



2022 West Watjask Stock Assessment

In part of reporting for FWEF Project 22-010 SVSFE
Initiatives and Monitoring of Recreational Fisheries
in the Swan Valley Area

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Executive Summary

In 2022, SVSFE secured funding from the Fish and Wildlife Enhancement Fund (FWEF) to conduct a stock evaluation of West Watjask Lake muskellunge. Featured in this report is the data and management considerations derived from the netting assessment.

Project objectives were to evaluate muskellunge stock. Information of interest included muskie growth, condition, abundance, and evidence of natural recruitment. A custom netting protocol was developed with inspiration from Ontario's Spring Muskie Index Netting Protocol (SMIN). The assessment occurred from May 23-24th, 2022. The program was anticipated to continue for 1-2 weeks to meet project objectives, however by May 24th it was realized the information collected was sufficient. Continued netting would only interfere with spawning fish and potentially be lethal to younger age classes of muskellunge.

Three trap nets fished for a total effort of 78.9 hours and ideal weather conditions facilitated an observational shoreline cruise on the morning of May 24th. During the shoreline cruise 5 muskie were observed, and through the netting survey 7 muskie were sampled. Fish sampled came from three different age classes including 2017 stock, 2019 stock, and naturally recruited fish believed to be from 2021 (1+ years). In addition, between July 10th and November 15th, 2022 48 muskie from West Watjask were registered through the Manitoba Master Angler Program. The fishery is growing in popularity, the fishery is continually establishing, and successful natural recruitment has been confirmed. Following are considerations for future management and monitoring:

- Monitoring through angling reports and master angler submissions will be sufficient for the time being.
- Investigate and experiment with "fingerprinting" and fingerprinting software as a method to monitor muskie populations.
- Continue annual dissolved oxygen testing on both Watjask Lakes (East and West).
- Replicate the three fine mesh trap nets to monitor forage response when applicable/if necessary. Discuss need with Fisheries Branch
- Infrastructure upgrades include gravelling the launching area and installing a secondary sign with lake regulations near the dock infrastructure (2023)

Background Information

Muskellunge are one of the most valued sport fishes in Canada and sought after by many Manitobans. With limited opportunities in the province, development of a new muskie fishery became a concept of interest in 2014. In 2015, SVSFE proposed to investigate West Watjask Lake as a candidate lake and a preliminary survey was completed (PRJ-15-004 Watjask Lake Investigation Summary). Following this survey, several questions remained, therefore a follow-up investigation was completed in 2016 (PRJ-15-036 - West Watjask Lake Muskellunge Suitability Assessment).

Following lake investigations, the consensus was that an experimental stocking of muskie would likely be successful. In 2016, SVSFE had successfully received grant dollars from FWEF to source and pay for muskie stock (PRJ-16-019). In June 2017, SVSFE received the first stock of muskie from Rob and Debbie Jost of Minnesota Muskie Farms of Alexandria, Minnesota. The stocking objective of 450 muskellunge (2 fish/acre) was not met due to high mortality at the hatchery. In late June 2017, 35 (~10") non-sterile spotted muskellunge (Leech Lake strain) were stocked into West Watjask Lake.

In 2019, SVSFE technicians conducted a short trap netting survey to assess growth and survival of the 2017 stock (PRJ-18-043). The results were promising, as 2 muskellunge were captured, measuring 665mm and 640mm (total length). Both fish had shown exemplary growth and were in excellent condition.

The West Watjask Muskie Introduction Project (PRJ-16-019) had been extended multiple times because of supplier issues and stock mortality. By July 2019, Minnesota Muskie Farms were confident they would be able to fill the order of 450 muskellunge by fall. On October 25th, 2019 the stock were picked up at the Emerson border and were destined for West Watjask. Around 5pm, various SVSFE directors and volunteers successfully scatter stocked 450 (~12") spotted muskie into West Watjask Lake.

In spring of 2021, SVSFE set out to assess stock size, condition, and abundance of muskellunge in West Watjask Lake. Methods included a custom live-release trap netting program along with a voluntary creel survey (PRJ 20-040). Results from the assessment were trivial, as the netting program only yielded two muskie, and the creel program only attracted two anglers. The information collected from the assessment was valuable, however it was concluded that the netting assessment occurred too late in spring. Recommendations were to re-assess the fishery in 2022 by netting as close to ice out as possible, along with several other managerial and infrastructure related objectives (PRJ - 20-040 - West Watjask Stock Evaluation 2021).

Methods

Muskie are known to be difficult to collect using scientific methods. Trap nets are the gear type most used to sample muskellunge in Pennsylvania lakes, and also represent the primary gear used in many out-of-state studies (Haas 1978, Hanson 1986, Hoff and Serns 1986 and Siler and Beyerle 1986). In 2021, SVSFE had conducted a stock assessment from June 7th-June 10th. Following the assessment, it was determined that the seasonal window to catch muskellunge by trap net was missed. The average water temperature recorded during the program was 18.01°C. At this point, muskie were long past spawn and had regressed to their summer behavior making the netting protocol less effective.

In 2022, SVSVE developed a similar netting program utilizing the same nets as in 2021. Nets were 2.5" mesh Lake Superior style spring-haul trap nets consisting of a 46m lead, and a 6-foot-wide trap. The program was based a variation of Ontario's "Spring Muskie Spawning Index" (SMSI) protocol to monitor muskie population trends. The sampling period was designed to occur as close to ice off as possible. Nets were to be set in suitable muskellunge spawning habitats. Locations chosen were sheltered vegetated embayments, island corridors, and fringing wetlands along shorelines. Net depth requirements were to achieve as close as possible to minimum gap depth (1.7m), while using as much of the 46m lead as possible. In total, three nets were set in three different netting locations (Figure 1). Muskellunge captured were measured for fork length/total length and checked for sex/maturity. All yellow perch were counted and released.



Figure 1: 2022 Net Locations

Results

The ice went out at some point between May 16-18th, 2022 and the netting program was completed on May 23-24th. Total effort included 78.9 hours of netting, with nets fishing for an average of 26.3 hours each. Weather conditions remained favourable during the survey with surface temperatures averaging 11.8°C. Total catch included 7 muskellunge and 476 yellow perch. Muskie ranged from 270mm-620mm (fork length). Based on the growth and population dynamics 6/7 fish were believed to be from the 2019 stock (3+) and 1 was naturally recruited in 2021 (1+). Fish gonads were checked externally to determine sex and maturity. Sexing of mature muskie can be done externally with the aid of insights into the urogenital features (Liskauskas, 2019). Each of the fish were observed for gonad shape and evidence of eggs and milt. No conclusions could be drawn from any of the sample as fish were either spawned out or still immature which was likely the case. Netting catch per effort (CPUE) equated to 0.088 fish per hour.

Table 1: 2022 Muskie Data

Site	Fish #	Spp	FL (mm)	TL (mm)	Sex	Age
WW-22-001	WW-22-0001	MSKL	270	287		1
WW-22-001	WW-22-0002	MSKL	600	650		3
WW-22-001	WW-22-0003	MSKL	575	622		3
WW-22-001	WW-22-0004	MSKL	600	649		3
WW-22-003	WW-22-0006	MSKL	604	668		3
WW-22-002	WW-22-0008	MSKL	600	655		3
WW-22-002	WW-22-0009	MSKL	620	672		3

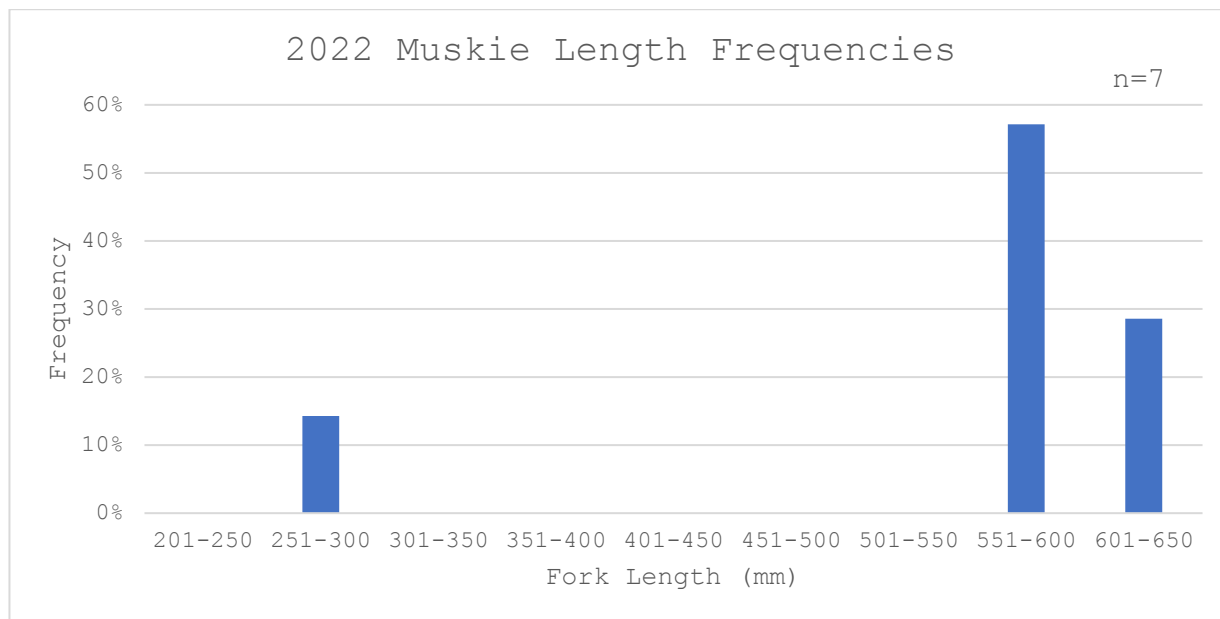


Figure 2: 2022 Muskie Length Frequencies

On the morning of May 24th weather conditions were favourable and technicians used an electric motor to conduct a shoreline cruise. The objective was to utilize the calm sunny conditions to identify areas of muskie congregation and spawning activity. In total, five muskie were observed, three of which were sizes that would resemble the 2019 stock, one resembled a size that may have been 2017 stock, and one juvenile (~10") was observed in the north bay. By the time technicians reached the west side travelling south towards the boat launch the wind picked up and reduced visibility considerably. Below is a map of where muskie were observed on the morning of May 24th, 2022.



Figure 3: 2022 Shoreline Cruise Results

Over the course of the 2021 and 2022 assessments there were no muskie caught from the original 2017 stock. However, on a couple occasions where fish were seen that were "notably larger". It wasn't until July 2022 when the first Manitoba Master Angler Muskie was caught in West Watjask Lake. Once word got out, many anglers from throughout province flocked to West Watjask over the open water season. SVSFE had assumed there would be fish in the waterbody >31" in 2022 but did not expect there to be so many at impressive sizes. By the time the fishery closed for the season (November 15th), a total of 48 master anglers had been registered from the 2022 season.

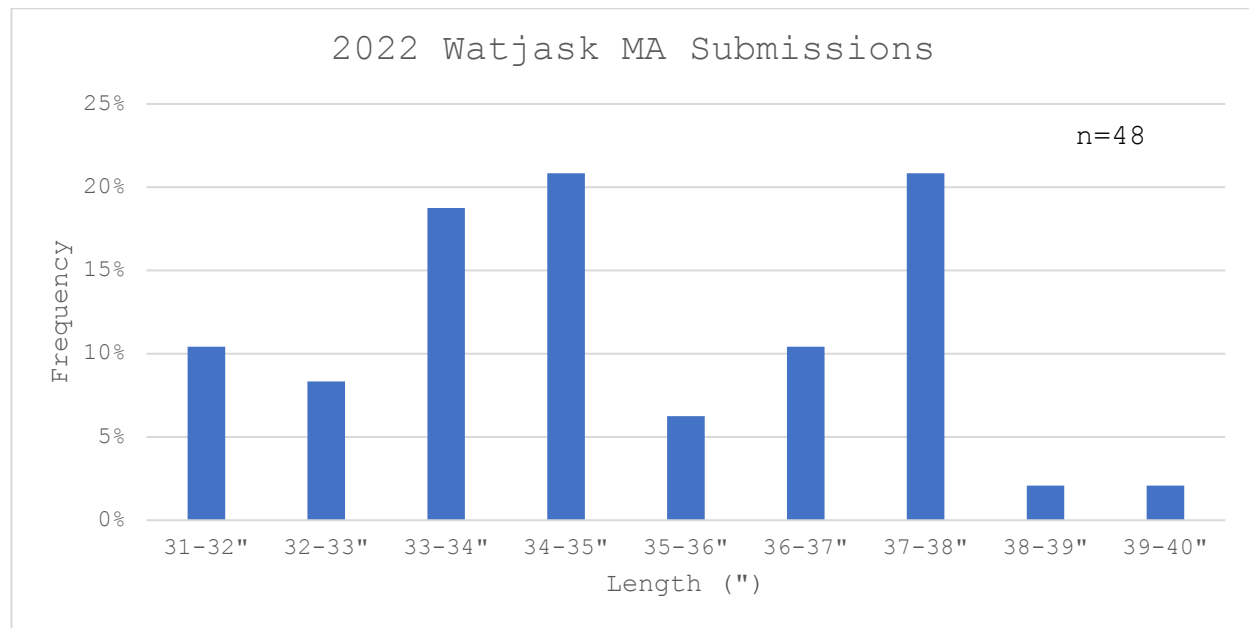


Figure 4: 2022 MA length frequencies

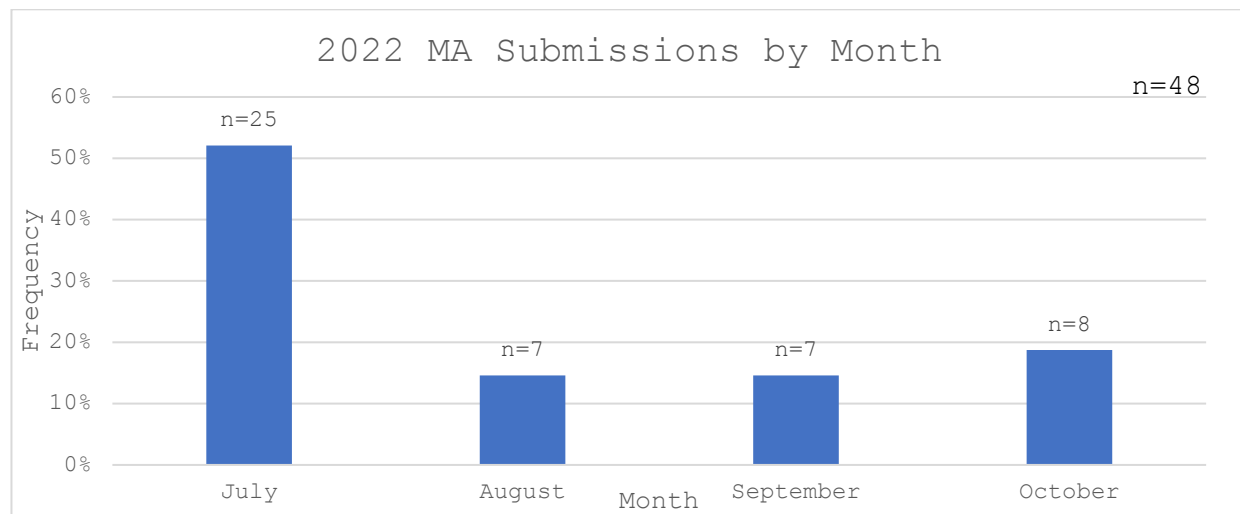


Figure 5: 2022 MA submissions by month

Discussion

The development of the West Watjask Lake is coming along very well. The 2017 stock are now 6+ years, mature and reproducing with some individuals as large as 39". The 2019 stock are now 3+ with some of the larger individuals reaching 31" by fall 2022. Managers can expect this stock to be mature very soon and begin contributing to the long-term sustainability of the fishery. The natural population is also being noted through observations, and even one instance in 2022 where an angler reportedly angled a 12" muskie. There have been multiple reports of anglers observing smaller muskie in addition to the ones observed during the spring netting assessment as well. It will be very interesting to continue to monitor this new and unique fishery during the 2023 open water season through general angling reports and Master Angler submissions. The fishery will without a doubt attract more anglers as the word continues to spread.

In certain circumstances it is important to monitor prey response to predator introductions. For this reason, SVSFE created a standardized perch monitoring survey which was conducted in 2016 and again in 2019. The assessment aims to monitor changes in perch population dynamics, and abundance, and was developed as a proactive tool. This survey could be completed in the future if any questions are to arise regarding prey availability or decreasing muskellunge condition.

SVSFE has been monitoring late winter dissolved oxygen (DO) since 2016. Historical dissolved oxygen testing was also completed on occasion in the late 1980's and mid 1990's. DO levels have never appeared to be an issue, however on a couple occasions readings may have been stressful for muskellunge in specific areas and depths within the lake. For this reason, it is recommended that annual late winter DO testing continue. It is also recommended that DO's be taken in neighbouring East Watjask Lake. There is a possibility with continued high-water muskellunge will naturally encroach East Watjask in future years. Past work on East Watjask Lake including DO testing and perch aging show late winter DO levels to be tolerable by muskie and perch aged as old as 11+ years (Lysak, 2001).

The landing and dock infrastructure was completed in July 2022. Upgrades planned for 2023 include adding gravel to the hill near the launch and to install another sign near the lake reiterating the lake regulations.

Future monitoring the fishery through angling reports and Master Angler submissions may be sufficient. If a netting assessment is to occur, following the standard set in 2022 were much more effective than previous years. It is imperative that netting occurs immediately after ice out or before surface temperatures exceed 15°C. It is important to state that younger muskie are susceptible to gilling in the 2" mesh trap nets and therefore will risk fish mortality if using these methods. In 2022, early season shoreline cruises were also effective in

confirming presence of multiple age classes of muskie and may be a non-intrusive monitoring method worth consideration in future years.

The term "fingerprinting" is a relatively new method of monitoring freshwater fish populations. Fingerprinting uses image recognition software to identify individual recaptured fish based on skin pattern. There are examples where using a well managed fingerprinting database researchers can determine population estimates alongside other important biological information including growth and condition of the target species. This methodology is based on freeware software and removes the need for modern tagging equipment. It can be used on freshwater fish where the skin pattern is distinctive, however it relies on the willingness of anglers to report their catches.

The idea came from Fisheries Branch Staff - Eric Mullen, Ian Kitch, and Brody Kitch. The concept is to use a free software called I3S Pattern+ to develop a muskie database based on the measurement photos submitted to the Master Angler Program. Using the Master Angler Program as the source of photographs eliminates angler participation, as anglers would likely be submitting photos of their fish regardless. However, this will only represent the muskie population >31", or the minimum Master Angler length.

I3S Pattern+ was used in a pike fingerprinting study on Lake Mjels, Denmark from 2017-2020. I3S Pattern+ was found the most suitable pike fingerprinting program, which is only a partially automatic program. There are programs that are fully automatic, meaning that they automatically extract and interpret pattern features. Kristensen (2020) found that when fingerprinting pike the partially automatic system - I3S Pattern+ was more suitable, but less sensitive to poor image quality and non-informative noise in the picture background. Each entry would require the researcher from 2-5 minutes to add a new (or recaptured) fish into the database. I3S Pattern+ is of course more labour intensive but found to be more suitable in this type of citizen science research.

Because fish are not perfectly symmetrical there will be a need for two databases - or a "left side database" and "right side database". In Lake Mjels it was found that the resemblance between the left and right side of pike individuals was quite low (Kristensen, 2020).

Kristensen also found that focusing on skin patterns of smaller areas or target areas provided sufficient information giving the software the ability to recognize individual fish (i.e. only the tail end of a pike). They also determined that most cell phone cameras available on the market provide photos of high enough quality to be used in the database. In addition, the researchers were also able to edit poor quality photos in Adobe Photoshop by modifying the exposure. Again, each photo requires about 2-5 minutes to add a fish to the database.

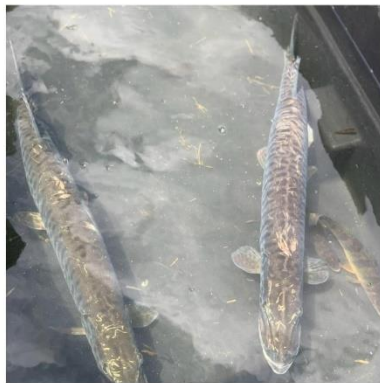
Each entry in the database would have associated information collected with it (i.e. date caught, length, etc.) The program then scans the database for fingerprint matches. The program also has the ability to use length filters to speed up the process and eliminate potential for impossible matches. In many cases, the potential matches must be accepted or rejected by the researcher. Using fingerprinting and other non-intrusive methods to monitor West Watjask are something very intriguing. It is a very interesting concept and would be able to provide lake managers with very valuable information on things like population estimates, survival, and growth rates using very little effort.

A project lead would have to be appointed and would have to set up and learn the software. It is recommended to treat each year as a sampling period, much like they did in the Lake Mjels study. SVSFE is eager to see how the Travel Manitoba photo submissions will work for the fingerprinting software; how the anglers hold the fish, which side of the fish is photographed most often, and what would be the best "area of interest" to use for muskie fingerprinting. This could also be a very cool opportunity for a Master's Thesis. A young mind could potentially set up the program and work out all the kinks before passing on to Fisheries Branch to manage the program long-term.

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Appendices



Appendix 1: Phil's masters and survey photos



Appendix 2: MA photos 2



Appendix 3: MA photos 3



Appendix 4: MA photos 4



Appendix 5: MA photos 5