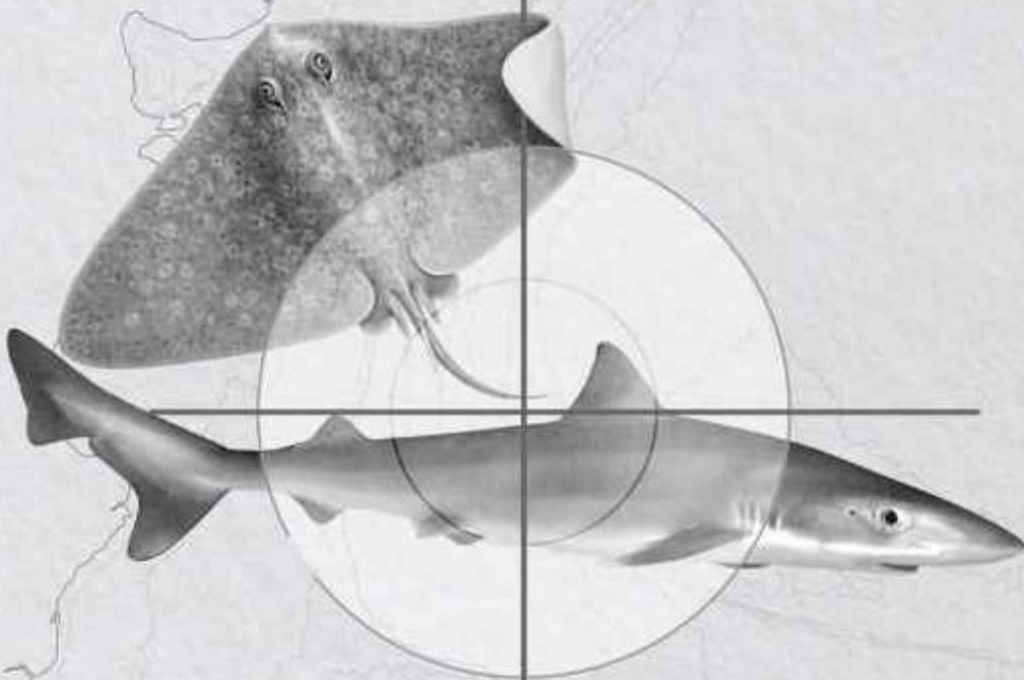


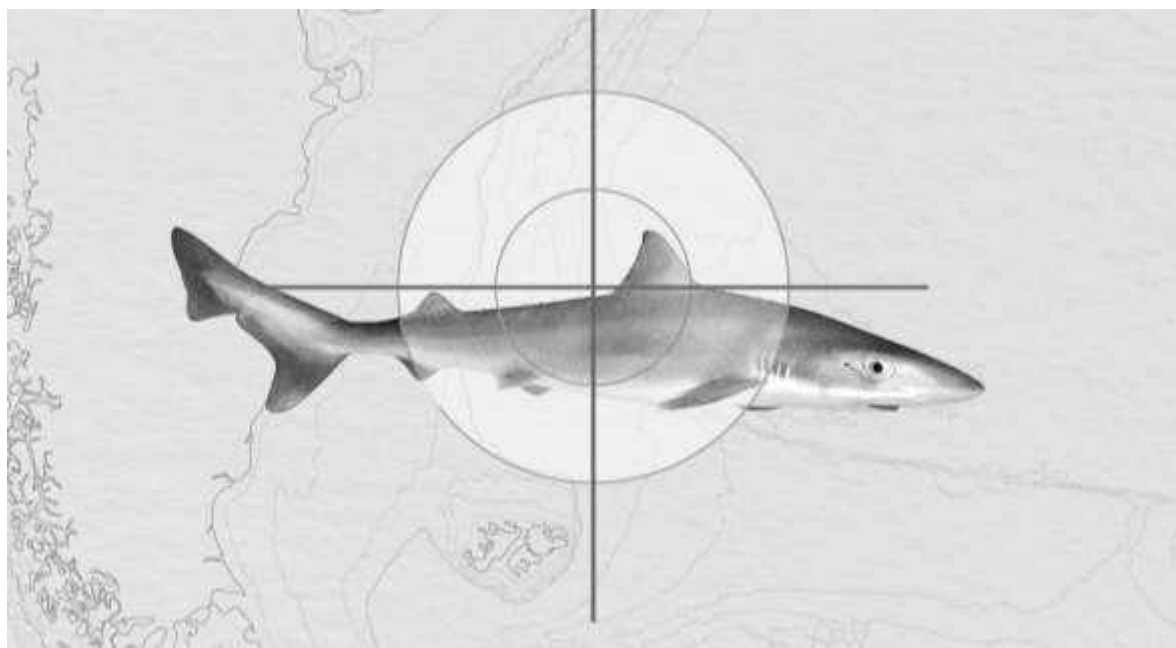


Foro para la Conservación  
del Mar Patagónico  
y Áreas de Influencia



CONDRICTIOS

Primer Taller Regional de  
EVALUACIÓN DEL ESTADO DE CONSERVACIÓN DE ESPECIES  
para el MAR PATAGÓNICO según criterios de la Lista Roja de UICN



Taller Regional de Evaluación del Estado de Conservación de Especies para el  
Mar Patagónico según criterios de la Lista Roja de UICN: CHONDRICHTHOS.  
Buenos Aires, ARGENTINA - 2017

*Results of the 2017 IUCN Regional Red List Workshop for Species of the Patagonian  
Sea: CHONDRICHTHYANS.*

Septiembre 2020

Con el apoyo de:



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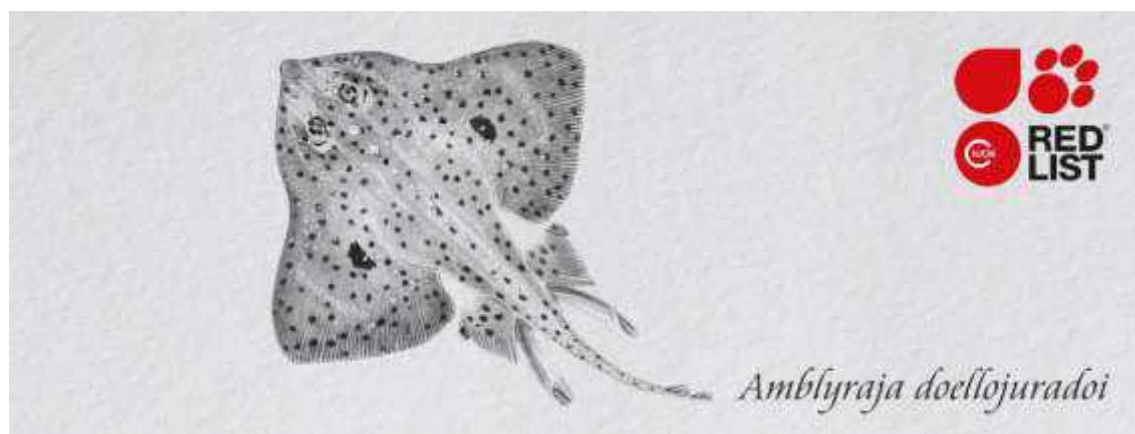
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## LC – Least Concern, (IUCN version 3.1)

### Assessment Rationale:

The Southern Thorny Skate *Amblyraja doellojuradoi* is a medium-sized skate (up to 69 cm TL) endemic to the Patagonian Sea. Found from Uruguayan waters to southern Chile and around Malvinas/Falkland Islands. Around the Malvinas/Falkland Islands the species is a small component in the multispecies skate fishery. There was a gradual decrease in the size of specimens taken in this fishery between 1993 and 1997 although the data were often sparse. Following fishery declines in the early 1990s, the southern area of the Islands was closed to the commercial ray fleet and fishing now only occurs north of 52°S. An assessment of the northern ray population has indicated that the CPUE of *A. doellojuradoi* has increased from 1992 to 2001. There have been no assessments yet of the population in the southern area of the Islands since the fishery closure and the species may still be subject to bycatch pressure by deepwater teleost trawlers in this area. Documented population trends do not exist for the rest of the species' distribution. It was a regular bycatch of deeper water benthic trawl fisheries targeting *Merluccius hubbsi* and *Dissostichus eleginoides* off Argentina however there are no species-specific bycatch estimates available for these fisheries. This species is assessed as Least Concern because it is common and there is no evidence of generalized decline; moreover, there are reports of increases in CPUE over some of the species' range, although the magnitude of these increases is difficult to assess. The expansion of fishing pressure in deeper waters could increase takes of this species as bycatch.

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**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

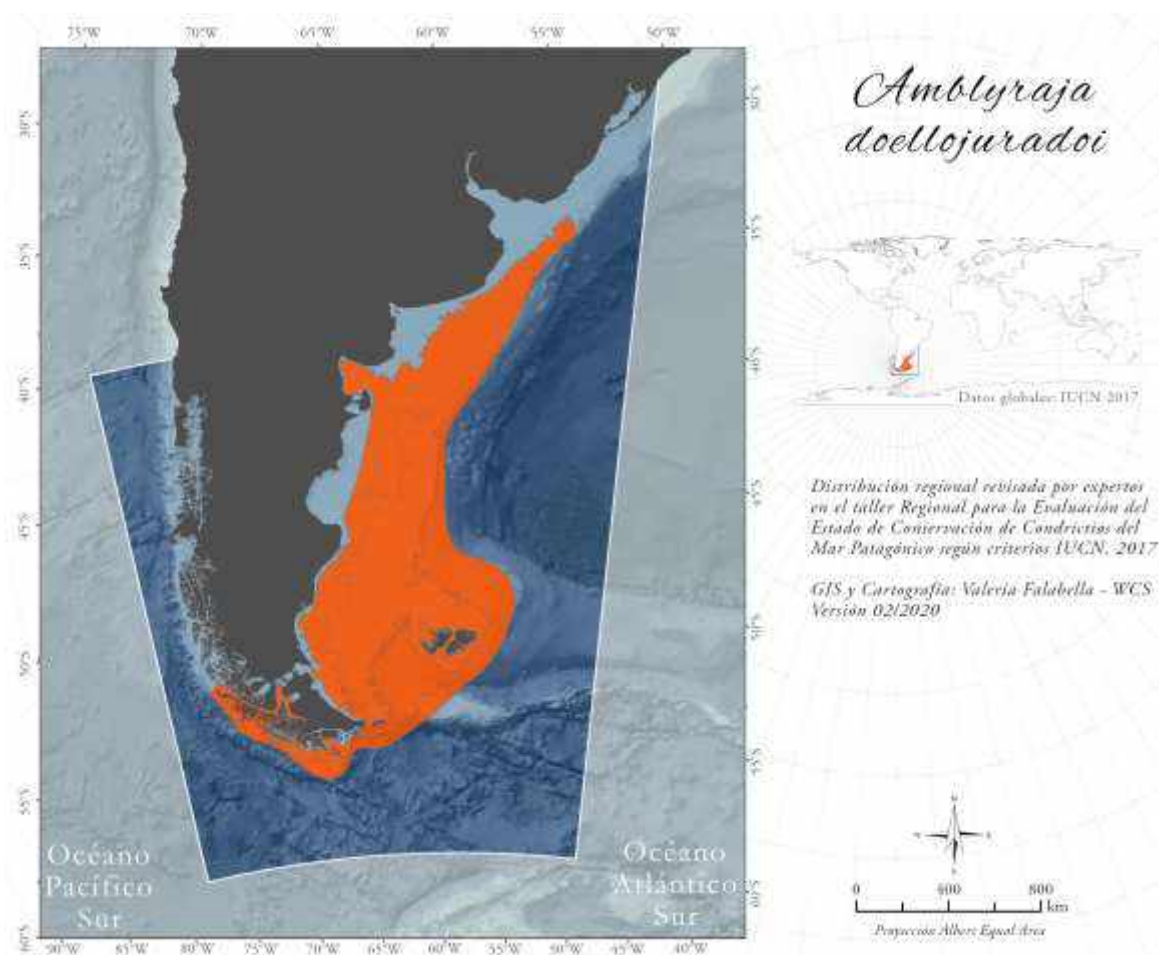
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - RAJIDAE - Amblyraja – doellojuradoi (Pozzi, 1935)

**Common Names:** Southern Thorny Skate (English), Raya (Spanish; Castilian), Raya Erizo (Spanish; Castilian)

## Geographic Range



The Southern Thorny Skate *Amblyraja doellojuradoi* is an endemic species of the Patagonian Sea found from southern Uruguayan waters to southern Chile and around Malvinas/Falkland Islands (Ebert, 2016, Cousseau *et al.*, 2007, Perier *et al.*, 2011).



## Population

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There are no species-specific bycatch estimates and therefore no population trend available for this species in the Patagonian Sea.

In Falkland/Malvinas Islands observer data for the species showed no significant trends in abundance between 1993 and 1997 (Agnew *et al.* 2000). Mean disc width gradually decreased from 1993 to 1997 although the data were often sparse (Agnew *et al.* 2000). The Wakeford *et al.* (2004) assessment of the northern ray population, based on observer data, indicated that the CPUE of *A. doellojuradoi* increased from 1992 to 2001. *Amblyraja doellojuradoi* comprised 2.4% of the catch from the northern area of the fishery between 1993 and 2002 (Wakeford *et al.* 2004) while in 2016 it comprised 3.9% of the total capture weight of 21 fishing vessels (Winter *et al.*, 2015).

Population trend: unknown.

## Habitats and Ecology

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*Amblyraja doellojuradoi* is a medium-sized benthic species distributed in deep temperate waters of the continental shelf and slope. It was reported at depths from 51 to 642 m in bottom temperatures ranging from 2.5°C to 6.8°C (Menni and Stehmann 2000), and off Punta Arenas, Chile at 185 m depth and between 105 m and 1640 m around Malvinas/Falklands Islands (Joost Pompert pers. comm. 2017). This species has been recorded from 57 m to 323 m depth over the continental shelf (Laura Paesch and Gustavo Chiamonte pers comm. 2017).

Males mature at 44.8 cm and females at 41.1 cm (Delpiani, 2016). No sexual dimorphism was observed in the total length at maturity at which 50% of individuals were sexually mature. Reproduction might occur throughout the year with peaks in autumn (Delpiani, 2016).

Diet is based mainly on crabs and to a lesser extent on polychaetes, teleosts, isopods, and other invertebrates. Ontogenetic diet changes include increased consumption of crabs as animals grow and decreased feeding on polychaetes and other invertebrates (Delpiani *et al.*, 2013).

## Threats

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*Amblyraja doellojuradoi* is a by-cath species of bottom trawl fisheries of Uruguay targeting argentine hake *Merluccius hubbsi* (Paesch and Lorenzo, 2017). It is also a bycatch species in bottom trawl fisheries of Argentina targeting vertebrates and invertebrates such as the patagonic scallop fishery (*Zygochlamys patagonica*) (Schejter *et al.* 2012). It has been captured during fishery-independent investigations on hake and other species in the past (García de la Rosa *et al.* 1999). Off Argentina, the great depth range of the species offers it some refuge beyond the depth

of current fishing pressure, however, especially as fisheries expand into greater depths, there is a need for close monitoring and the collection of species-specific catch and bycatch data where none currently exists.

This species may be caught as bycatch by finfish trawlers around the Falkland/Malvinas Islands including within the southern rajid closure area (Agnew *et al.* 2000). While vessels fishing under general finfish licenses are prohibited from targeting rajids, a small bycatch (below 10%) is allowed, therefore rajids to the south of the Islands are continuing to face bycatch fishing pressure (Agnew *et al.* 2000).

Catch reports are very low in general because the species is discarded mainly for its small size (< 40 cm DW) and because it is difficult to skin due to the extremely hefty spines on the median row and on the disk (Joost Pompert, pers. com. 2017). As for survivability, *Amblyraja doellojuradoi* seems quite robust. But, although often discarded seemingly alive, it is not known whether and how well it survives fishing capture (Joost Pompert, pers. com. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes the management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine

protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys biviatus*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are

small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2: effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al.*, 2000, Wakeford *et al.*, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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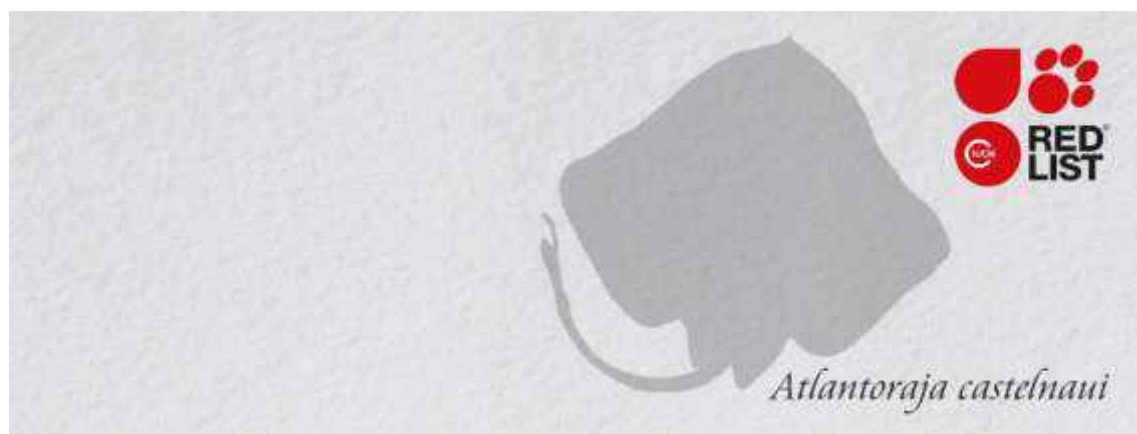
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EN - Endangered, A2bd, (IUCN version 3.1)

#### Assessment Rationale:

The Spotback Skate *Atlantoraja castelnaui* is an endemic species of the Southwest Atlantic (southern Brazil, Uruguay and Argentina) and one of the most caught by commercial fisheries. The geographical range of this oviparous species in the Patagonian Sea goes from southern Brazil in Rio Grande do Sul (30° S) to southern Argentina in the San Jorge Gulf (46° S) Chubut. These bottom trawl fisheries operate down to 100 m in Brazil and up to 50 m in depth in Argentina, overlapping perfectly with the species distribution. Large individuals of this species are now rarely seen. Over the past 45 years, there has been at least a 50-75 percent decline in the Patagonian Sea, inference based on trawl research conducted in Argentina and Uruguay, as well as studies in southern Brazil. This species has declined over the past 45 years due to capture in multi-species trawl fisheries, that includes skates. In the Common Fishing Zone of Argentina and Uruguay, the status of coastal skates, including *A. castelnaui*, indicates overfishing and since 2015 these catches are above the estimated replacement yield. Based on an average age of maturity that goes from 8-10 years and a longevity of at least 20 years, this species has a 15 year estimated generation length. Due to the fact that there has been a decline in the Patagonian Sea of at least 50 to 75 percent over the last 3 generations, this species is listed as Endangered under Criteria A2bd.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

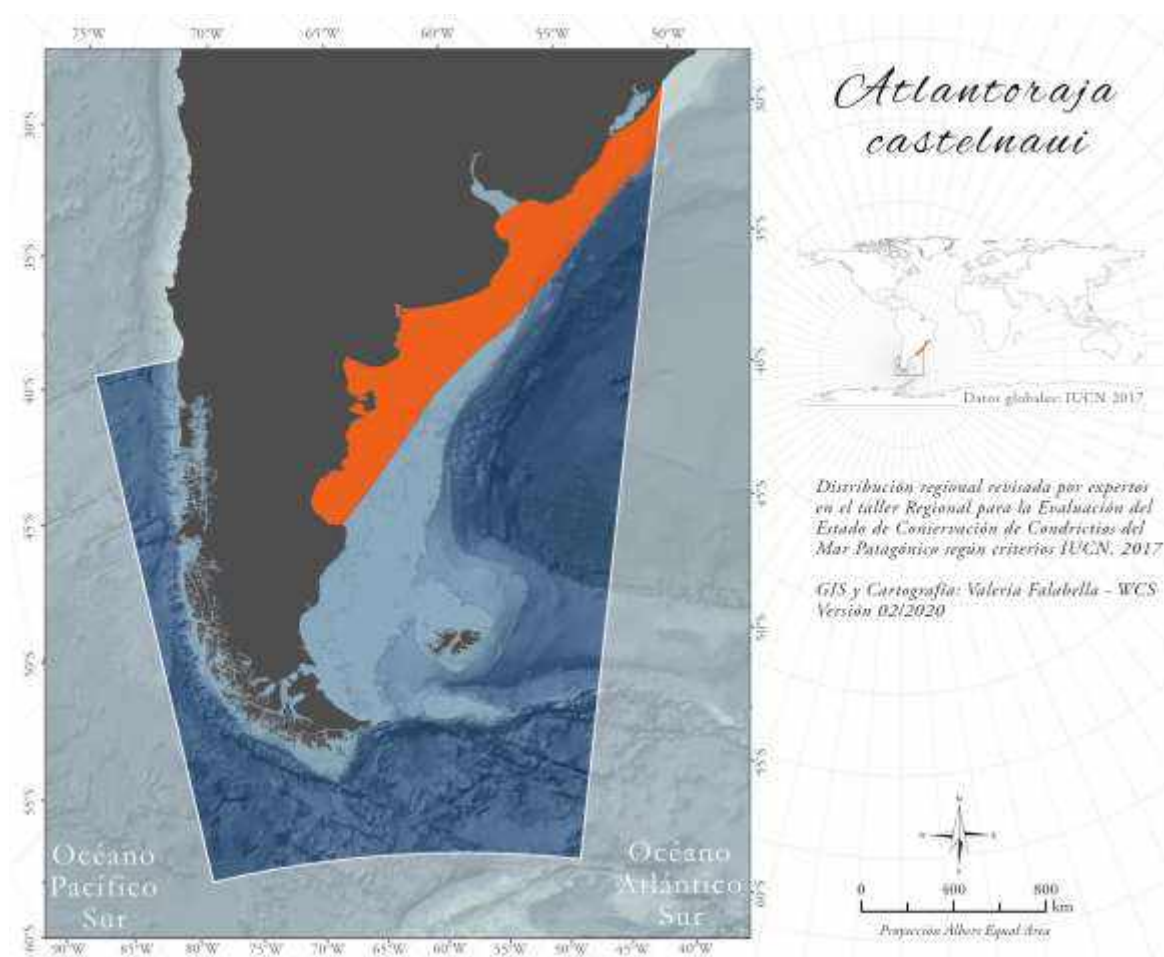
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE - *Atlantoraja* – castelnaui (Miranda Ribeiro, 1907)

**Common Names:** Spotback Skate (English), Raia-chita (Spanish; Castilian), Raia-jereba (Spanish; Castilian), Raya A Lunares (Spanish; Castilian), Raya Chita (Spanish; Castilian), Raya Pintada (Spanish; Castilian)

## Geographic Range



The known geographical range of the species in the Patagonian Sea goes from southern Brazil in Rio Grande do Sul (30° S) to the San Jorge Gulf (46° S) Chubut, Argentina (Vooren, 1997; Cousseau *et al.* 2007; Bovcon *et al.*, 2011).



## Population

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*Atlantoraja castelnaui* is one of the most common species of skates alongside its *geographic* distribution and one of the most caught by commercial fisheries (Menni & Stehmann, 2000; Massa *et al.*, 2004; Perier *et al.*, 2007; Oddone and Amorim, 2007). There exist density estimations for Uruguay and Buenos Aires province, Argentina (Colonello, 2009; Massa *et al.*, 2004). According to the one made in Buenos Aires Province, for the period 1994-1999, a decrease of more than the 50% in the densities of this species was reported (Massa *et al.*, 2004).

Biomass estimations of coastal skates of Uruguay and Argentina from 1981 to 2013 using Schaefer models indicate a decreasing trend since 1994. The biomass estimation for 2014 shows that the population of skates is at 63% regarding the original biomass for 1981 (Cortés *et al.* 2014).

Based on landings of the southern Brazilian fleet, between 1970 and 2009, there has been an estimated decline of 75% (Roberta A. Santos pers comm. 2017).

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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In the Common Fishing Zone of Argentina and Uruguay this species can be found between 4 m and 296 m (Laura Paesch pers. comm., 2017). While in southern Brazil *Atlantoraja castelnaui* occurs all year in a broader and deeper range over the continental shelf between 20 m and 300 m (Haimovici *et al.* 2008) and between a bottom temperature range of 9.5 - 22°C (Vooren 1997), in Argentina it prefers minor depths (40 m- 60 m) and a narrow bottom temperature range, 9.6 - 13.5°C (Menni and Stehmann 2000). The species could also reach 100 m in depth in southern areas of Argentina as the San Jorge Gulf, Chubut (Bovcon *et al.*, 2011).

Oviparous, annual cycle with egg-laying peaks occurs from January to October (Oddone *et al.* 2008; Colonello *et al.* 2012).

- Female size at maturity (total length: southern Brazil (between 23°37'S and 27°40'S): 105.5 cm (Oddone *et al.*, 2005; 2008); Buenos Aires province, Argentina: TL<sub>50%</sub> 108,9 cm (Colonello *et al.* 2012). In the San Matías Gulf, Argentina, female size at maturity is 107 cm (Estalles *et al.* 2011).

Male size at first sexual maturity (total length): southern Brazil (between 23°37'S and 27°40'S): 91.1cm (Oddone *et al.* 2008); Buenos Aires province: TL<sub>50%</sub> 98 cm. (Colonello *et al.* 2012). In the San Matías Gulf, Argentina, male size at maturity is 93 cm (Estalles *et al.* 2011).

- Female maximum size (total length): southern Brazil (between 23°37'S and 27°40'S): 116 cm; Buenos Aires province: 137 cm; Río Negro province: 147 cm. (Oddone *et al.*, 2005; 2008; Colonello *et al.* 2012, Estalles *et al.* 2011).

- Male maximum size (total length cm): Males: southern Brazil (between 23°37'S and 27°40'S): 111cm; Buenos Aires province: 125 cm; Río Negro province: 112 cm. (Oddone *et al.*, 2008; Colonello *et al.* 2012, Estalles *et al.* 2011)

- Reproductive seasonality: Year round reproduction (Colonello *et al.* 2012).

Age of maturity for males is 8.6 years and for females is 10.6 years (Hozbor and Massa 2013). Longevity is estimated at 22.1 years for males, and about 20.8 years for females (Hozbor and Massa 2013). In southeast Brazil, Casarini (2006) estimates longevity of 43 years for males and 63 years for females.

The species feeds mainly on fish, decapod crustaceans, elasmobranchs, mollusks, and cephalochordates (Paesch, 2000; Barbini and Lucifora 2012).

## Threats

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*Atlantoraja castelnaui* is part of the coastal skate group of Argentina and Uruguay Common Fishing Zone (AUCFZ) with one of the largest landed volumes (Massa *et al.* 2004). In southern Brazil, this species has been fished with trawling nets since at least 1975, and progressively added since early 1980s in the category "emplastro" (Miranda and Vucorac, 2003).

In northern Patagonia, specifically the San Matías Gulf, 88% of males and 90% of females landed of *A. castelnaui* are immature (Marilú Estalles, pers. comm. 2017).

This species has been caught by the shrimp trawl fishery that operates in the San Jorge Gulf and adjacent waters (Patagonia, Argentina) with a frequency of less than 2%. It has been recorded in 431 hauls over the period 2003-2007 mainly near 46° S (Góngora, 2011). The species is also occasionally caught by the coastal recreational fishery near Puerto Rawson (Patagonia) during spring and summer; on sandy substrate with a steep slope of the coast. Total length (TL) recorded in the recreational fishery ranges from 58.0 to 80.1 cm, all were juvenile individuals (Nelson Bovcon pers. comm. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentina. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*,

*Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Riñón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Riñón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyans. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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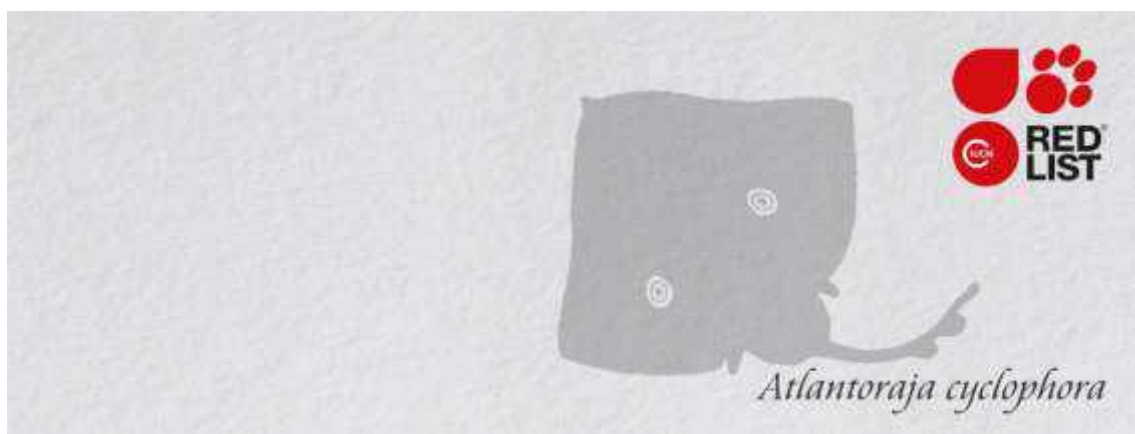
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VU - Vulnerable, A2bd, (IUCN version 3.1)

#### Assessment Rationale:

This endemic species of southern Brazil, Uruguay and Argentina is caught in multispecies trawl fisheries throughout its range as by-catch, that operate between 50 m-100 m. Although species-specific landings are not available, there has been a decline of 63% in abundance and/or biomass for skates recorded over the past 30 years in the Argentine and Uruguay Common Fishery Zone. At the same time, between 2003 and 2005, the 25% of the coastal skate individuals that landed in Puerto Quequén (Argentina) belong to this species, decreasing only in a 9% from 2007 to 2008. In Argentina, skate landings have increased significantly since 1993, when skate species became commercially important. This species was one of the most landed in the ports of Buenos Aires province. These ports hold the largest amounts of skate landings. During 2009 and 2016, commercial catches of non identified skates averaged 18,000 t (+/- 2,300). At present, together with Indonesia and the United States, Argentina is one of the countries with the largest amount of skate landings. In the ports of Río Negro province this species contributes with 1.8% in weight to commercial landings, and about 78% of the females and 73% of the males of the landed ones are immature. A serious problem is that in most jurisdictions skate capture statistics are not discriminated by species, making it difficult to estimate skate catches. Little is known about this species life history, but average generation length is estimated between 8-10 years. In Brazil, *A. cyclophora* is listed as Near Threatened. This species is listed in the Patagonian Sea as Vulnerable under Criterion A2bd. However, given that it is still captured throughout its range, it needs to be closely monitored.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L..

**Facilitators:** Polidoro, B., Falabella, V.

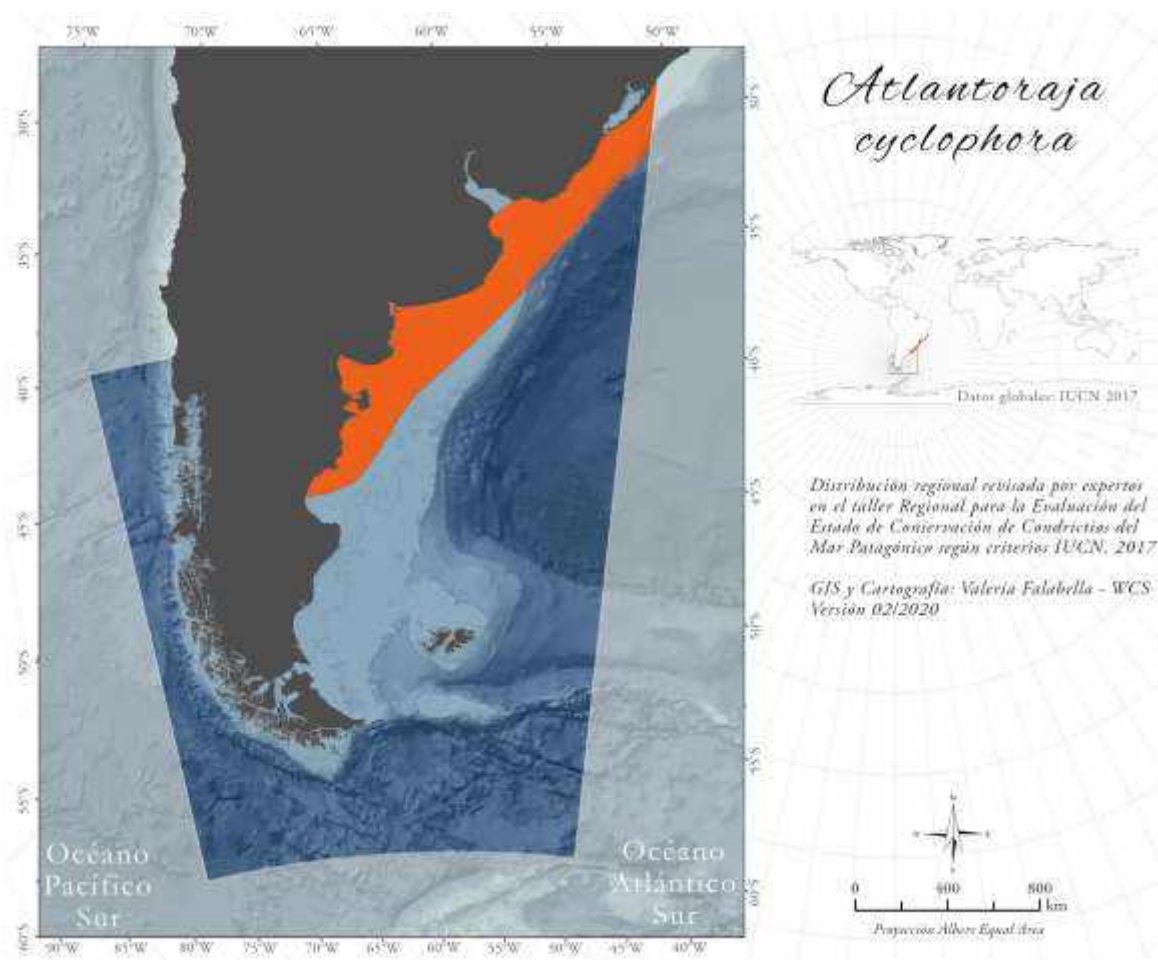
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE - *Atlantoraja cyclophora* (Regan, 1903)

Common Names: Eyespot Skate (English), Raia-santa (Portuguese), Raya Ojona (Spanish; Castilian), Raya (Spanish; Castilian).

## Geographic Range



The Eyespot Skate *Atlantoraja cyclophora* is endemic to the Western South Atlantic (Menni and Stehmann 2000). In the Patagonian Sea, it inhabits from Rio Grande do Sul State, Brasil (30° S) to central Patagonia (42° S) (Cousseau *et al.*, 2007) and also in the central area of the San Jorge Gulf (46° S), Argentina (Nelson Bovcon pers. comm. 2017).



## Population

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It is a common species in its area of distribution (Menni and Stehmann 2000, Perier *et al.*, 2007). From reports of INIDEP (Instituto Nacional de Investigación y Desarrollo Pesquero, Mar del Plata, Argentina) research campaigns conducted since 1981, it has been reported an abundance decrease greater than 50% in the area of El Rincón (Buenos Aires, Argentina) between 1994 and 1999 (Massa *et al.*, 2004). *A. cyclophora* is one of the most landed skates in the fisheries of Argentine and Uruguay Common Fishery Zone and although species-specific landings are not available, a decline in abundance and/or biomass of 63% has been recorded for skates over the past 30 years (Cortés *et al.* 2014). From 2003 to 2005, 25% of the coastal skate individuals landed in Puerto Quequén, Argentina, where *A. cyclophora* has decreased only a 9% from 2007 to 2008 (Perez Comesaña *et al.* 2011).

This species has been caught by the trawl fishery that operates in the San Jorge Gulf and adjacent waters with a frequency of less than 1% (Góngora *et al.* 2009). 206 hauls were recorded for the period 2003 to 2007, mainly in central San Jorge Gulf (48° 00' S; 66° 00' to 67° 00' W); It has been also occasionally captured by the small coastal fishery between 43° to 44°S, from the coastline to 65° W.

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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*Atlantoraja cyclophora* inhabits from 8 to 260 m in the Argentina and Uruguay Common Fishing Zone (Laura Paesch pers. comm. 2017) while in research cruises conducted between 100 and 600 m deep in southern Brazil, the species was caught between 100 m and 300 m deep (Oddone and Vooren, 2005).

Size at first sexual maturity (total length cm): female: 53.2 cm (Oddone and Vooren, 2005; Oddone *et al.* 2008); 59 cm (Estalles *et al.*, in *Revision*). Male: 46.3 cm (Oddone and Vooren, 2005; Oddone *et al.* 2008); 53 cm (Estalles *et al.* 2011).

Maximum size (total length cm): Female: 68 cm and Male: 58.5 cm (Oddone *et al.* 2008); Female: 69 cm and Male: 62 cm (Estalles *et al.* 2011).

Spawning mode: Egg-laying was noted all year round with higher proportions of egg-bearing females from April to July (Oddone *et al.* 2008).

Reproductive seasonality: Annual cycle with slight seasonal variations in the reproductive activity (Oddone *et al.* 2008).

In Argentina, age of first maturity is 6 years for males and 7.2 years for females and longevity is 10 years for males and 12.6 years for females (Marina Coller pers. comm., 2017). Thus, this species likely has a generation length between 8-10 years.

## Threats

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This species is fished all along its distribution. It is mainly caught as by-catch by bottom trawlers in multispecies fisheries or fisheries targeting bony fishes (Massa *et al.*, 2004, Tamini *et al.*, 2006, Perier, *et al.*, 2007, Oddone *et al.*, 2008, Domingo, 2008, Estalles *et al.* 2011). In Argentina, skate landings have increased significantly since 1993 when skate species became commercially important. This species was one of the most landed in the ports of Buenos Aires province (Massa *et al.*, 2004, Tamini *et al.*, 2006). These ports hold the largest amounts of skate landings and during 2009 and 2016, commercial catches of non identified skates averaged 18,000 t (+/- 2,300) (SAGYP, 2017). At present, Argentina together with Indonesia and the United States is one of the countries with the largest amount of skate landings (FAO, 2010). In the ports of Río Negro province this species contributes with 1.8% in weight to commercial landings, and about 78% of the females and 73% of the males of the landed are immature (Estalles *et al.* 2011). A serious problem is that in most jurisdictions skate capture statistics are not discriminated by species, making it difficult to estimate skate catches.

## Conservation

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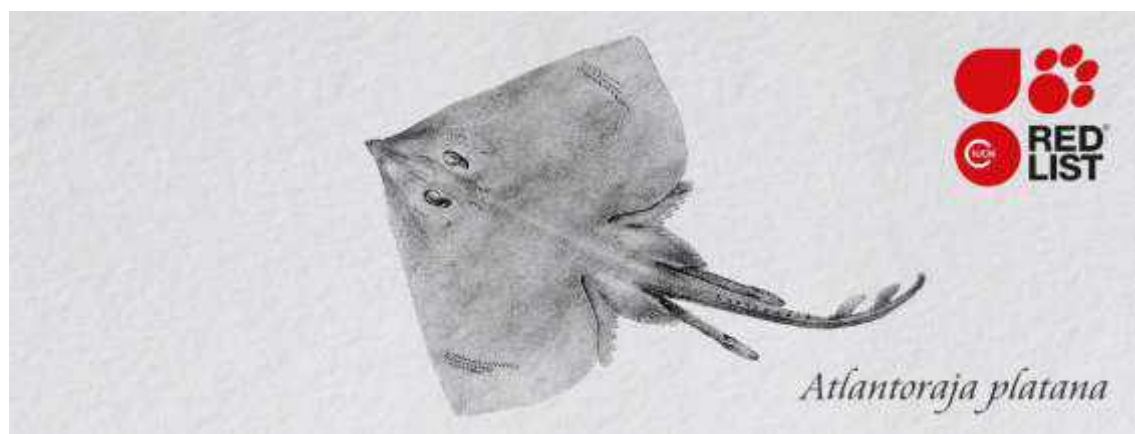
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## LC – Least Concern, (IUCN version 3.1)

### Assessment Rationale:

La Plata Skate *Atlantoraja platana* is a Southwest Atlantic endemic species, distributed in the Patagonian Sea from Rio Grande do Sul in southern Brazil to Chubut in Argentina. It is a patchy distributed species that may occur as two subpopulations in the Patagonian Sea, one in Argentina, in the Gulf of San Matías, and another in southern Brazil, and it is rarely observed between these two areas. It is a common species in southern Brazil and it is caught in the multispecies trawl fisheries at 100 m, where only 0.5 % of skate landings are part of this species and where there is no data trend. In Argentina, skate landings have increased significantly since 1993 when skate species became commercially important but a serious problem in most jurisdictions continuous to be that skate capture statistics are not discriminated by species, making it difficult to estimate skate catches. In the San Matías Gulf this species is taken as *by-catch* by bottom trawlers directed to *Merluccius hubbsi*. This species is the most landed species in this gulf, contributing with 41.8% in weight to commercial skate landings and about 77% of the females and 63% of the males of the landed are immature. The species is still abundant in the Gulf of San Matías, which is an important breeding area and it is a place which presents a permanent occurrence throughout the year. Based on research cruises, there are no signs of abundance decrease of this species between 2004 and 2017 and it remains stable in this gulf. Thus, due to its patchy distribution with scarce records over the continental shelf but with a stable population trend and with great biomass in its main distribution area inside the San Matías Gulf, this species is classified as Least Concern for the Patagonian Sea.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiamonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

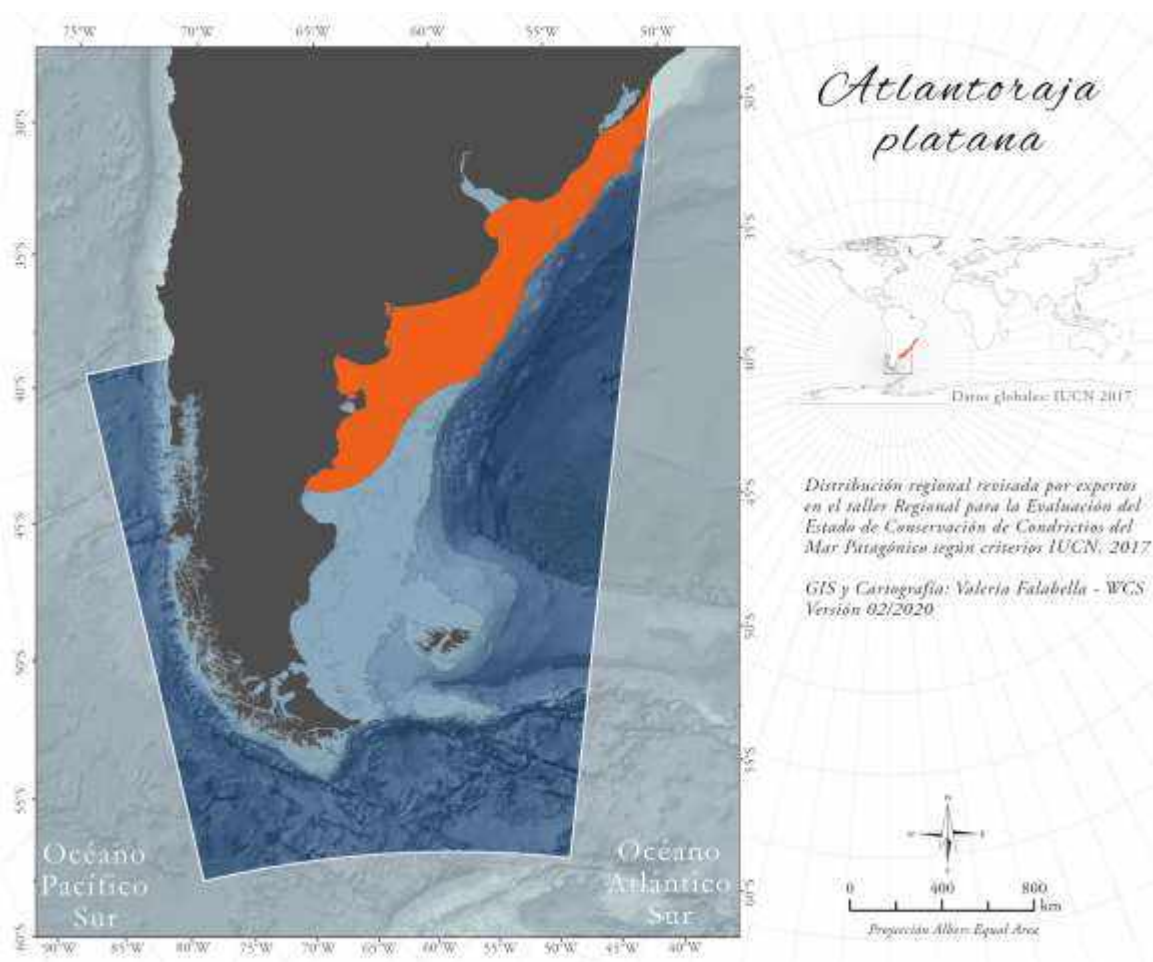
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE - *Atlantoraja* – platana (Günther, 1880)

**Common Names:** Empalastro (Spanish; Castilian), La Plata Skate (English), Oscura (Spanish; Castilian), Platana (Spanish; Castilian), Raya (Spanish; Castilian), Raya Oscura (Spanish; Castilian).

## Geographic Range



A Southwest Atlantic endemic species, distributed in the Patagonian Sea from southern Brazil in Rio Grande do Sul (Vooren, 1997) (30°S) to central (42° S) (Cousseau *et al.*, 2007) and southern Chubut (45°S) in Argentina (Nelson Bovcon pers. comm. 2017).

## Population

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It is a common species in southern Brazil (Figueiredo 1977, Oddone *et al.* 2004, Marçal 2003, Casarini 2006, Oddone & Amorim 2007, 2008). Its presence in the San Matías Gulf is permanent throughout the year with almost no records for the rest of the Argentine Sea (Cousseau *et al.* 2007, Coller, 2012). The species is still abundant in the Gulf of San Matías, which is an important breeding area, being the most landed skate species area. Based on research cruises, there are no signs of abundance decrease of this species in the Gulf of San Matías from 2004 to 2017 where there is a permanent occurrence of it throughout the year and it is the most landed skate area (Perier *et al.* 2007, Estalles *et al.* 2011, Coller, 2012, Marina Coller pers. comm. 2017). However, due to its patchy distribution, it is rare to find it in this area.

**Current Population Trend:** stable.

## Habitats and Ecology

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In southern Brazil, the species could be found at a maximum depth of 300 m but the highest abundances of it are between 100 and 200 m (Vooren, 1997; Haimovici *et al.* 2008). In Uruguay its depth distribution is between 56 and 156 m (Laura Paesch pers. comm. 2017) while in southern Argentina, over the continental shelf, it goes up to 50 m (Nelson Bovcon pers. comm. 2017) but the species could be also found at 168 m in the San Matías Gulf (Coller, 2012).

Size at first sexual maturity (total length cm): female: 69 cm (Marçal 2003), 67.8 cm (Casarini 2006), 71.5 cm (Odone & Amorin, 2008), 71.8 cm (Coller 2012). Male: 63 cm (Marçal 2003), 62 cm (Casarini 2006), 62 cm (Odone & Amorin 2008), 64.2 cm (Coller 2012).

Maximum size (total length cm): female: 79 cm and male: 73 cm (Marçal, 2003), female: 76 cm and male: 70 cm (Oddone & Amorin, 2007), female: 91 cm and male: 81 cm (Coller 2012).

Spawning mode: Egg capsules are present year round, with peaks in December (Coller 2012).

Reproductive seasonality: Annual cycle with peaks in summer and autumn (Coller 2012).

The longevity is estimated to be 31 for females and 29 years for males (Coller, 2012). Age of first maturity is 4.8 for males and 7.6 years for females (Coller, 2012). Average generation length is estimated to be approximately 15-18 years.

In the Gulf of San Matías, *A. platana* has epibenthic trophic habits with predominance to carcinofagia, being shrimps (*Pleoticus muelleri*) and the stomatopods (*Pterygosquilla armata armata*) the most consumed prey by both juveniles and adults of both sexes (Coller, 2012).

## Threats

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In Argentina, skate landings have increased significantly since 1993 when skate species became commercially important. In the San Matías Gulf this species is taken as by-catch by bottom trawlers directed to *Merluccius hubbsi* (Perier *et al.*, 2007, Estalles *et al.* 2011). A serious problem is that in most jurisdictions skate capture statistics are not discriminated by species, making it difficult to estimate skate catches. This species is the most landed one in Río Negro province ports, contributing with 41.8% in weight to commercial landings and about 77% of the females and 63% of the males of the landed are immature (Estalles *et al.* 2011).

It is caught in multispecies trawl fisheries in southern Brazil at 100 m, where 0.5 % of skate landing are *Atlantoraja platana* (Roberta A. Santos pers. comm. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional



Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhinchus callorynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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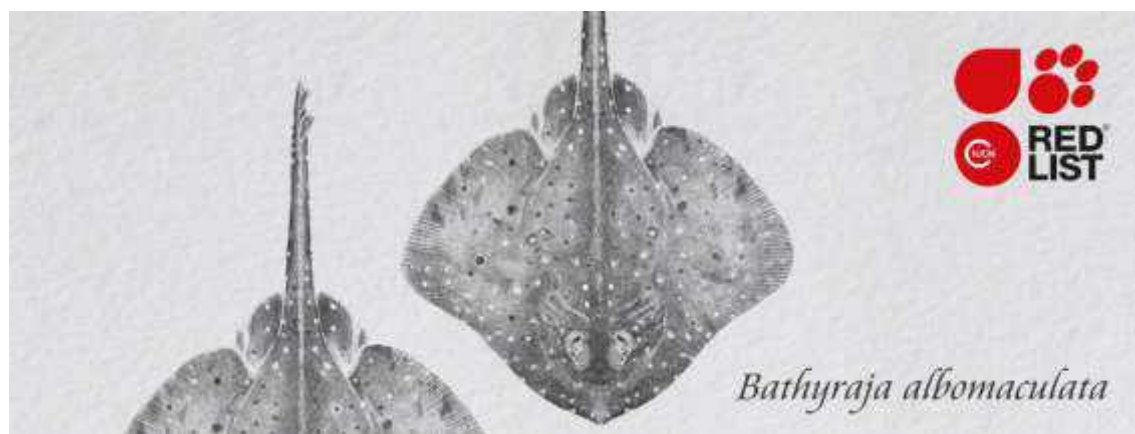
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## DD – Data Deficient, (IUCN version 3.1)

### Assessment Rationale:

The Whitedotted Skate *Bathyraja albomaculata* is widely distributed over the Patagonian Sea from northern Argentina to Chile and around Malvinas/Falkland Islands. It could be found from 50 m to 1000 m in depth, but it may occur at greatest abundances between 100 and 150 m. It is caught as by-catch in different bottom trawl fisheries, including hake which occurs to about 150 m in depth and shrimp which operates to about 500m off Chile. CPUE trends from 1994 to 2013 in Malvinas/Falkland Islands for this species show a decline or steady trend from 1994 to 2009, followed by an increase in the period 2009- 2013. *B. albomaculata* displays slow growth and late maturity and it can be susceptible to overfishing if not closely monitored. More information is required to determine the impact of fisheries on this species population, especially as this species has been shown to be vulnerable to overfishing in the past, due to slow growth and late maturity, and the continuous fishing pressure. It is listed as Data Deficient. Given heavy fishing pressure throughout its range, more information is needed on this species population trends.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

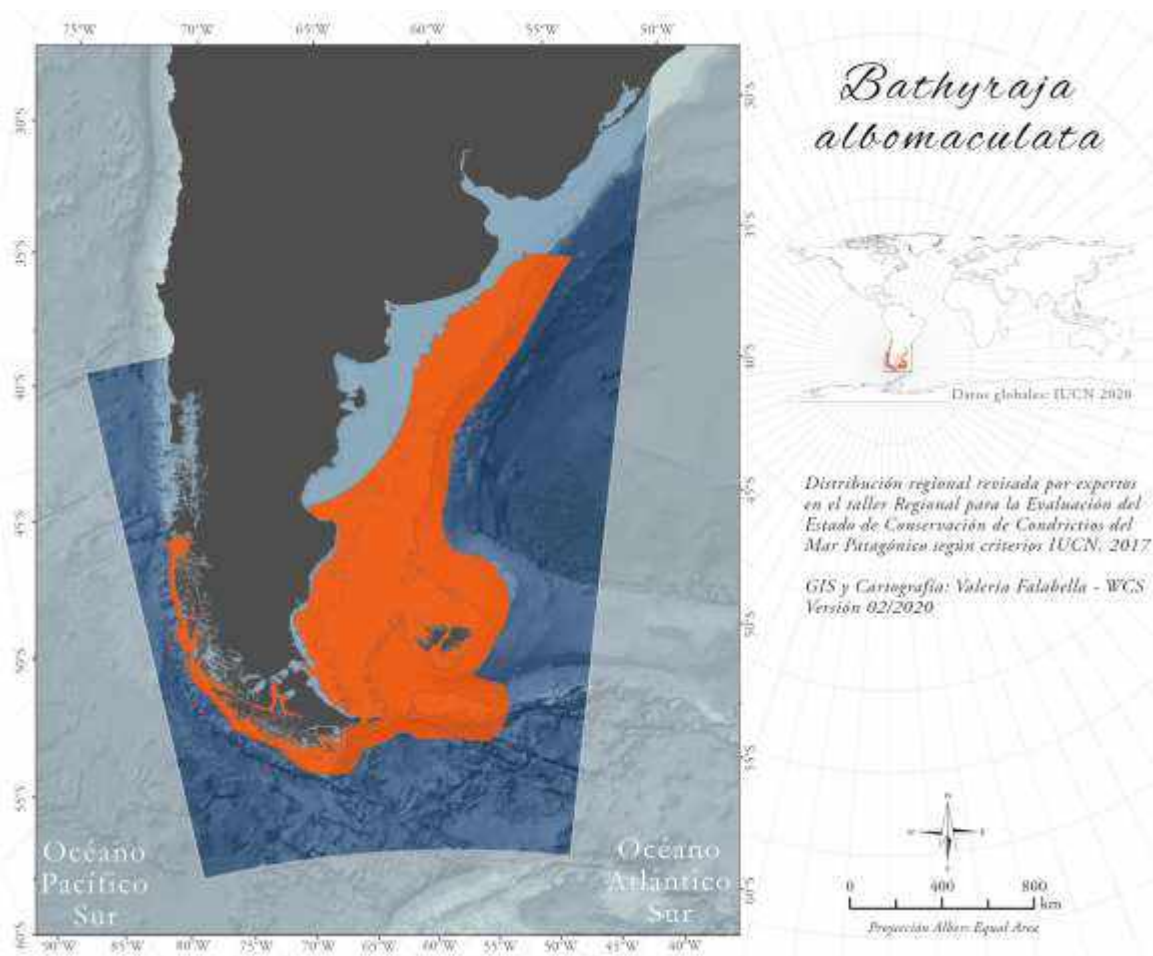
ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE -  
*Bathyraja* - albomaculata

**Common Names:** Raya De Manchas Blancas (Spanish; Castilian), Rayas De Lunares (Spanish; Castilian), Whitedotted Skate (English)

**Synonyms:** *Bathyraja albomaculata* (Norman, 1937)

**Taxonomic Note:** Compagno (1999, 2005) reallocated this species from *Bathyraja* to the genus *Rhinoraja* but the validity of this change remains unconfirmed. Both are currently in use, but *Rhinoraja* is now accepted as *Bathyraja* (Last *et al.* 2016, Ebert 2016).

## Geographic Range



The Whitedotted Skate *Bathyraja albomaculata* is widely distributed in the Patagonian Sea from the upper slope of southern Uruguay, the southern continental shelf of Argentina, Chile and around Malvinas/Falkland Islands (Ruocco *et al.* 2006, Cousseau *et al.*, 2007, Scenna, 2011, Bustamante *et al.*, 2014, Winter *et al.*, 2015).

## Population

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The CPUE trends of *Bathyraja albomaculata* from 1994 to 2013 in Malvinas/Falkland Islands for this species show a decline or steady trend from 1994 to 2009, followed by an increase between 2009 and 2013 (Winter *et al.*, 2015).

## Habitats and Ecology

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This species occurs in a wide depth range from the 50 m to around 1500 m deep, particularly between 65 m and 310 m over the argentine continental shelf an upper slope, in Chile (> 40°S) between 50 m and 1000 m (Bustamante *et al.*, 2014). Around Malvinas/Falklands Islands it could be found between 93 m and 1475 m deep (Joost Pompert pers. comm. 2017).

This species may occur at greatest abundances in depths between 100 and 310m over the argentine shelf an upper slope (Ruocco *et al.*, 2006).

*Bathyraja albomaculata* is a highly specific feeder on benthopelagic gammarid, polychaetes and isopods (Brickle *et al.* 2003, Sánchez and Mabragaña 2002, Ruocco *et al.* 2009).

## Threats

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*Bathyraja albomaculata* is a by-cath species of the bottom trawl fishery of Uruguay targeting the argentine hake *Merluccius hubbsi* (Paesch and Lorenzo, 2017). It is also caught as by-catch in a number of bottom trawl fisheries of Argentina targeting bony fishes, including hake which occurs to about 150 m deep (García de la Rosa *et al.*, 2000) and invertebrates as the patagonian scallop fishery (*Zygochlamys patagonica*) and shrimp trawls which operate to about 500 m off Chile (Schejter *et al.* 2012). In Chile it is also taken in the directed skate fishery which primarily targets *Dipturus chilensis* that it is also taken as by-catch in the deep artisanal Patagonian toothfish longline fishery (Lamilla *et al.*, 2001, 2002, 2003). This species is part of the multispecies skate trawl fishery around the Falkland/Malvinas Islands as well (Winter *et al.*, 2015).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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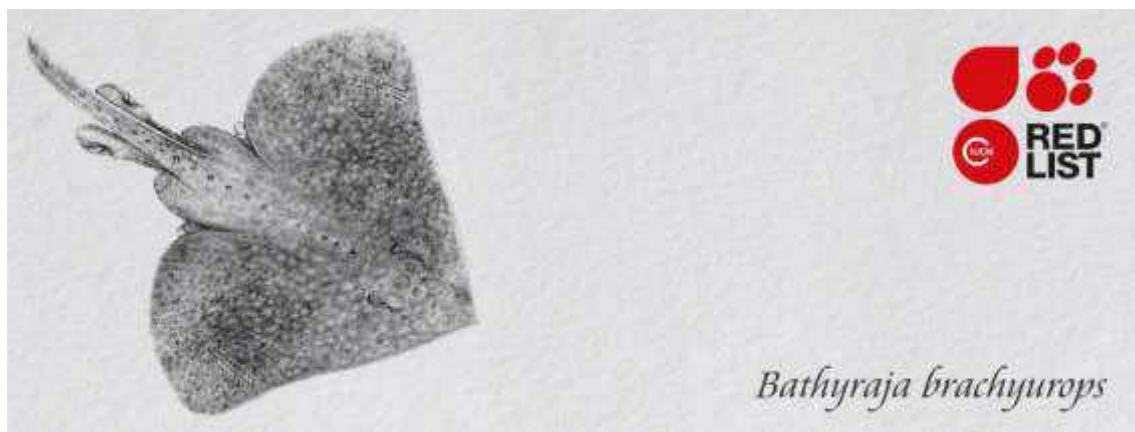
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## EN – Endangered, A2bd, (IUCN version 3.1)

### Assessment Rationale:

The Broadnose Skate *Bathyraja brachyurops* is an oviparous endemic species of the Patagonian Sea. This species inhabits from 50 to 800 m in Uruguay, Argentina, Malvinas/Falkland Islands and Chile. In Uruguay, northern zone of the Argentina and Uruguay Common Fishing Zone, it is a low frequency species (29% between 1984 and 2009) while in Chile it has not been recorded since 1999. *B. brachyurops* is abundant over the Argentinian continental shelf and around the Malvinas/Falkland Islands. It is caught as by-catch in Argentina and in Malvinas/Falklands Islands as part of the multi-species skate assemblage commercial target capture. In Argentina, a research survey in the southern part of the continental shelf recorded catches from 1992 to 2001 showing high fluctuations, with no clear trend. A more recent study identified a biomass decline of 70% from 1997 to 2012 over the Argentinian continental shelf between 35°S and 48°S which is probably related to the displacement of the industrial trawl fishing effort in the area. In Malvinas/Falklands Islands, catch proportion and abundance of *B. brachyurops* slightly increased from 1997 to 2013 (25.6%-30.3%). However, a decrease in size at 50% maturity has also been identified between 2004 and 2013 in areas where these skates continue to be commercially fished. The increasing abundances and concomitant reductions in size at maturity of this species suggest either plasticity in life-history traits or a density-dependent growth response to fishing pressure since 1989. Age at maturity has been estimated at 14 years for males and 17.78 years for females with a generation length estimated to be 13-15 years. In sum, this species is rare in Chile and Uruguay but there has been a 70% decline over the last 22 years in the most important area of its range in the Patagonian Sea, with increasing catches in by-catch and decreasing trends in size of first maturity in the Malvinas/Falkland Islands. Therefore, this species is estimated to have declined by at least 50 to 70% over the past 3 generation lengths (39-45 years) in the Patagonian Sea. It is listed as Endangered under Criterion A2bd.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

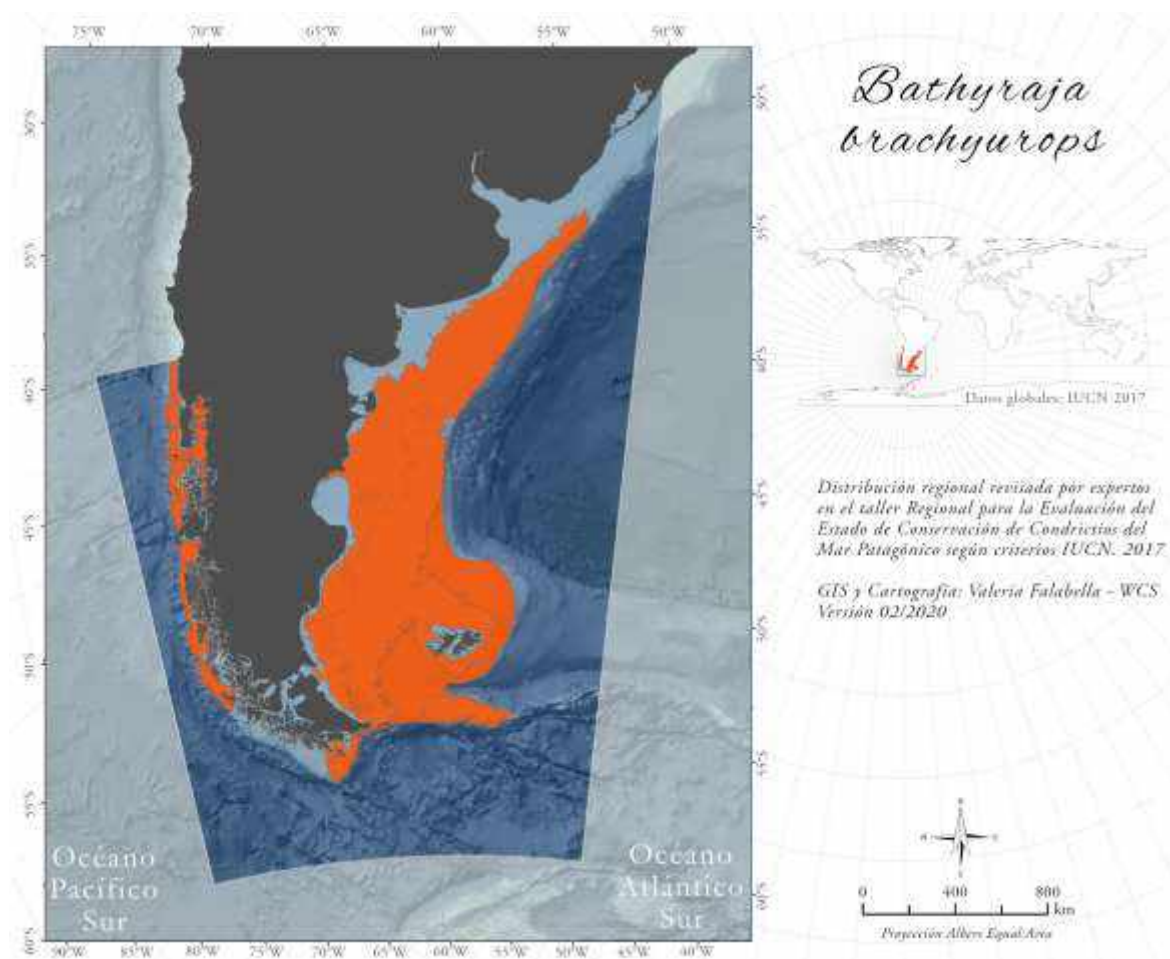
ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE -  
*Bathyraja* – brachyurops (Fowler, 1910)

**Common Names:** Broadnose Skate (English), Raya Cola Corta (Spanish; Castilian), Raya De Los Canales (Spanish; Castilian)

**Taxonomic Note:**

Until *B.ousseauae* was described recently, this was often identified as *B. brachyurops*.

## Geographic Range



The Broadnose Skate *Bathyraja brachyurops* is an oviparous endemic species of the Patagonian Sea. This species inhabits from 50 to 800 m in Uruguay, Argentina, Chile and around Malvinas/Falkland Islands (Perier *et al.* 2011, Cousseau *et al.*, 2007, Sielfeld & Vargas, 1999, Bustamante *et al.*, 2014, Góngora *et al.*, 2009, Ruibal Núñez 2016, Last *et al.*, 2016, Winter *et al.*, 2015).

## Population

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The species in Uruguay (northern zone of the Argentina and Uruguay Common Fishing Zone) is a low frequency species (29% between 1984 and 2009, Paesch *et al.*, 2014) while in Chile it has not been recorded since 1999 (Bustamante *et al.*, 2014).

*Bathyraja brachyurops* is abundant over the Argentinian continental shelf, including the southern zone of the Argentina and Uruguay Common Fishing Zone and around the Malvinas/Falkland Islands (Paesch *et al.*, 2014, Ibañez, 2017, Winter *et al.* 2015). In Argentina, a research survey in the southern part of the continental shelf recorded catches from 1992 to 2001 showing high fluctuations, with no clear trend (NPOA, 2009). A more recent study identified a biomass decline of 70% from 1997 to 2012 over the Argentinian continental shelf between 35°S and 48°S with the highest densities in the northern zone over the argentine continental slope (38°S - 41°S) (Ibañez, 2017). Furthermore, this decline is probably related to the displacement of the industrial trawl fishing effort in the area (Alemany *et al.*, 2013).

In Malvinas/Falklands Islands, catch proportion and abundance of *B. brachyurops* slightly increased from 1997 to 2013 (25.6%-30.3%) (Winter *et al.* 2015). However, a decrease in size at 50% maturity has also been identified between 2004 and 2013 in areas where these skates continue to be commercially fished (Winter *et al.* 2015). The increasing abundances and concomitant reductions in size at maturity of this species suggest either plasticity in life-history traits or a density-dependent growth response to fishing pressure (Winter *et al.* 2015).

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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Maximum size is 100 cm for males and 92 cm for females (Cousseau *et al.* 2007). Like all skates, it is oviparous. Size at maturity varies between 57.98 cm and 66.2 cm in males and between 63.9 cm and 75.4 cm for females (Arkhipkin *et al.* 2008, Paesch and Oddone 2008, Scenna 2011).

In Argentina, size at maturity decreased between 1997-2005 and 2006-2012 for both sexes. In the north, the LT50 for females decreased from 74.86 cm (1999-2005) to 69.69 cm (2006-2012); while the LT50 for males ranged from 69.43 cm to 68.51 cm between the same periods. In the south, LT50 of the females decreased from 71.07 cm (1999-2005) to 63.61 cm (2006-2012); whereas the LT50 of the males varied from 67.54 cm to 62.31 cm in the same periods. Age at maturity has been estimated at 14 years for males and 17.78 years for females (Arkhipkin *et al.* 2008). Spawning takes place on spatially segregated spawning grounds (Arkhipkin *et al.* 2008).

*Bathyraja brachyurops* prey mainly on fish, like the nototheniid *Patagonotothen ramsayi*, conger *Bassanago albescens* and common hake *Merluccius hubbsi*. Crustaceans are also a main item of its diet as crabs *Libidoclaea granaria*, isopods *Acanthoserolis schithey* and *Cirolana* spp. (Ibañez 2017).

## Threats

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*Bathyraja brachyurops* is one of the most abundant bycaught species landed from the bottom trawl fishery of Uruguay targeting the argentine hake *Merluccius hubbsi* (Paesch and Odonne 2008, Paesch and Lorenzo, 2017). In Argentina, this species is caught as bycatch by the trawl fishery that operates in the San Jorge Gulf and adjacent waters with a frequency of less than 1% (Góngora *et al.* 2009) as well as in the bottom trawl patagonian scallop fishery (*Zygochlamys patagonica*) (Schejter *et al.* 2012). In Chile, it was also fished as bycatch of other skate targeted species (Lamilla *et al.* 2001, 2002) but in the Malvinas/Falklands Islands this species is part of the multi-species skate assemblage which is commercially targeted for capture since 1989 (Winter *et al.* 2015).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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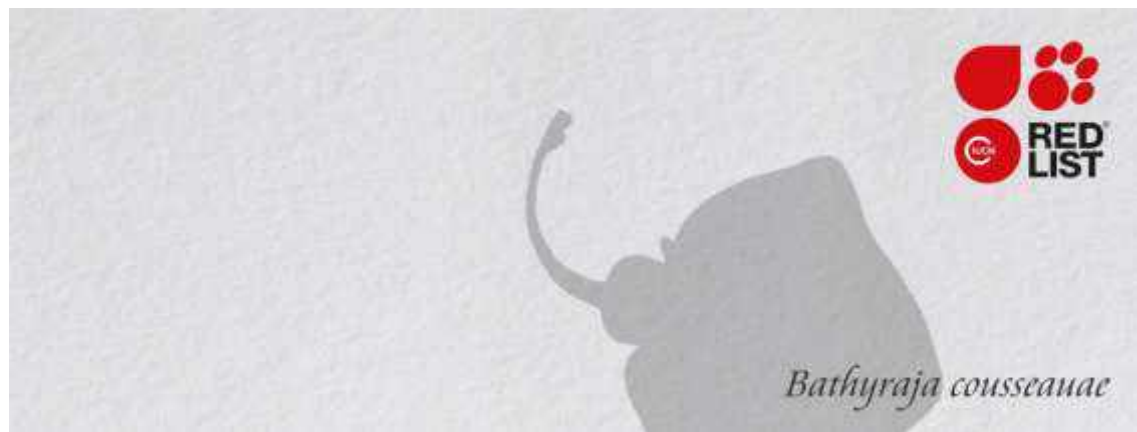
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LC – Least Concern, (IUCN version 3.1)

#### Assessment Rationale:

The Cousseau's Skate *Bathyraja cousseauae* is an endemic species of the Patagonian Sea from northern Argentina to southern Chile. This species is only known from a few locations in deep waters in the Patagonian Sea and it could be found up to 1479 m. There is no information available related to its population trend. *Bathyraja cousseauae* is a bycatch species in the patagonian scallop (*Zygochlamys patagonica*) bottom trawl fishery of Argentina and it is also a component of the multispecies assemblage directed skate fishery in Malvinas/Falkland Islands. Given its depth and distribution in the Patagonian Sea, and that it is not likely to be impacted by fisheries in most of its range, this species is listed as Least Concern. However, given its potential vulnerability to current and future fishing pressure, additional research on population trend on this species is needed.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiamonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

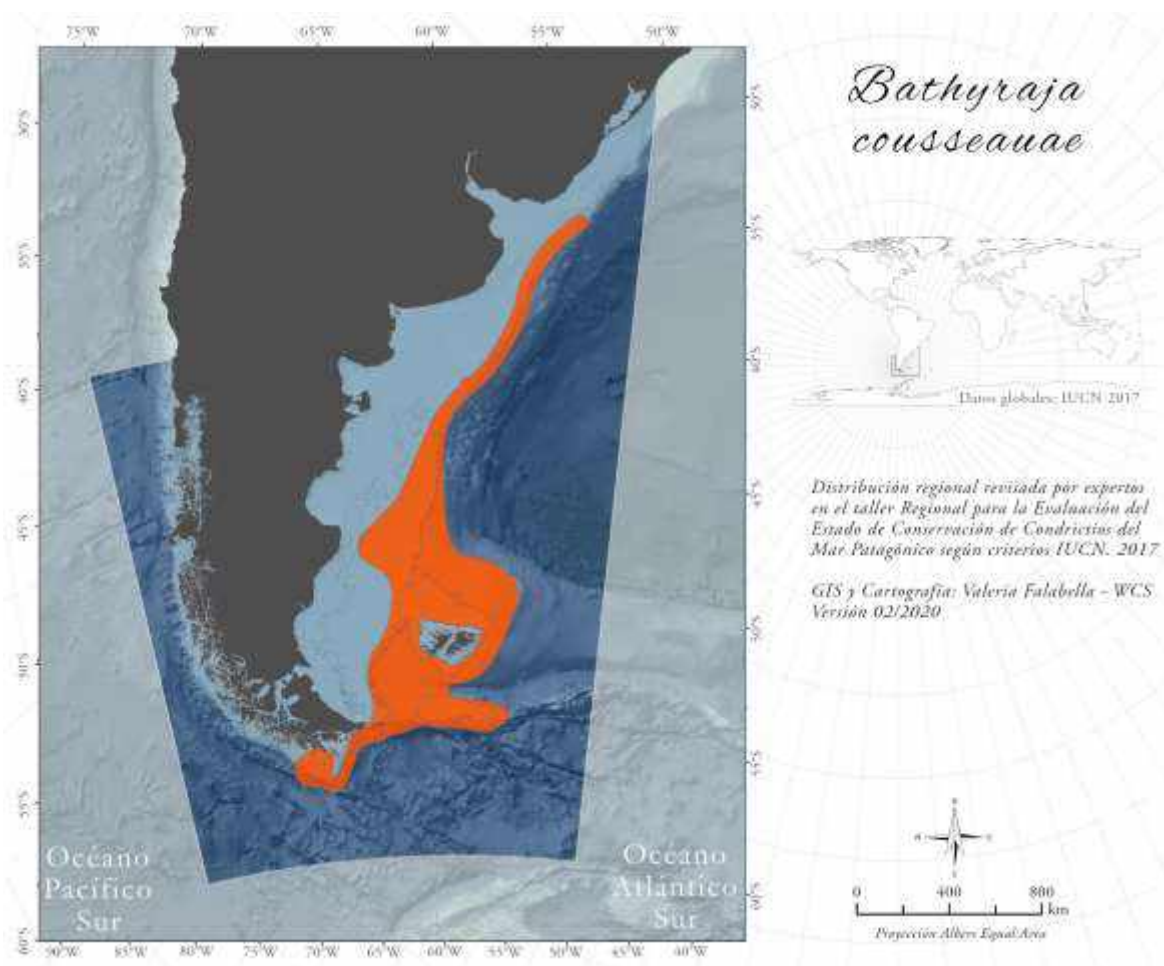
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE -  
*Bathyraja* – *cousseauae* (Díaz de Astarloa & Mabragaña, 2004)

**Common Names:** Cousseau's Skate (ערג'יסקו), Joint-fins Skate (English), Raya Aletas Juntas (Spanish; Castilian)

## Geographic Range



The Cousseau's Skate *Bathyrajaousseauae* is an endemic species of the Patagonian Sea from northern Argentina to southern Chile (Cousseau *et al.* 2007, Reyes & Torres-Flores, 2008).



## Population

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Population size is still unknown and this species is only known from a few locations in deep waters in the Patagonian Sea.

**Current Population Trend:** Unknown

## Habitats and Ecology

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The Cousseau's Skate may be found in deep waters of the Patagonian Sea over the continental shelf and the continental slope in Argentina (Cousseau *et al.* 2007) and between 101 and 1479 m around Malvinas/Falklands Islands (Joost Pompert *per. comm.* 2017).

Growth studies are known from a few individuals caught in Argentine waters, being the maximum age recorded 15 years for a 108,2 cm male (Bücker 2006) but it could be even longer due to the fact that there was a size reported of 120 cm TL in Malvinas/Falkland Islands (Agnew *et al.* 2000). In Argentine waters, this species feed mostly on teleosts, followed by isopods and amphipods (Bellegia *et al.* 2014).

## Threats

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*Bathyraja cousseauae* is a bycatch species in the patagonic scallop (*Zygochlamys patagonica*) bottom trawl fishery of Argentina (Schejter *et al.* 2012). It is also a component of the multispecies assemblage directed skate fishery in Malvinas/Falkland Islands contributing with the 4.9% of the total weight of 21 fishing vessels of the skates capture in 2016 (Winter *et al.*, 2015).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentina. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including

*Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particular y, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes the management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be

processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys bivius*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al*, 2000, Wakeford *et al*, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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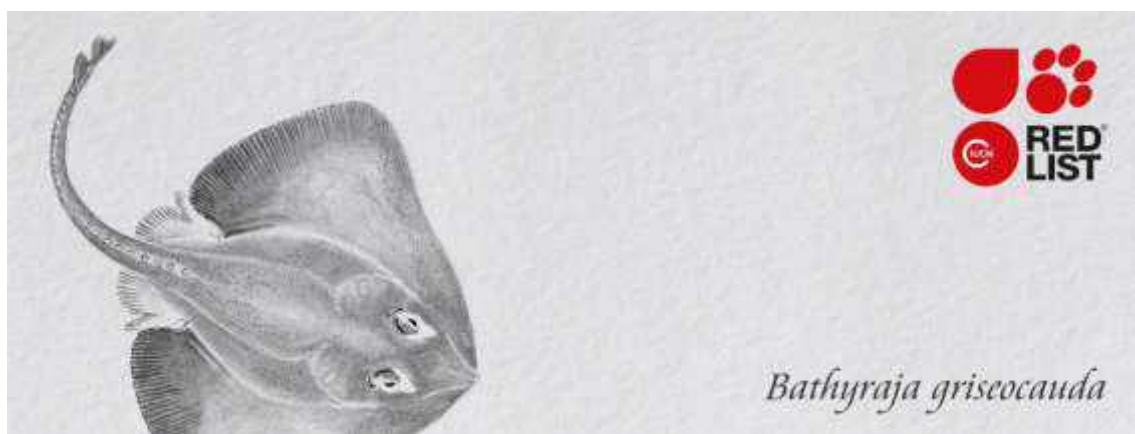
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EN - Endangered, A2bd, (IUCN version 3.1)

#### Assessment Rationale:

The Graytail Skate *Bathyraja griseocauda* is a large and slow growing species that occurs in the Patagonian Sea from 36°S on the slope off Uruguay and Argentina, around Malvinas/Falkland Islands and in the Southeast Pacific off Chile up to 40°S. In southern Patagonia (45°S – 54°S) over the continental shelf in Argentina, density ranged from 13,934 tons in 1992 to 3,410 tons in 2000, which is about a 75% decline. CPUE of this species has declined since 1997, but it has slightly increased between 2009 and 2013 in the Malvinas/Falkland Islands. The size at 50% maturity is also decreasing for this species in the Falkland Islands. The species is also taken as bycatch in the *Dipturus chilensis* and in the Patagonian toothfish longline fishery off Chile but there is no population trend available. Given these trends, it is estimated that this species has experienced at least a 50% decline over the past 3 generation lengths (60 years). This species is listed as Endangered under Criterion A2bd.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

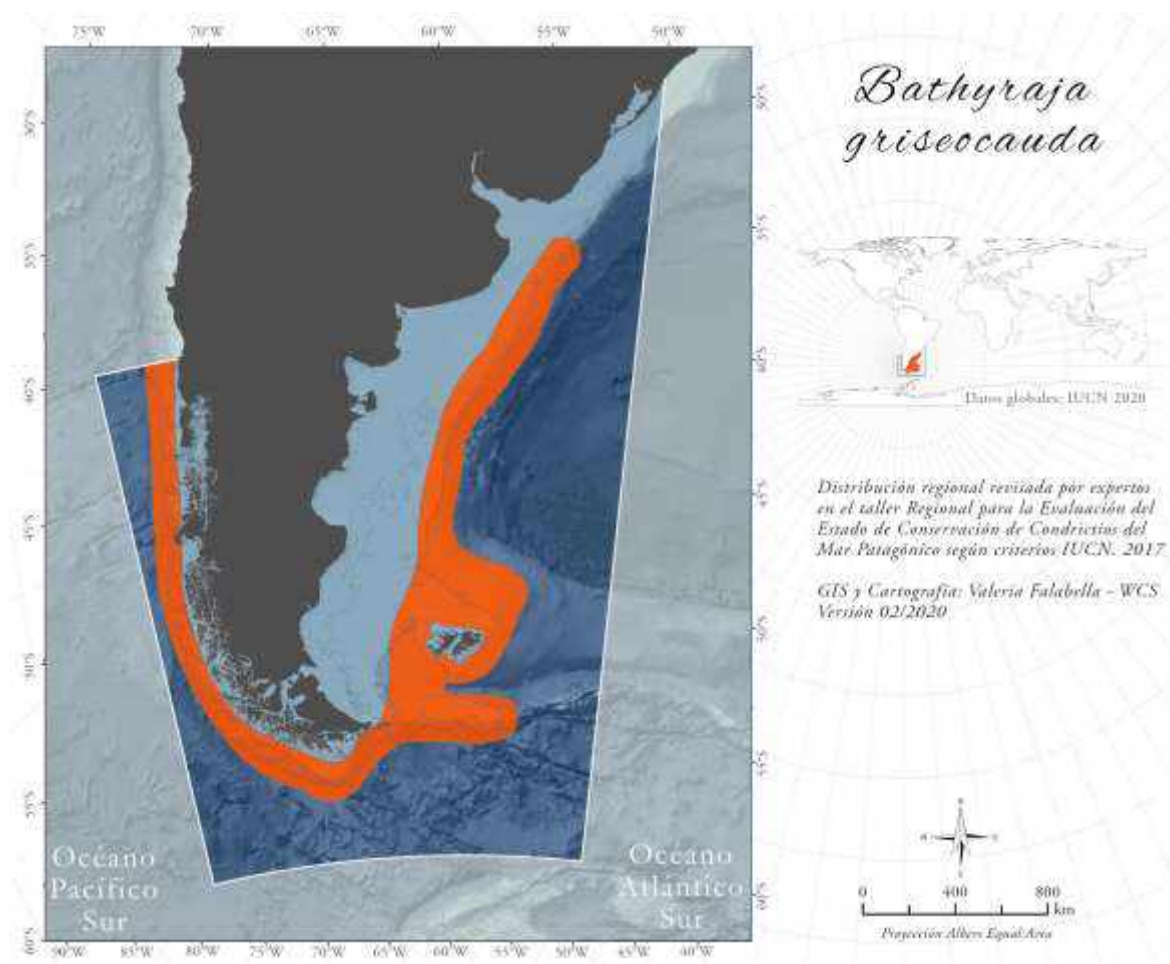
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE -  
*Bathyraja* – griseocauda (Norman, 1937)

**Common Names:** Graytail Skate (English), Raya Gris (Spanish; Castilian), Raya Lija (Spanish; Castilian)

## Geographic Range



The Graytail Skate *Bathyraja griseocauda* occurs in the Patagonian Sea from 36°S on the slope off Uruguay and Argentina, around Malvinas/Falkland Islands and in the Southeast Pacific off Chile up to 40°S (Sáez, & Lamilla, 2004, Bustamante, 2014).

## Population

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The population size is still unknown. In southern Patagonia (45°S – 54°S) over the continental shelf in Argentina, density ranged from 13,934 tons in 1992 to 3,410 tons in 2000, which is about a 75% decline (PAN 2009). The population size is still unknown. Several declines have been detected around the Malvinas/Falkland Islands (Agnew *et al.* 2000, Wakeford *et al.* 2004) since 1997, but it has increased slightly between 2009 and 2013 (Winter *et al.* 2015). The size at 50% maturity is also decreasing for this species in the Malvinas/Falkland Islands (Winter *et al.* 2015).

**Population trend:** Decreasing

## Habitats and Ecology

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The Graytail Skate may be found in deep waters of the Patagonian Sea over the continental slope in Argentina below 250 m (Cousseau *et al.*, 2007) and between 75 and 986 m around Malvinas/Falklands Islands (Joost Pompert per. comm. 2017).

Length frequency data around the Malvinas/Falkland Islands showed that all sizes of *B. griseocauda* used to be present in this area (Wakeford *et al.* 2004). Unlike some other species, there is no evidence for large spatial or temporal movements and the species may complete its entire life cycle within Malvinas/Falkland Island waters (Wakeford *et al.* 2004).

The Graytail Skate is known to be a slow growing, long-lived species (Wakeford *et al.* 2004). Individuals mature at around 15 years (Agnew *et al.* 2000). Size at maturity has been estimated at around 120cm TL in male specimens (Stehmann *et al.* unpubl. data). Individuals have been reported from a minimum of 13 cm (Stehmann *et al.* unpubl. data.) to a maximum of 157 cm (Agnew *et al.* 2000). This species lives as long as 28 years in the Malvinas/Falklands (Arkhipkin *et al.* 2008). Generation length is estimated to be 21-22 years.

Maximum age of 18 years was registered in a 119 cm male for Argentinean specimens (Bücker 2006).

It feeds mainly on the isopod *Acanthoserolis schythei* and teleosts like *Macruronus magellanicus* (Belleggia *et al.* 2014).

## Threats

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*Bathyraja griseocauda* is a by-catch species landed from the bottom trawl fishery of Uruguay targeting the Argentine hake *Merluccius hubbsi* (Paesch and Lorenzo, 2017). It is also a bycatch species in the bottom trawl fisheries of Argentina, targeting bony fishes (García de la Rosa *et al.*, 2000) and invertebrates as the Patagonian scallop fishery (*Zygochlamys patagonica*) (Schejter *et al.* 2012). In Chile, it is also taken in the directed skate fishery which primarily targets *Dipturus*

*chilensis* that is taken in the same way (bycatch) in the deep artisanal Patagonian toothfish longline fishery (Lamilla *et al.*, 2001, 2002, 2003) as well as in the deepsea shrimp *Heterocarpus reedi* fishery off central Chile (Enzo Acuña per. comm. 2017). This species is part of the multispecies skate trawl fishery around the Falkland/Malvinas Islands as well (Winter *et al.*, 2015).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particular y, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and



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In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys bivius*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al*, 2000, Wakeford *et al*, 2004). Stock

assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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LC – Least Concern, (IUCN version 3.1)

#### Assessment Rationale:

The Patagonian Skate is an endemic species to the Patagonian Sea found in Argentina, Chile and around Malvinas/Falkland Islands at depths up to 1000 m. It has an estimated generation length of approximately 8-9 years. Nursery areas for this species are closely related to the Argentine shelf where dense scallop beds are found. There is little species-specific information on population trends for *B. macloviana*, however, an assessment of the northern population did not indicate any significant trend in CPUE over the period from 1992 to 2001 (Mari *et al.* 2005). It is also taken in the targeted multispecies skate fishery around the Malvinas/Falkland Islands where dramatic declines had been experienced in the early 1990s especially in the southern area of the Islands. In the south-eastern Patagonian Shelf the abundance of this species increased between 1998 and 2004. This species is listed as Least Concern. However, as the scallop fishery is likely impacting this species nursing grounds in at least a portion of this species range, better monitoring and protection of this species nursery areas are needed.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

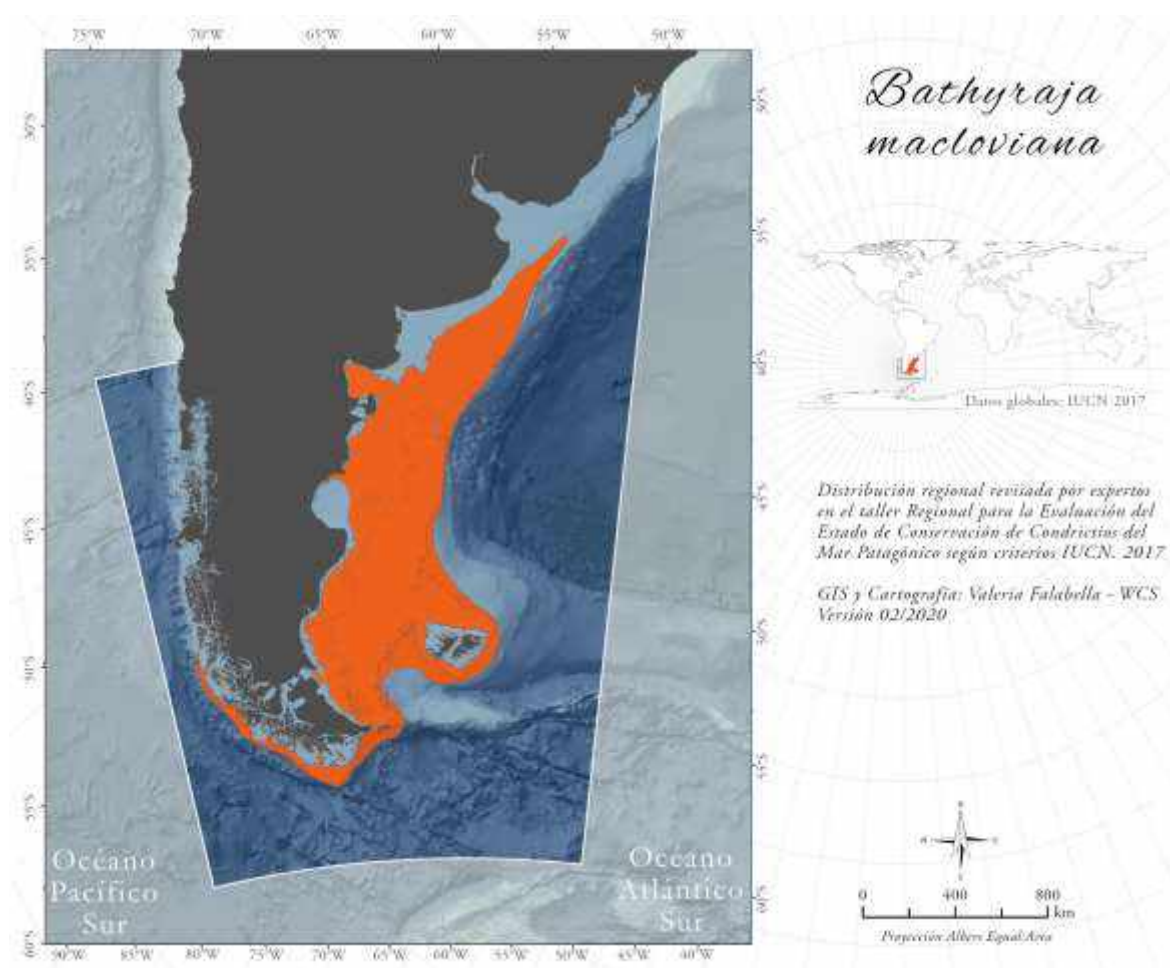
## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE -  
*Bathyraja*\_ macloviana (Norman, 1937)

**Common Names:** Patagonian Skate (English), Raya Espinosa (Spanish; Castilian)

**Taxonomic Note:** Compagno (1999, 2005) reallocated this species from *Bathyraja* to the genus *Rhinoraja* but the validity of this move remains unconfirmed. Both are currently in use, until a definitive systematic revision of these genera is conducted. However, *Bathyraja* is likely the accepted genus (Ebert 2016, Last *et al.* 2016).

## Geographic Range



The Patagonian Skate is an endemic species to the Patagonian Sea found in Uruguay, Argentina, Chile and around Malvinas/Falkland Islands. Is a widely distributed species within the Magellanic Province over the continental shelf from 35.20°S in the Atlantic Ocean (Laura Paesch pers comm. 2017) to 51°S in the Pacific Ocean in southern Chile (Ebert *et al.*, 2016).

## Population

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There is little species-specific information on population trends for *Bathyraja macloviana*, however, an assessment of the northern population a decade ago did not indicate any significant trend in CPUE over the period from 1992 to 2001 (Mari *et al.* 2005). However, Ruocco *et al.* (2012) found in the south-eastern Patagonian Shelf that the abundance of this species has increased between 1998 and 2004. The species used to be part of a small proportion of the catch of a longliner targeting *Dipturus chilensis* off Argentina (Colonello *et al.* 2002). It is also taken in the targeted multispecies skate fishery around the Falkland/Malvinas Islands where this fishery experienced dramatic declines in the early 1990s especially in the southern area of the Islands (Agnew *et al.*, 2000, Winter *et al.* 2015).

**Current Population Trend:** Unknown

## Habitats and Ecology

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Like other skates, this species is oviparous and it could be found in a range depth of 50 m to 1000 m (Ebert, 2016, Reyes, & Torres-Florez, 2009, Góngora *et al.*, 2009, Ruibal Núñez, 2016).

In Argentina, size at maturity has been estimated at 54.9 cm Total Length (TL) and 53 cm TL for females and males, respectively (Scenna 2003). In Uruguay, females mature at 52 cm TL and males at 53,5 cm TL (Paesch and Oddone 2008). Maximum size has been estimated at 77 cm TL (Agnew *et al.* 2000). The smallest known specimen was 13 cm TL (Stehmann *et al.* unpubl. data). The oldest individual was estimated to be approximately 11-12 years with the age of first maturity estimated to be 5-6 year (Bücker *et al.* 2006) and a generation length probable of 8-9 years.

*Bathyraja macloviana* is a specialist feeder on polychaetes, with a small proportion of amphipods, isopods and decapods completing its diet (Brickle *et al.* 2003, Mabragaña *et al.* 2005, Barbini *et al.* 2013).

## Threats

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As *Bathyraja brachyurops*, *B. macloviana* is one of the most abundant by-catch species landed from the bottom trawl fishery of Uruguay targeting the Argentine hake *Merluccius hubbsi* (Paesch and Odone 2008, Paesch and Lorenzo, 2017). It has been caught by the trawl fishery that operates in the San Jorge Gulf (Patagonia, Argentina) and adjacent waters with a frequency of less than 1% (Góngora *et al.* 2009). It was recorded in 101 hauls for the period 2003 to 2007, mainly in the northern area of the San Jorge Gulf, in coastal areas around Pan de Azúcar, Robredo and Quintano islands, and in the closed area of juvenile hake. It is also captured by the coastal vessels that operate in Rawson port, in Isla Escondida area (Chubut). This species is also bycatch of the bottom trawl patagonian scallop fishery (*Zygochlamys patagonica*) in the Argentine

continental slope (Schejter *et al.* 2012). *B. macloviana* is also part of the multispecies skate trawl fishery around the Falkland/Malvinas Islands (Winter *et al.*, 2015). Also, nursery areas for this species are closely related to the Argentine shelf and slope where dense scallop beds are found (Vazquez *et al.*, 2016).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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LC – Least Concern, (IUCN version 3.1)

#### Assessment Rationale:

The Cuphead Skate *Bathyraja scaphiops* is endemic to the Patagonian Sea from Uruguay to southern Chile and around the Malvinas/Falkland Islands, up to 1000 m deep. This species was recorded in low frequencies in scientific surveys taken over the continental shelf in southern Argentina between 1992 and 2002. It is also a bycatch species of the patagonian scallop (*Zygochlamys patagonica*) bottom trawl fishery of Argentina. *B. scaphiops* is part of the multispecies skate trawl fishery around the Malvinas/Falklands Islands and the CPUE had not significantly changed between 1993 and 2017, this has been recorded in 33 of the 35 observer stations in 2017. Also, in 2016 it represented the 4.3% of the total weight of 21 fishing vessels of the skates capture. There is no information on life history or generation length, but given this species relatively large-body size, it may be long lived. This species is listed as Least Concern for the Patagonian Sea. However, given its potential vulnerability to population decline from current and future fishing pressure, in combination with its likely long generation length, additional research on this species is needed.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

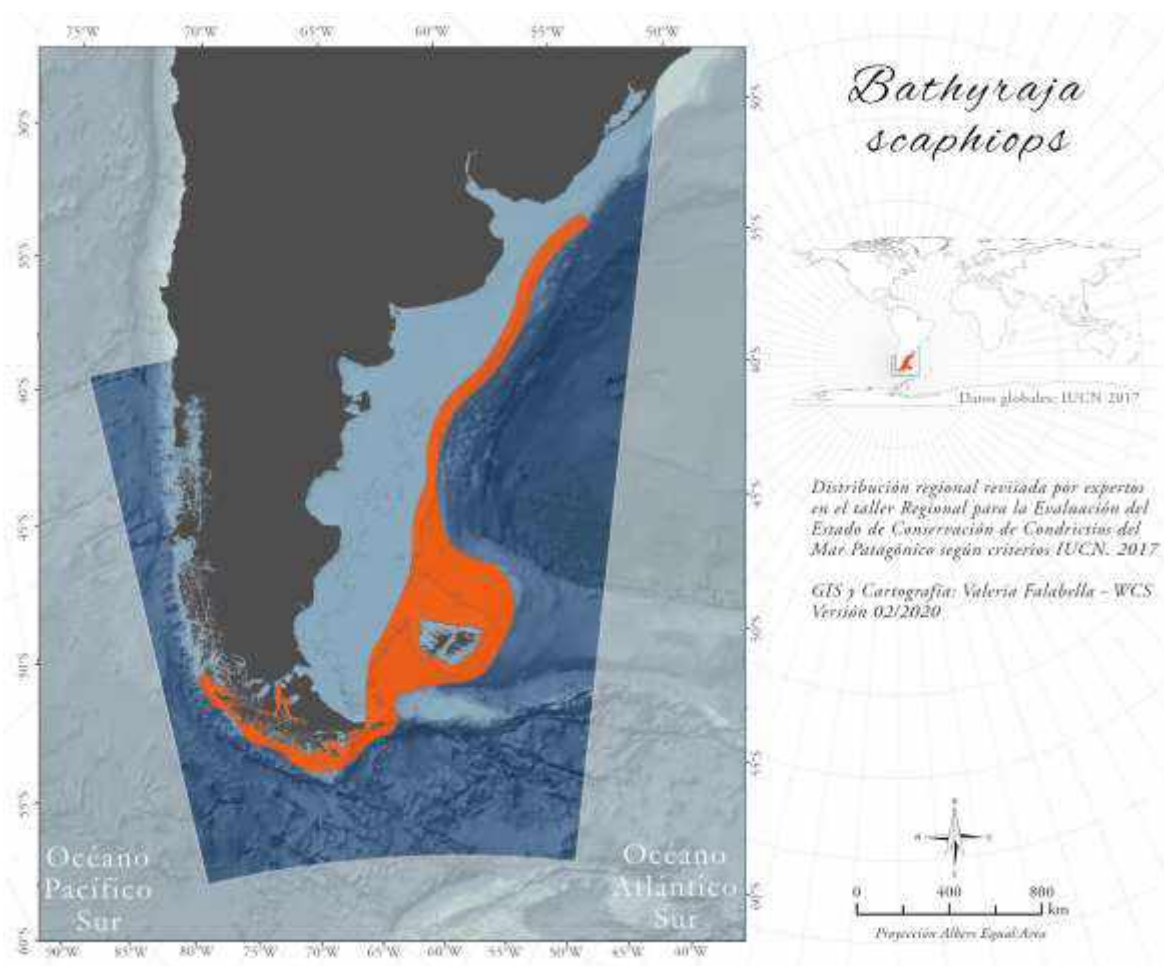
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA – CHORDATA – CHONDRICHTHYES – RAJIFORMES – ARHYNCHOBATIDAE –  
*Bathyraja* – scaphiops (Norman, 1937)

**Common Names:** Cuphead Skate (English), Raya Nariguda Manchada (Spanish; Castilian), Raya Picuda (Spanish; Castilian)

## Geographic Range



The Cuphead Skate *Bathyraja scaphiops* is endemic of the Patagonian Sea from Uruguay to southern Chile and around the Malvinas/Falkland Islands. It is reported from 35°S in the Atlantic (Cousseau *et al.* 2007, Laura Paesch pers. comm. 2017) to 52°S in the Pacific (Sielfeld & Vargas, 1999, Menni and Stehmann 2000, Carlos Bustamante, 2017).

## Population

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In Argentina this species was recorded in low frequencies in scientific surveys carried out over the southern portion of the continental shelf between 1992 and 2002 (NPOA 2009).

*Bathyraja scaphiops* is part of the multispecies skate trawl fishery around the Malvinas/Falklands Islands and the CPUE had not significantly changed between 1993 and 2017, this was recorded in 33 of the 35 observer stations in 2017 (Winter *et al.* 2015). Also, in 2016 it represented the 4.3% of the total weight of 21 fishing vessels capture (Winter *et al.*, 2015).

Population trend: unknown.

## Habitats and Ecology

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In the Argentina and Uruguay Common Fishing Zone this species can be found in waters as shallow as 57 m (Laura Paesch pers comm. 2017) and up near 1000 m around Malvinas/Falklands Islands (Joost Pompert pers comm. 2017). If we take into account its size, this species may be characterized as long-lived. Age studies are only based on 6 specimens (Bücker 2006). The oldest specimen was a male of 9 years old and 74.5 cm of total length (Bücker 2006); however, the species reach 110 cm of total length.

Diet of *B. scaphiops* consists mostly of teleosts followed by isopods and amphipods (Bellegia *et al.* 2014).

## Threats

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*Bathyraja scaphiops* is a by-catch species landed from the bottom trawl fishery of Uruguay targeting the Argentine hake *Merluccius hubbsi* (Paesch and Lorenzo, 2017). It is also a bycatch species in the patagonic scallop (*Zygochlamys patagonica*) bottom trawl fishery of Argentina (Schejter *et al.* 2012). The species is part of the multispecies skate trawl fishery around the Malvinas/Falklands Islands as well (Winter *et al.* 2015).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*,



*Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys bivius*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al*, 2000, Wakeford *et al*, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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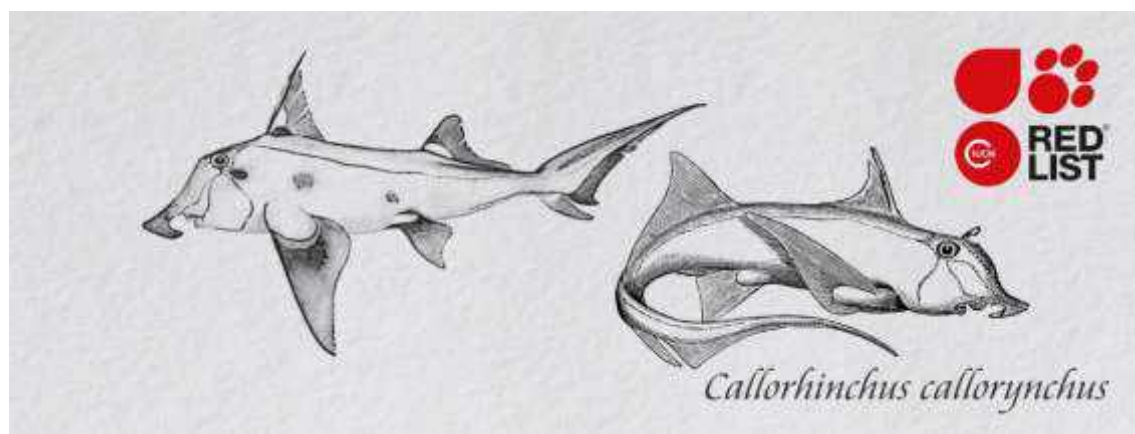
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Winter, A., Pomport, J., Arkhipkin, A., Brewin, P.E. 2015 Interannual variability in the skate assemblage on the South Patagonian shelf and slope. *Journal of Fish Biology* 87: 1449-1468.





## LC – Least Concern, (IUCN version 3.1)

### Assessment Rationale:

The American Elephantfish *Callorhynchus callorhynchus* is an oviparous species that could be found throughout all the Patagonian Sea. It is found mostly at depths of 90 and 130 m. In the Argentina and Uruguay Common Fishing Zone (AUCFZ) it is found up to 150 m in depth but more common in coastal waters (< 50m). Maximum age is 13.7 years for males (43 cm length at maturity corresponding to about 3 years) and 21.4 years for females (47 cm length at maturity, corresponding to about 5 years). Generation length is therefore estimated to be between 8 and 12 years. This species is caught by large and small scale fisheries of Argentina and Chile. The approximations of CPUE of this species in Argentina from 1992 to 2015, which are based on the number of vessels operating and landings in 2 fleets, show large fluctuations and no real trend. Argentine landings for this species from 1989 (from roughly 100 tonnes) to 2016 (almost 2000 tonnes) are relatively stable, if not increasing. As there is no real evidence of decline for this species over the past 30 years (from 1990s to 2016), this species is listed as Least Concern. However, this species is caught by commercial and recreational fisheries operating throughout its range, so it should still be carefully monitored. Especially taking into account that many juveniles are being captured. Additionally, in the northern portion of its range in southern Brazil and in the common fishing zone between Argentina and Uruguay, there have been recent declines recorded in catch - which might be a result of a change in the fishery.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

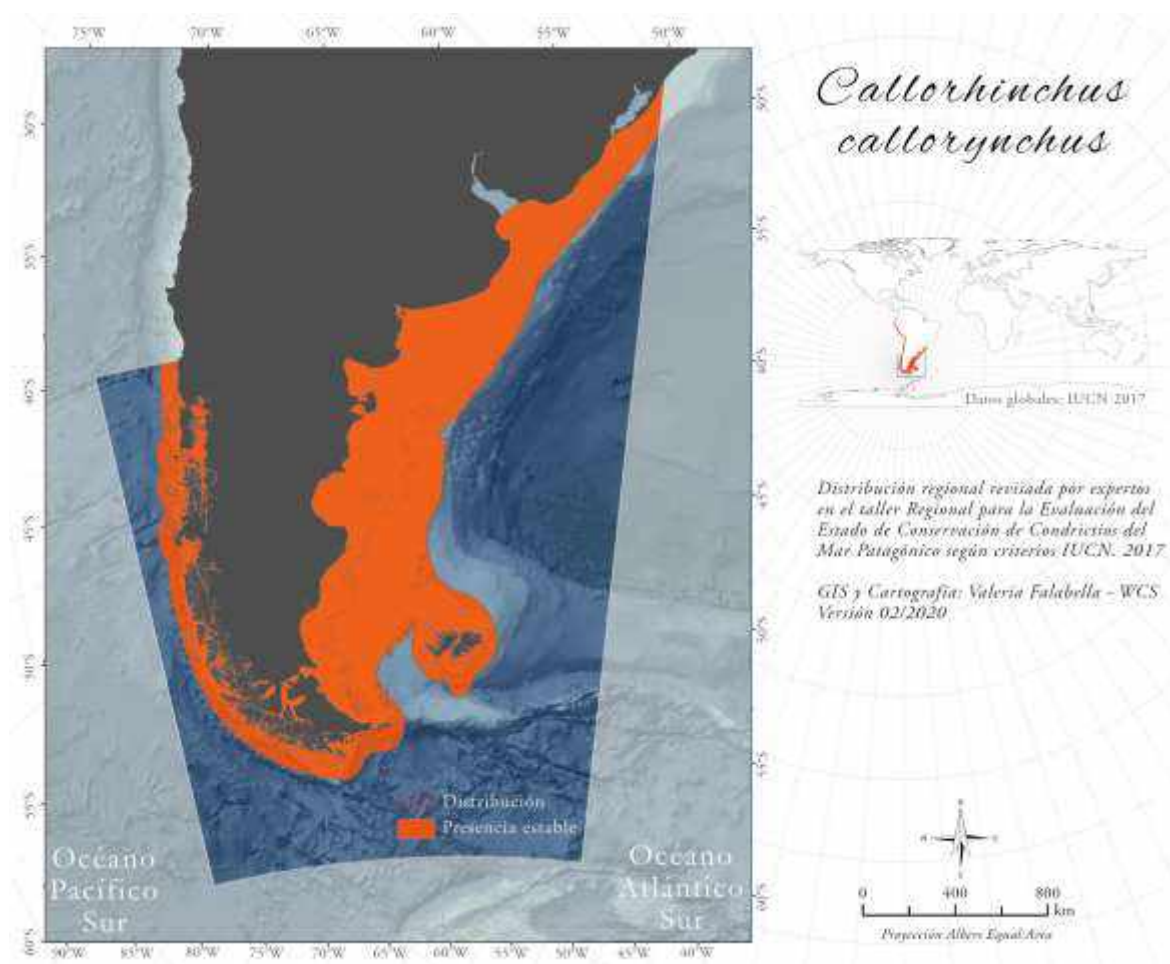
## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - CHIMAERIFORMES - CALLORHINCHIDAE - *Callorhinchus* – *callorynchus* (Linnaeus, 1758)

**Common Names:** American Elephantfish (English), Cockfish (English), Pez Gallo (Spanish; Castilian)

**Taxonomic Note:** Molecular studies are required to determine the level of genetic distinctness between the species in the Southwest Atlantic and the Southeast Pacific.

## Geographic Range



The American Elephantfish *Callorhinchus callorynchus* is found throughout all the Patagonian Sea from southern Brazil in the Atlantic to Chile in the Pacific and occasionally around

Malvinas/Falklands Is. waters (Di Giacomo *et al.* 1994, Góngora *et al.*, 2009, Bustamante *et al.*, 2014, Bovcon *et al.*, 2013, Bovcon, 2016, Ruibal Núñez *et al.*, 2016). Soto and Mincarone (2004) report the occurrence of ovigerous capsules in shallow waters of Rio Grande do Sul state, proving the existence of a reproductive population in southern Brazil, considerably distant from that already known in central Patagonia. Until then, the species was considered a winter migrator from Argentina.

## Population

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Approximations of CPUE of this species in Argentina (based on the number of vessels operating and landings in 2 fleets) from 1992 to 2016 show large fluctuations and no real trend based on number National Secretary for Fisheries, Argentine Fisheries Statistics (SSPyA, 2017). Argentine landings for this species from 1989 (from roughly 100 tonnes) to 2016 (almost 2000 tonnes) are relatively stable, if not increasing (SSPyA, 2017). There is no real evidence of decline for this species over the past 30 years between 1990s and 2016.

In Brazil this species is now less frequently observed than in the past, especially in Rio Grande do Sul (Roberta A. Santos pers. comm. 2017).

## Habitats and Ecology

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The depth range is generally from nearshore to about 200 m, however there are reported captures of this species from 481 m off Chile (Dagit *et al.*, 2007). Maximum recorded size for females is 102 cm total length (TL) and 85 cm TL for males (Di Giacomo and Perier 1994). In the Argentina and Uruguay Common Fishing Zone (AUCFZ) it is found up to 150 m in depth but more commonly in coastal waters (< 50m) (Laura Paesch pers. comm. 2017).

In coastal waters of south-eastern Buenos Aires Province, Argentina, females mature at 46.62 cm of precaudal length; the smallest mature male was 42 cm and the largest immature male was 42.5 cm of precaudal length (Chierichetti *et al.* 2017). In the Gulf of San Matías, Argentina, spawning migrations into shallow waters have been observed with eggs collected at depths of 20m to 40 m, but also as deep as 104 m (Di Giacomo and Perier 1994). Size at birth is 13 cm TL and gestation time is probably between 6 and 12 months. Males mature at 43.39 cm and females 47.48 cm of precaudal length (Bernasconi *et al.* 2015). The estimated maximum age is 13.7 for males and 21.4 for females (Bernasconi *et al.* 2015).

In the Pacific Ocean, females mature at 50.2 cm and males at 43.7 cm of precaudal length (Alarcón *et al.* 2011). Longevity for males is estimated at 9.4 years and 27.9 years for females (Alarcón *et al.* 2011).

The diet consists primarily of shelled invertebrate prey, particularly bivalve mollusks, gastropods and polychaetes (Di Giacomo *et al.* 1994). Differences in the diet of males and females as well as between juveniles and adults are attributed to prey availability, morphology and behavior of

predators (e.g., tooth plates of juveniles are not as large or strong as those of adults) (Di Giacomo *et al.* 1994).

## Threats

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This species is caught by large and small scale fisheries of Argentina and Chile (Di Giacomo & Perier 2005, Alarcón *et al.* 2011).

In Argentina, it is caught mainly as by-catch of bottom trawl fisheries targeting the Argentine hake *Merluccius hubbsi* and the Stripped weakfish *Cynoscion guatucupa* (Sánchez *et al.* 2011). It also caught by the trawl fishery that operates in the San Matías Gulf and the San Jorge Gulf and adjacent waters with a frequency of occurrence of 17% (Góngora *et al.* 2009). It is also frequently caught by the coastal fleet that operates in the Isla Escondida area (Rawson port). There are reports of juveniles captured by the artisanal fishery of Bahía Engaño (Nelson Bovcon pers. com. 2017), and eggs which have been caught by the trawl fishery (coastal and freezer fleet) that operates in the San Jorge Gulf and in Isla Escondida area (Nelson Bovcon pers. com. 2017). It is a very prized species for recreational anglers that target this species from the beach at different localities of Buenos Aires, Río Negro, Chubut and Santa Cruz Province, during spring and summer season from November to March (Juan Martín Cuevas pers. com. 2017).

In Uruguay, it is taken as by catch in longline and trawling fisheries (Domingo *et al.* 2015).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These



management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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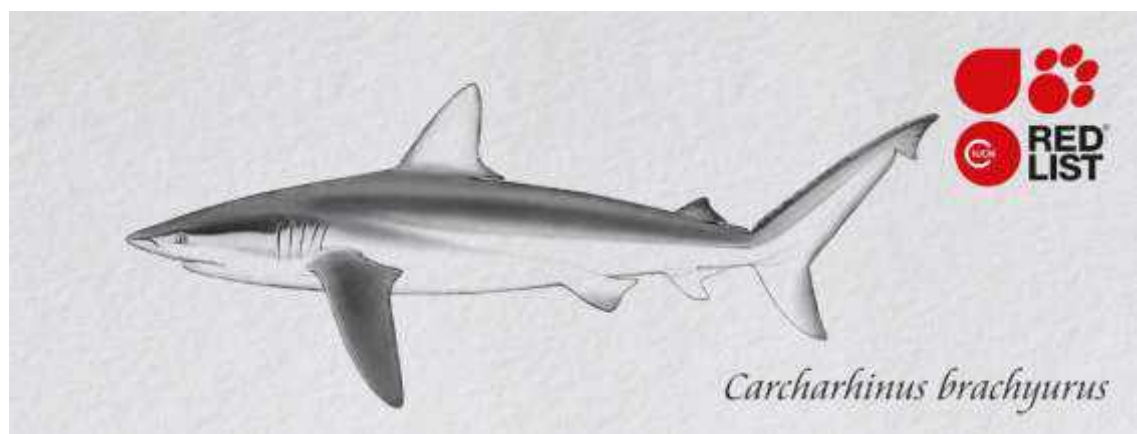
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VU – Vulnerable, A2bd (IUCN version 3.1)

#### Assessment Rationale:

In the Patagonian Sea, the Copper Shark *Carcharhinus brachyurus* is found from southern Brazil to southern Argentina over the continental shelf. It is a slow-growing species that matures at 22 years (females), with low productivity and an estimated generation length of 30 years. Over the past 30 years (1973 to 2008), the trophy photos in annual reports of the recreational fisheries have decreased by 29%, annually. Additionally, a 70% of recreational fishermen surveyed reported a decrease in the presence of this species in their catches. Based on demographic analyses, this species population is declining between 3-12% annually in Argentina. Therefore, this species is listed as Vulnerable under Criterion A2bd.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):**

**Facilitators:** Polidoro, B., Falabella, V.

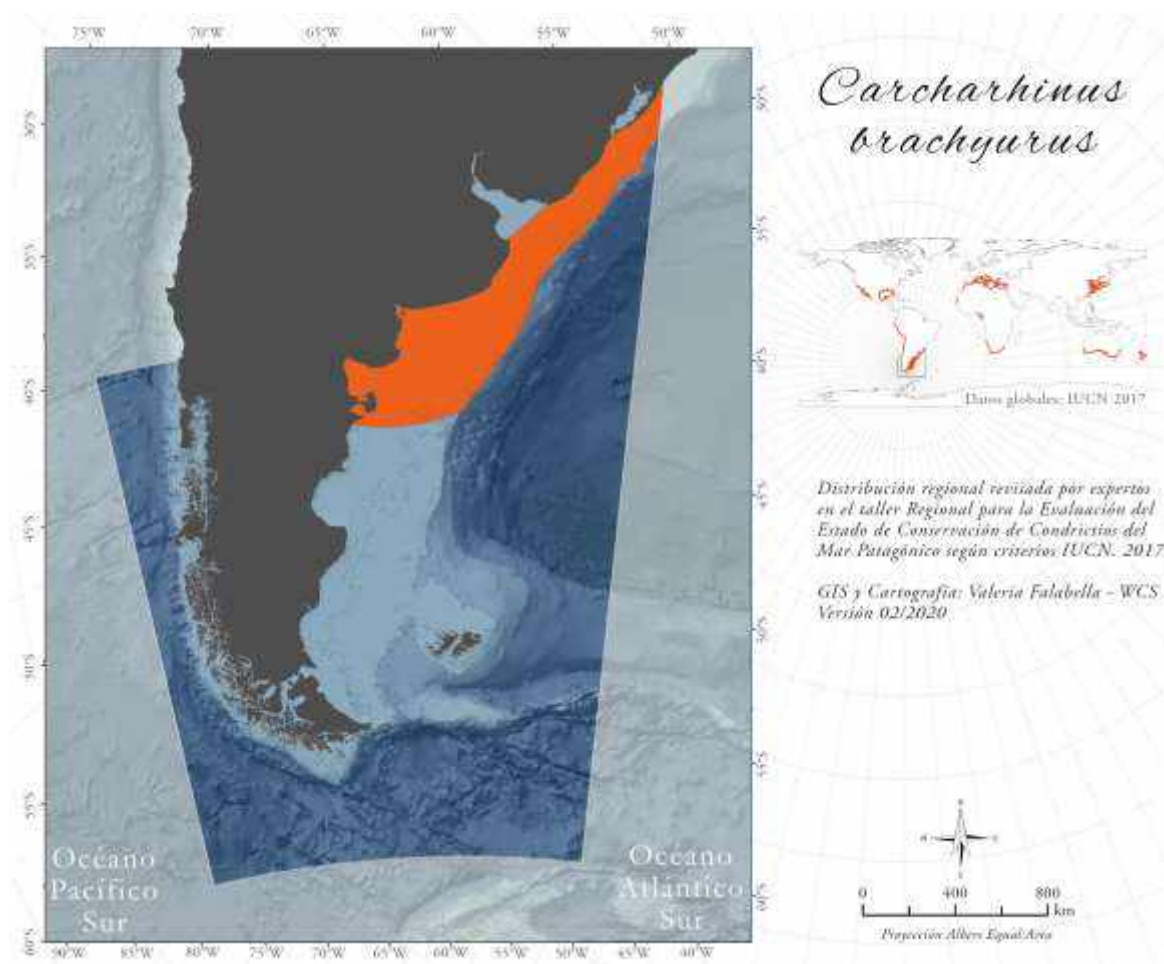
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - CARCHARHINIFORMES - CARCHARHINIDAE - Carcharhinus - brachyurus

**Common Names:** Copper Shark (English), Bacota (Spanish; Castilian), Bronze Whaler (English), Cocktail Shark (English), Jaqueton Del Estrecho (Spanish; Castilian), Kuroherimejiro (Japanese), Narrowtooth Shark (English), New Zealand Whaler (English), Requin Cuivre (French), Reremai (Maori), Squalo Bronzeo (Italian), Tiburón Cobrizo (Spanish; Castilian), Toiki (Maori).

## Geographic Range



It is a cosmopolitan coastal species, with a wide but spotted distribution from the shoreline to a depth of 100 m (Compagno *et al.* 2005). In the Patagonian Sea, this species appears from

southern Brazil to Central Patagonia (Argentina), from the coast to deeper waters over the continental shelf.

## Population

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There are no data on general abundance of *Carcharhinus brachyurus* in the Patagonian Sea. However, there are indications of a declining population trend in Argentinean waters (Lucifora 2003). Matrix models carried out with data obtained from recreational fisheries in Anegada Bay (Argentina) indicate that the population declines at a rate of between 3 and 13% annually (Lucifora 2003). Statistical analysis using opportunistic records of recreational fishery magazines indicate an annual declining of 29% (Barbini *et al.* 2015). Also, a 70% of 27 experienced recreational guides and fishermen interviewed indicate a decreasing tendency of 48% in the occurrence of this species in the last decades (Irigoyen and Trobbiani 2016).

In southern Brazilian waters, *C. brachyurus* is considered rare (Vooren, 1997; Soto, 2000). The species is caught as bycatch by gillnets and longlines, where their capture represents less than 5% of sharks caught by the operating fleets in these region (Amorim *et al.*, 1998).

**Current Population Trend:** Decreasing

## Habitats and Ecology

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*Carcharhinus brachyurus* is a large shark inhabiting primarily coastal waters from the shoreline to 100 m in depth (Compagno *et al.* 2005). In the Southwest Atlantic, the species is possibly a seasonal migrant between south Brazilian and Uruguayan waters and north Argentinean waters (Lucifora *et al.* 2005). In Argentinean waters, coastal habitats appear to be important feeding grounds for juvenile and adult individuals during the summer (Lucifora *et al.* 2009).

The species has one of the lowest intrinsic population growth rates among sharks (Cortés 2002, García *et al.* 2008), as a consequence of its very late age of maturity (see below) and biennial reproductive cycle which makes it particularly vulnerable to overexploitation.

**Age at first sexual maturity (years):** female: 21,7 years (Southwest Atlantic) (Lucifora 2003); male: 20 years (Southwest Atlantic) (Lucifora 2003).

**Size at first sexual maturity (total length cm):** female: The size at which 50% individuals are mature is 222 cm total length in the Southwest Atlantic (Lucifora *et al.* 2005); male: The size at which 50% individuals are mature is 216 cm total length in the Southwest Atlantic (Lucifora *et al.* 2005).

**Longevity (years):** The longest-living observed individual in the Southwest Atlantic is a 39-year-old male (Lucifora 2003).

**Maximum size (total length cm):** In the Southwest Atlantic, the largest observed individual is a female of 256 cm total length (Lucifora 2003).

**Reproductive seasonality (number of months per year):** In the Southwest Atlantic, the ovarian and gestation cycles are sequential. In consequence, females do not ovulate immediately after parturition, which suggests that the full reproductive cycle is, at least, biennial (Lucifora *et al.* 2005).

**Sex change param (sex ratio fished and unfished, size of sex change, type of hermaphroditism, etc.):** Unknown.

**Annual rate of population increase:** -3 to -13% (Lucifora 2003).

**Natural mortality:** Unknown.

Feeding habits include mainly small pelagic teleosts and chondrichthyans; ontogenetic diet shifts are identified in small and young sharks that prey upon small teleosts whereas as shark's size and age increase the diet includes larger prey as chondrichthyans (Lucifora *et al.* 2009).

## Threats

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The major threats to the species in the Southwest Atlantic come from overexploitation of several kinds of fisheries. *Carcharhinus brachyurus* used to be exploited in the coastal gillnet fishery around the coast of Necochea (Argentina) (Chiaramonte 1998a,b). Today, it is still captured in recreational fisheries along the coast of the Province of Buenos Aires and Río Negro (Argentina) (Chiaramonte 1998b, Lucifora 2003, Lucifora *et al.* 2005, Cuevas 2016), pelagic long-line fisheries and trawlers off Uruguay (Marín *et al.* 1998, Díaz *et al.* 2004, Domingo *et al.*, 2015) and southern Brazil (Amorim *et al.* 1998).

Lucifora 2003 estimates 366 (197-535) individuals caught in the recreational fishery of Bahía San Blas (Argentina) during summer season of 1998-99; 327 (232-432) during 1999-2000; and 471 (355-586) during 2000-01. Díaz *et al.* (2004) report catches of 290 individuals of *C. brachyurus* per 1000 hooks from a recently developed longline fishery off Uruguay; decline estimations in Argentina were done before the development of this fishery, suggesting a worse situation. Forty four percent of the 144 individuals caught in recreational fisheries of Bahía San Blas had hooks piercing in internal organs (Lucifora 2003). It is estimated that recreational fishing effort for this species is becoming greater due to an increasing angler population in Argentina.

There are specific coastal pupping areas without protection in the Patagonian Sea in: southern Brazil (Roberta A. Santos pers. com. 2017), Uruguay and northern Buenos Aires Province (Cuevas 2016).

Because of its coastal habitat, *Carcharhinus brachyurus* is threatened by habitat loss and modification, in addition to fisheries. Coastal areas are key habitats for this species in the Southwest Atlantic. The shallow bays of southern Province of Buenos Aires (Argentina) are



important secondary nursery areas (i.e. areas where juvenile individuals congregate after being born somewhere else) (Lucifora *et al.* 2005), and feeding grounds for both juveniles and adults before migrating northwards to Uruguayan and Brazilian waters (Lucifora *et al.* 2009). Modification of these areas through urbanization, pollution and infrastructure development would be detrimental to the species.

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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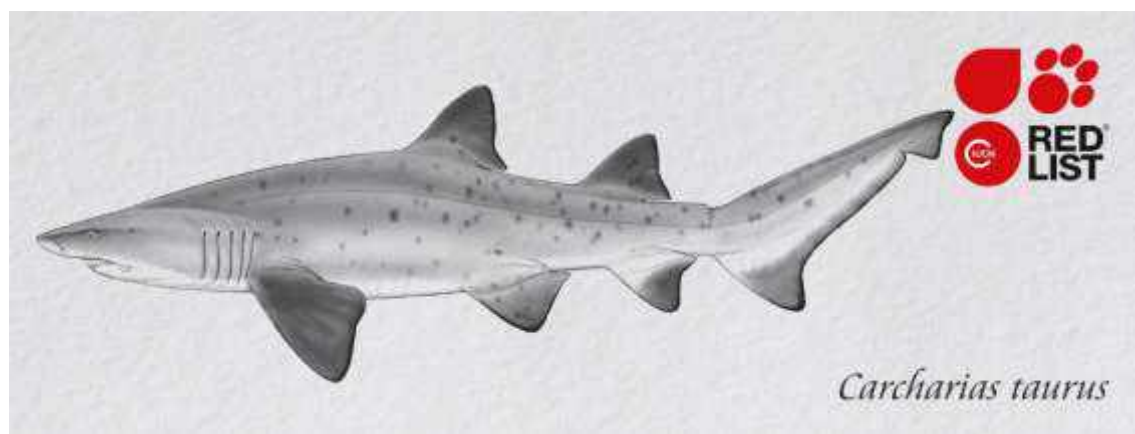
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## CR - Critically Endangered, A2bcd (IUCN version 3.1)

### Assessment Rationale:

In the Patagonian Sea, the Sand Tiger *Carcharias taurus* is found from southern Brazil to Argentina over the continental shelf. This species is relatively slow-growing, with an estimated generation length of 20 years. In southern Brazil, CPUE between 1980s and 1990s declined by 97%, based on number of sharks per 1000 m of nets. In Brazil, landings for this species have declined by 90% from 2001 – 2009, based on CPUE. In Uruguay, this species has been caught for over 50 years by the artisanal fishery, after that catches decreased by more than 90% from 784 kg/day in 1985 to 32 kg/day in 2001. Over the past 30 years (1973 to 2008) the trophy photos in annual reports of the recreational fisheries have decreased by 29% annually. *C. taurus* overlaps diet in 90% with most fishery exploited species in Argentina and it mostly swallows hooks when it is caught in recreational fisheries, which jeopardize attempts to release. In summary, over the past 40 years (roughly 1980s to 2008), there has been at least a 90% decline or more in several studies of this species population in the Patagonian Sea. There is no current indication of reducing recreational fishing effort, and this species is hardly recorded today. The quality of the habitat of nursery grounds in estuaries is also heavily degraded and polluted in many parts of its range. Therefore, this species is listed as Critically Endangered under A2bcd.

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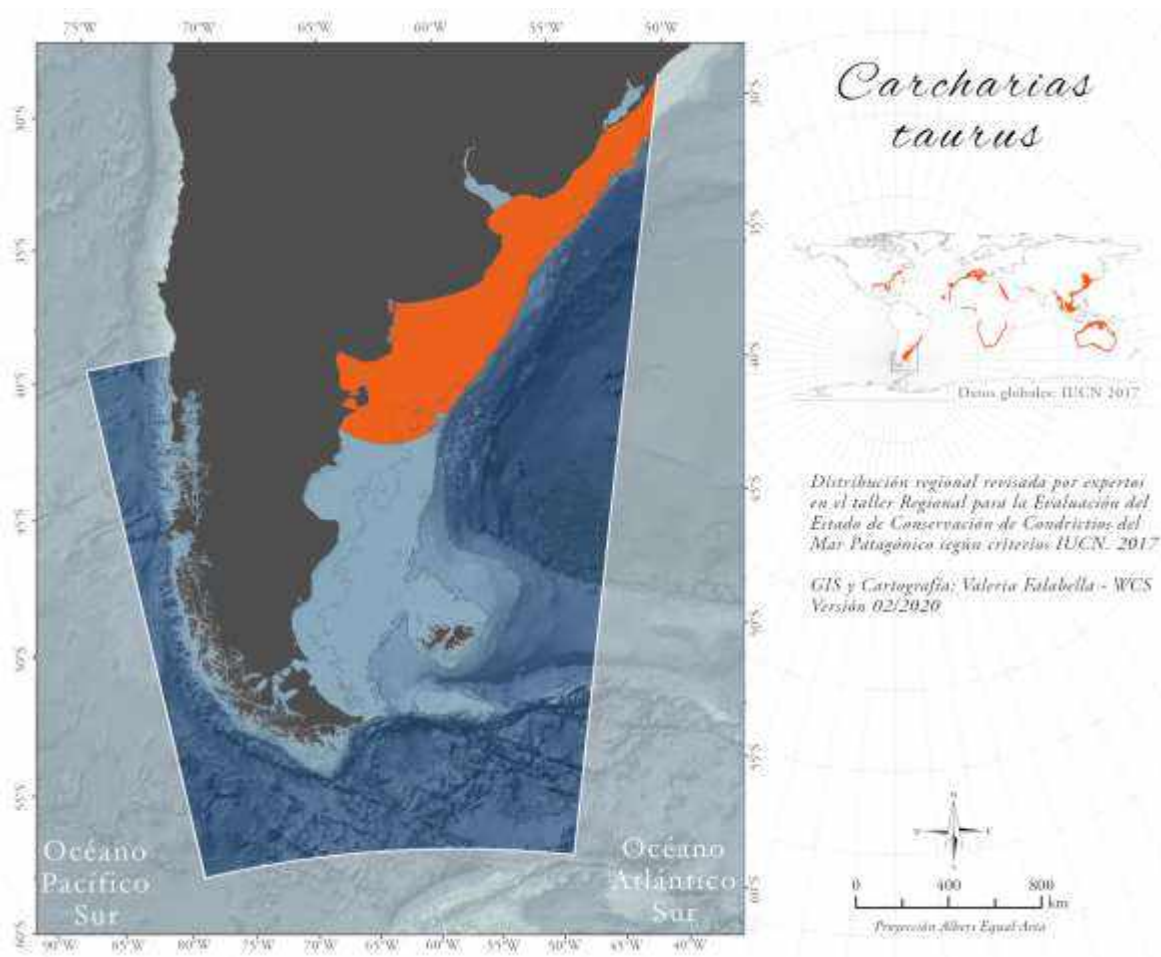
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - LAMNIFORMES - ODONTASPIDIDAE -  
Carcharias – Taurus (Rafinesque, 1810)

**Common Names:** Sand Tiger Shark (English), Grey Nurse Shark (English), Requin Taureau (French), Spotted Ragged-tooth Shark (English), Spotted Raggedtooth Shark (English), Toro Bacota (Spanish; Castilian), Escalandrún (Spanish; Castilian), Sarda (Spanish; Castilian), Mangona (Portuguese)

## Geographic Range



The Sand Tiger is a cosmopolitan species that occurs in the Patagonian Sea from southern Brazil to central Argentina over the continental shelf (Menni, 1983; Vooren, 1997; Soto, 2001; Lucifora, 2003; Perier *et al.*, 2011).

**Depth Zone:** Shallow photic (0-50m)

## Population

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There is no current data trend on abundance of *Carcharias taurus* in the Patagonian Sea, but demographic modelling showed a declining population (Lucifora 2003). Matrix models developed with biological data obtained from individuals caught in Anegada Bay (Argentina) suggests that the population is declining at an annually rate of 11% (Lucifora 2003). In southern Brazil, CPUE between 1980s and 1990s declined by 97%, based on number of sharks per 1000 m of nets (Soto 2001). In southern Brazil (1980s), the sand tiger shark *C. taurus* was the target species of an important coastal fishery with gillnets. The species was so abundant that beach trawl fishing caught shoals of this shark (Vooren *et al.*, 2005). However, fishing effort combined with the biological characteristics of this species is having a strong impact on populations. Currently, in Rio Grande do Sul, capture records of *C. taurus* are rare (Vooren *et al.*, 2005). Thus, landings in Brazil, for this species have declined up to 90% from 2001 - 2009 based on CPUE (Jorge Kotas pers comm. 2017). In Uruguay, this species has been caught for over 50 years by the artisanal fishery, after that catches decreased by more than 90% from 784 kg/day in 1985 to 32 kg/day in 2001 (Domingo 2003). Over the past 30 years (1973 to 2008) the trophy photos in annual reports of the recreational fisheries have decreased by 29% annually (Barbini *et al.* 2015). Ninety-two percent of 29 shark fishermen interviewed by Irigoyen and Trobbiani (2016) indicated a decline in catch of *C. taurus* during their fishing career in the Argentinean coasts. There is no current indication of a reducing recreational fishing effort and this species is hardly recorded today.

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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*Carcharias taurus* is a large shark inhabiting coastal waters up to about 200 m in depth, but usually it is found much shallower (Compagno 2001). In the Southwest Atlantic, it appears to be a migrant between southern Brazilian-Uruguayan waters and Argentinean waters (Lucifora *et al.* 2002). Its habitat use appears to change with ontogeny, with neonates and small juveniles dwelling in shallow environments in southern Brazilian and Uruguayan waters (Lucifora *et al.* 2002, Vooren & Klippel 2005a) and probably adults migrating seasonally (Lucifora *et al.* 2002). The species has a very low productivity, with an, at least, biennial reproductive cycle in the Southwest Atlantic, producing only two offspring per reproductive cycle (Lucifora *et al.* 2002).

The known populations of *Carcharias taurus* tend to have very defined migration boundaries, which limits genetic exchange (Lucifora *et al.* 2003, Stow *et al.* 2006, Dicken *et al.* 2006) and repopulation of depleted areas. Diet of *C. taurus* in this region is based on teleosts (55.4% of the total prey number, N) and elasmobranchs (41.84%N), eating more benthic elasmobranchs (batoids and angel sharks) as they become larger.

### LIFE HISTORY TABLE

**Age at first sexual maturity** (years): Female: Approximately 15 years in the southwest Atlantic (recalculated from Lucifora 2003); Males: Approximately 9 years in the southwest Atlantic

(recalculated from Lucifora 2003). Longevity (years): In the southwest Atlantic, the maximum observed age is 27 years (recalculated from Lucifora 2003). Generation length is estimated to be about 20 years.

**Size at first sexual maturity** (total length cm): female: In the Southwest Atlantic, females mature between 218 and 235 cm total length (Lucifora *et al.* 2002); Male: The smallest mature male observed in the Southwest Atlantic was 193 cm total length (Lucifora *et al.* 2002).

**Maximum size** (total length cm): In the Southwest Atlantic, the largest individual recorded was a female of 267 cm total length (Lucifora 2003).

**Reproductive seasonality** (number of months per year): In the Southwest Atlantic, the reproductive cycle appears to be biennial, i.e. one year of oocyte production and one year of gestation with 2 pups every two years (Lucifora *et al.* 2002).

**Annual rate of population increase**:-11% in the Southwest Atlantic (Lucifora 2003).

**Natural mortality**: Unknown.

## Threats

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Given its low productivity, the main threat to *Carcharias taurus* is overfishing. In the Southwest Atlantic, *Carcharias taurus* is caught in several fisheries. In the southern area of Brazil, it is caught in artisanal and industrial fisheries (Vooren and Klippel 2005); off the southern area of Uruguay, it is caught in artisanal gillnet and longline fisheries (Nion 1999); and off the southern area of Argentina, it used to be caught in gillnet fishery (Chiaramonte 1998) and it was commonly caught in 2000s in recreational fisheries (Lucifora 2003). Lucifora (2003) estimates 123 (56-191) individuals caught in the recreational fishery of Bahía San Blas (Argentina) during summer season of 1998-99; 313 (233-379) during 1999-2000; and 453 (336-570) during 2000-01. In Uruguay, it is also caught by rec fisheries, artisanal bottom gillnets, bottom trawl fisheries as well as bottom long-line fisheries (Domingo *et al.*, 2015).

*Carcharias taurus* is an apex predator whose diet is composed of mainly medium to large fish. In the Patagonian Sea, its diet composition overlaps more than 90% with the landed catch of commercial fisheries (Lucifora *et al.* 2009). Since these fisheries have depleted the populations of the main prey of *C. taurus*, there are concerns that food depletion may be an issue for *C. taurus* (Lucifora *et al.* 2009).

As *C. taurus* generally swallow their prey, they are usually hooked in internal organs (87.4%, n=175), causing occlusion and perforation of the esophagus and stomach, and lacerations to the pericardium, heart and liver, which may reduce significantly the survival of the released sharks (Lucifora *et al.* 2009).

Because of its coastal habitat, *Carcharias taurus* is also threatened by habitat loss and modification, as well as by fisheries. Coastal areas are key habitats for this species in this region.

The shallow bays of southern Province of Buenos Aires (Argentina) are mating and feeding grounds (Lucifora *et al.* 2002, 2009). Modification of these areas through urbanization, pollution and infrastructure development would be detrimental to the species.

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to

50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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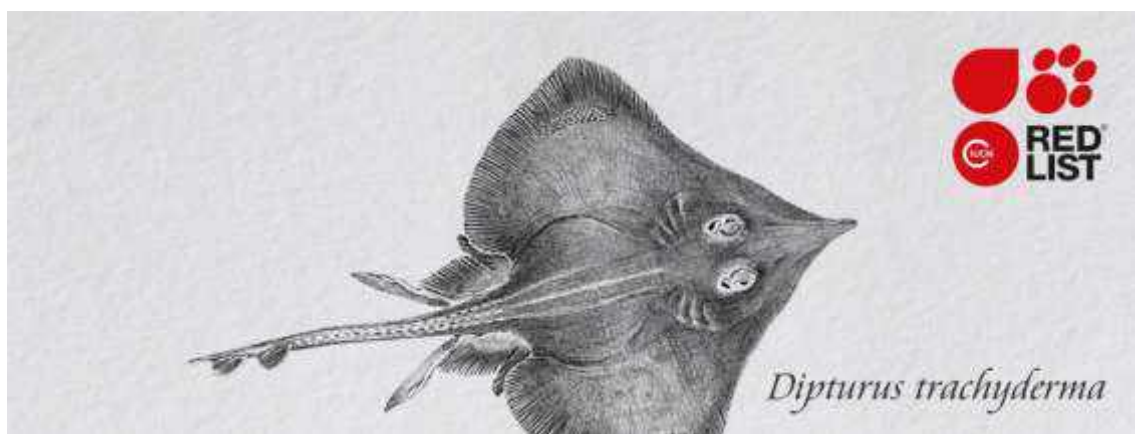
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## EN - Endangered, A4bd (IUCN version 3.1)

### Assessment Rationale:

The Roughskin Skate *Dipturus trachyderma* is found from Uruguay to southern Argentina and Chile, where it can be found in depths of 450 m. Average generation length is approximately 20 years. In Chile, overall biomass of *Dipturus* spp. (*D. trachyderma* and *D. chilensis*) has decreased by 51% and spawning biomass by 34% , since fishing began in 1979. Landing statistics are not separated by species, but research has shown that *D. trachyderma* makes up a 10% of catches. This species seems to be common in shrimp bycatch in Argentina, a trend that has increased in recent years. The species was recorded in 3% of 15,700 commercial shrimps hauls from 2003 - 2007 (missing 2005). However, in earlier years, these numbers were much higher, as this species was present in at least 10% of the hauls. Based on an estimated 50% declines of species recorded in hauls over the past 10 years in southern Argentina (about a quarter of its range), and 50% decline in biomass observed in Chile over the past 40 years (about half its range), along with a projected increase in the next 10 years in fishing effort for this species in shrimp fisheries (where this species is caught as by-catch), it is estimated that there has been at least a 50% decline in this species in the past 40 years and potentially the same tendency will be present in the next 20 years, given current and projected fishing pressure. It is listed as Endangered under A4bd. There may be some identification problems with this species, as it can be misidentified especially in juveniles (< 1m TL) with *D. chilensis*.

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**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

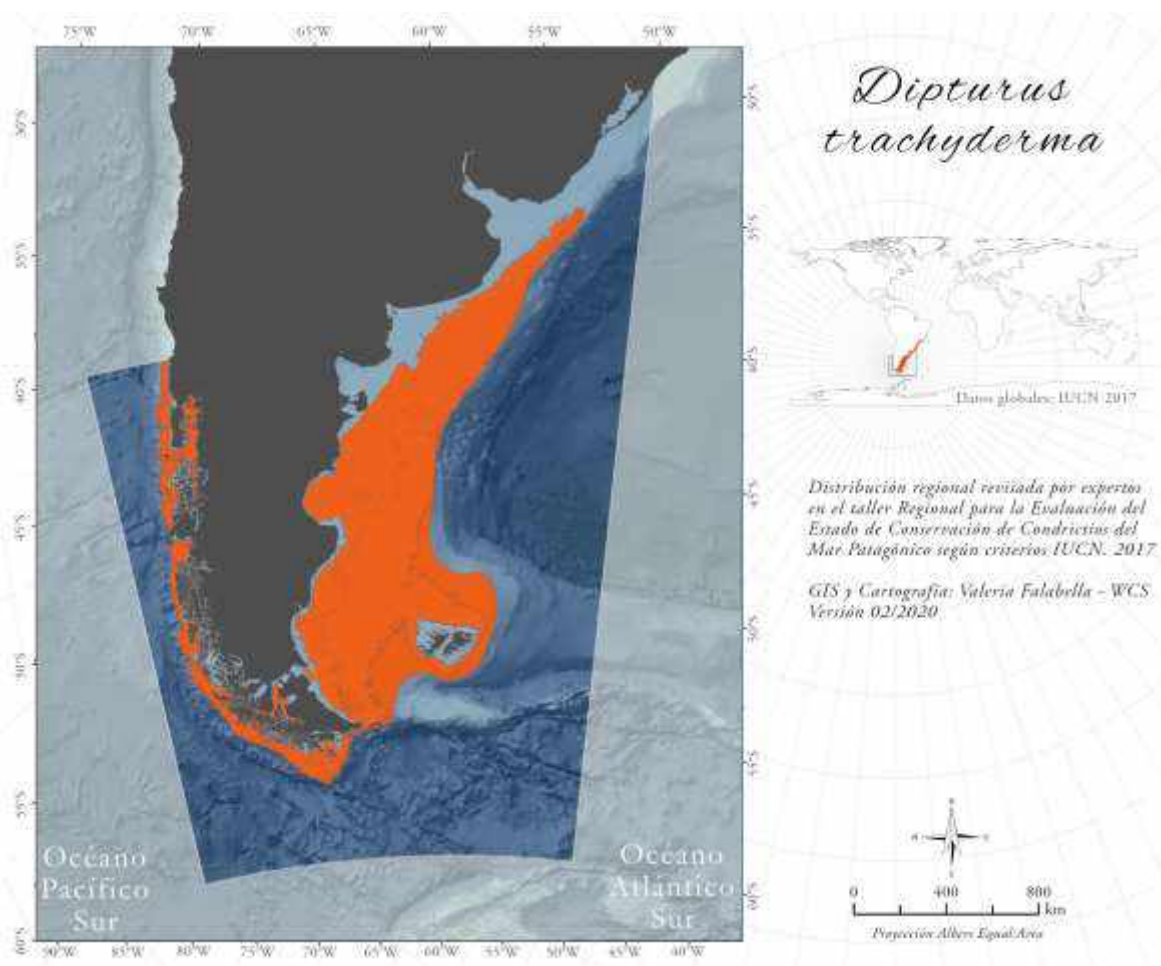
ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - RAJIDAE - Dipturus – trachyderma (Krefft & Stehmann, 1975)

**Common Names:** Roughskin Skate (English), Raya Espinuda (Spanish; Castilian)

**Synonyms:** *Raja trachyderma* Krefft & Stehmann, 1975

**Taxonomic note:** current valid name *Dipturus trachyderma* (Vargas-Caro *et al.* 2015).

## Geographic Range



The species is endemic to the temperate waters of South America (Licandeo *et al.*, 2007) being distributed in the Patagonian Sea from Uruguay to Southern Chile (Bustamante *et al.*, 2014; Vargas-Caro *et al.* 2015).

## Population

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In Chile, overall biomass of this species has decreased by 51% and spawning biomass has decreased by 34% since fishing began in 1979 (Quiroz 2005).

*Dipturus trachyderma* is not as abundant as *D. chilensis* in Uruguay and the Argentina and Uruguay Common Fishing Zone during the last 20 years (Laura Paesch pers. comm. 2017). Similarly, in Argentina, *Dipturus trachyderma* is not as abundant as *D. chilensis*, and its biomass was estimated in 1998 at 11,828 tons from 45° to 55°, in summer (García de la Rosa *et al.*, 2000). It was found in the center and northeast areas of the San Jorge Gulf at densities up to 2ton per square kilometer. This species was absent from the San Jorge Gulf during summer (2002), and the monthly average CPUE increased from near 1 kg t<sup>-1</sup> in March to 8 kg t<sup>-1</sup> in August (2002) (Cedrola *et al.*, 2005). In the hake fisheries in northern part of the San Jorge Gulf from 1497 hauls, this species was recorded in 209 hauls between 2003-2012 (Bovcon *et al.* 2013). In the ports of Río Negro province, this species contributes with 4% in weight to the commercial landings. About 33% of the females and 86% of the males sampled were immature (Estalles *et al.* 2011).

There is no population trend data on the Patagonian shelf and slope around the Malvinas/Falkland Islands.

**Current Population Trend:** Unknown.

## Habitats and Ecology

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Like other skates, this species is oviparous and it could be found in a range depth of 50 m to 1000 m (Ebert, 2016, Reyes, & Torres-Florez, 2009, Góngora *et al.*, 2009, Ruibal Núñez, 2016).

In Argentina, size at maturity has been estimated at 54.9 cm Total Length (TL) and 53 cm TL for females and males, respectively (Scenna 2003). In Uruguay, females mature at 52 cm TL and males at 53.5 cm TL (Paesch and Oddone 2008). Maximum size has been estimated at 77 cm TL (Agnew *et al.* 2000). The smallest known specimen was 13 cm TL (Stehmann *et al.* unpubl. data). The oldest individual was estimated to be approximately 11-12 years with the age of first maturity estimated to be 5-6 year (Bücker *et al.* 2006) and a generation length probable of 8-9 years.

*Bathyraja macloviana* is a specialist feeder on polychaetes, with a small proportion of amphipods, isopods and decapods completing its diet (Brickle *et al.* 2003, Mabragaña *et al.* 2005, Barbini *et al.* 2010). *D. trachyderma* resembles *D. chilensis* in external morphology and its on board differentiation is often difficult (Cedrola *et al.*, 2005). It is distributed in deep temperate waters of the continental shelf and upper slope, between 93 m (Menni and Gosztanyi 1977) and 450 m (Leible 1984) in depth, but it was also recorded in 20 m to 22 m in the Beagle Channel (Lloris and Rucabado 1991). This species inhabits sandy and muddy bottom sediments and it is commonly found at depths below 100 m (Menni & Stehmann 2000; Cousseau *et al.*, 2007). *D. trachyderma* has been found in deeper waters on the continental shelf (200 – 400 m deep) than *D. chilensis*, which dominates over the continental shelf (Leible, 1987, Licandeo *et al.*, 2007).

Maximum age recorded for chilensis individuals is 26 years for female and 25 for males (Licandeo *et al.* 2007).

Generation length is likely about 18-20 years.

Spawning mode: Oviparous.

Reproductive seasonality (number of months per year): Mature-active females (i.e. ovulating) were present in late summer (March) and early winter (July). However, given that few females carrying egg cases were found, more data are needed to identify the egg-deposition season for the species. (Licandeo *et al.*, 2007).

## Threats

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In Argentina, in the San Matias and San Jorge Gulfs, this species is captured as "by-catch" and its commercial fraction is composed mainly of mature females (Nelson Bovcon 2017, *pers. com.*). In the San Jorge Gulf, it is captured by the fishery directed to the red shrimp *Pleoticus muelleri* (Cedrola *et al.*, 2005) and in the San Matias Gulf (SMG) in the fishery targeting common hake, *Merluccius hubbsi* (Perier *et al.*, 2007). In SMG, it is a component of commercial landings, contributing with 4% in weight with around 40% of the individuals landed in immature state (Estalles *et al.* 2011).

This species has been caught by the trawl fishery that operates in the San Jorge Gulf and adjacent waters with a frequency of occurrence of 3% (Góngora *et al.* 2009). It was recorded in 519 hauls between 2003 and 2007 mainly in the central zone of San Jorge Gulf. It has been also captured by the coastal vessels that operate in this gulf and occasionally it has been caught by coastal vessels at Rawson port, in Isla Escondida area. Eggs of this species have been collected by trawlers at the San Jorge Gulf as well (Nelson Bovcon, *pers. com.* 2017).

In Chile, the species is mainly caught as "target" species by small scale fisheries (Licandeo *et al.*, 2007). It is also caught by the commercial fishery on the Patagonian shelf and slope around the Malvinas/Falkland Islands in a skate assemblage of more than 16 skate species (Winter *et al.*, 2015).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentina. Most chondrichthyan catches take place in what is known as the Argentina Uruguay

Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas

(<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys biviatus*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al*, 2000, Wakeford *et al*, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.



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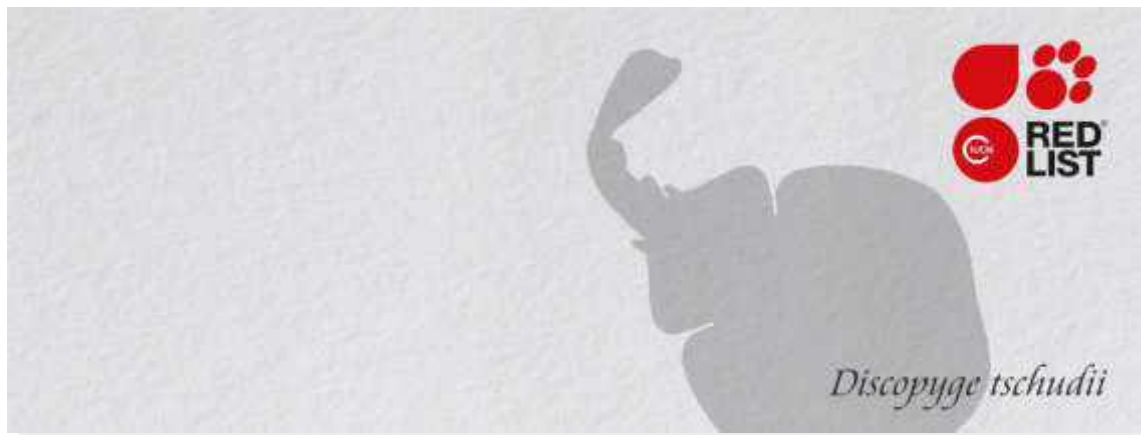
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## DD, Data Deficient, (IUCN version 3.1)

### Assessment Rationale:

The Apron Ray *Discopyge tschudii* is an endemic species of the Southern Cone and it distributes along the Patagonian Sea from southern Brazil to southern Chile. In the Southwest Atlantic (SWA) the main concentrations of the species are found along the coast of Buenos Aires Province and in northern Patagonia. Along the coast of Buenos Aires Province, two main zones of distribution have been recorded, one at 39°S and the other one in front of El Rincón. *D. tschudii* is also mainly found in the San Matías Gulf and the adjacent shelf up to the San Jorge Gulf. It is a relatively shallow water species, occurring at depths of about 22-181m in the SWA but between 0 and 50 m in Chile. It is also usually distributed in patches, which makes more difficult its biomass estimation. It is considered a noncommercial species and individuals caught by the bottom trawl fishery are discarded on board and survival post-capture is still unknown. The only population trend for the region was identified in the Argentine and Uruguayan Common Fishery Zone, between 1994-1999 an 88% of biomass decrease. Patchy distributed, low levels of catches were found in research studies carried out until 2012. In the Patagonia, the frequency of occurrence in the bottom trawl fisheries of shrimp (2005 and 2014) and hake (2007 and 2013) by the yellow fleet was 50%, showing to be much more common than in the north of Argentina. However, fishing pressures in northern Argentina have been higher than in the Patagonia. As age studies are not available for this species is not possible to get a generational length estimation and as well as an association of this species with a similar one in order to apply the same values of longevity or to estimate age of first calving. This species was listed as Data Deficient in Brazil and as Near Threatened globally, considering its Pacific area of distribution. This species was assessed as Data Deficient for the Patagonian Sea.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., Bustamante, C., Coller, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

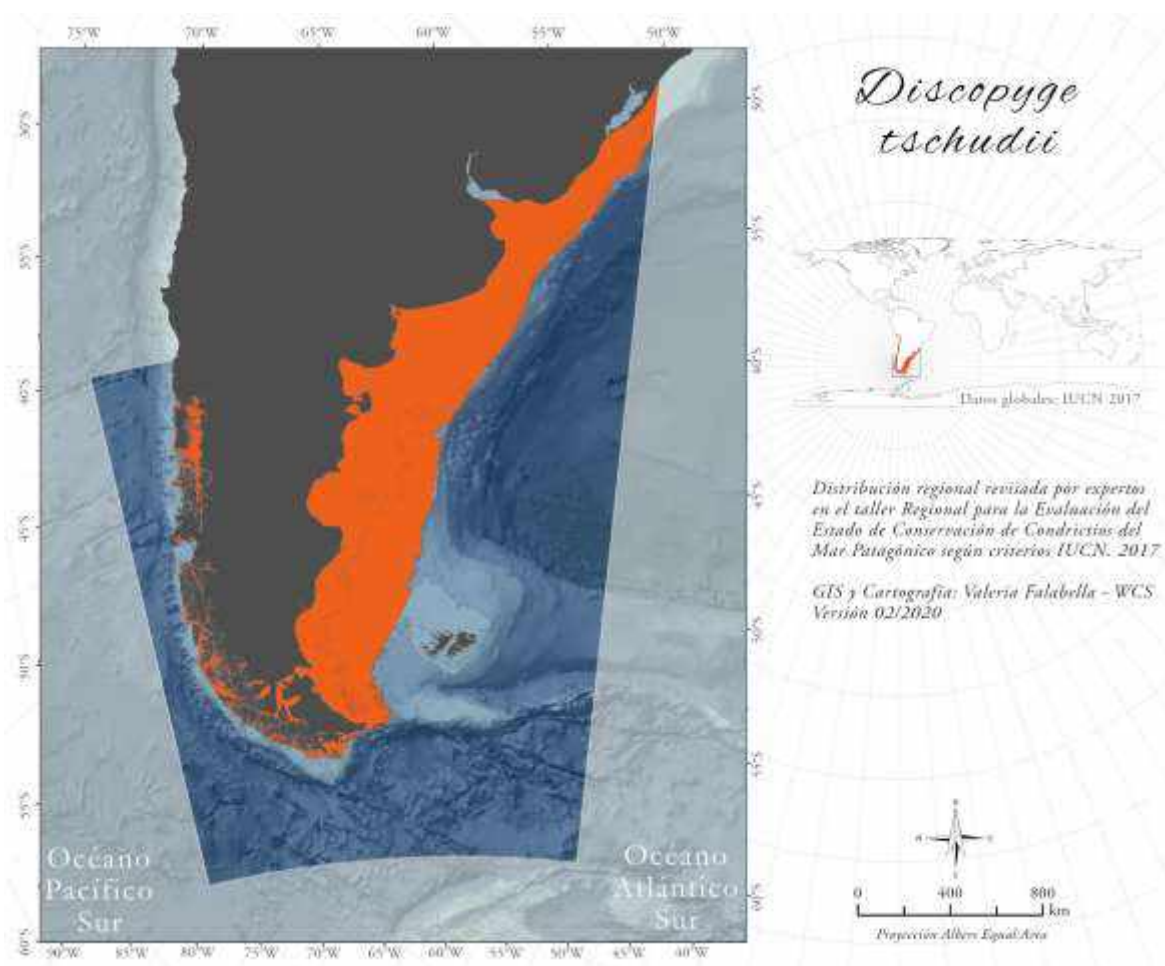
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - NARCINIDAE - *Discopyge tschudii* (Heckel, 1846)

**Common Names:** Apron Ray (English), Raya Eléctrica (Spanish; Castilian), Tembladera (Spanish; Castilian), Torpedo (Spanish; Castilian).

## Geographic Range



This species is endemic of the Southern Cone and distributes along the Patagonian Sea from southern Brazil to southern Chile (Figueiredo, 1977; Menni and Stehmann 2000; Pequeño *et al.*, 1988; Bustamante, 2014). In the Southwest Atlantic, the main concentrations of the species are found along the coast of Buenos Aires Province and in northern Patagonia. Along the coast of Buenos Aires Province, two principal zones of distribution have been recorded, one at 39°S and the other one in front of El Rincón (Menni *et al.*, 1981; Massa *et al.*, 2004a, Jaureguizar *et al.*,

2006). In northern Patagonia, *D. tschudii* is mainly found in the San Matías Gulf and in the adjacent shelf up to the San Jorge Gulf (Menni *et al.*, 1981; Estalles *et al.*, 2011).

## Population

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This species was listed as Data Deficient in Brazil (ICMbio 2016) and as Near Threatened globally, considering its Pacific area of distribution (Massa *et al.*, 2004b). In the Patagonian Sea, in the Argentine and Uruguayan Common Fishery Zone, between 1994 - 1999 an 88% of decrease in biomass was identified (Massa *et al.*, 2004a). It is difficult to know if fishery pressure over this species in the area has been maintained, however in the last research samples carried out until 2012, low levels of catches were found (Mirta Garcia, pers. comm., 2017). No other population trend is available for the region.

**Current Population Trend:** Unknown.

## Habitats and Ecology

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The Apron Ray is a benthic species reported from 10 m to 181 m in depth (Menni *et al.* 1981, Estalles *et al.*, 2011) but mainly found in shallow waters below 120 m in depth (Menni and Stehmann, 2000, Estalles *et al.*, 2011). In northern Patagonia, Argentina, this species presents an aggregated distribution mainly in the north, east and south areas of the San Matías Gulf (SMG) with a population that completes its entire reproductive cycle in it (Estalles *et al.*, 2011). In Chile, it is mostly found between 0 m and 50 m (Bustamante, 2014). Cortés *et al.* (2011) found that the species distribution over the continental shelf of northern Argentina and Uruguay is restricted to water temperatures lower than 16°C and salinities higher than 31.8°C.

Many aspects of the life history of *D. tschudii* are still unknown. It is an aplacental viviparous species (ovoviviparous) (Garcia 1984). The number of embryos per female varied from 1 to 12 (median 5) and it is positively correlated with mother size; males are larger and heavier than females and also they mature at a larger size (Estalles *et al.*, 2011).

Size at maturity: Chile - unknown; Argentina - 30 cm for males and 21 cm for females (Estalles *et al.* 2011)

Maximum size: Chile - females between 17.8 and 44.2 cm total length (TL), males between 21.9 and 53.8 cm TL (Pequeño *et al.* 1988); Argentina - females 39 cm TL, Males 54 cm TL (Garcia 1984).

Size at birth: Chile - unknown; Argentina – 8.2 (Estalles *et al.* 2011)

Average annual fecundity or litter size: Chile - unknown; Argentina - 1 to 12, mostly 2 to 5 (Estalles *et al.* 2011).

*D. tschudii* feeds mainly on polychaete worms and gammarid amphipods (Menni and Stehmann 2000; Spath *et al.* 2013).

## Threats

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In Argentine and in the Argentine and Uruguayan Common Fishery Zone, this species is considered a noncommercial species. Individuals caught are discarded on board (Massa *et al.*, 2004a; Tamini *et al.*, 2006, Estalles *et al.*, 2011) and survival post-capture is still unknown.

In Argentina, this species has been frequently caught by the bottom trawl fishery that operates in the San Jorge Gulf and adjacent waters with an occurrence frequency of 49%. It is the fifth by-catch species in order of occurrence for this fishery (Góngora *et al.* 2009). It has been mainly caught in the gulf mouth and in Santa Cruz Province jurisdictional waters. The species is also frequently caught by the coastal fishery that operates at Puerto Rawson in Isla Escondida area, and at Caleta Cordova (Nelson Bovcon *pers. comm.* 2017).

Catches in Chubut from the bottom shrimp trawl fishery showed females with embryos and eggs in Bahía Engaño and in northern areas inside the San Jorge Gulf (Nelson Bovcon *pers. comm.*, 2017).

There are no population data of *D. tschudii* in Brazil, but this species is sporadically caught in bottom trawl fisheries and discarded, with few records available (Soto and Mincarone, 2004).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentina. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina*



*guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "E. P. 100r" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabit the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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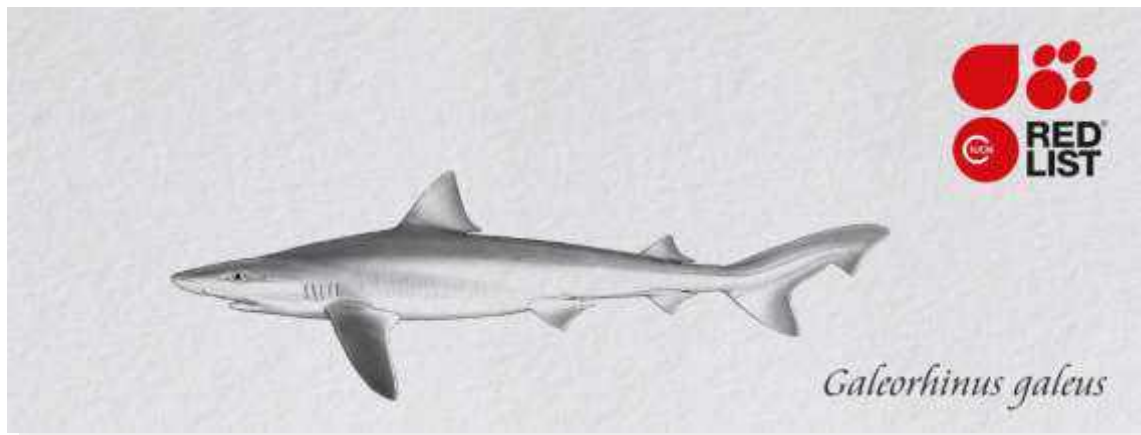
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## CR - Critically Endangered, A2bd, (IUCN version 3.1)

### Assessment Rationale:

The tope shark *Galeorhinus galeus* is a cosmopolitan widespread species, but populations are likely to be isolated. It is mainly a coastal and bottom associated shark of temperate areas which has been fished in all parts of its distribution. In the Patagonian Sea, it could be found between southern Brazil and southern Argentina over the continental shelf. Using an age at first sexual maturity between 12 and 17.5 years and an average longevity of 30.5 years, this species may have a generation length of approximately 22 - 24 years. Over the past 45 years, the proportion of sharks – "cazón" in total chondrichthyan landings (the majority being part of this species) since 1980s has declined from a high number of about 40% in 1984 to less than 2% in 2008. A population decline rate of 6.7 - 12.8% per year was calculated for this species. Over the past 30 years (1973 to 2008) the trophy photos of this species in annual reports of the recreational fisheries have decreased by 29% annually. Since 1972 to 2001, there has been a decline of 90% of this species in southern Brazil, with no signs of recovery since 2004, when the fishery was banned. Based on the sharks National Plan of Action of Argentina, abundance of this species was calculated as: (1978) 16,000 tonnes and in (1994), 7,300 tonnes and (1998) 17,800 tonnes, and (1999) 61,000 tonnes. Between 1943-1952, a 90% decline was estimated. The tope shark gillnet fishery in Argentina plummeted in 1998. Based on declines of at least 90% over the past 66-72 years (3 generation lengths) from southern Brazil and Argentina, this species is listed as Critically Endangered for A2bd. However, more information is needed on its distribution in southern Chile.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

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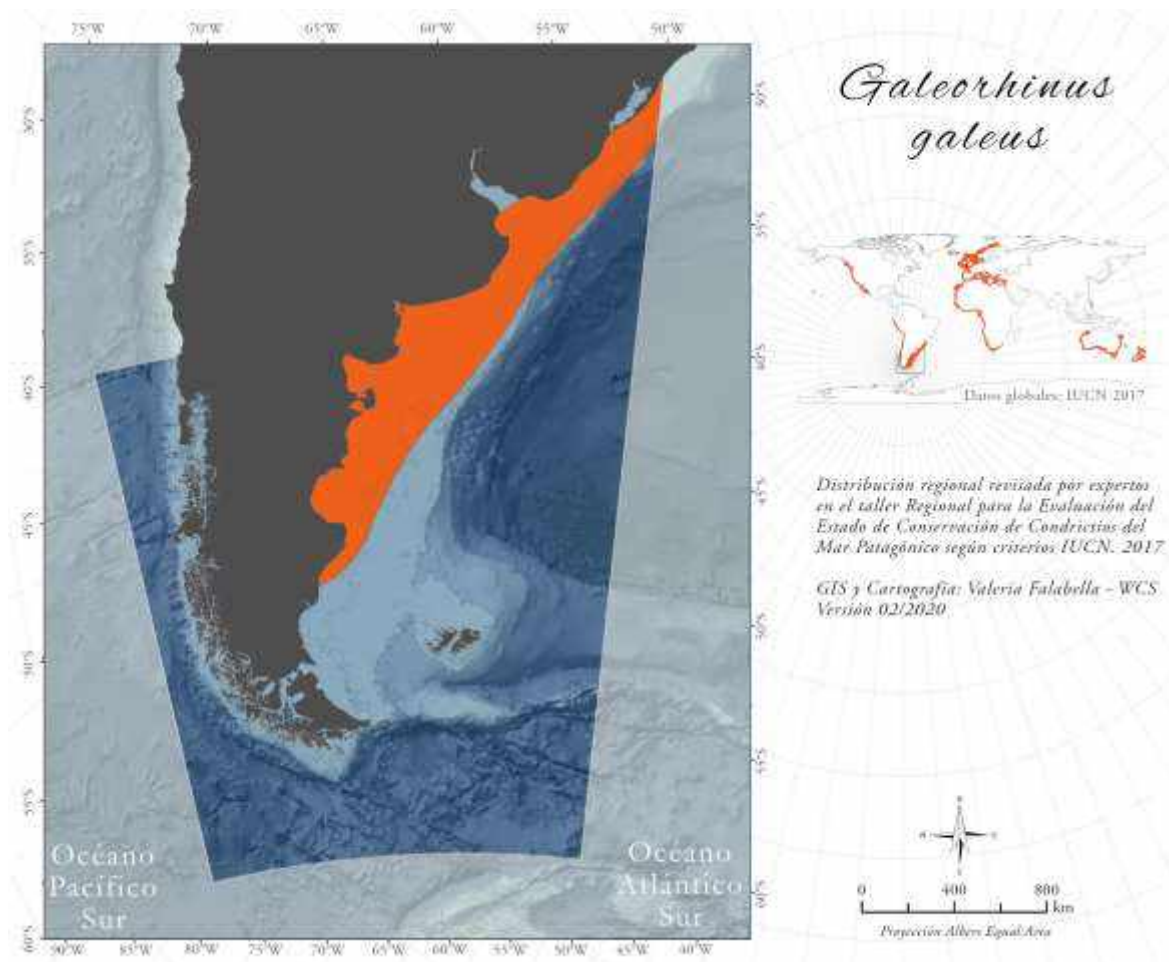
ANIMALIA - CHORDATA - CHONDRICHTHYES - CARCHARHINIFORMES - TRIAKIDAE - Galeorhinus – galeus (Linnaeus, 1758)

**Common Names:** Tope (English), Bethajen (Swedish), Blaaahai (Danish), Bosti (Spanish; Castilian), Bostrich (Spanish; Castilian), Ca Marí (Spanish; Castilian), Cacao (Spanish; Castilian), Cacao Tope (Portuguese), Cagnassa (Italian), Cagnesca O Canoso (Italian), Cagnot (French), Can (Italian), Can Da Denti (Italian), Can Negro (Italian), Canicule (French), Caniscu (Italian), Cascarra (Portuguese), Cassó (Spanish; Castilian), Cazón (Spanish; Castilian), Cação-bico-doce (Portuguese), Chien De Mer (French), Chião (Portuguese), Chona (Portuguese), Chonão (Portuguese), Dentudo (Portuguese), Galeo (Italian), Galeo Cane (Italian), Gat (Spanish; Castilian), Gemeine Meersau (German), Haastoerjen (Swedish), Haut (French), Hundshai (German), Lamia (Italian), Lamiola (Italian), Liver-oil Shark (English), Matsola Blaxeulda (Maltese), Mandró (French), Miler's Dog (English), Moretta (Italian), Musola (Spanish; Castilian), Musola Carallo (Spanish; Castilian), Oil Shark (English), Palloun (French), Palombo Cagnesco (Italian), Penny Dog (English), Perna De Moca (Portuguese), Pesce Cane (Italian), Pez Calzón (Spanish; Castilian), Pez Peine (Spanish; Castilian), Pesci Muzzolu (Italian), Requin-hâ (French), Rig (English), Roofhaai, School Shark (English), Snapper Shark (English), Sopvinhaai (Afrikaans), Soupfin (English), Soupie (English), Southern Tope (English), Speareye (Afrikaans), Spierhaai (Afrikaans), Steenhaei, Sweet William (English), Tchi (French), Tiburon (English), Tiburón Trompa De Cristal (Spanish; Castilian), Tiburón Vitamínico (Spanish; Castilian), Tope Shark (English), Toper (English), Touille (French), Vaalhaai (Afrikaans), Vitamin Shark (English), Whithound (English).

## Geographic Range

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*Galeorhinus galeus* has a wide but spotted distribution mostly on continental shelves up to 471 m in depth (Compagno 1984), with multiple isolated populations around the world (Chabot & Allen 2009, Bester-van der Merwe *et al.* 2017). In the Patagonian Sea, from Rio Grande do Sul (southern Brazil) to San Julián Peninsula (Argentina) (Soto 2001, Chiaramonte *et al.*, 2016) but its distribution in waters around southern Chile it is not clear (Carlos Bustamante pers. com., 2017).



## Population

*Galeorhinus galeus* is being and has been exploited wherever it occurs, with significant declines in most of each of these populations (Walker 1999). In the Southwest Atlantic, this species has been captured by fisheries since the 1940s in Brazil (Miranda & Vooren 2003), Uruguay (Nion 1999) and Argentina (Chiaramonte 1998, Elías *et al.* 2001, Lucifora 2003).

In southern Brazil, the catch per unit effort of *G. galeus* (combined with *Mustelus schmitti*) declined by 85% in 12 years (Miranda & Vooren 2003), considered regionally as critically endangered (Vooren & Klippel 2005). Since 1972 to 2001, there has been a decline of 90% of this species in southern Brazil (Ferreira *et al.* 2010), with no signs of recovery since 2004, when the fishery was banned.

In Uruguayan waters, this species is caught in the artisanal and industrial fisheries and landings of *G. galeus* declined from 1000 metric tonnes in 1977 to 158 metric tonnes in 1997 (Nion 1999) and from 150 tonnes in 2004 to 5.4 tonnes in 2016 and 0 tonnes in 2017 (CTMFM, 2017).

The declared landings for "sharks+cazón" in the SAGyP statistics (National Authority for Fisheries in Argentina), and in which *G. galeus* comprises most of these landings, show overall declines of

over 80% between 1992 (4,012 t) and 2004 (757 t), with landings around 1,000t or less since 2000, yet in the mid-1980s the landings were >5,000 t. The proportion of sharks + tope sharks in total chondrichthyan landings (the majority of which is part of this species) since 1980s has declined from 40% in 1984 to less than 2% in 2008 (Chiaramonte *et al.* 2016). Based on the National Plan of Action (NPOA, 2009), abundance trends of this species was calculated as follows: (1978) 16,000 tonnes, in (1994) 7,300 tonnes, in(1998) 17,800 tonnes, and in (1999) 61,000 tonnes. Also, between 1943-1952, a 90% decline was estimated (Lopez 1954, in Mateo 2006).

This species used to be caught in gillnet and longline fisheries (Chiaramonte 1998, Elías *et al.* 2001), but this tope shark gillnet fishery plummeted in 1998 (Chiaramonte *et al.*, 2016). It is still caught in recreational fisheries along the coast of Argentina (Lucifora 2003, Cuevas 2016). Over the past 30 years (1973 to 2008) the trophy photos of this species in annual reports of the recreational fisheries have decreased by a 29% annually (Barbini *et al.* 2015).

At the same time, population analyses based on biological data obtained from individuals caught by rec fish between 1998 and 2001 in southern Province of Buenos Aires (Argentina) indicate that the population declines at an annually rate of 6.7 to 12.8% (Lucifora 2003).

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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*Galeorhinus galeus* appears to perform seasonal migrations between southern Brazilian waters and northern Argentina (De Buen 1950, Lucifora 2003). The species has nursery areas off Argentina, where small juveniles and pregnant females at term are found in spring and summer (Lucifora *et al.* 2004).

It is a shark with a very low productivity, as a consequence of its late maturity and 3-year female reproductive cycle, with two years of oocyte maturation and one year of gestation (Lucifora *et al.* 2004).

Age at first sexual maturity (years): female: southern Brazil: 17.5 years (Ferreira & Vooren 1991), northern Argentina: 9.6 years (Lucifora 2003). Differences may have arisen from different methodologies. Male: South Brazil: 12 years (Ferreira & Vooren 1991), northern Argentina: 9.4 years (Lucifora 2003). Differences may have arisen from different methodologies. Maximum age recorded for the region was 21 years for males and 24 for females (Lucifora 2003) but it could be older as 40 years for this species (Walker *et al.*, 2006).

Using an age at first sexual maturity between 17.5 and 12 years and an average longevity of 30.5 years, thus this species may have a generation length of approximately 22 - 24 years.

**Size at first sexual maturity (total length cm):** Female: Size at 50% maturity is 124.7 cm total length in the Southwest Atlantic (Lucifora *et al.* 2004). Male: Between 108cm and 120 cm total length in the Southwest Atlantic (Lucifora *et al.* 2004).



**Reproductive seasonality (number of months per year):** In the Southwest Atlantic, females have a 3-year reproductive cycle (Peres & Vooren 1991, Lucifora *et al.* 2004).

**Annual rate of population increase:** -6.7 to -12.6% in the Southwest Atlantic (Lucifora 2003).

## Threats

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The main threat to the species in the Patagonian Sea is overexploitation mainly from small scale fisheries, especially longlining and gillnet fisheries, and as bycatch of the bottom trawl industrial fisheries in southern Brazil and the Argentine and Uruguayan Fishery Common Zone (Nion 1999, Elias *et al.* 2001, Vooren & Klippel 2005, Chiaramonte 1998 and 2016). The tope shark is a priced target species of the rec fish of Argentina (Cuevas, 2016).

In southern Patagonia, this species has been caught by the high-sea trawl fishery that operates in the San Jorge Gulf and adjacent waters with a frequency of occurrence of 5% (Góngora *et al.* 2009). However during 2005, when the fishery operated mostly in the north of San Jorge Gulf, captures were higher (from a total of 1562 captures registered for the period 2003-2007, 760 took place in the year 2005). This species is landed when it is captured by the freezer trawlers that operates at the San Jorge Gulf. It is frequently captured by the small coastal trawlers that operate in Bahía Camarones area (Nelson Bovcon, pers. comm. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life

stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "E. R. León" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhinchus callorynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabit the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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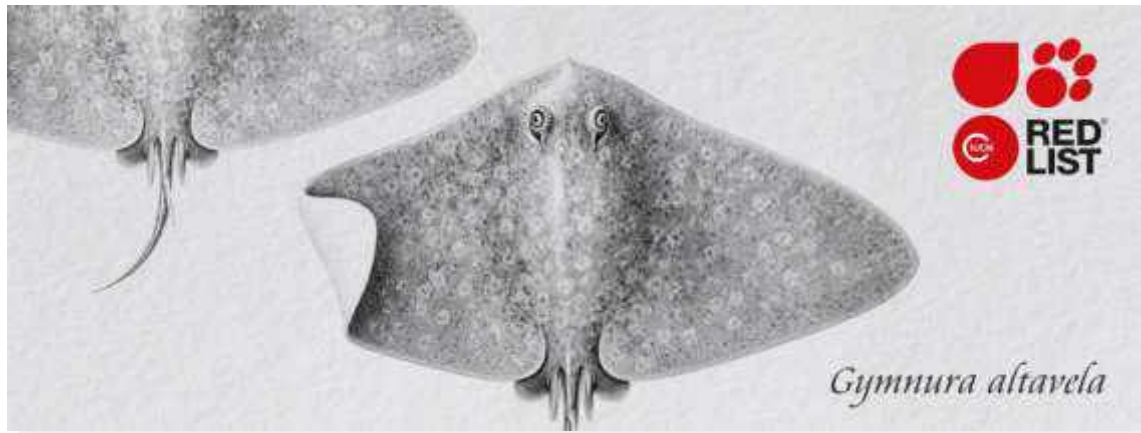
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## CR – Critically Endangered, A2bd, (IUCN version 3.1)

### Assessment Rationale:

The Spiny Butterfly Ray *Gymnura altavela* is a cosmopolitan wide-ranging butterfly ray, distributed at tropical and warm-temperate continental shelf. In the Patagonian Sea, the species is found from southern Brazil, Uruguay and northern Argentina. However, the bulk of the regional population is located at Brazil, where it was a very common species until the 80s. It is a very rare species and poorly recorded in Argentina and Uruguay with the last record in Uruguay in 2007. There is no information on biomass or trends for these countries. In Brazil, it is caught as bycatch in trawls and beach seine fisheries. This is a large (to 220 cm disc width) ray with a small litter size (producing 1-8 pups depending on geographic location), making it intrinsically vulnerable to population depletion. It has a patchy and discontinuous distribution and appears to be habitat-dependent. Fishing pressure is intense throughout its coastal habitat in southern Brazil, where the species occurs all year round and they breed. In southern Brazil this species has been landed commercially since at least 1986. The Spiny Butterfly Ray *Gymnura altavela* occurred in beach-seine catches in the 1980s, but it had disappeared from catches in 2002 and 2003. Trawl catch rates in kg/h in coastal waters of southern Brazil declined by ~99% between 1982 and 2005. The species was common and abundant in 1982, but it was caught only sporadically in 2005, when all captured specimens were small juveniles. The estimated generational length for similar species is 6-7 years. Considering the CPUE decrease from 16 kg / h to 0.2 kg / h in 23 years, it is possible to estimate a population reduction of 99% in three generations. Given observed and inferred declines, the exposure of its shallow coastal habitat to trawl fishing, its vulnerable life-history characteristics, patchy distribution, and continuing intense fishing pressure, this species is assessed as Critically Endangered in the Patagonian Sea for A2bd.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., Coller, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

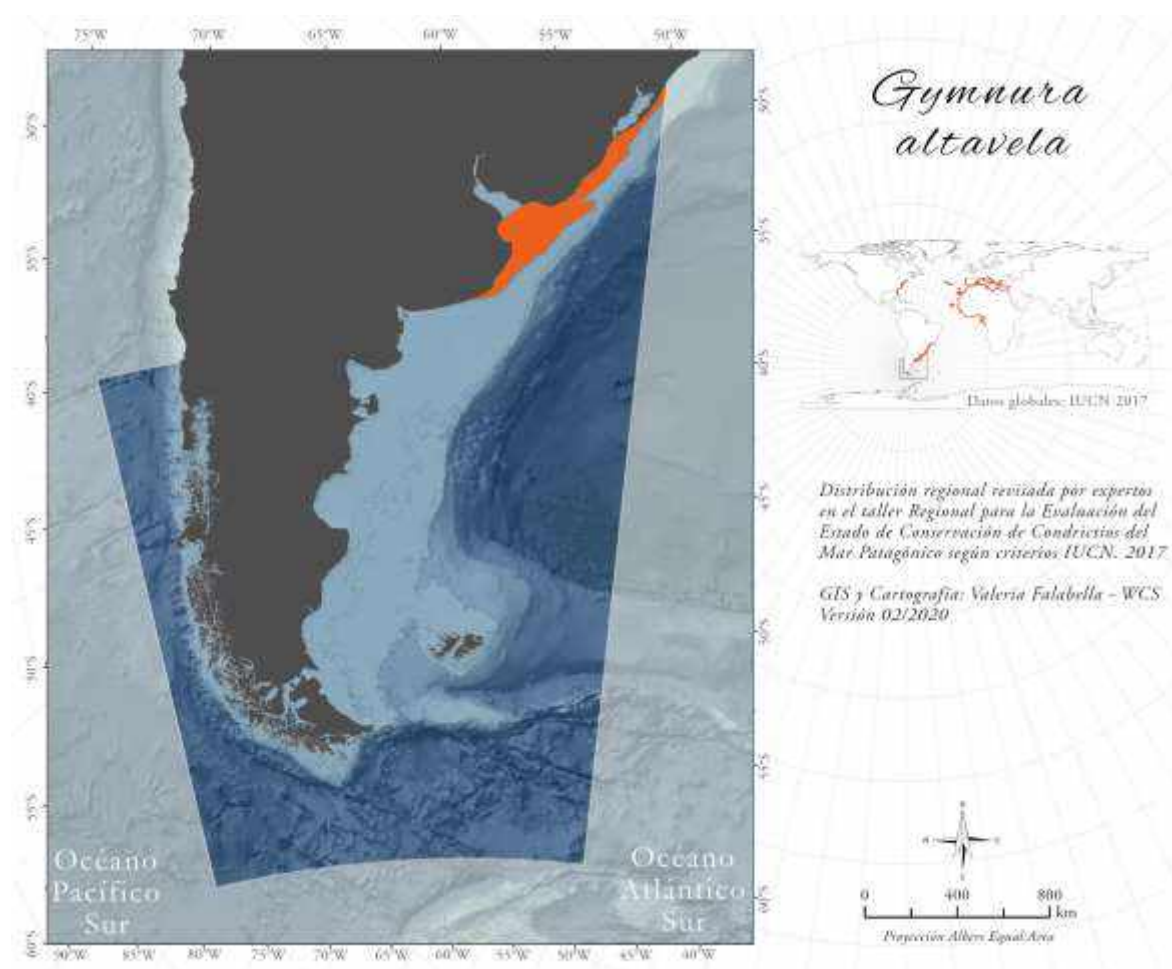
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - GYMNURIDAE - *Gymnura* – altavela (Linnaeus, 1758)

**Common Names:** Spiny Butterfly Ray (English), Raya mariposa (Spanish; Castilian)

## Geographic Range



In the Patagonian Sea, the species is found from southern Brazil to northern Argentina at 38° 37' S (Castello, 1973, Vooren 1997).

## Population

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In Argentina and Uruguay, it is a very rare species with sporadic catches and no data on abundance or population trends available for these countries. In this sense, in the Argentina and Uruguay Common Fishing Zone only four records have been documented between 1984 and 2017 with the last 3 during 2007 (Laura Paesch pers. comm., 2017).

In southern Brazil it was a common, abundant and breeding resident species in the 1980s throughout the year on the continental shelf (Vooren 1997) with small juveniles in the catches of 2005, indicating that reproduction still takes place in that area (Naves and Vooren 2001, Vooren *et al.* 2005). *Gymnura altavela* also disappeared from beach-seine catches in 2002 to 2003, where it had been historically observed in the 1980s (Vooren *et al.*, 2007). Also, drastic declines have been recorded in this zone between 1982 and 2005 with trawl survey catch rates standardized and frequency of occurrence, decreasing from 16.0 kg/h and 54% in January 1982 to 0.2 kg/h and 8% in February 2005 (Naves and Vooren 2001, Vooren *et al.* 2005). This strong decline in abundance is attributed to intense trawl fishing all year round in coastal waters (Vooren *et al.*, 2007).

**Current Population trend:** unknown

## Habitats and Ecology

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It is an aplacental yolk sac viviparous species with litter size varying from 1 to 8 depending on geographic location with up to five per litter in southern Brazil (Vooren *et al.*, 2007). *Gymnura altavela* is a large ray (to 220cm disc width) that reproduces annually with a gestation time reported as 4 to 9 months (Capapé *et al.* 1992). Size at maturity is reported as 155 cm DW in males and 102 cm DW in females (Daiber and Booth 1960). The only study on age and growth estimates a maximum age of 18 years for female and 11 for males, in the Northwestern Atlantic Ocean (Parsons *et al.* 2017). The estimated generational length for similar species is 6-7 years.

*Gymnura altavela* is a poor known species in the region. Rarely reported in Argentina; last record was in the 1950s at 47 m in depth (Cosztoyai 1981). Also, in the Argentina and Uruguay Common Fishing Zone (AUCFZ) the records were taken only during summer since 1984: 1 individual of 10.4 kg. in 1995 at 40 m and 3 individuals in 2007 between 5.5 kg. - 8 kg. and between 17.7 m and 30.7 m. in depth (Laura Paesch, pers. comm. 2017).

It used to be more frequent in Brazil than in other countries of the Patagonian Sea (Figueiredo 2003) recorded in depths of 10 to 150 m off southern Brazil (Vooren 1997).

## Threats

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This species has occasionally been reported in catches along the coast of Argentina and from Rio de la Plata to Quequén. It has been reported as irregular in the demersal catches at Mar del Plata (Menni and Stehmann 2000) and they are also rare in Uruguay (Laura Paesch pers. comm., 2017).

In southern Brazil, it was frequently caught by demersal multispecies trawling, beach-seine and recreational fisheries since 1986 (Araujo and Vooren 1986, Vooren 1997, Vooren *et al.* 2005, 2007). It is still critically threatened, as it is under strong pressure from fishing, with a drastic decline in catches (ICMbio, 2016), as well as from high levels of pollutants in other areas of the country (Rosenfelder *et al.*, 2012). The exposure of its coastal habitat to fisheries and its vulnerable life-history characteristics provide little capacity for recovery (Vooren *et al.*, 2007).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional

Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhinchus callorynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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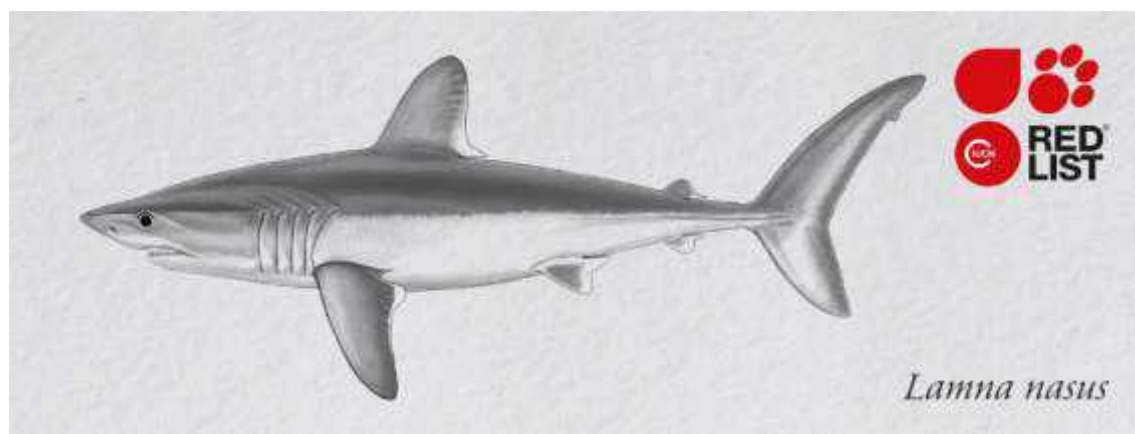
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## DD - Data Deficient, (IUCN version 3.1)

### Assessment Rationale:

In the Southern Hemisphere, the porbeagle shark *Lamna nasus* is a wide-ranging, coastal and oceanic shark, but with apparently little exchange between adjacent populations. Low reproductive capacity and high commercial value (bycatch of several fisheries) of mature and immature age classes make this species highly vulnerable to over-exploitation and population depletion. The latter, despite variations in availability of data and degree of depletion between the northern and southern hemispheres, is considered to meet Vulnerable criteria globally. Only limited trend data are available, including over 90% declines in landings by the Uruguayan longline fleet in the southwest Atlantic. In Argentina, annual by-catch in the surimi fleet of this species is fluctuating from 2006 to 2012 ranging from 12 to 117 tons annually. In total, 489 tonnes were taken in these 6 years, and given a maximum weight of 135 kg, a minimum of 3623 individuals were captured over 6 years. In the Southern Hemisphere, abundance estimations from the longline fishery and driftnet survey indicated a non continuous decreasing trend for this species from 1982 to 2011. In Brazil, this species is caught primarily in winter as by-catch, and it is mainly comprised of small juveniles due to the convergence of the subtropical front, indicating the presence of a nursery area. Also, there is only one boat targeting this species as by-catch in the region and the trend of this captures may be decreasing in the near future. Generation length may be 30 years or longer. Given that this species is very vulnerable to fishing activities, and there is a lack of data across 3 generation lengths, it is listed as Data Deficient for the Patagonian Sea.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiamonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

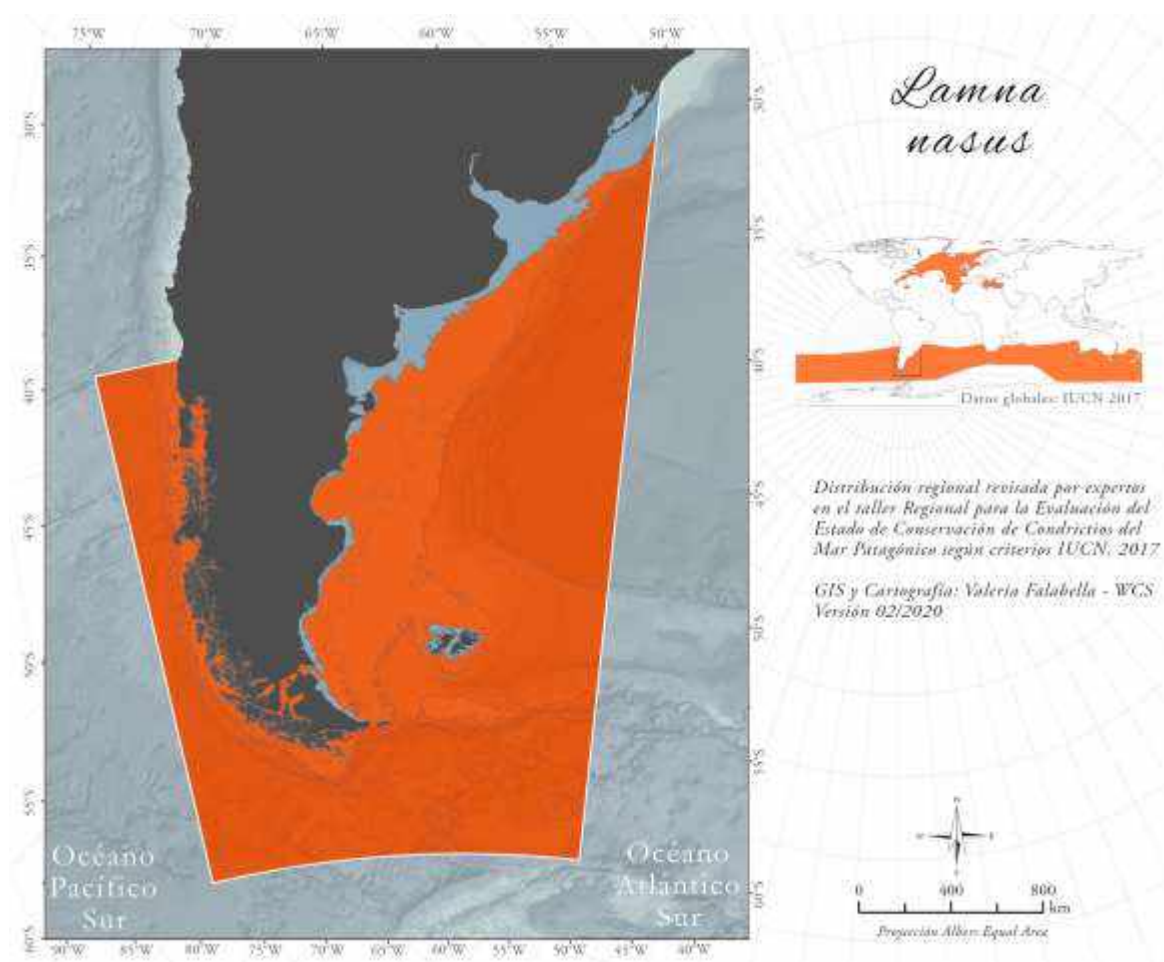
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - LAMNIFORMES - LAMNIDAE - Lamna – nasus (Bonnaterre, 1758)

**Common Names:** Porbeagle (English), Marracho (Portuguese), Marrajo Sardinero (Spanish; Castilian), Requin-taube Commun (French), Tiburón Sardinero (Spanish; Castilian), Tintorera (Spanish; Castilian), Tiburón Pinocho (Spanish; Castilian).

## Geographic Range



The porbeagle shark is a wide-ranging coastal and oceanic species found along the entire Patagonian Sea (Acuña, *et al.*, 2002, Menni and Lucifora, 2007, Montealegre-Quijano *et al.*, 2007; Bustamante *et al.*, 2014, Cortés and Waessle 2016).

## Population

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Although the status of the species is currently unknown for the Southern Hemisphere, there is a very low risk that the porbeagle is being overexploited according to these populations fishing mortality data (WCPFC-SC 2017). At the same time, no biomass estimation or population trend is available for the Patagonian Sea.

## Habitats and Ecology

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*Lamna nasus* is a viviparous shark that inhabits the temperate and cold waters of the South Atlantic and Pacific (Compagno, 1984). In the Atlantic Ocean, south of 50°S, the maximum registered Fork Length (FL) was 250 cm in males and 290 cm in females in incidental catches by longline and semi-pelagic and bottom trawl fleets (Waessle & Cortés, 2011). The seasonality and size structure observed by Acuña *et al.* (2001), Forselledo (2012) and Waessle & Cortés (2011) show that the nursery areas are found in temperate subtropical zones, while the feeding areas are in colder waters of the Pacific and Atlantic coasts of South America (Acuña *et al.*, 2001; Cortés *et al.*, 2017).

In Uruguay, Forselledo (2012) determined a size of maturity  $L_{50}$  of 147 cm, and  $FL_{100}$  of 164 cm.

## Threats

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In the Patagonian Sea the Porbeagle is incidentally caught by trawl fleets operating south of 44°S in the Southwestern Atlantic Ocean mainly by the surimi fleet targeting the southern blue whiting (*Micromesistius australis*) and the longtail hake (*Macruronus magellanicus*) (Waessle, 2007; Waessle and Cortés, 2011). By-catch data is available since 2004 as the fishery is covered by onboard observers (Waessle, 2007). From 8316 fishing hauls analyzed between 2006 and 2012, 12.36% has a positive *L. nasus* by-catch with an estimated annual bycatch by the Argentinean surimi fleet ranged from 11.79 to 117.43 tons (Cortés and Waessle 2016). In total, 489 tonnes were taken in these 6 years, and given a maximum weight of 135 kg, it would be a minimum of 3623 individuals captured over 6 years (Verónica García pers. comm. 2017). By-catch peaks at 62°30'W and south of 54°30'S. It decreases with depth and it is associated with high abundances of their main prey the longtail hake and the southern blue whiting (Cortés and Waessle 2016).

In Uruguay, the Porbeagle is mainly caught by pelagic longline fisheries but also by bottom trawlers (NPOA – Uruguay, 2015). During the 1980s, only the two most valuable shark species were retained for their meat: porbeagle *Lamna nasus* and mako *Isurus oxyrinchus*, representing about 10% of the total longline catch and peaking at 150 t in 1983 (NPOA – Uruguay, 2015). Since 1993, the landing records decrease drastically to around 10 t (NPOA – Uruguay, 2015). This was an 80% decrease in abundance in Uruguay for the period 1981 - 2012, where it has remained stable since 2009 (Pons and Domingo, 2010).

In Brazil, Porbeagles occur with relative low frequency in landings of swordfish longline fisheries in winter. However, in spring, large amounts of small juveniles are caught as by-catch, when the fleet moves to international waters, coinciding with the northernmost positioning of the Subtropical Convergence, and therefore being indicative of an ocean nursery area (Montealegre-Quijano *et al.*, 2007). The species is landed together with mako shark *Isurus* spp. preventing accurate statistics.

## Conservation

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The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys bivius*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the

skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew et. al, 2000, Wakeford et al, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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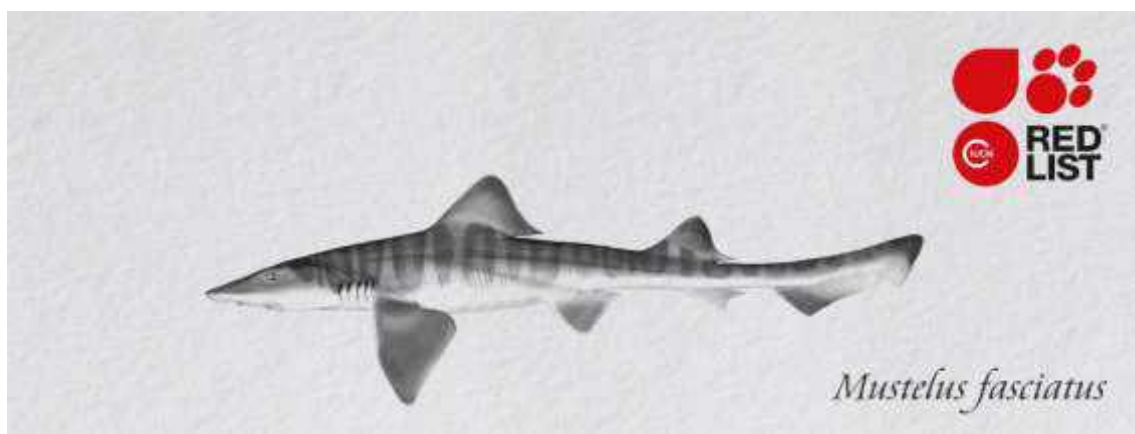
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CR - Critically Endangered, A4bd, (IUCN version 3.1)

#### Assessment Rationale:

The Striped Smooth-hound is an endemic Southwest Atlantic species which occurs at low densities over a restricted area, overlapping with the northern portion of the Patagonian Sea from southern Brazil in Rio Grande do Sul to northern Argentina in the south portion of the Buenos Aires Province. The major threat to the species is intensive by-catch by trawling fishery. In southern Brazil it is captured by pair trawl fishing, shrimp trawl, and gillnet in the coastal nursery area of the species, where gravid females are caught during their inshore migration in spring and summer. In southern Brazil, where the core of its distribution is established, fishing is intense in the habitat of this demersal shark, with a recorded population reduction of 90% during 24 years since 1981. As fishery pressure has not decreased, it is possible to estimate a past population reduction of 97% in the last 37.5 years (three generational length, using biological param of the similar species *Mustelus canis*). In the coastal region of the Bonaerensean District of northern Argentina and Uruguay the biomass of the species, as measured by trawl surveys, decreased by 96% between 1994 and 1999. With fishing pressure expected to continue, it is possible to estimate a past and future population reduction of 99% in 37.5 years. As such, the species is listed as Critically Endangered for A4bd.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., Coller, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

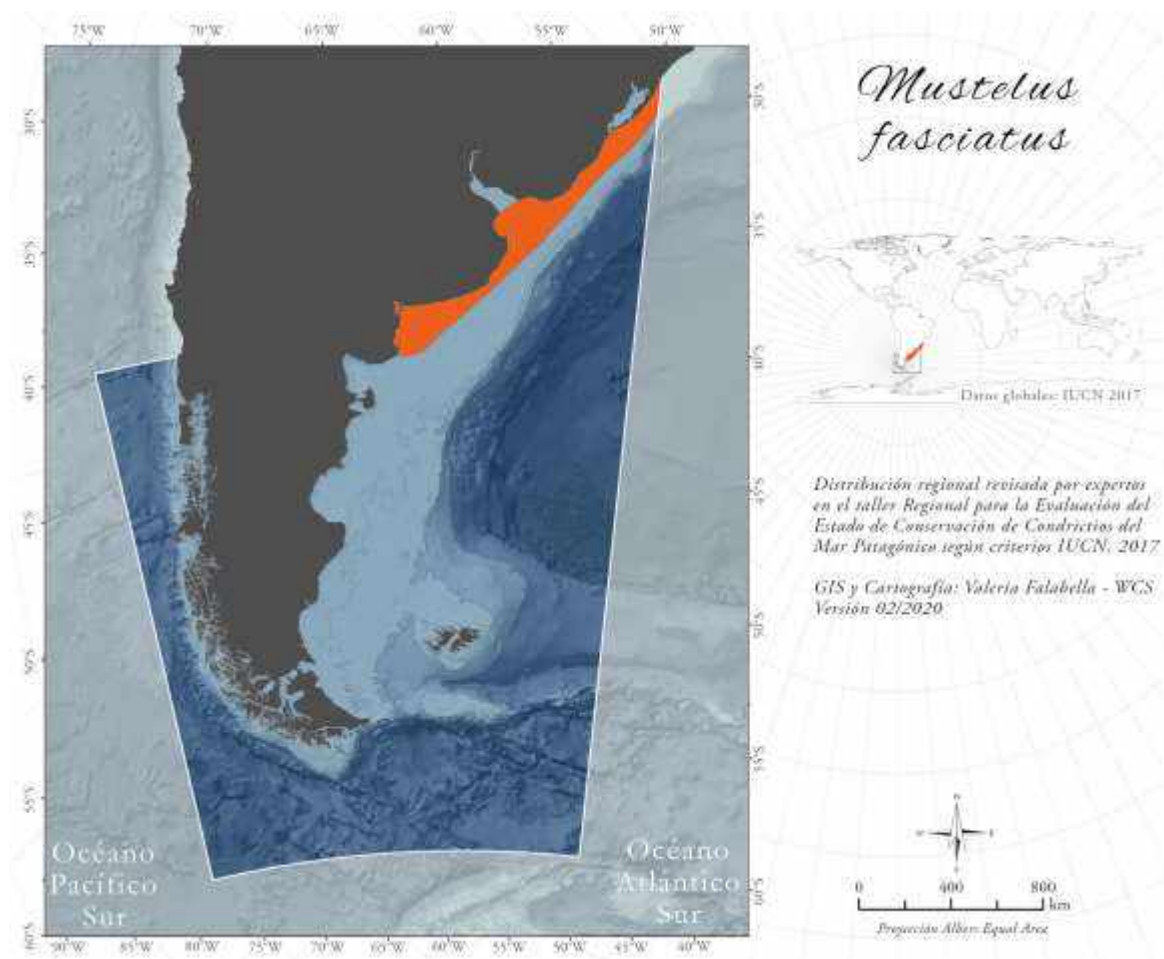
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - CARCHARHINIFORMES - TRIAKIDAE - *Mustelus fasciatus* (Garman, 1913)

**Common Names:** Cação-listrado (Portuguese), Cação-malhado (Portuguese), Gatuso (Spanish; Castilian), Gatuzo (Spanish; Castilian), Gatuzo a rayas (Spanish; Castilian), Recorre-costas (Portuguese), Striped Dogfish (English), Striped Smooth-hound (English)

## Geographic Range



This endemic Southwest Atlantic species occurs at low densities over a restricted area (1,500 km of coastline) overlapping with the northern portion of the Patagonian Sea from southern Brazil to northern Argentina. Thus, in Brazil the species occurs only in the extreme south, between latitudes

of approximately 29°S and 34°S (Soto 2001) and the range extends southward to around 40°52'S in Argentina (Cuevas *et al.*, unpublished data).

## Population

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In the Argentine-Uruguayan Common Fishing Zone, a 96% decrease in biomass was estimated between 1994 and 1999 (Hozbor *et al.*, 2004). In Brazil, the species was common in the State of Rio Grande do Sul during the 1970s and 1980s, but it became a rare species from the year 2000 (Soto 2001). Scientific campaigns carried out in the Rio Grande do Sul shelf that evaluated CPUE, determined a reduction in biomass of approximately 90% from 1981 to 2005 (Vooren and Klippel 2005). There was also a drastic reduction of 95% in the production of neonates and a reduction of 10,000 km<sup>2</sup> to 400 km<sup>2</sup> in the distribution area of the species, which is consistent with the proportion of biomass reduction of adult females (Vooren and Klippel 2005).

## Habitats and Ecology

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*Mustelus fasciatus* has been classified as a non-migratory permanent resident of southern Brazil, with adult females having a seasonal inshore-offshore migration (Vooren 1997, Vasconcellos and Vooren 1991, Soto 2001). In Brazil, the species used to be more common in shallow waters of the inner continental shelf, between 20 and 50 m, but it has been registered up to 200 (Soto 2001, Vooren and Klippel 2005). In Uruguay, the only two records that exist were obtained in an area of approximately 20 m in depth during the fall of 2001 (Laura Paesch pers. comm. 2017). Nursery area and birth of young occur only on the coast of Rio Grande do Sul State, Brazil, at latitudes from approximately 30 to 34°S and into northern Uruguay (Soto 2001), which is a considerable portion of the species' distribution.

## Threats

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The species was common in Brazil during the 1970s and 1980s. Since year 2000, the species was rare (Soto 2001) with only one record in 2008 in the Cassino beach, Rio Grande do Sul (Santiago Montealegre Quijano pers. comm. 2017). It was mainly caught with bottom trawl and gillnet fisheries (ICMBio, 2016).

In Argentina, at the southern part of the Buenos Aires province, the last record was an immature individual captured by a recreational fisher and released alive (Cuevas *et al.*, unpublished data). In Uruguay, where this species is not targeted but taken as by-catch in industrial and artisanal fisheries, species-specific catch data are still not available.

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

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In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common

Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolução CTMFM N° 9/10).

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Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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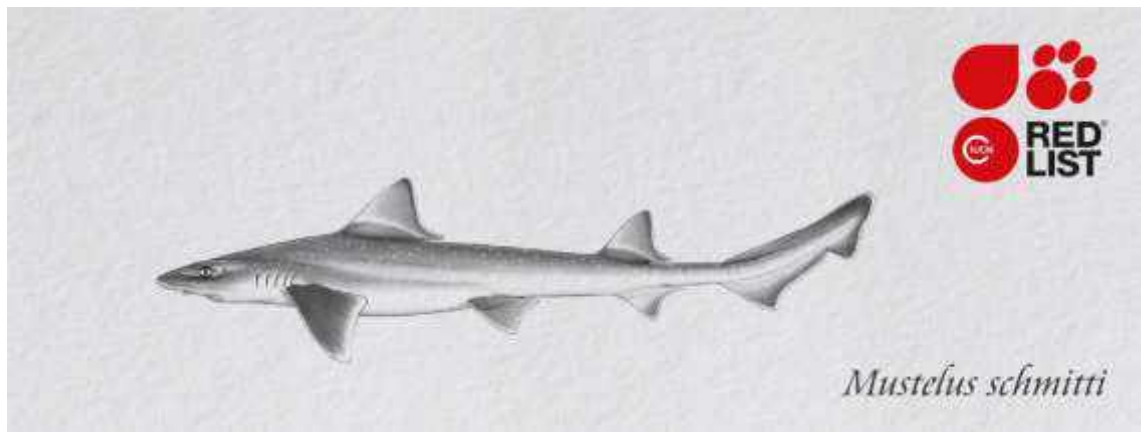
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## CR – Critically Endangered, A2bd, (IUCN version 3.1)

### Assessment Rationale:

The Narrownose Smoothhound *Mustelus schmitti* is an endemic species to the Southwest Atlantic which is known in the Patagonian Sea from southern Brazil to southern Argentina, and it may be patchily distributed throughout its range. The species is demersal, inhabiting sandy, muddy and rocky substrates up to 121 m deep with temperatures ranging between 7 and 20° C and salinity between 14 and 34.47. It is a migrant species using coastal zones as reproductive areas where neonates as well as juveniles are associated, and adults disperse in the continental shelf during non-reproductive periods. Longevity for this species is estimated to be 20.9 for females and 12.2 for males. Apparently, this species has a slow growth and late age at maturity ranging from 4.6 to 7.6 years for females and 4 to 6.8 years for males. This species has a generation length between 9 and 13 years (1987 - 2017 = 3 generation lengths). The species is caught by recreational, industrial as well as artisanal fisheries in nearly all its distribution. In Argentina, the species has been an important fishery resource since 1988 and the most landed shark in Argentinean ports. Between 1989 and 2015 CPUE from coastal vessels has declined about 65% and 75% from ice trawlers. In the Argentina and Uruguay Common Fishery Zone, density of the species decreased from 2,792 t/nm<sup>2</sup> in 1994 to 0,229 t/nm<sup>2</sup> in 2013, which represents a 92% of decreasing in the abundance index. In addition, over the past 30 years there has been a more than 90% decline in southern Brazil. Therefore, it is estimated that there has been at least between a 90 and 92% decline over the past 3 generation lengths (30-40 years) in the Patagonian Sea. This species is listed as Critically Endangered under A2bd.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

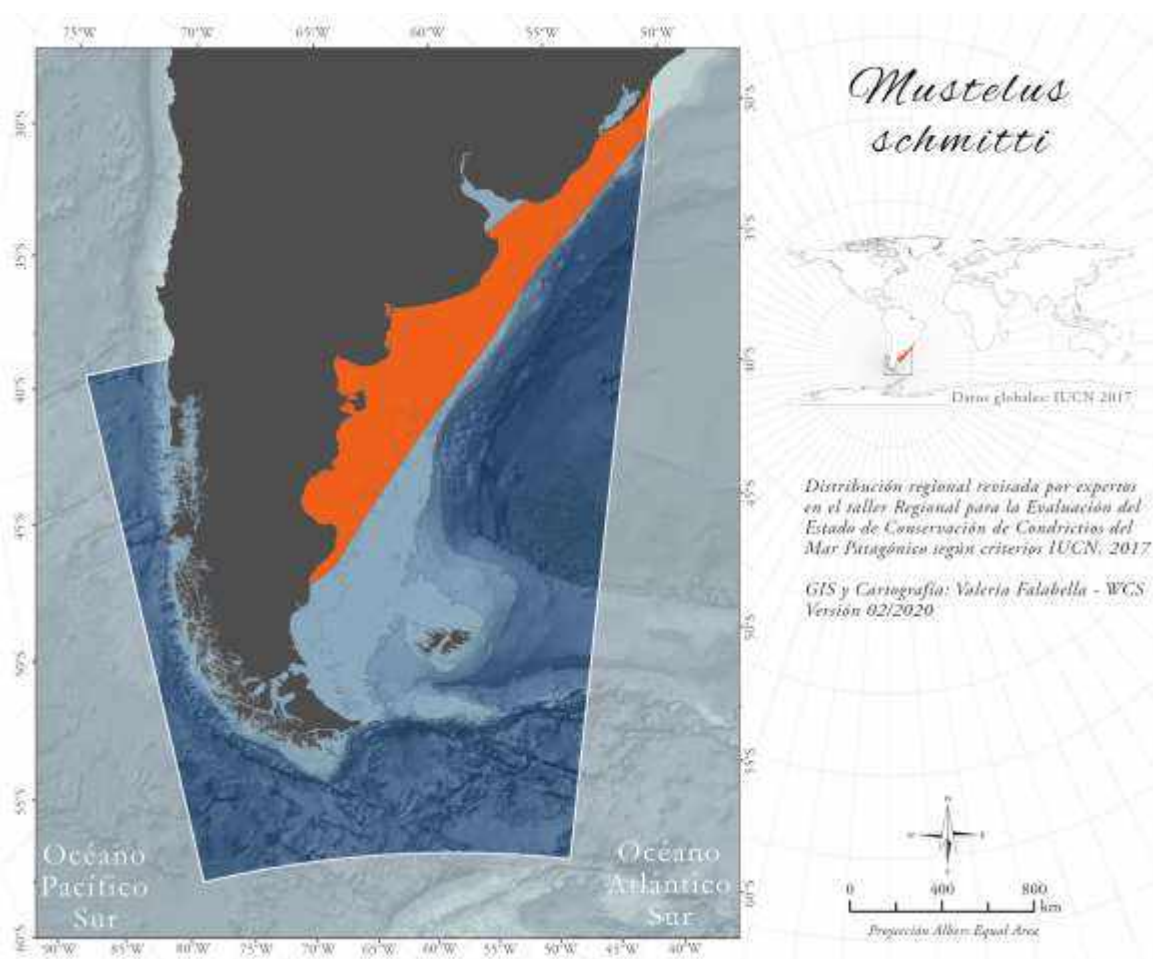
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - CARCHARHINIFORMES - TRIAKIDAE - *Mustelus schmitti* (Springer, 1939)

**Common Names:** Caçonete E Cação-cola-fina (Portuguese), Gatuza (Spanish; Castilian), Narrownose Smoothhound (English)

## Geographic Range



This is an endemic species to the Southwest Atlantic. In the Patagonian Sea, *Mustelus schmitti* is known from southern Brazil (30° S) to southern Argentina, Puerto Deseado (47° S) (Massa *et al.* 2004, Chiaramonte and Pettovello, 2000) and it may be patchily distributed throughout its range (Gustavo Chiaramonte pers. comm. 2017).



## Population

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The species is caught by recreational, industrial as well as artisanal fisheries in nearly all its distribution. In Argentina, the species has been an important fishery resource since 1988 (Chiaramonte 1998) and the most landed shark in the Argentinean ports (SSGyP 2017). Market demand has increased during the last decade and, in this sense, its price could be higher than bony fishes in the artisanal fishery of Buenos Aires coast (Juan Martín Cuevas pers. comm. 2017). From 1999 to 2016, landing for this species over the last 10 years (2008-2016) has decreased (10,361 to 3,498 tonnes) by 60% (SSGyP 2017). From 1989 to 2015, CPUE for this species from coastal vessels has declined about 22t in 1992 to 7t in 2015 (65% decline), and from ice trawlers has declined in 1989 from 24t to 6t in 2015 (75% decline) (SSGyP 2017, Gustavo Chiaramonte pers comm. 2017). In Argentina from 1993 to 2009, the abundance decreased by 50% (Massa and Hozbor 2011). Density of the species in the Argentina and Uruguay Common Fishing Zone (AUCFZ) decreased from 2,792 t/nm<sup>2</sup> in 1994 to 0,229 t/nm<sup>2</sup> in 2013, this represents a 92% of decrease in the abundance index which was estimated using a Delta Model (Cortés *et al.* 2016). At the same time, between 2010 and 2013 the catches reported by the Uruguayan coastal commercial fleet in the AUCFZ varied between 211t and 253 t and increased to 537 t and 507t in 2014 and 2015, respectively, decreasing to less than 200 t in 2016 (CTMFM, 2016).

Bottom trawl fishery CPUE data from southern Brazil are evidence that due to intensive fishing from 1985 onwards, the abundance of the winter migrant population of the species decreased by 85% in 1997, and the fishery continues without restraint (Miranda and Vooren 2003). From 1972 to 2001, this species has decreased by 90% in research surveys (Ferreira *et al.* 2010). *Mustelus schmitti* is assessed as Critically Endangered in Brazil given the observed declines of 85% of the winter migrating population, probable extirpation of a local breeding population and continuing with intense fishing (ICMBio, 2016).

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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*Mustelus schmitti* is benthic, inhabiting sandy, muddy and rocky substrates up to 121 m deep. Its habitat is not restricted and it can tolerate some disturbance. Temperature range is between 7 and 20° C and salinity range is between 14 and 34.47 (Massa, 2013). It is a migrant species using coastal zones as reproductive areas. Neonates and juveniles are associated to coastal zones and adults disperse in the shelf during non-reproductive periods (Cortés *et al.*, 2011).

Size at first sexual maturity (total length cm): 59 cm for males and 72 cm for females (Oddone *et al.* 2005). Female: from 59 cm to 61 cm. Male: From 56 cm to 75 cm (Segura and Milessi 2009).

Longevity for this species is estimated to be 20.9 for females and 12.2 for males (Molina *et al.* 2017). Age at first maturity is 7.6 years for females and 6.8 years for males (Molina *et al.* 2017). This species has a generation length between 9 and 13 years.

**Litter size:** The litter size goes from 1cm to 10cm and size-at-birth is 26 cm total length in the Argentine-Uruguayan Common Fishing Zone (AUCFZ) (Oddone *et al.* 2005).

**Maximum size (total length in cm):** 91.3 cm (Chiaramonte and Petovello, 2000).

**Spawning mode:** Spawning aggregations.

Births occur in late spring and summer months (Oddone *et al.* 2005, Elisio *et al.* 2016). Bahía Engaño (Chubut) is one of the known breeding areas of the species (Van der Molen and Caille 2001) and another one is located in the northern zone of the San Jorge Gulf in central Patagonia (Nelson Bovcon pers. comm. 2017).

Feed mostly on crustaceans, this species diet shows seasonal, regional and ontogenetic variations. Fish and molluscs are more important and polychaetes are less frequent while increasing total length (Belleggia *et al.* 2012). Coastal sharks feed more on crustaceans whereas those inhabiting deeper waters prey upon teleosts more frequently (Belleggia *et al.* 2012).

## Threats

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The major threat faced by the species in the Patagonian Sea is overfishing. This species is subject to intensive fishing in its entire area of distribution, including heavy pressure on its nursery grounds. It is known to migrate seasonally in large numbers between wintering grounds in southern Brazil and summer grounds off Uruguay and/or Argentina (Vooren 1997). In winter, the species is fished in southern Brazil as a component of a mixed-species fishery and also by directed fishing.

In Uruguay, it is targeted by artisanal fisheries and it is also fished as by-catch in the coastal industrial fisheries. The threats are regional and they include most of the species in distributional range. The artisanal fisheries in Uruguay operate with bottom gill-nets on a daily basis. Artisanal fisheries were originally directed to other shark species, such as *Galeorhinus galeus* and shifted towards this species in the 90's. *Mustelus schmitti* is the second most important species in Atlantic artisanal fisheries (167 t) and the species with the greatest contribution in volumes landed between La Paloma and Punta del Diablo (Silveira *et al.* 2016). The highest catches which would be determined by the reproductive migratory movements of the species according to Vooren (1997) and Oddone *et al.* (2005) were observed mainly in spring (Silveira *et al.*, 2016)

*Mustelus schmitti* is captured as bycatch in the bottom trawl fishery targeting the red shrimp (*Pleoticus muelleri*) and the Argentine hake (*Merluccius hubbsi*) fishery that operates between 42° and 47° S into the San Jorge Gulf, Chubut and Santa Cruz waters. In this sense, the coastal fleet from Rawson Port recorded a frequency of 18% in average in their hauls (min.= 8%, max.= 32%) when they target shrimp and around 16% (min.= 2%, max.= 25%) when they used to fish hake (Ruibal Núñez *et al.* 2016). Between 2003 and 2007, in the frozen shrimp fleet a frequency of 8% (Góngora *et al.* 2009) was recorded. In the San Jorge Gulf, the bottom trawl industrial fleet that target shrimp and hake captured a frequency of 7% and 8.5%, respectively (Bovcon *et al.* 2013).

It is also frequently captured by the coastal fleet that operates in Escondida Island area (Ruibal Nuñez *et al.* 2016).

At the same time, the species is captured by recreational fisheries along its distribution. Although there are few estimates recorded about this type of fishery, one of the most important capture areas is Bahía San Blás MPA, with a total catch of 12,573 kg between November 2008 and April 2009 (Llompart *et al.* 2011). It is usual to be captured in recreational tournaments in Argentina and, particularly in Chubut, juveniles and neonates are also bycatch of the cockfish (*Callorhynchus callorhynchus*) recreative fishery (Nelson Bovcon pers. comm. 2017). A decline of neonates, juveniles and adults of *M. schmitti* as bycatch in the recreative fishery tournaments of Bahía Engaño (Chubut) during the last 10 years has also been recorded but the causes are still unknown (Nelson Bovcon pers. comm. 2017).

Bahía Engaño is one of the known breeding areas of the species (Van der Molen and Caille, 2001). In this area the species is frequently captured by the artisanal fishery (Nelson Bovcon pers. comm. 2017). It is also a prized species by sport fishermen, especially during fishing tournaments (Bovcon, 2016).

In addition, the main nursery areas in Argentina are under fishing pressure, with only one (El Rincón) under management measures. It has been reported by on board observers in Argentina that the size of individuals being caught is decreasing, from 621 mm to 528 mm (Gustavo Chiaramonte pers. comm. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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CR - Critically Endangered, A2bd, (IUCN version 3.1)

#### Assessment Rationale:

The Southern Eagle Ray *Myliobatis goodiei* is a western Atlantic species that is distributed in the Patagonian Sea from Rio Grande do Sul, southern Brazil, to Puerto San Julián, southern Argentina (35° to 47°S). In Brazil, it is recorded in the whole coast but it is thought to be more abundant in the south. It is recorded on the shelf, between 5 and 200 m, with a higher abundance recorded up to 50 m. In southern Brazil, data collected on research cruises recorded a reduction of captures by effort units of 3,500 kg/h in 1974 to 1.29 kg/h in 2005, which represents more than 99% decline in the past 40 years, with little to no recovery assumed as fishing pressures have remained the same, if not increased, since 2005. In Argentina, the areas of higher abundance correspond to the Common Fishing Zone of Argentina-Uruguay and El Rincon. The application of generalized additive models concluded in the estimation of a decrease in the abundance of the species of 6.5% annually and 83.6% in the entire period of study from 1981 to 2008. Northern Argentina and southern Brazil represent the 70% of the regional distribution at the Patagonian Sea. Given a clear decline since 1974 in Brazil and 1981 in Argentina, with an assumed stable or increasing fishing pressure, in both countries, the estimation of population reduction is at least 82-90% over the past 27-36 years (three generational lengths). As such, this species is listed as Critically Endangered for A2bd.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., Coller, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

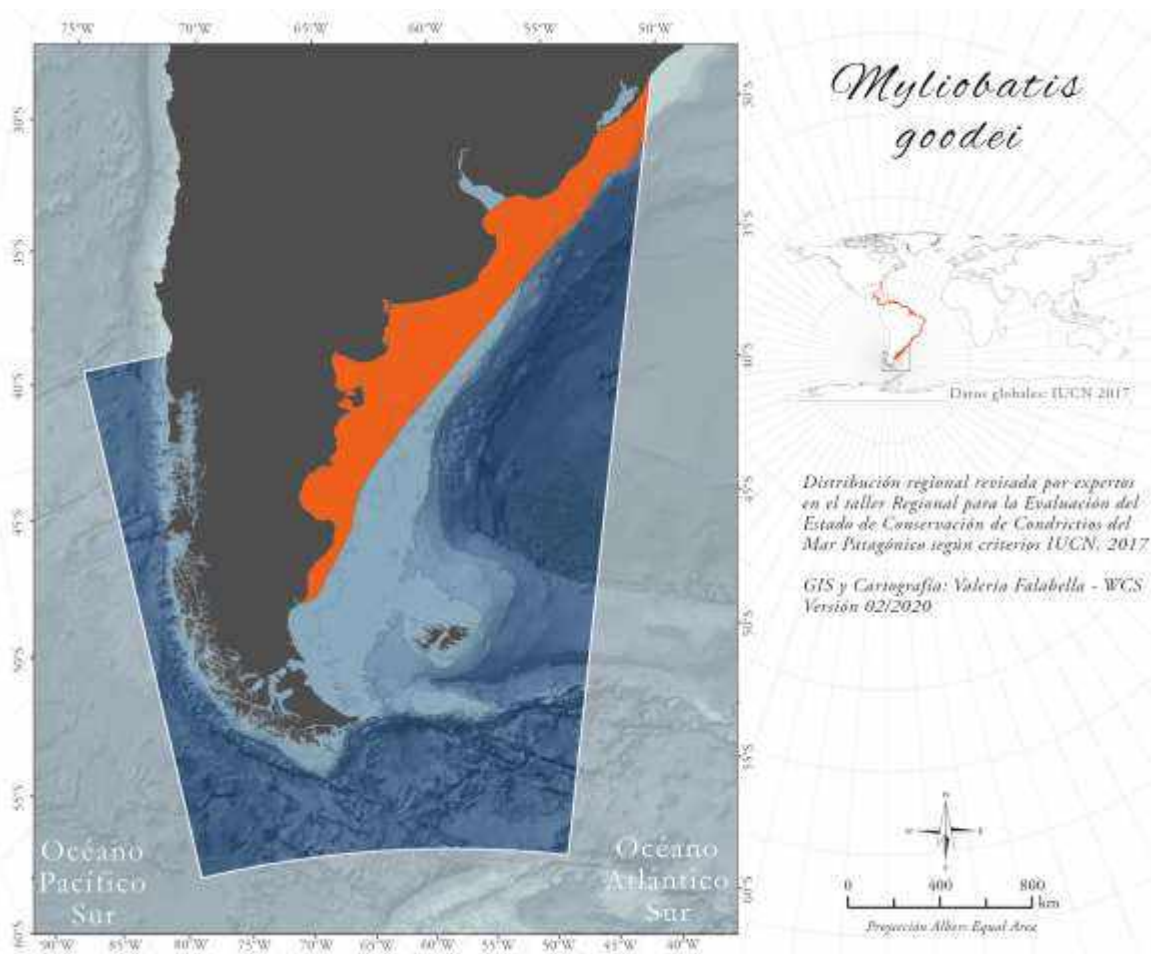
## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - MYLIOBATIFORMES - MYLIOBATIDAE -  
 Myliobatis – goodie (Garman, 1885)

**Common Names:** Southern Eagle Ray (English), Aigle de Mer du Sud (French), Chucho (Spanish; Castilian), Chucho Amarillo (Spanish; Castilian), Raia-amarela (Portuguese), Raia-manteiga (Portuguese).

**Taxonomic Note:** Records of eastern Atlantic *Myliobatis aquila* from southern Brazil probably refer to this species, if both species are indeed distinct (if not, the name *M. aquila* has priority). There are two sister species in the southern part of its range under the present name *M. goodei*, with a description of the second species pending (M.F.W. Stehmann and C.M. Vooren pers. comm.). The existence of two species was confirmed by morphometric and molecular studies: *Myliobatis goodei* and *Myliobatis* sp. (Ruocco 2012).

## Geographic Range



The Southern Eagle Ray *Myliobatis goodei* is a western Atlantic species from South Carolina, USA south to Patagonia, Argentina (Bigelow and Schroeder 1953, McEachran and Carvalho 2002). In the Patagonian Sea is distributed from Rio Grande do Sul, southern Brazil, to Puerto San Julián, southern Argentina (47°S).

**Depth Zone:** Shallow photic (0-50m)

## Population

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The highest abundances of this species in the Patagonian Sea are between 34° and 36°S at the Argentine-Uruguayan Common Fishing Zone and at El Rincón area between 39° and 40°S (Ruocco 2012).

Biomass estimations were made between 34° S and 41° S through 35 research campaigns carried out between 1981 to 2008. For both, *Myliobatis goodei* and *Myliobatis* sp., the population has decreased a 6.5% annually and 83.6% in the entire period (27 years) (Ruocco 2012).

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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*Myliobatis goodei* is a coastal species inhabiting waters from the shore up to 156 m (Laura Paesch pers. comm. 2017) but mainly between 50 m and 100 m in depth (Menni & Stehman, 2000, Cousseau *et al.*, 2007, Perier *et al.*, 2011, Hozbor *et al.*, 2011). It is also a common species in the coastal area (< 50m) of the Argentina and Uruguay Common Fishing Zone (Laura Paesch pers. comm. 2017) but with higher abundances at 5 and 25 m in depth (Ruocco 2012).

The size at which 50 per cent of individuals were sexually mature was 598.7 and 496.8 mm in females and males respectively (Ruocco 2012). Births took place in coastal areas in late spring and early summer (Ruocco 2012). Maximum recorded age is 12 years for a male (590 mm WD) and 16 years for a female (1070 mm WD) (Ruocco 2012). Based on logistic model, longevity is estimated at 13 and 25 years for male and female, respectively (Ruocco 2012). Age at 50% of maturity is 6.1 years for males and 8.4 years for females. Thus, this species has an estimated generational length of 9-12 years (3 GL: 27-36 years).

In the Natural Reserve of Bahía San Blás (39.96°S to 40.60°S), Argentina, *M. goodei* exhibited seasonal migrations with young-of-the-year remaining in the bay all year long, while adults entered during spring and summer (Molina and Lopez Cazorla 2015). Thus, this MPA was proposed as a mating and nursery area for the species (Molina and Lopez Cazorla 2015).

Diet of *M. goodei* is based on polychaetes, crustaceans (Ruocco 2012) and bivalves, and it is identified as a secondary consumer with a trophic level of 3.2 (Molina and Lopez Cazorla 2015).

## Threats

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*Myliobatis goodei* is highly susceptible to trawl fisheries operating in the Argentine-Uruguayan Common Fishing Zone with the highest frequency of occurrence recorded in Uruguayan waters (Paesch *et al.*, 2014). The industrial fishing pressure over *M. goodei* increased between 34° and 41° S since 1994, as a result of a decline in commercial fish abundance over the rest of the Argentine continental shelf (Ruocco 2012). This was recorded by a 58% increase of trawling vessels and 181% of those targeting shrimps (Sanchez *et al.* 2011).

This species is also captured with a frequency of 1% by the shrimp trawl fishery in San Jorge Gulf (Patagonia, Argentina) (Góngora *et al.* 2009). Occasionally, it is also captured by the coastal fleet that operates in Rawson port, Escondida Island area (Patagonia, Argentina) (Nelson Bovcon pers. comm. 2017). It is a very prized target species by recreational fishermen in Argentina and it is used to win recreational fish tournaments due to its large weight (Bovcon 2016, NPOA 2009).

In southern Brazil, a major threat is beach seine fishing that captures and discards large concentrations of gravid females (n=150 in one site) during seasonal movements of these individuals towards shallow waters for reproduction (Velasco *et al.* 2011). Other threats are represented by bottom trawl and gillnet fisheries along southern Brazilian coast (ICMBio, 2016).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentina. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyrops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particular y, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina*

*guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "E. P. Acór" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabit the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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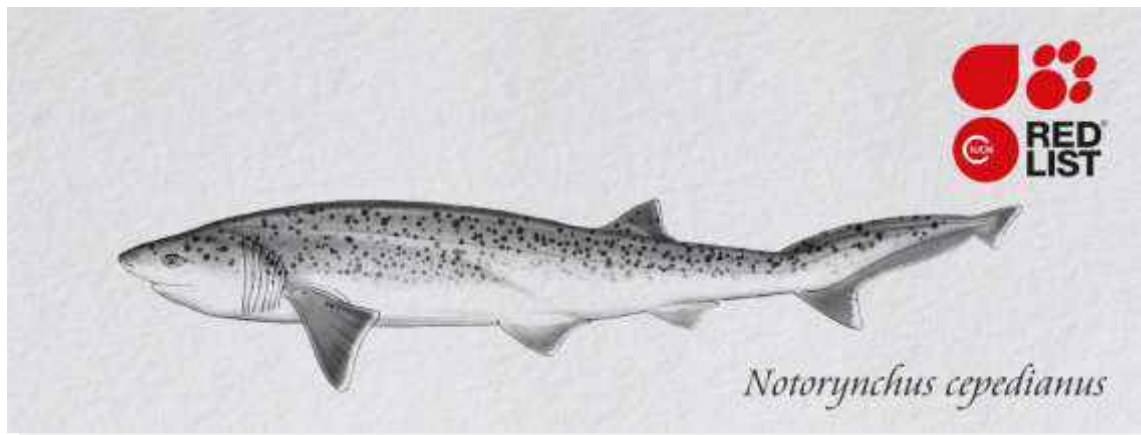
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DD - Data Deficient, (IUCN version 3.1)

#### Assessment Rationale:

The Broadnose Sevengill *Notorynchus cepedianus* is a wide ranging cosmopolitan shark from mostly temperate coastal seas cosmopolitan species. It is found along the entire Patagonian Sea, where it occurs on the continental shelves at depths to at least 136 m, but mostly at less than 50 m and often it can be found in shallow coastal waters of closed bays and gulfs. It is a long-lived and late maturing species with males maturing at 170 cm and females at 224 cm of total length. As other sites, it has relatively large litters in the Patagonia as well, between 82 and 96 pups. It is caught by artisanal, industrial and recreational fisheries that operate in southern Brazil, Uruguay and Argentina. Also, there are several nursery areas without protection in the northern of Buenos Aires Province in Argentina where unregulated artisanal fisheries occur and recreational fisheries retain the catch. Based on opportunistic records, there has been an estimated annual rate of decrease of 27% of the presence of this species in trophy photos and 61% of 29 fishermen interviewed recognize an 80% decline in occurrence. Due to age of first maturity and longevity, there is still a lack of information for the region, so it is listed as Data Deficient.

**Assessor(s):** Bovcon, N., Chiaramonte, G., Cuevas, J.M., García, V. & Paesch, L.

**Contributor(s):** Bustamante, C.

**Facilitators:** Polidoro, B., Falabella, V.

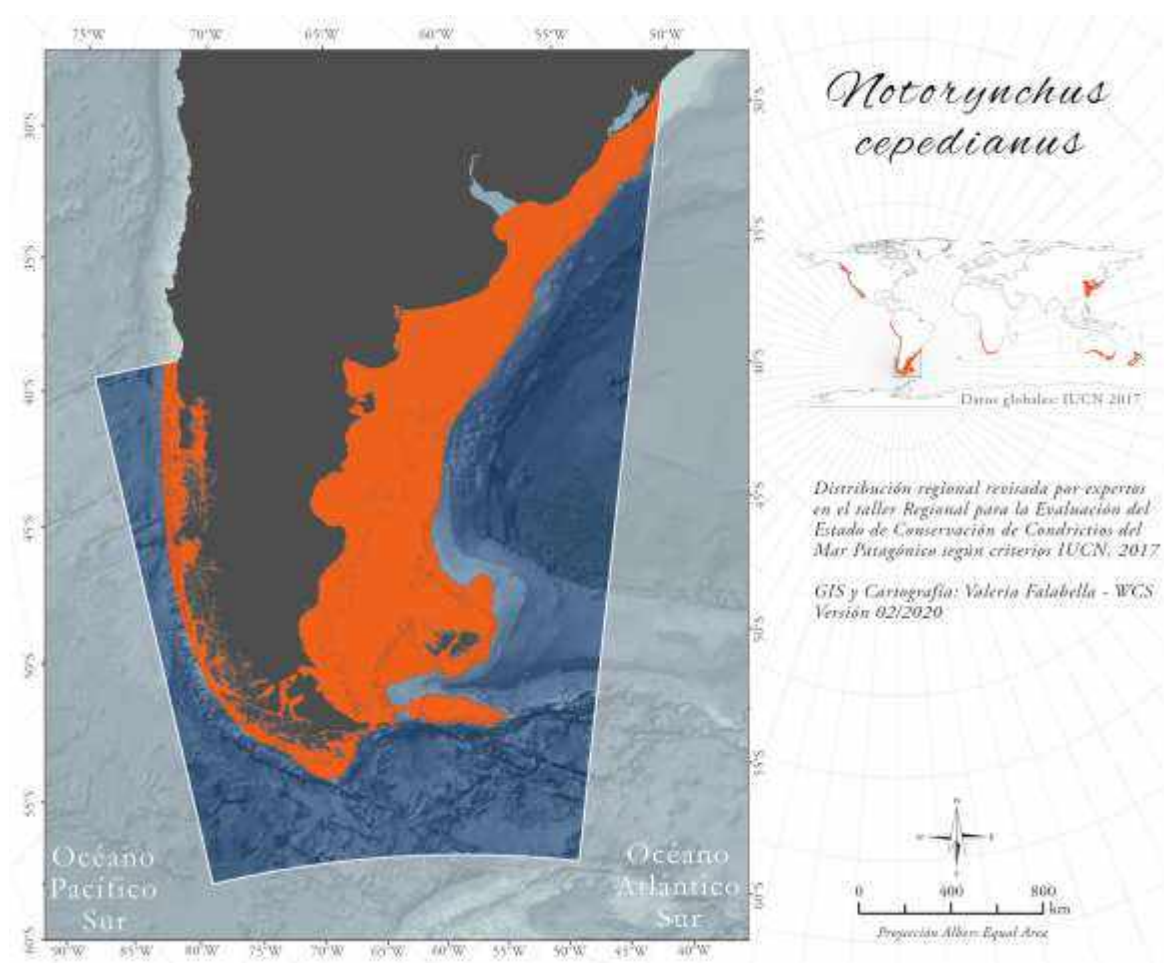
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - HEXANCHIFORMES - HEXANCHIDAE -  
*Notorynchus cepedianus* (Péron, 1807)

**Common Names:** Broadnose Sevengill Shark (English), Gatopardo (Spanish; Castilian)

## Geographic Range



*Notorynchus cepedianus* is a wide ranging cosmopolitan shark from mostly temperate coastal seas (Compagno 1984). In the Patagonian Sea, the species is found from southern Brazil to southern Argentina, Chile and around Falklands / Malvinas Islands as well (Compagno 2009, Menni and Lucifora, 2007; Vooren *et al.*, 2005).

**Depth Zone:** Shallow photic (0-50m), Deep Photic (51-200m)

## Population

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In the Southwest Atlantic, there are few data on abundance of these species. It was previously found as far as Rio de Janeiro, but since 1980s it has only been seen occasionally in Rio Grande do Sul (Roberta A. Santos pers. comm. 2017). Vooren *et al.* (2005) record the occurrence of neonates in November, and state that in southern Brazil there is a regional population with a nursery area in coastal waters during the spring season, but no abundance data are available. Opportunistic record analyses showed declining trends in Argentina over the past 30 years (1973 to 2008) with trophy photos in annual reports of the recreational fisheries decreasing by 27% annually (Barbini *et al.* 2015). Sixty one percent of 29 shark fishermen interviewed by Irigoyen and Trobbiani (2016) indicated a decline of 80% in catch of *N. cepedianus* during their fishing career in the Argentinean coasts.

**Population trend:** Unknown

## Habitats and Ecology

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It is found along the entire Patagonian Sea, where it occurs on the continental shelves at depths to at least 136 m, but mostly at less than 50 m and often it can be seen in shallow coastal waters of closed bays and gulfs (Juan Martín Cuevas and Nelson Bovcon, pers. comm. 2017).

It is a long-lived (23-49 years) and late maturing (4-21 years) species according with data from other populations (Camhi *et al.*, 1998). However, most key age data are still lacking for the region. Males mature at 170 cm and females at 224 cm of total length (Lucifora *et al.* 2005). As in other sites, it has relatively large litters in Patagonia as well: between 82 and 96 pups (Lucifora, 2003).

*Notorynchus cepedianus* consumes a variety of prey including marine mammals, chondrichthyans and teleosts (Lucifora *et al.* 2005).

## Threats

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Since 1950, *N. cepedianus* has been caught by artisanal and recreational fisheries along southern Brazil, Uruguay and Argentina (Cedrola *et al.* 2011, Silveira *et al.* 2016). In Chubut Province, Argentina, this species is caught especially for consumption of its valuable meat by anglers (Nelson Bovcon pers. comm. 2017). Few records from southern Brazil were obtained in industrial and scientific trawl fishing (Vooren *et al.*, 2005; Montealegre-Quijano, unpublished data).

This species is also captured by the patagonian shrimp (*Pleoticus muelleri*) trawl fishery in the San Jorge Gulf and adjacent waters (Patagonia, Argentina) with a frequency of occurrence of less than 1% (Góngora *et al.* 2009). However, higher captures were registered during 2005, when the fleet efforts were concentrated in the north of this gulf (from 96 captures registered for the period 2003-2007, 80 occurred during 2005). This species is also captured in the permanently closed area for juveniles of the argentine hake (Góngora *et al.* 2009). There are also capture reports by

the coastal fleet in Escondida Island area, Patagonia, Argentina (Nelson Bovcon *pers. comm.* 2017).

There are several nursery areas without protection in the north of the Buenos Aires Province where unregulated artisanal fisheries take place and recreational fisheries retain their catches (Juan Martin Cuevas *pers. comm.* 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates,

sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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## DD – Data Deficient, (IUCN version 3.1)

### Assessment Rationale:

The Blotched Sand skate *Psammobatis bergi* is an endemic species to the Southwest Atlantic and it distributes in the Patagonian Sea from southern Brazil to southern Argentina. The southernmost record for this species corresponds to 47° 42' S and 65° 20' W, which extends the known distribution of this species to the San Jorge Gulf, Argentina. It is known to be a coastal and abundant small skate that can be found between 30 m and 100 m deep but it is more abundant between 31 m and 53 m. Although it was previously caught and discarded, this skate is now a target species in the multi-species coastal bottom trawl fishery operating in Buenos Aires province (Argentina). Both adults and juveniles are caught in low frequency as by-catch and discarded in other fisheries off Argentina, including those for hake and shrimp in Patagonian bottom trawl fisheries. Females are assumed to be able to breed throughout the entire year. In southern Brazil, it is captured as by-catch in the coastal bottom-trawl fishery mainly in winter, but all specimens are discarded at sea. Due to the fact that there is no data on population trend or abundance in Brazil, Uruguay and Argentina this species is labeled as Data Deficient.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., Coller, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

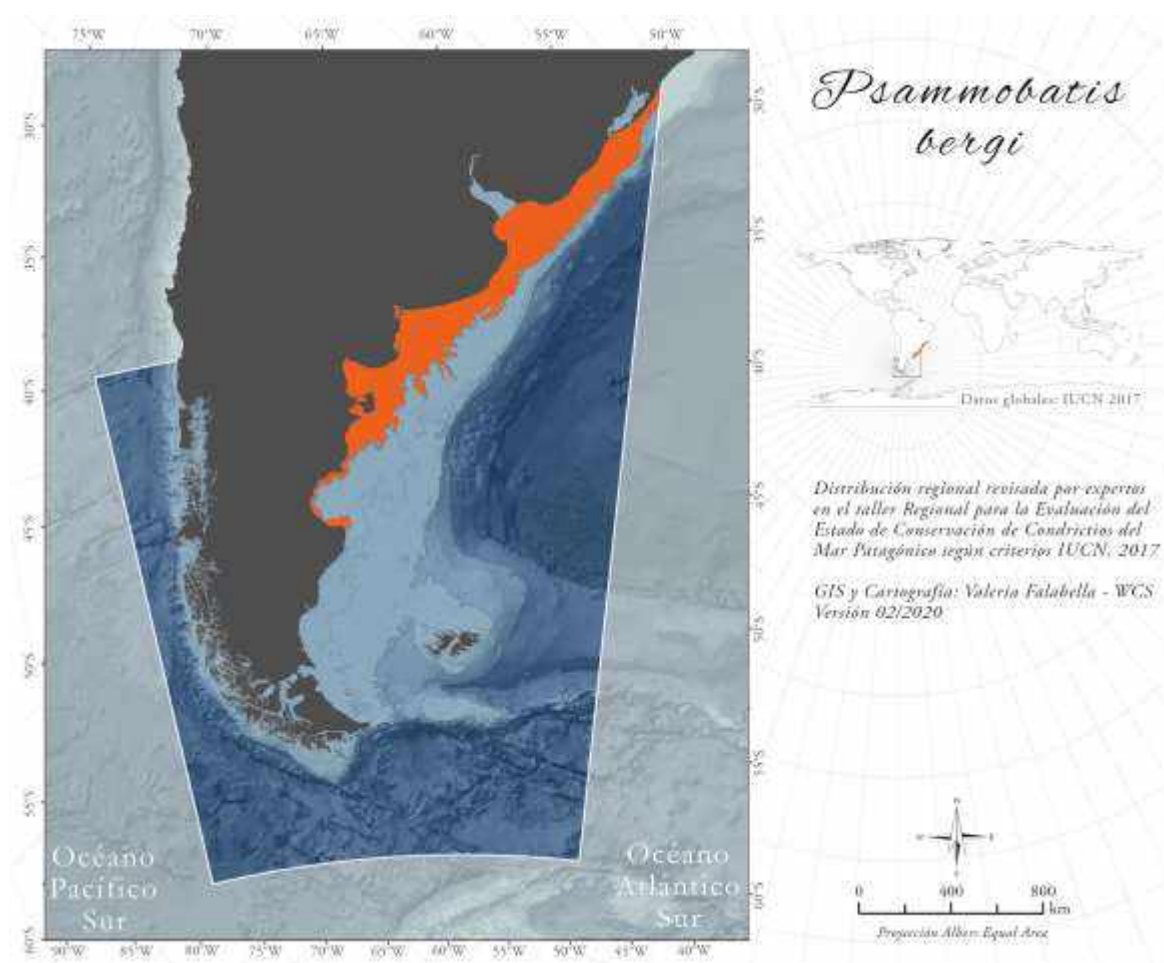
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE - *Psammobatis bergi* (Marini, 1932)

**Common Names:** Blotched Sand skate (English), Raya Reticulada (Spanish; Castilian)

## Geographic Range



The Blotched Sand skate *Psammobatis bergi* is an endemic species to the Southwest Atlantic that distributes in the Patagonian Sea from southern Brazil to southern Argentina. The southernmost record for this species corresponds to 47° 42' S and 65° 20' W, which extends the known distribution of this species to the San Jorge Gulf, Patagonia, Argentina. (Figueiredo, 1977, McEachran 1983, Menni & Stehmann, 2000, San Martín *et al.*, 2005, Mabragaña, 2007, Cousseau, 2007, Perier *et al.*, 2011, Bovcon *et al.* 2011, Ruibal Núñez *et al.*, 2016).



## Population

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There is no data on population trend or abundance estimation for the Patagonian Sea. Even though it is a common coastal species in Brazil, there are no abundance or population trend data since all specimens are discarded at sea, and it has been classified recently as Data Deficient in this country (ICMBio, 2016).

**Current Population Trend:** Unknown.

## Habitats and Ecology

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In Argentina, in central Chubut, this species was caught between 43° 00' S and 46° 00' S and between 30 and 37 m deep (Ruibal Nuñez *et al.*, 2016). In the Argentina and Uruguay Common Fishing Zone, it could be found at 100m but it is commonly caught below 70 m (Laura Peasch comm. pers. 2017). Mabrugaña (2007) found the species between 34° 04' S and 41° 19' S and between 11 and 66 m, being more abundant in the south of its distribution place and between 31 and 53 m. In Brazil, this species occurs in low abundance, usually as a winter visitor from Argentina and Uruguay (Carolus Vooren pers. comm. 2010).

The size at 50% of maturity was 44.3 TL and 41.6 cm TL for males and females, respectively (Mabrugaña, 2007). Females are assumed to be able to breed throughout the entire year (San Martín, 2003).

## Threats

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This skate has very recently become a target species in the multi-species coastal bottom trawl fishery operating in Buenos Aires province (Argentina) (Hozbor y Massa, 2014). Previously, it was commonly caught and discarded in this fishery (Tamini *et al.*, 2006). Both adults and juveniles of this species are caught in low frequency (~1%) as bycatch of the bottom trawl coastal fleet operating in Chubut and the San Jorge Gulf (Argentina) (Bovcon *et al.* 2011, Ruibal Nuñez *et al.* 2016). Since 2010, egg cases and neonates of this species started to be recorded as bycatch of the coastal bottom trawl shrimp fishery fleet captures of Rawson Port (Julián Ruibal Nuñez and Nelson Bovcon Pers. comm., 2017). In southern Brazil, *Psammobatis bergi* is also caught as bycatch of the coastal bottom trawl fishery fleet (Santiago Montealegre-Quijano and Roberta Aguiar pers. comm. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires

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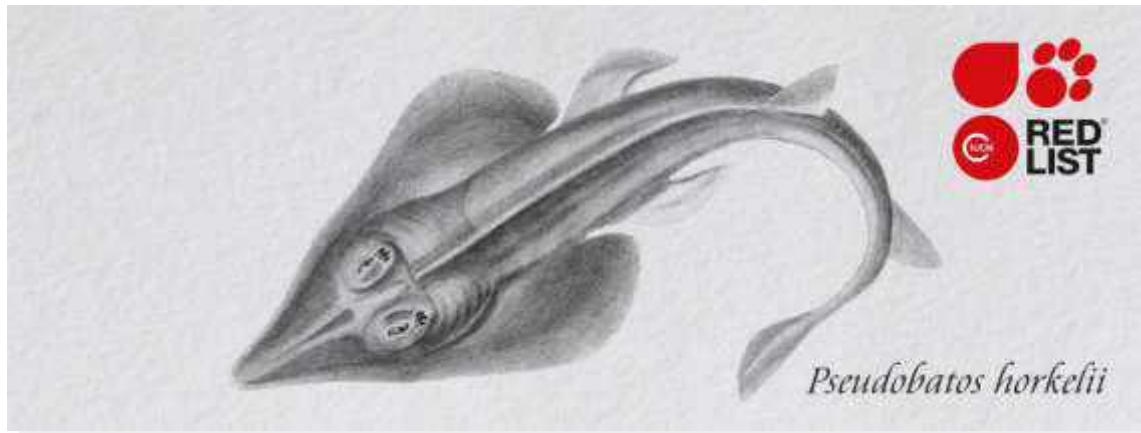
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CR - Critically Endangered, A2bd, (IUCN version 3.1)

#### Assessment Rationale:

The Brazilian Guitarfish *Pseudobatos horkelii* is an endemic species from the Southwestern Atlantic Ocean, mainly present in the northern limit of the Patagonian Sea, in southern Brazil, where this species has declined by more than 90% over the past 39 years or 3-generation lengths. Up to 2001 -2007, they were still landed in Brazil, with a reduction of 92% due to capture in paired trawls and beach seines operating in shallow waters (<30m) in southern Brazil. From 2004 to 2012, scientific studies have not recorded this species in Santa Catarina, Southern Brazil. Although there are no data from Uruguay, this species center of distribution is in southern Brazil, where the highest number of decline has been observed. This species is still being captured and not reported. Generation length may be 13-18 years, based on longevity and age of first maturity. This species is listed as Critically Endangered under A2bd.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiamonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):**

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

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ANIMALIA - CHORDATA - CHONDRICHTHYES - RHINOPRISTIFORMES - RHINOBATIDAE -  
Pseudobatos – horkelii (Müller & Henle, 1841)

**Common Names:** Brazilian Guitarfish (English), guitarra (Spanish; Castilian), guitarra grande (Spanish; Castilian), viola (Portuguese)

**Synonyms:** *Rhinobatos horkelii* Müller & Henle, 1841

### Taxonomic Note:

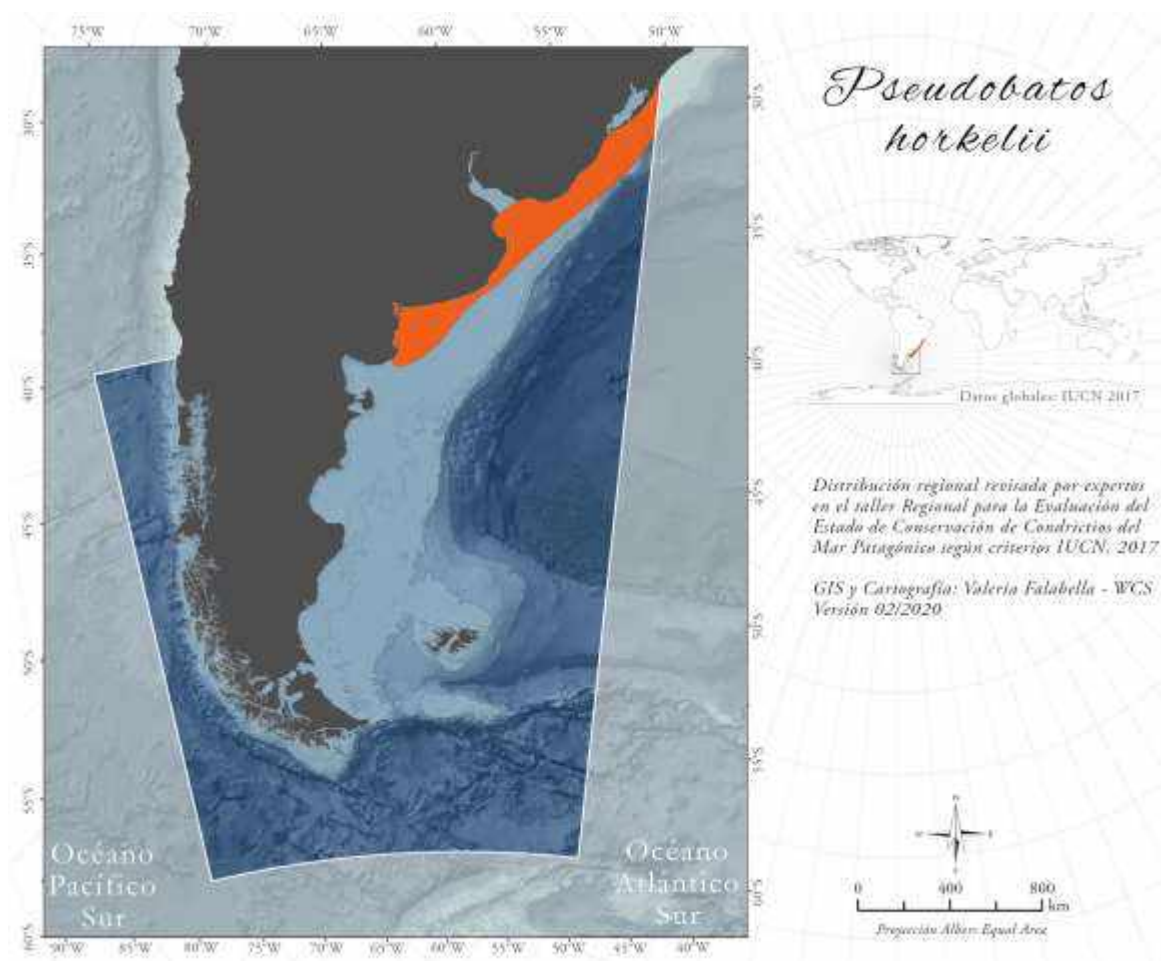
Last *et al.* (2016) revised the genus *Rhinobatos*, transferring *glaucostigma*, *horkelii*, *lentiginosus*, *leucorhynchus*, *percellens*, *planiceps*, *prahli*, and *productus* to the new genus *Pseudobatos*.

Published records of *Pseudobatos percellens* in southern Brazil (Chao *et al.* 1982 in Vooren *et al.* 2005) are due to problems with one of the criteria used for separating *P. horkelii* and *P. percellens*. From measurements of only four specimens (two juveniles of *P. percellens* and two juveniles of *P. horkelii*, all from Rio de Janeiro), Bigelow and Schroeder (1953) used the relative size of the nasal groove as a diagnostic criterion for separating *P. horkelii* and *P. percellens*. However, the value of this morphometric measurement as stated by Bigelow and Schroeder (1953) does not allow the correct identification of specimens of all sizes and from all areas where these species occur. All 9,853 specimens of *Rhinobatos* from southern Brazil examined according to other criteria described by Bigelow and Schroeder (1953) (adult body size and colour) since 1972 by Lessa (1982) and Sadowsky (1973) in Vooren *et al.* (2005) were *P. horkelii*. Therefore, all fishery data for *Rhinobatos* from southern Brazil refers to *P. horkelii* (Vooren *et al.* 2005). This aspect of taxonomy and identification is important for the enforcement of laws for the protection of *P. horkelii* in Brazil

## Geographic Range

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*Pseudobatos horkelii* is distributed in the Patagonian Sea from Rio Grande do Sul in southern Brazil to San Blas (40° 33'S; 62° 03'W) in northern Argentina (De la Casca, 2012). Fishery statistics of *P. horkelii* show important commercial catches of the species only in southern Brazil between latitudes 28°S to 34°S. This is a proof that the species has its center of distribution in southern Brazil and it is scarcely found elsewhere (Vooren *et al.* 2005).



## Population

In southern Brazil, *Pseudobatos horkelii* has declined by 92% over the past 39 years or 3-generation lengths based on CPUE from scientific surveys carried out in Rio Grande do Sul (Vooren *et al.*, 2005). Also in southern Brazil, between 2004 and 2007, there is a decline of 92% of its biomass as it is a by-catch species in the industrial bottom trawl fishing operating in shallow waters (<30m) (Univali-CTTMar 2001, 2002, 2003, 2004, 2005, 2007, 2008). At the same time, between 2004 and 2012, scientific studies have not recorded this species in the southern states as well (Roberta A. Santos pers comm. 2017).

Although there are no data trend from Argentina and Uruguay for this species, its center of distribution is in southern Brazil, where the highest number of declines have occurred.

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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In the Patagonian Sea this is a coastal species that distributes itself mainly between 0 and 50 m in Argentina and Uruguay but it can go up to 200 m in southern Brazil (Vooren *et al.*, 2005). Its generation length may be 13-18 years, based on longevity and age of first maturity.

Age at first maturity: 8 years for females and 5 years for males (Vooren *et al.*, 2005).

Longevity: females 28 years and males 15 years (Vooren *et al.*, 2005).

## Threats

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As other batoids, landings of *Pseudobatos horkelii* are not specific in the Argentina and Uruguay Common Fishing Zone (AUCFZ) and they are declared together as guitarfishes with *Zapteryx brevirostris* (CTMFM, 2017). *P. horkelii* in Buenos Aires Province, Argentina, is captured and retained in recreational fisheries during summer (Juan Martin Cuevas pers. comm. 2017).

This species is still being captured and exploited in Brazilian waters but not reported (De-Franco *et al.* 2012).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentina. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these



waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabit the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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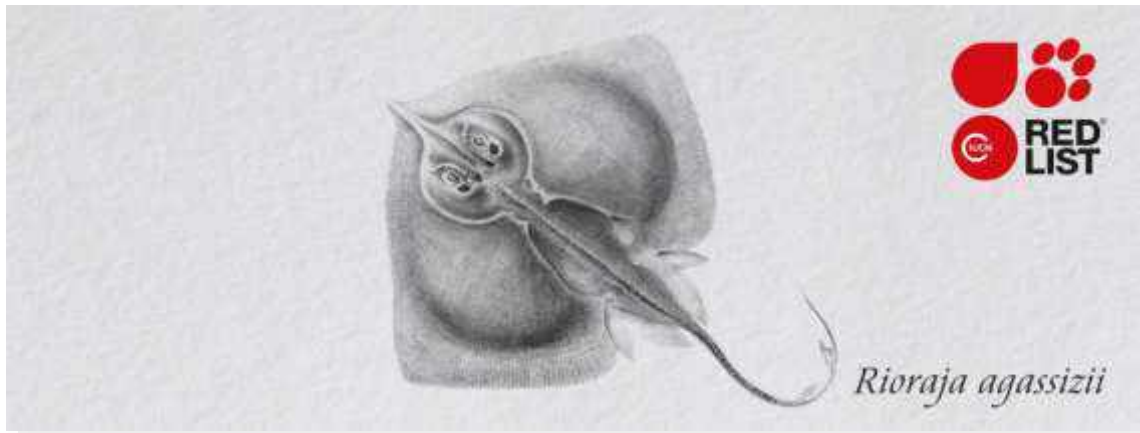
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VU - Vulnerable, A2bd, (IUCN version 3.1)

#### Assessment Rationale:

*Rioraja agassizii* is endemic to the Southwest Atlantic. In the Patagonian Sea, the species is found from Rio Grande do Sul (southern Brazil) to Península Valdéz (Chubut, Argentina). This is one of the most abundant skates on the continental shelf off southern Brazil, Uruguay and Northern Argentina (Buenos Aires, Province). *R. agassizii* is one of the most frequently species caught by bottom trawling fisheries in the northern sector of the Argentina and Uruguay Common Fishing Zone (AUCFZ). Although no species-specific data is available in Argentina, the estimated abundance for mixed skates in the AUCFZ from 1981 to 2014 declined by about 36.6%, highlighting the pressure placed on the coastal skates assemblage, in which *R. agassizii* is a dominant component. In southern Brazil, there was a 50% decline in CPUE between 1980 and 2005. Generation length could be estimated between 8-10 years, using *Atlantoraja cyclophora* as a potential sister species. Given the estimated reduction of abundance in the AUCFZ and the decline of the CPUE in southern Brazil during a past period of three generation lengths (24-30 years), the species is listed as Vulnerable (A2bd) in the Patagonian Sea.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., Coller, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

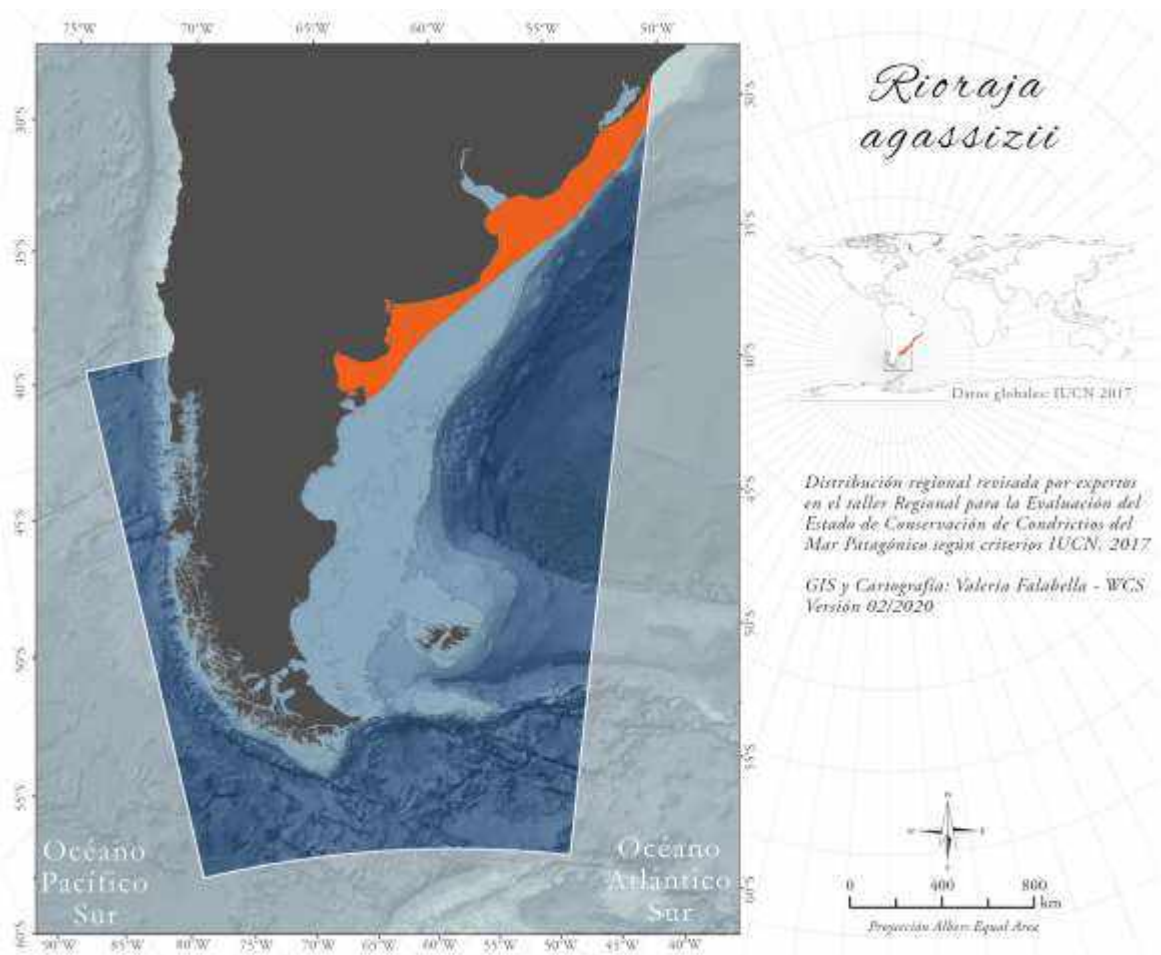
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE - Rioraja – agassizii (Müller & Henle, 1841)

**Common Names:** Raia-santa (Portuguese), Raya Lisa (Spanish; Castilian), Rio Skate (English)

## Geographic Range



The Rio Skate is endemic to the Southwest Atlantic and it distributes along the Patagonian Sea from Rio Grande do Sul in southern Brazil (Figueiredo, 1977) to Chubut (Argentina) in Península Valdéz (42° S) (Nelson Bovcon pers. comm. 2017).

## Population

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*Rioraja agassizii* is one of the most abundant skates on the continental shelf off Uruguay, Argentina (Buenos Aires, Province) and southern Brazil (Colonello *et al.* 2003, Oddone *et al.* 2007). It is also one of the most frequent species caught by bottom trawling fisheries in the northern sector of the Argentina and Uruguay Common Fishing Zone (AUCFZ) (Paesch, 2017). Some abundance estimations for the Buenos Aires coast and Uruguay region include: 506 tonnes in 1994, 8,163 t in 1998 and 1,319 t in 1999 (NPOA, 2009). There is a peak of abundance during spring in Buenos Aires Province, Argentina (Estalles *et al.*, 2009). Although no species-specific data is available in Argentina, based on mixed catch data for skates from 1981 to 2014 in the Argentina and Uruguay Common Fishing Zone (AUCFZ), the estimated abundance for mixed skates has declined by 36.6% from 93,498 t to 58,977 t (Cortés *et al.* 2014). While this data is not species-specific, it highlights the pressure placed on the coastal skate assemblage, of which *R. agassizii* is a dominant component.

In southern Brazil, data obtained on research cruises have recorded a reduction on the catches by effort units from 21.1 kg/h in 1980 to 10.1 kg/h in 2005, thus a 50% decline (Ferreira *et al.*, 2010). In the same region, between 2014 and 2015 *Rioraja agassizii* was the most abundant landed skate (45.7 - 54.4%) of the bottom trawl industrial fleet (Roberta A. Santos pers. comm. 2017).

**Current Population trend:** Decreasing.

## Habitats and Ecology

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In Brazil, the species occurs from the coast up to 130 m (Figueiredo, 1977; Oddone *et al.*, 2007) but it can go 159 m deeper in Uruguay (Laura Paesch pers. comm. 2017). In northern Argentina, it goes from the coast to 150 m and it seems to get closer to the coast southward up to 50 m (Menni y Stheman, 2000).

**Size at first sexual maturity (total length cm):** Brazil: males = 32 cm TL and females = 40 cm TL (Oddone *et al.*, 2007). Argentina and Uruguay: males = 47.5 cm TL- 50.4 cm TL and females = 52 cm TL- 54 cm TL (Colonello *et al.*, 2007; Estalles *et al.*, 2009).

**Fecundity:** *Rioraja agassizii* is estimated to lay 62 egg cases per year (Oddone & Capapé, 2011). Taking into account that *Atlantoraja cyclophora* age of first maturity is 6 years for males and 7.2 years for females and longevity is 10 years for males and 12.6 years for females (Marina Coller pers. comm., 2017), it can be considered a sister species.), Likely, this species has a generation length of between 8-10 years.

## Threats

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The majority of this species geographic and bathymetric distribution is tied to fairly intensive trawl fishing (Massa *et al.* 2004, Oddone *et al.* 2007, Cortés *et al.* 2014, ICMBio, 2016, Paesch *et al.*, 2014, Paesch, 2017). This species is taken off Argentina and Uruguay in a multi-species coastal demersal fishery where skate landings have increased considerably since 1994 (Cedrola *et al.*, 2005). Indeed, increasing international demand for skates has resulted in growing fishing pressure on skate species along the coastal and shelf waters of Argentina, Uruguay and Brazil. Declines in the overall biomass estimates of the coastal skate assemblage have been recorded and considerable declines in the biomass of some skate species (i.e., the similarly sized *Atlantoraja cyclophora* and the smaller *Sympterygia acuta*), including *R. agassizii*, have been documented off Buenos Aires Province, Argentina and Uruguay (34° to 41°S) an area where trawl fishing is intensive (Cortés *et al.* 2014).

In southern Brazil, the main threats are bottom trawling and gillnet fisheries (ICMBio, 2016). Although it has been classified as Endangered (A4bd) in the country, following IUCN criteria, the species is still captured and discarded (ICMBio, 2016).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

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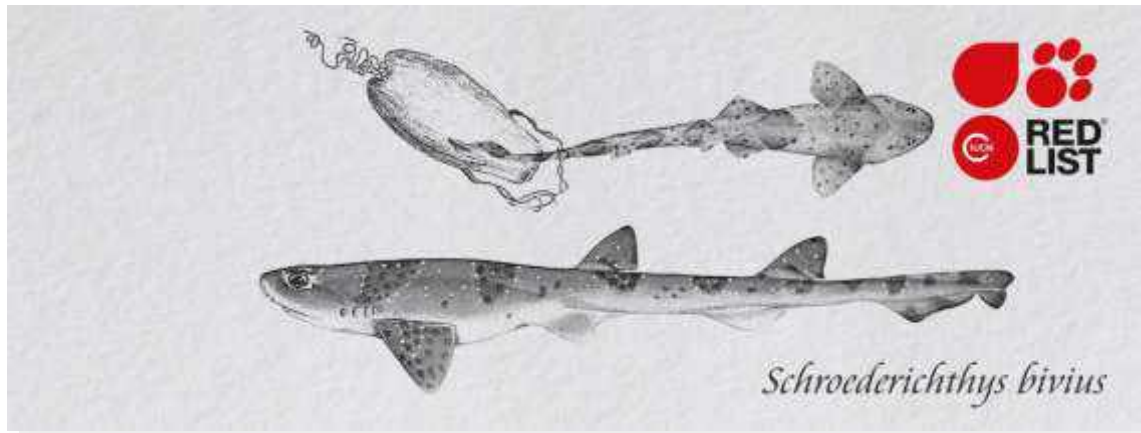
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## VU - Vulnerable, A4bd, (IUCN version 3.1)

### Assessment Rationale:

The Narrowmouth Catshark, or 'Pintarroja' (*Schroederichthys bivius*) is an endemic species of the southwest Atlantic. In the Patagonian Sea, it is distributed from southern Brazil to central Chile. It can be found at depths between 10 and 359 m. The highest biomass for the species was registered in southern Argentina, between 45° and 54°S, and a decrease of at least 50% in biomass was also identified in this area in a period of 10 years (1996-2006). It is possible that this reduction can be associated with the increase in the fishing activity of the bottom trawl shrimp fleet, which also overlaps with its reproduction and breeding area. In recent years, shrimp fishing pressure has increased with historical landing records for the species (export increased from 45,000 tons in 2008 to 121,000 tons in 2015). There is no information that makes possible to define the generational length for the species, but taking into account the longevity in a similar species and with calculations on the size reached in first reproduction, the generational length could be between 5 and 6 years. Based on a measured reduction of biomass of at least 50%, between 1996-2006, along with increased fishing activity in this area since 2006, we estimate a population reduction of approximately 65-70% in a period of three generations (15-18 years) in Argentina, the area is described as the most important for the species. This would allow categorizing it as Endangered according to criterion A4bd. However, bearing in mind that we do not have information for the entire distribution area in the Patagonian Sea, we can at least consider that the species is Vulnerable for A4bd.

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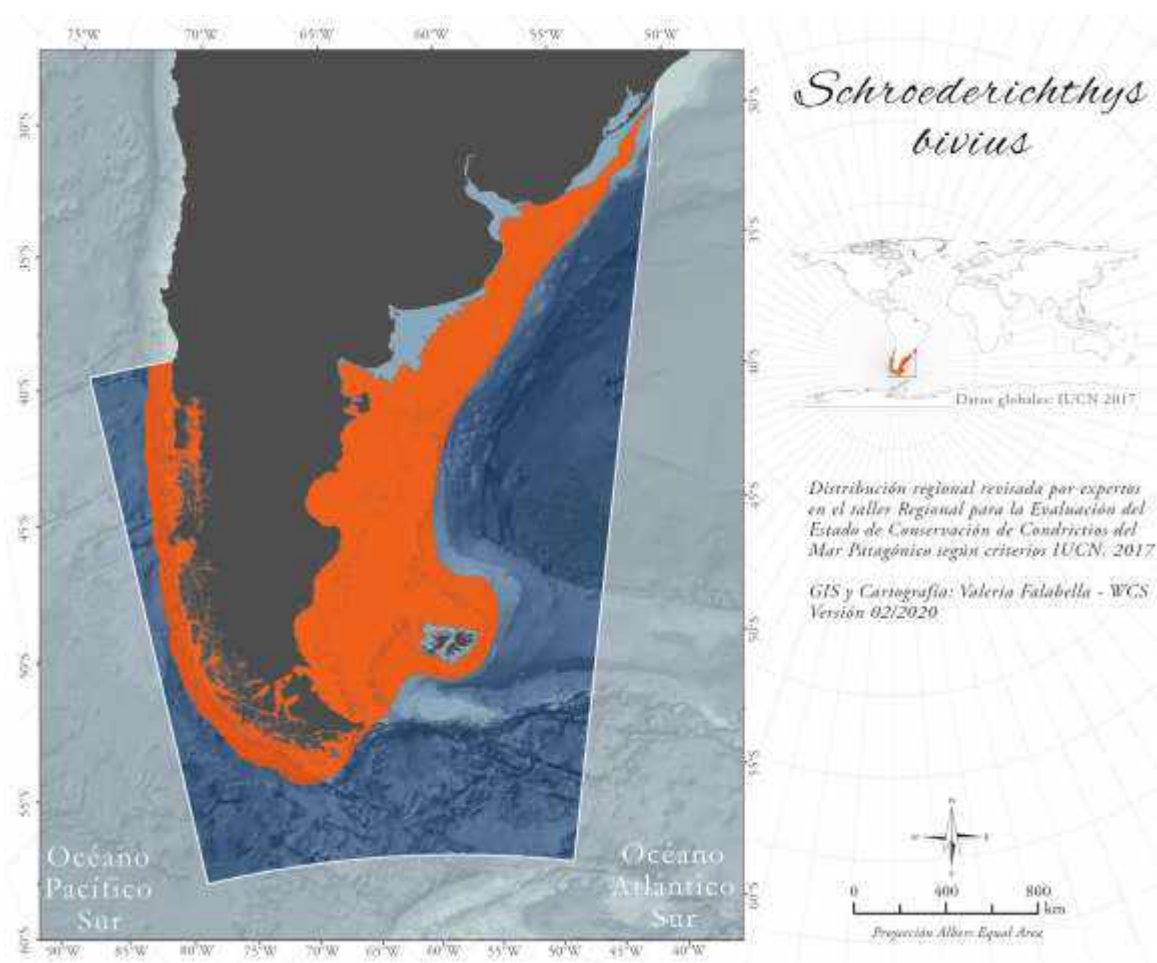
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - CARCHARHINIFORMES - SCYLIORHINIDAE - Schroederichthys – bivius (Müller & Henle, 1838)

**Common Names:** Narrowmouth Catshark (English), Pintaroja (Spanish; Castilian)

## Geographic Range



The Narrowmouth Catshark is an endemic shark from the coasts of South America within the Magellanic province (Norman 1937) and all the Patagonian Sea. It originates from the Pacific basin (Krefft 1968), and inhabits the Southwest Atlantic from Brazil (Soto, 2001a, 2001b) to the Beagle Channel (Lloris and Rucabado 1991, Matallanas *et al.* 1993) and the Southeast Pacific to north of Chile (Compagno 1984).

## Population

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This species is frequently caught by the shrimp trawl fishery in the San Jorge Gulf and adjacent waters (Patagonia, Argentina) with an occurrence frequency of 23% (Góngora *et al.* 2009). It is the ninth most important species and the fourth species of Chondrichthyes. It is captured more frequently in the closed area for protection of juvenile hake. There are records of hauls that state that this species has been common in catches and that is usually discarded (Góngora *et al.* 2009) with a high survival rate (Nelson Bovcon pers. comm., 2017).

Sánchez *et al.* (2009) conducted scientific campaigns over a period of 10 years, which included the study of distribution and biomass of this species. In Argentina, two zones were identified: the northern Patagonian shelf of Buenos Aires - NP (34°-48°S) and the southern Patagonian shelf - SP (45°-54°S). Abundance increases from north to south in the distribution area (Sánchez *et al.*, 2009). The estimated annual biomass in a period of 10 years (1996-2006) for the northern zone varied between 7000 and 26000 tons, without a clear trend (Sánchez *et al.*, 2009). In the southern zone, an abrupt decrease in biomass was identified between 1997 (67,256 tons), 1998 (60,888 tons) and in 1999 decreasing to 20,118 tons, after which it remained at values close to 20,000-30,000 tons, with an estimated minimum in 2003 (18,636 tons). These authors identify a downward trend of biomass in the southern zone since 1999 and an increase in the northern NP zone, with the hypothesis of relating it to a decrease in fishing effort in NP since 1999, when the commercial trawler fleet targeting hake transferred its operation and effort to south of 48°S, capturing the species as by-catch, (Sánchez *et al.*, 2009).

In Brazil, there are few records of this species which is considered sporadic or rare (Soto, 2001a; 2001b).

No data or biomass trend was available for the Chilean and for the Malvinas/Falklands Islands sector.

**Current Population trend:** decreasing.

## Habitats and Ecology

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This species is typical of the Magellanic Province of cold waters. It is mainly present at 45 and 199 m in depth but it could be found from the surface to 359 m in the Atlantic and Pacific Ocean (Bellisio *et al.* 1979, Menni *et al.* 1979, Ojeda 1983, Sanchez *et al.* 2009). The highest relative abundances in the distribution of this species were detected between 6.3°C and 7.8°C (Sánchez *et al.*, 2009). In the Argentina and Uruguay Common Fishing, it could be found between 9 and 219 m with a great abundance between 50 and 80 m (Paesch, 2011). This species is considered rare in Brazilian waters with some records of dozens of individuals in the 60s at Rio Grande do Sul (Soto, 2001a), in southern Brazil.

It preys on cephalopods (39%), fishes (36%), benthic crustaceans (18%), other benthic invertebrates (6%) and gelatinous zooplankton (1%) (Sánchez *et al.*, 2009).

## Threats

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*Schroederichthys bivi* is incidentally caught in most of the bottom trawl fisheries of Argentina (Sánchez *et al.* 2009). This is a species caught as by-catch and discarded in the Patagonian red shrimp (*Pleoticus muelleri*) fishery that operates in the San Jorge Gulf, with an occurrence frequency of 23% (Góngora *et al.*, 2009) and with 37% (22.6 ton) of the total shark by-catch weight (Cedrola *et al.*, 2012). Studies on the freezing fleet in the San Jorge Gulf determined an occurrence frequency of 5.8% in sets for the bottom trawl shrimp fishing and 15.7% in sets for the Argentine common hake *Merluccius hubbsi* (Bovcon *et al.*, 2013). This species was also frequently captured as by-catch of bottom trawlers that targeted *M. hubbsi* in the northern and central Patagonian shelf between 2001 and 2003 (Crespi *et al.*, 2013). It was present in more than 60% of the tows studied and most of the individuals (>70%) were immature. *S. bivi* is also caught as bycatch in the bottom trawl Patagonian scallop fishery over the Argentine continental slope (*Zygochlamys patagonica*) (Schejter *et al.* 2012).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentina. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine



protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys bivirus*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are

small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al*, 2000, Wakeford *et al*, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert *pers. comm.*, 2017).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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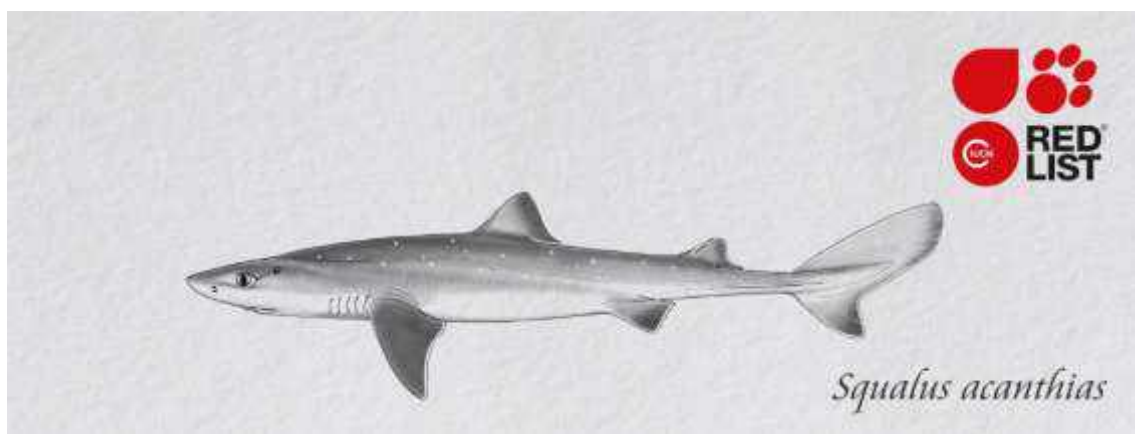
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NT, Near Threatened, (IUCN version 3.1)

#### Assessment Rationale:

The Spiny Dogfish *Squalus acanthias* is a cosmopolitan, highly migratory and long-lived species. It is found along the entire Patagonian Sea from southern Brazil to southern Argentina, Chile and around Falklands/Malvinas Islands. The species is taken by recreational and commercial fisheries, as well as by-catch in longline demersal fisheries. It is fished in Brazil and it was listed nationally as Critically Endangered in 2016, where there has been a decline of 80% over the past 3 generation lengths, and where it has rarely been seen afterwards in landings. Currently, there is a monitoring program in place, although they continue to be caught as by-catch. Data over roughly the same period in Argentina show relatively stable trends for this species, at least in deeper waters where it is considered abundant. There are no data trend from Chile. This slow growing species matures at 14 years in females and 9 in males, with a maximum age of 35 years. This species is listed as Near Threatened, however, given an estimated generation length of 20 years and the lack of data trend beyond 30 years in the past, more information is needed on this species population throughout its range in the Patagonian Sea.

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**Contributor(s):** Bustamante, C. & Pompert, J.

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**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

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ANIMALIA - CHORDATA - CHONDRICHTHYES - SQUALIFORMES - SQUALIDAE - *Squalus* – *acanthias* (Linnaeus, 1758)

**Common Names:** Spiny Dogfish (English), Aiguillat commun (French), Cape Shark (English), Cazón Espinoso (Spanish; Castilian), Cação Espinho (Portuguese), Espinillo (Spanish; Castilian), Galhudo Malhado (Portuguese), Galludo (Spanish; Castilian), Mielga (Spanish; Castilian), Piked Dogfish (English), Spurdog (English)

This is the new taxonomic concept for *Squalus acanthias*. It is now confirmed that *S. suckleyi* (formerly treated as a subspecies of *S. acanthias* then as the Northwest Pacific subpopulation of *S. acanthias*) is a separate species. **Use this entry for the revised assessment.**

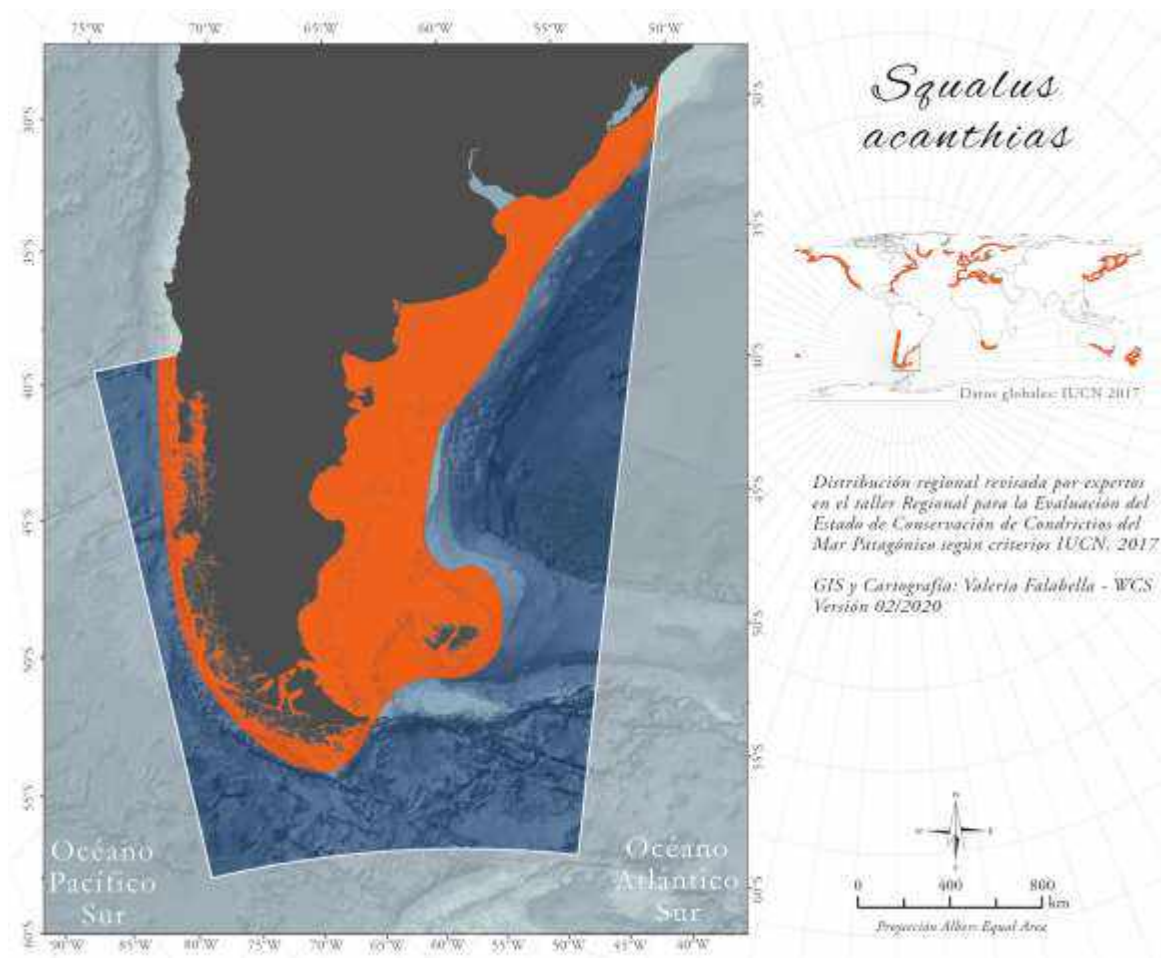
### Taxonomic Note:

While there are reported subpopulations of *Squalus acanthias* (Linnaeus, 1758) elsewhere in the world, the North Pacific subpopulation is now considered a separate species, *Squalus suckleyi* (Girard, 1854) (see Ebert *et al.* 2010). Further taxonomic studies on this genus are required, including Mediterranean and Black Sea (English)

## Geographic Range

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In the Patagonian Sea, the species is found from southern Brazil to southern Argentina, Chile and around Falklands / Malvinas Islands as well (Compagno 1984, Menni and Lucifora, 2007).



## Population

Unregulated and expanding fisheries used to take the spiny dogfish as a by-catch species in the Argentina and Uruguay Common Fishing Zone (AUCFZ), where declines of ~50% have been reported (Massa *et al.* 2002). Data from 1992 to 2007 show decreases in the estimated abundances in the north of the studied area, between 45° and 55° S, where the species has the highest concentration (Massa 2009). However, the time series of abundance estimates in the last years show a stable trend, with an estimated value of 137,010 t (95% CI: 91,733) for 2007 (Massa 2009). This species sporadically occurs in trawl fisheries in Brazil and it was listed nationally as Critically Endangered in 2016, where there has been a decline of at least an 80% in 3 generation lengths, and it has rarely been seen afterwards in landings (ICMBio/MMA, 2016).

There are no data trend from Chile.

Current Population Trend: Unknown.

## Habitats and Ecology

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The Spiny Dogfish is a highly migratory species, travelling in large, dense schools, segregated by size and sex (Fordham *et al.*, 2016). It matures late and it is a very long-lived, lecithotrophic viviparous species (Castro, 1983, Nammack *et al.*, 1985). Also, it is not known to be associated with any particular habitat (McMillan and Morse 1999).

In the Patagonian Sea length at maturity for males varies between 56,5 cm and 58,3 cm and for females between 65,1 cm and 70,4 cm depending on the area (Oddone *et al.* 2015, Colonello *et al.* 2016). It reproduces every two years with 6 embryos on average (Colonello *et al.* 2016). Pups are born with 22-25 cm of total length (Oddone *et al.* 2015).

## Threats

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The main threat to this species worldwide is over-exploitation, by target and bycatch fisheries. This is a valuable commercial species in many parts of the world, caught in bottom trawls, gillnets, longlining, and by rod and reel (Fordham *et al.*, 2016). In the Patagonian Sea, *Squalus acanthias* is still caught as a bycatch species in almost all countries mainly by bottom trawl fisheries.

In southern Brazil, there is a monitoring program in place, although it continues to be caught as a by-catch species (Roberta A. Santos pers. comm. 2017).

In Argentina, it is captured by bottom trawl fisheries targeting the argentine hake (*Merluccius hubbsi*), the patagonian shrimp (*Pleoticus muelleri*) and the patagonian scallop (*Zygochlamys patagonica*) (Bovcon *et al.* 2013, Schejter *et al.* 2012) and also by pair-trawling in southern Brazil, where the species is not abundant with sporadic records (Vooren, 1997; Soto, 2001). In Argentina, the species is also caught by recreational fishery of Buenos Aires Province (Juan Martin Cuevas pers. comm. 2017). In the San Jorge Gulf, central Patagonia, this species represents the 60% of the incidental catch in hake ice-wet trawlers (Bovcon *et al.* 2013). In Chubut Province, fishermen had reported large catches of this species between 3-5 miles from the coast (Nelson Bovcon pers. Common. 2017). This species is also frequently caught by the shrimp trawl fishery operating in this gulf and adjacent waters, with a occurrence frequency of 21%, representing the tenth most important species and the fifth species of chondrichthyans (Góngora *et al.*, 2009). It is captured more frequently in the closed area for juvenile hake. There are also records of hauls in which this species has been dominant in the catches (Góngora *et al.*, 2009). This species is also caught by the coastal fishing fleet operating in the Isla Escondida area in Chubut (Nelson Bovcon pers. comm. 2017).

*Squalus acanthias* in Uruguay is landed as "galludo" with others similar species as *S. lobularis* and *S. quasimodo* (CTMFM, 2017).

There is no data trend on this species in Chile, however, interactions between shark nurseries and aquaculture had been recorded (Gaitán-Espitia *et al.* 2017).



## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common

Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys biviatus*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al*, 2000, Wakeford *et al*, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).

Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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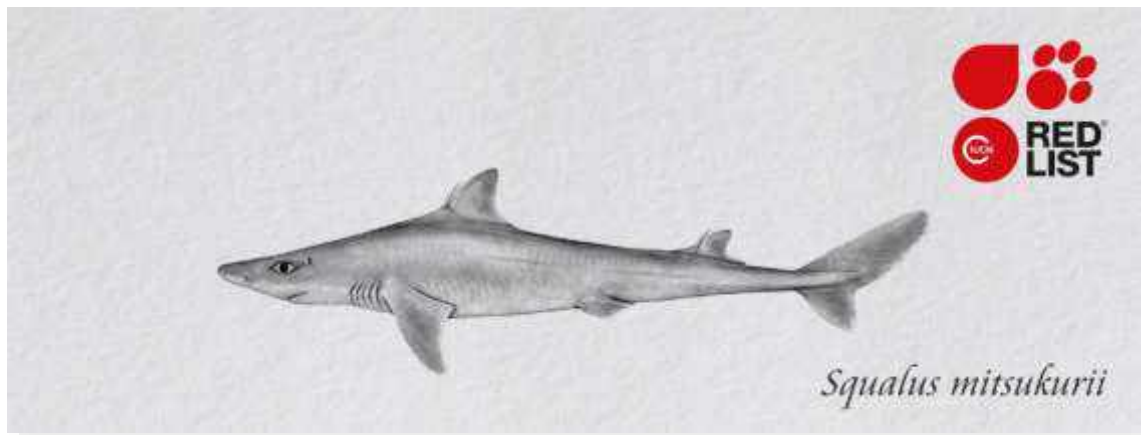
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DD - Data Deficient, (IUCN version 3.1)

#### Assessment Rationale:

The Shortspine Spurdog *Squalus mitsukurii* is distributed in the Patagonian Sea from southern Brazil to southern Argentina over the continental shelf. It is a rare and bycatch species in the catches of the shrimp trawl fishery that operates in the San Jorge Gulf, Chubut, Argentina. During the period 2003-2007 it was recorded in only 8 hauls. Population size is still unknown. According to a recent revision for the Southwest Atlantic Ocean in the Patagonian Sea there exist only 3 species of the genus *Squalus*: *Squalus acanthias*, *S. lobularis* sp. nov., and *S. quasimodo* sp. nov., the latter could be also present at least up to the AUCFZ. Furthermore, dermal denticles from individuals identified as *S. mitsukurii* in Argentina in the past seems to be more similar to those from *S. quasimodo* rather than *S. lobularis*. As the taxonomy of this species is still under revision, this species is listed as Data Deficient.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Santos, R.A., Bustamante, C., Coller, M., Paesch, L. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

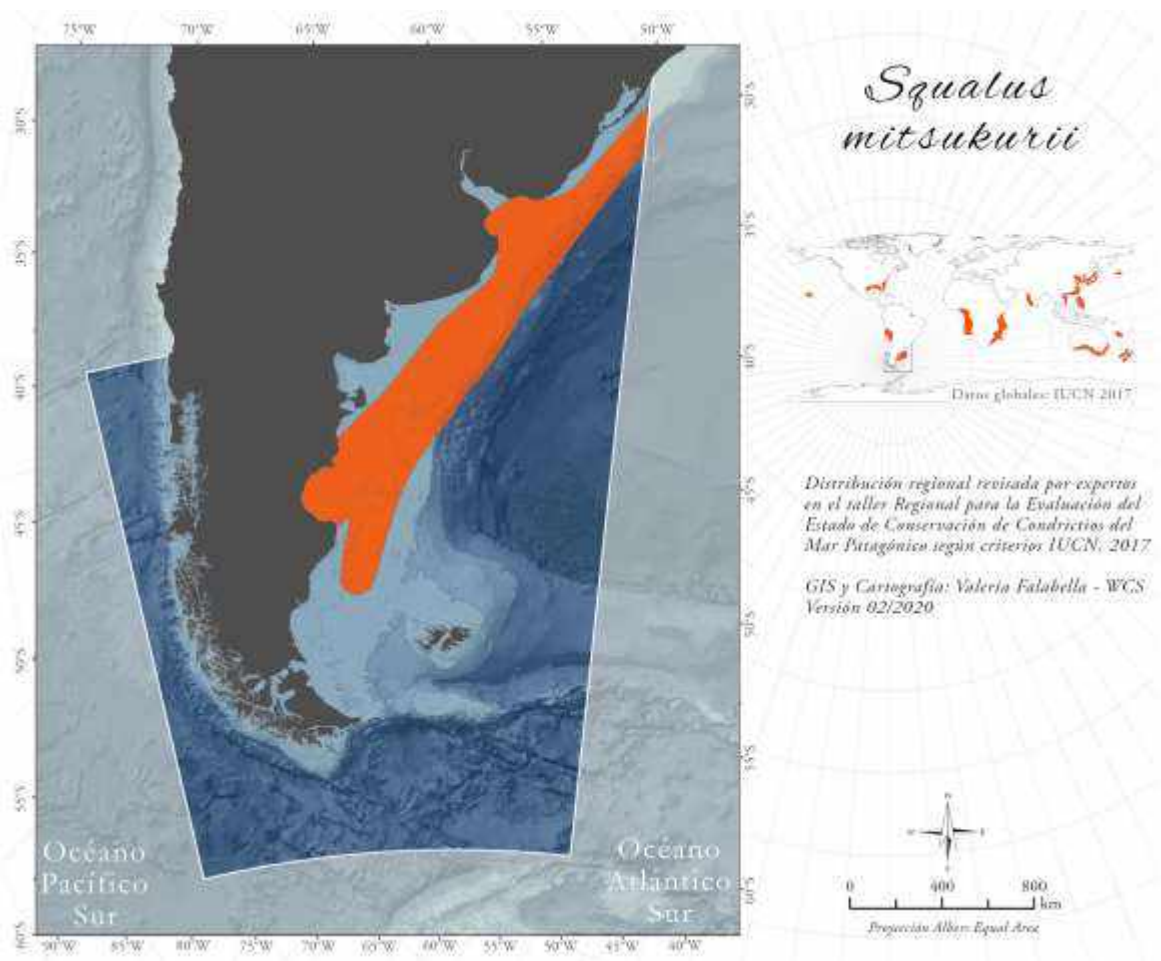
## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - SQUALIFORMES - SQUALIDAE - *Squalus* – *mitsukurii* (Jordan & Snyder, 1903)

**Common Names:** Shortspine Spurdog (English), Aiguillat Épinette (French), Galludo Espinilla (Spanish; Castilian), Cazón espinoso (Spanish; Castilian), Green-eye Spurdog (English).

**Regional Taxonomic Note:** According to a recent revision for the Southwest Atlantic Ocean (Viana and Carvalho, 2016) in the Patagonian Sea there exist only 3 species of the genus *Squalus*: *Squalus acanthias*, *S. lobularis* sp. nov., and *S. quasimodo* sp. nov., the latter could be also present at least up to the AUCFZ (Luis Lucifora pers. comm. 2017). Furthermore, dermal denticles from individuals as *S. mitsukurii* identified in Argentina in the past seem to resemble more to those from *S. quasimodo* rather than *S. lobularis* (Luis Lucifora pers. comm. 2017).

## Geographic Range



In the Patagonian Sea this species is distributed from southern Brazil to southern Argentina over the continental shelf (Góngora *et al.*, 2009, Ruibal Núñez *et al.*, 2016).

**Depth Lower Limit (in metres below sea level):** 954

**Depth Upper Limit (in metres below sea level):** 5

**Depth Zone:** Shallow photic (0-50m), Deep Photic (51-200m), Bathyal (201-4,000m)

## Population

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Population size is still unknown mainly due to taxonomic problems. As *Squalus acanthias*, this species is common to be abundant wherever it occurs, often as large aggregations or schools.

**Current Population Trend:** Unknown.

## Habitats and Ecology

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In the Patagonian Sea, males mature between 43 cm and 55 cm and females between 52 cm and 60 cm (Lucifora *et al.* 1999, Odonne *et al.*, 2011, Colonello *et al.* 2016). It feeds mostly on teleosts as anchovy and hake and, in a less proportion, on crustaceans and cephalopods (Colonello *et al.* 2016).

## Threats

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In the Patagonia, Argentina, it is a rare species in the catches of the shrimp trawl fishery that operates in the San Jorge Gulf. In this sense, during the period 2003-2007 it was recorded in only 8 hauls of 18,718 (Góngora *et al.* 2009).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was

established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas

(<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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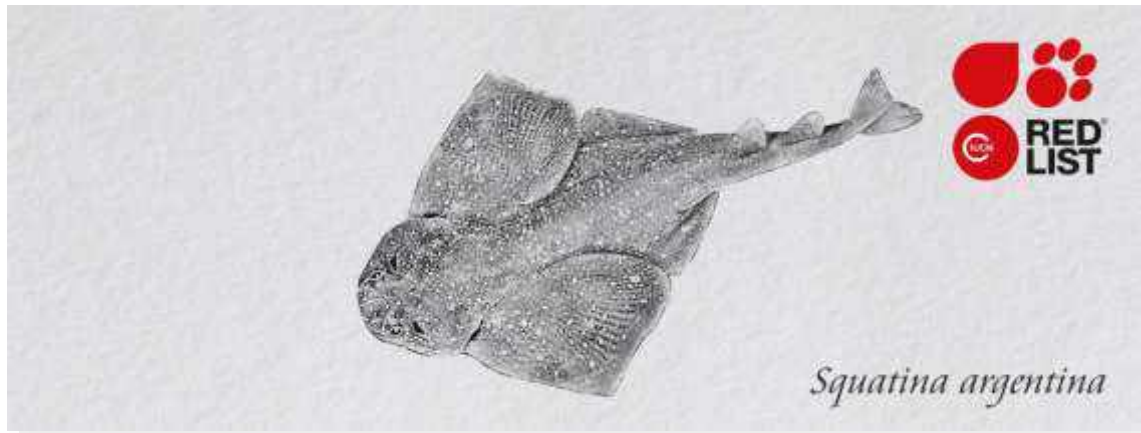
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## EN - Endangered, A2bd, (IUCN version 3.1)

### Assessment Rationale:

The Longfin Angel Shark *Squatina argentina* is a relatively rare endemic species to the Southwest Atlantic. In the Patagonian Sea it is found from 32°S (Rio Grande, Rio Grande do Sul, southern Brazil) through Uruguay to 39°S off Buenos Aires Province, Argentina. *S. argentina* inhabits the outer shelf and upper slope of southern Brazil, Uruguay and Argentina. In the Argentina and Uruguay Common Fishing Zone (AUCFZ), there are records of this species from 27 m to 120 m but in southern Brazil it was recorded between 100 m and 400 m. This species is relatively rare. In Brazil, between 1996 and 2001, research cruises in Rio Grande do Sul, showed a 96% decline in abundance of this species. Commercial landings for mixed *Squatina* spp. from 2008 to 2016 were 443 tons to 65 tons; however, this species is likely less than 10 % of these catches (90% is *S. guggenheim*). There are no catch statistics in Argentina and Uruguay for this species, as it is rare and it can be found in deeper waters. Over the past 3 generation lengths (45 years) there has been at least a 96% decline in southern Brazil, an 85% decline (based on landings) in Uruguay over the past 10 years, and no further data from Argentina. This species is listed as Endangered under A2bd.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):**

**Facilitators:** Polidoro, B., Falabella, V.

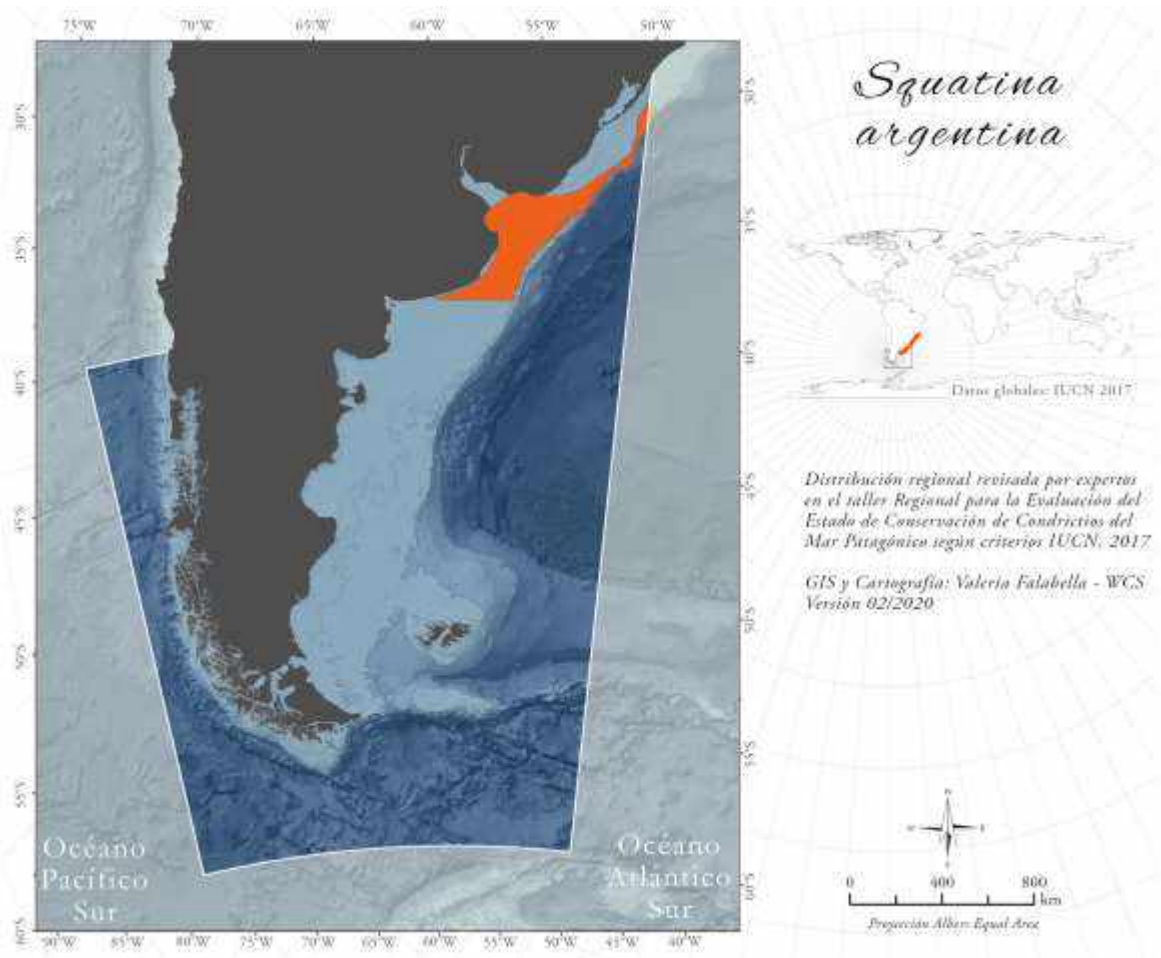
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - SQUATINIFORMES - SQUATINIDAE - *Squatina* – argentina (Marini, 1930)

**Common Names:** Argentine Angel Shark (English), Angelote (Spanish; Castilian), Longfin Angel Shark (English), Pez Ángel (Spanish; Castilian), Pez ángel de aleta larga (Spanish; Castilian)

## Geographic Range



The Longfin Angel Shark is endemic to the Southwest Atlantic and in the Patagonian Sea it is found from 32°S (Rio Grande, Rio Grande do Sul, southern Brazil) through Uruguay to 39°S off Buenos Aires Province, Argentina (Vaz and Carvalho, 2013).



## Population

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There are no catch statistics in Argentina and Uruguay for this species, as it is rare and found in deeper waters. In Brazil, between 1996 and 2001, research cruises in Rio Grande do Sul indicate a 96% decline in abundance of this species (Ferreira *et al.* 2010). Commercial landings for mixed *Squatina* spp from 2008 to 2016 were 443 tonnes to 65 tonnes in the common fishery zone of Argentina and Uruguay (CTMFM, 2017), however, this species is likely less than 10 % of these catches (90% is *S. guggenheim*) (Milessi *et al.* 2001, Marilú Estalles pers. comm. 2017).

## Habitats and Ecology

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*Squatina argentina* is a bottom-dwelling shark of smooth sandy and muddy grounds that inhabits the outer shelf and upper slope of southern Brazil, Uruguay and Argentina. In southern Brazil, a regional population of *Squatina argentina* occurs in outer shelves (shelf) and upper slope, in depths from 100 m to 400 m, but the highest abundance can be found at 180 m-250 m deep. Longfin angel sharks of both sexes and in all life stages were found in this area, as well as two neonates, evidencing that this is also a reproductive area (Silva, 1996; Vooren, 1997). The species does not occur in commercial landings from trawl fisheries, which operate out of the main habitat of *S. argentina* (Vooren and Klippel, 2005). However, Perez and Wahrlich (2005) stated that this species was incidentally caught in gillnets targeting the monkfish *Lophius gastrophysis* during 1990s in depths of 160 – 600m. In the Argentina and Uruguay Common Fishing Zone (AUCFZ), there are records of this species from 27 m to 120 m (Laura Paesch pers. comm. 2017) but in southern Brazil it was recorded between 100 m and 400 m (Vooren and Silva 1991, Vooren 1997, Vooren and Klippel, 2005).

The Longfin Angel Shark may have a generation length of 15 years based on *S. occulta* (which seems to be a similar species) which has a maximum age of 21 years and an age of first maturity of 10 years (Vooren and Klippel 2005).

## Threats

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Fishery landing statistics of "angel shark" in southern Brazil, Uruguay and Argentina refer to *S. guggenheim*, *S. occulta* and *S. argentina* combined. In these three countries, the species is uncommon in commercial landings with the largest captures of angel sharks (>90%) that probably correspond to *S. guggenheim* (Milessi *et al.*, 2001; Vooren and Klippel, 2005; Marilú Estalles pers. comm. 2017). Artisanal fishers of southern Buenos Aires (Argentina) and Punta del Diablo (Uruguay) may also catch the Longfin Angelshark but in much lower frequencies when compared with the Spiny Angelshark: 1 / 1000 (Juan martin Cuevas pers. comm. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the Argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common

Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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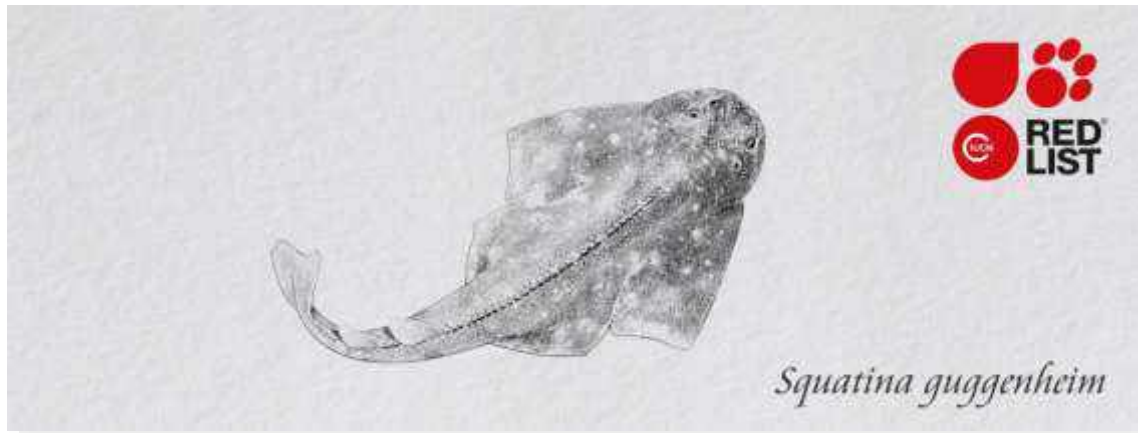
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## EN - Endangered, A2bd, (IUCN version 3.1)

### Assessment Rationale:

The Spiny Angel Shark is endemic to the Southwest Atlantic and in the Patagonian Sea it is found from Rio Grande do Sul, southern Brazil) through Uruguay to the San Jorge Gulf in southern Argentina. It inhabits from shallow coastal waters to 200 m in depth. It migrates in spring to shallow coastal waters where the females give birth and where small juveniles occur all year round. The species gives birth from two to nine pups, depending on the female size and the reproductive cycle lasts 2 or 3 years with a gestation length of 10 to 12 months. In outershelf waters off Uruguay (100-200 m) there may be an isolated subpopulation of this species and there is some genetic evidence of a potential long-term population decline or recent bottleneck event as well. In the Argentina and Uruguay Common Fishing Zone (AUCFZ), based on models of relative abundance estimation, there was a decline in densities from 0.86 to 0.29 t/NM<sup>2</sup>, or 67% decline for the period of 1994-2013. However, close to the AUCFZ, in the El Rincon nursery area, densities for this species over the past 22 years were more or less stable, with declines observed from 1 to about 0.5 t/NM<sup>2</sup>, with some recovery in the last year. Commercial fishery landing statistics of "angel shark" in southern Brazil, Uruguay and Argentina refer to *S. guggenheim*, *S. occulta* and *S. argentina* combined. In Argentina, CPUE of angel sharks of coastal vessels has declined from 0.38 in 1992 to 0.16 in 2015 (50% decline), while ice trawlers have fluctuated, but they do not show a decline; although compared to coastal vessels, landings for ice trawlers are much lower. Commercial landings in the AUCFZ for mixed *Squatina* spp have decreased from 443 tonnes in 2008 to 65 tonnes in 2016. In southern Brazil, this species is more abundant than other *Squatina* spp, and it is listed as Critically Endangered (>80% decline). Generation length is approximately 8 years. This species has therefore declined by at least 50% over the past 3 generation lengths in the Patagonian Sea and is listed as Endangered under A2bd.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Santos, R.A., Bustamante, C., Coller, M., Paesch, L. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

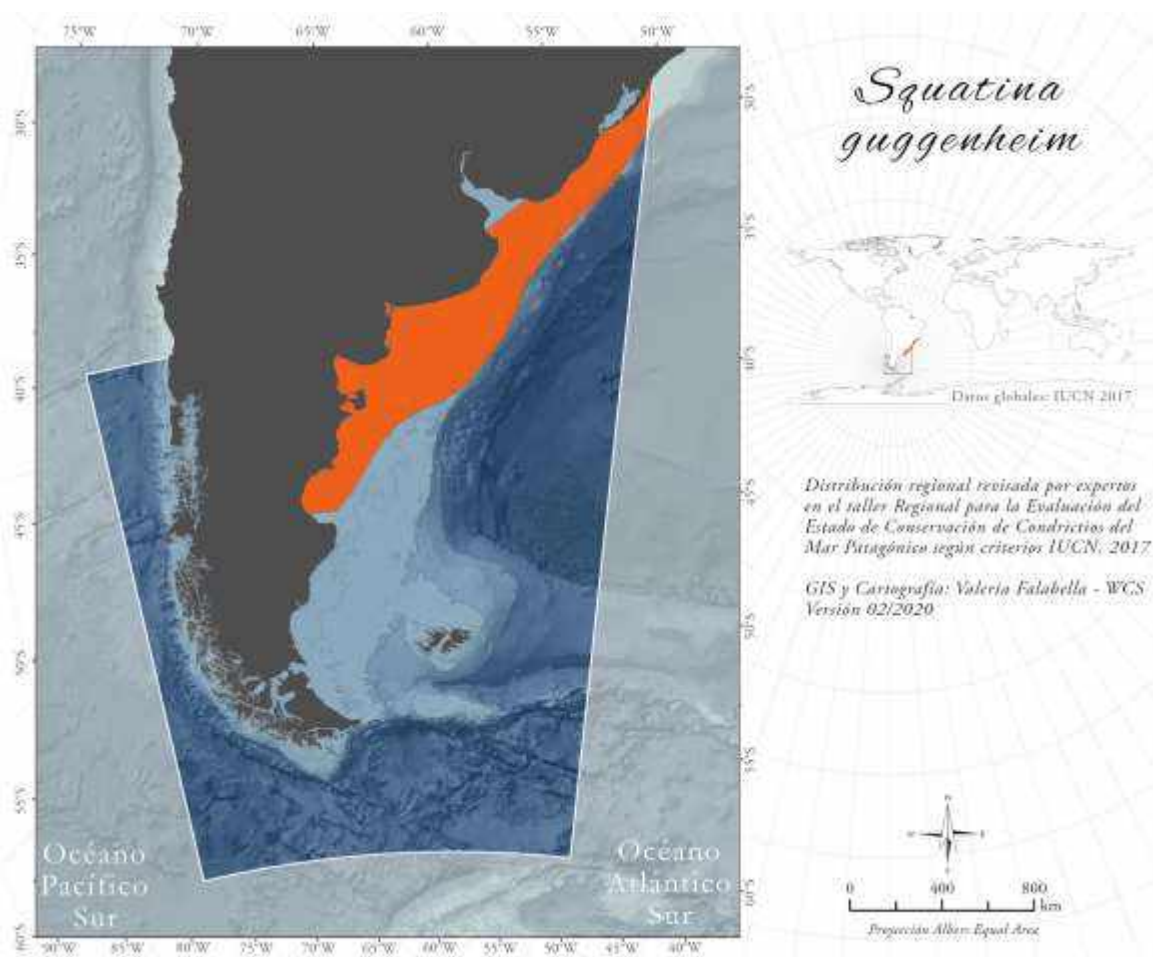
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - SQUATINIFORMES - SQUATINIDAE - *Squatina* – Guggenheim (Marini, 1936)

**Common Names:** Hidden Angelshark (English), Spiny Angel Shark (English), Pez ángel (Spanish; Castilian), Pez ángel espinoso (Spanish; Castilian)

## Geographic Range



The Spiny Angel Shark is endemic to the Southwest Atlantic and in the Patagonian Sea it is found from 32°S (Rio Grande do Sul, southern Brazil) through Uruguay to 46°-47°S in southern Argentina in the San Jorge Gulf (Vooren and Klippel, 2005; Góngora *et al.*, 2009; Bovcon *et al.*, 2013).

## Population

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In the Argentina and Uruguay Common Fishing Zone (AUCFZ), based on models of relative abundance estimation, there was a decline in densities from 0.86 to 0.29 t/NM<sup>2</sup>, or 67% decline for the period of 1994-2013 (Cortés *et al.* 2015a). At the same time, in the El Rincon nursery area, close to the AUCFZ, densities for this species remained more or less stable around 1 t/NM<sup>2</sup> between 1994 and 2005, with declines of near 50% (from 1 to about 0.5 t/NM<sup>2</sup>) between 2005 and 2012 (Cortés *et al.* 2015b). Commercial landings in the AUCFZ for mixed *Squatina* spp have decreased from 443 tonnes in 2008 to 65 tonnes in 2016 (CTMFM, 2017).

In Argentina, CPUE of coastal vessels has declined from 0.38 in 1992 to 0.16 in 2015 (50% decline), while ice trawlers have fluctuated, but they do not show a decline, although compared to coastal vessels, landings for ice trawlers are much lower (SSPyA 2017, Gustavo Chiaramonte pers. comm. 2017).

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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*Squatina guggenheim* is a relatively small, shelf bottom-dwelling shark and an aplacental yolk sac viviparous species (Chiaramonte and Vooren, 2007). In the Patagonian Sea, the Spiny Angelshark inhabits from shallow coastal waters (<10m, Juan Martín Cuevas pers. comm. 2017) to near 200 m in depth on the upper slope (García *et al.*, 2015).

In outershelf waters off Uruguay (100-200 m), there may be an isolated subpopulation of this species and there is some genetic evidence of a potential long-term population decline or recent bottleneck event as well (García *et al.*, 2015).

In southern Brazil, *Squatina guggenheim* was common throughout the year at depths of 10 m to 100 m. Densities of about 50 kg/h occurred in autumn and winter at depths of 50 m to 100m, and during spring and summer at depths below 50 m, evidencing a seasonal migration to shallow waters (Vooren and Klippel, 2005) Birth occurs from October to January also in shallow waters (Silva, 1996). Due to a reduction in abundance greater than 80%, the species was listed as Critically Endangered in Brazil (ICMBio, 2016).

It migrates in spring to shallow coastal waters where the females give birth and where small juveniles occur all year round (Vooren and Silva 1991, Vooren and Klippel 2005, Cortés 2011). The species gives birth from two to nine pups (mostly 5 and 6), depending on the female size (Vooren and Klippel 2005, Colonello *et al.* 2007). The reproductive cycle lasts 2 or 3 years with a gestation length of 10 to 12 months (Vooren and Klippel 2005, Colonello *et al.* 2007). A summary of the main data for the region could be found in the life history table.

The generation length is estimated to be approximately 8 years (Chiaramonte and Vooren, 2007).

## Threats

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Commercial fishery landing statistics of "angel shark" in southern Brazil, Uruguay and Argentina refer to *S. guggenheim*, *S. occulta* and *S. argentina* combined. In Argentina and Uruguay the species is common in commercial landings with the largest captures of angel sharks (>90%) that probably correspond to *S. guggenheim* (Milessi *et al.* 2001, Marilú Estalles pers. comm. 2017). There is also an small-scale bottom gillnet fishery along the coast of Buenos Aires targeting this species but it is not recorded in official catch statistics (Juan Martín Cuevas pers. comm. 2017).

In Chubut Province, Argentina, this species is caught by the patagonian shrimp trawl fishery with an occurrence frequency of 1.4% (Góngora *et al.* 2009). It is also captured by the coastal fishing fleet in the Isla Escondida area and by the artisanal fleet in Bahía Engaño (Nelson Bovcon pers. comm. 2017).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional



Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhinchus callorynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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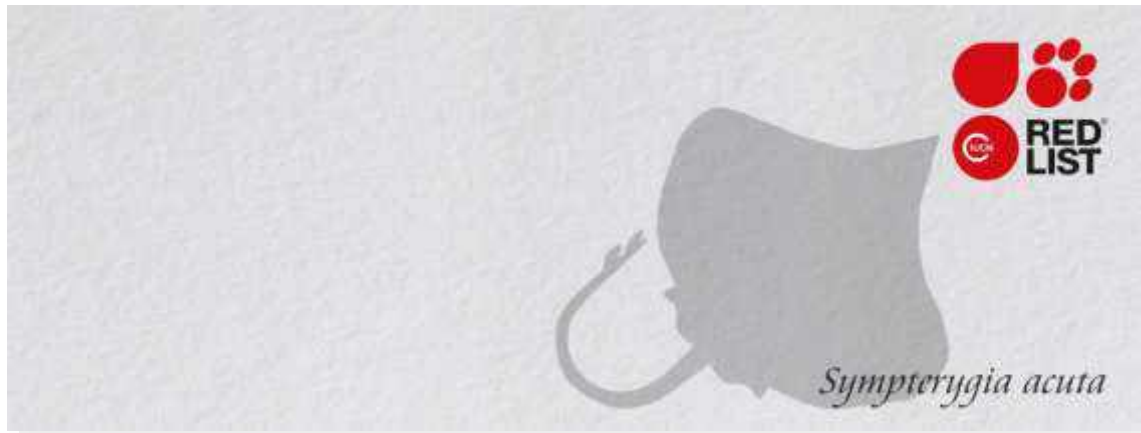
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## VU - Vulnerable, A2bd, (IUCN version 3.1)

### Assessment Rationale:

The Bignose Fanskate *Sympterygia acuta* is a small inshore skate endemic to the Southwest Atlantic and it could be found in the Patagonian Sea from its northern limit at Rio Grande State (30 S°) in Brazil to Chubut, Argentina (45°). *Sympterygia acuta* is still taken by the multi-species fleet that exploits the coastal demersal fish assemblage in southern Brazil, in Argentina (Buenos Aires Province) and Uruguay (34°-41°S). Although it has been landed since 1994, specific statistic catches are unavailable for these fisheries due to the fact that all species of batoids are recorded as "unidentified rays and skates". Based on mixed catch data for skates from 1981 to 2013 in the Argentina- Uruguay Common Fishery Zone, the estimated abundance for skates has declined by 36.3%. In Brazil, it is listed as Endangered where there has decreased by 75% from 1974 to 2005. Although there is no generation length for this near-shore, shallow species, it may have a lower generation length than other skate species given its relatively small body size. Therefore, it is conservatively estimated that this species has declined by at least 30% over the past 20-40 years. It is consequently assessed as Vulnerable for A2bd, but it may be listed as Endangered when generation length is estimated and additional trend data is available.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):**

**Facilitators:** Polidoro, B., Falabella, V.

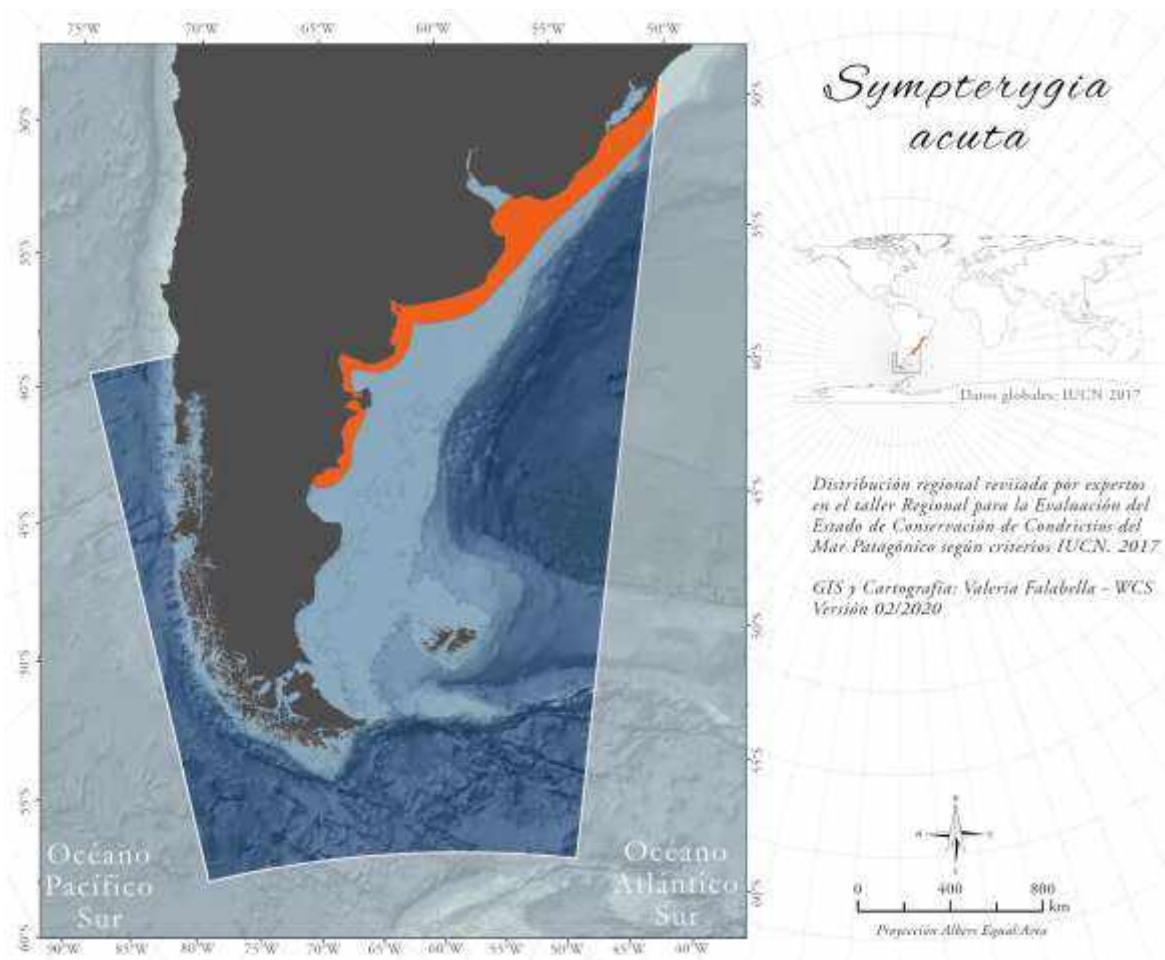
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE -  
*Sympterygia acuta* (Garman, 1877)

**Common Names:** Bignose Fanskate (English), Raya (Spanish; Castilian), Raya Marrón Oscuro (Spanish; Castilian), raia-emplastro (Portuguese), emplastro-bicudo (Portuguese)

## Geographic Range



*Sympterygia acuta* is an endemic coastal species of the Southwestern Atlantic Ocean (Menni and Stehmann 2000). From a zoogeographical approach, Menni and Stehman (2000) consider this species endemic to the 'Provincia Argentina' with its type locality in Buenos Aires Province, Argentina. In the Patagonian Sea, it inhabits from its northern limit at Rio Grande State in Brazil

(30° S) to Bahía Solano, near Comodoro Rivadavia (Chubut, Argentina), this information is confirmed by recreational fishermen, who confirm that the species extends its known distribution to 45° 40 'S (Bovcon *et al.* 2011).

## Population

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In Argentina and Uruguay, based on mixed catch data for skates from 1981 to 2013 in the Argentina and Uruguay Common Fishing Zone (AUCFZ), estimated abundance for skates has declined by 36.3% (Cortés *et al.* 2014). Analysis of the CPUE based on past data for the southern Brazilian platform in Rio Grande do Sul, showed a biomass decline of 74.5% considering the period of 1974 (with values of ~ 33 kg / h) to 2005 (with values of ~ 8 kg / h) (Ferreira *et al.*, 2010).

**Current Population Trend:** decreasing.

## Habitats and Ecology

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The Bignose Fanskate is very common at the center of its distribution and its occurrence decreases towards North and South (Perez Comesaña *et al.* 2011).

The maximum size for this species is 57 cm total length for males and 58.5 cm for females (Pereyra *et al.* 2012; Mabragaña *et al.* 2014).

Size at maturity appears to be decreasing over the last 30 years (Basallo and Oddone 2014). In Brazil, first sexual maturity size shifts from 53 cm of total length in females and 52 cm in males (Queiroz 1986) to 46.1 for males and 44.7 cm for females (Basallo and Oddone 2014). In Argentina, size at maturity for males is 47.8 cm and for females is 47.5 cm (Mabragaña *et al.* 2014). Average fecundity is 52 eggs per female for each laying season and eggs are hatched in captivity after 119–131 days (Mabragaña *et al.* 2014).

*S. acuta* also feeds on the shrimp *Artemesia longinaris* which comprises more than 50% of its diet. Other prey items include Polychaeta, Amphipoda, Cumacea, Isopoda, decapod crustaceans, Mollusca and teleost fish (Queiroz 1986, in Menni and Stehmann 2000).

## General Use and Trade Information

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In Argentina, skates used to be discarded until 1994 when they started to be landed and nowadays they are the first chondrichthyan landed group and one of the most important commercial fish items in the country (Cedrola *et al.* 2005, Dellacasa 2011, SSPyA 2017).

## Threats

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Juveniles and adults (between 150 mm and 400 mm TL) are caught throughout the year by recreational fishermen from the shore and by coastal artisanal fishery operating in Engaño Bay (Chubut, Argentina) (Nelson Bovcon, pers. comm. 2017).

In Puerto Quequén (Buenos Aires Province, Argentina), between 2003 and 2005, a 12% of the total rays caught belonged to this species (Perez Comesaña *et al.* 2011) while, between 2007 and 2008, this number decreased to 5% of the total weight catch (Dellacasa, 2011).

Research cruises carried out in coastal waters of southern Brazil evidenced *Sympterygia acuta* as the most frequent species of elasmobranch occurring in 85% of hauls, mostly neonates. Thus, shallow waters of southern Brazil are a nursery area for this species (Vooren *et al.*, 2005).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

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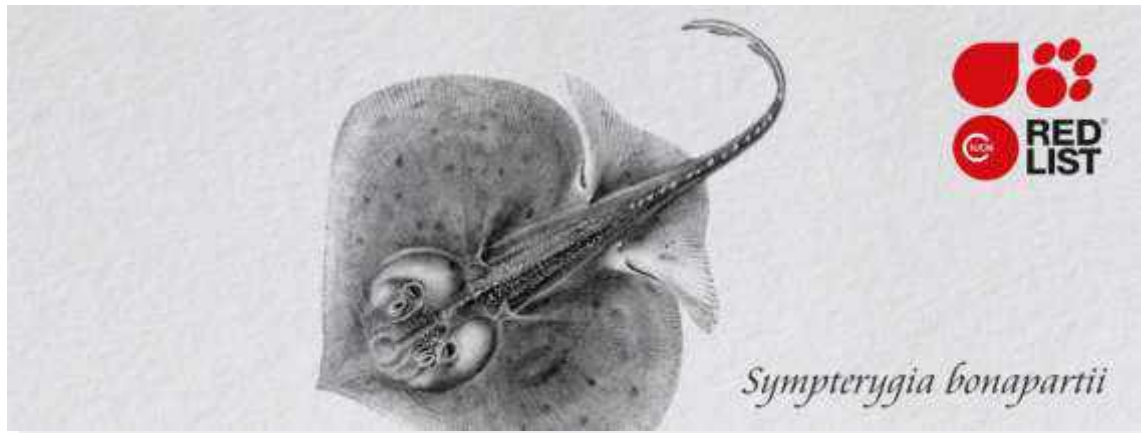
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## NT – Near Threatened, (IUCN version 3.1)

### Assessment Rationale:

The Smallnose Fanskate is distributed in the Patagonian Sea over the continental shelf from southern Brazil to southern Chile in the Pacific in waters up to 100m. Over the past 30-40 years, this species has declined by 95% in southern Brazil. Although no species-specific data is available in Argentina, based on mixed catch data for skates from 1981 to 2014 in the Argentine Uruguayan Common Fishing Zone - AUCFZ, the estimated abundance for mixed skates has declined by 36.6% (from 93,498 t to 58,977 t), of which approximately 20-30% could potentially be part of this species. However, other studies in this area showed that abundance for this species may have increased and stabilized between 2001 and 2008 in the AUCFZ. This species used to be caught in the hake fishery in the San Matias Gulf, Argentina until 2012, when the fleet shifted to target shrimp. This species may have a high recovery rate as high as 88% when discarded and it is generally considered common and abundant. Longevity is 19 years for males and 24 years for females; age of first maturity is 9 years for males and females. This may represent a generation length of 12 -15 years and a potential average of 14-15 years. This species may qualify for Vulnerable, but given its assumed high rate of survival in discards, evidence of changing fisheries which may reduce its capture, expanding range and potentially increased abundances in at least one portion of its range (AUCFZ) it may warrant a lower listing of Near Threatened.

**Assessor(s):** Santos, R.A., Bovcon, N., Chiamonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):**

**Facilitators:** Polidoro, B., Falabella, V.

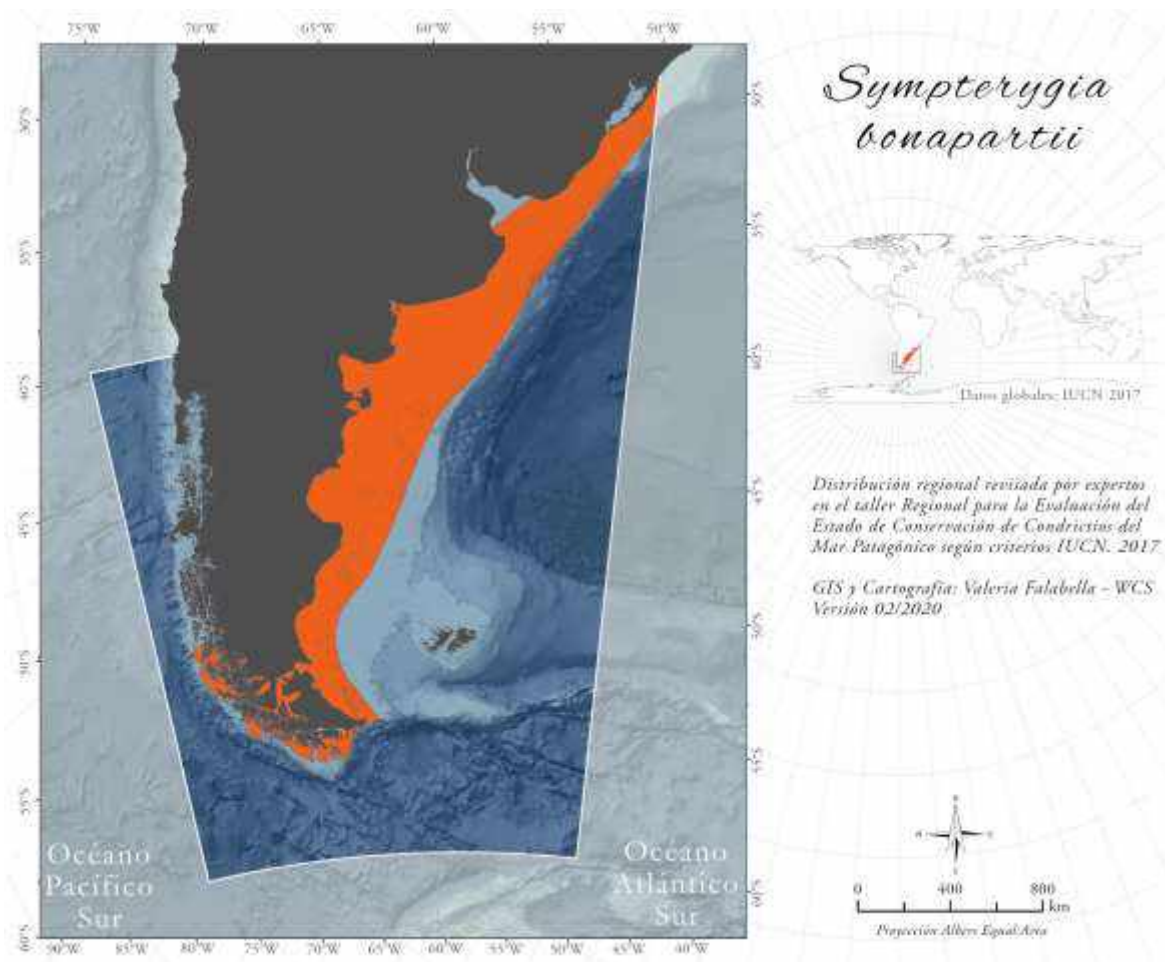
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - ARHYNCHOBATIDAE -  
Sympterygia – bonapartii (Müller & Henle, 1841)

**Common Names:** Raya (Spanish; Castilian), Raya Marmorada (Spanish; Castilian), Smallnose  
Fanskate (English)

## Geographic Range



In the Patagonian Sea *Sympterygia bonapartii* is distributed over the continental shelf from southern Brazil (Figueiredo, 1977), to southern Chile in the Pacific above 100 m in depth (Cousseau *et al.*, 2007, Lamilla and Sáenz, 2003, Estalles, 2012).

## Population

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This species is listed as Endangered in Brazil, where there has been a decline of 95% in biomass based on research investigations from 1980 to 2005 in the southern area of the country (Ferreira *et al.* 2010). A decrease in size at maturity for females of *Sympterygia bonapartii* of the southern coast of Brazil was observed in comparison to previous studies carried out over the last 30 years (Basallo and Oddone 2014).

It is one of the most abundant skates from Uruguay to northern Patagonia (Menni and Stehmann, 2000; Massa *et al.*, 2004; Paesch and Meneses, 1999; Perier *et al.*, 2007). *S. bonapartii* is also one of the most frequent species in the northern sector of the AUCFZ (Paesch, 2017).

Although no species-specific data is available in Argentina, based on mixed catch data for skates from 1981 to 2014 in the Argentine Uruguayan Common Fishing Zone (AUCFZ), estimated abundance for mixed skates has declined by 36.6% (from 93,498 t to 58,977 t (Cortés *et al.* 2014), of which approximately 20-30% could potentially be part of this species. However, other studies in this area showed that abundance for this species may have increased and stabilized between 2001 and 2008 in the AUCFZ (Paesch, 2014). This species used to be caught in the hake fishery in the San Matias Gulf, Argentina until 2012, when the fleet shifted to target shrimp (Estalles, 2012).

There are density estimations for the area covering the zone from Uruguay to El Rincón, Buenos Aires, Argentina (Mabragaña *et al.*, 2002). Density estimations made between 1994 and 1999 in Buenos Aires province showed a stable population tendency (Massa *et al.*, 2004). In the San Matías Gulf (Río Negro province), northern Patagonia, it was recorded a sharp decrease in body size between 1995 and 2005. The maximum size was reduced in almost 10 cm TL and the mode of the size frequency distribution decreased 12 cm TL (Estalles, 2012).

It is one of the most abundant and fished species along the coast of Argentina, caught in bottom trawlers and coastal multispecies fisheries, as well as caught and discarded in the Red Shrimp Fishery (Tamini *et al.* 2006; Estalles *et al.*, 2011, Cedrola *et al.* 2005). This species is commonly caught in coastal multispecies fisheries in Buenos Aires, Province. In this sense, between 1998 and 2000 in Puerto Quequén, 22% of the ray and skate catch was made up of this species (Tamini *et al.* 2006); while between 2003-2005 this rose up to 29% of the landings (Perez Comesaña *et al.* 2011); and continued rising to 32% between 2007 and 2008 (Dellacasa, 2011). This species is caught frequently and discarded, with an estimated 88% recovery rate (based on experimental survival) (Chiaramonte *et al.* 2011). In the bottom trawl fishery of the San Matias Gulf that operated up to 2012, the species was present in the 97% of the port landings assessed, the relative abundance was 35.1% and it contributed with 26.5% of the relative weight among skates during 2007- 2009 period.

There are no data trends on this species from Brazil and Chile.

**Current Population Trend:** Unknown.

## Habitats and Ecology

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It is a benthic species associated to sandy and muddy bottoms. The species is not dependent to a specific habitat as adult. Neonates and juveniles are associated to coastal waters and then they migrate to deeper ones. The presence of neonates and juveniles has been recorded in the outer areas of Bahía Blanca estuary (El Rincón) and Río de La Plata in the Argentine Uruguayan Common Fishing Zone (AUCFZ), as well as the coastal areas of the southern continental shelf of Brazil (Mabragaña *et al.*, 2002; Vooren *et al.*, 2005; Díaz Andrade, 2010). It is especially abundant in the outer portion of the Río de la Plata and El Rincón estuaries (Mabragaña *et al.*, 2002) and in the coastal zone in Punta del Diablo in Uruguay (A. Segura unpublished data). The depth range of the species ranges from 0 m to 100 m (Cousseau *et al.*, 2007).

This species presents sexual segregation (Estalles *et al.*, 2017, Cedrola *et al.*, 2005). Seasonal migrations related with its reproductive activity have been reported (Mabragaña *et al.*, 2002; Estalles *et al.*, 2017) and probably related to avoidance of low winter temperatures (Mabragaña *et al.*, 2002). Nursery areas have been found in Buenos Aires province in the estuaries of the Río de La Plata River and in El Rincón (Mabragaña *et al.*, 2002). These areas are also under intense human activities.

Egg-cases and juveniles are frequently found at nursery areas located near estuaries (Río de La Plata and El Rincón in Buenos Aires province) at depths below 50m (Mabragaña *et al.*, 2002) and southern Brazil (Vooren *et al.*, 2005). Adults achieve seasonal migrations towards these areas (Mabragaña *et al.*, 2002). The egg-laying season is from November to February (Estalles *et al.*, 2017). In captivity the species may lay egg cases at a rate of 0.5 capsules per day and the developmental rate of the embryo inside is around 135 days (Jañez & Sueiro, 2007; 2009).

**Size at first sexual maturity (total length):** Female: Uruguay: 65.5 cm (Oddone and Velasco, 2004); Buenos Aires province: 63.6 cm (Mabragaña *et al.*, 2002); Río Negro province: 59.4 cm (Estalles *et al.*, 2017); southern Brazil: 59.9 cm (Basallo and Oddone 2014). Male: Uruguay: 50-57 cm (Oddone & Velasco, 2004); Buenos Aires province 65 cm (Mabragaña *et al.*, 2002); Río Negro province: 54.5 cm (Estalles *et al.*, 2017); southern Brazil: 58.4 cm (Basallo and Oddone 2014).

**Maximum size (total length):** Females: Uruguay: 79cm; Buenos Aires province: 88 m; Río Negro province: 75 cm (Oddone and Velasco, 2004; Mabragaña *et al.*, 2002, Estalles *et al.*, 2017). Males: Uruguay: 78 cm; Buenos Aires province: 74.6 cm; Río Negro province: 69 cm (Oddone and Velasco, 2004; Mabragaña *et al.*, 2002; Estalles, 2012).

**Spawning mode:** Oviparous.

**Reproductive seasonality (number of months per year):** Annual reproductive cycle with seasonal spawning (Mabragaña *et al.*, 2002; Estalles *et al.*, 2017). In Buenos Aires province, the egg-laying season is from late spring to late summer (Mabragaña *et al.*, 2002). In Río Negro province, the egg laying season is from November to February (Estalles *et al.*, 2017).

Estimated capsules per year in captivity: 60 (Jañez & Sueiro, 2007; 2009; Marilu Estalles pers. comm. 2017).

**Generation length:** Longevity is 19 years for males and 24 years for females. Age of first maturity is 9 years for males and females (Hozbor and Massa 2015). This may represent a generation length of 12 -15 years and the average may be 14-15 years.

**Diet:** the main items are crustaceans and the diet varies according to the size of the individuals, reproductive stage, season and geographic area (Barrera Oro and Maranta, 1996; Sánchez & Prenski, 1996; Paesch, 2000; Sánchez and Mabragaña, 2002; Barbini *et al.*, 2010; Estalles *et al.*, 2016). In the San Matías Gulf, the diet is mainly composed of crabs, followed by osteichthyans (mainly *Engraulis anchoita*) and showed significant differences depending on sex, size group and period of the year (Estalles *et al.*, 2016).

## General Use and Trade Information

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In Argentina, skates used to be discarded until 1994 when they started to be landed and nowadays they are the first chondrichthyan landed group as well as one of the most important commercial fish items in the country (Cedrola *et al.*, 2005, Dellacasa, 2011, SSPyA, 2017). In Brazil, this species used to be landed as "bico astro" and sold domestically and abroad, but since 2014 capture and marketing have been banned (Montealegre-Quijano pers. comm. 2017).

## Threats

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Major threats for this species are fishing mortality, pollution and habitat loss of coastal nursery grounds.

In Uruguay, it is also caught as target by long-liners and bottom trawlers in fisheries directed to skates (Domingo *et al.*, 2008) but the catch volumes are not known due to the fact that skate species are not identified (Laura Paesch, pers comm. 2017).

In Brazil and Argentina, the species is part of the bycatch in the bottom trawl fisheries, targeting vertebrates and invertebrates (Vooren *et al.*, 2005; Schejter *et al.* 2012). In this sense, skate landings have increased significantly from 1993, when skate species became commercially important. During the 2008 - 2009 period commercial catches rounded 24,000 t in Argentina. At present, Argentina is one of the countries with the highest amount of skate landings (FAO, 2010). This species is fished all along its distribution. It is mainly caught as bycatch by bottom trawlers in multispecies fisheries or fisheries targeting bony fishes and the shrimp fishery of the San Jorge Gulf (Cedrola *et al.*, 2005; Massa *et al.*, 2004; Tamini *et al.*, 2006; Paesch & Meneses, 1999; Domingo *et al.*, 2008; Perier *et al.*, 2007; Estalles *et al.* 2017). This species is caught incidentally by the shrimp trawl fishery operating in the San Jorge Gulf (Argentina) with an occurrence frequency of 36% (Góngora *et al.* 2009). There have been hauls in which this species was abundant, capturing both juveniles and adults. Eggs from this species were collected by this fishery and by the small coastal trawlers operating from Puerto Rawson (Nelson Bovcon pers. comm. 2017). This species is also caught by recreational fishermen on the coast of the Chubut province, capturing specimens of 160 mm to 605 mm TL (Nelson Bovcon pers. comm. 2017).

Cedrola *et al.* (2005) presented data about the contribution of this species to the bycatch of the shrimp fishery of the San Jorge Gulf. This species is one of the most landed species by bottom trawlers in Buenos Aires province and the San Matías Gulf (Río Negro province) (Massa *et al.*, 2004; Tamini *et al.*, 2006; Estalles *et al.*, 2017). In the San Matías Gulf this species contributes with 26.5% in weight to commercial landings and about 48% of the females and 61% of the males are immature (Estalles *et al.* 2011).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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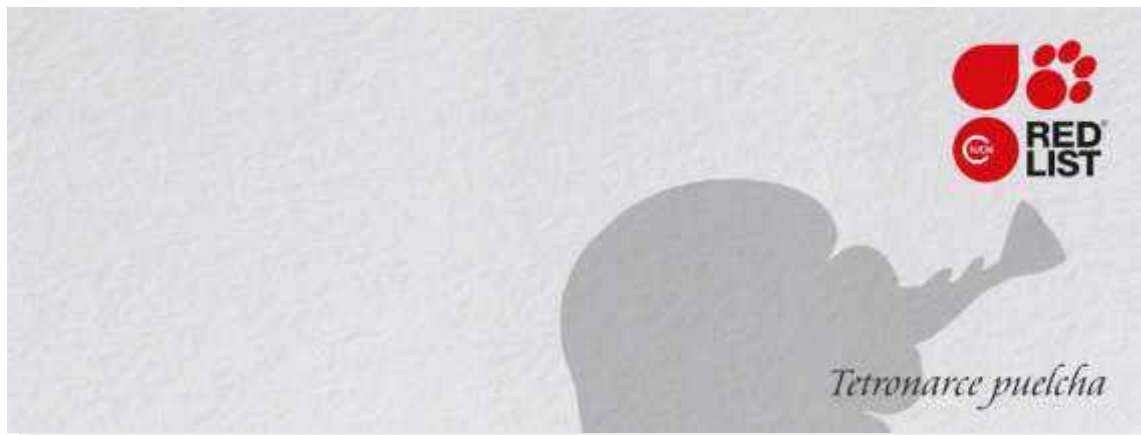
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## DD - Data Deficient, (IUCN version 3.1)

### Assessment Rationale:

The Argentine Torpedo is a moderately large (110 cm), rare electric ray endemic to the Southwest Atlantic. In the Patagonian Sea, it is distributed from southern Brazil to southern Argentina. It is recognized for inhabiting the continental shelf and slope inshore to 600 m (generally in deeper water in Argentina than in Brazil). It is known from only a few published records across a very patchy geographical distribution and, as such, little is known of its biology. It is known that this species usually is taken as bycatch in shelf bottom trawl fisheries of Brazil and discarded. There is no information on trends or biomass. A recent national assessment in Brazil has listed the species as Vulnerable based on life history of similar species, and also in the recent decrease in bycatch records. However, it is not clear and reliable information that historically the species has been discarded. In Argentina, it has not been threatened by fisheries or other human activities.

Given its large size, rarity, patchy and relatively restricted distribution and the operations of bottom trawl fisheries, the species may prove to be of conservation concern with further information. Nevertheless, we do not have enough information to estimate the risk of extinction. The species is rare in Argentina, hardly frequent in Uruguay and more common in southern Brazil, with records of bycatch in the trawling fisheries of Brazil. As such, the species is listed as Data Deficient. Further research is needed to evaluate the impact of the trawling fisheries on the population.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., C., Collier, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

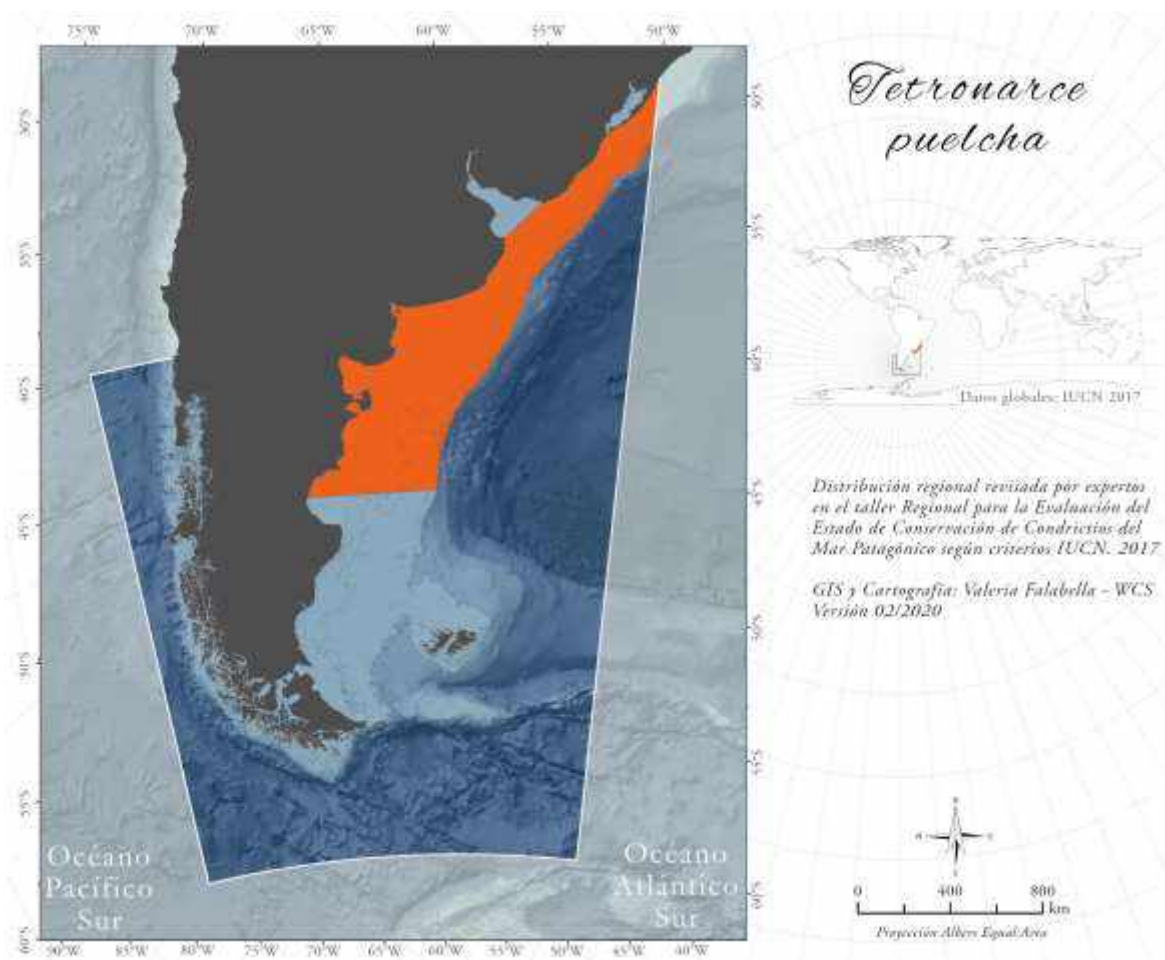
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - TORPEDINIDAE - *Tetronarce* – puelcha (Lahille, 1926)

**Common Names:** Argentine Torpedo (English), Raia Eléctrica (Spanish; Castilian), Raya Eléctrica (Spanish; Castilian), Torpedo (Spanish; Castilian), Raia-eléctrica (Portuguese), Treme-treme (Portuguese).

## Geographic Range



The Argentine Torpedo is an endemic species of the Southwest Atlantic. From a zoogeographical approach, Menni and Stehmann (2000) consider that this species belongs to the '*Provincia Zoogeográfica Argentina*'. In the Patagonian Sea it is distributed from southern Brazil to southern

Argentina. The southernmost record corresponds to 45° 49' S and 66° 20'W, which extends the knowledge of its distribution south, in about 7 degrees latitude, to the San Jorge Gulf (Argentina) (Bovcon *et al.* 2011).

## Population

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This species is known from only a few published records across a very patchy geographical distribution and, as such, little is known of its biology (García *et al.* 2000; Belleggia *et al.* 2008). In 2014, the national assessment in Brazil has listed the species as Vulnerable based on life history of similar species. Also, from data obtained on research cruises in southern Brazil, a reduction on the catches by effort units from 80 to 340 kg/h in 1980s to 10 kg/h in 2005 has been recorded. Thus, more than a 90% decline in this area (Ferreira *et al.*, 2010).

**Current Population Trend:** Unknown.

## Habitats and Ecology

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*Tetronarce puelcha* is a benthic species of the continental shelf and slope waters. Reported inshore to 600 m in depth, apparently it can be found generally in deeper water in Argentina than in Brazil (Menni and Stehmann 2000). Garcia *et al.* (2000) indicate that from 1993 to 2000 only five specimens were recorded in several research cruises captured in Uruguay and in the mouth of La Plata River, Argentina, in a restricted range depth.

This species is moderately large (to at least 110 cm TL), viviparous like other electric rays, but nothing else is known of its biology.

LIFE HISTORY PARAM:

**Age at maturity** (years): Unknown.

**Size at maturity** (total length): From ~65 cm TL (female); From ~60 cm TL (male).

**Longevity** (years): Unknown.

**Maximum size** (total length): At least 110 cm TL.

**Size at birth** (cm): Unknown.

**Average reproductive age** (years): Unknown.

**Gestation time** (months): Unknown.

**Reproductive periodicity:** Unknown.

**Average annual fecundity or litter size:** Unknown.

**Annual rate of population increase:** Unknown.

**Natural mortality:** Unknown.

## Threats

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This species is taken as bycatch in the shelf bottom trawl fisheries of Brazil, where it is caught and discarded at sea, mainly due to the fact that it is considered a menace by fishers, thus post-capture survivorship is probably low (Lessa *et al.*, 1999; Santiago Montealegre-Quijano pers. comm. 2017). Even more, in 2012 an onboard observer recorded 13 individuals during 7 hours of trawling activities (Santiago Montealegre-Quijano pers. comm. 2017). However, there is still a lack of specific catch data in Brazil from commercial fisheries.

In Argentina and Uruguay, it is a very rare species known from a very few specimens, 17 individuals in Uruguay between 1984 and 2016 (Laura Paesch, per. comm. 2017) and in Argentina (García *et al.* 2000; Belleggia *et al.* 2008). The species has not been threatened by fisheries or other human activities yet.

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

Several management fishing measures protect chondrichthyans either directly or indirectly in Argentine. Most chondrichthyan catches take place in what is known as the Argentina Uruguay Common Fishing Zone (AUCFZ) where Total Allowable Catch (TAC) for chondrichthyans was established in 2014 by the Binational Technical Commission (Comisión Técnica Mixta del Frente Marítimo). Only 3 groups of cartilaginous fishes are regulated by a TAC limit each year: the smoothhound *Mustelus schmitti*, the angel sharks *Squatina* spp. and an assemblage of at least 20 species of skates divided into coastal (9 species) and deeper (11 species) catches including *Atlantoraja castelnaui*, *A. cyclophora*, *Rioraja agassizii*, *Sympterygia acuta*, *S. bonapartii*, *Psammobatis bergi*, *P. rutrum*, *P. exenta*, *Amblyraja doellojuradoi*, *Bathyraja brachyurops*, *B. macloviana*, *B. albomaculata*, *Zearaja chilensis* and others.

Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these waters. Particular y, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional



Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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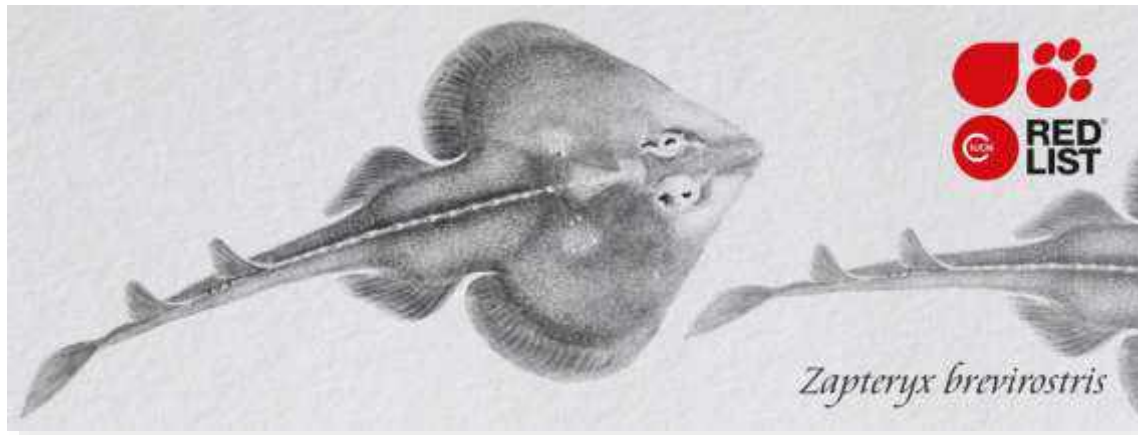
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## CR – Critically Endangered, A2bc, (IUCN version 3.1)

### Assessment Rationale:

The shortnose guitarfish *Zapteryx brevirostris* is an endemic species of the Southwest Atlantic. It used to be a common species in southern Brazil, northern area of the Patagonian Sea, where it inhabits from Rio Grande State (30 S°) to Santa Cruz Province (48 S°), southern Argentina. It is a coastal species found mainly between 0-50 m in depth. Its main threats are bycatch and discard in bottom trawling fisheries from Argentina and Brazil. The threats continue until now in the entire area of distribution. With low reproductive capabilities, this species is very vulnerable to the fishery impact. In Argentina, estimations of biomass reduction between 1995 and 1999 represent an estimated past and inferred future reduction of more than 85% in approximately 24 years (three generational lengths). In Brazil, the reduction of catches by effort units measured between 1985 and 2005 represents an estimation of past reduction of more than 85% over the past 30 years. Given that fishing pressure has not been reduced and the same rate of decline is likely to continue, the species is listed as Critically Endangered for A2bc.

**Assessor(s):** Bovcon, N., Cuevas, J.M., Estalles, M., García, V., García, M., & Montealegre-Quijano, S.

**Contributor(s):** Santos, R.A., C., Coller, M. & Paesch, L.

**Facilitators:** Polidoro, B., Falabella, V.

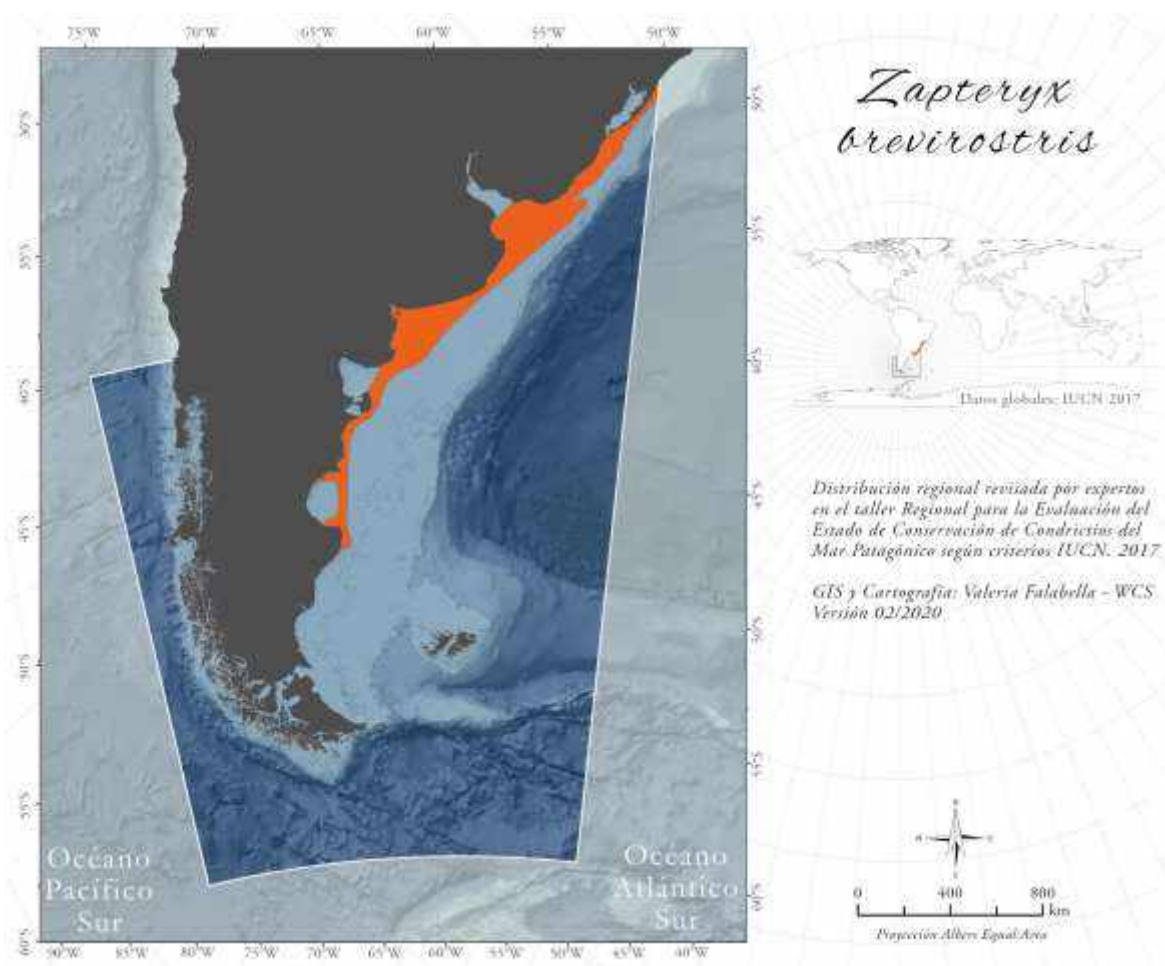
**Compilers:** García, V., & Cuevas, J.M.

## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RHINOPRISTIFORMES - TRYGONORRHINIDAE  
 - *Zapteryx brevirostris* (Müller & Henle, 1841)

**Common Names:** Shortnose Guitarfish (English), Banjo (Portuguese), Raia-viola-de-bico-curto (Portuguese), guitarra chica (Spanish)

## Geographic Range



*Zapteryx brevirostris* is an endemic species of the Southwest Atlantic (Menni & Stehmann 2000, Cousseau *et al.*, 2007, Pinheiro *et al.* 2008). It used to be a common species in southern Brazil, northern area of the Patagonian Sea, where it inhabits from Rio Grande State (30° S) to Santa Cruz Province (48° S), southern Argentina (Nelson Bovcon pers. comm. 2017).

## Population

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Estimates of abundance during spring in the coastal regions of Buenos Aires Province (Argentina) and Uruguay determined a biomass reduction of 86% between 1994 and 1999 (Massa *et al.*, 2004). Analyses of abundance as a function of bottom type, using generalized linear models for data standardization, including more recent data series (1994 to 2004), showed that the population are still decreasing at a rate of 12.6% annually in Argentina and Uruguay (Barbini *et al.* 2011).

In southern Brazil, at the beginning of the 1980s the maximum CPUE varied between 75 and 105 kg / h of trawling. In 2005, the maximum CPUE did not exceed 10 kg / h (data from scientific campaigns published in Ferreira *et al.*, 2010), which indicates a reduction of at least 85% (ICMBio, 2016).

**Current Population Trend:** Decreasing.

## Habitats and Ecology

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*Zapteryx brevirostris* is a medium-sized batoid (up to 65 cm total length) that inhabits coastal waters of the Southwest Atlantic (Cousseau *et al.* 2007). The species lives on a variety of substrates (e.g. mud, rock, tuff, sand, sea grasses) but it prefers sandy bottoms, which may affect its diet composition (Barbini *et al.* 2011). In the Argentine and Uruguayan Common Fishery Zone, the species is commonly caught in research cruises until depths of 50 m, but it could be found also at 90 m in the northern zone (Laura Paesch pers. comm. 2017).

*Zapteryx brevirostris* appears to have a low productivity, as evidenced by a 3-year reproductive cycle (Colonello *et al.* 2011).

**Size at first sexual maturity (total length cm):** female: 50.6 cm total length off Uruguay and north Argentina (Colonello *et al.* 2011). Male: 49.9 cm total length off Uruguay and north Argentina (Colonello *et al.* 2011).

**Maximum size (total length cm):** 65 cm total length (Cousseau *et al.* 2007).

**Reproductive seasonality (number of months per year):** *Zapteryx brevirostris* has a 3-year reproductive cycle with two years of oocyte maturation and a 1-year gestation period (Colonello *et al.* 2011).

**Annual rate of population increase:** -12.6% (Barbini *et al.* 2011)

Age at first parturition is between 5-6 years. Maximum age is 12 years and the generation length is estimated at 8 years (Caltabellotta 2014).

It is a predator that feeds mostly on benthic invertebrates (Castello 1971, Batista 1984, Soares *et al.* 1992), especially polychaetes and cephalochordates, although its diet appears to vary both geographically and seasonally (Barbini *et al.* 2011).

## Threats

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Although *Zapteryx brevirostris* has no commercial value, it is affected by recreational and commercial fisheries, especially coastal bottom trawling fisheries, throughout its range in Argentina, Brazil and Uruguay (Vooren *et al.* 2006, Massa *et al.* 2004, Tamini *et al.* 2006, Colonello *et al.*, 2011). In this sense, sharp declines of its biomass and density have been recorded in Uruguay and northern Argentina (Vooren *et al.* 2006, Barbini *et al.* 2011), as the result of trawling fisheries bycatch captures and discards. In Argentina, in Puerto Quequén, between 1998 and 2000, the species was captured in 17.8% of the hauls and discarded as well (Tamini *et al.*, 2006). Also, its preference for sandy bottoms may expose *Z. brevirostris* to a higher fishing pressure, since sandy bottoms are heavily trawled in Uruguay and northern Argentina (Barbini *et al.* 2011).

In Brazil, it is also threatened by incidental capture by bottom trawling in fish and shrimp fisheries, and artisanal gillnet fisheries (Santos *et al.* 2005; R.A. Santos, Comm. Pers. 2017). Since 2014, the capture and commercialization of this species is prohibited by IN MMA 445 2014, but *Zapteryx brevirostris* is still found in commercial fisheries landings.

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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Over the argentine continental shelf and the Argentine Sea and inside the Argentina and Uruguay Common Fishing Zone (AUCFZ) there are 12 important management fishing areas. These management areas directly or indirectly protect those chondrichthyan species that habit these

waters. Particularly, "El Rincón" is considered a hotspot for chondrichthyans, including early life stages for endemic species as well as a nursery area for *Mustelus schmitti*, *Squatina guggenheim*, *Atlantoraja castelnaui*, *Rioraja agassizi*, *Sympterygia bonapartii* and *S. acuta*. The "El Rincón" coastal marine system includes one management zone and two provincial MPAs: Reserva Natural de Usos Múltiples Bahía Blanca, Falsa y Verde and Reserva Natural de Usos Múltiples Bahía San Blás. At the same time each Argentine maritime province has its own management fishing area to regulate the effort inside their jurisdiction (<12 NM) and marine protected areas. In particular, Chubut has an inter-jurisdictional MPA (Parque Interjurisdiccional Marino Costero Patagonia Austral) in the north zone of the San Jorge Gulf managed by the province of Chubut and the national park service.

In Argentina, Resolutions 4 and 7 of the Federal Fishery Council (2013) established that target fishing of chondrichthyes is forbidden as well as shark finning; all sharks larger than 160 cm should be returned alive to the sea; the use of boat hooks for chondrichthyans is forbidden; specimens caught dead must be declared; when a shark larger than 160 cm is caught dead it should be delivered to the research institute for study; a maximum limit for the landing of skates, sharks and cock fish (*Callorhynchus callorhynchus*), as a whole, is established and equivalent to 50% of the total species caught per take; a maximum limit of landing of skates is established and equivalent to 30% of the total of species caught per take; a maximum limit for the landing of sharks is established and equivalent to 30% of the total number of species caught per take; in the event that a haul is verified with a percentage that exceeds the limits established in the preceding articles, the vessel must move to another area of operation; on board observers should be present on vessels to record frequent captures of chondrichthyes. A management fishing area for chondrichthyans in national waters (> 12 NM), regulated by the Argentina and Uruguay Common Fishing Zone (AUCFZ) protects temporally demersal and benthic coastal chondrichthyans through the exclusion of bottom net trawling activity during 5 months each year from the 1<sup>st</sup> of November to the 31<sup>st</sup> of March in a small area (~1630 NM<sup>2</sup>) since 2010 (Resolución CTMFM N° 9/10).

In Brazil several cartilaginous species are fully protected by law (IN MMA 445 2014) since 2014 including many species that inhabits the Patagonian Sea as *Tetronarce puelcha*, *Squalus acanthias*, *Squatina argentina*, *Squatina guggenheim*, *Squatina occulta*, *Pseudobatos horkelii*, *Zapteryx brevirostris*, *Carcharias taurus*, *Atlantoraja castelnaui*, *Rioraja agassizii*, *Sympterygia acuta*, *Sympterygia bonapartii*, *Gymnura altavela*, *Myliobatis goodei*, *Galeorhinus galeus*, *Mustelus fasciatus*, *Mustelus schmitti* and *Notorynchus cepedianus*. Nevertheless, the impact of this protection action has not been tested yet. There are also some industrial trawl exclusion areas (<12 NM) along southern Brazilian coast in Rio Grande State, that minimize incidental catch of chondrichthyans (Lei estadual Rio Grande do Sul, N° 15223).

Regional efforts should be adopted (e.g. trinational plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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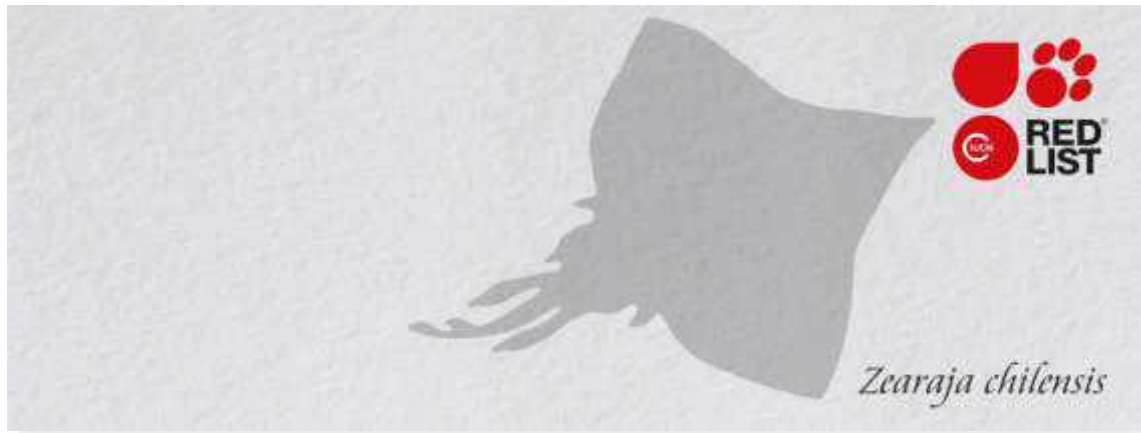


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## VU - Vulnerable, A4bd, (IUCN version 3.1)

### Assessment Rationale:

The Large-nose Ray *Zearaja chilensis* can be found in the Patagonian Sea from southern Uruguay to Chile, over the continental shelf and upper slope and around Malvinas/Falklands Islands. It is a slow growing species that matures between 14 and 18 years old. Over the past 20-25 years, biomass for this species has declined by more than 50% in Chile (from 36°S to 41.30 S), considered a collapsed stock and actually overexploited, although there are now closures for this species since 2010. In Argentina, CPUE (primarily Freezer Ships) has declined by more than 80% since 1994. In Argentina, CPUE has declined by more than 80% since 1994 (20 years). This species is the most landed skate in Argentina, and 90% of landings in at least one area of its range are juveniles. A reduction in size at first maturity was found for this species in the Argentina Uruguay Common Fishery Zone from 83-87 cm to 78.5 cm for males and from 102-106 cm to 81.4 cm in females. Based on past declines in Chile and Argentina, and assuming continued effort for this species in Argentina, it is estimated that there could be at least a 50-60% decline of this species over 60 years (2 generation lengths in past, and 1 in future). However, as it is not sure if pressure for this species will continue over the next 10-20 years, given potential changes in the direction of the fishery, to focus on prawns for example, it is listed as Vulnerable under A4bd.

**Assessor(s):** Acuña, E., Santos, R.A., Bovcon, N., Chiaramonte, G., Coller, M., Cuevas, J.M., Estalles, M., Figueroa, D., García, V., García, M., Montealegre-Quijano, S. & Paesch, L.

**Contributor(s):** Bustamante, C. & Pompert, J.

**Facilitators:** Polidoro, B., Falabella, V.

**Compilers:** García, V., & Cuevas, J.M.

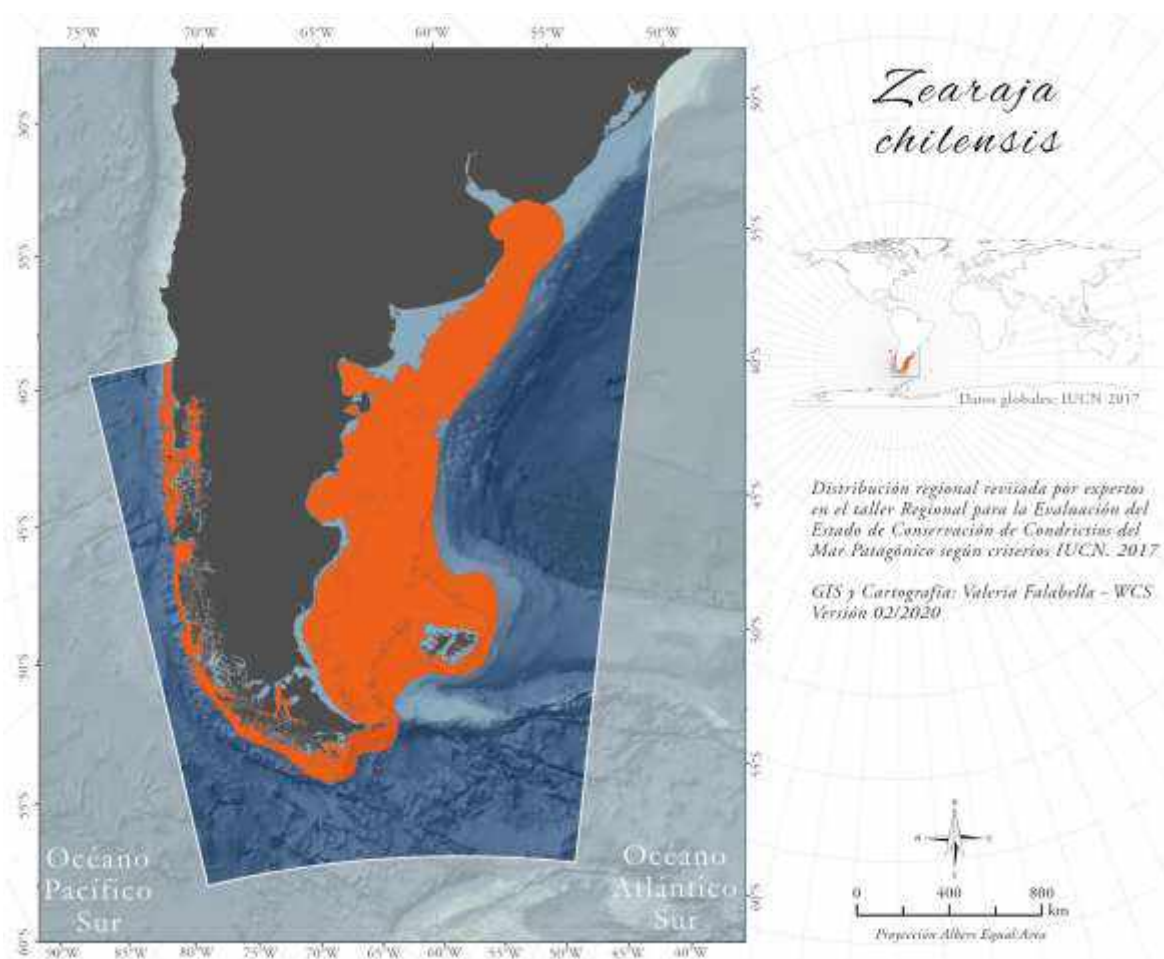
## Taxonomic information

ANIMALIA - CHORDATA - CHONDRICHTHYES - RAJIFORMES - RAJIDAE - *Zearaja chilensis* (Guichenot, 1748)

**Common Names:** Kite Ray (English), Large-nose Ray (English), Raya (Spanish; Castilian), Raya De Ramales (Spanish; Castilian), Raya Picuda (Spanish; Castilian), Raya Roja (Spanish; Castilian), Raya Trompa De Cristal (Spanish; Castilian), Volantín (Spanish; Castilian), Yellownose Skate (English)

**Taxonomic Note:** There are genetic differences between the Atlantic and the Pacific populations. In this sense Izzo *et al.* (2017) found that the individuals over the argentine continental shelf are *Zearaja flavirostris* and those from Chile are *Z. chilensis* with an overlapping zone in the Magellan Strait.

## Geographic Range



The Large-nose Ray *Zearaja chilensis* can be found in the Patagonian Sea from southern Uruguay (34° 35'S) to Chile (40°S) over the Argentine continental shelf and slope and around Malvinas/Falklands Islands (Tamini *et al.*, 2006, Vargas-Caro *et al.*, 2015, Bovcon *et al.*, 2013, Góngora *et al.*, 2009, Ruibal Núñez *et al.*, 2016, PAN, 2009).

## Population

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In Argentina, abundances of this species over the range 45°S – 54°S varied between 2,758 and 40,463 tons during the period 1992 – 2001 (PAN, 2009). Between 2009 and 2016, landings for this species in Argentina have declined from 1330 tonnes to 549 tonnes (SSPyA, 2017), with no change in effort (Gustavo Chiaramonte pers comm. 2017). This species is the most landed ray species in Argentina. Catches of rays in Argentina have declined significantly since 2006, when aggregated ray catch started to be reported by species. CPUE for all rays species caught in Argentina between 1992 and 2015 shows a fluctuating trend until 2005, when CPUE for Freezer Ships strongly declined from an average of 4.5 to less than 1, which is only for this species and 4 other ray species (Gustavo Chiaramonte pers comm. 2017). In Buenos Aires province, in coastal mixed fisheries, this species was found to be the main skate species, of which 90% were juveniles (Colonello and Massa 2016). Between 2005-2007, in the Argentina Uruguay Common Fishery zone (AUCFZ) in commercial fisheries the majority of the specimens of this species were juveniles, of which the size at first maturity may have declined by 10 cm (Silveira *et al.* 2014). This represents potentially at least an 80% decline in this species in Argentine waters over the past 20-25 years (1994-2015) (SSPyA, 2017, Gustavo Chiaramonte pers. comm. 2017). Paesch and Odonne (2008) found a reduction in size at first maturity for this species in the AUCFZ from 83-87 cm to 78.5 cm for males and from 102-106 cm to 81.4 cm in females (Oddone *et al.*, 2005).

In Chile, a decrease in biomass of *Z. chilensis* is well documented since 1979 (Quiroz, 2006). Landings in Chile for this species from 1997 to 2011 have declined significantly until 2010, when a fishing ban was implemented and since then they have risen slightly with subsequent quotas (Enzo Acuña pers comm. 2017). Catches are now regulated by quota and closures in Chile and there may be some refuge for the species in the most remote regions of southern Chile (Enzo Acuña pers comm. 2017). Total and spawning biomasses in Chile were estimated in 40,000 and 25,000 tons, respectively, during the period 1980-1993, in which they were stable (CCT-RDZCS 2016). Between 1992 and 2012, biomasses have been decreasing constantly to its historical minimum and the spawning population is at 10% of the initial values. In Chile, it is considered a collapsed stock at 5% of the  $B_{msy}$  and actually overexploited (CCT-RDZCS 2016).

**Current Population Trend:** Decreasing

## Habitats and Ecology

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The Large-nose Ray inhabits mainly between 50 m and 500 m in depth in Uruguay, Argentina and Chile and between 75 m to 572 m around Malvinas/Falklands Islands.

In Southeastern Atlantic Ocean, females mature at 94.04 cm and males at 83.04 cm of total length (Zavatteri, 2010). Age at maturity is 17,8 years for female and 14.7 years for males (Zavatteri, 2010).

Argentina and the Argentina and Uruguay Common Fishing Zone (AUCFZ): For the males, size at 50% maturity was estimated at 78.5 cm, while for the females this parameter was estimated at 81.4 cm (Paesch & Oddone 2008).

In the Southeastern Atlantic, it is considered a top predator, preys upon large fish as notothenids, hake when adults and isopods and crustaceans when they are juveniles (Belleggia *et al.*, 2016).

A resume of age and size at maturity estimations from the Patagonian Sea is shown below in the life history table.

## Threats

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In the Patagonian Sea, there is heavy fishing pressure across most of the species' distribution, and particularly in the coastal and continental shelf waters of Argentina, fishing pressure on all skate species has increased rapidly due to international demand, with landings rising from <1,000 t prior to 1994 to 17,465 t in 2003 (Cedrola *et al.* 2005). During the period 2008- 2009 commercial skates catches rounded 24,000 t. At present, Argentina is one of the countries with the largest amount of landings of skates (FAO, 2010).

*Zearaja chilensis* is mainly caught as *by-catch* by bottom trawlers in multispecies fisheries or fisheries directed to bony fishes as the argentine hake and invertebrates as the shrimp fishery of San Jorge Gulf or the patagonian scallop fishery (*Zygochlamys patagonica*) (Cedrola *et al.*, 2005; Massa *et al.*, 2004; Tamini *et al.*, 2006; Perier *et al.*, 2007; Estalles *et al.* 2011, Schejter *et al.* 2012). This species is frequently caught by the high seas trawl fishery that operates in the San Jorge Gulf and adjacent waters. With a frequency of occurrence of 64% and being the fourth most important by-catch species in this fishery (Gongora *et al.* 2009) this species is mainly fished in central San Jorge Gulf (between 45°30 and 46°00 S). When it is caught by the coastal fleet at San Jorge Gulf it is landed for fin consumption. It is also captured by the coastal fleet that operates at Rawson port (Isla Escondida area) (Nelson Bovcon *pers. comm.* 2017). Eggs have been also captured by the trawling fishery at San Jorge Gulf (Nelson Bovcon *pers. comm.* 2017). In the bottom trawl fishery of San Matías Gulf (Río Negro province, Argentina) this species contributes with 21.3% in weight to commercial landings and about 96% of the females and 88% of the males are immature (Estalles *et al.* 2011). It has also been caught as *target* species by a long-liner fishery with a maximum allowable catch of 1,800 t per year between 1999 and (PAN, 2009).

In Uruguay, it used to be caught as target species by long-liners in fisheries directed to skates and today it is the major proportion of bycatch in Argentine hake fisheries of the bottom trawling commercial fleet (Paesch & Oddone, 2008, Paesch & Meneses, 1999). In southern Chile, it is mainly caught as a target species by small-scale longline fleets and as by-catch by the industrial bottom trawl fleets that operates in south-central Chile (Quiroz *et al.*, 2006, CCT-RDZCS 2016).

## Conservation

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Chile (2006), Uruguay (2008), Argentina (2009) and Brazil (2014) have adopted their own National Plan of Action for Sharks, skates, rays and chimaeras (NPOA) while for the Malvinas/Falklands Islands there is no NPOA currently in place. In Argentina, effective NPOA implementation requires improved coordination between different national and provincial fishery agencies, research institutions, fishing community and NGOs.

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The Malvinas/Falklands has ratified the Convention on Migratory Species (CMS), which prohibits the targeting of *Lamna nasus* in this region. Occasional by-catches of this species may be processed (if caught and the animal is dead), but they are also commonly released if specimens are still alive.

There are no targeted fisheries for spiny dogfish *Squalus acanthias* or catsharks *Schroederichthys biviatus*, but by-catches do occur and they are most commonly returned to the sea (either dead or alive). Although this is a common practice, there are no specific restrictions about place on the processing of these species yet (Joost Pompert pers. comm., 2017).

Occasional by-catches of skate species (primarily *Amblyraja cf. georgiana*, *Bathyraja papilionifera* and *B. meridionalis*) caught on longlines occur in the *Dissostichus* (toothfish) longline fishery, and licence requirements require hooks to be removed and animals to be released alive. The skate catch-release practice has been part of the longline licence condition at least since 2012 in the run up to the MSC certification of this fishery in 2014 (Joost Pompert pers. comm., 2017). Skate species in the demersal finfish trawl fleet are normally retained as catch, except if animals are small <30cm DW or if they are *Amblyraja doellojuradoi*. Fishery extraction levels are monitored by catch reporting and catch verifications, and more specifically for biological and species composition monitoring, by the observer program. The fleet is not required to report catch by species, but in the last few years there has been an initiative to produce quality identification posters to be introduced on vessels, with a view to report catches to species level better in the future. Currently, however, the level of extraction is monitored as an assemblage and regulated through the setting of fishing effort limits within different zones, with the observer data providing the detail on the species composition, and these are included in the stock assessments (Winter *et al.*, 2015). There are broadly two components considered in the management/conservation of the skate fishery: 1: effort by the targeted skate fishery, and 2. effort by the demersal finfish fleet where skates are caught as a by-catch (e.g. Agnew *et. al*, 2000, Wakeford *et al*, 2004). Stock assessments and management advice being produced around May-June each year with a view to set maximum effort for the forthcoming calendar year bring these two major elements together.

All fleets (squid trawlers, demersal finfish trawlers, skate licence trawlers) have their respective area limitations detailed in their licences and no areas inside the territorial baselines are open to fishing (Joost Pompert pers. comm., 2017).



Regional efforts should be adopted (e.g. trilateral plans of action, Regional Fisheries Management Organizations) to improve the current conservation status of targeted species in the Patagonian Sea.

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