

Shortnose Sturgeon - General Life Stage/Behavior Descriptions

We are providing this document to complement the data in the NOAA Fisheries GARFO Section 7 Consultation Areas located [here](#). The general descriptions below define the shortnose sturgeon life stages and behaviors used in the Consultation Areas.

Stage	Size (mm)	Duration	Description
Egg	3-4	13 days post spawn	Stationary on bottom; Cobble and rock, fresh, fast flowing water
Yolk-Sac Larvae (YSL)	7-15	8-12 days post hatch	Photonegative; swim up and drift behavior; form aggregations with other YSL; Cobble and rock, stay at bottom near spawning site
Post Yolk-Sac Larvae (PYL)	15-57	12-40 days post hatch	Free swimming; feeding; Silt bottom, deep channel; fresh water
Young of Year (YOY)	57-140 (north); 57-300 (south)	From 40 days post-hatch to one year	Deep, muddy areas upstream of the salt-wedge
Juveniles	140 to 450-550 (north); 300 to 450-550 (south)	1 year to maturation	Increasing salinity tolerance with age; same habitat patterns as adults
Adults	450-1100 average; (max recorded 1400)	Post-maturation	Freshwater to estuary with some individuals making nearshore coastal migrations

Eggs & Yolk-sac larvae (EYL)-N/A	Spawning occurs in low salinity waters (0.0-0.5 ppt) over hard bottom with interstitial spaces where eggs can adhere and settle (e.g., rock, cobble, gravel, limestone, boulder, etc.) (SSSRT 2010). Eggs adhere to the substrate quickly after being deposited. Development of eggs depends on water temperature, with hatch times ranging from approximately 8-13 days post spawn (Dadswell et al. 1984, p. 16; Buckley and Kynard 1981, p. 74). The yolk-sac phase lasts approximately 8-12 days and is characterized by “swim up and drift” behavior. Yolk-sac larvae are photonegative and seek cover in hard substrate. Yolk-sac larvae remain near the spawning site.
Post Yolk-sac Larvae (PYL)-Migrating & Foraging	The larval life stage has two phases, yolk-sac and post yolk-sac (PYL). PYL begin feeding (on aquatic insects, insect larvae, and other invertebrates) and are free-swimming; they disperse downstream of the spawning/rearing area. The PYL phase ends at about 40 days post-hatch. PYL are typically found in the deepest water available (Taubert and Dadswell 1980; Bath et al. 1981; Kieffer and Kynard 1993). Different studies have documented different preferred substrate (Parker 2007; Richmond and Kynard 1995). PYL are intolerant of salinity; therefore, they occur only in freshwater (Dadswell et al. 1984; Kynard 1997; SSSRT 2010).
Young of year (YOY)-Migrating & Foraging	YOY describes shortnose sturgeon that are from 40-days post-hatch to 1-year old. They are not tolerant to salinity, and remain above the salt front in the 0.0-0.5 ppt range for the entire first year. They occur over a wide range of depths and forage on benthic invertebrates over soft, typically muddy, substrate (SSSRT 2010; Carlson and Simpson 1987). Free passage between the salt front and spawning sites is necessary to support seasonal and physiologically-dependent movement, especially in the bottom meter of the water column (Kynard 1997, p. 331).
Juvenile-Migrating & Foraging	Juvenile shortnose sturgeon (from age 1 to maturation) become increasingly tolerant to salinity with age and size and can occur from freshwater to the river mouth as they make seasonal in-river migrations (SSSRT 2010). They forage on benthic invertebrates in areas with soft substrate (e.g., sand, mud) and a salinity gradient of 0.5-20 ppt (Bain 1997, p. 353; Ziegeweid et al. 2008, p. 1494).
Juvenile-Overwintering	There is limited data on where juvenile shortnose sturgeon overwinter. In some rivers, juveniles overwinter with adults and in some rivers they do not (SSSRT 2010; Bain 1997, p. 351-353). Overwintering typically occurs in low salinity waters. In some rivers, juveniles have a more dispersed

	overwintering strategy rather than the typical dense aggregations formed by adults (SSSRT 2010, p.194).
Adult-Migrating & Foraging	Adult shortnose sturgeon move throughout the river during the year, remaining in important resting and feeding areas for extended time periods (Hastings et al. 1987; Kieffer and Kynard 1993). The exact migratory pattern varies by river system but typically involves: 1) spawning adults moving from overwintering areas to upriver spawning sites in the spring; 2) downstream movements to feeding areas lower in the river in the later spring; 3) movements to overwintering areas in the fall. Adult shortnose sturgeon move up river towards spawning grounds in the spring, can be found throughout the river and estuaries during the warmer months, and over winter at optimal sites that may vary year to year (Kynard 1997, p. 328). Adults feed primarily from the spring-fall over soft substrates (mostly sandy-mud) on benthic insects, crustaceans, mollusks, polychaetes, gastropods, and small benthic fish (Dadswell et al. 1984; numerous references cited in SSSRT 2010). Temperatures above 28°C are considered stressful for sturgeon. Dissolved oxygen (DO) affects distribution, with preference shown for waters with DO levels at or above 5 mg/L (with specific conditions dependent on temperature and salinity).
Adult-Overwintering	Overwintering patterns vary by river and across the species range. In northern rivers, adults form dense aggregations in deeper segments of the river (3-10m; Kynard et al. 2012; Dadswell 1979; Li et al. 2007). The activity level of shortnose sturgeon during the winter varies widely throughout the range. In some rivers, overwintering occurs only in freshwater; in other rivers, overwintering occurs in the mixing zone (SSSRT 2010). Overwintering typically occurs over soft substrates but can also occur over gravel (SSSRT 2010).
Adult-Spawning	Spawning adult shortnose sturgeon migrate from overwintering sites to spawning sites in the early spring, stimulated by changing riverine conditions including day length, temperature, and river discharge (Kynard et al. 2012, p. 188). Habitat necessary for spawning is hard bottom substrate (e.g., rock, cobble, gravel, limestone bedrock, etc.) in low salinity waters (0.0-0.5 ppt). Spawning sites are typically located close to the upstream limit of shortnose sturgeon distribution in a river (SSSRT 2010). Spawning typically occurs when water is well-oxygenated, flowing can be influenced by temperature (Kynard 1997, p. 325-326). Spawning occurs from a few days up to 30 days, depending on conditions in a given year (SSSRT 2010).

Adult-Marine Migrating & Foraging	Limited data exists on the use of marine waters by shortnose sturgeon; outside of the Gulf of Maine (Penobscot River, ME to Merrimack River, MA), marine migrations are not known to be part of the shortnose sturgeon life history strategy. Within the Gulf of Maine, a portion of adults makes seasonal migrations along the coast, traveling between the Penobscot, Kennebec, and Merrimack rivers and making short stops in smaller coastal rivers along this route (Zydlewski et al. 2011, pp. 42-44). It is unknown if foraging occurs in marine waters. All of these marine migrations have been documented in the April – November period. Outside the Gulf of Maine, marine migrations have only rarely been documented.
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