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The Status of Fishes in the Missouri River, Nebraska: Lake Sturgeon (*Acipenser fulvescens*)

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Abstract

Lake Sturgeon (*Acipenser fulvescens*) occurrences in the Missouri River along Nebraska's eastern border are historically sporadic and rare. Presently, the wild Lake Sturgeon population in this river reach may be extirpated. A Recovery Program initiated by the Missouri Department of Conservation (MDC) has stocked almost 150,000 hatchery-reared Lake Sturgeon into the lower Missouri River at several sites in Missouri. As a result, the number of Lake Sturgeon collected has increased. Since monitoring began in 2003, no Lake Sturgeon have been collected above Gavins Point Dam while 40 fish were collected downstream of Gavins Point Dam. The majority of captures occurred in the lower channelized reach downstream of the confluence of the Platte and Missouri rivers. All fish collected are assumed to be progeny of MDC's Recovery Program as either they were hatchery marked or their size (mean fork length = 764 mm, range = 602–997 mm) correlated with the expected growth rates. At present, their rarity warrants continued listing as a state threatened species.

Key words: Missouri River, Lake Sturgeon, *Acipenser*, Status, Threatened

Introduction

Historically, Lake Sturgeon (*Acipenser fulvescens*) were abundant and widely distributed throughout North America, inhabiting the Great Lakes, the Hudson Bay and the Mississippi River basins (Coker 1930, Harkness and Drymond 1961, Houston 1987). Lake Sturgeon populations rapidly declined in the late 1800's due to over-exploitation as they were a desired species for their meat and eggs (i.e., caviar, Priegel and Wirth 1971, Peterson, Gunderman and Vecsei 2002, Peterson, Vecsei and Jennings 2007). Since the turn of the century, habitat alterations and river fragmentation have impeded spawning migrations and reduced available spawning habitats (Hay-Chmielewski and Whelan 1997) which has limited reproduction and recruitment, resulting in reduced abundance (MDC 2007).

Eighty-five percent of sturgeon species worldwide are considered in danger of extinction (ICUN 2013). Eight sturgeon species and one subspecies inhabit North American waters. Lake Sturgeon is the only sturgeon species in North America that is not listed as federally threatened or endangered. Pallid Sturgeon (*Scaphirhynchus albus*), Alabama Sturgeon (*Scaphirhynchus suttkusi*), White Sturgeon (*Acipenser transmontanus*), Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*), and Shortnose Sturgeon (*Acipenser brevirostrum*) are federally listed as endangered species and Green Sturgeon (*Acipenser medirostris*), Gulf Sturgeon (*Acipenser oxyrinchus desotoi*), and Shovelnose Sturgeon (*Scaphirhynchus platyrhynchus*) are federally listed as threatened species. However,

Shovelnose Sturgeon is only listed as a threatened species under the similarity of appearance clause of the Endangered Species Act to protect Pallid Sturgeon. Three sturgeon species inhabit the Missouri River, including the Pallid Sturgeon, Shovelnose Sturgeon and Lake Sturgeon.

Currently the Lake Sturgeon is not federally protected in the United States or Canada, and the Convention on International Trade of Endangered Species (CITES) only lists the Lake Sturgeon under Appendix II. This means the species is not in immediate danger of extinction but requires strict regulations to avoid over utilization to ensure the species survival in the wild. Specifically within the United States, ten states have offered additional protection to Lake Sturgeon and have listed it endangered (i.e., Iowa, Illinois, Ohio, Missouri, Pennsylvania, Tennessee and Vermont) or threatened (i.e., Nebraska, New York and Michigan). Additionally, Lake Sturgeon is provincially listed as threatened in seven Canadian provinces. As Lake Sturgeon is currently listed a Nebraska threatened species, the objective of this paper is to review the current population status of Lake Sturgeon in the Missouri River along Nebraska's border and present a future management recommendation.

Habitat Preferences

Lake Sturgeon is the only *Acipenser* species in the Missouri River (the Pallid and Shovelnose Sturgeons are *Scaphirhynchus* species) and the only potamodromous *Acipenser* species in North America. Lake Sturgeon are



Figure 1. Lake Sturgeon. Image copyright of Joseph R. Tomelleri.

a fluvial dependent species, meaning they are found in a variety of habitats but require flowing water at some point in their life cycle (Galat *et al.* 2005). Adult Lake Sturgeon migrate long distances, generally into smaller streams, in search of suitable spawning habitats (Bemis and Kynard 1997). Lake Sturgeon form aggregations in shallow water near bank lines (Becker 1983), and generally spawn in late spring over a gravel or cobble substrate. Following the spawning event, adults typically return to deepwater habitats within large lakes, while juvenile Lake Sturgeon commonly remain in their natal streams (Peterson, Vecsei and Jennings 2007). In riverine habitats, Lake Sturgeon is primarily a benthic species that inhabits the main channel, over sand and gravel substrate.

Species Description

Generally, Lake Sturgeon are green to brownish in color with a white belly and can exceed lengths of 2,430 mm (8 ft.) and 90,000 g (200 lbs., Figure 1), although these large specimens are rare (Peterson, Vecsei and Jennings 2007). Five rows of scutes (i.e., bony plates) cover their streamlined bodies. Their mouth is protractible and in the inferior position suited for feeding on benthic organisms. Lake Sturgeon are omnivorous, feeding on a variety of aquatic macroinvertebrates, worms, crayfish and other small fishes (Pflieger 1997). Lake Sturgeon are differentiated from *Scaphirhynchus* species by a rounded, conical shaped snout with two lobes on the lower lip (Pflieger 1997) and by a small opening or spiracle on each side of the head between the eye and top of the gill cover (i.e., operculum, Morris, Morris and Witt 1974). Additionally, their four barbels are not fringed and caudal peduncle is only partly covered by bony plates.

Typical of most sturgeon species, Lake Sturgeon exhibit slow growth, late maturity, reproduce relatively infrequently and are a long-lived species (Pikitch *et al.* 2005). Females often mature between 18-27 years (Bruch 1999, Bruch, Dick and Choudhury 2001) at lengths of 130-215 cm (Peterson, Vecsei and Jennings 2007) and spawn

every 4-9 years (Fortin, Dumont and Guenette 1996) with a life span ranging from 80-150 years. Males reach maturity at 12-15 years (Bruch 1999, Bruch, Dick and Choudhury 2001) at lengths of 100-185 cm (Peterson, Vecsei and Jennings 2007) and spawn every 2-7 years (Fortin, Dumont and Guenette 1996). However, their life span is typically around 55 years.

Historic Distribution in Nebraska

Over 3,200 kg (7,100 lbs) of Lake Sturgeon were harvested from the Missouri River in 1894, principally around Niobrara, Dakota, Blair, Omaha, Plattsmouth and Nebraska City (Smith 1898). However, Morris, Morris and Witt (1974) and Berry and Young (2004) stated Lake Sturgeon have historically been uncommon with a sporadic or rare distribution in the Missouri River along Nebraska's eastern border. Besides the Smith (1898) report, historic records of Lake Sturgeon in the Missouri River along Nebraska's eastern border are scarce or are based on hearsay evidence. Johnson (1942) confirmed two Lake Sturgeon capture records, one at the mouth of the Platte River and the other in the Elkhorn River near Elk City, NE. Between 1962 and 2002, fisheries monitoring by Nebraska Game and Parks Commission (NGPC) only resulted in the capture of three Lake Sturgeon from the Missouri River. All three fish were sub-adults (fork lengths: 361, 405 and 601 mm) and were captured on 14 April 1971 near Brownville (rkm 861.0) while electrofishing. Hesse, Mestl and Robinson (1993) concluded the wild Lake Sturgeon population had probably been extirpated from Nebraska waters.

Current Distribution in Nebraska

Since 2003, forty (40) Lake Sturgeon were collected along Nebraska's border by sampling crews from the Nebraska Game and Parks Commission (NGPC), South Dakota Department of Game, Fish and Parks (SDGFP), and the U.S. Fish and Wildlife Service's Great Plains Fish and Wildlife Conservation Office working on the U.S. Army Corps of Engineers' Pallid Sturgeon Population

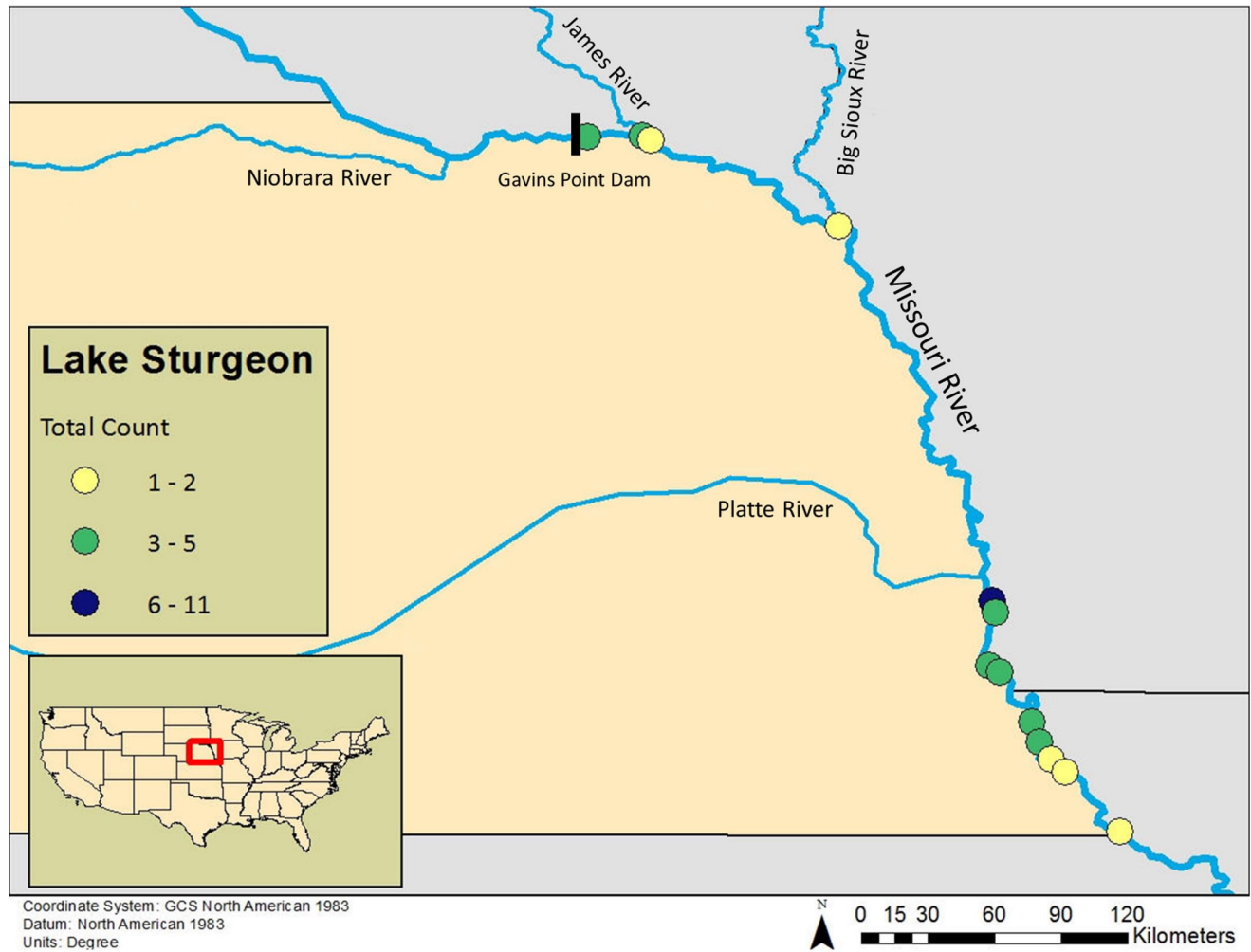


Figure 2. Distribution of Lake Sturgeon collected in the Missouri River along Nebraska’s eastern border from 2003-2012.

Assessment Program (Welker and Drobish 2012ab, Table 1, Figure 2). No Lake Sturgeon were captured in the unchannelized reach of Missouri River above Gavins Point Dam (rkm 1,305.2). Three Lake Sturgeon were captured in the Gavins Point tail waters and six were captured in the open river of the unchannelized reach between Gavins Point Dam and the Big Sioux River. Only a single Lake Sturgeon has been sampled in the channelized reach of the Missouri River between the Big Sioux and the Platte Rivers. The majority (N = 30) were collected in the lower channelized reach downstream of the confluence of the Missouri and Platte rivers to the Kansas state line. Lengths of all Lake Sturgeon at time of capture indicate they were juvenile or sub-adult sized fish. The mean fork length was 764 mm (SD ± 96 mm) but varied from 602-997 mm while the mean weight was 2,913 g (SD ± 1,173 mm) and varied from 1,354-6,350 g (Table 1, Figure 3). Currently, Lake Sturgeon is the rarest sturgeon species sampled from the Missouri River along Nebraska’s border (K. Steffensen, unpublished data).

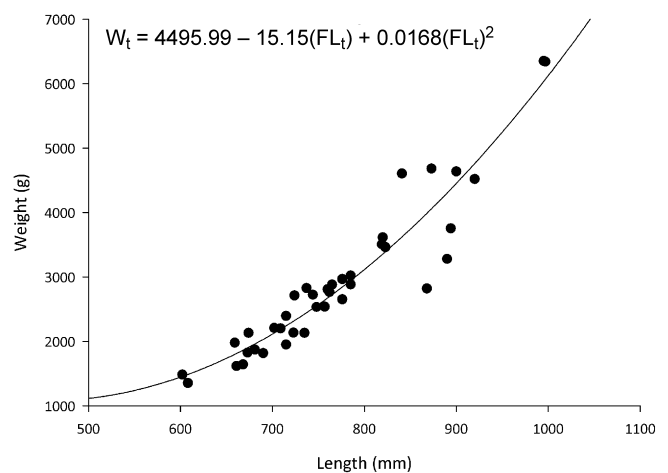


Figure 3. Length-weight relationship for 40 Lake Sturgeon captured from the Missouri River along Nebraska’s border during 2003-2012.

Table 1. Individual capture information for Lake Sturgeon captured from the Missouri River along Nebraska's eastern border during 2003-2012 sampled following the Pallid Sturgeon Population Assessment Program. Methods of capture included gill nets, trot lines and fishing (Welker and Drobish 2012ab) and detailed river reaches are described in Steffensen *et al.* (2014).

Reach	Date	Capture location (rkm)	Gear	Length (mm)	Weight (g)
Lower Unchannelized	4/17/2008	1305.2	TL	620	
	9/22/2008	1305.2	TL	765	2882
	9/22/2008	1305.2	TL	690	1818
	4/4/2011	1289.9	TL	868	2820
	11/19/2008	1289.1	TL	873	4680
	6/18/2010	1289.1	FISH	735	2130
	4/4/2011	1289.1	TL	997	6340
	6/29/2012	1286.7	FISH	785	3020
	3/30/2010	1281.8	TL	995	6350
Upper Channelized	4/17/2008	1182.4	TL	715	1950
Lower Channelized	10/15/2008	957.6	TL	823	3462
	4/1/2012	957.6	TL	841	4604
	4/4/2012	957.6	TL	776	2968
	10/15/2008	947.9	TL	757	2538
	4/17/2009	947.9	TL	709	2202
	4/17/2009	947.9	TL	748	2534
	4/13/2010	947.9	TL	890	3280
	4/4/2011	947.9	TL	894	3754
	4/4/2011	947.9	TL	900	4636
	4/16/2007	943.1	GN	668	1642
	4/4/2012	943.1	TL	819	3505
	4/16/2007	937.8	GN	661	1618
	10/18/2010	937.8	TL	785	2884
	4/9/2010	909.3	TL	674	2130
	4/10/2010	909.3	TL	737	2828
	4/14/2010	909.3	TL	762	2766
	4/5/2011	909.3	TL	760	2808
	4/12/2010	906.1	TL	744	2724
	3/8/2006	900.7	GN	608	1354
	4/19/2008	900.7	TL	659	1980
	4/20/2008	900.7	TL	602	1485
	10/28/2009	900.7	TL	820	3614
	4/12/2011	900.7	TL	776	2654
	4/21/2008	868.7	TL	702	2208
	4/23/2008	868.7	TL	715	2394
2/1/2006	860.5	GN	673	1826	
5/4/2010	858.6	TL	920	4518	
11/28/2005	843.1	GN	681	1871	
11/5/2007	834.3	GN	723	2136	
3/18/2009	790.5	TL	724	2713	

Discussion

Lake Sturgeon captured from the Missouri River along Nebraska's eastern border appear to be hatchery-reared fish from the MDC's Recovery Program, based on the presence of tags and the lengths of fish at capture. The presence of coded wire tags verified many fish as hatchery origin, but not all fish stocked were implanted with a tag. Additionally, the length at capture correlates with the growth rates expected of these hatchery-reared fish. Since 1992, MDC has stocked 149,013 hatchery-reared Lake Sturgeon in the Missouri River at 13 different sites in the lower 546 rkm (J. Colehour, MDC, pers. comm.). As the MDC stocking program continues the abundance of Lake Sturgeon in the Missouri River along Nebraska's border will likely increase, and reproductively mature fish will make spawning migrations up the Missouri River and potentially into tributaries in search of spawning habitats. These tributaries may also provide the necessary nursery areas for age-0 Lake Sturgeon.

The frequency of Lake Sturgeon captures below the confluence of the Platte River is influenced by intensive trot lining effort by NGPC to collect reproductively ready pallid sturgeon. The majority (N = 18) of Lake Sturgeon reported for the lower channelized reach in this study were sampled during this annual, early April broodstock collection effort, that began in 2008. Lake Sturgeon occurrences increased throughout the lower Missouri River in Missouri. Sampling efforts by MDC below the Nebraska / Kansas state line (rkm 788.1) to the confluence of the Missouri and Kansas rivers (rkm 591.4) have resulted in the capture of nine Lake Sturgeon between 2005-2012, and 40 Lake Sturgeon were collected between the confluences of the Kansas River and the Grand River (rkm 402.3) during 2005-2012 (K. Winder, MDC, Pers. Comm.). In the lower 402.3 rkm of the Missouri River, the US Fish and Wildlife Service Columbia Fish and Wildlife Conservation Office have collected 411 Lake Sturgeon since 2003 (K. Winder, MDC, Pers. Comm.). There has been no documented reproduction in the Missouri River and these trends in Lake Sturgeon captures appear to be associated with the hatchery stocking program.

Management Recommendation

Smith's (1898) report indicates Lake Sturgeon is a native fish to the Missouri River along Nebraska's border and were once prolific. In 1894, Lake Sturgeon was the fifth most commercially harvested fish. It appears that the Lake Sturgeon population was quickly over-exploited due to the infrequency of Lake Sturgeon collections throughout the 20th century. As MDC continues their Lake Sturgeon Recovery Program and continues to stock fish into the lower Missouri River, the number of Lake Sturgeon throughout the lower Missouri River should increase. Therefore, the populations of Lake

Sturgeon in Nebraska will likely increase as these hatchery-reared Lake Sturgeon reach maturity and start to migrate in search of spawning locations in the Missouri River and its tributaries. These fish will become even more vulnerable to harvest and require further management and protection. Continued listing of Lake Sturgeon as a state threatened species in Nebraska is necessary to eliminate incidental take and aid MDC's recovery efforts.

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