

RECENT OCCURRENCE OF THE SMALLTOOTH SAWFISH,
PRISTIS PECTINATA (ELASMOBRANCHIOMORPHI:
PRISTIDAE), IN FLORIDA BAY AND THE FLORIDA KEYS,
WITH COMMENTS ON SAWFISH ECOLOGY

GREGG R. POULAKIS⁽¹⁾¹ AND JASON C. SEITZ⁽²⁾

⁽¹⁾Florida Marine Research Institute, Florida Fish and Wildlife Conservation Commission,
Charlotte Harbor Field Laboratory, 1481 Market Circle, Unit 1, Port Charlotte,
Florida 33953-3815 and Department of Biological Sciences, Florida Institute of Technology,
150 West University Boulevard, Melbourne, Florida 32901-6975

⁽²⁾Collier County Environmental Services Department, 2800 North Horseshoe Drive,
Naples, Florida 34104

ABSTRACT: Encounters with the smalltooth sawfish, *Pristis pectinata*, in Florida Bay and the Florida Keys were documented by soliciting information from anyone who might have encountered them in these areas. Each person who had information was asked the same series of questions to determine the date and location of the encounter, estimated total length (ETL), and habitat characteristics. A total of 1,632 sawfish encounters occurring between 1990 and 2002 were reported to us (89% occurred between 1998 and 2002). Sawfish were encountered during the day and night. Most sawfish were probably immature when encountered. The smallest sawfish (≤ 1 m ETL) were found in ≤ 2.4 m of water and virtually all larger immature sawfish (1.1–2.9 m ETL) were found in ≤ 10 m of water. The largest sawfish (≥ 3 m ETL) were found in shallow water (≤ 10 m) and deeper water (to 122 m). This study is the first to document the regular occurrence of smalltooth sawfish in water deeper than 10 m. A wide variety of habitat types were reported and included mud, sand, seagrass, limestone hard bottom, rock, coral reef, and sponge bottom. Most sawfish encounters in Florida occurred between March and August, though numerous encounters were reported throughout the year. Most encounters consisted of a single sawfish being observed or caught on hook and line, but groups of 2–20 similar-sized individuals were also reported. These data support our previous observation that the United States sawfish population is larger than previously estimated, and that sawfish are relatively common in south Florida.

Key Words: Endangered species, Everglades, Florida Bay, Florida Keys, largetooth sawfish, nursery, *Pristis pectinata*, *Pristis perotteti*, *Pristis pristis*, ray, smalltooth sawfish

SAWFISHES belong to a small group of batoid elasmobranchs that are cosmopolitan in coastal tropical and subtropical waters, including estuaries and freshwater (Bigelow and Schroeder, 1953; Last and Stevens, 1994). As the name implies, these fishes possess an elongated, blade-like snout (rostrum) that has lateral, tooth-like denticles (rostral teeth) set in sockets. The rostrum, often referred to as the “saw”, is used during feeding and for defense (Breder, 1952; Compagno and Last,

¹ Correspondence: poulakis@comcast.net; www.floridasawfish.com

1999). Despite their worldwide distribution and distinct morphology, little is known about the biology of this group of fishes.

Although worldwide sawfish systematics remain unsettled (Compagno and Cook, 1995), two species of sawfishes (*Pristis pectinata* Latham, 1794 and *Pristis perotteti* Müller & Henle, 1841) have been historically recognized in the western Atlantic (*P. perotteti* has recently been referred to by some authors as *P. pristis*). Both western Atlantic species are found in similar habitats (Bigelow and Schroeder, 1953; McEachran and Fechhelm, 1998), but the largetooth sawfish, *P. perotteti*, typically ranges south and west of Florida (Baughman, 1943; Thorson, 1974). The vast majority of published records of sawfish encountered in Florida refer to the smalltooth sawfish, *P. pectinata*, with hundreds having been historically reported from both coasts of the state (e.g., Henshall, 1895; Evermann and Bean, 1898). The largetooth sawfish has only been reported three times in the state, the last time being prior to 1960 (Seitz and Poulakis, 2002). Thus, we assume that the extant sawfish in Florida are *P. pectinata*.

In Florida, smalltooth sawfish were regularly reported in early ichthyofaunal surveys (e.g., Henshall, 1891; Evermann and Bean, 1898), but for a variety of reasons the species became scarce in the state. Because of their unique morphology and large size, sawfish have been particularly susceptible to fishing nets (Evermann and Bean, 1898). Although sawfish were not targeted commercially, removing them from nets often involved killing the animals for logistical and safety reasons (Henshall, 1895). Fishing mortality, combined with K-selected life history, caused sawfish populations to decline in the United States during the nineteenth and twentieth centuries (Snelson and Williams, 1981; Hoenig and Gruber, 1990). Because of the population decline, conservation efforts directed toward western Atlantic sawfishes have been initiated from various organizations beginning in 1992, such as the World Conservation Union, the State of Florida, and the American Fisheries Society (IUCN, 1996; Florida Fish and Wildlife Conservation Commission, 1999; Musick et al., 2000). The smalltooth sawfish was listed as endangered in the United States under the Endangered Species Act on April 1, 2003 (United States National Marine Fisheries Service, 2003).

Seitz and Poulakis (2002) used an interview method to document the occurrence of smalltooth sawfish in Florida. This research demonstrated the existence of a reproductive population of sawfish in the United States, allowed us to take the first steps toward understanding sawfish ecology in Florida, and helped us realize that sawfish were being captured to the south of our original study area. The survey has been successful (despite obvious limitations) because it has bridged the gap that exists between scientists and laymen. Because of the success of this initial data collection effort, we expanded our encounter database and our methodology has been adopted by other sawfish researchers. Incidental captures of sawfish have been occasionally reported in the literature from Florida Bay and the Florida Keys (e.g., Tabb and Manning, 1961; Starck, 1968; Sogard et al., 1989), but to date, no studies have focused on sawfish in these areas of the state. The goals of this study were to: (1) document the location of recent (1990–2002) encounters with smalltooth sawfish in Florida Bay and the Keys and (2) further define aspects of sawfish ecology in Florida.

STUDY AREA—A wide range of habitats exist in the south Florida study area. Shallow, seagrass-covered, carbonate mudbanks are a common feature in Florida Bay, a large (1500 km²) lagoonal estuary situated between the Florida Keys and the mainland (Sogard et al., 1989). The mudbanks are typically flat on top and slope into various relatively shallow basins. In general, mudbanks toward the eastern side of Florida Bay are long and narrow, and banks on the western side are wider and larger. Florida Bay supports macroalgal, mud bottom, and hard bottom communities. It has extensive mangrove and saltmarsh shorelines, and constitutes the southernmost portion of Everglades National Park (Fernald and Purdum, 1998). Since the late 1800s, the Everglades ecosystem, which naturally drained into Florida Bay, has been ditched and drained for farming and flood control. Today, about 80% of the water that historically passed through the Everglades and emptied into Florida Bay is discharged to east and west coast estuaries (Fernald and Purdum, 1998).

In contrast to Florida Bay, the Florida Keys and their associated coral reef tract have physiographic characteristics and species compositions similar to the tropical reefs of the Bahamas and the Caribbean (Fernald and Purdum, 1998). The reef tract is comprised of bank reefs (primary reef systems; 7 to 15 km seaward of the larger Keys), patch reefs (smaller, isolated reefs typically found between shore and bank reefs), and Dry Tortugas reefs (more staghorn coral, ca. 139 km west of Key West). In general, bank reefs consist of elongate limestone spurs (covered with macroalgae and living corals) and grooves (valleys of sand and rubble between the spurs). Patch reefs are typically found associated with seagrass beds in water ca. 2 to 9 m deep.

MATERIALS AND METHODS—Because of their unusual appearance and relatively large size, sawfish are easily recognizable and tend to represent a memorable experience for those who encounter them. Encounters with sawfish in Florida Bay and the Keys were documented by soliciting information from anyone who would possibly encounter these fish (e.g., recreational and commercial fishermen, fishing guides; Seitz and Poulakis, 2002). We also ran newspaper articles, appeared on local television fishing shows, and circulated posters that asked for anyone with any information on these fish since 1990 to contact us (by telephone, mail, e-mail, or website). Posters were distributed beginning in January 1999, and covered the area from Charlotte Harbor to Key West, Florida by April 2001. The posters were displayed where anglers and boaters would likely encounter them (e.g., bait and tackle shops, boat ramps). Each person that had information was asked the same series of questions about their encounter(s). The survey included determination of the date and location of the encounter, estimated total length (ETL), and habitat characteristics (e.g., water depth, habitat type). In cases where a person reported a size range for a fish, we used the midpoint of the range. Photographic or video documentation of encounters was obtained when available. All encounters were plotted on charts as exact points or in general areas (depending on the detail of the available information) and summarized using a geographic information system (GIS; Florida Fish and Wildlife Conservation Commission, 2000). In most cases, the exact location of the encounter(s) could be determined during the interviews. Although size at maturity is currently unknown for *P. pectinata*, we assume that this species matures at about 3 m total length or larger, based on size at maturity data for *P. perotteri*, and because *P. pectinata* reaches a larger maximum length (Thorson, 1976; Last and Stevens, 1994). Encounters reported in Seitz and Poulakis (2002) that occurred in northern Florida Bay are included for continuity purposes.

RESULTS—A total of 414 interviews were conducted that documented 1,632 sawfish encounters in Florida Bay and the Keys (i.e., south Florida) between 1990 and 2002 (89% occurred between 1998 and 2002; Figs. 1–2). Of these encounters, 88% were observations or hook and line captures and 9% were captured on longlines. Other methods reported that resulted in sawfish encounters included commercial and experimental gill nets, shrimp trawls, cast nets, seines, and lobster pot line entanglement, as well as sightings from helicopters, ultralite airplanes, and divers. Virtually all of the sawfish that were captured were bycatch of fishermen targeting sharks, tarpon (*Megalops atlanticus*), snook (*Centropomus undecimalis*), or red drum (*Sciaenops ocellatus*). Sawfish were encountered during the day and

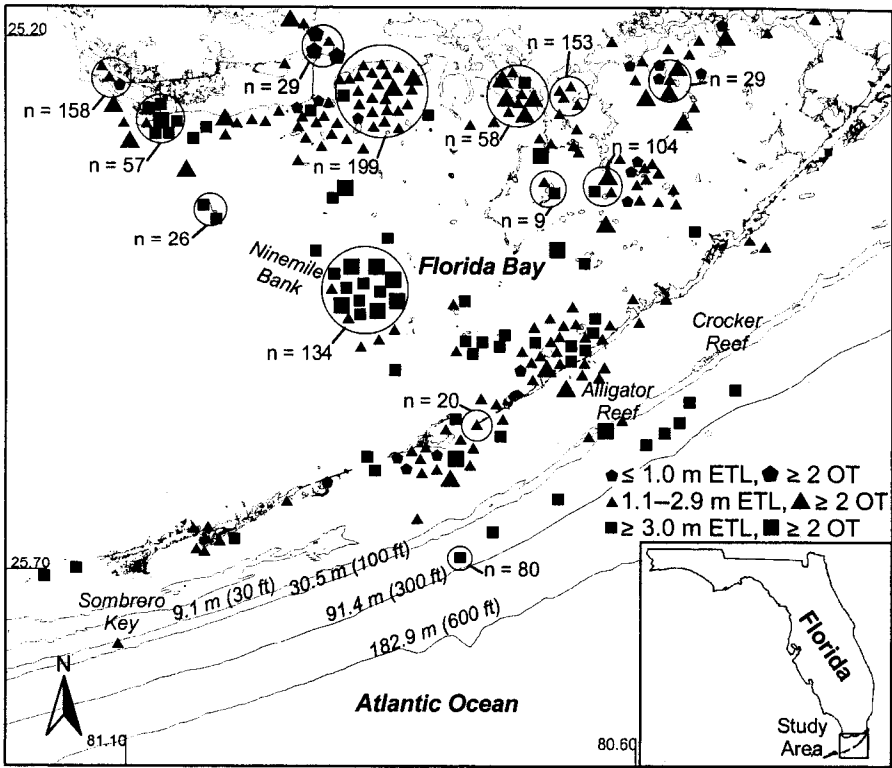


FIG. 1. Map of Florida Bay and the upper Florida Keys where at least 1,348 sawfish were encountered between 1990 and 2002. Each small symbol indicates an encounter with a single sawfish and each large symbol indicates ≥ 2 sawfish observed together (OT) in an estimated total length (ETL) size class. Sixty-six sawfish were reported from this section of the study area without specific location information.

night. It is important to note that several biases affect these data (e.g., more charter boat trips during the winter tourist season, most recreational fishing occurs during the day, longlines typically soak at night).

Size—Most sawfish encountered in south Florida probably had not reached sexual maturity when they were encountered (ca. 68% < 3 m ETL; mean = 2.4 m ETL; Fig. 3). The same observation was made when all encounter information from Florida was examined (mean = 2.1 m ETL; Fig. 4). A total of 52 sawfish from south Florida were very small (≤ 1 m ETL), potentially young-of-the-year, 1,050 were larger (1.1–2.9 m ETL), but probably still sexually immature, and 519 were very large (≥ 3 m ETL), and probably sexually mature. Eleven sawfish were reported without length estimates.

Water depth—Of the sawfish encounters in south Florida where water depth was estimated ($n = 642$), 67% (regardless of size) came from water ≤ 10 m deep (Figs.

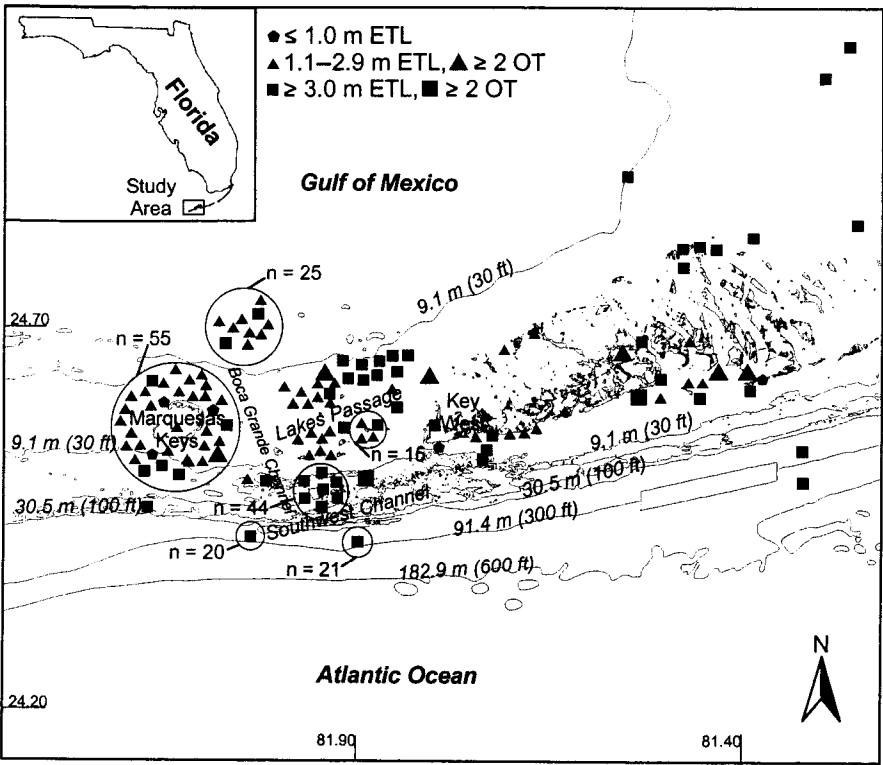


FIG. 2. Map of the lower Florida Keys where at least 260 sawfish were encountered between 1990 and 2002. An additional 24 encounters came from waters further west off the Dry Tortugas (not shown). Each symbol indicates an encounter with a single sawfish and each large symbol indicates ≥ 2 sawfish observed together (OT) in an estimated total length (ETL) size class.

1–2). Of the 33% that came from water > 10 m deep, 70% were found on the bottom in > 70 m of water. The smallest sawfish (≤ 1 m ETL) were found in ≤ 2.4 m of water. Virtually all (98%) of the larger immature sawfish (1.1–2.9 m ETL) were found in ≤ 10 m of water (maximum = 62 m). The largest sawfish (≥ 3 m ETL) were found both in shallow water (37% in ≤ 10 m of water) and deeper water (46% in > 70 m of water; maximum = 122 m).

Habitat—The primary habitat types where sawfish were encountered in south Florida were: mud (61%), sand (11%), seagrass (10%), limestone hard bottom (7%), rock (4%), coral reef (4%), and sponge bottom (2%). Sawfish were also reported associated with sea fans, an artificial reef, a culvert pipe, a freshwater spring, and an oil rig.

Seasonality—Month or season was reported for many sawfish encounters in Florida. Of all encounters in the state since 1990 where the month of the encounter was known ($n = 439$), 78% occurred between March and August. However,

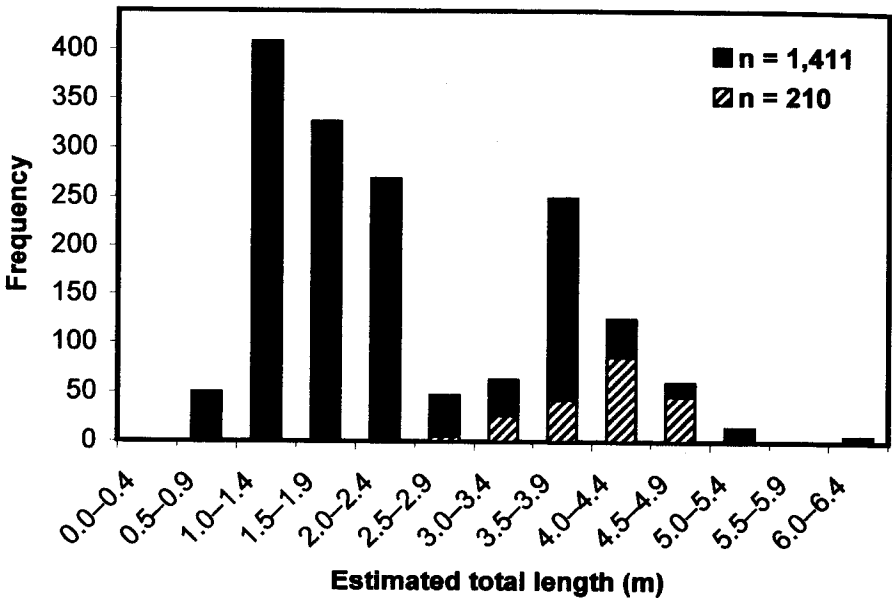


Fig. 3. Estimated total lengths (ETL) of all sawfish reported with length data from Florida Bay and the Florida Keys between 1990 and 2002 ($n = 1,621$; mean = 2.4 m ETL; range = 0.3–6.1 m ETL). Hatched areas are sawfish caught in water deeper than 10 m (maximum = 122 m) off the Keys and dark areas correspond to sawfish from all other shallow areas (≤ 10 m) depicted in Figs. 1 and 2 (including the Dry Tortugas). There is one sawfish in the smallest size class. Eleven sawfish were reported without length estimates.

numerous encounters were reported in all months. The smallest sawfish (≤ 1 m ETL) were encountered mostly during April and May. Larger immature sawfish (1.1–2.9 m ETL) were encountered mostly between May and August. The largest sawfish (≥ 3 m ETL) were encountered mostly between March and June. Of the encounters where only a season could be confidently reported ($n = 924$), “spring” (36%) and “winter” (33%) were most commonly reported, followed by “summer” (19%) and “fall” (12%).

Groups—Most sawfish encounters in south Florida were reported as single fish being observed or caught on hook and line, but there were numerous reports of several sawfish observed together. Groups of 2–20 similar-sized individuals (0.7–5.2 m ETL) were reported. Cape Sable (East Cape), northern Florida Bay (e.g., Snake Bight, Terrapin Bay, Madeira Bay), and Ninemile Bank were commonly reported localities where several sawfish were observed together (Fig. 1).

DISCUSSION—Because of the paucity of published data on smalltooth sawfish, the first step in learning about sawfish ecology in the United States is to determine their present range. Records of smalltooth sawfish in the United States have been documented by various sources (Adams and Wilson, 1995; Seitz and Poulakis,

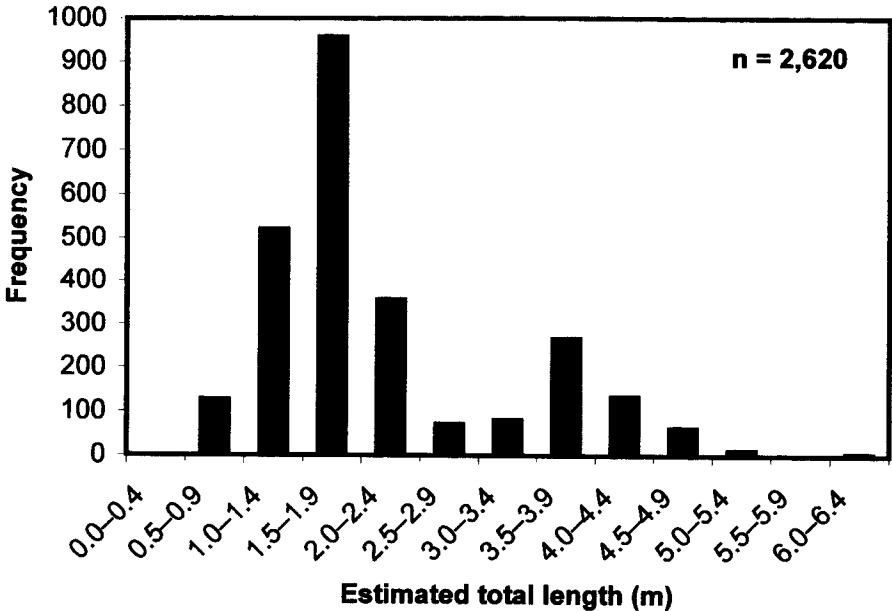


FIG. 4. Estimated total lengths (ETL) of all sawfish reported with length data from anywhere in Florida between 1990 and 2002 (mean = 2.1 m ETL; range = 0.3–6.4 m ETL). There are two sawfish in the smallest size class, there is one sawfish in the 5.5–5.9 m ETL size class, and there are seven sawfish in the largest size class. Sixty-three sawfish were reported without length estimates.

2002). Seitz and Poulakis (2002) demonstrated that a reproductive sawfish population still exists in southwest Florida, because neonates and juveniles are regularly encountered there. This paper demonstrates that sawfish are relatively common in southernmost Florida and that they use a variety of habitats not previously identified, including coral reefs and coastal waters deeper than 10 m.

Sawfishes are considered inhabitants of “shallow” (e.g., Bigelow and Schroeder, 1953; Thorson, 1982a), “shallow coastal” (e.g., van der Elst, 1981; Camhi et al., 1998), “estuarine” (e.g., Thorson, 1982a; McEachran and Fechhelm, 1998), and “freshwater” (e.g., Schwartz, 1984; Camhi et al., 1998) habitats, typically in water ≤ 10 m deep (Bigelow and Schroeder, 1953; Schwartz, 1984). This study demonstrates that smalltooth sawfish (≥ 3 m ETL) regularly occur in water deeper than 10 m. To date, we know of at least 210 sawfish that have been recently encountered in water >10 m deep off the Florida Keys by longliners, shrimp trawlers, recreational anglers, and SCUBA divers ($n = 148 >70$ m). From our data, it is clear that smalltooth sawfish are regularly found in water up to 122 m.

A general description of habitat use by smalltooth sawfish can be inferred based on our data. Sawfish are present throughout the year in Florida. The smallest sawfish (≤ 1 m ETL) are found most often in shallow (<2.4 m), protected, mangrove areas during April and May. Immature sawfish (1.1–2.9 m ETL) are found most often in shallow water (≤ 10 m) between May and August, primarily in northern Florida Bay.

The largest sawfish (≥ 3 m ETL) are found most often in shallow water (≤ 10 m) between March and May, and in deeper water (to 122 m) throughout the year.

Sawfishes have been declining in numbers throughout the world because they occur in heavily fished coastal waters where they become entangled in nets, and because they have a limited reproductive potential (Thorson, 1982b; Hoening and Gruber, 1990). Although both western Atlantic species are protected from harvest in Florida, much remains to be learned about the ecology of the smalltooth sawfish, and more research is needed if this species is going to survive in the United States.

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