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

Virtual meeting, 17–19 March 2021

PROPOSAL FOR THE UPLISTING OF THE GIANT MANTA RAY *MANTA BIROSTRIS* FROM ANNEX III TO ANNEX II OF THE PROTOCOL CONCERNING SPECIALLY PROTECTED AREAS AND WILDLIFE (SPAW PROTOCOL)

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Proposal for the uplisting of the Giant manta ray *Manta birostris* from Annex III to Annex II of the Protocol concerning Specially Protected Areas and Wildlife (SPAW Protocol)

From IUCN redlist website https://www.iucnredlist.org/species/198921/68632946

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the Giant Manta Trust

I. Nomination Requirements

1. Requirements regarding species nomination are set forth in Specially Protected Areas and Wildlife (SPAW) Protocol Articles 11, 19, and guidelines and criteria adopted by the Parties pursuant to Article 21. The procedures to amend the annexes, contained in Article 11(4), state that "any Party may nominate an endangered or threatened species of flora or fauna for inclusion in or deletion from these annexes," and that, after review and evaluation by the Scientific and Technical Advisory Committee, the Parties shall review the nominations, supporting documentation and the reports of the Scientific and Technical Advisory Committee and shall consider the species for listing. Such a nomination is to be made in accordance with guidelines and criteria adopted by the Parties pursuant to Article 21. As such, this nomination addresses the 2014 "Revised criteria for the listing of species in the Annexes of the Protocol Concerning SPAW and Procedure for the submission and approval of nominations of species for inclusion in, or deletion from Annexes I, II and III." Finally, Article 19(3) lists the type of information that should be included, to the extent possible, in reports relevant to protected species.

2. Article 1 of the SPAW Protocol defines Annex II as "the annex to the Protocol containing the agreed list of species of marine and coastal fauna that fall within the category defined in Article 1 and that require the protection measures indicated in Article 11(1)(b). The annex may include terrestrial species as provided for in Article 1(c)(ii)." Further, Article 11 of the Protocol specifies that "each Party shall, in cooperation with other Parties, formulate, adopt and implement plans for the management and use of such species…"

3. Listing of species can be justified based on a variety of criteria set out in the Revised criteria for the listing of species in the Annexes of the SPAW Protocol, in particular:

- *Criterion #1. For the purpose of the species proposed for all three annexes, the scientific evaluation of the threatened or endangered status of the proposed species is to be based on the following factors: size of populations, evidence of decline, restrictions on its range of distribution, degree of population fragmentation, biology and behaviour of the species, as well as other aspects of population dynamics, other conditions clearly increasing the vulnerability of the species, and the importance of the species to the maintenance of fragile or vulnerable ecosystems and habitats.*

- *Criterion #2. When evaluation of the factors enumerated above clearly indicates that a species is threatened or endangered, 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 #4. When compiling a case for adding a species to the Annexes, application of the IUCN criteria in a regional (Caribbean) context will be helpful if sufficient data are available. The evaluation should, in any case, use best available information, and expertise, including traditional ecological knowledge.*

- *Criterion #5. The evaluation of a species is also to be based on whether it is, or is likely to be, the subject of local or international trade, and whether the international trade of the species under consideration is regulated under CITES or other instruments.*

- *Criterion #6. The evaluation of the desirability of listing a species in one of the annexes should be based on the importance and usefulness of regional cooperative efforts on the protection and recovery of the species.*

II. Substantiated Nomination Requirements to Support Inclusion in Annex II

A.Article 19(3) – Information to be included in reports relevant to protected species, to the extent possible

a. Article 19(3)(a) – Scientific and Common Names of the Species

a.1. Classification

Class : Chondrichthyes, subclass Elasmobranchii
Order : Rajiformes
Family : Mobulidae
Genus : *Manta* (Dondorff, 1798)

a.5 Common name(s)

English: Giant manta ray, Chevron manta ray, Pacific manta ray, Pelagic manta, Oceanic manta ray
French: Diable de mer, raie manta, raie manta géante
Spanish: Manta Diablo, Manta gigante, Manta voladora, Manta comuda, Manta raya, Manta atlantica

a.6 Biological data

4. The Mobulidae family are planktivorous elasmobranchs comprised of manta and devil rays (ten extant species), with a circumglobal range; all are recognised by the cephalic lobes used for feeding, a stingless tail, and wing-like pectoral fins (Notarbartolo di Sciara 1987a; Couturier *et al.* 2012; Stevens *et al.* 2018). Within the *Mobula* genus, two distinct species of manta ray have been scientifically described; the oceanic (*Mobula birostris*) and reef (*M. alfredi*) manta rays. The larger of the two described species, the oceanic manta ray, attains a maximum disc-width of 680 cm, but averages between 400 – 500 cm (Stevens *et al.* 2018) (Fig. 1). Mantas are filter feeders. Their frontal lobes help driving water to their mouths where planktonic organisms are filtered. Like other elasmobranchs, the Giant manta has long gestation periods and low fecundity, which makes them highly vulnerable to any kind of exploitation or fishery (Bigelow and Schroeder 1953, Homma et al. 1999, Clark 2001). Further, a low rate of exchange of individuals between populations is suggested (Marshall *et al.* 2011).

5. Studies suggest that a potential third, putative species, *Mobula cf. birostris*, commonly known as the Atlantic manta ray (and also the Caribbean manta ray), occurs in regions of the Atlantic Ocean and the Caribbean Sea (Marshall *et al.* 2009; Hinojosa-Alvarez *et al.* 2016). This putative species is sympatric to oceanic manta rays in the Gulf of Mexico and the Caribbean Sea, but adopts a similar niche to that of reef manta rays, which are restricted to the Indo-West Pacific Oceans (Kashiwagi *et al.* 2011). This niche separation may explain the proposed speciation from oceanic manta rays in this region (Stevens *et al.* 2018). With a disc-width comparable to reef manta rays, the putative Atlantic manta ray reaches a maximum disc-width of 500 cm (averaging 300-400 cm) and has slightly different dorsal and ventral markings to the other manta species (Stevens *et al.* 2018). Although recent genetic analysis supports the validity of the Atlantic manta ray (Hinojosa-Alvarez *et al.* 2016), it is yet to be formally described. Therefore, all specimens of this putative species are still scientifically considered oceanic manta rays, and for the purpose of this proposal, are treated as such.

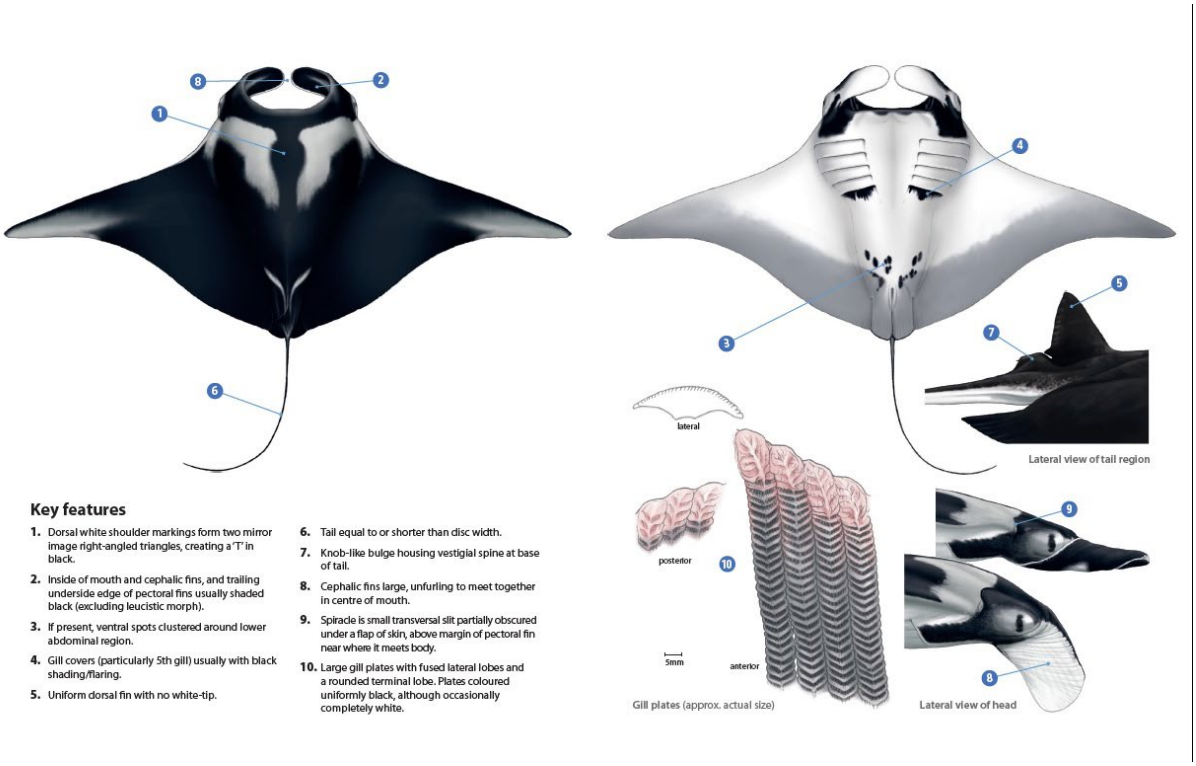


Fig.1 Manta ray (*Mobula birostris*) © Marc Dando (Source: Stevens *et al*. 2018).

a.7 Habitat

6. Oceanic manta rays inhabit areas of high productivity across tropical, sub-tropical and temperate waters. They are observed along coastlines, islands, offshore pinnacles, and seamounts, visiting shallow reefs to be cleaned, or observed surface-feeding both inshore and offshore (Stevens *et al.* 2018). Oceanic manta rays spend significantly more time in the oceanic zone, and are less frequently sighted on shallow reefs and at cleaning stations than reef manta rays (Stevens *et al.* 2018). T. Clark (unpublished data) indicates an active presence of mantas on cleaning stations, which are areas where they eliminate skin parasites or clean their wounds. The aggregation of mantas in some coastal areas (cleaning stations) and their short and long periodical migrations between the same areas may create genetically isolated populations (Deakos et al. 2011).

7. Mobulid rays are capable of making significant migrations across broad geographic ranges throughout pelagic and coastal waters (Jaine *et al.* 2014; Thorrold *et al.* 2014; Francis & Jones 2016). Oceanic manta rays are capable of migrations in excess of 1,000 kilometres (Marshall *et al.* 2018). Although populations appear to be fragmented, and across ocean-basin migrations are likely to be rare, records of individual large-scale movements across jurisdictional borders and into the open ocean support the fact that the species are capable of large migrations (Marshall *et al.* 2018). Cross border movements have been recorded using satellite tracking

between Ecuador and Peru, between Mozambique and South Africa, and within the Yucatán into the Gulf of Mexico (Marshall *et al.* 2018).

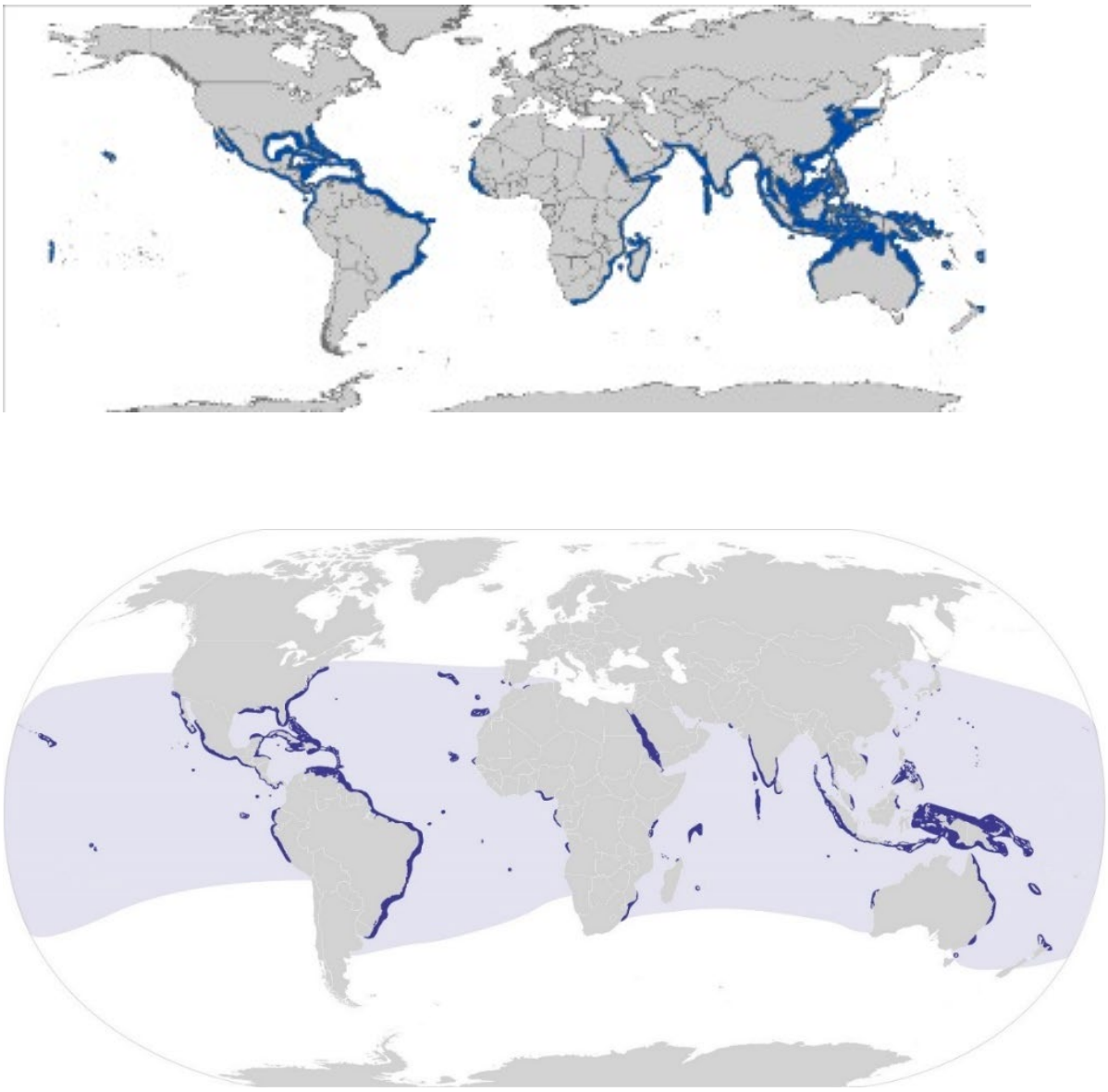


Figure 2: Worldwide distribution of the oceanic manta ray (*Mobula birostris*). Dark purple indicates confirmed sighting, light blue encompasses estimated range (Source: Stevens *et al*. 2018).

a.8. Range of distribution

8. Oceanic manta rays have a circumtropical and subtropical range (Kashiwagi *et al.* 2011), with their most northerly sightings recorded off the New Jersey coastline in the United States, and off Aomori in Northern Japan, extending as far south as Uruguay and New Zealand in the Southern Hemisphere (Marshall *et al.* 2018; Stevens *et. al* 2018) (Fig. 2). Sightings and movement dynamics appear to be influenced by environmental oceanic drivers that affect localised productivity seasonally (Couturier *et al.* 2015; Stewart *et al.* 2016a).

9. When NMFS examined all the available scientific and commercial information for a critical habitat designation for giant manta rays in 2019, sightings were pretty rare throughout the U.S. Caribbean.

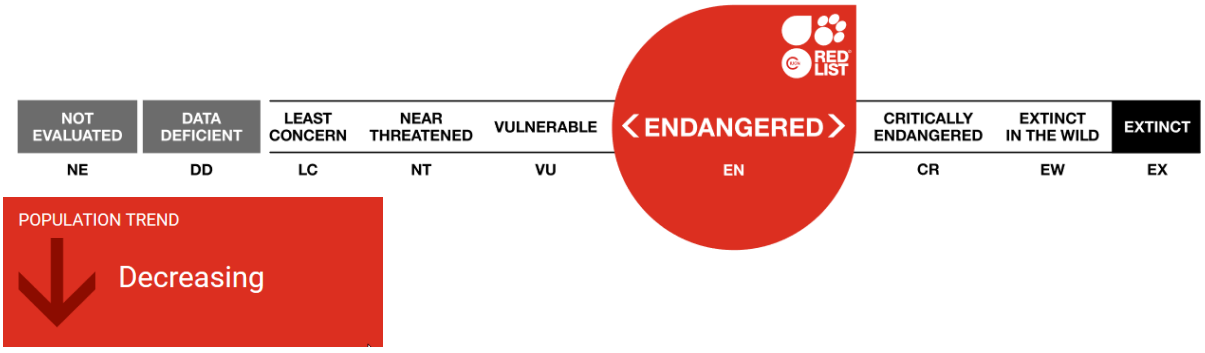
b. Article 19(3)(b) - Estimated Populations of Species and their Geographic Ranges

b.1. Size of Populations

10. Accurate estimates of the global population of oceanic manta rays remain unknown due to its wide distribution, migratory lifestyle, and its recent split from *M. alfredi*. However, it is probable that sub-populations are small (Marshall *et al.* 2018). Photo-identification databases at key aggregation sites globally often contain 300 or less individuals (Marshall *et al.* 2018), although several sub-populations (e.g. Ecuador, Pacific Mexico, and the Maldives) have been recorded in excess of 700 individuals (Stevens, pers. comm.). Sub-populations have been identified and actively monitored in southern Brazil (Luiz *et al.* 2009); Ecuador (Cabanillas-Torpoco *et al.* 2019; Guerrero unpublished data 2020); at the Revillagigedo Islands, Mexico (Rubin 2002); the Yucatán Peninsula, Mexico (Hinojosa-Alvarez unpublished data 2010; Manta Caribbean Project (MCP) unpublished data 2020); the Ogasawara Islands, Japan (Yano *et al.* 1999a, Kashiwagi *et al.* 2011); Mozambique (Marshall 2009); the Maldives (MMRP unpublished data 2020); the Similan Islands, Thailand, (Marshall unpublished data 2011).

b.2. Evidence of Decline

Fig 3. IUCN global status from https://www.iucnredlist.org/species/198921/68632946



11. In January 2021 a review paper was published in Nature which analyses 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).

12. Giant Manta Ray was reviewed as one of the species displaying a strong decline especially in areas with heavy fishing pressure. Rapid local declines have been noted in sightings records and landings where they are targeted or caught as bycatch; these range from 71 to 95% declines over 13- to 21-year periods (all less than one generation length of 29 years) (Marshall *et al.* 2020). It is suspected that the Giant Manta Ray has undergone a population reduction of 50–79% over the past three generation lengths (87 years) and a reduction in area of occupancy due to suspected local and regional extinctions. In areas where Giant Manta Ray are protected the sighting trends appear stable.

13. There is a distinct paucity of information on population dynamics and local populations are likely to decline in areas of fisheries or where anthropogenic activities have been identified as a major threat to the species (Alava et al. 2002, White *et al*. 2006, Anderson *et al*. 2010 in Marshall *et al.* 2011).

14. Global decline of the species is estimated at over 30%, with some regional decreases reaching up to 80% in just 75 years (Marshall *et al.* 2011; CMS 2015). For example, oceanic manta rays were historically a common feature of marine wildlife off the west coast of Mexico and Baja California. However, due to intense overfishing of the species in the 1980s, it is now only rarely seen in the region; a stark contrast to the once large aggregations observed just decades before. In the Sea of Cortez, manta rays were locally targeted for consumption, for use as shark bait, and exported as 'fake scallops' (Booda 1984, Rubin 2002). As a result, severe population declines occurred, with a huge volume of individuals caught within short periods of time. It is estimated that 94% of the total catch in this region across a three-year period in the early-1980s were mobulid species (Notarbartolo di Sciara 1987b; Marshall *et al*. 2018).

15. Targeted and bycatch fisheries are believed to be the cause of declines in mobulid landings in the Philippines, Indonesia, Mexico, India, and Mozambique (Couturier *et al.* 2012; Stewart *et al.* 2018), and resulted in former manta bycatch fisheries making a switch to directed commercial export fisheries (Marshall *et al.* 2018). Population decline across mobulid species was so severe in Mexico across the 1980's that regional protection was implemented (Table 1). Current regulations ban the targeting and use of manta rays as shark bait in the Yucatán Peninsula, Mexico.

16. Recent studies provide evidence of steep localised declines in manta populations from sightings and catch rate data (Lewis *et al.* 2015; White *et al.* 2015; Stewart *et al*. 2017), and a general global and family-wide decline in mobulid rays is also suggested (Ward-Paige *et al.* 2013; Stewart *et al.* 2017). In 2006, with little species-specific data available, the IUCN's Red List evaluated manta rays as "Near-threatened". In 2011, both manta

ray species were reassessed, and upgraded to "Endangered" due to their conservative life history traits and increased human exploitation through directed and bycatch fisheries (Lawson *et al.* 2017; Marshall & Bennett 2010; Stevens 2016; Stewart *et al.* 2018). In 2020 Manta birostris was reassessed again and classified as "Endangered" due to a suspected population decline of 50–79% over the past three generations with further population reduction suspected due to current and ongoing levels of exploitation, and a reduction in area of occupancy due to suspected local and regional extinctions (Marshall et. al 2020).

c Article 19(3)(c) - Status of Legal Protection, with Reference to Relevant National Legislation or Regulations

c.1 The Bahamas, Honduras, the BVI, St Maarten and the Cayman Islands

17. *M. birostris* is fully protected in shark sanctuaries in the Caribbean, i.e., in the Bahamas (2011), Honduras (2011), the BVI (2014), St. Maarten (2016), and the Cayman Islands (2016).

c.2. Colombia

18. Through Resolution 1743 of 2017, among other actions, the exercise of industrial fishing directed at chondrichthyans is prohibited throughout the territory, allowing a percentage of incidental capture of up to 35%. Likewise, the prohibition of the use of steel wires in longlines and not to make modifications of baits or to use other unspecified methods that are aimed for attracting cartilaginous fish to the fishing operation.

19. By the Decrees 2153 of 2016 and 1515 of 2019, Colombia has customs codes tariffs numbers for meat and fins for the shark and ray species, included in the CITES appendices.

c.3. Kingdom of the Netherlands

20. In the Caribbean Netherlands, it has been protected in Bonaire since 2010. With the establishment of the Yarari Sanctuary in all waters of Bonaire, St. Eustatius and Saba in 2015 *M. birostris* is fully protected in those waters.

c.4. Republic of France

21. *M. birostris* is totally protected in the European Union by EU Regulation No. 2018/120 of 23 January 2018, this includes all the French waters under the range of the SPAW Protocol.

c.5. United States

22. In 2018, the United States listed the giant manta ray as a threatened species under its Endangered Species Act.

c.6. Additional information

23. Several other states, outside the European Union, have banned all forms of manta rays' capture and even created marine parks to promote their protection.

c.7. International protection status

24. In response to increased demand for their gill plates, both manta ray species were listed on Appendix II of the Convention on International Trade in Endangered Species (CITES) in March 2013. In November 2014, the reef manta ray joined the oceanic manta ray, being listed on Appendices I and II of the Convention on Migratory Species of Wild Animals (CMS) (Table 1).

25. Recognizing the value of a collaborative arrangement between the CEP and CMS Secretariats, and their respective associated scientific and technical bodies, as well as the need for coordination among Secretariats of relevant biodiversity-related conventions, a Memorandum of Cooperation (MoC) was concluded in 2005 between the Secretariat of the Cartagena Convention and Secretariat of the CMS.

26. Contracting Parties to the Cartagena Convention have encouraged the CEP Secretariat to further enhance cooperation and coordination with regional fisheries management organisations and mechanisms. This is in line with the endorsed regional policy under the Caribbean and North Brazil Shelf Large Marine Ecosystems Project (CLME+) which seeks to guide harmonised sectoral policies and strengthen cooperation between regional fisheries bodies and environmental organisations.

27. Table 1 lists all those nations where oceanic manta rays are protected nationally and locally at the state level.

Location	Legal Protection Measures
International	
CITES Appendix II	Listing of the genus *Manta* (2013) and *Mobula* (2016) on Appendix II of the Convention on International Trade in Endangered Species (CITES).
CMS Signatories	Convention on the Conservation of Migratory Species of Wild Animals (CMS), Appendix I and II; *M. birostris* (2011), all other mobulid species (2014).
Regional	
European Union member countries	Council Regulation (EU) 2015/2014 amending Regulation (EU) No 43/2014 and repealing Regulation (EU) No 779/2014.
Inter-American Tropical Tuna Commission (IATTC)	Resolution C-15-04 on the Conservation of Mobulid Rays Caught in Association with Fisheries in the IATTC Convention Area.
National	
United States of America (USA)	Oceanic manta ray listed Threatened under U.S. Endangered Species Act and Protected by the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce. Endangered Species Act (2018).
State	
Commonwealth of the Northern Mariana Islands, USA Territory	Public Law No. 15-124.
Florida, USA	FL Admin Code 68B-44.008 – no harvest.
Guam, USA Territory	Bill 44-31 prohibiting possession/sale/trade in ray parts 2011.
Hawaii, USA	H.B. 366 2009 – no harvest or trade.

Table 1: Protective legislation for oceanic manta rays (*Mobula birostris*).

***Note**: Adapted from Conserving Mobulid Ray; A Global Strategy & Action Plan, Manta Trust, 2018, p. 13.*

d. Article 19(3)(d) - Ecological Interactions with Other Species and Specific Habitat Requirements

d.1 Migration

28. When manta rays were identified as two separate species in 2009 (Marshall *et al*. 2009), a key differentiating characteristic was the more migratory nature of oceanic manta rays (Couturier *et al.* 2012; Stewart *et al.* 2016a). However, recent studies indicate that reef manta rays, although thought to be more resident in nature, also make occasional significant migrations, sometimes extending hundreds of kilometres (Germanov & Marshall 2014; Jaine *et al*. 2014; Braun *et al.* 2014; Stewart *et al.* 2016a; Armstrong *et al.* 2019). Conversely recent data suggest that oceanic manta rays can exhibit high site fidelity (Deakos *et al.* 2011; Braun *et al.* 2014; Stewart *et al.* 2016a; Stewart *et al.* 2016b; Arauz et al. 2019), exploiting both coastal and offshore habitats to forage (Stewart *et al.* 2016a).

29. Previously considered 'ocean wanderers', recent studies suggest more localised movements, with populations showing a degree of philopatry to remote islands and seamounts, with periods of migration throughout the year (Rubin 2002, Luiz *et al.* 2008, Stewart *et al.* 2016a; Marshall *et al.* 2018; Stevens *et al.* 2018). Data from acoustic tracks indicate that mantas migrate in short periods between cleaning stations and feeding ground (Clark unpublished data, Baquero *et al*. unpublished, Hardin and Bierwagen unpublished). The migratory movements of this oceanic species are thought to be driven by oceanic currents, following the seasonal blooms of their zooplankton prey (Stevens *et al.* 2018). Oceanic manta rays also undertake vertical migrations, with depths varying across a season, but often diving to between 100 – 150 metres, presumably foraging on the dense zooplankton aggregations located within the thermocline commonly located between 80 – 100 metres (Stewart *et al.* 2016b; Stewart *et al.* 2019). Variations in vertical movement behaviour (linked to the location and availability of zooplankton) was observed on a seasonal basis from data collected from satellite tags deployed on oceanic manta rays at the Revillagigedo Archipelago, Mexico (Stewart *et al.* 2016b). The species shows a circadian swimming behavior. During the day it inhabits 3 of 11 shallow reefs and superficial waters while migrating vertically at night to deeper waters (Dewar *et al*. 2008).

e. Article 19(3)(e) - Management and Recovery Plans for Endangered and Threatened Species

e.1. Colombia

30. There is the "National Action Plan for the Conservation and Management of Sharks, Rays and Chimeras of Colombia (PAN - Tiburones Colombia)", as the Policy instrument that establishes the guidelines for the conservation and sustainable management of the species of sharks, rays and chimeras in the marine and continental waters of the country and interact with tourist and cultural activities and the different fisheries on an artisanal and industrial scale. Its objectives include the following:

- Identify and evaluate the threats to the populations of sharks, rays and chimaeras in Colombia, associated with the extraction of individuals from their natural environment and the deterioration or modification of critical habitats.

- Determine and develop a regulatory and normative framework that allows the proper management and management of sharks, rays and chimeras in Colombia.

- Structure and guide an efficient program for the surveillance and control of fishing or other activities that impact sharks, rays and chimeras of marine and continental waters, by the competent entities.

e. 2. United States

31. The United States is developing a recovery plan for the giant manta ray and in 2019 published a recovery outline to serve as an interim guidance document to direct recovery efforts for the giant manta ray until a full recovery plan is developed and approved. The recovery outline presents a preliminary strategy for the recovery of the species and recommends high priority actions to stabilize and recover the species (NOAA, 2019).

f. Article 19(3)(f) - Research Programs and Available Scientific and Technical Publications Relevant to the Species

32. Appendix I and II of CMS and Annex I of the Sharks MoU.

g. Article 19(3)(g) - Threats to the Protected Species, their Habitats and their Associated Ecosystems, Especially Threats which Originate Outside the Jurisdiction of the Party

g.1. Harvesting threats

33. *M. birostris* is considered highly susceptible to anthropogenic threats. Being a migratory pelagic species that is often observed feeding near the surface; mantas are highly susceptible to direct, by-catch fishing incidents or indirect fishing activities. (Dewar 2002).

34. The greatest threat facing all mobulid species are targeted and bycatch fisheries (Croll *et al.* 2016; Stewart *et al.* 2018). Heinrichs *et al*. 2011 gathered fishery information of several countries indicating the existence of some important fishing grounds for this species, and also the reported reduction of sighting near fishing areas.There are at least 13 recognised targeted fisheries globally, and 30 fisheries catching mobulids as bycatch (Hall & Roman 2013; Croll *et al*. 2016; Stewart *et al*. 2018). Their large body size, and predictable aggregatory behaviour, has resulted in large numbers of individuals being caught within a short space of time (Couturier *et al.* 2012; O'Malley *et al.* 2017; Stewart *et al*. 2018). Vulnerable to almost all types of targeted and bycatch fishing gear, mobulids are commonly caught in both large- and small-scale fisheries across a tropical and subtropical range (Croll *et al*. 2016; Stewart *et al*. 2018).

35. Oceanic manta rays also get caught as bycatch to unsustainable levels given their life histories (Dulvy et al. 2014a). Manta rays have among the lowest fecundity of all elasmobranchs (Dulvy et al. 2014a; Stevens, 2016). Their low rate of reproduction, long maturation time, small size of subpopulations, and aggregating behaviour makes them particularly vulnerable to over-exploitation from fishery, (Dulvy et al. 2014a).These biological constraints would also contribute to its slow or lack of recovery from population reductions.The slow

reproductive output of manta rays means that there is no 'sustainable' targeted fishery (Dulvy *et al*. 2014b; Pardo *et al.* 2016a; Stewart *et al*. 2018).

36. Unintentional landings (bycatch) account for the majority of total mobulid catch (Stewart *et al.* 2018). Due to their high metabolic rates and the lack of a protective skeleton around their vital organs (Poisson *et al.* 2014; Stewart *et al.* 2018), post release mortality is high (Croll *et al*. 2016). Safe release methods have been adopted by a small number of tuna fisheries, however further research is needed to support this as an effective management strategy (Poisson *et al*. 2014; Hutchinson *et al.* 2017; Stewart *et al.* 2018). With mortality rate results reaching as high as 50-60% for certain mobulid species following release from purse seine fisheries (Francis & Jones 2016), further testing on a full range of fishing gear is needed to fully evaluate the post-release mortality of mobulids, particularly in gear with a longer soak time, i.e. purse seines or long lines (Stewart *et al*. 2018). Evidences from other threats related to fisheries, such as wounds from sport fishing and entanglement in nets can also have detrimental effects on survival and population decline.

g.2. Growing national and international utilization

37. The demand for this species has grown in recent years. Mantas that used to be considered by-catch are now kept and processed. An illegal market has been also identified mostly to export manta and mobula parts to Asian markets. (Notarbartolo-di-Sciara 1987b; Alava *et al*. 2002; White *et al*. 2006). Many parts of the body are used for traditional medicine, tallow, leather, and a recent demand for gill-rakers all of which have placed the species in a threatened position and classified it as Endangeredon the IUCN Red List of endangered species (Marshall *et al.* 2020).

38. The greatest threats to oceanic manta rays are targeted fisheries, increasingly driven by the international demand and resulting trade in their gill plates. These plates are used in Asian medicine for a health tonic purported to treat a wide variety of conditions, but for which evidence is unfounded (O'Malley *et al.* 2017). This demand for mobulid gill plates, combined with local meat use (as shark bait and for human consumption) (Croll *et al.* 2016; O'Malley *et al.* 2017; Stewart *et al.* 2018), has led to the unsustainable targeting of species around the world (Marshall *et al.* 2018).The international trade in the gill rakes of mantas, centered in Asia, may be driving local depletion.

g.3. Tourism

39. Aside from their consumptive use in the gill plate trade and meat (for bait and local consumption), manta rays are the focus of highly lucrative ecotourism "swim-with" experiences. Worldwide, manta tourism now generates US$ 140 million annually to the global economy (O'Malley *et al.* 2013; Murray *et al.* 2019). Manta ray hotspots, including the Maldives, are shown to economically benefit from such tourism, growing from an

estimated contribution of US$ 8.1 million in direct revenue in 2010 (Anderson *et al.* 2011) to US$ 15.4 million in 2013 (O'Malley *et al.* 2013). However, this tourism must be sustainable to not negatively affect the species (Murray *et al.* 2019). Manta rays feed on ephemeral blooms of zooplankton which can disperse quickly, meaning that any disturbance to feeding behaviour could highly impact their nutritional intake (Murray *et al.* 2019). Manta rays can be disturbed by divers' poor buoyancy or divers approaching too close to the station, which in turn, can also cause damage to the fragile coral ecosystem (Murray *et al,* 2019). If "swim-with" encounters are regulated and guidelines followed, manta ecotourism can be a sustainable alternative, economically beneficial to local communities and contribute to marine conservation and education (Norman & Catlin 2007; Murray *et al*. 2019).

g.4. Habitats destruction and pollution

40. Coastal regions are in high demand for residential and commercial development, heavily used for industrial and tourism purposes (Marshall *et al.* 2018). Lucrative coastal development results in erosion, pollution, and degradation of critical habitats for many marine species, including manta rays. The increasing size of human populations inhabiting the coastline contributes to the release of chemicals, and liquid and solid wastes, which damage key marine habitats, including cleaning stations and aggregation sites for numerous marine species (Last & Stevens 1994; Bray & Hawkins 2000; Worm *et al.* 2017; Stewart *et al.* 2018). In addition to habitat degradation, bio accumulation of dissolved lipophilic pollutants amasses up the food chain, leaving filter feeding species such as manta rays exposed to pollutants and chemicals (Stewart *et al.* 2018). Critical juvenile sites (often shallow, more protected areas of the reef) are vulnerable to anthropogenic pressures, including pollution and habitat or coastal erosion (CMS 2015). Increased anthropogenic activity in coastal regions results in species' heightened exposure to boat traffic and strikes, mooring lines, and fishing activities, marine debris, storm water runoff, and humans partaking in "swim-with" encounters (Deakos *et al.* 2011; Stewart *et al.* 2018; Ulmer 2020).

g.5. Climate change

41. Climate change is an increasing stressor to oceanic manta rays (Doney *et al*. 2011; Harley *et al*. 2006; Stewart *et al.* 2018). Manta rays show sensitivity to large-scale climatic variability; driven by the movement of their zooplankton prey, manta rays are likely to feel the shift in primary and secondary productivity led by carbon dioxide emissions and rising global sea surface temperatures, expected to increase by 1 - 3° this century (Church *et al*. 2013; Collins *et al*. 2013; Kirtman *et al*. 2013; Taylor *et al.* 2012; Stewart *et al*. 2018). Temperature changes, and the associated shift in ocean circulation, are likely to impact zooplankton distribution and biomass, expected to move blooms poleward from tropical waters, moving foraging grounds

away from other key habitats for manta rays; for example, cleaning stations (Stewart *et al.* 2018). This in turn will strain the energetic demands of individuals and threaten population sustainability (Stewart *et al,* 2018).

g.6. Pollution

42. Pollutants, such as persistent organic pollutants (POPs) and heavy metals, which were introduced to the marine environment through poor industrial procedures and wastewater, have the potential to be ingested by filter feeding species, including manta rays (Stewart *et al.* 2018). Microplastics (plastic particles < 5 mm in size) further contaminate the marine environment with phthalates, styrenes, and bisphenol amongst many other toxins (Worm *et al.* 2017; Stewart *et al.* 2018). Evidence of manta ray foraging grounds crossing over with areas of high plastic pollution highlights a potential risk to mobulid species. However, the full extent of plastic consumption and the resulting effects has yet to be rigorously studied and remains a topic for future research (Stewart *et al.* 2018).

g.7. Threats Related to Migratory Behaviour

43. Whilst regional populations are recognised, manta rays are a migratory species (Marshall *et al.* 2018). For this reason, the inclusion of the oceanic manta ray on Appendix I and II of the Convention on Migratory Species (CMS) was key, increasing the species protection across 54 of the range states of the CMS signatories. National management strategies present limitations to species protection. The migratory habits of species such as oceanic manta rays*,* moving between aggregation sites, traveling offshore into international waters between key habitats, means they are vulnerable to multiple fisheries, and leaves national protection alone insufficient (Stevens 2000; Heinrichs *et al.* 2011; Kessel *et al.* 2017; Stewart *et al.* 2018). Therefore, identifying these key habitats and establishing regional protection and management is more likely to ensure sustainable protections for oceanic manta rays.

B. Article 21 – Establishment of Common Guidelines or Criteria

a. Article 21 criterion 2 - Precautionary principle

44. ‘When evaluation of the factors enumerated above clearly indicates that a species is threatened or endangered, 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.’

45. Global population sizes are difficult to assess due to its wide distribution, migratory lifestyle, and its recent split from M. alfredi. There is a distinct paucity of information on population dynamics (Alava et al. 2002,

White et al. 2006).

b. Article 21 criterion 3 - levels and patterns of use and the success of national management programmes

46. 'With particular reference to listing in Annex III, the levels and patterns of use and the success of national management programmes should be taken into account.'

c. Article 21 criterion 5 - local or international trade

47. 'The evaluation of a species is also to be based on whether it is, or is likely to be, the subject of local or international trade, and whether the international trade of the species under consideration is regulated under CITES or other instruments.'

48. An illegal market has been also identified mostly to export manta and mobula parts to Asian markets (Heinrichs et al. 2011).

d. Article 21 criterion 6 - Usefulness of Regional Cooperative Efforts

49. 'The evaluation of the desirability of listing a species in one of the Annexes should be based on the importance and usefulness of regional cooperative efforts on the protection and recovery of the species.'

50. There is a concern regarding the limitations of implementing national management strategies alone. The lack of regional protection jeopardizes the future of these animals. Giant mantas are mostly pelagic and can be seen in coastal and open waters. They are migratory, leaving exclusive economic zones (EEZs), crossing migratory corridors, and entering the high seas, leaving them exposed to unregulated anthropogenic threats (Molony 2005; Perez & Wahlrich 2005; White *et al.* 2006; Zeeberg *et al*. 2006; Pianet *et al.* 2010; Couturier *et al.* 2012; CMS 2015). Fisheries regulation and extended protection measures are crucial to halt further species decline, and to allow depleted populations to recover (Stewart *et al*. 2016a; Dill *et al*. 2017; Barr & Abelson 2019; Booth *et al.* 2020). Moreover, given the pelagic lifestyle, wide range of distribution and migratory nature of *M. birostris*, national management and protection plans are not sufficient to effectively conserve their populations. Therefore it is critical to establish regional and international plans to reduce the impact of human pressure on their abundance and distribution (Marshall *et al*. 2011).

51. Additionally, the aggregation of mantas in some coastal areas (cleaning stations) and their short and long periodical migrations between the same areas may create genetically isolated populations (Deakos *et al.* 2011).

Since fishermen and divers know aggregation spots, these areas should be protected regionally to prevent massive depletions of an animal that can be easily harpooned (Dewar 2002; Dewar *et al.* 2008).

III. Discussion points and recommendations

52. As developed in section 1 of the document, the listing of species is to be justified based on a variety of criteria set out in the Revised criteria for the listing of species in the Annexes of the SPAW Protocol.

53. In particular, regarding the evidence of decline (criterion #1 in the guidelines) "*the scientific evaluation of the threatened or endangered status of the proposed species is to be based on the following factors: size of populations, 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, other conditions clearly increasing the vulnerability of the species, and the importance of the species to the maintenance of fragile or vulnerable ecosystems and habitats"*. Criterion #2 states that: *"When evaluation of the factors enumerated above clearly indicates that a species is threatened or endangered, 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 #4 states the importance of considering the IUCN red list listing for the Caribbean region, criterion #5 the interest of alignment with CITES and other international instruments and criterion #6 the importance and usefulness of regional cooperative efforts on the protection and recovery of the species.

54. All authors and most experts of the group conclude that the relevant criteria for inclusion in Annex II of SPAW are considered to be met and that uplisting to Annex II is warranted for the giant Manta Ray, based on the criteria and information available in the proposal. They in particular emphasize that there is clear evidence of global decline with a population decrease over 70- 80 % for the past 3 generations/ Giant manta rays have suffered rapid local declines that range from 71 to 95% declines over 13- to 21-year periods (all less than one generation length of 29 years). Furthermore, as the whale shark, the species is characterized by a K life history, low reproductive output and thus low resilience to anthropogenic impact. They are long-lived with late maturation, low fecundity, and long periods of gestation increase the vulnerability of the species (criterion # 1). They emphasize that the most recent IUCN assessment for the global population is that it is Endangered, the regional assessment from 2012 classifies it as Vulnerable though stipulates that this is not based on regional modelling but aligned to what was then the global assessment. As the global assessment has been updated to Endangered this apply to the Caribbean region too (criterion #4).

55. It is a highly migratory species which justifies the importance and usefulness of regional and cooperative efforts on the protection and recovery of the species (criterion #6), all the more there is a high market demand in Asian markets and that this demand has grown in recent years. *M. birostris* is listed in CMS Appendix I and

II and Sharks MOU Annex 1. The species is strictly protected under CMS and shall not be taken in accordance with Article III (5) of the Convention. The species is listed on CMS appendix I (full protection). They consider SPAW annex 2 listing would align both treaties (criterion #5).

56. Many experts insist that while the data needed may not be there, it is normal considering the limited scientific research on local population levels especially for such a rare and difficult to study species like the giant Manta ray. Thus most insist that the lack of data and lack full scientific certainty can't be evoked to prevent the listing of the species and can't be a barrier to implementing effective management and commitments (criterion #2). Rapid decline over past two decades merits highest form of protection, not just regulation. One point out the interest for the protection of migratory corridors, critical habitat and areas of congregation (criterion #10).

57. One (1) expert considers Annex II listing is not justified. She considers that there is lack of information about population size, population dynamics, and species status and identified threats in the Caribbean (criteria #1) and that the amount of data/evidence available at this time is insufficient to warrant a precautionary approach (criteria #2).

58. While protective legislation has improved in recent years, there is still a much greater need for protection throughout the range of all manta and devil ray species globally. A few countries have taken the lead in manta ray conservation, protecting these species to differing degrees within their territorial waters. Not surprisingly, the most conservation minded of these nations are also those that derive the most economic benefits from manta and mobula tourism. Some recommendations can be made to improve giant manta rays management

A. Better-managed tourism industry

59. The tourism industry worldwide has increased in recent years. Specifically, diving tourism has been part of this growth thanks to technological advances and human attitude changes that have allowed man to experience marine life. However, this non-extractive activity depends directly on the conservation of the marine realm. Therefore, species such as the Giant manta ray have become a major attraction around the world. In this context, manta hotspots such as feeding and cleaning stations are major diving destinations worldwide.

60. Manta rays remain important species for many communities worldwide, both economically and culturally. With the growing success of manta "swim-with" experiences in certain regions, for example in Indonesia, there is the opportunity for a transition from destructive fishing practices to regulated ecotourism activities in areas which have previously relied upon consumptive use. A well-managed tourism industry can positively contribute to the conservation of the marine environment, while being economically profitable for the human communities that use the resources sustainably (Norman and Catlin 2007).

B. Efficient regulation of extractive activities

61. Manta rays are migratory, leaving exclusive economic zones (EEZs), crossing migratory corridors, and entering the high seas, leaving them exposed to unregulated anthropogenic threats (Molony 2005; Perez & Wahlrich 2005; White *et al.* 2006; Zeeberg *et al*. 2006; Pianet *et al.* 2010; Couturier *et al.* 2012; CMS 2015). Fisheries regulation and extended protection measures are crucial to halt further species decline, and to allow depleted populations to recover (Stewart *et al*. 2016a; Dill *et al*. 2017; Barr & Abelson 2019; Booth *et al.* 2020).

62. It is clear that fisheries targeting oceanic manta ray are unsustainable (Couturier *et al*. 2012; O'Malley *et al.* 2013, Dulvy *et al.* 2014a; Marshall *et al.* 2016; Beale *et al*. 2019). However, further research is needed to quantify the full extent of directed and bycatch fisheries on the species throughout its range. The implementation of Marine Protected Areas (MPAs) is essential to reduce anthropogenic pressures on oceanic manta rays, especially for small, geographically isolated populations, or areas of critical habitat. In the face of the climate crisis, many larger MPAs are urgently needed for wildlife to retain the greatest resilience in the face of all the threats they face (Deakos *et al*. 2011; Graham *et al*. 2012; CMS 2015; Stewart *et al*. 2016a).

63. With human populations increasing significantly in some coastal regions, many low-income communities rely on the ocean; some specifically on mobulid species for their income and protein intake (Allison *et al.* 2009; Fernando & Stevens 2011; Lewis *et al.* 2015; Lawson *et al.* 2017). For conservation procedures to be effective, there must be financially beneficial, yet sustainable, alternatives to fishing, which aid a shift in both economic and social practices (McClanahan *et al.* 2008; Lawson *et al.* 2017).

64. In addition, in order to implement successful species conservation and management plans, it is imperative to fully understand a species' habitat use and spatial dynamic trends (Cooke, 2008; Ogburn *et al.* 2017).

IV. Conclusion

65. In 2020 Manta birostris was classified as "Endangered" by the IUCN due to a suspected population decline of 50–79% over the past three generations. Although further data is needed to understand the population size and structure of most sub-populations, it is evident that the species is highly vulnerable to targeted and bycatch fisheries (Croll *et al.* 2016; Stewart *et al.* 2018). Moreover, oceanic manta rays are vulnerable to anthropogenic pressures due to their conservative life history; long-lived with late maturation, low fecundity, and long periods of gestation (Burgess *et al.* 2016; Lawson *et al.* 2017; Marshall *et al.* 2018).

66. All authors and all experts but one consider the species meets key criteria and that is it is of the greatest importance to list the species in the Annex II of the SPAW Protocol mainly because of evidence of global decline, very high vulnerability to threats and the most recent IUCN assessment for the global population that is Critically Endangered. One expert consider that Annex II listing is not justified as there is lack of information about population size, population dynamics, and species status and identified threats in the Caribbean.

V. Annexes

Annex 1. Evaluation criteria for Manta birostris listing under the Annex II

Concerns Annexes I, II and III								

Criteria evaluation for the: Manta (Manta birostris) listing under the Annex II

SPAW Article	Criterion number	Criterion	Criterion details	Presence of information in the proposal report	Information quotes	Literature	1 is the criterion relevant for this species R/NR 2 is it possible to obtain the information O/NO)	If relevant Criterion validation Yes/ No
21	#1	The scientific evaluation of threatened or endangered status of the species is to be based on these factors :ic evaluation of the threatened or endangered status of the species is to be based on these factors :	Size of population	Y/N	No specific data for the region		NR, NO	Y
			Evidence of decline	Y	Rapid local declines have been noted in sightings records and landings where they are targeted or caught as bycatch; these range from 71 to 95% declines over 13- to 21-year periods (all less than one generation length of 29 years)	Marshall et al. 2020 Pacoureau et al. 2021	R	Y

SPAW Article	Criterion number	Criterion	Criterion details	Presence of information in the proposal report	Information quotes	Literature	1 is the criterion relevant for this species R/NR 2 is it possible to obtain the information O/NO)	If relevant Criterion validation Yes/ No
			Restriction on its range of distribution	N			NR	
			Degree of population fragmentation	N	the aggregation of mantas in some coastal areas (cleaning stations) and their short and long periodical migrations between the same areas may create genetically isolated populations	Deakos et al. 2011		
			Biology	Y	conservative life history; long-lived with late maturation, low fecundity, and long periods of gestation	Marshall et al. 2011 Burgess *et al.* 2016; Lawson *et al.* 2017; Marshall *et al.* 2018	R	Y

SPAW Article	Criterion number	Criterion	Criterion details	Presence of information in the proposal report	Information quotes	Literature	1 is the criterion relevant for this species R/NR 2 is it possible to obtain the information O/NO)	If relevant Criterion validation Yes/ No
				Y	this species has a very conservative life history with an extremely low reproductive output (1 pup every 4 to 5 years) site fidelity to critical habitats			
			Other population dynamics	N				
			Conditions increasing the vulnerability of the species/ major threats	Y	demand for this species has grown in recent years An illegal market has been also identified mostly to export manta and mobula parts to Asian markets	Notarbartolo-di-Sciara 1987b; Alava et al. 2002; Marshall et al. 2006; White et al. 2006; Hilton unpublished data (Heinrichs et al. 2011)	R	Y

SPAW Article	Criterion number	Criterion	Criterion details	Presence of information in the proposal report	Information quotes	Literature	1 is the criterion relevant for this species R/NR 2 is it possible to obtain the information O/NO)	If relevant Criterion validation Yes/ No
			Importance of the species to the maintenance of fragile or vulnerable ecosystems and habitats	N			NR	
	#2	Does the precautionary principle apply (are there clear indications from criteria 1 that the species is threatened or endangered, but the exact population status is not clear)		Y	Global population sizes is estimated to be greatly reduced (over 80% reduction in 3 generations) but exact numbers for the Caribbean population are not available	Pacoureau et al. 2021	R	Y

SPAW Article	Criterion number	Criterion	Criterion details	Presence of information in the proposal report	Information quotes	Literature	1 is the criterion relevant for this species R/NR 2 is it possible to obtain the information O/NO)	If relevant Criterion validation Yes/ No
21	#4	Application of the IUCN criteria in a regional (Caribbean) context will be helpful if sufficient data are available	IUCN category for the Caribbean	Y	In 2020 Manta birostris was classified as “Endangered” due to a suspected population decline of 50–79% over the past three generations		R	Y
21	#5	Is the species the subject of local or international trade AND is the international trade regulated under CITES or other instruments ?		Y	There is no information to indicate this is happening in this region(see CITES trade data base). When NMFS did its review of the species, we did not find information indicating illegal markets are located in the Caribbean. This is mostly occurring in the Indo-Pacific.	Heinrichs et al. 2011	R	Y
21	#6	Importance and usefulness of regional and cooperative efforts on the protection and recovery for species	I	Y	Their migratory characteristic makes it necessary to develop regional and international plans to reduce the impact of human pressure on their abundance and distribution + listed on Appendix I and II of CMS and Annex I of the Sharks MoU	Marshall et al. 2011	R	Y

SPAW Article	Criterion number	Criterion	Criterion details	Presence of information in the proposal report	Information quotes	Literature	1 is the criterion relevant for this species R/NR 2 is it possible to obtain the information O/NO)	If relevant Criterion validation Yes/ No
21	#7	Endemism of the species (and importance of regional cooperation for its recovery)		N			NR	
21	#8	Listing as a taxonomic group		N	*Elasmobranchs*		NR	
11 (a)	#10	listing as an "appropriate measure to ensure the protection and recovery" of fragile ecosystems/habitats where they occur		N			NR	
11 (4,a) – 19 (3)	#	Presence of the species in another annex of the SPAW Protocol		Y	Annex III		R	Y
	#	information demonstrating the applicability of the appropriate SPAW listing criteria						
	***	Does the species benefit from another protection tool ?						

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