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

Sixteenth meeting of the Conference of the Parties
Bangkok (Thailand), 3-14 March 2013

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of the Genus *Manta*[1] (including *Manta birostris*, *Manta alfredi* and any other possible species of *Manta*) in Appendix II in accordance with Article II paragraph 2(a) of the convention and satisfying Criterion A and B in Annex 2a of Resolution Conf. 9.24 (Rev. CoP14).

Annotation: The entry into effect of the inclusion of the genus *Manta* in CITES Appendix II will be delayed by 18 months to enable Parties to resolve the related technical and administrative issues.

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.

All *Manta* species 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 fishing pressure driven by international trade in *Manta* gill plates has led to significant rates of decline in population sizes in recent years and resulted in IUCN listings of Vulnerable with declining population trends for both described *Manta* species in 2011. Additionally evidence of intensified fishing effort on already depleted populations has been documented in Indonesia and Sri Lanka, two of the largest documented *Manta* fisheries. Several *Manta* populations already qualify for listing in Appendix I (Annex 1 criteria A i, ii, v; B i, iii, iv; and C i), given their 1) small populations with small, highly fragmented, and isolated subpopulations, preventing recruitment and recovery following declines, 2) characteristics including extreme low productivity and known aggregating behaviour, causing them to be highly vulnerable to exploitation, and 3) marked recent rates of decline. Studies demonstrate recent declines of 56% to 86% over the past six to eight years (well under one generation, which is estimated at 25 years for *Manta spp*.) meeting the CITES Appendix I guideline for marked recent rate of decline of commercially exploited aquatic species. These species are only protected in a few range States and there are no management measures in the range States with the largest documented fisheries. Without prompt regulation of international trade, all *Manta spp*. will likely qualify globally for Appendix I listing in the near future.

Annex 2a, Criterion B. *It is known, or can be inferred or projected, that a regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which survival might be threatened by continued harvesting or other influences*.

Manta spp. qualify for inclusion in Appendix II under Criterion B, because of their small and highly fragmented populations, extremely low productivity (average of one offspring every two to five years after reaching maturity at approximately ten years), and known aggregating behaviour, that cause them to be

1 *The Manta genus was split into two species in 2009 (prior to this, the genus consisted only of M. birostris), and a third species may soon be declared (Manta cf. birostris). As a result, the majority of trade and trend data are not distinguished by species; however, all species are targeted in largely unregulated fisheries for their very similar gill plates, and all populations are suffering similar declines driven by international trade. Whereas a trained observer would likely be able to visually identify M. birostris, M. alfredi and possibly the third putative species when alive or landed whole, it is extremely difficult to identify visually body parts and derivatives in trade.*

highly vulnerable to exploitation. From available evidence it can be inferred and projected that under current fishing pressure levels, *Manta* populations will continue to exhibit a declining trend in the future, putting the survival of these species at risk.

B. Proponent

Brasil, Colombia and Republic of Ecuador,[2]

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 of Genus *Manta*: *Manta birostris* (Donndorff 1798), *Manta alfredi* (Krefft, 1868), *Manta* cf. *birostris* (putative; see Annex I) and any other putative *Manta* species.

1.5 Scientific synonyms:
M. birostris: *Manta hamiltoni* (Hamilton & Newman 1849)*; Raja birostris* (Donndorff*, 1798*)*,*
M. alfredi: *Deratoptera alfredi* (Krefft, 1868); *Manta fowleri* (Whitney, 1936)

1.6 Common names:

M. birostris:	English:	Oceanic Manta Ray, Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray
	Spanish:	Manta Comuda, Manta Diablo, Manta Gigante, Manta Raya, Manta Voladora.
M. alfredi:	English:	Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray.

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

1.7 Code numbers: N/A

2. Overview

2.1 Manta rays are slow-growing, large-bodied migratory animals with small, highly fragmented populations that are sparsely distributed across the tropics of the world. They have among the lowest fecundity of all elasmobranchs, typically giving birth to only one pup every two to three years (or longer in some subpopulations) after reaching maturity at 10 years on average (Section 3). Whereas global population numbers are unknown, almost all identified subpopulations are estimated to be very small (100 to 1000 for *M. birostris* and 100 to 1500 for *M. alfredi,* with one exceptional subpopulation of *M. alfredi* in the Maldives estimated at 5000). Substantial take of *M. birostris* in fisheries in one migratory pathway in Indonesia suggests this subpopulation may be larger (or may have been larger prior to declines from directed fisheries) or that multiple subpopulations use this pathway. While these aggregation groups have not been verified through genetic analysis to meet the criteria for CITES' definition of subpopulation, the distance between aggregation sites combined with satellite tagging data recording the longest known migrations for each species and active efforts to identify interchange among groups through photo identification databases, strongly suggest that all studied populations (listed in Annex V) meet the definition of "geographically or otherwise distinct groups in

2 *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.*

the population between which there is limited genetic exchange". Given that globally only twenty-four subpopulations (14 *M. alfredi*, 9 *M. birostris*, 1 *M. c.f. birostris*) in fifteen countries have been studied and approximately twenty-five other, mostly very small, aggregations in fifteen more countries have been identified through tourism operations and fisheries, and further manta ray sightings in all other range States are very infrequent, it can be inferred that global population numbers are quite small (Section 4.2) *Manta* rays' biological and behavioural characteristics (extremely low reproductive rates, late maturity, small subpopulations and aggregating behaviour) make these species particularly vulnerable to over-exploitation in fisheries with low probability of recovery from depletion (Section 3.3).

2.2 The prebranchial appendages (or gill plates), which *Manta spp*. use to filter planktonic food from the water, are highly valued in international trade. Cartilage and skins are also traded internationally. A single mature *M. birostris* can yield up to 7 kilos of dried gills that retail for up to USD 680 per kilo in China. There are currently no specific import-export codes for *Manta spp*. gill plates; trade records for cartilage and skins are generally not species-specific. As such, international trade levels, patterns and trends have not been accurately documented (Section 6). DNA tests and visual ID guides are increasingly available and can enable informed non-experts to distinguish *Manta spp*. and their parts and derivatives in trade from other species (Annex II).

2.3 Manta rays are caught throughout their global warm water range in the Atlantic, Pacific, and Indian Oceans in commercial and artisanal fisheries. Fishermen targeting *Manta* rays primarily use harpoons and nets, while significant manta bycatch occurs in purse seine, gillnet, and trawl fisheries targeting other species. The high value of gill plates has driven an increase in targeted fishing for *Manta spp*., predominantly *M. birostris*, in key range states, with the largest landings observed in Indonesia, India, and Sri Lanka. Fisheries in other countries (Peru, Mozambique, and China) are also thought to be significant, but landings data from most locations are not readily available. There are reports of mantas being 'gilled' (gills removed and the carcasses discarded at sea.) (Sections 4, 5, and 6.)

2.4 There are no population assessments, official monitoring programs, or fisheries management measures for *Manta spp*. for the range States with the largest fisheries. Regional Fishery Management Organizations (RFMOs) have not adopted any binding measures specific to *Manta spp.* Incidental landings and discards are rarely recorded at the species level. *Manta spp*. are legally protected in a few countries and in some small Marine Protected Areas, and *M. birostris* was listed in Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals in 2011. (Sections 7 and 8)

2.5 Whereas there are no historical baseline data, scientists have documented recent population declines of 56% to 86% within six to eight years, or well under one generation period (25 years for *Manta spp.)* in key *Manta* range States. Meanwhile experts suspect commercial extinction and local extirpation in certain areas. At current levels of fishery pressure, these recent rates of decline would be expected to drive populations down to the historical extent of decline guideline for low productivity commercially exploited aquatic species to qualify for Appendix I listing (15-20% of baseline) within ten years. (Section 4.4)

2.6 Manta rays are iconic species that are highly valued by the marine tourism industry and not considered a fishery species in most range States. Most coastal communities where known aggregation sites occur participate in and benefit from this non-consumptive, sustainable use of these species. Unsustainable fisheries, driven by the international trade in Manta gill plates, primarily benefit a small group of traders yet pose a significant threat to ecotourism operations, which have the potential to yield much larger and longer-term benefits to coastal communities in a number of range States. (Section 6.5)

2.7 An Appendix II listing for the Genus *Manta* is necessary in order to ensure that international trade does not continue to drive unsustainable fisheries. Without Appendix II listing, the survival of these species is in jeopardy with populations likely qualifying for Appendix I listing in the near future. An Appendix II listing will help immensely to ensure that international trade is supplied by fisheries that are not detrimental to wild populations. Under CITES non-detriment findings will be required before trade permits can be issued. CITES measures will reinforce and complement fisheries management measures for these particularly vulnerable species, thus contributing to implementation of the UN FAO IPOA–Sharks and the recent CMS Appendix I and II listings. (Section 11)

3. Species characteristics

Genus *Manta* was previously considered monotypic, but has recently been re-evaluated and two species *Manta alfredi* and *Manta birostris* identified, with evidence of a third putative species, *Manta c.f. birostris* in the Caribbean (Marshall *et al*. 2009). A focused genetic study has confirmed that *M. birostris* and *M. alfredi* are two distinct species (Kashiwagi *et al.* 2012). Descriptions or photographs can be used to verify accounts to the species level.

3.1 Distribution

Manta spp. are circumglobal in range, with the two described species sympatric in some locations and allopatric in others. *M. birostris* is the more widely distributed, inhabiting tropical, subtropical, and temperate waters, while *M. alfredi* is found in tropical and subtropical waters (Marshall *et al*. 2009, Kashiwagi *et al*. 2011, Couturier *et al*. 2012). *Manta cf birostris* appears to be a regional endemic with a reported distribution throughout the Gulf of Mexico, the Caribbean, and along the eastern coast of the United States. Within this broad range, Manta populations are sparsely distributed and highly fragmented, likely due to their resource and habitat needs. See Annexes III & IV for distribution maps, range States and FAO fishing areas.

3.2 Habitat

Manta birostris are thought to be seasonal visitors along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. They visit cleaning stations on shallow reefs, are sighted feeding at the surface inshore and offshore, and are also occasionally observed in sandy bottom areas and seagrass beds (Marshall *et al*. 2011c). *M. alfredi* are commonly sighted inshore, but are also observed around offshore coral reefs, rocky reefs and seamounts. This species is often resident in or along productive near-shore environments, such as island groups, atolls, or continental coastlines, and may also be associated with areas or events of high primary productivity (e.g., upwelling) (Homma *et al*. 1999, Dewar *et al*. 2008, Kitchen-Wheeler 2010, Anderson *et al*. 2011, Deakos *et al*. 2011, Marshall *et al*. 2011b). *Manta cf birostris* exhibits similar habitat preferences to *M. alfredi.*

3.3 Biological characteristics

Manta spp. are large-bodied, pelagic, planktivorous rays. *M. birostris* grows to over 7 meters wingspan (disc width or DW; Marshall *et al*. 2009) with anecdotal reports up to 9 meters (Compagno 1999). *M. alfredi* grows to an average 4 meters DW, and a maximum of 5 meters DW (Marshall *et al*. 2011b). Mantas are slow growing and long-lived with low fecundity and reproductive output and long generation times (estimated at 25 years[3]). Longevity is estimated to be at least 40 years (Marshall *et al*. 2011b,c) and natural mortality is thought to be low (Couturier *et al.* 2012). Mantas are among the least fecund of all elasmobranchs (Couturier *et al*. 2012), bearing only one pup on average every two to three years (Marshall *et al.* 2011a,b, with a gestation period of 10–14 months (Homma *et al*. 1999; Marshall *et al*. 2009; M. de Rosemont pers. comm.) and reaching maturity at ~10 years (Marshall *et al*. 2011b,c). Earlier age at maturity (~3-6 years) was estimated in males in one subpopulation in Kona, Hawaii (Clark 2010). Later maturity (15 years or more) and lower reproductive rates (one pup every five years) have been observed for female *M. alfredi* in a subpopulation in the Maldives (G. Stevens in prep.). With such conservative life history characteristics, a female manta ray can produce no more than 5-15 pups over her lifetime. Subpopulations are therefore exceptionally vulnerable to extirpation, slow to recover once depleted; the possibility of successful re-colonization is low.

While *M. birostris* seems more solitary than *M. alfredi*, *M. birostris* are often seen aggregating in large numbers to feed, mate, or be cleaned. Sightings are often seasonal or sporadic, but in a few locations their presence is a more common occurrence (Marshall *et al.* 2011c). Observations of *M. birostris* demonstrate site fidelity to certain areas during parts of the year (Marshall *et al.* 2011c). Satellite-tracking of *M. birostris* from aggregation sites across the world has revealed significant (thousands of

[3] *'Generation length' is the average age of parents of the current cohort (i.e. newborn individuals in the population). Generation length therefore reflects the turnover rate of breeding individuals in a population. Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual, except in taxa that breed only once. Where generation length varies under threat, the more natural (i.e. pre-disturbance) generation length should be used (Conf. 9.24 Rev. CoP15). Generation length for Manta spp. is best approximated as halfway between age at first maturity and maximum age. Thus female manta rays may be actively breeding for 30 years and the age at which 50% of total reproductive output is achieved would be approximately 24–25 years (Marshall et al. 2011b,c).*

kilometre) migrations across national jurisdictional boundaries, both along the coastline between adjacent territorial waters and national EEZs and from national waters into the high seas in several regions (A. Marshall *et al*. unpubl. data 2011, R. Rubin pers. comm. 2009). Their highly migratory behaviour, combined with predictable aggregations in easily accessible coastal areas, makes *M. birostris* vulnerable to multiple fisheries, both targeted and bycatch, in coastal areas and in the high seas (Molony 2005, Perez and Wahlrich 2005, White *et al*. 2006, Zeeberg *et al*. 2006, Pianet *et al*. 2010, Marshall *et al.* 2011c).

Long-term sighting records of *M. alfredi* at established aggregation sites suggest that this species, when compared to *M. birostris,* is more resident in tropical waters and may exhibit smaller home ranges, philopatric movement patterns and shorter seasonal migrations (up to several hundred kilometres) (Homma *et al.* 1999, Dewar *et al*. 2008, Kashiwagi *et al*. 2011, Kitchen-Wheeler 2008, Marshall *et al*. 2011a, Anderson *et al*. 2011, Deakos *et al*. 2011, L. Couturier unpublished data, A. Marshall unpublished data). Acoustic tracking studies indicate that individual *M. alfredi* do not commonly venture out from coastal waters, but often move between inshore cleaning stations and feeding areas (Homma *et al*. 1999, Dewar *et al*. 2008, Marshall *et al*. 2009, Deakos 2010, M. Bennett unpubl. data 2011, T. Clark pers. obs. 2008, G. Stevens unpubl. data 2011, Papastamatiou *et al.* 2012). Satellite tracking, acoustic monitoring and photographic surveys of *Manta cf birostris* suggest that this putative species exhibits similar movement patterns to *M. alfredi* (Graham *et al.* 2012, Marshall *et al*. unpublished data). Because of the isolation and migration patterns of these highly fragmented populations, all research to date strongly suggests that there is little to no exchange between members of neighbouring populations. Fishing could therefore deplete a single population quite rapidly, with little chance of recovery.

Daily diurnal migrations are reported in *M. birostris, M. alfredi, and M. cf birostris*, with individuals using inshore environments like shallow reef cleaning stations and coastal feeding grounds during daylight hours and deeper water/off shore habitats in the evening hours (Dewar *et al*. 2008, Marshall 2009, Anderson *et al*. 2011, Marshall *et al*. unpublished data, Graham *et al*. 2012). Migrations into offshore environments with high fishing pressure could put both species at risk, even if their inshore habitats are protected. Deakos (2012) provides data on reproductive ecology from a population in Hawaii.

3.4 Morphological characteristics

Manta spp. are distinguished by their large diamond-shaped body with elongated wing-like pectoral fins, ventrally placed gill slits, laterally placed eyes, wide terminal mouths, and paired cephalic lobes. Melanistic (black) and leucistic (white) colour morphs occur in both species (Marshall *et al*. 2009). Most *Manta spp*. show a counter-shading pattern (black dorsally and white ventrally) and have unique spot patterns on their underside that do not change over time and help identify individuals (Clark 2001, Marshall *et al*. 2008, Kitchen-Wheeler 2010, Deakos *et al*. 2011).

3.5 Role of the species in its ecosystem

The role of the *Manta spp*. in their ecosystem is not fully known but, as large plankton feeders, it may be similar to that of the smaller baleen whales. As large species which feed low in the food chain, *Manta spp*. can been viewed as indicator species for the overall health of the ecosystem. Studies have suggested that removing large, filter-feeding organisms from marine environments can result in significant, cascading species composition changes (Springer *et al*. 2003).

4. Status and trends

4.1 Habitat trends

The loss of some coral reef habitats, which provide food, cleaning stations and reproductive areas, could have a negative impact on *Manta spp*. (Deakos 2010). Alterations to terrestrial ecosystems have also been shown to affect *Manta spp*. populations. At Palmyra Atoll in the Pacific, a study linked declines in the manta rays' planktonic food source to areas where native trees have been replaced by human propagated palms, revealing a complex interaction chain linking trees to manta rays (McCauley *et al*. 2012). *Manta spp*. are also likely to be susceptible to oil spills and pollution because of their wide ranging near-shore habitat preferences (Notarbartolo di Sciara 2005, Handwerk 2010).

Chin and Kyne (2007) estimated that mobulid rays (Genus *Manta*; Genus *Mobula*) 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. In the Republic of Maldives, over the past two years, despite intensive directed research, there has not been a single recorded pregnancy amongst a subpopulation of over 870 individually identified mature female *M. alfredi* (G. Stevens in prep). This scarcity of pregnancies correlates directly with un-seasonally weak monsoonal winds in the region, which should drive the nutrient upwellings that lead to the rich productivity of the Archipelago upon which the manta ray directly depend (Anderson *et al*. 2011, G. Stevens pers. comm.). These broad scale fluctuations in the productivity of the Maldivian waters are reflected in catch rates of the local tuna fishery, which have been linked to wider climatic patterns such as the El Niño Southern Oscillation (ENSO) (Anderson 1999).

Other habitat threats that affect *Manta spp*. populations include marine debris such as, ghost nets and plastics, and pollution from vessels.

4.2 Population size

Global population sizes of both species are unknown, but some regional subpopulations have been estimated (Annex V). Subpopulations appear, in most cases, to be small (fewer than 1000 individuals). In study areas where subpopulation estimates have not yet been calculated, data strongly suggest that these subpopulations are also small. The small number of additional aggregation sites that have been identified through tourism operations and fisheries (approximately 25; Heinrichs et al. 2011, Setiasih et al. in prep, Fernando and Stevens in prep, O'Malley et al. in prep) also appear to be small in most cases. Active research investigations into the degree of interchange of individuals between subpopulations have uncovered no genetic or photographic evidence of exchange. In addition the geographic distance between most of these small, isolated populations is greater than the maximum distance travelled observed in satellite tagging studies, further reinforcing these findings (Graham et al. 2012, Couturier et al. 2012, Deakos et al. 2011, Rubin and Kumli 2002).

M. birostris are believed to be sparsely distributed, with small subpopulations in the range of 100 to 1,000 individuals (Marshall *et al*. 2011c). The maximum number of *M. birostris* individuals identified in the four largest monitored aggregation sites ranges from 180 to 650 (Marshall 2009, M. Harding, pers. comm., Rubin and Kumli, pers. comm., Graham *et al*. 2008). A mark-recapture population study in southern Mozambique over five years from 2003 to 2008 estimated the local subpopulation during that time to be 600 individuals (Marshall 2009).

M. alfredi subpopulations also appear to be small, with the number of identified individuals recorded at most monitored aggregation sites ranging between 100 and 700 individuals (Marshall *et al.* 2011a, Kashiwagi *et al*. 2011, Homma *et al*. 1999, M. Deakos, pers. comm., Manta Pacific Research Foundation 2011, L. Couturier, pers. comm., J. Denby and J. Etpison, pers. comm., McGregor 2009, Komodo Manta Project & The Manta Trust unpubl. 2011, Indonesia Manta Project and The Manta Trust unpubl. 2011, Misool Manta Project and The Manta Trust unpub. 2011). A mark-recapture population study in southern Mozambique over five years from 2003 to 2008 estimated the subpopulation during that time to be 890 individuals (Marshall 2009). An *M. alfredi* subpopulation in Maui, Hawaii was estimated at more than 290 (later revised to 350) studied (Deakos *et al.* 2011, M. Deakos pers. comm.). In the Ningaloo Reef area in Western Australia, a mark-recapture study identified 532 individuals and estimated the total subpopulation of *M. alfredi* at 1,200-1,500 individuals (McGregor 2009). The Maldives has the only monitored subpopulation of *M. alfredi* with recorded numbers of more than 1,000 identified individuals (2,400, G. Stevens, pers. comm.) and an estimated subpopulation greater than 1,500 (5,000, G. Stevens in prep)[4]. Extensive study of these regional subpopulations strongly suggests that they represent genetically distinct populations (Marshall *et al*. 2009, Deakos *et al*. 2011, Marshall *et al*. 2011b).

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4 *Kitchen-Wheeler et al. (2011) published subpopulation estimates for what were assumed to be distinct subpopulations in the Maldives ranging from 181 to 1,468. It has since been demonstrated, however, that with the exception of a very small aggregation of M. alfredi in the very south of the Maldives (Addu Atoll, which appears to be isolated with approximately 100 individuals) there is regular movement of individuals across and between all the atolls in the Maldives, and therefore the archipelago as a whole should be considered a subpopulation (G. Stevens in prep) as defined by CITES (Conf. 9.24, Rev. CoP15).*

The only population data available for *M. cf birostris* are the recording of >70 identified individuals in the Flower Garden Banks, Gulf of Mexico (US) (Graham *et al.* 2008 & unpubl.)

4.3 Population structure

Despite the broad ranges of *Manta spp.*, actual populations appear to be sparsely distributed, highly fragmented, segregated by age and sex, and highly vulnerable to depletion and regional extirpation (Marshall *et al*. 2011b,c). For both species, intensive research efforts have so far failed to identify interchange of individuals between subpopulations. Molecular analysis of subpopulations is underway (Poortvliet *et al*., 2011) to determine how genetically distinct they are, but work is still needed to more clearly define the population and species structure of Genus *Manta*.

Researchers studying *M. birostris* aggregations in Mozambique and Mexico observed a significant female bias, with the majority of females believed to be mature (Marshall 2009) while, in the Maldives and in mainland Ecuador, populations are heavily biased towards males (G. Stevens, unpubl. data, M. Harding unpubl. data). Identified individuals at aggregation sites across the world are on occasion re-sighted frequently, but at other locations are typically re-sighted only many years later, if at all (Marshall 2009, Harding and Bierwagen 2009). The majority of identified subpopulations comprise mature rays with few or no juveniles. Exceptions include the Sinai peninsula, Egypt, where observations of immature individuals exceed those of mature individuals, and Sri Lanka, where *M. birostris* landings in a 2011 fishery survey consisted of 95% immature individuals (DW <3.5m), with a higher ratio of males (57%) to females (43%) (Fernando and Stevens in prep).

In extensively studied *M. alfredi* subpopulations in Mozambique and the Maldives, a significant female bias has been observed, with the majority in Mozambique considered to be mature (Marshall *et al.* 2011a, G. Stevens, unpubl. data). In an *M. alfredi* subpopulation in Maui, Hawaii, the sex ratio is close to parity with juveniles and adults present. This study also suggests that juveniles may segregate from the adult population, residing in areas where they are less vulnerable to predation (Deakos *et al.* 2011). In Ningaloo, Australia, the distribution of males to females and adults to juveniles fluctuates throughout the year, but mature females consistently dominate (McGregor 2009). Of three *M. alfredi* aggregation sites surveyed in eastern Australia, only the largest site exhibited a significant female bias while the other two showed no bias (Couturier *et al.* 2011).

4.4 Population trends

Both *M. birostris* and *M. alfredi* are classified under the IUCN Red List as Vulnerable globally with declining population trends. The extent of population reduction for both *M. birostris* and *M. alfredi* appears high in several regions, with local declines as high as 56% to 86% over six to eight years (well under one generation period) in areas with targeted fisheries (Dewar 2002, Heinrichs *et al*. 2011, Setiasih *et al.* in prep, White *et al*. 2006, Alava *et al*. 2002, Homma *et al*. 1999 Michiyo Ishtani, pers. comm.1996, Marshall *et al*. 2011b,c, Rohner *et al* in review). Sustained pressure from fishing (both directed and incidental) has been isolated as the main cause of these declines (Rohner *et al* in review). In contrast, some subpopulations that are not fished (Rohner *et al* in review) or are within protected areas in the Maldives, Yap, Palau, and Hawaii appear stable (M. Deakos, pers. comm., G. Stevens, pers. comm., M. Etpison, pers. comm., Marshall *et al*. 2011b). See Annex VI Table 1 and Figure 1 for trend data and map.

Reports from fishermen, traders and retailers indicate that *Manta* gills are becoming harder to source, with prices escalating as the supply continues to dwindle (Heinrichs *et al*. 2011). Meanwhile commercial extinction is already suspected in Lamakera's nearshore population (Dewar 2002, Setiasih *et al*. in prep.) and in the Sea of Cortez (Homma *et al.* 1999).

Pacific Ocean: Following targeted fishing in the 1980s in the Sea of Cortez, Mexico, the *M. birostris* population collapsed (Homma *et al.* 1999). Prior to the commencement of these fisheries, *M. birostris* reportedly could be found around every major reef in this area and were a lucrative attraction to dive businesses (M. McGettigan, SeaWatch, pers. comm.). Filmmaker Howard Hall reported seeing three to four manta rays on every dive in the Sea of Cortez during a 1981 project, and did not see one manta during two years of filming for a later project in 1991-2. This population has still not recovered more than twenty years after its collapse (M. McGettigan, pers. comm.). Sightings at Okinawa Island, Japan, by T. Itoh fell from 50 manta rays (most likely *M. alfredi*) in 1980 to 30 in 1990 to 14 - 15 in 1997 (70+% decline in 17 years) (Homma *et al*. 1999).

Indo-Pacific: Significant declines in the number and size of *Manta spp*. caught in Indonesian target fisheries in Lamakera and Lombok are reported over the past decade (Dewar 2002, Heinrichs *et al.* 2011, Setiasih *et al.* in prep.,White *et al.* 2006, Marshall *et al.* 2011c) despite evidence of increased directed fishing effort (Setiasih *et al.* in prep). Annual landings estimates from Lamakera for 2010 were estimated at 660 *M. birostris* (Heinrichs *et al.* 2011, Setiasih *et al.* in prep.) compared with the estimate of 1,500 nine years earlier (Dewar 2002) (56% decline in 9 years). Fishing effort in the 2011 investigation was higher as evidenced by an increase in number of boats from 30 in 2001 to 40 in 2011. Other factors associated with fishing effort were consistent, with the same type of gear and boats used and similar fishing areas and seasons (Setiasih *et al.* in prep). Local dive operators and park rangers in Komodo National Park, near Lamakera, also report a decline in abundance of manta rays (*M. alfredi*) in the park (H. Dewar, pers. comm.). In Lombok, surveys from 2007 to 2012 estimated annual landings of 143 *M. birostris* (Setiasih *et al.* in prep.), compared with 331 during 2001-2005 surveys (White *et al*. 2006) (57% decline in 6-7 years). Fishermen and traders in Lombok also reported in 2011 that *Manta spp*. landed today are much smaller (Heinrichs *et al*. 2011, Setiasih *et al.* in prep.) and some noted that since 2010 they have begun to focus on mobulids as a primary target. In response to a 2011 survey on manta tourism (Heinrichs *et al.* 2011), a dive operator near Sangalaki in Kalimantan, often referred to as the 'World Capitol of Mantas', reported that staff members had seen manta rays in a fish market on the mainland and also reported that manta ray sightings had become increasingly rare (E. Oberhauser pers. comm.). In the Philippines, a survey (standardized questionnaire) of artisanal fishermen indicated a 50% decline in *Manta spp*. landings over 30 years from the 1960s to 1990s, following directed fisheries there (Alava *et al*. 2002). Sightings data by scuba divers suggest that the local population of *Manta spp*. in the Sulu Sea off Palawan Island (Philippines) fell by one half to two-thirds in seven years from the end of the 1980s (M. Nishitani pers. comm.). Despite legal protection since 2003, mantas are now reported to be rare in the Philippines, especially around the Bohol Sea where the fishery was focused (Marshall *et al*. 2011c).

Indian Ocean: In Sri Lanka, fishermen have reported declines in *Manta spp*. catches over the past five to ten years as targeted fishing pressure has increased (Fernando and Stevens in prep, Anderson *et al.* 2010). In India, *Mobulid* catches have declined in several regions, including Kerala, along the Chennai and Tuticorin coasts and Mumbai, despite increased fishing effort (Couturier *et al*. 2012, Mohanraj *et al*. 2009). Prior to 1998 *Manta spp.* (suspected *M. alfredi*) were landed abundantly at Kalpeni, Lakshadweep Islands in a directed harpoon fishery (Pillai 1998), but a local dive operator reports that this fishery is no longer operating and *Manta* sightings around these islands are now rare (S. Pujari, pers. comm.). Dive operators in the Similan Islands, Thailand, have witnessed increased fishing for *Manta spp*., even in Thai National Marine Parks, and have reported consistent declines in *Manta spp*. sightings from 59 during the 2006-7 season down to 14 during the 2011-12 season (76% decline) (R. Parker, pers. comm.). Manta ray researchers from Western Australia report dramatically decreased sightings of *M. birostris* over the past ten years. Where large seasonal groups of *M. birostris* were once seen migrating north up the coast, sightings are now rare (F. McGregor pers. comm.). In Madagascar, scuba divers and fishermen report a large decline in *Manta spp.* sightings over the past 10 years (R. Graham, pers. comm.). In Mozambique, it is estimated that 20 to 50 *M. alfredi* are taken by subsistence fishermen annually in/along a ~100 km area/length of coast (<5% of the total coastline) (Marshall *et al*. 2011b). Rohner *et al*. (in review) aimed to distinguish true population trends for both *Manta* species from environmentally driven short-term fluctuations over an eight-year period in Mozambique. Their data indicate a pronounced decrease in abundance of the most heavily fished species, with an 86% decline in the sightings of *M. alfredi*. In contrast, the abundance of the relatively un-targeted *M. birostris* remained stable over the last eight-year period, despite the expanding *M. alfredi* fishery.

4.5 Geographic trends

Included in Section 4.4.

5. Threats

The greatest threat to *Manta spp*. is excessive targeted and incidental take in fisheries, increasingly driven by the international trade in gill plates for use in an Asian health tonic purported to treat a wide variety of conditions. Artisanal fisheries also target *Manta spp.* for food and local products (White *et. al.* 2006, Marshall *et al*. 2011a, Fernando and Stevens in prep). *Manta spp*. are easy to target because of their large size, slow swimming speed, aggregating behaviour, predictable habitat use, and tendency to not avoid humans. They are killed or captured by a variety of fishing methods including harpooning, netting, and trawling (Marshall *et al*. 2011b,c; White *et al.* 2006, Heinrichs *et al.* 2011, Setiasih *et al.* in prep., Fernando and Stevens in prep). 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 (Marshall *et al*. 2011a, Couturier *et al.* 2012). Regional subpopulations appear to be small and localized declines are unlikely to be mitigated by immigration, because of large geographic distance between most of these small, isolated populations that is greater than the maximum distance travelled observed in satellite tagging studies (Graham et al. 2012, Couturier et al. 2012, Deakos et al. 2011, Rubin and Kumli 2002).

This situation is exacerbated by the exceptionally conservative life history of these rays, which severely constrains their ability to recover from a depleted state. Manta rays are incidentally caught as by-catch in fisheries (Romanov 2002, Amande *et al*. 2010, Coan *et al.* 2000 and in shark control bather protection nets (C. Rose unpubl., Young 2001). Entanglement (in ghost nets, mooring lines, anchor lines, and other types of abandoned, lost or otherwise discarded fishing gear (ALDFG), boat strikes, and sport fishing-related injuries can also wound manta rays, decrease fitness, and/or contribute to non-natural mortality (Deakos *et al* 2011). Additional threats include habitat destruction, pollution, climate change, irresponsible tourism, oil spills, and ingestion of marine debris such as micro plastics (Couturier *et al.* 2012).

5.1 Direct Fisheries

Historically, subsistence fishing for *Manta spp*. occurred in isolated locations with simple gear, which limited the area and time fishermen could hunt. In recent years, however, fishers have begun targeting *Manta spp*. with modern fishing gear and expanding their fishing range and season, primarily in response to the emerging market for dried gill plates (Dewar 2002, White *et al*. 2006, Rajapackiam *et al*. 2007, White and Kyne 2010, Heinrichs *et al.* 2011, Setiasih *et al.* in prep., Fernando and Stevens in prep). This increase in fishing pressure is driving regional *Manta spp*. subpopulations toward commercial extinction (Dewar 2002, White *et al*. 2006, Heinrichs *et al*. 2011). Today, the largest documented fishing and exporting range States are Indonesia, Sri Lanka, and India, but high international trade demand may stimulate directed and opportunistic fisheries elsewhere. See Annex VII, Table 1 for available directed catch data and Figure 1 for fisheries map.

Pacific Ocean: Targeted fisheries have been observed in Peru: ~150 per year (Heinrichs *et al.* 2011), China (Zhejiang): ~100 per year (Heinrichs *et al.* 2011) and Mexico (M. McGettigan, SeaWatch.com, P. Thomas 1994). Opportunistic hunting of a small *M. alfredi* population has recently been reported in the islands of Tonga (B. Newton, pers. comm.). Because of their isolation and low numbers, such local subpopulations of *M. alfredi* are extremely vulnerable to any fishing pressure.

Indo-Pacific: *Manta spp.* fisheries have been observed in Indonesia in Lamakera and Lamalera (Nusa Tenggara), Tanjung Luar (Lombok), Cilacap (Central Java) and Kedonganan (Bali) (Dewar 2002, White *et al*. 2006, Barnes 2005) with ~1,026 *M. birostris* landed per year (Heinrichs *et al.* 2011, Setiasih *et al.* in prep.). Most fisheries are targeted and have arisen or greatly increased over the past ten years. In and around the Wayag and Sayang Islands in Raja Ampat, Indonesia, where shark populations have collapsed, shark fishermen have reportedly begun to target *Manta spp*. (Donnelly *et al*. 2003). In Lamakera, when motorized boats replaced traditional dugout canoes to target *Manta spp*., catch rates increased by an order of magnitude above historic levels (Dewar 2002).

Indian Ocean: Targeted fisheries are reported in Sri Lanka: ~1,055 *M. birostris* per year (Fernando and Stevens 2011), India: ~690 *Manta spp.* per year (Heinrichs *et al*. 2011), Thailand (R. Parker, pers. comm.), the Philippines (Alava *et al*. 2002 – now legally prohibited), and several locations in Africa, including Tanzania and Mozambique, where annual landings of ~35 *M. alfredi* are reported from less than 5% of the coastline, but fisheries are widespread (Marshall *et al*. 2011b).

Atlantic Ocean: The only known directed fishing of *Manta spp.* in the Atlantic occurs seasonally off Dixcove, Ghana (likely to be *M. birostris*) (Essumang 2010), and illegally off Mexico's Yucatan (Graham *et al.* 2012, S. Heinrichs, pers. comm.).

5.2 Incidental Fisheries

Manta spp. are a bycatch of myriad fisheries targeting other species throughout the Atlantic, Pacific, and Indian Oceans, but are most frequently bycaught in purse seines, gillnets, and longlines (all commonly used in tuna fisheries). Bycatch data are collected in only a few fisheries and, when they are, *Manta spp*. are often recorded under various broad categories such as "Other", "Rays", or "Batoids", with a breakdown by species almost never recorded (Lack and Sant 2009, Camhi *et al*.

2009). Numbers of animals released alive are only rarely recorded, while visual identification field guides for *Manta* and *Mobula spp.* have only recently been published (See Annex II). As such, *Manta spp*. have generally been overlooked in most oceanic fisheries reports, with very little effort to properly identify or accurately record the species caught (Chavance *et al*, 2011, G. Stevens, pers. comm.). See Annex VII, Table 2 and Figure 1.

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

All utilisation and trade in the products of *Manta* spp. is derived from wild-caught animals. Records cannot be quantified fully, due to a lack of species and product-specific codes, catch, landings, and trade data. All available information, however, indicates that fisheries are trending from bycatch to more targeted operations primarily to supply gill plates to Asian markets (Fernando and Stevens in prep, Heinrichs *et al.* 2011, Setiasih *et al.* in prep., Dewar 2002, Marshall *et al*. 2011c). For example, fishermen in Sri Lanka used to avoid setting their nets where *Manta spp*. were known to occur, and any rays caught incidentally were released, often alive, at sea. Following the rapid growth of the gill plate trade over the past decade, however, fishermen now land all *Manta spp*. and have recently begun removing the gill plates at sea, discarding the remaining low-value carcass (D. Fernando, pers. comm.)

6.1 National utilization

There is no documented domestic use of *Manta spp*. gill plates in the three largest *Manta spp*. fishing range States (Indonesia, Sri Lanka and India) (Heinrichs *et al*. 2011, Fernando and Stevens in prep, Setiasih *et al.* in prep.). The relatively low-value meat of *Manta* spp. taken in these and other domestic fisheries is used locally for shark bait, animal feed, and human consumption or discarded, while high value products (primarily gill plates, also skin and cartilage) are exported for processing elsewhere (Heinrichs *et al.* 2011, Setiasih *et al.* in prep., Fernando and Stevens in prep, Marshall *et al*. 2011c, Booda 1984, C. Anderson, pers. comm., D. Fernando pers. comm.).

Landings in China, reportedly from the South China Sea and international waters, are not exported for processing. A 2011 survey of a shark processing plant in Puqi, Zhejiang Province in China, which is a major processor of *Manta spp*., revealed that the gill plates are sold directly to buyers in Guangdong (with wholesale prices for large *M. birostris* gills of ~1400RMB (USD 219) per kg (Heinrichs *et al*. 2011). The carcasses are shipped to another plant in Shangdong, where the meat is ground up for fishmeal and the cartilage is processed to make chondroitin sulfate supplements. An Appendix II listing of *Manta spp*. would not affect the national use of these species and their products.

6.2 Legal trade

High value *Manta spp*. gill plates, which retail at up to USD 680/kg in Chinese markets, are the most important *Manta* product in international trade (Heinrichs *et al*. 2011, Townsend *et al*. in prep). Consumption occurs primarily in China (including Hong Kong and Macao SARs) and Singapore (Heinrichs *et al*. 2011, Townsend *et al.* in prep.). Surveys have also identified international trade in *Manta spp*. cartilage and skins, but these products are of significantly lower value than gill plates. For example, in Tanjung Luar, Lombok, Indonesia, a buyer who had paid Rp 5 million (USD 545) for a whole *Manta* subsequently received Rp 4.5 million (USD 490) for the gill plates, but only Rp 1 million (USD 109) for both skins and cartilage (White *et al*. 2006). Cartilage is used in the manufacture of some nutritional supplements (see above, Heinrichs *et al*. 2011) and has reportedly been sold as a cheap substitute for shark fin (Alava *et al*. 2002). The meat of mobulids has been exported from Mexico (Booda 1984, Marshall *et al*. 2011c).

Small numbers of *M. birostris* and *M. alfredi* are also caught and transported to aquariums for use in large display tanks in the US, Bahamas, Portugal, Japan, and South Africa. Uchida (1994) reported the number of surviving days for manta rays in captivity from 1 to 1,943.

6.3 Parts and derivatives in trade

The gill plate, commonly sold under the trade names “Fish Gills” or “Peng Yu Sai”, is the *Manta spp.* part most valued in international trade, with cartilage and skins of lesser importance (Heinrichs *et al*. 2011, Townsend *et al*. in prep.). Because gill plates, shark fins, and many other seafood products are classified under one import/export code, it is impossible to extract accurately the overall volume of the gill plate trade from import/export data (P. Hilton pers. comm., Townsend *et al*. in prep). Instead, an estimate of the total volume of the gill plate trade has been produced from an analysis of market surveys in the major *Manta spp*. gill plate markets (Guangzhou, Hong Kong and Macao SARs in China; and Singapore, with an estimated 99% of the market based in Guangzhou). These surveys estimated the annual volume of the gill plate trade as ~21,000 kg of dried *Manta spp*. gill plates, worth USD 5 million[5] and representing an estimated 4,652 manta rays each with an average retail value of USD 849 (Heinrichs *et al*. 2011, Townsend *et al*. in prep.). See Annex VIII. Annual manta ray landings from known fisheries are estimated at close to 3,100 (see Annex VII), but expected to be somewhat higher due to unreported landings in some areas. These market estimates demonstrate that a very high percentage of manta rays landed are likely entering the gill plate trade, the high value of manta ray parts in international trade is clearly a primary driver of fisheries for these species, and the gill plate trade appears to be a very small component of the total dried seafood trade.

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

6.4 Illegal trade

The vast majority of international trade in *Manta spp*. products is unregulated. A few range States have protected these species or have banned the possession or export of any ray products, however illegal landings and trade of *Manta spp*. have been reported (Philippines, GMA TV May 2012). The extent of illegal trade is not known because no mechanisms have been implemented to monitor and regulate it.

6.5 Actual or potential trade impacts

The unsustainable *Manta spp.* fisheries described above are primarily driven by the high value of gill plates in international markets (Dewar 2002, White *et al*. 2006, Marshall *et al*. 2011b,c, Heinrichs *et al*. 2011, Couturier *et al*. 2012). This trade is the driving force behind population depletion throughout most of the range of *Manta spp*. and poses the greatest threat to their survival. Additional trade impacts include the significant economic consequences for existing (and potential) high value, non-consumptive sustainable ecotourism operations, which have the potential to yield much larger and longer-term benefits to range States than short-term unsustainable fisheries (Anderson *et al*. 2010, Heinrichs *et al*. 2011, O'Malley *et al*. unpubl.).

An analysis of *Manta* tourism relative to fisheries value in Indonesia, home to the largest fishery for *Manta spp.*, estimated tourism revenues in excess of USD 18 million per year compared with fishery revenues of ~USD 475 thousand annually (O'Malley *et al*. unpubl.). Dive tourism in Yap is focused almost exclusively on *Manta* ray encounters, with an annual value estimated at USD 4 million (B. Acker, unpubl.). Tourism operations focused on viewing marine megafauna such as manta rays bring millions of dollars in revenue annually primarily to local communities (Norman and Caitlin 2007, Pine et al. 2007, Brunnschweiler 2009, Tibirica et al. 2009, Jones et al. 2009, Graham 2004, Martin and Hakeem 2006, Hara et al. 2003, Topelko and Dearden 2005). In the Maldives, for example, direct revenue from manta dive and snorkel excursions was estimated to generate over USD 8.1 million per year during 2006–2008 (Anderson *et al*. 2010). The total value of *Manta spp*. dive tourism in just seven[6] locations is estimated at over USD 27 million per year (Heinrichs *et al*. 2011). Including revenue generated in other popular diving locations in Mozambique, Indonesia, Thailand, Mexico, Japan, Ecuador, Solomon Islands, Papua New Guinea, Australia, the Philippines, the US and several other countries, current global *Manta* tourism is estimated to exceed USD 75 million in direct dive operation revenues annually, and with associated expenditures possibly twice as much (O'Malley *et al*. in prep). Meanwhile, tourism opportunities in a number of range States have still not been explored. These existing and potential tourism revenues are significantly greater than the estimated

5 *Researchers surveyed stores in Guangzhou, China, Hong Kong SAR, Macao SAR and Singapore, and recorded the number of stores selling gill plates, current stock, prices and estimated annual sales volume. Results were compiled and analyzed to produce low, high and median estimates for total mobulid gill plate sales volume. The percentage of each different type of gill plate (small Mobula spp., large Mobula spp., small Manta spp. and large Manta spp.) and the corresponding average price for each type of gill plate was then applied to calculate the estimated market value.*

6 *Maldives; Kona, Hawaii; Yap; Palau; Socorro, Mexico; Nusa Penida, Bali, Indonesia; Ningaloo, W. Australia*

market value of USD 5 million per year for the global *Manta spp.* gill plate trade (Heinrichs *et al*. 2011). The development of high value community-based whale shark tourism in the former fishing range States of India, the Philippines, and Indonesia illustrates the potential for *Manta* tourism to provide long-term, sustainable income to many coastal communities, if short-term boom and bust fisheries are avoided.

7. <u>Legal instruments</u>

7.1 National

Range States with legislation prohibiting the catch and/or trade of *Manta spp*. include: Ecuador, the European Union, Maldives, Mexico, New Zealand, Philippines, Yap (FSM), and some US States/Territories (Florida, Hawaii, Guam, Commonwealth of the Northern Mariana Islands (see Annex IX). Other range States protect *Manta* rays in relatively small marine park zones, and *Manta spp.* are proposed to be protected in the Micronesian Regional Shark Sanctuary, which applies to the waters of the Federated States of Micronesia, Palau, the Republic of the Marshall Islands, Guam and the Commonwealth of the Northern Mariana Islands starting in 2013.

Effectiveness of these measures varies, with reports of illegal fishing of *Manta spp*. (most likely *M. birostris*) in Mexico and the Philippines (Graham *et al.* 2012, S. Heinrichs, pers. comm., Marshall *et al*. 2011c, GMA TV, May 2012). *Manta spp*. (primarily *M. alfredi*) are also targeted in the Komodo Marine Park, near Lamakera, Indonesia, despite regulations forbidding fishing (H. Dewar, pers. comm.). Some existing manta ray legislation defines “manta ray” as “*Manta birostris*”. The recently described *M. alfredi* and *M. c.f. birostris*, should it be determined a distinct species, are therefore potentially vulnerable even where “manta ray” protection is in place (Couturier *et al*. 2012).

7.2 International

M. birostris was listed in Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) in 2011. Until also listed in the Annex to the CMS Memorandum of Understanding (MoU) on Migratory Sharks, *Manta spp.* will not be specifically considered under the MoU Conservation Action Plan. Furthermore, many *M. birostris* fishing States have yet to sign the CMS Shark MoU.

8. <u>Species management</u>

8.1 Management measures

The top three *Manta spp*. fishing countries (Indonesia, Sri Lanka, and India), which account for an estimated 90% of the world’s *Manta spp*. catch (Heinrichs *et al*. 2011), have no landings restrictions or population monitoring programs for *Manta spp*. No RFMOs have adopted binding measures to specifically protect or regulate landings of *Manta spp*. (See Annex IX for table of management measures.) Scientists affiliated with the Inter-American Tropical Tuna Commission and the International Seafood Sustainability Foundation have recently begun to explore means for mitigating bycatch of *Manta spp*. in Pacific tuna purse seine fisheries.

8.2 Population monitoring

There are no known national government fishery or population monitoring programmes for *Manta spp*. Monitoring of *Manta spp*. subpopulations has been undertaken by privately funded projects and/or local dive tourism operators in some aggregation areas in Australia (Lady Elliot Island and Ningaloo), Ecuador (Isla de la Plata), the U.S. (Flower Garden Banks, Gulf of Mexico), Hawaii (Kona and Maui), Indonesia (Komodo, Raja Ampat and Nusa Penida), the Maldives, Mexico (Isla Holbox and Revillagigedo Islands), southern Mozambique, Brazil, Palau, and Yap (Project Manta, Equilibrio Azul, Marine Megafauna Foundation, The Manta Trust, Manta Pacific Research Foundation, Palau Manta Rays, Komodo Manta Project, Misool Manta Project, Indonesia Manta Project, Aquatic Alliance, Instituto Laje Viva, Mantas Ecuador, HAMER). Most of these programmes are aimed at estimating subpopulation size, tracking ray movements and studying other biological characteristics. Some have also involved short–term evaluation of mobulid fisheries, but there are no known population assessments to demonstrate that fishing mortality for *Manta spp*. is sustainable.

8.3 Control measures

8.3.1 International

There are no controls, monitoring systems, or marking schemes in place to regulate, track, or assess international trade in *Manta spp*.

8.3.2 Domestic

Measures to prohibit the landing and trade of *Manta spp*. are listed in 7.1 and Annex IX. There are no *Manta spp.* catch limits in place in the three States that account for as much as 90% of *Manta spp*. fisheries worldwide, nor is there specific regulation of *Manta spp*. catches in high seas fisheries. No trade measures restrict the sale or export of *Manta spp.* landings except in the States that have prohibited *Manta* ray product trade (Ecuador, Maldives, Mexico, New Zealand, Philippines, and Yap), and those rules are not always well enforced (Heinrichs *et al*. 2011).

8.4 Captive breeding and artificial propagation

Four captive breeding events and births have been reported, all coming from a pair of *M. alfredi* in Churaumi Aquarium, Japan (Tomita et al. 2012). The potential for captive breeding is extremely limited and only likely to provide a small number of animals for display.

8.5 Habitat conservation

Some *Manta spp.* critical habitats occur inside marine protected areas, but there is little or no comprehensive protection for most coastal and high seas habitats.

9. Information on similar species

Manta spp. are often confused with rays of the Genus *Mobula*, also in family *Mobulidae* (Mobulids). The nine species in Genus *Mobula* vary widely in body size and geographic distribution (Couturier *et al*. 2012). Fisheries for *Mobula spp.* generally occur in the same locations as for *Manta spp*., in most cases with larger numbers of *Mobula spp* landed (Fernando and Stevens in prep, White *et al*. 2006). *Mobula* 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). Annex II presents guides for gill plates and live animals.

10. Consultations

Ecuador's proposal was sent through email to the countries that make up the distribution areas and other countries that could have supported the proposal. Comments and observations were received from Brazil, Colombia, United States, United Kingdom, Thailand, New Zelanada and Nomenclature Specialist Group of the Animals. Colombia and Brazil had also decided to be co-proponents of the proposal.

11. Additional remarks

11.1 Achieving sustainable fisheries

An Appendix II listing will encourage the sustainable consumptive and non-consumptive uses of *Manta* species. It is intended to stimulate and complement sustainable fisheries management measures by ensuring that international trade is supplied by sustainably managed, well monitored fisheries that are not detrimental to the status of the wild populations that they exploit. Under CITES Article IV, non-detriment findings will require evidence of an effective sustainable fisheries management programme for *Manta spp*. before trade permits can be issued. Other CITES measures for the regulation and monitoring of international trade can reinforce and complement fisheries management measures for these particularly vulnerable species, thus also contributing to implementation of the UN FAO IPOA–Sharks.

11.2 Implementation Issues

11.2.1 Scientific Authority

Scientific Authorities are available to provide resources and guidance on gill plate identification and non-detriment findings.

11.2.2 Identification of Products in Trade

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

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Taxonomic Notes (From Marshall et al. 2011, IUCN Red List assessment):

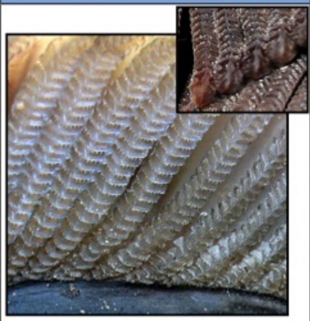
Previously, the Genus *Manta* was considered monotypic by most authors. The genus was recently re-evaluated and split into two species, the reef manta ray (*Manta alfredi*) and the giant manta ray (*Manta birostris*) (Marshall *et al*. 2009). Genetic evidence further confirms the existence of two separate species (Kashiwagi *et al* 2012). Both species have worldwide distributions. *Manta spp*. are sympatric in some locations and allopatric in other regions (Kashiwagi *et al*. 2011).

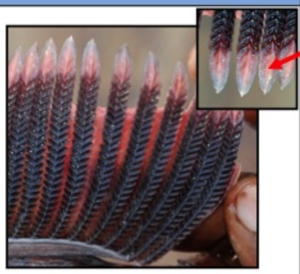
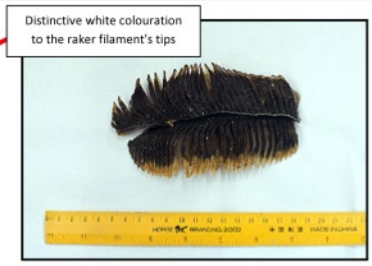
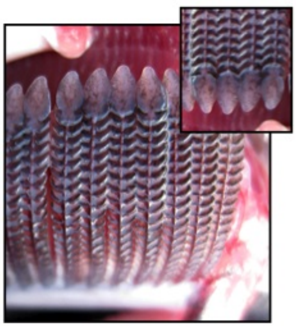
Reports are often mixed as the splitting of the genus occurred very recently (Marshall *et al*. 2009). Historical reports can often be confusing as well without adequate descriptions or photographs. Care should be taken when using reports or accounts of *Manta birostris* that they are not referring to *Manta alfredi* (or vice versa), or even *Mobula spp*.

It has been suggested by Marshall *et al*. (2009) that a third, putative species, *Manta cf. birostris*, in the Atlantic may be distinct from the giant manta ray (*Manta birostris*). This putative species shares some characteristics with the giant manta ray, such as a large maximum disc width and the presence of a distinct, reduced (vestigial) caudal spine. However, from the limited specimens and photographs examined, clear differences exist between *M. cf. birostris* and *M. birostris* including dissimilar denticle morphology and distribution, intermediary dentition and, most noticeably, differences in dorsal and ventral coloration. While *Manta cf. birostris* occurs in sympatry with *M. birostris* in parts of the Atlantic and Caribbean, there is some evidence that differences in fine-scale habitat partitioning and seasonal habitat use may occur in some locations (Bigelow and Schroeder 1953, Notarbartolo-di-Sciara and Hillyer 1989, Graham *et al*. 2012). At present there is not enough empirical evidence to warrant the separation of a third species of *Manta*.

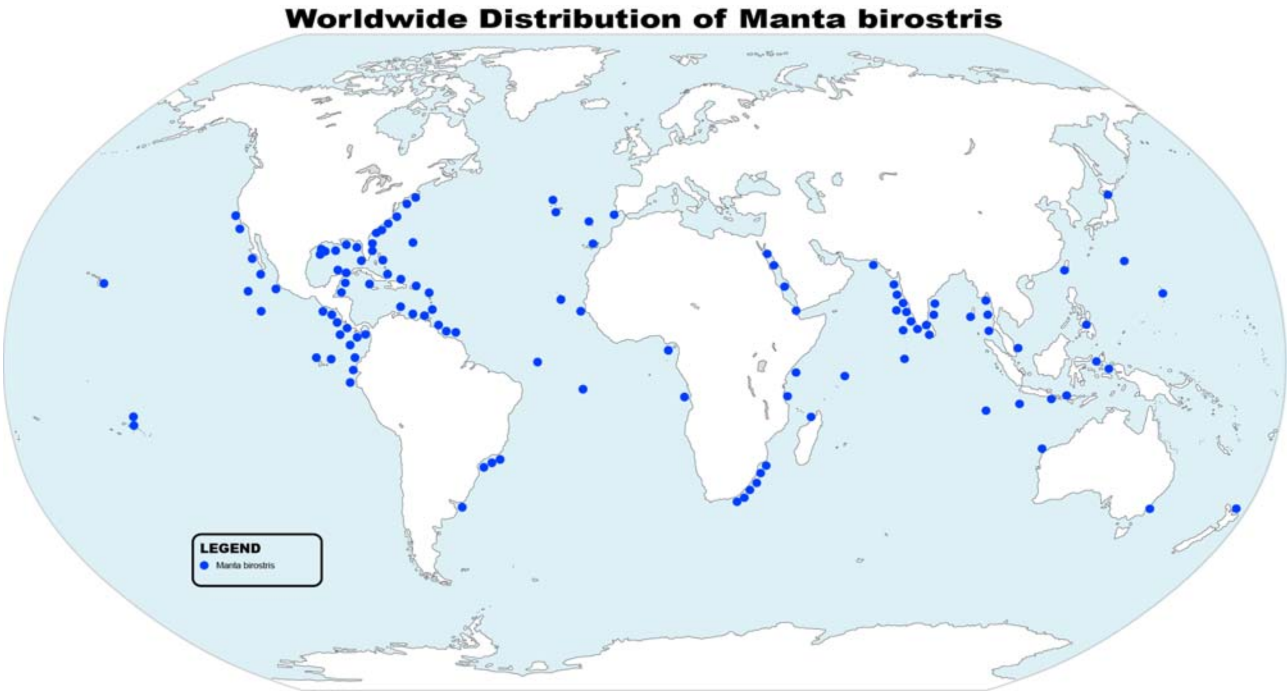
Mobulid Ray Identification Field Guides

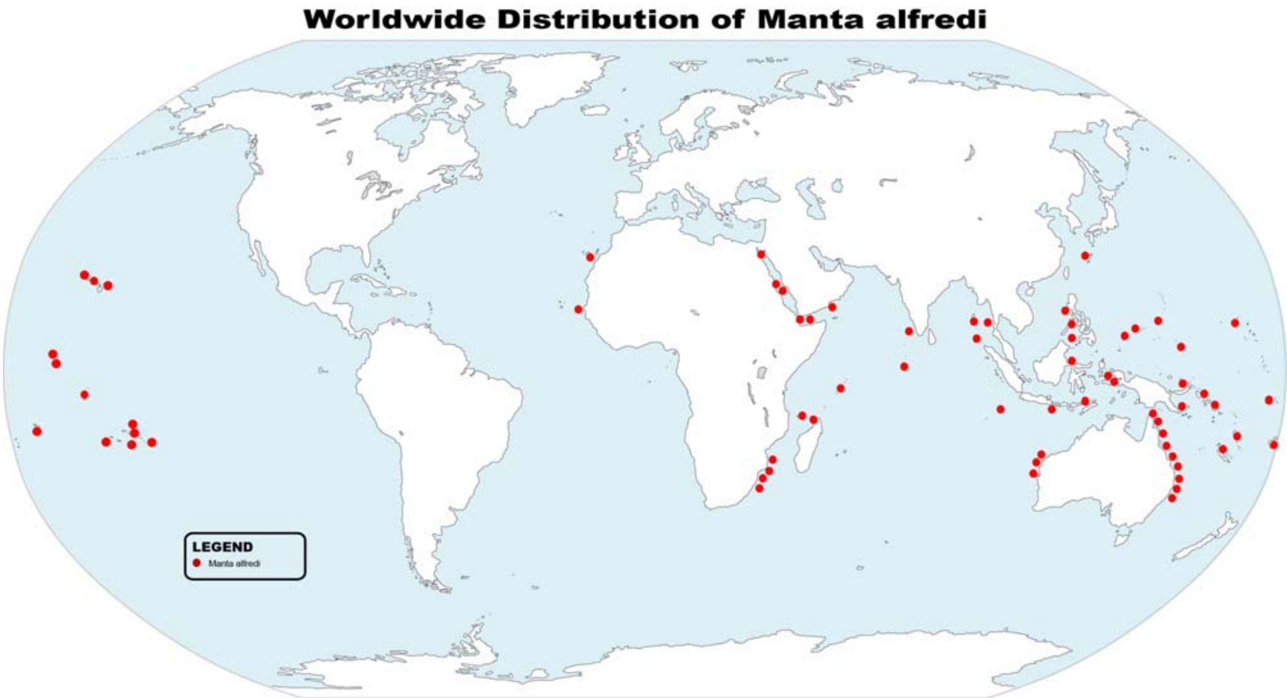
Guide to the Identification of Mobulid Rays (Mobulidae): Indo-West Pacific (2011), The Manta Trust (Note: A step by step identification instruction guide will be available soon, which demonstrates very clearly how to easily distinguish gill plates from Manta spp. from those of Mobula spp.

Species	Whole Animal	Gill Raker Close-up	Traded Raker Section
Oceanic Manta Ray - *Manta birostris*			
Sickle-fin Devil Ray - *Mobula tarapacana*			
Species	Whole Animal	Gill Raker Close-up	Traded Raker Section

Species	Whole Animal	Gill Raker Close-up	Traded Raker Section
Spine-tail Devil Ray - *Mobula japanica*			
Bent-fin Devil Ray - *Mobula thurstoni*			

Distribution Maps (A. Marshall)





Distribution Table – Range States and FAO Fisheries Areas

Range States and FAO Fisheries Areas	*Manta birostris*	*Manta alfredi*
FAO Fisheries Areas	31, 34, 41, 47, 51, 57,71, 77, 81, 87	51, 57, 71, 77, 81
Azores & Madeira Islands (Portugal)	x	
Canary Islands (Spain)	x	x
Cape Verde Islands	x	
Senegal	x	x
Nigeria	x	
Angola	x	
Ascension Island (British Oversees Territory)	x	
South Africa (Eastern Cape Province, KwaZulu-Natal, Western Cape Province)	x	x
Mozambique	x	x
Madagascar (Nosy Be)	x	x
Comoros - Mayotte (France)		x
United Republic of Tanzania (Zanzibar)	x	
Kenya	x	
Israel (Eilat Bay)	x	
Egypt - Sinai (African part)	x	x
Saudi Arabia	x	x
Sudan	x	x
Djibouti	x	x
Yemen		x
Oman		x
Seychelles (Mahé & Poivre Islands)	x	x
Chagos Archipelago (British Indian Ocean Territory)		x
Maldives	x	x
India (Lakshadweep & Andaman Is., Andhra Pradesh, Goa, Gujarat, Kerala, Maharashtra, Tamil Nadu)	x	x
Sri Lanka	x	
Myanmar (Coco Is. & Mainland)	x	
Thailand	x	x
Malaysia	x	x
Indonesia (Sumatra, Bali, Komodo, Flores, Irian Jaya, Java, Lombok, Alor, Borneo, Sulawesi)	x	x
Cocos (Keeling) Islands (Australia)	x	x
Christmas Island (Australia)	x	

Range States and FAO Fisheries Areas	*Manta birostris*	*Manta alfredi*
Australia (New South Wales, Northern Territory, Queensland, Western Australia)	x	x
Philippines (Monad Shoal, Tubbataha Reef, Pamilacan, Apo Reef, Gigdup Shoal, Ticau & Masbate)	x	x
Ryukyu & Nampo-shoto Archipelagos' (Japan)	x	x
Taiwan - Province of China (Main Island)	x	
Northern Mariana Islands (Saipan) & Guam (US)	x	x
Federated States of Micronesia (Yap, Pohnpei)		x
Palau		x

Range States and FAO Fisheries Areas	*Manta birostris*	*Manta alfredi*
Papua New Guinea (Bismarck Archipelago, North Solomon's, Main Island Group)		x
Solomon Islands		x
New Zealand (North Is.)	x	
New Caledonia (France)		x
Vanuatu		x
Marshall Islands		x
Fiji		x
Tuvalu		x
Tonga		x
Cook Islands		x
Kiribati (Christmas Island)		x
Line Islands - Jarvis, Palmyra & Kingman (US)		x
Hawaiian Islands (US)	x	x
French Polynesia - Society, Marquises & Tuamotu Islands		x
Mexico (Baja California, Baja California Sur, Quintana Roo, Revillagigedo Is., Sinaloa, Yucatán)	x	
Clipperton Island (France)	x	
Guatemala	x	
Belize	x	
El Salvador	x	
Honduras	x	
Nicaragua	x	
Costa Rica (Cocos I., Costa Rica Mainland)	x	

Range States and FAO Fisheries Areas	*Manta birostris*	*Manta alfredi*
Panama	x	
Colombia (Malpelo I.)	x	
Ecuador (Galápagos Islands & Mainland)	x	
Peru	x	
United States Continent (Alabama, California, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, New Jersey, North Carolina, South Carolina, Texas, Virginia)	x	
Bermuda (UK)	x	
The Bahamas	x	
Cuba	x	
Cayman Islands (UK)	x	

Range States and FAO Fisheries Areas	*Manta birostris*	*Manta alfredi*
Jamaica	x	
Dominican Republic	x	
Grenada	x	
Netherlands Antilles - Curaçao (Netherlands)	x	
ABC Islands (Bonaire)	x	
Trinidad and Tobago	x	
Venezuela	x	
Guyana	x	
French Guiana (France)	x	
Brazil	x	
Uruguay	x	

Regional Recorded Individuals and Subpopulation Estimates

Table 1. ***Manta alfredi***

Region	Species	Recorded Individuals	Subpopulation Estimate	Reference
Southern Mozambique	*M. alfredi*	685	890	Marshall *et al*. 2011a, Marshall unpubl., Marshall 2009
Republic of Maldives	*M. alfredi*	2,410	5,000	G. Stevens, in prep.,
Bali, Indonesia	*M. alfredi*	135	-	IMP & The Manta Trust, unpubl.
Komodo, Indonesia	*M. alfredi*	150	-	KMP & The Manta Trust, unpubl.
Raja Ampat, Indonesia	*M. alfredi*	231	-	MMP & The Manta Trust, unpubl.
Ryukyu Archipelago, Japan	*M. alfredi*	368	-	Kashiwagi *et al*. 2011
Yap, Micronesia	*M. alfredi*	100	~100	Marshall *et al*. 2011a
Guam	*M. alfredi*	35	-	J. Hartup, pers. comm.
Palau	*M. alfredi*	170	-	J. Denby & M. Etpison, pers. comm.
East Coast, Australia	*M. alfredi*	620	-	L. Couturier, pers. comm.
Ningaloo Reef, Australia	*M. alfredi*	676	1,200-1,500	McGregor 2009
Bora Bora, French Polynesia	*M. alfredi*	93	-	M. De Rosemont, pers. comm.
Maui, Hawaii	*M. alfredi*	323	350	M. Deakos, pers. comm.
Kona, Hawaii	*M. alfredi*	181	-	MPRF 2011

Table 2. ***Manta birostris***

Region	Species	Recorded Individuals	Subpopulation Estimate	Reference
Mozambique	*M. birostris*	180	600	Marshall 2009 & 2012 pers. comm.
Egypt	*M. birostris*	60	-	Marine Megafauna Foundation unpubl.
Republic of Maldives	*M. birostris*	63	-	G. Stevens, pers. comm.
Thailand	*M. birostris*	75	-	Kashiwagi *et al*. 2011
Raja Ampat, Indonesia	*M. birostris*	72	-	MMP & The Manta Trust, unpubl.
Isla de la Plata, Ecuador	*M. birostris*	~ 650	-	M. Harding, pers. comm.
Brazil	*M. birostris*	60	-	Laje Viva Institute unpubl., Luiz et al. 2008
Mexico (Revillagigedos Is.)	*M. birostris*	412	-	R. Rubin & K. Kumli, pers. comm.
Mexico (Isla Holbox)	*M. birostris*	> 200	-	R. Graham, pers. comm.

Table 3. ***Manta c.f. birostris (putative species)***

Region	Species	Recorded Individuals	Subpopulation Estimate	Reference
Flower Garden Banks, US	*M. c.f. birostris*	> 70	-	Graham *et al* 2008 & unpubl.

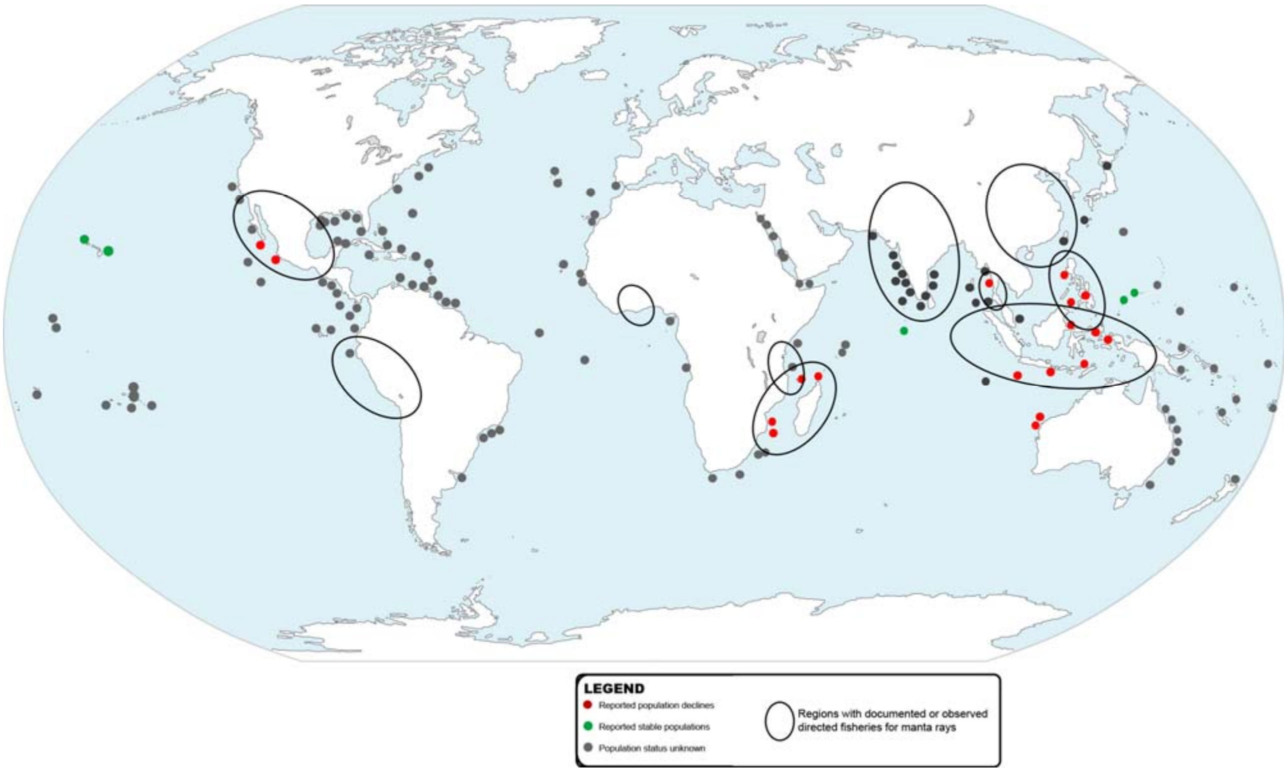
Population Trends
Table 1. Reported Declines by Region

Indo-Pacific

Area	Species	Year 1 Landings	Year 2 Landings	% Decline	Time Period	Source(s)	Methodology
Lamakera, Indonesia	*Manta spp.*	2001: 1,500	2010: 648	57% despite increased effort	9 years	Dewar 2002; Setiasih *et. al* in prep.	Structured community interviews 2002 and 2011. Comparison of fishing effort parameters
Tanjung Luar, Lombok, Indonesia	*Manta spp.*	2001-2005: 331	2007-2012 146	56% despite increased effort; large size declines	6-7 years	White *et al*. 2006; Setiasih *et al*. in prep.	Market surveys and fishermen / dealer interviews 2001-5 (~47 survey days); 2007-12 (33 survey days)
Bohol Sea, Philippines	*Manta spp.*	1960's: 100	1997: 50	50%	~ 30 years	Alava *et al*. 2002	Standardized questionnaire to artisanal fishermen to assess catch and effort previous year and 30 years prior
Sulu Sea, Philippines	*Manta spp.*	End 1980's	1996	50% - 67%	7 years	Michiyo Ishitani, pers. comm. 1996	Scuba diver sightings data
Indian Ocean							
S. Mozambique	*M. alfredi*	2003 6.8 / dive	2011 .6 / dive	86%	8 years	Rohner *et al.* in press	Scuba diver sightings data - adjusted to exclude environmental factors.
Thailand Similan-Surin Islands	*Manta spp.*	2006-7 59	2011-12 14	76%	5 years	R. Parker, pers. Comm..	Local dive professional detailed sightings data (per season)
Sri Lanka	*M. birostris*	2000	2011	Unspecified	5 – 10 years	Fernando & Stevens in prep, Anderson *et al.* 2010	Market surveys and structured fishermen interviews
Ningaloo, W. Australia	*M. birostris*	2001 Large seasonal groups	2011 Rare	Large decline	10 years	F. McGregor, pers. comm.	Manta researchers' sightings observations

Area	Species	Year 1 Landings	Year 2 Landings	% Decline	Time Period	Source(s)	Methodology
Madagascar	*Manta spp.*	2001	2011	Large decline	~ 10 years	R. Graham, pers. comm. 2011	Scuba diver and fishermen sighting observations
India, Lakshadweep Islands	*Manta spp.*	1998 Directed fishery	2011 No fishery; diver sightings rare	Poss. comm. extinction	~ 10 years	Pillai 1998; S. Pujari, pers. comm. 2011	Report of Central Marine Fisheries Res. Inst.; Dive operator observations.
Pacific Ocean							
Okinawa Island, Japan	*Manta spp.*	1980: 50 1990: 30	1997 14-15	71%	17 years	Homma *et al*. 1999	Local dive professional detailed sightings data (T. Itoh)
Sea of Cortez, Mexico	*Manta spp.*	1980s	1990s	Population collapse	~ 10 years	Homma *et al*. 1999; Notarbartolo-di-Sciara 1995	Mobulid researcher fishery observations
Sea of Cortez, Mexico	*Manta spp.*	1981 3-4 per dive	1991-2 0 in 2 yrs		~ 10 years	H. Hall, pers. comm.	Underwater filmmaker observations from 1981 and 1991-2 film projects
Sea of Cortez, Mexico	*Manta spp.*	1980 On every major reef	1990 Rarely seen		~ 10 years	M. McGettigan, SeaWatch 2000	Scuba diving / recreational fishing operator observations

Figure 1. Manta Species Population Trends Map (A. Marshall)



Fisheries

Estimated Annual Landings from Available Catch Data – Individuals

Table 1. Directed Fisheries – Individuals

Country/Region	Reference	Landing Year(s)	International Trade	Annual Landings Manta spp.	Annual Landings All Mobulids
Indonesia-Lamakera	Setiasih *et al.* in prep	2010	Yes	648	972
Indonesia-Lombok	Setiasih *et al.* in prep	2007-12	Yes	146	1,220
Indonesia-other[1]	White *et al*. 2006	2001-05	Yes	232	2,536
Sri Lanka	Fernando & Stevens in prep	2011	Yes	1,055	56,552
India	Raje *et al*. 2007	2003-04	Yes	690	24,959
China	Hilton 2011, Townsend et al. in prep	2011	Yes	100	2,100
Peru	Planeta Oceano 2011	2011	DD[2]	150	8,150
Southern Mozambique	Marshall *et al*. 2011a	2003-2012	Yes	35[4]	35
Madagascar	Graham pers comm.	2007	DD	DD	DD
Ghana	Essumuang 2010		DD	DD	DD
Total Estimate				**3,056**	**96,524**

1 Landing locations other than Lamakera or Lombok per White *et al.* 2006 are Kedonganan, Cilicap and Pelabuhanratu (*Mobula spp* only)
2 DD = Data Deficient

Table 2. Bycatch Fisheries - Individuals

Country/Region	Reference	Ref Year	International Trade	Annual Manta spp.	Total Mobulids
Brazil	Perez and Wahlrich 2005	2001	DD	DD	809
Mauritania	Zeeberg *et al*. 2006	2001-04	DD	DD	620
Indian Ocean	Pianet *et al* 2010	2003-08	DD	36[1]	361
New Zealand	Paulin *et al*. 1982	1975-81	DD	DD	39
South Africa	Young 2001	2001	DD	20	20
W. Central Pacific	Molony 2005	1994-04	DD	DD	1,500
Total Estimate				**56**	**3,349**

Notes:

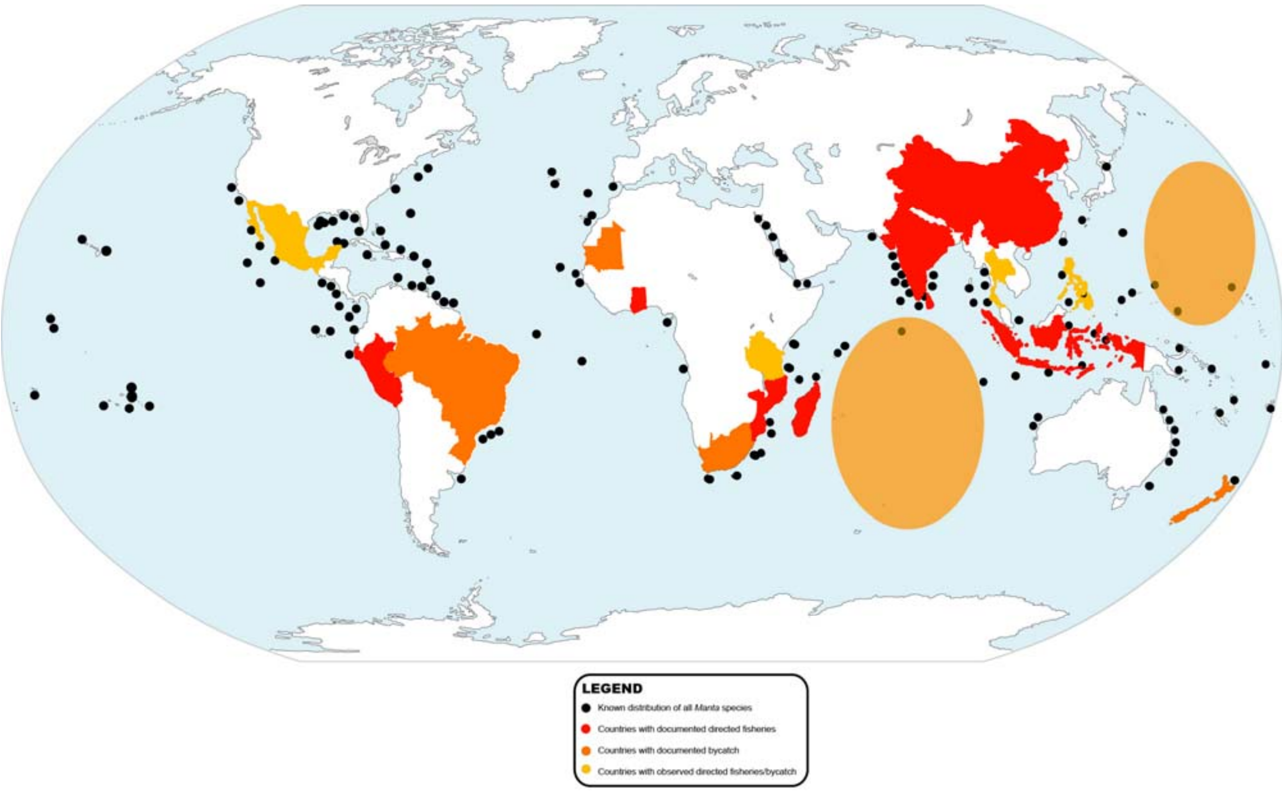
- *Most fishery figures listed are extrapolated estimated catches.*
- *Reports by weight have been converted to estimates of number of individuals (Townsend et al. in prep)*
- *Countries known to have targeted and/or bycatch fisheries for Manta spp. and Mobula spp., but where no catch records or estimates are available include, but are not limited to:*
    - o *Mozambique (only figures from approximately 5% of the coastline included),*
    - o *Southern China (only number from one processing plant included),*

- *Mexico, Madagascar, Ghana, Tanzania, Thailand and the Philippines.*

- *Some landings estimates included under "Directed Fisheries" are from fisheries that primarily target other species. There is evidence, however, that these fisheries actively target Manta and Mobula spp. and catches should not be considered to be incidental. Organized trade in gill plates in Indonesia has moved some fisheries to actively target Manta spp. along with the original target species.*

- *Much of the bycatch from high seas fisheries is likely to be discarded and may not go into the gill plate trade.*

Figure 1. Manta Species Fisheries Map



Manta and _Mobula spp._ Gill Plate Market Estimates from Market Surveys in Primary Gill Plate Markets
(Source: Heinrichs *et al*. 2011, Townsend *et al.* in prep.)

Table 1. Estimated Dried Gill Plate Market by Weight (kg)

Market	Stores w gills (actual)	Annuals Sales (kg) Low	Annual Sales (kg) High	Est. % of Market Surveyed	Total Mkt Est (kg) Low	Total Mkt Est (kg) High	Total Mkt Est (kg) Average[1]	% of Market
Guangzhou	53	37,777	79,726	85%	37,777	79,726	**60,969**	**99.61%**
Macao SAR	16	0.6	1.2	80%	12	24	**18**	**0.03%**
Hong Kong SAR	19	20.8	41.6	65%	32	64	**48**	**0.08%**
Singapore	24	53	223	80%	66	279	**173**	**0.28%**
Total Estimates					**37,887**	**80,093**	**61,208**	**100.00%**

Table 2. Estimated Dried Gill Plate Market by Gill Type (kg)

Gill Type	Est. % of Market	Low Mkt Est 37, 887 kg	High Mkt Est 80,093 kg	Avg[1] Mkt Est 61,208 kg
Small Mobula	30%	11,366	24,028	18,362
Large Mobula	36%	13,639	28,833	22,035
Total Mobula		**25,005**	**52,861**	**40,397**
Small Manta	4%	1,515	3,204	2,448
Large Manta	30%	11,367	24,028	18,362
Total Manta		**12,882**	**27,232**	**20,811**
TOTALS	**100%**	**37,887**	**80,093**	**61,208**

Table 3. Estimated Dried Gill Plate Market by Value (USD)

Gill Type	Avg. Price per kg USD	Low Mkt Est USD	High Mkt Est USD	Avg[1] Mkt Est USD
Small Mobula	$133	$1,511,691	$3,195,711	$2,442,199
Large Mobula	$177	$2,414,160	$5,103,526	$3,900,174
Total _Mobula spp._		**$3,925,851**	**$8,299,237**	**$6,342,373**
Small Manta	$177	$268,240	$567,058	$433,353
Large Manta	$251	$2,852,891	$6,031,003	$4,608,962
Total _Manta spp._		**$3,121,131**	**$6,598,061**	**$5,042,315**

Table 4. Estimated Retail Gill Plate Value per Manta / Mobula (USD)

Gill Type	Avg Dried Gill Plate Retail Price per kg	Est. kg dried gill plate per animal	Avg Mkt Est - kg	Avg Est. Animals in Gill Plate Mkt	Avg Est Retail Mkt Value / Animal
Small Mobula	$133	0.5	18,362	36,725	$67
Lge Mobula	$177	2.5	22,035	8,814	$443
Avg Mobula				45,539	$255
Small Manta	$177	2.5	2,448	979	$443
Lge Manta	$251	5.0	18,362	3,672	$1,255
Avg Manta				**4,652**	**$849**

1. Average markets estimates are the sum of average sales values for each store surveyed, not the average of the low and high total estimates.

2. Annual manta ray landings from known manta ray fisheries are estimated at approximately 3,100 (see Annex VII), but it's expected that actual landings are somewhat higher. This estimate of 4,652 manta rays in the gill plate trade from analysis of gill plate markets demonstrates that a very high percentage of manta rayslanded are likely entering the gill plate trade.

3 The high retail value of manta rays in international trade is clearly the primary driver of directed fisheries for manta rays.

Manta spp. Legal Protection Measures

Location	Species	Legal Protection / Conservation Measure
International		
CMS Signatories	*M.birostris*	Convention on the Conservation of Migratory Species of Wild Animals (CMS), Appendix I and II, 2011
Regional		
Micronesia: Federated States of Micronesia, Guam, Mariana Islands, Marshall Islands, Palau	All ray species	Micronesia Regional Shark Sanctuary Declaration to prohibit possession, sale, distribution and trade of rays and ray parts from end 2012
National		
Ecuador	*M. birostris*	Ecuador Official Policy 093, 2010
European Union	*M. birostris*	Article 1 of COUNCIL REGULATION (EU) No 692/2012
Maldives	*Manta spp.*	Exports of all ray products banned 1995
Mexico	All ray species	NOM-029-PESC-2006 Prohibits harvest and sale
New Zealand	*M. birostris*	Wildlife Act 1953 Schedule 7A (absolute protection)
Philippines	*M. birostris*	FAO 193 1998 Whale Shark and Manta Ray Ban
Yap (FSM)	*Manta spp.*	Manta Ray Sanctuary and Protection Act 2008
State		
Florida, USA	Genus *Manta*	FL Admin Code 68B-44.008 – no harvest
Guam, USA Territory	All ray species	Article 1, Chapter 63 of Title 5, Guam Code Annotated, Sec. 63114.2
Commonwealth of the Northern Mariana Islands	All ray species	Public Law No. 15-124
Hawaii, USA	*Manta spp.*	HI Rev Stat Sec. 188-39.5
Raja Ampat Regency, Indonesia	*Manta spp.*	Shark and Ray Sanctuary Bupati Decree 2010

Note: While both *M. birostris* and *M. alfredi* are found in the Philippines, this law was passed prior to the separation of the two *Manta* species and defines “manta” as *Manta birostris*. The laws in Ecuador, Mexico and New Zealand also define “manta” as *Manta birostris*, but *Manta alfredi* are not present in these States.