Eaton Brook Reservoir Fisheries Survey 2013

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Abstract

Eaton Brook Reservoir is a 109 hectare (272 acre) mesotrophic lake located in the Towns of Eaton and Nelson, Madison County. Two sampling efforts were conducted on the lake during 2013: a two-night electrofishing sample in June, and a two-night standard inland gill netting in July. The primary objectives of the survey were to determine the status of the fish community, and to determine if stocked walleye (*Sander vitreus*) and rainbow trout (*Oncorhynchus mykiss*) were recruiting to the fishery. In total, 621 fish were caught, representing 16 species. Largemouth bass (*Micropterus salmoides*) were the most numerous with 172 caught (28% of catch). The next most abundant species was bluegill (*Lepomis machrochirus*) (n=94, 15% of catch), followed by pumpkinseed (*Lepomis gibbosus*) (n= 91, 15% of catch), smallmouth bass (*Micropterus dolomieu*) (n=66, 11% of catch), and chain pickerel (*Esox niger)* (n=61, 10% of catch). Ten walleye and one rainbow trout were also caught (2% and 0.2% of catch each, respectively).

Walleye ranged in size from 436 to 705 mm. No young-of-year (YOY) were captured, which isn't too surprising with the timing of the electrofishing and mesh size of the gill net. However, the lack of any walleye younger than age-5 indicates that survival of recently stocked fish has likely been poor and recruitment has been limited in recent years. Because of this apparent failure to establish a self-sustaining population, consideration should be given to dropping the special walleye regulation of an 18-inch minimum length and 3 fish per day and reinstating the statewide walleye regulation of 15-inch minimum length and 5 day. As walleye will be managed as a secondary sportfish there is no longer a need for special protection.

The primary objective of the rainbow trout stocking is to support a put-and-take fishery, but collection of one larger two-year-old rainbow trout does indicate some summer hold-over is occurring. While water temperatures and DO levels during the July gill netting were sufficient to support trout survival, it is unknown whether these conditions lasted through the rest of the summer period. However, water chemistry sampling conducted in mid-August from 1991 through 1994 (unpublished NYSDEC data) indicates that sufficient oxygen should be available in the thermocline to sustain trout through the end of summer. Survival through the summer months is critical to maximizing angler harvest of stocked trout and justifies the special regulation which allows ice fishing for them.

Though information from Owasco Lake suggests that walleye are major predators on rainbow trout and the stocking of both species in the same water should be avoided (Prindle et al. 2015), we recommend continuing with the current stocking policies for both species in Eaton Brook Reservoir over the next several years. An evaluation of angler effort and catch should be conducted to ascertain the popularity and success of both the walleye and rainbow trout fisheries before any changes are made to the current stocking policies. Ultimately a choice must be made to stock either rainbow trout or walleye, since the stocking of both is not a wise long-term use of these limited resources. Angler input is critical for making this decision.

Introduction

Eaton Brook Reservoir is a 109 hectare (272 acre) mesotrophic lake located in the Towns of Eaton and Nelson, Madison County. It has a maximum depth of 16 m (52 ft) and a mean depth of 7 m (23 ft; Jackson et al. 2003). It is one of numerous area reservoirs that were built to supply water to the Erie Canal. The reservoir supports a two-story fishery and is stocked yearly by the New York State Department of Environmental Conservation (DEC) with 2,000 yearling rainbow trout (*Oncorhynchus mykiss*) and 760,000 walleye (*Sander vitreus*) fry. Rainbow trout were stocked intermittently from 1938-1969, and then annually since 1974. Walleye fry were stocked annually from 1910-1969, and then from 1984 to present. Fingerling walleye were stocked from 1991-1996 and in 2002, as part of a walleye study being conducted by Cornell University (Jackson et al. 2003).

Rainbow trout are managed under a special regulation with an all year open season, any size minimum length, and a daily limit of 5 with no more than 2 longer than 12 inches; ice fishing is permitted. The intent of this regulation is to allow harvest of trout throughout the year, as there is limited holdover potential, and to allow equitable distribution of larger trout. The size limit also maintains consistency with other Madison County trout waters. Walleye are also managed under a special regulation with a minimum length of 18 inches and a daily limit of 3 (statewide regulation is 15-inch minimum length and a daily limit of 5). The initial intent of this more restrictive walleye regulation was to provide additional protection of adult walleye in an effort to establish a self-sustaining walleye population. For all other species statewide regulations apply. There is a DEC boat launch on the reservoir that provides public access for both open water and ice fishing.

The purpose of this survey was to evaluate age, growth, abundance, and predator/prey balance of the reservoir's sportfish community. Additionally, we hoped to determine if stocked rainbow trout are surviving and whether recent year classes of walleye are recruiting.

Methods

Water Chemistry

Surface water temperatures were recorded on June 3rd and 4th, 2013, prior to electrofishing. Temperature and dissolved oxygen (DO) profiles were conducted on July 15th and 16th in 11.9 meters (39 feet) and 11.4 meters (38 feet) of water, respectively, using a YSI meter.

Electrofishing

Eaton Brook Reservoir was electrofished at night on June 3rd and 4th, 2013, following the methods outlined in the Centrarchid Sampling Manual (Green 1989). Eight sites (Figure 1) covering the entire shoreline of the main lake were fished for a total of 4.25 hours of "on-time". The small 8.5 hectare (21 acre) section southwest of Eaton Brook Road was not sampled, as it's inaccessible from the main lake, and there is no formal access. 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 (120 pulses per second) with 3.5 amps and 100 volts was used. Shocking started half an hour before sunset and sampling was conducted along the shoreline in 0.6 m (2 ft) to 1.5 m (5 ft) of water. The crew consisted of a driver and two netters. Four 15-minute "all-fish" runs and four "gamefish-only" runs were conducted. Gamefish-only runs had on-times ranging from 35 to 55 minutes. During the all-fish runs, attempts (within reason) were made to collect every fish that was shocked, while largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), walleye, rainbow trout and chain pickerel (*Esox niger)* were the target species during gamefish runs.

Collected fish were identified to species, and lengths and weights were recorded. For largemouth bass, smallmouth bass, walleye, chain pickerel, bluegill (*Lepomis machrochirus*), pumpkinseed sunfish (*Lepomis gibbosus*), rock bass (*Ambloplotes rupestris*) black crappie (*Pomoxis nigromaculatus*), and yellow perch (*Perca flavescens*), scale samples were collected from five individual fish per 10 mm size increment. Age structure of the unaged sample of fish was estimated based on the frequency of known age fish in each 10 mm size increment.

Gill netting

Six DEC standard inland gill nets (Forney et al. 1994) were set over two nights, July 16th and 17th (Figure 1). 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 in) stretch mesh monofilament netting. Nets were set on the bottom, perpendicular to shore, starting at a nearshore depth of 3 m (10 ft). Depths at the outer end of the nets ranged from 7.6 m (25 ft) to 13.1 m (43 ft). Orientation of gill net mesh size was random, with some set with the largest mesh close to shore and others with the smallest near shore. Gill nets were fished for 18.9 to 22.3 hours.

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Fish Indices

Indices used to assess the status of the fish populations in Eaton Brook Reservoir included electrofishing catch rates, gill net catch rates, growth rates, proportional stock density (PSD), relative stock density (RSD), and relative weight (Wr). PSD is expressed as the percentage of the stock that is of “quality” size; and RSD is expressed as the percentage of the stock that is of “preferred” size (Anderson 1980). Wr is an index of condition that compares the actual weight with a standard weight for fish of the same length (Anderson 1980). Abundance estimates for largemouth and smallmouth bass were derived from regression equations based on spring nighttime electrofishing catch rates from Green (1989).

Results and Discussion

Water Chemistry

During the June 3rd and 4th electrofishing survey, the surface water temperature (68° F) was within the range of 59° to 77° F suggested in the Centrarchid Sampling Manual (Green 1989) (Table 1). The lake was thermally stratified during the July 16th and 17th gill netting with a surface temperature of 79° F and a near-bottom temperature of 51° F at 10.7 m (35 ft). DO levels from the surface to 10.7 m (35 ft) ranged from 7.9 to 3.4 parts per million (ppm) (Figure 2). At the time of the July survey, water temperature and DO levels at 6.1 to 9.1 m (20-30 ft) were sufficient to support rainbow trout.

Species Collected

Overall, 621 fish were caught, representing 16 species (Table 2). This is the same number of species found by SUNY Cobleskill in 2008 (Lord and Johnson 2009), but fewer than the 20 species collected by Cornell University in 2000 (Table 3; Brooking et al. 2001). Largemouth bass were the most numerous with 172 caught (28% of catch). The next most numerous species was bluegill (n=94, 15% of catch), followed by pumpkinseed (n= 91, 15% of catch), smallmouth bass (n=66, 11% of catch), and chain pickerel (n=61, 10% of catch). Ten walleye and one rainbow trout were also caught (2% and 0.2% of catch each, respectively).

Gillnet catches were unexpectedly low (n=68) but the cause for this is unknown. Electrofishing conducted earlier in the year resulted in good catch rates of most species. Two of our six nets were missing one buoy each and the buoy lines had been cut. However, the nets were still straight and didn't appear to have been tampered with, indicating the buoys may have been caught in an outboard motor. In similar DEC gill netting surveys conducted in 1978 and 1979, 240 and 355 fish were caught, respectively. The reservoir had been above normal pool level prior to our survey, as a result of heavy rains. But, had returned to its normal elevation by the start of the survey and water chemistry data showed normal lake stratification for this time of year. All nets were set in 3.1 to 13.1 m (10-43 ft) of water but perhaps fish were in shallower water (>3.1 m) as a result of the recent heavy rains and/or higher lake elevations.

Largemouth bass

Largemouth bass electrofishing catch per unit effort (CPUE) ranged from 16 to 57 fish per hour (fish/h), with an average of 40/h (14 standard deviation, SD) for all size largemouth bass. For largemouth bass ≥ 254 mm (10 in), the average catch was 31/h (SD 15), which is well above the statewide average of 17/h (SD 19; Perry et al. 2014). According to Green (1989), this catch rate yields a first order density estimate of 8.2 largemouth bass ≥254 mm per acre, which indicates a moderate bass population density. This number may be misleading, however, as a significant proportion of the reservoir, approximately 56%, is comprised of water that is 6.1 m (20 ft) or greater. The mean largemouth bass CPUE per gill net (fish/net night) was 0.33/net night (SD 0.82).

Largemouth bass in the 305 mm to 356 mm (12 to 14 in) size range accounted for 48% of the total catch (Figure 3). The resulting largemouth bass PSD was 69, and the RSD_{15} was 15. Anderson (1980) suggests that a balanced bass population has a PSD range of 40 to 70, and RSD_{15} of 10 to 40. No “memorable” or “trophy” length largemouth, as defined by Anderson (1980), were captured (Table 4). The largest largemouth bass collected was 497 mm (19.5 in).

Largemouth bass were in good condition with a mean relative weight (Wr) of 96 (SD 8). This was just below the spring statewide Wr average of 98 (SD 7; Perry et al. 2014). Mean length at age was close to the NYS mean at most ages, but Eaton Brook Reservoir bass were not reaching legal size (≥12 in) until nearly age-5; the NYS mean is age-4 (Figure 4; Green 1989). Age-5 bass were the most abundant year class followed by age-6 (Figure 5). Although largemouth bass were slow growing, which may be a contributing factor for the scarcity of bass ≥ 457 mm (18 in) collected, the other population indices, PSD, RSD_{15}, and Wr would suggest Eaton Brook Reservoir currently has a balanced largemouth bass population and no regulation changes are necessary.

Bluegill

The mean bluegill electrofishing and gill netting CPUEs were 91/h (SD 83) and 0.50/net night (SD 0.82), respectively. Bluegill PSD was 59 and RSD_8 was 24. The PSD just falls within the range of 20 to 60 that would represent a balanced population while the RSD_8 is just slightly above the range of 5 to 20 that represents a balanced bluegill population (Anderson 1985), and would indicate an unbalanced population with a higher percentage of bluegill ≥203 mm (8 in; Figure 6). Though many of the bluegills were of “preferred” size (≥8 in), no bluegills sampled were of “memorable” (≥10 in) or “trophy” (≥12 in) size (Table 4). This situation is indicative of either an overabundant bluegill population or a high harvest rate of memorable or trophy sized bluegills. Given that bluegills were in very good condition with a mean Wr of 105 (SD 14), and mean length at age was consistent with or above the NYS mean (Figure 7), it's safe to assume "stunting" is not an issue. Many definitions of stunting exist, but Heath and Roff (1987) define stunting as a population with drastically reduced growth rates. Age-5 was the most abundant year class of bluegills in the sample (Figure 8). The data suggest that the lack of larger size bluegill in Eaton Brook is most likely related to angler harvest, and not an overabundant population. However, because of the abundance of quality size bluegill (≥ 8 in) there are likely other factors involved, as one would assume that angler harvest would also be impacting those length fish as well.

Pumpkinseed

The mean pumpkinseed electrofishing and gill netting CPUEs were 74/h (SD 45) and 2.8/net night (SD 3.5), respectively. Pumpkinseeds in the 203 mm (8 in) range accounted for 44% of the catch (Figure 9). The resulting PSD was 77 and RSD_8 was 48. As with bluegills, this high PSD and RSD_8 would represent an unbalanced population. And also like with bluegill, no memorable or trophy size fish were collected (Table 4). Pumpkinseeds were in good condition, mean Wr was 101 (SD 12). Mean length at age was at or above the NYS mean for all ages of pumpkinseed (Figure 10). Although, as with bluegills, the data suggest that the lack of memorable and trophy sized pumpkinseeds may be related to angler harvest, it may also be due to poor or varied recruitment. The sample age frequency was dominated by older age fish, ages 8 and 9, while pumpkinseeds in ages 2 to 7 were very poorly represented (Figure 11).

Smallmouth bass

The mean smallmouth bass electrofishing CPUE was 14.4/h (SD 16), for all sizes. For smallmouth bass ≥254 mm (10 in), the average catch was 12.9/h (SD 15). This CPUE is 3.2 times greater than the statewide smallmouth mean CPUE of 4/h (SD 8; Perry et al. 2014). According to Green (1989), this catch rate yields a first order density estimate of 2.2 smallmouth bass ≥254 mm per acre, which indicates a moderate smallmouth bass population density. The mean smallmouth bass CPUE per gill net was 0.83/net night (SD 1.3).

Smallmouth bass were on the thin side, with a mean Wr of 89 (SD 8). Though low, this Wr is only slightly below the statewide smallmouth spring mean Wr of 90 (SD 8; Perry et al. 2014). The Wr index uses a range of 95 to 105 as the benchmark for fish in good condition (Pope and Kruse 2007). Bass in the 330 mm to 356 mm (13 and 14 in) range were the most frequently collected, and combined they accounted for 50% of the catch (33 of 66; Figure 12). The resulting PSD was 89 and RSD_{14} was 50, this high PSD and RSD_{14} represents an unbalanced population with a high percentage of large (≥279 mm) fish. Though many of the bass were over 279 mm (11 in), only five smallmouth were of memorable size (≥17 in) and none were trophy size (≥20 in; Table 4). Smallmouth bass growth rates were good with mean length at age at or slightly below the NYS mean for all ages; with bass reaching legal size between years 4 and 5 (Figure 13). Age-6 fish were the most abundant (Figure 14). The "unbalanced" population is most likely due to this strong age-6 year class of 350 to 356 mm fish.

Chain pickerel

Chain pickerel mean electrofishing CPUE for all size pickerel was 13.4/h (SD 9.2), and the mean gill net fish/net night was 0.50 (SD 0.84). The mean electrofishing CPUE for "quality" size pickerel (≥15 in) was 9.4/h (SD 7.8). Pickerel lengths ranged from 178 to 533 mm (7 to 21 in), with the majority (72%) being at or above legal size (≥15 in; Figure 15). Two pickerel were of preferred size (≥20 in), and no pickerel were collected of memorable (≥25 in) or trophy size (≥30 in; Table 4). Pickerel were on the thin side with a mean Wr of 87 (SD 7). No age frequency was done as scale based age analysis for chain pickerel is generally unreliable.

When comparing predator abundance, chain pickerel appear to comprise a major component of the Eaton Brook Reservoir fish community, and many of the pickerel are of quality size or larger. The mean electrofishing CPUE of 9.4/h for quality size pickerel is comparable to nearby Lake Moraine, which is often considered a good chain pickerel angling destination. Everard (2015) found a mean electrofishing CPUE of 10.6/h (SD 6.4) for quality size pickerel on Lake Moraine in 2014. These quality size pickerel can offer a good angling opportunity, and are most likely an underutilized resource by Eaton Brook anglers.

Rock bass

The mean rock bass electrofishing and gill netting CPUEs were 33/h (SD 17) and 0.67/net night (SD 1.2), respectively. Rock bass in the 203 mm (8 in) range accounted for 35% of the catch (Figure 16). The resulting PSD was 64 and RSD_9 was 12. As with the other "sunfish", no memorable or trophy size rock bass were collected (Table 4). Rock bass were in good condition with a mean Wr of 104 (SD 7).

Yellow perch

The yellow perch mean electrofishing and gill netting CPUE was 17/h (SD 16) and 2.8/net night (SD 3.3), respectively. Electrofishing catch rates of >15 yellow perch/h (but <50/h) would suggest a moderate abundance, while a gill net catch of <5 yellow perch/net would suggest that perch abundance is low (Forney et al. 1994). Yellow perch mean length at age-4 was 164 mm (6 in) which indicates slow growth. Slow growth is usually a symptom of intense inter- or intra-specific competition (Forney et al. 1994), and can suggest high yellow perch abundance. This contradicts the electrofishing and gill net CPUE that suggest moderate and low abundance. Considering that overall gill net catch rates were low for all species, Eaton Brook Reservoir likely has a moderate to high abundance of yellow perch.

Yellow perch were on the thin side with a mean Wr of 88 (SD 8). Although thin, 52% of yellow perch in our sample were of quality size, 8 inches or larger (Figure 17). Perch PSD was 60 and RSD_{10} was 40 indicating the population has a considerable proportion of "keeper" size fish. Of the stock size yellow perch collected, 13% (4) were of memorable size, which is 12 inches or larger (Table 4). Yellow perch mean size at age was highly variable, with some age classes being equal to the NYS mean while others were above or below it (Figure 18).

Walleye

Only 10 walleye were collected during the survey yielding electrofishing and gill netting mean CPUEs of 1.2/h (SD 2.1) and 0.83/net night (SD 1.1), respectively. Both CPUEs suggest a low abundance of walleye (Forney et al. 1994). We can also compare growth rates of walleye when trying to determine abundance, specifically, the mean length at age-4. As no age-4 walleye were collected during the survey (Figure 19), back-calculation was used to determine the average age-4 mean length of 403 mm (15.9 in) for the 10 aged walleye in the sample (Table 5). For NY State populations, a mean length at age-4 of 457 mm (18 in) would suggest low abundance, while a mean length of 380 mm (15 in) would suggest high abundance (Forney et al. 1994). So, there is discrepancy in abundance estimates with the electrofishing and gill netting CPUE showing low abundance and mean length at age-4 suggesting moderate to high abundance. It should be noted that fall electrofishing catch rates for walleye are generally higher than those for spring (Forney et al. 1994) so the observed electrofishing catch rate likely underestimates the walleye density. Also, as mentioned previously, the gill net catch rates were unexpectedly low for all species and were thus likely underestimating the walleye population density as well. Although walleye populations are probably more abundant than the catch rates are showing on Eaton Brook Reservoir, they are still almost certainly in the low to moderate range.

Walleye were in fair condition with a mean Wr was 91 (SD 8). As only ten walleye were collected, the data set was not sufficient to calculate an accurate PSD and RSD_{20}. Walleye ranged in size from 436 to 705 mm (17.1 to 27.7 in; Figure 20). No young-of-year (YOY) were captured, which isn't too surprising with the timing of the electrofishing and mesh size of the gill net. One of the objectives of the survey was to determine if recent year classes of walleye were recruiting. No age 1-to 4-year old walleye were captured, indicating little walleye recruitment in recent years. Since 2000, walleye fry stocking rates have ranged from 760,000 to 1.27 million with the policy being permanently set at 760,000 since 2011. Eaton Brook Reservoir appears to have an abundance of potential walleye fry and fingerling 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 in; Jackson et. al. 2003). The average combined electrofishing catch rate for largemouth bass and chain pickerel >381 mm was 14.5 fish/h, indicating that we would expect survival of stocked walleye to be low. Though walleye recruitment appears to have been low in recent years, the presence of the older aged walleye shows the potential for recruitment.

Black crappie

Black crappie were poorly represented, with only one being collected in each sampling gear. The two collected were 232 and 274 mm (7.9 and 10.8 in) and in good condition with a mean Wr of 102 (SD 3). Though there have been reports from anglers having some good success crappie fishing on Eaton Brook Reservoir, it would appear that black crappie are a minor component of the lakes fishery. It should be noted that crappie can often be difficult to collect with the two gear types used. Trap nets are generally considered a more effective gear for collecting crappie.

Rainbow trout

With the near shore water temperature being 67-68^{o} F, during our electrofishing survey, it was not surprising that no rainbow trout were collected. One 325 mm (12.8 in) rainbow was collected during the gill netting survey and was aged at two years old. This fish would have been from the 2012 stocking and shows there is at least some holdover. The rainbow trout was a little on the "skinny" side though, with a Wr of 86. The reservoir's trout fishery is primarily a put-and-take fishery, but collection of the one two-year-old rainbow trout does indicate some summer hold-over is occurring. While water temperatures and DO levels during the July gill netting were sufficient to support trout survival, it is unknown whether these conditions lasted through the rest of the summer period. However, water chemistry sampling conducted in mid-August from 1991 through 1994 (unpublished NYSDEC data) indicates that sufficient oxygen should be available in the thermocline to sustain trout through the end of summer. Survival through the summer months is critical to maximizing angler harvest of stocked trout and justifies the special regulation which allows ice fishing for them.

Other Fishes

Sixteen brown bullhead (*Amerius nebulosis*) were collected with an average size of 329 mm (12.9 in). Five "non-sport fish" were also collected with golden shiner (*Notemingonus crysoleucas*) being most numerous (Table 2). The other non-sport fish were emerald shiner (*Notropis atherinoides*), spottail shiner (*Notropis hudsnius*), white sucker (*Catostomus commersoni*) and tessellated darter (*Etheostoma olmstedi*). These species, along with bluegill, pumpkinseed sunfish and yellow perch, are prey for the Eaton Brook Reservoir predatory species.

Recommendations

Management recommendations based on the results of this survey are:

- Continue the current walleye fry stocking policy. If at some point, pond fingerlings or 50-day fry become more readily available, the department should consider stocking these larger sized walleye. Jackson et al. (2003) found moderate success with pond fingerling walleye stocking on Eaton Brook Reservoir during the 1991-1996 walleye study.
- Continue with the current yearling rainbow trout stocking policy.
- An evaluation of angler effort and catch should be conducted to ascertain the popularity and success of both the walleye and rainbow trout fishery before any changes are made to the current stocking policies. This will help to determine whether future trout or walleye stocking is warranted. Ultimately a choice must be made to stock either rainbow trout or walleye, since the stocking of both is not a wise long-term use of these limited resources. Consideration is still being given to which angler survey method(s) would be most efficient to obtain the data. One example would be post card questionnaires placed at the Eaton Brook boat launch site and at the unofficial shore access location along Eaton Brook Road. An angler survey will be initiated in April 2017.
- Fall electrofishing will be conducted in 2016 for YOY walleye to monitor the spring fry stocking in an attempt to document some recruitment.
- As natural reproduction of walleye appears to be limited, consideration should be given to reinstating the statewide walleye regulation of 15-inch minimum length and 5 per day.
- Continue with current special regulation for trout, and statewide angling regulations for all other species.
- Repeat the Centrarchid and General Biological Survey again in 2022. Survey methods used should be similar to the 2013 survey and include a spring Centrarchid electrofishing survey covering the entire shoreline and a summertime standard inland gill netting survey.

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References

Anderson, R. O. 1980. Proportional stock density (PSD) and relative weight (Wr): Interpretive indices of fish populations and communities. pp. 27-35. In: S. Gloss and B. Shupp (eds.) Practical fisheries management: More with less in the 1980's. Proceedings 1st annual workshop of New York chapter American Fisheries Society.

Anderson, R. O. 1985. Managing ponds for good fishing. Columbia: University of Missouri Extension Division.

Brooking, T.E., J.R. Jackson, L.G. Rudstam and A.J. VanDeValk. 2001. Factors affecting survival of stocked walleye in New York lakes: Progress report 1991-2000. New York State Department of Environmental Conservation, Albany.

Brooking, T.E., A.J. VanDeValk, L.G. Rudstam, and M.H. Olson. 1997. Five year summary of factors affecting survival of stocked walleye in New York lakes, 1992-1996. New York Federal Aid Study VII, Job 102. New York State Department of Environmental Conservation, Albany.

Forney, J.L., L.G. Rudstam, D.M. Green, and D.L. Stang. 1994. Percid sampling manual. New York State Department of Environmental Conservation, Albany, NY.

Everard, J.F. 2015. Lake Moraine Fisheries Survey 2014. New York State Department of Environmental Conservation, Cortland, NY.

Green, D.M. 1989. Centrarchid Sampling Manual. New York State Department of Environmental Conservation, Albany, NY.

Green, D.M., T.E. Brooking, J.L. Forney, and T. Greig. 1993. Evaluation of the effects of exploitation on the structure of panfish populations, N.Y. federal aid study VII, NYSDEC Report.

Heath, D.D. and Roff, D.A. 1987. Test of Genetic Differentiation in Growth of Stunted and Nonstunted Populations of Yellow Perch and Pumpkinseed. Transactions of the American Fisheries Society 116:1, 98-102.

Jackson, J.R., T.E. Brooking, A.J. VanDeValk, and L.G. Rudstam. 2003. Factors Affecting Walleye in New York Lakes. Cornell Warmwater Fisheries Unit. Cornell University Biological Field Station. Bridgeport, NY.

Lord, P.H. and R.L Johnson. 2009. Year 5: Monitor and evaluate herbivorous insect impacts on Eurasian watermilfoil (*Myrophyllum spiacatum*) growth in Lebanon Reservoir in conjunction with stocking of walleye (*Sander vitreus*) and smallmouth bass (*Micropterus dolomieu*). 2008 Rpt. for Madison County Planning Department. Cornell University Research ponds, Dept. of Ecol & Evol Bio. Cornell University, Ithaca, NY 14853.

Perry, P.C., J.J. Loukmas, W.L. Fisher, P.J. Sullivan, and J.R. Jackson. 2014. Characterizing the status of black bass populations in New York. Final Report. New York State Department of Environmental Conservation, Albany, NY.

Prindle, S.E., D.K. Lemon, and D.L. Bishop. 2015. Owasco lake Angler Opinion Survey 2013. New York State Department of Environmental Conservation, Cortland, NY.

Pope, K.L. and C.G. Kruse. 2007. Condition. Pages 423-471 in C.S. Guy and M.L. Brown, editors. Analysis and Interpretation of Freshwater Fisheries Data. American Fisheries Society, Bethesda, Maryland.

Table 1. 2013 Water Chemistry Eaton Brook Reservoir (Madison County).

Date	Air Temp (Fahrenheit)	Depth (Feet)	Water Temp (Fahrenheit)	DO (ppm)	pH	Conductivity (umho/cm3)
6/3/2013		0	68.1	8.0	8.4	181
6/4/2013		0	67.8	8.2	8.5	212
7/15/2013	85	0	79.7	7.6	7.4	
		5	79.1	7.3		
		10	76.2	7.7		
		15	69.4	6.5		
		20	63.6	6.7		
		25	57.1	6.2		
		30	52.3	4.4		
		35	50.6	3.4		
7/16/2013	83	0	79.2	7.9	8	
		5	78.3	7.5		
		10	75.7	7		
		15	70.0	6.3		
		20	63.0	6.2		
		25	57.2	5.4		
		30	52.5	4.2		
		35	50.8	3.4		

Table 2. Number of fish collected in 2013 at Eaton Brook Reservoir (Madison County).

Species	Scientific name	Electrofishing	Gill netting	Sum	Sum percent
Chain Pickerel	*Esox niger*	57	3	60	10%
Golden shiner	*Notemigonus crysoleucas*	12	8	20	3%
Emerald Shiner	*Notropis atherinoides*	10	0	10	2%
Spottail Shiner	*Notropis hudsnius*	4	0	4	1%
White Sucker	*Catostomus commersoni*	1	2	3	0%
Brown Bullhead	*Ameirus nebulosis*	16	0	16	3%
Rock Bass	*Ambloplities rupestris*	33	4	37	6%
Pumpkinseed	*Lepomis gibbosus*	74	17	91	15%
Bluegill	*Lepomis macrochirus*	91	3	94	15%
Smallmouth Bass	*Micropterus dolomieu*	61	5	66	11%
Largemouth Bass	*Micropterus salmoides*	170	2	172	28%
Black Crappie	*Pomoxis nigromaculatus*	1	1	2	0%
Tessellated Darter	*Etheostoma olmstedi*	1	0	1	0%
Yellow Perch	*Perco flavescens*	17	17	34	5%
Walleye	*Sander vitreus*	5	5	10	2%
Rainbow Trout	*Oncorhynchus mykiss*	0	1	1	0%
	Total	**553**	**68**	**621**	

Table 3. Species of fish collected by electrofishing at Eaton Brook Reservoir by Cornell University (Fall 2000) SUNY Cobleskill (Fall 2008) and NYSDEC (Spring 2013).

Species	Scientific name	Cornell 2000	Cobleskill 2008	NYSDEC 2013
Chain Pickerel	*Esox niger*	X		X
Common Carp	*Cyprinus carpio*		X	
Golden shiner	*Notemigonus crysoleucas*	X	X	X
Emerald Shiner	*Notropis atherinoides*	X	X	X
Spottail Shiner	*Notropis hudsnius*	X	X	X
Bluntnose Minnow	*Pimephales notatus*	X		
Rudd	*Scardinius erythrophthalmus*	X		
White Sucker	*Catostomus commersoni*	X		X
Brown Bullhead	*Ameirus nebulosis*	X	X	X
Madtom	*Noturus insignis*	X		
Banded Killifish	*Fundulus diaphanus*	X	X	
Rock Bass	*Ambloplities rupestris*	X	X	X
Pumpkinseed	*Lepomis gibbosus*	X	X	X
Bluegill	*Lepomis macrochirus*	X	X	X
Smallmouth Bass	*Micropterus dolomieu*	X	X	X
Largemouth Bass	*Micropterus salmoides*	X	X	X
Black Crappie	*Pomoxis nigromaculatus*	X	X	X
Tessellated Darter	*Etheostoma olmstedi*	X	X	X
Yellow Perch	*Perco flavescens*	X	X	X
Walleye	*Sander vitreus*	X	X	X
Rainbow Trout	*Oncorhynchus mykiss*	X		X
Unknown			X	
	Total species	**20**	**16**	**16**

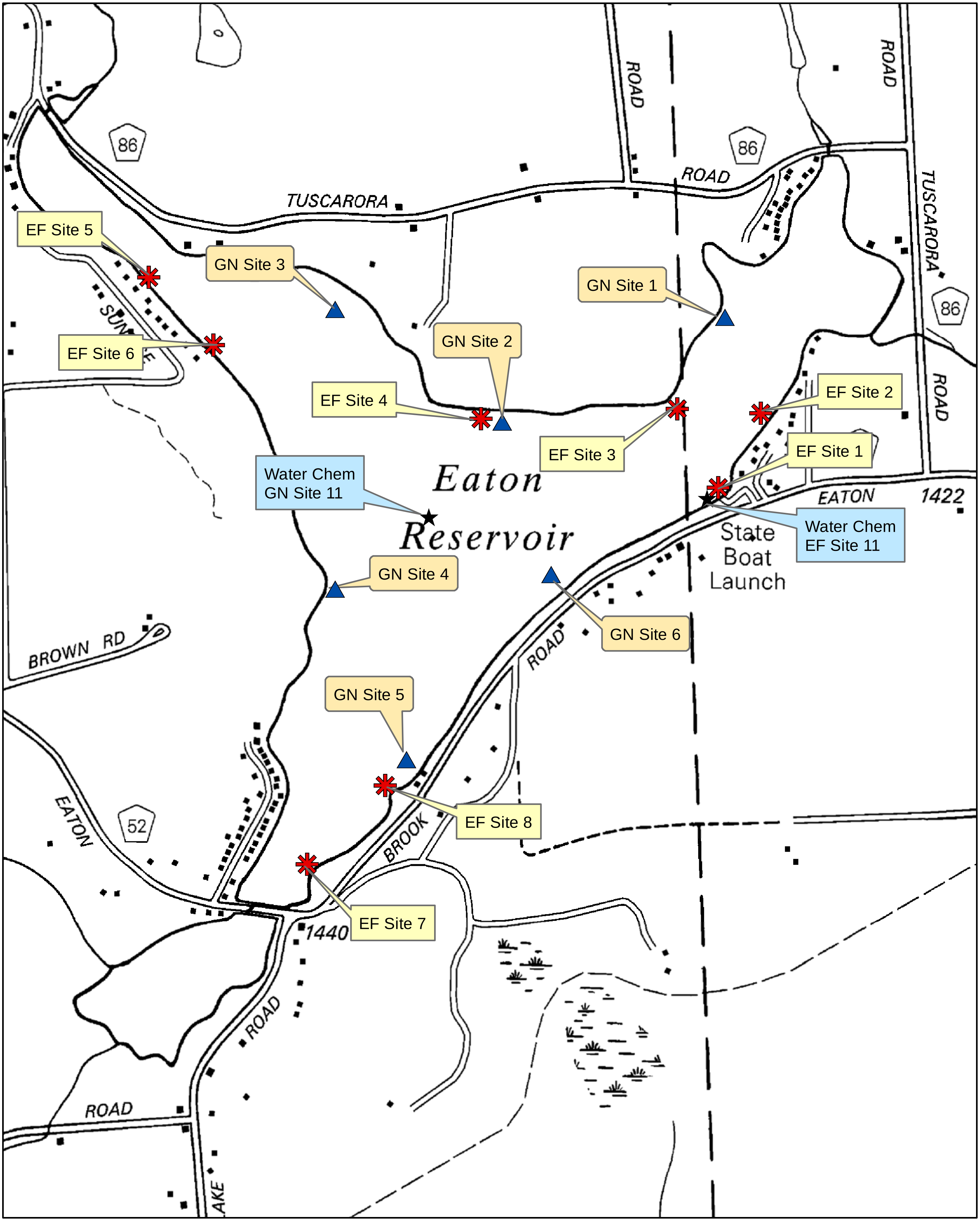
Table 4. Number of fish collected of stock, quality, preferred, memorable and trophy lengths in 2013 during electrofishing and gill netting surveys on Eaton Brook Reservoir(Madison County).

	FREQ	Stock		Quality		Preferred		Memorable		Trophy	
Chain pickerel	60	53	(10)	43	(15)	2	(20)	0	(25)	0	(30)
Rock bass	37	33	(4)	21	(7)	3	(9)	0	(11)	0	(13)
Pumpkinseed	91	91	(3)	71	(6)	46	(8)	0	(10)	0	(12)
Bluegill	94	90	(3)	58	(6)	22	(8)	0	(10)	0	(12)
Smallmouth bass	66	64	(7)	57	(11)	37	(14)	5	(17)	0	(20)
Largemouth bass	172	154	(8)	108	(12)	23	(15)	0	(20)	0	(25)
Black crappie	2	2	(5)	2	(8)	1	(10)	0	(12)	0	(15)
Yellow perch	34	30	(5)	18	(8)	12	(10)	4	(12)	0	(15)
Walleye	10	10	(10)	10	(15)	4	(20)	1	(25)	0	(30)
Rainbow trout	1	1	(10)	0	(16)	0	(20)	0	(26)	0	(31)

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

Table 5. 2013 Eaton Brook Reservoir Walleye mean back-calculated length (mm) at age (number of fish in parenthesis).

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Back-calculated	162 (10)	269 (10)	352 (10)	403 (10)	453 (10)	481 (9)	514 (7)	550 (5)	593 (3)	631 (2)	652 (2)	705 (1)
NYS Mean	192	302	378	421	462	496	512					



Fiigure 1. Site locations for electrofishing (EF), gill netting (GN) and water chemistry at Eaton Brook Reservoir 2013.

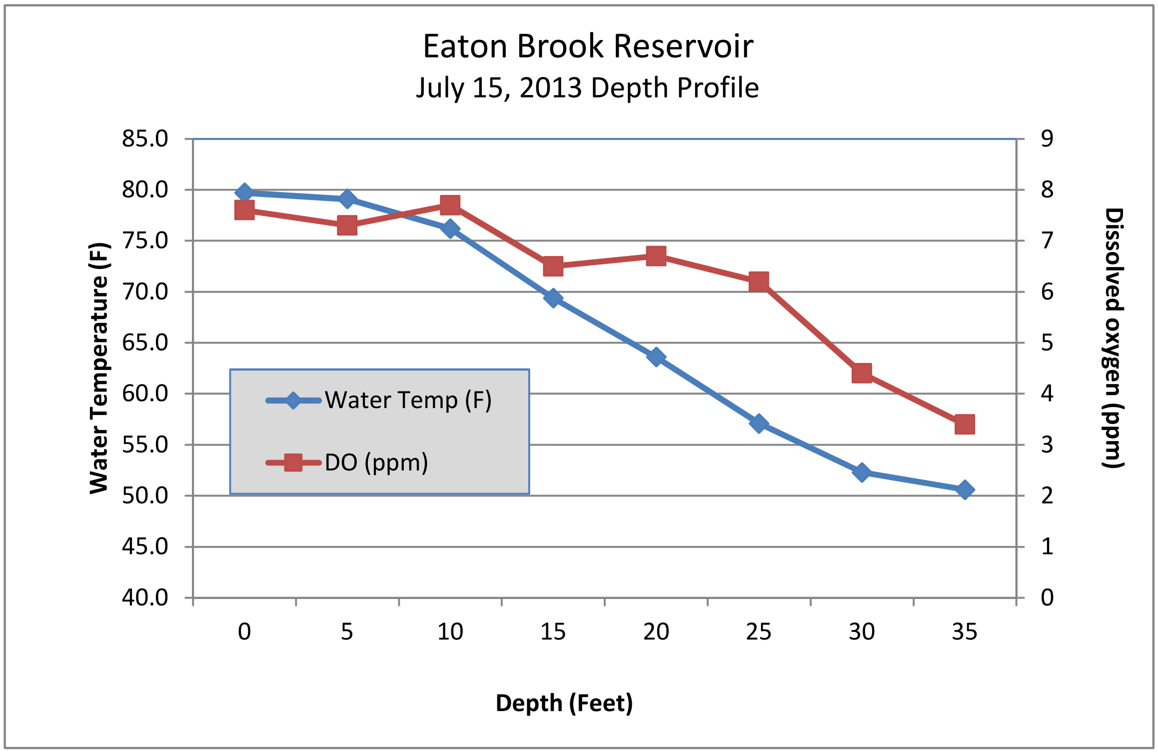


Figure 2. Eaton Brook Reservoir temperature and dissolved oxygen profile July15, 2013.

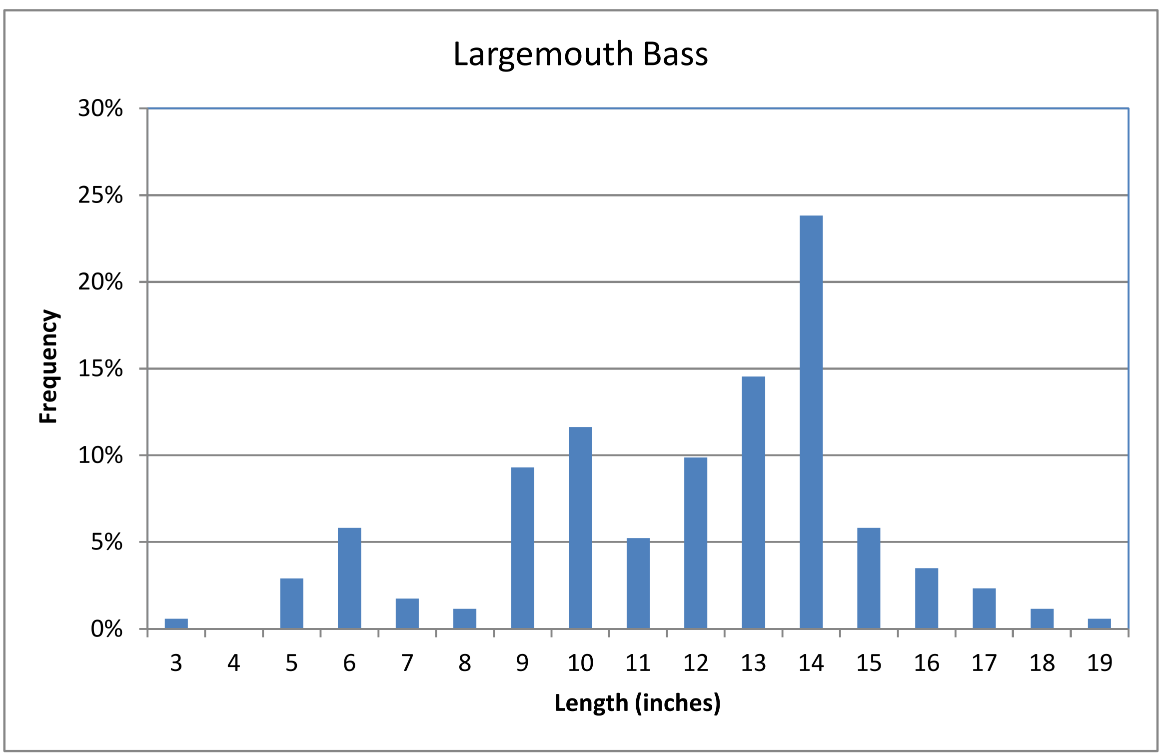


Figure 3. Length frequency distributions of largemouth bass sampled in Eaton Brook Reservoir 2013.

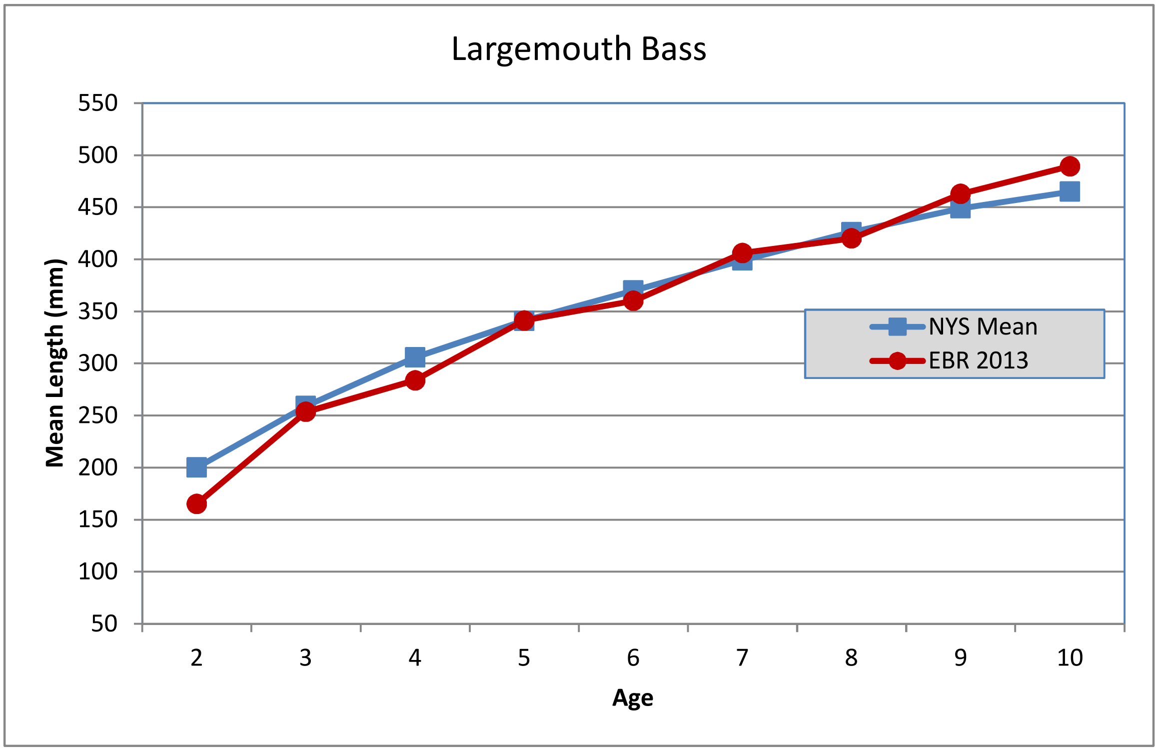


Figure 4. 2013 Eaton Brook Reservoir largemouth bass mean lengths (mm) at age and the New York State mean growth rate (Green 1989).

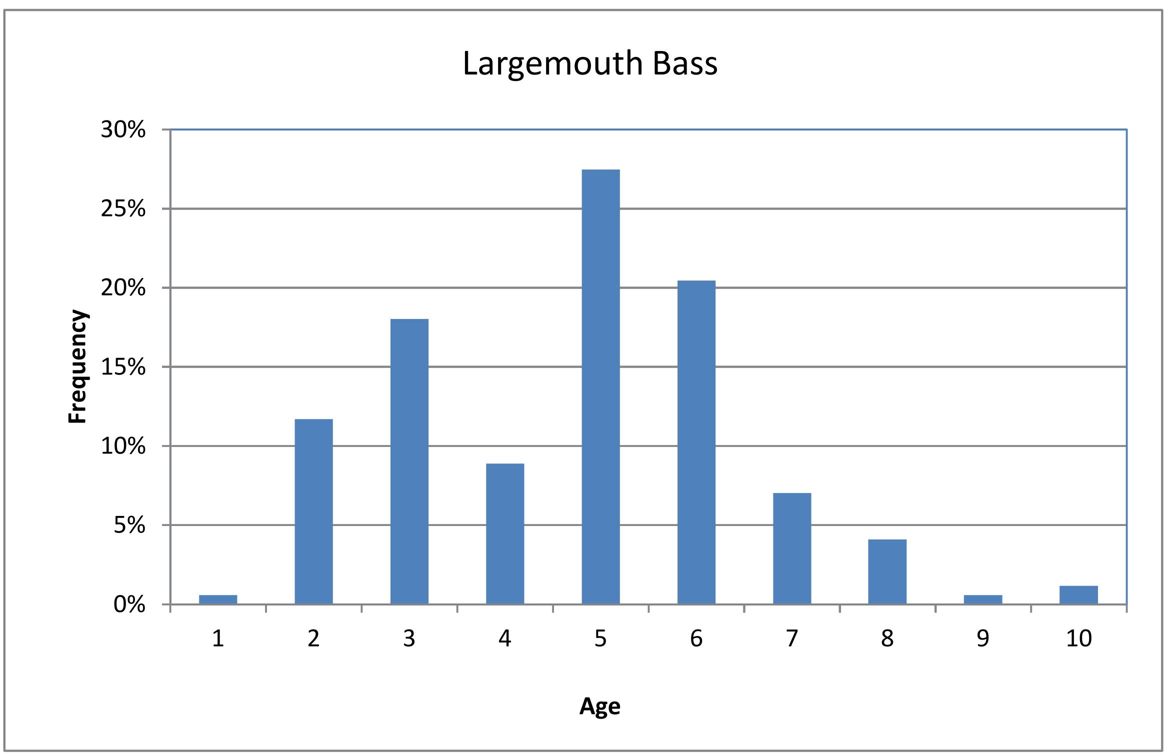


Figure 5. Age frequency distributions of largemouth bass sampled in Eaton Brook Reservoir 2013.

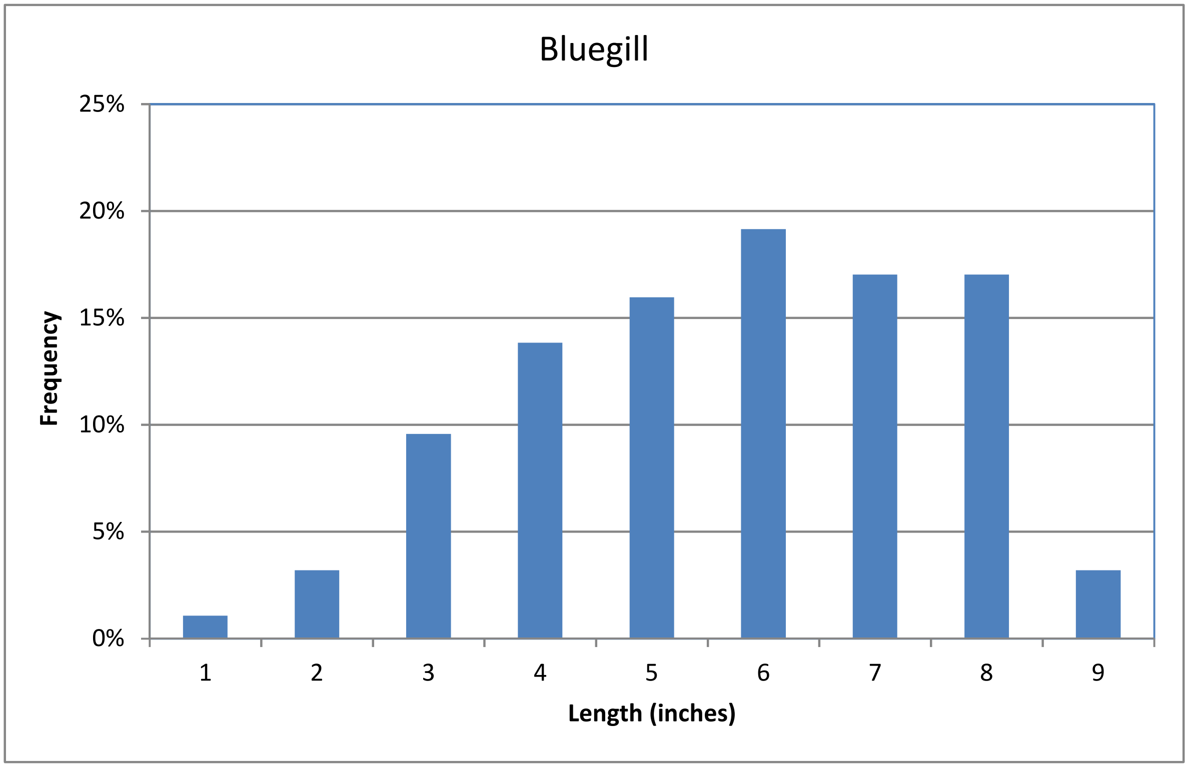


Figure 6. Length frequency distributions of bluegill sampled in Eaton Brook Reservoir 2013.

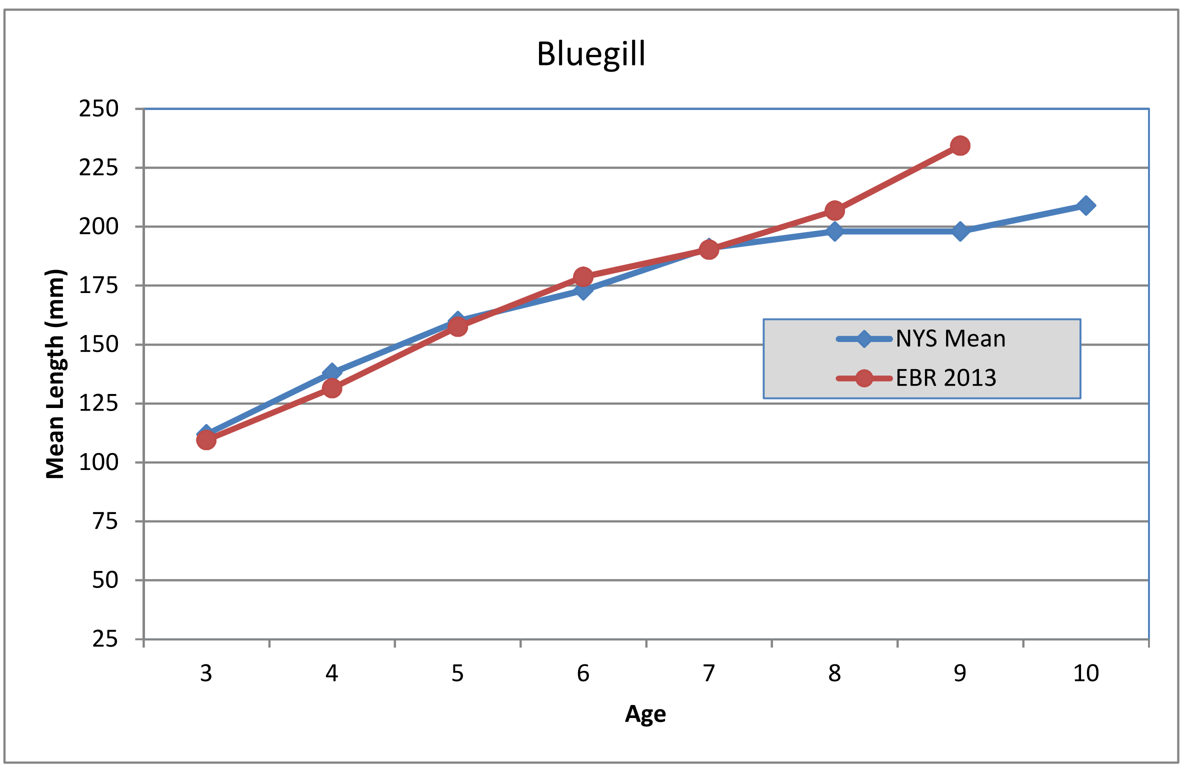


Figure 7. 2013 Eaton Brook Reservoir bluegill mean lengths (mm) at age and the New York State mean growth rate (Green 1989).

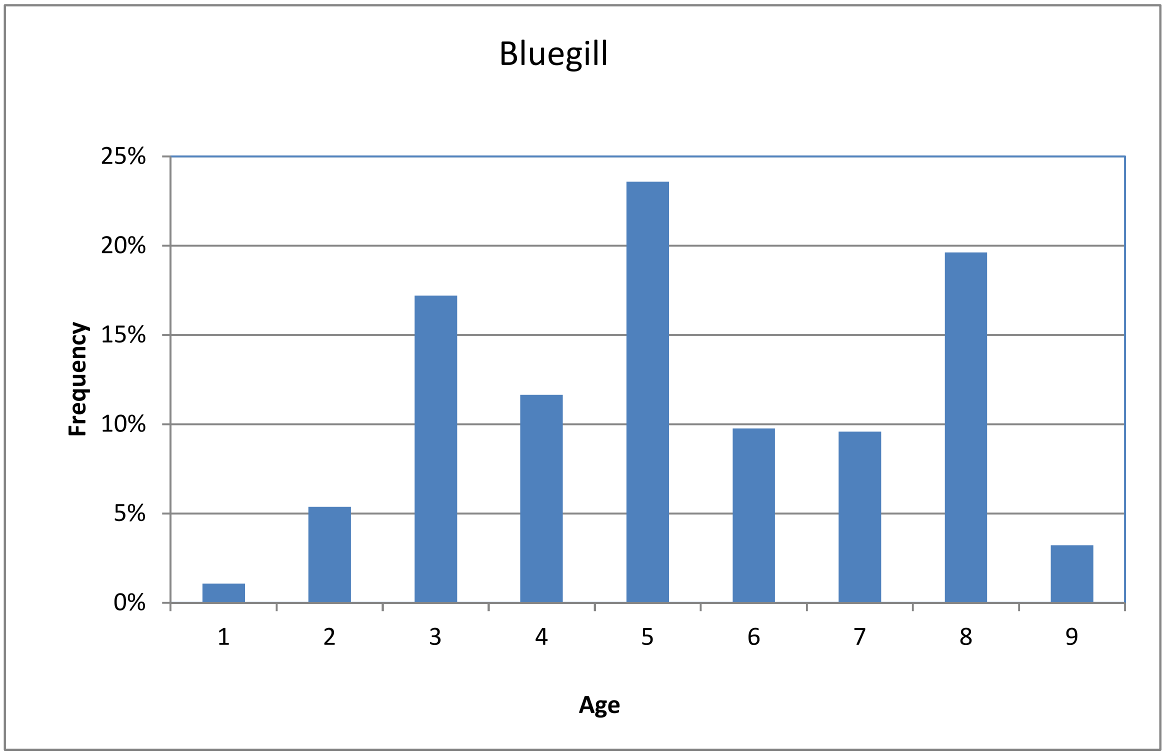


Figure 8. Age frequency distributions of bluegill sampled in Eaton Brook Reservoir 2013.

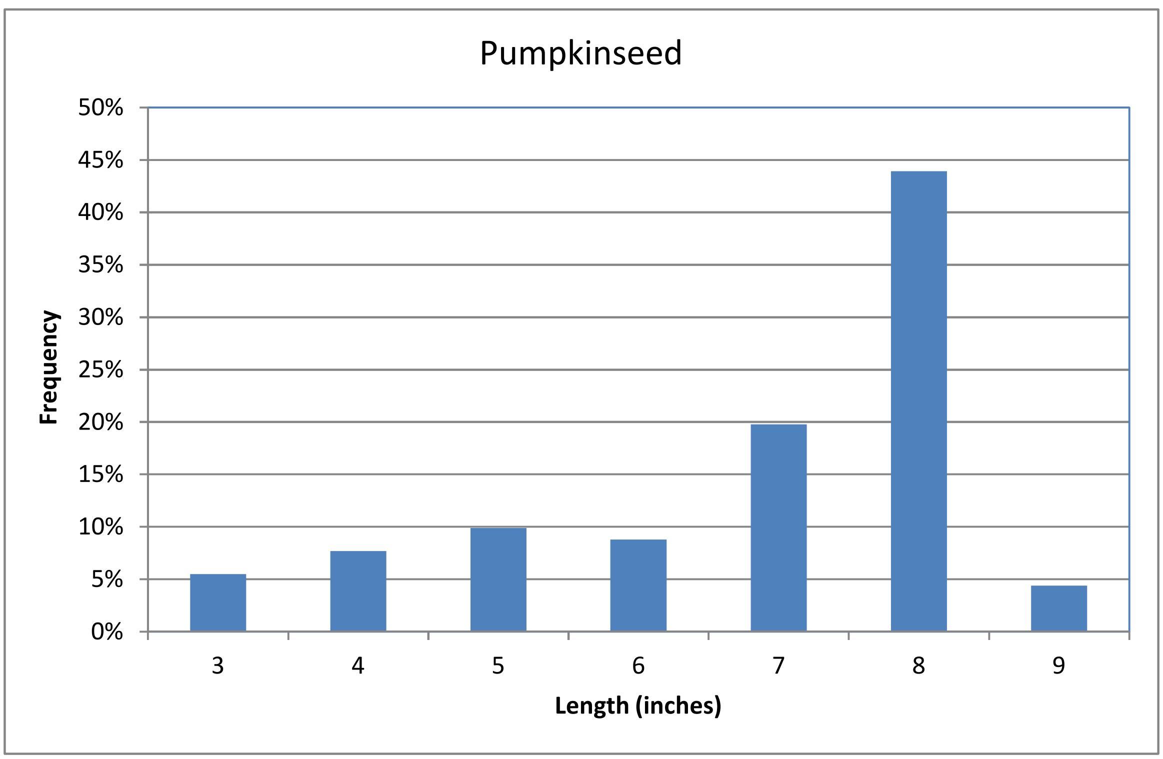


Figure 9. Length frequency distributions of pumpkinseeds sampled in Eaton Brook Reservoir 2013.

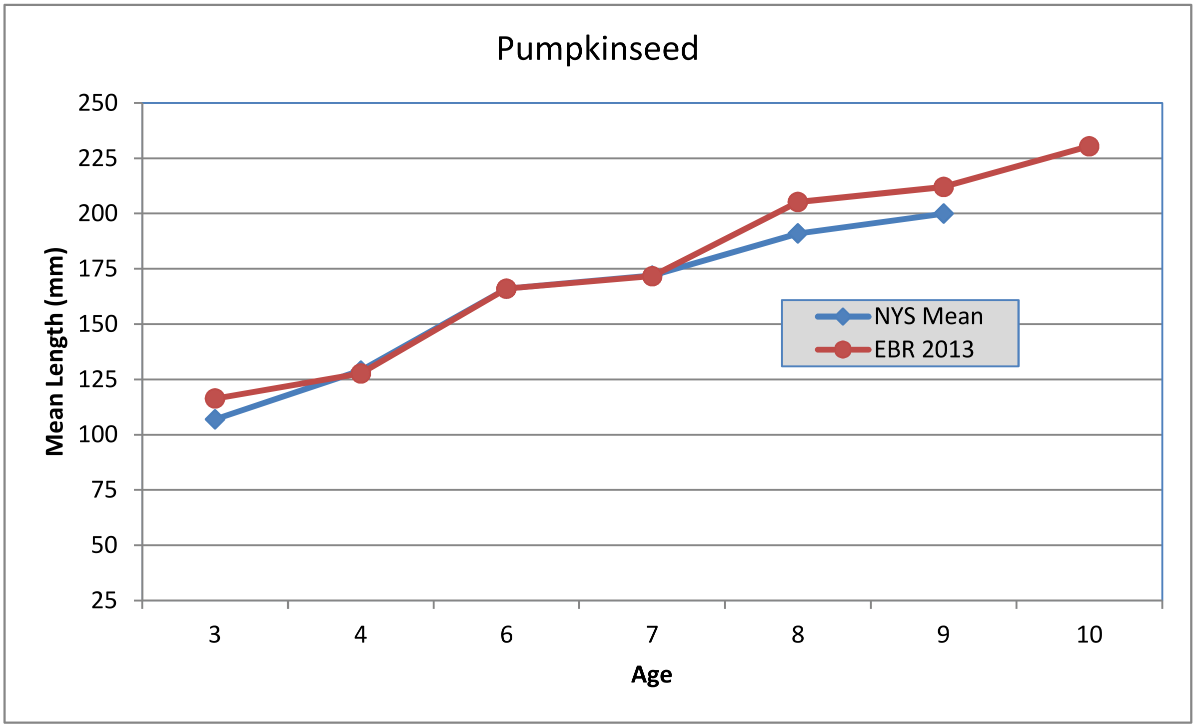


Figure 10. 2013 Eaton Brook Reservoir pumpkinseed mean lengths (mm) at age and the New York State mean growth rate (Green 1989).

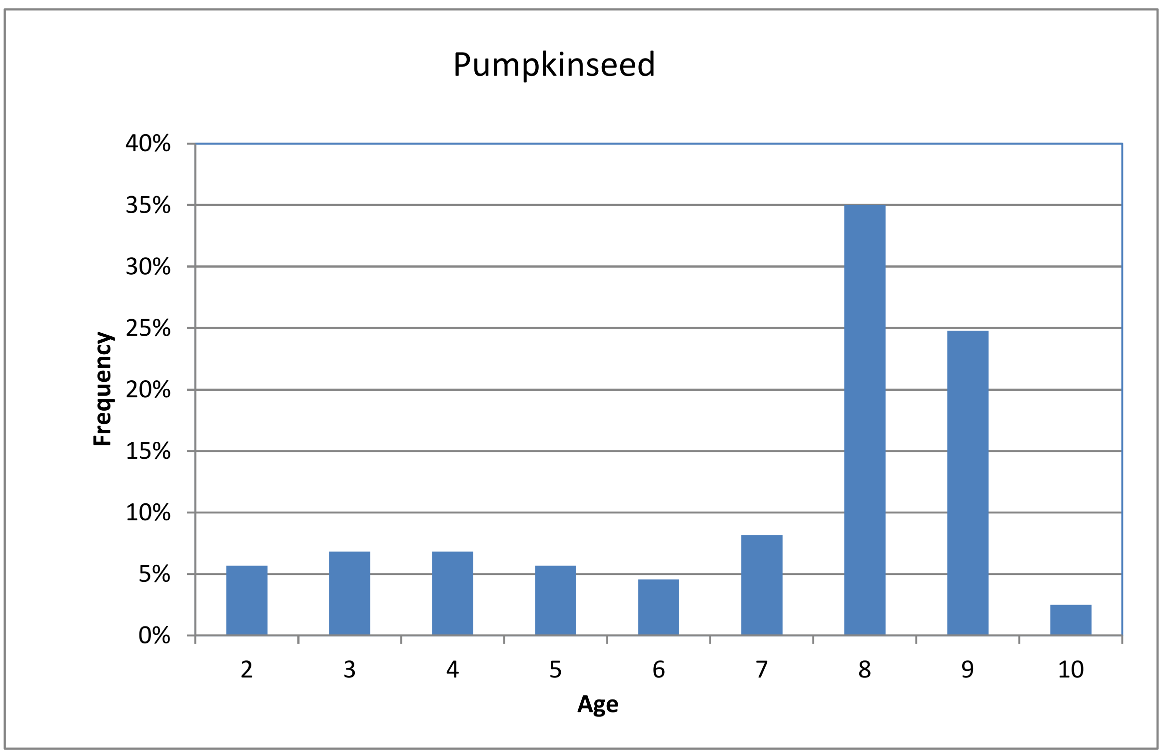


Figure 11. Age frequency distributions of pumkinseed sunfish sampled in Eaton brook Reservoir 2013.

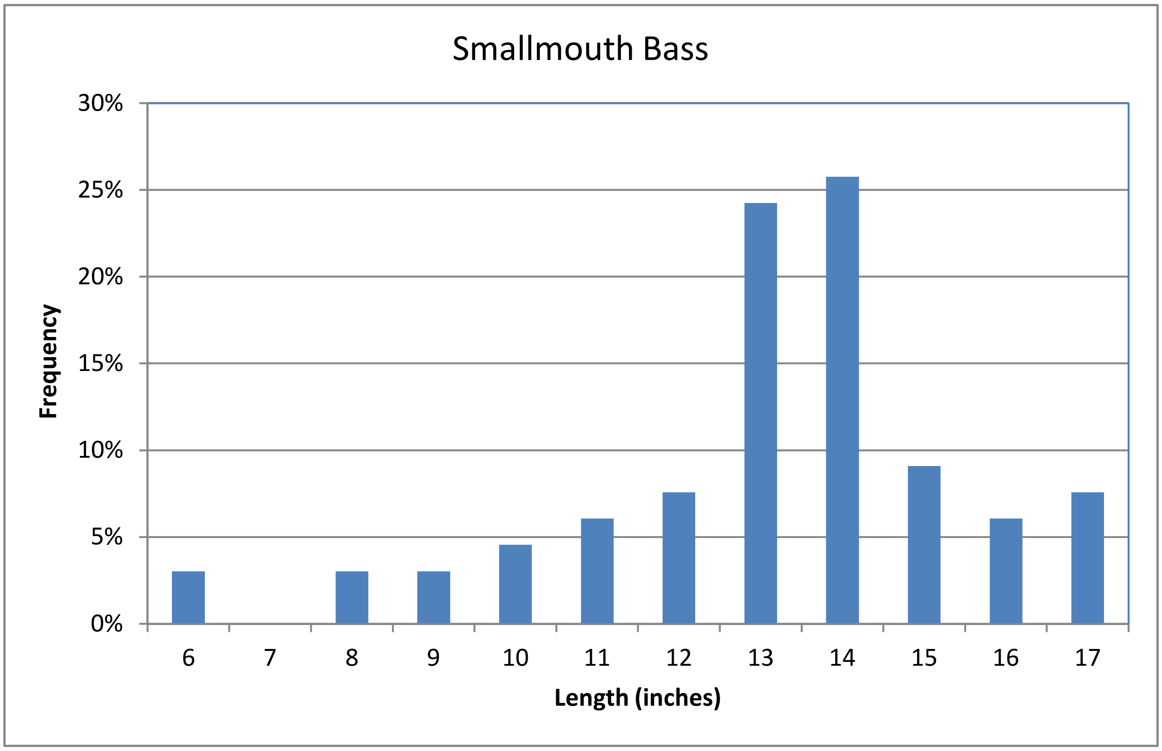


Figure 12. Length frequency distributions of smallmouth bass sampled in Eaton Brook Reservoir 2013.

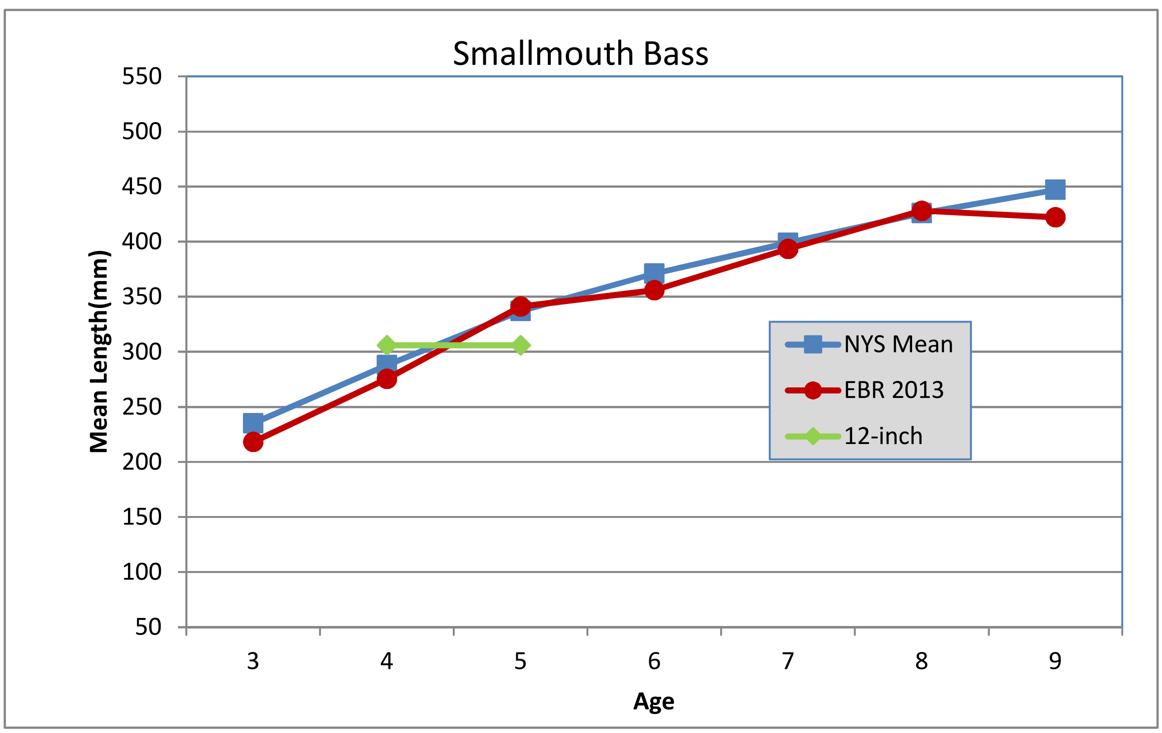


Figure 13. 2013 Eaton Brook Reservoir smallmouth bass mean lengths (mm) at age and the New York State mean growth rate (Green 1989) and the 12-inch legal size length.

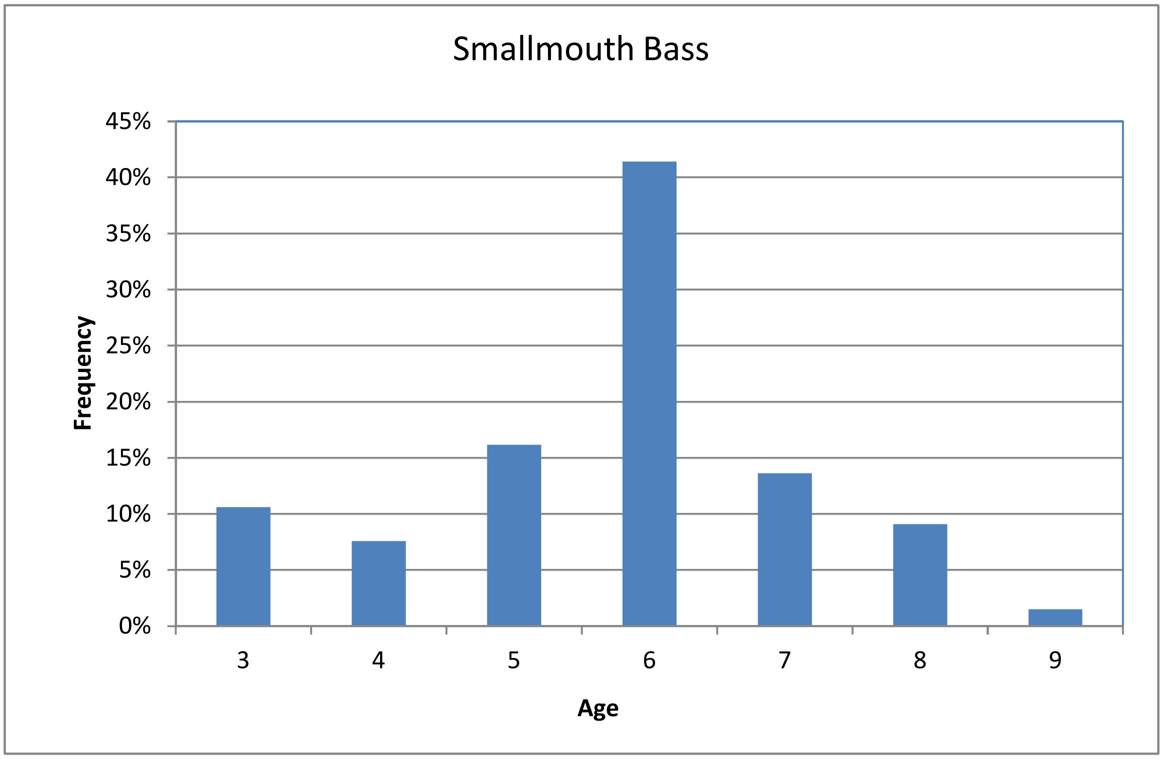


Figure 14. Age frequency distributions of smallmouth bass sampled in Eaton Brook Reservoir 2013.

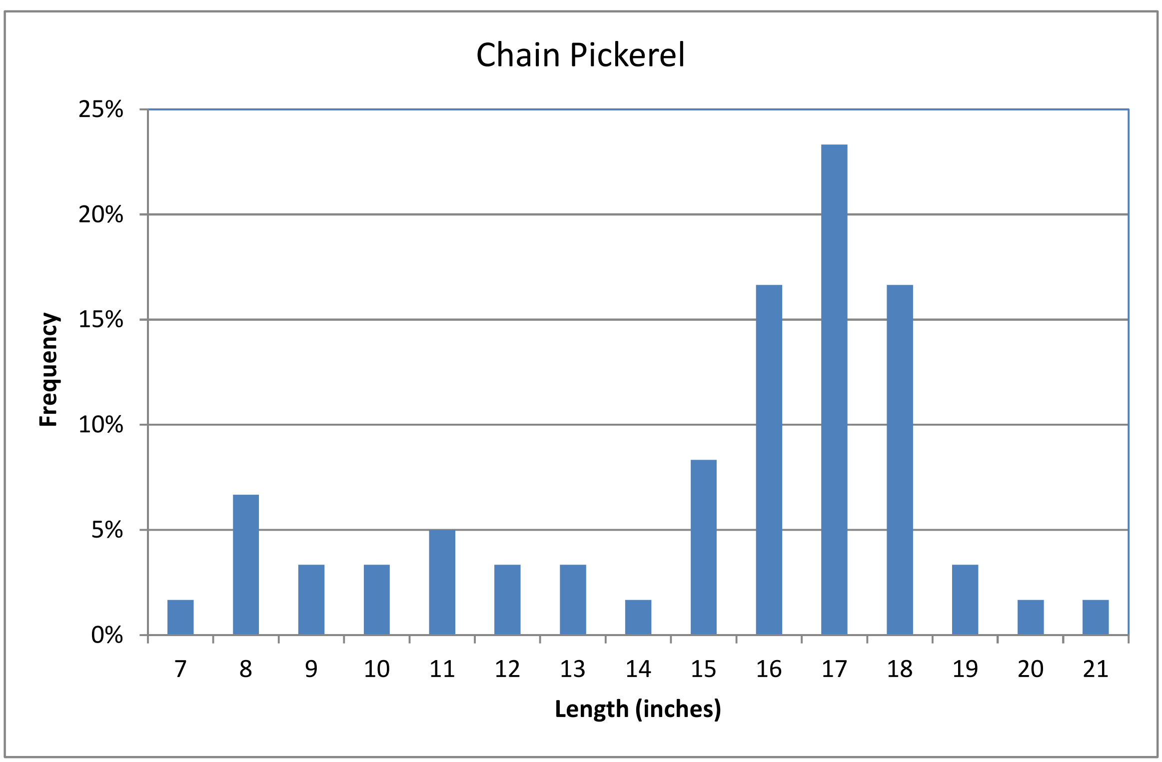


Figure 15. Length frequency distributions of Chain Pickerel sampled in Eaton Brook Reservoir 2013.

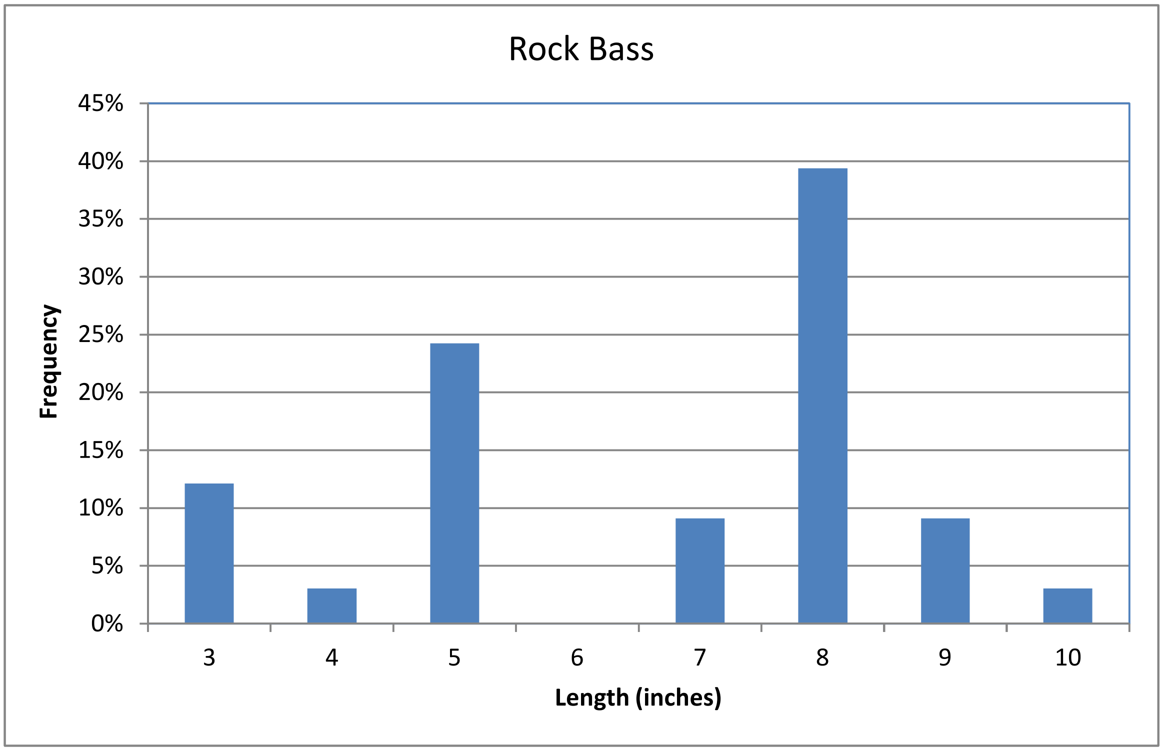


Figure 16. Length frequency distributions of rock bass sampled in Eaton Brook Reservoir 2013.

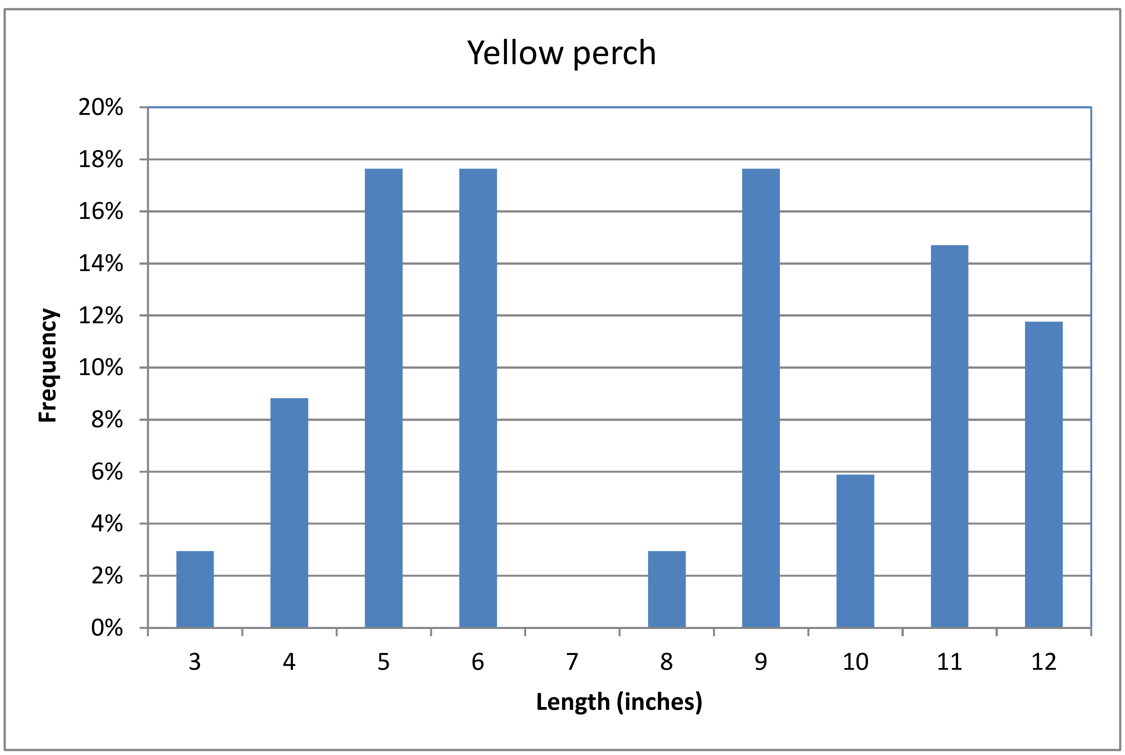


Figure 17. Length frequency distributions of yellow perch sampled in Eaton Brook Reservoir 2013.

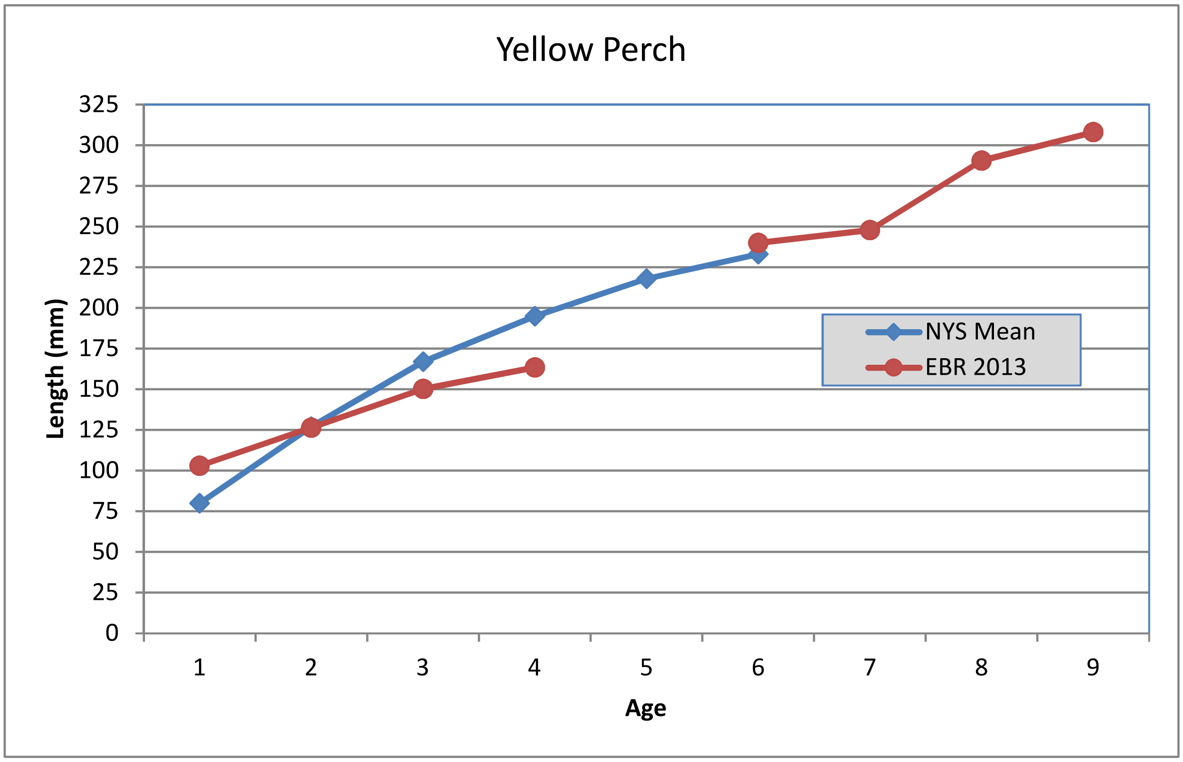


Figure 18. 2013 Eaton Brook Reservoir yellow perch mean lengths (mm) at age and the New York State mean growth rate (Green et al. 1993).

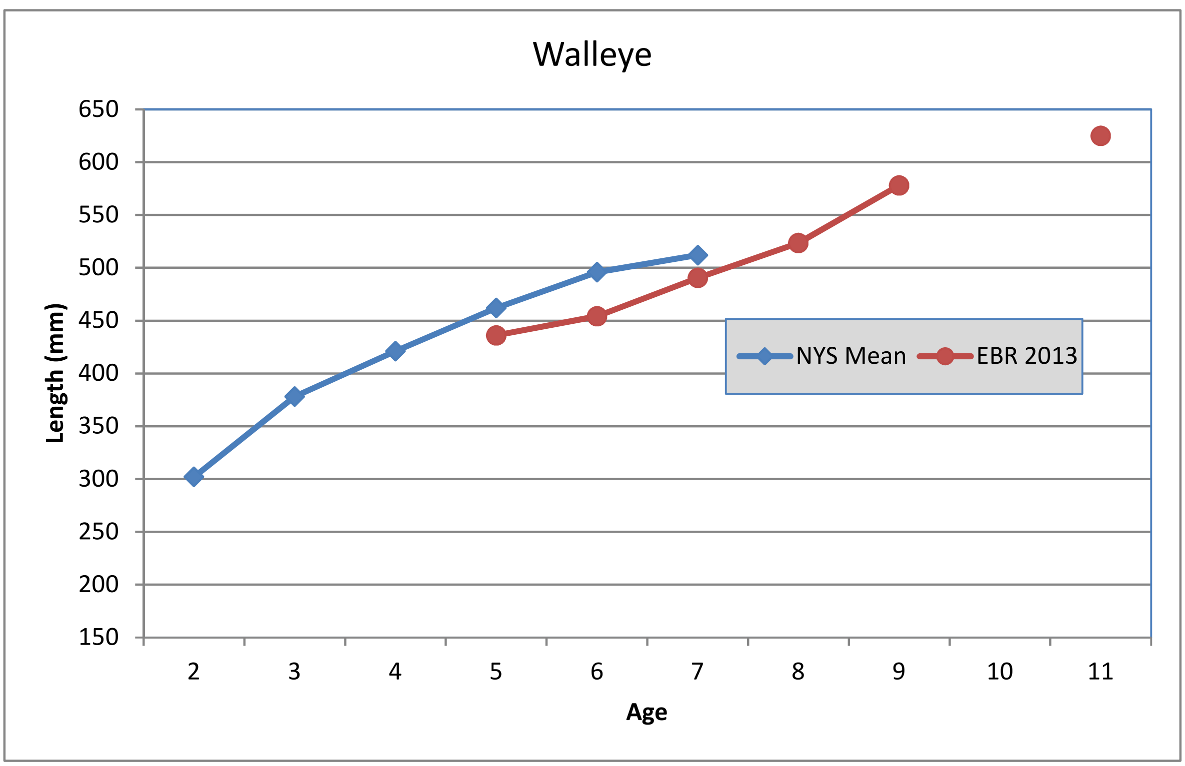


Figure 19. 2013 Eaton Brook Reservoir walleye mean lengths (mm) at age and the New York State mean growth rate (Green et al. 1993).

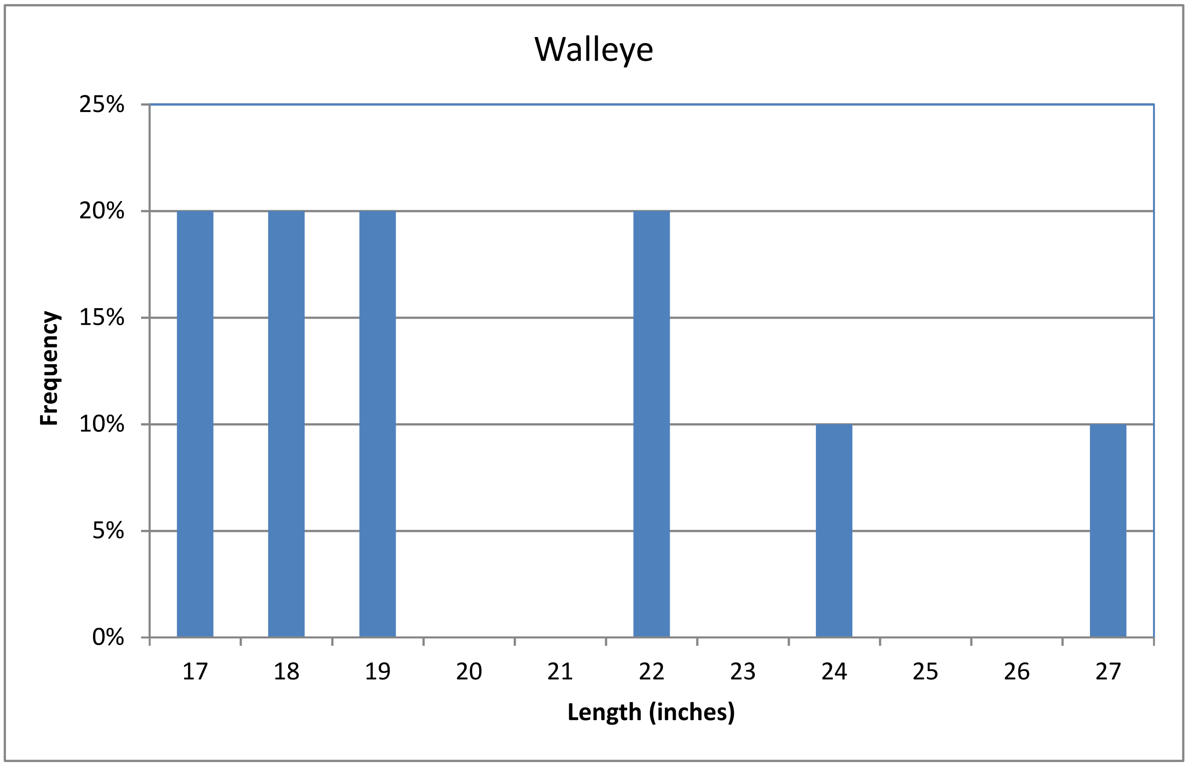


Figure 20. Length frequency distributions of walleye sampled in Eaton Brook Reservoir 2013.