

2020 Winnebago System Lake Sturgeon Spearing Season

Post-Season Synopsis

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Introduction and Methods:

The Winnebago System is home to one of the nation's largest lake sturgeon populations and hosts the largest recreational harvest for the species. The fishery is a winter spear harvest that represents one of only two locations (Black Lake, Michigan being the other) where lake sturgeon can be harvested with a spear. The method of spearing sturgeon through a hole cut in the ice was first practiced by Native Americans to provide needed protein during harsh winters. Settlers later adopted this method to harvest lake sturgeon. A significant decline in sturgeon abundance in the late 1800s resulted in the first sturgeon harvest regulations being enacted in the early 1900s, which eventually included a harvest ban from 1915-1931. However, a winter spear fishery on the Winnebago System re-opened in 1932 as part of an economic relief bill during the Great Depression. There has been an annual season since.



Regulations associated with sturgeon spearing seasons have changed through time, but the premise of using a spear to harvest a sturgeon through the ice has remained constant. Currently, there are two separate spear fishing opportunities for lake sturgeon on the Winnebago System. One fishery occurs on Lake Winnebago, while the other takes place on the Upriver Lakes (Butte des Morts, Winneconne, and Poygan). The average success rate between the two fisheries is quite different, with spearers being much more successful on the Upriver Lakes (average success rate = 62%) relative to Lake Winnebago (average success rate = 9%). The biggest factor affecting success rates between the fisheries is the difference in water depth. The Upriver Lakes are much shallower than Lake Winnebago, meaning that water clarity doesn't have as much impact on the fishery. The Upriver Lakes also serve as juvenile rearing habitat and gravid fish tend to overwinter in the Upriver Lakes as they prepare for spring spawning runs. Therefore, a higher density of fish likely reside within the Upriver Lakes at that time of the year.

The difference in success rate between the two fisheries substantially impacts the regulations for each fishery. For example, effort is not restricted for the fishery on Lake Winnebago. Each spearer is limited to the purchase of a single spearing license that permits the harvest of one fish per season. In comparison, effort is restricted to 500 permits per season on the Upriver Lakes. Spearers interested in fishing the Upriver Lakes apply for a permit or purchase a preference point prior to an August 1st deadline. Permits are then

issued through a drawing where priority is granted to applicants with the most preference points. All applicants not awarded a permit accumulate a preference point for use in future drawings. Spearers must purchase a spearing license for Lake Winnebago (\$20 for residents, \$65 for non-residents) prior to an October 31st deadline. There is not a deadline for purchasing licenses on the Upriver Lakes, as effort is already restricted through the drawing.

Overharvest is the biggest threat to the long-term sustainability of sturgeon populations. Therefore, it is critical to proactively manage fisheries and ensure that harvest is maintained at or below sustainable levels. The lake sturgeon spear fishery on the Winnebago System is one of the most heavily regulated fisheries in North America. Implementation of various regulations, including implementation of a lottery fishery on the Upriver lakes and reductions in season length and spearing hours per day, have all benefitted the sturgeon resource. However, implementation of the harvest cap system in 1999 has been the most influential.

The goal of the harvest cap system is to maintain harvest at or below 5% of the adult population. Abundance estimates derived from mark recapture data are used to set adult female (>55") and male harvest caps for each spearing season. Abundance estimates are not available for juvenile females, so that harvest cap has remained fairly stable at

around 400 fish. Both fisheries open on the 2nd Saturday of February and are open daily for a maximum of 16 days, or until any of the pre-set harvest caps for juvenile females (<55"), adult females (>55"), or males are reached. Participants can spear from 7AM-1PM each day the fishery is open and must register their fish at a DNR operated registration station prior to 2 PM the same day the fish was harvested. Harvest numbers are tallied by WDNR staff at the end of each spearing day and the fishery is immediately closed if 100% of any of the sex-specific harvest caps have been reached for that fishery. The

fishery closes 24-hours after harvest has exceeded 90% of any of the sex-specific harvest caps for that fishery. This harvest management strategy provides recreational harvest opportunities without threatening the long-term sustainability of the sturgeon resource.

The annual sturgeon spear fishery not only provides the unique opportunity for anglers to harvest a lake sturgeon with a spear, but it also provides WDNR staff with a unique opportunity to collect biological data from harvested fish. Data collected during the registration process are critical to managing the fishery and recapture data collected from harvested fish are used to estimate population abundance. Each fish is measured to the nearest 0.1" (total length to the longest point of the caudal fin), weighed to the nearest 0.1 pound, checked for internal (PIT: passive integrated transponder) and external (Monel: metal tags on the dorsal fin) tags, and assessed for sex and reproductive stage. All PIT



Kaitlyn Ortlieb registered her 61.2 pound, 60.6" lake sturgeon at Stockbridge Harbor on 9 February 2020.

tagged fish are referenced against a database to determine whether they are stocked fish of known-age or wild recruits. The stocked fish consist of 15 unique year classes that have been stocked in the upper Fox River as part of a restoration effort to increase the abundance of migrant adult lake sturgeon in the upper Fox River. There have been various life stages of fish stocked through these efforts, but fish have primarily been stocked out as either fall fingerlings (average 9.7") or yearlings (average 17.8"). Most stocked fish were marked with PIT tags prior to stocking, which will allow managers to quantify natural recruitment rates while also evaluating movement and survival of stocked fish.



In addition to the length, weight, sex and tagging data collected from each harvested fish, stomach samples are collected from roughly 65 fish harvested from Lake Winnebago and 35 from the Upriver Lakes for diet analysis (photo inset). The sturgeon harvest assessment also provides a unique opportunity to collect fecundity data from harvested fish. The term fecundity refers to the ability to produce an abundance of offspring or new growth. In fisheries management, fecundity is quantified as the number of

eggs that a female carry. Lake sturgeon are known to have high fecundity, but collection of fecundity data is rare as the fish needs to be sacrificed or harvested for the ovaries to be removed for sampling. The winter spear fishery on the Winnebago System provides a unique opportunity to collect fecundity data that could be applied to population models for the Winnebago System population as well as other sturgeon populations throughout North America. Bruch et al. (2006) was one of the first studies to report fecundity data for a wild lake sturgeon population. However, the publication was based off a relatively small sample size of fish and recommended additional collection of fecundity data from larger lake sturgeon. The data set has since been expanded through intensive sampling conducted during the 2006-2016 spear seasons. Fecundity data from fish larger than 130 pounds and less than 35 pounds are still sparse. Therefore, WDNR staff looked to collect data from any F4 (females carrying mature, black eggs) lake sturgeon meeting these criteria during the 2020 spearing season.

Additional sampling may occur during spearing seasons based on management needs and ongoing research projects. Sampling strategies often change from year to year depending on what internal projects are being conducted and what requests are received from researchers outside of the WDNR. For the 2020 season, otolith and dorsal spines were collected from all known-age (stocked) fish for an age validation study that the WDNR is working on. There were no requests for sampling in support of non-DNR sponsored research projects.

The primary objective of the lake sturgeon harvest assessment on the Winnebago System is to manage harvest, but there are many facets of that core objective. More specifically, our assessment objectives for the 2020 season were to: 1) obtain sex-specific estimates of sturgeon abundance and exploitation, 2) monitor size structure and condition of the harvestable sturgeon population, 3) monitor sturgeon foraging habits, 4) monitor

effort, spearer success rate and demographics of the spearing community, 5) evaluate sturgeon age and growth, 6) add to fecundity data set, and 7) promote the sturgeon resource and sturgeon management program through outreach at WDNR operated registration stations.

Results and Discussion:

The 2019 abundance estimates for the Winnebago System lake sturgeon population were 24,100 adult males and 18,400 adult females. Abundance estimates were used to set the system-wide safe harvest caps at 430 juvenile females (<55"), 950 adult females (>55"), and 1,200 males. The Lake Winnebago spear fishery was allocated 90% (855 fish) of the adult female harvest cap and 80% of the juvenile female (344 fish) and male (976 fish) harvest caps. The remaining harvest caps were allocated to the Upriver Lakes fishery. The 2020 season marked the 5th straight season that the system-wide adult female cap was set at 950 adult females.

There were 12,721 sturgeon spearing licenses purchased for the 2020 sturgeon spearing season (Lake Winnebago = 12,248; Upriver lakes = 473). The 2004 season was the first year that a Lake Winnebago sturgeon spearing license was not offered with the purchase of a Wisconsin Patron's License, thus 2004-present provide the best comparison of license sales. During that time period, license sales for the Lake Winnebago fishery steadily increased between 2004-2016 (Figure 1). However, license sales have been consistent in recent years with 12,200-12,500 licenses purchased per season. The limited entry fishery on the Upriver Lakes was implemented in 2007 and the number of applicants has steadily increased to a record 8,554 for the 2020 season (Figure 2). Applicants with 8 or more preference points were awarded a spearing permit, while 325 of the 714 applicants with 7 preference points were drawn for Upriver Lakes spearing permits (Table 1). There were some applicants with >8 preference points who were not drawn, and in all situations the applicant was part of a group. Group applications enter the drawing at the preference point level of the group member with the fewest preference points. Therefore, one group member must have had fewer than 8 preference points for the group not to be selected in the drawing.



The biggest storyline of the 2020 sturgeon spearing season was ice conditions. The winter leading up to the season was highlighted by mild temperatures, which caused serious concerns about poor ice conditions. In fact, there were reports of pockets of thin ice (4-6") out from just about every access point on Lake Winnebago during the week leading up to the season. Most fishing clubs didn't put out tree lines or vehicle bridges as ice conditions were not safe for vehicle traffic. Thus, travel over most of Lake Winnebago was restricted to UTVs, ATVs, and snowmobiles. Ice conditions out from Payne's Point and along the north shore were better and many spearers were able to drive vehicles out to the first crack.

The variable ice conditions strongly impacted participation in the 2020 spearing season, particularly on opening weekend. Opening day shanty counts on Lake Winnebago averaged 4,483 shanties between the 2015-2019 seasons (Figure 3). In comparison, there were 2,439 shanties observed on Lake Winnebago during opening day of the 2020 spearing season. Further, the 2020 opening day shanty count was a 47% reduction from 2019. We also observed a different trend in distribution of the shanties throughout the lake. Due to ice conditions and travel concerns, most shanties were cut in within a mile of shore and the main basin of the lake was mostly barren. It's not abnormal to see high concentrations of shacks within a mile of shore, but typically there are shanties dispersed throughout the entire lake. As the season went on, some spearers began to venture further out into the lake. Aerial shanty counts were conducted again on the 2nd Saturday of the season and a slight increase in shacks was observed (2,616 shanties). Peak spearing effort typically occurs on opening weekend and then decreases as the season continues, so observing an increase in shanty counts was a rare occurrence.

Ice conditions on the Upriver Lakes were more favorable than Lake Winnebago. In fact, many ice fishing anglers were driving vehicles on Lake Poygan a week or two prior to the sturgeon spearing season opener. There were 611 shanties observed on the Upriver Lakes during opening day of the 2020 spearing season. Lake Poygan contained the most shanties with 462, followed by Lake Butte des Morts and Lake Winneconne with 104 and 45 shanties respectively. You may be wondering how the number of shanties on the Upriver Lakes could exceed the number of spearing permits given out. Well, the Upriver Lakes is a popular fishing spot for ice anglers and some of the shacks observed were likely not intended for use during sturgeon spearing. It's near impossible for a pilot to differentiate while in the air whether a shack is in use for sturgeon spearing or ice fishing, therefore, the protocol is to count all shacks observed during the survey.

Water clarity is the best predictor of sturgeon spearing success for the Lake Winnebago sturgeon spear fishery. Typically, WDNR staff collect water clarity data during the week leading up to the spearing season. However, ice conditions prohibited collection of water clarity data for the 2020 season. In order to gauge water clarity in areas around the system, we relied on reports from spearers who were out prior to the season scouting. Water clarity was reported to be fair to good in the northern portion of the lake as spearers typically reported seeing 12-15'. However, clarity over most of the lake was poor with most reports being 7-10' of visibility. Based on this information, we projected an average water clarity of 10' coming into opening weekend, which is below the 12' clarity threshold that is typically required to allow enough harvest to shorten the spearing season.

The variable water clarity and reduction in spearing effort due to ice conditions resulted in a full 16-day season on Lake Winnebago. This marks the 5th consecutive full 16-day season for that fishery and the 8th over the past 10 years. There were 491 sturgeon harvested during the 2020 fishery (4.0% success rate), which ranks as the 51st highest harvest dating back to 1941 (80 seasons). The time component of the 2020 harvest was very interesting. In a typical season, the highest daily harvests occur on opening weekend and then decrease as the season goes on. The opposite occurred during the 2020 season as the two largest harvest days occurred on days 15 and 16. Effort didn't seem to drop off as precipitously as normal following opening weekend, which likely played an impact in the abnormally high harvest later in the season. However, there were also reports of spearers finding clearer water and concentrations of fish off the east shore in areas 4 and 6 (Table

2) between Quinney and Calumet Harbor. Most of the fish being registered late in the season were coming from that area.

The spearing season on the Upriver Lakes also lasted the full 16-days. This was only the 2nd time in the 14 seasons since the lottery fishery was implemented that a season went the full length (the other season being 2017). There were 320 lake sturgeon harvested during the 2020 spearing season on the Upriver Lakes, meaning that 67.7% of license holders registered a fish. The average harvest from the Upriver Lakes under the current regulations has been 300 fish per season. Thus, the extended season length in 2020 was not attributable to a reduced harvest. The 2020 season marks the 5th straight season with a harvest cap of 950 adult females. The lottery fishery was implemented in 2007, a season in which the system-wide harvest caps were set at 556 adult females. Harvest caps steadily increased before leveling off at 950 adult females in 2016. The average harvest and season length during the 2007-2015 seasons were 296 fish and 5 days respectively. In comparison, the average harvest (305 fish) and season length (10 days) have increased in recent seasons under the current harvest cap of 950 adult females. The number of permits issued for the Upriver Lakes fishery have not changed through time as the harvest caps have increased, thus extending the season length in seasons managed by the higher harvest caps. This trend is something that WDNR staff will be monitoring in future seasons.

The southeast corner of Lake Winnebago experienced the highest harvest with 36.3% of the fish being harvested from area 6 (Table 2). Areas 1 and 4 were the next highest contributors with 17.1% and 15.9% of the harvest coming from these portions of the lake (Table 2). Logically, the number of fish registered at each station indicated similar trends as the Jim and Linda's registration station paced the way with 180 fish registered, followed by Stockbridge Harbor with 99 fish registered (Table 3). The harvest from the Upriver Lakes was driven by Lake Poygan as 82.2% of the fish were reported as harvested from that waterbody. The registration station at Critter's led the way with 193 fish registered, followed by Indian Point and Boom Bay with 98 and 29 fish respectively (Table 3). The number of fish registered at each station during the 2020 spearing season was impacted by station closures as Waverly Beach, Quinney, Jerry's, Payne's Point, and Boom Bay stations were all closed at some point during the season. These stations were closed due to work restrictions placed on WDNR staff and the relatively low registration numbers at that station during the season.

In general, males between 50-59.9" were most commonly represented in the harvest, while females 60-69.9" were most frequently observed (Figure 4). The Upriver Lakes harvest contained a higher proportion of smaller fish relative to Lake Winnebago (Figure 4). For



Brandi Lefeber registered this 91.7 pound, 71.7 inch lake sturgeon at Stockbridge Harbor on February 8, 2020.

example, the average length and weight of fish harvested from Lake Winnebago were 58.5” and 51.1 pounds compared to 53.6” and 36.5 pounds for the Upriver Lakes. The discrepancy in size of fish within the two fisheries is attributable to two main factors. For starters, the Upriver Lakes are known as juvenile rearing habitat for lake sturgeon, meaning there is a higher percentage of younger fish residing in those lakes and contributing to the harvest. Second, many gravid lake sturgeon overwinter in the Upriver Lakes prior to spawning. Males mature at an earlier age and exhibit shorter spawning periodicity of 1-2 years compared to every 3-5 years for females. These factors lead to an increased presence of males in the Upriver Lakes and a higher percentage of males (59.7%) within the harvest relative to Lake Winnebago (41.5%). Lake sturgeon exhibit sexual dimorphic growth where females grow larger than males. Therefore, the increased prevalence of males within the Upriver Lakes harvest reduces the average size of fish showing up in the harvest.

The largest fish harvested during the 2020 spearing season was 142.0 pounds and measured 80.0.” The fish was registered at Wendt’s by William Thern of Fond du Lac on February 9, 2020. The largest fish harvested from the Upriver Lakes was 140.0 pounds, 75.0” and registered at Critter’s on February 8 by Vincent Catania of North Fond du Lac.



William Thern (left) and Vincent Catania (right) both harvested 140+ pound lake sturgeon during the 2020 spearing season. William’s 142.0 pound, 80.0” fish was the largest fish harvested from Lake Winnebago and Vincent’s 140.0 pound, 75.0” fish was the largest from the Upriver Lakes.

These were some very impressive fish but were both roughly 30 pounds shy of entering the record books as one of the heaviest fish harvested from the Winnebago System (Figure 5). The fish registered by William Thern had the length potential to break into this elite club as it was longer than 7 of the 11 fish on this list. However, records are based off weight not length. As Figure 5 displays, most of the heaviest fish on record were harvested during the 2010-2013 seasons. Fish harvested during these seasons were in extremely good condition (Figure 6) resulting from strong gizzard shad hatches in 2009, 2010, and 2012 (Figures 7). Numerous fish have been harvested during recent seasons that are long enough to carry the necessary weight to join the list, but the last addition came during the 2013 season. I expect the record books to experience a large shake up the next time we see multiple strong year classes of gizzard shad in a short time span, similar to 2009-2012 (Figure 7).

Stomach samples were collected from 84 fish harvested during the 2020 sturgeon spearing season (Lake Winnebago = 57; Upriver lakes = 27). The proportion of empty diets was higher for fish harvested from the Upriver Lakes (44.4%) relative to Lake Winnebago (5.3%; Figure 8). Chironomid larvae (redworms) were the most commonly observed prey item from diets collected from both Lake Winnebago (71.9%) and the Upriver Lakes (44.4%; Figure 8). No gizzard shad were observed during diet sampling conducted during the 2020 spearing season. This was the 2nd consecutive season, and 3rd time in 9 years, that no shad were observed in sturgeon diets collected from the Lake Winnebago harvest. Further, this was the 3rd time in 8 years of sampling on the Upriver Lakes where no shad were observed in sturgeon stomachs. Isopods were observed in 17.5% of the stomachs collected from Lake Winnebago and 7.4% of samples collected from the Upriver Lakes (Figure 8). The prevalence of isopods in sturgeon diets was likely biased by the variable ice conditions and that most spearers were fishing relatively close to shore. Isopods tend to live on hard substrate, which is mainly found in the near shore areas along the north and west shores of Lake Winnebago. Live zebra mussels were only observed in a single stomach sample (1.8%) collected from fish harvested on Lake Winnebago. No live zebra mussels were observed in stomach samples collected from the Upriver Lakes. Dead zebra mussel shells were observed in several stomachs that contained isopods, but these shells were dead and believed to have been inadvertently ingested as fish were feeding on isopods. A total of 7 frogs were observed in one stomach sample removed from a fish that was harvested from Lake Winneconne. To my knowledge, this is the first-time lake sturgeon have been documented as feeding on frogs within the Winnebago System.

The WDNR conducts forage analyses each year to evaluate trends within the forage base, particularly for gizzard shad and Chironomid larvae. Relative abundance of Chironomid larvae is assessed by collecting dredge samples at 32 sites from Lake Winnebago and 48 sites from the Upriver Lakes during the early part of August. This standardized assessment commenced in 2013 on Lake Winnebago and 2017 on the Upriver Lakes. The catch rate observed during the 2019 assessment on Lake Winnebago was above average and almost identical to the catch rate observed during sampling conducted in 2018 (Figure 9). It's premature to make firm conclusions about Chironomid density on the Upriver Lakes given that 2019 was only the 3rd year of sampling.

Relative abundance and hatch strength of gizzard shad is assessed through an

annual bottom trawl assessment that samples 46 standardized waypoints during each month of August, September, and October. Few gizzard shad were observed during the 2019 trawl assessment, indicating a weak year class of shad that would be available to sturgeon during



Top: David Meier Jr (left) and David Meier Sr. (right) with David Meier Jr.'s 131.6 pound, 72.8" sturgeon from February 14.

Bottom: Renee Reszel (left) and David Meier Sr. with their two fish that were registered at Waverly Beach on February 15, 2020. Renee's fish was 105.4 pounds, 73.7", while David's was 38.3 pounds, 56.7."

the 2020 spear fishery (Figure 7). Based on these results, WDNR staff predicted that lake sturgeon would be keying in on Chironomid larvae during the 2020 spearing season. This prediction was confirmed by the diet analysis, and diet data likely would have been even more skewed towards Chironomid larvae had ice conditions allowed more spearers to fish over deeper water areas that typically hold the highest concentration of Chironomid larvae.

Fish condition, or plumpness, is a metric that is used to compare overall health of fish within the population through time. Condition often fluctuates from year to year depending on availability of key forage items. For lake sturgeon within the Winnebago System, the two staple forage items are Chironomid larvae and gizzard shad. There hasn't been a strong shad hatch on the Winnebago System since 2016; however, strong cohorts of Chironomid larvae in 2018 and 2019 provided important forage for lake sturgeon over the past two years. As a result, fish condition has improved markedly the past two seasons following a recent low point during the 2018 spearing season, particularly based on data collected from the Lake Winnebago fishery (Figure 6). In fact, the condition value of 1.04 for

fish harvested from Lake Winnebago indicates that fish were in slightly above average condition. Chironomid abundance is typically lower in the Upriver Lakes, making condition of fish harvested from that fishery more dependent on gizzard shad abundance.

Thus, the condition value of 0.96 for fish harvested from the Upriver Lakes was lower and slightly below average.

Fish harvested during the 2010-2013 spearing seasons were in well above average condition resulting from several strong year classes of gizzard shad in a short period of time. Fish harvested during these spearing seasons virtually rewrote the record books in a short period of time (Figure 5). Some spearers look at the length-weight relationship of fish harvested in recent seasons and believe that the population has been undernourished because they aren't as heavy as they were during that time period. What we need to keep in mind is that fish condition values observed during the 2010-2013 seasons were the anomaly and that what we are observing in recent seasons is a more likely representation of normal condition for lake sturgeon within the Winnebago System.

Fecundity was estimated for one fish harvested during the 2020 season. That fish was a 140.0 pound, 80.0" female that was harvested from the Upriver Lakes on opening day. The ovary weight from this fish was 25.7 pounds, meaning that 37.6% of the fish's body weight was attributable to ovary weight. Based on the data collected, this fish was estimated to be carrying 1.3 million eggs.

There were 24 known-age fish registered during the 2020 sturgeon spearing season with 11 harvested from Lake Winnebago, 7 from Lake Butte des Morts, and 6 from Lake Poygan. These known-age fish comprised 2.2% of the total harvest from Lake Winnebago, 14.3% of the harvest from Lake Butte des Morts and 2.3% of the harvest from Lake Poygan. It's premature to make any conclusions based on recapture data of the stocked fish, however, if this trend continues into the future then it appears that fish stocked in the upper Fox River have a tendency to take up residence in Lake Butte des Morts at least for a period of time following stocking. Known-age fish ranged in size from 40.2-56.9" and were 15-19 years of age (Table 4). There have been fifteen year classes of lake sturgeon stocked in the upper Fox River since 2001. As indicated by harvest data, several of the earlier year classes have recruited to the 36" minimum length limit. The contribution of these stocked fish to the harvest will increase through time as more year classes grow into harvestable sizes.

The Wisconsin DNR and the University of Wisconsin Stevens Point have collaborated on multiple lake sturgeon research projects in recent years. Aging structures (otoliths and fin rays) were collected from the known-age fish that were harvested as part of an ongoing age validation study to evaluate the accuracy of age estimates derived from otoliths and pectoral fin rays. Fish accumulate growth information in their calcified structures (fins, otoliths, etc.), and these structures can be cross sectioned and viewed under a microscope to estimate age, like counting the number of rings on a tree stump to estimate the age of the tree. Given that the stocked fish are of a known age, we can compare age estimates derived from the calcified structure to the true age of the fish to evaluate the accuracy of our aging methods. Previous research has demonstrated that age estimates derived from pectoral fin rays are relatively accurate for lake sturgeon up to age 14 but underestimate the age of older fish. The oldest known-age fish within the Winnebago System are 19 years of age, which is relatively young by the lake sturgeon standards. Collection of additional aging data from these known-age fish during future spearing seasons will be used to evaluate the accuracy of using calcified structures to estimate age.

Following conclusion of a sturgeon spearing season, I am often asked how I would summarize the season. There's no doubt that the 2020 sturgeon spearing season was

unique. Mother Nature threw spearers a very big curve ball with the extremely variable ice conditions. Many spearers decided not to venture out on the lake solely for that reason. In addition to the reduced participation, the buzz around the 2020 sturgeon spearing season felt a bit different. There was a bit of apprehension in the air, and conversations leading up to the season typically centered on lake conditions and whether people were going to venture out on the lake or not, rather than the general excitement and anticipation that typically comes with another season drawing near. Spearers that did participate were able to adapt to the conditions and find ways to participate in the sport safely. Despite less than ideal conditions, thankfully there were no major safety issues encountered during the 2020 season and that is the most important thing.



In terms of the fishery itself, spearers that navigated the variable ice conditions and water clarity were able to harvest some very respectable fish. The harvest caps may not have been reached on Lake Winnebago or the Upriver Lakes, but the system-wide harvest of 811 fish still represents the largest recreational harvest opportunity of lake sturgeon in the world. Further, there were some very

nice fish harvested during the season including numerous fish that were over 100 pounds. The number of fish harvested and 100+ pounders would have certainly been higher with better ice conditions and more spearers participating.

In conclusion, I have mixed opinions about the success of the 2020 sturgeon spearing season. On the surface, the season was a success as thousands of spearers were able to get out and take part in a sport that they love, and they were able to do it safely. Further, there were 811 fish registered during the season, and each one of those fish has a unique story. A story that is now part of the spearing legacy for that individual spearer and will be shared countless times in the future. On the other hand, the reduced participation gives the season a feeling that something was missing. This is not the fault of any one person or group of people. The adverse conditions impacted everyone, and I certainly respect the decision of spearers that chose not to participate this year. A price cannot be put on personal safety and I'm sure it was a difficult decision for those folks to make. However, the reduction in participation and the variable ice conditions took away some of the social benefits of the season. Hopefully Mother Nature will reward us spearers with colder weather and more stable ice conditions in seasons to come so that we can get back to full participation in the sport that we all love. Thank you to everyone for making the 2020 spearing season a safe season, I'm already looking forward to 2021!

Ryan Koenigs

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Table 1. Displays the number of applicants at each preference point level for the 2020 sturgeon spear fishery. Some of the applicants with >8 points were not selected in the drawing as they had applied in a group with at least one group member having fewer preference points.

| Upriver Lakes Sturgeon Spearing Drawing Results (2020 Season) | | | |
|--|--------------|-----------|-------------------------|
| # of Preference Points | # Applicants | # Winners | # Purchased Pref. Point |
| 12 | 1 | 0 | 0 |
| 11 | 1 | 0 | 1 |
| 10 | 4 | 3 | 3 |
| 9 | 25 | 24 | 9 |
| 8 | 163 | 148 | 33 |
| 7 | 714 | 325 | 193 |
| 6 | 624 | 0 | 305 |
| 5 | 541 | 0 | 402 |
| 4 | 464 | 0 | 516 |
| 3 | 497 | 0 | 677 |
| 2 | 611 | 0 | 967 |
| 1 | 683 | 0 | 1120 |
| Total | 4328 | 500 | 4226 |

Table 2. Displays the number of juvenile female, adult female, male, and total lake sturgeon harvested from individual areas of Lake Winnebago. The number of fish harvested from each Upriver Lake is also represented.

| | Juv Fem | Adult Fem | Male | Totals |
|---------------------|---------|-----------|------|--------|
| L. Winnebago Area 1 | 9 | 40 | 35 | 84 |
| L. Winnebago Area 2 | 4 | 28 | 26 | 58 |
| L. Winnebago Area 3 | 5 | 19 | 14 | 38 |
| L. Winnebago Area 4 | 6 | 37 | 35 | 78 |
| L. Winnebago Area 5 | 10 | 27 | 18 | 55 |
| L. Winnebago Area 6 | 23 | 79 | 76 | 178 |
| L. Winnebago | 57 | 230 | 204 | 491 |
| L. BD Morts | 8 | 6 | 35 | 49 |
| L. Poygan | 44 | 69 | 150 | 263 |
| L. Winneconne | 2 | 0 | 6 | 8 |
| Upriver Lakes | 54 | 75 | 191 | 320 |
| Totals | 111 | 305 | 395 | 811 |

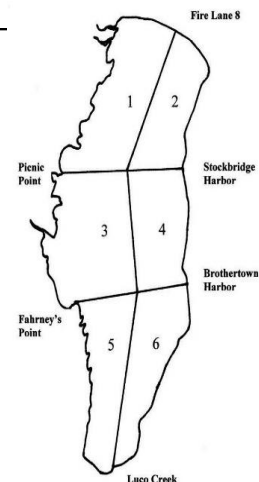


Table 3. Displays the number of juvenile female, adult female, male, and total lake sturgeon registered at DNR registration stations during the 2020 spearing season on the Winnebago System. The number of fish registered at each station during the 2020 spearing season was impacted by station closures as stations at Waverly Beach, Quinney, Jerry's Payne's Point, and Boom Bay were all closed at some point during the season.

| | Juv Fem | Adult Fem | Male | Totals |
|-------------------------|---------|-----------|------|--------|
| Waverly | 9 | 22 | 28 | 59 |
| Stockbridge | 6 | 50 | 43 | 99 |
| Quinney | 1 | 11 | 5 | 17 |
| Jim & Lindas/Cal Harbor | 22 | 76 | 82 | 180 |
| Wendts | 16 | 40 | 25 | 81 |
| Jerry | 0 | 5 | 6 | 11 |
| Paynes | 3 | 26 | 15 | 44 |
| Critters | 26 | 43 | 124 | 193 |
| Indian Point | 27 | 24 | 47 | 98 |
| Boom Bay | 1 | 8 | 20 | 29 |

Table 4. Displays the number of known-age lake sturgeon that were harvested from various year classes of fish that were stocked into the Winnebago System. Most of the known-age fish were stocked in Montello or Princeton as part of the lake sturgeon restoration efforts in the upper Fox River watershed.

| Year Class | Age | # Harvested |
|------------|-----|-------------|
| 2001 | 19 | 7 |
| 2002 | 18 | 1 |
| 2003 | 17 | 11 |
| 2004 | 16 | 3 |
| 2005 | 15 | 2 |

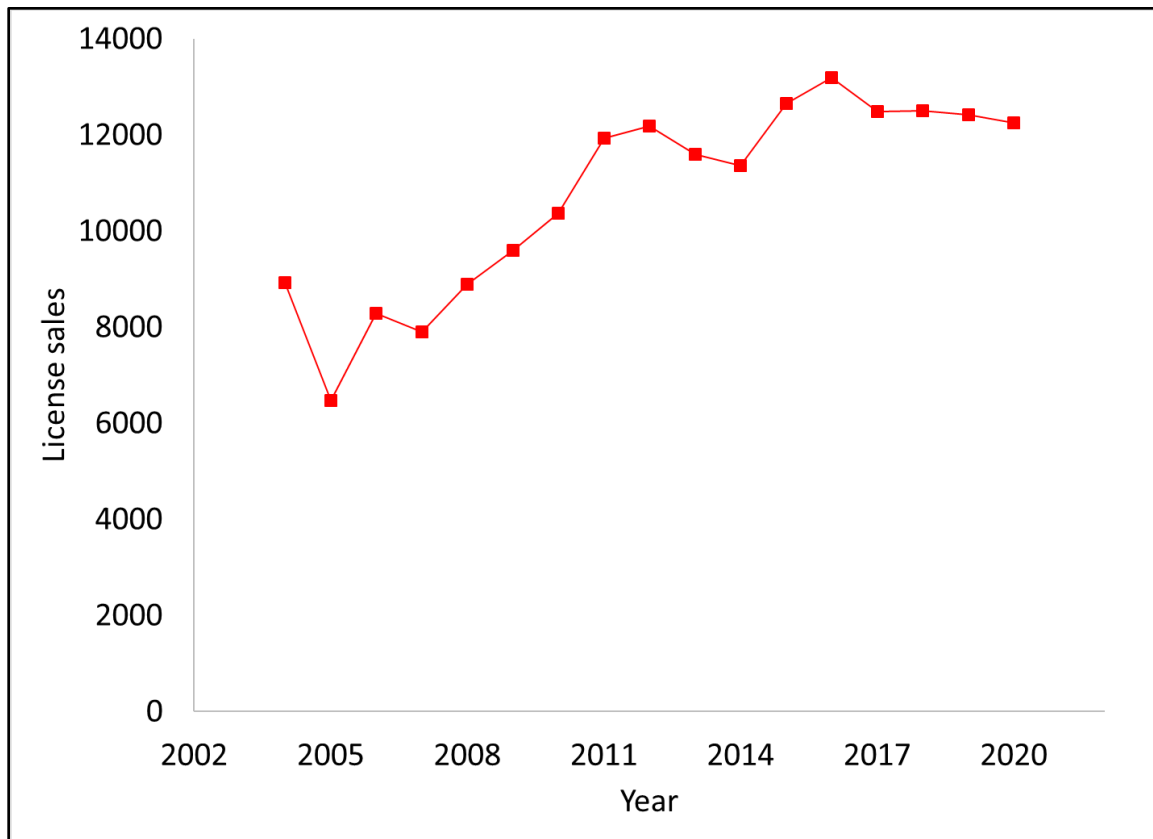


Figure 1. Number of sturgeon spearing licenses sold for the 2004-2020 sturgeon spearing seasons on Lake Winnebago.

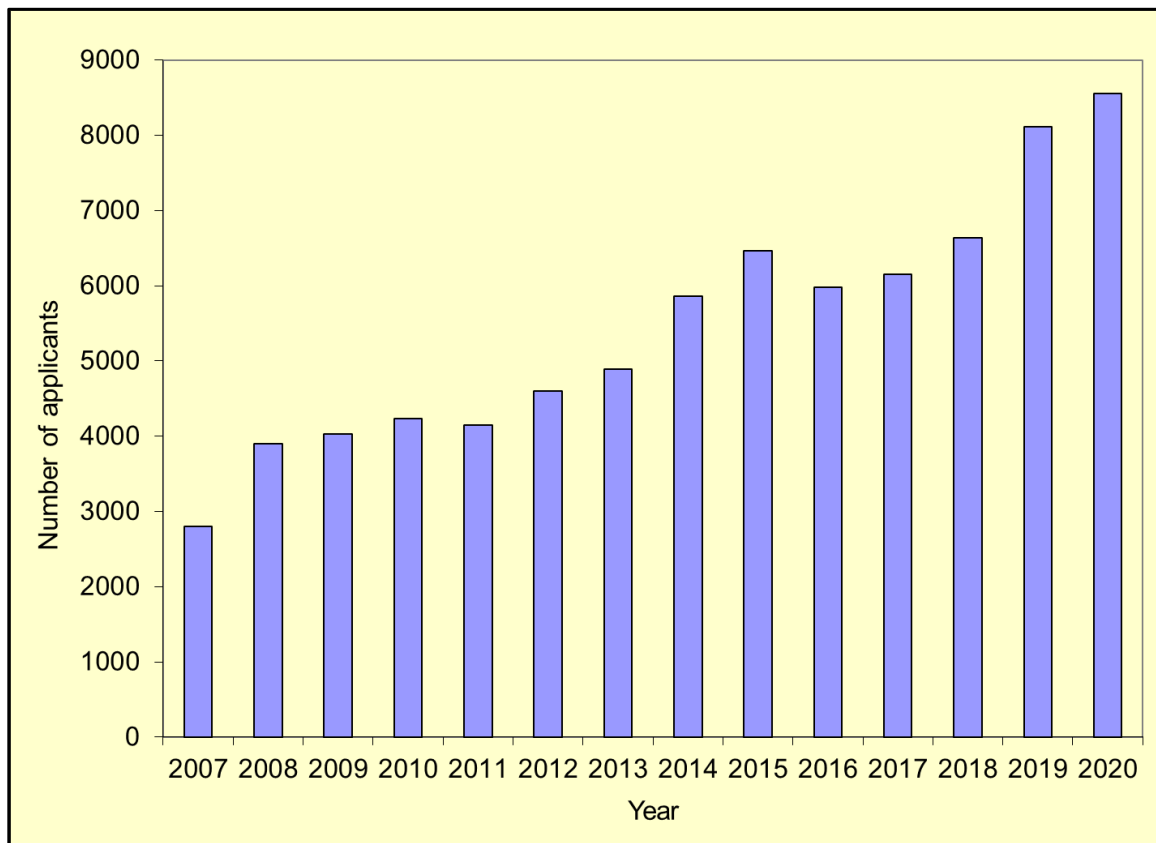


Figure 2. Number of applicants for the Upriver Lakes limited entry fishery. The current drawing format was implemented in 2007 and 500 permits are awarded per season.

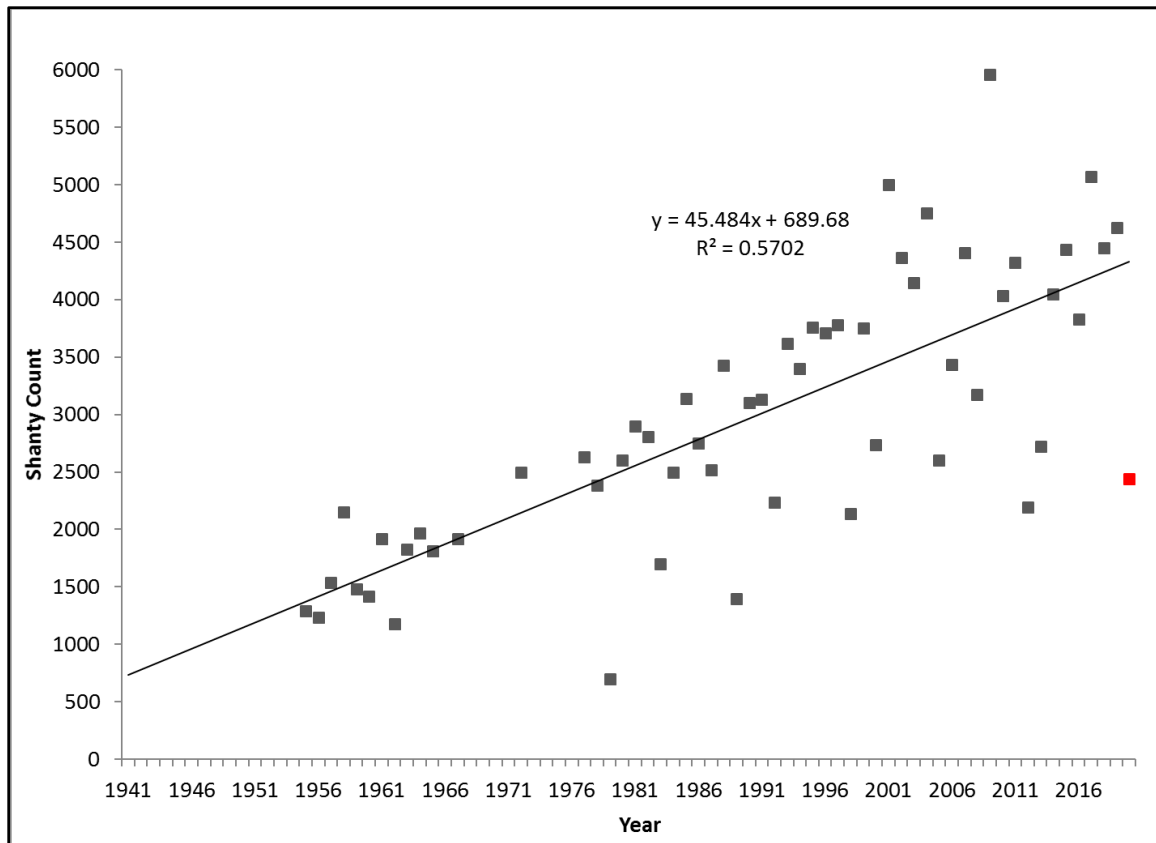


Figure 3. Aerial shanty counts from opening day of the lake sturgeon spear fisheries (1955-2020). The aerial shanty count for the 2020 season is displayed in red.

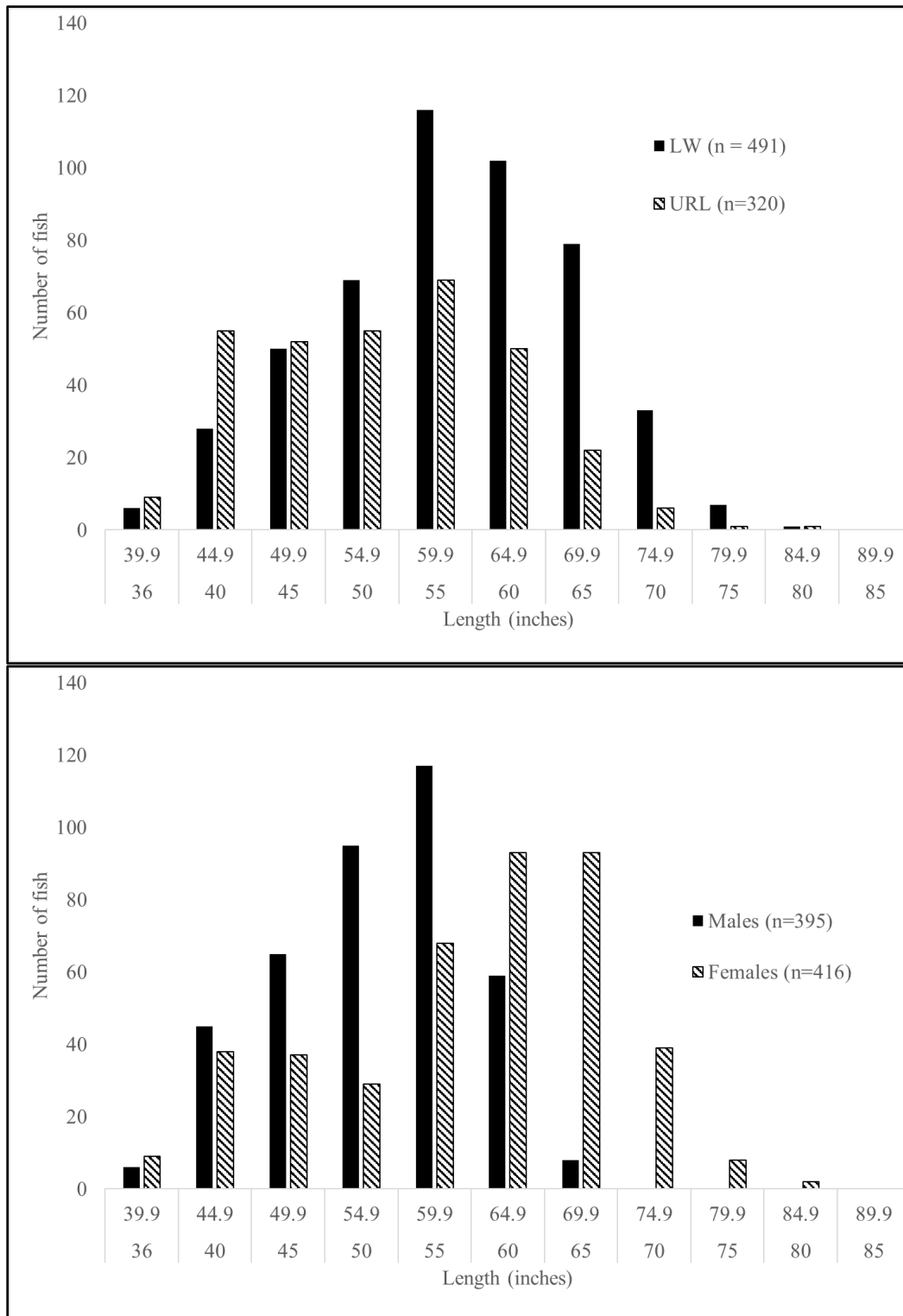


Figure 4. Top: Length distribution of lake sturgeon harvested from the Lake Winnebago (black bars) and Upriver Lakes (hashed bars) during the 2020 spearing seasons
Bottom: Length distribution of male (black bars) and female (hashed bars) lake sturgeon harvested from the Winnebago System during the 2020 spearing season.

"Heavy Hitters Club"

STURGEON

Largest on Lake Winnebago System

1941 to Present
(170 lbs & over)

| | Weight | Length | Year |
|------|--------|--------|------|
| 1st | 212.2 | 84.2 | 2010 |
| 2nd | 188 | 79.5 | 2004 |
| 3rd | 185 | 80.2 | 2011 |
| 4th | 180 | 79 | 1953 |
| 5th | 179.8 | 79.6 | 2012 |
| 6th | 179.0 | 80.0 | 2013 |
| 7th | 175.3 | 78.5 | 2012 |
| 8th | 172.7 | 76.9 | 2011 |
| 9th | 172 | 78 | 2008 |
| 10th | 171.3 | 83.0 | 2010 |
| 11th | 171.3 | 75.6 | 2011 |

2016

Figure 5. Top 11 heaviest lake sturgeon on record as harvested from the Winnebago System during sturgeon spearing seasons dating back to 1941.

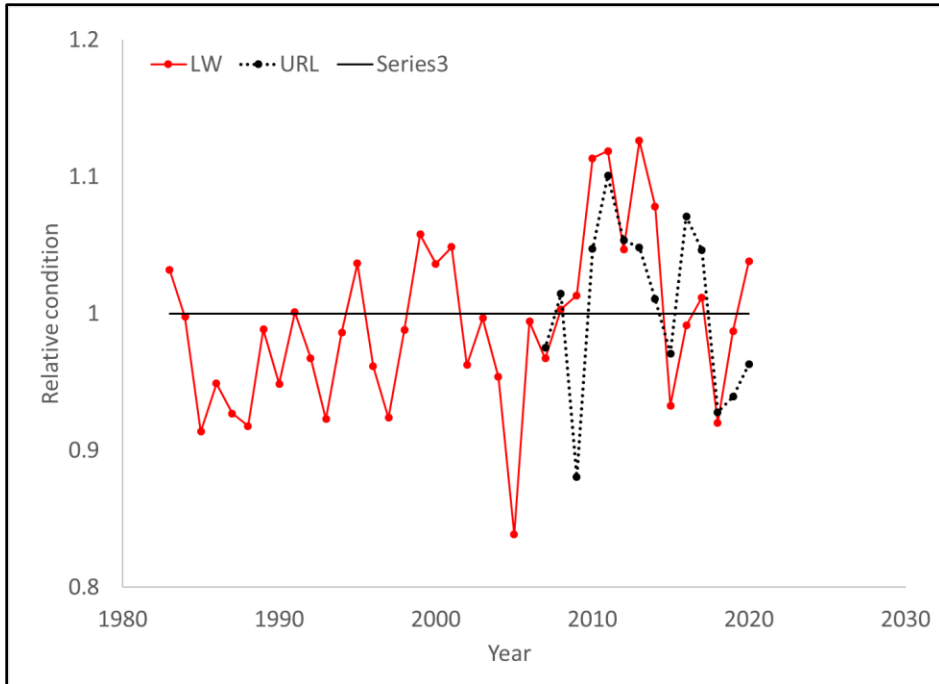


Figure 6. Relative condition (plumpness) of lake sturgeon harvested during the 1983-2020 spearing seasons on Lake Winnebago (solid red line) and the 2007-2020 seasons on the Upriver Lakes (dashed black line). A value of 1 is considered average.

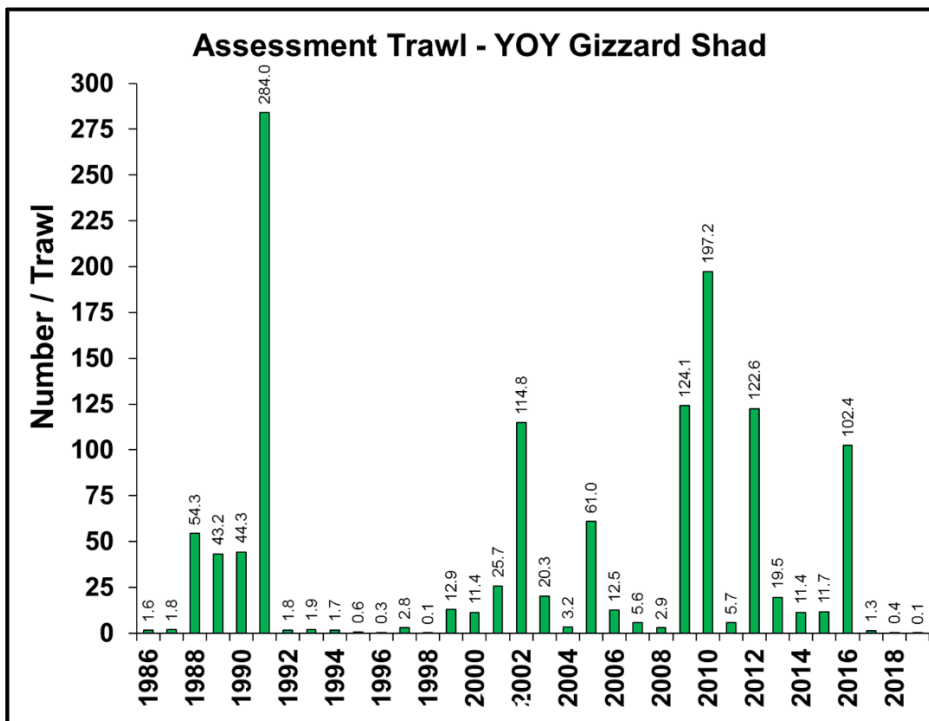


Figure 7. Year class strength of gizzard shad observed during fall (August-October) bottom assessments conducted on Lake Winnebago (1986-2019). Gizzard shad experience large winter die-offs. Therefore, year classes of gizzard shad observed during trawling are available to sturgeon during the following spearing season.

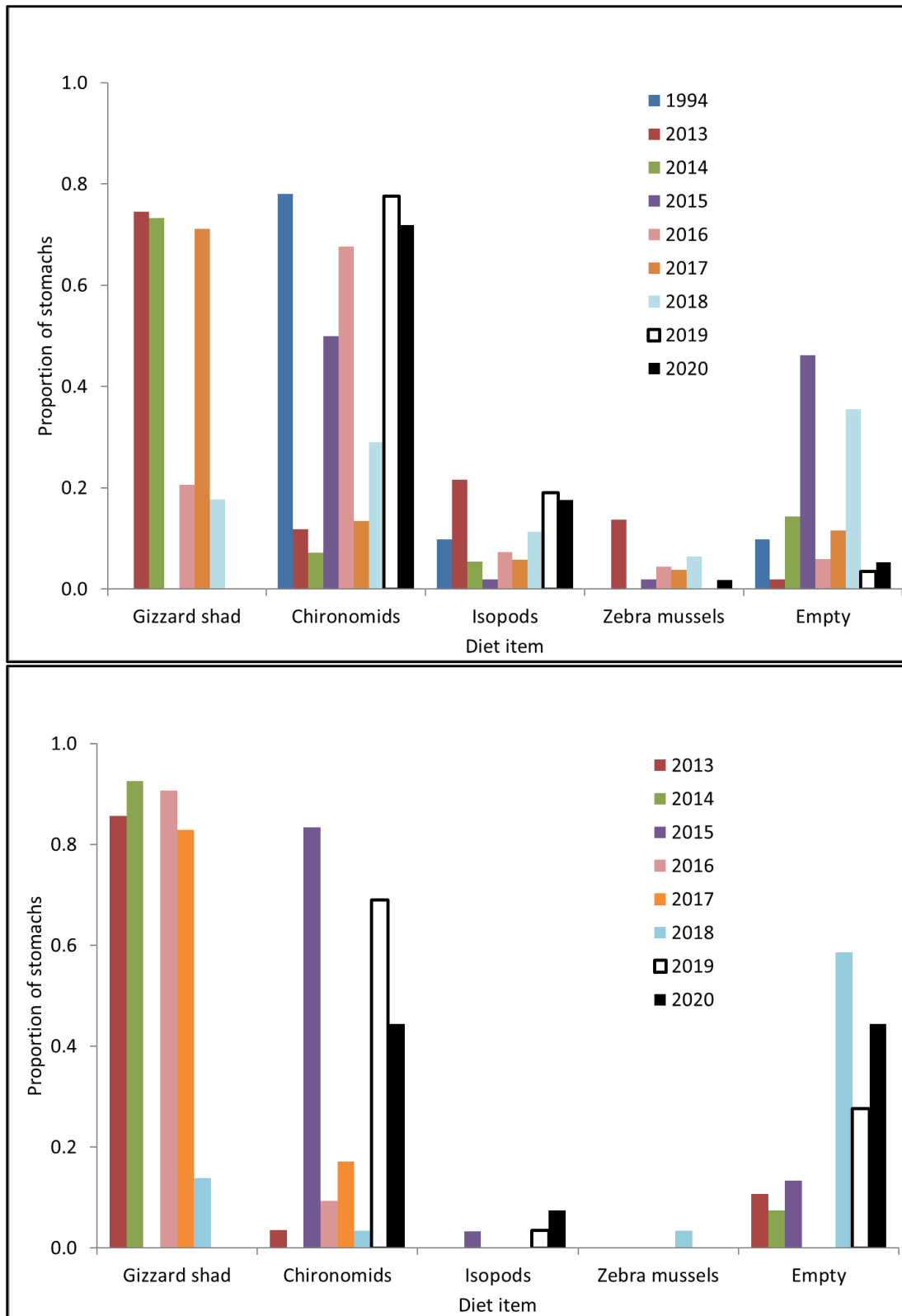


Figure 8. Prevalence of diet items observed in lake sturgeon stomachs removed from fish harvested during the 2013-2020 spear fisheries on Lake Winnebago (top) and the Upriver Lakes (bottom).

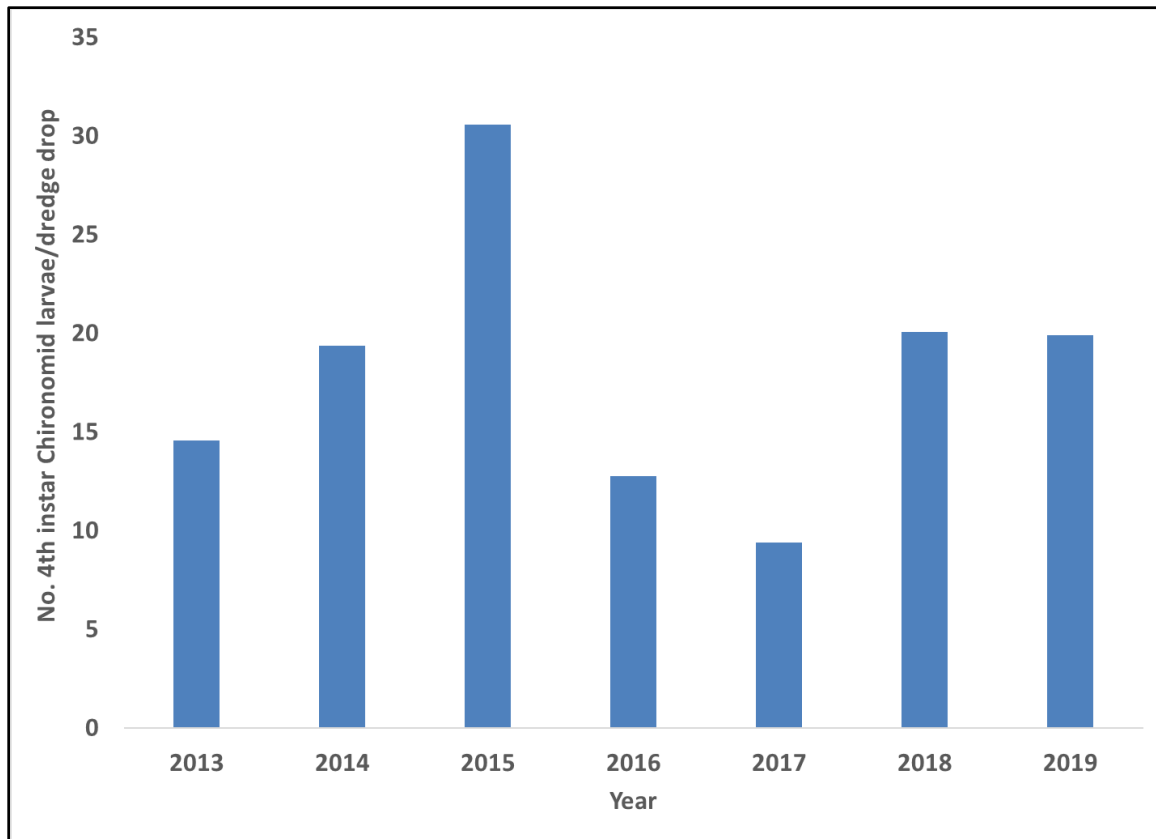


Figure 9. Relative abundance of 4th instar Chironomid larvae observed during August Ekman dredge sampling conducted at 33 standardized locations on Lake Winnebago (2013-2019).