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Geographic distribution and conservation status of sawfish *Pristis* spp (Pristiformes: Pristidae) in the southern Caribbean Sea

Distribución geográfica y estado de conservación de los peces sierra *Pristis* spp (Pristiformes: Pristidae) en el Caribe sur

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Abstract

The former presence of sawfishes (*Pristis* spp) is confirmed for the southern Caribbean Sea from the coasts of Colombia and Venezuela, based on review of eleven rostral saws exhibited in businesses, museums and private collections, as well as bibliographic references, photographs and surveys to detect sightings or captures in both countries. We determined that *Pristis pristis* and *Pristis pectinata* were present in the southern Caribbean coasts of Colombia and Venezuela, but that they are now probably locally extinct.

Key words. *Pristis pristis*. *Pristis pectinata*. Sawfish. Threatened species. Colombia. Venezuela.

Resumen

Se confirma la presencia en el pasado de las especies de pez sierra (*Pristis* spp) en el mar Caribe de Colombia y Venezuela, a partir de la revisión de once extensiones rostrales exhibidas en establecimientos, museos y colecciones de particulares, así como la consulta bibliográfica, encuestas y el examen de material fotográfico disponible sobre avistamientos o capturas realizadas en ambos países. Se determinó que las especies presentes en el Caribe de Colombia y Venezuela eran *Pristis pristis* y *Pristis pectinata*, las cuales en la actualidad se encuentran probablemente extintas localmente.

Palabras clave. *Pristis pristis*. *Pristis pectinata*. Pez sierra. Especies amenazadas. Colombia. Venezuela.

Introduction

Sawfishes are elasmobranchs of the order Pristiformes, and the unique family Pristidae that includes two genera and five species (Faria *et al.* 2013). The genus *Pristis* is characterized by the presence of an anteriorly depressed body, with an elongate rostrum bearing large teeth on each side, two large, well-separated dorsal fins, and the posterior region of the head, anterior trunk of the body and pectoral fins widened and joined into a disc-like shape. The eyes

and spiracles are on the dorsal surface of the head. The nares and straight mouth are ventral, without barbels or grooves and with numerous teeth forming a band all along the jaws, and the anterior nares are completely separate from the mouth (Cervigón & Alcalá 1999, McEachran & Carvalho 2002).

The species reported from Colombia and Venezuela differ mainly in the number of teeth on the rostrum.

Pristis pristis has 14 to 23 pairs of teeth in its jaw, the upper and lower caudal-fin lobes are well developed and differentiated and the origin of the first dorsal fin is anterior to a vertical through the pelvic-fin origins. *Pristis pectinata* has 20 to 34 teeth, the lower caudal fin lobe is poorly developed or absent and not well differentiated from the dorsal lobe, and the origin of the first dorsal fin is at or behind a vertical through the pelvic-fin origins (Compagno & Last 1999, Faria *et al.* 2013). The records of *P. perotteti* from both countries correspond instead to *P. pristis* according to Faria *et al.* (op. cit.).

It was once thought that the genus *Pristis* consisted of two groups of species that differed in characteristics of their dermal denticles: The *P. pristis* group, commonly referred to as the “largetooth sawfishes”, included *P. pristis*, *P. perotteti* and *P. microdon* which had both their dorsal and ventral dermal denticles with crests and grooves along their anterior margins; and the *P. pectinata* group, or “smalltooth sawfishes” that included *P. clavata*, *P. zijsron* and *P. pectinata*, that lacked grooves or crests on their denticles (Deynat 2005). However Faria *et al.* (2013), using genetic analysis, determined that *P. pristis*, *P. perotteti* and *P. microdon* are just one species, for which the valid name is *P. pristis*, thus reducing to four the number of *Pristis* species in the entire world.

The worrisome situation of the sawfishes of the world has been widely recognized because their populations have been severely decimated, to the point that global captures are now only 4-6 % of historical harvests, suggesting that in many regions the population decline is more than 90 % (IUCN 2011). The main causes of sawfish mortality are directed and incidental fisheries, habitat modification and pollution, the sale of the saw and fins, and crashes with boats and wounds from propellers (Seitz & Poulakis 2006).

Keeping in mind the existing reports for species of the genus *Pristis*, the previous taxonomic confusion and the current National Action Plan for Sharks and Rays in Colombia, in which the genus *Pristis* is earmarked for high priority for research and conservation (Caldas *et al.* 2010), the “*Pristis* Colombia”, project was developed with the specific objective of determining the presence and current distribution of sawfishes in

the Caribbean versant of Colombia. At the same time, the same information was gathered for the Caribbean coasts of Venezuela.

Materials and methods

To begin this project, an exhaustive literature search was undertaken as well as the revision of available photographs and surveys. To confirm the identifications of the species of *Pristis* found in the Caribbean Sea the rostral saws of all available species were located, examined and photographed from businesses, museums, and aquarium exhibits including the following: Mundo Marino (Magdalena), Acuario El Rodadero (Magdalena), Oceanario Islas del Rosario (Bolívar) and Las Flores (Atlántico); private collections in Medellín, Antioquia in Colombia & museums in Venezuela: Museo de Historia Natural La Salle (MHNLS) and Estación Biológica de Rancho Grande (EBRG).

Morphometric methods follow Robillard & Séret (2006): i) rostrum length; ii) rostrum width at anteriormost (distal) teeth; iii) rostrum width at posteriormost teeth; iv) length of the last three distal teeth; v) distance between teeth; and vi) number of rows of teeth along the rostrum. Taxonomic identification follows Faria (2007, 2013), where the number of tooth pairs on the rostrum is the diagnostic character differentiating species of the genus.

Results

Colombia

Eight saws were examined, six of which were identified as *P. pectinata*, because they had 27 pairs of rostral teeth (Figure 1a), 28 (Figure 1b), 29 (Figure 1c), 29 (Figure 1d), 28 (Figure 1e) and 26 (Figure 1f) and two identified as *P. pristis* which each had 20 pairs of teeth (Figure 2a, b).

Venezuela

Three museum specimens of saws and one photographic record were examined *P. pectinata*: EBRG 10774 (sand bar in Lake Maracaibo) (20-04-1961) (26 pairs of teeth; photograph in Cervigón &



a. *P. pectinata*. Magdalena Department. 27 pairs of teeth.



b. *P. pectinata*. Magdalena Department. 28 pairs of teeth.



c. *P. pectinata*. Bolívar Department. 29 pairs of teeth.



d. *P. pectinata*. Bolívar Department. 29 pairs of teeth.
Livespecimen.



e. *P. pectinata*. Antioquia Department. 28 pairs of teeth.



f. *P. pectinata*. Magdalena Department. 26 pairs of teeth.

Figure 1. Photographs of saws identified as *P. pectinata*. a) Santa Marta, Magdalena. b) Santa Marta, Magdalena. c) Cartagena, Bolívar. d) Cartagena, Bolívar. e) Medellín, Antioquia. f) Santa Marta, Magdalena. Photo by www.siemma.org.



a) *P. pristis*. Magdalena Department. 17 pairs of teeth.



b) *P. pristis*. Magdalena Department. 20 pairs of teeth.

Figura 2. Photographs of saws identified as *P. pristis*. a, b) Departamento de Magdalena. Photo by www.siemma.org.

Alcalá 1999, p. 147-148) (south of Trinidad = Gulf of Paria, Delta Amacuro state) (28 pairs of teeth) (Figure 3).

Pristis pristis: EBRG 10775 (north coast Cumaná, Sucre state) (18-06-1957) (16 pairs of teeth); MHNLS (not cataloged) (Orinoco River delta, no additional data) (17 pairs of teeth).

As a complement to the revision of sawfish rostra, pertinent literature was reviewed to update the identifications of those records. And via surveys and questioning of the owners of the rostra located during this study and local ichthyologists, the distribution

pattern of *Pristis* species from the Caribbean coasts of Colombia and Venezuela was reconstructed. The two species were sympatric in Colombia and seven bibliographic records were confirmed from 1920 (Atrato River, Eigenmann 1920) up to 1985 (Cartagena Bay, Alvarez & Blanco 1985), although the latter referred to older specimens and not living specimens obtained at that date. So it was determined that both species occurred in the Atrato River, the Gulf of Urabá, Sinu River, Magdalena River, Cartagena Bay and Salamanca Island (Table 1, Figure 4).

It is important to note that *P. pectinata* was recorded mainly from the Gulf of Urabá and Cispatá Bay.



Figure 3. *Pristis pectinata*. South of Trinidad (= Gulf of Paria), Delta Amacuro state. Photo courtesy of Fernando Cervigón.

In Venezuela more records (12) were found than from Colombia, and the species probably were sympatric as well. Records date from 1925 (Gulf of Venezuela, Schultz 1949) to 2011 (Lago de Maracaibo, Barboza 2011), and as for Colombia, the recent records are actually of older reports of specimens that have probably disappeared. Both species were distributed from Lake Maracaibo to the Orinoco Delta, including Margarita Island for *P. pectinata* (Table 1, Figure 4).

Discussion

Previous studies were unclear as to the precise distribution of *Pristis* species. From the Western Atlantic, Simpfendorfer (2000), reported *P. pectinata* and *P. perotteti* and McEachran & Carvalho (2002), reported *P. pectinata* & *P. pristis*. Colombian and Venezuelan reports were also unclear. For fishing area 31 of FAO, which includes Colombia and Venezuela (Western Central Atlantic) (McEachran & Carvalho 2002), reported *P. pristis* and *P. pectinata*. More recently Charvet & Faria (2014) reported records of both species from the Caribbean.

Table 1. Historic geographic records of *Pristis* species from the Caribbean coasts of Colombia and Venezuela.

Lcality	Author/Museum	Species	Reviews
Colombia			
Atrato River	Eigenmann (1920)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	More abundant: <i>P. pectinata</i>
Gulf of Urabá	Gómez (1972)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	More abundant: <i>P. pectinata</i>
Cispata Bay	Dahl (1971)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	More abundant: <i>P. pectinata</i>
Sinú River	Dahl (1964, 1971)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	<i>P. pectinata</i> arriving at Montería and <i>Pristis pristis</i> at Betanci
Magdalena River	Dahl (1971)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	More abundant: <i>P. pectinata</i> . <i>Pristis pristis</i> travels upstream to Calamar
Cartagena Bay	Alvarez & Blanco (1985)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	More abundant: <i>P. pectinata</i>
Ciénaga Grande de Sta. Marta	Acero <i>et al.</i> (1986)	<i>Pristis pectinata</i>	-
Gulf of Salamanca	Frank & Rodríguez (1976), Acero <i>et al.</i> (1986)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	More abundant: <i>P. pectinata</i>

Cont. **Table 1.** Historic geographic records of *Pristis* species from the Caribbean coasts of Colombia and Venezuela.

Lcality	Author/Museum	Species	Reviews
Venezuela			
Lake Maracaibo sandbar	EBRG: 10774	<i>Pristis pectinata</i>	20/04/1961
Lake Maracaibo	Cervigón (1966)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	-
Lake Maracaibo	Barboza, J. (2011)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	see: "Aquellos Peces" http://gustavoguillenzulia.blogspot.com/2011/06/aquellos-peces-jesus-barboza.html
Sagua Creek, Sinamaica	Schultz (1949)	<i>Pristis pristis</i>	-
Gulf of Venezuela, Pta. Macoya	Schultz (1949)	<i>Pristis pectinata</i>	1925
Margarita Island	Cervigón & Alcalá (1999)	<i>Pristis pectinata</i>	Hypersaline lagoons
Margarita Island (La Restinga, Raya and Las Marites lagoons)	Ehemann (com. pers.)	<i>Pristis pectinata</i>	Extinct for 50 years
Cumaná (north coast)	EBRG: 10775	<i>Pristis pristis</i>	18/07/1977
Punta Arenas, Sucre state	Tavares (pers. com.)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	Upper records over 10 years ago
Araya Peninsula, Sucre state	Cervigón & Alcalá (1999)	<i>Pristis pectinata</i>	-
Southern Trinidad (= Gulf of Paria)	Cervigón & Alcalá (1999)	<i>Pristis pristis</i>	-
Southern Trinidad (= Gulf of Paria)	Tavares (pers.com.)	<i>Pristis pristis</i> - <i>Pristis pectinata</i>	Upper records over 10 years ago
Orinoco River Delta	MHNLS (not cataloged)	<i>Pristis pristis</i>	-

Dahl (1971) reported *P. perotteti* and *P. pectinata* from Colombia in the Magdalena and Sinú rivers, and mentioned that the fishermen did not distinguish between the species, that they were easily tangled in fishing nets, and that large specimens were extremely dangerous when handled. Mejía & Acero (2002) reported *P. pristis* (identified by them as *P. perotteti*), as the only species present in Colombian territory, a claim they based on review a reference collection. The other species (*P. pectinata*) was considered of doubtful presence since there were no specimens deposited in collections or museums (Mejía-Falla *et al.* 2007). Rey and Acero (2009) reported more records of *P. pectinata* than *P. pristis*. Acero (2010) and Acero & Morales-Betancourt (2010) mentioned that the two species occurred in both the Caribbean Sea and the

Atlantic Ocean. More details about this information are shown in Table 1 and Figure 4. It is important to emphasize that the people interviewed all stated that in all probability both species of sawfishes have been eliminated from the Colombian coast, with the only case of a live individual (a female of *P. pectinata*) is in the Oceanario Ceiner on San Martín de Pajares Island, of the Rosario Island archipelago), that was captured more than 26 years ago. This specimen was photographed by the the authors in December of 1989 (C. Lasso) and again in November 2012 (S. Gómez) (Figure 5). Acero *et al.* (2002) considered both *P. pectinata* and *P. pristis* as Critically Endangered (CR A2a) and no specimens have been captured since that time (Viera, R., com. pers.).

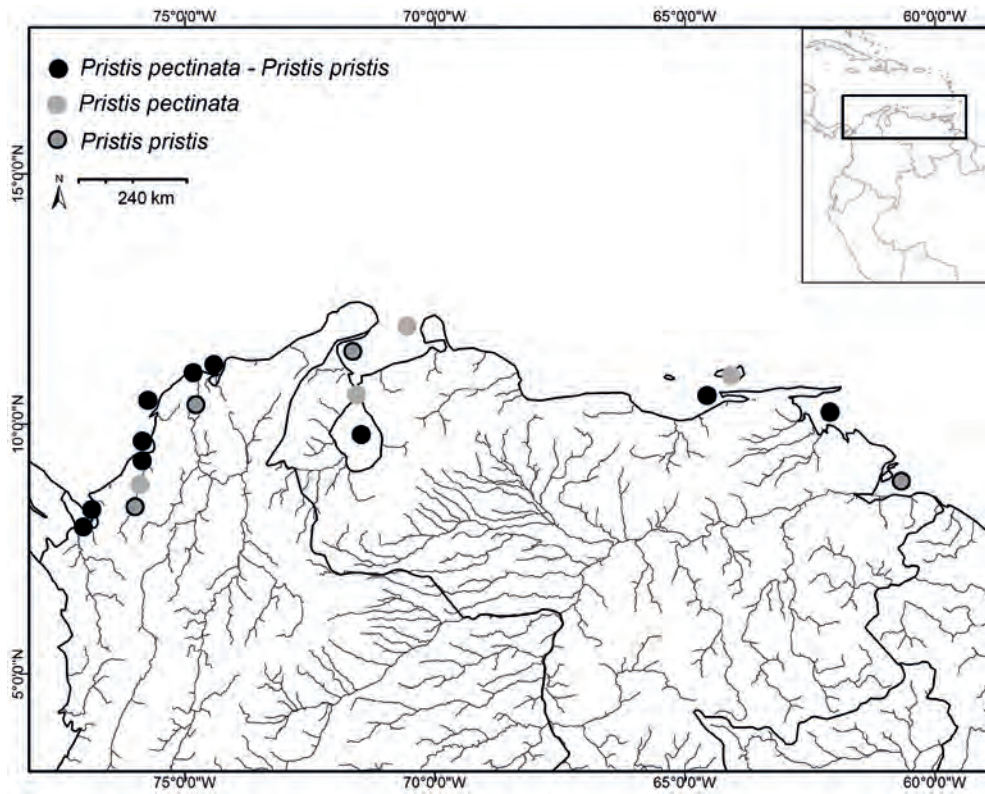


Figure 4. Geographic distribution of *Pristis* species from the Caribbean coast of Colombia and Venezuela). Map elaborated by: Mónica A. Morales-B.



Figure 5. a) Last living specimen of *Pristis pectinata* from Colombia, photographed in December of 1989 at the Oceanario Ceiner, San Martín de Pajares Island, Islas del Rosario Archipelago by C. A. Lasso. b) Photographed in November 2013 by S. Gómez.

In Venezuela there has also been confusion because of the taxonomic problems already mentioned. In Table 1 the records are shown with corrected taxonomy. Both species were common in various regions of Venezuela in the past. For example, Cervigón and Alcalá (1999) noted that *P. pectinata* was frequent and abundant in the Gulf of Paria and south of Trinidad in front of the Orinoco River delta, but that recent searches found it extirpated from that region (Lasso & Lasso-Alcalá 2011). Cervigón and Alcalá (op. cit), stated much the same situation for the Gulf of Venezuela and Lake Maracaibo. The story is similar for *P. pristis*, which was present along the entire continental coastline of Venezuela, but is no longer found there (Tavares com. pers.). Only *P. pectinata* has been recorded from Margarita Island, from hypersaline lagoons, and the species was considered rare by Cervigón and Alcalá (op. cit.) and that Ehemann, N. (com. pers.), stated that the last sawfish captured from La Restinga, La Raya and Las Marites lagoons were over 60 years ago. Both species are considered Data Deficient (DD) in the Red Data Book (*P. pristis* identified as *P. perotteti*) (Rodríguez & Rojas-Suárez 2008), but newer evaluation of their status reports them as extinct from Venezuela (Tavares com. pers.).

Both species were used for their meat and decorative value of their jaws (Cervigón & Alcalá 1999, Acero & Morales-Betancourt 2010, Lasso & Lasso-Alcalá 2011). One former use of this species has not been previously reported: Barboza (2011) reported the following with respect to the harvest of their eggs in fish from Lake Maracaibo:

“...the unloading of the fishermen was another spectacle, with tied up animals over two meters long arriving in their long boats, grey in color and looking like sea monsters, from which a thick beak armed with two rows of teeth protruded, those were the famous sawfishes, very common in the area, and with tasty meat, whose eggs were buried until ripe, when their oil could be used to combat asthma and whose saw was painted and hung up as a trophy...”

The extinction of both species is associated with their extreme vulnerability to diverse factors including overfishing, their propensity to become entangled in fishing nets because of their jaws, incidental fishing, their narrow habitat limits, low fecundity,

late maturation and low population growth (Acero *et al.* 2002). In Venezuela, the shrimp trawling industry has negatively impacted this species (Cervigón 1992) which was perhaps the principal cause of their demise (Lasso obs. pers.). According to the IUCN both species are now classified as Critically Endangered species (CR A2 cd) and the entire family is listed in Appendix I of CITES.

In conclusion, the available data indicates that both species have been extirpated from the continental and insular Caribbean coasts of Colombia and Venezuela. Recently Harrison and Dulvy (2014) presented a global conservation strategy that will hopefully have a positive impact for the recuperation of *Pristis* populations.

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Geographic distribution and conservation status of
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