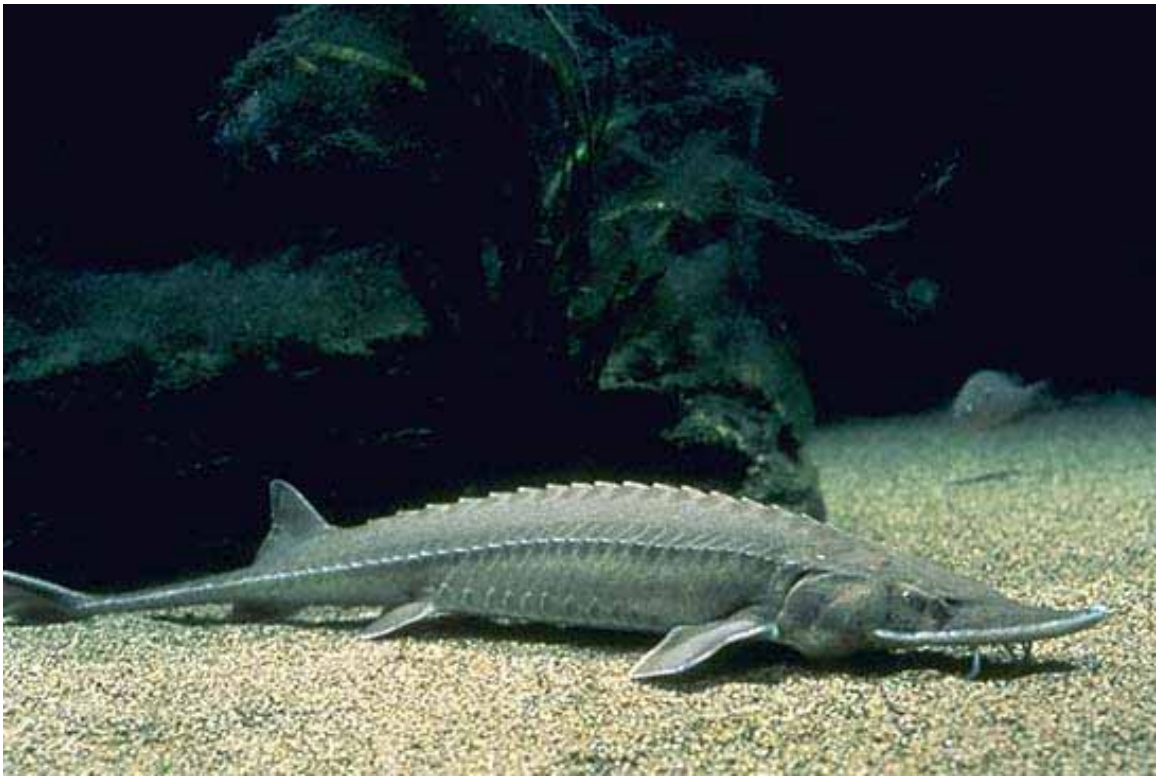
Shovelnose Sturgeon Spawning Populations in the Chippewa and Red Cedar Rivers



By: Marty Engel, Jay Wanner & Gene Hatzenbeler
WDNR Baldwin, WI
March 31, 2006

Introduction:

Shovelnose sturgeon (*Scaphirynchus platorynchus*) are widely distributed in the Mississippi River and its major tributaries: the Chippewa River upstream to the Dells dam in Eau Claire, the Red Cedar River upstream to the dam in Menomonie, the Wisconsin River upstream to the Prairie du Sac dam, and the St. Croix River upstream to the St. Croix Falls dam (Becker 1983). During the 1960s and 1970s, populations of shovelnose sturgeon were strong in the lower Red Cedar and lower Chippewa Rivers (Christenson 1975). Christenson (1975) found catch per effort (CPE) of shovelnose sturgeon on the Chippewa River from the junction of the Red Cedar downstream to Durand (a total of 15 river miles) to be 20 fish per mile. Historical information on the Red Cedar River from nine electrofishing surveys during the early 1960s covering 34 river miles, reported a CPE of 8.53 sturgeon per mile (WDNR unpublished data). Recent investigations conducted by Wisconsin Department of Natural Resources (WDNR) have shown major declines in the shovelnose sturgeon populations in the Chippewa and Red Cedar Rivers (WDNR unpublished data 1999-2005). For instance, from 1999 to 2005, 32 surveys covering 122 river miles were conducted on the Red Cedar River with an average CPE of 0.02 shovelnose sturgeon per mile. During the same time period on the Chippewa River, 58 surveys covering 228 river miles revealed a CPE of 0.06 per mile.

There are several possible explanations for the decline in population of shovelnose sturgeon in the Chippewa and Red Cedar Rivers: 1) Low catch rates in recent years are attributed to different electrofishing sampling techniques. Surveys during the 1990s and 2000s used pulsed direct current (DC) while surveys during the 1960s and 1970s used alternate current (AC). 2) Construction of the lock and dam navigation system on the Mississippi River may have altered the shovelnose sturgeon migration to the Chippewa and Red Cedar Rivers during low water periods (Benjamin, personal comm.). Low water levels occurred during the late 1990's and early 2000's (Houser 2005). 3) Hydropower peaking operations on the Chippewa and Red Cedar Rivers may have influenced shovelnose sturgeon recruitment and spawning habitat. Recently negotiated settlements with Excel Energy have resulted in restoring natural flow regimes. 4) Habitat degradation and water quality changes may have resulted in population declines. Christenson (1975) found high densities of shovelnose sturgeon in the vicinity of Nine Mile Slough. Nine Mile Slough has since become a dry channel during base flow conditions. The main stem is dominated by large sand flats with few gravel bars and pools. The Red Cedar River is currently plagued by high concentrations of algae dumped from upstream flowages during summer and fall. Water quality downstream from the Twin Cities was also a problem in the Mississippi River during the 1960's and 1970's. Endris & Benjamin (personal comm.) indicate shovelnose sturgeon may have vacated the Mississippi River for more suitable water quality in the Chippewa and Red Cedar Rivers. 5) Periodic migrations from the Mississippi River may result in highly variable populations. It is generally accepted that shovelnose sturgeon migrate upstream for spawning and migrations into smaller streams have been reported (Forbes and Richardson 1920). Coker (1930) stated that runs of shovelnose sturgeon in the Mississippi River are variable; best when the river is low in the spring and poor when it is

high. Cross (1967) suggested that perhaps the species seeks an optimal volume of flow, departing from the largest rivers to enter tributaries for spawning in years when streams are high. Short (personal comm.) felt environmental queues such as floods prompt spawning migrations into tributaries or other movement within the study area.

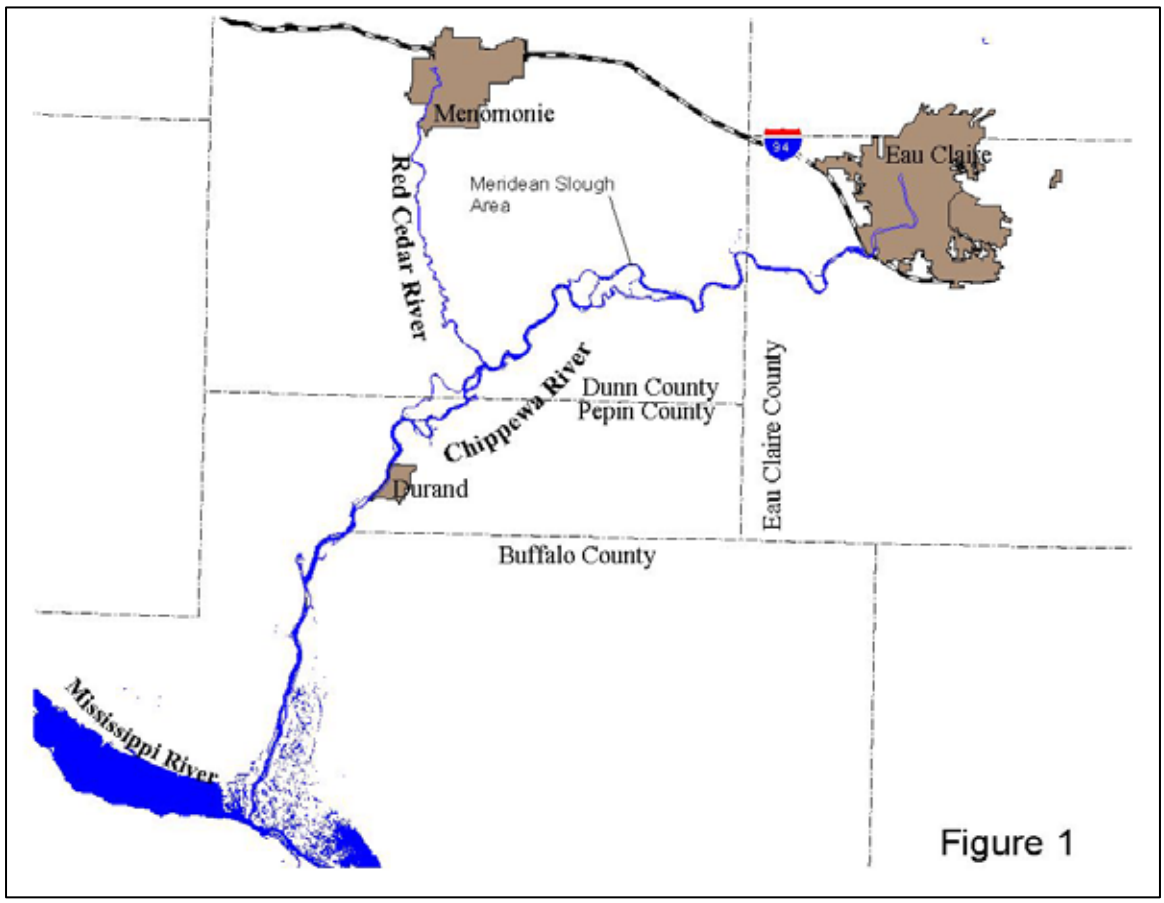
Over exploitation and excessive commercial fishing harvest of female shovelnose sturgeon for roe and flesh in Pool 7 of the Mississippi River and downstream are unlikely impairments at this time. Heavy commercial harvest is a recent phenomenon (Short, unpublished DNR reports).

Several explanations for shovelnose sturgeon decline in the Chippewa and Red Cedar Rivers are linked directly to periodic or altered recruitment and migration from the Mississippi River. Christenson & Hatzenbeler (1996) found that shovelnose sturgeon movement in the Red Cedar and Chippewa Rivers was limited to short distances on average of 1.2-1.7 miles per observation, but were capable of longer movements, up to 24 miles taking them from the Chippewa River into the Mississippi River. Unfortunately, they were unable to characterize any seasonal or spawning migrations within their sampling design. Other studies within the Mississippi River drainage have documented greater movements of 34 to 335 miles (Helms 1974, Hurley et al 1987, Curtis 1990). It is possible that these larger movements are seasonal or associated with spawning migrations. Hatzenbeler, Engel & Wanner (2006) found resident shovelnose sturgeon in the Chippewa River remained in the Chippewa River year round and had small home ranges of 10 miles or less. Migrations to the Mississippi River to winter were not apparent.

In order to determine the short term status and long term trend in Red Cedar and Chippewa River shovelnose sturgeon populations, spawning concentrations need to be identified. An electrofishing study was conducted during the springs of 2000 - 2002 to identify those concentrations. The overall objective was to document spawning locations, adult population density and physical characteristics of the spawning population. A basic understanding of spawning concentrations and population characteristics would allow us to determine the current status and develop long term monitoring sites. Long term monitoring should identify whether documented declines in sturgeon populations in the Chippewa and Red Cedar Rivers are real or part of natural variation from periodic recruitment from the Mississippi River.

Study Area:

The study area included the lower Chippewa River from Dells Dam in Eau Claire and the Lower Red Cedar River from the dam in Menomonie to the Mississippi River (Figure 1). From the mouth of the Chippewa River to Dells Dam in Eau Claire there are 59.16 river miles. From the mouth of the Red Cedar River to the Menomonie Dam, there are 17.65 river miles.



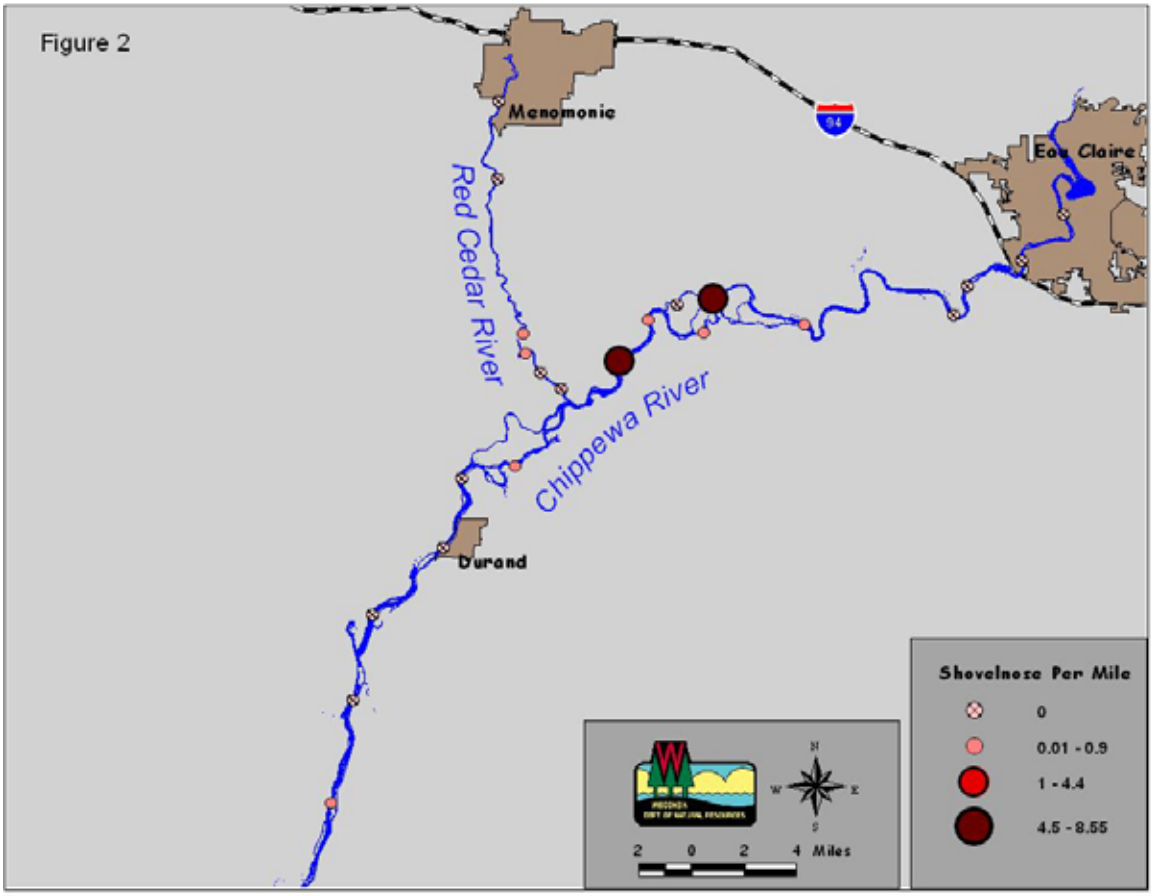
Methods:

During 1972, Christenson (1975) found shovelnose sturgeon in the Red Cedar and Chippewa Rivers spawned the last week in May through the first week in June at water temperatures of 67-70^{o} F. During late May and early June of 2001 - 2002, either one or two 230-volt pulse DC, mini-boom shocking boats moving downstream along the shoreline and across channel break lines were used to collect shovelnose sturgeon and identify spawning grounds. Each sturgeon was measured to the nearest 1/10th inch fork length, sexed and tagged with a floy tag. An attempt was made to determine sex by extrusion of sex products. Catch per Unit Effort (CPE) was recorded by river stretch.

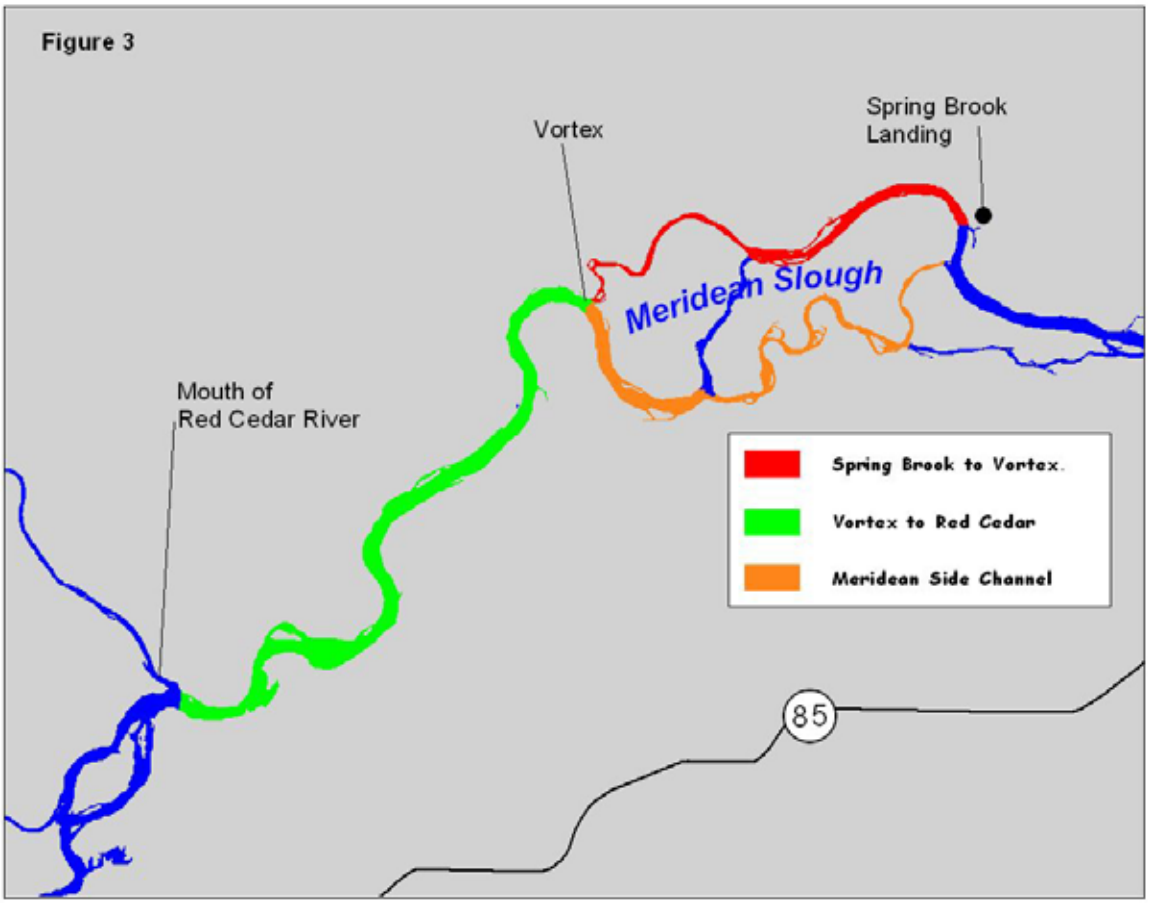
Results:

Over the course of three spring sampling periods (2001-2002) covering 271.5 miles of shoreline, a total of 362 shovelnose sturgeon were captured in the lower Chippewa and lower Red Cedar Rivers (Appendix A). A total of 360 (99%) sturgeon were captured by electrofishing 224.3 miles of shoreline in the Chippewa River. Catch rates ranged from zero to 12.2 sturgeon per mile. Only two (<1%) sturgeon were captured in 47.2 miles of electrofishing surveys on the Red Cedar River. Catch rates were zero to 0.2 per mile.

Figure 2, shows the catch expressed as number per mile, per electrofishing boat. Catch per Unit Effort at several sites with multiple visits were averaged for display purposes.



Only one spawning concentration was documented during spring of 2002 in the Chippewa River between Spring Brook Landing and the mouth of the Red Cedar River. There were two adjoining sections of the river that were found to contain high numbers of shovelnose sturgeon (Figure 3 and Appendix A), Spring Brook Landing to what is known as the Vortex (4.45 miles) and the Vortex to the mouth of the Red Cedar River (6.45 miles). A multiple mark and recapture population estimate was attempted in this area but failed to obtain sufficient recaptures. A total of 353 sturgeon were captured between Spring Brook Landing and the mouth of the Red Cedar River (64.8 miles of electrofishing). Catch rates (5 runs) in the main channel during spring of 2002 ranged from 4.5 to 12.2 shovelnose sturgeon per mile. The Meridean Side Channel (1 run) produced only 0.3 sturgeon per mile.



A total of 332 shovelnose sturgeon from the spawning concentration were sexed and measured using fork length (Figure 4). Sturgeon ranged from 20 to 32 inches forked length. Modal length was 26-26.9 inches. Sturgeon less than 22 inches were scarce, less than 1% (2) of the sample. Males made up 83.1% (276) of the sampled population while unknown sex fish was 16.6% (55). Only one known female was sampled which made up 0.3% of the sample population.

A total of 332 fish were captured on the spawning grounds and were marked with Floy Dart Tags in spring of 2002. To date, there has been only one tag return. The shovelnose sturgeon was captured by hook and line four months later, near the original tagging site.

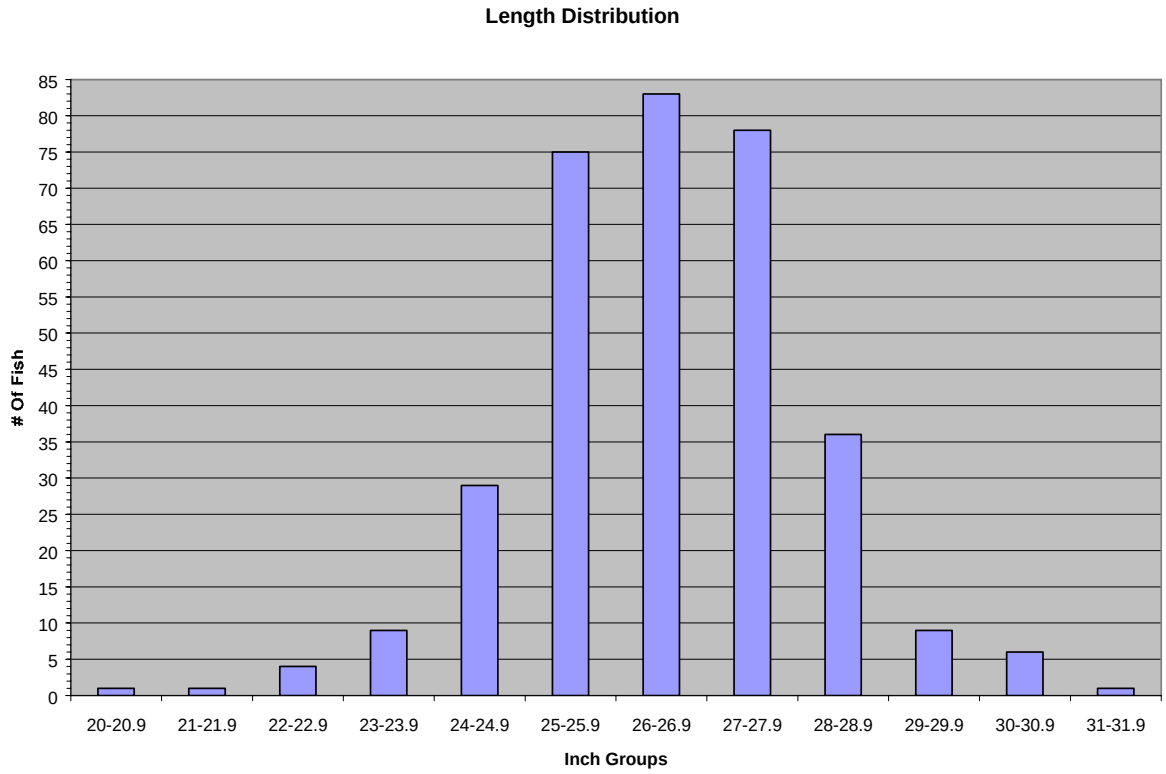


Figure 4. Length distribution of spawning shovelnose sturgeon population in the Meridean Slough Area.

Discussion and Management Implications

Christenson (1975) documented shovelnose sturgeon populations in the lower Chippewa River from the mouth of the Red Cedar River to Durand to be 150-176 per mile. CPE averaged 20 per mile. DNR staff found CPE averaged 0.06 shovelnose sturgeon per mile in the Chippewa River during 1999 through 2005 (WDNR unpublished data 1999-2005). The lower Red Cedar River showed similar results. During the 1960's unpublished DNR records documented CPE of 8.53 sturgeon per mile. Records from 1999 through 2005 found only remnant populations with CPE reported as 0.02 per mile. Such declines in catch rates are alarming and not well understood. It must be determined whether documented declines in shovelnose sturgeon populations are caused by natural variations (recruitment or periodic migration) or are actual long-term continuous declines caused by other factors such as degraded habitat.

Sport angler harvest is not perceived to be a primary reason for the population decline in these rivers however, the shovelnose sturgeon fishing season was recently closed as a precautionary measure. Christenson (1975) found angler exploitation to be only two percent. Fishing pressure on the Red Cedar and Chippewa Rivers is generally considered light. Anglers generally target gamefish other than sturgeon on these river systems and therefore it is not believed to be the root of the problem.

We suspect that the different sampling gears do not explain the decline in shovelnose sturgeon because they have been successfully captured during this study with DC-electrofishing gear in the Meridean Slough Area (CPE 4.5 -12.3 per mile) and in the Yellowstone River in Montana (Haddix and Estes 1976).

Hydropower peaking operations were mentioned as a possible cause, however peaking operations have since been eliminated.

Hatzenbeler, Engel and Wanner (2006) suggest that the population decline in the Chippewa and Red Cedar Rivers may not be related to the migration and recruitment of sturgeon from the Mississippi River. Results show that shovelnose in the Chippewa River generally remain in a small home range and have limited mixing with the Mississippi River. The study does not show whether there is periodic recruitment from the Mississippi River and therefore recommends populations in the two rivers should be managed individually until it can be determined whether periodic recruitment actually occurs from the Mississippi River. Further recommendations from this study include investigation of potential habitat degradation and water quality problems, particularly in the Chippewa and Red Cedar Rivers.

Young shovelnose sturgeon have not been found in the lower Red Cedar or lower Chippewa Rivers. These rivers are also located in the northern limits of the shovelnose sturgeon's range. It remains unknown whether natural reproduction of shovelnose sturgeon is successful in the Red Cedar and Chippewa Rivers or whether periodic migration and/or recruitment from the Mississippi River replenishes populations causing highly variable population changes. We are also uncertain about the long term and short term impacts of the lock and dam navigation system on sturgeon movement, especially during low flow periods.

In order to address population variation issues, a long-term monitoring program will be initiated in 2006 on the Chippewa River from Spring Brook Landing to the Vortex. Annual population estimates will be conducted during the spring spawning period. In addition, annual baseline monitoring will continue both in the Red Cedar and Chippewa Rivers. This program will determine whether documented declines in shovelnose sturgeon populations are caused by natural variations or long-term continuous decline.

A comparison of electrofishing gear study (AC vs DC) will also be initiated in the spring of 2006 to investigate if the low catch rates in the 1990s and 2000s are related to sampling inefficiency.

Further studies should investigate the success of natural reproduction within the Red Cedar and Chippewa Rivers. If the population is determined to be in decline, a long-term management plan for the recovery of the sturgeon populations will be developed.

Acknowledgments

Thanks to Heath Benike for initiating the study and providing review of earlier versions of the manuscript. Thanks to Ron Benjamin and Pat Short for additional review and their insight into the possible causes of shovelnose sturgeon decline. Many people assisted with the field sampling, including Brain Spangler, Dean Johnson, Arno Lamm, Jodi Hanson, and Dan Gilbertson.

Literature Cited

Becker, G.C. 1983. Fishes of Wisconsin. University if Wisconsin Press, Madison. 1052 pp.

Christenson, L.M. 1975. The shovelnose sturgeon, *Scaphirnchus platorynchus* (Rafinesque), in the Red Cedar-Chippewa River System. Wisconsin DNR Research Report 82. 23 pp.

Christenson, L.M. and G.R. Hatzenbeler. 1996. Growth and movement of shovelnose sturgeon in the Chippewa River, Wisconsin, 1972-1979. Wisconsin DNR Research Report 173. Publ-RS-573-96

Coker, R.E. 1930. Studies of common fishes of the Mississippi River at Keokuk. U.S. Department of Commer. Bur. Fish. Doc. 1072:141-225.

Cross, F.B. 1967. Handbook of fishes of Kansas. Univ. Kans. Mus. Nat. Hist. Misc. Publ. 45. 357 pp.

Curtis, G.L. 1990. Habitat use by shovelnose sturgeon in Pool 13, Upper Mississippi River, Iowa. M.S. Thesis, Iowa State University, Ames. 79pp.

Forbes, S.A., and R.E. Richardson. 1920. The fishes of Illinois. Illinois Natural History Survey. Bulliten 3. 357pp.

Haddax, M., and C. Estes. 1976. Yellowstone Fishery Study. Final Report, Montana Department of Fish and Game. 86pp.

Hatzenbeler, G.R., M.P. Engel and J. Wanner. 2006. Radio telemetry tracking of shovelnose sturgeon in the Chippewa River, from July 2001 to October 2002. Wisconsin Department of Natural Resources, Baldwin, Wisconsin. 12 pp.

Helms, D.R. 1974. Shovelnose sturgeon, *Scaphirynchus platorynchus* (Rafinesque), in the navigational impoundments of the Upper Mississippi River. Iowa Fisheries Research Technical Series #74-3. Iowa Conservation Commission, Des Moines. 68pp.

Houser, J.N., editor. 2005. Multiyear synthesis of limnological data from 1993 to 2001 for the Long Term Resource Monitoring Program. Final Report submitted to the U.S.

Army Corps of Engineers from USGS, U. Midwest Environment Sciences Center, La Crosse, WI. LTRMP Technical Report 2005-T003. 59 pp.

Hurley, S.T., W.A. Hubert, and J.G. Nickum. 1987. Habitats and movements of shovelnose sturgeon in the upper Mississippi River. Trans. Am. Fish. Soc. 116:655-62.

Spring catch rates (CPE) of shovelnose sturgeon in the in the Lower Chippewa and Lower Red Cedar River. (Appendix A).

Date	River	Start Location	Stop Location	Miles Sampled	Number Caught	No. Boats	CPE No. Mile
5/21/2001	Chippewa	Rock Ledge Below Dells Dam	D.S 1 Mile	1.0	0	2	0.0
5/17/2001	Chippewa	1 MI U.S. Eau Claire R	D.S. 8 Miles	8.0	0	1	0.0
5/16/2001	Chippewa	I 94 Bridge	2.4 MI U.S. CTH H	8.5	0	2	0
5/23/2001	Chippewa	CTH "H"	4.6 Miles D.S.	4.6	0	2	0.0
5/22/2002	Chippewa	Lake St	Caryville	14.4	0	2	0.0
5/22/2002	Chippewa	Caryville	Spring Brook Landing	5.4	1	2	0.1
5/17/2001	Chippewa	0.6 U.S. Spring Brk Landing	Red Cedar	10.0	4	2	0.2
5/21/2001	Chippewa	Spring Brook Landing	D.S. 4.3 Miles	4.3	0	2	0.0
5/25/2001	Chippewa	Spring Brook Landing	7 Miles D.S.	7.0	0	1	0.0
6/6/2002	Chippewa	Spring Brook (MSC)	Vortex	5.9	3	2	0.3
6/11/2002	Chippewa	Spring Brook	Vortex	4.5	49	2	5.5
5/28/2002	Chippewa	Spring Brook	Vortex	4.5	69	2	7.8
5/29/2002	Chippewa	Spring Brook	Vortex	4.5	109	2	12.2
6/3/2002	Chippewa	Vortex	Red Cedar	6.5	58	2	4.5
5/30/2002	Chippewa	Vortex	Red Cedar	6.5	65	2	5.0
5/23/2001	Chippewa	Mouth Red Cedar	1 MI D.S	1.0	0	2	0.0
5/23/2001	Chippewa	Mouth 9 MI Slough	1.5 Miles D.S.	1.5	0	1	0.0
5/23/2001	Chippewa	Inlet 9 MI Slough	STH 10	6.6	1	2	0.1
5/24/2001	Chippewa	STH 10	1 MI D.S	1.0	0	2	0.0
5/24/2001	Chippewa	1 MI D.S. STH 10	Ella Boat Landing	7.0	0	2	0.0
5/30/2001	Chippewa	Ella boat landing	1 MI D.S	1.0	0	2	0.0
5/30/2001	Chippewa	1 MI D.S. Ella boat landing	STH 35	7.0	1	2	0.1
5/10/2000	Red Cedar	HWY 29	1 MI D.S Hwy 29	1.0	0	2	0.0
5/22/2000	Red Cedar	STH 25	Chippewa River	9.1	1	1	0.1
5/10/2002	Red Cedar	Menomonie	Downsville	8.0	0	2	0.0
6/10/2002	Red Cedar	Menomonie	Downsville	8.2	0	1	0.0
6/10/2002	Red Cedar	Dunnville	CTH "Y"	6.6	1	1	0.2
5/8/2000	Red Cedar	1 MI U.S. CTH "Y"	CTH "Y"	1.0	0	2	0.0
5/8/2000	Red Cedar	CTH "Y"	Chippewa River	1.1	0	2	0.0
6/10/2002	Red Cedar	CTH "Y"	Chippewa River	1.1	0	1	0.0