

**Lake Sturgeon Spawning Activity in the Lower Black River**

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Lake sturgeon (*Acipenser fulvescens*), are the largest freshwater fish inhabiting the waters of New York. It historically inhabited the lower Black River and supported a limited local fishery through the 1950's. Over fishing, spawning bed degradation, and poor water quality likely caused the decline of this species. Currently listed as threatened in New York, the lake sturgeon has been a focal species for restoration and enhancement since 1993. There have been no previous efforts to quantify use of the lower Black River by lake sturgeon. A single capture in 1995 by the New York State Department of Environmental Conservation (NYSDEC), and sightings of adult sturgeon during the spawning period in 2003-04 by anglers, prompted this survey.

**Methods**

The Black River drains approximately 1,900 square miles of upstate New York and empties into Lake Ontario, six miles west of the City of Watertown. The study area is located in the Village of Dexter, approximately 1.2 mi upstream from the confluence of the Black River and Lake Ontario (Figure 1). Specifically, the surveyed area lies between NYS Rte. 180 upstream to a hydro power facility (300 yards) with three dams (Lat 44° 0' 15", Long 76° 2' 36"). Two of three dams have turbine units associated with them which generally provide the primary flow. Total area is approximately 6.4 acres. Current velocities can range from swift to relatively still depending on the river discharge, and hydro facility operation.

Prior to the predicted spawning period of mid May, the survey area below the first impoundments was inspected. A depth contour and substrate map were generated prior to sampling utilizing a portable depth finder and a SeaView® underwater video camera. Transects were made parallel to the current and spaced approximately 10 feet apart. Substrate was

roughly classified as bedrock, large rock, cobble, and gravel. Data were plotted using ArcView® GIS software to generate a morphometric and substrate map of the study area (Figure 1). Discharge was recorded daily by the U.S. Geological Survey gage (#04260500) in Watertown.

Gill nets were set from 9-13 May to capture mature sturgeon in spawning condition. Monofilament gill nets (8'x150'x 10" stretch mesh) were set parallel to the current in two locations daily (Figure 2). Nets were set on substrate dominated by cobble-gravel. Due to current velocities, and potential gear fouling from anglers, nets was deployed only during daylight hours. Nets were fished for an average of 6.2 hours, and were tended on an hourly basis to reduce capture stress to fish. All sturgeon captured were held for a maximum of 10 minutes in river water while being assessed for gender, stage of maturity, and total length (TL). Individually numbered yellow Floy Tags® were attached on the dorsal side of the right pectoral fin of all sturgeon collected. Small sections (0.4 in<sup>2</sup>) of dorsal fin were fixed in ethanol and sent to the University of California-Davis, for processing and inclusion in the lake sturgeon genetic data bank. By-catch species were identified, enumerated, and released.

Twenty egg traps, consisting of concrete blocks (4"x8"x16") wrapped in hogs hair filter media, were constructed to collect eggs deposited in the study area (Figure 2). Traps were tied approximately five feet apart in lines of four and were set perpendicular to the current over optimal spawning substrate. Five trap lines were set daily from 9-13 May, generally from 0830-1530 hours, so as not to interfere with walleye anglers. One exception was on 10 May when traps remained overnight and were checked after 24 hours. Upon hauling, all traps were examined for presence of sturgeon eggs and those of other species.

Random drifts were made with underwater video when not actively tending nets or processing sturgeon, and proved useful in locating sturgeon eggs on the substrate. Species observed within the study area were identified and classified as abundant, common, or present.

### **Results**

Conditions during the survey period were dominated by above normal air temperatures (70-75°F), clear skies, and low flows. Due to limited snow-pack in the watershed, discharge during this period (2,580-3,570 cfs) fell below the 83-year median value (Table 1). Water temperatures were unusually high and ranged from 56-60°F during the survey period. Water depth ranged from 4-8 feet, with a mean of 7 feet.

Although the Black River is brown in color from upper watershed tannins, underwater video proved useful in delineating substrate features. Available spawning substrate was dominated by bedrock, with lesser amounts of large rock, cobble and cobble-gravel mix (Table 2). Of the available area, only 20,000 ft<sup>2</sup> (8% of total) was determined to be optimum spawning habitat with cobble-gravel substrate and high water velocities (Figure 1, Table 2).

Prior to the actual survey a test net was set to determine how current velocities below the hydro facility affected the gear. The test was made on 5 May at a discharge of approximately 6,600 cfs. Conditions proved marginal both for crew safety and gear efficiency. When sampling commenced, base flows had fallen dramatically to <4,000 cfs, allowing nets to function adequately.

On 10-12 May, 11 sturgeon were captured and evaluated for sex, stage of gamete maturation, and total length (Table 3). All fish, ten males and one female, were in ripe/running condition. Weight data were not collected in order to minimize stress. The single female was estimated at >70 lbs. Sturgeon were returned to the water approximately 200 yards downstream of the capture location.

Egg traps were found to be effective at sampling recently deposited eggs. Throughout the sampling period, up to 300 *Moxostoma* sp. eggs per trap of were collected. Silver redhorse (*Moxostoma*

*anisurum*) have nearly identical spawning requirements and are typically associated with sturgeon spawning events in the St. Lawrence River (LaPan et al. 1997). Observations with underwater video confirmed the presence of *Moxostoma* sp. in the study area. Six fish species were encountered during the survey with underwater video (Table 4).

A single sturgeon egg was collected from an egg trap on 11 May, during the period that egg traps were fished overnight (24 hrs). Underwater video confirmed egg deposition on the substrate assessed as optimal. No further egg deposition was documented during the survey period.

### **Discussion**

Lake sturgeon spawning has recently been documented in several upstate New York waters, including the Grass and St. Lawrence Rivers (LaPan and Klindt 1995), and recent increases in sturgeon catches in Eastern Lake Ontario surveys suggest that population levels may be expanding (Eckert 2005). Preferred spawning habitat generally consists of a cobble-gravel substrate with current velocities of 2 ft/second or greater. Optimal spawning temperature for lake sturgeon is 50-55 °F (Auer 1996, Kempinger 1988). Sturgeon are broadcast spawners whose adhesive eggs have a high dissolved oxygen requirement and also need interstitial spaces for development (Smith 1985).

Swift water spawning habitat is a limited resource in the Eastern Basin of Lake Ontario. The Black River provides spawning opportunity for walleye, smallmouth bass, quillback and a host of other species, which require high velocities and/or rocky substrate. The presence of mature sturgeon and fertilized eggs confirm use of the Black River as a lake sturgeon spawning area.

Due to weather and water conditions at the time of this survey, it is likely that the spawning run was abbreviated in 2005. The presence of only one adult female during this survey suggests a depressed population level. Reports by anglers in the previous two years (2003-04) may suggest that a larger number of fish were actively spawning at that time. Since female sturgeon spawn on a 4-6 year basis, it is possible that in 2005 only a single ripe female was present in this population.

Suitable sturgeon spawning substrate is limited in the lower Black River. Scoured bedrock, which accounts for >60% of the available habitat, is of little value for most of the species utilizing the area for spawning. Spawning bed enhancement (i.e. addition of cobble and gravel sized substrate) would likely benefit sturgeon and a host of other species.

Three techniques (gill netting, egg trapping, and underwater video) were used to evaluate the use of the lower Black River by spawning sturgeon. Unusual environmental conditions in 2005 (low flow, warm water) were conducive to the use of both gill nets and egg traps to obtain samples of adults and document egg deposition. Underwater video also provided useful information as to the extent of egg deposition. Future studies will likely incorporate all techniques where possible.

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### **References**

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