<u>Indiana</u>

Esocid Technical Committee Update Nicholas Haunert - Indiana Chapter Representative January 18, 2019

Indiana Muskellunge Program Overview

Muskies stocked by the Indiana DNR (IDNR) are reared at the East Fork State Fish Hatchery with eggs obtained from broodstock collected each spring at Lake Webster (Kosciusko County). The quota is 500,000 (250,000-300,000 streaked) eggs annually. The egg-taking operation usually requires 40-50 trap net lifts to capture around 8 mature females. Fry and small fingerlings (8 inches) are fed dry pellets through August and then minnows for 30-45 days. Spring-stocked fish (10 inches) are held overwinter at the Fawn River State Fish Hatchery. The standard stocking rate of Muskies in Indiana is 5 fingerlings (8 inches) per acre in the fall. Stockings are evaluated 8-10 years after the initial stocking. Lakes or impoundments with established populations are sampled every 5-10 years. IDNR Muskie sampling guidelines require a minimum of eight trap net lifts in March or April at three or more locations using either large Lake Michigan (LM-style) or small Inland Michigan (IM-style) traps. The Indiana Muskie Strategic Plan was updated in 2018 by IDNR staff.

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		Resource			1		
Waterbody	County	Туре	Acres	N/Acre	N stocked*	Initial Year	Regulation
Barbee Lakes Chain	Kosciusko	Glacial Lake	850	5	4250	1998	36-inch
Bass	Sullivan	Excavated Lake	222	5	1110	1997	36-inch
Bluegrass	Warrick	Excavated Lake	195	5	975	2006	36-inch
Brookville	Franklin/Union	Impoundment	5260	1	5260	1974	36-inch
Bruce	Pulaski	Glacial Lake	245	5	1225	2000	36-inch
Duck	Sullivan	Excavated Lake	59	5	295	2008	36-inch
Eagle Creek	Marion	Impoundment	1350	1	1350	2011	36-inch
Everett	Allen	Glacial Lake	43	5	215	2010	36-inch
Loon Pit	Warrick	Excavated Lake	184	5	920	2006	36-inch
Plover/Sandpiper	Bartholomew	Excavated Lake	84	5	500	1997	36-inch
Skinner	Noble	Glacial Lake	125	5	625	1986	36-inch
Tippecanoe Chain	Kosciusko	Glacial Lake	1133	1	1133	1997	36-inch
Webster ²	Kosciusko	Glacial Lake	774	4	3096	1981	44-inch
IDNR Subtotal	-	-	10,524	-	20,954	-	-
Loon ³	Noble/Whitley	Glacial Lake	222	1	200	1978	36-inch
Upper Long ³	Noble	Glacial Lake	86	2	172	1996	36-inch
Statewide Total	-	-	10,832		21,326		
¹ Current stocking rate.							
² 50:50 ratio of fall age-0 and spring age-1 fingerlings.							

Table 1. Summary details of currently stocked Muskie waters in Indiana.

³ IDNR-permitted private stockings.

Brookville Lake Muskellunge Survey

Brookville Reservoir (Franklin/Union Counties) has served as an IDNR surplus Muskie stocking site for over 20 years. Thus, stockings have been inconsistent on both size and number of fish causing catch rates to be low and variable. Brookville Reservoir received a full stocking of surplus fish in 2015 and was then added to the standard stocking list for Muskie in 2016. A targeted Muskie survey was conducted from March 5 to April 6, 2018 using small inland Michigan trap nets to evaluate the fishery. Additionally, Muskie bycatch data collected during the 2018 spring Walleye broodstock gill netting was included in this survey. Length, weight, and sex were recorded for each fish and ages were determined using the left pelvic fin. A total of 42 Muskies that ranged from 28.3 to 49.3 inches were collected in both the targeted survey (6 fish) and the gill netting (36 fish). The catch rate for Muskies in the small inland Michigan trap nets (108 lifts) was 0.1/lift and gill nets (128 lifts) was 0.3/lift. Muskie ages ranged from 3 to 9 years with the majority of the fish being age-3 (2015 stocking). A targeted survey is scheduled for 2023 in order to evaluate any changes in the population after receiving regular stockings.



49.3 inch (38 pounds) Muskie sampled at Brookville Reservoir in 2018.



37.8 inch Muskie sampled at Brookville Reservoir in 2018.

Iowa's 2018 Esocid Update

Prepared by Jonathan Meerbeek

Muskellunge Stocking, Tagging, and Population Dynamics (Contact: Jonathan Meerbeek

jonathan.meerbeek@dnr.iowa.gov) - Thirteen lakes and impoundments are managed as Muskellunge fisheries in lowa and populations are maintained via stocking spring-stocked, pellet-started minnow finished yearlings. In 2018, 474 yearling Muskellunge were stocked in one natural lake and 557 were stocked into Big/Brushy Creek Reservoirs. In lakes where Muskellunge are used as broodstock, populations are monitored via annual spring gillnetting and population metrics are estimated using the Jolly-Seber model. Due to the late ice-out conditions in 2018, sampling was limited to East Okoboji (N = 91; 41 recaps) and Clear Lake (N = 326; 165 recaps) and fish ranged from 26.3-50.9 inches in these lakes. Adult (≥ 30 inches) Muskellunge population estimates for 2017 in East Okoboji and Clear Lake were 0.21 and 0.16 fish/acre, respectively. All yearling Muskellunge stocked into Iowa's natural lakes are tagged via PIT tags prior to stocking (since 2011). To date, 648 yearling Muskellunge have been recaptured and initial analyses indicate that size (TL) at stocking is the single most important variable influencing survival. However, we have observed that survival rates vary considerably among lakes. More specifically, survival is much higher in general in lakes where large populations of top-level predators are absent (i.e., Clear Lake; Figure 1).



Figure 1. Known yearling Muskellunge survival by length group (0.5 in) in Clear, Spirit, and the Okoboji chain of lakes.

Big Creek/Brushy Creek Muskellunge Emigration Study (Principle Investigators: Ben Dodd Ben.Dodd@dnr.iowa.gov, Ben Wallace Ben.Wallace@dnr.iowa.gov, Michael Weber mjw@iastate.edu), Robert Weber rweber@iastate.edu- lowa State University, the U.S. Army Corps of Engineers and the lowa DNR are collaborating on a Muskellunge emigration study at two central Iowa impoundments, Big Creek Lake (814 ac) and Brushy Creek Lake (690 ac). A horizontal bar barrier was installed at the Big Creek spillway in 2012. Brushy Creek has no barrier but is similar in size, depth and watershed: lake ratio, and is serving as a reference lake for this study. PIT tag readers and antennas were installed on the spillways of both impoundments to quantify fish escapement and evaluate the efficacy of the barrier. Nighttime boat electrofishing and gill nets were used to collect Muskellunge in April 2016 and 2017. In both years combined, we collected 48 adult Muskellunge at Big Creek and 73 adult Muskellunge at Brushy Creek Lake and implanted a 32mm HDX PIT tag into the dorsal muscle of each fish. Additionally, 593 and 504 age-1 Muskellunge were PIT tagged prior to being stocked into Big Creek and Brushy Creek, respectively. Two adult Muskellunge escaped from Brushy Creek (no barrier) in 2016, which was approximately 4% of the tagged fish from 2016. No adult Muskellunge escapement was detected from Big Creek (barrier) in 2016. In 2017, 12 tagged Muskellunge emigrated from Brushy Creek (28 to 37"). Nine of those fish were tagged in 2016, one of which was radio tagged. The other three were tagged in 2017, one of which was radio tagged. The three that were tagged in 2017 escaped less than a month after being collected. At Big Creek, we had two Muskellunge escape during the first two weeks of May. Both of those fish were tagged at Rathbun and stocked during May 2016. In 2018, we had six tagged muskies escape from Big Creek; five were in May and June, while the sixth escaped in September. At Brushy we had 45 tagged muskies escape this year, 12 of which were radio tagged adults. Of those 45 muskies that escaped in 2018, 20 were tagged pre-stocking in 2016 and 2017, while the other 25 fish were tagged during sampling efforts and ranged from 27-50 inches when they were tagged. In addition, we sampled the spillway below Brushy in July and November and returned 49 muskies to the lake.

Muskellunge Emigration/Relocation Telemetry (Principle Investigator: Jonathan Meerbeek

<u>jonathan.meerbeek@dnr.iowa.gov</u>) - **Downstream** movement of adult Muskellunge in an interconnected chain of lakes has been extensively documented in Iowa via the states broodstock collection program and extensive PIT tagging database. In some years, approximately 50% of the adult Muskellunge population has moved from Spirit Lake downstream to the Okoboji chain via a spillway that connects the two waterbodies. Since the spillway acts as a fish barrier to fish migration upstream during most of the year, Muskellunge populations in Spirit Lake have suffered and drastic population imbalances have been observed. A similar problem exists at the outlet structure of the interconnected system and Muskellunge loss to the river has commonly occurred. However, an electric fish barrier was installed in 2013 to prevent Asian Carp from entering the lake system and as a side-benefit, hopefully reduce Muskellunge loss. In 2018, the area directly below the outlet dam was sampled via electrofishing to collect Muskellunge and determine if escapement has occurred post-barrier installation via PIT tag information. Fifty-six Muskellunge (30.0-46.7 in) were collected below the electric fish barrier from May to October (35 sampling events). Collectively in 2017 and 2018, 80 Muskellunge were returned to the lake and 79% were known to have emigrated from the lake to the river post-electric barrier installation. In October, we implanted external radio transmitters on 3 fish that were captured in the river and stocked those fish back in the river to examine Muskellunge movements within the river. All Muskellunge stayed within the upper 1.6 river mi and did not make long migrations to seek winter refuge. One fish was observed on multiple occasions near or within a discharge pipe from the adjacent water treatment facility.

Yearling Muskellunge Survival Study (Principle Investigator: Jonathan Meerbeek jonathan.meerbeek@dnr.iowa.gov) – Year three of a stocked yearling Muskellunge telemetry project was completed in 2018. The first two years of the study found that the size of fish stocked was most important variable influencing yearling Muskellunge survival. Based off logistic regression models, a 13.0" Muskellunge had a 70% chance of survival to 100 day, whereas, a 14.0" Muskellunge had a 90% chance of survival. In 2018, additional efforts were made to increase stocked yearling Muskellunge to lengths ≥13.0 inches. More specifically, fish will be sorted by size in May and fish not exceeding the minimum length of 13.0 in (or 200 g) were reared for an additional 39 days. Unfortunately, shortly after sorting and tagging fish, a pathogenic bacterium (Aeromonas salmonicida salmonicida) was diagnosed and fish were individually injected with OTC. 598 fish died due to the outbreak. On average, the remaining 329 yearling Muskellunge grew 1.1 in and 59 g during the grow-out period (mean TL of 13.1 in). Prior to stocking, 16 yearling Muskellunge were affixed with radio telemetry tags. Short-term (108 d) mortality was 25% (4 of 16). Findings from this study will guide Iowa's production and stocking techniques.

Northern Pike Propagation and Stocking (Spirit Lake Hatchery Manager: Kim Hawkins <u>kim.hawkins@dnr.iowa.gov</u>; Fairport Hatchery Manager and Mississippi River Management Station: Andy Fowler <u>andy.fowler@dnr.iowa.gov</u>; - Northern Pike propagation is still an important component to manage these fish in lakes, rivers and impoundments across Iowa. In 2018, 1,265,547 Northern Pike fry, 172,244 3-inch fingerlings, 8,762 4inch fingerlings, and 904 10-inch fall fingerlings were produced from the Spirit Lake hatchery.

Northern pike adults were captured from the Mississippi River on March 26, 27, and 29 using fyke nets and brought back to the hatchery. None of the females were flowing and Szabo (2003) indicated that injections of carp pituitary were the only way to induce spawning. However, this procedure was not feasible at the Fairport Hatchery. Further research indicated that pond spawning of Northern Pike was possible (McCarraher 1964). Six males and 4 females were stocked into pond 25, a 0.5 acre pond exhibiting much rooted vegetation, on March 29. The pond was observed for fry daily; they were first spotted in early May. Fish were seined and measured on May 5, 18, and 31. On May 18, 58 northern were moved to pond 29 and on May 21 another 154 were moved to pond 29. Pond 29 was, at that time, being utilized as a koi holding pond and multiple koi spawning events had produced an ample food supply for the Northern Pike fingerlings. Pond 25 was harvested 64 days after stocking adults. We were unable to drain the pond before this date due to the Mississippi River levels being too high. Pond 29 was harvested on August 28 to remove koi and Northern Pike.

Pond 25 produced 1,025 fish averaging 5 inches in length. High levels of cannibalism most likely occurred due to the later harvest date, reducing our production considerably. During the growing season 212 were moved from pond 25 into pond 29 where koi had spawned. When 29 was drained 162 Northern Pike averaging 12 inches were harvested. All the fish were stocked in Green Island. Production numbers and costs are listed in the table below.

5 inch fish produced	1025
12 inch fish produced	162
Fish per female	297
Total Northern Pike produced	1187
Total production cost	\$2,813.54
Cost per 5 inch fish	\$2.27
Cost per 12 inch fish	\$4.27

Table 1. Northern Pike production and cost at Fairport Fish Hatchery, 2018.

Michigan 2018 ETC State Update

Fish Production Update:

Wolf Lake State Fish Hatchery- (provided by Matt Hughes)

Musky Production- Harvested 24,132 fingerlings averaging 9.6 inches. Stocked 22,247 into nineteen bodies of water. Filled all priority one sites and all but one site in priority 2. Pit tagged 2,171 fingerlings for broodlakes and two study lakes. We had a 51% average return from lined ponds. Pond started with lowest density (8,300 fish) had the best return (78%) compared to ponds with higher densities (10,000 fish) average return (43%). Maximum number of fingerlings to be started in ponds will be reduced to 8,000/pond or less in 2019. We still experienced several mortality events in ponds with higher densities, primarily within days of forage addition. Barley bails were extremely successful in controlling filamentous algae. This will become our standard operating procedure in the future. Currently overwintering 1,800 fingerlings in a lined pond to produce 860 yearlings for broodlakes. These fish will be harvested, tagged, and stocked in mid-May.

Thompson State Fish Hatchery- Coolwater Facility Upgrades (provided by Jan VanAmberg)

-Upgrades include: new coolwater hatchery building, 1 solar pond, 6 new lined ponds, electrical updates, coolwater storage building, natural gas, and various updgrades for the coldwater production side.

-Upgrades to support: production of 250,000 additional spring fingerling walleye, production of 15,000 additional fall fingerling Muskies, enhanced biosecurity by segregating coolwater and coldwater production, and more efficient production by modernizing coolwater production with a new hatchery building and new lined ponds.

Muskellunge assessments

-Southern Lake Michigan Management Unit: Campau and Murray Lakes spring surveys. Campau Lake is no longer stocked with Musky (northern) and Murray Lake receives an every third year stocking of Great Lakes strain Musky. Both lakes displayed very slow growth for those Musky captured. Ages for Murray Lake were 5-17 years and in Campau they were 9-18 years.

Northern Pike assessments

-Southern Lake Michigan Management Unit: Sand Lake and Long Lake both with protected slot limit (no harvest 24-34 inches) regulation. Sand Lake survey was first since instatement of PSL regulation in 2016 and found 14% of pike at legal size with a maximum size of 28 inches. Long Lake northern pike received the PSL regulation in 2013. The 2018 survey found pike growing slowly, but with an improved size structure when compared with samples prior to the instatement of the regulation.

Muskellunge Harvest Reporting

-Michigan implemented a mandatory registration regulation for Muskellunge in spring of 2018. Anglers can register their harvested fish by using a hotline number, internet-based registry, or in person with a call ahead. Anglers have 24 hours from the time of harvest to register their fish. At the time of this report, a total of 19 harvested Muskellunge have been registered for the angling year. This system also doubles as a registration system for Lake sturgeon. For the year there were 14 Lake Sturgeon harvested in the state.

Minnesota Esocid Update – ETC January 2019 Mike Habrat

Muskellunge Production

- Statewide stocking quotas came up ~25% short
 - Most of the priority waters were stocked, and efforts were made to stock full quotas in lakes as opposed to partial quotas in more lakes.
 - The Stocking Plan Spreadsheet (priority list) has been functioning well.
 - The shortfall is generally attributed to the late spring, particularly lack of pinhead
 Fathead Minnows at crucial point when transplants (2.5" 4") are moved off dry diet indoors to ponds.
 - Several large drainable ponds were fallow, missing out on potential 3-5k in production.
- Hatcheries experimented with a new feed (Otohime) that appeared to result in less mortality. Total switch to this diet is planned for 2019.
- Pure-strain were not purchased from the private sector.

Northern Pike Regulations

- 2019 was the first year in which the new statewide (3) zone regulations were in effect.
 - Support for these regulations has been very good.
 - \circ $\;$ When contacted many anglers expressed lack of knowledge of the new rules.

- We expected and planned for several years of high noncompliance as these new rules are rather drastic changes.
- Discussions have begun regarding what to do with existing special regulations (PSL's) and if any waters would be better served under these new statewide regulations.

Research

- Funding has been secured and grad students hired for a stable isotope project in relation to dietary patterns of introduced and native populations of Muskellunge in lakes with and without cisco. The three year project is a collaboration of DNR, Bemidji State University, and University of St. Thomas.
- The Lake Vermilion (15,000 acres) Muskellunge population estimate is a go for 2019. The lake will be broken into three basins utilizing three survey crews. Numerous Fisheries Areas are providing labor and equipment. This is planned for two years.
- An update to "Fish community responses to the introduction of Muskellunge in Minnesota lakes" (Knapp et al. 2012) is in progress. Hopeful submission in early 2019.
- Despite the recent negative socio-political push towards stocked Muskellunge, early returns from a statewide human dimensions survey of general anglers suggest nearly 69% of respondents expressed some level of interest for Muskellunge angling.
- A thesis has recently been completed on the St. Louis River Estuary (Lake Superior). Upcoming presentation at MN chapter meeting:
 Muskellunge (Esox masquinongy) movement patterns and habitat use in the St. Louis River Estuary and southwestern Lake Superior

Erin Schaeffer, Loren M. Miller and Paul A. Venturelli

The St. Louis River Estuary (SLRE) is a designated Area of Concern by the Environmental Protection Agency due to severe environmental degradation. Uncertain is the spatial ecology of muskellunge (Esox masquinongy), an indicator species, in relation to both degraded and restored habitats. We collaborated with the Minnesota and Wisconsin Department of Natural Resources to collect genetic samples and used passive acoustic telemetry to track 60 Muskellunge in the SLRE and southwestern Lake Superior for 15 months. Genetic analysis revealed that the estuary is utilized by two genetic strains (Wisconsin and Minnesota) that were previously stocked to restore a likely extirpated population. Individual movement patterns were highly variable, but Muskellunge tended to move upstream in the spring, downstream and into Lake Superior throughout summer, and to the middle river during fall and winter. Males and females spent significantly more time in the upper and lower rivers, respectively. Movements were influenced by strain in that hybrids and WI strain spent more time in the upper and middle river, and the MN strain spent more time in Lake Superior. A Random Forest model indicated that Lake Superior use was related to strain (the MN strain made up 80% of the 25 individuals using Lake Superior), but not sex or body length. Lastly, a Negative Binomial Hurdle model determined that Muskellunge were detected in restored sites more often than in non-restored, poor quality sites (P =0.002). A better understand of Muskellunge ecology in the SLRE will guide future management and restoration efforts of Muskellunge in the SLRE and other areas of the Great Lakes.

Missouri 2018 ETC State Update Mike Anderson

2018 Spring Fyke Netting

Standardized fyke net surveys were conducted at Pomme de Terre Lake, Fellows Lake, and August A. Busch Conservation Area Lake 35. Hazel Creek and Henry Sever lakes were not sampled for muskie in 2018.

Pomme de Terre Lake – Water temperature was 45°F and lake elevation was 842.7 msl (normal pool = 839.0), which are not optimal temperature or lake level sampling conditions. The ideal water temperature for sampling is between 50°F and 55°F. The lake level was only about a foot high, however, that put most of the button bush in the water within a couple of feet of the shoreline. The water visibility this year was measured at about four feet, which is typical during muskie netting. A total of 64 muskies (42 males and 22 females) were captured in 28 net-days, resulting in a catch rate of 2.3 fish per net-day. Of the muskies captured, 27 percent were 36 inches or longer and 9 percent were 40 inches or longer. The largest fish captured was a female that measured 44.5 inches long and weighed 25 lbs., 14 oz. The long-term average catch rate for muskies on Pomme is 5.3 fish per net day. Catch rates were likely depressed due to low water temperatures and relocating a few nets to avoid button bush. Overall, the muskies captured looked healthy and in good body condition.

Fellows Lake – Water temperature was 48°F, and the lake was rising throughout the week. A total of 92 muskies (63 males, 29 females) were captured in 28 net-days, resulting in a catch rate of 3.3 fish per net-day. Of the muskies captured, 38 percent were 36 inches or longer and 20 percent were 40 inches or longer. The largest fish captured was 46.7 inches long and weighed 30 pounds. Sampling this year produced the highest proportion of fish over 40 inches since 2004.

Busch CA Lake 35 – Water temperature was 47°F with the lake level approximately 12 inches below normal pool. Nineteen muskies (10 males, 9 females) were captured in 8 net-days, resulting in 2.4 fish per net-day, the second highest catch rate since 2004. Fifty percent of the muskies captured were 36 inches or longer, including two fish over 40 inches with the largest measuring 46.8 inches.

2018 Muskie Stocking

In Missouri, muskie program lakes less than 1,000 surface acres are stocked annually with one muskie fingerling (\geq 12 inches) per acre. Pomme de Terre Lake is annually stocked with 0.65 muskie fingerlings per acre. In 2018, Hazel Creek Lake and Busch CA Lake 35 received full stocking requests. Commitments were short at Pomme de Terre Lake and Fellows Lake because excessive mortality likely occurred due to warmer-than-normal hatchery water temperatures during the summer. Adjustments will be made to the 2019 stocking requests to make up for these shortages.

Lake	Surface Acres	Number of Muskies	Number of Muskies
		Requested	Stocked
Pomme de Terre	7,820	5,083	2165
Fellows	820	820	411
Hazel Creek	530	530	531
Henry Sever*	158	0	0
Busch CA Lake 35	62	62	64

*Provides supplementary angling opportunities at Henry Sever Lake by only stocking surplus muskie fingerlings when available (up to one per acre annually).

State of Nebraska

Esocid Technical Committee Report 2019

The following report is being submitted to the Esocid Technical Committee meeting in January 2019 at the Midwest Fish and Wildlife Conference. Nebraska has limited use of esocids within our systems. We are managing to stock both muskie and northern pike in the requested systems at 2-3 year intervals. Space to culture esocids to a desirable size and the expense involved with raising them to this size are limiting factors for increased production and stocking. Many waters seem unable to successfully recruit these species. Thus, a statewide 40 inch minimum is in effect for muskie.

Northern pike regulations have been adjusted within our state. A variety of regulations were being employed (28", 30" and no length restrictions) across state waters and multiple regulations can be confusing for anglers and law enforcement. Thus, a new statewide regulation would allow for a daily bag of 3 fish of which only 1 could be over 34 inches. Six separate waters will have a 34" minimum applied while one lake is still a catch and release lake only for northern pike. At Box Butte Reservoir the regulation was changed to include a daily bag of 10 pike of which only 3 may be over 22 inches and only one may be over 34 inches. The intent is to encourage extra harvest on smaller pike while protecting the faster growing females.

One of our more popular areas for northern pike fishing is being renovated with the hopes of removing common carp from the entire system. The first leg of this renovate and place fish

movement barriers was completed on the National Wildlife Refuge in North Central Nebraska. It is the hope that at the completion of this series of management activities we can re-establish fisheries and have better control of fish movement. Northern pike are anticipated to be reintroduced back in this complex of lakes.

Northern pike production has been improved the past year. Early spring temperatures still is suspected to influence successful egg fertilization at our collection sites. We continue to use buffer solutions to augment fertilization rates and demonstrated better results this past season. Our hatchery systems have been producing some tiger muskies for trade, but are also looking into developing muskie broodstock operations because the traditional source at Spirit Lake hatcheries has had confirmation of zebra mussels within the system.

The northern pike tagging project at Lake Wanahoo continued in 2018. This project was initiated in March 2012 with the goal of getting a population estimate, and to monitor population dynamics such as length frequency, dynamics, and growth. Northern pike are collected with trap nets in the spring and floy tagged. Population estimates indicate a stable population within the reservoir from 2012-2018 and it was believed that it was mostly comprised of originally stocked fish. After moving to every other year stocking it was noticed that a potential year-class was developed in a non-stocked year. Further investigations into natural recruitment as well as potentially individually marking stocked northerns to track recruitment success may be incorporated in the future. If anyone has some suggestions on best ways to mark 10" northern pikes for individual identification we are soliciting ideas.

Ohio Muskellunge Program: ETC Report - January 22, 2019

Curtis Wagner and Kevin Page, ODNR-Division of Wildlife

Reservoir Escapement and Angler Use of Stocked Muskellunge in Ohio – Project Update

Within four reservoirs, all advanced fingerling muskellunge stocked from 2013 – 2018 (6 cohorts) were implanted with passive integrated transponder (PIT) tags. PIT tags are a reliable marker for monitoring muskellunge over long time periods. Emigration of PIT tagged muskellunge is being monitored using PIT tag antennas extended across the width of the spillways connected to shore-based, continuous-scanning readers (Biomark systems) stationed below reservoir dams. Data are expected to provide a detailed picture of muskellunge emigration and other population dynamics.

Monitoring of tagged muskellunge within reservoirs is being conducted through reporting of tagged fish by anglers. Anglers will report tagged fish via the Ohio Muskie Angler Log (<u>https://apps.ohiodnr.gov/muskielog/welcome.aspx</u>). Hand-held PIT tag readers have been supplied to the most productive anglers chosen based on previous catch reports reported in the Muskie Angler Log and additional readers are available at marinas and distributed during club outings.

To date nearly 52,000 muskellunge have been tagged and stocked. In agreement with prior literature, we are generally seeing emigration from muskellunge age-3+. Below are some slides from a recent project update.

Slide 1. Detections by reservoir and categorized as angler catch and release, angler harvest, escaped (reservoir emigration via spillway), ODNR sampled, and found dead (from a number of causes). Note the variation among reservoirs in escapement; Alum Creek is a large reservoir with multiple gate types including tainter gates and Clear Fork is a fixed spill-over dam, whereas Leesville and Salt Fork are low water exchange reservoirs with deeper sluice gates.



Location	Total	Angler catch	Angler harvest	Escaped	Agency captured	Found dead
Alum Creek	388	121	2	176	87	2
Leesville	265	131	5	0	126	3
Clear Fork	123	8	0	94	21	0
Salt Fork	109	74	7	12	15	1

Slide 2. Escapement (green bars; unique muskellunge) and mean weekly discharge (brown line) from Alum Creek Reservoir, Ohio 2015-2018. Note most reservoir escapement is occurring during spring high-flow (high release) events. Also note the variation among years. The probability of any single adult (age-1.5+) muskellunge escaping during a 1-year period as derived from in-progress MARK modeling was 0.34 in 2016, 0.04 in 2017, and 0.38 in 2018. Additionally, early estimates of in-reservoir survival from MARK modeling for Alum Creek are 0.07 for age-0 (one-year post-stocking) and 0.58 for age-1.5+ muskellunge. Estimates will be refined over time as more data is collected and factors including reservoir and age/cohort are incorporated.



Ohio Muskie Angler Log Update – Explorations of angling patterns

The online Ohio Muskie Angler Log (MAL) (<u>https://apps.ohiodnr.gov/muskielog/welcome.aspx</u>) was launched online in 2008. Anglers register by setting up a username and password, much like any other user-based internet tool. Consequently, the Ohio Division of Wildlife gets basic user information for a unique angler that can be used in fisheries analyses while the muskie angler has the ability to tailor their online experience and keep their catch and trip diary online. The MAL is a collaborative effort between the Ohio Division of Wildlife and the organized muskellunge clubs throughout Ohio.

Below are some data from 2008-2017 MAL entries:

Figure 1. Monthly catch rates of muskellunge (excluding no-fish trips**) to explore the seasonality of muskellunge angling success in Ohio reservoirs.



Figure 2. Number of muskellunge reported into the MAL during the first 10 years of online reporting categorized by angling presentation type.



Figure 3. Number of muskellunge reported into the MAL during the first 10 years of online reporting categorized by angling presentation type by season (winter: Dec, Jan, Feb; spring: Mar, Apr, May; summer: Jun, Jul, Aug; fall: Sep, Oct, Nov).



Figure 4. Muskellunge catch rates (excluding no-fish trips**) of casting and trolling during the first 10 years of the MAL across Ohio reservoirs by season. Although trolling is by far the most popular method and produces the highest number of reported fish, casting is the more efficient angling method across all seasons.



Figure 5. Does being a member of a muskellunge angling club make you a better angler? Or are better anglers members of muskellunge angling clubs? Not statistically! (catch rates excludes no-fish trips).



Figure 6. Depth of fish upon hook-up as estimated by the angler and the depth of the water column at the location of hook-up also estimated by the angler. Note that anglers are fishing deeper water in the winter and summer compared to spring and fall and also catching deeper fish in the winter and summer.



Other Ohio Muskellunge Updates

We are discontinuing stocking of East Fork reservoir in southwestern Ohio due to low angler use, low angler reporting, and low abundance estimates from Ohio Division of Wildlife index netting. An alternative muskellunge program reservoir will likely be selected base on geographic distribution, presence of gizzard shad, few or no competing top-predator/trophy fisheries, and water retention schedules in the reservoir. Production will remain static around 20,000 fall advanced fingerlings. Due to cost and determination of enough cohorts, muskellunge will not be PIT tagged for the emigration study in 2019 nor in any future years. We will move forward with the 6 complete stocking cohorts across the 4 reservoirs that we have already tagged.

Dakota Chapter Esocid Update

January 2019

North Dakota

North Dakota Game and Fish Department initiated a "trophy" northern pike tagging study in the spring of 2017 to gain a better understanding of how anglers are utilizing these fish in two Missouri River Reservoirs: Lake Sakakawea and the North Dakota portion of Lake Oahe. All northern pike \geq 1 meter in length that were encountered during spring spawning operations were tagged with individually numbered jaw tags and released.

In 2017, 75 "trophy" northern pike were tagged on the ND portion of Lake Oahe. Within one year of tagging, 19 of these fish were caught by anglers (4 harvested, 15 released). Two additional tagged fish were sampled by the North Dakota Game and Fish Department (mortality) and South Dakota Game, Fish and Parks (released).

In 2017, 69 northern pike were tagged in Lake Sakakawea. To date anglers have caught 9 (5 harvested, 4 released) of this tagged cohort. Spearfishing accounted for only 1 of the angler harvested fish. One additional pike was sampled by North Dakota Game and Fish Department (mortality) and another was recovered dead from the shoreline. In total we have information on only 11 of the 62 pike tagged in 2017.

North Dakota Game and Fish Department tagged an additional 66 fish on Lake Oahe and 76 fish on Lake Sakakawea in the spring of 2018 and plan to tag fish again in the spring of 2019.

South Dakota

In 2018, the South Dakota Department of Game, Fish and Parks Commission implemented a statewide catch and release only regulation for Muskellunge/Tiger Muskellunge. This regulation change resulted from a private individual proposing the establishing a statewide 50-inch minimum length limit. The Commission rejected the 50-inch proposal, but made a subsequent catch and release only proposal and passed the proposal following a 30-day public comment period.

The South Dakota Muskellunge stocking program is currently on hold until AIS-free source of Muskellunge fingerlings can be located or developed. No Muskellunge fingerlings were stocked in 2018 and it currently does not appear that any will be stocked in 2019.

Because no Muskellunge fingerlings were available in 2018, the research project evaluating poststocking survival, movement and habitat use of fingerling Muskellunge in four eastern South Dakota lakes had to be revamped. Project plans are to now evaluate available habitat and habitat use by adult Muskellunge in two eastern South Dakota lakes. If juvenile Muskellunge can be obtained in 2019, the initial objectives of the project will be revisited.

A volunteer creel survey was completed at Lynn Lake (1 May – 31 October, 2018) to gain information concerning Muskellunge anglers. Survey response sheets and a drop box were posted at the only usable boat ramp on the lake. A total of 32 angler groups reported information. Completed trips averaged 6.0 hours and 17 Muskellunge were reported being caught. Residence of the anglers included: 65% South Dakota, 10% Minnesota, 5% Iowa, 5% Wisconsin, 5% North Dakota and 10% unknown. Approval of the new catch-and-release regulation for Muskellunge was high with 94% support and 6% not commenting.

Northern Pike numbers continue to be down across eastern South Dakota most likely due to the lack of spring runoff. Above normal precipitation in southeast South Dakota during the fall 2018 is creating optimism that the southeast will have good spawning conditions in 2019.

AFS Esocid Technical Committee Report-Wisconsin

Jordan Weeks-WI Rep

Tim Simonson-Alternate

Upcoming Rule Proposals-Wisconsin Conservation Congress Spring Hearings April 8, 2019

1. Muskellunge – Extend the Northern Zone fishing season

This proposal would extend the open fishing season for muskellunge to December 31 in all inland, outlying and boundary waters north of US HWY 10, excluding Wisconsin-Minnesota boundary waters, and in outlying waters of Lake Michigan and Green Bay north of Waldo Boulevard, Manitowoc.

The goal of extending the season would be to provide increased late-season, open-water fishing opportunities for muskellunge in northern Wisconsin, similar to what is currently available in southern Wisconsin during December. Many muskellunge anglers in northern WI have expressed a desire to continue late-season fishing during open water, when available. A citizen resolution from Vilas County to allow musky fishing in December during open water was

introduced at the 2017 spring hearings and passed with public support. Some concerns have been expressed about allowing ice fishing for muskellunge during a portion of December, based primarily on the potential for higher hooking mortality relative to open-water angling. In most years, however, there is often open water (or poor ice conditions) in many northern Wisconsin lakes during a portion of December. The department does not believe that providing this expanded fishing opportunity will result in any adverse impacts to muskellunge populations in northern WI. The objective is to increase musky fishing participation by 15% (as measured by directed fishing effort).

Do you favor extending the open fishing season for muskellunge in all inland, outlying and boundary waters north of US HWY 10, excluding Wisconsin-Minnesota boundary waters, and in outlying waters of Lake Michigan and Green Bay north of Waldo Boulevard, Manitowoc, from November 30 to December 31?

2. Muskellunge – Wisconsin-Michigan Boundary Waters

This proposal seeks to more closely match both Michigan's and Wisconsin's muskellunge regulations by establishing new dates for the open harvest season as June 1 to December 31 (currently May 15 to November 30), creating a catch-and-release season during what would be the closed harvest season (January 1 to May 31) and increasing the minimum length limit from 40" to 50" on all Wisconsin-Michigan boundary waters. See also question 8 regarding extending the open season through December on northern Wisconsin waters.

The Michigan DNR believes that the May 15 opening date opener does not offer enough protection for spawning muskellunge in these northern boundary waters. Wisconsin is proposing to extend the open season for muskellunge through December 31 on all northern Wisconsin waters. The proposal to establish a catch-and-release season on Wisconsin-Michigan boundary waters during the closed harvest season is intended to improve consistency with other Michigan waters. The 50-inch minimum length on Wisconsin-Michigan boundary waters will allow adult populations to reach their full growth potential and attain an optimum size-structure.

Do you favor changing the opening date of the muskellunge season on all Wisconsin-Michigan boundary waters from May 15 to June 1 and the closing date from November 30 to December 31?

Do you favor creating a catch-and-release fishing season during the closed harvest season (January 1 to May 31, assuming the first question is supported) on all WI-MI boundary waters?

Do you favor increasing the minimum length limit for muskellunge from 40" to 50" on Wisconsin-Michigan boundary waters?

3. Muskellunge – Rainbow Flowage, Little Tomahawk, Mud, Tomahawk, Mid, Minocqua, Jerome and Kawaguesaga lakes (Oneida County) and White Sand Lake (Vilas County)

This proposal would apply a 50" minimum length limit for muskellunge in White Sand Lake in Vilas County, and Rainbow Flowage and Little Tomahawk, Mud, Tomahawk, Mid, Minocqua, Jerome and Kawaguesaga lakes (Minocqua Chain) in Oneida County. The current regulation is a 40" minimum length limit. The management goal is to provide a trophy musky angling opportunity. This regulation proposal will help meet that management goal by protecting large muskellunge from harvest.

These proposals originated as citizen resolutions that received public support at the 2018 Spring Hearings.

Do you favor a 50-inch minimum length limit on muskellunge for the Rainbow Flowage and Little Tomahawk, Mud, Tomahawk, Mid, Minocqua, Jerome and Kawaguesaga lakes in Oneida County and White Sand Lake (T42N, R7E, S27) in Vilas County?

4. Northern Pike – Geneva Lake, Walworth County

The proposal would apply a daily bag limit of 5 fish and no minimum length limit on northern pike in Geneva Lake, Walworth County. The current regulation is a daily bag limit of 1 fish and 32" minimum length limit.

The management goal is to maximize harvest pressure and reduce abundance of northern pike. Pike in Geneva Lake consistently underperform, particularly in comparison to the trophy performance of all other gamefish species in the lake. Pike in Geneva Lake are the adult host for a unique parasitic tapeworm that also infests cisco. Significantly reducing pike abundance will directly impact the tapeworm life cycle, likely leading to decreased tapeworm abundance. Pike growth and size structure and tapeworm abundance will be closely monitored in future surveys.

Do you favor applying a daily bag limit of 5 fish and no minimum length limit on northern pike in Geneva Lake, Walworth County?

5. Northern pike – Amey Pond and Mason Lake, Adams and Marquette counties

This rule proposal would set a 32-inch minimum length limit and daily bag limit of one fish for northern pike on Mason Lake in Adams and Marquette counties. Mason Lake currently has a 26-inch minimum length limit with a daily bag limit of two for northern pike. Gizzard shad and common carp are in Mason Lake; they can negatively impact the fish community and fish habitat. Northern pike are a top predator fish with below average abundance in Mason Lake. The objective is to increase the abundance of northern pike and increase northern pike predation on these rough fish species beyond current conditions. Increasing the minimum length limit to 32 inches will still provide a quality northern pike fishery with some harvest opportunity as survey data show that northern pike can reach sizes larger than 32 inches.

Do you favor applying a 32-inch minimum length limit with a daily bag limit of one on northern pike in Amey Pond and Mason Lake in Adams and Marquette Counties?

6. Northern pike – Lake Emily (Dodge County), Little Lake Butte des Morts Outagamie and Winnebago counties), Big Cedar and Gilbert Lakes (Washington County), and Okauchee and Upper Oconomowoc Lakes (Waukesha County)

The proposed regulation is a 25- to 35-inch protected slot limit and daily bag limit of two, with one northern pike over 35 inches allowed for harvest. The current regulations are:

- Little Lake Butte des Morts (Winnebago/Outagamie counties): No minimum length limit and a daily bag limit of five
- Lake Emily (Dodge County): A 26-inch minimum length limit and 2-fish daily bag limit
- Okauchee Lake and Upper Oconomowoc Lakes (Waukesha County): A 26-inch minimum length limit and 2-fish daily bag limit
- Big Cedar and Gilbert lakes (Washington County): A 40-inch minimum length limit with a daily bag limit of one

The management goal is similar for these lakes and aims to provide pike harvest opportunities while improving the trophy potential of pike by increasing the survival and density of larger fish. The proposed regulation would allow anglers to harvest smaller pike for consumptive purposes while protecting larger adults, especially during spawning.

A 2017 netting survey on Lake Emily yielded an adult northern pike population estimate of 13.7 fish/acre. Literature suggests that growth can be negatively influenced when northern pike populations exceed 5 fish/acre. This proposal would aid in maintaining lower densities while protecting spawning size adults.

On Okauchee and Upper Oconomowoc Lakes, northern pike size structure has not increased significantly since the current regulation (26-inch minimum length limit and daily bag limit of 2) was implemented in 1995. Okauchee Lake has slower northern pike growth rates and higher abundance when compared to other southern Wisconsin lakes, despite the presence of a high-density cisco population. The northern pike fishery is very healthy and abundant and will likely sustain a considerable amount of angler harvest.

For Big Cedar Lake and Gilbert Lake, this regulation is one tool to help meet the management goal of allowing for some harvest while maintaining the fishery because the decreased minimum size limit and increased daily bag limit will provide additional harvest opportunities of Northern Pike on Big Cedar Lake and Gilbert Lake. The current year-round open season and 5 daily bag limit for northern pike on Little Lake Butte des Mortes (Neenah/Menasha Dams downstream to Appleton Lock 1 Dam) is fairly liberal. In 2015, fisheries staff received numerous inquiries from concerned anglers regarding the high harvest of northern pike on LLBDM, particularly on large fish during late season ice fishing near Strobe Island, which is a well-known northern pike spawning area. In addition, local groups have also voiced concerns and advocated for more restrictive northern pike regulations. Survey results indicated that LLBDM has the potential to produce a quality northern pike fishery with both eater- and trophy-size angling opportunities, but the current, more liberal regulation may be limiting the potential for producing quality fishing opportunities.

Do you favor a daily bag limit of 2 fish and no minimum length limit for northern pike, however all pike between 25 to 35 inches must be released and only one fish greater than 35 inches may be is allowed for the following waters: Lake Emily, Dodge County; Big Cedar and Gilbert lakes, Washington County; Okauchee and Upper Oconomowoc lakes, Waukesha County; and Little Lake Butte des Morts, Winnebago/Outagamie counties?

7. Northern Pike – Dutch Hollow and Mirror lakes (Sauk County) and White Lake (Waupaca County)

This proposal would apply a daily bag limit of 5 fish and no minimum length limit on northern pike, however all northern pike from 25 to 35 inches must be released and only 1 fish greater than 35 inches per day is allowed in Dutch Hollow Lake and Mirror Lake, Sauk County and White Lake, Waupaca County. The current regulation is a 26-inch minimum length limit and daily bag limit of 2 fish for the Sauk County lakes and no minimum length limit and a daily bag of 5 for White Lake.

The management goal is to decrease abundance of smaller northern pike, reducing competition for prey resources and improving growth rates and population size structure. This will provide a northern pike fishery with more large fish available to anglers in Dutch Hollow Lake, Mirror Lake and White Lake.

The management goal for Dutch Hollow and Mirror lakes is currently not being met because of an overabundant population of small northern pike in these lakes. One objective is to decrease the abundance of adult northern pike in each lake as calculated from spring netting survey data. The second objective is to decrease the amount of time it takes a northern pike to reach 34 inches in length. The third objective is to increase the percentage of the northern pike populations over 28 and 34 inches. This regulation is one tool to help meet the management goal because increased harvest of small northern pike is expected to improve growth rates by reducing competition for prey, preserve a range of sizes by protecting 25- to 35-inch pike, and provide an additional harvest opportunity.

Recent fisheries surveys have shown that northern pike size structure in White Lake is suboptimal due to a very high density (catch per unit effort of 39 northern pike per net night and an estimated population size of 9,242 northern pike, or 8.7 northern pike per acre) of small, slow-growing northern pike. In 2016, only 1% of the stock size and larger (i.e., \geq 14.0 inches) northern pike were greater than 21 inches in length. 99% of the stock size and larger northern pike were between 14 – 21 inches in length. This regulation will allow for harvest of smaller northern pike while protecting larger individuals from harvest. Furthermore, if the number of small northern pike is reduced, predation on other species will also be reduced resulting in more consistent fisheries for other gamefish and panfish species.

Do you favor applying a daily bag limit of 5 fish and no minimum length limit on northern pike, however all northern pike from 25 to 35 inches must be released and only 1 fish greater than 35 inches is allowed, on Dutch Hollow Lake and Mirror Lake in Sauk County and White Lake in Waupaca County?

Stocking

- 1. Review of Stocking guidance and compliance (in process).
- 2. Stocking Great Lakes Spotted Musky in connected waterbodies to the Great Lakes
 - a. Policy change to aim to stock Great Lakes Spotted strain into connected Great Lakes waterways
 - b. Musky team has previously discussed this and agrees. We are limited by money and fish currently.

Genetics

- 1. Private hatcheries-we are in the process of providing private growers with appropriate genetic stock. Process and rules are being developed.
- 2. Angler and DNR survey in Northern Wisconsin
 - a. Genetic clips from adult Musky to determine if fish are from stocking or NR
 - b. Interest from anglers and DNR so UW-Stevens Point will develop more of a proposal on this topic
- 3. Broodstock Lakes-Great Lake Strain (GLS) and inland stocks will be monitored in 2019.

Research Update

- 1. Hooking mortality study
 - a. Funding limited, not working on this project this year
 - b. Figuring out how to properly have reference fish has been challenging
- 2. Population estimate study
 - a. Looking at if population estimates can be longer than 2 years
 - b. Continuing until 2021
 - c. Unknown analytical analysis at this time

- 3. Green Bay habitat and spawning locations
 - a. 192 acoustic readers set up across Green Bay
 - b. Continuing to tag Musky and track fish
 - c. Musky tracked by boat and air

Green Bay Update

- 1. Monitoring (GLS) 2019
 - a. Yearly on Fox River
 - i. Taking eggs and milt from fish and raising these fish at Kewaunee
 - ii. 77 Musky netted in 2018
 - b. 5-6 rotation on Peshitgo River and Menominee River
- 2. Broodstock Lakes
 - a. Low recruitment back to the nets; however, the timing may be off
 - b. Low recruitment from fall electrofishing

Research Update

- 1. Pedigree work on Escanaba Lake and Sanford Lake
 - a. Broad ecological study encompassed around adding tree drops
 - b. Looking at how Musky use woody habitat
 - c. Radio tagged Musky (3 years of preliminary data collected)
 - d. Long term study upwards of 25 years
- 2. Escanaba Lake
 - a. No regulations and how anglers have reacted
 - b. Data crunching started to look at changes over time
- 3. Green Bay research needs
 - a. VHS free eggs from the Fox River
 - b. Musky spawning locations with PIT tag arrays and acoustic arrays
- 4. New Research Ideas
 - a. Broodstock lakes and Green Bay diet studies or tissue plugs
 - b. Better sampling techniques for riverine systems (gear vulnerabilities)
 - c. Stocking rates in systems and potential emigration out of systems (#1)
 - d. Review safe harvest (27%) (#2)
 - e. Stocking rates and movements of stocked fish within larger riverine and flowage systems
 - f. Relating temperature, depth, density, and growth because some systems may be limited by depth and temperature of the lake not actually density.
 - g. Incorporate lake classification with management and possibly water characteristics
 - h. Angler contributions to genetics pedigree and natural reproduction (#3)