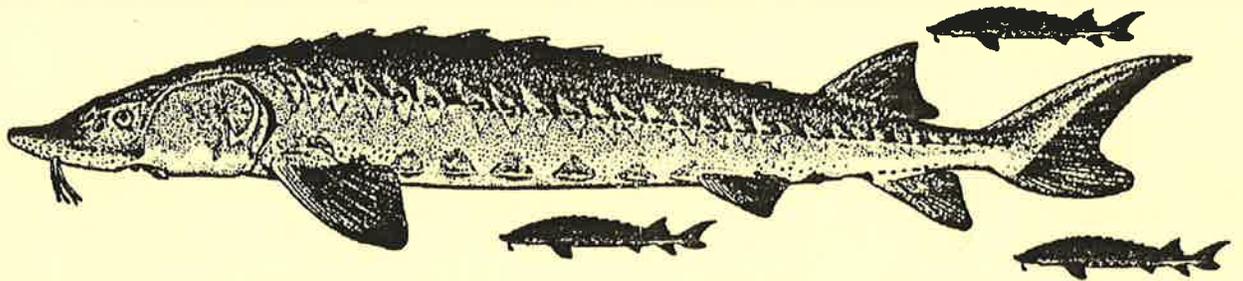


POPULATION
CHARACTERISTICS OF
BAD RIVER LAKE
STURGEON



by

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INTRODUCTION

This report will describe the results of an anadromous fish study conducted by the Bad River Natural Resources Department which was funded by the Anadromous Fish Grants Program of the U.S. Fish and Wildlife Service (Service). The proposal to conduct this study was cooperatively drafted by the Wisconsin Department of Natural Resources (WDNR), the Service's Ashland Fishery Resources Office (FRO), the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), and the Bad River Natural Resources Department (BRNRD). It was submitted to the Service's Anadromous Fish Grants Program by the WDNR.

In order to provide the most comprehensive understanding of the status and population characteristics of Bad River lake sturgeon, additional information collected by the GLIFWC and the Ashland FRO, in cooperation with the BRNRD, will also be presented.

BACKGROUND

The Bad River, Wisconsin, drains into southwest Lake Superior approximately 19 km west of the Michigan and Wisconsin state border (Figure 1). The Bad River Band of Lake Superior Chippewa is the principal manager of the main stem of the lower Bad River and many of its tributaries. The Bad River supports spawning populations of many anadromous fishes, including lake sturgeon *Acipenser fulvescens*, and walleye *Stizostedion vitreum*. It is one of only two tributaries on the south shore of Lake Superior with a self-sustaining population of lake sturgeon, which are a Candidate 2 species for listing under the Federal Endangered Species Act. Fishery resources of the Bad River are utilized by both tribal and state licensed sport fishermen. This system is extremely important to fisheries management in Lake Superior, as it is the largest producer of sea lampreys *Petromyzon marinus*, in the basin. A hydroelectric dam on the White River, operated by the Northern States Power Company, is the only man-made barrier to fish migration on this system.

The Bad River watershed is dominated by glacial-lacustrine till soils that make up the eastern-most extent of the Lake Superior clay plain (Tom Cogger, Soil Conservation Service, personal communication). Runoff over red clay soils produces turbid waters, especially during periods of high precipitation. Mean annual discharge is 281 cubic feet per second with daily mean discharge ranging from a high of 4100 cfs to a low of 61 cfs (Spotts 1994). The Bad River drains a watershed of approximately 871 square miles (Sather and Threinen 1966). High spring flows during anadromous walleye and lake sturgeon spawning migrations,

together with poor water clarity, have hindered attempts to collect biological information from anadromous fishes.

ASSESSMENT ACTIVITIES

1986-1988 Gamete Collection

In 1986, the GLIFWC initiated an assessment designed to capture adult spawning lake sturgeon. The primary objective was to collect gametes for potential reintroduction efforts. Attempts to collect adult fish in 1986 were unsuccessful (Shively and Kmiecik 1989). In 1987, eight lake sturgeon were captured in gillnets fished near the junction of the White River (Figure 2). These fish were not sexually mature and no gametes were collected, but total lengths were recorded and cross-sections of the first marginal pectoral fin ray were taken for aging purposes (Shively and Kmiecik 1989). In 1988, GLIFWC personnel captured six adult fish with snares at the base of the lower falls, and tribal spear fishers harvested three lake sturgeon from which biological information was collected. As in 1987, total length was recorded and aging structures removed from each fish. Gametes were successfully collected, fertilized, and reared at state and tribal hatcheries, resulting in the stocking of approximately 1500 fingerling lake sturgeon into the Bad River. Table 1 contains the length, age, sex and tag number of all lake sturgeon captured during 1987 and 1988 by the GLIFWC. Attempts by the Bad River Natural Resources Department to capture lake sturgeon for gamete collection were unsuccessful from 1989-1993.

1991 Fish Distribution Study

In 1991 three juvenile lake sturgeon (152-505 mm total length) were captured in experimental gillnets by the Ashland FRO during a study designed to measure the distribution of fishes of the Bad River before and after a lampricide treatment (Slade 1991). All three were captured downstream from the falls, two prior to the treatment during the months of June and July and one following the treatment in September. Biological information recorded from these fish is listed in Table 1.

1992 Anadromous Fish Study

In 1992, the BRNRD received funding from the Service's Anadromous Fish Grants Program through the WDNR to conduct a study of anadromous fishes on the Bad River, specifically walleye and lake sturgeon. Funding for this study was used to hire seasonal employees and purchase equipment needed to conduct the field work. A comprehensive work plan was cooperatively

developed by the Ashland FRO, WDNR and the BRNRD. Based on the experience of natural resources personnel familiar with anadromous fish runs on Bad River, tribal subsistence fishermen, and published information regarding the life history of walleyes and lake sturgeon, the adult walleye spawning migration precedes that of lake sturgeon. With this in mind, the study was designed in two phases. Phase one focused on the assessment of walleyes and phase two on lake sturgeon. Objectives of the study included: develop estimates of population size using standard mark-recapture techniques, measure distribution, describe migration patterns, and collect biological information of anadromous Bad River walleyes and lake sturgeon. The results of the study were to be used in the development of future management and assessment recommendations.

Field crews were hired by the BRNRD to prepare for the assessment in March 1992. In mid-April, the crews began fishing fykenets and gillnets for walleyes in the lower river. During the first two weeks of assessment netting only 10 walleyes were captured. High water and floating woody debris complicated the use of assessment nets, and as water levels dropped and warmed the decision was made to shift the emphasis of the study to lake sturgeon. At this time, a few walleyes were being harvested by tribal spear fishers near the rapids, an indication that assessment netting in the lower river for walleyes had been ineffective, or that a portion of the spawning run may have ascended the river prior to April 14, the date that assessment nets were first fished. Although the objectives set for assessing the status of adult walleyes were not met, it was necessary to pull the fykenets and gillnets set to capture walleyes in order to implement the second phase of the work plan.

Phase 2 of the study began on May 5. Larger mesh gillnets were fished for lake sturgeon at two locations: one near the mouth and the other near the confluence of the White River by Odanah. A third crew was stationed just below the rapids and attempted to capture lake sturgeon with snares. A total of 9 lake sturgeon were captured near the mouth and 25 near the confluence of the White River. One lake sturgeon captured and tagged at the mouth was recaptured at the mouth the following day. Several lake sturgeon were observed downstream from the falls, but efforts to capture them failed. On May 10 the crew working at the mouth pulled their nets and moved to a location near the Elmhoist Road bridge, upstream from the upper rapids, where they fished a large mesh gillnet (Figure 2). One lake sturgeon was captured above the falls on May 15. The three crews worked through May 19 when the study was concluded.

A total of 34 lake sturgeon were captured during this assessment: 8 near the mouth, 25 near the confluence of the White River, and one upstream from the falls near Elmhoist Road. All fish were sexed, measured to the nearest millimeter total

length, and released. All but one were tagged with numbered Monel tags near the insertion of the dorsal fin. Due to the small number of lake sturgeon marked and recaptured, no estimates of abundance were developed. A complete summary of the biological characteristics collected, date and location of capture, and tag numbers is listed in Table 1.

1992 Ruffe Surveillance

Surveillance trawling for the exotic percid ruffe *Gymnocephalus cernus*, conducted in October 1992 and September 1994 by the Ashland FRO, captured a total of five juvenile lake sturgeon in the lower Bad River and one just offshore from the mouth in Lake Superior (Table 1). Based on their total length, these fish were likely young of the year and age one lake sturgeon.

1993-1994 Juvenile Lake Sturgeon Assessment

In October 1993, the Ashland FRO in cooperation with the BRNRD, initiated a pilot study designed to collect biological information, and describe the habitat requirements, distribution, and movements of juvenile Bad River lake sturgeon. No sturgeon were captured in October 1993. In 1994, with the assistance of the GLIFWC and the Service's Marquette Biological Station this assessment was expanded in duration and successfully captured 16 lake sturgeon near the mouth in Lake Superior. Measurements of length, weight and girth were taken from most fish, and all were tagged with either Monel or Floy tags (Table 1).

In July 1994 a diver using SCUBA gear observed several juvenile, presumably young-of-the-year, lake sturgeon in a pool directly downstream from the lower rapids while conducting a mollusc survey (Tom Doolittle, personal communication). Acting on this observation, divers from the GLIFWC and Sigurd Olson Environmental Institute, accompanied by personnel from the Marquette Biological Station and Ashland FRO, surveyed the pools directly downstream from the lower rapids with SCUBA gear for the presence of lake sturgeon on August 15, 1994. Water levels were low and clarity was good, but no lake sturgeon were observed.

1994 Spawning Lake Sturgeon Assessment

In May 1994, the Ashland FRO coordinated an assessment of adult spawning lake sturgeon with the BRNRD. The objective of this assessment was to collect biological information from adult spawning lake sturgeon captured near the base of the lower Bad River rapids. A total of 13 adult lake sturgeon were captured with snares, dipnets and seines. The seines were constructed of

17.8 cm stretch-mesh gillnet material. Measurements of length, weight and girth were taken, each fish was tagged with numbered Monel and Floy tags, identified to sex, checked for sexual condition, and released (Table 1). Gametes were collected from one male and one female by BRNRD Fish Hatchery personnel. Gametes were successfully hatched, but the resulting progeny died in early July at the BRNRD tribal hatchery prior to stocking (Russell Corbine, BRNRD, personal communication). Several other lake sturgeon were observed during this assessment but were not captured.

POPULATION CHARACTERISTICS

Distribution/Habitat

Lake sturgeon have been observed spawning in and near the lower Bad River rapids by both tribal members and personnel from several natural resource agencies. The rapids are made up of sandstone ledges, boulders and cobble. In May 1994, several lake sturgeon were observed and photographed downstream from the hydroelectric dam on the White River (The Daily Press, Ashland, WI, May 27, 1994). We presumed that these fish were spawning over substrate similar to that in the Bad River rapids. The single lake sturgeon captured near Elmhoist Bridge in 1992 is the only documented capture upstream of the rapids. Natural resources personnel are aware of anecdotal accounts of observations of lake sturgeon in the upper Bad River near Copper Falls, but none have been documented. The capture of an adult sturgeon upstream from the rapids suggests that lake sturgeon do successfully ascend the rapids during certain flow conditions.

One adult lake sturgeon captured in May 1992 had previously been tagged on June 4, 1990 in Chequamegon Bay by the WDNR. The WDNR tags lake sturgeon during its annual index sampling in Chequamegon Bay and has received several tag returns from lake sturgeon captured by tribal members in the Bad River (Steve Schram, WDNR, personal communication). This suggests that lake sturgeon that spawn in the Bad River utilize Chequamegon Bay during part of their adult and/or immature life.

Juvenile lake sturgeon were captured in the lower river over silt-covered clay and within one mile of the mouth in Lake Superior over sand substrate from May through October. Capture depths ranged from less than 1 m to 6 m. Based on the total length of some of the lake sturgeon captured in the lower Bad River and offshore locations in Lake Superior, and the growth rates of known age lake sturgeon captured in the St. Louis River (Minnesota DNR, unpublished data), it is likely that some of these juveniles were young-of-the-year and age one fish. This indicates that some lake sturgeon move downstream to the lower

Bad River and offshore locations in Lake Superior at a young age. The capture/recapture of one lake sturgeon originally tagged about one mile west of the mouth of the Bad River in July and recaptured about one month later near the river mouth, together with the capture of juvenile lake sturgeon of various sizes near the river mouth throughout the open water season, demonstrates that young lake sturgeon of various ages utilize this area, perhaps feeding on organisms flushed out of the river into the open, less productive waters of Lake Superior.

Temperature

Lake sturgeon were captured in the Bad River when temperatures ranged from 7 to 20 C, and in Lake Superior at temperatures ranging from 7 to 19 C. Spawning was observed at a range of 10 to 18 C. In 1992, catch rates increased as water temperatures rose from 10 to 20 C over a two-week period.

Age and Size Composition

Of the 86 lake sturgeon captured in or near the Bad River since 1987, 28 were juveniles and 59 adults. Adult fish are defined as any lake sturgeon captured during April and May upstream from the U.S. Highway 2 bridge or any lake sturgeon greater than 90 cm in total length. The 90 cm measurement was used because adult lake sturgeon spawning in the Sturgeon River, Baraga County, Michigan, rarely are less than 90 cm total length (Auer 1987, 1988, 1989, 1990, 1991).

Adults ranged from 86.4 to 182.9 cm total length with a mean length of 125.2 cm (Table 1 and Figure 3). Juveniles ranged from 15.5 to 85.8 cm total length with a mean length of 51.7 cm (Table 1 and Figure 4). Since sample sizes were small and many fish were of an undetermined sex, length-frequency distributions were not developed by sex.

Age and Growth/Maturity

Of the 86 lake sturgeon captured, 16 were aged. Of these, 7 were adult males of age eight to twenty, 3 were adult females age twenty-two to twenty-four, 5 were adults of an undetermined sex of age sixteen to twenty-nine, and 1 was an age three juvenile (Table 1). Since adult fish were captured during their spawning migration we presumed that they were all in mature spawning condition. Mature males (29) ranged from 86.4 to 182.9 cm total length with a mean length of 116.1 cm. Mature females (15) ranged from 121.9 to 182.9 cm total length with a mean length of 145.1 cm, and the 15 fish of an undetermined sex ranged from 94.2 to 143.5 cm total length with a mean length of 122.8 cm. Age

data collected by the WDNR in western Lake Superior (WDNR unpublished data) was used to estimate age of maturity of Bad River lake sturgeon. Males first matured at about 9 years of age and females at about 20 years of age. Mean age of all spawning males was 18 years and all spawning females about 30 years.

We computed weight-length and weight-girth relationships from data in Table 1 (Figures 5 and 6). Because sample sizes are small we did not develop individual equations for each sex. As more data is collected these equations will be refined by sex. The weight-length relation is described by the equation:

$$W = .00000086 L^{3.298}$$

where W = weight (g), and L = total length (mm).

The weight-girth equation is described by the equation:

$$W = .00010041 G^{3.0454}$$

where W = weight (g), and G = girth (mm).

Individual growth rates, based on total length, were measured from the recapture of 2 tagged fish. The first was an adult fish initially tagged in June 1990 at 139.4 cm total length. This fish was recaptured nearly two years later in the Bad River and measured 139.7 cm total length, an annual growth rate of about 1.5 mm. The second fish was a juvenile initially tagged in June 1994 at 37.5 cm total length. It was recaptured 28 days later about 1.6 kilometers away over similar habitat and measured 39.9 cm, a daily growth rate of about 0.86 mm at water temperatures of 15 to 19 C. Growth, based on total length, appears to be greater for younger fish.

Recruitment

Based on unpublished aging data collected by the Minnesota and Wisconsin Departments of Natural Resources, and the length-frequency distribution developed for Bad River lake sturgeon (Figures 3 and 4), it appears as though some level of recruitment has occurred annually for at least the past 10 years in the Bad River.

Harvest

Bad River lake sturgeon are harvested by both tribal

subsistence and state licensed sport fishermen. There is no legal commercial harvest of lake sturgeon. State licensed harvest has been monitored through mandatory registration since 1983. The bag limit is one fish per angler annually. In 1991 the minimum size limit for state licensed fishermen was increased from 101.6 cm to 127 cm. Licensed fishermen must acquire a tag prior to fishing for sturgeon and register legally tagged sturgeon with the WDNR. Since 1991, reported sport harvest from Lake Superior has been 2 fish or less annually (WDNR unpublished data). Reporting of lake sturgeon harvest is not required of tribal members. The tribal harvest is unknown, but is estimated to be 5 to 15 fish annually.

Management Needs\Recommendations

Cooperating agencies should continue to collect biological information regarding the age and size structure, movements, distribution, habitat requirements, and abundance of Bad River lake sturgeon. Data should be collected in a standardized format and made available to all agencies involved in lake sturgeon management. Spawning adults should be genetically described and compared to other populations of lake sturgeon in the Lake Superior basin and throughout the Great Lakes. Genetic descriptions of remnant stocks may be critical to future restoration efforts and important to the preservation of the genetic make up of remnant stocks. Spawning and rearing habitat should be protected from degradation or enhanced when necessary. Water quality parameters should be monitored annually and fishery managers should increase communication with land managers in an effort to maintain or improve the relatively pristine quality of the Bad River watershed.

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Figure 1. Geographic location of the Bad River, Wisconsin.

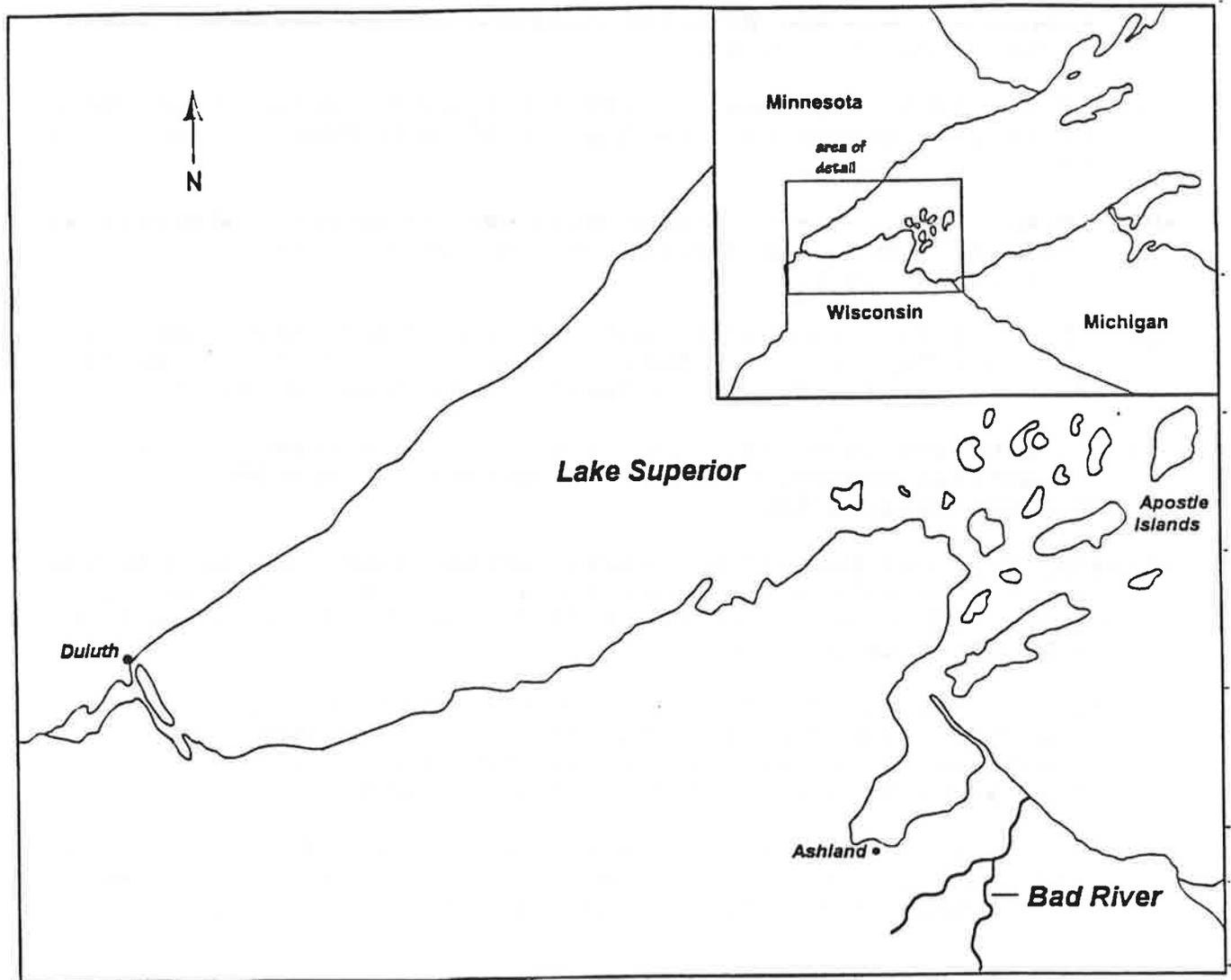


Figure 2. Lower Bad River watershed,
Ashland County, Wisconsin.

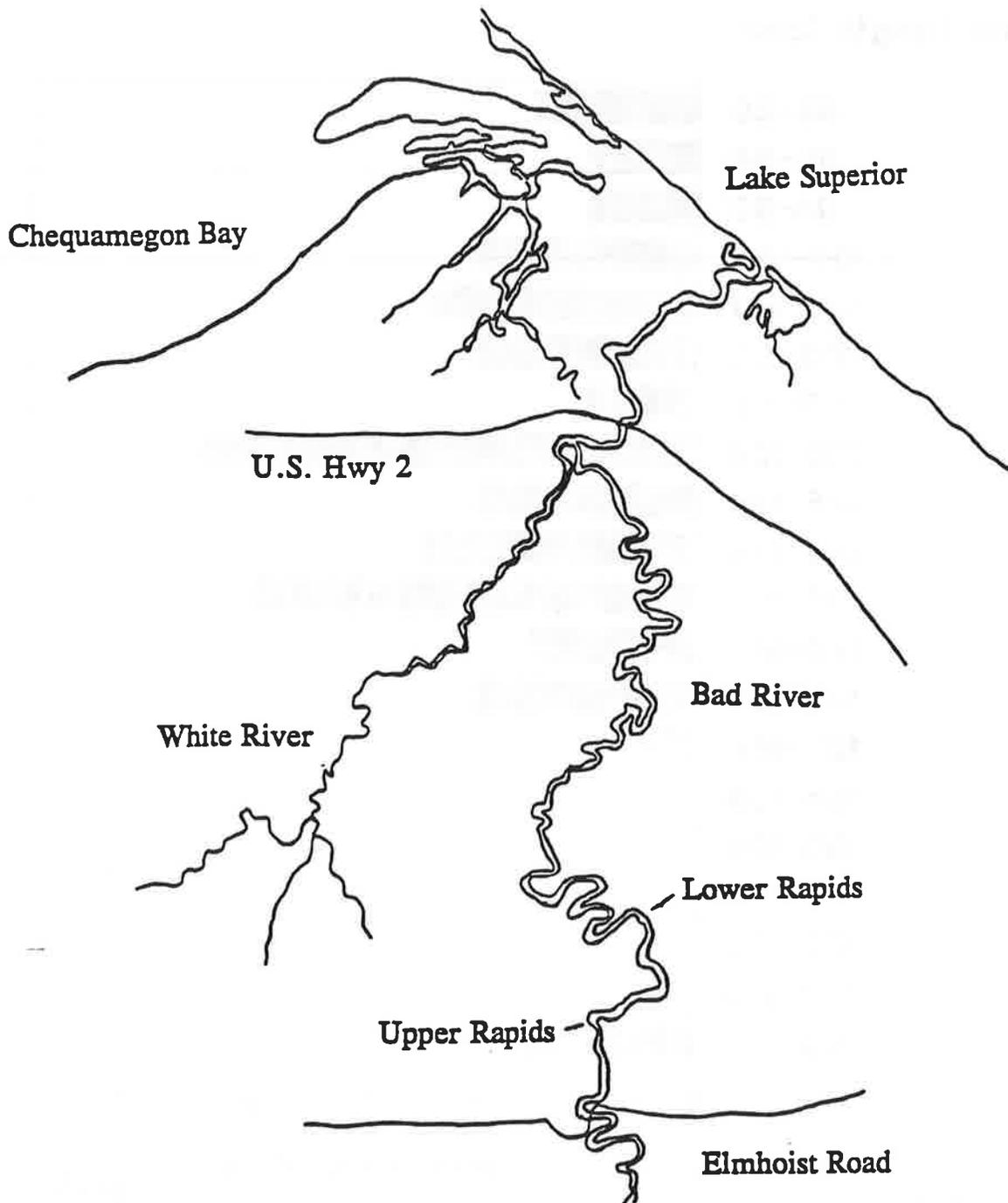
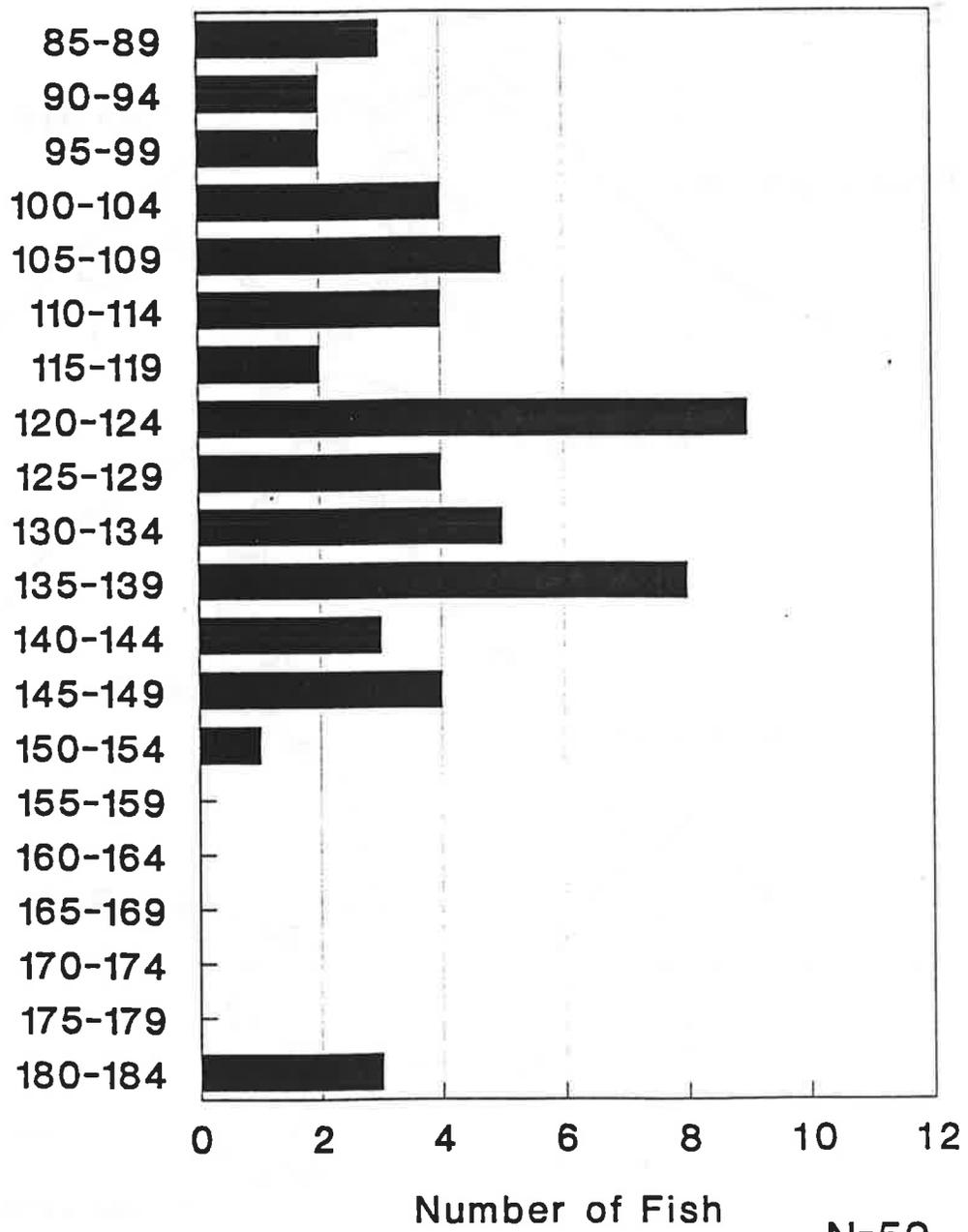


Figure 3. Length-frequency distribution of adult lake sturgeon, Bad River, WI.

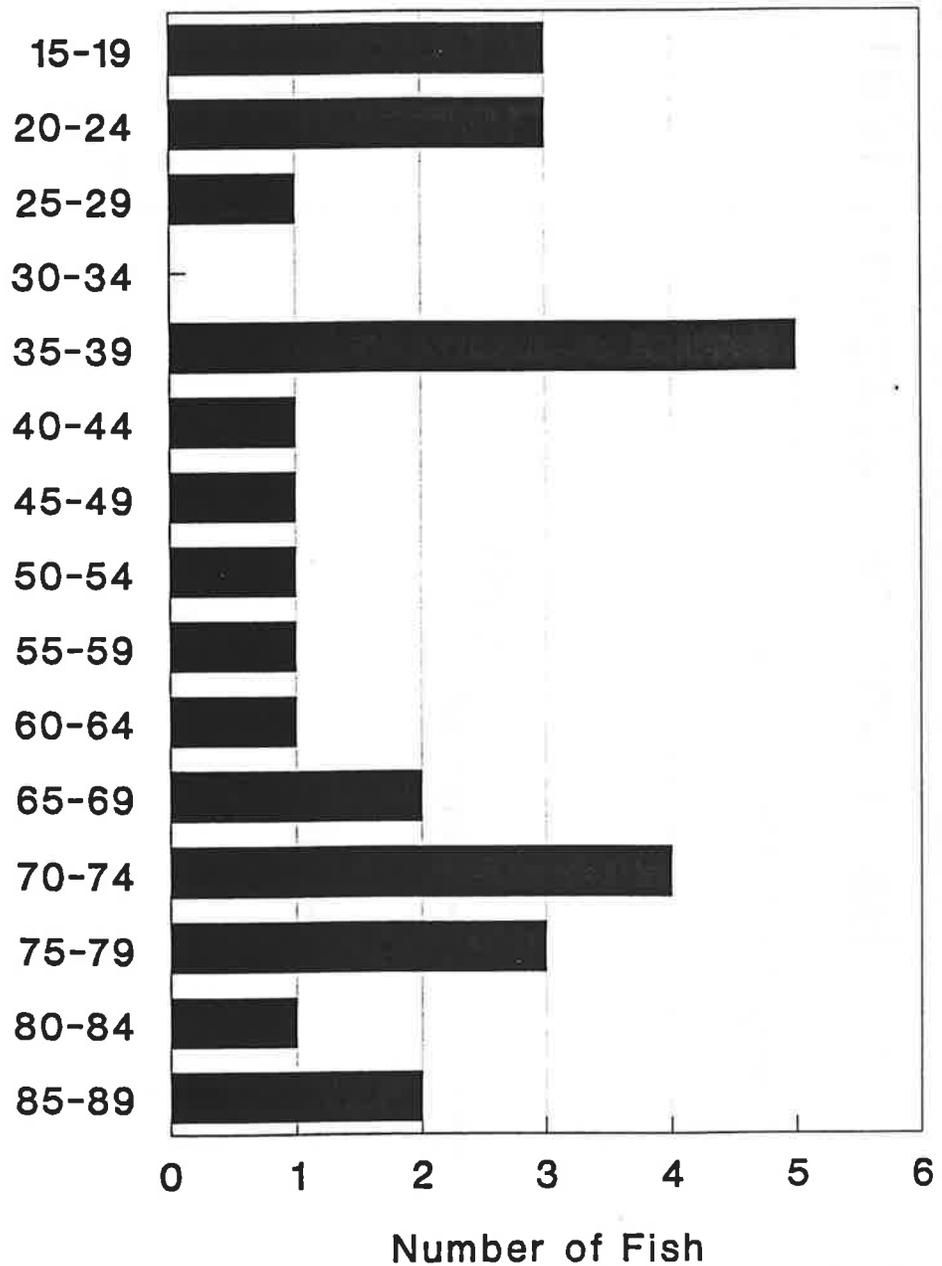
Total Length (cm)



(1987-1994)

Figure 4. Length-frequency distribution of juvenile lake sturgeon, Bad River, WI

Total Length (cm)



(1987-1994)

N=28

Figure 5. Weight-length relation for Bad River lake sturgeon, 1991-1994.

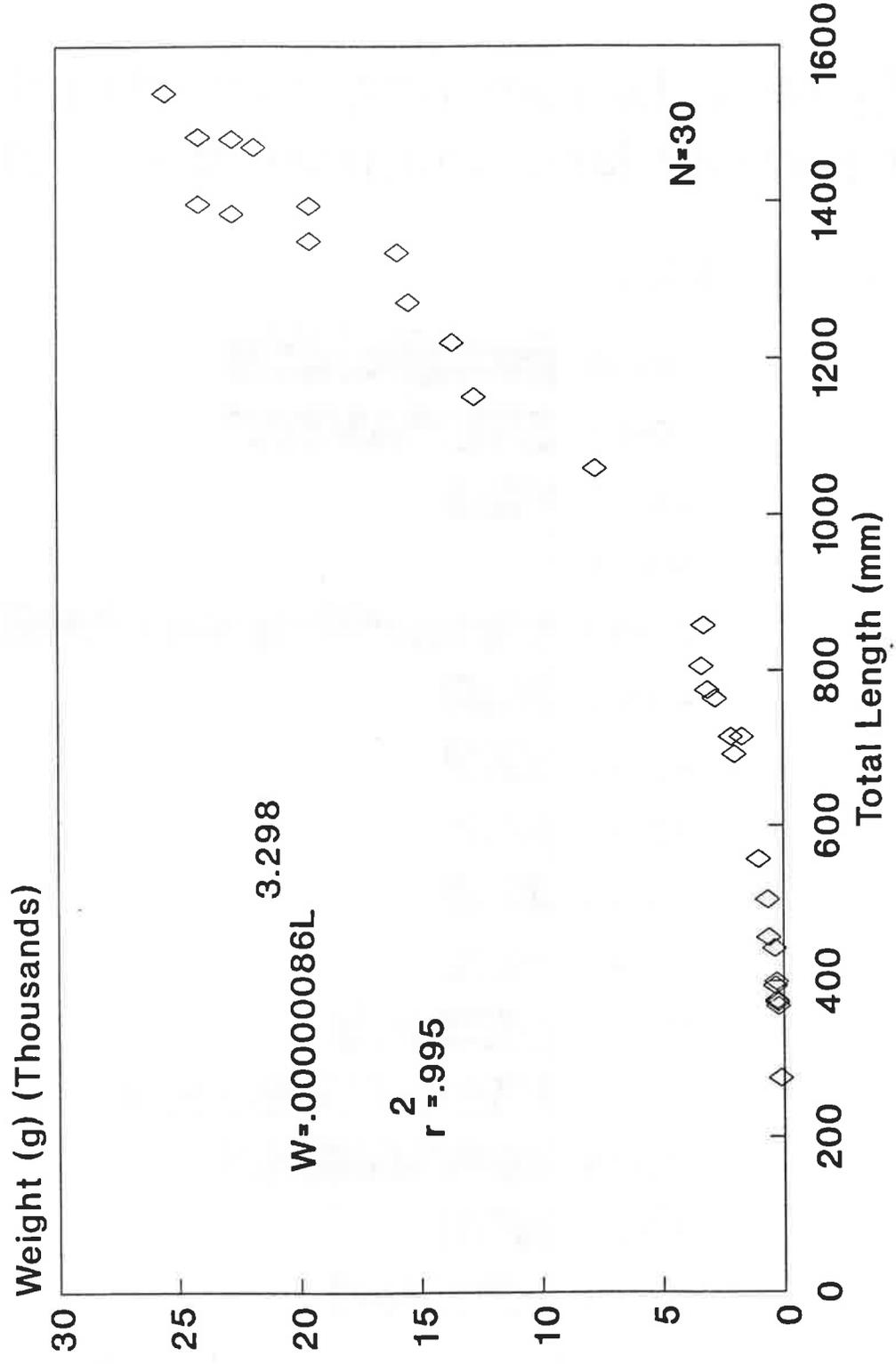


Figure 6. Weight-girth relation for Bad River lake sturgeon, 1994.

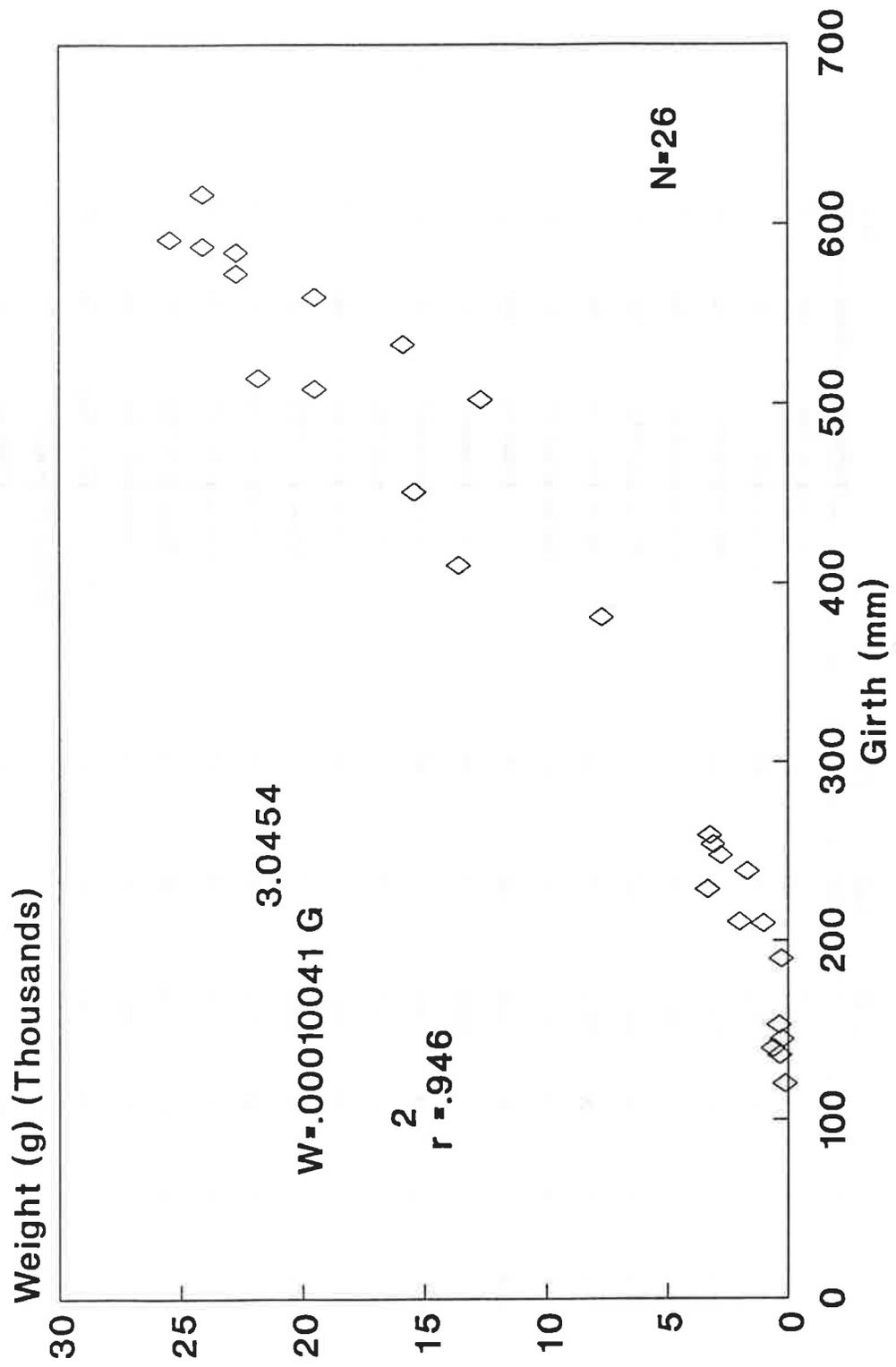


Table 1. Bad River lake sturgeon capture records 1987–1994.

| Date | Number | Sex | Age | Length (cm) | Weight (kg) | Girth (cm) | Tsp/Agency | Recap. | Depth (m) |
|---------|--------|-----|-----|-------------|-------------|------------|------------------------|--------|-----------|
| 4-24-87 | 1 | U | 16 | 108.0 | NT | NT | 0001 Monel GLIFWC | No | NT |
| 4-24-87 | 2 | U | 18 | 128.3 | NT | NT | 0003 Monel GLIFWC | No | NT |
| 4-25-87 | 3 | U | 20 | 130.8 | NT | NT | 0004 Monel GLIFWC | No | NT |
| 4-26-87 | 4 | M | 14 | 104.1 | NT | NT | 0006 Monel GLIFWC | No | NT |
| 4-26-87 | 5 | M | 16 | 114.3 | NT | NT | 0007 Monel GLIFWC | No | NT |
| 4-26-87 | 6 | F | 24 | 139.7 | NT | NT | 0008 Monel GLIFWC | No | NT |
| 4-27-87 | 7 | M | 8 | 86.4 | NT | NT | 0005 Monel GLIFWC | No | NT |
| 4-30-87 | 8 | M | 20 | 124.5 | NT | NT | NT/GLIFWC | No | NT |
| 5-88 | 9 | U | 27 | 127.0 | NT | NT | NT/Tribal Member | NT | NT |
| 5-88 | 10 | U | 29 | 142.2 | NT | NT | NT/Tribal Member | NT | NT |
| 5-88 | 11 | U | NT | 141.0 | NT | NT | NT/Tribal Member | NT | NT |
| 5-5-88 | 12 | M | 17 | 124.5 | NT | NT | 0051 Monel GLIFWC | No | <1 |
| 5-5-88 | 13 | M | 18 | 129.5 | NT | NT | 0052 Monel GLIFWC | No | <1 |
| 5-5-88 | 14 | F | 24 | 137.2 | NT | NT | 0053 Monel GLIFWC | No | <1 |
| 5-6-88 | 15 | F | 22 | 133.4 | NT | NT | 0056 Monel GLIFWC | No | <1 |
| 5-6-88 | 16 | M | NT | 134.6 | NT | NT | 0055 Monel GLIFWC | No | <1 |
| 5-6-88 | 17 | M | 21 | 138.4 | NT | NT | 0054 Monel GLIFWC | No | <1 |
| 6-27-91 | 18 | U | 3 | 50.5 | 0.653 | NT | 0004 USFWS orange Floy | No | NT |
| 7-24-91 | 19 | U | NT | 36.8 | 0.218 | NT | 0018 USFWS orange Floy | No | 1-3 |
| 9-10-91 | 20 | U | NT | NT | NT | NT | NT/USFWS | No | NT |
| 4-29-92 | 21 | U | NT | 60.9 | NT | NT | NT/BRNRD | No | NT |
| 5-5-92 | 22 | U | NT | 71.1 | NT | NT | 799 Monel BRNRD | No | NT |
| 5-5-92 | 23 | U | NT | 79.2 | NT | NT | 797 Monel BRNRD | No | NT |

Table 1. Bad River lake sturgeon capture records 1987–1994 (cont).

| Number (cont.) | Bottom Comp. | Gear | Temp. (C) | Location | Comments |
|----------------|--------------|-------------------------|-----------|--|---|
| 1 | NT | GN | NT | Near the junction of the White River | Hard |
| 2 | NT | GN | NT | Near the junction of the White River | Hard |
| 3 | NT | GN | NT | Near the junction of the White River | Hard |
| 4 | NT | GN | NT | Near the junction of the White River | Hard |
| 5 | NT | GN | NT | Near the junction of the White River | Hard |
| 6 | NT | GN | NT | Near the junction of the White River | Hard |
| 7 | NT | GN | NT | Near the junction of the White River | Hard |
| 8 | NT | GN | NT | Near the junction of the White River | Hard |
| 9 | NT | Spear | NT | At the base of the lower rapids Section 36 | Speared by tribal member |
| 10 | NT | Spear | NT | At the base of the lower rapids Section 36 | Speared by tribal member |
| 11 | NT | Spear | NT | At the base of the lower rapids Section 36 | Speared by tribal member |
| 12 | Bedrock | Snare | 18 | At the base of the lower rapids Section 36 | Gametes collected by GLIFWC |
| 13 | Bedrock | Snare | 18 | At the base of the lower rapids Section 36 | Gametes collected by GLIFWC |
| 14 | Bedrock | Snare | 18 | At the base of the lower rapids Section 36 | Gametes collected by GLIFWC |
| 15 | Bedrock | Snare | 18 | At the base of the lower rapids Section 36 | Gametes collected by GLIFWC |
| 16 | Bedrock | Snare | 18 | At the base of the lower rapids Section 36 | Gametes collected by GLIFWC |
| 17 | Bedrock | Snare | 18 | At the base of the lower rapids Section 36 | Gametes collected by GLIFWC |
| 18 | NT | EXPNGN | NT | 1.6 km upstream from mouth | |
| 19 | NT | EXPNGN | 23.5 | 1.6 km downstream from U.S. HWY 2 | |
| 20 | NT | EXPNGN | 13 | 1.6 km upstream of U.S. HWY 2 | Fish dropped (approximately 15 cm total length) |
| 21 | NT | 11.4 cm GN | 10 | Just inside mouth | |
| 22 | NT | 15.2, 17.8 & 20.3 cm GN | NT | Just inside mouth | |
| 23 | NT | 15.2, 17.8 & 20.3 cm GN | NT | Just inside mouth | |

Table 1. Bad River lake sturgeon capture records 1987–1994 (cont).

| Date | Number | Sex | Age | Length (cm) | Weight (kg) | Girth (cm) | Tag/Agency | Recap. | Depth (m) |
|---------|--------|-----|-----|-------------|-------------|------------|-------------------------|--------|-----------|
| 5-6-92 | 24 | U | NT | 66.0 | NT | NT | 779 Monel BRNRD | No | NT |
| 5-6-92 | 25 | U | NT | 143.5 | NT | NT | 780 Monel BRNRD | No | NT |
| 5-6-92 | 26 | U | NT | 110.5 | NT | NT | 781 Monel BRNRD | No | NT |
| 5-6-92 | 27 | U | NT | 71.1 | NT | NT | 799 Monel BRNRD | Yes | NT |
| 5-6-92 | 28 | M | NT | 121.9 | NT | NT | 292 (not identified) | ? | NT |
| 5-6-92 | 29 | M | NT | 91.4 | NT | NT | 764 Monel BRNRD | No | NT |
| 5-6-92 | 30 | U | NT | 122.2 | NT | NT | 772 Monel BRNRD | No | NT |
| 5-6-92 | 31 | M | NT | 122.7 | NT | NT | 767 Monel BRNRD | No | NT |
| 5-8-92 | 32 | U | NT | 94.2 | NT | NT | 791 Monel BRNRD | No | NT |
| 5-8-92 | 33 | U | NT | 139.7 | NT | NT | Z003916 WIDNR Blue Floy | Yes | NT |
| 5-8-92 | 34 | U | NT | 119.4 | NT | NT | 793 Monel BRNRD | No | NT |
| 5-8-92 | 35 | U | NT | 114.3 | NT | NT | 790 Monel BRNRD | No | NT |
| 5-10-92 | 36 | U | NT | 109.2 | NT | NT | 768 Monel BRNRD | No | NT |
| 5-10-92 | 37 | U | NT | 111.8 | NT | NT | 715 Monel BRNRD | No | NT |
| 5-10-92 | 38 | F | NT | 182.9 | NT | NT | 727 Monel BRNRD | No | NT |
| 5-10-92 | 39 | F | NT | 182.9 | NT | NT | 728 Monel BRNRD | No | NT |
| 5-11-92 | 40 | M | NT | 147.3 | NT | NT | 770 Monel BRNRD | No | NT |
| 5-11-92 | 41 | M | NT | 106.7 | NT | NT | 771 Monel BRNRD | No | NT |
| 5-11-92 | 42 | M | NT | 106.7 | NT | NT | 773 Monel BRNRD | No | NT |
| 5-12-92 | 43 | M | NT | 99.1 | NT | NT | 729 Monel BRNRD | No | NT |
| 5-12-92 | 44 | M | NT | 101.6 | NT | NT | 730 Monel BRNRD | No | NT |
| 5-12-92 | 45 | F | NT | 134.6 | NT | NT | 731 Monel BRNRD | No | NT |

Table 1. Bad River lake sturgeon capture records 1987 – 1994 (cont).

| Number (cont). | Bottom Comp. | Gear | Temp. (C) | Location | Comments |
|----------------|--------------|-------------------------|-----------|------------------------------|--|
| 24 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Just inside mouth | |
| 25 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Just inside mouth | |
| 26 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Just inside mouth | |
| 27 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Just inside mouth | |
| 28 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Near junction of White River | Tagging agency not identified |
| 29 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Near junction of White River | |
| 30 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Near junction of White River | |
| 31 | NT | 15.2, 17.8 & 20.3 cm GN | 11 | Near junction of White River | |
| 32 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near junction of White River | |
| 33 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near junction of White River | Tagged June 4, 1990 near breakwall (1394 mm) |
| 34 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Just inside mouth | Lamprey Scar |
| 35 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Just inside mouth | |
| 36 | NT | 15.2, 17.8 & 20.3 cm GN | 16 | Near junction of White River | |
| 37 | NT | 15.2, 17.8 & 20.3 cm GN | 16 | Near junction of White River | |
| 38 | NT | 15.2, 17.8 & 20.3 cm GN | 16 | Near junction of White River | |
| 39 | NT | 15.2, 17.8 & 20.3 cm GN | 16 | Near junction of White River | |
| 40 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near junction of White River | |
| 41 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near junction of White River | |
| 42 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near junction of White River | |
| 43 | NT | 15.2, 17.8 & 20.3 cm GN | 20 | Near junction of White River | |
| 44 | NT | 15.2, 17.8 & 20.3 cm GN | 20 | Near junction of White River | |
| 45 | NT | 15.2, 17.8 & 20.3 cm GN | 20 | Near junction of White River | |

Table 1. Bad River lake sturgeon capture records 1987–1994 (cont).

| Date | Number | Sex | Age | Length (cm) | Weight (kg) | Girth (cm) | Tag/Agency | Recap. | Depth (m) |
|----------|--------|-----|-----|-------------|-------------|------------|----------------------------------|--------|-----------|
| 5-13-92 | 46 | M | NT | 121.9 | NT | NT | 784 Monel BRNRD | No | NT |
| 5-13-92 | 47 | M | NT | 121.9 | NT | NT | 733 Monel BRNRD | No | NT |
| 5-13-92 | 48 | M | NT | 182.9 | NT | NT | 732 Monel BRNRD | No | NT |
| 5-14-92 | 49 | F | NT | 121.9 | NT | NT | 757 Monel BRNRD | No | NT |
| 5-15-92 | 50 | M | NT | 88.9 | NT | NT | 743 Monel BRNRD | No | NT |
| 5-15-92 | 51 | M | NT | 101.6 | NT | NT | 741 Monel BRNRD | No | NT |
| 5-16-92 | 52 | M | NT | 101.6 | NT | NT | 726 Monel BRNRD | No | NT |
| 5-16-92 | 53 | M | NT | 88.9 | NT | NT | 742 Monel BRNRD | No | NT |
| 5-17-92 | 54 | M | NT | 96.5 | NT | NT | 747 Monel BRNRD | No | NT |
| 10-20-92 | 55 | U | NT | 19.6 | NT | NT | NT/USFWS | No | 2 |
| 10-22-92 | 56 | U | NT | 17.5 | NT | NT | NT/USFWS | No | 3 |
| 10-22-92 | 57 | U | NT | 15.5 | NT | NT | NT/USFWS | No | 6 |
| 5-5-94 | 58 | F | NT | 135.0 | 19.505 | 55.9 | 2217 Monel/2774 USFWS Green Floy | No | <1 |
| 5-9-94 | 59 | M | NT | 139.5 | 19.505 | 50.8 | 2223 Monel/2772 USFWS Green Floy | No | <1 |
| 5-9-94 | 60 | F | NT | 148.3 | 24.041 | 61.6 | 2218 Monel/2771 USFWS Green Floy | No | <1 |
| 5-9-94 | 61 | F | NT | 153.9 | 25.402 | 59.1 | 2220 Monel/2770 USFWS Green Floy | No | <1 |
| 5-10-94 | 62 | F | NT | 147.0 | 21.773 | 51.4 | 2229 Monel/2769 USFWS Green Floy | No | <1 |
| 5-10-94 | 63 | M | NT | 122.0 | 13.608 | 41.0 | 2230 Monel/2767 USFWS Green Floy | No | <1 |
| 5-11-94 | 64 | F | NT | 139.7 | 24.041 | 58.7 | 2232 Monel/2232 USFWS Green Floy | No | <1 |
| 5-12-94 | 65 | M | NT | 105.9 | 7.711 | 38.1 | 2233 Monel/2764 USFWS Green Floy | No | <1 |
| 5-12-94 | 66 | F | NT | 133.5 | 15.876 | 53.3 | 2234 Monel/2762 USFWS Green Floy | No | <1 |
| 5-12-94 | 67 | M | NT | 115.1 | 12.701 | 50.2 | 2237 Monel/2761 USFWS Green Floy | No | <1 |

Table 1. Bad River lake sturgeon capture records 1987 – 1994 (cont).

| Number (cont.) | Bottom Comp. | Gear | Temp. (C) | Location | Comments |
|----------------|--------------|-------------------------|-----------|--|--|
| 46 | NT | 15.2, 17.8 & 20.3 cm GN | NT | At Elimholst bridge above upper rapids | |
| 47 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near Junction of White River | |
| 48 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near Junction of White River | |
| 49 | NT | 15.2, 17.8 & 20.3 cm GN | 15 | Near Junction of White River | |
| 50 | NT | 15.2, 17.8 & 20.3 cm GN | 17 | Near Junction of White River | |
| 51 | NT | 15.2, 17.8 & 20.3 cm GN | 17 | Near Junction of White River | |
| 52 | NT | 15.2, 17.8 & 20.3 cm GN | 17 | Near Junction of White River | |
| 53 | NT | 15.2, 17.8 & 20.3 cm GN | 17 | Near Junction of White River | |
| 54 | NT | 15.2, 17.8 & 20.3 cm GN | 16 | Near Junction of White River | |
| 55 | Sand | 4.9 m BT | 7 | In mouth near Lake Superior | |
| 56 | Sand | 4.9 m BT | 7 | Off of mouth | |
| 57 | Sand | 4.9 m BT | 7 | In mouth near Lake Superior | |
| 58 | Bedrock | Snare | 11 | At base of lower rapids in Section 36 | Water level dropping |
| 59 | Bedrock | Snare | 11 | At base of lower rapids in Section 36 | Ripe |
| 60 | Bedrock | Snare | 11 | At base of lower rapids in Section 36 | |
| 61 | Bedrock | Snare | 11 | At base of lower rapids in Section 36 | |
| 62 | Bedrock | Seine (17.8 cm GN) | 10 | At base of lower rapids in Section 36 | Ripe |
| 63 | Bedrock | Dipnet | 10 | Above base of lower rapids in rapids | Spent |
| 64 | Bedrock | Seine (17.8 cm GN) | 13 | At base of lower rapids in Section 36 | Hard |
| 65 | Bedrock | Seine (17.8 cm GN) | 12 | At base of lower rapids in Section 36 | |
| 66 | Bedrock | Seine (17.8 cm GN) | 12 | At base of lower rapids in Section 36 | Ripe (provided to hatchery crew for gametes) |
| 67 | Bedrock | Seine (17.8 cm GN) | 12 | At base of lower rapids in Section 36 | Ripe (provided to hatchery crew for gametes) |

Table 1. Bad River lake sturgeon capture records 1987--1994 (cont).

| Date | Number | Sex | Age | Length (cm) | Weight (kg) | Girth (cm) | Tag/Agency | Recap. | Depth (m) |
|---------|--------|-----|-----|-------------|-------------|------------|----------------------------------|--------|-----------|
| 5-13-94 | 68 | F | NT | 148.0 | 22.680 | 57.2 | 2239 Monel/2758 USFWS Green Floy | No | <1 |
| 5-13-94 | 69 | F | NT | 138.5 | 22.680 | 58.4 | 2240 Monel/2755 USFWS Green Floy | No | <1 |
| 5-13-94 | 70 | M | NT | 127.2 | 15.422 | 45.1 | 2241 Monel/2754 USFWS Green Floy | No | <1 |
| 6-21-94 | 71 | U | NT | 37.5 | 0.264 | 19.0 | 2074 USFWS Green Floy | No | 1.5 |
| 6-21-94 | 72 | U | NT | 45.6 | 0.591 | 14.0 | 2071 USFWS Green Floy | No | 1.5 |
| 6-22-94 | 73 | U | NT | 27.6 | 0.124 | 12.0 | 2069 USFWS Green Floy | No | <1 |
| 6-23-94 | 74 | U | NT | 55.7 | 1.026 | 21.0 | 2066 USFWS Green Floy | No | 1 |
| 6-23-94 | 75 | U | NT | 37.2 | 0.249 | 14.5 | 2065 USFWS Green Floy | No | 1.3 |
| 7-26-94 | 76 | U | NT | 39.4 | 0.342 | 13.6 | 2062 USFWS Green Floy | No | 1.3 |
| 7-26-94 | 77 | U | NT | 44.2 | 0.373 | 15.3 | 2063 USFWS Green Floy | No | 1.3 |
| 7-19-94 | 78 | U | NT | 85.0 | NT | 29.2 | 0052 Monel GLIFWC | No | 1.5-4.5 |
| 7-19-94 | 79 | U | NT | 76.4 | 2.800 | 24.8 | 0053 Monel GLIFWC | No | 1.5-4.5 |
| 7-19-94 | 80 | U | NT | 69.3 | 2.000 | 21.1 | 0054 Monel GLIFWC | No | 1.5-4.5 |
| 7-19-94 | 81 | U | NT | 77.5 | 3.100 | 25.4 | 0055 Monel GLIFWC | No | 1.5-4.5 |
| 7-19-94 | 82 | U | NT | 39.9 | 0.290 | NT | 2074 USFWS Green Floy | Yes | 1.5-4.5 |
| 7-19-94 | 83 | U | NT | 71.5 | 2.150 | NT | 0056 Monel GLIFWC | No | 1.5-4.5 |
| 7-19-94 | 84 | U | NT | 80.6 | 3.350 | 22.9 | 0057 Monel GLIFWC | No | 1.5-4.5 |
| 7-20-94 | 85 | U | NT | 85.8 | 3.250 | 25.9 | 0026 Monel GLIFWC | No | 1.5-4.5 |
| 7-20-94 | 86 | U | NT | 71.5 | 1.700 | 23.9 | 0027 Monel GLIFWC | No | 1.5-4.5 |
| 9-21-94 | 87 | U | NT | 23.6 | NT | NT | NT/USFWS | No | 4 |
| 9-21-94 | 88 | U | NT | 20.9 | NT | NT | NT/USFWS | No | 4 |
| 9-21-94 | 89 | U | NT | 22.0 | NT | NT | NT/USFWS | No | 4 |

NT - Data not taken or recorded or fish not tagged. GN - Gillnet. BT - Bottom Trawl

Table 1. Bad River lake sturgeon capture records 1987--1994 (cont).

| Number (cont.) | Bottom Comp. | Gear | Temp. (C) | Location | Comments |
|----------------|--------------|--------------------|-----------|---------------------------------------|----------|
| 68 | Bedrock | Seine (17.8 cm GN) | 12 | At base of lower rapids in Section 36 | |
| 69 | Bedrock | Seine (17.8 cm GN) | 12 | At base of lower rapids in Section 36 | |
| 70 | Bedrock | Seine (17.8 cm GN) | 12 | At base of lower rapids in Section 36 | |
| 71 | Sand | 8.9 cm GN | 15 | 1.6 km west of mouth | |
| 72 | Sand | 11.4 cm GN | 15 | 100 m west of mouth | |
| 73 | Sand | 3.2 cm GN | 16 | 1.6 km east of mouth | |
| 74 | Sand | 6.4 cm GN | 15.5 | 1.6 km east of mouth | |
| 75 | Sand | 11.4 cm GN | 15.5 | 100 m east of mouth | |
| 76 | Sand | 8.9 cm GN | 17 | 1.6 km east of mouth | |
| 77 | Sand | 8.9 cm GN | 17 | 1.6 km east of mouth | |
| 78 | Sand | 11.4 cm GN | 19 | 100 m west of mouth | |
| 79 | Sand | 11.4 cm GN | 19 | 100 m west of mouth | |
| 80 | Sand | 11.4 cm GN | 19 | 100 m west of mouth | |
| 81 | Sand | 11.4 cm GN | 19 | 100 m west of mouth | |
| 82 | Sand | 11.4 cm GN | 19 | 100 m west of mouth | |
| 83 | Sand | 11.4 cm GN | 19 | 100 m east of mouth | |
| 84 | Sand | 11.4 cm GN | 19 | 100 m east of mouth | |
| 85 | Sand | 11.4 cm GN | 19 | 100 m east of mouth | |
| 86 | Sand | 11.4 cm GN | 19 | 100 m east of mouth | |
| 87 | Clay/silt | 3 m BT | 13.5 | 0.4 km upstream from mouth | |
| 88 | Clay/silt | 3 m BT | 13.5 | 0.4 km upstream from mouth | |
| 89 | Clay/silt | 3 m BT | 13.5 | 0.4 km upstream from mouth | |

NT - Data not taken or recorded or fish not tagged. GN - Gillnet. BT - Bottom Trawl

