ASSESSMENT OF WHITE PERCH IN LAKE WINNIPESAUKEE, TUFTONBORO (2016)

STATE: New Hampshire

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GRANT TITLE: Anadromous and Inland Fisheries Operational Management Investigations

JOB 9: Warmwater and Coolwater Fisheries Population Assessments

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INTRODUCTION

Lake Winnipesaukee, a natural lake located in east central New Hampshire has a surface area of 17,992 ha. This lake is classified as oligotrophic (NHDES 1992), has a full pool elevation of 154 m above mean sea level, a mean depth of 13.1 m, and a maximum depth of 54.9 m. Lake Winnipesaukee is managed to provide principal recreational fisheries for landlocked salmon (*Salmo salar*), Smallmouth Bass (*Micropterus dolomieui*), Largemouth Bass (*Micropterus salmoides*) and Lake Trout (*Salvelinus namaycush*) (NHFGD 1984). Secondary recreational fisheries exist for Rainbow Trout (*Oncorhynchus mykiss*), Chain Pickerel (*Esox niger*), Yellow Perch (*Perca flavescens*), White Perch (*Morone Americana*), Brown Bullhead (*Ameiurus nebulosus*), Burbot (*Lota lota*), Black Crappie (*Pomoxis nigromaculatus*), and Bluegill (*Lepomis macrochirus*). Rainbow Smelt (*Osmerus mordax*) provide the primary forage for salmonids and are also utilized by Smallmouth Bass and White Perch.

The NHFGD currently has limited data on White Perch populations. White Perch are a popular sport fish among anglers during winter and spring so it is important for the NHFGD to learn more about their populations, age, and growth, in order to better manage these fisheries.

METHODS

Two New Hampshire design fyke nets were fished in Lake Winnipesaukee, Tuftonboro (Melvin Village) from May 2 to May 6 and May 13 to May 16, 2016 and two fyke nets were fished in the Nineteen Mile Bay section of the lake, also in Tuftonboro, from May 2 to May 6 and May 13 to May 17, 2016 (Figure 1). Nets were set in areas to intercept White Perch during their pre-spawn to spawning movements. Nets were checked four times. No fish were captured in the Nineteen Mile Bay nets.

White Perch were measured to the nearest millimeter, total length (TL), weighed to the nearest gram, marked (upper caudal fin clip on unclipped fish to identify recaptures), and checked for fin clips. For aging purposes, scale samples were taken from White Perch in the region below the lateral line and slightly posterior to the pectoral fin on the left side of the fish. Scale samples were taken from a subsample (a maximum of 5 fish per 10 mm size class) of each species. Scales were cataloged, then permanently recorded in an acetate impression and aged using an Eyecom 1100 microfiche projector. Fish were processed shortly after capture and then released at least 200 yards from the fyke net. In this report, only fish aged as ≤ 6 years of age and having scales with ageing confidence ratings of 1 or 2 (very confident or confident) were analyzed.

Proportional Stock Density (PSD) measures for White Perch were determined according to length categories (based on total length) described in Gablehouse (1984): for White Perch: stock 130-199 mm; quality 200-249 mm; preferred 250-299 mm; memorable 300-379 mm; and trophy > 380 mm.

$$PSD = \frac{number\ of\ fish \geq quality}{number\ of\ fish \geq stock} \bullet 100$$

Confidence intervals were calculated for PSD estimates at the 80% confidence level using formulas based on Zar, J.H. (1984). A PSD value ranging from 30 to 60 indicates a balanced fish population for White Perch; a balanced fish population is defined as one that is intermediate between the extremes of a large number of small fish and a small number of large fish and indicates that rates of recruitment, growth and mortality rates may be satisfactory (Gablehouse 1984). Values < 30 indicate an extreme number of small fish when compared to the number of large fish. Values > 60 indicate an extreme number of large fish when compared to the number of small fish.

Relative weight (W_r) values were derived as a measure of condition of individual fish. Relative weight values were calculated for White Perch ≥ 80 mm (TL). This index compares the actual weight of an individual (W) with a standard weight (W_s) for a fish of the same length:

$$W_r = W/W_s \cdot 100$$

The standard weight equation used for White Perch was $\log_{10} W_s$ (g) = -5.122 + 3.136 x $\log_{10}$ TL (mm), proposed by Bister et al (2000). Relative weight values > 90 may be considered good, with values > 100 considered excellent.

All reported mean values include estimated standard deviations, unless otherwise noted. Linear regression was used to examine the relationship of fish total length to relative weight. The level of significance for all statistical analyses was 0.10.

RESULTS

A total of 99 White Perch were sampled (Figure 2). The PSD for White Perch was 100 (lower CI: 90; Table 1) compared to the statewide mean of 65. Mean relative weight values for White Perch were calculated by length category (Table 2). Mean relative weight values for White Perch were lower for quality and higher for preferred and memorable size fish when compared to statewide mean values. The relationship between White Perch total length and relative weight was significant with a positive trend (P = 0.005; R^2 = 0.08; Figure 2), but should be interpreted with caution due to the extremely low R^2 value.

Mean back-calculated length at age, total number of fish aged, logarithmic trendline correlation coefficient, and age at quality size for White Perch are presented in Table 3 and Figure 3. White Perch took an average of 2.93 years to reach quality size (200 mm). No comparison was made to a statewide average due to lack of White Perch age and growth data.

DISCUSSION

For White Perch, a PSD value ranging from 30 to 60 indicates a structurally balanced population. Values < 30 indicate an extreme number of small fish when compared to the number of large fish. Values > 60 indicate an extreme number of large fish when compared to the number of small fish. The PSD value calculated for White Perch in Lake Winnipesaukee was 100,

indicating an unbalanced population with an extreme number of large fish when compared to the number of small fish (Table 1).

Relative weight values > 90 may be considered good, with values > 100 considered excellent. Three of the four White Perch size categories had Wr values > 90 with one category having a value > 100 (Table 2). Observed values are acceptable from a management standpoint, as no exceptional values were documented.

RECOMMENDATIONS

The NHFGD should continue to assess White Perch populations throughout the state and continue to update the statewide database. This database will allow biologists to target specific water bodies for more detailed assessments and make well-informed management recommendations to preserve and improve the quality of White Perch populations state-wide.

ACKNOWLEDGMENTS

LITERATURE SITED

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Table 1. Proportional Stock Density (80% confidence intervals) of White Perch assessed in Lake Winnepesauke, Melvin Village 2016.

Water body	Sample Date	Lower CI 80%	PSD	Upper CI 80%	≥ Quality Size	≥ Stock Size
Lake Winnepesaukee	May 2016	98	100	-	99	99
Statewide average	1997-2015	57	65	61	40	56

Table 2. Sample size, mean relative weight value and one standard deviation by length category for White Perch assessed in Lake Winnepesaukee, Melvin Village 2016.

		Total Length Interval (mm)															
		Stock 130-199			Quality 200-249			Preferred 250-299			Memorable 300-379			Trophy 380 +		
Waterbody	Sample Date	n	Wr	SD	n	Wr	SD	n	Wr	SD	n	Wr	SD	n	Wr	SD
Winnipesaukee-Melvin Village	May 2016	-	-	-	3	81.6	12.5	14	99.5	8.9	79	100.0	6.9	3	106	5.8
Statewide average	1997-2015	15[b]	82.3	6.8	23[b]	83.2	6.8	21[b]	84.4	5.2	9[b]	86.0	5.5	-	-	-

[b.] n represents the number of waterbodies (some waterbodies provided more than one sample)

Table 3. Mean back-calculated length at age, total number of fish aged, logarithmic trendline correlation coefficient and age at quality size for White Perch in Lake Winnipesaukee 2016.

Water body	Sample Year(s)	Species	Maximum age used for back-calculations	Mean back-calculated length (mm) at age						Number of fish aged		R^{2b}	Age at quality size 200 mm
				1	2	3	4	5	6	≥1	5-6		
Lake Winnipesaukee	2016	WP	6	85	131	182	233	279	307	19	16	0.95	2.93

b. Correlation coefficient for logarithmic trendline.
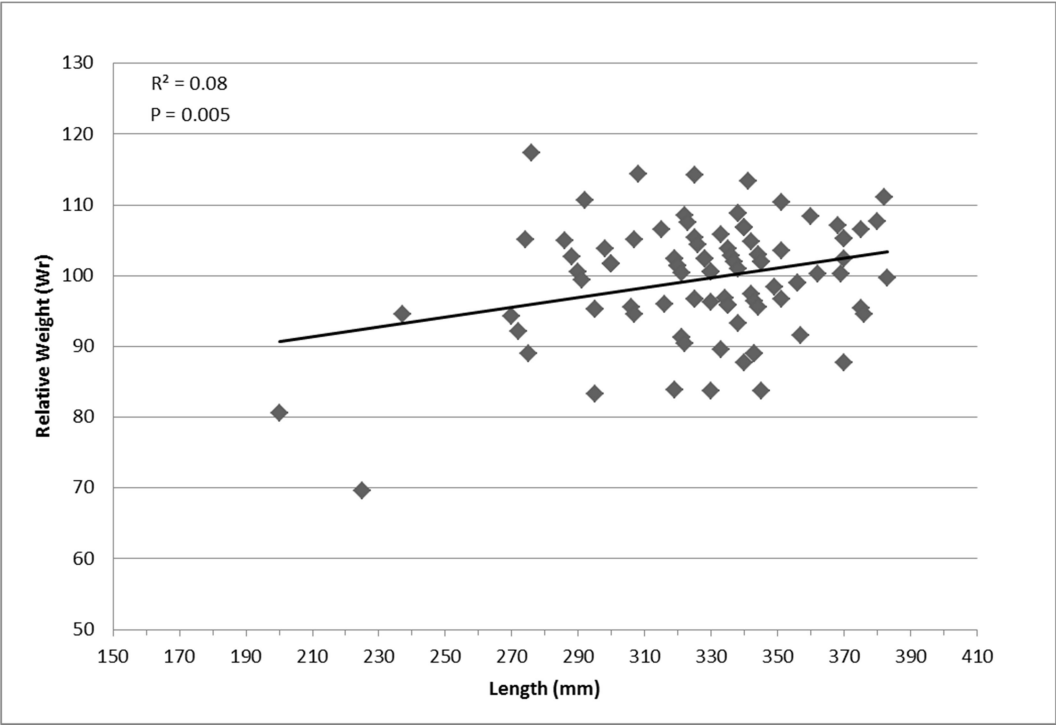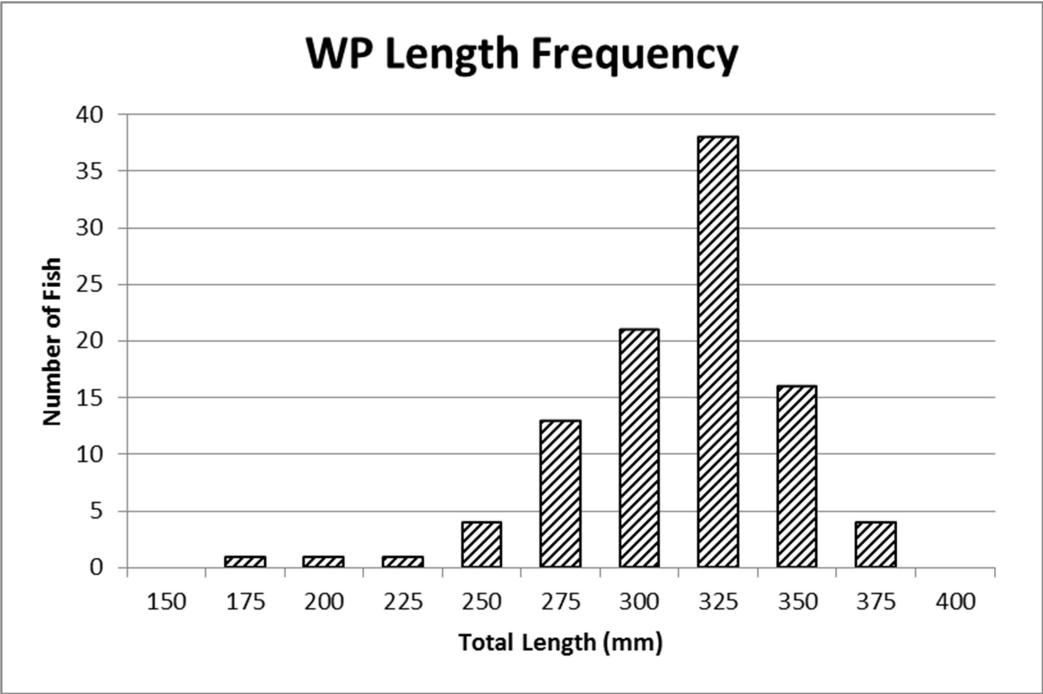
Figure 1. Fyke net locations on Lake Winnipesaukee 2016.

Figure 2. Length-frequency distribution (*n* = 99) and relationship of total length to relative weight (Wr; *n* = 99) for White Perch sampled in Lake Winnipesaukee 2016.

Lake Winnepesaukee, Melvin Village 2016
WP back-calculated length at age

$y = 127\ln(x) + 63.532$
$R^2 = 0.954$

Legend:
- Lake Winnipesaukee, Melvin Village 2016
- Log. (Lake Winnipesaukee, Melvin Village 2016)
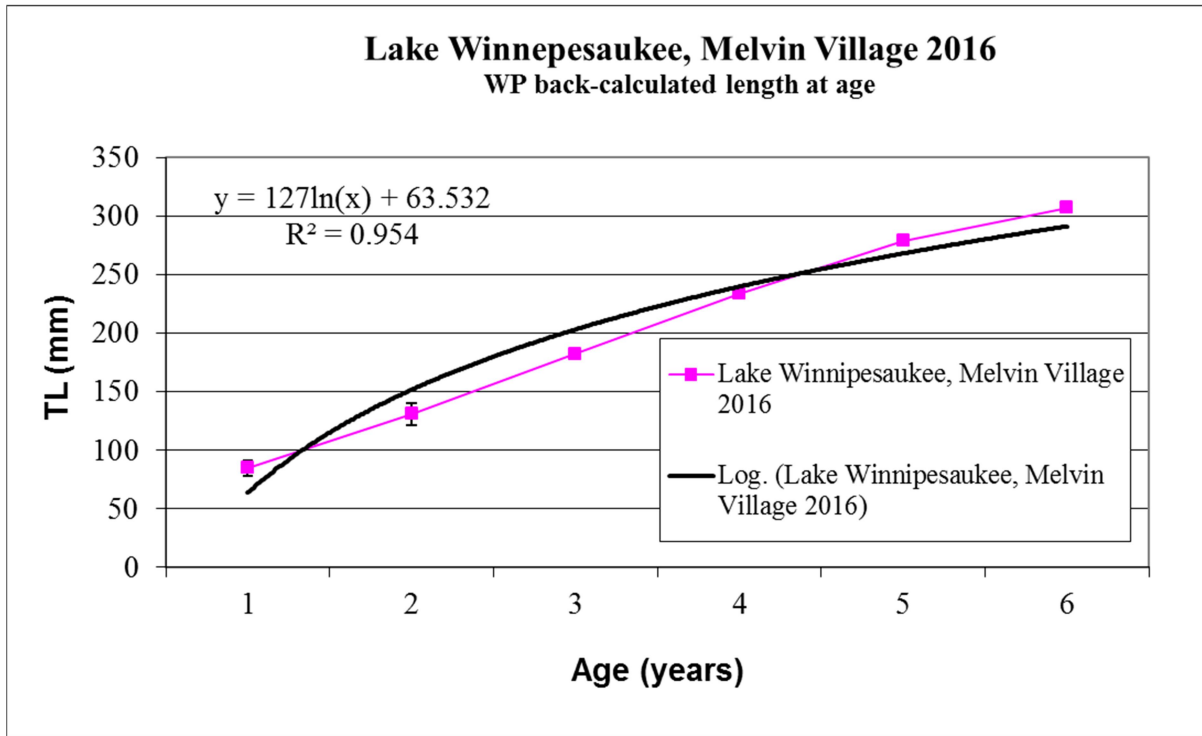
X-axis: Age (years)
Y-axis: TL (mm)

Figure 3. Average back-calculated length at age for White Perch in Lake Winnipesaukee in 2014 ($\pm$ 1 SD), and corresponding logarithmic trendline and equation.