STATUS OF THE MUSKELLUNGE POPULATION IN WANETA LAKE 2005-2009

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ABSTRACT

Trap netting for spawning muskellunge (*Esox masquinongy*) was conducted on 813 acre Waneta Lake during the month of April in 2005 and 2009 to assess the status of the adult muskellunge population after a whole lake herbicide treatment. Trap nets were also set for spawning muskellunge in 1970, 1971, 1979, 1980, 1991, 1992, 1997, and 1998.

The number of muskellunge captured per trap net night was 6.4, 2.1, 0.8, 0.3, 0.9, 2.0, 2.1, 4.3, 9.3, and 5.5 respectively for 1970, 1971, 1979, 1980, 1991, 1992, 1997, 1998, 2005, and 2009. No clips were identified on 26% of the fish caught in 2005 and 17% of the fish caught in 2009, indicating that some natural reproduction of muskellunge is occurring in Waneta Lake. In the 2009 netting, most males were between 651 and 800 mm (25.5-31.5 inches) and most females between 751-950 mm (29.5-37.5 inches) in total length. In the 2005 netting, muskellunge were slightly larger than in 2009, with most males between 751 and 875 mm (29.5-34.5 inches) and most females were between 851-1075 mm (33.5-42.5 inches) in total length. More adult muskellunge greater than 1100 mm (43.25 inches) were captured in 2009 and 2005 than in 1998. Age 4 and age 6 muskellunge were predominant in the 1998 trap net catch. These age classes survived very well, as four age 11 and one age 13 muskellunge were caught in 2005. There was poor survival of older muskellunge, especially males, past age 5, from 2005 to 2009. Low numbers of muskies that were age 3 and 4 in the 2005 nets, and age 6, 7, and 8 in the 2009 nets indicated poor survival of muskellunge that were age 0 to age 2 in 2003, the year of the treatment. Age 4 and 5 muskellunge were well represented in the 2009 sample. Growth rates for female muskellunge exceeded those of males at all ages. Growth rates of both male and female muskellunge in 1997and 1998 were similar to 2005. However, muskellunge growth rates for both males and females declined from 2005 to 2009. The mean total length of age 3 and older male muskellunge declined by 76 mm (three inches), and females declined by 25 mm (one inch), from 2005 to 2009 and is probably related to the low survival of age 5 and older males from 2005 to 2009. The mean Fulton condition factor and relative weight for each 25 mm (one inch) total length group was slightly higher in 2005 than 2009.

It would appear that the whole lake aquatic herbicide treatment in 2003 had no long term adverse effect on adult muskellunge abundance because adult muskellunge abundance increased after the fluridone treatment and the 2004 and 2005 year classes appear to be strong during years of low vegetation after the 2003 treatment. However, it is possible that the catchability of muskellunge in the 2005 trap nets was higher in absence of vegetation, as muskellunge may have been more mobile while seeking vegetative cover. Without vegetative cover, older legal sized muskellunge were perhaps more vulnerable to angling mortality. Stocked fingerling and juvenile muskellunge appear to have suffered heavy predation in 2003 when vegetation density was low or non-existent, since there was little cover for fingerling muskellunge to hide in to avoid predation. It is possible that the low density of submersed aquatic vegetation from 2003 to 2005 affected muskellunge feeding and growth by disrupting preferred hunting tactics and disassociating them from their prey. It is recommended that the present annual stocking policy of five muskellunge fingerlings per acre be maintained, the statewide fin clip be applied to each stocked year class in order to facilitate future aging, and clip quality checked so natural reproduction can be further assessed. Trap nets should set at the same three sites in 2013 to further monitor adult stocks, and the treatment of only small dispersed areas of aquatic vegetation should be permitted, rather than large whole lake treatments.

INTRODUCTION

Waneta Lake, an 813 acre lake with a maximum depth of 29 ft, is located in the northwest corner of Schuyler County between Keuka and Seneca Lakes (Figure 1). Chautauqua Lake strain muskellunge (*Esox masquinongy*) fry were first stocked in Waneta Lake in 1954 (Table 1). Annual plantings of fry and up to 500 extensively reared fingerlings occurred from 1955 through 1962 with sporadic plantings of fry and fingerlings from 1963 through 1974. These extensively reared fingerlings were placed as fry into outside earthen ponds inoculated with plankton, until large enough to feed on live minnows (Bubnack J., DEC Chautauqua Hatchery, personal communication). From 1975 to 1980 Waneta Lake was stocked with 2,400 intensively reared (inside, trough culture) fingerlings annually. In 1981 the stocking rate was increased to 4,800 intensively reared fingerlings per year to increase recruitment to the fishery and to provide the Bureau of Fisheries with a backup brood stock water. Between 1984 and 1987 the diet of the intensively reared fish was changed from live minnows to dry food (Bubnack J., DEC, personal communication). Stockings from 1987 through 1996 have included both intensively and extensively reared fingerlings. The extensively reared fish in the 1991-1996 plantings were raised inside and fed dry food to three inches and then transferred to outside earthen ponds and fed minnows (Bubnack J., DEC Chautauqua Hatchery, personal communication). From 1997 on, stocking was comprised entirely of extensively raised muskellunge (Table 1).

Waneta Lake is a shallow body of water and tends to warm quickly after ice out in mid to late March. Muskellunge spawning activity, reflected in the trap net catch, begins to occur at 45°F water temperature in mid April and runs into early May (Kosowski, 1994). Trap netting operations to assess the status of the adult muskellunge population in Waneta Lake occurred in mid-April 1970, 1971, 1979, 1980, 1991, and 1992 (Kosowski 1994). The 1991, 1992 and 1993 extensively reared fish were fin clipped for comparison to the unmarked, intensively reared portions of the same stockings (Table 1). Trap netting surveys were conducted in mid-April 1997 and 1998 to determine Waneta Lake's potential as a backup brood stock water for statewide muskellunge hatchery production and to evaluate the success of extensively raised vs. intensively raised muskellunge fingerlings (Kosowski 1998).

The Waneta Lake fishery, including muskellunge, is managed under statewide angling regulations, which allows one muskellunge per day of 30 inches or greater to be creeled during the open season of the 3rd Saturday in June through November 30.

In April 2003, a whole lake herbicide treatment using fluridone (trade name Sonar) was conducted in Waneta Lake in an attempt to control a dense nuisance population of non-native Eurasian water milfoil (*Myrophyllum spicatum*). This treatment resulted in a drastic reduction of littoral zone submersed aquatic vegetation coverage and density that persisted from 2003 to 2005 (Johnson and Keith 2006). In April 2008, select areas of dense Eurasian water milfoil were treated with the herbicide triclopyr (trade name Renovate). Submersed aquatic vegetation had largely recovered to near 2003 pre-treatment coverage and density by the end of the 2008 growing season (Johnson et al. 2008). Because muskellunge are solitary, sedentary, and prefer vegetated habitat (Scott and Crossman 1973, Bimber and Nicholson 1981, Dombeck 1986) and because habitat alterations have been cited as impacting muskellunge populations (Bimber and Nicholson 1981, Dombeck 1986), post-treatment trap netting surveys were conducted in 2005 and 2009 to assess the status of the adult muskellunge population in Waneta Lake and to

determine if the lower coverage and density of submersed aquatic vegetation as a result of the treatments had any effect on the stocked muskellunge population.

METHODS

Three Oneida style trap nets were set at three previously sampled sites (Figure 1) for a period of 25 trap net nights from April 13 - 26, 2005 and 26 trap net nights from April 14 - 24, 2009. Site 1 was located on the west shore approximately one half mile from the north end of the lake. A 5 ft net was set perpendicular to shore in front of 9362 Wixon Road, using a 100 ft leader set in an easterly direction from shore. Site 2 was also located on the west shore across from and north of site 3. A 6 ft net was set on the east end of the point. The net was set perpendicular to shore in a northerly direction, with a 110 ft leader. A 6 ft net at site 3 was set on the south side of the point at Camp Groton. This net was angled from shore in a southeasterly direction, using a 75 ft leader. Trap nets were set at these same three sites in April 1970, 1971, 1979, 1980, 1991, 1992, 1997 and 1998. Effort in trap net nights at the three sites from 1970 to 2009 is shown on Table 2.

Total length, weight, fin clip, sex, and maturity data, and scale samples for age analysis were taken on all muskellunge. Total length was recorded for all other fish. Data was recorded on standard Department of Environmental Conservation Statewide Fisheries Database forms.

Fish were aged by examining an acetate scale impression with a stereo microscope, and confirmed by the fin clip where present.

Data were entered into the Statewide Fisheries Database and downloaded into Lotus 123 and Microsoft Excel spreadsheets for analysis. Catch per unit effort (CPUE), total length frequency, proportional stock density (PSD), age frequency, mean total length, mean total length at age, Fulton condition factor (K), and relative weight (Wr) were calculated.

RESULTS AND DISCUSSION

In 1997 and 1998, muskellunge weight was not measured, and only the relative abundance of other fish species was noted (Appendix A). Raw length, age, sex, and clip data from the 1970 to 1998 samplings were not available. Only summary data from the 1997 and 1998 samplings were detailed enough to make pre- and post-herbicide treatment comparisons. Many different sites were trap netted since 1970, however, only the three sites described captured significant numbers of muskellunge and only these three sites have been used for muskellunge index netting since 1997 (Kosowski, 1998). The number of adult muskellunge captured per trap net night ranged from 0.2 to 9.3 from 1970 to 2009 (Figure 2, Table 2). Adult muskellunge catch per unit effort (CPUE) was highest in 2005. The 2009 and 2005 CPUEs were greater than in 1998, the last sample prior to herbicide treatment, and very much greater than the 1971-1997 average (1.4). As a comparison, 1.44 muskellunge were caught per net night (8 foot trap equivalent) on Chautauqua Lake in 2005 (McKeown 2006). It would appear that adult muskellunge abundance increased after the fluridone treatment and the reduced submersed aquatic vegetation density that persisted from 2003 to 2006 as a result of the treatment had no adverse effect on adult muskellunge abundance. However, because muskellunge are solitary, sedentary fish and are so closely associated with macrophytes (Scott and Crossman 1973), it is

possible that the catchability of muskellunge in the 2005 trap nets was higher in absence of vegetation, as muskellunge may have been more mobile while seeking vegetative cover to spawn.

Clip quality prior to stocking was not checked from 2000 to 2009. However, clip quality data collected prior to 1999, and from 2010 and 2011 suggests that nearly all of the stocked muskellunge were clipped (Kosowski and Hammers unpublished data). Assuming that clip quality from 2000 to 2009 was similar, some natural reproduction of muskellunge is occurring in Waneta Lake, as no clips were identified on 17% of the fish caught in 2009 and 26% of the fish caught in 2005. By comparison, 19% of the muskellunge caught in trap nets set in Chautauqua Lake in 2005 had no clips (McKeown 2006).

In the 2009 netting, 40% of the males were between 751 and 1050 mm (29.5-41.5 inches, Figure 3) and 43% of the females were between 851-1150 mm (33.5-45.25 inches) in total length (Figure 4). In the 2005 netting, muskellunge were slightly larger than in 2009, with 79% of the males between 751 and 1050 mm (29.5-41.5 inches) and 85% of the females between 851-1150 mm (33.5-45.25 inches) in total length. In the 1998 netting, males were slightly larger than the 2005 and 2009 samples- 74% of the males were between 751 and 1050 mm (29.5-41.5 inches) and females were slightly smaller than the 2005 and 2009 samples- 50% of the females were between 851-1150 mm (33.5-45.25 inches) in total length. More large adult muskellunge were captured in 2009 and 2005 than in 1998. Five, nine, and two females greater than 1100 mm (43.25 inches) and two, 30, and one male greater than 875 mm (34.5 inches) were caught in 2009, 2005, and 1998, respectively. The size quality of muskellunge as measured by proportional stock density (PSD) in 1998 was similar to 2005, and were both higher than in 2009 (Table 3).

In the 2009 and 2005 nettings, males outnumbered females. In the 1998 netting, females outnumbered males (Figure 5). The male muskellunge population in 2009, 2005, and 1998 is comprised of younger aged fish while the female population is comprised of older aged fish (Figures 6 and 7). In the 2005 Chautauqua Lake trap net catch females (77%) greatly outnumbered males (23%) similar to the 1998 Waneta Lake catch, while the age distribution of male and female muskellunge was similar to the 1997-2009 Waneta Lake catches (McKeown 2006).

Age 4 (28 caught) and age 6 (26 caught) muskellunge were predominant in the 1998 catch. These age classes survived very well, as four age 11 and one age 13 female muskellunge were caught in 2005. The 2005 age 13 muskellunge was the oldest caught during all surveys. There was poor survival of older muskellunge, especially males, past age 5, from 2005 to 2009 (Figures 6 and 7). In 2005, 58 age 5, 48 age 6, and 38 age 7 muskellunge were caught. Only three, four and one of these age classes were caught in 2009 at age 9, 10, and 11, respectively. Without vegetative cover, older legal sized muskellunge were perhaps more vulnerable to angling mortality. There was also poor survival of muskellunge that were young-of-year to age 2 in 2003, when vegetation density after the whole lake fluridone treatment was low, an observation supported by low numbers of muskies age 3 (15 caught) and 4 (24 caught) in 2005 and age 7 (seven caught) and 8 (five caught) in 2009. In addition, only nine age 6 muskellunge were caught in the 2009 trap net catch. These fish were stocked in 2003, the year of the whole lake fluridone treatment. It is possible that stocked fingerling and juvenile muskellunge suffered heavy predation in 2003 when vegetation density was low or non-existent, since there was little cover for fingerling muskellunge to hide in to avoid predation. Age 4 (49 caught) and 5 (65

caught) muskellunge were well represented in the 2009 sample. The 2004 and 2005 year classes appear to be strong during years of low vegetation after the 2003 treatment.

Growth rates, as measured by mean total length at age, for female muskellunge exceeded those of males at all ages (Figure 8). However, muskellunge growth rates for both males and females declined from 2005 to 2009. Growth rates of both males and female muskellunge in 1997 and 1998 was similar to 2005. Muskellunge feed by hiding in aquatic vegetation and ambushing prey in quick short rushes (Smith 1985, Scott and Crossman 1973). Juvenile muskellunge and the prey of adult muskellunge feed on epiphytic invertebrates and hide from predators in vegetative cover. Without vegetation, muskellunge have no place to hide, and their prey is more widely dispersed. It is possible that the low density of submersed aquatic vegetation from 2003 to 2005 affected muskellunge feeding and growth by disrupting preferred hunting tactics and disassociating them from their prey. Muskellunge had to expend more energy to forage over a larger area. The mean total length of age 3 and older male muskellunge declined by 76 mm (three inches), and age 3 and older females declined by 25 mm (one inch), from 2005 to 2009 (Figure 9). This is probably related to the low survival of age 5 and older males from 2005 to 2009. Because there were fewer age 5 and older males caught in 2009, the 2009 sample of male muskellunge is made up of younger and smaller fish. The mean total length of age 3 and older male muskellunge in 1997 and 1998 were similar to 2005, while females were 39 mm (1.5 inches) and 70 mm (2.75 inches) larger in 2005 than in 1997 and 1998, respectively. Waneta Lake muskellunge exhibited good growth compared to Chautauqua Lake muskellunge. In the Waneta Lake 2005 trap net sample the mean total length of an age 7 male muskellunge was 889 mm (35 inches) and an age 7 female was 981 mm (38.6 inches). By comparison, the mean total length of an age 7 male muskellunge was 855 mm (33.7 inches) and an age 7 female was 960 mm (37.8 inches) in the Chautauqua Lake 2005 trap net sample (McKeown 2006).

The mean Fulton condition factor (K, Figure10) and relative weight (Wr, Figure 11) for each 25 mm total length group was slightly higher in 2005 than 2009. A close look at the data reveals only two fish were caught in the 2009 1000-1025 mm (39-40 inch) total length group. One was a 1003 mm (39.5 inches) female that weighed 7484 grams (16.5 lbs) and the other was a 1013 mm (40 inches) female that weighed 4073 grams (9 lbs). The weight measurement of the latter muskellunge, an obvious weighing or recording error, was not used to calculate K or Wr. The greatest differences between condition factor and relative weight were in the 700-875 mm (27.5-34.5 inch) total length range. Condition and relative weight of muskellunge from this size range were much lower in 2009 than 2005. This size range is composed of age 4 and 5 fish, which were strong year classes in the 2009 sample. Perhaps the low condition and relative weight of this size range can be attributed to heavy interspecific competition of these two large year classes for limited food supplies. Lack of aquatic vegetation could have caused the epiphytic invertebrate food supply of juvenile muskellunge and their prey to be limited.

RECOMMENDATIONS

1. Maintain the present annual stocking policy of five muskellunge fingerlings per acre (4,100 as adjusted from 4,800 by staff for 2010 and beyond). Check clip quality so natural reproduction can be further assessed.

2. Maintain existing statewide angling regulations on Waneta Lake. If future trap net surveys show continued low survival of larger, older muskellunge, increase the minimum size limit to 40 inches, if supported by anglers.

3. Continue to apply the statewide fin clip to each stocked year class in order to facilitate future aging.

4. Set trap nets at the same three sites in 2013 to further monitor adult stocks.

5. If muskellunge eggs are needed by the Bureau of Fisheries, set trap nets at sites 2 and 3 in early to mid April when the water temperature nears 45°F.

6. Permit the treatment of only small dispersed areas of aquatic vegetation, rather than large whole lake treatments.

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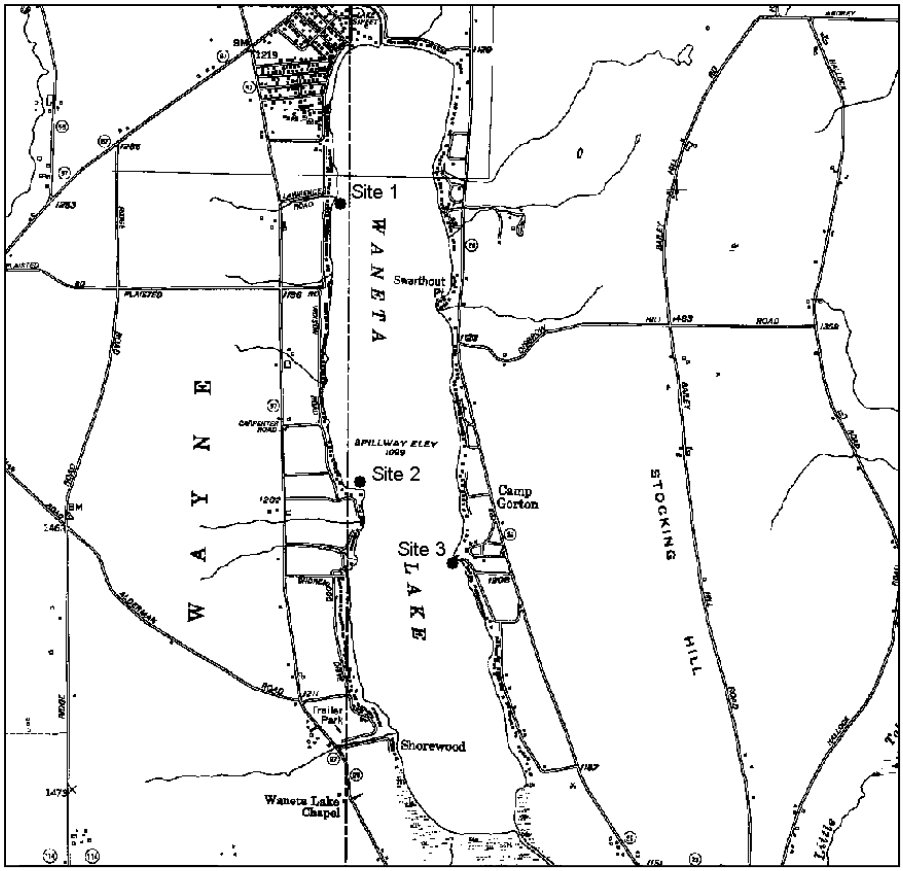

Figure 1. Waneta Lake showing the location of the three trap net sites used in April 1970-1998, 2005, and 2007.

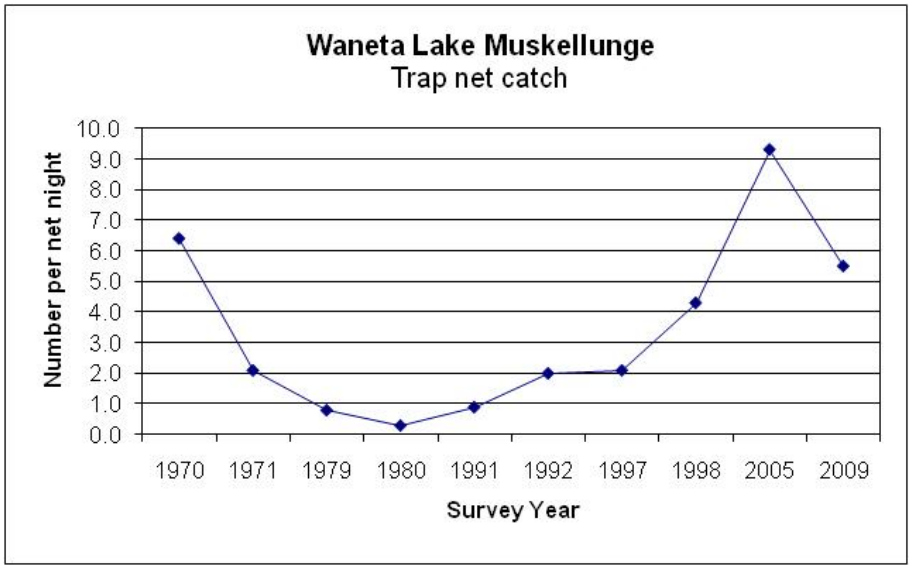

Figure 2. Number of muskellunge caught per net night from three trap net sites set in Waneta Lake in April from 1970 to 2009.

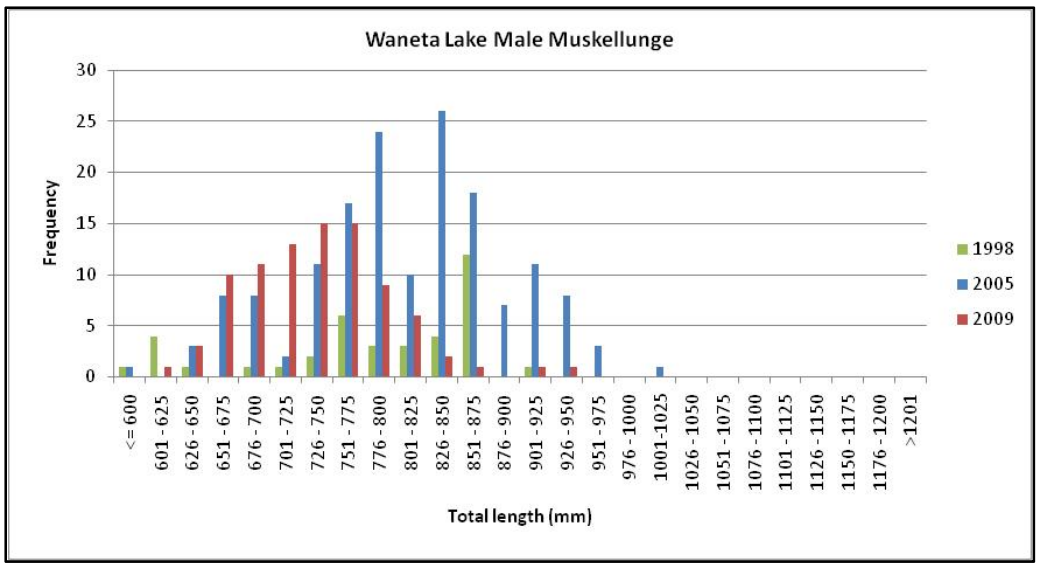

Figure 3. Total length frequency of male muskellunge caught in trap nets set in Waneta Lake in April 1998, 2005, and 2009.

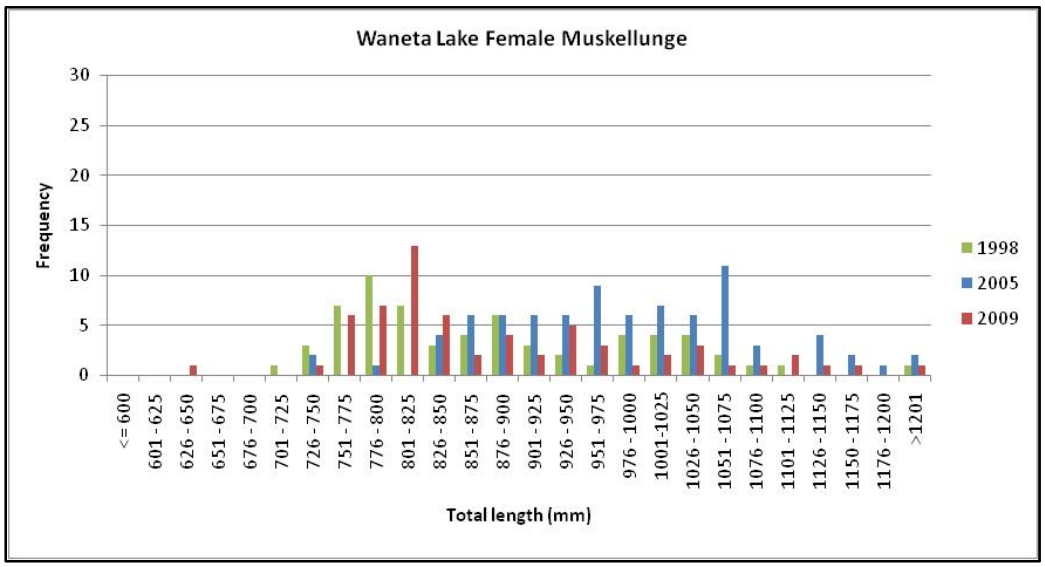

Figure 4. Total length frequency of female muskellunge caught in trap nets set in Waneta Lake in April 1998, 2005, and 2009.

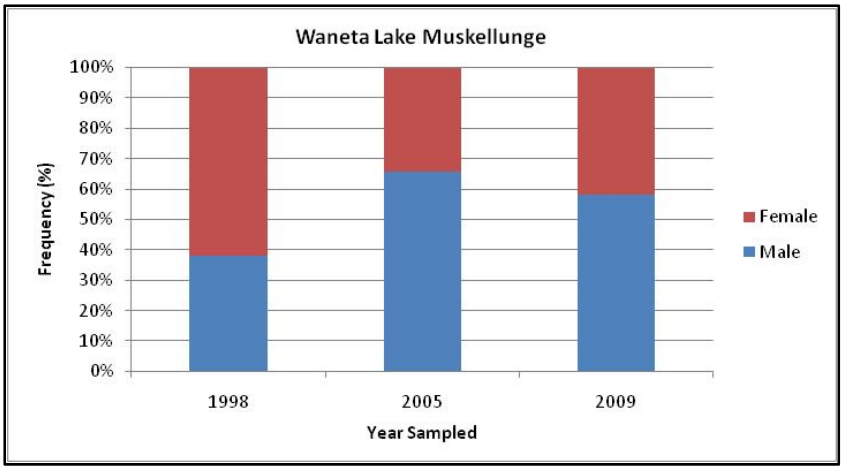

Figure 5. Proportion of male and female muskellunge caught in trap nets set in Waneta Lake in April 1998, 2005, and 2007.

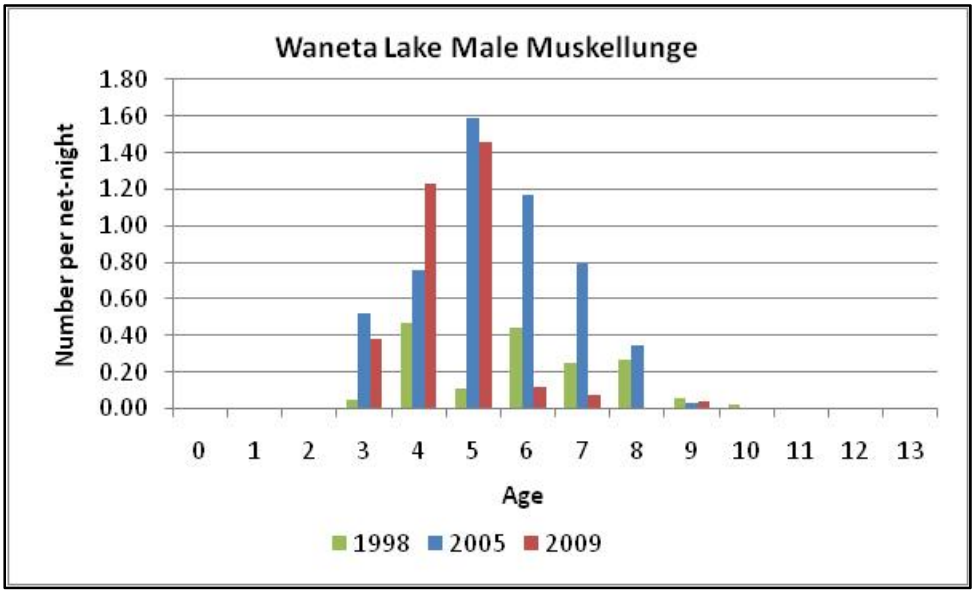

Figure 6. Age frequency in number per net night of male muskellunge caught in trap nets set in Waneta Lake in April 1998, 2005, and 2009.

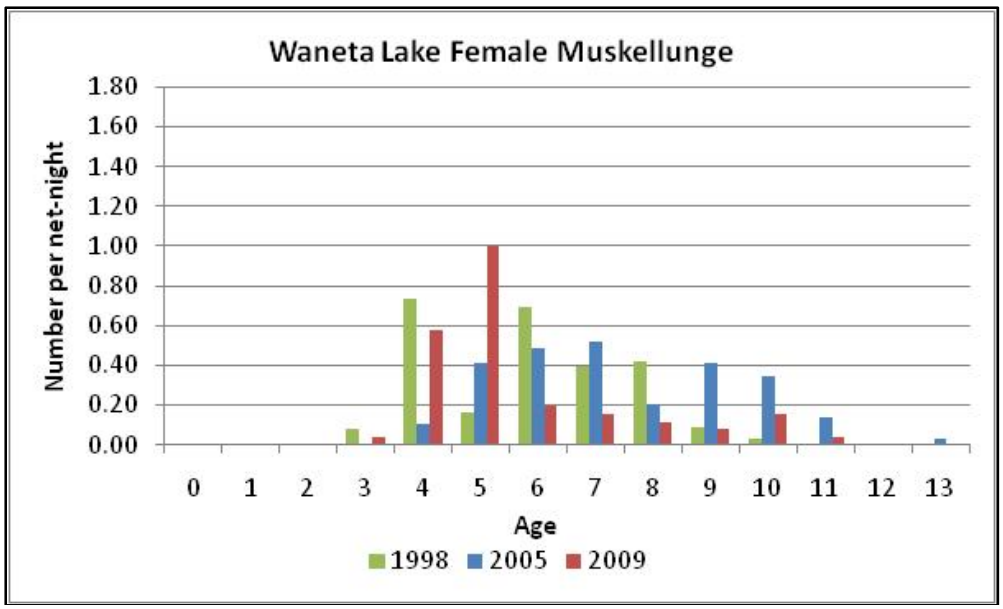

Figure 7. Age frequency in number per net night of female muskellunge caught in trap nets set in Waneta Lake in April 1998, 2005, and 2009.

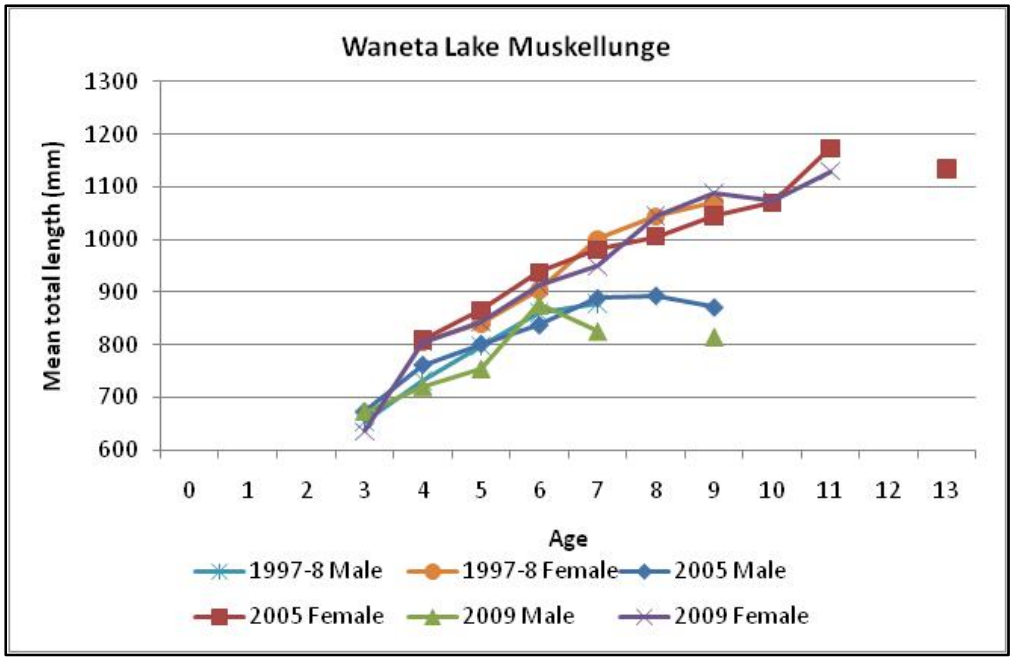

Figure 8. Mean total length at age of muskellunge caught in trap nets set in Waneta Lake in April 1997, 1998, 2005, and 2009.

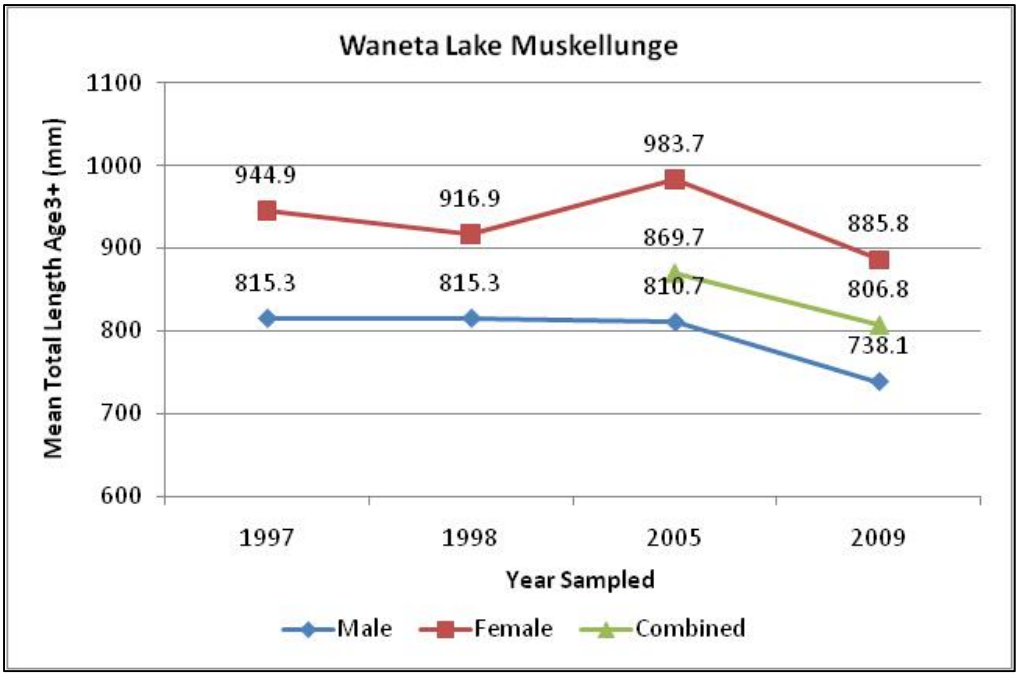

Figure 9. Mean total length of age 3 and older muskellunge caught in trap nets set in Waneta Lake in April 1997, 1998, 2005, and 2009.

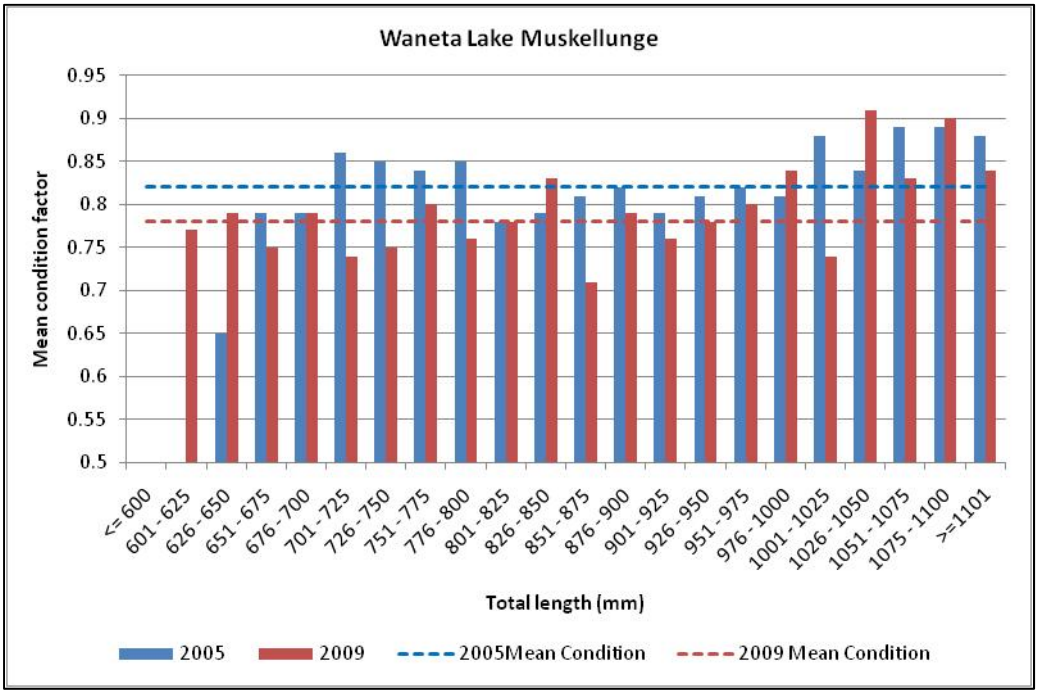

Figure 10. Mean Fulton condition factor of muskellunge caught in trap nets set in Waneta Lake in April 2005 and 2009.

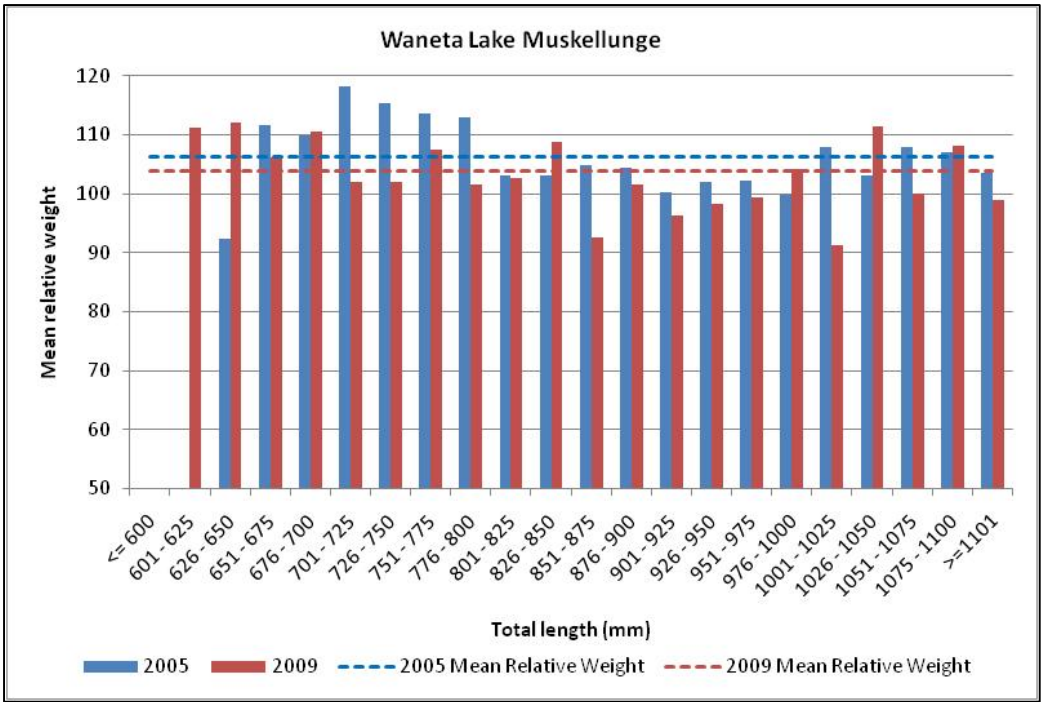

Figure 11. Mean relative weight of muskellunge caught in trap nets set in Waneta Lake in April 2005 and 2009.

Table 1. Stocking history of Muskellunge in Waneta Lake from 1954 - 2009.

Year	Number	Stage	Mark	Length (in)	Fingerling Culture Method *
1954	100,000	fry	None	---	
1955	100,000	fry	None	---	
1955	250	fing	Lv	8.9	Extensive
1956	500,000	fry	None	---	
1956	495	fing	Rp	6.0	Extensive
1957	316,250	fry	None	---	
1957	500	fing	Rv	4.5	Extensive
1958	500,000	fry	None	---	
1958	163	fing	Lp	5.0	Extensive
1959	500,000	fry	None	---	
1959	500	fing	None	6.5	Extensive
1960	500,000	fry	None	---	
1960	500	fing	None	8.0	Extensive
1961	500,000	fry	None	---	
1961	500	fing	None	4.3	Extensive
1962	500,000	fry	None	---	
1962	500	fing	Lv	7.8	Extensive
1963	NONE			---	
1964	400	fing	Rv	7.4	Extensive
1965	NONE			---	
1966	NONE			---	
1967	NONE			---	
1968	1,200,000	fry	None	---	
1968	2,400	fing	None	2.5	Unknown
1969	2,400	fing	None	2.5	Unknown
1970	NONE			---	
1971	15,000	fry	None	---	
1972	2,400	fing	Lp	6.4	Intensive
1973	NONE				
1974	1,000	fing	Rp	6.4	Intensive
1975	2,400	fing	Lv	7.0	Intensive
1976	2,400	fing	Rv	5.6	Intensive
1977	2,400	fing	Lp	6.6	Intensive
1978	2,400	fing	Rp	6.1	Intensive
1979	2,400	fing	Lv	5.8	Intensive
1980	2,400	fing	Rv	5.3	Intensive
1981	4,800	fing	None	5.7	Intensive
1982	NONE				
1983	4,960	fing	None	5.5	Intensive
1984	4,800	fing	None	5.0	Intensive
1985	4,800	fing	None	6.5	Intensive

Table 1. (continued)

Year	Number	Stage	Mark	Length (in)	Fingerling Culture Method *
1986	4,800	fing	None	5.8	Intensive
1987	5,000	fing	None	6.8	Extensive
1988	4,800	fing	None	7.1	75% Extensive
1989	4,800	fing	None	7.7	85% Extensive
1990	1,770	fing	None	7.0	Extensive
1991	2,800	fing	None	6.5	Intensive
1991	2,000	fing	Lv	8.2	Extensive
1992	2,800	fing	None	5.4	Intensive
1992	2,000	fing	Lp	8.5	Extensive
1993	3,800	fing	None	4.7	Intensive
1993	1,000	fing	Rv	9.0	Extensive
1994	4,800	fing	Lv	7.0	Extensive
1995	3,200	fing	Rp	7.6	Extensive
1996	1,200	fing	Lp	6.1	Intensive
1996	3,600	fing	Lp	7.5	Extensive
1997	7,500	fing	Rv	7.0	Extensive
1998	4,840	fing	Lv	8.0	Extensive
1998	2,000	fing	None	8.5	Extensive
1999	4,970	fing	Rp	7.5	Extensive
2000	4,870	fing	Lp	8.5	Extensive
2001	5,800	fing	Rv	8.0	Extensive
2002	4,800	fing	Lv	9.0	Extensive
2003	4,350	fing	Rp	8.5	Extensive
2004	4,800	fing	Lp	8.5	Extensive
2005	4,800	fing	Rv	8.0	Extensive
2006	4,800	fing	Lv	9.0	Extensive
2007	4,800	fing	Rp	8.0	Extensive
2008	2,900	fing	Lp	9.5	Extensive
2009	4,120	fing	Rv	8.0	Extensive

* Intensive - inside, trough culture. Extensive - outside, earthen pond culture

Table 2. Summary of trap netting operations for spawning muskellunge in Waneta Lake, 1970-2009 at net sites 1, 2 and 3.

Year	Netting Dates	Effort, # of net nights	# Fish Caught	Catch per net night	Mean length (in) at all Sites Male (#)	Female (#)
1970	4/27-4/30	9	58	6.4	35.0 (27)	40.6 (34)
1971	4/26-5/7	30	63	2.1	35.6 (36)	43.5 (27)
1979	4/23-5/4	35	29	0.8	36.4 (25)	46.2 (12)
1980	4/23-5/1	41	12	0.3	30.2 (14)	39.0 (4)
1991	4/11-4/26	40	35	0.9	30.1 (31)	39.4 (8)
1992	4/13-4/29	45	90	2.0	30.2 (58)	36.7 (32)
1997	4/14-4/29	47	100	2.1	32.1 (53)	37.2 (47)
1998	4/13-4/23	23	103	4.3[1]	32.1 (39)	36.1 (64)
2005	4/13-4/26	22	239	9.3[2]	31.9 (158)	38.7 (82)
2009	4/14-4/24	26	158	5.5[3]	29.1 (88)	34.9 (63)

Footnotes:
1. 98 fish divided by 23 trap net nights (5 fish captured in collapsed net over weekend)
2. 205 fish divided by 22 trap net nights (31 fish captured in collapsed net over weekend, 3 captured in biased net)
3. 143 fish divided by 26 trap net nights (15 fish captured in collapsed net over weekend)

Table 3. Proportional Stock Density (PSD) of selected fish species collected in trap nets set in Waneta Lake in 1998, 2005, and 2009.

	PSD	Sub-stock	Stock	Quality	Preferred	Memorable	Trophy	Total
				1998				
Muskellunge	81	0	103	83	17	3	0	103
				2005				
Muskellunge	85	0	239	204	46	14	0	239
Chain Pickerel	100	0	10	10	5	1	0	10
Brown Bullhead	100	0	124	124	120	4	0	124
Rock Bass	50	0	22	11	2	0	0	22
Pumpkinseed	88	0	145	128	0	0	0	145
Bluegill	88	0	163	144	0	0	0	163
Smallmouth Bass	97	0	30	29	18	10	0	30
Largemouth Bass	95	0	21	20	9	0	0	21
Black Crappie	60	0	142	85	34	3	0	142
Yellow Perch	79	1	325	256	8	3	0	326
				2009				
Muskellunge	58	0	158	91	18	8	0	158
Chain Pickerel	91	0	11	10	3	0	0	11
Brown Bullhead	84	3	37	31	28	2	0	40
Rock Bass	74	0	47	35	9	0	0	47
Pumpkinseed	69	1	45	31	0	0	0	46
Bluegill	74	0	127	94	7	0	0	127
Smallmouth Bass	88	0	8	7	3	0	0	8
Largemouth Bass	100	0	20	20	11	0	0	20
Black Crappie	95	0	22	21	10	1	0	22
Yellow Perch	73	1	102	74	20	2	0	103

APPENDIX A

Relative Abundance of Fish Species Captured in Trap nets on Waneta Lake, April, 1997-2009.

Common Name	Scientific Name	Relative Abundance			
		1997[1]	1998[1]	2005[2]	2009[2]
Alewife	*Alosa pseudoharengus*	R	A	4.82	0.35
Chain Pickerel	*Esox niger*	C+	C	0.45	0.42
Muskellunge	*Esox masquinongy*	C	C	9.31	5.50
Common Carp	*Cyprinus carpio*	C	C-	R	0.12
Golden Shiner	*Notemigonus crysoleucas*	C+	C	0.55	0.08
Rudd	*Scardinius erythrophthalmus*	None	R	None	None
Quillback	*Carpiodes cyprinus*	R	None	None	None
White Sucker	*Catostomus commersoni*	R	R	0.05	None
Brown Bullhead	*Ameiurus nebulosus*	C+	C+	10.64	1.54
Rock Bass	*Ambloplites rupestris*	R+	R+	1.23	1.81
Bluegill	*Lepomis macrochirus*	A+	A+	49.41	28.31
Pumpkinseed	*Lepomis gibbosus*	C-	C-	35.41	2.42
Black Crappie	*Pomoxis nigromaculatus*	A	A	8.86	0.85
Smallmouth Bass	*Micropterus dolomieui*	C-	C	1.36	0.31
Largemouth Bass	*Micropterus salmoides*	C	C	0.95	0.77
Yellow Perch	*Perca flavescens*	A	A	23.86	33.04

Footnotes:
1. A = Abundant C = Common R = Rare
2. Number per net night