CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Seventeenth meeting of the Conference of the Parties
Johannesburg (South Africa), 24 September – 5 October 2016

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of *Mobula tarapacana* (sicklefin devil ray) and *Mobula japanica* (spinetail devil ray) in Appendix II in accordance with Article II paragraph 2(a) of the Convention and satisfying Criterion A in Annex 2a of Resolution Conf. 9.24 (Rev. CoP16). Inclusion of all other species of mobula rays, genus *Mobula* spp. in Appendix II in accordance with Article II paragraph 2(b) of the Convention and satisfying Criterion A in Annex 2b of Resolution Conf. 9.24 (Rev. CoP16).

Qualifying Criteria (Conf. 9.24 Rev. CoP15)

Annex 2a, Criterion A. *It is known, or can be inferred or projected, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future*.

Mobula japanica and *Mobula tarapacana* qualify for inclusion in Appendix II under Annex (2a) Criterion A, meeting CITES' guidelines for the application of decline for low productivity, commercially exploited aquatic species. Increasing international trade in *Mobula* gill plates has led to expansion of unsustainable fisheries, which are largely unregulated and unmonitored. As a result, local catch declines of up to 96% for *Mobula japanica* and 99% for *Mobula tarapacana* in the Indo-Pacific region have been observed in fished populations over the past ten to fifteen years despite increased directed effort. Small and highly fragmented populations, exceptionally low productivity, and known aggregating behaviour make these species highly vulnerable to exploitation with limited ability to recover from a depleted state. Without prompt regulation of international trade, these species will likely soon qualify globally for Appendix I listing.

Annex 2b, Criterion A. *The specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II under the provisions of Article II, paragraph 2 (a), or in Appendix I, so that enforcement officers who encounter specimens of CITES-listed species are unlikely to be able to distinguish between them*.

All other species in the genus *Mobula* (the species currently described are *Mobula mobular, Mobula thurstoni, Mobula eregoodootenkee, Mobula kuhlii, Mobula hypostoma, Mobula rochebrunei,* and *Mobula munkiana*) qualify for inclusion in Appendix II under Annex (2b) Criterion A, meeting CITES' guidelines for the application due to the great difficulty in distinguishing between the traded dried gill plates of the different species in genus *Mobula*.

All species in the genus *Mobula* qualify for inclusion in Appendix II under Annex (2b) Criterion A, due to the similarities between the dried gill plates of large *Mobula* and small specimens of *Manta* spp., listed on Appendix II at CoP16. Dried gill plates from M. *japanica* are also very similar in size and appearance to M. *thurstoni,* and *M. kuhlii*. Bi-coloured gill plates are generally considered to be from M. *tarapacana*, though it has recently been discovered that gill plates from some M. *thurstoni* and M. *hypostoma* are also bi-coloured.

B. Proponent

Bahamas, Bangladesh, Benin, Brazil, Burkina Faso, Comoros, Costa Rica, Ecuador, Egypt, European Union, Fiji, Ghana, Guinea, Guinea-Bissau, Maldives, Mauritania, Palau, Panama, Samoa, Senegal, Seychelles, Sri Lanka and the United States of America*:

C. Supporting statement

1. Taxonomy

1.1 Class: Chondrichthyes (Subclass: Elasmobranchii)

1.2 Order: Rajiformes

1.3 Family: Mobulidae

1.4 Genus and species: All species within the genus *Mobula* (Rafinesque, 1810): currently including nine described: *Mobula mobular* (Bonnaterre, 1788), *Mobula japanica* (Müller & Henle, 1841), *Mobula thurstoni* (Lloyd, 1908), *Mobula tarapacana* (Philippi, 1892), *Mobula eregoodootenkee* (Bleeker, 1859), *Mobula kuhlii* (Müller & Henle, 1841), *Mobula hypostoma* (Bancroft, 1831), *Mobula rochebrunei* (Vaillant, 1879), *Mobula munkiana* (Notarbartolo-di-Sciara, 1987) and any other undescribed *Mobula* species.

1.5 Scientific synonyms:
M. mobular: *Raja diabolus (Shaw, 1804), Raja giorna* (Lacépède, 1802)
M. japanica: Mobula rancureli (Cadenat, 1959).
M. thurstoni: Mobula lucasana (Beebe & Tee-Van, 1938).
M. tarapacana: Mobula coilloti (Cadenat & Rancurel, 1960) & *Mobula formosana* (Teng 1962).
M. eregoodootenkee: Mobula diabolus (Whitley, 1940).
M. kuhlii: Mobula draco (Günther, 1872), *Cephaloptera kuhlii* (Müller & Henle, 1841) & M. *diabolus* (Smith, 1943).
M. hypostoma: Ceratobatis robertsii (Boulenger, 1897), *Cephalopterus hypostomus* (Bancroft, 1831).
M. rochebrunei: Cephaloptera rochebrunei (Vaillant, 1879).
M. munkiana: None

1.6 Common names:

M. mobular:	English:	Giant Devil Ray
	French:	Mante
	Spanish:	Manta
M. japanica:	English:	Spinetail Mobula, Spinetail Devil Ray, Japanese Devil Ray
	French:	Manta Aguillat
	Spanish:	Manta De Espina, Mante De Aguijón
M. thurstoni:	English:	Bentfin Devil Ray, Lesser Devil Ray, Smoothtail Devil Ray, Smoothtail Mobula, Thurton's Devil Ray
	French:	Mante Vampire
	Spanish:	Chupasangre, Chupa Sangre, Diablo, Diablo Chupasangre, Diablo Manta, Manta, Manta Diablo, Manta Raya, Muciélago

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

M. tarapacana:	English:	Box Ray, Chilean Devil Ray, Devil Ray, Greater Guinean Mobula, Sicklefin Devil Ray, Spiny Mobula
	French:	Diable Géant De Guinée, Mante Chilienne
	Spanish:	Diabolo Gigante De Guinea, Manta Cornuada, Manta Cornuda, Manta Raya, Raya Cornuda, Vaquetilla.
M. eregoodootenkee:	English:	Pygmy Devil Ray, Longhorned Pygmy Devil Ray
M. kuhlii:	English:	Shortfin Pygmy Devil Ray, Lesser Devil Ray, Pygmy Devil Ray
	French:	Petit Diable
M. hypostoma:	English:	Atlantic Pygmy Devil Ray, Lesser Devil Ray
	French:	Diable Géant
	Spanish:	Manta del Golfo
M. rochebrunei:	English:	Lesser Guinean Devil Ray, Guinean Pygmy Devil Ray
	French:	Petit Diable de Guinée. Spanish: Diablito de Guinea
M. munkiana:	English:	Munk's Pygmy Devil Ray, Pygmy Devil Ray, Smoothtail Mobula
	French:	Mante De Munk. Spanish: Diabolo Manta, Manta Raya, Manta Violácea, Tortilla

Trade Names**:** (for Mobula Ray gill plates or rakers):
English: Flower Gills, Fish Gills, Manta Gills, Ray Gills;
Chinese: Peng Yu Sai.

1.7 Code numbers: N/A

2. <u>Overview</u>

2.1 *Mobula japanica* and *M. tarapacana* are slow-growing, large-bodied animals with small, highly fragmented populations that are sparsely distributed across tropical and temperate oceans. They have among the lowest fecundity of all elasmobranchs, giving birth to a single pup every two to three years, and have a generation period greater than ten years. This places them into FAO's lowest productivity category (Section 3). Global genus-wide declines have been recorded and dramatic local declines observed in the Indo-Pacific over only 10 to 15 years. Their biological and behavioural characteristics make them particularly vulnerable to overexploitation in fisheries and extremely slow to recover from depletion. This proposal focuses particularly on the two largest species of *Mobula* with the most valuable gill plates and highest market demand. M. *japanica* is the primary species landed in the markets and recorded in trade, and "white" gill plates from M. *tarapacana* are marketed separately. Other devil ray species classify as look-alike since their gill plates are difficult to distinguish from M. *japanica* or from the *Manta* species already listed in Appendix II..

2.2 The gill plates, used by mantas and mobula rays to filter food from the water, are highly valued in international trade. A single mature *Mobula* can yield up to 3.5 kilos of dried gills that retail for up to US$557 per kilo in China. Recent market surveys have documented an alarming escalation of demand for mobulid gill plates, with the estimated number of individual devil rays represented increasing almost threefold from early 2011 to late 2013 (Section 6, Annex VI). The recent implementation of the CITES Appendix II listings of *Manta* spp. and national protections in important mobulid fishery states are expected to put further pressure on *Mobula* spp. to meet this growing market demand.

2.3 *M. japanica* and *M. tarapacana* are caught in commercial and artisanal, target and bycatch, fisheries throughout their global range in the Atlantic, Pacific and Indian Oceans. The high and increasing value of gill plates has driven increased target fishing pressure for all *Mobula* spp., in key range states, with many former bycatch fisheries having become directed commercial export fisheries (Sections 4, 5 and 6; Annex V).

2.4 There have been no stock assessments, monitoring, or management of *Mobula* fisheries in the range States with the largest fisheries. Incidental landings and discards are rarely recorded at the species level. One Regional Fishery Management Organization (RFMO), the Inter-American Tropical Tuna Commission (IATTC), regulates bycatch of *Mobula* spp. by prohibiting retention and mandating safe release of manta and devil rays from RFMO fisheries. The General Fisheries Commission for the Mediterranean (GFCM) regulates M. *mobular* in the Mediterranean. *Mobulas* are legally protected in a few countries (Sections 7 and 8, Annex VII).

2.5 An Appendix II listing for the genus *Mobula* is necessary in order to ensure that international trade demand does not continue to drive unsustainable fisheries, leading to further significant population decline in *M japanica* and *M. tarapacana,* until they qualify for Appendix I. It will ensure that international trade is supplied by legally obtained products from sustainably managed, accurately recorded fisheries that are not detrimental to the status of the wild populations they exploit. Non-detriment findings will require evidence of an effective sustainable fisheries management program for M. *japanica* and *M. tarapacana* before trade permits can be issued. Other CITES measures for the regulation and monitoring of international trade will reinforce and complement traditional fisheries management measures for these particularly vulnerable species. (Section 11).

3. Species characteristics

The genus *Mobula* comprises nine currently recognized species (listed in section 1.4) with a wingspan (disc width; DW) ranging from 1 to 3.7 M. Notarbartolo di Sciara (1987) completed the most recent taxonomic review of the genus *Mobula*, and Poortvliet *et al*. (2015) recently completed a detailed genetic analysis of the genus. At least 29 different species have been proposed previously (Notarbartolo di Sciara, 1987; Pierce & Bennett, 2003; Froese & Pauly, 2010; Polack, 2011). Species-specific reports are often mixed and can be confounding, particularly without adequate descriptions or photographs.

3.1 Distribution

M. japanica and *M. tarapacana* have worldwide distributions in the tropical and temperate waters of the Pacific, Atlantic and Indian Oceans (Clark *et al*. 2006, White *et al*. 2006a, Couturier *et al*. 2012, Bustamante *et al*. 2012). Within this broad range, M. *japanica* and *M. tarapacana* populations are sparsely distributed and believed to be highly fragmented (Clark *et al.* 2006, White *et al*. 2006a), likely due to their resource and habitat needs (see Annexes II & III for distribution maps, range States and FAO fishing areas).

3.2 Habitat

M. japanica and *M. tarapacana* appear to be seasonal visitors along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. The southern Gulf of California is believed to serve as an important spring and summer mating and feeding ground for adult *M. japanica* (Notarbartolo di Sciara 1988, Sampson *et al.* 2010). Pupping appears to take place offshore (Ebert 2003) possibly around offshore islands or seamounts. *M. tarapacana* are known to make seasonal migrations into the Gulf of California during the summer and autumn, and sightings are rare in winter months (Notarbartolo di Sciara 1988). *M. tarapacana* is primarily oceanic, but is occasionally found in coastal waters (Clark et al. 2006). *M. japanica* and *M. tarapacana* are commonly found throughout the year in the Indian Ocean waters around Sri Lanka (Fernando & Stevens 2011).

3.3 Biological characteristics

M. japanica and *M. tarapacana* are large-bodied, pelagic, planktivorous and ichthyophagous rays. M. *japanica* feed mainly on mysid and euphausiid shrimps (Croll *et al*. 2012, Sampson *et al*. 2010, Notarbartolo di Sciara 1988, Fernando & Stevens 2011), while M. *tarapacana* appear to specialize in catching small schooling baitfish (White *et al*. 2006b, Thorrold *et al*., 2014). M. *japanica* grows to a maximum of 310 cm wingspan (disc width or DW; Notarbartolo di Sciara 1987), with males maturing at 201.6 cm wingspan and females at >207 cm (White *et al.* 2006b; Notarbartolo di Sciara 1987). M. *tarapacana* grows to a maximum of 370 cm wingspan (disc width or DW; Compagno & Last 1999), with males maturing at 234-252.2 cm wingspan. Size at maturity for females is unknown (White *et al.* 2006c), but is likely to be >270 cm.

All *Mobula* are oviparous (eggs develop *in utero* without a placenta), with embryos feeding initially on yolk, then receiving additional nourishment from the mother by absorption of uterine fluid (Dulvy and Reynolds 1997). Mobulid rays, including M. *japanica* and *M. tarapacana*, are among the least fecund of all elasmobranchs (Dulvy *et al*. 2014), however scientific data on the life history strategies of these species are severely lacking (Couturier *et al*. 2012). Mobulids give birth to a single pup after an estimated gestation period of approximately 1 year and have likely resting periods of two or more years between pregnancies (Notarbartolo di Sciara 1988). M. *japanica* DW at birth is approximately 90 cm (White *et al.* 2006a) and >105 cm for M. *tarapacana* (Notarbartolo di Sciara 1987). Preliminary age/growth data from examination of a small sample of vertebrae estimates age at maturity for M. *japanica* at 5-6 years (Cuevas-Zimbrón 2012). However at least some mobulid species have a highly derived vertebral structure that makes it difficult to use the conventional ageing technique applicable to most elasmobranchs (Couturier *et al*. 2012). All mobulids are widely presumed to be long lived and slow growing, in keeping with their relatively large sizes and low reproductive rates (Couturier *et al*. 2012). The lifespan estimate of M. *japanica* lies between 15 and 20 years ((Pardo *et al.,* 2016). Combining this with estimated age at maturity, the median average lifespan of M. *japanica* is 11.5 years, and median natural mortality M is 0.087 year^{-1} (Pardo *et al.,* 2016). Data suggests that larger mobula rays have a low productivity due to their low somatic growth rate, low annual reproductive output and low maximum population rates (Pardo *et al.,* 2016). The intrinsic growth rate of mobula rays is similar to *Manta spp.*, as the median maximum intrinsic rate of population increase (r_{max}) for devil rays equals 0.077 year^{-1}, indicating that there is the potential to drive mobula rays to local extinction under even low levels of fishing mortality (Pardo *et al.,* 2016).

Both species have been observed underwater travelling in schools and as solitary individuals (G. Stevens, pers. Comm., Clark *et al*. 2006). Fishermen frequently report catching large numbers of M. *japanica* in gill nets during a single set, supporting underwater observations that this species often travels in groups (D. Fernando, pers. comm.).

M. japanica spend most of their time in depths of less than 50 m (Croll *et al*. 2012). Aggregations of M. *tarapacana* congregate around seamounts at the Princess Alice Bank, Azores, during the summer (Sobral & Afonso 2014). Many of the females observed during this time appear to be close to parturition and this is probably an important birthing and mating ground for this species in the North Atlantic Ocean (E. Villa, pers. comm.). Similar aggregations are also reported from The St Peter & St Paul's Archipelago, Brazil (R. Bonfil, pers. comm.) and around Cocos Island, Costa Rica (E. Herreño, pers. comm.). M. *tarapacana* individuals are encountered in the Gulf of Mexico at the Flower Garden Banks National Marine Sanctuary (FGBNMS, 2013).

M. japanica and M. *tarapacana* are highly migratory. Satellite tagging data from M. *japanica* captured in Baja California Sur documented long-distance movements through a broad geographic range, including coastal and pelagic waters from southern Gulf of California, to the Pacific coastal waters of Baja California and pelagic waters between the Revillagigedos Islands and Baja California (Croll *et al.* 2012.). M. *tarapacana* tagged in the Azores traveled straight-line distances up to 3,800 km over 7 months, crossing through oligotrophic tropical and subtropical waters (Thorrold *et al.* 2014). M. *japanica* traveled 1,400 – 1,800 km, at minimum speeds of 47 and 63 km per day, crossing high seas from New Zealand to Vanuatu and south of Fiji (Francis & Jones, 2016).

This highly migratory behaviour combined with predictable aggregations in easily accessible areas, makes both M. *japanica* and *M. tarapacana* vulnerable to many target and bycatch, coastal and high seas fisheries (Couturier *et al.* 2012, Croll *et al.* 2012, Thorrold *et al*. 2014). Migrations into offshore environments where fisheries are unregulated could put both species at risk, even if their inshore habitats are protected.

3.4 Morphological characteristics

Mobula spp. are distinguished from other rays by their large diamond-shaped bodies with elongated wing-like pectoral fins, laterally placed eyes, wide ventral mouths and paired cephalic lobes (Notarbartolo di Sciara 1987). All *Mobula* spp. show a counter-shading pattern (olive green to dark blue and black dorsally and white ventrally). M. *japanica* possess a defensive spine at the base of their tail. M. *mobular* is the only other *Mobula* species with a spine and it is difficult to distinguish between these two species and their gill plates (see Annex 1).

3.5 Role of the species in its ecosystem

The ecosystem role of M. *japanica* and *M. tarapacana* may, as large filter feeders, be similar to that of the smaller baleen whales. As large species which feed low in the food chain, M. *japanica* and *M. tarapacana* can be viewed as indicator species for overall ecosystem health. Removing large, filter-feeding organisms from marine environments may result in significant, cascading species composition changes (Papastamatiou *et al*. 2003). *Mobula* spp. are suspected on death to contribute significantly to food falls, supporting fauna in deep water environments, and increasing the transfer efficiency of the biological pump of carbon from the ocean surface to the deep sea (Higgs *et al*. 2014).

4. Status and trends

4.1 Habitat trends

Mobula spp. are likely to be susceptible to oil spills and pollution because of the wide-ranging near-shore habitat preferences of many of the species (Notarbartolo di Sciara 2005, Handwerk 2010). Chin and Kyne (2007) estimated that mobulid rays (genus *Mobula*; genus *Manta*) are the pelagic species most vulnerable to climate change, since plankton, a primary food source, may be adversely affected by the disruption of ecological processes brought about by changing sea temperatures, as evidenced from past divergence dates overlapping with periods of global warming (Poortvliet *et al*., 2015). *Mobula spp*. may also be at risk from increasing amounts of marine debris (Secretariat of the CBD 2012). Phantom nets, plastics and other types of waste discarded at sea pose threats from entanglement, ingestion, bioaccumulation and degradation of habitat (Vegter *et al.* 2014).

4.2 Population size

Global population sizes of *M. japanica*, *M. tarapacana* and all *Mobula* spp. are unknown. Without significant natural markings on which to base photo-identification studies (which are used to determine population sizes in genus *Manta*), efforts to quantify numbers of *Mobula* spp. are effectively limited to fisheries data, aerial surveys and studies that employ conventional tags. Such approaches have so far not produced reliable population estimates for these species..

4.3 Population structure

Despite their broad ranges, *M. japanica* and *M. tarapacana* populations appear to be sparsely distributed, highly fragmented, and highly vulnerable to depletion (Clark *et al.* 2006, White *et al*. 2006a). Molecular analysis of subpopulations is underway (Poortvliet *et al*., 2011) to determine how genetically distinct they are, but much work is still needed to define the population and species structure of genus *Mobula*.

4.4 Population trends

Though global population numbers are unknown for *Mobula* spp., global, genus-wide declines have been recorded (Ward-Paige *et al*. 2013 - see Annex IV Figure 1). Global catch of manta and mobula rays reported to FAO have risen from less than 1,000 t before 2005 to 6,319 t by 2013 (FAO FishStat 2016 - see annex IX), however these figures only include landings from five countries and are mostly aggregated with *Manta* spp. It is likely that other fishing countries either report mobulid landings aggregated with other species or do not report them at all. Dramatic declines in mobulid catches have been documented in some areas suggesting serial depletions through over-fishing (Couturier *et al.* 2012, Lewis *et al*. 2015, Annex IV). The IUCN Red List assessment for M. *japanica* is Near Threatened globally and Vulnerable in Southeast Asia (White *et al.* 2006a) and for M. *tarapacana* is Data Deficient globally and Vulnerable in Southeast Asia (Clark *et al.* 2006), with unknown population trends. Both assessments were published in 2006 and are out of date, but noted that Vulnerable listings may also be warranted elsewhere if future studies show declines in populations where fished. Reassessments for these two species are currently underway. New data indicate that M. *japanica* most likely qualifies for Vulnerable globally, and the forthcoming 2016 IUCN Red List reassessment of *Mobula tarapacana* recategorized this species as Vulnerable, globally, and Endangered in three of the six ocean regions: Southeast Asia, Eastern Pacific, and Indian Ocean. While there are no historical baseline population data, new research on the scale and impacts of mobulid fisheries in Sri Lanka, India, Indonesia, the Philippines, Peru, and Guinea and continued strong demand for mobulid gill plates in China strongly suggest recent, marked increases in rates of depletion for these species during the past decade (Annex IV). The generation time for *Mobula* species is estimated at 10 years (Cuevas-Zimbrón 2012), suggesting the declines observed took place in approximately one generation.

Of particular concern is the exploitation of this species from within critical habitats, well-known aggregation sites, and migratory pathways, where numerous individuals can be targeted with relatively high catch-per-unit-effort (Heinrichs *et al*. 2011). Moreover, reports from fishermen and traders of mobulid gill plates indicate that *Mobula* gills are becoming harder to source, with prices escalating as the supply continues to dwindle (O'Malley *et al*. in press). See Annex IV for summary of regional population declines.

Atlantic Ocean: In Guinea, West Africa, reported annual catch of mobulids (predominantly M. *rochebrunei* and *M. thurstoni*) at 3 survey sites (Kassa, Kamsar and Katcheck) was 18t in 2004, decreasing significantly in subsequent years to 4t in 2005, 3t in 2006, 8t in 2007, and 7t in 2008, despite increased fishing efforts and fishermen adopting new techniques (Doumbouya, 2009). In 2009, annual reported catch was 17t, attributable to fishing fleets expanding their range to the waters of Sierra Leone and Liberia (Doumbouya, 2009).

Pacific Ocean: A decline of 78% in the abundance of mobula rays at Cocos Island, Costa Rica was reported over 21 years (White *et al*. 2015). Cocos Island is one of the world's oldest MPAs, yet faces pressures from multi-nation fisheries in the eastern tropical Pacific, elsewhere within the migratory ranges of these species (White *et al*. 2015). In Peru, reported landings of *Mobula* spp. fluctuated considerably between 1999 and 2013, but appear to show a significant downward trend from an apparent peak of 1,188t in 1999 (Llanos *et al*. 2010) to 135t in 2013 (IMARPE 2014). The IMARPE landings reports describe all mobulas as M. *thurstoni,* but recent surveys of landings in northern Peru observed M. *japanica* most frequently, followed by M. *munkiana* and M. *thurstoni*, with M. *tarapacana* also identified (Ayala 2014).

IATTC catch and bycatch data of Mobula from purse seine fisheries in the Eastern Pacific between 1998-2009 shows a slow increase and peak in 2006 where >80t of Mobula were caught, and a subsequent steep decrease over three years until 2009, where the reported catch was 40t (Hall & Roman, 2013).

Indo-Pacific: In Indonesia, catches of M. *tarapacana* and M. *japanica* at the country's three largest mobulid landing sites (Tanjung Luar, Lombok; Lamakera, Solor; Cilacap, West Java) declined dramatically over 10 to 15 years, despite evidence of increased directed fishing effort in Tanjung Luar and Lamakera (effort data were not available for Cilacap) (Lewis *et al*. 2015). M. *tarapacana* landings declined by 77% in Cilacap from 2001-05 to 2014 and by 99% in Tanjung Luar from 2001-05 to 2013-14. Over the same time periods, M. *japanica* landings declined by 50% in Cilacap and 96% in Tanjung Luar. Landings of *Mobula* spp. in Lamakera, primarily M. *tarapacana* and M. *japanica,* declined by 86% from 2002 to 2014. In Bohol, Philippines, mobulid fishing grounds expanded dramatically from small coastal waters within 5 km of shore from the 1900s to 1960s, to offshore waters extending over the jurisdiction of municipal waters (15 km from the coastline) following fleet motorization in 1970s. By 2013-14, the Bohol Sea mobulid fishing grounds had contracted to a smaller area in the north east, suggesting a decreased mobulid fishing effort led by several factors including a possible depletion of fishing grounds and decrease in financial viability of the fishery, compared to historical records (A. Ponzo, unpublished data). Rayos et al. (2012) reported increased landings of M. *thurstoni* and M. *eregoodootenkee* in 2010 surveys compared with 2002 in the Bohol Sea, concluding that these fisheries were sustainable. However, small sample size, unreliable species identification and lack of accounting for fishing effort, question the validity of these data and the conclusions drawn (Acebes, 2012; A. Ponzo, pers. comm.).

Indian Ocean: In Sri Lanka, fishermen have reported declines in *Mobula* spp. (*M. japanica, M. tarapacana, M. thurstoni)* catches over the past five to ten years as targeted fishing pressure has increased (D. Fernando, pers. comm., Anderson *et al.* 2010). Anecdotal data reported by fisherman in 2014 indicate steep declines in mobulid landings compared to 2013, without any decrease in fishing pressure (Fernando, pers. comm.). In India, mobulid catches have declined in several regions, including Kerala, along the Chennai and Tuticorin coasts and Mumbai, despite increased fishing effort, suggesting serial depletions (Couturier *et al*. 2012, Mohanraj *et al*. 2009). Fisheries surveys in Mumbai waters revealed maximum landings of 6.3t for "*M. diabolus*" (likely refers to M. *japanica* and/or M. *tarapacana*) in 1993-1995 surveys, dropping to 4.8t in 1996-1998, and then to 3.1t in 1999-2001 and 2002-2004 (Raje & Zacharia, 2009).

4.5 Geographic trends

Included in Section 4.4.

5. Threats

The greatest threat to M. *japanica* and *M. tarapacana* is unmonitored and unregulated directed and bycatch fisheries that are increasingly driven by the rising international trade demand for their gill plates, which are used in an Asian health tonic purported to treat a wide variety of conditions (Heinrichs *et al*. 2011, Couturier *et al*. 2012). M. *japanica* and *M. tarapacana* are not likely to be able to tolerate high catch levels, given these species' low reproductive potential (Pardo *et al.* 2016; Dulvy *et al.* 2014) .

Entanglement in marine debris and boat strikes can also injure M. *japanica* and *M. tarapacana*, decrease fitness or contribute to non-natural mortality (Couturier *et al*. 2012). Additional threats include habitat destruction, pollution, climate change, oil spills and ingestion of marine debris such as micro plastics (Couturier *et al.* 2012).

5.1 Directed Fisheries

Historically, subsistence fishing for M. *japanica* and *M. tarapacana* occurred in isolated locations with simple gear, limiting the distance and time fishermen could travel to hunt. In recent years, however, fishers have begun targeting M. *japanica* and *M. tarapacana* with modern fishing gear and expanding their fishing range and season, primarily in response to demand for highly valued dried gill plates (Dewar 2002, White *et al*. 2006b, Rajapackiam *et al*. 2007, White & Kyne 2010, Heinrichs *et al.* 2011, Lewis *et al.* 2015, Fernando & Stevens 2011). The largest documented fishing and exporting range States are Sri Lanka, India and Indonesia, but high international trade demand may stimulate directed fisheries elsewhere (Heinrichs *et al*. 2011).

Artisanal fisheries also target M. *japanica* and *M. tarapacana* for food and local products (Ayala 2014). M. *japanica* and *M. tarapacana* are killed or captured by a variety of methods including harpooning, longlining, netting and trawling (White *et al.* 2006b, Heinrichs *et al.* 2011, Ayala 2014, Lewis *et al.* 2015, Fernando & Stevens 2011). Targeting of M. *japanica* and *M. tarapacana* at critical habitats or aggregation sites, where individuals can be caught in large numbers in a short time frame, is a serious threat (Couturier *et al.* 2012), particularly as the conservative life history of these rays also constrains their ability to recover from a depleted state (Dulvy *et al.* 2014).

Reports by gill plate traders of South America, Europe, Africa, and the Middle East as gill plate sources, is especially troubling as it not only suggests undocumented and unregulated mobulid fisheries in countries and regions that do not report catches to FAO, but also that the gill plate trade may have begun to spread beyond Southeast Asia (O'Malley *et al*. in press). Countries in which directed catch and bycatch of *Mobula* spp. have been reported are listed in Annex V, Table 1 (note that Table 1 includes reports of all mobulid catch, not only mobulid landings supplying the gill plate trade).

Pacific Ocean: While the full extent of mobulid landings in China is not known, the manager of a shark processing plant in Puqi, Zhejiang Province in China reported processing an estimated 1,000 kg of dried gill plates from M. *japanica* annually (Heinrichs *et al*. 2011, O'Malley *et al*. in press). He told researchers that the mobulids are landed at Chinese ports but are caught in international waters. Gill plate vendors in Guangdong Province identified Yangjiang (Shapa Bay, Zhapo, and Dongping Harbor) and Zhangjiang (Naozhou Island) as the primary ports for sourcing "domestic" gill plates, as well as one smaller landing site in Maoming (Bohe) (O'Malley *et al.* in press). They also reported sourcing gill plates from Japan, Australia and South America. Gill nets and harpoons have been used in the past to target mobulids seasonally in the Gulf of California on the West coast of Mexico (Notarbartolo di Sciara, 1987). During a survey of mobulid landings by artisanal fisheries, M. *tarapacana* was the rarest species observed, comprising 3% of the observed mobulid catch, while M. *japanica* represented 30% and M. *thurstoni* 58% (Notarbartolo di Sciara 1988). Despite national protection for *Mobula* spp. (*M. japanica*, M. *tarapacana*, M. *thurstoni*, M. *munkiana, M. hypostoma*) in Mexico, illegal targeted catch and substantial mortality from artisanal and large-scale fisheries still occur (Croll *et al*. 2012).

Indo-Pacific: *Mobula* spp. fisheries have been identified throughout the Indonesian archipelago with the largest landings reported off East and West Nusa Tenggara and Central Java provinces (Lewis *et* *al*. 2015). In Indonesia, mobulid catch composition from surveys conducted during 2001 to 2005 at Indian Ocean landing sites was 50% M. *japanica*, 24%, M. *tarapacana*, 14% M. *birostris*, 9% M. *thurstoni* and 2% M. *kuhlii* (White *et al*. 2006c). In a survey of Lamakera's mobulid fishery in 2002, the most frequently caught species was M. *birostris*, followed by M. *tarapacana* and a smaller species believed to be M. *thurstoni* (Dewar 2002). For the ten year period from 2004 to 2013, Indonesia reported 'Mantas, devil rays nei' catches of 24,059 tonnes to the FAO, the majority of which were taken in the Western Central Pacific (22,799 tonnes), with the remaining quantity taken in the Eastern Indian Ocean (FAO 2013). Dharmadi & Fahmi (2014) cited a report from Indonesia's Directorate General of Capture Fisheries that production of the Family Mobulidae (*Mobula* spp., *Manta* spp.) was 200 t in 2005 and increased to 3,720 t in 2011. However, it is likely that over-reporting and double-counting of elasmobranch catches have affected the accuracy of the data reported to FAO (Blaber et al., 2009; Fahmi and Dharmadi, 2015). While previously mainly taken in Indonesia as bycatch of the inshore pelagic tuna gillnet fisheries and purse seine fisheries, mobulids are increasingly being targeted in response to Asian demand for mobulid gill plates (Dharmadi & Fahmi 2014, White *et al*. 2006a, Dewar 2002, Lewis *et al*. 2015). During the shark fishing off-season (December to March) fishers are landing more mobulids as an alternative (White *et al*. 2006a) and a number of fishers in Lombok report a shift in focus to mobulid rays since 2010 (Lewis *et al.* 2015). Targeted *Mobula* spp. (*M. japanica, M. thurstoni, M. tarapacana)* fisheries are also reported from the Philippines (Acebes 2012; Acebes 2013, Alava *et al*. 2002, A. Ponzo, pers. comm.) and Malaysia (A. Hochstetter, pers. comm.). M. *japanica* was reported to comprise 42% of total mobulid catch in Bohol, Philippines (971 individuals) during 2013 and 34% (600 individuals) in 2014 (Large Marine Vertebrates Research Institute Philippines and Balyena, unpublished study). M. *tarapacana* comprised 1% of mobulid catch in 2013 (28 individuals) and 3% (50 individuals) in 2014 (Large Marine Vertebrates Research Institute Philippines and Balyena, unpublished study). Fishing for *Mobula spp.* has also been reported from Vietnam (A. Hofford, pers.comm.), which is reported as a source of gill plates to Guangzhou, China.

Indian Ocean: Targeted fisheries are reported in Sri Lanka, India, and Myanmar (BOBLME 2015; J. Williams, pers. comm., Mohanraj *et al*. 2009). In Sri Lanka, it is estimated that over 50,000 mobulids are landed annually, comprised primarily of M. *japanica* (86%) and M. *tarapacana* (12%) (Fernando & Stevens 2011). Targeted mobulid fisheries in India are reported along the coast of Chennai, Tuticorin, Mumbai and Veraval, within the Union Territory of Lakshadweep and in the Andhra Pradesh and Kerala regions (Sivaprakasam, 1964; Said Koya *et al*., 1993; Rajapackiam & Balasubramanian, 1994; Pillai, 1998; Nair, 2003; Rajapackiam *et al*., 2007a, b; CMFRI, 2009; Mohanraj *et al*., 2009; Zacharia & Kandan, 2010). Following the high demand for mobulid products, a new mechanized gillnet fishery formed along the Chennai coast (Pillai, 1998; Rajapackiam *et al*., 2007a). Raje *et al*. (2007) reported average annual catch of M. *mobular* of 270 t in fisheries throughout India in 2002 to 2003, most likely a misidentification of M. *japanica*. Applying average DW for M. *japanica* to Notarbartolo di Sciara's (1988) DW to total weight conversion formula, these landings equate to an estimated 4,900 M. *japanica*. Over 18 months of surveys of landing sites in India from July 2012 to December 2013, total of 1,994 *Mobula* individuals were caught, of which 95% were M. *japanica* (Mohanraj *et al.,* pers.comm.). In recent years, trade in devil and manta ray gill plates has increased at Chennai, where rays are sold for approximately USD 0.50 per kg landed price (Kizhakudan *et al*., 2015) and dried gill plates are sold by traders at a significantly higher price of up to USD 150/kg. Nair et al. (2013) reported that the sudden increase in mobulid landings seemed to be linked to the international trade in gill plates. In total, five species of *Mobula* (*M. japanica, M. tarapacana, M. thurstoni, M. kuhlii,* and *M. eregoodootenkee*) are recorded to be fished on the west and east coast of India in marine, pelagic-oceanic, and benthopelagic/reef-associated environments, primarily through use of gill nets (Kizhakudan *et al*. 2015). M. *japanica, M. tarapacana* and M. *kuhlii* are a common occurrence in the fishery, whereas records of M. *thurstoni* and M. *eregoodootenkee* are of moderate occurrence (Kizhakudan *et al*., 2015). At least two *Mobula* spp., M. *japanica* and M. *thurstoni*, are recorded to be caught in Myanmar (BOBLME 2015, Tilley pers. comm.). In the Ayeyarwady region, fishers have started targeting *Mobula* spp. near Coco Kyun Island using 18 inch mesh size gillnets. These fishers work for 90 days at the fishing ground and every 15 days a "mother boat" will collect their catch. This offshore gillnet fishing near Coco Kyun Island started in June 2014 as a response to export demands from China and East Asian markets, as the plates of mobula rays are highly valued as gourmet food and Chinese medicine (BOBLME 2015). In the Langann Island group within Myeik Archipelago a fishery also targeting *Mobula* spp. has been ongoing for approximately 8 years, involving around five boats, although not by villagers on the island. The fishers use purse seine nets from 30-40 ft wooden boats (BOBLME 2015). During a separate visit to Langann in December 2014, a boat with thirty M. *thurstoni* was encountered (BOBLME 2015). Traders reported that the largest landing site for marine fish is at Thabawwseik, outside of Dawei Town on the beach. At the Thabawwseik beach market/landing site, ten M. *japanica* were recorded to be landed, with sizes ranging from 3 to 5.5 feet. A second market was identified at the Tha-Kay-Ta quarter of Myeik, where landing of M. *japanica* by-catch was documented. Mobula rays are sold for US$20-50 per individual, and dried mobula rays gill plates for US$100-300/1.5 kg (BOBLME 2015). Mobulid gill plate traders in Guangzhou, China, also reported sourcing gill plates from Mauritius, South Africa, and the Middle East.

Mediterranean Sea: A seasonal directed catch and bycatch fishery for M. *mobular* in Gaza, Palestine, landed 370 specimens in 2013. While mobulas are primarily utilized locally for their meat, a gill plate export trade has emerged from this region in the past three years (Couturier 2013, Abudaya *et al*. 2014).

Atlantic Ocean: Liberia reported 'Mantas, devil rays nei' catches to the FAO totalling 3,651 t from 1998 to 2006 in the Eastern Central Atlantic, but have not reported landings since then (FAO Fishstat 2016). Mauritania and Spain occasionally report small quantities. In Guinea, West Africa, an annual mobulid catch of 3 to 18t per year has been documented and this country's fleets have reportedly expanded their range to the waters of Sierra Leone and Liberia (Doumbouya 2009). Gill plate traders in China have reported importing mobulid products from Brazil.

5.2 Incidental Fisheries

M. japanica and *M. tarapacana* are a bycatch of industrial and artisanal fisheries targeting other species throughout the Atlantic, Pacific and Indian Oceans. Mobulids have been reported as bycatch in 21 small-scale fisheries in 15 countries and in nine industrial scale fisheries in 11 countries (Croll *et al.* 2015). M. *japanica* and *M. tarapacana* are incidentally caught as by-catch in large-scale fisheries (Romanov 2002, Amande *et al*. 2010, Coan *et al.* 2000, Hall & Roman 2013, Croll *et al.* 2015) and in shark control bather protection nets (C. Rose unpubl., Young 2001). Most frequently, mobulids are bycaught in purse seines, gillnets and longlines (all commonly used in tuna fisheries) (Couturier *et al.* 2012). Historically mobulid bycatch data, if recorded at all, has been recorded under various broad categories such as "Other", "Rays", or "Batoids", with a breakdown by species almost never recorded (Lack & Sant 2009, Camhi *et al*. 2009). As such, M. *japanica* and *M. tarapacana* have generally been overlooked in most oceanic fisheries reports, with very little effort given to properly identify or accurately record the species caught (Chavance *et al*, 2011, G. Stevens, pers. comm.). However following the recent publication of clear visual identification field guides for *Mobula* and *Manta* spp. (see Annex I) and increased awareness of the vulnerability of this group of species, data collection in industrial tuna fisheries has begun to improve in some regions. See Annex IV, Table 2 for a summary of published mobulid bycatch numbers.

Tuna purse-seine fisheries are one of the main contributors to mobulid bycatch with several species regularly caught in relatively large numbers (Couturier *et al*. 2012). A recent study estimates global bycatch in tuna purse seine fisheries of ~ 13,000 mobulids annually (Croll *et al*. 2015). The *Mobula* species incidentally caught in purse seine fisheries in the IATTC Convention area include M. *thurstoni, M. japanica, M. tarapacana*, and M. *munkiana*. While identification of mobulid bycatch has improved greatly in IATTC fisheries, as of 2011 more than 1/3 of the mobulid catch was still not identified to species level. In the western Indian Ocean, between 53 and 112 t of mobulids are caught each year in these fisheries (Romanov, 2002). M. *japanica* are also regularly caught in purse-seine fisheries in the eastern Atlantic Ocean (Amande` *et al.*, 2010), central-western Pacific Ocean (Coan et al., 2000), and in northern New Zealand purse seine fisheries targeting skipjack tuna (*Katsuwonus pelamis*), which began there in 1976 (Paulin *et al*., 1982).

A New Zealand Department of Conservation study found a very high post release mortality rate among M. *japanica* incidentally caught in tuna purse seine fisheries (Francis 2014). Of six M. *japanica* specimens tagged in this study, 4 of the tags transmitted information, and 3 of the 4 transmitting rays died within 2-4 days of release, even though the released individuals appeared to be in good condition on release.

Industrial trawlers also affect mobulid stocks, with up to 620 mobula rays (most likely M. *tarapacana*) caught per year by trawlers operating off the northwest African coast (Couturier *et al.* 2012, Zeeberg *et al*., 2006). M. *japanica* may also be incidentally captured in trawl fisheries (White *et al*. 2006a).

M. japanica is highly susceptible to gillnets and is taken, either as bycatch or as a target species in Indonesia, Peru, Mexico and the Philippines (White *et al*. 2006a). M. *japanica* is a common catch in the inshore pelagic tuna gillnet fisheries of Indonesia and is also taken by purse seine in that country (White *et al*. 2006a). Though the threat to M. *tarapacana* from coastal fisheries is more limited, given its apparent offshore habitat, it is highly susceptible to pelagic gillnets, regularly taken in Indonesia and Sri Lanka, and likely elsewhere in its Asian range (for example Taiwan) and probably in West Africa (Clark *et al*. 2006). Both species are also captured on longlines in Brazil, Peru, Malaysia and Gulf of Aden (Bonfil & Abdallah 2004, Ayala, 2014, Mas *et al.* 2015). The majority of M. *tarapacana,* M. *japanica* and M. *thurstoni* seen at Semporna fish market, East Malaysia, were caught using small fish live baited hand-lines (A. Hochstetter, pers. comm.). By-catch of M. *japanica* and M. *thurstoni* is also reported from the artisanal fishery in Guatemala (Ixquiac-Cabrera *et al*. 2009).

Mobulids are regularly recorded as incidental catches in shark-control nets off both Australian and South African coasts (Couturier *et al*. 2012). Young (2001) reported that the KwaZulu-Natal shark-control nets caught 440 *Mobula* spp. between 1981 and 2000. Mobulids (*Manta* and *Mobula* spp.) constituted 12% of the total catch by number from these nets between 1981 and 1990, with a mean annual catch of 66 individuals and an average mortality rate of 33%. Of the 440 devil rays caught, 19 were identified as M. *kuhlii*, four as M. *japanica* and one as M. *eregoodootenkee*, leaving over 94% of the catch unidentified to species (Young, 2001). Similarly in Queensland, Australia, Sumpton et al. (2011) found that 93 mobulids from both genera were caught between 1992 and 2008 in shark-control nets, with a mortality rate of 41% for *Manta* spp. and 89% for *Mobula* spp.

6. <u>Utilization and trade</u>

All utilization and trade in the products of M. *japanica* and *M. tarapacana* is derived from wild-caught animals. Records cannot be quantified precisely, due to a lack of species or product-specific commodity codes, catch, landings and trade data (Mundy-Taylor & Crook 2013). However, all available information indicates that many former bycatch fisheries have become directed fisheries, primarily in order to supply gill plates to Asian markets (Dharmadi & Fahmi 2014, White *et al.* 2006a, Fernando & Stevens 2011, Heinrichs *et al.* 2011, Dewar 2002). For example, fishermen in Sri Lanka used to avoid setting their nets where M. *japanica* and *M. tarapacana* were known to occur, and any rays caught incidentally were released, often alive, at sea. However, following the rapid growth of the gill plate trade over the past decade fishermen now land all M. *japanica* and *M. tarapacana* (D. Fernando, pers. comm.).

6.1 National utilization

Traditionally, mobulids were utilised for their meat and this continues in many countries. For example, in Chennai, India, the meat is sold for local use for USD$ 3/kg wet weight, compared with USD$ 40-150/kg for the dried gill plates. There is no documented domestic use of *Mobula* spp. gill plates in the three largest M. *japanica* and *M. tarapacana* fishing range states; these products are destined for export (Indonesia, Sri Lanka and India) (Heinrichs *et al*. 2011, Fernando & Stevens 2011, Kizhakudan *et al*. 2015). The low-value meat of M. *japanica* and *M. tarapacana* taken in these, and most other domestic fisheries, is used locally or regionally for human consumption, shark bait, fishmeal or animal feed or discarded. In Guinea, West Africa and Peru, mobula meat is consumed locally and gill plate exports from these countries have not been reported to date. An Appendix II listing of *Mobula* spp. would not affect the national utilization of products from *Mobula* spp. caught within national waters. However species caught on the high seas would be considered Introduction from the Sea and harvest would need to be regulated. Species caught on the high seas must either be accompanied by introduction from the sea certificates or export permits [see CITES Resolution 14.6 (Rev. CoP16)].

6.2 Legal trade

High value M. *japanica* (black) and *M. tarapacana* (white) gill plates are the most important mobulid products in international trade with M. *japanica* gill plates retailing at up to US$290 per kg in Chinese markets, M. *tarapacana* gill plates (the largest gill plates after *Manta* spp.) selling at up to US$557/kg and other unidentified *Mobula* spp. retailing at up to US$317/kg (Heinrichs *et al*. 2011, O'Malley *et al*. in press)). (Average prices for gill plates by species and location are listed in Annex VI, Table 3). Mobulid gill plate consumption occurs primarily in southern China with smaller markets in Hong Kong, Macau and Singapore (Heinrichs *et al*. 2011, O'Malley *et al.* in press). Small quantities of gill plates have also been reported in markets in Vancouver, British Columbia, Canada (Dulvy *et al*. 2014) and Semporna, Sabah, East Malaysia (D. Fernando, pers. comm.). International trade in *Mobula* spp. meat and cartilage also takes place, but these products are of significantly lower value (White *et al.* 2006c, Heinrichs *et al*. 2011, Kizhakudan *et al*. 2015). For example, fishers in Senegal have reported exporting dried *Mobula* spp. meat for human consumption to neighbouring African countries such as Ghana, Togo and Mali (I. Ender, pers.comm.). In Guinea, West Africa, mobula meat is exported as smoke-dried meat to Ivory Coast, Sierra Leone and Liberia and as salt-dried meat to Nigeria, Ghana and Togo for human consumption (F. Doumbouya, pers.comm.). The manager of a mobulid processing plant in Puqi, Zhejiang Province, China reported shipping M. *japanica* carcasses to a plant in Shandong, where the cartilage is processed to make chondroitin sulfate supplements for export to Japan and Britain (Heinrichs *et al*. 2011).

6.3 Parts and derivatives in trade

The mobulid gill plate, commonly sold under the trade names "Peng Yu Sai" (translated as "Fish Gills"), or "Flower Gills" (referring specifically to M. *tarapacana*), is the part most valued in international trade, with meat, cartilage and skins of lesser importance (Heinrichs *et al*. 2011). Because there are no commodity codes in the global Harmonized Commodity Description and Coding System specifically for gill plates or any mobulid products, gill plates are reportedly traded with shark fins and other dried seafood products, and no data on gill plate imports/exports are available (Mundy-Taylor & Crook 2013). However, an estimate of the total volume of the gill plate trade has been produced from an analysis of gill plate market surveys in Guangzhou (Guangdong Province), Hong Kong and Macau in China; and Singapore. These surveys suggest a rapid escalation in demand for mobulid gill plates in China from early 2011 to late 2013 (O'Malley *et al.* in press). Guangzhou was identified as the centre of the trade accounting for over 99% of the total estimated global market volume of 60.5 tons of dried mobulid gill plates in 2011, increasing to 120.5 tons by 2013. The number of mobulids represented more than doubled over the period to over 130,000, comprising an estimated 109,000 (83%) M. *japanica* and other 'black gill' mobula species, 17,000 (13%) M. *tarapacana*, and 5,000 (4%) *Manta spp.* (O'Malley *et al*. in press). Note that as M. *japanica* and M. *thurstoni* gill plates are very similar in size and appearance and are mixed together in the same containers, possibly with gill plates from other *Mobula* species, it was not possible to determine the proportion of each species in stock estimates (O'Malley *et al*. in press). Heinrichs *et al.* (2011) estimated annual *Mobula* spp. landings from known fisheries at approximately 94,000, noting that actual figures were likely to be considerably higher due to unreported landings in many areas. Market estimates converted into estimated number of mobulids required to supply the gill plate trade suggest that a high percentage of *Mobula* spp. landed are likely entering the gill plate trade and the high value of *Mobula* spp. parts in international trade is clearly a primary driver of fisheries for these species. Relative to the previous survey conducted in 2011, quantities of mobulid gill plates were substantially higher in Hong Kong in December 2015 (O'Malley *et al*. in press).

The gill plate trade appears to be a very small component of the total dried seafood trade and concentrated in a small number of businesses in the dried seafood industry (Heinrichs *et al*. 2011). In Sri Lanka, a study found that the fisherman do not earn significant income from the fishing of *Mobula* spp. and *Manta* spp., while the small number of gill plate dealers and exporters profited considerably (Fernando & Stevens 2011). Analysis reveals that without the gill plate trade, income from directed fisheries for *Mobula* spp. and *Manta* spp. may not even cover the fishermen's cost of the fuel in some range states (Heinrichs *et al*. 2011).

A CITES Appendix II listing will require exports to be derived from sustainably managed fisheries that are not detrimental to the status of the wild populations that they exploit, thus regulating international trade from unsustainable fisheries in the primary fishing range states (which do not consume gill plates), preventing further population declines, and reducing the extinction risk for M. *japanica* and *M. tarapacana*. While some M. *japanica* and *M. tarapacana* will most likely still be landed as bycatch or opportunistically for local consumption, total mortality should be greatly reduced once NDFs are required before export permits are issued.

6.4 Illegal trade

International trade in M. *japanica* and *M. tarapacana* products is unregulated, with the exception of exports from those range States that have protected these species or have banned the possession or export of ray products.

6.5 Actual or potential trade impacts

The unsustainable M. *japanica* and *M. tarapacana* fisheries described above are primarily driven by the high value of gill plates in international markets (Dewar 2002, Clark *et al.* 2006, White *et al*. 2006a, b, Heinrichs *et al*. 2011, Couturier *et al*. 2012). This trade is the driving force behind population depletion throughout most of the range of M. *japanica* and *M. tarapacana* and poses the greatest threat to their survival.

7. Legal instruments

(See Annex VII for table of Regional, Country and State Measures)

7.1 National

The catch and/or trade of M. *japanica* and *M. tarapacana* is prohibited in Australia, Brazil, Ecuador, Israel, Maldives, Mexico, New Zealand (*M. japanica* only), EU Member States and three U.S. states/territories (Florida, Guam, Commonwealth of the Northern Mariana Islands) which prohibit harvest of all *Mobula* species. Other range States protect *Mobula* rays in relatively small marine park zones. However, enforcement is insufficient in some areas and mobulids are still being taken illegally, for example in Mexico (Croll *et al*. 2012).

7.2 International

All species of *Mobula* were recently listed in Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and the Annex to the CMS MOU for Migratory Sharks. Two regional seas bodies, the Bern Convention and the Barcelona Convention, list *Mobula mobular* as a species requiring strict protection. In July 2015 the IATTC passed a resolution to prohibit retention, unless accidentally captured on purse seine vessels, and mandate safe release of all *Mobula* spp. in the RFMO fisheries in the eastern Pacific Ocean. Four species of *Mobula* are typically caught in the IATTC fisheries in the eastern Pacific Ocean: *Mobula tarapacana*, M. *munkiana*, M. *japanica*, and M. *thurstoni (*IATTC, 2015).

8. Species management

8.1 Management measures

The top five M. *japanica* and *M. tarapacana* fishing countries (Sri Lanka, India, Peru, Indonesia and China), which may account for as much as 95% of worldwide Mobula spp. catch (Heinrichs et al. 2011), do not manage or monitor their *Mobula* fisheries. Two RFMOs, the IATTC and GFCM, have passed a Resolution to regulate catch of *Mobula* spp. (IATTC 2015, GFCM 2012). Parties to CMS are required to protect species listed in Appendix I. Countries with national legislation restricting catch and trade of *Mobula* spp. include: Australia, Brazil, Ecuador, the European Union and its Member States, Israel, the Maldives, Mexico and New Zealand (*M. japanica*).

8.2 Population monitoring

There are very few government fishery or population monitoring programmes for M. *japanica* and *M. tarapacana*, but monitoring at some landing sites has been undertaken by NGO-funded projects. Publication of a field guide for *Mobula* and *Manta* spp. (see Annex I) and increased awareness of the vulnerability of this group of species has improved data collection in industrial tuna fisheries (notably in the IATTC Eastern Tropical Pacific region).

8.3 Control measures

8.3.1 International

There are no controls, monitoring or marking schemes to regulate, track or assess trade in *Mobula species.*

8.3.2 Domestic

Measures to prohibit the landing and trade of M. *japanica* and *M. tarapacana* are listed above in section 7.1 and below under Annex VII. There are no fisheries control measures in place in the five States (Sri Lanka, India, Peru, Indonesia and China) that account for as much as 95% of documented *Mobula* spp. fisheries worldwide, nor is there regulation or monitoring of *Mobula* spp. catches in high seas fisheries. No trade measures prevent the sale or export of landings except in the States that have prohibited *Mobula* spp. product trade (Brazil, Ecuador, Israel, Maldives, Mexico, New Zealand, and the U.S. states/territories of Florida, Guam and Commonwealth of the Northern Mariana Islands).

8.4 Captive breeding and artificial propagation

There are no known M. *japanica* or *M. tarapacana* in captivity, but there are records of M. *munkiana, M. hypostoma, M. mobular* and M. *kuhlii* held in captivity in small numbers for aquarium display.

8.5 Habitat conservation

Some M. *japanica* and *M. tarapacana* habitat occurs inside marine protected areas, but there is little or no protection for most coastal and high seas habitats.

8.6 Safeguards

N/A

9. Information on similar species

M. japanica and *M. tarapacana* are often confused with other *Mobula* spp. and with the species in the Genus *Manta* (also in family *Mobulidae*), which are listed in Appendix II. Fisheries for *Manta spp.* generally occur in the same locations as for *Mobula* spp. Manta rays are also targeted for the international trade of their gill plates, and the trade names, "fish gills" or "peng yu sai", are used to refer to gill plates from both genera (Heinrichs *et al*. 2011). It can be very difficult to distinguish visually between the dried gill plates of small *Manta* and large *M. japanica*, and dried gill plates from M. *japanica* are very similar in size and appearance to M. *thurstoni,* and *M. kuhlii*. Bi-coloured gill plates (referred to as "flower gills" in the trade) are generally considered to be from M. *tarapacana*, though it has recently been discovered that gill plates from some M. *thurstoni* and M. *hypostoma* are also bi-coloured (D. Fernando, pers. comm.). Annex VIII presents a guide for identification between *Mobula* spp. and *Manta* spp. gill plates.

10. Consultations

The Fiji CITES Management Authority sent range State consultation emails to the following countries: Algeria, Antigua and Barbuda, Argentina, Australia, Bangladesh, Barbados, Brazil, Cambodia, Cape Verde Islands, Chile, China, Colombia, Congo, Costa Rica, Cote d'Ivoire, Cuba, Democratic Republic of Congo, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, France, Gabon, Ghana, Greece, Grenada, Guadeloupe, Guatemala, Guinea, Honduras, India, Indonesia, Iran, Israel, Italy, Jamaica, Japan, Kenya, Kuwait, Madagascar, Malaysia, Maldives, Malta, Martinique, Mauritania, Mexico, Mozambique, Myanmar, Netherlands Antilles, New Zealand, Nicaragua, Nigeria, Pakistan, Palau, Panama, Papua New Guinea, Peru, Philippines, Portugal, Qatar, Saudi Arabia, Senegal, Seychelles, Somalia, South Africa, South Korea, Spain, Sri Lanka, St. Lucia, Sudan, Tanzania, Thailand, The Bahamas, Tunisia, UK (Ascension Islands), United Arab Emirates, United States of America, Uruguay, Vanuatu, Venezuela, Vietnam, Yemen.

Responses received:

Range States	Support Indicated (Yes/No/Undecided/ No Objection)	Summary of Information Provided
Australia	Undecided	Due to strict national protections already in place for mobula in Australia, and the lack of targeted commercial harvest, a CITES listing would not impact Australian populations and they are therefore unlikely to co-sponsor the proposal
Bangladesh	Yes	Support and co-sponsor the proposal
Comoros	Yes	Support and co-sponsor the proposal
Cote d'Ivoire	Yes	Support the proposal
Dominican Republic	Yes	Support the proposal

Range States	Support Indicated (Yes/No/Undecided/ No Objection)	Summary of Information Provided
Ecuador	Yes	Support and co-sponsor the proposal
Egypt	Yes	Support and co-sponsor the proposal
The European Union and its Member States	Yes	Support and co-sponsor the proposal
Fiji	Yes	Support and co-sponsor the proposal
Gabon	Yes	Support and co-sponsor the proposal
Ghana	Yes	Support and co-sponsor the proposal
Guinea	Yes	Support and co-sponsor the proposal
The Maldives	Yes	Support and co-sponsor the proposal
Mauritania	Yes	Support and co-sponsor the proposal
Palau	Yes	Support and co-sponsor the proposal
Samoa	Yes	Support and co-sponsor the proposal
Senegal	Yes	Support and co-sponsor the proposal
The Seychelles	Yes	Support and co-sponsor the proposal
Sri Lanka	Yes	Support and co-sponsor the proposal
United Arab Emirates	Yes	Support and co-sponsor the proposal
The USA	Yes	Support and co-sponsor the proposal. Comments received and addressed
Japan	No	Japan believes that the conservation and management of fishery resources must be implemented through appropriate management of fisheries by each country or by international organizations such as Regional Fisheries Management Organizations (RFMOs).
Non-range States	**Support Indicated (Yes/No/ Undecided/ No Objection)**	**Summary of Information Provided**
Burkina Faso	Yes	Support and co-sponsor the proposal

Comments from TRAFFIC were also received and addressed.

11. Additional remarks

11.1 Achieving sustainable fisheries

Legal acquisition findings and non-detriment findings are required prior to the issuance of an export permit for specimens of species listed in Appendix II of CITES. Therefore, an Appendix II listing will encourage the legal and sustainable use of *Mobula* spp. It is intended to stimulate and complement sustainable fisheries management measures by ensuring that international trade is supplied by legal, sustainably managed, accurately recorded fisheries that are not detrimental to the status of the wild populations that they exploit. The regulation and monitoring of international trade in *Mobula* spp. will reinforce and complement traditional fisheries management measures for these particularly vulnerable species and the measure adopted by IATTC and GFCM.

11.2 Implementation Issues

A listing of *Mobula spp.* on CITES Appendix II would complement the current *Manta spp.* listing and facilitate implementation and enforcement, as both *Manta* and *Mobula spp.* are caught in the same fisheries and gill plates of both species are traded through the same supply chains. Furthermore, given the similarities in sensitivity and appearance, particularly of the dried gill plate product between both genus, conservation measures need to be harmonised, particularly for the larger species in this subfamily (Lawson *et al.,* 2016). Multiple national and regional level workshops have been conducted across the world to aid in implementation of the *Manta* spp. Appendix II listing from CoP16, and the same training materials and tools used to identify *Manta* spp. gill plates in trade can be applied to identify *Mobula* spp. gill plates

11.2.1 Scientific Authority

It would be most appropriate for the Scientific Authority for this species to be advised by a mobula ray expert, or organization, with experience in fisheries management, stock assessment, and trade research.

11.2.2 Identification of Products in Trade

There are no species-specific commodity codes for *Mobula* spp. and *Manta* spp. gill plates, the primary product that is traded internationally. Visual identification guides (Annex I) and DNA tests are available.

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Mobulid Ray Identification Field Guides

Fernando, D., Notarbartolo di Sciara, G., and Stevens, G. 2016. Global Mobulid Identification Key (basic version)**. The Manta Trust.**

1a Terminal mouth; head width 21-22% of DW; toothband present only on lower jaw.
Genus ***Manta*** → 2

1b Ventral (undercut) mouth; head width 16-17% of DW; toothbands in both jaws.
Genus ***Mobula*** → 3

2 If present, ventral spots clustered around lower abdominal region only; gill covers (particularly 5th gill) and mouth with black shading/flaring; dorsal white shoulder markings form two mirror image right-angled triangles creating a "T" in black.

Yes → ***Manta birostris***

(found circumtropical, throughout the Indo-Pacific and Atlantic Oceans)

No → ***Manta alfredi***

(found circumtropical, throughout the Indo-West Pacific Oceans)

3 White ventral markings wrap up behind and above the uppermost level of the eyes, and these white markings on either side are clearly visible when viewing the dorsal surface of specimen directly from above.

Yes → 4

No → 8

4 Caudal spine present; spiracle under a distinct ridge **above** the margin of the pectoral fin where it joins body; tail equal to or longer than disc width.

Yes → 5

No → 6

5 Found only in the Mediterranean Sea. Large.

Yes → ***Mobula mobular***

No → ***Mobula japanica***
(found circumtropical throughout the Indo-Pacific and Atlantic Oceans)

6 Found only in the Eastern Pacific Ocean. Small.

Yes → ***Mobula munkiana***

No → 7

7 Found only in the Western Atlantic Ocean. Small.

Yes → *Mobula hypostoma*

No → *Mobula rochebrunei*

(found only in the Eastern Atlantic Ocean)

8 Large species reaching 340 cm DW; trailing edge of pectoral fins distinctly falcate; spiracle under a ridge **above** and behind the margin of pectoral fin where it joins body; dark grey shading on first (or more) gill cover(s); grey ventral shading on posterior margin of pectoral fins and white anteriorly, with irregular demarcation between both; olive-green to brown dorsally.

Yes → *Mobula tarapacana*

(found circumtropical throughout the Indo-Pacific and Atlantic Oceans)

No → 9

9 Medium-sized species reaching 180 cm DW; anterior margin of pectoral fins have a distinctive double curvature with golden black-grey shading on curve ventrally; large pelvic fins which extend past the base of the pectoral fins.

Yes → *Mobula thurstoni*

(found circumtropical throughout the Indo-Pacific and Atlantic Oceans)

No → 10

10 Long-necked appearance; distinct triangular-shaped black to dark-grey shading on the leading edge of pectoral fin at the mid-point; long cephalic fins with length from tip of each fin to corner of mouth greater than 16% DW. Small.

Yes → *Mobula eregoodootenkee*

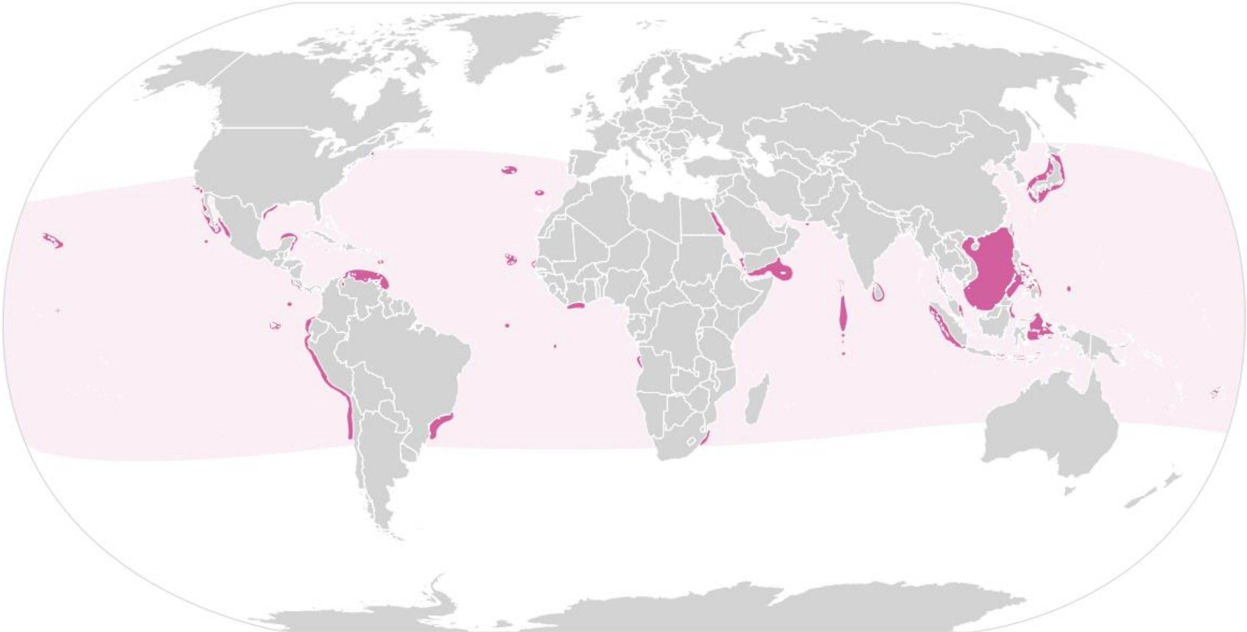
(found throughout the Indo-West Pacific Oceans)

No → *Mobula kuhlii*

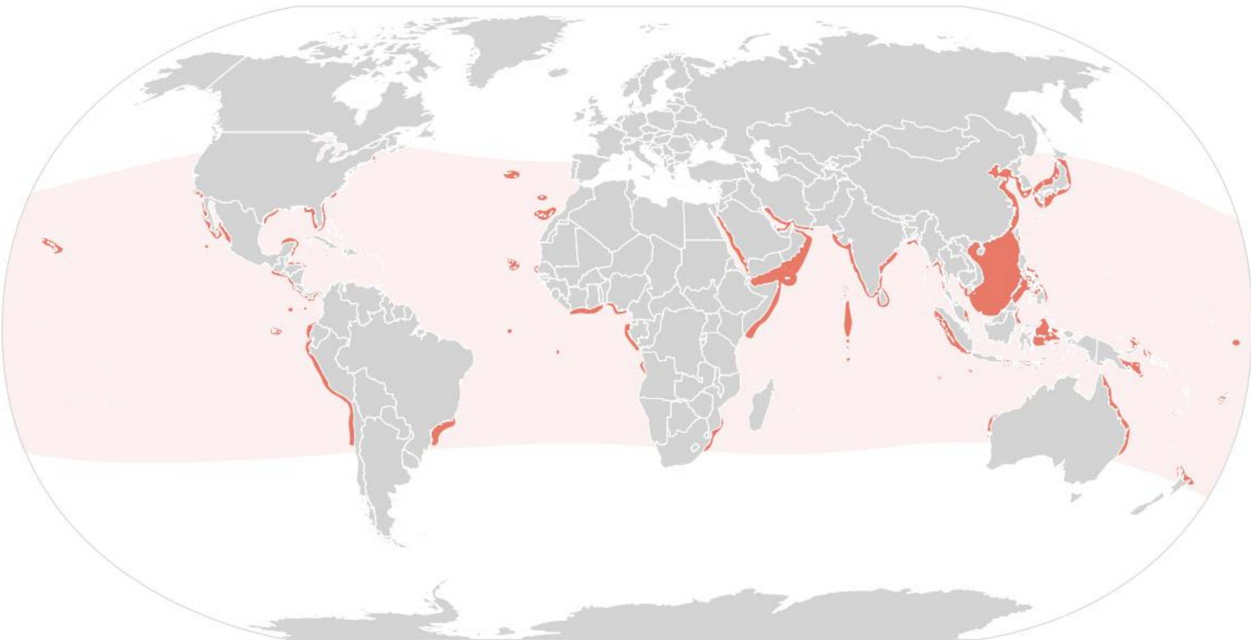
(found throughout the Indo-West Pacific Oceans)

Distribution Maps

M. tarapacana



M. japanica



Distribution Table – Range States and FAO Fisheries Areas

Range States and FAO Fisheries Areas	***Mobula tarapacana***	***Mobula japanica***
FAO Fisheries Areas	31, 51, 57, 61, 71, 77, 87	31, 34, 47, 51, 41, 87, 77, 81, 71, 61
Azores & Madeira Islands (Portugal)	x	x
Canary Islands (Spain)	x	x
Cape Verde Islands	x	x
Senegal	x	x
Cote d'Ivoire	x	x
Ghana		x
Nigeria		x
Gabon		x
Congo		x
Democratic Republic of the Congo		x
Angola	x	x
Ascension Island (British Overseas Territory)	x	
South Africa	x	x
Mozambique		x
Somalia		x
Egypt - Sinai (African part)	x	
Eritrea		
Saudi Arabia		x
United Arab Emirates		x
Yemen	x	x
Oman		x
Iran		x

Pakistan	x	x
Maldives	x	x
India	x	x
Sri Lanka	x	x
Bangladesh		x
Myanmar (Coco Is. & Mainland)		x
Thailand	x	x
Malaysia	x	x
Cambodia		x
Vietnam		x
China		x
North Korea		x
South Korea		x
Japan	x	x
South China Sea (including Spratly Islands)	x	
Indonesia	x	x
Australia		x
Papua New Guinea		x
Philippines	x	x
Taiwan - Province of China (Main Island)	x	x
Palau	x	
New Zealand		x
Fiji	x	x
Tuvalu		x
Hawaiian Islands (US)	x	x
México	x	x

Guatemala		x
El Salvador		x
Honduras		x
Nicaragua		x
Costa Rica (Cocos I., Costa Rica Mainland)	x	x
Panama		x
Colombia (Malpelo Is.)		x
Ecuador (Galápagos Islands & Mainland)	x	x
Peru	x	x
Chile	x	x
United States Continent (California, Texas, Florida, South Carolina, Massachusetts)	x	x
Netherlands Antilles (Bonaire)	x	
St Lucia	x	
Venezuela	x	
Brazil (including St Peter and St Paul Archipelago)	x	x

Population Trends

Table 1. Reported Declines by Region

Indo-Pacific

Area	Species	Year 1 Landings	Year 2 Landings	% Decline	Time Period	Source(s)	Methodology
Lamakera, Indonesia	*Mobula* spp. (*M. tarapacana* and M. *japanica*)	2002: 525	2014: 75	**86%** despite substantial increased effort	12 years	2002: Dewar, 2002; 2014: Lewis *et. al* 2015	2002: Estimate from community interviews; 2014: Reported landings from village enumerator; Structured community interviews; Comparison of fishing effort parameters
Tanjung Luar, Lombok, Indonesia	*M. tarapacana* *M. japanica*	2001-5: 337 518	2013-14: 3 20	**99%** **96%** despite increased effort	7-13 years	White *et al*. 2006b; Lewis *et al*. 2015	Market surveys and fishermen / dealer interviews
Cilacap, Java, Indonesia	*M. tarapacana* *M. japanica*	2001-5 212 635	2014 48 320	**77%** **50%**	8 - 13 years	White et al. 2006b; Dharmadi & Fahmi, unpublished	Fishery observer landing surveys

Indian Ocean

Sri Lanka	*M. japanica*	2010	2015	Unspecified declines	5 years	Fernando & Stevens in prep.	Market surveys and structured fishermen interviews
Sri Lanka	*M. tarapacana*	2010	2015	Unspecified declines	5 years	Fernando & Stevens in prep.	Market surveys and structured fishermen interviews
India	*M. japanica*	2002-3	2012-13	Unspecific declines	~ 10 years	Raje et al. 2007; Mohanraj, unpublished data	
India, Mumbai	*M. japanica*	1993-95	2002-4	**> 50%**	9 years	Raje & Zacharia 2009	Fishery surveys

Pacific Ocean

Cocos Island, Costa Rica	*Mobula spp.*	Jan 1993	Dec 2013	**78%**	21 years	White *et al.* 2015	Dive operator sightings records
Tumbes, Peru	*Mobula spp.*	1999	2013	**89%** (1,188t to 135t)	14 years	Llanos et al. 2010; IMARPE 2014	Government fishery reports

Atlantic Ocean

Guinea	*Mobula spp.*	2004	2008	**61%** (18t to 7t despite increased effort)	4 years	Doumbouya 2009	Fishery surveys

Figure 1. Landing trends for manta and mobula rays (Ward-Paige et al. 2013)

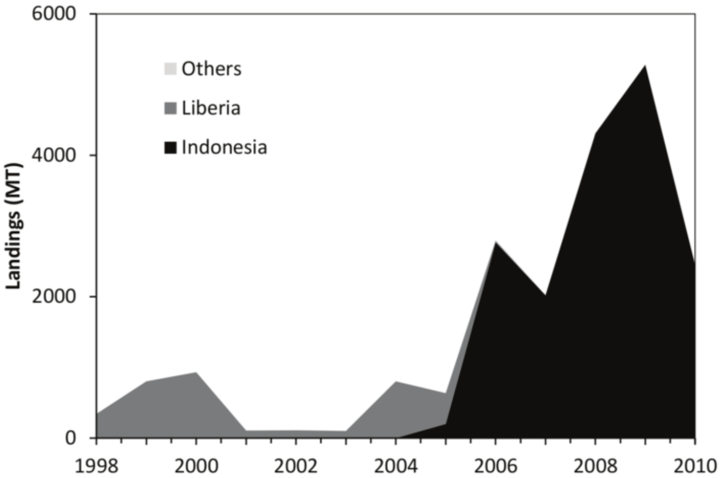


Figure 1. Landings trends. Globally reported *Manta* and *Mobula* landings were derived from the FAO Fisheries and Aquaculture FishStatJ dataset [36] by country (in metric tons). The relevant FAO species categories ("Giant manta" and "manta/devil rays, nei") were pooled. An undifferentiated category of 'rays, stingrays, manta nei', was excluded from our dataset, because the proportion of mobulids in this category could not be estimated. No mobulid landings were reported prior to 1998. Note that other countries' (Spain and Ecuador) reported landings were relatively small (<10t yr^{-1}) and hence not visible at this scale.
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Global fisheries capturing *Mobula* spp. as targeted or bycatch

(*Adapted from Croll et al. 2015 - Slow Life Histories and Fisheries Impacts: The Uncertain Future of Manta and Devil Rays*)

Targeted Fisheries							
Species	**Fishery Scale**	**Gear Type**	**Target Species**	**Fisher Origin**	**Fishery Location**	**Ocean Region**	**Reference**
Mobula spp.	small	driftnet	*Mobula spp.* sharks bonito mahi-mahi	Peru	Peru	Pacific – Equatorial E	Alfaro-Shigueto et al. 2010
M. tarapacana *M. japanica* *M. thurstoni* *M. kuhlii*	small	Harpoon, gillnet, trawl net	Mobulidae	Indonesia	East and West Nusa Tenggara	Indian – Equatorial W	Lewis et al. 2015, Dharmadi and Fahmi 2014
M. tarapacana *M. japanica* *M. thurstoni*	small	baited handline	*Mobula* spp.	Malaysia	Semporna, Sabah, Malaysia	Pacific	A. Hochstetter, pers. comm.
M. japanica	unknown	unknown	Mobulidae, unknown	China	International waters	Pacific	Heinrichs et al. 2011, O'Malley et al. in press
M. japanica *M. thurstoni* *M. tarapacana*	small	harpoon	Mobulidae	Mexico	Mexico – Baja California	Pacific – NE	Bizzarro et al. 2007
M. kuhlii	small	harpoon	Mobulidae	Mozambique	Mozambique	Indian – SW	Marshall et al. 2011; Couturier et al. 2012
M. japanica	small	harpoon	*M. japanica* smooth hammerhead shortfin mako	Taiwan	Taiwan	Pacific – NE	Chen et al. 2002
Mobula spp. *M. eregoodootenke*	small	harpoon	*Mobula* spp.	India	India – Lakshadweep	Indian	Pillai 1998
Moubla spp. *M. japanica*	small	gillnet, trawl	*Mobula* spp.,	India	Chennai, Mumbai, Tuticorin, West and East coasts	Indian	Rajapackiam et al. 2007a, Nair 2003, Mohanraj et al. 2009, Zacharia and Kandan 2010, Mohanraj et al., pers. comm., Kizhakudan et al. 2015
M. japanica *M. thurstoni*	small	gill net	*Mobula* spp.	Sri Lanka	Sri Lanka	Indian	Fernando and Stevens 2011

M. tarapacana							
M. japanica *M. thurstoni*	small	gillnet	*Mobula* spp.	Myanmar	Coco Kyun island, Myanmar	Pacific	BOBLME 2015
Mobulidae spp.	small	trap	Mobulidae	Indonesia	Indonesia - Sulawesi	Pacific Equatorial W	White & Cavanagh 2007
M. tarapacana	unknown	unknown	unknown	Senegal	Western Africa	Atlantic	Couturier et al. 2012 [MO1]
Mobula spp. *M. japanica* *M. thurstoni* *M. tarapacana*	small	gillnet harpoon longline hook & line	*M. birostris*	Philippines	Philippines – Bohol Sea	Pacific – Equatorial W	Alava et al. 2002; Marshall et al. 2006; Acebes 2013
M. kuhlii	small	longline trawl setnet	unknown	Tanzania	Tanzania	Indian – W	Bianchi 1985
M. eregoodootenkee *M. japanica* *M. kuhlii* *M. thurstoni*	small	unknown	unknown	Oman	Gulf of Oman Arabian Sea	Indian – NW	Henderson & Reeve 2011; Reeve & Henderson 2013
M. mobular	small	purse-seine	*M. mobular*	Palestinian Territories	Levantine Sea	Mediterranean	Abudaya et al. 2014
Mobula spp.	small	unknown	unknown	Liberia	Liberia	Atlantic - E	Mundy-Taylor and Crook 2013
Mobula spp.	small	unkown	*M. thurstoni, M. rochebrunei*	Guinea	Guinea,	Atlantic - E	Doumbouya 2009
Bycatch Fisheries							
Species	**Fishery Scale**	**Gear Type**	**Target Species**	**Fisher Origin**	**Fishery Location**	**Ocean Region**	**Reference**
M. japanica	large	purse-seine	skipjack tuna	New Zealand	New Zealand	Pacific – SW	Paulin et al. 1982
Mobula spp.	large	purse-seine	yellowfin tuna	Mexico	Eastern Pacific Ocean	Pacific – NE	Chong-Robles 2006
M. tarapacana *Mobula spp.*	large	purse-seine	yellowfin tuna skipjack tuna	European Union Russia	Western Indian Ocean	Indian - W	Romanov 2002; Molina et al. 2005
Mobula spp.	large	purse-	yellowfin	European	West	Atlantic –	Ménard et al.

M. japanica *M. mobular* *M. tarapacana*		seine	tuna bigeye tuna skipjack tuna	Union	Africa – South Sherbo	Equatorial W	2000; Amandè et al. 2008
M. japanica	large	purse-seine	yellowfin tuna bigeye tuna skipjack tuna albacore tuna	United States Japan Korea Taiwan	Central & Western Pacific Ocean	Pacific – Equatorial & SW	Coan et al. 2000; Désurmont & Chapman 2001
Mobula spp.	large	trawl	demersal fish	European Union	Mauritania	Atlantic – Equatorial E	Zeeberg et al. 2006
M. hypostoma	large	trawl	shrimp	United States	US – Gulf Coast	Gulf of Mexico – Northern	Shepherd & Myers 2005
M japanica *M. kuhlii* *M. tarapacana* *M. thurstoni*	small	driftnet	skipjack tuna	Indonesia	East Indonesia	Indian – Equatorial W	White et al. 2006; White & Dharmadi 2007; Lewis et al. 2015
Mobula spp.	small	driftnet	small sharks	Mexico	Mexico – Central Mexican Pacific	Pacific – NE	Pérez-Jiménez et al. 2005
M. japanica *M. munkiana* *M. thurstoni*	small	gillnet	demersal fish	Mexico	Mexico – Gulf of California	Pacific – NE	Bizzarro et al. 2007
M. mobular	small	gillnet	bluefin tuna	France	France	Mediterranean	Banaru et al. 2010
M. hypostoma	small	gillnet	shark	United States	US – Florida & Georgia	Atlantic – NW	Carlson & Baremore 2003
Mobula spp. *M. eregoodootenkee* *M. kuhlii*	small	gillnet	shark	South Africa	South Africa Natal	Indian Ocean – SW	Dudley & Cliff 1993
Mobula spp.	small	gillnet	shark	Australia	Queensland	Pacific – SW	Sumpton et al. 2011
.Mobula spp.	small	gillnet	shark broad-barred king mackerel	Australia	Queensland – Great Barrier Reef	Pacific – SW	Harry et al. 2011

M. hypostoma	small	gillnet driftnet	scalloped hammerhead angel shark	Brazil	Brazil – Itajai	Atlantic – SW	Zerbini & Kotas 1998; Mazzoleni & Schwingel 1999
M. japanica	small	gillnet longline	elasmobranchs	Mexico	Mexico – NW Mexican Pacific	Pacific – NE	Cartamil et al. 2011
Mobula spp.	small	gillnet trawl	unknown	Thailand	Gulf of Thailand Andaman Sea	Pacific – Equatorial W	Vidthayanon 2002
Mobula spp.	small	gillnet trawl driftnet	unknown	India	Vizhinjam, India Gulf of Mannar	Indian Ocean	Pillai 1998; Zacharia & Kanthan 2010
M. thurstoni	small	harpoon	swordfish	United States	US - Southern California	Pacific – NE	MacGinitie 1947
Mobula spp.	small	longline	shark mahi-mahi	Costa Rica	Costa Rica – Pacific	Pacific – Equatorial E	Swimmer et al. 2010
M. mobular	small	longline	bluefin tuna	Malta	Malta	Mediterranean	Burgess et al. 2010
M. mobular	small	pair trawl	small pelagic clupeids	Italy	Adriatic Sea	Mediterranean	Scacco et al. 2009
M. mobular	small	trap	bluefin tuna	Italy	Italy - Sardinia	Mediterranean	Storai et al. 2011
M. mobular	small	trap	tuna	Portugal	Southern Portugal – Algarve	Atlantic – NE	dos Santos et al. 2002
M. mobular	unknown	trawl seine	unknown	Algeria	Algerian Coast	Southern Mediterranean	Hemida et al. 2002
M. mobular	large	pelagic-driftnet	swordfish	Italy, Turkey	Mediterranean	Mediterranean	Celona 2004; Akyol et al. 2005

***Mobula* and *Manta spp.* Gill Plate Market Estimates from Market Surveys in Primary Gill Plate Markets** (Source: O'Malley *et al.* in press, gill plate trader surveys)

Table 1. Estimated Annual Gill Plate Sales Volume (KG)

	Manta	***Tarapacana***	***Japanica*/other**	**Total**
Apr 2011 Surveys				
Guangzhou	21,876	20,324	17,952	**60,152**
Singapore	92	64	27	**183**
Hong Kong	90	9	26	**125**
Macau	11	7	10	**28**
Dec 2013 Guangzhou	23,811	42,165	54,493	**120,469**
Dec 2015 Surveys				
Guangzhou*	NA	NA	NA	**NA**
Hong Kong	1,925	875	700	**3,500**

Guangzhou Apr 2011 to Dec 2013 Change %	+9%	+107%	+204%	**+100%**
Hong Kong Dec 2011 to Dec 2015 Change %	+2,039%	+9,622%	+2,592%	**+2,700%**

* It was not possible to estimate 2015 annual sales estimates for the Guangzhou market since large traders reported plans to exit the market.

Table 2. Estimated Number of Mobulids Represented in Guangzhou Annual Sales 2011 and 2013

Species	Dried Gills (KG)/ Animal	Apr 2011 Survey			Dec 2013 Survey		
		Dried Gill Plate Volume (KG)	Number of Mobulids	% Per Species	Dried Gill Plate Volume (KG)	Number of Mobulids	% Per Species
Manta spp	5	21,876	4,375	9%	23,811	4,762	4%
M. tarapacana	2.5	20,324	8,130	17%	42,165	16,866	13%
M. japanica /other	0.5	17,952	35,904	74%	54,493	108,986	83%
Totals		**60,152**	**48,409**	**100%**	**120,469**	**130,614**	**100%**

*Calculated by dividing the total estimated volume (kg) of gill plates per species by average dried gill weight (kg) per animal.

Change Apr 2011 to Dec 2013

Species	Number of Mobulids	%
Manta spp	+387	+9%
M. tarapacana	+8,736	+107%
M. japanica /other	+73,082	+204%
Totals	**+82,206**	**+170%**

Table 3. Average Dried Gill Plate Prices per KG - Local currency and USD*

Market City	Apr 2011 Surveys		Dec 2013 Survey		Dec 2015 Surveys	
	Local Curr	USD	Local Curr	USD	Local Curr	USD
Guangzhou	CNY		CNY		CNY	
Manta spp.	¥1,813	$277	¥1,970	$325	¥2,127	$329
M. *tarapacana*	¥1,269	$194	¥1,553	$256	¥1,850	$286
M. *japanica*/other	¥923	$141	¥1,173	$193	¥1,218	$189
Hong Kong	HKD				HKD	USD
Manta spp.	3,670$	$472			3,250$	$419
M. *tarapacana*	1,790$	$230			1,875$	$242
M. *japanica*/other	1,450$	$187			1,550$	$200
Macau	HKD					
Manta spp.	2,670$	$343				
M. *tarapacana*	1,870$	$241				
M. *japanica*/other	1,200$	$154				
Singapore	SGD					
Manta spp.	507$	$408				
M. *tarapacana*	446$	$359				
M. *japanica*/other	360$	$290				

Mobula spp. Legal Protection Measures – Regional, National, State

(Source: Lawson *et al*. 2016)

Location	Species	Measure
International		
Convention on Conservation of Migratory Species	Genus *Mobula*	Appendix I and II
IATTC	Genus *Mobula*	Resolution C-15-04 on the Conservation of Mobulid Rays Caught in Association with Fisheries in the IATTC Convention Area
Barcelona Convention	*M. mobular*	Annex II
Bern Convention	*M. mobular*	Annex II
National		
Australia	Genus *Mobula*	
Brazil	Genus *Mobula*	Inter-ministerial Normative Instruction No. 2 of 14/3/2013
Croatia	*M. mobular*	Law of the Wild Taxa 2006 Strictly prohibited
Ecuador	*M. japanica, M. thurstoni, M. munkiana* and *M. tarapacana*	Ecuador Official Policy 093, 2010
European Union member states	Genus *Mobula*	Council Regulation (EU) 2015/2014 amending Regulation (EU) No 43/2014 and repealing Regulation (EU) No 779/2014
Israel	Genus *Mobula*	All sharks (Order Selachii) and all rays (Order Batoidae) are fully protected in Israel since 2005. They may not be captured, harmed, traded or kept, without a specific permit from the Israel Nature and Parks Authority (INPA).
Maldives	All ray species	Environment Protection Agency rule - illegal to capture, keep or harm any type of ray
Malta	*M. mobular*	Sch. VI Absolute protection
Mexico	*M. japanica, M. thurstoni, M. munkiana, M. hypostoma, M. tarapacana*	NOM-029-PESC-2006 Prohibits harvest and sale
New Zealand	*M. japanica*	Wildlife Act 1953 Schedule 7A (absolute protection)

State		
Guam, US Territory	All ray species	Bill 44-31 prohibiting possession, sale, distribution, trade in rays and ray parts
Florida, US State	Genus Mobula	FL Admin Code 68B-44.008 – No harvest
Commonwealth of the Northern Mariana Islands	All ray species	Public Law No. 15-124
Raja Ampat Regency, Indonesia	*Mobula spp.*	PERDA (Provincial Law) Hiu No. 9 Raja Ampat 2012

Mobulid Gill Plate Identification Guide

Key to Visual Identification of Traded Mobulid Ray Gill Plates

Question 1:
Is the gill plate longer than 30cm and a uniform dark brown/black in coloration?

Yes = Manta
No = Go to question 2

Question 2:
Does the gill plate have central or edge whitening and/or separated bristled filament tips?

Yes = Mobula
No = Manta

FAO landings of mobulid and manta rays (t)