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The status of the smalltooth sawfish, *Pristis pectinata* Latham 1794 (Pristiformes: Pristidae) in the United States

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ABSTRACT

Historic records suggest that during the 19th century, the smalltooth sawfish, *Pristis pectinata* Latham, was a common resident of the Atlantic and Gulf coastal waters of the southeastern United States. During the 20th century, it has been recorded with declining frequency. Today, the species can no longer be considered a functional member of the nearshore coastal community of the northwest Atlantic. This decline appears to have gone unrecognized by fishery management agencies and the conservation community. Due to limited reproductive capacity and an affinity for coastal waters which are heavily fished, stocks of this species have undergone range-wide depletion and are in need of protection under management and conservation regulations.

INTRODUCTION

Pristis pectinata Latham 1794, is the largest of the sawfishes, reaching lengths of 6 m (Bigelow and Schroeder 1953). It is most common in nearshore ocean waters less than 10m deep (van der Elst 1981, Schwartz 1984) and there are many records from estuarine environments (Yarrow 1877, Bigelow and Schroeder 1953, Swingle 1971).

The diet of *Pristis pectinata* is primarily fish, but it also consumes crustaceans and other bottom dwelling organisms (Bigelow and Schroeder 1953). Breder (1952) summarized the function of the saw in the feeding strategy of *P. pectinata*, noting that prey is impaled on the rostral teeth then scraped-off on the bottom and consumed. Because of its size and abundance, *P. pectinata* was a major seasonal predator in nearshore and estuarine waters of the southeastern United States before the twentieth century. Its significance in the natural functioning of these systems is unknown. Van der Elst (1981) reported that, in South Africa, female *Pristis pectinata* enter estuarine waters

to give birth. In North America, young are probably born from late spring through the summer (Bigelow and Schroeder 1953). Being ovoviviparous, *P. pectinata* has low fecundity, with large females giving birth to only 15-20 young per year. Maturation is presumed to be slow, but available literature is silent on this issue.

West and south of Port Arthur, Texas, *Pristis pectinata* is sympatric with *Pristis perotteti* Müller and Henle, 1841, and *P. perotteti* has been noted to stray as far east as peninsular Florida. Because of this range overlap and similarities in overall appearance, some confusion between the two species occurs in the literature. Baughman (1943) discussed and clarified this issue. While many subtle differences are apparent, *P. pectinata* in the region can usually be separated from *P. perotteti* by the rostral teeth; *P. pectinata* bearing 25-32 pairs, *P. perotteti* 16-19 pairs. A few instances of overlap in tooth count have been reported; in such cases, reference to other characters is necessary.

MATERIALS AND METHODS

Record keeping for landings of *Pristis pectinata* has been virtually nonexistent in the United States, making trend and stock assessment based on actual numbers impossible. Early accounts of its occurrence in the United States used imprecise terms such as "seasonal," "common" and "abundant," all of which mean different things to different people. Compounding this difficulty, historic sawfish records from the Gulf of Mexico are sometimes impossible to interpret correctly as there is insufficient evidence provided to distinguish whether the fish in question is *P. pectinata* or *P. perotteti*.

Old and recent literature documenting results of coastal fishery surveys was examined in order find reliable records of *Pristis pectinata*. While old records proved abundant, this approach failed to disclose any recent records. Consequently, all state fisheries management agencies from New York south and west to Texas were contacted and asked for any records of recent landings. In addition, research institutions and museums with marine holdings were contacted. From the response to these inquiries, a fairly clear picture of the status of *P. pectinata* was obtained.

RESULTS

Pristis pectinata and its congeners have occupied suitable habitats worldwide, with forms of *P. pectinata* noted from: the eastern Atlantic in Senegal, West Africa; the western Atlantic; the Pacific coast of Central America (possibly *P. perotteti*, needs verification); South Africa; and the Indo-west Pacific, including the Red Sea, India, Burma, and the Philippines (Bigelow and Schroeder 1953, van der Elst 1981, Compagno and Cook 1995). Whether populations outside of the western Atlantic represent *P. pectinata* sensu stricto is unknown.

The historical breeding range for *Pristis pectinata* in the western Atlantic was from central Brazil throughout the Caribbean and Gulf of Mexico north to the St. Johns River in Florida. During the northern hemisphere summers, the species would expand its range northward along the Atlantic seaboard to the mid-Atlantic states; similar movements to the south during southern hemisphere summers may also occur (Pozzi and Bordale 1935, in Bigelow and Schroeder 1953). North of Florida, most western Atlantic records are of large specimens (> 4 m) which followed warm water north during the summer months.

The earliest western Atlantic record of *Pristis pectinata* is an account given by Schöppf (1788, as *Squalis pristis* (Bonnaterre)) in which he relates a 15-foot specimen taken off New York in July, 1782, with anatomical detail sufficient to allow assignment of the specimen to *P. pectinata*. To date, this remains the only record of the species from New York waters and the northernmost reliable record of the species along the North American coast. Enough records are available to determine that *P. pectinata* migrated north along the coast during the summer months but was not a permanent resident in western Atlantic waters north of Florida. Confirmed and anecdotal records are available for every Atlantic and Gulf coastal state south of New York except Delaware and Georgia, and for the sake of brevity they are not repeated here. Interested readers should consult Bigelow and Schroeder (1953) and Compagno and Cook (1995) for complete listings. While no records document *P. pectinata* in Delaware and Georgia, it certainly frequented the waters of these states given its occurrence both to the north and south of each.

While *Pristis pectinata* occurred in the mid-Atlantic region only during the summer months, it was apparently abundant during this period. In discussing the fishes of Fort Macon, North Carolina, Yarrow (1877) relates that *P. pectinata* is "abundant in brackish rivers emptying into Bogue and [Core] sounds. It is frequently taken in the New River..." Thirty years later, Smith (1907) is less emphatic in stating that the species is "not rare in the sounds and brackish rivers of North Carolina... In the Beaufort region and at Cape Lookout the species is observed almost every year, and some seasons is common." Jordan and Gilbert

(1882) reported *P. pectinata* from South Carolina after observing skins and saws taken from its waters but gave no indication of its abundance.

Pristis pectinata was once a major component of the nearshore and estuarine fauna of peninsular Florida. According to Evermann and Bean (1897) it was "an abundant species" and a permanent resident of the Indian River system. They further related the incidental capture of 300 *P. pectinata* from this system by one fisherman in a single season. In like manner, Henshall (1895, in Bigelow and Schroeder 1953) relates reports of hundreds occurring on the Gulf coast of the peninsula.

In the Gulf, our knowledge of the historic abundance of *Pristis pectinata* becomes clouded by a paucity of reporting and uncertainty of identifications due to a sympatric population of *Pristis perotteti* west of Port Arthur, Texas (Baughman 1943). Breder (1948) reports *P. pectinata* as "common in the Gulf of Mexico." Boschung (1957) reported *P. pectinata* as "not uncommon" in Alabama waters. In Texas, sawfishes were apparently abundant as Baughman (1943) reported that both *P. pectinata* and *P. perotteti* were "frequently taken" during early months of the year at Galveston and Freeport and that *P. pectinata* was "plentiful" in Brown Cedar Cut in May and June. Caldwell (1990) provides confirmation, noting that prior to the 1960's recreational fishermen took "many sawfish."

After a thorough review of available records, Bigelow and Schroeder (1953) considered *Pristis pectinata* to be "abundant" in Texas and "plentiful" in Florida. However, by 1957, *Pristis pectinata* was no longer being reported in fisheries surveys of the Beaufort, North Carolina region. Tagatz and Dudley (1961) reported the findings of monthly fisheries surveys of estuarine and inlet habitat in the area conducted over a four-year period and did not encounter *P. pectinata*. This trend continued south into South Carolina where Bearden (1965) reported "only one authentic record of it in the last ten years." Dahlberg and Odum (1970) reported results of trawling every three weeks from January 1967 to February 1968 in Georgia sounds and no *P. pectinata* were captured. About that same time, Miller and Jorgenson (1969) also sampled the ocean and sounds around Brunswick, Georgia, with no *P. pectinata* documented.

Snelson and Williams (1981) conducted a three and one-half year study of the elasmobranch fishes of the Indian River Lagoon System in Florida and captured no *Pristis pectinata*, a finding the authors termed "dramatic." They further speculated that the decline was caused by "heavy mortality associated with incidental captures by commercial fishermen" since it seemed to predate most of the manmade alterations of the area. The absence of *P. pectinata* from this system was subsequently confirmed by Schmid et al. (1988).

Gulf populations may have persisted longer. Swingle (1971) reported "two sawfish, both about 1m long" from Mobile Bay in July 1968. Baughman (1952) reported that sawfish breed off the Texas coast but Caldwell (1990) reported that sawfishes in Texas are "now apparently a footnote in outdoor history."

Since 1993, we have been seeking landing records for this species from state fishery management agencies and large museums from New York south and west to Texas. From the responses received (Table A), it appears that the species no longer occurs along the eastern seaboard and that by the 1970's, the species was restricted in the Gulf of Mexico to a few restricted locales in Florida, Louisiana, and Texas waters. Whether the species is still reproducing in any of these states is unknown. It is possible that the individuals that are still occasionally taken in the Gulf of Mexico have their origins outside United States territorial waters.

DISCUSSION

Reasons for decline

Due to limited record keeping in the past, a precise chronology of the decline of *Pristis pectinata* in United States waters is not possible. However, since estuarine and nearshore waters were the first and most readily exploited habitats for commercial fishing, some impacts to *P. pectinata* populations probably began soon after colonization. Although there are no known records to support substantial earlier harvest, there is no reason to believe that such harvest did not occur. Lawson (1709) reports a "swordfish," which almost certainly was *P. pectinata*, as among the fishes consumed by Native Americans in the Carolinas.

Reports of *Pristis pectinata* becoming entangled in fishing nets are common in the early literature. Entangled specimens frequently had to be cut free, causing extensive damage to nets, and presented a substantial hazard if brought on board. For these reasons, *P. pectinata* was considered a nuisance by fishermen and most specimens were either killed outright or released only after removal of their saw, an action that, in most cases, probably resulted in mortality.

Snelson and Williams (1981) attribute the loss of the species from the Indian River directly to the activities of commercial fishing. We find no reason to doubt this conclusion but would add that, based on the observations of Caldwell (1990), recreational fishing may have also played a substantial role. Over-exploitation of *Pristis perotteti*, similar to *P. pectinata* in size and fecundity, has led to severe population reductions for that species in Lake Nicaragua (Thorson 1976). Given that many of the largest, and therefore most productive, specimens of *P. pectinata* traveled up the coast, there is no reason to believe that harvest of these individuals could not significantly affect the sustainability of the population. Other factors that may

have contributed to the decline of *P. pectinata* populations, and may still be limiting its recovery today, include population reductions in prey species and pollution of nearshore and estuarine waters.

Implications for the future

Given the decline in recorded abundance, limited reproductive capacity and a documented heavy take by commercial and recreational fishermen, it appears that *Pristis pectinata* has been eliminated as a functional component of the nearshore fauna of the United States. Due to its early decline and a lack of commercial value for the species, this extirpation went unnoticed by management agencies. With the current fishing pressure being placed on coastal fishing stocks worldwide and the increasing efficiency of equipment being used, there is little reason to believe that the decline of *P. pectinata* has occurred only in the United States. This species, and other species of sawfish, need protection from over harvest under international conservation and management agreements. In the United States, only Florida currently prohibits the take of sawfish. Stock assessments of all sawfish populations are urgently needed and future takes should be closely monitored.

Diagnostic tools for assessing genetic differentiation should be employed to determine whether *Pristis pectinata* stock of the western Atlantic is distinct from that of the eastern Atlantic/Mediterranean, and how these Atlantic stocks compare with those of the Indian and Pacific Oceans. Since substantial distance and temperature barriers separate these stocks, it is quite possible, if not probable, that significant genetic divergence has occurred.

Identification of remaining nursery areas for *Pristis pectinata* in western Atlantic waters should be given high priority and, once found, should receive the level of protection necessary to assure continuous successful recruitment of young into the population. However, even under ideal circumstances, the recovery potential of *Pristis pectinata* populations will be limited by the low fecundity and apparent late sexual maturation of the species. Given the fishing pressures and water quality degradation occurring in the coastal waters of North America today, it is doubtful that *P. pectinata* populations can ever recover to historic levels.

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Table A. Recent records of *Pristis pectinata* in Atlantic and Gulf waters

STATESOURCECOMMENT

ALL	National Museum Natural History	No recent records
NY	NY State Dept. Environmental Conservation	No recent records
NJ	NJ Division of Fish, Game and Wildlife	No recent records
DL	DL Dept. Natural Resources & Environmental Control	No recent records
MD	MD Department of Natural Resources	No recent records
VA	VA Institute of Marine Science	No records since collecting began in 1967
NC	NC State Museum of Natural Sciences	No recent records
NC	UNC Institute of Marine Science	Last record for state, 27 June 1963, 0.5 mi off Carolina Beach (4600 mm TL). N=1
SC	SC Wildlife & Marine Resources Department	Last known record, 7 August 1958, off Georgetown (4572 mm TL) N=1
GA	GA Department of Natural Resources	No recent records
FL	FL State Museum Fish Collection	Six specimens between 1953 and 1983, all Gulf N=6
FL	FL Department of Environmental Protection	Two specimens, both 27 May 1959, Old Tampa Bay, (897 mm and 810 mm TL). One specimen, 27 January 1994, between Key West and Dry Tortugas (4310 mm TL) N=3
AL	AL State Department of Conservation and Natural Resources	Last specimens in 1968, only anecdotal reports since N=2
MS	MS Department of Wildlife, Fisheries and Parks	Gulf Coast Research Laboratory Museum Two records: 1) 19 July Belle Fontaine Point (young specimen); 2) 10 August 1966, Mississippi Sound near Dear Island (young specimen) N=2
LA	LA Department of Wildlife and Fisheries	Between 1978 and 1992, landings in 7 years; between 20 and 2,000 lbs. per year of record N=2 1/2 for 7 yrs
TX	TX Parks and Wildlife Department	Two records since 1974: 1) 7 August 1979, Carancahua Bay (1700 mm TL); 2) 24 April 1984, Aransas Bay (1500 mm TL) N=2

Notes: NY = New York, NJ = New Jersey, DL = Delaware, MD = Maryland, VA = Virginia, NC = North Carolina, SC = South Carolina, GA = Georgia, FL = Florida, AL = Alabama, MS = Mississippi, LA = Louisiana, TX = Texas.