

Green Sturgeon

History of the Fishery

Historically, the green sturgeon (*Acipenser medirostris*) resource has been of minor importance to Californians, although they may have been more important to American Indians in the north coast area. An early commercial fishery developed for sturgeon in the San Francisco Bay estuary between the 1860s and 1901, stimulated by a growing acceptance of smoked sturgeon and caviar on the East Coast of North America. However, green sturgeon probably were a minor component of that fishery, as they were considered to be of inferior quality and were actually claimed by some people to be poisonous. The commercial fishery was closed in 1901, then reopened from 1909 to 1917. Commercial sturgeon fishing in California ceased in 1917.

Sport fishing for green sturgeon was legalized in 1954, with a 40-inch total length minimum size limit and a one fish per day per person creel limit. In 1956, snagging for sturgeon was outlawed and the minimum size limit was raised to 50 inches through 1963. The sport fishery for green sturgeon in California is small, being overshadowed by the sport fishery for white sturgeon in the San Francisco Bay estuary and its tributaries and by the tribal green sturgeon fishery in the Klamath River. Exact sport catch data are not available. However, concern about potential over-harvest of white sturgeon in the late 1980s led to angling regulation changes starting in 1990 that instituted a 72-inch maximum size limit and increased the minimum size limit by two inches per year until a new minimum size of 46 inches was reached in 1992. These regulation changes have also benefitted green sturgeon.

Status of Biological Knowledge

Green sturgeon are generally found in marine waters from the Bering Sea to Ensenada, Mexico. However, spawning populations have been found only in medium-sized rivers from the Sacramento-San Joaquin system north; spawning has not been documented in either the Columbia or Fraser rivers. Green sturgeon apparently spend much less time in the San Francisco Bay estuary than white sturgeon, either as young or adults. Adult green sturgeon probably enter the estuary and move up the Sacramento River in early spring. Spawning occurs as far upstream as the area above Red Bluff Diversion Dam, which is now open to allow fish passage during part of the green sturgeon spawning period. Anecdotal evidence suggests that spawning may also occur in the Feather River but has not yet been documented there. Almost all recoveries from a tagging program in the San Francisco Bay estuary have come from outside the estuary, primarily from rivers and coastal areas in Oregon and Washington.

California green sturgeon grow rapidly when young, probably reaching 12 inches fork length in one year. Juvenile green sturgeon raised in captivity grow substantially faster than white sturgeon raised under similar conditions. Relatively rapid growth continues until they reach 51-55 inches in about 15-20 years. Maximum size in the Klamath River in recent years has been about 90 inches and about 180 pounds, but historical accounts report fish up to 350 pounds. Like white sturgeon, their growth is likely affected by water temperature and dissolved oxygen concentration. The largest recently captured fish from the Klamath River were estimated to be about 40 years old.

Compared with most freshwater or anadromous fishes, green sturgeon are quite old (15-20 years) when they become sexually mature. Fecundity varies with female size, ranging from 60,000-140,000 eggs per female. These values are lower than for white sturgeon, both because green sturgeon are smaller than white sturgeon and because green sturgeon eggs are larger than white sturgeon eggs.

Spawning occurs in the Sacramento River between March and June; it may extend slightly longer, into July, in the Klamath River. Water temperature during spawning is likely 50° to 70°F. Little is known about spawning behavior. Spawning occurs in deep, fast water. The fertilized eggs are slightly adhesive and hatch after four to 12 days. Larvae stay close to the bottom and appear to rear primarily in rivers well upstream of estuaries. Under hatchery conditions, larval green sturgeon remain near the bottom and do not move up into the water column where they could be transported downstream. Most young green sturgeon migrate from river to ocean when they are one to four years old, which may partly explain their relative scarcity in the San Francisco Bay estuary.

Green sturgeon feed on a variety of bottom-dwelling animals. Sturgeon feed by suction with their ventral, protrusible mouths. Dense aggregations of taste buds on their four barbels presumably assist in identification of food on the bottom. Young sturgeon (eight inches) feed pri-



Green Sturgeon, *Acipenser medirostris*
Credit: DFG

marily on small crustaceans such as amphipods and opossum shrimp. As they develop, they take a wider variety of benthic invertebrates, including various species of clams, crabs, and shrimp. Larger green sturgeon diet includes fishes.

Little is known about predators on green sturgeon. Smaller fish are undoubtedly taken by various fish and bird predators, although the five lines of sharp, bony scutes along their bodies probably make them less desirable prey than most other species. Information from the Columbia River suggests that total mortality of green sturgeon is less than for white sturgeon.

Status of the Population

Because green sturgeon spend most of their lives in the ocean and are not readily available to the sport fishery or sampling programs in estuaries or rivers, their population status is difficult to determine. Although green sturgeon have never been abundant, limited evidence suggests that the overall population may have declined in California. This is supported by the apparent extirpation of the species from some rivers, such as the Eel and South Fork Trinity, leaving the Sacramento, Klamath, and mainstem Trinity rivers as the only documented spawning streams in California, along with the Rogue and Umpqua rivers in Oregon. However, abundance estimates in the San Francisco Bay estuary, based on mark-recapture estimates of white sturgeon abundance and the ratio of white to green sturgeon in tagging catches, do not suggest that the population has declined in that system. Additionally, the recent opening of the Red Bluff Diversion Dam gates during much of the spawning period has provided green sturgeon with access to additional spawning area upstream of Red Bluff. Catches of juvenile green sturgeon during sampling for downstream-migrant chinook salmon smolts at the dam in midsummer indicates that they have taken advantage of this additional spawning habitat. The number and size distribution of green sturgeon caught incidental to a commercial salmon fishery in the lower Columbia River leads Oregon biologists to suggest that "tens of thousands" of green sturgeon inhabit the ocean offshore of Oregon and Washington.

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