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Tenth Meeting of the Scientific and Technical Advisory Committee (STAC) of the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) in the Wider Caribbean Region

Virtual, 30 January – 1 February 2023

PROPOSAL OF THE KINGDOM OF THE NETHERLANDS AND THE REPUBLIC OF FRANCE FOR LISTING ON SPAW PROTOCOL ANNEX II THREE SPECIES OF HAMMERHEAD SHARKS – GENUS *SPHYRNA*

This meeting is being convened virtually. Delegates are kindly requested to access all meeting documents electronically for download as necessary.

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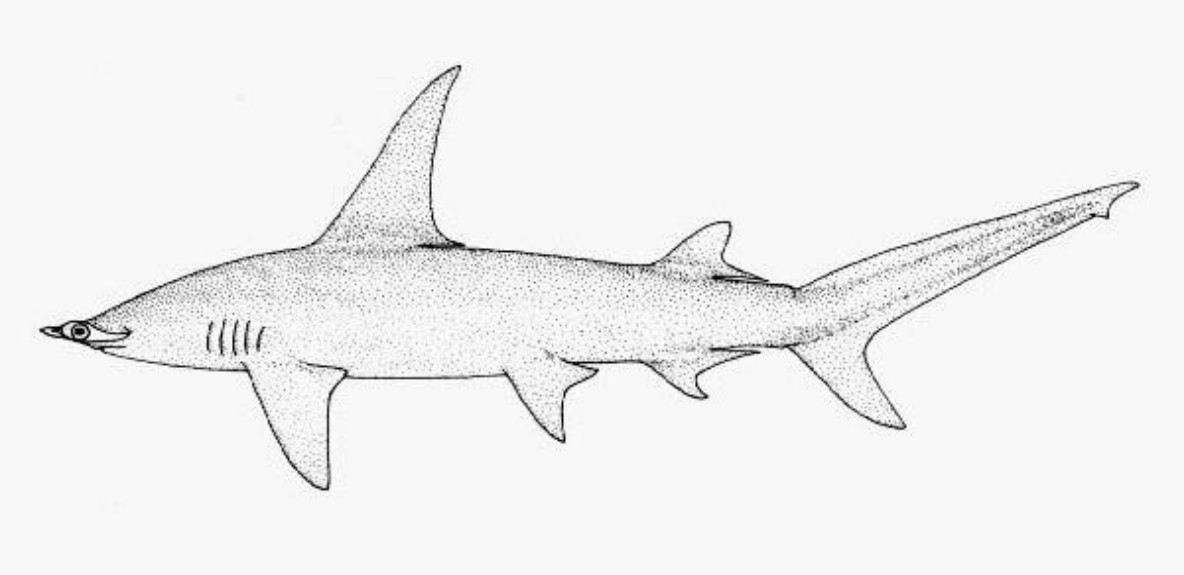
Contents

1 Overview

1. The justification for Annex II listing of Scalloped Hammerhead (*Sphyrna lewini),* Great Hammerhead (*Sphyrna mokarran*) and Smooth Hammerhead (*Sphyrna zygaena*) is presented together as these are look-a-like species for which both data collection as well as conservation action are best assessed jointly. The similar overall appearance as well as cephalofoil and fin shape of these three species of hammerhead sharks has often led to confusion in identifying catches at species level. As a result, catch numbers are typically reported at the genus level (*Sphyrna*) which prevents assessing fishing mortality at species level. This translates directly to management and conservation actions as failing to have the same level of protection for all three species would create loopholes for allowing unwanted mortality to continue.



2. *S. lewini, S. mokarran and S. zygaena* are circumglobal shark species residing in coastal warm temperate and tropical coastal seas, all three are present in the SPAW area year round although the main area of abundance for *S. zygaena* seems to be outside the Caribbean region. *S. lewini* has among the lowest recovery potential when compared to other species of sharks. Population growth rates determined for populations in the Pacific and Atlantic Ocean are low (r=0.08-0.10 yr-1) and fall under the low productivity category (r<0.14) as defined by Food and Agriculture Organization of the United Nations (FAO). Abundance trend analyses of catch-rate data specific to *S. lewini* and to a hammerhead complex of *S. lewini*, including *Sphyrna mokarran* and *Sphyrna zygaena*, have reported large declines in abundance ranging from 60-99% over recent years. A stock assessment using information on catch, abundance trends and biology specific to *S. lewini* from the northwest Atlantic Ocean indicate a decline of 83% from 1981-2005. Standardized catch rates from the U.S. pelagic longline fishery show declines in Sphyrna spp. of 89% between 1986

and 2000 and declines of 76% between 1992 and 2005. Hammerhead fins are highly valued and they are being increasingly targeted in some areas in response to increasing demand for shark fins. Hammerhead shark species *S. zygaena* and *S. lewini* were found to represent at least 4-5% of the fins auctioned in the Hong Kong shark fin market.

3. In 2017 the Sphyrnidae family was added to Annex III of the SPAW protocol, which should have been a call to action to design consistent management throughout the Wider Caribbean region. Five years later the unfortunately conclusion has to be that efforts have not been adequate to lead to recovery of populations of all three species, although evidence from the US fisheries in the Gulf of Mexico and North West Atlantic seem to indicate that implementing strict management measures will have a positive effect on populations. The logical next step is therefore to uplist the species within this genus to Annex II of the protocol which would increase the protection for these species o the level needed. It would also align the management to the existing retention ban for these species within the ICCAT management area.

4. The vulnerability to overexploitation and low recovery potential due to a low intrinsic growth rate and slow reproduction, and ongoing catches in the Northwest and Western Central Atlantic Ocean. The exact amount of fishing pressure and the corresponding mortality rate is hard to define as species-specific inferences cannot easily be made, because of the difficulties in distinguishing between *S. zygaena*, *S. lewini*, and *S. mokarran*. The precautionary approach should be taken because of these constraints, and the dire situation of the conservation status of hammerhead sharks, which is assessed by IUCN as Critically Endangered for *S. mokarran* and *S. lewini* and Vulnerable for *S. zygaena*. The family of hammerheads is listed under Appendix II of CITES, Appendix II of Convention on Migratory Species (CMS) and in Annex I of the United Nations Convention on the Law of the Sea (UNCLOS) and should therefore be subject to protective management in throughout its range.

5. In summary, the three hammerhead species are eligible for listing under SPAW Annex 2 (II) according to the criteria 1 (decline in population),2 (precautionary approach) 4 (IUCN listing), 5 (CITES and CMS listing) and 6 (the importance of regional cooperation to protect the species).

2 Species information

2.1 Scientific and common names of the species

6. The family of Sphyrnidae, or hammerhead sharks, with primarily the following three species:

- Smooth hammerhead *Sphyrna zygaena*
- Great hammerhead *Sphyrna mokarran*
- Scalloped hammerhead, *Sphyrna lewini*

7. Taxonomy:

8. **1.1** Class: Chondrichthyes (Subclass: Elasmobranchii)

9. **1.2** Order: Carcharhiniformes

10. **1.3** Family: Sphyrnidae

11. **1.4a** Genus, species: *Sphyrna lewini* (Griffith and Smith, 1834)

12. **1.4b** Genus, species: *Sphyrna mokarran*(Rüppell, 1837)

13. **1.4c** Genus, species: *Sphyrna zygaena*(Linnaeus 1758)

14. **1.5a** Scientific synonyms: Cestracion leeuwenii (Day 1865), Zygaena erythraea (Klunzinger 1871), Cestracion oceanica (Garman 1913), Sphyrna diplana (Springer 1941), Sphyrna couardi (Cadenat, 1951), Zygaena lewini (Griffith & Smith, 1834)

15. **1.5b** Scientific synonyms: *Zygaena mokarran* (Rüppell, 1837)

16. **1.5c** Scientific synonyms: none

17. **1.6a** Common names: English: scalloped hammerhead, bronze hammerhead shark, hammerhead, hammerhead shark, kidney-headed shark, scalloped hammerhead shark, and southern hammerhead shark,

18. French: requin marteau halicorne

19. Spanish: tiburón-martillo, cachona, cornuda común

20. Portuguese: tubarão martelo, tubarão-martelo-entalhado, cambeva, cambeva-branca, cambevota, vaca, vacota, panã

21. Papiamentu: tribon martin, krus

22. **1.6b** Common names: Great Hammerhead, Squat-headed Hammerhead Shark, Hammerhead Shark

23. French: Sorosena, Grand Requin-marteau, Marieau Millet, Poisson Pantouflier

24. Spanish: Cornuda, El Tiburon, Guardia Civil, Pez Martillo, Tiburon

25. Papiamentu: tribon martin, krus

26. **1.6c** Common names: Smooth Hammerhead

27. French: Requin-marteau commun, Requin marteau lisse

28. Papiamentu: tribon martin, krus

2.2 Estimated population of species and its geographic ranges

All three species

29. Misidentifications as well as the lack of species-specific data for hammerhead sharks result in many studies examining trends for the Sphyrna-complex (*Sphyrna* spp.) This is a combination of scalloped hammerhead *Sphyrna lewini*, great hammerhead *Sphyrna mokarran* and *Sphyrna zygaena* other species in the genus (Bonnethead Shark - *S. tiburo*, Carolina Hammerhead – *S. gilberti* and Smalleye Hammerhead - *S .tudes*) are not considered look-a-like as these species are much smaller and almost never appear in fisheries where the larger three species are caught.

30. An accurate abundance estimate for this species on a global scale is not feasible at this stage, based on the available data for different regions. This supports the argument that the listing should not be for specific species but the species complex as a whole to prevent identification difficulties.

31. Within the Caribbean Sea, research efforts are made to assess distribution, habitat use, population structure, and trophic ecology of sharks using acoustic telemetry, satellite tagging methods, genetic analysis and stable isotope research. The occurrence and relative abundance of sharks are investigated using Baited Remote Underwater Videos (BRUVs). The skillful use of modern techniques such as genetic analyses, telemetry, and Baited Remote Video monitoring can help circumvent the often-low abundance (and low sampling) of many species, and has helped develop powerful new insights and introduce new techniques to the region where capacity and technology have lagged behind (Espinoza et.al, 2020).

Sphyrna lewini

32. S. lewini is a coastal and semi-oceanic hammerhead shark that is circumglobally distributed in coastal warm temperate and tropical seas. It occurs over continental and insular shelves, as well as adjacent deep waters and occur from the surface and intertidal areas to at least 275 m depth. Throughout its wide ranging, there is genetic evidence for multiple subpopulations, with a separate subpopulations in the Northwest and Western Central Atlantic, Eastern Pacific, Indo-West Pacific and Eastern Atlantic). Where catch data are available, significant declines have been documented: both species-specific estimates for S. lewini and grouped estimates for Sphyrna spp. combined suggest declines in abundance of 50-90% over periods of up to 32 years in several areas of its range, including the northwest Atlantic (Rigbly et.al; 2019).

33. Interviews with fishermen also suggest declining trends. Similar declines are also inferred in areas of the species' range from which specific data are not available, but fishing pressure is known to be high. Estimates of trends in abundance are available from two long-term research surveys conducted on the U.S. east coast, both of which indicate this species has undergone substantial declines in this region (98% between 1972 and 2003, and an order of magnitude between 1975 and 2005). A third survey comparing catch rates between 1983/84 with those in 1993-95 showed a decline of two-thirds, while a survey beginning more recently showed increases in catch rates of juveniles. Standardized catch rates from the U.S. pelagic longline fishery show declines in Sphyrna spp. of 89% between 1986 and 2000 (according to the logbook data) and declines of 76% between 1992 and 2005 (according to observer data). The other information for this species from this region comes from Belize, where it has been heavily fished since the 1980s and fishermen have reported dramatic declines, which led to the end of the fishery. Guatemalan fishermen sustain fishing pressure in Belize (Baum *et al.,* 2005).

34. Given the major declines reported in many areas of this species' range, increased targeting for its high value fins, low resilience to exploitation and largely unregulated, continuing fishing pressure from both inshore and offshore fisheries, this species is assessed by IUCN as Critically Endangered globally (Rigbly et.al 2019). the assessment for the Northwest and Western Central Atlantic has not been updated, for the 2005 assessment global data was used so should be evaluated in the context of the global assessment. Hayes *et al.* (2009) conducted an assessment in the Northwest Atlantic using two surplus production models. Population size in 1981 was estimated to be between 142,000 and 169,000 sharks, but decreased to about 24,000 sharks in 2005 (an 83-85% reduction). A new stock assessment by the NMFS for the northwestern Atlantic was released April 2011 Under the Magnuson Stevens Act. The stock assessment estimated that a total allowable catch (TAC) of 2,853 scalloped hammerhead sharks per year (or 69 percent of the 2005 catch) would allow a 70 percent probability of rebuilding to MSY in 10 years. Great hammerhead (*S. mokarran*) and smooth hammerhead (*S. zygaena*) are also part of the Atlantic Large Coastal Shark Complex, but are assessed at the complex level. The overfished and overfishing status of this complex is unknown as of the 4th quarter of 2011 (NMFS 4th Quarter 2011 stock status).

Sphyrna mokarran

35. *S. mokarran* ranges widely throughout the tropical waters of the world, from latitudes 40°N to 35°S. It is apparently nomadic and migratory, with some populations moving polewards in the summer, as off Florida and in the South China Sea. There is a pupping and nursery ground in a coastal mangrove estuarine area of southern Belize (R.T. Graham, pers. obs). The large, widely distributed, tropical hammerhead shark is largely restricted to continental shelves.

36. Although there is very little species-specific data available, the absence of recent records give cause to suspect a decline of at least 80% in the past 25 years. Fishing proceeds unmanaged and

unmonitored, resulting in an assessment of Critically Endangered in the Eastern Atlantic. Although not targeted in the Northwest Atlantic and Gulf of Mexico it is taken as by-catch in several fisheries and suffers greater than 90% vessel mortality. Two time series data sets (pelagic logbook, large pelagic survey) have shown a decline in the catch of Sphyrna spp. since 1986. Difficulties in species identification and accurate recording make an assessment of this species very difficult, however low survival at capture makes it highly vulnerable to fishing pressure, whether directed or incidental. It is therefore assessed by IUCN as Endangered in the Northwest Atlantic and Gulf of Mexico, based on a suspected decline of at least >50% over the past 10 years. The decline is poorly documented and has not been curtailed (Gallagher & Kimley; 2018).

Sphyrna zygaena

37. Specific data on populations of this species are generally unavailable in many areas because hammerhead shark catches are often grouped to include several *Sphyrna* species. Furthermore, this species has sometimes been confused with the *S. lewini* in the Caribbean and these two species are probably misidentified with each other. *Sphyrna zygaena* is one of the larger hammerhead sharks, found worldwide in temperate and tropical seas, with a wider range than other members of its family. It is semi-pelagic and occurs on the continental shelf. Although few data are available on the hammerhead's life-history characteristics, it is a large hammerhead shark and presumably at least as biologically vulnerable as *S. lewini*. Few species-specific data are available to assess population trends because catches of hammerhead sharks are often grouped together under a single category. Very often these sharks are finned and the carcasses discarded. This species has sometimes been confused with *S. lewini* in the tropics and these two species are probably misidentified with each other in some areas. Time series data on population trends in hammerhead sharks, including *S. zygaena*, are available from the Northwest and Western Central Atlantic and the Mediterranean Sea. In the Northwest and Western Central Atlantic, where *S. zygaena* is outnumbered by *S. lewini* by about ten to one, analysis of U.S. pelagic longline logbook data estimated that Sphrynidae (including *S. lewini*, *S. mokarran* and *S. zygaena*) declined in abundance by 89% since 1986. In the Mediterranean Sea, where *S. zygaena* outnumbers *S. lewini*, compilation and meta-analysis of time series abundance indices estimated that Sphyrnidae (including *S. lewini*, *S. mokarran* and *S. zygaena*) declined by >99% in abundance and biomass since the early 19th century. The species is currently assessed by IUCN as Vulnerable with a decreasing trend(Rigby *et al.,* 2018) and further investigation into threats, population trends, catches and life-history parameters throughout its range are required to determine whether it may warrant a higher category in the future.

2.3 Ecological interactions with other species and specific habitat requirements

38. The diet of *Sphyrna mokarran* includes fish (mainly demersal species), other elasmobranchs, crustacea and cephalopods (Compagno in prep. b). Strong *et al.* (1990) observed a large (*ca* 4 m) Great Hammerhead feeding on a southern stingray *Dasyatis americana* (disc width 1.5 m). Adult *S. lewini* feed on mesopelagic fish and squids. In certain areas stingrays of the *Dasyatis* family are the preferred food. Pups and juveniles feed mainly on benthic reef fishes (e.g., scarids and gobiids), demersal fish and crustaceans. (Rigby *et al*., 2019). For *S. zygaena*, Smale (1991) reported that the diet was dominated by inshore squid (mostly *Loligo v. reynaudii*), with teleosts such as hake, horse mackerel and ribbon fish also being important. Crustaceans and smaller elasmobranchs have also been reported from stomach analyses of *S. zygeana* (Compagno, 1984; Smale 1991; Last and Stevens, 1994).

39. Large sharks like these hammerheads are predators mostly feeding at a high trophic level and are therefore thought to exert a significant top-down control over the ecosystem. Both empirical studies and ecosystem modeling studies demonstrated that the decline of large coastal elasmobranch species could induce a trophic cascade, as well as decreased ecosystem functioning and resilience. Because of their large size they occupy ecological niches first occupied by large predatory reptilians and have likely played a critical role in the evolution of marine mammals as well as other predators and prey species (Ferretti *et al*., 2010). Sharks are largely seen as feeding generalists and typically take a wide range of prey and therefore likely have limited effect on mortality rates in individual species (Ellis and Musick, 2007). They are typically wide ranging and interconnect food webs across wide geographic ranges (Musick *et al.*, 2000). The ecological role each species can play in this is likely influenced by their distribution across habitats. Hammerheads migrate between the pelagic and near-shore habitats.

40. We know very little about the specific roles of sharks in Caribbean coral reef ecosystems, and hammerheads are no exception, but current models and theories suggest that their loss causes multiple effects throughout local food webs and could lead to reef collapse. A study by Rezende *et al*. (2009) highlighted the importance of sharks for the organization, and potentially also for the stability and biodiversity of the Caribbean food webs. Modeling suggests that sharks are important regulators of grouper biomass on Caribbean reefs (Bascompte *et al*., 2005) and potentially important for the biological control of the invasive lionfish *Pterois volitans* (Albins and Hixon, 2008; Arias-Gonzalez *et al.,* 2011). Other work suggests the role of sharks in regulating grouper biomass has an indirect positive effect on parrotfish biomass and grazing capacity (Chapman *et al*., 2006). The model of Arias-Gonzalez *et al*. (2011) predicts that lionfish will replace sharks as apex predators as a result of a decrease in sharks due to overfishing throughout the region. The ecological effects of loss of sharks as top predators is difficult to understand and generally obscured by the fact that ecosystems have simultaneously been undergoing many other major changes. *S. lewini* is a high trophic level predator in coastal and open ocean ecosystems. It has a diverse diet, feeding on crustaceans, teleosts, cephalopods and rays

(Compagno, 1984). An analysis of its stomach contents revealed that the males feed on 42% of *Ancistrocheirus lesueurii* (Orbigny 1842), a species of mesopelagic cephalopod (Klimley, 1987). On the other hand, females consumed 63% mesopelagic squid species, *Mastigoteuthis* sp and *Moroteuthis robusta* (Verril, 1876). Cortés (1999) determined the trophic level to be 4.1 (maximum=5.0) for *S. lewini,* based on diet information. Navia *et al*. (2010) propose that this is the second most topologically important species for the maintenance of the structure of the community in the central fishing zone in the Colombina Pacific.

2.4 Threats to the species, its habitats and associated ecosystems

All three species

41. In January 2021 a review paper was published in Nature which analyzes the trends in 16 pelagic shark and ray populations over the past 50 years. The authors found clear evidence of decline for all species studied which led them to conclude that the global abundance of oceanic sharks and rays has declined by 71%, the decline is directly linked to an increase in fishing pressure specifically an increase in long line and purse seine fisheries (Pacoureau et al. 2021).

42. The Great Hammerhead shark was estimated to have decreased dramatically in global population size with a reduction above 80% in the last 3 generations and scalloped hammerhead was estimated to have reduces with 33%. The authors do note that the Atlantic population of the species has increased since protective measures were introduced in 2005.

43. Baum *et al.* (2003) have shown a a decline of 89% of hammerheads (primarily scalloped hammerheads (*Sphyrna lewini*)) in the northwestern Atlantic, including the Caribbean between 1986 and 2000.

44. For pelagic species, fishing is identified as the main threat, which is corroborated by studies that have demonstrated the extent of overfishing of large predators in the Caribbean (e.g. Bonfil, 1997; Stallings, 2009; Pandolfi *et al.,* 2003). Pelagic sharks are all found to be declining, albeit at different rates (Cortés *et al.*, 2007; Baum and Blanchard, 2010). A decadal dataset (1994–2003) of the Venezuelan longline fisheries recorded (by order of importance) landings of the Blue Shark (*Prionace glauca*), Night shark (*C. signatus*), Silky Shark, Great Hammerhead (*Sphyrna mokarran*), and the Shortfin Mako (*Isurus oxyrinchus*; Tavares and Arocha, 2008). A study after bycatch rates of the Venezuelan longline fleet showed a major bycatch of great, and smooth hammerhead Cortes *et al.,* 2010).

45. The Scalloped, Great and Smooth Hammerhead are taken as target and bycatch by trawls, purse seines, gillnets, fixed bottom longlines, hook and line, pelagic longlines and inshore artisanal fisheries (Rigby et al. 2019; Baum et al. 2007; Rigby et al. 2019). The artisanal fisheries catch large numbers of juvenile Scalloped Hammerheads in some regions. The aggregating behavior of the Scalloped Hammerhead makes them vulnerable to capture in large schools (Baum et al. 2007).

There is an indication that *S. lewini* is caught more than the other species, in Virginia Institute of Marine Science sampling programs since 1973, *S. lewini* outnumbered *S. zygaena* by more than ten to one (Ha, 2006).

46. As explained above, it is typical for catches to be reported at the genus level, *Sphyrna* spp or even just as "shark". Therefore, it is rare to find fisheries statistics that are specific to one species of hammerhead shark. Some constant catch reporting of Sphyrnidae is available from the Atlantic Ocean since 1991 and these landings are generally viewed to be underreporting the actual catch elvels. The catch was near 2,200 tons in 2004 (Maguire *et al.,* 2006). Only *S. zygaena* and *S. lewini* are reported as individual species in the Food and Agriculture Organisation (FAO) fisheries statistics, but hammerhead catches are often grouped in one category as, Sphyrna species, which makes identification of actual catches of hammerheads difficult. The high at-vessel fishing mortality for hammerheads makes the threat of fishing even greater for these species.

47. A global scale of overlap between fisheries and pelagic sharks was conducted and applies to all hammerheads. Geolocation data from thousands of pelagic longline fishing vessels were examined from 2012 to 2016 to derive the spatial overlap of the vessel activity with shark presence from 23 pelagic shark species, including the scalloped hammerhead and great hammerhead that were tagged from 2002 to 2017 in the Atlantic, Indian, and Pacific Ocean (Queiroz et al. 2016). Overlap was calculated as the number of grid cells that sharks (shark track length) and fishing effort (in days) occurred in the same 1° × 1° (1° = 110.6 km) grid cells in an average month. Shark presence and fishing effort overlapped in 24% of the mean monthly space, although exposure to fishing vessels was as high as 76% in some of the hotspot areas (Queiroz et al. 2019). Major hotspots in the Atlantic Ocean include the Gulf Stream, Caribbean Sea, Gulf of Mexico, and around oceanic islands such as the Azores. (see Figure 1 : source Queiroz et al. 2019 from NOAA 2020).

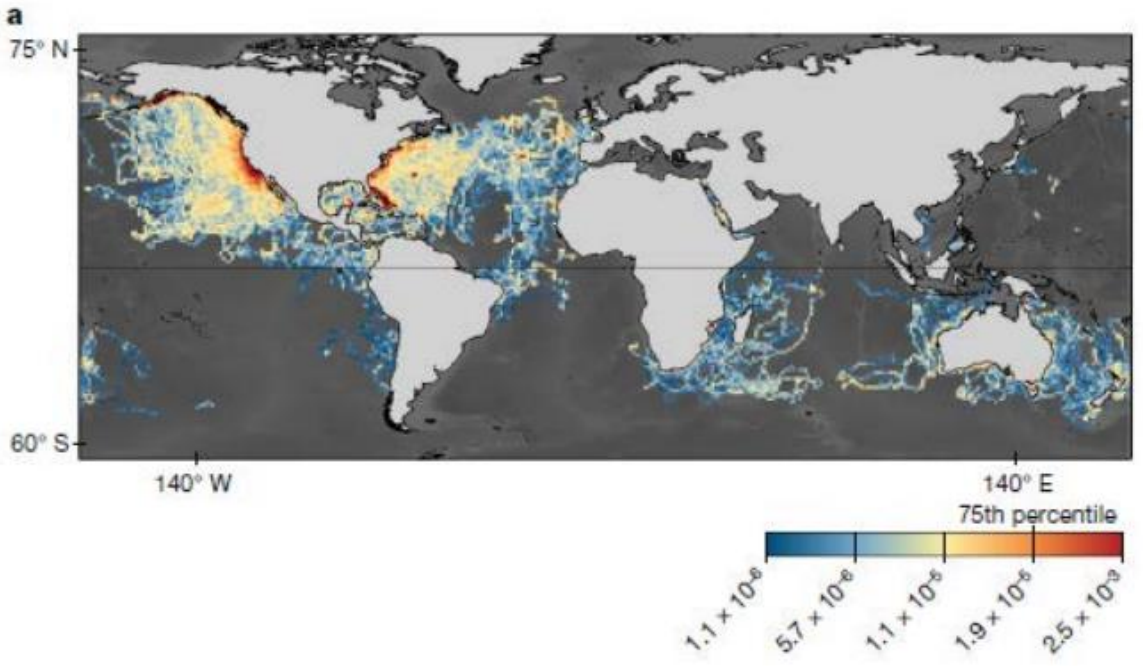


Figure 1: Relative density of sharks. Distribution of the mean monthly weighted normalized location density of tracked sharks in 1° × 1° grid cells (shark hotspots were defined by cells with > 75th percentile of relative density). Source: Queiroz et al. 2019 Figure 2a.

48. Hammerhead fins are highly valued compared to other species because of their large size and Hammerhead their high fin ray count (S. Clarke unpubl. data). They continue to be targeted to feed demand for their fins. Hammerhead shark species *S. zygaena* and *S. lewini* were found to represent at least 4-5% of the fins auctioned in Hong Kong, the world's largest shark fin trading center (Clarke *et al*., 2006). Fins from the Hong Kong SAR market can be genetically assessed and have been shown to originate western Atlantic Ocean basins. In a study by Chapman et al. (2009) approximately 21% of the samples were sourced from the western Atlantic. It is estimated that between 1.3 and 2.7 million *S. zygaena* or *S. lewini* are represented in the shark fin trade each year or, in biomass, 49,000 to 90,000 mt (Clarke *et al*., 2006).

49. Research shows that large, oceanic sharks may actually depend on shallow coastal areas during part of their life cycle (e.g. Carrier and Pratt, 1998; Tavares, 2008; Clarke *et al*., 2011; Daly-Engel *et al.,* 2012; Hammerschlag *et al.,* 2012). This makes many sharks vulnerable to habitat destruction in coastal areas, as caused by man (Jennings *et al.,* 2008) and possibly, in the long-term by climate change (Field *et al*., 2009). The dependence of sharks on habitat quality has hardly been studied so far (Field *et al.,* 2009). One important dimension of habitat quality is that of food availability. Sharks populations can be affected by shortage of prey, also when fish stock are overexploited by humans, but this has not been quantified by research.

S. lewini

50. *Sphyrna lewini* is taken as both a target and bycatch by trawls, purse seines, gillnets, fixed bottom longlines, pelagic longlines and inshore artisanal fisheries. The latter catch large numbers of pups and juveniles in some regions. The species' aggregating habit makes them vulnerable to capture in large schools. This also means that they may appear more abundant in landings, where they are caught in high, localized concentrations. Intense fishing pressure can deplete regional stocks rapidly, and re-colonization of depleted areas from neighboring regions is expected to be a slow and complex process. This species is expected to have a low resilience to exploitation because of its life-history characteristics. Also, the aggregating habit of *S. lewini* makes it very vulnerable to capture. In the nursery zones (<10 m) south and southeast of Brazil the newborn are intensively fished through coast gillnets, prawn trawls and pair trawls, as well as recreational capture (Haimovici & Mendonça, 1996; Kotas 2004; Kotas *et al*., 2005; Vooren *et al*., 2005).

51. In the USA, this species was caught in both commercial coastal shark bottom longline and gillnet fisheries and the pelagic longline fishery, where it suffers high mortality (Piercy *et al.,* 2007). It is also taken in recreational shark fisheries. The USA pelagic longline fishery has operated since the 1960s and encompasses the entire range of this species in the Northwest and Western Central Atlantic, from the equator to about 50°N. Although this is quite a fecund shark, its late age at maturity in this region (15 years) will render it quite vulnerable to overexploitation, and limit its recovery potential.

52. Estimates of trends in abundance of *Sphyrna* spp. are available from standardized catch rate indices of the U.S.A. pelagic longline fishery, from logbook data between 1986 and 2000 and from observer data between 1992 and 2005. The area covered by this fishery, ranging from the equator to about 50°N, encompasses the range of this species in these two regions. Although this fishery will not sample individuals closest to the coast, the sample size of hammerheads recorded in the logbook data (the majority of which are thought to be *S. lewini*) is substantial, with over 60,000 recorded during this period. This subpopulation of Scalloped Hammerhead sharks is estimated from the logbook data to have declined by 89% over the 15-year time period, from 1986-2000 (Baum *et al*., 2003), which is less than one generation. A more recent analysis of the pelagic longline observer data indicates that *Sphyrna* spp. declined by 76% between 1992 and 2005 (Baum *et al*., in prep.). The pelagic longline fishery has operated in these regions since the 1960s, thus declines from 1986 were certainly not from virgin population abundance.

53. Off the Atlantic coast of Belize hammerheads were fished heavily by longline in the 1980s and early 1990s (R.T. Graham, pers. obs.). Hammerheads are a favored target species for their large fins. Interviews with fishermen indicate that the abundance and size of Sphyrnids has declined dramatically in the past 10 years as a result of over exploitation, leading to a halt in the Belize based shark fishery (R.T. Graham, pers. obs.). However, the pressure is still sustained by fishers driving into Belizean waters from Guatemala (R.T. Graham, pers. obs.). *Sphyrna lewini* is also taken in various fisheries along the Caribbean coast of South America. It is taken in artisanal

gillnet fisheries targeting mackerel off Guyana, Trinidad and Tobago and in pelagic tuna fisheries of the eastern Caribbean (Chan A Shing, 1999).

54. In 2019 the IUCN re-assessed the global population of *S. lewini* and came to the conclusion that: The Scalloped Hammerhead has undergone steep declines in all oceans, with some signs of stabilization and possible recovery in response to management only in the Northwest Atlantic and Gulf of Mexico. The weighted global population trend estimated median reductions of 76.9–97.3%, with the highest probability of >80% reduction over three generation lengths (72.3 years), and is therefore assessed as Critically Endangered.

S. mokarran

55. *Sphyrna mokarran* is taken by target and bycatch, fisheries (Dudley and Simpfendorfer, 2006; Zeeberg *et al*., 2006) and is regularly caught in the Caribbean, with longlines, fixed bottom nets, hook-and-line, and possibly with pelagic and bottom trawls (Compagno, *in prep*). Hammerhead sharks, with *S. mokarran* in particular, have been noted as a favored target species due to the size of their fins (R.T. Graham, pers. comm). Fin prices are rising above US$50/lb in the neighboring countries of Guatemala, driven by Asian buyers, according to interviews (R.T. Graham, pers. obs). Bonfil (1994) gives an overview of global shark fisheries. This species is mentioned specifically with reference to fisheries in Brazil, East USA and Mexico, however *Sphyrna* spp. are mentioned in the majority of tropical fisheries cited.

56. This species is caught primarily as a bycatch in the pelagic longline, bottom longline and net fisheries along the northwest Atlantic and Gulf of Mexico. It is also caught in the recreational fishery. The species represents 0.7% of the species catch and suffers from greater than 90% at-vessel fishing mortality in the U.S. bottom longline fishery (Commercial Shark Fishery Observer Program unpubl. data). The U.S. pelagic fishery logbook data has shown a decline close to 90%, however this dataset is known for inaccurate data reporting (Beerkircher *et al.,* 2002). There is probably a lack of reporting of the catch of Great Hammerheads because this species is routinely finned and discarded, which is illegal in the US Atlantic Federal Waters (Commercial Shark Fishery Observer Program, unpub. data). Both the pelagic and bottom longline observer programs have recorded a 2 to 3:1 ratio for *S. Lewini* to *S. mokarran.* The meat is not valuable but the fins are high grade and bring in a good price, thus finning still occurs in the U.S. fishery.

57. There is little data available on landings and catch effort for this species in Central America and the Caribbean. Off the coast of Belize hammerheads were fished heavily by longline in the 1980s and early 1990s. Interviews with fishermen indicate that the abundance and size of Sphyrnids has declined dramatically in the past 10 years as a result of over exploitation, leading to a halt in the Belize based shark fishery (R.T. Graham, pers. obs). However, the pressure is still sustained by fishers driving into Belizean waters from Guatemala (R.T. Graham pers. obs). The Cuban directed shark fishery (longline) recorded between 1983 and 1991 *S. mokarran* (sub adults and

juveniles) as one of 23 species caught. Since 1992 small increases in mean sizes were noted, indicating partial recovery of the species. In Mexico between November 1993 and December 1994 (Tamaulipas, Veracruz, Tabasco, Campeche and Yucatan) 901 vessels were monitored every day. *Sphyrna mokarran* represented 86% of the total catch.

58. In 2019 the IUCN re-assessed the global population of S. mokarran and came to the conclusion that: "The Great Hammerhead appears to have undergone steep declines in the Indian Ocean, Mediterranean Sea, and in the Atlantic prior to management measures, where slow recovery may now be occurring in the Northwest Atlantic. The global population is estimated to have undergone reductions of 50.9–62.4%, with the highest probability of >80% reduction over three generation lengths (71.1–74.4 years). There is a lack of data from the Pacific, limited regional representation of some time-series, intensive fisheries in data-poor regions that are suspected to have driven significant declines, and uncertainty about levels of exploitation that are potentially similar to those of the Scalloped Hammerhead (S. lewini) (which has been assessed as globally Critically Endangered). Expert judgment elicitation thus used a precautionary approach and concurred with the highest probability of reduction of >80% over three generation lengths (71.1–74.4 years). The Great Hammerhead is therefore assessed as Critically Endangered."

Sphyrna zygaena

59. *S. zygaena* is caught with a variety of gears, including with pelagic longlines, hand lines, gillnets, purse seines and pelagic and bottom trawls (Bonfil, 1994; Compagno in prep; Maguire *et al.,* 2006). This shark has undoubtedly been caught in shark fisheries in most parts of its range, but it is not always reported separately from other hammerhead species. Bonfil (1994) reported that this species is caught as bycatch in a number of non-shark fisheries, particularly pelagic longline and gillnet fisheries that operate close to temperate and subtropical continental shelves. The capture of *S. zygaena* in many of these fisheries is infrequent (Bonfil, 1994). Although size data are limited, catches in pelagic fisheries appear to be dominated by larger individuals, while juveniles are common in inshore shelf fisheries.

60. An exploratory assessment was undertaken by Hayes (2007; cited by Miller, 2016) that suggested a 91% decline from 1982 to 2005,with this study highlighting a number of uncertainties in the input data. As noted before several times, logbook-data on sharks have certain inherent inaccuracies (i.e. misidentification and inadequate sampling) and inferences based on such data should be treated with caution. A subsequent study by Jiao et al. (2009) estimated a 72% decline in the abundance of hammerhead sharks (species-complex) in the Northwest Atlantic and Gulf of Mexico (1981–2005), using a Bayesian hierarchical surplus production model and US fisheries data. However, most of the underlying data referred to scalloped hammerhead *Sphyrna lewini*.

61. In 2019 the IUCN re-assessed the global population of S. zygaena and came to the conclusion that: "It has undergone steep historic declines in the Atlantic but the introduction of

management measures may be allowing slow recovery, lesser declines in the South Pacific, and increases in the Indian Ocean. The weighted global population trends estimated a median reduction of 21.8–64.8%, with the highest probability of <20% and >80% reduction over three generation lengths (72.3 years). The Northwest Atlantic data that includes the period after management changes led to the lower estimated global reduction. However, there is uncertainty in some of the catch data, limited regional representation of some time-series, and intensive-fisheries in data-poor regions that are suspected to have driven declines, balanced with the relatively lower level of artisanal fisheries threat to this species compared to that of the Scalloped Hammerhead (S. lewini) and Great Hammerhead (S. mokarran), due to its generally more temperate distribution. Expert judgement elicitation thus inferred a global population reduction of 30–49% and the Smooth Hammerhead is therefore assessed as Vulnerable A2bd. More robust species-specific data and monitoring of catches is required to improve certainty of catch estimates for a future assessment of this species."

3 Status of legal protection (with reference to relevant national legislation or regulation)

3.1 International Legislation and Management

CITES

62. The Convention on International Trade in Endangered Species (CITES) is a trade treaty that regulates the international trade in threatened and endangered species. All three hammerhead species *S. lewini*, *S. mokarran* and *S. zygaena* are listed on Appendix II of CITES. This means that all transboundary trade has to be licensed, based on an analysis of the effects of the removal from the wild through a Non-Detriment Finding. For international trade an export permit or re-export is required which is to be issued by the Management Authority of the State of export or re-export. This export permit may be issued only if the specimen was legally obtained and if the export will not be detrimental to the survival of the species. (www.cites.org)

UNLCOS

63. The family Sphyrnidae is listed on Annex I, Highly Migratory Species, of the UN Convention on the Law of the Sea. States are urged to cooperate over the management of these species. No such management yet exists.

IPOA Sharks

64. The International Plan Of Action for the Conservation of Sharks (IPOA-Sharks) is a voluntary international instrument, developed within the framework of the 1995 FAO Code of Conduct for Responsible Fisheries, that guides nations in taking positive action on the conservation and management of sharks and their long-term sustainable use. Its aim is to ensure the conservation and management of sharks and their long-term sustainable use, with emphasis on improving species-specific catch and landings data collection, and the monitoring and management of shark fisheries. The Code sets out principles and international standards of behavior for responsible fishing practices to enable effective conservation and management of living aquatic organisms while considering impacts on the ecosystem and biodiversity. The IPOA-Sharks recommends that FAO member states 'should adopt a national plan of action for the conservation and management of shark stocks (NPOA-Sharks), if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries'.

65. To date 10 countries in the SPAW region have a National Plan of Action for Sharks (Antigua & Barbuda, Belize, Brazil, Colombia, Costa Rica, Cuba, Mexico, Panama, Venezuela and The United States. As the French islands are part of the EU the EU's Community Plan of Action for the conservation of sharks applies here.

CMS & CMS Sharks MoU

66. The Convention on Migratory Species (the full name is the Convention on the Conservation of Migratory Species of Wild Animals) is an environmental treaty under the aegis of the United Nations Environment Programme (UNEP). CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range. SPAW Contracting Parties that are also parties to CMS are:, Cuba, Dominican Republic, Republic of France, the Netherlands, Honduras, Panama, and Trinidad and Tobago.

67. The basis for management under CMS is formed by two types of lists (appendix I and II), Appendix I list endangered species that are directly threatened with extinction. Appendix II includes migratory species with an unfavorable conservation status or those that would significantly benefit from international co-operation. Range States have to enter into auxiliary agreements with each other to protect these species.

68. *S. lewini* and *S. mokarran* have been listed on Appendix II of CMS since 2014 , *S. zygaena* was added in 2020.

69. The Memorandum of Understanding on the conservation of migratory sharks (Sharks MoU) of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) is a legally non-binding instrument of the CMS and the first global instrument for the conservation of migratory shark species. The Sharks MoU entered into force on 1 March 2010 with the aim to sustainably manage and protect migratory shark species, in particular the species included in appendices I en II of the CMS. The MoU now has 39 signatories; these are 38 national governments and the European Union.

70. All three Hammerhead species are listed on the annex of the MoU as species that have an unfavorable conservation status and which require international agreements for their conservation and management, or would significantly benefit from the international cooperation that could be achieved by an international agreement.

3.2 Regional Management

ICCAT

71. The International Convention for the Conservation of Atlantic Tuna (ICCAT) is the Regional Fisheries Management Organisation (RFMO) that manages international fisheries on tuna and tuna-like species for the Wider Caribbean Region (FAO fisheries area) this also includes (by)catches of sharks. The following SPAW countries are members: members: U.S, Brazil, Venezuela, Republic of Guinea, UK (overseas territories), EU, Mexico, Belize, Trinidad and Tobago, Panama, Barbados, Guatemala, St. Vincent and the Grenadines, Curacao, Guyana, Suriname, Grenada and Honduras.

72. In 2004 ICCAT was the first RFMO to adopt recommendations for shark management; ICCAT Recommendations are binding on ICCAT members and cooperating non-members (referred to as "CPCs" in the Recommendations).

73. Recommendation by ICCAT Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT (04-10)

- CPCs shall take the necessary measures to require that their fishermen fully utilize their entire catches of sharks. Full utilization is defined as retention by the fishing vessel of all parts of the shark except head, guts and skins, to the point of first landing.
- CPCs shall require their vessels to not have onboard fins that total more than 5% of the weight of sharks onboard, up to the first point of landing.
- Fishing vessels are prohibited from retaining on board, transshipping or landing any fins harvested in contravention of this Recommendation.

74. In 2008 ICCAT added specific recommendation for the conservation of Hammerhead Sharks (Family Sphyrnidae) caught in Association with Fisheries Managed by ICCAT (10-08)

- CPCs shall prohibit retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of hammerhead sharks of the family Sphyrnidae (except for the Sphyrna tiburo), taken in the Convention area in association with ICCAT fisheries.
- CPCs shall require vessels flying their flag, to promptly release unharmed, to the extent practicable, hammerhead sharks when brought alongside the vessel.
- Developing coastal CPCs catching hammerhead sharks for local consumption exempted from this prohibition pursuant to this paragraph should endeavor not to increase their catches of hammerhead sharks. Such CPCs shall take necessary measures to ensure that hammerhead sharks of the family Sphyrnidae (except of Sphyrna tiburo) will not enter international trade and shall notify the Commission of such measures.
- CPCs shall require that the number of discards and releases of hammerhead sharks are recorded with indication of status (dead or alive) and reported to ICCAT in accordance with ICCAT data reporting requirements.

OSPESCA

75. The Organization of the Fisheries and Aquaculture Sector of the Central American Isthmus (Organización del Sector Pesquero y Acuícola del Istmo Centroamericano, OSPESCA) OSPESCA aims at promoting coordinated and sustainable development of fishing and aquaculture, in the framework of the Central American integration process (SICA), defining, approving and implementing policies, strategies, programmes and regional projects on fisheries and aquaculture. This is a legally binding framework and its members are Belize, Costa Rica,

Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. In 2011 OSPESCA adopted measures on shark finning and the sustainable use of sharks.

3.3 National Legislation

USA

76. In 2014 *Sphyrna lewini* populations in the Central & Southwest Atlantic were listed as threatened on the US Endangered Species Act this provides a legal obligation to sustainably manage this species. This was done through implementing the ICCAT retention ban of hammerhead sharks.

77. In 2016 the National Marine Fisheries Service (NMFS) published a Magnuson-Stevens Fishery Conservation and Management Act (MSA). This law prohibits any person from removing fins of a shark at sea, possessing shark fins on board a fishing vessel unless they are naturally attached to the corresponding carcass, transferring or receiving fins from one vessel to another at sea unless the fins are naturally attached to the corresponding carcass, landing shark fins unless they are naturally attached to the corresponding carcass, or landing shark carcasses without their fins naturally attached.

78. In January 2020, NMFS clarified that the MSA requires NMFS to prevent overfishing in shark fisheries regardless of whether fins are allowed to be sold, and that a ban on the sale of shark fins would only regulate which parts of a sustainably harvested shark can be used.

US Caribbean Region

79. In the U.S., *S. lewini, S. mokarran* and *S. zygaena* are included in the Large Coastal Shark complex management unit, on U.S. Highly Migratory Species Fishery Management Plan (National Marine Fisheries Service: Federal Fisheries Management Plan for Atlantic Tuna, Swordfish and Sharks).

US Gulf of Mexico and (Caribbean) Florida

80. Following years of declines in catches, and concern about the protection status of many shark species, in 1993 the USA established a Federal Management Plan for Shark Fisheries in the Atlantic Ocean, particularly directed at the coastal bottom long-line fishery. Since 1993 several amendments of the original plan have been implemented and local state governments have tied in by implementing complementary legislation. Measures included successively restrictive catch quotas, finning limitations, area closures, seasonal closures, adjustments of size limits, limits to retention in recreational fisheries, establishment of protected species lists, establishment of a shark research y and the use of regional and species specific quotas.

Bahamas

81. The Bahamas have had a longline fishing ban since 1993 and consequently there has been no commercial shark fishing activity. This longline ban has effectively made the whole archipelago of the Bahamas a shark “no-take” zone. In July 2011 the Bahamas went a step further and legally

banned all shark fishing. That law firmly turns all 630,000 sq km of Bahamian waters into a shark sanctuary17. The fines for shark fishing were raised from 3000 to 5000 USD per incident.

Venezuela

82. Towards implementing its Plan de Acción Nacional (PAN) de conservación for sharks, in June 2012 Venezuela joined the rest of the Americas in outlawing the finning of sharks in its waters and established a 3,730 km2 shark sanctuary surrounding the touristic archipelago of Los Roques. Recent research (e.g. Tavares 2005, 2008 2009) had demonstrated the importance of the shallow waters of Los Roques as a shark nursery area.

Dominican Republic

83. The Dominican Republic has, together with Belize and six other Central American countries, united under the name SICA (Central American Integration System), signed an agreement to prohibit shark finning. This ban is also applicable to fishing vessels in international waters under the flag of SICA member states. This arrangement OSP-05-11 entered into force in 1 January 2012.

The Kingdom of the Netherlands

The (Caribbean) Netherlands

84. The Caribbean Netherlands consists of the islands Saba, St Eustatius and Bonaire, which are special municipalities of the Netherlands but not part of the European Union. In 2019 the government of the Netherlands adopted an International Shark Strategy. The strategy sets out how the government which protective and management actions for sharks and rays are to be taken in all seas and oceans where the Netherlands has influence (the North Sea, international waters and the Dutch Caribbean).

85. The entire Exclusive Economic Zone of the Caribbean Netherlands has been declared as the Yarari Sanctuary for marine mammals, sharks and rays. Legislation is currently in the process to be formally adopted, with the aim of entering into effect January 1st 2023.

86. In Bonaire, all shark species are listed as protected species by means of Island Ordinance AB 2010, No. 15. All catches and landings if sharks caught in Bonaire's territorial waters are illegal.

Sint Maarten

87. St. Maarten issued a temporary moratorium on shark fishing in accordance with Art. 4 of the St. Maarten National Ordinance on Maritime Management (landsverordening Maritiem Beheer (PB 2007, No. 18) and Art. 5 of the National Fisheries Ordinance (Visserijlandsverordening (PB 1991, No. 74) which provides for temporary closures and moratoria. The shark fishing moratorium prohibits the take and landing of sharks and requires immediate release of incidentally caught

sharks, under penalty of a maximum of 500,000 Antillean Guilders or 3 months in prison. This r moratorium is currently under review.

Curacao

88. Curacao is in the process of adopting marine management and fisheries actions as part of their SDG14 strategy.

France

89. The three hammerhead sharks are protected by the Council Regulation (EU) 2022/109 of 27 January 2022 fixing for 2022 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in Union waters and for Union fishing vessels in certain non-Union waters. This regulation states that it is prohibited to hold, tranship and / or land those three species of hammerheads in European Union waters and on European vessels in ICCAT area.

90. No species of shark or ray is protected under the Environmental Code in Guadeloupe and Saint-Martin. Only management measures for sea fishing exist at the local level, as presented below.

- Recreational fishing

91. It is regulated by decree 971-2019-08-20-003 regulating the exercise of recreational sea fishing in Guadeloupe and Saint-Martin. Fishing for sharks and rays of all species is prohibited at all times and in all places.

- Professional fishing

92. Professional sea fishing is governed by order 2002/1249 / PREF / SGAR / MAP of August 19, 2002 regulating coastal sea fishing in the waters of the Department of Guadeloupe (pj2). This decree also applies to St-Martin, which was still a municipality of Guadeloupe in 2002.

93. Besides the legislative aspects, the management aspect is still to be taken into account. There are several ongoing projects that should be emphasized:

- Establishment of the list of species present,
- Development of identification sheets on state of knowledge on biology,
- State of fishing activity on these species in Guadeloupe- sensitization of marine stakeholders (via participatory sciences in particular via a network of observers), including the animation of a network of observers, the Regular network
- Identification of coastal nursery areas

94. One of the study projects, based on the use of baited cameras, was part of an international project that resulted in publication in the scientific journal Nature in 2020.

95. The improvement of knowledge on elasmobranchs aims to establish red lists of this group of species, a necessary prerequisite for the implementation of farm management measures at the national or local level. The intentions at the local level being to intervene on fishing regulations when the threat is linked to this activity, otherwise to set up protection under the environmental code when other threats are identified (disturbance of individuals, alteration of habitats…). The CSRPN of Guadeloupe has undertaken an initial analysis of candidate species for protection. The Kap Natirel association has issued recommendations for the management of these species in the Antilles.

96. The challenges of preserving Elasmobranchs in Guadeloupe have also been taken into account since 2017 in the fishery control plan and the preservation of the marine environment with clearly displayed dedicated objectives, on the proposal of the DEAL. The sea control services received theoretical training in the challenges of preserving Elasmobranchs and their identification, delivered by the kap Natirel association alongside the DEAL.

3.4 MPAs and Shark Sanctuaries

Bahamas

97. The Bahamas created the first shark sanctuary in the Atlantic Ocean in 2011. Over 40 shark species reside in its 630,000 km2 marine area. The Bahamian sanctuary was created by adding an amendment to the Fisheries Resources (Jurisdiction and Conservation) Act (Chapter 244) to prohibit commercial shark fishing along with the sale, importation and export of shark products.

Kingdom of the Netherlands

98. In 2015, the government of the Netherlands designated the Economic Exclusive Zone of the Caribbean Netherlands (Bonaire and Saba) as a marine mammal, shark and ray sanctuary. In 2017 the EEZ of St.Eustatius was added to this.

Curacao

99. Curacao has committed to protecting 30% of its waters by establishing nearshore protected areas and an offshore marine sanctuary. The protective regime for these is not developed yet.

Honduras

In June 2011 Honduras created the first shark sanctuary in America and declared all its marine waters in both the Pacific and Caribbean as a permanent shark sanctuary. This had been preceded in 2010 by a shark fishing moratorium and created the first shark sanctuary of the Americas amounting to about 240,000 km2 of national waters, most of which lie along the 700 km-long Caribbean coast of the nation.

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5 Criteria for SPAW listing

Criterion 1. Is the listing of the species warranted by the size of the population, evidence of decline, restrictions on its range of distribution, degree of population fragmentation, biology and behavior of the species, as well as other aspects of population dynamics, or other conditions clearly increasing the vulnerability of the species?

[If applicable] Criterion 2. Why is a precautionary approach necessary i.e., the lack of full scientific certainty about the exact status of the species is not to prevent the listing of the species on the appropriate annex?

Criterion 3. [In particular with respect to species proposed for Annex III], what are the levels and patterns of use and how successful are national management programs?

Criterion 4. Does the evaluation according to IUCN criteria, applied in a Caribbean context, i.e., the status of the population at the regional level, warrant listing of the species?

Criterion 5. Is the species subject to local or international trade, and is the international trade of the species regulated under CITES or other instruments?

Criterion 6. How important and useful are regional cooperative efforts for the protection and recovery of the species? [Include strengthening of existing cooperative efforts through global MEAs such as CMS]

Criterion 7. The species is not an endemic species [or there are specific reasons why cooperative action is important for its recovery].

Criterion 8. The species is not a sub-species.

Criterion 9. The status of the population at the regional level warrants listing, not only of a sub-population.

Criterion 10. Is the species essential to the maintenance of fragile and vulnerable ecosystems/habitats, such as mangrove ecosystems, seagrass beds and coral reefs, and is the listing of the species considered an "appropriate measure to ensure its protection and recovery"?

Criterion 10. Is the species essential to the maintenance of such fragile and vulnerable ecosystems/habitats, as mangrove ecosystems, seagrass beds and coral reefs and is the listing of the species felt to be an "appropriate measure to ensure the protection and recovery"?