

Chondrichthyans of the San Matías Gulf, Patagonia, Argentina

María R. PERIER^{1,2}, Marilú ESTALLES^{1,3}, Nidia M. COLLIER^{1,2}, Matías N. SUAREZ^{1,2},
Gimena J. MORA¹ & Edgardo E. DI GIÁCOMO^{1,2}

¹Grupo CONDROS. Instituto de Biología Marina y Pesquera "Alte. Storni", Güemes 1030, 8520 San Antonio Oeste, Río Negro, Argentina. raquelperier@gmail.com. ²Universidad Nacional del Comahue (UNCo). edgardodigiaco.com@gmail.com. ³Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET). ml.estalles@conicet.gov.ar/ mariluestalles@gmail.com

Abstract: The San Matías Gulf (SMG; 41°- 42° S; 64°- 65° W) is the largest gulf in Northern Patagonia, Argentina. Up to date, the chondrichthyan fauna of this area has not been reported. Therefore, the aim of this work is to provide a list with species presence and biological characteristics of the chondrichthyans recorded in SMG during the last 30 years. A total of 13 sharks distributed in 11 families, 19 skates and rays distributed in six families, and one holocephalan have been so far recorded in SMG. From the zoogeographical point of view, this chondrichthyan fauna is a mixed assemblage of species typically found in the Argentinean and Magellanean Provinces. The holocephalan *Callorhynchus callorynchus* is the most landed chondrichthyan of the local fishery. With it, five sharks and seven skates are also exploited.

Key words: Holocephali, Elasmobranchii, Batoidea, Southwest Atlantic, Patagonia.

Resumen: Los condriictios del Golfo San Matías, Patagonia, Argentina. El Golfo San Matías (SMG; 41°- 42° S - 64°-65° O) se encuentra ubicado en el norte de la Patagonia, Argentina. Hasta la fecha no se cuentan con reportes de la fauna de condriictios de esta zona. Por lo tanto, el objetivo de este trabajo es proporcionar una lista de la presencia y las características biológicas de los condriictios registrados en el SMG durante los últimos 30 años. Un total de 13 tiburones distribuidos en 11 familias, 19 batoideos distribuidos en seis familias y un holocefalo han sido reportados para la zona. Desde el punto de vista zoogeográfico, el SMG presenta un ensamble de especies pertenecientes a las Provincias Magallánica y Argentina. El holocefalo *Callorhynchus callorynchus* es el condriictio más desembarcado de la pesquería local. Con menor importancia son explotadas comercialmente, cinco especies de tiburones y siete de rayas.

Palabras clave: Holocephali, Elasmobranchii, Batoidea, Atlántico suroccidental, Patagonia.

INTRODUCTION

The San Matías Gulf (SMG; 41°- 42° S; 64°- 65° W) is the largest gulf of Northern Patagonia, Argentina (Fig. 1). This gulf is a semi-closed basin separated from the adjacent continental shelf by an 80 m-deep sill. Hydrographically, a thermohaline front with NE-SW direction divides the gulf during spring-summer into two water mass (Perier & Di Giacomo, 2002). The northern water mass presents from 1 to 3° C temperature and 2‰ salinity more than the southern one (Di Giacomo *et al.*, 1993; Piola & Scasso, 1988). The dynamics of this front is associated with the presence and spawning areas of several fishes such as the common hake *Merluccius hubbsi*, the

savorín *Serirolella porosa* and the holocephalan *Callorhynchus callorynchus* (Di Giacomo, 1992; Di Giacomo & Perier, 1992; Perier & Di Giacomo, 2002).

A bottom trawl fishery, an economically important activity in the region, has been established in SMG since 1971. Its annual landings are around 13,000 t. The common hake is the target species and chondrichthyans are captured as bycatch (Di Giacomo & Perier, 1991; 1992). *C. callorynchus* is the most landed chondrichthyan (Di Giacomo & Perier, 1992). With an average of 1060 t landed between 2009 and 2010. Batoids (skates and rays) are in second place with 350 t, followed by sharks with 160 tons.

The study of chondrichthyans of SMG for-

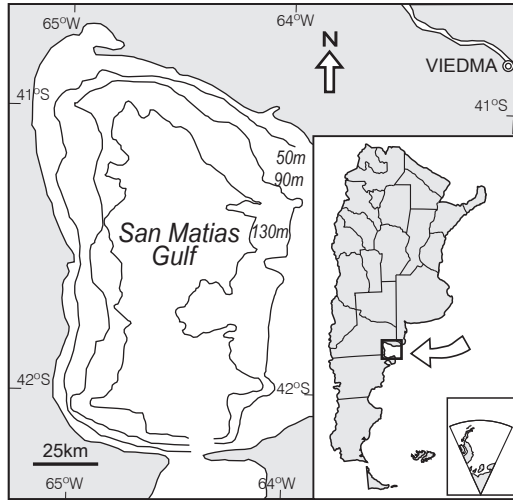


Fig. 1: Spatial location of the San Matías Gulf.

mally started in 1984 when the biological characteristics and commercial exploitation of *C. callorhynchus* (Di Giacomo, 1990) have been initially described. Since then, studies on distribution, biology and commercial exploitation have been carried out on several fish species (Di Giacomo, 1992; Di Giacomo & Perier, 1991; 1994; 1996; Di Giacomo *et al.*, 1994; 2009; Van der Molen *et al.*, 1998; Awruch *et al.*, 2008; Perier *et al.*, 2010; Coller *et al.*, 2011; Estalles *et al.*, 2011). However, basic information such as species composition has remained unpublished. Therefore, the aim of this work is to report the presence and some biological characteristics of the chondrichthyan fauna of SMG.

MATERIALS AND METHODS

The present work is based on the reported records of chondrichthyan species during the last 30 years in SMG. Sharks and holocephalans were classified according to Compagno (2005). The systematic hierarchy of the list comprises: Class, Subclass, Infraclass, Cohorte, Superorder, Order, Family, Scientific name, Authorship, English and Spanish common names. Species were listed alphabetically within the families.

Fish species distribution and English and Spanish common names were extracted from Fishbase (Froese & Pauly, 2011), Cousseau *et al.* (2007), Compagno (2005), Menni & Stehmann (2000), Chiaramonte (1998), McEachran (1983) and Figueiredo (1977). Maximum total length recorded for fish species considering male and female, commercially exploited and rare species

were also indicated. Species were considered rare when their occurrence were registered less than five times in SMG in the surveyed period.

Species recordings and their maximum total lengths were obtained from three different sources. Bottom trawl surveys from 1986; 1993 to 1997; 2004 to 2007, samplings at local fish-processing plants from 2007 to 2009 and commercial catches by onboard observers from 2007 to 2009. Bottom trawl surveys were performed to assess the stocks of the demersal species of SMG (Fig. 1) and were conducted during spring. For each bottom trawl survey several number of hauls (30–40) of 30 minutes each were performed covering a depth-range of 40–175 m, according to the methods described by Di Giacomo & Perier (1991; 1992). During 2007 the bottom trawl survey design was changed and a systematic sampling was adopted.

RESULTS

A total of 13 sharks distributed in 11 families, 19 skates and rays distributed in six families, and one holocephalan have been recorded in SMG. These species represent 33 and 44 % of the sharks and batoids, respectively, and one of the two chimaeras reported for the Argentine Sea (Menni & Lucifora, 2007).

According to the classification followed by Balech & Ehrlich (2008), SMG is situated in the limit between the Bonaerensean District of the Argentinean Province and the Patagonian District of the Magellanean Province. As a result, the chondrichthyan fauna of SMG is a mixed assemblage of species typically found in these two provinces. Only for the skates *Atlantoraja platana* and *Psammodontus lentiginosa* SMG is considered their main distributional area in the Argentine sea.

ANNOTATED TAXONOMIC LIST OF THE REPORTED RECORDS

Class Chondrichthyes
Subclass Holocephali
Order Chimaeriformes
Family Callorhynchidae

Callorhynchus callorhynchus (Linnaeus, 1758). Elephant fish, Cockfish- Pez gallo, Pez elefante. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to Argentina and through the Beagle channel.

Remarks. The main concentrations of *C. callorynchus* within SMG are found in its northern area between 20 and 50 m depth. The reproductive activity of the species extends throughout the year. Length at maturity was estimated at 40 and 49 cm standard length (SL) for males and females respectively. Maximum length recorded for males was 85 cm SL and 102 cm SL for females. This species is the most landed chondrichthyan species of the bottom trawl fishery of SMG. During the 1971- 1989 period it was the second most landed fish of the local fishery.

References. Di Giacomo & Perier (1991; 1994); Di Giacomo (1992); López et al. (2000) and Menni et al. (2007).

Subclass Elasmobranchii
 Infraclass Euselachii
 Cohorte Neoselachii
 Subcohorte Selachii

Superorder Squalomorphi
 Order Hexanchiformes
 Family Hexanchidae

Notorynchus cepedianus (Péron, 1807). Broadnose sevengill shark- Gatopardo, Tiburón moteado. This species is distributed worldwide in temperate seas. In the Southwest Atlantic it is found from southern Brazil to the beagle channel (55°S).

Remarks. This species is commercially exploited in SMG. Maximum length recorded for males was 204 cm TL and 186 cm TL for females.

Order Squaliformes
 Family Squalidae

Squalus acanthias Linnaeus, 1758. Piked dogfish- Espinillo. This species has a worldwide range distributon. In the Western Atlantic it is found from Greenland to Argentina.

Remarks. The main concentrations of *S. acanthias* within SMG were found in its southeast area between 86 and 105 m depth. Maximum total lengths were 94 and 101 cm TL for males and females respectively. This species is not commercially exploited by the local fishery, individuals caught are discarded on board.

Reference. Di Giacomo et al. (2009).

Order Squatiniformes
 Family Squatinidae

Squatina guggenheim Marini, 1936. Angular angel shark- Pez ángel. This species is endemic

to the Southwest Atlantic. It is distributed from southern Brazil to Argentina as far south as central Patagonia.

Remarks. Maximum lengths recorded were 88 and 96 cm TL for males and females respectively in SMG. Both sexes matured at similar sizes between 73 and 76 cm TL. This species shows a biannual or triannual reproductive cycle according with the authors with gestation taking one year. This species is commercially exploited by the local fishery.

Reference. Colonello et al. (2007) and Awruch et al. (2008).

Superorder Galeomorpii
 Order Lamniformes
 Family Odontaspidae

Carcharias taurus Rafinesque, 1810. Sand tiger shark- Escalandrún. This species is found in all warm seas except the eastern Pacific. In the Western Atlantic, it is distributed from Canada to Argentina.

Remarks. Its presence in SMG is rare.

Family Alopiidae

Alopias vulpinus (Bonnaterre, 1788). Thresher shark- Tiburón zorro. This species is found worldwide in temperate and tropical seas. In the Western Atlantic, it is distributed from Canada to Argentina.

Remarks. The presence of this species is rare. Their occurrence in SMG was reported by local fishermen.

Family Cetorhinidae

Cetorhinus maximus (Gunnerus, 1765). Basking shark- Tiburón peregrino. This species is worldwide distributed. In the Western Atlantic, it is found from Canada to Argentina.

Remarks. The presence of this species is rare. Only two individuals have been recorded in SMG. The maximum length recorded was 540 cm TL for a female.

Reference. Di Giacomo (1991).

Family Lamnidae

Isurus oxyrinchus Rafinesque, 1810. Shortfin mako- Mako. This species is found worldwide in temperate and tropical seas. In Western Atlantic, it is found from Canada to northern Patagonia, Argentina.

Remarks. The presence of this species is rare.

Only one female of 150 cm TL has been recorded in SMG.

Order Carcharhiniformes
Family Scyliorhinidae

Schroederichthys bivius (Müller & Henle, 1838). Narrowmouthed catshark- Pintarroja. It is distributed in the Southeast Pacific and Southwest Atlantic, from central Chile to southern Brazil.

Remarks. Maximum length recorded was 86 cm TL for an individual of unknown sex in SMG. This species is occasionally found among commercial species of the local fishery.

Reference. Soto, 2001.

Family Triakidae

Galeorhinus galeus (Linnaeus, 1758). Tope shark- Cazón. This species is widely distributed in temperate seas. In the Southwest Atlantic it is found from southern Brazil to northern Patagonia, Argentina.

Remarks. Maximum lengths recorded were 156 and 146 cm TL for males and females respectively in SMG. This species is commercially exploited by the local fishery.

Mustelus schmitti Springer, 1939. Narrownose smooth-hound- Gatuzo. This species is endemic to the Southwest Atlantic. It is distributed from southern Brazil to south Patagonia, Argentina.

Remarks. Maximum lengths recorded were 95 and 100 cm TL for males and females respectively in SMG. This species is commercially exploited by the local fishery.

References. Chiaramonte & Pettovello (2000)

Family Carcharhinidae

Carcharhinus brachyurus (Günther, 1870). Copper shark- Bacota. This species is mainly found in temperate waters. In the Southwest Atlantic it is distributed from Rio de Janeiro to northern Patagonia, Argentina.

Remarks. Maximum length recorded was 264 cm for a male in SMG. This species is commercially exploited by the local fishery.

Prionace glauca (Linnaeus, 1758). Blue shark- Tiburón azul. This species is distributed worldwide in temperate and tropical waters. In the Western Atlantic, it is found from Canada to Argentina.

Remarks. The presence of this species in SMG is rare.

Family Sphyrnidae

Sphyrna zygaena (Linnaeus, 1758). Smooth hammerhead- Tiburón martillo. This species is distributed in temperate and tropical seas. In the Western Atlantic, it is found from Canada to northern Patagonia, Argentina.

Remarks. Only one individual has been recorded in SMG. The presence of this species is rare.

Superorder Batoidea
Order Torpediniformes
Family Torpedinidae

Torpedo puelcha Lahille, 1926. Argentine torpedo- Torpedo. This species is endemic to the Southwest Atlantic. It is distributed from southern Brazil to northern Patagonia, Argentina.

Remarks. The presence of this species is rare. Only one female of 70 cm TL has been recorded in SMG.

Family Narcinidae

Discopyge tschudii Heckel, 1846. Apron ray, Electric ray- Raya eléctrica. It is distributed in the Southeast Pacific and Southwest Atlantic, from Peru to southern Argentina.

Remarks. Maximum length recorded were 43 and 38 cm TL for males and females respectively in SMG. This species is not commercially exploited by the local fishery, individuals caught are discarded on board.

Reference. Estalles *et al.* (in press).

Order Rajiformes
Family Arhynchobatidae

Atlantoraja castelnaui (Miranda Ribeiro, 1907). Spotback skate- Raya a lunares. This species is endemic to the Southwest Atlantic. It is distributed from southern Brazil to northern Patagonia, Argentina.

Remarks. Maximum lengths recorded were 112 and 147 cm TL for males and females respectively in SMG. This species is commercially exploited by the local fishery.

Reference. Estalles *et al.* (2011).

Atlantoraja cyclophora (Regan, 1903). Eyespot skate- Raya ojona, Raya de círculos. This species is endemic to the Southwest Atlantic. It is distributed from southern Brazil to northern Patagonia, Argentina.

Remarks. Maximum lengths recorded were 62 and 69 cm TL for males and females respectively in SMG. Size at maturity was estimated at 53 and 59 cm TL for males and females. This species is commercially exploited by the local fishery.

Reference. Estalles et al. (2011).

Atlantoraja platana (Günther, 1880). La Plata skate- *Raya platana*, *Raya oscura*. This species is endemic to the Southwest Atlantic. It is found in southern Brazil and SMG.

Remarks. San Matías Gulf is the main distribution area of *A. platana* in the Argentine Sea. Maximum lengths recorded were 81 and 91 cm TL for males and females respectively. This species is commercially exploited by the local fishery.

References. Collier et al. (2011) and Estalles et al. (2011).

Bathyraja brachyurops (Fowler, 1910). Broadnose skate- *Raya de cola corta*. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to southern Brazil.

Remarks. The presence of this species is rare. This species has been recorded twice in SMG. Maximum lengths recorded were 72 and 77 cm TL for males and females respectively.

Reference. Estalles et al. (2011).

Bathyraja multispinis (Norman, 1937). Multispine skate- *Raya aserrada*. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to Uruguay.

Remarks. The presence of this species in SMG is rare. Maximum length recorded was 81 cm TL for one specimen of unknown sex.

Bathyraja macloviana (Norman, 1937). Patagonian skate- *Raya espinosa*. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to Uruguay.

Remarks. The presence of this species is rare. Only one female of 60 cm TL has been recorded in SMG.

Psammodontus lentiginosa McEachran, 1983. Freckled sand skate- *Raya lentiginosa*. This species is endemic to the Southwest Atlantic. It is found from southern Brazil to northern Patagonia as far as San Jorge Gulf (Cousseau et al., 2007).

Remarks. So far, the main distribution area of *P. lentiginosa* is SMG in the Southwest Atlantic.

It presents a continuous reproductive cycle with the peak of egg-case production during autumn. Maximum lengths recorded were 55 and 52 cm TL for males and females. Both sexes matured at similar sizes, 41 cm TL. Due to its small size, individuals caught by the local fishery are discarded onboard.

Reference. Perier et al. (2010).

Psammodontus bergi Marini, 1932. Blotched sand skate- *Raya marmorada*. This species is endemic to the Southwest Atlantic. It is found from Uruguay to northern Patagonia, Argentina.

Remarks. Maximum lengths recorded were 51 and 46 cm TL for males and females respectively in SMG. This species is found sporadically among commercial species of the local fishery.

Psammodontus rudis Günther, 1870. Smallthorn sand skate- *Raya de hocico corto*. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to Uruguay.

Remarks. The presence of this species is rare. Only one female of 21 cm TL has been recorded in SMG.

Rioraja agassizii (Müller & Henle, 1841). Rio skate- *Raya lisa*. This species is endemic to the Southwest Atlantic. It is distributed from southern Brazil to northern Patagonia, Argentina.

Remarks. The presence of this species is rare. Maximum lengths recorded were 52 and 59 cm TL for males and females respectively in SMG. This species is commercially exploited by the local fishery.

Reference. Estalles et al. (2011).

Sympterygia bonapartii Müller & Henle, 1841. Smallnose fanskate- *Raya marmorada*. This species is distributed in the Southeast Pacific and Southwest Atlantic, from southern Chile to southern Brazil.

Remarks. Maximum lengths recorded were 69 and 75 cm TL for males and females respectively in SMG. Size at maturity was estimated at 56 and 59 cm TL for males and females. This species is commercially exploited by the local fishery.

Reference. Estalles et al. (2011).

Sympterygia acuta Garman, 1877. Bignose fanskate- *Raya picuda*. This species is endemic to the Southwest Atlantic. It is found from southern Brazil to northern Patagonia, Argentina.

Remarks. Only a few individuals, most of them immature have been recorded in SMG. Maximum lengths recorded were 25 and 50 cm TL for males and females respectively.

Family Rajidae

Amblyraja doellojuradoi (Pozzi, 1935). Southern thorny skate- Raya erizo. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to Uruguay. **Remarks.** The presence of this species in SMG is rare.

Dipturus trachyderma (Kreff & Stehmann, 1975). Ray- Raya de vientre áspero. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to southern Brazil.

Remarks. Maximum lengths recorded were 90 and 125 cm TL for males and females respectively in SMG. This species is commercially exploited by the local fishery.

Reference. Estalles *et al.* (2011).

Zearajachilensis (Guichenot, 1848). Yellownose skate- Raya hocicuda. This species is distributed in the Southeast Pacific and Southwest Atlantic, from Chile to southern Brazil.

Remarks. Maximum lengths recorded were 100 and 119 cm TL for males and females respectively in SMG. Size at maturity was estimated at 83 and 93.5 cm TL for males and females. This species is commercially exploited by the local fishery.

Reference. Estalles *et al.* (2011).

Order Myliobatiformes

Family Dasyatidae

Dasyatis hypostigma Santos & de Carvalho, 2004. Eagle ray- Raya látigo. This species is endemic to the Southwest Atlantic. It is distributed from southern Brazil to SMG.

Remarks. The presence of this species is rare. Only one female of 95 cm TL has been recorded in SMG.

Family Myliobatidae

Myliobatis goodei Garman, 1885. Southern eagle ray- Chucho. This species is distributed in the Atlantic from the United States to northern Patagonia, Argentina.

Remarks. This species is frequently captured by recreational fishermen in SMG. Maximum length recorded was 97 cm TL for females.

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