1999 Warmwater Fisheries Survey of McCabe Pond

by

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Abstract

McCabe Pond was surveyed by Washington Department of Wildlife Warmwater Enhancement Program personnel May 24-25, 1999. Survey methods consisted of boat electrofishing, fyke netting, and slat trapping. Largemouth bass (*Micropterus salmoides*) and pumpkinseed sunfish (*Lepomis gibbosus*) were sampled at the highest proportion by weight and number. Yellow perch (*Perca flavescens*), rainbow trout (*Oncorhynchus mykiss*), and channel catfish (*Ictalurus punctatus*) were sampled at lower numbers. Population indicies for largemouth bass indicated variable year-class strength and/or extensive harvest of stock length fish. Pumpkinseed sunfish showed indications of a crowded population. The relatively few rainbow trout, yellow perch, and channel catfish allowed only limited interpretation of population indicies for these species. Management options include continuing with the current management strategy of stocking rainbow trout and channel catfish, stocking additional stock length largemouth bass, and considering a slot limit for largemouth bass. Additionally, suggestions are provided to improve future survey efforts by including gill nets, monitoring angler harvest, and sampling aquatic vegetation in the spring and fall.

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Introduction

McCabe Pond is a small body of water (surface area = 4 acres) located in Kittitas County, south of Ellensburg. Development around the lake is low and limited to livestock grazing. There are no inlets or outlets to McCabe Pond. Parking and good shoreline access are available through a Washington Department of Fish and Wildlife (WDFW) access site.

Historically, McCabe Pond has been managed primarily as a put-and-take rainbow trout (*Oncorhynchus mykiss*) and channel catfish (*Ictalurus punctatus*) fishery. It is stocked with approximately 2,500 "catchable" rainbow trout throughout the year to provide angling opportunity. Additionally, the pond has been stocked periodically with channel catfish since 1983. Since 1996, the pond has been stocked with 6-8 inch channel catfish at 25/acre every other year. The pond also is known to have naturally reproducing populations of largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), and pumpkinseed sunfish (*Lepomis gibbosus*).

The pond is open to fishing year-round. Regulations include a five fish limit (all species combined) and boats or floating devices are not allowed on the pond. All angling must be done from shore. Aquatic vegetation has been reported to be a nuisance to anglers at times.

WDFW Warmwater Enhancement Program personnel conducted this survey of McCabe Pond in May 1999 to assess the state of the fish community.

Methods

Sampling

McCabe Pond was surveyed by a WDFW warmwater assessment team and volunteers from Central Washington University May 24 - 25, 1999. Fish were sampled using boat electrofishing, fyke netting, and slat traps. The electrofishing unit consisted of a 5.5 m Smith-Root 5.0 GPP "shock boat" using a DC current of 120 cycles / sec $^{-1}$ at 4 to 6 amps power. Fyke nets were constructed of a main trap net (4.7 m long and 1.2 m diameter), a lead net (30.5 m long x 1.2 m deep) and two wings (7.6 m long x 1.2 m deep). Slat traps were round "Alabama type" constructed of wood (1.4 m long x .4 m diameter; .35 m x 3 cm throats).

Sampling locations were selected by dividing the shoreline into three consecutively numbered sections of approximately 400 meters. The entire shoreline was sampled by boat electrofishing for a total of 1733 seconds "pedal-down" time, two sections were randomly selected for fyke netting, and six locations were randomly selected for slat traps. While electrofishing, the boat was maneuvered along the shoreline. Fyke nets were set perpendicular to the shore with the lead net anchored onshore and the wing nets set at a 45 degree angle to the trap. Length of the lead from shore and depths the fyke nets were set varied with the slope of the shoreline. Slat traps were anchored on the bottom and baited with a slurry of cheese bait secured in cheesecloth.

Each fish captured was identified to species, measured for total length (mm) and weighed (g). Scales were collected from largemouth bass and pumpkinseed sunfish for analyzing age and growth. Scale samples were mounted, pressed, and aged according to Jearld (1983) and Fletcher et al. (1993).

Estimates of percent coverage for emergent, submergent, and floating aquatic vegetation were made by visual observation.

Data Analysis

Percentages of the total biomass and number of fish collected for each species provides useful information regarding the balance and productivity of the community (Swingle 1950; Bennet 1962; Fletcher et al. 1993). Species composition by weight (kg) and number was calculated from data collected using boat electrofishing and fyke netting.

Catch per unit effort (CPUE) by sampling method was determined for each fish species collected (number of fish/hour electrofishing and number of fish/fyke net night). The CPUE for each fish species was calculated using only stock length fish and larger. Stock length, which varies by species, is the size of a particular fish species that offers threshold recreational value to an angler (Anderson 1976). Randomly chosen sample sections can contribute to high variability among

samples, therefore 80% confidence intervals (CI) were calculated for each mean CPUE by species and by sampling method. Each CI was calculated as the mean $\pm t(\propto,N-1)\times SE$, where t=Student's t for $\propto$ confidence level with N-1 degrees of freedom (two tailed) and SE=standard error of the mean. When standardized sampling is used, CPUE is a useful index that can be used to compare lakes within the state of Washington and monitor changes in relative abundance over time.

Length frequency histograms (percent frequency captured by different sampling methods) were used to evaluate the size structure of all warmwater fish species collected.

Proportional stock density (PSD), calculated as the number of fish≥quality length/number of fish≥stock length×100, was determined for each warmwater fish species collected (Anderson and Neuman 1996). PSD can provide information about the proportion of various size fish in a population and can be a useful tool when sample size is adequate (Willis et al. 1993; Divens et al. 1998). Stock and quality lengths used in the calculation of PSD are based on a percentage of world record catch size and vary depending on fish species (Table 1). Stock lengths (20-26% of the world record) refer to the minimum size fish with recreational value, and quality lengths (36-41% of the world record) refer to the minimum size fish anglers prefer catching. In addition to stock and quality length, Gabelhouse (1984b) introduced preferred, memorable, and trophy length categories (Table 1). Preferred length (45-55% of world record length) refers to the size fish anglers would prefer to catch when given a choice. Memorable length (59-64% of the world-record length) refers to the minimum size fish most anglers remember catching, whereas trophy length (74-80% of world record length) refer to the minimum size fish worthy of acknowledgment. Relative Stock Density (RSD), calculated as the number of fish≥specific length/number of fish≥stock length×100, was also calculated for each game fish species. Like PSD, it can also provide useful information regarding population dynamics and is more sensitive to changes in year-class strength. For example, RSD P was the percentage of stock length fish greater than or equal to preferred length, RSD M, the percentage of stock length fish that are greater than or equal to memorable length, and so on. Eighty-percent confidence intervals for PSDs and RSDs are provided as an estimate of statistical precision and were calculated using normal approximation (Conover 1980; Gustafson 1988).

Table 1. Length categories for warmwater fish species captured at McCabe Pond (Kittitas County), May 1999. Measurements are minimum total lengths (mm) for each PSD, and RSD category .

	Size				
Species	**Stock**	**Quality**	**Preferred**	**Memorable**	**Trophy**
Largemouth Bass	200	300	380	510	630
Yellow Perch	130	200	250	300	380
Pumpkinseed Sunfish	80	150	200	250	300

Age and growth of warmwater fishes sampled were evaluated using the direct proportion method (Fletcher et al. 1993) and Lee's modification of the direct proportional method (Carlander 1982).

Although Lee's modification does correct for species-specific threshold length at the time of scale formation, direct proportion allows for comparison of growth with in-state survey averages previously calculated using direct proportion. We have chosen to present the results for calculations from both methods until survey averages can be developed using Lee's modification. Using the direct proportional method, total length at annulus formation, Ln, was back-calculated as $L_n=(A\times TL)/S$, were A is the radius of the fish scale at age n, TL is the total length of the fish captured, and S is the total radius of the scale at capture. Using Lee's modification, L_n was back-calculated as $L_n=a+A\times(TL-a)/S$, where a is the species-specific standard positive y-axis intercept from a scale radius-fish length regression. Mean back-calculated lengths at age n for each species were presented in tabular form for easy comparison of growth between year classes, as well as between the lake average and what has been found in other areas around the State of Washington for the same species using the direct proportion method (Fletcher et al. 1993).

Relative weight (Wr) index was used to evaluate the condition of fish in the lake. Relative weight is useful for comparing the condition of different size groups within a single population to determine if all sizes are finding adequate nutrition (ODFW 1997). A Wr value of 100 generally indicates that a fish is in good condition when compared to the national average for that species. This index was calculated as $Wr=W/Ws\times100$, where W is the weight (g) of an individual fish and Ws is the standard weight of a fish of the same length (mm) (Murphy and Willis 1991). Ws is calculated from the standard log10 weight-log10 length relationship defined for the species of interest. Anderson and Neumann (1996) list the parameters for the Wr equations of many warmwater fish species, including the minimum length recommendations for their application. Wr values calculated from this survey were compared to the national average (Wr=100) for each species.

Results

Aquatic Vegetation

Visual observations of aquatic vegetation conducted at the time of this survey showed submergent vegetation covered ≈75 percent of the pond bottom, emergent vegetation occurred along ≈25 percent of the shoreline, and floating vegetation covered ≈10 percent of the surface. A full assessment of the affect aquatic vegetation has on the fish community cannot be made from this data due to the timing of this spring survey. Aquatic vegetation abundance would likely be higher in the summer and fall.

Species Composition

Five species were collected at McCabe Pond in May 1999. Largemouth bass and pumpkinseed sunfish were the most abundant species sampled by weight and by number (Table 2). Largemouth bass and pumpkinseed sunfish together totaled 97% of the catch by weight and number. Yellow perch , rainbow trout, and channel catfish were sampled at lower densities.

Table 2. Species composition by weight (kg) and number of fish captured at McCabe Pond (Kittitas County) during May 1999.

Species	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
	(kg)	(%)	(#)	(%)	Min	Max
Largemouth Bass	19.88	66.68	107	22.81	60	437
Pumpkinseed Sunfish	9.05	30.35	351	74.84	62	176
Yellow Perch	0.58	1.95	7	1.49	171	232
Rainbow Trout	0.26	0.87	3	0.64	195	228
Channel Catfish	0.04	0.14	1	0.21	190	190

CPUE

Electrofishing catch rates were higher than both fyke nets and slat traps for all species collected (Table 3). Pumpkinseed sunfish were captured at the highest rate by electrofishing. Although slat traps were used to selectively sample the stocked channel catfish in McCabe Pond, no fish were captured using slat traps. This was likely the result of too few hours of effort using the gear type and/or an indication of the low density of the channel catfish population in McCabe Pond.

Table 3. Mean catch per unit effort by sampling method including 80% confidence intervals for stock length fish collected from McCabe Pond (Kittitas County) during May 1999.

	Gear Type			
	Electrofishing		Fyke Netting	
Species	(#/hour)	Sites	#/Net Nights	Nights
Largemouth Bass	63 ± 21	3	0	2
Pumpkinseed Sunfish	559 ± 172	3	20 ± 3	2
Yellow Perch	0	3	4 ± 4	2

Stock Density Indices

Few stock length largemouth bass were collected from McCabe Pond (Table 4). This resulted in broad confidence limits for PSDs allowing for only limited interpretation. All largemouth bass of quality length (≥300mm) were also of preferred length (≥ 380 mm) which may be a result of variable year-class strength and recruitment of largemouth bass. More adequate sample sizes of stock length pumpkinseed sunfish (≥80 mm) were collected. A low PSD value, such as that seen for pumpkinseed sunfish, typically indicates a crowded population. Crowding of panfish populations are often the result of extensive competition for limited food resources and/or low predation rates due to a low abundance of predators, represented in this fish community by largemouth bass and channel catfish.

Table 4. Traditional stock density indices, including 80% confidence intervals, of fish collected from McCabe Pond (Kittitas County) May 1999 by sampling method.

Species	# Stock Length	PSD	RSD-P	RSD-M	RSD-T
Largemouth Bass	31	35 ± 11	35 ± 11	0	0
Pumpkinseed Sunfish	269	1 ± 1	0	0	0

Largemouth Bass

McCabe Pond largemouth bass ranged in size from 60 to 437 mm TL (age 1 to 8) and displayed variable year-class strength (Table 5; Figure 1). Largemouth bass growth rates were higher than the known Washington state average at most ages. Largemouth bass condition was relatively low for fish under 250 mm in length. Condition was higher for fish greater than 350 mm (Figure 2). Adult bass that are not harvested apparently do well as indicated by growth rates and high condition. The presence of few quality length largemouth bass (250-380 mm) may indicate extensive harvest of stock length fish from the population.

Table 5. Age and growth of largemouth bass sampled from McCabe Pond (Kittitas County) May 1999. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Fletcher et al. 1993). Shaded values are mean back-calculated lengths using the Lee's modification (Carlander 1982).

		Mean length (mm) at age							
Year Class	**# Fish**	1	2	3	4	5	6	7	8
1998	2	91							
		99							
1997	7	78	179						
		90	182						
1996	2	67	124	198					
		81	132	200					
1995	0	0	0	0	0				
		0	0	0	0				
1994	0	0	0	0	0	0			
		0	0	0	0	0			
1993	3	54	102	209	316	362	404		
		71	117	218	321	365	405		
1992	2	49	92	176	260	346	379	421	
		67	108	188	268	350	381	421	
1991	2	53	97	164	302	354	395	419	435
		71	113	177	308	358	397	420	435
Direct Proportion Overall Mean		65	119	187	293	354	393	420	435
Lee's Weighted Mean		82	146	198	302	358	396	420	435
Direct Proportion State Average		60	146	222	261	289	319	368	396

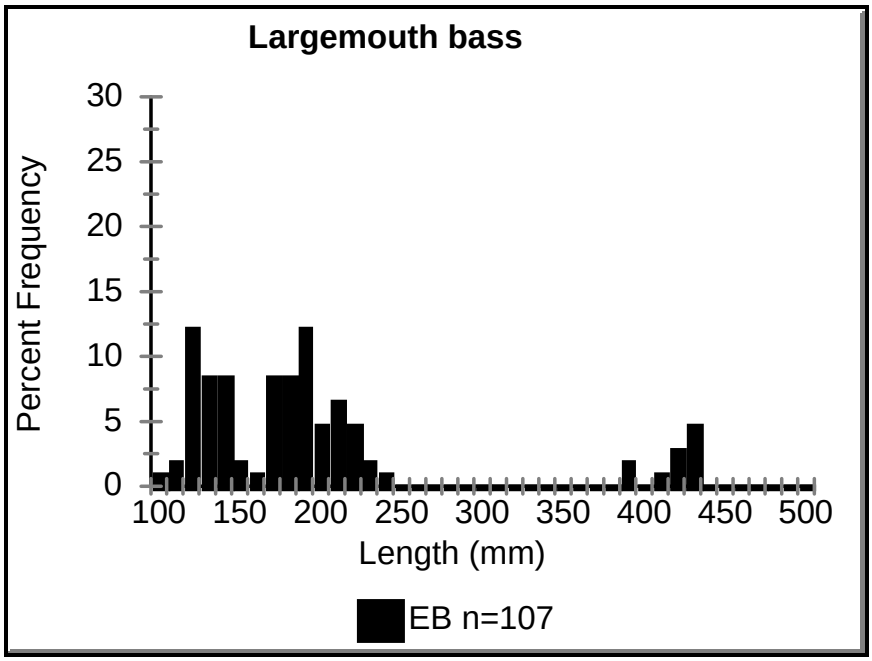

Figure 1. Length frequency distribution of largemouth bass sampled at McCabe Pond (Kittitas County) May 1999 by boat electrofishing (EB).

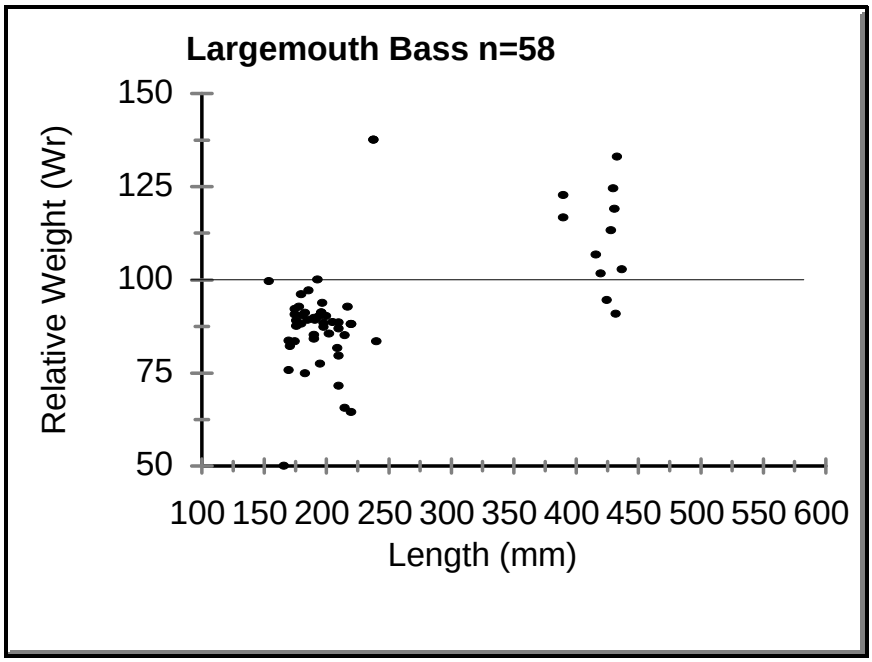

Figure 2. Relative weight (Wr) of largemouth bass sampled at McCabe Pond (Kittitas County) May 1999 compared to the national 75th percentile.

Yellow Perch

McCabe Pond yellow perch sampled ranged in size from 171 to 232 mm TL (Figure 3). The low number of yellow perch sampled at McCabe Pond may be more a result of geartype bias than a true indication of their relative abundance. Gill netting typically provides a better sample of the yellow perch populations than the geartypes used in this survey. Additionally, a fall sample may allow for sampling of young-of-year yellow perch by electrofishing.

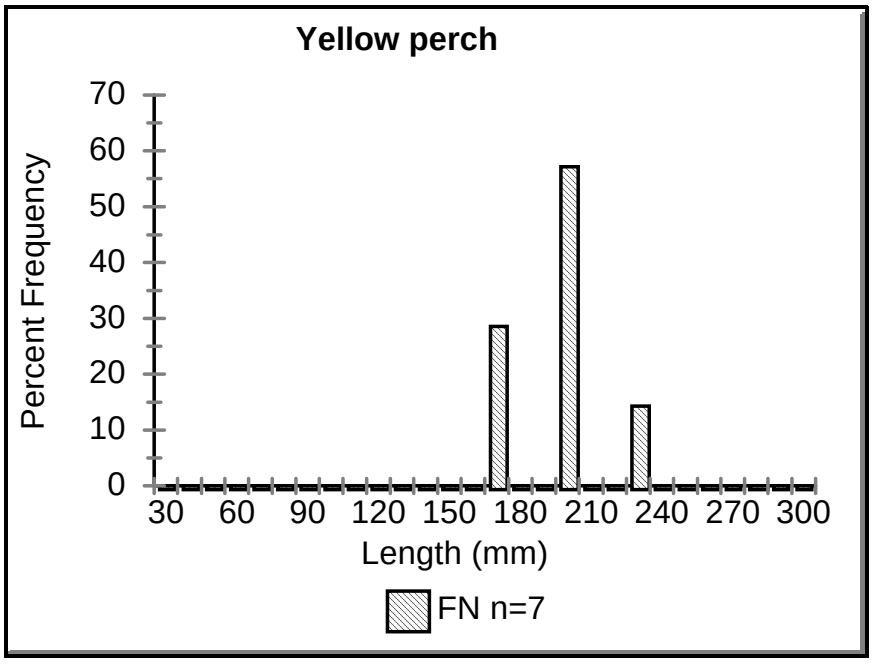

Figure 3. Length frequency distribution of yellow perch sampled at McCabe Pond (Kittitas County) May 1999 by fyke net (FN).

Pumpkinseed Sunfish

McCabe Pond pumpkinseed sunfish sampled ranged in total length from 62 to 176 mm TL (Figure 4). The growth of the few pumpkinseed sunfish collected was slightly higher than the known state average (Table 6). The relative weights of pumpkinseed sunfish were variable, with fish both above and below the national average (Figure 5). The pumpkinseed sunfish population in McCabe Pond is apparently thriving and their relatively high abundance may contribute to inter-specific competition with more desirable gamefish species such as young largemouth bass. However, the population is likely the primary food source for larger bass and channel catfish.

Table 6. Age and growth of pumpkinseed sunfish sampled from McCabe Pond (Kittatas County) May 1999. Unshaded values are mean back-calculated length at annulus using the direct proportion (Fletcher et al. 1993). Shaded values are mean back-calculated lengths using the Lee's modification (Carlander 1982).

		Mean length (mm) at age			
Year Class	**# Fish**	**1**	**2**	**3**	**4**
1998	0	0			
1997	2	30	80		
		46	82		
1996	6	24	70	121	
		44	81	121	
1995	1	31	59	107	134
		50	73	112	134
Direct Proportion Mean		28	70	114	134
Lee's Weighted Mean		45	80	120	134
Direct Proportion State Average		24	72	102	123

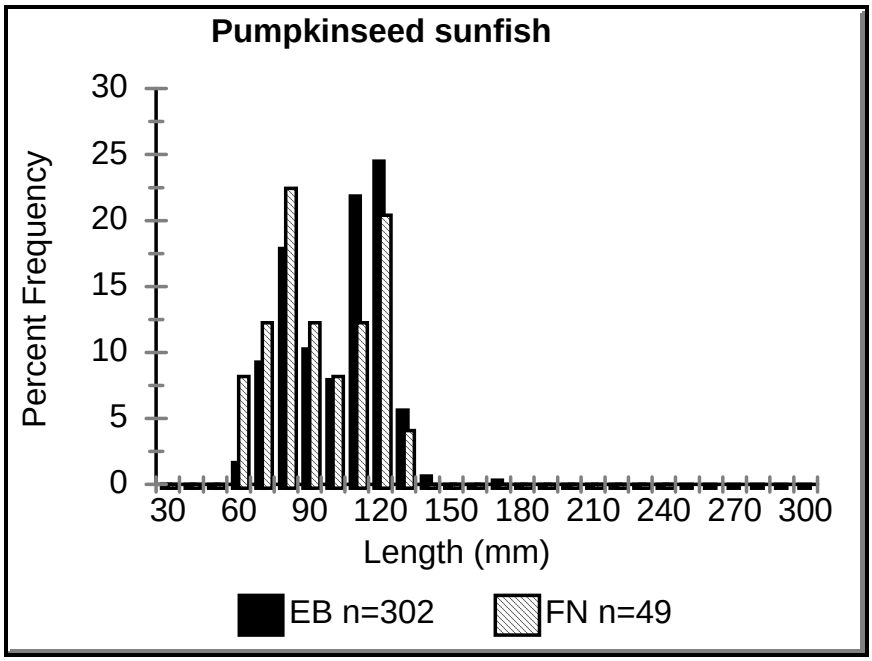

Figure 4. Length frequency distribution of pumpkinseed sunfish sampled at McCabe Pond (Kittitas County) May 1999 by boat electrofishing (EB) and fyke net (FN).

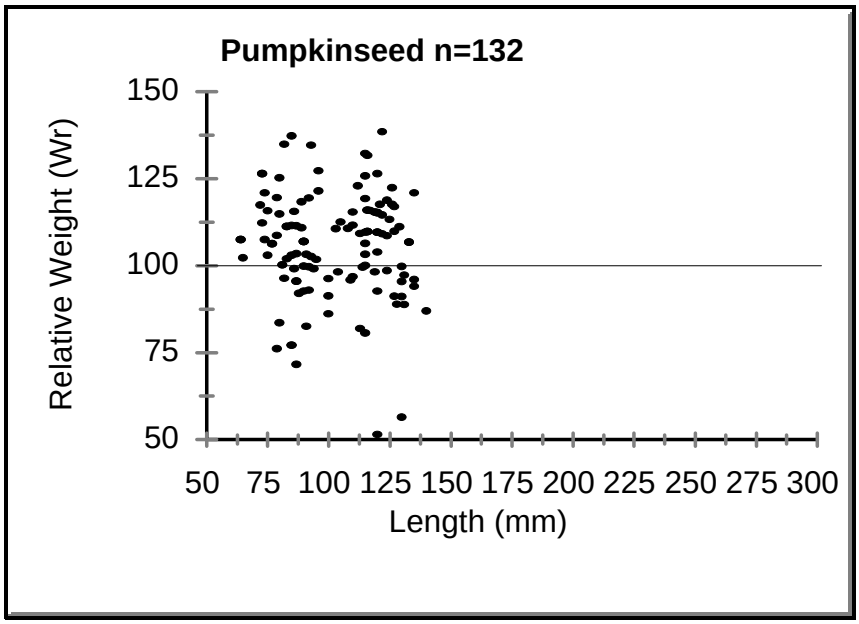

Figure 5. Relative weight (Wr) of pumpkinseed sunfish sampled from McCabe Pond (Kittitas County) May 1999 compared to the national 75th percentile.

Discussion

Due to the limited duration and number of fish sampled in this survey, the results are less than conclusive and interpretation limited. However, some inferences can be made from analysis of the data collected. Results indicate that the fish community of McCabe Pond is prey crowded and dominated by pumpkinseed sunfish. Although the lake has populations of largemouth bass and stocked channel catfish, the abundance of larger predator fish capable of preying upon panfish could likely be increased. Additionally, the low condition of smaller largemouth bass (≤ 200 mm) may indicate high interspecific competition for limited forage. Therefore, the fish community at McCabe Pond should benefit by increasing the number of predator fish in the lake. Increasing the number of adult largemouth bass and/or channel catfish in McCabe Pond would increase angling opportunity for quality size largemouth bass and/or channel catfish.

Rainbow Trout & Channel Catfish

Few changes to the current management strategy for McCabe Pond can be suggested from the results of this limited survey. It seems reasonable that future stocking of this put-and-take fishery include channel catfish, catchable rainbow trout, and possibly quality size largemouth bass. This combination of species should continue to provide diverse fishing opportunities. Channel catfish (> 6 inches) should be stocked every other year at 25-30/acre, a total of 100 fish (Bonar et al. 1995). Catchable rainbow trout should continue to be stocked at the current rate early and late in the year to provide angling during the cooler months of spring and fall.

Largemouth Bass

If increased opportunity for quality length largemouth bass is desired, adult fish (>200 mm) should be stocked at five per acre (75 fish) to supplement the current population (WDFW unpublished data). Following an initial supplemental stocking of largemouth bass, the population should be monitored prior to any additional stocking. If further protection of quality and preferred length largemouth bass is needed, imposing the states 12 - 17 inch slot-limit for largemouth bass should be considered. This regulation would allow anglers to keep largemouth bass less than 12 inches, require the release of those between 12 and 17 inches, and allow one fish larger than 17 inches to be retained. The intent of the regulation would be to increase the number of quality length largemouth bass available for catch and release angling.

Future Monitoring

Future monitoring of McCabe Pond should include fall sampling by boat electrofishing, gill netting, fyke netting, and possibly slat traps. Gill nets should be included in future sampling to more adequately sample yellow perch and channel catfish populations. Multiple nights of sampling will likely be required if slat traps are to be used successfully in sampling channel catfish.

Additionally, an aquatic vegetation survey should be conducted in the summer and fall to evaluated potential affects to the fish community and to angler access.

Creel

Angler harvest data would bolster monitoring efforts of the put-and-take fishery at McCabe Pond. Biology students at nearby Central Washington University might be employed for credit through an independent study program to collect creel data from McCabe and /or other local lakes.

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