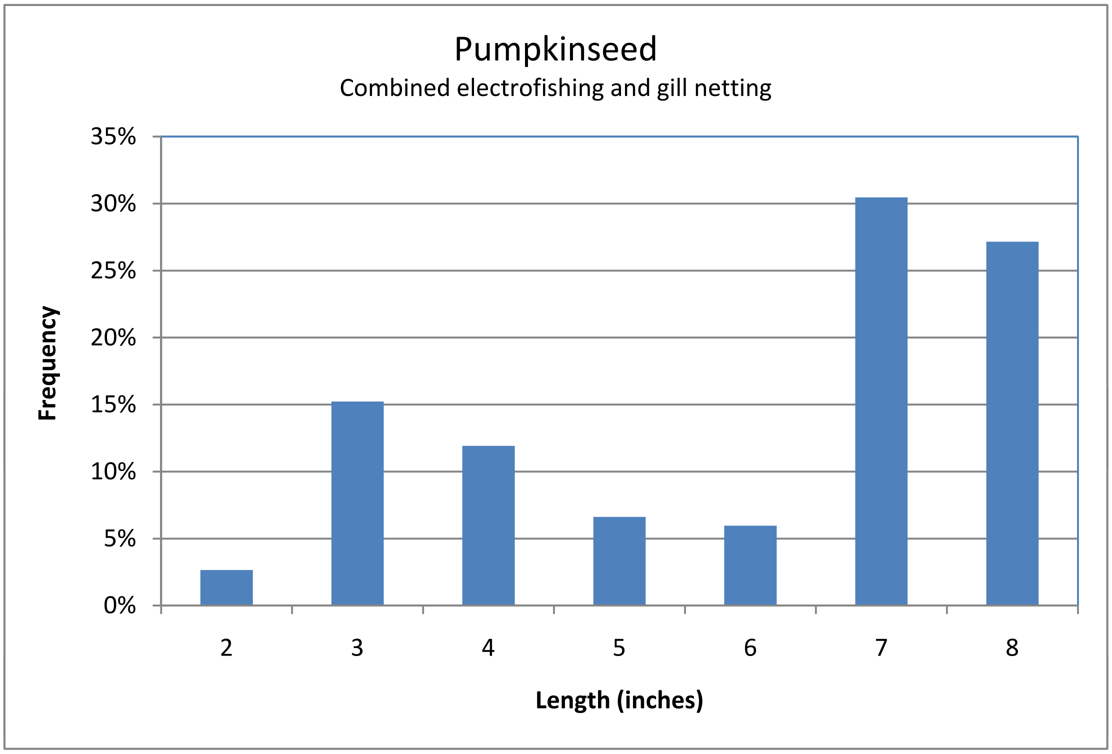


Figure 13. Age frequency distributions of bluegill sampled in Cazenovia Lake 2012.



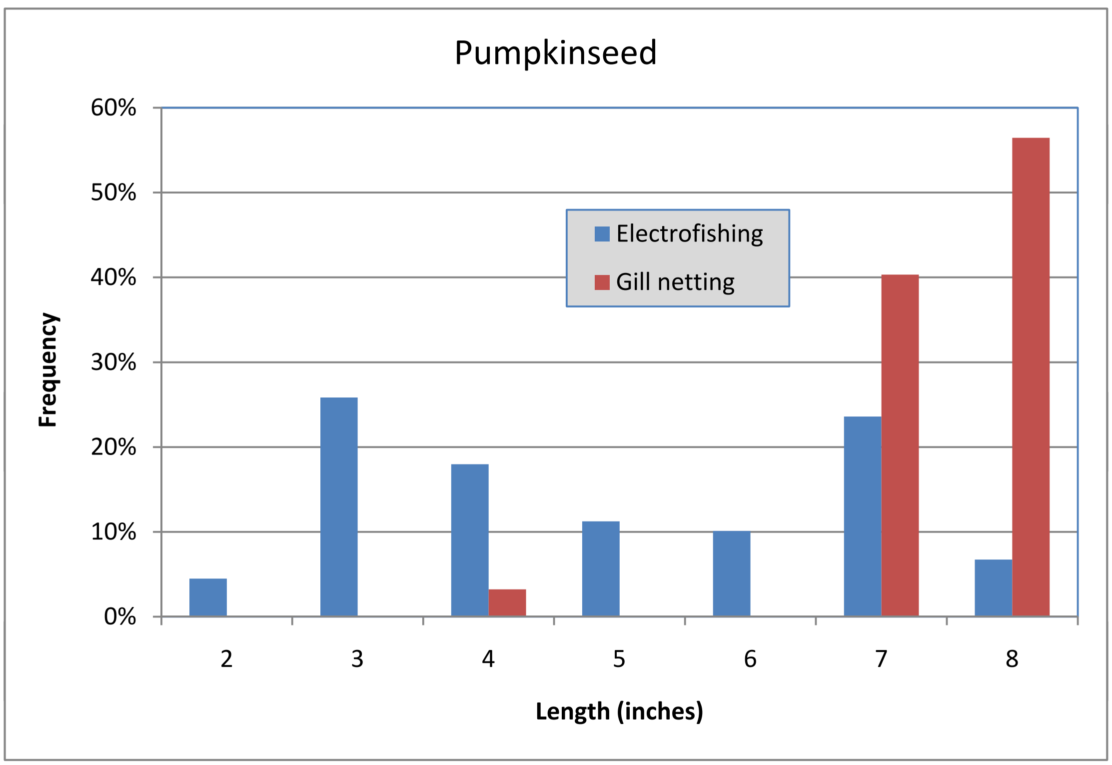


Figure 14. Length frequency distributions of pumpkinseed sampled in Cazenovia Lake 2012.

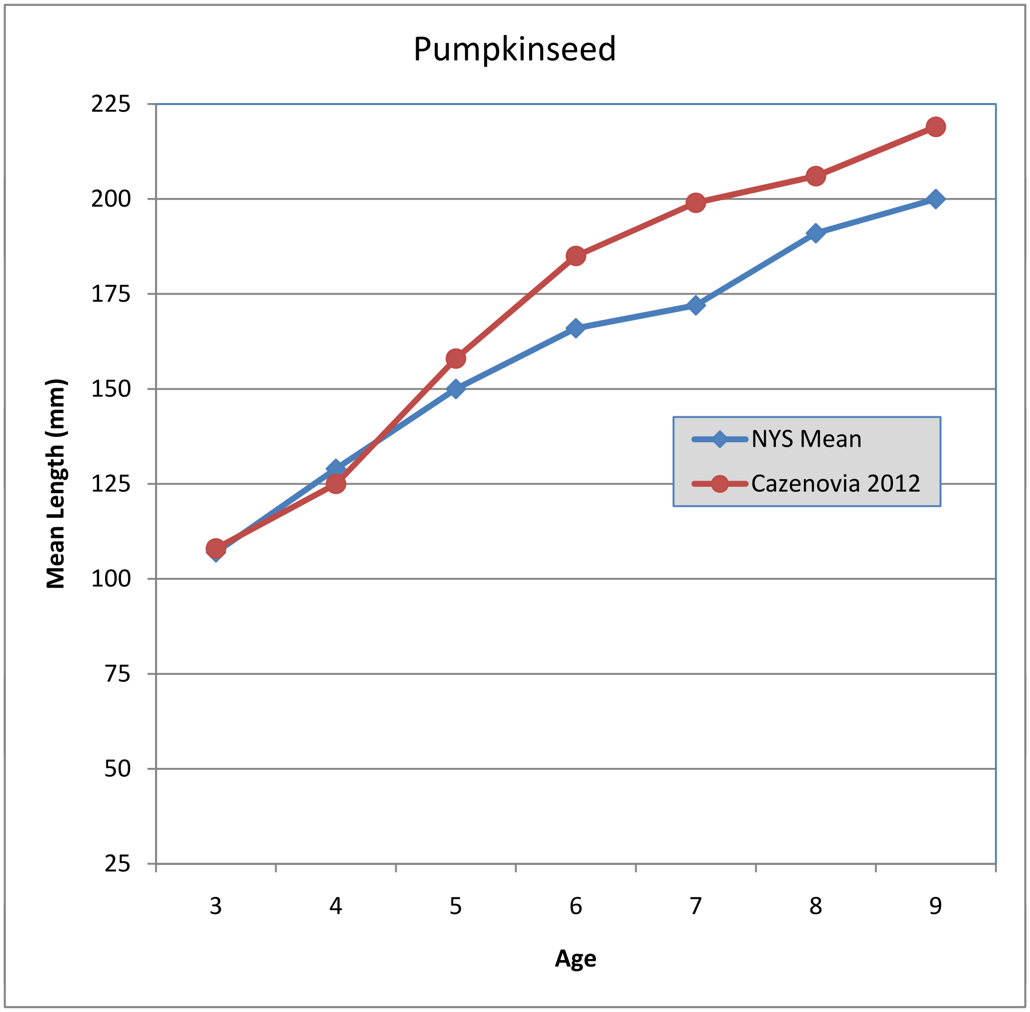
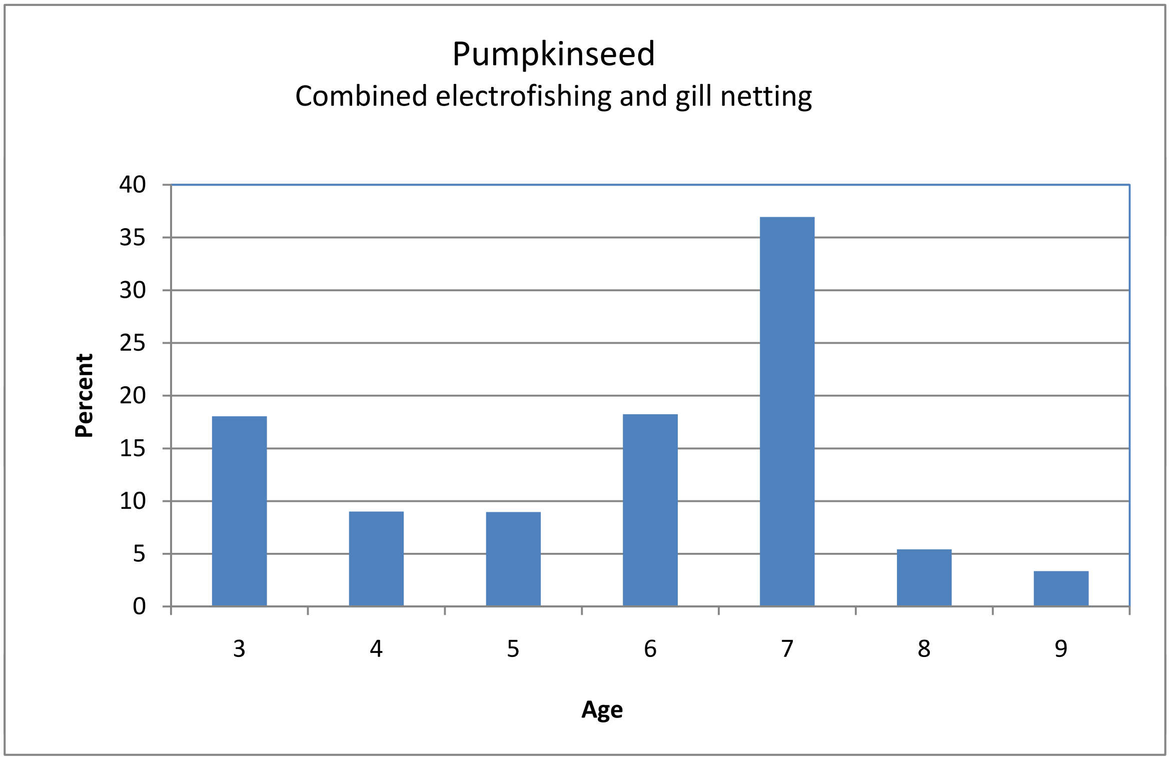


Figure 15. Cazenovia Lake pumpkinseed mean lengths (mm) at age and the New York State mean growth rate (Green 1989)



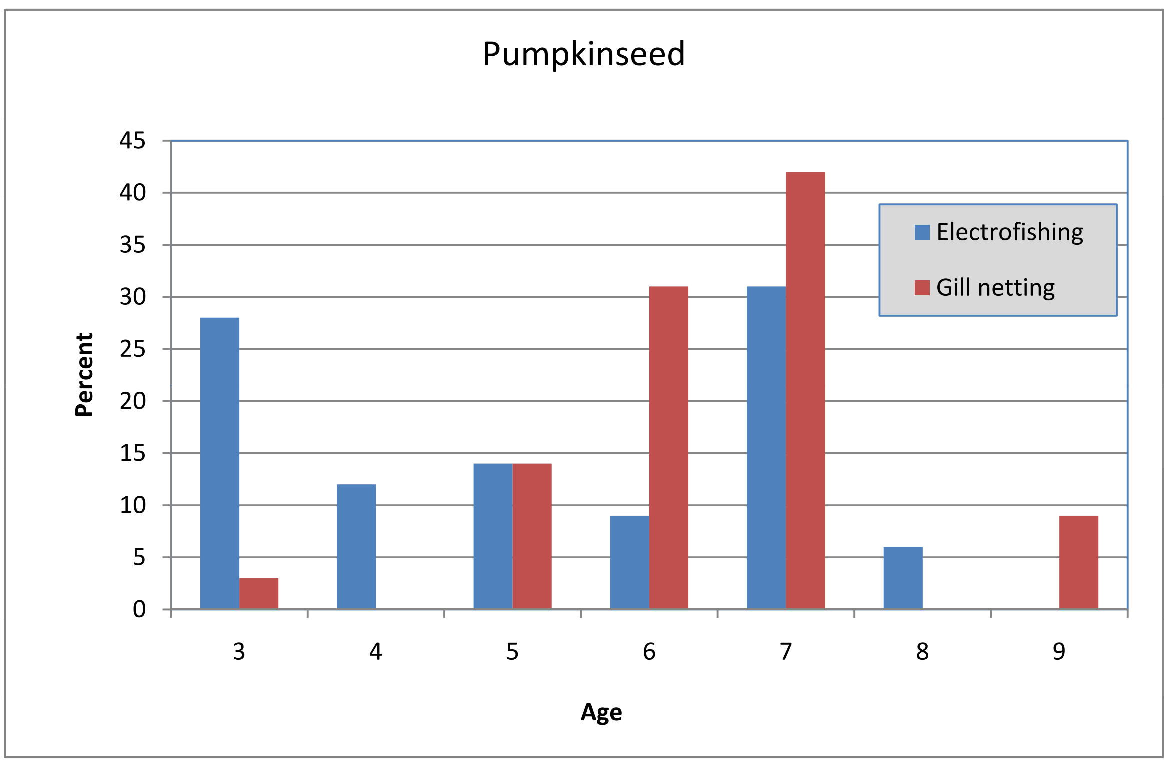


Figure 16. Age frequency distributions of pumkinseed sunfish sampled in Cazenovia Lake 2012

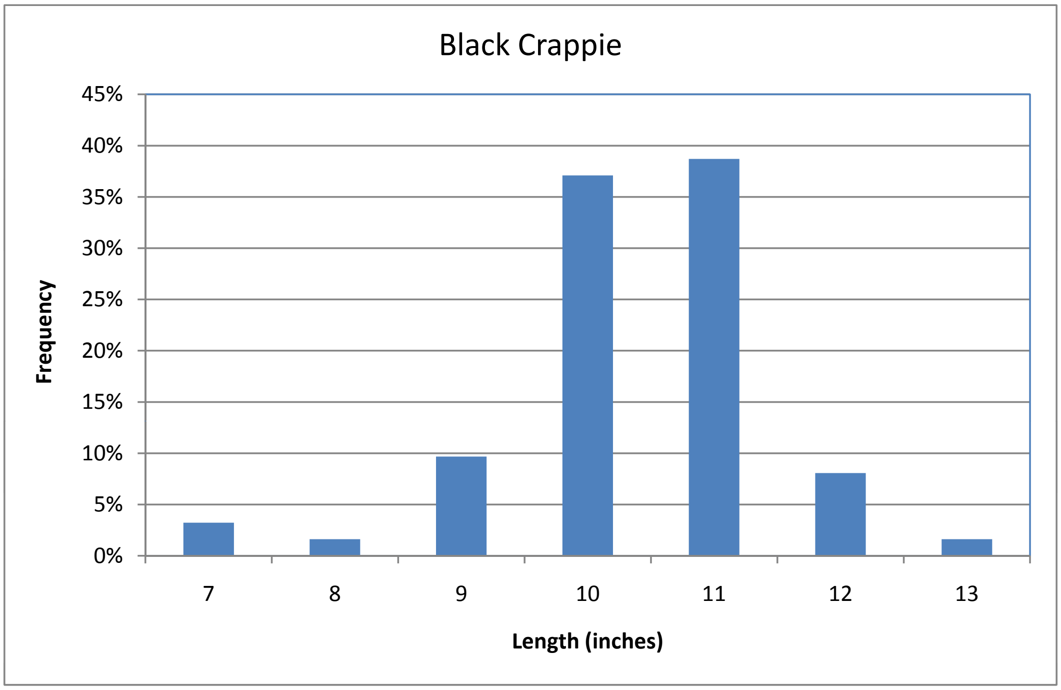


Figure 17. Length frequency distributions of black crappie sampled in Cazenovia Lake 2012.

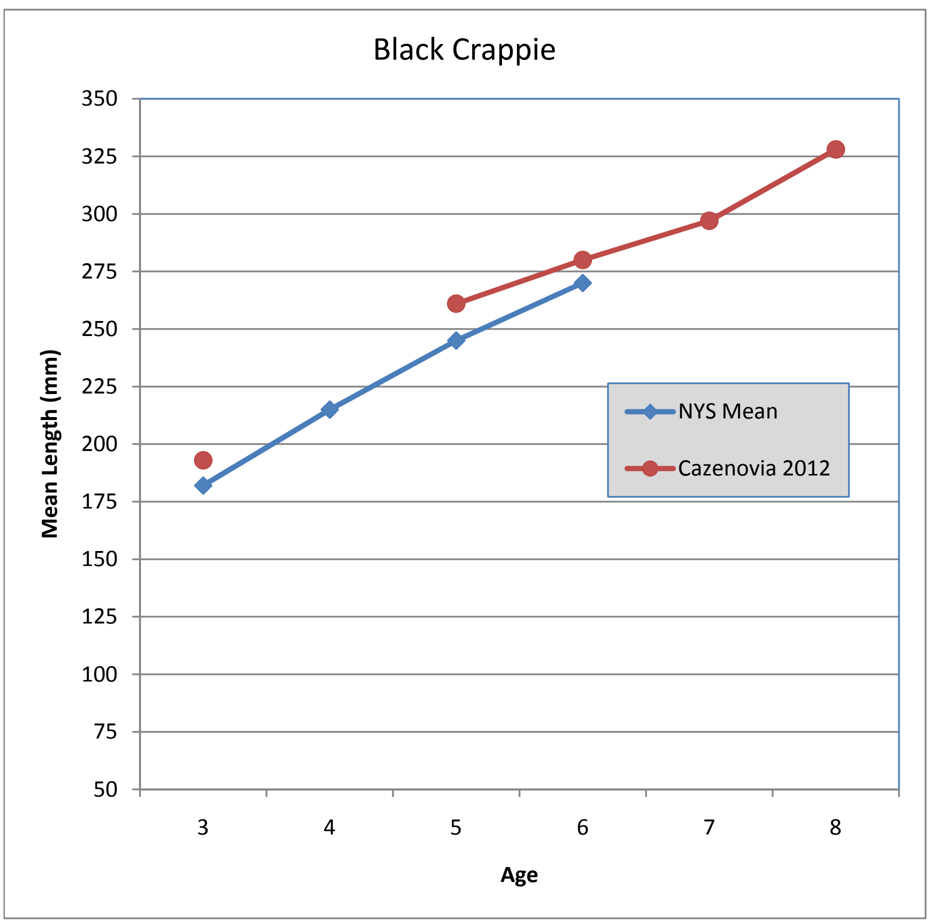


Figure 18. Cazenovia Lake black crappie mean lengths (mm) at age and the New York State mean growth rate (Green 1989)

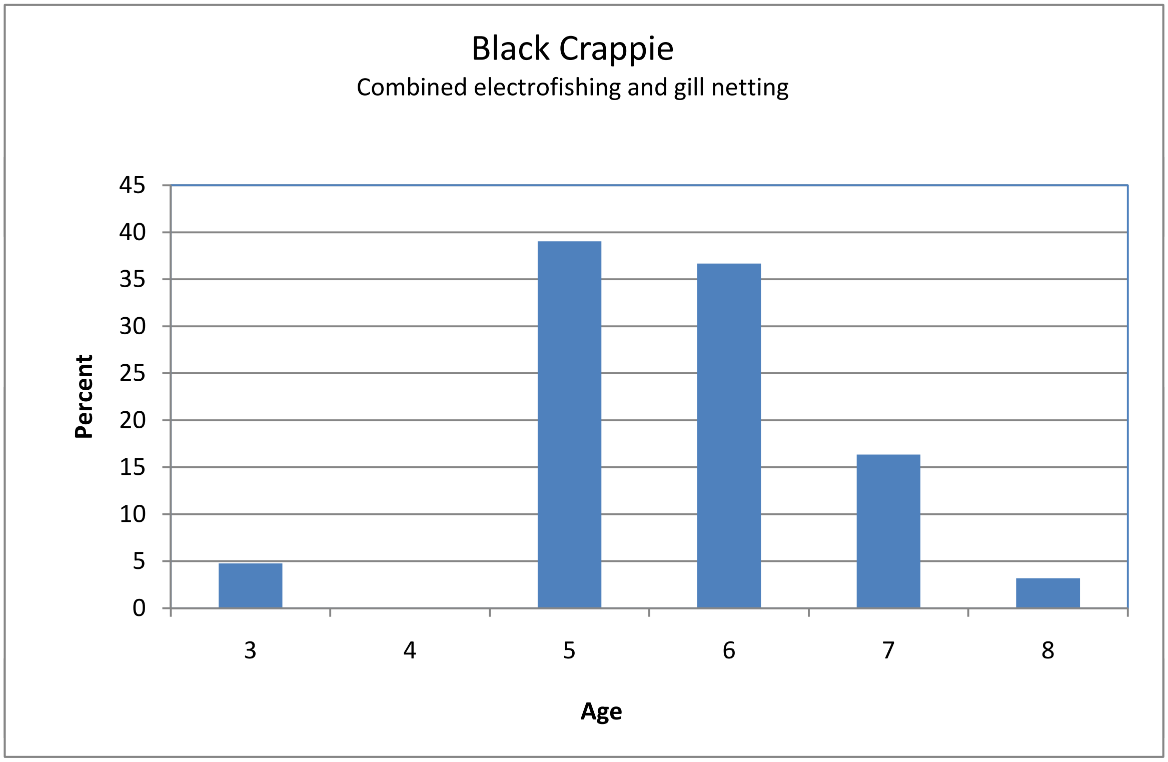
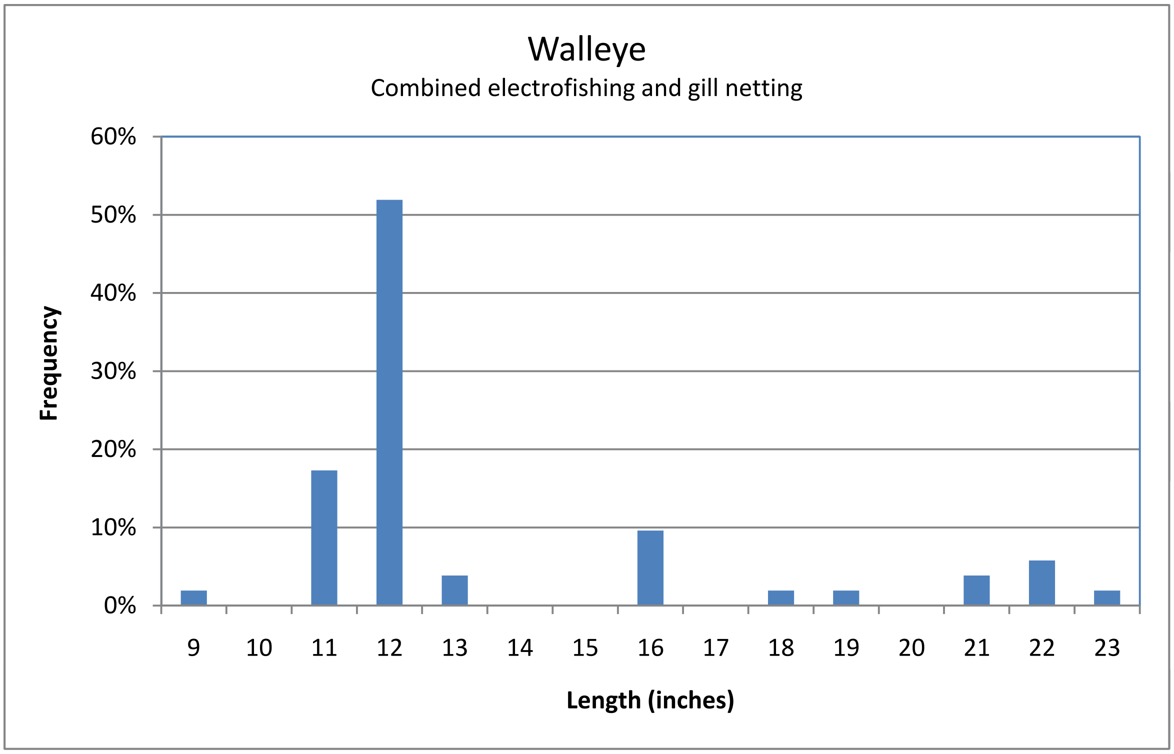


Figure 19. Age frequency distributions of black crappie sampled in Cazenovia Lake 2012.



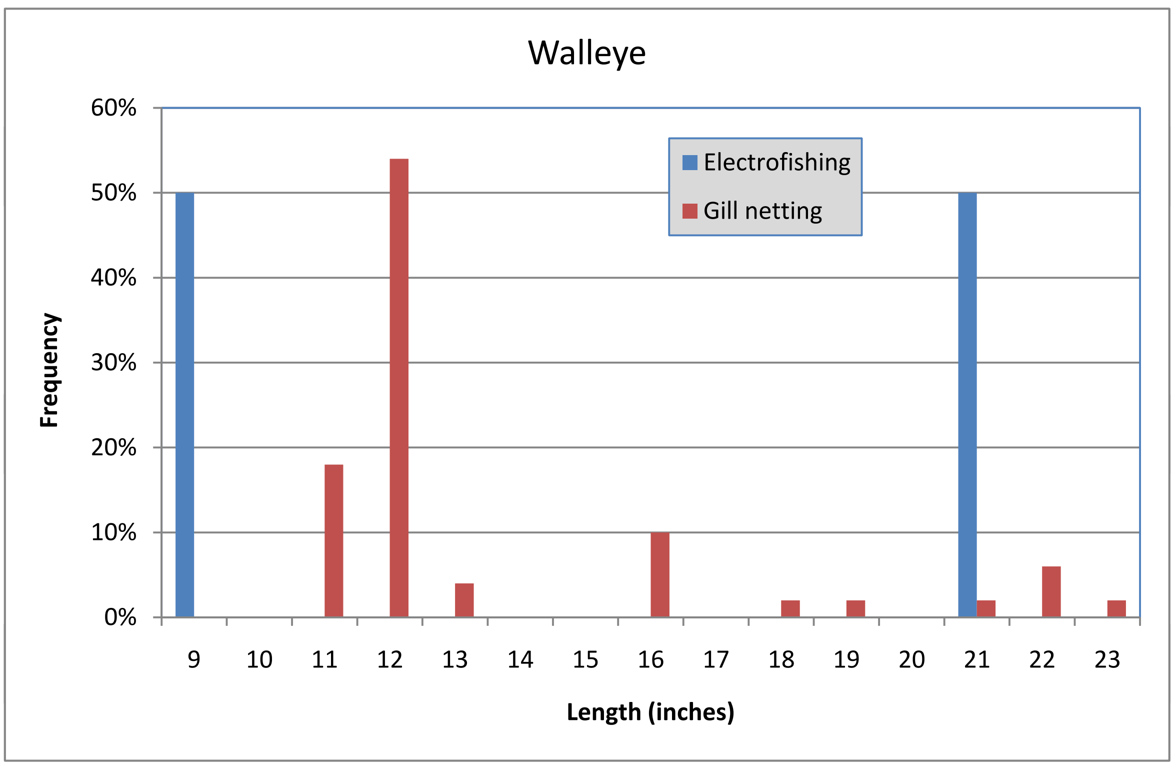
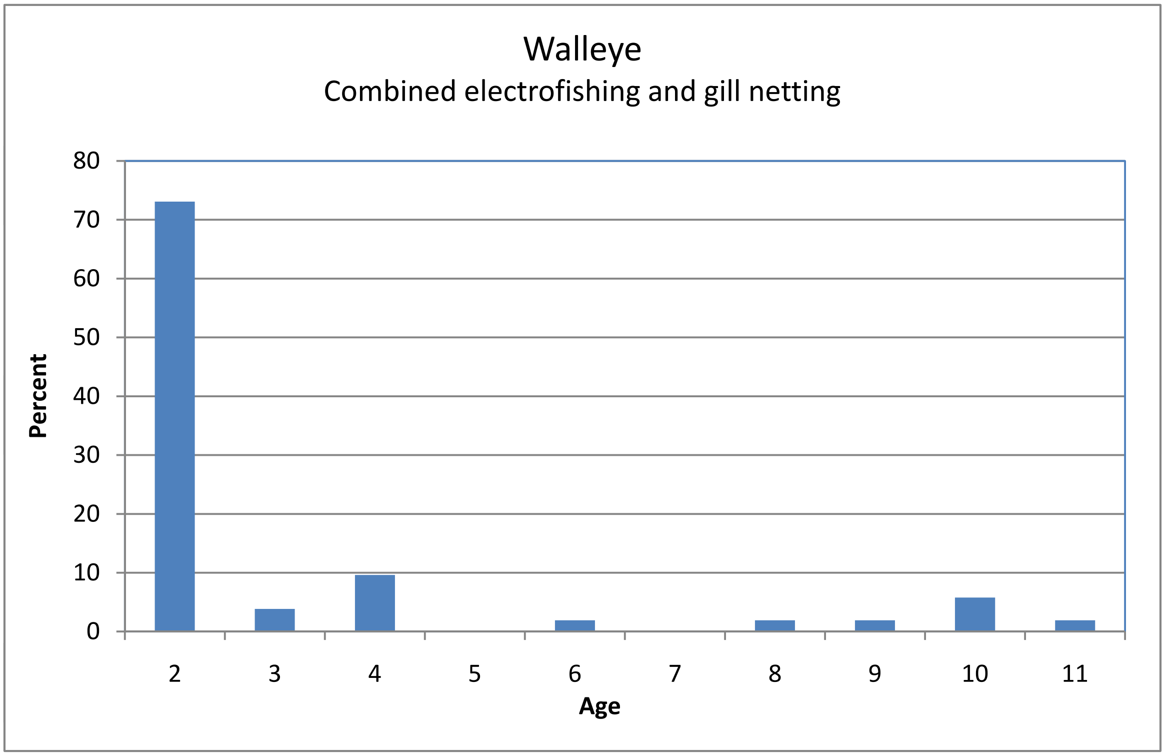


Figure 20. Length frequency distributions of walleye sampled in Cazenovia Lake 2012.



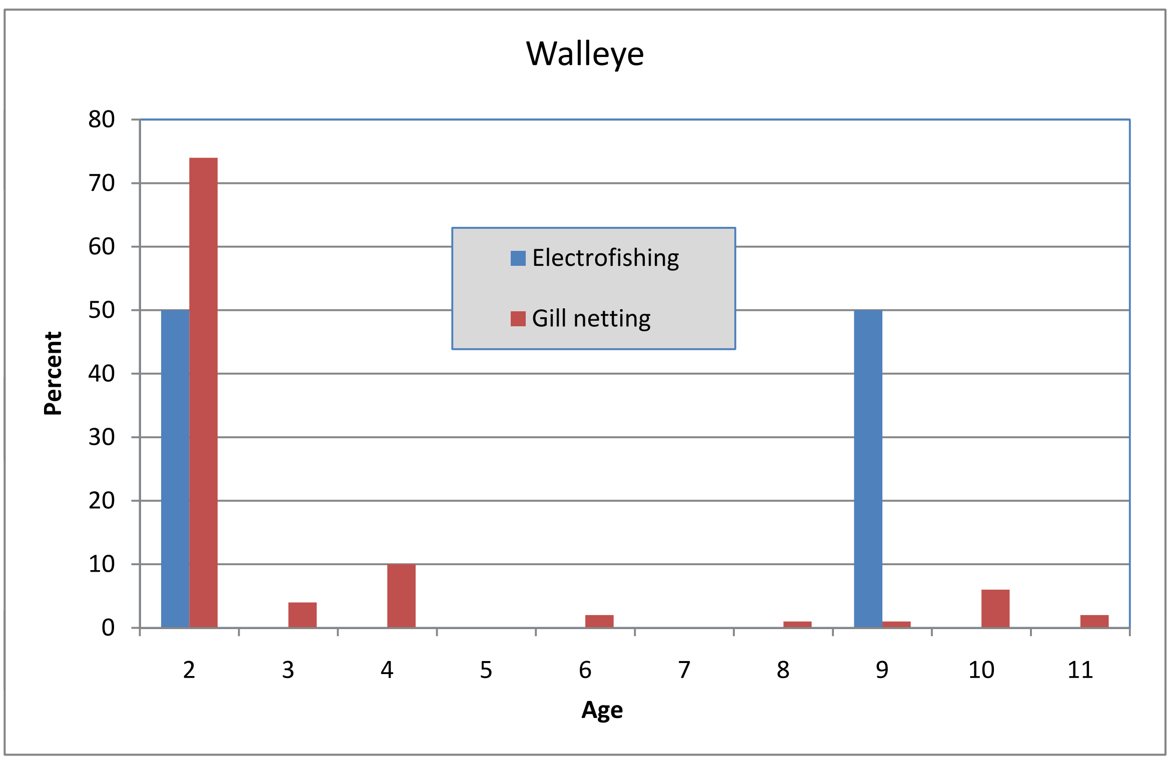


Figure 21. Age frequency distributions of walleye sampled in Cazenovia Lake 2012.

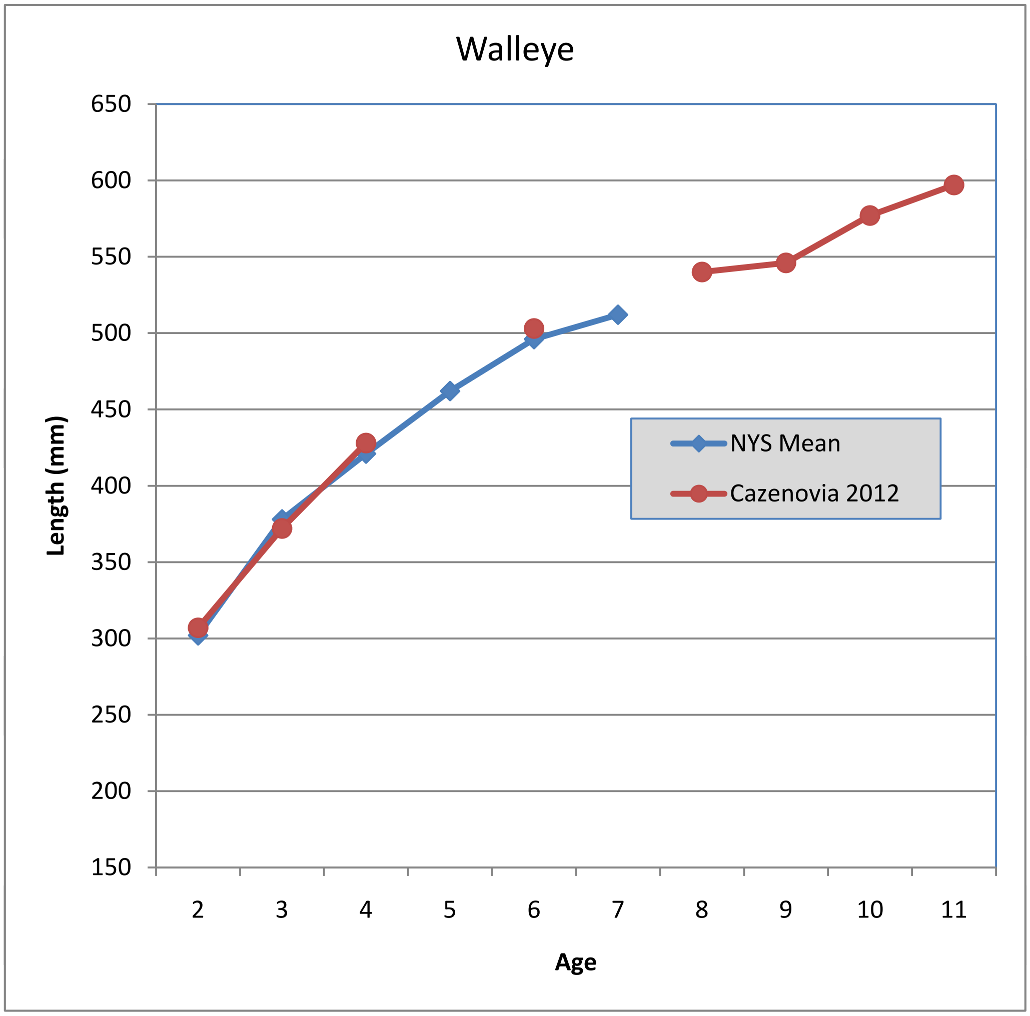
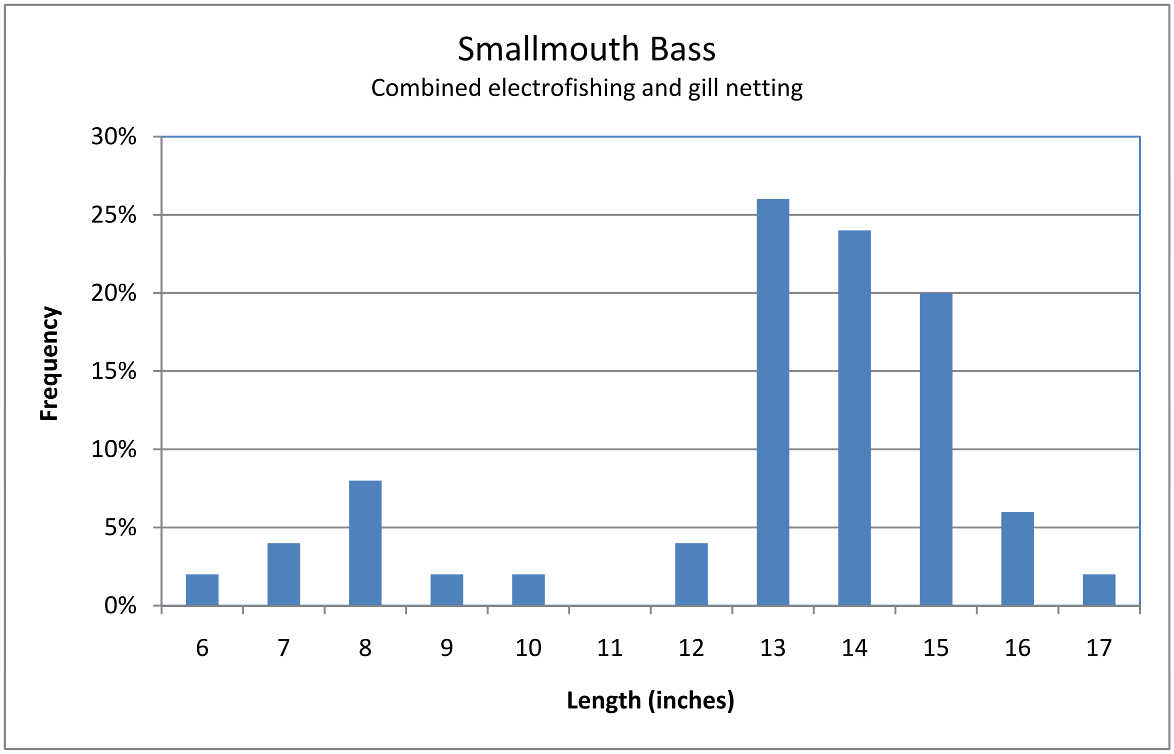


Figure 22. Cazenovia Lake walleye mean lengths (mm) at age and the New York State mean growth rate (Forney et al. 1994)



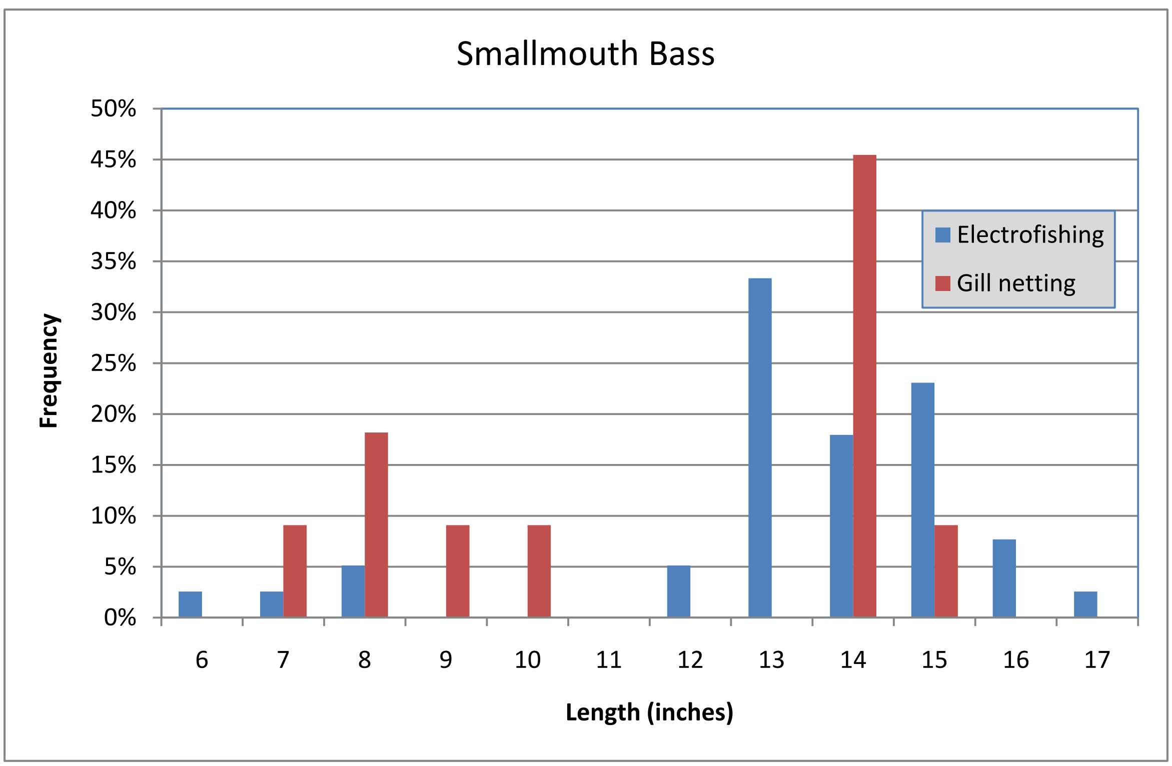


Figure 23. Length frequency distributions of smallmouth bass sampled in Cazenovia Lake 2012

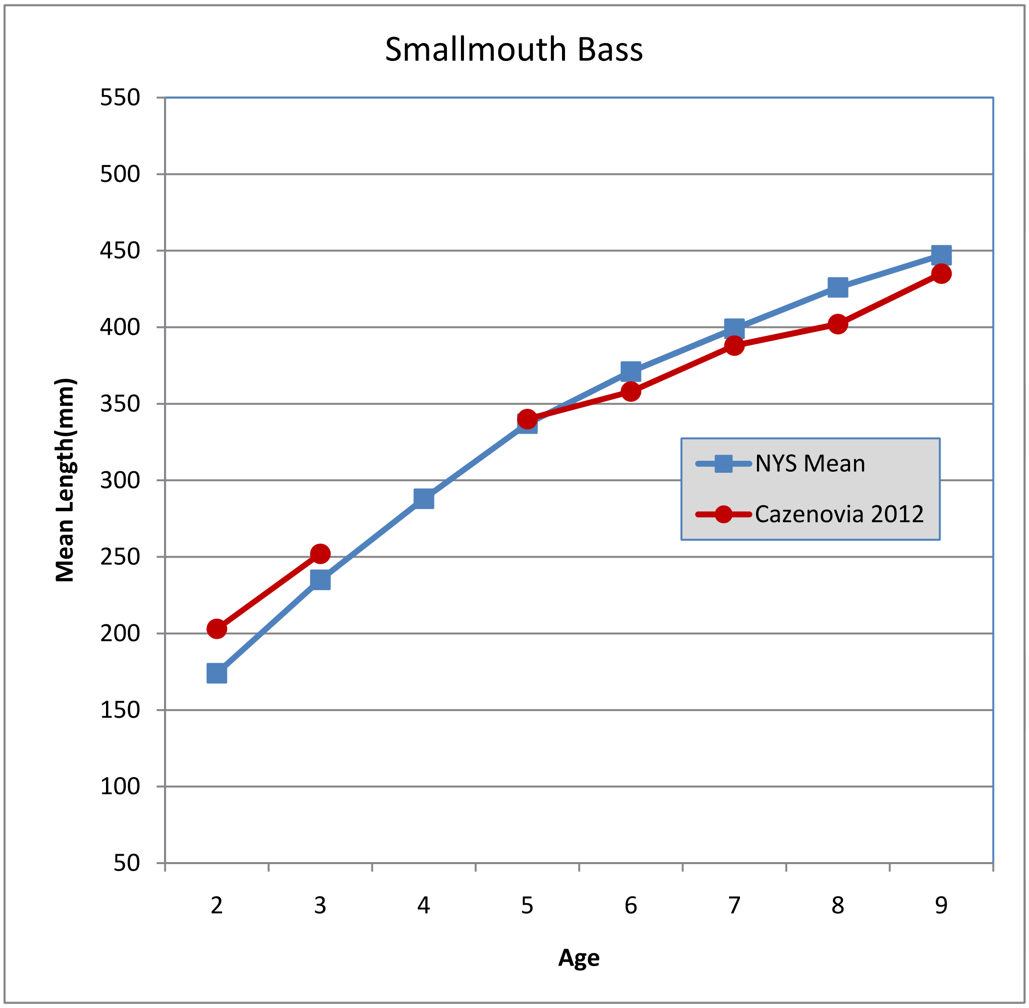
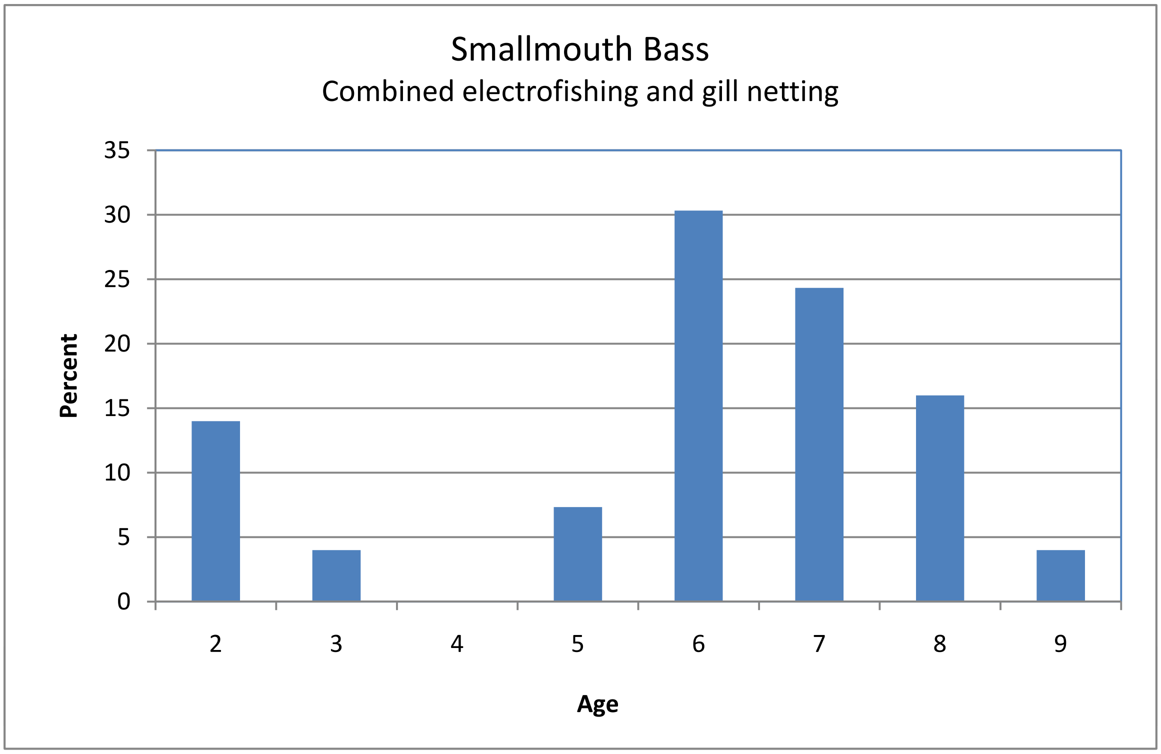


Figure 24. Cazenovia Lake smallmouth bass mean lengths (mm) at age and the New York State mean growth rate (Green 1989)



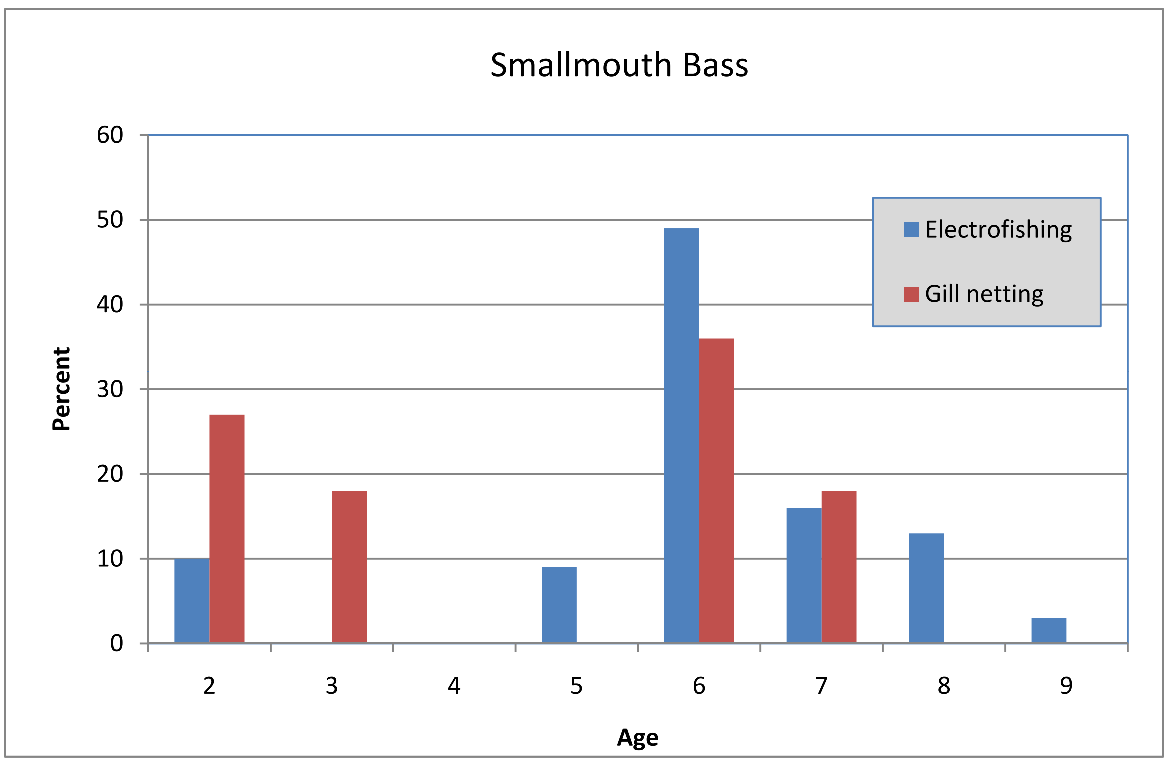
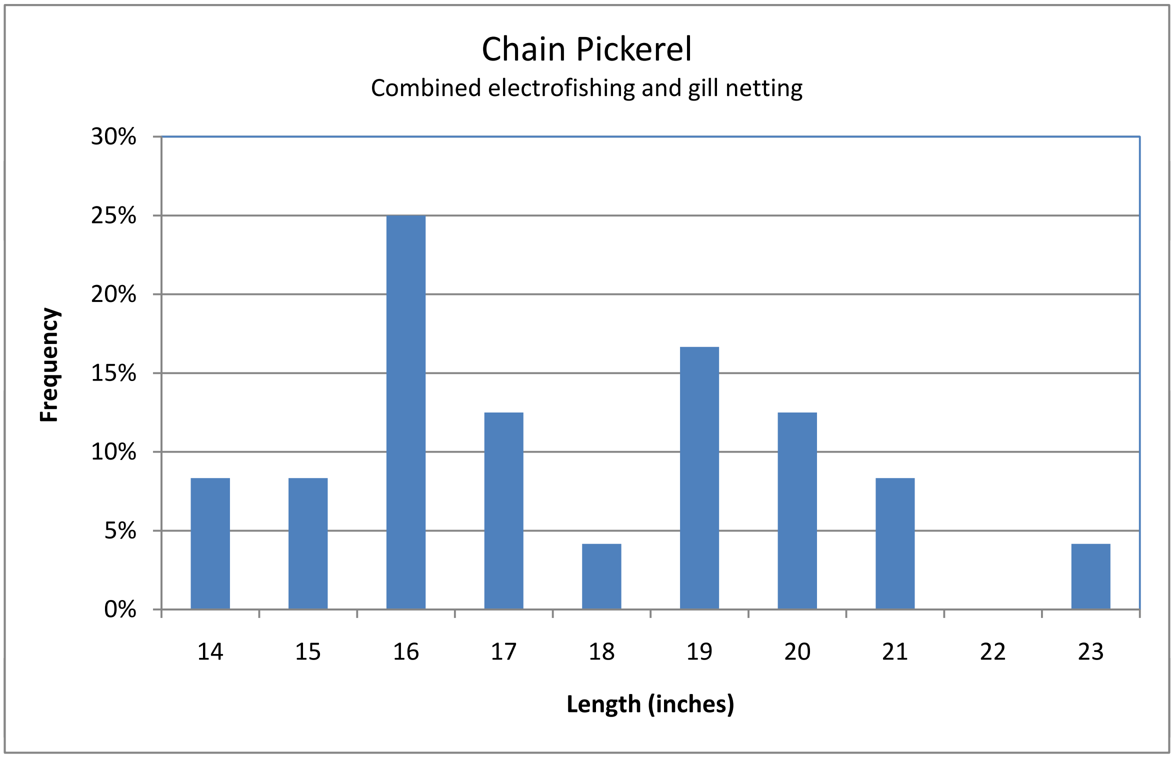


Figure 25. Age frequency distributions of smallmouth bass sampled in Cazenovia Lake 2012.



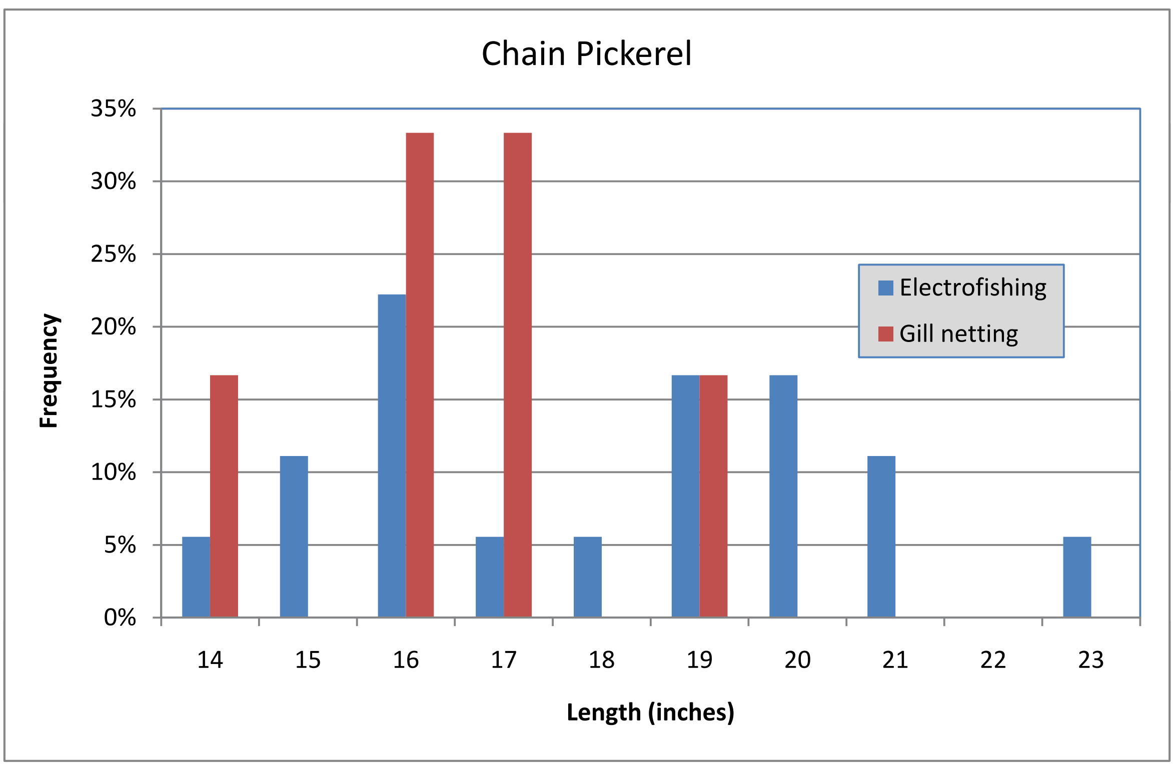


Figure 26. Length frequency distributions of chain pickerel sampled in Cazenovia Lake 2012.