13th MEETING OF THE CONFERENCE OF THE PARTIES
Gandhinagar, India, 17 - 22 February 2020
Agenda Item 27.1

PROPOSAL FOR THE INCLUSION OF
THE SMOOTH HAMMERHEAD SHARK *(Sphyrna zygaena)*
IN APPENDIX II OF THE CONVENTION

Summary:

The Federative Republic of Brazil has submitted the attached proposal for the inclusion of the Smooth Hammerhead Shark *(Sphyrna zygaena)* in Appendix II of CMS.

PROPOSAL FOR THE INCLUSION OF THE SMOOTH HAMMERHEAD SHARK (*Sphyrna zygaena*) ON APPENDIX II OF THE CONVENTION

A. PROPOSAL

Inclusion of the regional population of smooth hammerhead shark, *Sphyrna zygaena* (Linnaeus, 1758), which occurs along Brazil, Uruguay, Argentina EEZs and international adjacent waters, in Appendix 2 of the CMS.

Common name: Smooth Hammerhead shark (Figure 1)

Taxonomic name: *Sphyrna zygaena*

Inclusion of the entire species or only one or more populations? **Brazil, Uruguay and Argentina.**

B. PROPONENT

Brazil

C. SUPPORTING STATEMENT

1. Taxon

1.1 Class: Chondrichthyes, subclass: Elasmobranchii

1.2 Order: Carcharhiniformes

1.3 Family: Sphyrnidae

1.4 Taxon Name: *Sphyrna zygaena* (Linnaeus, 1758)

1.5 Scientific synonyms

1.6 Common name(s):

English: Smooth hammerhead shark
French: Requin-marteau commun
Spanish: Tiburón martillo liso
German: Glatter Hammerhai
Italian: Squalo martello comune
Portuguese: Tubarão-martelo-liso, Cambevota, Cambeva-preta, Panam

Figure 1. Smooth hammerhead shark (*Sphyrna zygaena*). Source: CEPSUL collection, Jorge E. Kotas.

2. Overview

Sphyrna zygaena is a highly migratory species, widespread pelagic shark with an amphitemperate distribution, which occurs along the Brazilian Ecological-economic zoning (EEZ) and adjacent international waters (Kotas et al. 2012; Ebert et al. 2013). Globally, it was assessed as Vulnerable (VU), using IUCN criteria (Rigby et al. 2019). In Brazil smooth hammerheads are targeted by artisanal and industrial fisheries due its highly priced fins and the meat of pups and juveniles are also marketed fresh by the fishmongers in the Southeast Brazilian States (Rio de Janeiro and São Paulo). The species has an unfavourable conservation status, mainly in southern Brazil, because intense fishing mortality over pups is caused by gillnets and trawls operating on shallow waters (≤ 20 m) and over juveniles along the continental shelf (> 20 m and ≤ 200 m). Additionally, adults are exploited by driftnets and longlines along the shelf border and slope (> 200 m). Therefore, the smooth hammerhead is exploited at all life-stages and throughout their migratory circuit (Kotas *et al.* 2012). This includes their inshore-offshore migration, while they are growing from pups to juveniles and as the offshore-inshore migration of pregnant females to pupping areas in shallower waters. This unsustainable exploitation pattern, over different size classes (newborns-juveniles-adults), and the economic pressure caused by the international fin market, is one of the reasons for population declining of the smooth hammerhead in southern Brazil (Kotas *et al.* 2012). In the southwest Atlantic *S. zygaena* conservation would require international agreements with Uruguay and Argentina, because these are the transboundaries countries embracing its latitudinal distribution, and responsible for their catches. Including the smooth hammerhead in the CMS appendix II, would help to improve cooperation between Brazil, Uruguay and Argentina with respect fishing regulations, like non-fishing zones, fishing effort reduction and a control over the international fin market.

3   Migrations

3.1 Kinds of movement, distance, the cyclical and predicable nature of the migration

Smooth hammerhead sharks are highly mobile and may undergo seasonal migrations (toward cooler waters in the summer and the reverse in the winter), with juveniles (of up to 1.5 m in length) forming large aggregations during these migrations (Compagno 1984; Diemer et al. 2011; Ebert et al. 2013).

Several difficulties exist to understand the migration patterns of *S.zygaena* in southern Brazil: lack of funds to do tagging and recapture experiments with the hammerheads; the official statistics do not differentiate the *Sphyrna* species, putting them in a group sometimes called "hammerheads" or simply "sharks" (Arfelli & Amorim, 1994; Kotas, 2004); a lack of an observers program to collect information from the hammerhead shark's species aboard the different fleets (Kotas *et al.* 2012; Amorim *et al.* 2011). However, the few results obtained, showed evidences that off southern Brazil, pregnant females of *S. zygaena* migrate inshore between October and February, most likely for parturition (Amorim *et al.* 2011). Kotas et al. (2012) based on catches of 353 smooth hammerheads from different fishing fleets, observed that the species occurred from inshore shallow waters of 33 m to offshore areas over the slope, with local depths of 3100 m. In this case, most of the catches occurred over the shelf border with local depths of 226 m. Also, the horizontal movements of *S. zygaena* from inshore waters to offshore areas was observed, following the increase in the mean total length (cm) of these hammerheads. The results showed that the pups are in shallow waters (< 20 m), and juveniles spread over the continental shelf. The adults occur offshore, in areas with local depths higher than 200 m. There is a horizontal migration of smooth hammerheads as they grow, from their pupping grounds in shallow waters, passing through the continental shelf, where most of the juveniles are developing and ending in offshore areas over the slope, where most of the adults stay most of their time. The possible pupping grounds and nursery areas for this species are the shallow coastal waters off southern Brazil and Uruguay (Vooren 1997, Vooren and Klippel 2005, Doño 2008).

3.2 Proportion of the population migrating, and why that is a significant proportion

There is no information available for southern Brazil, Uruguay and Argentina. However, research done in other areas around the world, indicate that 100% of the adults, probably sexually segregated, do seasonal migrations. In the North Atlantic, Santos and Coelho (2018) confirmed that smooth hammerhead is a highly mobile species and a migration higher than 6600 km was recorded.

4. Biological data (other than migration)

4.1 Distribution (current and historical)

Sphyrna zygaena is a circumglobal especies, worldwide distributed in temperate to tropical waters, between 59°N and 55°S (CITES 2013; Ebert et al. 2013). It is the most tolerant of temperate waters of hammerhead species (Compagno 1984). In the southwestern Atlantic, *S. zygaena* range extends from Brazil to southern Argentina (Compagno 1984; Cortés et al. 2012) (Figure 2).
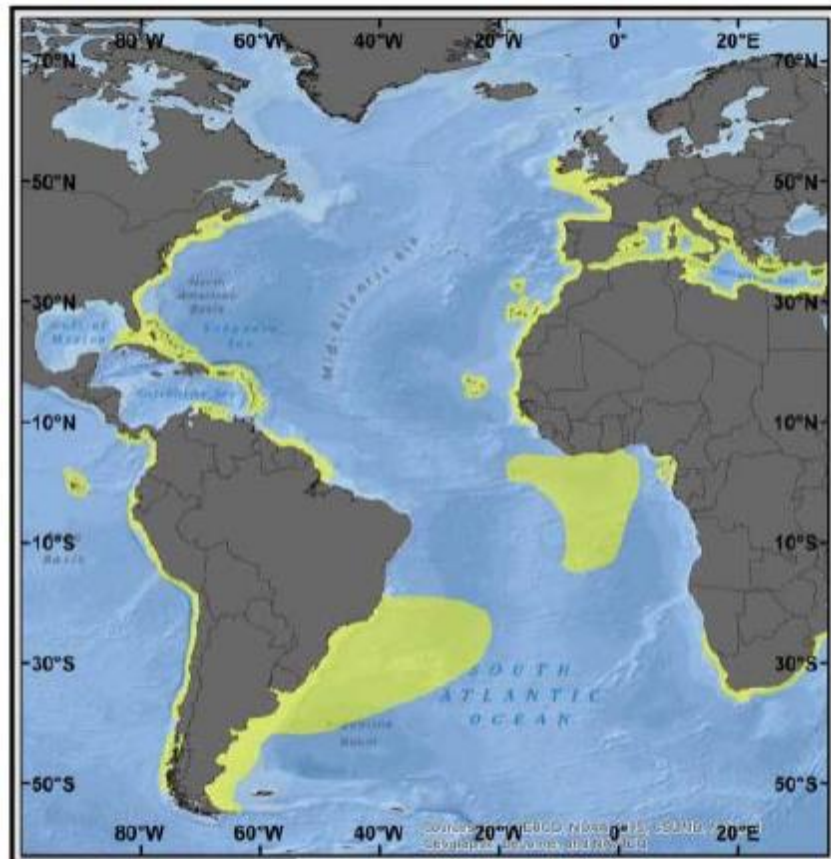
Figure 2 – Range of *Sphyrna zygaena* in the Atlantic Ocean and Mediterranean Sea (Source: Cortés *et al.* (2012))

4.2 Population (estimates and trends)

In terms of actual estimates of abundance, there is very little information available, with only occasional mention of the species in historical records. Although more countries and regional fishery management organizations (RFMOs) are working towards better reporting of fish catches down to species level to provide data for establishing population trends, catches of smooth hammerhead sharks have and continue to go unrecorded in many countries, including Brazil. Many catch records that do include hammerhead sharks do not differentiate between the *Sphyrna* species or shark species in general (Jiao *et al.* 2009; Baum and Blanchard (2010); Kotas *et al.* (2012)). These numbers may also be likely under-reported as many catch records reflect dressed weights instead of live weights, or do not account for discards (Vooren & Klippel, 2005; Miller, 2016). With respect to general trends in population abundance, multiple studies indicate that smooth hammerhead sharks have likely experienced population declines over the past few decades. However, many of these studies suffer from very low sample sizes and a lack of reliable data due to the scarcity of the smooth hammerhead sharks in the fisheries data (Miller, 2016; Myers et al. 2007). Also, Hayes (2007) and Kotas *et al.* (2012) remark that the species is thought to be less abundant than the scalloped and great hammerhead sharks. For example, along the southern Brazilian coast, the proportion of *S. zygaena* found by Kotas *et al.* (2012) in the industrial bottom gillnet fishery was 20%, and for *S. lewini* 80%. Jiao et al. (2011) estimates that *S. lewini* comprise

up to 70-80% of the hammerhead complex. As such, trends in the hammerhead complex, particularly the estimated magnitudes of decline, more likely reflect the trends in the scalloped hammerhead shark abundance within a region rather than the rarely observed smooth hammerhead shark. On the other hand, considering only the 20% proportion of smooth hammerhead found by Kotas *et al.* (2012) in southern Brazil, it was observed a declining trend in the yields of *S. zygaena* caught by the commercial gillnets and longliners based in Itajaí, Santa Catarina State, for the period 2000-2012 (UNIVALI/CTTMar – 2001 – 2013) (Figure 3).
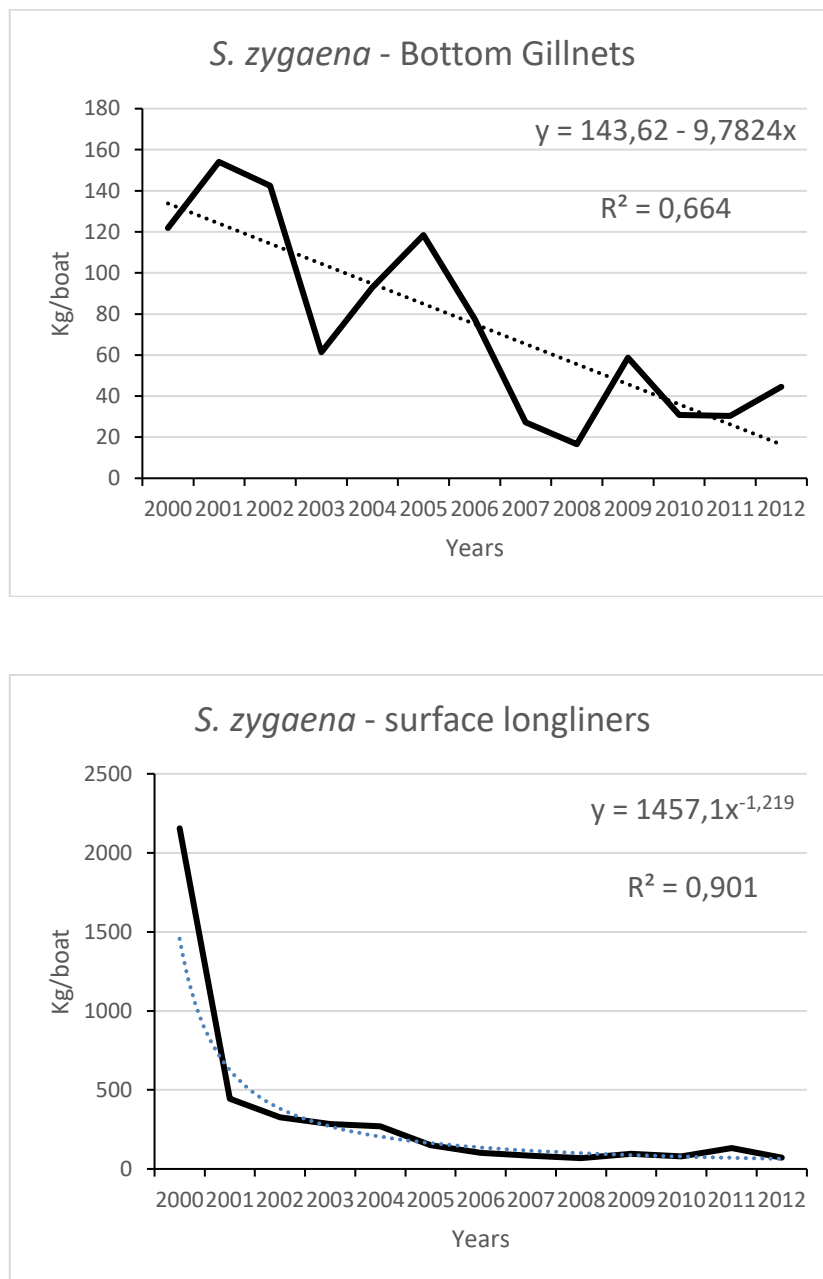

$$y = 143,62 - 9,7824x$$

$$R^2 = 0,664$$

$$y = 1457,1x^{-1,219}$$

$$R^2 = 0,901$$

Figure 3 – Yields (kg/boat) of *S. zygaena* caught by the commercial bottom gillnets and surface longlines, based in Itajaí – SC, which operated along the southern Brazilian coast, during the period 2000 – 2012. Solid lines – Yields; dotted lines – fitted models. (UNIVALI/CTTMar – 2001 – 2013).

For the southern coast of Brazil, analyzes of the fishery statistics between 2000 and 2010 (UNIVALI / CTTMar 2001 - 2011) for the hammerhead category (*Sphyrna* spp.) also showed significant declines in total catches (kg) in various important fisheries highlighting: pair trawl = -99%; pelagic gillnet = -25%; bottom gillnet = -60%; bottom longline = -80%; pelagic longline = -99%; double trawl = -99% (Figure 4). The institution responsible for these data was the only in Brazil to continue collecting fishery data in the 2000s and 2010s (Brazil's fishery statistics ceased to exist in 2007). It is in Itajaí (Santa Catarina State), which is the port responsible for receiving / processing approx. 50% of the national fish landings (Rodrigo Barreto, personal communication in Brazilian Red Listing process).
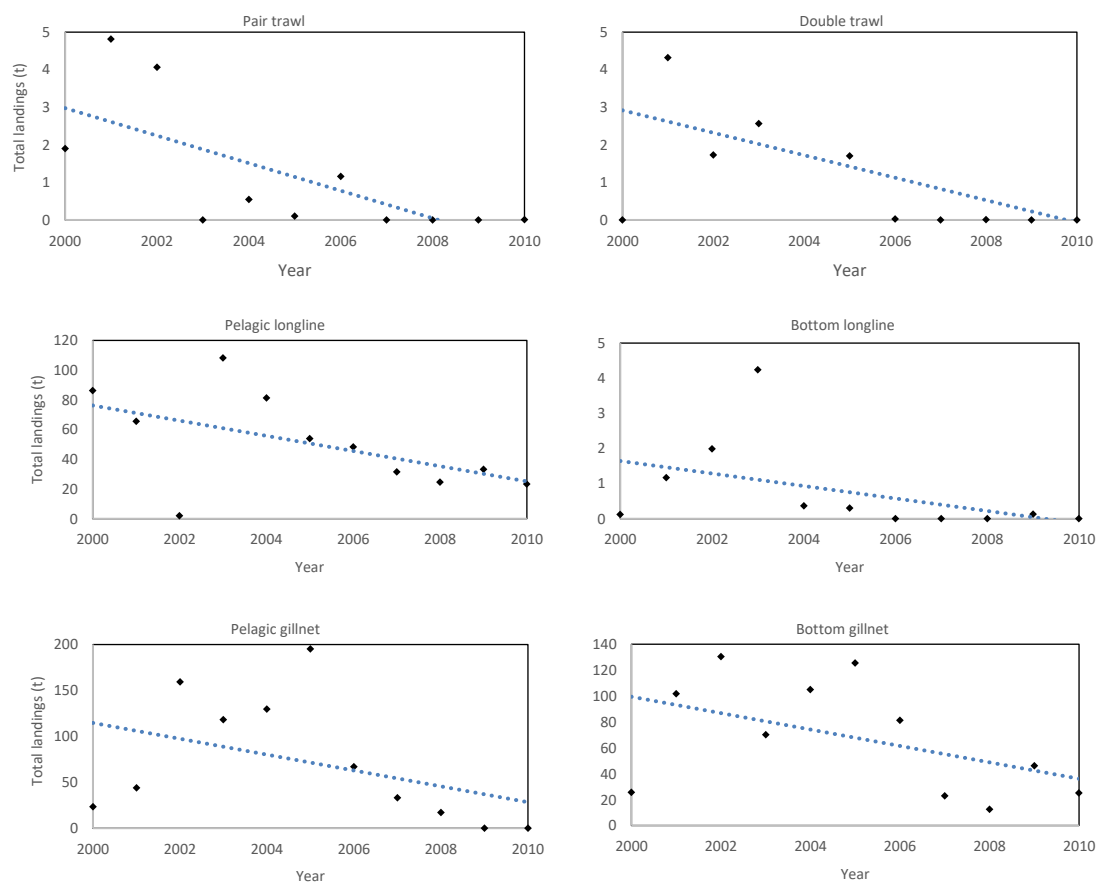

Figure 4 – Trends in total landings (kg) for the hammerhead category (*Sphyrna* spp.) caught by different industrial fleets based in Santa Catarina State, between 2000 and 2010 (UNIVALI/CTTMar – 2001 – 2011).

Barreto *et al.* (2016) analysing data from pelagic longliners operating in the South Atlantic, also observed a 32% decline in the standardized CPUE of hammerhead sharks between 1979 and 2007, and 98 % decline between 1998 and 2011.

4.3 Habitat (short description and trends)

The smooth hammerhead shark is a coastal-pelagic and semi-oceanic species and generally occurs close inshore and in shallow waters, most commonly in depths of up to 20 m (CITES 2013). However, the species may also be found over continental and insular

shelves to offshore areas in depths as great as 200 m (Compagno 1984; Ebert et al. 2013). In fact, Clarke et al. (2015) note that *S. zygaena* is likely the most oceanic of the hammerhead species, leaving the coastal environment at around 2-3 years of age. *S. zygaena* was also observed in freshwater in the Rio de la Plata estuary in Uruguay (Doño 2008, Domingo in prep.). Nursery areas and juveniles have been reported in coastal waters off Uruguay from mid-Rio de la Plata to the border with Brazilian waters from November do March at temperatures of 16 - 23°C and salinities of 12-27 ups (Doño 2008, Domingo in prep.). In south Brazilian coast, the parturition season seems to occur during summer (December and January), with newborns size estimated at 50 cm (Vooren *et al.* 2005). *S. zygaena* is the most common hammerhead shark species caught in Uruguayan waters, and the most tolerant to temperate waters (Compagno, 1984, De Mello *et al.* 2016).

Off southern Brazil, pregnant females of *S. zygaena* migrate inshore between October and February, most likely for parturition (Amorim *et al.* 2011). Kotas et al. (2012) observed that the species occurred from inshore shallow waters of 33 m to offshore areas over the slope, with local depths of 3100 m. The pups are in shallow waters (< 20 m), and juveniles spread over the continental shelf. The adults occur offshore, in areas with local depths higher than 200 m. There is a horizontal migration of smooth hammerheads as they grow, i.e., from their pupping grounds in shallow waters, passing through the continental shelf, where most of the juveniles are developing and ending in offshore areas over the slope, where most of the adults stay most of their time. The possible pupping grounds and nursery areas for this species are the shallow coastal waters off southern Brazil and Uruguay (Vooren 1997, Vooren and Klippel 2005, Doño 2008).

4.4 Biological characteristics

The smooth hammerhead shark is a long-lived, slow-growing and late maturing species (Miller, 2016). Individuals can reach lengths of 5 m (400 kg), but the mean size ranges between 2.5-3.5 m (CITES 2013; Rosa et al. 2017). In the Atlantic, females reach maturity between 247-288 cm Total Length (Castro & Mejuto 1995). Conversely, males mature at a smaller size than females, i.e. 210-250 cm TL (Hayes, 2007). With respect longevity, in the eastern equatorial Atlantic Coelho *et al.* (2011) aged females up to 18 years and males 21 years, but the longevity seems to be higher, because the bigger fishes (> 233 cm total length) were not caught in this study. The median age at maturity would be 9 years (Cortes et al. 2012). *S. zygaena* is viviparous placentotrophic, with a gestation of 10-11 months (White *et al.* 2006) and annual reproductive periodicity (Cortés *et al.* 2012). Southern Brazil and Uruguayan coastal waters are considered pupping grounds and nursery areas for the smooth hammerhead (Sadowsky 1965, Vooren & Klippel 2005, Costa & Chaves 2006, Kotas *et al.* 2012, CITES 2013, Bornatowsky et al. 2014). Litter sizes range between 20 to 50 pups, with a mean of around 33 pups, although this number can be higher due to abortion upon capture (Bigelow & Schroeder 1948; Stevens 1984; Castro & Mejuto 1995; Kotas 2004, Vooren& Klippel 2005). Parturition occurs in summer, with average length at birth 49-64 cm (Vooren & Klippel 2005). During the first four years of its life *S. zygaena* use to growth an average of 25 cm per year and latter slowing down (Coelho *et al.* 2011; Rosa *et al.* 2017). In the Atlantic, the growth rate parameter (k) ranged between 0.06-0.09 year^{-1} for males and females; L$_\infty$ = 285 cm FL

for males and L_∞ = 293 cm FL for females. However, there is uncertainty with respect study parameters, and further research is needed (Coelho et al. 2011, Clarke et al. 2015, Rosa et al. 2017). Cortes *et al.* (2012) estimated for the North Atlantic the Generation Time of 13.4 years and Productivity (r, intrinsic rate of population increase, yr^{-1}) as 0.225. For the southern Brazilian coast Vooren *et al.* (2005) considered a Generation Time superior than 30 years.

4.5 Role of the taxon in its ecosystem

S. zygaena is a high trophic level predator (trophic level = 4.2; Cortés (1999)) and an opportunistic feeder on teleosts, small sharks, skates, stingrays, dolphins, sea snakes, crustaceans and cephalopods (Nair & James 1971; Compagno 1984; Bornatowski *et al.* 2014; Sucunza *et al.* 2015). In coastal waters off southern Brazil, analysis of juvenile smooth hammerhead shark stomachs showed a predominance of cephalopods (including *Doryteuthis* spp., *Lolliguncula brevis*, and *Loligo spp*.) and teleosts (*Harengula clupeola*) (Bornatowski et al. 2007; Bornatowski et al. 2014). There is very little information on habitat utilization of smooth hammerhead sharks (Miller, 2016). In southern Brazil, Kotas *et al.* (2012), Vooren & Klippel (2005), showed the importance of shallow waters (< 20 m) as pupping grounds and nursery; the continental shelf for feeding of the juveniles and the slope in oceanic areas for the mating and feeding of adults.

5. Conservation status and threats

5.1 IUCN Red List Assessment (if available)

Global IUCN assessment: **Vulnerable A2bd+3bd+4bd** (Casper, *et al.* 2005)

Last Global IUCN assessment (2019): **Endangered A2bd** (Rigby *et al.* 2019)

Rationale: The Smooth Hammerhead (*Sphyrna zygaena)* is a large (to 500 cm total length) coastal and semi-oceanic pelagic shark, wide-ranging in temperate and tropical seas to depths of at least 200 m, possibly 500 m. Population growth rates of 0.225 per year are among the fastest of the known pelagic sharks and the fastest of the hammerhead species. The Smooth Hammerhead is caught globally as target and bycatch in coastal and pelagic commercial and small-scale longline, purse seine, and gillnet fisheries, and is generally retained for the fins, and sometimes the meat. It has undergone steep declines in the Atlantic prior to management measures, where slow recovery may be occurring, lesser declines in the south Pacific, and increases in the Indian Ocean. The weighted global population trend estimated a median reduction of 64.9%, with the highest probability of >80% reduction over three generation lengths. However, due to the uncertainty in some of the catch data and large differences in trends between regions, expert elicitation of judgement inferred a global population reduction of 50-79%, based on abundance data, levels of exploitation, and the likely ability of the population to recover quicker than other hammerhead species due to its faster population growth rate. The Smooth Hammerhead is therefore assessed as Endangered A2bd.

Brazilian IUCN assessment: **Critically Endangered A4bd (**ICMBio/MMA 2018).

5.2 Equivalent information relevant to conservation status assessment

The smooth hammerhead shark occurs along the Brazilian coast, from Piauí to Rio Grande do Sul States (Gadig 2001; Soto 2001). The main threats to the species are the gillnets and bottom trawl activities, causing the mortality of pups and juveniles on the continental shelf. Additionally, catches of adults by gillnets and longliners on the shelf border and oceanic environment use to happen. Between 1989 and 2008, offshore driftnet fishing of adults and juveniles caused a decline of more than 90% in the relative abundance of hammerheads in southern Brazilian coast. After this period, the fishery collapsed. The fishing activities in pupping and nursery grounds also showed similar declines for the period 2000-2009. Due this high decline levels, *S. zygaena* was regionally assessed as Critically Endangered (CR) A4bd. The income of individuals from the neighbor countries (Uruguay and Argentina) is not considered an important factor that could improve the condition of the Brazilian population, due the high fishing intensity in the area (ICMBio/MMA, 2018).

5.3 Threats to the population (factors, intensity)

5.3.1. Habitat modification and climate changes

There is very little information on specific habitat (or patches) used by smooth hammerhead sharks. For example, habitat deemed necessary for important life history functions, such as parturition, breeding, feeding, and growth to maturity, is currently unknown for this species. Although potential nursery areas for the species have been identified in portions of its range, there is no information that these areas are at risk of destruction or directly impacting the extinction risk of smooth hammerhead populations. The highly migratory and opportunistic behavior of the smooth hammerhead sharks, give them the ability to shift their range or distribution to remain in an environment conducive to their physiological and ecological needs, providing the species with some resilience to the effects of climate change (Miller, 2016; Chin *et al.* 2010). The smooth hammerhead shark range is comprised of open ocean environments occurring over broad geographic ranges. Although dispersal rates are currently unknown, there is no reason to believe that they are low within the range of *S. zygaena*. While the available data suggest a potentially patchy distribution for the species, given the relative absence of physical barriers within their marine environments (compared with terrestrial or river systems) and the shark's highly migratory nature, with tracking studies that indicate its ability to move long distances, it is unlikely that insufficient genetic exchange or an inability to find and exploit available resource patches are risks to the species (Miller, 2016).

5.3.2. Overexploitation

The Smooth Hammerhead is caught globally as target and bycatch in pelagic commercial and small-scale longline, purse seine and gillnet fisheries. Most of the catch is likely taken as bycatch of industrial pelagic fleets in offshore and high-seas waters. It may also

be captured in coastal longlines, gillnets, trammel nets and sometimes trawls, particularly in areas with narrow continental shelves (Camhi *et al.* 2008, Martinez-Ortiz *et al.* 2015).

The species is generally retained for the fins (Clarke *et al.* 2006a, Clarke *et al.* 2006b, Dent and Clarke 2015, Fields *et al.* 2017), unless regulations prohibit retention. Under-reporting of catches in the pelagic and domestic fisheries is likely (Dent and Clarke 2015). High at vessel mortality of 71% was estimated on Portuguese longlines in the Atlantic (Coelho *et al.* 2012). The post-release mortality varies by pelagic species and is higher for injured released sharks; it has been reported as 100% for the closely related Scalloped Hammerhead (*Sphyrna lewini*) in purse seines (Eddy *et al.* 2016). The species is taken in beach protection programs that target large sharks with high mortality in the beach mesh nets in New South Wales of ~95% prior to 2010 (Dudley and Simpfendorfer 2006, Simpfendorfer *et al.* 2010, Reid *et al.* 2011).

Commercial and artisanal fisheries, driven by the fin trade are the main causes of overexploitation for the smooth hammerhead shark (Miller, 2016). The species is taken as target or bycatch, by several gear types, i.e., pelagic and bottom longlines, handlines, gillnets, purse seines, traps and bottom trawls. The species is target for their high-quality and large fins, used for shark fin soup. On the other hand, some countries, consume the meat domestically, like Brazil, where the smooth hammerheads are preferred over scalloped hammerheads (Amorim *et al.* 2011). It is noteworthy that the current volume of traded meat and products is insignificant when compared to the volume of fins in the international market (CITES 2013). These sharks presented high mortality rates after being caught in fishing gears (61 – 98 %) and low post-capture survival, around 6% (Cliff & Dudley 1992; Braccini *et al.* 2012; Coelho *et al.* 2012; Fernandez-Carvalho *et al.* 2015). Off southern Brazilian coast, *S. zygaena* had a 47% at-vessel mortality rate in tuna longline sets (Kotas *et al.* 1999).

In the southern Brazilian coast, the artisanal gillnets, recreational (rod and reel, handlines) and industrial trawl fishing, operating within inshore areas and on the continental shelf, cause fishing mortality over pups and juveniles of *S. zygaena*. Moreover, the industrial gillnet and longline fisheries operating throughout the continental shelf and adjacent oceanic waters threat the larger juveniles and adults of the species (Kotas 2004; Vooren & Klippel 2005; Kotas *et al.* 2012; CITES 2013). However, it is unclear the real magnitude of the impact of the catches on the smooth hammerhead shark, because all the hammerhead species are lumped together in the available fishing statistics, and there is an underestimate of the catches during the sea operations, due the absence of sea observers and the practice of shark finning aboard (Vooren and Klippel 2005; Kotas *et al.* 2012; Miller, 2016). However, the available *S. zygaena* specific fisheries data indicated that the smooth hammerhead shark comprise a small proportion of the total hammerhead catch, with estimates between <1 to 20% (Sadowsky 1965; Vooren and Klippel 2005; Kotas *et al.* 2012). On the other hand, considering only the 20% proportion of smooth hammerhead found by Kotas *et al.* (2012) in southern Brazil, it was observed a declining trend in the landings of *S. zygaena* caught by the commercial gillnets and longliners based in Itajaí, Santa Catarina State, during the period 2000 - 2012 (Figure 5).

S. zygaena - Bottom Gillnets
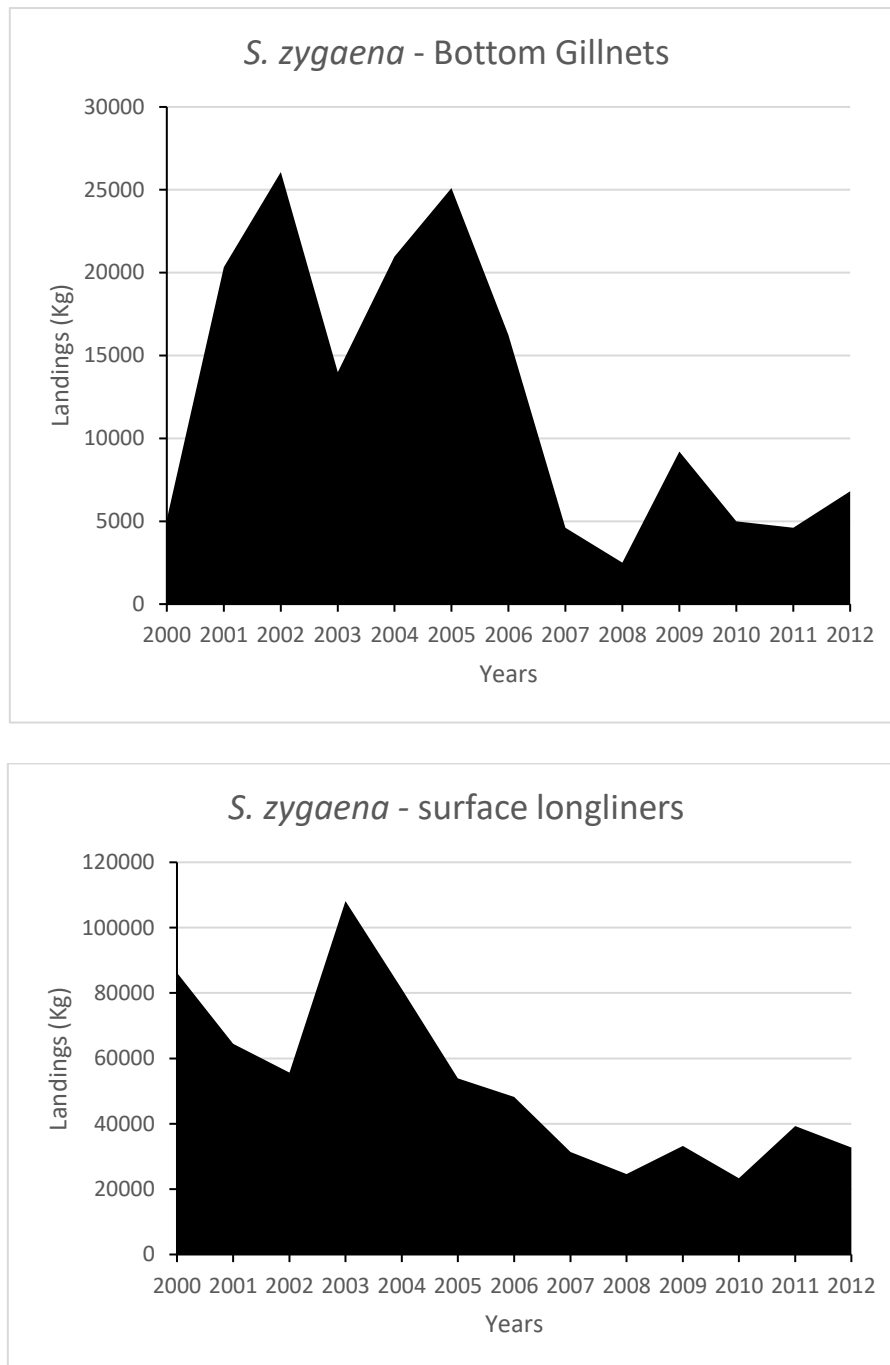

S. zygaena - surface longliners

Figure 5 – Landings (kg) of *S. zygaena* caught by the commercial bottom gillnets and surface longlines, based in Itajaí – Santa Catarina State, which operated along the southern Brazilian coast, during the period 2000 – 2012.

Amorim *et al.* (1998) observed a proportion of hammerheads (particularly *S. lewini* and *S. zygaena*) >5% of the total number of sharks caught by the commercial longliners based in Santos, São Paulo State, which operated off southern Brazil. In this case, *S. zygaena* represented approximately 40% of the hammerhead catches. In another study, Hammerheads comprised 6.3% the total shark caught in weight by the same fleet, for the period 2007-2008 (Amorim *et al.* 2011). However, in this latter study *S. zygaena* comprise 65% of the total hammerhead catch in number. Most of the smooth

hammerheads were juveniles (67%) and adults (33%), distributed in depths between 200 and 3000 m.

In southern Brazil, *S. zygaena* is also caught by artisanal net fisheries. The gillnets operate up to 30 m deep, close to shore, in shallow water. The catches are composed mainly by juveniles. Costa & Chaves (2006) observed along the coast between Paraná and Santa Catarina States, that the smooth hammerhead sharks were mainly caught in the Spring, but the abundance was low (only 25 individuals for the period 2001-2003). Conversely, Bornatowski *et al.* (2014) registered higher quantities of *S. zygaena* (77 juveniles in the same area, with sizes ranging from 67.1 – 185 cm total length). In this case, smooth hammerheads comprise around 38.5% of the observed catch of hammerheads by the artisanal gillnet fishery. The difference (61.5%) was composed of *S. lewini*. Finally, Vooren & Klippel (2005) monitoring artisanal fisheries (gillnets, cable nets and beach seines) along the southernmost Brazilian state (Rio Grande do Sul), found a lower proportion of *S. zygaena* in the hammerhead catches in number, i.e. between 1-1.8%. The distribution of the smooth hammerhead seems to be patchy and highly uncertain along the southern Brazilian coast. The low proportion of *S. zygaena* does not appear to be caused by overexploitation of the species, as surveys from over three decades ago also indicate a low occurrence of the species, particularly in comparison to *S. lewini* (Vooren & Klippel 2005). This phenomenon was also observed along the oceanic areas throughout the Atlantic Ocean by Coelho *et al.* (2012).

Overall, all life stages of the smooth hammerhead shark are susceptible to the fisheries operating in southern Brazil (Kotas *et al.* 2012). However, the degree to which these fisheries are contributing to the species' extinction risk is highly uncertain. Where species-specific data is available, the regional and local information above indicates that smooth hammerhead sharks tend to be a rare occurrence, observed (for the most part) only sporadically in the fisheries data and in low numbers (Miller, 2016). Given their relatively high price and popularity in the Hong Kong fin market, there is concern that many smooth hammerhead sharks may be either targeted or caught as incidental catch but kept for the fin trade as opposed to released alive, as ICCAT recommended. The shark fin trade has also led to many instances of illegal fishing of sharks, and specially with respect the hammerheads.

5.4 Threats connected especially with migrations

Off southern Brazil, pregnant females of *S. zygaena* migrate inshore between October and February, most likely for parturition (Amorim *et al.* 2011). Kotas et al. (2012) observed that pups are in shallow waters (< 20 m), and juveniles spread over the continental shelf. The adults occur offshore, in areas with local depths higher than 200 m. There is a horizontal migration of smooth hammerheads as they grow, i.e., from their pupping grounds in shallow waters, passing through the continental shelf, where most of the juveniles are developing and ending in offshore areas over the slope, where most of the adults stay most of their time. The possible pupping grounds and nursery areas for this species are the shallow coastal waters off southern Brazil and Uruguay (Vooren 1997, Vooren and Klippel 2005, Doño 2008).

In the southern Brazilian coast, the artisanal gillnets, recreational (rod and reel, handlines) and industrial trawl fishing, operating within inshore areas and on the continental shelf, cause fishing mortality over neonates and juveniles of *S. zygaena*.

Moreover, the industrial gillnet and longline fisheries operating throughout the continental shelf and adjacent oceanic waters threat the larger juveniles and adults of the species (Kotas 2004; Vooren & Klippel 2005; Kotas *et al.* 2012; CITES 2013).

5.5 National and international utilization

The main product from the species that is traded is the fins (CITES 2013). Hammerhead fins are among both the dominant shark species in the fin trade and the preferred species for shark fin soup (Clarke *et al.* 2006a, Dent and Clarke 2015, Fields *et al.* 2017). Three species of hammerhead shark, Smooth Hammerhead, Scalloped Hammerhead (*S. lewini*) and Great Hammerhead (*S. mokarran*), collectively accounted for 4% of the fin imported in Hong Kong in 2014 (Fields *et al.* 2017). While a demand for other shark products (including liver oil, hides, meat, teeth and jaws) has existed since the early 1900s, beginning in the 1980s, the focus shifted to fins primarily due to the increasing demand for shark fin soup (Biery and Pauly 2012; Almerón-Souza *et al.* 2018). Hammerhead fins are one of the most valuable in the international market. In 2003, smooth hammerhead shark fins fetch prices as high as $88/kg (Abercrombie et al. 2005).

In the Hong Kong fin market, *S. lewini* and *S. zygaena* are mainly traded under a combined market category called *Chun chi*, and found in a 2:1 ratio, respectively (Abercrombie et al. 2005; NMFS 2014a). *Chun chi* is the second most traded category, comprising around 4-5% of the annual total fins (Clarke et al. 2006a). Based on data from 2000-2002, Clarke et al. (2006b) estimated that around 1.3-2.7 million individuals of scalloped and smooth hammerhead sharks (biomass of 49,000-90,000 tons) were traded in this market each year.

By 2003-2004, both global catches of chondrichthyans and trade in shark fins had peaked, and, despite the continued expansion of the Chinese economy, in the following years (2008-2011), quantities leveled out at around 82-83% of the peak figure (Dent and Clarke 2015; Eriksson and Clarke 2015; Figure 6).

FIGURE 3
World trade in shark fins, 1976–2011

Legend:
— Shark fin imports, quantity
— Shark fin exports, quantity
- - - Shark fin imports, value
- - - Shark fin imports, value
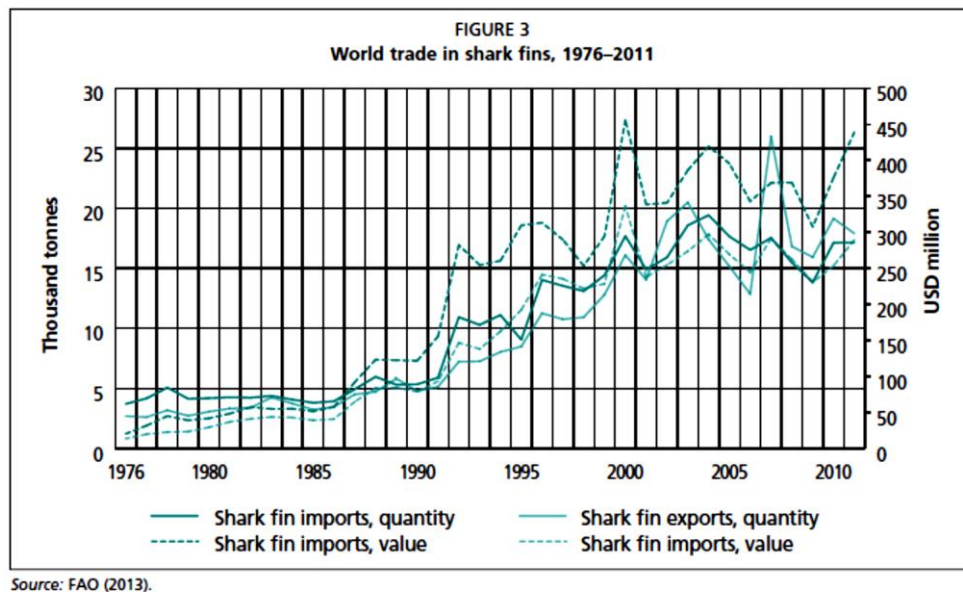
Source: FAO (2013).

Figure 6 – Trends in the global trade in shark fins (including exports and imports) from 1976 to 2011 (Source: Dent and Clarke 2015).

In 2012, the trade in shark fins through China, Hong Kong Special Administrative Region (SAR), saw a decrease of 22% from 2011 figures, indicating that recent government-led backlash against conspicuous consumption in China, combined with global conservation momentum, appears to have had some impact on traded volumes (Dent and Clarke 2015; Eriksson and Clarke 2015).

While smooth hammerhead shark meat is preferred over the other hammerhead species, in general, hammerhead meat is considered essentially unpalatable due to its high urea concentration which requires more intensive processing and preparation for consumption (Vannucinni 1999). Furthermore, as smooth hammerhead sharks tend to have relatively low survival rates after being caught by various fishing gears (including longlines and gillnets), a change in market demand (from fins to meat) would not necessarily change the species' mortality rates in commercial fisheries.

6. Protection status and species management

6.1 National protection status

Due the fact that by the Brazilian IUCN assessment *S. zygaena* was considered Critically Endangered (ICMBio/MMA 2018), the species now is included in the National Action Plan for the Conservation of Marine Sharks and Rays Threatened to Extinction (ICMBio 2014). Therefore, along the Brazilian Jurisdictional waters, the species is prohibited to be caught, transshipped, landed and marketed by the Ministry of Environment Regulation n° 445/2014. However, the enforcement of this legislation is difficult due to the existence of IUU fishing, consumption by local communities, resistance of the fishing sector due the international fin market, and logistic monitoring difficulties.

In Brazil, driftnets are prohibited, and the extension of the bottom gillnets are regulated by the Ministry of Fisheries and Aquiculture/Ministry of Environment Regulations n°11/2012 and n°12/2012 respectively. Also, in southern Brazil, trawlers are prohibited to operate at distance less than 1.5 – 3 nautical miles from the coast, a measured used

to protect the nurseries and breeding grounds of many elasmobranch species, including the smooth hammerhead shark. However, the trawl and gillnet fishing activities persist in these shallow waters.

Finning is prohibited in Brazil, through the Ministry of Fisheries and Aquiculture/Ministry of Environment Regulation n° 14/2012, that stablished that all the sharks landed should have all the fins attached to their carcasses.

6.2 International protection status

International Commission for the Conservation of Atlantic Tunas (ICCAT) in 2011 developed recommendation 10-08 which specifically prohibits the retention, transshipping, landing, sorting, or selling of hammerhead sharks, other than bonnethead sharks, caught in association with ICCAT fisheries. However, there is an exception for developing coastal nations for local consumption if hammerheads do not enter international trade. The problem with this recommendation is that most of the hammerhead species arrive death on the deck, because their survival levels are very low when hooked or caught by the nets. Therefore, in most of the cases is difficult to release them alive.

Since September 14, 2014, scalloped, smooth, and great hammerhead sharks are also listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Appendix II includes species not necessarily threatened with extinction, but for which trade must be controlled to avoid exploitation rates incompatible with species survival. Unfortunately, some countries do not separate the hammerhead statistics by species, being also incomplete for several years. This condition does not allow to assess the Catch Per Unit Effort (CPUE) trends, to indicate that international trade is not detrimental to species survival (NDF).

The family Sphyrnidae is listed on Appendix I of Highly Migratory Species, of the UN Convention on the Law of the Sea. This means that states need to cooperate over the management of the fisheries that catch *S. zygaena* as target or bycatch, improving data collection and stock assessments.

The increasing shark finning bans adopted by states (e.g. USA, Australia, Brazil), European Community (EU) and regional fisheries organizations (e.g. ICCAT, IOTC, IATTC, WCPFC), need enforcement to be effective.

The IPOA-Sharks (FAO) was an important driving force to start movements throughout de fishing nations for the conservation and management of highly migratory species, as the case of smooth hammerhead shark. To reach their targets, these plans need support and agreement from the fishing sector.

6.3 Management measures

In Brazil a National Action Plan for the Conservation and Management of Sharks and Rays is on the run, following similar procedures and methodology used by de IPOA-Sharks from FAO. The first five-year cycle (2012-2019) is finishing and the main advances were related with the increase in number and size of marine protected areas, environmental education and research. The creation of big marine protected areas embracing the seamounts chain of Trindade-Vitória and the Islands of Fernando de Noronha, Rocas Atoll, and the seamounts of Saint Peter and Saint Paul will help to

protect the migration, mating and feeding areas for adults of *S. zygaena*. The efficiency to protect these two big areas will depend on the surveillance systems used (e.g. VMS, sea observers). Also, another several marine protected areas distributed along the Brazilian coast would help to protect the pupping grounds and nursery areas of the smooth hammerhead sharks. Conversely, the most difficult task of the plan is how to reduce the fishing mortality over pups, juveniles and adults, caused by different types of gear (trawls, gillnets, longlines, handlines, rod and reel) along the continental shelf and slope, and this point will depend on agreements between the Brazilian Ministry of the Environment, Ministry of Agriculture and Ministry of Foreign Affairs. At the same time Chico Mendes Institute for Biodiversity Conservation (ICMBio) is developing an integrated monitoring system of the elasmobranch catches, along the Brazilian coastal states. However, there isn't a national sea observers program working effectively which could help Brazilian authorities to know the levels of catches for *S. zygaena*.

6.4 Habitat conservation

The study of the horizontal movements of *Sphyrna lewini* and *Sphyrna zygaena* and their exploitation pattern by different fisheries (trawls, gillnets, longliners) along southern Brazilian coast, showed the necessity for the hammerheads to have non-fishing zones for the protection of their pupping grounds, juveniles and adults. These protected areas need to embrace different depth strata, from the shallow areas where the neonates occur (< 20 m depth), passing through juveniles 'zone over the continental shelf (< 200 m), and finally reaching the slope where the adults use to stay for mating and feeding purposes (< 1000 m). These protected areas called "Biodiversity Corridors", would also allow the pregnant hammerhead females to migrate from the upper slope to the shallower waters over the continental shelf (< 20 m) which are the parturition zones (Vooren & Klippel, 2005; Kotas *et al.* 2012). Due the fact that some fisheries operating along the Brazilian coast are multispecific, it is recommended to implement non-fishing zones.

6.5 Population monitoring

At a federal level, Chico Mendes Institute for Biodiversity Conservation (ICMBio), with the help of its research centers, is developing a monitoring program along the Brazilian Coast (Called "Monitora"), to assess the catches of marine-estuarine elasmobranchs by the different types of fishing gear. The registry of smooth hammerhead catches is included in this program. The program consists to identify places where sharks and ray's species are landed, obtain data about fishing effort and catches, perform biological sampling and if possible, conduct some fishing cruise with sea-observers. The data obtained will help to assess the exploitation levels of *S. zygaena* and depending on the quality of the information, could help to understand the spatial-temporal distribution of the species, its conservation status, pupping grounds and nursery areas. Also, biological sampling will help to study the age and growth, reproduction, and population structure of the species for stock assessment purposes. Along the southern coast of Brazil, industrial and artisanal fisheries are also monitored by this "Monitora" program, whose activities are managed by one of the ICMBio Research Centers (CEPSUL), located in Itajaí, Santa Catarina State.

7. Effects of the proposed amendment

7.1 Anticipated benefits of the amendment

Global IUCN assessment considered the smooth hammerhead shark **Vulnerable** and Brazilian IUCN **Critically Endangered**, an unfavorable conservation status caused mainly by fishing activities of multiple fleets throughout all the species distribution and ontogenetic development. The inclusion of the species in the Appendix II, would help to better control the catch, landings and market processes of *S. zygaena* in the southern coast of Brazil. The inclusion would also increase the possibilities of getting funds for research projects involving several biological aspects of the species (e.g. growth, reproduction, mortality, migrations).

In the southwest Atlantic *S. zygaena* conservation could be improved with international agreements with Uruguay and Argentina, because these are the transboundary countries embracing its latitudinal distribution, and responsible for their catches. It is also important to consider that the smooth hammerhead shark is a priority species for the National Action Plans of Brazil and Uruguay (Domingo *et al.* 2015; Sumário executivo do PAN-Tubarões 2016), occurring also in Argentinean waters (Consejo Federal Pesquero 2009). Including the smooth hammerhead in the CMS Appendix II, would increase the chances of an international cooperation between Brazil, Uruguay and Argentina with respect fishing regulations, non-fishing zones, fishing effort reduction and a control over the international fin market. Also, scientific cooperation between the countries would be strengthened.

7.2 Potential risks of the amendment

No potential risks to smooth hammerhead shark conservation are foreseen from an Appendix II listing.

7.3 Intention of the proponent concerning development of an Agreement or Concerted Action

- International agreement Brasil-Uruguay-Argentina for the conservation and management of the smooth hammerhead shark, *Sphyrna zygaena,* through their National Action Plans, considering the species included in the CMS Appendix II.

- The Focal Points for the nominated taxon could be one of the ICMBio Research Centers (CEPSUL), located in Itajaí, Santa Catarina State, Brasil, with the help of TAMAR (Florianópolis - SC).

8. Range States *UNEP/CMS/Resolution 11.33 (Rev.COP12)/Annex 2*

Brasil, Uruguay and Argentina (breeding and migrating ranges);

9. Consultations

Important to consult Uruguayan and Argentinean government to support this proposal, as *S. zygaena* conservation could be improved with joint action with Brazil, Uruguay and Argentina

10. Additional remarks

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