Species of Concern
NOAA National Marine Fisheries Service

Atlantic sturgeon
Acipenser oxyrinchus oxyrinchus

Photo credit: University of Maine.

KEY INFORMATION

Area of Concern
Western Atlantic - Labrador, Canada through the St. Johns River, Florida.

Year Identified as "Species of Concern"
1988, formally retained in 1998.

Factors for Decline
- Fishing
- Bycatch
- Estuarine and freshwater habitat degradation
- Locks and dams

Conservation Designations
IUCN: Near Threatened
CITES: Appendix II
American Fisheries Society: Endangered in all stream systems except Conservation Dependent in Hudson, Delaware, and Altamaha rivers.

Brief Species Description:
The Atlantic sturgeon is a subtropical, **anadromous** species. Atlantic sturgeon attain lengths of up to approximately 14 feet (425 cm), and weights of more than 800 pounds (363 kg). They are bluish black or olive brown dorsally with paler sides and a white ventral surface and have five major rows of dermal **scutes** (Collette and Klein-MacPhee 2002). Atlantic sturgeon can be distinguished from shortnose sturgeon by their larger size, small mouth (less than 62% interorbital width), presence of bony scutes between the anal fin base and the lateral scute row, a double row of dorsal scutes behind the dorsal fin, a double row of scutes before the anal fin, and the presence of a pale intestine.

Atlantic sturgeon have been aged to 60 years (Mangin 1964); however this should be taken as an approximation as the only age validation study conducted to date show variations of ±5 years (Stevenson and Secor 1999). Vital parameters of sturgeon populations show latitudinal variation with faster growth and earlier age at maturation in more southern systems, though not all data sets conform to this trend. For example, Atlantic sturgeon mature in South Carolina at 5 to 19 years of age (Smith *et al.* 1982), in the Hudson River at 11 to 21 years (Young *et al.* 1998), and in the Saint Lawrence River at 22 to 34 years (Scott and Crossman 1973).

Spawning adults migrate upriver in spring, beginning in February or March in the south, April to May in the mid-Atlantic, and May to June in Canadian waters. In some areas, a small spawning migration may also occur in the fall. Spawning occurs in flowing water between the salt front and the **fall line** of large rivers. Atlantic sturgeon do not spawn every year, as multiple studies have shown that spawning intervals range from 1 to 5 years for males (Smith 1985, Collins *et al.* 2000, Caron et al. 2002) and 2 to 5 years for females (Vladykov and Greeley 1963, Van Eenennaam *et al*. 1996, Stevenson and Secor 1999). Fecundity of Atlantic sturgeon has been correlated with age and body size (ranging from 400,000 to 8 million eggs) (Smith *et al*. 1982, Van Eenennaam and Doroshov 1998, Dadswell 2006); with the average age at which 50% of maximum lifetime egg production is achieved estimated to be 29 years, approximately 3 to 10 times longer than for other bony fish species examined (Boreman 1997).

Following spawning, males may remain in the river or lower estuary until the fall; females typically exit the rivers within four to six weeks. Adults forage on benthic invertebrates (mussels, worms, shrimp) while Juveniles move downstream and inhabit **brackish** waters for a few months; and at about 30 to 36 inches length (76-92 cm) they move into coastal waters. Tagging data indicate that immature Atlantic sturgeon travel widely once they emigrate from their natal (birth) rivers.

Historically, Atlantic sturgeon were present in approximately 38 rivers in the United States from St. Croix, ME to the Saint Johns River, FL, of which 35 rivers have been confirmed to have had a historical spawning population. Atlantic sturgeon are currently present in 35 rivers, and spawning occurs in at least 20 of these rivers (NMFS, unpublished). The range for the species of concern is shown in Figure 1.

Rationale for "Species of Concern" Listing:

Demographic and Genetic Diversity Concerns:

The genetic diversity of Atlantic sturgeon throughout its range has been well documented. Initial investigations began in the early 1990s and have continued to the present (Bowen and Avise 1990, Ong *et al.* 1996, Waldman *et al.* 1996a, Waldman *et al*. 1996b, Waldman and Wirgin 1998). Overall, these studies have consistently found populations to be genetically diverse and the majority can be readily differentiated. The most recently published articles on Atlantic sturgeon genetic diversity (King et al. 2001, Wirgin *et al.* 2002, Waldman *et al.* 2002) indicate that from the areas that have been sampled, there are between 7 and 10 populations that can be statistically differentiated; however, there are some differences between studies and results do not include samples from all rivers inhabited by Atlantic sturgeon.

There are only two Atlantic sturgeon subpopulations for which population size estimates are available - the Hudson and the Altamaha Rivers. In 1995, Cornell University sampling crews collected 15 stocked and 14 wild age-1 Atlantic sturgeon from the Hudson River (Peterson *et al.* 2000). A Petersen mark-recapture population estimate from these data suggests that there were 9,529 (95% CI = 1,916 – 10,473) age-0 Atlantic sturgeon in the estuary in 1994. Since 4,929 were stocked, 4,600 fish were of wild origin, assuming 0% mortality among stocked fish. Estimates of spawning adults were also calculated by dividing the mean annual harvest from 1985 to 1995 by the exploitation rate. The mean annual spawning stock size (spawning adults) was 870 (600 males and 270 females) (Kahnle *et al*. in press). Current abundance trends for Atlantic sturgeon in the Hudson River are available from a number of surveys. All available data on abundance of juvenile Atlantic sturgeon in the Hudson River estuary (i.e., mark/recapture studies, bycatch data from commercial gill net fishery, and utilities sampling) indicate a substantial drop in production of young since the mid 1970s. The greatest decline seemed to occur in the middle to late 1970s, followed by a secondary drop in the late 1980s. The capture of juvenile sturgeon in 1991, 1993-1996, and 2003, provides evidence of successful spawning.

The Altamaha River supports one of the healthiest Atlantic sturgeon populations in the Southeast, with over 2,000 subadults captured in trammel nets, 800 of which were nominally age-1 (as indicated by size). Independent monitoring of the American shad gill net fishery incidentally intercepts Atlantic sturgeon. Using these data, the population does not seem to be increasing or decreasing, as catch trends are variable (NMFS, unpublished).

Factors for Decline:

A large U.S. commercial fishery (100,000 - 250,000 lbs/yr) existed for the Atlantic sturgeon from the 1950's through the mid-1990's; the origin of the fishery dates back to colonial times. The Atlantic sturgeon is managed under a Fishery Management Plan implemented by the Atlantic States Marine Fisheries Commission (ASMFC). They implemented a coast-wide moratorium on the harvest of wild Atlantic sturgeon in late 1997/early 1998. This moratorium is to remain in effect until there are at least 20 protected year classes in each spawning stock (anticipated to take up to 40 or more years). Most of the population data available before the moratorium were fishery-dependent, since the moratorium there have been few surveys to assess status and abundance. Cultured Atlantic sturgeon continue to be a valued commercial fish for both flesh and eggs (roe). Furthermore, because the sturgeon is dependent on **estuarine** and freshwater habitat, habitat degradation and loss continue to be a threat. Other significant threats include bycatch mortality and impacts from dredging activities. Additionally, some populations are being impacted by unique stressors, such as habitat impediments including locks and dams (e.g., Cape Fear and Santee-Cooper Rivers) and apparent ship strikes (e.g., Delaware and James Rivers). Although currently there are no known disease organisms threatening the Atlantic sturgeon populations, there is concern that non-indigenous sturgeon pathogens could be introduced through aquaculture operations.

Status Reviews/Research Underway:

The status of Atlantic sturgeon was initially reviewed in 1998 after the Services received a petition to list the species under the Endangered Species Act (ESA), and it was determined, at that time, that listing was not warranted. In 2003, a workshop sponsored by the National Marine Fish Service (NMFS) and U. S. Fish and Wildlife Service (USFWS) (collectively, the Services) was held to review the status of Atlantic sturgeon. The workshop provided an opportunity to gain additional information to determine if a new review of the status of the species was warranted. The 2003 workshop attendees concluded that some populations seemed to be recovering while other populations continued to be depressed. As a result, NMFS initiated a second status review of Atlantic sturgeon in 2005 to reevaluate whether this species required protection under the ESA. The status review report is now available (ASSRT 2007). It concluded that the Carolina, Chesapeake, and New York Bight Distinct Population Segments (DPS) are likely (> 50% chance) to become endangered in the foreseeable future (20 years) and recommended that they should be listed as threatened under the ESA. The remaining DPSs (South Atlantic and Gulf of Maine) were found to have a moderate risk (<50% chance) of becoming endangered in the next 20 years and no recommendation for listing was made as the available science was insufficient to allow a full assessment of these populations. A petition to list Atlantic sturgeon under the ESA was submitted by the Natural Resources Defense Council in October 2009. NMFS announced on 6 January 2010 that the petitioned action may be warranted and decided to seek a new round of public comment to update the 2007 status review before moving forward with a 12-month finding and determination on whether to propose ESA listing. Thus Atlantic sturgeon are currently considered a **candidate species**.

The program currently funds a number of projects to gather data and develop conservation strategies for Atlantic sturgeon in the northeastern US including spawning habitat assessment, tracking marked individuals, genetics, etc.

Data Deficiencies:
Long-term monitoring programs are needed for most of the subpopulations to help determine the status of the species (e.g., whether it is decreasing, increasing, or remaining stable). Spawning population abundance estimates are needed for all but two (the Hudson and Altamaha) of the extant reproducing populations. Also, locations of spawning and nursery grounds need to be identified for most of the subpopulations. While the genetic analyses that have been completed to date have yielded very important information, samples of young-of-the-year or spawning adults from many river systems are lacking. These are needed to remove any potential sampling bias that may result from using tissue samples from juvenile fish which are known to be migratory. Accurate estimates of **bycatch** and bycatch mortality are needed to determine the magnitude of this threat. Information on contaminant levels in Atlantic sturgeon is also needed.

Existing Protections and Conservation Actions:
In 1998, ASMFC instituted a coast-wide moratorium on the harvest of Atlantic sturgeon, which is to remain in effect until there are at least 20 protected year classes in each spawning stock (anticipated to take up to 40 or more years). NMFS followed this with a similar moratorium for Federal waters. Amendment 1 to ASMFC's Atlantic sturgeon Fishery Management Plan also includes measures for preservation of existing habitat, habitat restoration and improvement, monitoring of bycatch and stock recovery, and breeding/stocking protocols. Other organizations involved with Atlantic sturgeon conservation include, but are not limited to, state and local governments, and private and conservation organizations, including the Hudson River Foundation.

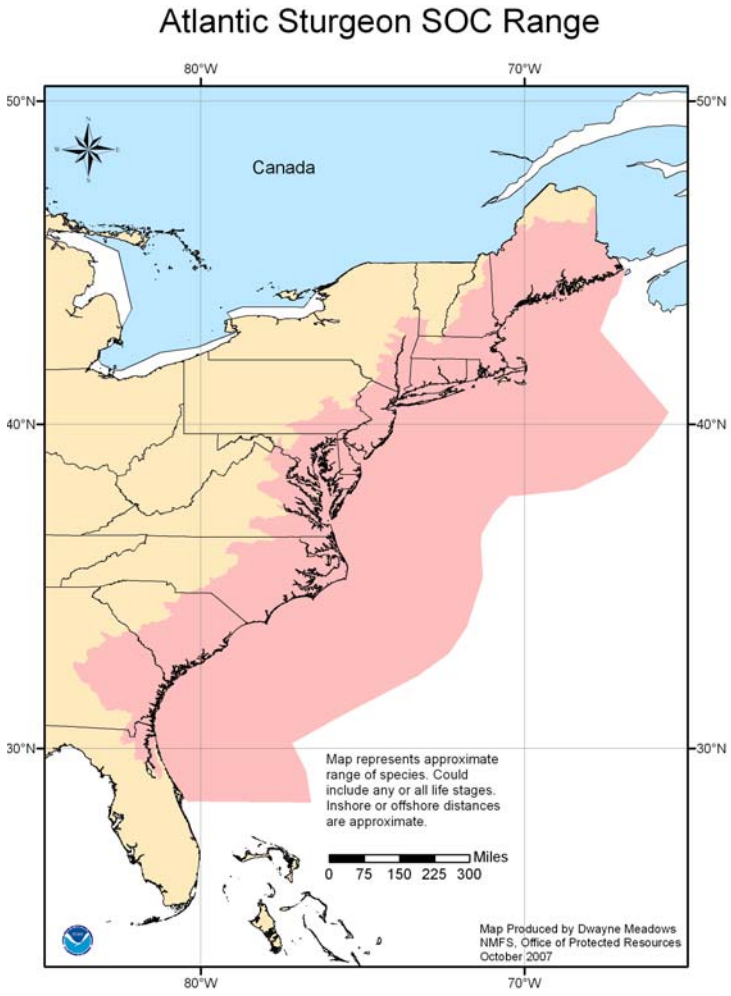

Figure 1. Range of the Atlantic sturgeon species of concern.

Videos:
Leaping (1:32) http://www.youtube.com/watch?v=kLysy3hozKs

Feeding (0:24) http://www.youtube.com/watch?v=0gWphqF6zZ8

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Point(s) of contact for questions or further information:

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