

Threatened fishes of the world: *Scaphirhynchus albus* (Forbes & Richardson, 1905) (Acipenseridae)

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Common name: Pallid sturgeon (E)

Conservation status: Listed under Endangered Species Act as Federally Endangered (Federal Register 1990). Currently receives federal protection, detailed recovery plan prepared by Dryer & Sandvol (1993).



Identification. One of three species of *Scaphirhynchus* distinguished by having pallid cream, gray, or whitish head, body, and fin coloration in mature adults, very small orbit diameter; elongate and pointed snout, inner barbels positioned anterior to outer barbels, few to no sharp, retrose spines on snout tip and anterodorsal to cyc, and poorly developed squamation on venter. Other features include different number of dorsal plates, anus to anal fin plates, plates posterior to anal fin, lateral plates anterior to dorsal fin origin, anal and dorsal fin rays, and head, fin, and body proportions, relative to its close relatives *S. platyrhynchus* and *S. suttkusi*. One of the most detailed morphological analyses currently available was presented by Bailey & Cross (1954); recent morphological comparisons and analyses presented by Keenlyne et al. (1994a) and Mayden & Kuhajda (1996). Illustration from Forbes & Richardson (1920).

Distribution. Endemic to Mississippi River Basin but naturally limited to the Missouri and lower Mississippi river drainages (Bailey & Cross 1954). Historic range includes the Atchafalaya River, lower Mississippi River upstream to confluence with Missouri River, and Missouri River (Keenlyne 1995). The species has never been found to occur in either the Ohio or upper Mississippi rivers where the shovelnose sturgeon, *S. platyrhynchus*, typically abounds. **Abundance.** Species rare, abundance declined markedly following channelization and dam construction in the lower Mississippi and Missouri rivers. These activities not only limit migratory routes of the species but have largely curtailed natural Spring flooding periods that are thought to trigger spawning. Habitat alterations have also impacted the naturally turbid characteristics of the Missouri and lower Mississippi rivers to the extent that forage species are declining and the typical turbid, large-river habitat of the pallid sturgeon has declined. Riverine ecosystems historically occurring in these major waterways are being replaced with lentic habitats that are less turbid and with aquatic species adapted to these clear, lentic environments (Pflieger & Grace 1987). Dryer & Sandvol (1993) provide detailed account of the distribution and abundance of this species. **Habitat and ecology.** Life history aspects of *S. albus* are relatively poorly known. Species is found in large river channels with considerable diversity in microhabitats. They are usually associated with rapid current over sand, gravel or rocky substrates (Kallemeyn 1983, Carlson et al. 1985, Erickson 1992). Known to prefer turbid water conditions that historically characterized the Missouri and lower Mississippi rivers. Diet of adults is dominated by fishes, typically large-river minnows and shiners (Cyprinidae) (Erickson 1992). Based on observed food habits, the pallid sturgeon depends on the historical, naturally occurring turbid water conditions to conceal itself from prey items (Keenlyne 1995). The documented decline of many cyprinid species known to serve as regular food items for the pallid sturgeon is likely involved in its imperilment. Relative to the shovelnose sturgeon, growth is much more rapid throughout various age groups (Carlander 1969, Ruelle & Keenlyne 1993). Pallid sturgeon may weigh up to 45 kg (Brown 1971); males reach 39 years of age, while females may live as long as 41 years (Ruelle & Keenlyne 1993). **Reproduction.** Reproductive biology poorly known. Spawning believed to occur between April and mid June, depending upon latitude (Keenlyne & Jenkins 1993). Males mature at 53 to 58 cm or 5 to 7 or 9 years, with 2- or 3-year intervals between spawning; size of females at maturity unknown, but estimated to occur by 9 to 12 or 15 to 20 years of age, with 3- to 10-year intervals between spawning (Kallemeyn 1983, Dryer & Sandvol 1993, Keenlyne & Jenkins 1993). Like shovelnose sturgeon, pallid sturgeon have been observed to possess mature gametes during periods coinciding with high river flow levels, possibly indicating that onset of spawning is initiated by typical Spring flooding of rivers. Spawning habitat not known. Gross habitat modifications made to the large river habitats in the Mississippi and Missouri river drainages through channelization and dams for navigational purposes preclude an accurate appraisal of the natural spawning habitats of this rare species. Under natural conditions it likely spawns in fast-flowing sections of the main-stem portions of the rivers. Because very few records exist for the species outside of main rivers, this species may not ascend smaller tributaries to spawn as does the shovelnose sturgeon. Although unknown for pallid sturgeon, eggs of shovelnose sturgeon are adhesive and require current for proper development, indicating that both a stable and silt-free substrate is necessary for their successful development. Hatching probably occurs in five to eight days under natural conditions (see Mayden & Kuhajda 1996). **Threats.** The gross human-induced habitat modifications in the Missouri and lower Mississippi rivers are the primary factors involved in the decline of the pallid sturgeon. These alterations, made primarily under the guise of navigation and flood control, have resulted in regulated flow patterns of these major rivers and have created habitats more lentic than lotic. Both of these conditions differ radically from the natural habitats to which the pallid sturgeon is adapted (e.g., braided channels, irregular flow patterns, flooding of terrestrial habitats, extensive

microhabitat diversity, and turbid waters) These changes have also reduced the natural forage base of the pallid sturgeon, another likely reason for its decline. Purported cases of hybridization with the shovelnose sturgeon (incidentally or intentionally occurring) may also be detrimental to the pallid sturgeon populations. **Conservation action.** This species was listed as endangered by the U.S. Fish and Wildlife Service on 6 September 1990 (Federal Register 1990). A panel of scientists has been assembled to serve as an advisory group for the recovery of this species, they have developed a recovery plan that may eventually lead to downlisting the pallid sturgeon (Dryer & Sandvol 1993). The major elements in the recovery of the species include establishing three wild-caught broodstock populations in different hatcheries; captive breeding, propagation, and stocking; protection of wild individuals, and habitat restoration in designated areas of the Missouri and lower Mississippi rivers. **Conservation recommendation:** Restoration of natural habitat and migratory patterns are essential. The historic habitats in the Missouri and lower Mississippi rivers must be restored in sections of these systems to provide appropriate microhabitats for pallid sturgeon foraging, spawning, and migration. Natural migratory patterns may be reestablished for the pallid sturgeon with the development of novel structures associated with dams that assist this species and others with overcoming these barriers. **Remarks.** Considerable interest exists as to whether the pallid and shovelnose sturgeon are different species. Much of this concern stems from the genetic study by Phelps & Allendorf (1983) wherein 'hybrid' and parental sturgeon were examined and no genetic differences were detected for these species at 37 loci. This study is technically and theoretically flawed and should not be used as either a basis for the existence of hybridization between these sturgeon species or for determining genetic variation either within or between these species. Their study employed buffer media standard for salmonid fishes, did not provide an adequate examination of differing environmental conditions for electrophoretic examination of protein variation, and did not demonstrate any empirical evidence for the existence of purported hybrids between these species. Unfortunately, because of the above study and that by Carlson et al. (1985), some biologists and laypersons have preconceived notions that hybridization between the pallid and shovelnose sturgeon is common in the wild. However, there is no empirical evidence to support this premise. To the contrary, in addition to these species possessing different geographic distributions, there are abundant morphological, behavioral and ecological attributes that may be used to distinguish these species.

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