Noxon Rapids and Cabinet Gorge Reservoirs Fisheries Monitoring

2020 Annual Progress Update

Montana Tributary Habitat Acquisition and Recreational Fishery Enhancement Program, Appendix B

September 2021

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Appendix B

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Overview

This is an annual update of work completed as part of the Montana Tributary Habitat Acquisition and Recreational Fishery Enhancement Program, Appendix B (Avista 1999). Specifically, this report focuses on fish sampling activities in Noxon and Cabinet Gorge reservoirs. The objectives of this monitoring are:

1) Monitor trends in fish populations in Noxon and Cabinet Gorge Reservoirs with emphasis on species of recreational value and potential predators of native salmonids which inhabit the reservoirs.
2) Monitor the population of Walleye in Noxon Reservoir.
3) Monitor the overall status of the Bass fishery in Noxon Reservoir with tournament data.

Due to the COVID-19 pandemic most normal fish sampling activities including gillnetting and bass tournament monitoring were not performed. During the 2020 field season only spring Walleye electrofishing was conducted. Normal fisheries sampling activities will resume during the 2021 season.

The annual survey results presented here will be compiled with future sampling data and presented as a comprehensive report scheduled for 2022. For a more thorough description of the study area and methods, refer to: Kreiner and Tholl (2013), Kreiner and Tholl (2016), Horn and Tholl (2010), and Scarnecchia et al. 2014.

Spring Walleye

Introduction

Walleye were illegally introduced into Noxon Rapids Reservoir in the 1980s or early 1990s (WWP 1995, Horn and Tholl 2010). Since 2000, the population of Walleye has become self-sustaining and has increased in abundance relative to other species. Stemming from the illegal introduction in Noxon Rapids Reservoir, Walleye have since become established in the downriver waterbodies of Cabinet Gorge Reservoir, Lake Pend Oreille, and the Pend Oreille River through Idaho and into Washington. Based on information obtained during a previous telemetry study (Horn et al. 2009), Montana Fish, Wildlife and Parks (MFWP) began spring surveys for Walleye on suspected spawning grounds in 2012. This work has continued through 2020, primarily using jet-boat electrofishing at night. To coincide with suitable spring spawning temperature and pre-runoff flows, spring Walleye electrofishing is conducted from late March to early May (Willis and Stephen 1987). Efforts occur in two spawning areas directly downstream of Thompson Falls Dam, adjacent to the River's Bend Golf Course and upstream of the Highway 200 bridge (FIGURE 1).

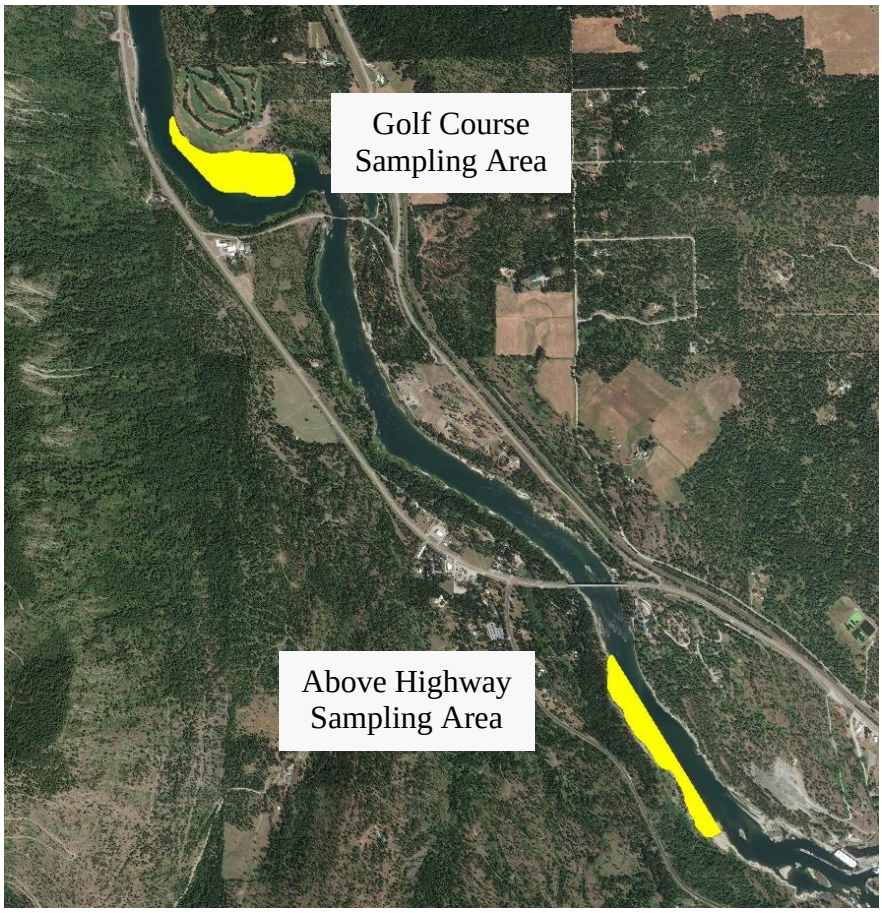

FIGURE 1. Map of two spring Walleye sampling locations in upper Noxon Rapids Reservoir.

Methods

Walleye were collected by jet-boat mounted boom electrofishing during nighttime hours, in April and early May of 2020. Walleye captured were measured (total length, TL, mm) and weighed (g). A subsample of up to five Walleye of each sex in 25 mm length bins for Walleye up to 500 mm and up to five Walleye of each sex in 50 mm length bins for Walleye greater than 500 mm in length were sacrificed for age analysis. Sex and maturity of Walleye was assessed by visual inspection of gonads of scarified fish or manipulating the abdomen following methodology outlined by Duffy et al. 2000. All remaining Walleye were scanned and if not found to be previously tagged were implanted with passive integrated transponders (PIT tags), marked via dorsal spine removal, and released. Otoliths of walleye sacrificed were removed using the "up through the gills method" (Stevenson and Campana 1992), embedded in epoxy, and transversely sectioned using a low-speed isometric saw. Sections were then aged independently by two readers and any fish with age discrepancies were aged by a third reader (Quist and Isermann 2017).

Ages derived from otolith analysis were used to construct age-length keys using Fisheries Stock Assessment (FSA) v0.8.12; R v3.3.2 (Ogle 2010; R Core Team 2020). Age-length keys were constructed for both female and male Walleye using 10 mm length bins and ages were assigned to all unaged fish based on the corresponding age-length keys (Isermann and Knight 2005; Ogle 2016). Condition of Walleye, was calculated as an index, using relative weight (Wege and Anderson 1978; Murphy et al. 1990; Pope and Kruse 2007). Size structure of Walleye was described using proportional size distribution and relative stock density where species specific lengths refer to stock, quality, preferred, memorable, and trophy length fish (Gabelhouse 1984; Neumann et al. 2012). Condition was compared between length groups using one-way ANOVA and Tukey's Honestly Significant Difference (Ogle 2016). Using ages derived from otolith analysis we also fitted von Bertalanffy growth curves for both male and female Walleye spawning populations (von Bertalanffy 1938).

Results

Montana Fish, Wildlife and Parks electrofished upper Noxon Rapids Reservoir for Walleye on 9 separate occasions. Sampling time was split between the area above the Highway 200 bridge (70%) and the area adjacent to the River's Bend Golf Course (30%). A total of 285 sexually mature fish were captured, of which 71 (25%) were females and 214 (75%) were males (FIGURE 2). Of the 286, fish captured 73 (26%) of them were sacrificed for age analysis. The remaining 213 fish were released alive.

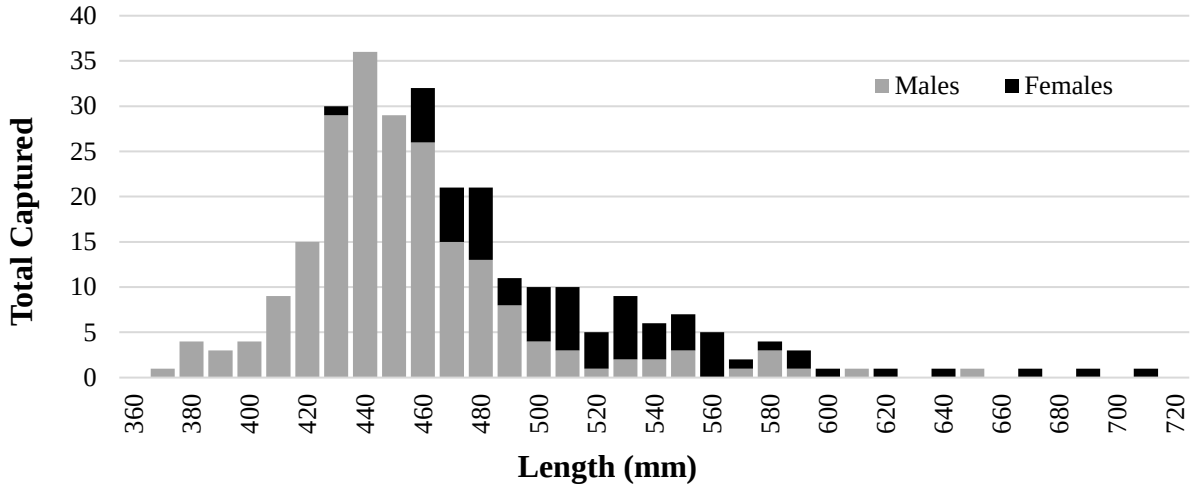

FIGURE 2. Length frequency distribution of spring caught walleye from Noxon Rapids Reservoir in 2020.

Males were represented primarily by the 2015 year-class (83%) followed by the 2014 and 2016 year-class (5%; FIGURE 3). Females' most abundant year-class was also 2015 (87%) followed next by the 2013 year-class (6%; FIGURE 3). Mature males were captured from eight different year-classes and mature females from four different year-classes (TABLE 1). Additionally, one immature age-3 female Walleye was captured.

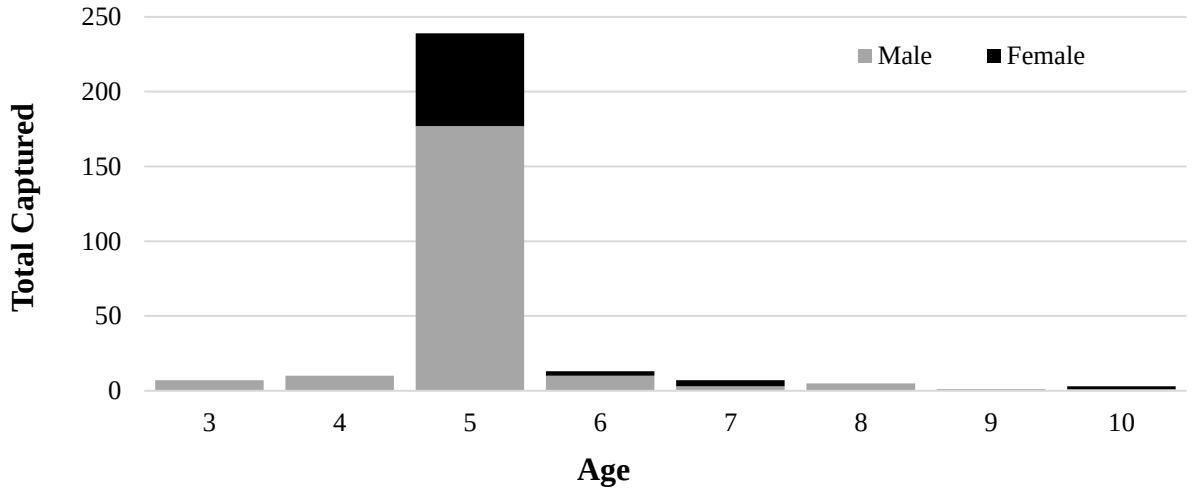

FIGURE 3. Age frequency distribution of spring caught Walleye from Noxon Rapids Reservoir in 2020

Less than 1% (n = 3) of the total mature fish were captured adjacent to the River's Bend Golf Course; the majority were captured upstream of the Highway 200 bridge (n = 282). Mean length

of mature males captured was 450 mm (range = 365–648; TABLE 1) of these fish 202 (94%) exceeded 400 mm in length, this large size structure is evidently from the strong 2015 year-class. In contrast, mean length of mature females captured was 518 mm (range = 430-705; TABLE 1). All females exceeded 400 mm in length with the majority of fish also being represented by the 2015 year-class.

TABLE 1. Mean length-at-age for male and female of spring caught Walleye from Noxon Rapids Reservoir in 2020.

	Males			Females		
Age	n	Mean Length (mm)	SD	n	Mean Length (mm)	SD
3	7	376	6.5	-	-	-
4	10	403	9.8	-	-	-
5	177	447	25.9	62	507	37.5
6	10	467	35.7	3	494	2.3
7	3	562	19.2	4	628	15.6
8	5	569	46.1	-	-	-
9	1	585	-	-	-	-
10	1	605	-	2	694	11

Proportional size distribution for Walleye captured during spring 2020 (98) also points to a large size structure of spawning individuals. Mean relative weight (Wr) for captured walleye was 84.8 with female Walleye averaging better condition (92.3) than males (82.3). Walleye condition also had a positive relationship with length (FIGURE 4). Small length groups showed below average condition, whereas memorable length class fish were above average (FIGURE 4). Both preferred and memorable length groups (stock = 165-213 mm, quality = 297-338 mm, preferred = 371-455 mm, and memorable = 488- 528 mm) were in statistically better condition than stock and quality (preferred-stock $p = 0.02$, memorable-stock $p = 0.01$, preferred-quality $p \leq 0.01$, memorable-quality $p = 0.01$).

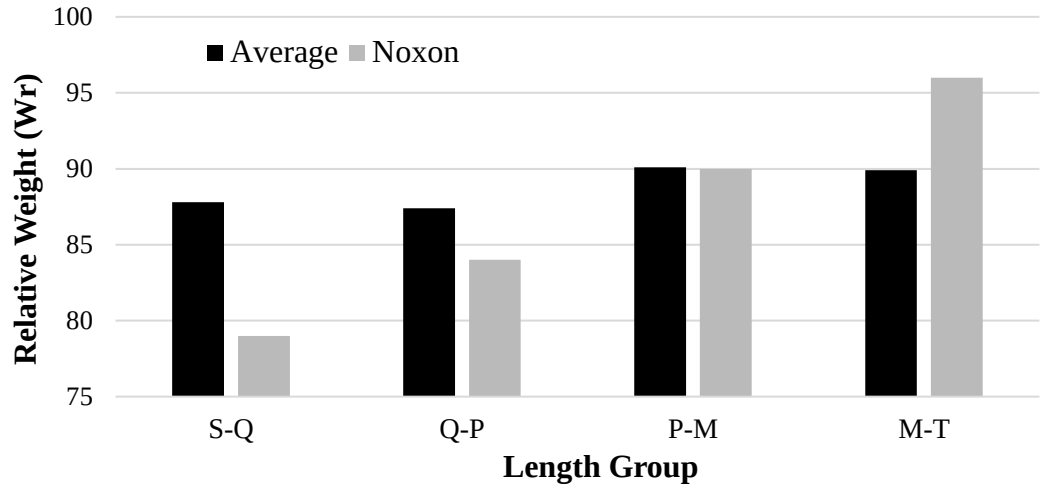

FIGURE 4. Average condition of Walleye caught using standardized gill nets in large standing waters in North America and average condition of spring caught Walleye from Noxon Rapids Reservoir in 2020. S = stock, Q = quality, P = preferred, M = memorable, and T = Trophy (Gabelhouse 1984).

Overall catch rate was 37.2 fish per hour, and nightly catch rate ranged from 1.7-176.5 fish per hour. Total catch peaked at 176 fish per hour on April 28 when water temperature was 10.3°C and flow was 25,390 cfs (FIGURES 5 and 6). Female catch remained low most of the year peaking on April 20 at 36.5 per hour when water temperature was 9.5°C and flow was 12,300 cfs (FIGURE 5; FIGURE 6).

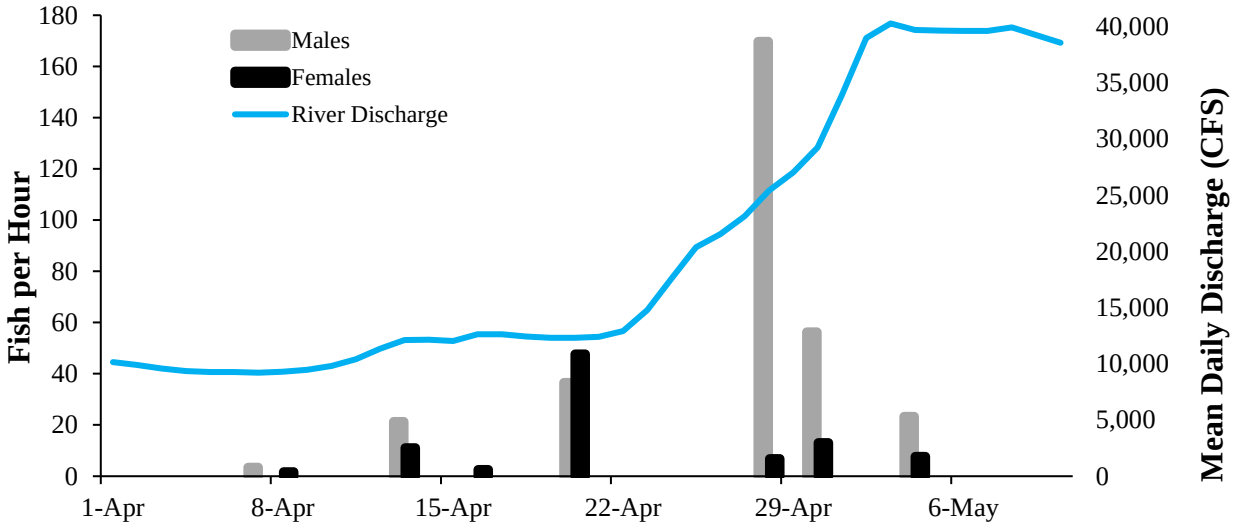

FIGURE 5. Catch per unit effort of Walleye during spring 2020, with river discharge.

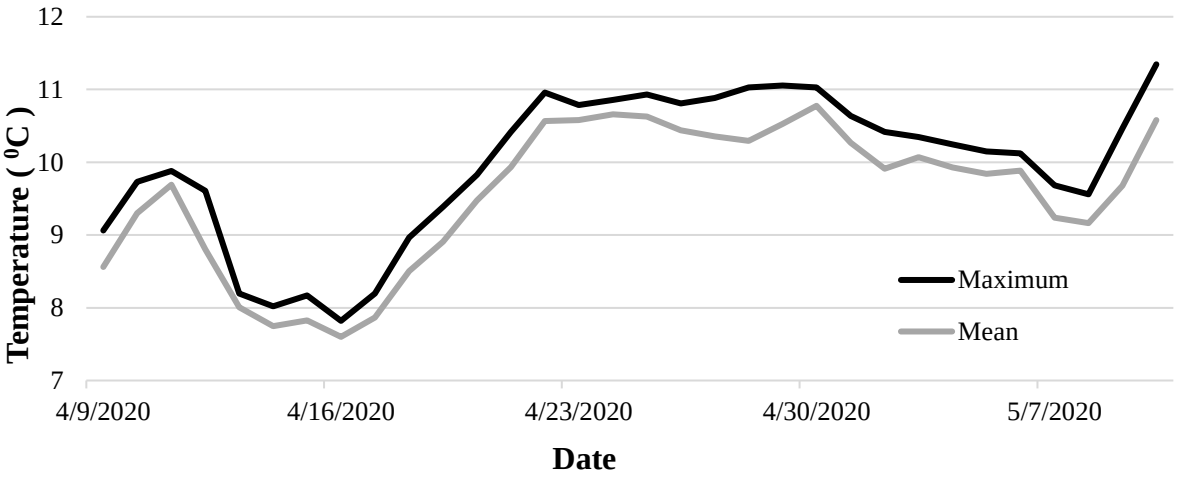

FIGURE 6. Water temperature of upper Noxon Rapids Reservoir, spring 2020.

Of the 213 fish PIT tagged and released alive, three were subsequently captured during a later sampling date in 2020 (within year recaptures), and 19 additional fish captured in 2020 had been captured and tagged in prior years (previous year recaptures). Most fish were recaptured after only one growing season (84%). The remaining fish were captured after two growing seasons (5%) and four growing seasons (11%) (TABLE 2). Recapture rates for fish PIT tagged in 2019 were 3.3%. All previous year recapture fish were male with a mean length of 449 mm. The 19 recaptured males grew between 20 and 78 mm per growing season with a mean value of 52 mm (TABLE 2).

TABLE 2. Mean yearly growth of recaptured walleye sampled during spring 2020.

PIT Tag Number	Initial Capture Year	Initial Capture Length (mm)	Recapture Date	Recapture Length	Sex	Mean Yearly Growth (mm)
982000363519162	2018	317	4/13/2020	426	M	54.5
982000362691566	2019	382	4/13/2020	404	M	22
900226000731129	2016	498	4/20/2020	578	M	20
982000363519301	2019	424	4/20/2020	460	M	36
900226000731208	2016	402	4/20/2020	510	M	27
982000362929565	2019	408	4/28/2020	475	M	67
982000362929593	2019	405	4/28/2020	451	M	46
982000362691483	2019	362	4/28/2020	425	M	63
982000363518014	2019	411	4/28/2020	475	M	64
982000362929574	2019	364	4/28/2020	430	M	66
982000363517958	2019	363	4/30/2020	390	M	27
982000362691536	2019	363	4/30/2020	432	M	69
982000363519303	2019	384	4/30/2020	446	M	62
982000362691585	2019	400	4/30/2020	454	M	54
982000363519372	2019	384	4/30/2020	437	M	53
982000363519326	2019	395	4/30/2020	448	M	53

982000362929590	2019	362	4/30/2020	421	M	59
982000362929602	2019	384	5/5/2020	445	M	61
982000362691584	2019	354	5/52020	432	M	78

Von Bertalanffy growth curves (FIGURE 7) and parameters (TABLE 3) were calculated for both male and female fish using the 73 sacrificed for age analysis (TABLE 4). Of those fish, 51 were male and 22 were female. Supporting reported mean length-at-age data, female Walleye growth rate was greater than that of males (FIGURE 7; TABLE 3).

FIGURE 7. Von Bertalanffy growth curves for both male and female Walley using estimates derived from Walleye collected from Noxon Rapids Reservoir in 2020.

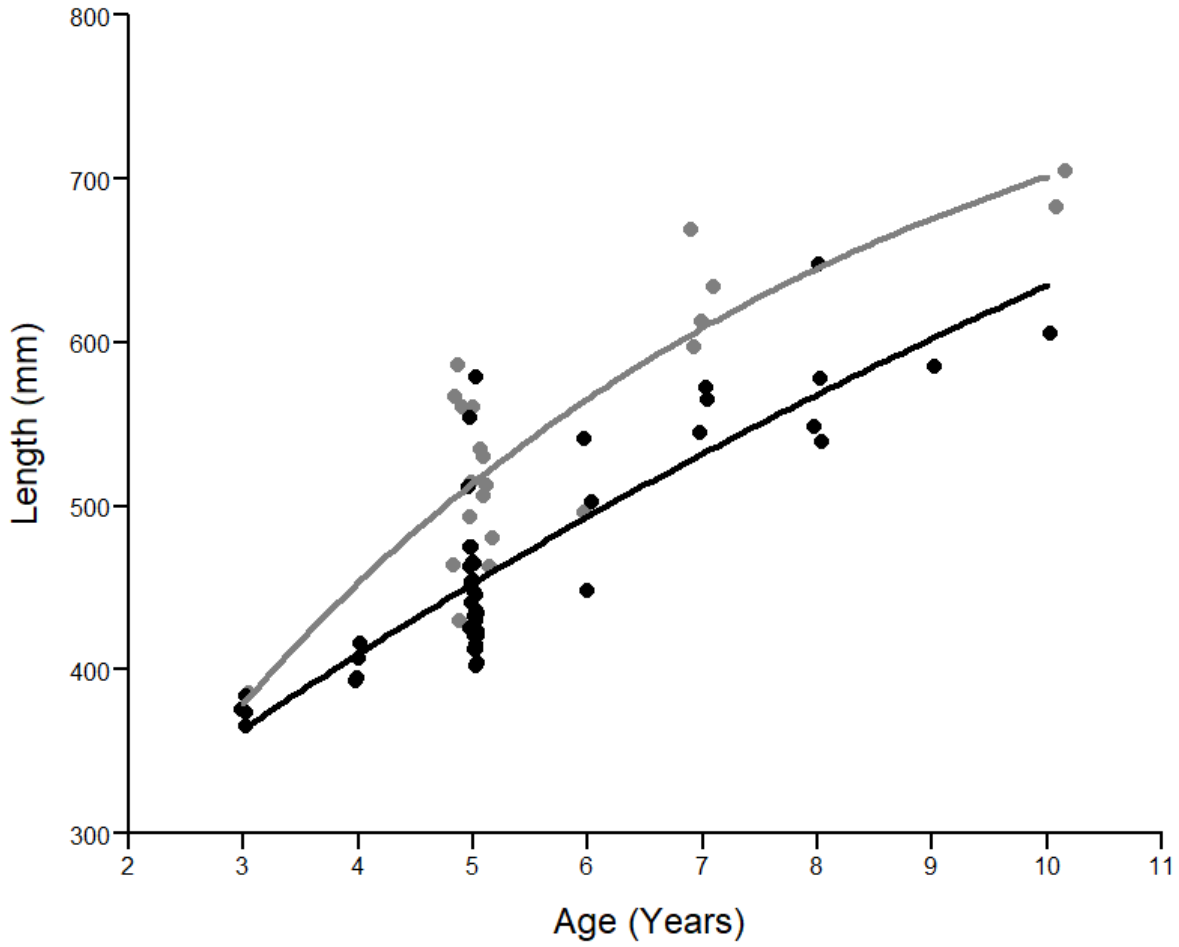

TABLE 3. Von Bertalanffy parameter estimates derived from Walleye collected from Noxon Rapids Reservoir in 2020.

von Bertalanffy parameter	Data Source					
	Female		Male		All Walleye	
	Est.	95% CI	Est.	95% CI	Est.	95% CI
L_{inf}	835	666–1,004	1,177	235–2119	987	621–1,023
K	0.18	0.07–0.29	0.06	-0.02–0.14	0.09	0.02–0.16
T_0	-0.46	-2.26–1.34	-3.39	-6.27– -0.51	-1.94	-3.77– -0.11

Discussion

Spring Walleye sampling in 2020 continued to show a spawning population dominated by the 2015 year-class. At age-5 in 2020 the year-class should have been fully recruited to the spawning population. Walleye from the 2015 year-class will persist for at least 5 more years and will have the opportunity to contribute to another strong year-class when conditions permit. Our monitoring has shown that even moderate year classes can make noticeable contributions to the overall population up to seven years later (Kreiner et al. 2020 and Kreiner et al. 2021). Spring river conditions (e.g., comparatively low flow and temperatures above 10 ºC in mid-to-late April; Elis and Giles 1965) seemed optimal for another strong year class of Walleye in 2016, but indications are that these fish are not a major component of the population. It is also unlikely that a strong year-class (i.e., 2015) was produced during 2018, 2019, and 2020 with respective run-off conditions in those consecutive years.

Unlike past years, the overwhelming majority of Walleye were captured upstream of the Highway 200 Bridge and catch rates for adjacent to the River's Bend Golf Course were very low (Kreiner et al. 2020 and Kreiner et al. 2021). These discrepancies in catch-rates between sampling location are not well understood. Catch rate was highest on the increasing limb of the hydrograph as temperatures hovered around 10-11 ºC. This increase is likely attributed to Walleye responding to spring temperature and flows and moving to spawning areas (Colby et al. 1979). However, as flows continue to rise the catchability of our sampling equipment quickly decreased and with it catch rates.

Size structure of the spawning population of Walleye continues to grow due to the aging of the 2015 year-class and little observed recruitment from younger year classes. Over the next couple of years, we predict that overall size structure will continue to increase as the dominate 2015-year class continues to age and grow, barring a strong younger year-class recruiting to the spawning population. This large size structure was well represented by proportional size distribution for Walleye of 98. Condition (Wr) of all Walleye in 2020 continues to be low as it falls between 10^{th} and 25^{th} percentile based on the weight standard formula (Murphy et al. 1990). However, there is a large divergence between the condition of female and male condition where females averaged just below the 50^{th} percentile and males between the 10^{th} and 25^{th}. Condition data should be more informative during 2021, when we resume fall gill netting of Noxon Rapids and Cabinet Gorge Reservoirs. Condition also improved as fish grew, with small length groups

showing below average condition and large with above average. We postulate, that in Noxon Rapids Reservoir's piscivore rich environment, as Walleye grow and gape limitations lessen, they are able to exploit larger prey resources with less competition.

We also observed a return to increased growth rate for younger Walleye in 2020 where male age-3 had a mean length of 376 mm. In 2018, age-3 males were markedly smaller than previous years (339 mm), compared to a mean length of 377 mm in 2016 (Kreiner et al. 2020). This temporary decline in growth rate can be attributed to density dependent growth associated with the 2015 year-class. We have observed this reduction in growth rate continue for both female and male fish, as the large 2015 cohort ages. Similarly sized fish (age-4, age-5 and age-6) also exhibit signs of density dependent growth, seemingly associated with inter-cohort competition with the 2015 year-class. We expect these reduced growth rates to subside as the 2015-class continues to age or until another strong year class is recruited to the population. Mean length-at-age and growth rate were also greater for female Walleye. While this is not unexpected, it is important to note that not only are female Walleye in better condition, they are also growing faster than their male counterparts. This was well demonstrated when comparing von Bertalanffy parameters. While the discrepancies in L_{inf} between the sexes is most likely due to the small sample size of older cohorts, particularly female Walleye, the growth coefficient also demonstrates females Walleye's greater growth rate.

Over the past decade, the major fish community change in Noxon Rapids and Cabinet Gorge reservoirs has been the establishment and continued increase of Walleye (Kreiner and Tholl 2016; Kreiner et al. 2020; Kreiner et al. 2021). Walleye abundance was observed to be increasing 2005-2015, however currently numbers appeared to be stabilizing (Scarnecchia et al. 2014; Scarnecchia and Lim 2014; Kreiner et al. 2020). Concurrently, abundance of native sucker and minnow species has declined. Recent (2016-2018) declines in condition of Walleye, Northern Pike, and Smallmouth Bass also indicate that the increase in total piscivores has ultimately resulted in a shortage of forage fishes (Kreiner et al. 2020). If trends in condition, growth, and prey abundance continue on this trajectory, both the native species and quality of angling for non-native predators could suffer. The continued monitoring of the fish community and population of Walleye in Noxon Rapids Reservoir and Cabinet Gorge Reservoir will be paramount to informing management decisions into the future.

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