

# Shortnose Sturgeon – *Acipenser brevirostrum*

Overall Vulnerability Rank = Very High ■

Biological Sensitivity = High ■

Climate Exposure = Very High ■

Data Quality = 83% of scores  $\geq 2$

<i>Acipenser brevirostrum</i>		Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)	
Sensitivity attributes	Stock Status	3.6	1.6		
	Other Stressors	2.5	2.2		
	Population Growth Rate	3.8	2.3		
	Spawning Cycle	3.4	2.9		
	Complexity in Reproduction	2.5	2.6		
	Early Life History Requirements	3.0	2.3		
	Sensitivity to Ocean Acidification	1.6	1.8		
	Prey Specialization	1.3	3.0		
	Habitat Specialization	2.5	3.0		
	Sensitivity to Temperature	2.0	2.9		
	Adult Mobility	2.7	3.0		
	Dispersal & Early Life History	3.0	2.6		
	<b>Sensitivity Score</b>		<b>High</b>		
	Exposure variables	Sea Surface Temperature	4.0	3.0	
Variability in Sea Surface Temperature		1.0	3.0		
Salinity		1.3	3.0		
Variability Salinity		1.2	3.0		
Air Temperature		4.0	3.0		
Variability Air Temperature		1.0	3.0		
Precipitation		1.3	3.0		
Variability in Precipitation		1.4	3.0		
Ocean Acidification		4.0	2.0		
Variability in Ocean Acidification		1.0	2.2		
Currents		2.0	1.0		
Sea Level Rise		2.6	1.5		
<b>Exposure Score</b>		<b>Very High</b>			
<b>Overall Vulnerability Rank</b>		<b>Very High</b>			

## **Shortnose Sturgeon (*Acipenser brevirostrum*)**

Overall Climate Vulnerability Rank: **Very High** (98% certainty from bootstrap analysis).

Climate Exposure: **Very High**. Three exposure factors contributed to this score: Ocean Surface Temperature (4.0), Ocean Acidification (4.0) and Air Temperature (4.0). Shortnose Sturgeon are anadromous, spawning in freshwater, developing in freshwater and estuarine habitats, and feeding as adults in marine habitats.

Biological Sensitivity: **High**. Four sensitivity attributes scored above 3.0: Population Growth Rate (3.8), Stock Status (3.6), Spawning Cycle (3.4), Early Life History Requirements (3.0), and Dispersal and Early Life History. Shortnose Sturgeon was listed as Endangered under the Endangered Species Act in 1967 (SSSRT, 2010) and are long-lived and slow growing (Musick 2002). Spawning occurs in the spring and individuals spawn every 1-3 years. Eggs are benthic and relatively large and hatched larvae are relatively well-developed. Eggs and larvae inhabit fresh and brackish waters.

Distributional Vulnerability Rank: **Low** (98% certainty from bootstrap analysis). Shortnose Sturgeon are relatively invulnerable to distribution shifts. Spawning occurs in freshwater and adults are primarily resident to individual river systems (Able and Fahay 2010). However, recent genetic and acoustic tagging indicate that individuals do move between near-by river systems providing a basis for the species to shift distribution (Wirgin et al., 2010, Dionne et al., 2013).

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Shortnose Sturgeon is estimated to be neutral, but this estimate has a high degree of uncertainty (<66% certainty in expert scores). Climate factors have the potential to decrease (sea level rise; reduced dissolved oxygen) or increase (temperature) productivity of Shortnose Sturgeon. Understanding the magnitude and interaction of different effects is difficult at the point. The effect of ocean acidification over the next 30 years is likely to be minimal.

Data Quality: 83% of the data quality scores were 2 or greater indicate that data quality is moderate.

Climate Effects on Abundance and Distribution: The effect of climate on Shortnose Sturgeon populations is not well understood. A population viability analysis for Shortnose Sturgeon at the southern end of their range found that salt-water intrusion and decreases in summer dissolved oxygen could reduce population productivity (Jager et al., 2013). In the Hudson River, Woodland and Secor (2007) found that flow volume and water temperature in the fall months preceding spawning were significantly correlated with subsequent year-class strength. Numerous aspects of Shortnose Sturgeon life history and ecology are linked to temperature, river flow, dissolved oxygen, salinity, but the effect of change in these environmental variables on Shortnose Sturgeon is unclear (Cech and Doroshov, 2005; Ziegeweid et al., 2008a, 2008b). Habitat models coupled with global climate models for the congener, European Atlantic Sturgeon (*Acipenser sturio*) indicate strong climate effects throughout the range, especially in the southern portions (Lassalle et al. 2010).

Life History Synopsis: Shortnose Sturgeon is an anadromous and land-locked fish species that occurs in rivers and estuaries from the St. John River, New Brunswick, to the St. Johns River, Florida (Able and Fahay, 2010). In northeastern United States waters, males of the species reach maturity in 3-5 years, females in 6-7 years; however the age at maturity is younger in the southeastern United States and older in Canadian waters (Musick, 2002). Spawning occurs from February in the southern areas to mid-

May in the northern areas in deep, swiftly moving, 9-12°C freshwater, over rocky substrate, in upstream areas of the main branch of large rivers (Musick, 2002; Able and Fahay, 2010). Benthic, adhesive eggs are deposited on the rocky bottom, then adults head back downstream as far as low-salinity estuarine water shortly after spawning (Musick, 2002; Able and Fahay, 2010). The large eggs hatch after 2 weeks and the demersal larvae remain hidden on the bottom for approximately 9 days before becoming active, photopositive swimmers and begin heading downstream (Musick, 2002). Larvae transform into juveniles at 57-67 mm (Able and Fahay, 2010). Larvae and juveniles occur in deep (>9 m) channels of the river with strong currents and sand or gravel substrates and remain in freshwater for at least 2 years (Able and Fahay, 2010). Juveniles are benthic foragers on crustaceans and insects and are consumed by perch (Able and Fahay, 2010). Adults spend most of their lives in rivers and low salinity areas of estuaries, but occasionally venture into near-coastal areas (Able and Fahay, 2010). Shortnose Sturgeons make seasonal migrations between spawning, feeding, and overwintering grounds. Summers are spent in areas with little or no current and cooler waters (Able and Fahay, 2010). Part of the population migrates upstream and overwinters near the spawning grounds, while the rest of the population remains in deep, higher-salinity areas until an upstream migration in spring just before spawning (Able and Fahay, 2010). Spent adults return to shallow, downstream, foraging habitat shortly after spawning (Musick, 2002). Adults prey on benthic crustaceans, insects, molluscs, small flounders, and polychaete worms (Musick, 2002; Able and Fahay, 2010). A long history of overfishing (for meat and caviar) and habitat destruction decreased the populations so much that Shortnose Sturgeon is listed as an endangered species in United States waters (NMFS, 1998) and a Species of Special Concern in Canada (COSEWIC, 2005).

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