What are the sturgeon feeding on this season?

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DNR staff working at registration stations are frequently asked questions from spearers about a wide array of topics. The standard questions are how many fish have you registered today, what was the biggest and how long will the season go this year. After the big three, there is a litany of other questions asked. However, a very common question is what are you seeing in the stomachs, what are the fish eating?

The spear fishery provides a unique opportunity to remove stomachs from harvested fish to better identify foraging trends and address these questions. We typically target a combined 80 stomachs between Lake Winnebago and the Upriver Lakes for diet analysis each season. Lake sturgeon have a fairly primitive digestive system including a gizzard-like structure that functions to grind food and our sampling quantifies the amount of forage in the foregut of the sturgeon down to the gizzard (photo inset). Forage located in this part of the stomach is still readily identifiable, whereas it is much harder to identify forage further "downstream." Lake sturgeon are typically predating on a single prey source of gizzard shad, chironomid larvae (redworms), isopods, or zebra mussels during our sampling. Diet items from each stomach are separated by prey source and each prey source is weighed individually.

The foregut and gizzard of a sturgeon stomach sampled from a fish harvested during the 2013 spearing season.

Stomachs from 87 fish (52 from Lake Winnebago and 35 from the Upriver Lakes) were sampled during the 2017 spearing season. Gizzard shad were observed in the majority of stomachs sampled from both Lake Winnebago (71.2%) and the Upriver Lakes (82.9%). This was not a surprise given the strong gizzard shad hatch observed during fall bottom trawl assessments conducted on Lake Winnebago in 2016 (Figure 1). The number of gizzard shad observed in stomachs ranged

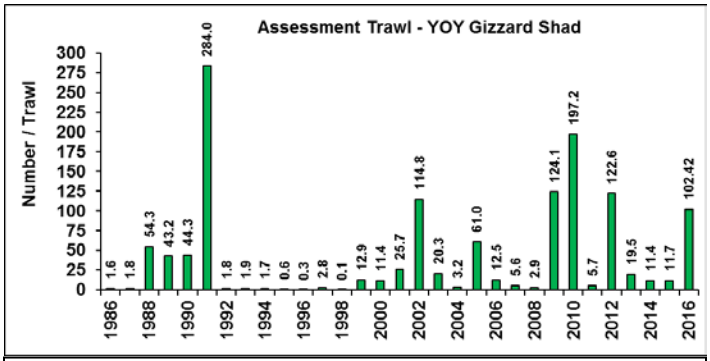
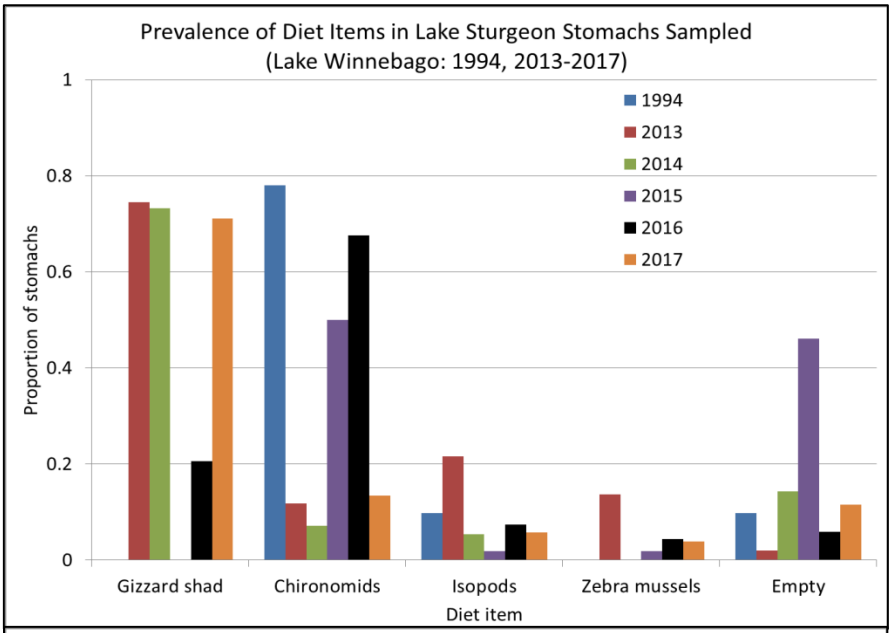


Figure 1. Catch per effort of gizzard shad observed during August-October bottom trawling surveys conducted on Lake Winnebago (1986-2016).

from 0-68 (average 23.5), while wet mass ranged from 0-1,912 grams (average 535.6 grams). For reference, there are 454 grams in a pound meaning that fish carried up to 4.2 pounds of undigested shad in their stomachs.

Chironomid larvae (redworms), isopods, and zebra mussels were also observed in a portion of sturgeon stomachs collected from Lake Winnebago, while Chironomid larvae were the only non-shad forage item observed in stomachs collected from the Upriver Lakes (Figure 2). Results from this season's sampling were very similar to the 2013 and 2014 seasons on Lake Winnebago and the 2013, 2014, and 2016 seasons on the Upriver Lakes. Whereas sturgeon stomachs collected from the 1994, 2015, and 2016 seasons on Lake Winnebago and the 2015 season on the Upriver Lakes contained mostly Chironomid lake fly larvae following weaker gizzard shad hatches in 1993, 2014, and 2015.



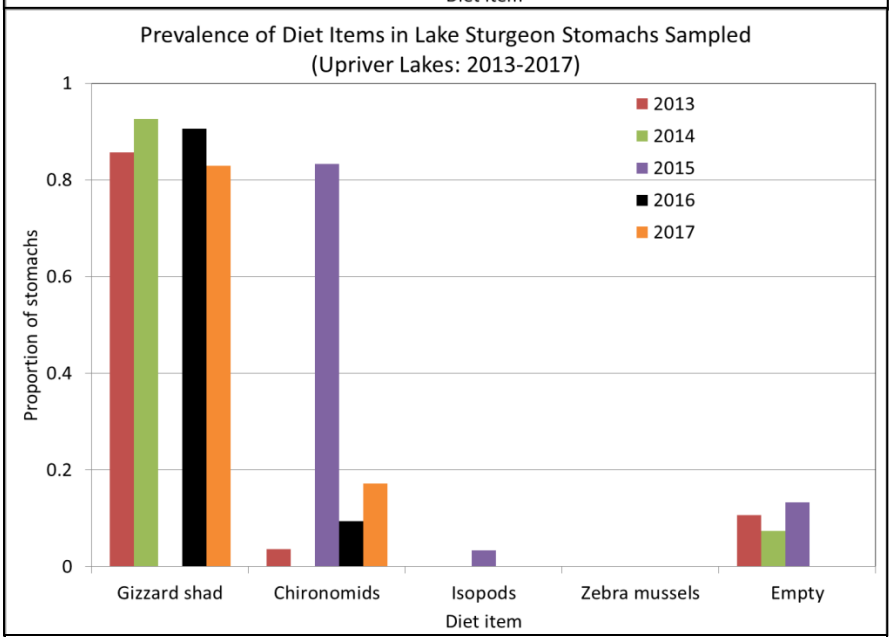


Figure 2. Proportion of sturgeon stomachs collected from Lake Winnebago (top) and the Upriver Lakes (bottom) containing gizzard shad, Chironomid larvae, isopods, zebra mussels, or empty (1994, 2013-2017).

Overall, there was little difference in diet results between the 6 areas of Lake Winnebago and the 3 Upriver Lakes (Figure 3). Gizzard shad were the primary forage item observed in stomachs sampled from each location, while Chironomid larvae were observed in at least a portion of the samples collected from most of the locations. There were a couple subtle trends though. For example, isopods and zebra mussels were only observed in stomachs collected from areas 1, 3, and 5 on Lake Winnebago and only stomachs sampled from Lake Winnebago were empty. The presence of isopods and zebra mussels intuitively makes sense given the west shore contains more suitable rock and reef habitat relative to the east shore. The presence of only empty stomachs from Lake Winnebago is a bit tougher to explain, but this trend has been observed during other seasons as well. We don't currently survey the forage base of the Upriver Lakes like we do Lake Winnebago, but I have heard of shad being more abundant on the Upriver Lakes in some years. 2016 was a prime example, where most of the sturgeon stomachs collected from the Upriver Lakes contained gizzard shad, while the majority of the stomachs collected from fish taken on Lake Winnebago contained Chironomid larvae. It is possible that forage is more abundant on the Upriver Lakes, but we do not currently have the data to neither confirm nor deny that assertion.

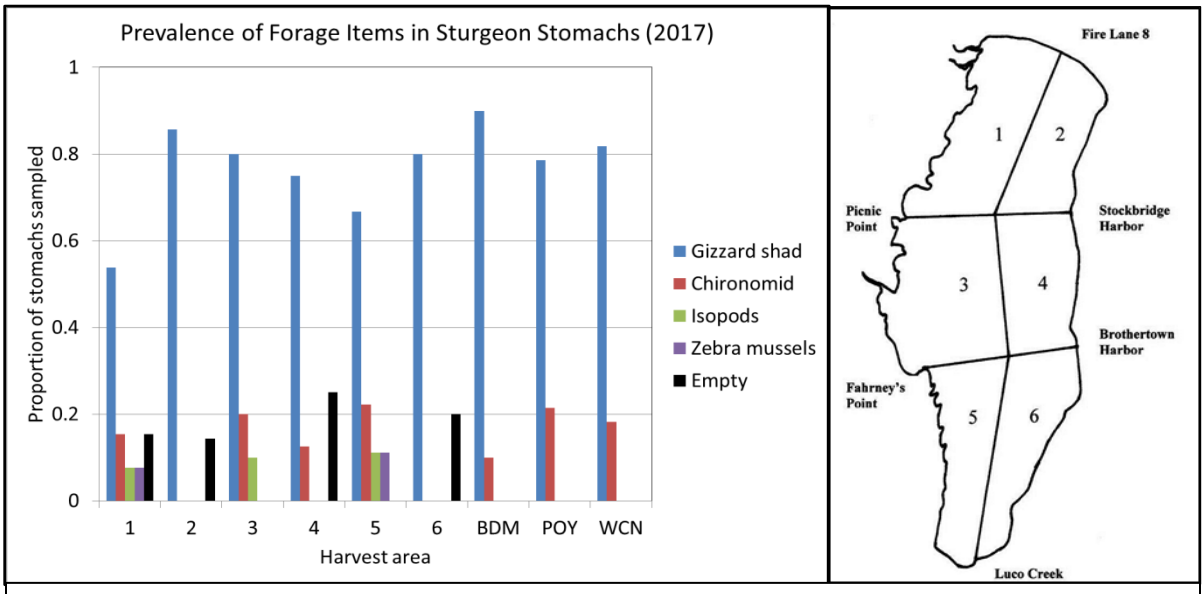


Figure 2. Prevalence of gizzard shad, Chironomid larvae (red worms), isopods, and zebra mussels in stomachs of lake sturgeon harvested from Lake Winnebago (areas 1-6) and the Upriver Lakes (Butte des Morts, Poygan, and Winneconne) during the 2017 spearing season.

Based on the strong gizzard shad hatch observed in 2016, we anticipated that shad would be the primary food source of lake sturgeon during the 2017 spearing season. However, I was uncertain how much fish condition (plumpness) would increase as a result. I plan to conduct further analyses of the length-weight relationships of fish in this season's harvest, but it's apparent that fish are currently in very good condition. Through the first 11 days, 8.2% of the fish harvested from Lake Winnebago were larger than 100 pounds. I will be writing a report in the coming days about the resurgence of these heavy fish in the harvest, but gizzard shad are the primary reason. The average stomach that we

collected had 1.27 pounds of undigested forage in their foregut, with 1.18 pounds being gizzard shad (Figure 3). The foregut is just a portion of the digestive tract of a sturgeon, meaning these fish are literally swimming around with pounds of food in various stages of digestion in their stomach and intestines. That does not take into account the increased fat reserves that fish have been able to build with the increase in available forage.

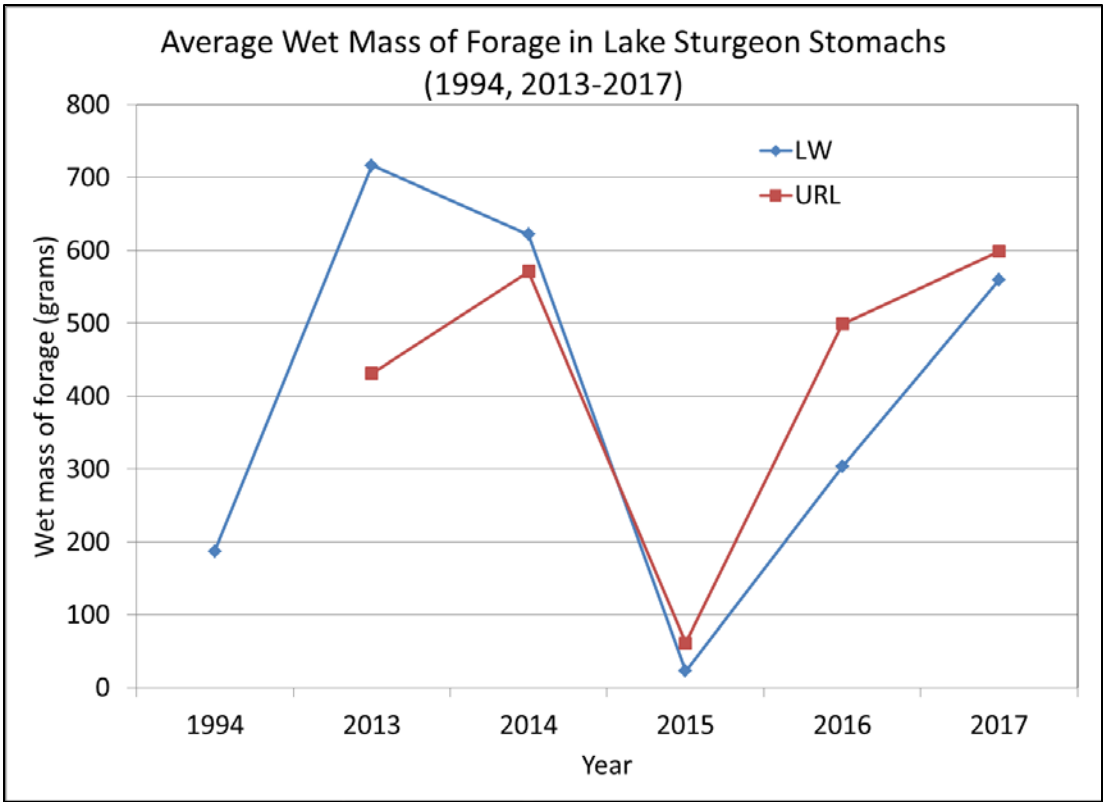


Figure 3. Average wet mass of forage observed in stomachs of lake sturgeon sampled from Lake Winnebago (1994, 2013-2017 seasons) and the Upriver Lakes (2013-2017 seasons) (Reference there are 454 grams to a pound).

In conclusion, it certainly appears that condition of our lake sturgeon has improved over the last 2 years due to an increase in available forage. However, we won't know to what degree condition improved this season until the length and weight data are entered and analyzed after the season closes Sunday. Monitoring trends in forage abundance and diet preference is important when managing a robust sport fish population. Thus, I plan to continue assessing the forage base over the next few years to keep a fingers on the pulse of changes in the food web.