

**Esocid Technical Committee
Winter Business Meeting 2017
State/Provincial Updates**

Indiana

Provided by Nicholas Haunert

**James Skipper
Hatchery Biologist
East Fork State Fish Hatchery
Indiana Department of Natural Resources**

The state of Indiana has switched weening feeds in 2016. We've have made the switch from the Bio Oregon to the Otohime diet. Many other states have used this diet with positive results. Last year we did a small trial with the Otohime diet, and saw improved growth and survivals in the swim up to first 50 days period. Hopefully this switch results in better quality fish for stocking public waters. Additionally, Indiana stocked a total of 53,414 Muskies in public waters that averaged 10 inches in length during 2016.

**Larry Koza
Assistant Fisheries Biologist
Fish Management District 2
Indiana Department of Natural Resources**

In 2016, District 2 participated in a Northern Pike Status and Trends netting project. We used small Lake Michigan style trap nets at two lakes. Eight trap net lifts were performed at Jimmerson Lake (Steuben County) from March 14 to 18. A total of seven Northern Pike was collected that ranged in length from 13.1 to 31.1 inches. In Crooked Lake (Steuben County), a total of seven trap net lifts were performed from March 21 to 24. A total of 11 Northern Pike was collected and they ranged in length from 21.9 to 37.3 inches.

**Jed Pearson
Assistant Fisheries Biologist
Fish Management District 3
Indiana Department of Natural Resources**

James Lake is being considered as potential broodfish site for Muskie in Indiana. Ten muskies were captured. All but two were caught in the Lake Michigan trap nets, including seven the first day. The others were caught near the inlet from Webster and near the outlet to Tippecanoe. Four were males measuring 37-39.5 inches. Of the six females, four were 36.5-45.5 inches and "ripe" (eggs flowing) and two (40-46 inch) were "green". The ripe females were used to supplement the egg-take at Webster. Nine northern pike, 21.5-29.5 inches long, were also captured. Water temperature at the time was 42-44F.

A Muskie abundance estimation was conducted at Lake Webster. Only 42 muskies were trapped: 20 females, 19 males, and three immature fish. The catch rate (0.8/trap-day) was the lowest on record. Only 11 "ripe" females were captured. Meanwhile, female lengths continued to increase with few less than 36

inches. Four of 15 previously tagged fish had been originally caught in 2005, including a 39.5-inch male that grew only 4.5 inches and a 47.5-inch female that grew 1.5 inches. The adult muskie population may now be at its lowest level since consistent stockings at 5/acre began in 1997. Seven of 91 adults marked in 2015 (RPclip) were recaptured in 2016 for an estimate of only 195 ($N=39*91/7$). For the first time, egg collection fell short of the goal and was supplemented by fish captured in nearby James Lake. However, anglers anecdotally reported catching more small muskies in 2016, so recent steps to improve stocking size and limit weed control may be contributing to a recovery. The switch to stocking age-1 yearlings could also speed recovery. The adult muskie population may now be at its lowest level since consistent stockings at 5/acre began in 1997. Seven of 91 adults marked in 2015 (RPclip) were recaptured in 2016 for an estimate of only 195 ($N=39*91/7$). For the first time, egg collection fell short of the goal and was supplemented by fish captured in nearby James Lake. However, anglers anecdotally reported catching more small muskies in 2016, so recent steps to improve stocking size and limit weed control may be contributing to a recovery. The switch to stocking age-1 yearlings could also speed recovery.

Northern pike catches were analyzed at Wawasee and Syracuse Lakes. The overall catch was 58 pike (1.8/lift), including 30 (1.9/lift) in Syracuse and 28 (1.8/lift) in Wawasee. Forty were males, 17 were females, and one was an immature fish. Eleven females were captured in Syracuse, three of which were ripe with eggs. Males were 14.0-28.8 inches long and averaged 22.0 inches. Females were 23.0-34.0 inches (28.6 mean). Ten females were ≥ 28 inches but only one was ≥ 34 inches. Most females were age-5 (27.0 inches) and age-6 (29.8 inches). Pike catch rates at Wawasee and Syracuse lakes were below the 25th percentile compared to other area lakes (2.8/lift). Catch rates by gender were also low. Because the catch rate the second week (2.0/lift) was greater than the first week (1.6/lift) and ripe females were caught the second week, sampling could have been delayed a week. Even so, only six more pike were captured the second week. In addition to lower catch rates, mean lengths of age-5 and age-6 females were also below the 25th percentiles, perhaps due to competition. Soft-rayed forage species are general scarce (Fink 2005). As a result, percentages of females ≥ 28 inches (59%) and ≥ 34 inches (6%) were somewhat less than other lakes (65% and 16%, respectively).

Nicholas Haunert
Assistant Fisheries Biologist
Fish Management District 4
Indiana Department of Natural Resources

Muskie surveys were conducted at Plover (67 acres) and Sandpiper (17 acres) pits in Driftwood State Fishing Area from March 14-18, 2016. Muskie have been annually stocked at 5 fish per acre in both pits since 1997. The water level during sampling was high enough that at least 3 feet of water connected the two pits at a low spot in the levee. This connection allowed boating and fish passage between both pits. Lake Michigan style trap nets were used in both Plover and Sandpiper pits during sampling. Length, weight, and left pectoral spine for aging was taken on each Muskie. A total of 10 Muskies was collected from 9 trap net lifts. The Muskie ranged in length from 36.5 to 47.6 inches and ages were 4 to 9 years old. Six of the 10 Muskies captured were greater than 40 inches. Two Muskies were recaptured during the survey.

David Kittaka
Fisheries Biologist
Fish Management District 5
Indiana Department of Natural Resources

Muskie surveys were conducted in 2016 at Bass Lake and Duck Lake, two reclaimed coal strip pits in the Greene-Sullivan State Forest in Sullivan County Indiana. Southern Indiana reclaimed and abandoned coal strip mine lakes are some of the larger complexes of water that the IDFW manages for hunting and fishing. Often connected to a river system these pits have an abundant and diverse forage base. Stocking programs for these lakes began as early as 1997 and as recent as 2008. The Duck Lake muskie program began in 2008. This 59 acre pit is the outfall for the 220 acre Bass Lake, which has been stocked with muskie since 1997. Using Michigan style trap nets, effort consisted of 8 lifts per lake. At Duck Lake, a 32.3 inch and a 36.0 inch muskie were collected. Reports of anglers catching and seeing muskie are increasing at Duck Lake. The same effort and gear were used at Bass Lake. A total of 29 muskie was collected for a total weight of 362.25 lbs. The length range was 33.0 to 45.5 inches. Twenty-four of the muskie were at or greater than the 36 inch size limit. Thirteen were 38 inches and greater and of those 6 were 40 inches and greater.

Rebecca Munter
Fisheries Biologist
Fish Management District 6
Indiana Department of Natural Resources

In 2017, we will be surveying our two Muskie pits down at Bluegrass FWA in March. We hope to catch more than 7 this year. Recently, two anglers posted decent Muskie photos on the 'Friends of Bluegrass' Facebook page. If we can catch fish, we will collect more information on the fish in the pits. We will try to get some good photos and advertise this unique opportunity near Evansville as much as we can.

Iowa

Prepared by Jonathan Meerbeek

Muskellunge Stocking, Tagging, and Population Dynamics (Contact: Jonathan Meerbeek jonathan.meerbeek@dnr.iowa.gov) - Thirteen lakes and impoundments are currently being managed as Muskellunge fisheries. In 2016, approximately 3,400 yearling (mean TL = 13.0") Muskellunge were stocked in 2 natural lakes and 8 reservoirs/small impoundments. 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. In 2016, 490 broodstock Muskellunge were captured (318 recaptures) ranging from 26.8-52.2 inches in these lakes. Adult (≥ 30 inches) Muskellunge population estimates for 2015 in the Spirit Lake/Okoboji Chain and Clear Lake were 0.06 and 0.13 fish/acre, respectively. Currently, spring-stocked, pellet-started minnow finished yearlings are used in Iowa's Muskellunge culture program. All yearling Muskellunge stocked into Iowa's natural lakes are tagged via PIT tags prior to stocking (since 2011). In 2011 and 2012, yearlings were tagged in the check and tag retention was poor (52%; 118 of 225 tagged) at 2-3 years post-tagging. Since 2013, all yearling Muskellunge were

tagged in the dorsal musculature. Retention (2-3 year) of 46 recaptured yearlings was 98% (45 of 46). Short-term PIT tag retention studies conducted by IA DNR and IA State, as well as other published literature, have found high retention rates for PIT tags inserted in this location. Conversely, PIT tag retention for tags (12mm, 23mm, and 32 mm) inserted in the body cavity of fall age-0 Muskellunge has been relatively poor. Evidence of natural reproduction has been observed in both Clear Lake and the Okoboji Lakes as several yearling Muskellunge have been captured during non-stocked years. Although natural reproduction has been documented in the past, this is the first time that several individuals were captured from each system.

Big Creek/Brushy Creek Muskellunge Emigration Study (Principle Investigators: Ben Dodd Ben.Dodd@dnr.iowa.gov, Ben Wallace Ben.Wallace@dnr.iowa.gov, and Michael Weber mjw@iastate.edu) - Iowa State University, the U.S. Army Corps of Engineers and the Iowa 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. We collected 16 Muskellunge at Big Creek and 30 Muskellunge at Brushy Creek Lake and implanted a 32mm HDX PIT tag into the dorsal muscle of each fish. Additionally, approximately 500 age-1 Muskellunge were PIT tagged prior to being stocked into each lake. To date, no Muskellunge have escaped from Big Creek (barrier) whereas two adult Muskellunge (7%) have escaped Brushy Creek (no barrier). No age-1 Muskellunge have escaped from either lake to date. The project will be continued through 2020 to evaluate annual variation in escapement.

Known-age Muskellunge Research Project (Principle Investigators: Derek Crane dcrane@coastal.edu and Jonathan Meerbeek jonathan.meerbeek@dnr.iowa.gov) - The Iowa DNR is collaborating on a Muskellunge known-age project that is being led by Dr. Derek Crane a researcher out of Coastal Carolina University. In 2015, we recaptured 132 Muskellunge of known-age and collected several aging structures on many of those fish. In 2016, we recaptured another 59 fish of known age. Of particular importance, the age structure from known age fish collected from Iowa ranges from age 3-25 and is well distributed amongst the different age classes. The objectives of the study are to: (1) evaluate the accuracy of fin rays as an aging structure, (2) determine if rays from different fins result in the same estimated age, (3) determine if rays from within a fin result in the same estimated age, (4) determine if the location viewed within a ray affects age estimation, and (5) validate cleithra as an aging structure. Known-age structures from Muskellunge managed from several other systems are also being collected. Samples are currently being processed and read.

Yearling Muskellunge Survival Study (Principle Investigators: Jonathan Meerbeek jonathan.meerbeek@dnr.iowa.gov and Michael Weber mjw@iastate.edu) - Muskellunge angling opportunities in Iowa are a direct result of stocking since natural reproduction is extremely limited. Research studies conducted in the 1990s found that spring stocked minnow-finished yearling Muskellunge survived much better than those stocked in fall and, since 2002, the Iowa Department of Natural Resources (DNR) has exclusively used this approach for all Muskellunge stockings. Initially, success of spring-stocked yearling Muskellunge greatly improved population densities in many of Iowa's

lakes. However, since this initial surge, adult populations in some lakes have decreased to levels below management objectives, despite increases in stocking rate and frequency. Mark-recapture studies indicate that individual stocked yearling cohort survival to age-4 was highly variable and has been as low as 7% in recent years. Anecdotal observations at stocking suggest that transportation stress and initial predation may be contributing to these observed decreases in survival. For example, in an effort to prevent the spread of zebra mussels, the Iowa DNR treats all water that leaves their hatchery facilities with the Edwards Treatment procedure. This additional treatment in conjunction with a 6 hour transport time may have potential negative effects on survival of stocked yearling Muskellunge. In addition, stocking stressed yearling Muskellunge directly at boat ramps may be contributing to increased predation (avian and/or fish) and hence, reduced cohort survival. Specifically, managers want to know if the reductions are a result of hauling stress, predation, fish condition, or a combination of factors. The objective of this project was to evaluate post-stocking survival of stocked yearling Muskellunge in Spirit Lake, Iowa and to compare cohort survival via three stocking techniques: (1) stocked directly at ramp; (2) transported to holding tanks at Spirit Lake Hatchery for 36 hours (to allow for hauling stress recovery) then stocked at boat ramp; (3) transported off-shore via boat and stocked. Two fish were never located during the study. Twenty-eight of the remaining 59 tagged fish went missing soon during the dispersal event in late May/early June. Twenty Muskellunge yearlings (mean TL = 12.9") from each stocking technique were implanted with radio tags and fish were tracked periodically up to 108 days post-stocking. Both cohorts of yearling Muskellunge stocked near shore had a strong affinity to cover (bulrush/cattail) and most remained near stocking site 2 weeks post-stocking. All yearling Muskellunge stocked from the ramp experienced low Initial mortality (2.4%). Fish stocked offshore were difficult to detect via radio telemetry and initial mortality could not be estimated. Known mortality over 100-d was 10%, 35%, and 20% for direct, hatchery holdover, and offshore stocked fish, respectively. Mortality events appeared to be associated to periods of fish movement from stocking location site (or predators abundances increasing near stocking area) from late May to early June. Overall, short-term (100-d) mortality was at least 22%. A logistic regression model found that total length at time of stocking significantly influenced yearling Muskellunge survival. Based on these data, production techniques that result in larger fish size will benefit Muskellunge populations in Iowa. The project will be repeated next year and findings will guide Iowa's production and stocking techniques.

Northern Pike Propagation and Stocking (Hatchery Manager: Kim Hawkins kim.hawkins@dnr.iowa.gov - Northern Pike propagation is still an important component to manage these fish in lakes, rivers and impoundments across Iowa. In 2016, 875,955 Northern Pike fry and 152,265 Northern Pike 1.5-3-inch fingerlings were stocked. An additional 13,750 2-inch fingerlings were obtained from Jake Wolf Fish Hatchery in Illinois to fulfill stocking requests.

Maryland

Prepared by Michael Kashiwagi and Matt Sell (Southern Division AFS)

Muskellunge

The upper Potomac River supports Maryland's only muskellunge fishery. Sections of the river in Washington and Allegany counties contain a naturally reproducing population of muskellunge that is specifically targeted by a growing group of anglers. The Maryland Department of Natural Resources (MD DNR) Freshwater Fisheries Division has been monitoring the muskellunge fishery through annual fall electrofishing surveys, a volunteer angler diary, and a muskellunge tagging program.

Since the tagging program started in 1997, over 750 muskellunge have been tagged with a recapture rate of roughly 40%. Tagging data combined with scales collected from 157 muskellunge (2008-2015) were used to generate sex specific length-at-age models. Female Potomac River muskellunge reach the 36" minimum size in 4.9 years, while males reach the minimum length in 5.2 years. The largest known fish was a female measuring 50.5" (1262mm) that was aged to 14-16 years using both the cleithrum bone and pelvic fin ray. In 2017 the department plans to analyze the tagging data in more detail using Program MARK to develop population and mortality rate estimates. Initial estimates using catch curve regression produced an annual mortality rate of 22%.

The volunteer angler diary program was started in 2009 to obtain better information on recreational effort, catch, and harvest. The average catch rate for the past five years (2011-2015) was 11.6 hours/fish. Release rates are very high for anglers in the diary program which is matched by a 3% fishing mortality rate from the tag data. Angler catch rates were highest in July, corresponding to higher water temperatures in the river and muskellunge moving and concentrating in areas that provide coolwater conditions.

In an effort to better identify seasonal movement patterns and key habitat areas (spawning locations, thermal refuge) in the upper Potomac River, MD DNR plans to begin a muskellunge radio telemetry study in spring 2017. The department has 15 radio tags that will be implanted into muskellunge in a 12km section of the Potomac near Clear Spring, MD. This section is between two dams that should restrict the movement of the tagged fish out of the study area. MD DNR will then conduct biweekly tracking by boat to monitor the location of tagged muskellunge. Continuous temperature loggers will also be deployed in the coolwater tributaries and mainstem river of the study section to collect water temperature data. Combining both the radio tracking and temperature data, MD DNR hopes to better understand muskellunge movement, habitat use, and angler exploitation during the thermally stressful summer months.

Northern Pike

Maryland Freshwater Fisheries division has been working to complete a comprehensive life history project on a unique population of trophy Northern Pike in Deep Creek Lake, Garrett County, Maryland. The goal of the project is to better understand the fishery from both a biological and angling perspective with the intent to maximize its trophy potential. Currently we are conducting spring and fall electrofishing surveys, collecting scales and fin rays for aging, determining sex, and FLOY tagging adult fish. With this data we are beginning to understand adult and young-of-year densities, mortality, movement, growth, age, and angler exploitation of the fishery, although more research is necessary.

Preliminary results suggest that there is strong sexual dimorphism in growth. Upon review of the growth data from all aged fish, northern pike in DCL appear to be recruited to the legal minimum size (762 mm, 30 inch) at an average age of 6.2 years. The maximum age is estimated at 10.8 years with a maximum length of 1110 mm (43.7 inch). However, when considering the collection of known-sex fish (N=22), only two males have been collected that were of legal size. Further, the largest male collected was 753 mm (29.5 inch) and estimated to be seven years old. This suggests that the current minimum legal size for northern pike in DCL could be at, or near the upper size limit for male fish in the population, although limited known-sex data makes it difficult to draw any reliable conclusions. Likewise, faster growing females are seemingly the only fish in the population growing to "memorable" size or larger and are therefore likely harvested at a disproportionately higher rate. The impacts of this, coupled with the inherently disproportional harvest of female pike due to somatic and reproductive growth requirements, could have implications for sex ratios and the size structure of the fishery. In any case, it further supports the need to collect more sex-specific data in order to understand maximum age and length estimates for both male and female pike in the population.

Once northern pike in DCL reach the minimum legal size for harvest the total annual mortality is 44.2% with an estimated total annual natural mortality of 31.1%. This means that 13.1% of their annual mortality is related to angling and includes both angler harvest and post-release impacts. In order to differentiate between the two and determine the impact to the fishery, we would like to complete an angler creel survey and determine a formal population estimate.

Michigan

Prepared by Cory Kovacs

Great Lakes Muskellunge Production:

- 2016-egg source still Detroit River; Wolf Lake SFH reared 25,740 fall fingerlings; 12 waters statewide were stocked; fish averaged 9.1 inches; one lake was stocked with Northern strain Muskie in the Upper Peninsula (Mississippi drainage)

Inland Broodstock Lake Development:

- MDNR Esocid Committee reviewed broodstock plan and development of inland sources. Big Bear and Thornapple lakes were broodstock waters through fall 2015. Survey in 2015 in Big Bear Lake found zero stocked GL-Muskies. Thornapple Lake spring 2016 survey found four stocked GL-Muskies. Big Bear Lake was removed as broodstock lake and changed to Lake Hudson. Lake Hudson was the former Northern Muskie broodstock lake for many years.
- In efforts to reduce competing predator abundances in Thornapple and Hudson lakes, northern strain Muskie and Northern Pike will be targeted for a trap and transfer in spring 2017. Fish transferred will be moved to some lakes without a pre-existing Muskie population. Since northern strain Muskie are being moved, receiving waters could not have outlets capable of passage downstream into native Great Lakes Muskie populations. Northern Pike will be moved downstream of the outflow structure in Thornapple Lake keeping these fish in the watershed.
- In order to improve stocking success and carry-over, fall fingerling Muskies will be overwintered at Wolf Lake SFH. These will be stocked out as yearlings. Each fish will be PIT tagged immediately before stocking. These fish will only be utilized in the broodstock lakes. In 2012 experimental yearlings were reared. Survival was 21% from fall to winter. These fish were then stocked in Thornapple Lake.

Regulations:

- Muskellunge harvest tag will be eliminated in 2018. Tags are costly to produce at \$0.07 per tag. Total cost for the Muskellunge harvest tag in 2015 was \$65,000. A total of 580,000 tags issued since 2013. Only 16 harvested fish have been registered since 2013 (voluntary registration). A new electronic check system is being considered for the start of the 2018 fishing season. This system would mirror the new call in system for Lake Sturgeon being implemented in 2017. This would be a more economical system than the tag.
- Muskellunge regulation suite underwent an internal review. The Muskellunge Management Plan recommends 38, 42, 46, and 50 inches depending on population. The 50 inch length limit had

previously been reserved for broodstock lakes. However, 50 inches can now be considered other waters.

- The Esocid Committee ran a von Bertalanffy model for each population across the state using the most recent age and growth data available. The model produced L-infinity for each population. If L-infinity achieved or exceeded a minimum size limit then that length limit was recommended for that population. Midpoints of the length limits were also used and resulted in higher length limits for more waters. This regulation proposal is being vetted through the Warmwater Resources Steering Committee, public meetings, and the Natural Resources Commission.

Muskellunge Angler Survey:

- MDNR opened online Muskellunge angler survey to collect catch and angler values information. This is a partnership with Michigan Muskie Alliance. As of February 1, 2017, a total of 471 responses were received. The survey will close at the end of February.

Fish Production Upgrades

- For Fiscal year 2017, Thompson State Fish Hatchery (Upper Peninsula) has been approved \$12.2 million to for upgrades to their facility and construction of 8 new lined ponds. First capital outlay project funded in many years for the Michigan DNR Fisheries Division. Expectations of the improvements will benefit Muskellunge production by adding 15,000 fall fingerlings to the state system. Expected to be up and running in 2019 or 2020. Project will also improve Walleye production in the state system.

Special Projects

- Muskellunge floy tagging project in the Inland Waterway (northern lower Michigan). Anglers are tagging Muskellunge for field staff. Similar work to that of Jordan Weeks' project.
- Muskellunge telemetry study-St. Clair and Detroit River system: see attached project detail

Missouri

Prepared by Dave Woods

Currently, five lakes in Missouri are managed for muskies: Pomme de Terre Lake (7,820 ac.), Fellows Lake (820 ac.), Hazel Creek Lake (530 ac.), Henry Sever Lake (158 ac.) and Lake 35, Busch Conservation Area (62 ac.). Henry Sever Lake is included in the program as a surplus stocking location only.

The Show-Me Muskie Project is a volunteer reporting program in which the Missouri Department of Conservation invites conservation-minded muskie anglers to help evaluate Missouri's muskellunge management program. Volunteers include a wide cross-section of muskie anglers at all levels of skill and experience. Missouri's Muskellunge Plan sets muskie angler catch-rate objectives, which can be documented most efficiently by anglers themselves. The 2016 Show-Me Muskie Project data is currently being received from anglers across the state. That data will be summarized and a report will be available in the Show-Me Muskie Project newsletter in the spring of 2017. This information will be shared with

the ETC at the summer meeting in 2017 and included in the 2018 Winter Business Meeting written report.

2016 Spring Sampling Results

Standardized fyke net surveys were conducted this spring at Pomme de Terre Lake, Fellows Lake, Hazel Creek Lake and Henry Sever Lake. August A. Busch Conservation Area, Lake 35 was not sampled for muskies in 2016.

- **Pomme de Terre Lake** – Water temperature was 52°F and lake elevation was 840.4 msl (normal pool = 839.0), making for optimal sampling conditions. A total of 101 muskies (56 males and 45 females) were captured in 30 net-days, resulting in a catch rate of 3.4 fish per net-day. Of the muskie captured, 42% were 36 inches or longer and 14% were 40 inches or longer. The largest fish captured was a female that measured 45.0 inches long and weighed 23 lbs, 9 oz. The long-term average catch rate for muskie on Pomme is 6.2 fish per net day. The lower than average catch rate may be reflective of poor timing rather than decreased relative abundance, as the water temperatures were warming quickly and most female muskies were either flowing eggs or already had spawned.
- **Fellows Lake** – Water temperature was 50°F and the lake was 0.5 feet above normal pool. A total of 27 muskies (17 males and 10 females) were captured in 28 net-days, resulting in a catch rate of 1.0 fish per net-day. Of the muskie captured, 39% were 36 inches or longer and 19% were 40 inches or longer. The largest fish captured was 43.0 inches long and weighed 21 lbs, 5 oz. High lake levels caused poor sampling efficiency due to interference from shoreline vegetation. Therefore, the 2016 survey of Fellows Lake muskie may not be an accurate representation of the fishery.
- **Hazel Creek Lake** – Water temperature was in the low 50's. A total of 21 muskies (17 males and 4 females) were captured in 8 net-days, resulting in a catch rate of 2.6 fish per net-day. Of the muskie captured, 14% were 36 inches or longer and no fish 40 inches or above were observed. Due to equipment issues, Hazel Creek Lake was sampled a week later than normal. With water temperatures in the low 50's the week before, and evidence the spawn was over during sampling, the lower than normal catch rates do not seem to be representative of the actual muskie population in that lake.
- **Henry Sever Lake** - Water temperature was 52°F. A total of 24 muskies (12 males, 5 females and 7 unknown) were captured in seven net-days, resulting in a catch rate of 3.4 fish per net-day. Of the muskie captured, 33% were 36 inches or longer and 4% were 40 inches or longer. The largest fish captured was 42.8 inches.

In the fall of 2016, most program lakes received their annual commitment stocking rate. Fellows Lake did not receive its full commitment and efforts are being made to acquire the extra 300 fish needed. Henry Sever Lake and Busch CA Lake 35 received their commitments in the spring of 2016.

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|----------------------|-------|
| Fellows Lake..... | 526 |
| Pomme de Terre | 4,707 |
| Hazel Creek..... | 532 |

| | |
|--------------------|-----|
| Busch Lake 35..... | 119 |
| Henry Sever..... | 125 |

TOTAL.....6,009

The Missouri Department of Conservation partnered with the Pomme de Terre Chapter Muskies Inc. to design signage promoting the Show-Me Muskie Project last year. Those signs have been posted at all program lakes in Missouri. Muskies Inc. members also promote the project through their chapter newsletter and personal contacts with Muskie anglers around the state.

Nebraska

Prepared by Keith Koupal

The following report was submitted to the Esocid Technical Committee meeting in February 2017 at the Midwest Fish and Wildlife Conference held in Lincoln, NE. 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 and many stocked waters have a 30" minimum on northern pike. Recent interest in the muskellunge fishery at Merritt Reservoir has initiated a consideration for a 50" minimum length regulation on this water that is currently being considered.

Northern pike production has hit a snag. There has been a decline in hatch percentage of broodstock spawned from our National Refuge lakes near Valentine Nebraska. An experimental design to test the efficacy of using saline and a buffer/saline mixture to enhance northern pike egg fertilization and subsequent eye-up in our Production Sections northern pike was employed this past spring. Eye-up percentage generally increased with the use of buffer solutions but was still below optimum values that were desired for management production (<60%) and variability of eye-up is still too high for staff to feel comfortable with the protocol. Additional trials are planned that will attempt to isolate the impacts of buffer solutions by splitting eggs from larger females into control and experimental units as well as reducing the amount of milt used for fertilization so milt source for both experimental units are from similar parent stock. Adult collection may move to Dewey Lake because individuals from this water have shown greater relative condition the past few years.

A northern pike tagging project was started at Lake Wanahoo 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 2012-2016. Sex-specific growth increments were calculated using recaptured fish since aging structures are not being collected (see Jordan Katt for more details on methods). Tracking of the first year-class stocked into the reservoir was used to determine if/when recruitment has occurred from later stockings of northern pike. Results of this showed limited recruitment, with 61% of the overall

population still consisting of the original stocked year-class even though advanced (10-12" fish) have been stocked annually 2012-2015. This project is scheduled to continue into the future.

The only other esocid mention in research activity was a compilation of muskellunge sampling, growth and condition for all Nebraska waters by a graduate student at University of Nebraska-Kearney. This exercise used the existing sampling database from the Nebraska Game and Parks Commission Fisheries Division to determine growth curves, relative weights. The lack of individuals captured by standard sampling techniques indicates a need to specifically sample for this species or potentially cooperate with anglers who may be handling more individual fish than sampling gear. The report generated from this work was the nexus for creating an extended abstract on management of muskie in Nebraska for the peer-reviewed publication that was generated from presentations at the Muskie Symposium held in Minnetonka, MN.

Ohio

Provided by Curtis Wagner and Kevin Page, ODNR-Division of Wildlife

2015 Ohio Muskellunge Angler Survey – A collaboration between the Ohio Division of Wildlife and Muskellunge angler clubs

Executive Summary from final report document

As expected, the majority of Muskellunge anglers were found to be male, generally older, and highly avid. They were also experienced, with most indicating they had been fishing for 20 years or longer. On average, anglers were financially heavily invested in Muskellunge fishing. However, while experienced overall, an appreciable portion of Muskellunge anglers were comparatively “new” to Muskellunge fishing; 18% fishing less than 5 years for Muskellunge. Most Muskellunge anglers (58%) were a member of a Muskellunge club, and considered supporting management efforts and promoting Muskellunge fishing to be the most important benefits of club membership. Similarly, nearly half of anglers participated in tournaments with the vast majority doing so to support their club and Muskellunge management efforts. Interestingly, while the majority of anglers indicated that they had a “home” fishing location, they were prone to spending a substantial amount of their time fishing multiple locations within and among years. When asked to estimate the percentage of days dedicated to fishing various locations in 2014, with the exception two locations (Caesar Creek and West Branch), fewer than half the anglers fishing a given location ever dedicated 50% or more of their fishing days to those locations; an indication that Muskie anglers may be highly transient and that most locations do not have a large “core” group of highly fidelity anglers in 2014. Given “quality Muskellunge fishing” is the most important factor when deciding where to fish, assuming time and travel distance is not a factor, anglers, as a whole, may be focusing on locations with a “hot bite” (West Branch for example) and visiting other locations spuriously. Similar to other specialized fisheries, Muskellunge anglers were fairly content with various aspects of fishing, highly supportive of management programs, but appeared less supportive of current harvest regulations. The Ohio Division of Wildlife’s Muskie Angler Log (MAL) appears to be well known and utilized among anglers surveyed. Anglers that were aware of the MAL, but choose not to use the MAL, generally preferred to keep their own catch records; although there was some indication that improving the functionality of the MAL, such as integrating catch reporting between the MAL and the Muskies Inc. Lunge Log, could help encourage greater participation.

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

Within four reservoirs, all advanced fingerling muskellunge stocked from 2013 – 2022 are being 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 readers (Biomark systems) stationed on shore, below dam spillways. Readers are housed in a PVC case secured to a nearby structure (pole, building), or within nearby structures (gauging station, pump house). Readers are powered using either deep-cycle marine batteries maintained using solar power (Salt Fork Lake) or by connecting directly to AC power located onsite (Alum Creek Lake, Clear Fork Reservoir, and Leesville Lake). Antennas are extended from the reader across the width of the spillway. Similar designs have been used previously to monitor fish emigration through dams and movement of stream fishes. In addition to PIT tags, all muskellunge stocked within these reservoirs were initially tagged with an individually numbered (and yearly cohort colored) T-bar anchor tag (Floy Tag and Manufacturing; type FD-94); however, we have discontinued the external tagging due to fouling of the tags and readability issues. 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 using a designated 1-800 phone number or online via the Ohio Muskie Angler Log (<https://apps.ohiodnr.gov/muskielog/welcome.aspx>). Hand-held PIT tag readers (Biomark 601 Reader) 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.

From 2013 through 2016, nearly 35,000 muskellunge have been tagged and stocked, with good post-stocking survival (~70-90% across lakes and years). A previous long-term tagging study on Clear Fork Reservoir, Ohio, found that few age-1 and age-2 muskellunge emigrated and a recent published study from Illinois suggested that notable muskellunge escapement begins around sexual maturity (Wolter et al. 2013, NAJFM 33:829-838). Consequently, we are only now expecting significant numbers of tagged muskellunge to begin being detected below the reservoirs, primarily from the 2013 and 2014 stocking classes. Below are some slides from a recent project update.

Muskie Tagging Study



Objectives

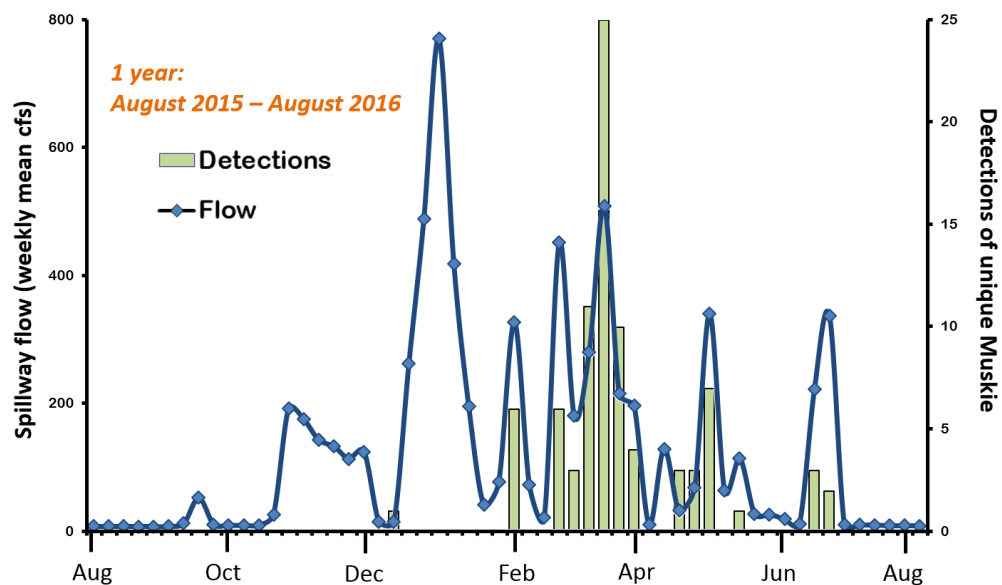
- *Emigration*
- *Survival*
- *Angler catch and release*

Methods

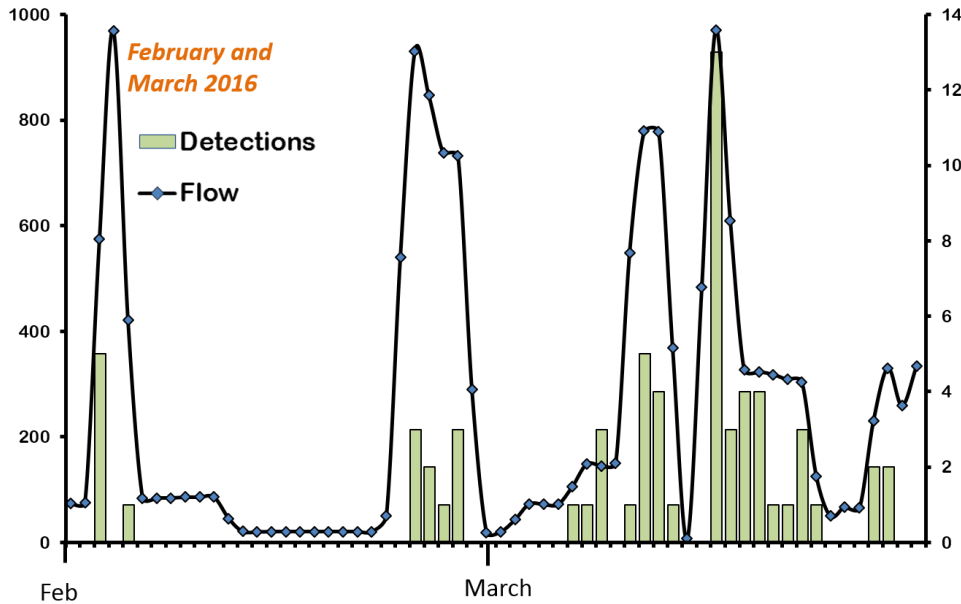
- *Ten year study (2013-2022)*
- *Alum Creek, Clear Fork, Leesville, Salt Fork*
- *Tag all fish stocked*
- *Spillway and angler tag detections*



Alum Creek Escapement



Alum Creek Escapement



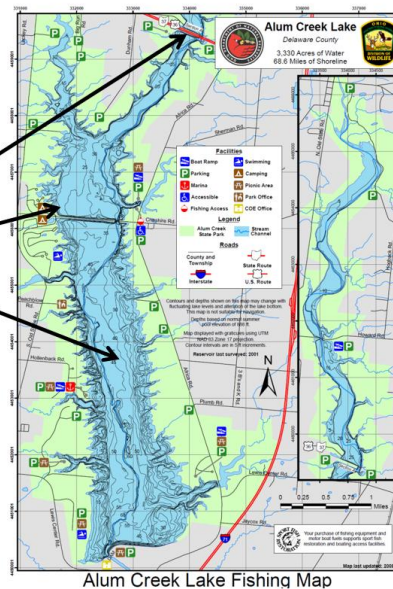
Alum Creek Escapement



- **11 fish were seen prior to emigrating**

| <u>Fish</u> | <u>Seen</u> | <u>Emigrated</u> |
|-------------|-------------|------------------|
| #15A285D0 | 12/13/2015 | 3/9/2016 |
| #184A0B46 | 4/8/2016 | 5/4/2016 |
| #15A1F7E1 | 10/7/2015 | 3/17/2016 |

- **1 fish detected by spillway reader was later harvested 63 days later**
- **Fish have stayed as long as 311 days in the spillway**



Muskie Tagging Study



Preliminary Results

- 4 years of tagging
- 34,479 fish tagged
- 281 detections



| Location | Total | Angler catch | Emigrated | DOW captured | Found dead |
|------------|-------|--------------|-----------|--------------|------------|
| Alum Creek | 161 | 55 | 84 | 21 | 1 |
| Leesville | 64 | 26 | | 35 | 3 |
| Salt Fork | 34 | 32 | 1 | 1 | |
| Clear Fork | 21 | 3 | 12 | 7 | |

- *Angler catch and Emigration: mostly 2013 stocked fish*
- *Emigration: spring; older fish; reservoir differences*

Ohio Muskie Angler Log 2016 Update

The online Ohio Muskie Angler Log (MAL) (<https://apps.ohiodnr.gov/muskielog/welcome.aspx>) 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. Of important note is that anglers can go into their preferences and opt in to declare themselves as Reporting All Trips angler. This allows the Ohio Division of Wildlife to filter the data to include only those who declared this status when calculating catch-per-unit-effort estimates, while also allowing anglers who only want to log their caught fish to do so without skewing data analyses. The MAL is a collaborative effort between the Ohio Division of Wildlife and the organized muskellunge clubs throughout Ohio.

Below are some data from a recently compiled 2016 Muskie Angler Log summary distributed to the clubs.

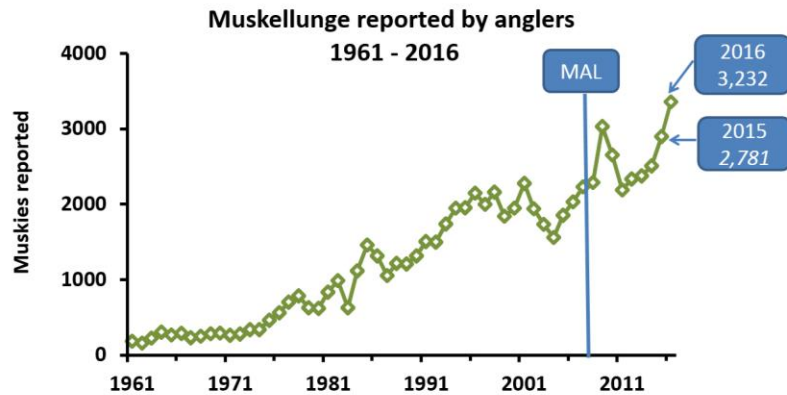
MAL Highlights:

- 22,413 Ohio muskies reported into the MAL since 2008 launch
- 2,065 Ohio muskie anglers have registered in the MAL since 2008 launch
- In 2016, 222 anglers reported 3,232 muskies
- 1,476 trips were reported by 93 anglers who committed to report all of their trips during 2016
- Statewide average catch rate in 2016 was one muskie for every 6.5 hours of angling
- The release rate of reported muskies since 2008 is 98.5%

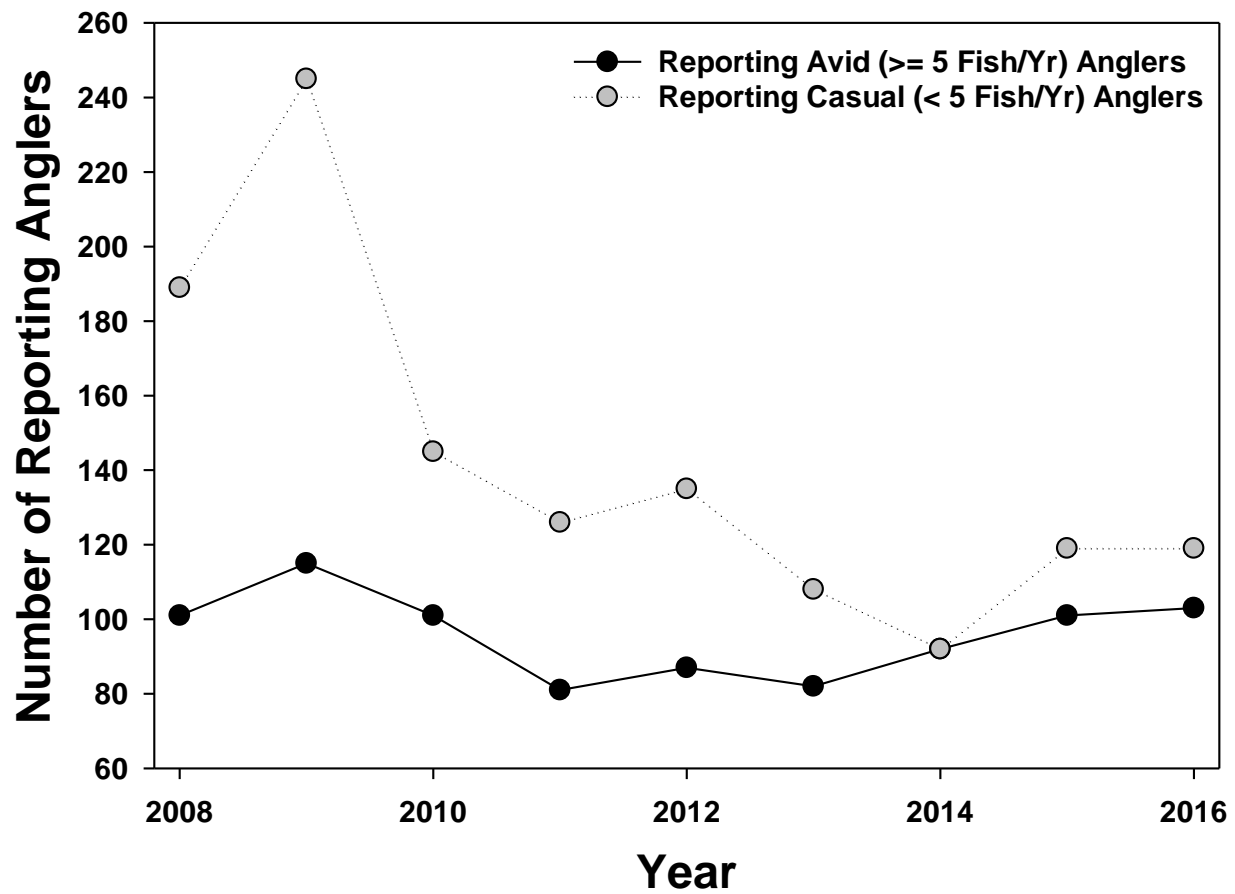
Muskie Angler Log



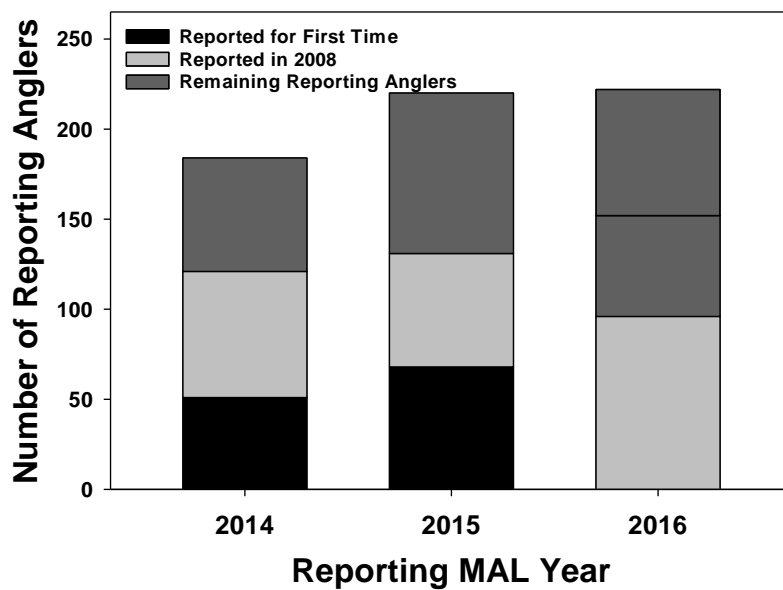
*More and more
catch reports*



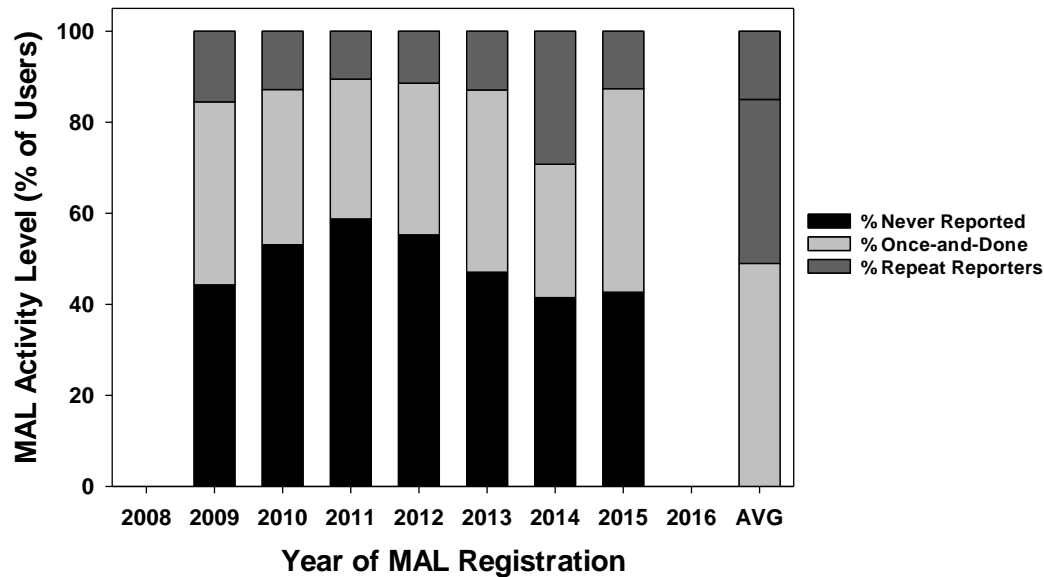
MAL Participation Over Time:



- We saw a decline since the 2008 launch of the online Muskie Angler Log of casual anglers (those reporting 1-4 fish/yr) while maintain a steady base of “avid” anglers reporting 5 or more fish/yr. These categorizations are based solely on number of reported fish, not necessarily trips or hours fished.



- We see that each year, roughly 1/3 of the anglers reporting at least one fish are new to the MAL (black bar segment). Another 1/3 are long-time participants who have reported at least since the MAL launch in 2008 (light grey), and the remaining 1/3 are multi-year anglers newer to the MAL than the 2008 launch (dark grey).

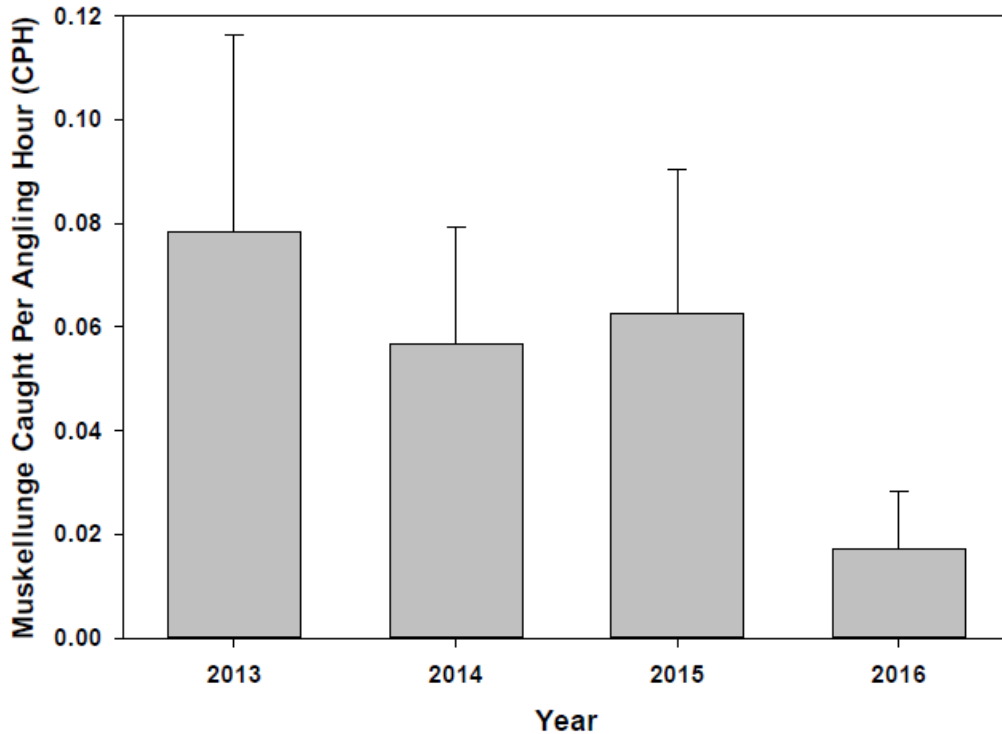


- Another way to look at this churn is that across years, about 45% of the accounts (user profiles) created that year never result in a reported fish or trip. Another 40% of the accounts created that given year result in reported trips or fish in only that year the account was created. Of the accounts created in any given year, only 15% result in trip and fish reports across multiple years. Clearly we have some marketing to do with the goal of creating repeat users and keeping anglers engaged with the MAL.

MAL Management Uses – an example:

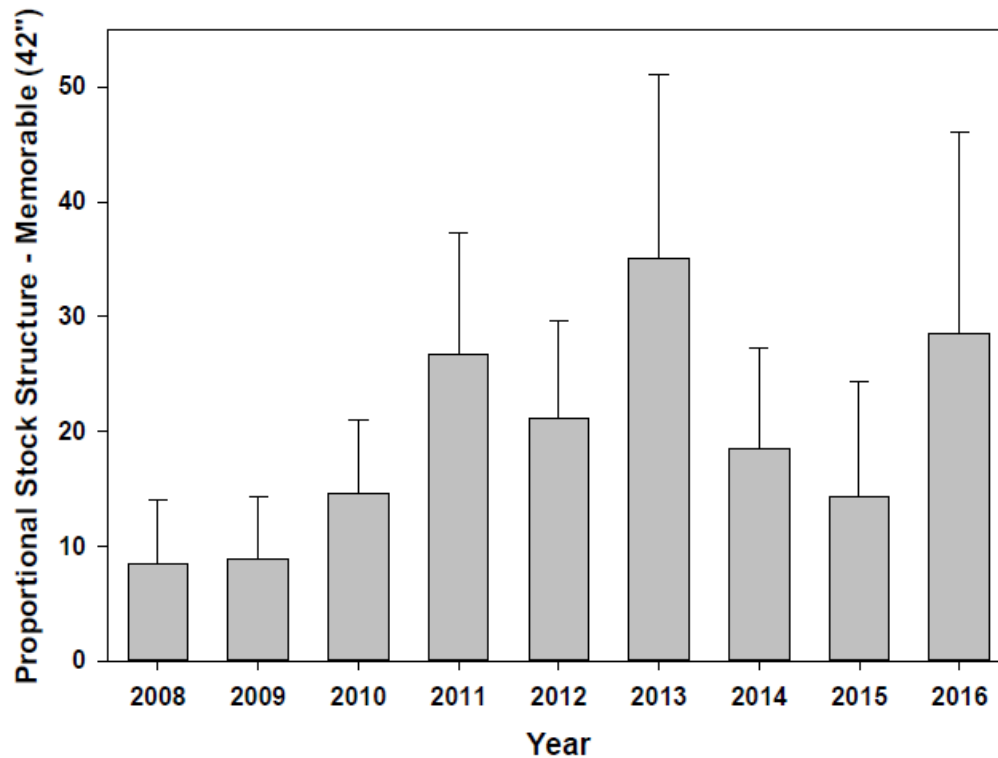
The MAL allows us to take detailed look at reservoir fisheries using angler data because fishery-independent data is too time consuming and costly to collect on a routine basis. Here is an example of the angler-derived CPH from one muskellunge population in Ohio, Clear Fork Reservoir.

FIGURE 3. Mean catch per effort (number of muskellunge caught per hour of angling effort) from MAL anglers reporting all trips from 2013-2016 for Clear Fork Reservoir. Error bars represent 95% confidence intervals.



If CPH is related to muskellunge abundance then Figure 3 suggests that the muskellunge population size is declining in recent years in Clear Fork Reservoir. Often, the size structure of the population can both support the suspicion of a declining population (abundance) and can also suggest possible causes. In an over-fished (over-harvested) population, the proportion of larger fish in the population generally declines initially when larger individuals are targeted. This is seen in commercial fisheries and could likely be the case in a situation where muskellunge are targeted. Anglers often target larger individuals and it is presumed that larger individuals are also more susceptible to post-release mortality. However, a disproportionate abundance of larger individuals (e.g. a lower than expected proportion of small individuals) can indicate recruitment problems. In the case of stocked muskellunge, recruitment problems could be low stocking numbers, initial stocking mortality, high emigration of young individuals, or a combination of these and other factors.

FIGURE 4. Proportional stock structure (PSSm) of memorable size fish (42") from Clear Fork Reservoir MAL reports during 2008-2016. PSSm is the number of memorable size fish as a proportion of the number of stock size (20") fish caught per year. 42" also aligns with the size that the Ohio Huskie Muskie Club considers a "Huskie Muskie" in their scoring system. Error bars represent 95% confidence intervals.



Despite variation, the data suggests an increasing trend in PSSm during the MAL years (2008-2016). In two of the past four years, an estimated 25-33% of the muskellunge caught were 42" or larger. This value is high for Clear Fork Reservoir and is also high when compared among most of the other muskellunge program reservoir MAL years.

From this data, we may speculate that the muskellunge population in Clear Fork Reservoir is comprised of a higher proportion than normal of older (larger) individuals, suggesting some failure of younger individuals to recruit to the fishery. This could be due to many reasons. Certainly spring rainfall could be explored to see if high spring discharge might relate to changes in PSSm. Alternatively, stocking survival can vary markedly from year to year as shown in the literature. Specifically, variations in stocking size and stocking water temperature can effect initial stocking mortality (success).

From this small exercise using MAL data we can explore estimated metrics of abundance and size structure (including estimated variation) and begin to make conclusions (or at least informed hypotheses) regarding the status of a muskellunge fishery – this is an example of how Ohio anticipates using the MAL data as time series builds.

West Virginia

Prepared by Jeff L. Hansbarger

-The WVDNR continues to develop a statewide esocid management plan. The historical stocking history was recently completed with a number of interesting findings. The first stocking of muskellunge occurred in 1958 in Bluestone Lake, WV, on the New River. Since then WV has given muskellunge to Virginia, Kentucky, Oklahoma, Alabama, and New York. West Virginia has received Ohio River drainage muskellunge from Ohio, Kentucky, and New York. Muskellunge, northern pike and tiger muskellunge were stocked extensively at various times, sometimes together to evaluate stocking success or return to anglers. Broodstock sources, stocking, and locations, are much more scrutinized today for a variety of reasons. Northern pike and tiger muskellunge are presently not stocked and have not been for years. We are considering tiger muskellunge for two small impoundments due to possible availability (PA) and angler interest.

-A number of anglers within the WV muskellunge fishing community are equipped with PIT tag readers and continue to supply the WVDNR with valuable information from the muskellunge they catch and release. All enjoy tremendously hearing about the history of the fish they catch and release, the more extensive the history the better it seems. Muskellunge are PIT tagged for broodstock collections, telemetry projects, past movement projects, and during other surveys. Recently an angler turned in an Elk River female that was initially tagged on 11/12/2010 at 904 mm (35.6") as part of a past movement project (2008-12). The angler caught and released her on 2/4/2017 at 1207 mm (47.5"). Her estimated age based on past size and capture history is 12-13. We continue to work with other regional agency personnel and researchers to better understand age and growth of this magnificent gamefish along their southern edge of distribution.

-The WVDNR is gearing up for another spring of broodstock collection and another year of experimenting with the buffering solution (aka hot sauce) that many other agencies have been using more extensively to increase fertilization rates. Rodney Null, the manager of Palestine State Fish Hatchery will again lead that effort.

-We are in the process of working out another contribution from the Trooper Eric Workman Foundation to the WVDNR, mainly equipment for Palestine State Fish Hatchery in Elizabeth, WV. Funds raised by the foundation come from their annual catch and release tournament held each June on all WV waters, and from donations. I highly recommend participating if ever possible, I am sure this year's edition will be a great time again. The tournament is now a two day tournament, complete with a great ending meal and awards banquet centrally located in WV. Please check their website (eworkman.org) or Facebook page for details regarding the annual tournament and upcoming events, and please spread the word and come join us. We can always find places for people to stay or camp if they want to experience WV muskellunge fishing and enjoy the tournament, feel free to contact the foundation or myself. It is a tournament, but it is more of a time to remember Trooper Eric Workman and celebrate the great fish that brings us all together with other like-minded people.

Wisconsin

Prepared by Jordan Weeks

Muskellunge Team charge

Implement Wisconsin's Muskellunge Management Plan and coordinate muskellunge management statewide. Specific assignments are:

1. Develop/review regulation guidance and proposals,
2. Develop/review stocking guidance and stocking plans,
3. Develop/review assessment metrics and sampling protocol,
4. Develop/review habitat management guidance,
5. Review/update management plan; assess status of fishery,
6. Identify research needs; coordinate statewide evaluations,
7. Maintain/update musky water classifications.

Great Lakes Stock

-Brood lakes (3) are coming along nicely, fish should be mature in a year or two.

Here's a quick breakdown of how the ponds fared this year out at Kewaunee:

Hill pond 9/22/16

1,000 fish to Sturgeon Bay

1,010 fish to Fox River

1,009 fish to Peshtigo River

153 fish to Menominee River

Total: 3,172 fish

Average Length 10.88"; 4.25 fish per pound = 746.4 lbs.

Road Pond 9/23/16

1,000 fish to Little Sturgeon

239 fish to Menominee River

Total: 1,239

Average Length 10.64"; 4.29 fish per pound = 288.8 lbs.

Total for 2016: 4,411 fish = 1,035.2 lbs.

New Proposed Muskellunge Regulations

Muskellunge Questions for the 2017 Spring Hearings

1. Motor trolling on inland waters

"Trolling" means trailing a lure or bait from a boat being propelled by any means other than drifting or rowing. Trolling is currently allowed with at least 1 hook, bait or lure (i.e., 1 "line") per angler (and a

maximum of 2 hooks, baits or lures per boat) on all inland waters; on many waters, up to 3 hooks, baits or lures (i.e., 3 “lines”) may be used per angler.

At the 2014 Spring Hearings, a proposal to allow trolling with 1 line per angler in 17 counties (excluding 31 waters already open to trolling with 3 lines per angler) and to allow trolling with 3 lines per angler in the other 55 counties was supported by a vote of 3,646 (Yes) to 2,250 (No), with 61 counties in favor and 11 counties opposed. This proposal was adopted by the Natural Resources Board in 2014 with 2 modifications: 1) a maximum of 2 lines per boat was established; and 2) a sunset of April, 2018 was added, meaning that if not renewed, this rule would revert back to pre-2014 trolling rules.

The department is proposing minor revisions to the current rule: 1) reduce the number of exceptions within counties; 2) address comments received on the 2-line per boat maximum; and 3) eliminate the sunset. Under this proposal, trolling would be allowed with 1 line per angler (and a maximum of 3 lines per boat) in Florence, Iron, Lincoln, Oneida, Sawyer*, Sheboygan, Vilas and Waupaca Counties; and trolling would be allowed with 3 lines per angler in the remaining 64 counties (*trolling would continue to be allowed with 3 lines per angler on Chetac, Grindstone, Lac Courte Oreilles, Nelson, Big and Little Round and Whitefish lakes, Sawyer County).

Trolling has had no adverse biological impacts where this method is already legal. Allowing trolling with at least 1 line per angler: 1) eliminates confusion about where trolling is legal; 2) allows anglers to trail a sucker or other minnow and cast and retrieve another lure while the boat is moving; 3) eliminates the need for disabled anglers to apply for a trolling permit; and 4) provides opportunities for anglers with physical limitations that make fishing by other methods difficult.

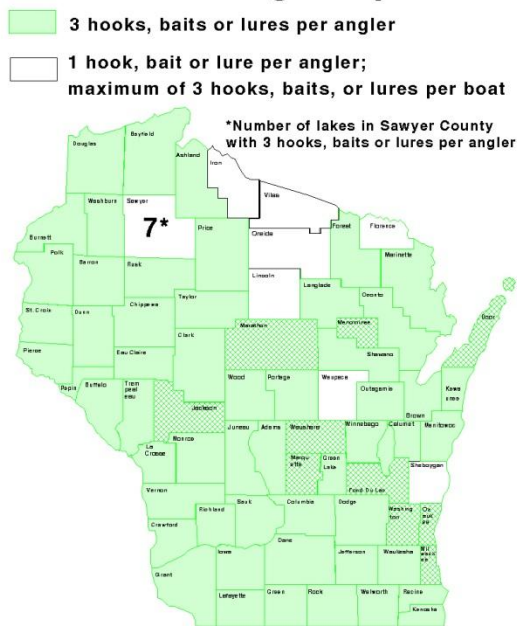
Do you favor allowing trolling with 1 hook, bait, or lure per angler (and a maximum of 3 hooks, baits or lures per boat) in Florence, Iron, Lincoln, Oneida, Sawyer (except the 7 lakes listed above), Sheboygan, Vilas and Waupaca Counties and allowing trolling with 3 hooks, baits or lures per angler in all other waters?

2. Change the minimum length limit for Muskellunge from 45 inches (or catch and release) to 50 inches on 8 waters in Adams, Dane, Juneau, Lafayette, Portage, Sawyer, Vilas and Wood Counties.

This proposal would increase the minimum length limit for muskellunge from 45” to 50” on the Wisconsin River from DuBay Dam to Castle Rock Dam, Adams, Juneau, Portage and Wood Counties; Lakes Monona, Waubesa, and Wingra, Dane County; Chippewa River, Winter Dam to Arpin Dam, Sawyer County; Little Saint Germain Lake and Trout Lake, Vilas County; and change the harvest regulation for muskellunge from “catch and release only” to a 50” minimum length limit on Yellowstone Lake, Lafayette County.

This change reduces the number of regulatory options used for trophy management by consolidating all “trophy” muskellunge waters into one length-limit category (50” minimum). The management goal for these waters, to provide a low-density, trophy muskellunge fishery, will not change. These trophy waters have had either a 45” minimum length limit or have been catch and release for 10 years or more. In a recent mail survey, 63% of musky anglers defined a “trophy” as 50” or larger. Based on the growth

2017 Trolling Proposal



potential of these populations and angler interest in catching 50"+ fish, the department recommends standardizing all trophy muskellunge length limits at 50", rather than having 3 options (45", 50", and catch and release). The 50" minimum length limit has been in effect on 20 other waters, some since 1996. This change was specifically supported for the central Wisconsin River at the local level by a citizen resolution, introduced at the spring hearings in 2012, and was subsequently supported statewide as a Conservation Congress Advisory Question (1,989 Yes, 1,016 No) in 2013. This change was also specifically supported for Trout Lake (Vilas County) at the local level by a citizen resolution that was introduced at the 2015 spring hearings, and was subsequently supported statewide as a Conservation Congress Advisory Question (1,809 Yes, 1,140 No) in 2016.

Do you favor increasing the minimum length limit for muskellunge from 45" to 50" on the Wisconsin River from DuBay Dam to Castle Rock Dam, Adams, Juneau, Portage and Wood Counties; Lakes Monona, Waubesa, and Wingra, Dane County; Chippewa River, Winter Dam to Arpin Dam, Sawyer County; Little Saint Germain Lake and Trout Lake, Vilas County; and changing the harvest regulation for muskellunge from "catch and release only" to a 50" minimum length limit on Yellowstone Lake, Lafayette County?

3. Increase the minimum length limit for Muskellunge from 40" to 50" on 10 waters in Adams, Chippewa, Dane, Juneau, Marinette, Oneida, Rusk, Sauk, Sawyer, Vilas and Walworth Counties.

This proposal would increase the minimum length limit from 40 inches to 50 inches for muskellunge in the Lower Wisconsin River (Castle Rock dam, Adams and Juneau Counties, downstream to the WI & Southern Railroad Bridge, Sauk City, Dane and Sauk Counties); Lake Wissota, Chippewa County; Holcombe Flowage, Chippewa and Rusk Counties; High Falls Flowage and Caldron Falls Flowage, Marinette County; Katherine Lake and Willow Flowage, Oneida County; Whitefish Lake, Sawyer County; North and South Twin Lakes, Vilas County; and Lake Geneva, Walworth County.

These proposals have good local support, based on past outreach efforts, resolutions and advisory questions. The proposal for the Lower Wisconsin River was supported at the local level by several citizen resolutions that were introduced at the Spring Hearings in 2009 (Columbia, Dane, Juneau and Sauk Counties – 174 Yes, 46 No), 2010 (Juneau County – 21 Yes, 7 No) and 2016 (Adams County – 15 Yes, 5 No). The proposal for Lakes Wissota and Holcombe were supported at the local level by citizen resolutions that were introduced in 6 counties at the spring hearings in 2014 (244 YES, 100 No). Katherine Lake and Willow Flowage proposals were supported at the local level by a citizen resolution introduced at the 2016 spring hearings in Oneida County. The proposal for Whitefish Lake was supported at the local level by a citizen resolution introduced at the 2009 spring hearings in Sawyer County and, in 2010, was supported statewide as a Conservation Congress Advisory Question (1,465 YES, 957 NO). The proposal for North and South Twin Lakes, Vilas County, was supported at the local level by a citizen resolution that was introduced at the 2015 spring hearings in Vilas County and in 2016, was supported statewide as a Conservation Congress Advisory Question (1,689 YES, 1106 NO).

The goal is to provide trophy muskellunge fishing in these waters, where muskellunge have the proven potential to reach 50 inches. Based on available data, annual angler harvest must be less than 5% in order to produce trophy muskellunge fishing. Harvest occurs at a low level, but the potential for harvest still exists. For low density species such as muskellunge, any amount of harvest impacts the number of trophy fish in the population. The objective is to insure that at least 10% of the population is \geq 45 inches.

Do you favor increasing the minimum length limit for muskellunge from 40 inches to 50 inches in the lower Wisconsin River, from Castle Rock dam (Adams and Juneau Counties) downstream to the WI & Southern Railroad Bridge, Sauk City (Dane and Sauk Counties); Lakes Wissota and Holcombe, Chippewa and Rusk Counties; High Falls Flowage and Caldron Falls Flowage, Marinette County;

Katherine Lake and Willow Flowage, Oneida County; Whitefish Lake, Sawyer County; North and South Twin Lake, Vilas County; and Lake Geneva, Walworth County?

4. Eliminate the 28” minimum length limit for muskellunge in the following 15 waters: Day, East Twin, English, Mineral, Potter, Spider/Moquah and Spillerberg Lakes (Ashland County); Owl Lake (Iron County); Bearskin, Booth, Julia and Squaw Lakes (Oneida County); Butternut and Solberg Lakes (Price County); and Black Lake (Sawyer County).

This proposal would eliminate the 28” minimum length limit regulation category for muskellunge management and establish “no minimum length limit” on all these waters. The daily bag limit would remain at 1.

The management goal is to provide high angler catch rates of muskellunge of any size, and to provide the occasional muskellunge for the creel. Few muskellunge reach 40” in these waters; in some cases, few fish even exceed 30”. Low numbers of larger muskellunge is generally related to lake characteristics (e.g., small, shallow, weedy lakes), a high abundance of muskellunge, and/or a genetic predisposition to small body size, and not due to fishing pressure or harvest. Angler harvest of smaller muskellunge will not harm these populations and may improve growth by reducing competition among muskellunge. The objective is to allow the occasional harvest of muskellunge from these high-density, slow-growing populations.

Do you favor eliminating the 28” minimum length limit and establishing “no minimum length limit” for muskellunge in Day, East Twin, English, Mineral, Potter, Spider/Moquah and Spillerberg Lakes, Ashland County; Owl Lake, Iron County; Bearskin, Booth, Julia and Squaw Lakes, Oneida County; Butternut and Solberg Lakes, Price County; and Black Lake, Sawyer County?

Statewide Advisory Question – Fisheries Management

5. The department would like to gauge public support for the idea of eliminating angler harvest of muskellunge from lakes that are used as a source of eggs for DNR hatcheries by establishing “Catch & Release only”. The department relies solely on wild muskellunge populations to provide these eggs. It’s important to capture a sufficient number of adults in these lakes each year to maximize the genetic diversity of the eggs and, subsequently, the young fish that are used to stock other lakes and rivers throughout the state. While angler harvest of muskellunge is relatively low, some harvest still occurs. Any harvest could reduce the genetic diversity of the population and could hinder our ability to capture the minimum recommended number of spawning adults used to provide the quality and quantity of eggs needed for our production goals. The following waters are currently used as “Brood Stock Lakes” Lac Courte Oreilles (currently 50” minimum length limit), Chippewa Flowage (currently 50”), and Lost Land/Teal Lakes (currently 40”), Sawyer County; Elkhart Lake (currently 50”), Sheboygan County; Anderson and Archibald Lakes (currently 50”), Oconto County; the Minocqua Chain of Lakes (currently 40”) and Pelican Lake (currently 50”), Oneida County; and Big Arbor Vitae Lake (currently 40”), Vilas County.

Do you favor establishing “Catch & Release Only” for muskellunge from brood lakes that are used as a source of eggs for DNR hatcheries?

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Research (WDNR/UWSP Genetic Lab)

TO: Joe Gerbyshak, Wisconsin Department of Natural Resources

FROM: Keith Turnquist, Molecular Conservation Genetics Laboratory

University of Wisconsin-Stevens Point Stevens Point, Wisconsin 54481-3897 (715) 346-2178 FAX (715) 346-3624

Wisconsin Cooperative Fishery Research Unit

SUBJECT: Strain assignment of muskellunge caught in lakes Wissota and Holcombe during 2014-2015

DATE: August 1, 2016

We are finished with the analysis of the muskellunge collected by Joe Gerbyshak on lakes Wissota and Holcombe [Gollon Bait and Fish Farm (Dodgeville, WI) stocked fingerlings] during spring 2014 and 2015. Genetic diversity was surveyed at a standardized suite of 13 microsatellite loci commonly employed for muskellunge throughout the Great Lake region. We analyzed 89 samples collected in 2014 and 99 collected in 2015 (188 samples total). Seven samples from 2014 and one sample from 2015 were missing genotypes at more than half of the 13 loci and were removed from further analyses. We then used the program STRUCTURE (Pritchard et al. 2000) to assign each individual sampled from lakes Wissota and Holcombe to their strain of origin (Wisconsin vs Leech Lake). STRUCTURE uses a Bayesian approach to group individuals into K genetically similar clusters and is also able to identify putative hybrids. We also assigned fish sampled from lakes Wissota and Holcombe to their strain of origin using a maximum likelihood approach employed in ONCOR (Anderson et al. 2008). We included eight reference populations for both analyses: Chippewa Flowage (N=73), Lost Land Lake (N=72), Lac Courte Oreilles (N=41), Big Arbor Vitae (N=69), Emily Lake (N=31), North-South Twin Lakes (N=34), and Leech Lake (N=93). These populations were chosen because they have been shown to be representative of the Leech Lake, Chippewa River, and Upper Wisconsin River strains in previous research. Leech Lake is highly diverged from Wisconsin populations, therefore fish from this population are easily identifiable using the types of analyses implemented here. Fish from the Wisconsin populations included in the reference are somewhat diverged from each other but not enough for them to be highly identifiable (e.g. it is difficult to differentiate a muskellunge from the Chippewa drainage and Wisconsin River drainage using these types of analyses). Therefore, our analysis focused on assignment to two genetic groups (1) Wisconsin, and (2) Leech Lake. Results from assignment tests for each fish are found in the attached file Wissota_musky_assignment_test_results.xlsx. All data from our analysis are available at your request.

Greater than 95% of the samples that we analyzed were assigned to the Wisconsin genetic group. Specifically, STRUCTURE (with K=2) assigned 172 fish to the Wisconsin group, four fish to the Leech Lake group, and classified four fish as putative hybrids between Wisconsin and Leech Lake (q-value > 0.3 for both groups, Fig. 1). Results from ONCOR were similar, with 176 out of 180 fish assigned to the Wisconsin group and four assigned to the Leech Lake group. The discrepancies between analysis methods likely stem from the fact that STRUCTURE is more suited to identify hybrids than ONCOR.

Three of the four fish identified as pure Leech Lake strain were over 30 inches long and two of these fish appeared to be older males (~36 in long) from the 2004-year class (both age 10). The other Leech Lake fish was likely a recently stocked fingerling (12.2 in). One of the Leech lake fish also had a note about light coloration with an accompanying picture. Three of the four fish identified as hybrids were relatively

small (< 16 in). These fish may have been produced by recent natural reproduction. The other hybrid was larger (36.2 in).

We encountered a somewhat unique genetic signature from 24 fish identified as fingerlings from the Gollon Bait and Fish Farm out of Dodgeville that were stocked into Holcombe Lake. These fish assigned to the Wisconsin group in both STRUCTURE analysis (when $K = 2$) and ONCOR analysis, but appeared to be part of a different genetic group in STRUCTURE analyses with $K > 2$ (Fig. 2). We investigated genetic diversity and relatedness in the Gollon fish and found that these fish did not have unusually low diversity, but a relatively large number of the 24 individuals appeared to be related (full or half siblings), and the effective population size of the 24 individuals was small (seven). This level of relatedness likely led to the population structure that we observed because highly related groups of individuals can appear to be separate populations (Hansen et al. 1997). Taken together, these analyses suggest that Gollon Bait and Fish Farm utilized broodstock derived from Wisconsin populations and the offspring produced from these broodstock were sufficiently diverse, but these offspring showed elevated levels of relatedness compared to what would likely be expected in wild populations. We suggest that Gollon Bait and Fish Farm take further steps in the future to decrease relatedness between individuals that are being stocked together such as increasing the number of broodstock or mixing up offspring from different broodstock more thoroughly.

Figure 1. STRUCTURE analysis with $K=2$. Population 1 is the unknown Wisconsin and Holcombe samples, population 3 is the Chippewa Flowage, population 4 is Lost Land Lake, population 5 is Lac Courte Oreilles, population 6 is Big Arbor Vitae, population 7 is Emily Lake, population 8 is North-South Twin Lakes, and population 9 is Leech Lake. Each bar in the graph represents an individual and different colors represent different genetic groups. Individuals that are mostly or all green are Wisconsin strain, individuals that are mostly or all red are Leech Lake strain, and individuals with both colors at intermediate levels are putative hybrids (q -value > 0.3 for both groups).

Figure 2. STRUCTURE analysis with $K=7$. Population numbers are the same as those described above. The pink grouping in the unknown Wisconsin and Holcombe samples corresponds to fingerlings from the Gollon Bait and Fish Farm (Dodgeville, WI). These fish are genetically distinct from the other reference populations.

References:

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