2020 NAMEKAGON RIVER SMALLMOUTH BASS SURVEY REPORT

WATERBODY IDENTIFICATION CODE 2689500

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INTRODUCTION

A 2020 survey of the Namekagon River assessed the status of the smallmouth bass fishery. We conducted hook-line and electrofishing surveys and used collected data to calculate the average size, growth and mortality in the Namekagon River. No recent management activities have taken place for smallmouth bass, and this survey set a baseline for the population.

RIVER CHARACTERISTICS

The Namekagon River is a moderate-sized river flowing through Bayfield, Sawyer, Washburn and Burnett counties in northwest Wisconsin. The river is approximately 100 miles in length, with its headwaters at Lake Namekagon in Bayfield County ending at the confluence with the St. Croix River in Burnett County. Most of the Namekagon River's shoreline is owned by the National Park Service, the State of Wisconsin or the local County Forest.

There are a few impoundments on the river: Lake Namekagon, Pacawong Lake, Phipps Flowage, Lake Hayward and Trego Lake. The river from Lake Namekagon to Hayward Lake is a classified trout stream. Below the Hayward Dam, the river is considered a warm water fishery with these game fish present (in order of relative abundance): smallmouth bass, walleye, muskellunge, northern pike and largemouth bass.

FISHING REGULATIONS

The Namekagon River smallmouth bass regulations have generally followed the statewide or northern-region base regulations for bass. In 2012, it was decided to keep the general statewide bass regulation (14-inch minimum size limit) for the Namekagon River when the rest of Washburn and Burnett counties went to a no minimum size, five-fish bag limit.

This decision was made for several reasons by the fisheries biologist at the time, including regulation consistency with Minnesota and for National Park Service float trips, movement of bass out of the Namekagon River into the St. Croix River for overwintering and no apparent issues with growth (Damman, retired Wisconsin Department of Natural Resources (DNR) biologist, personal communication).

METHODS

The DNR staff from Hayward and Spooner used hook and line sampling starting July 21, 2020, through Sept. 2, 2020, to assess the smallmouth bass population in Upper

Namekagon River (Hayward Dam to Trego Lake) and Lower Namekagon River (County Highway K landing to St Croix River Confluence). Hook and line sampling occurred during daylight hours with one to four anglers for each sampling trip. Anglers sampled using either artificial lures or nightcrawlers.

Smallmouth bass were aged using both scales and dorsal spines. All spines were cross-sectioned and aged under a microscope multiplied by 100. Size structure quality of smallmouth bass sampled was determined using proportional size distribution (PSD) indices (Neumann et al. 2013).

The PSD and PSD-14 values for smallmouth bass are the number of fish over 11 inches and 14 inches divided by the number at/above stock length (7 inches). The mean length at age was used to assess smallmouth bass growth using the von Bertalanffy equation (Quist et al. 2013). $L\infty$ predicts the average ultimate length attained for fish in that population.

Estimated conditional mortality was calculated using eight predictors in Fisheries Analysis and Model Simulator (FAMS) 1.64.2 (Slipke and Maceina 2014). Annual mortality and survival (%) were calculated using catch curve analysis (Slipke and Maceina 2014). All population analyses were performed using FAMS 1.64.2.

RESULTS AND DISCUSSION

A total of 192 smallmouth bass were collected from the Upper Namekagon River, and 150 smallmouth bass were collected from the Lower Namekagon River. Smallmouth bass in the Upper Namekagon River ranged in length from 5.0 to 19.5 inches and averaged 12.5 inches.

Smallmouth bass in the Lower Namekagon ranged from 5.3 to 18.5 inches and averaged 10.9 inches (Figure 1). PSD and PSD-14 were 65 and 48 for the Upper Namekagon and 39 and 28 for the Lower Namekagon.

Approximately 45% of smallmouth bass were over 14 inches in the Upper Namekagon, while 23% of smallmouth bass were over 14 inches in the Lower Namekagon. Approximately 5% of the fish sampled were over 18 inches in the Upper Namekagon, and 1% were over 18 inches in the Lower Namekagon River.

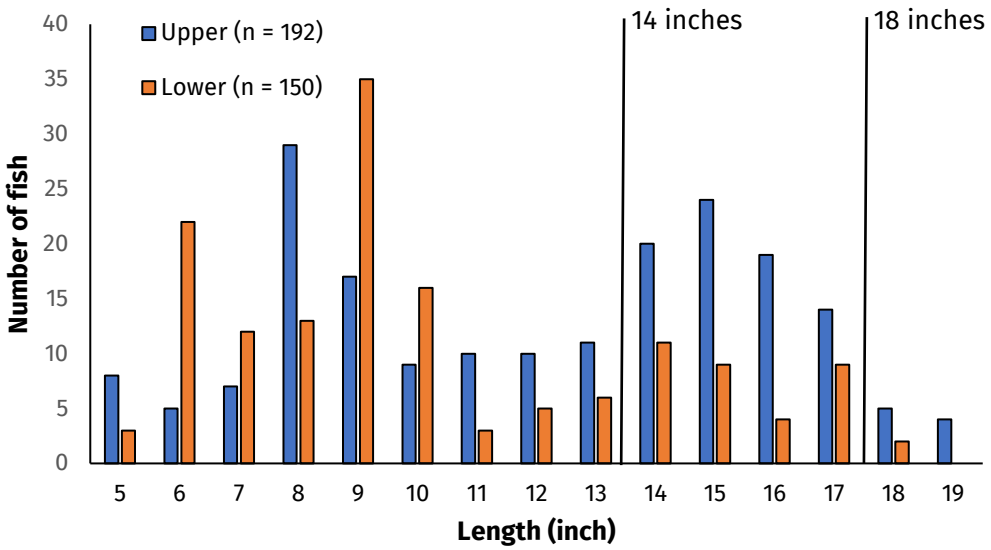

Figure 1. The number of smallmouth bass sampled per inch group in the Upper and Lower Namekagon River in 2020.

Growth is near or below average until the age of eight, where growth slowed in older ages when compared to Northern Region averages for smallmouth bass (Figure 2). Growth was very similar between the nearby Couderay River and Namekagon River (Figure 2).

The von Bertalanffy growth equation found nearly identical growth coefficients (K) and L∞ for both river sections (Table 1). The estimated time to reach 14 inches is six years and 11-12 years to reach 18 inches (Table 1). The Namekagon River's estimated time to reach 14 inches and 18 inches was similar to the Couderay River and slower than the Menominee River (Table 1).

Estimated and calculated annual mortality rates were low for the Namekagon River using two methods and likely fall between 24% and 34% (Table 2). Annual mortality was estimated to be lower using catch curve analysis than the Menominee River (Table 2). Survival was identical between the Upper and Lower Namekagon River and high at 76% (Table 2). Mortality metrics were similar between the Couderay and Namekagon Rivers (Table 2).

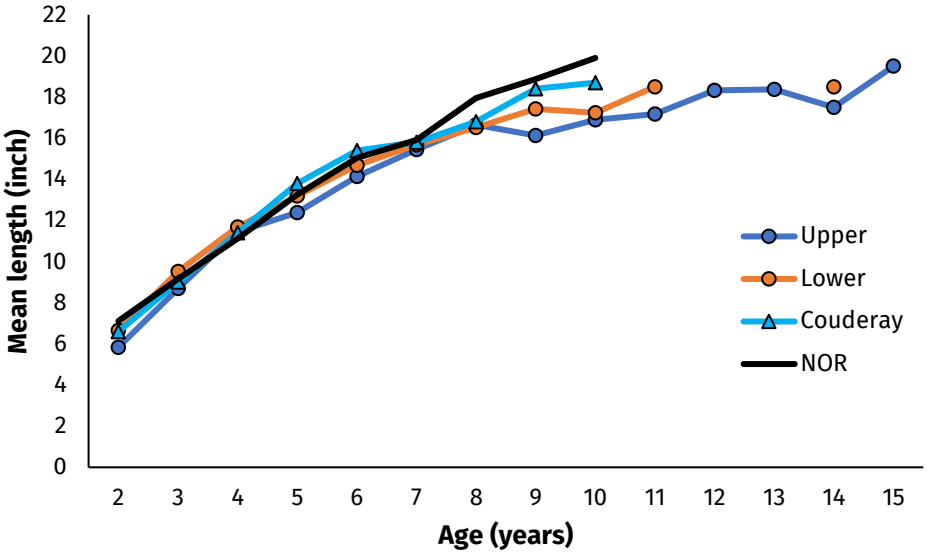

Figure 2. The mean length of smallmouth bass by year sampled in the Upper and Lower Namekagon Rivers in 2020 compared with the Couderay River and Northern Region averages (NOR).

Table 1. Von Bertalanffy model growth parameters include the number of smallmouth bass sampled (n), asymptotic total length (TL_∞), longest fish observed (TL_{max}), growth coefficients (K). Estimated time in years to reach 14inches (t_{14}) and 18 inches (t_{18}) are reported for each river segment.

River Segment	Sampling Year	n	TL_∞	TL_{max}	*K*	t_{14}	t_{18}
Upper Namekagon	2020	192	19.1	19.5	0.24	6	11
Lower Namekagon	2020	150	19.4	18.5	0.25	6	10
Menominee River (3)	2016 -2018	57 – 460	20.5 – 21.8	20.5	0.17 -0.18	4	8 – 10
Couderay River	2020	170	21.7	19.5	0.20	6	9

Table 2. Survival rates (S) and total annual mortality rates (A) estimated from catch curves for smallmouth bass age ranges used in catch curves are reported for each river segment. Instantaneous natural mortality rates (M) and conditional natural mortality rates (cm) represent mean values obtained using the eight estimators provided in Fishery Analysis and Modeling Simulator (FAMS) version 1.64.2 (Slipke and Maceina 2014). Namekagon River compared to similar results from Menominee River (Isermann et al. 2018) and Couderay River.

River Segment	Year of Sampling	Ages	S (%)	A (%)	M	cm
Upper Namekagon	2020	3-15	0.76	0.24	0.34	0.29
Lower Namekagon	2020	3-14	0.76	0.24	0.34	0.29
Menominee River (3)	2016-2018	4-15	0.66-0.68	0.34-0.36	0.28-0.31	0.24-0.27
Couderay River	2020	3-10	0.71	0.29	0.35	0.29

Based on data collection/analysis, the Namekagon River holds a healthy smallmouth bass population in both sections. The average size of smallmouth bass was greater in the Upper Namekagon River than the Lower Namekagon River. Overall, PSD was good (39-Lower) to excellent (65-Upper) in the Namekagon River.

Anderson and Weithman (1978) suggest a PSD of 39 means the Lower Namekagon has a relatively balanced smallmouth bass population (suggested range is 30 to 60). The Upper Namekagon's PSD of 65 suggests a larger size structure with more old fish in

the sample. In general, there appears to be more smallmouth bass in the Upper Namekagon than the Lower Namekagon River

Our aging data found many year classes represented in both sections of the river sampled. Growth was average when compared to the available Northern Region data and similar to the Couderay River. However, the DNR's statewide averages are likely comprised mostly of lake smallmouth bass populations, not rivers. Growth potential ($L\infty$) was similar as well between the Upper and Lower Namekagon.

The Namekagon River smallmouth bass took two more years to reach 14 inches based on the growth equation compared to the Menominee River in northeast Wisconsin. However, the Menominee River data was mainly collected with spring electrofishing, so the growth data isn't perfect compared to our late summer angling data. The Namekagon's growth potential was also lower than the nearby Couderay River. As stated in Isermann et al. (2018), older aged fish were potentially underaged for the Couderay or Menominee Rivers leading to a larger calculated $L\infty$ than observed in the Namekagon River sections.

Mortality rates were found to be relatively low in both the Upper and Lower Namekagon Rivers. This data suggests that overall fishing mortality is also likely low in the system. However, without a formal tagging study, we cannot safely estimate fishing mortality.

When compared to the Menominee system, survival was higher overall in the Namekagon River. Reed and Rabeni (1989) measured annual mortality rates compared to estimated fishing pressure. That study found smallmouth bass streams with low fishing pressure had 11% to 16% mortality rates, while heavy fishing pressure streams had mortality rates from 43% to 66%.

The Namekagon River's annual mortality rates were 24% to 34%, suggesting some fishing harvest occurs, but it is likely low. The Namekagon also had similar mortality and survival to the Couderay River. The Couderay River likely experiences little fishing pressure. There are only four non-advertised public accesses compared with seventeen advertised National Park Service canoe launches present on the Namekagon River.

Another factor to consider is aging using spines/scales. Isermann et. al (2018) found that these structures underestimate age and overestimate growth in older fish. This

means estimated mortality is potentially even lower and growth slower than is predicted here.

When looking at all potential smallmouth bass regulations, there are three options for the Namekagon River: 1) the protective slot (no minimum length limit, 14 – 18 inches protected slot, one fish over 18 inches, five-fish bag limit), 2) the trophy regulation (18-inch minimum, one fish bag limit), and 3) the current statewide regulation (14-inch minimum, five-fish bag limit).

Based on our data, the protective slot exposes a large portion of the younger fish to harvest (55% of our sample in the Upper Namekagon and 77% in the Lower Namekagon are below 14 inches). The trophy regulation received good reviews from the public, and a proposed regulation for the Namekagon River was passed at the local and state levels in spring 2020 (Question 36 – Wisconsin Conservation Congress 2020). However, our analyses do not suggest the smallmouth bass population would benefit, given the low mortality and average growth.

In this situation, it could potentially make the size structure smaller and create a stunted population composed of more small fish. The current regulation seems to offer the best balance of protecting younger fish while allowing some harvest on the Namekagon River. Overall, this assessment found a healthy population with average growth and high relative survival in both the Upper and Lower Namekagon Rivers under the current regulation.

LOCAL BIOLOGIST RECOMMENDATIONS

1. Given the low mortality rates, the high number of year classes and average growth rates, the 14-inch minimum length limit and five-fish bag limit should stay in place.
2. A smallmouth bass assessment should take place every five years on the Namekagon River. This assessment will help the DNR track trends and see if the population characteristics are stable. Increased fishing popularity will increase the need to monitor this population.
3. Future assessments should focus on using hook-line sampling and use electrofishing as a secondary method for smallmouth bass (as used in this survey). This sampling method proved more effective at capturing all size ranges of smallmouth bass than using standard river electrofishing during the summer months when we sampled.

4. The next study should consider using a tag-reward design. Tagging smallmouth bass would give fisheries the ability to estimate fishing mortality. Funding for this type of study would need to be explored.

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