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Manta birostris, Giant Manta Ray

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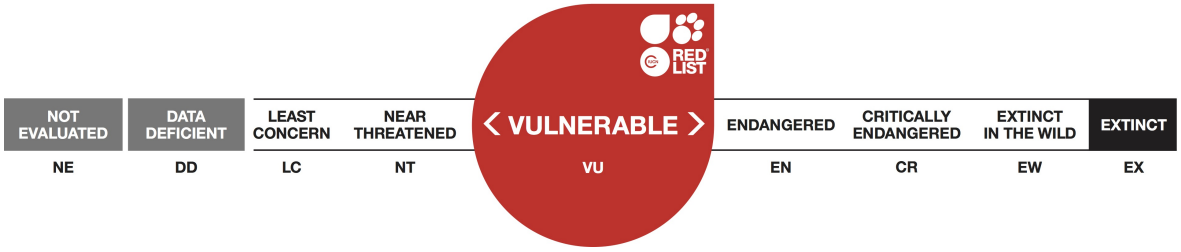

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Chondrichthyes	Rajiformes	Mobulidae

Taxon Name: *Manta birostris* (Walbaum, 1792)

Synonym(s):

- *Manta hamiltoni*
- *Raja birostris*

Common Name(s):

- English: Giant Manta Ray, Chevron Manta Ray, Oceanic Manta Ray, Pacific Manta Ray, Pelagic Manta Ray
- Spanish: Manta Cornuda, Manta Diablo, Manta Gigante, Manta Raya, Manta Voladora

Taxonomic Notes:

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*. 2008, Ito and Kashiwagi 2010). Both species have worldwide distributions. *Manta* species 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 (2009). Historical reports can often be confusing as well without adequate descriptions or photographs. Care should be taken when using reports or accounts of the Giant Manta Ray that they are not referring to the Reef Manta Ray (or vice versa).

Melanistic (black) and leucistic (white) colour morphs occur in both species of *Manta* (Marshall *et al*. 2009). Variant colour morphs often contributed an added degree of confusion when attempting to discriminate between species of *Manta* in the field or in photographs, especially when close examination was not possible. It should be noted that these colour morphs could be a possible source of error, resulting in mis-identifications in future studies or surveys of distribution.

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. 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 caudal spine. However, from the limited specimens and photographs examined, clear differences exist between *Manta cf. birostris* and the Giant Manta Ray including dissimilar denticle morphology and distribution, intermediary dentition and, most noticeably, differences in dorsal and ventral colouration. While *Manta cf. birostris* occurs in sympatry with the Giant Manta Ray in parts of the Atlantic and Caribbean, there is some evidence that differences in fine-scale habitat selection and seasonal habitat use may occur in some locations (Bigelow and Schroeder 1953, Notarbartolo-di-Sciara and Hillyer 1989). At present there is not enough empirical evidence to warrant the separation of a third species of *Manta*.

Manta rays are often confused with rays of the genus *Mobula*, and care should be used to ensure

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reports of mantas are actually of Manta and not its sister genus.

Assessment Information

Red List Category & Criteria: Vulnerable A2abd+3bd+4abd ver 3.1

Year Published: 2011

Date Assessed: November 1, 2010

Justification:

The Giant Manta Ray (*Manta birostris*), the largest living ray, has a circumtropical and also semi-temperate distribution throughout the world's major oceans, however within this broad range, actual populations appear to be sparsely distributed and highly fragmented. This is likely due to the specific resource and habitat needs of this species. Overall population size is unknown, but subpopulations appear to be small (about 100–1,000 individuals). Only recently separated from the Reef Manta Ray (*M. alfredi*), little is currently known about this ray except that it is elusive and potentially highly migratory.

The degree of interchange of individuals between subpopulations is unclear but is assumed to be low as there are currently no data that support such interchange despite active efforts to do so. As such, the decline of these small subpopulations may result in regional depletions or extinctions with the reduced possibility of successful recolonization. To aggravate this situation, this species has a very conservative life history with an extremely low reproductive output (one pup per litter). These biological constraints would also contribute to its slow or lack of recovery from population reductions.

Currently this species has a high value in international trade and directed fisheries exist that target this species in what is certain to be unsustainable numbers. Artisanal fisheries also exist that target this species for food and medicine. Individuals are also taken as bycatch in everything from large-scale fisheries to shark control programs/bather protection nets.

The rate of population reduction appears to be high in several regions, as much as 80% over the last three generations (approximately 75 years), and globally a decline of 30% is strongly suspected. Sustained pressure from fishing (both directed and bycatch) has been isolated as the main cause of these declines. Certain monitored subpopulations appear to have been depleted, such as in the Philippines, Indonesia, and parts of Mexico and are believed to be decreasing in other areas such as India and Sri Lanka as a result of sustained pressure from fishing. Of particular concern is the targeting of this species at critical habitats or well-known aggregation sites where numerous individuals can be targeted with relatively low catch-per-unit-effort.

Dive tourism involving this species is a growing industry and it has been demonstrated that sustainable tourism significantly enhances the economic value of such species in comparison to short-term returns from fishing. Tourism related industries can also negatively impact individual behaviour, entire populations and critical habitat for this species, thus the responsible development of these industries is recommended.

Geographic Range

Range Description:

Circumglobal in tropical and temperate waters, this species has a widespread distribution. The Giant Manta Ray has been documented to occur as far north as southern California and New Jersey on the United States west and east coasts, respectively, Mutsu Bay, Aomori, Japan, the Sinai Peninsula, Egypt and the Azores Islands in the Northern Hemisphere and as far south as Peru, Uruguay, South Africa and New Zealand in the Southern Hemisphere.

In a few locations, including Mozambique, the Giant Manta Ray is sympatric with the Reef Manta Ray. When they occur together these species typically exhibit different habitat use and movement patterns (Marshall *et al*. 2009, Kashiwagi *et al*. 2011).

The Giant Manta Ray appears to be a seasonal visitor to coastal or offshore sites. While this species seems more solitary than the Reef Manta Ray, Giant Manta Rays are often seen aggregating in large numbers to feed, mate, or clean. Sightings of these giant rays are often seasonal or sporadic but in a few locations their presence is a more common occurrence. Observations of the Giant Manta Ray at aggregation sites such as the Similan Islands, Thailand; northeast North Island, New Zealand; Laje de Santos Marine Park, Brazil; Isla de la Plata, Ecuador; and Isla Holbox, Mexico, indicate that this species is a regular seasonal visitor, with sightings only during specific, predictable times of the year (Duffy and Abbott 2003, Luiz *et al*. 2009, A. Marshall pers. obs. 2011).

Observations of the Giant Manta Ray frequenting remote seamounts in Isla Socorro, Mexico, Malpelo, Columbia and off some remote islands (Cocos Island, Costa Rica; Galápagos, Ecuador; Laje de Santos, Brazil) show a degree of philopatry to these sites but also indicate that these mantas make migrations away from these areas during parts of the year (Rubin 2002, Luiz *et al*. 2009, A. Marshall unpubl. data 2011). In other areas, such as southern Mozambique, the Giant Manta Ray is seen sporadically throughout the year although individuals are not commonly re-sighted over time (Marshall 2009).

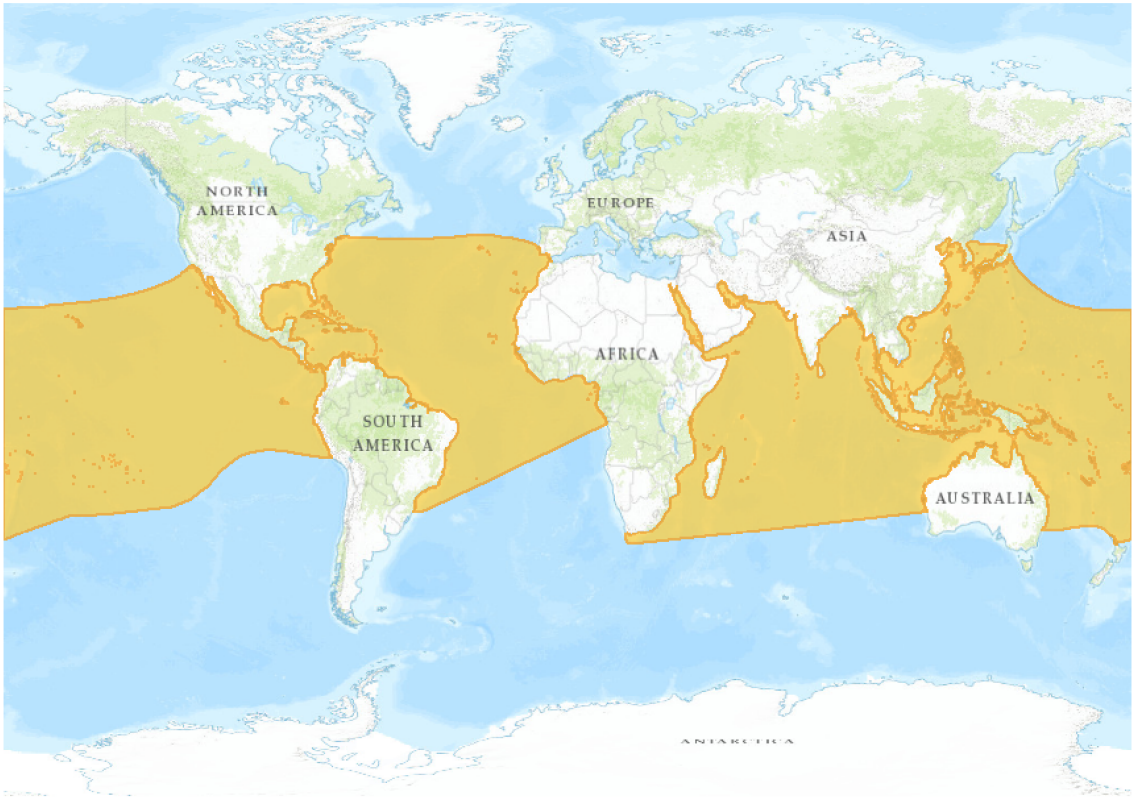
Country Occurrence:

Native: Australia (Western Australia); Belize; Bermuda; Bonaire, Sint Eustatius and Saba (Saba, Sint Eustatius); Brazil; Cayman Islands; Christmas Island; Colombia (Malpelo I.); Costa Rica (Cocos I., Costa Rica (mainland)); Cuba; Curaçao; Djibouti; Dominican Republic; Ecuador (Galápagos); Egypt; El Salvador; French Guiana; Guatemala; Guyana; Honduras (Honduras (mainland)); India (Andaman Is., Andhra Pradesh, Goa, Gujarat, Kerala, Maharashtra, Tamil Nadu); Indonesia (Bali, Papua, Sumatera); Jamaica; Japan; Kenya; Malaysia; Maldives; Mexico (Baja California, Baja California Sur, Quintana Roo, Revillagigedo Is., Sinaloa, Yucatán); Mozambique; Myanmar (Coco Is., Myanmar (mainland)); New Zealand (North Is.); Nicaragua (Nicaragua (mainland)); Nigeria; Northern Mariana Islands; Panama; Peru; Philippines; Portugal (Azores, Madeira); Saint Martin (French part); Senegal; Seychelles (Seychelles (main island group)); Sint Maarten (Dutch part); South Africa (Eastern Cape Province, KwaZulu-Natal, Western Cape); Spain (Canary Is.); Sri Lanka; Sudan; Taiwan, Province of China (Taiwan, Province of China (main island)); Tanzania, United Republic of; Thailand; Trinidad and Tobago; United States (Alabama, Arkansas, California, Delaware, Florida, Georgia, Hawaiian Is., Louisiana, Maryland, Mississippi, New Jersey, North Carolina, South Carolina, Texas, Virginia); Uruguay; Venezuela, Bolivarian Republic of (Venezuela (mainland))

FAO Marine Fishing Areas:

Native: Atlantic - eastern central, Atlantic - northeast, Atlantic - northwest, Atlantic - southeast, Atlantic - southwest, Atlantic - western central, Indian Ocean - eastern, Indian Ocean - western, Pacific - eastern central, Pacific - northwest, Pacific - southeast, Pacific - southwest, Pacific - western central

Distribution Map



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Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

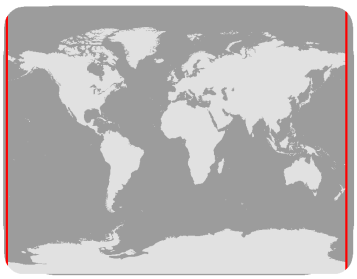
Manta birostris

NE DD LC NT VU VULNERABLE EN CR EW EX

Range

Extant (resident)

Compiled by:
International Union for Conservation of Nature (IUCN)



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

This species is not regularly encountered in large numbers and, unlike the Reef Manta Ray do not often appear in large schools (>30 individuals) when feeding. Overall they are encountered with far less frequency than the smaller *Manta* species, the Reef Manta Ray, despite having a larger distribution across the globe.

Due to the global nature of their individual distributions, absolute population sizes will always be difficult to assess. Currently, the overall total global population sizes of both these species are unknown, but subpopulations appear, in most cases, to be small (less than 1,000 individuals). The degree of interchange of individuals between subpopulations is unclear but is assumed to be low, as there are currently no data that support such interchange, despite active efforts to do so (A. Marshall *et al*. unpubl. data 2011).

Photo-identification studies at major aggregation sites in southern Mozambique (Marshall 2009); southern Brazil (Luiz *et al*. 2009); Revillagigedo Islands, Mexico (Rubin 2002); the Ogasawara Islands, Japan (Yano *et al*. 1999a, Kashiwagi *et al*. 2010); the Maldives (G. Stevens unpubl. data 2011); Isla Holbox, Mexico (S. Hinojosa-Alvarez unpubl. data 2010); Isla de la Plata, Ecuador (M. Harding unpubl. data 2010) have databases of less than 300 individuals, with many of these studies having been underway for the last 10–20 years. A semi-exhaustive study of Japan-wide photographic records confirmed that the known main aggregation in Ogasawara Islands (42 known individuals during 1995–1998 study) represents a part of a fairly isolated population (Kashiwagi *et al*. 2010).

A mark-recapture population study in southern Mozambique over five years from 2003 to 2008 estimated the local population during that time to be 600 individuals (Marshall 2009). Flight surveys and re-sightings data of individuals at Isla Holbox, Mexico have estimated that roughly 100 manta rays use this area during every season (S. Hinojosa-Alvarez unpubl. data 2010).

While the Giant Manta Ray is widely distributed and appears to be a migratory species, regional populations appear to be small considering the scale of their habitat. Individuals most commonly show a degree of site fidelity to specific regions, as well as critical habitats within them, such as cleaning stations and feeding sites. Preliminary satellite tracking studies and international photo-identification matching projects have suggested a low degree of interchange between populations.

While there is a distinct paucity of information on population numbers or trends, local populations are likely to be in decline in areas where they are fished, or are under threat from anthropogenic influences e.g., India/Sri Lanka (Pillai 1998, Anderson *et al*. 2010), Indonesia (White *et al*. 2006), Philippines (Alava *et al*. 2002) and the west coast of Mexico where encounter rates have dropped significantly over the last five years or anthropogenic mortality has been elevated.

Overall, the rate of population reduction appears to be high in several regions, up to as much as 80% over the last three generations (approximately 75 years), and globally a decline of >30% is strongly suspected.

Historical fisheries data and reported declines in population numbers:

A study in the Pamilacan Island, Philippines reported that up to 1,000 rays, particularly manta rays (Giant Manta Ray) and a few species of the genus *Mobula*, were harvested per year in directed fisheries. Over 35 villages reportedly participated in this fishery. Seasons that started in September and went through until May or June the following year, peaked in the November and December months. Manta rays were fished with gaff hooks, hand spears, harpoons, and gillnets. Although these targeted fisheries were reported to have been active for generations (some claiming since the 1800s and others since the mid 1950s), interviewed fishermen noted that the catch-per-unit-effort (CPUE) and overall number of rays in the area has declined significantly in recent times. Record landings were reported in the 1960s (Alava *et al*. 2002).

Japanese sports divers suggest that the population of manta rays at one site in the Sulu Sea, Philippines (probably part of the same population fished at Pamilacan Island, Philippines) fell by one half to two-thirds in seven years from the end of the 1980s (M. Nishitani pers. comm.). Fishermen from this region reported a decrease in their CPUE and number of landings since the 1960s.

The Giant Manta Ray once occurred in large numbers along the west coast of Mexico and Baja California. The species appears to be rare after several decades of fishing. Manta rays were commonly used as shark bait, for local consumption and for export as 'fake scallops' (Booda 1984, Rubin 2002). A specific study of the fisheries (predominately gillnets, harpoons and baited hooks from engine powered fibreglass boats) in La Paz from 1981–1984 targeting rays in waters from 10–200 m revealed that 94% of the catch were mobulid rays, including manta rays in small numbers (Notarbartolo-di-Sciara 1987).

In the Yucatan Peninsula, Central America, manta rays were used as bait for shark fisheries, but recent legislation has prohibited this use. These actions have seemingly prevented the continued decrease of the species in Mexican Caribbean waters.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

The Giant Manta Ray occurs in tropical, sub-tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. Commonly sighted along productive coastlines with regular upwelling, oceanic island groups and particularly offshore pinnacles and seamounts. The Giant Manta Ray is commonly encountered on shallow reefs while being cleaned or is sighted feeding at the surface inshore and offshore. It is also occasionally observed in sandy bottom areas and seagrass beds.

A global investigation of major aggregation sites revealed that the Giant Manta Ray may be a more oceanic and a more migratory species than the Reef Manta Ray (A. Marshall *et al*. unpubl. data). Rare or seasonal sightings of the Giant Manta Ray at locations such as northern New Zealand (Duffy and Abbott 2003), southern Brazil (Luiz *et al*. 2009) and Uruguay (Milessi and Oddone 2003), the Azores Islands, the Similan Islands, Thailand (A. Marshall unpubl. data 2011) and the eastern coast of the United States (Bigelow and Schroeder 1953), suggests that this species undergoes significant seasonal migrations.

Despite these data, preliminary satellite tracking studies and international photo-identification matching projects have suggested a high degree of fragmentation between regional populations of this species, suggesting that movements across ocean basins may be rare. Satellite tracking results have been able to reveal that the Giant Manta Ray is capable of large migrations (over 1,100 km straight line distance) and

have monitored individual movements across international borders, across large bodies of water, and into international waters (A. Marshall *et al*. unpubl. data 2011, R. Rubin pers. comm. 2009). Satellite tracking studies using archival PAT tags have registered movements of the Giant Manta Ray from Mozambique to South Africa (a distance of 1,100 km), from Ecuador to Peru (190 km), from the Yucatan, Mexico into the Gulf of Mexico (448 km). This species is capable of deep dives and has been both seen at depth and tracked down to depths exceeding 1,000 metres (A. Marshall *et al*. unpubl. data 2011).

The Giant Manta Ray reaches disc widths (DW) of at least 700 cm, with anecdotal reports up to 910 cm DW (Compagno 1999, Alava *et al*. 2002). Size at maturity for the Giant Manta Ray may vary slightly throughout its range, but males in southern Mozambique mature at approximately 400 cm DW while females appear to mature well over 400 cm DW (Marshall 2009). In Indonesia, data from fisheries dissections suggest that in that region male Giant Manta Rays mature at 375 cm DW, while females may mature by approximately 410 cm DW (White *et al*. 2006).

The Giant Manta Ray appears to be a relatively long-lived species. Although the actual longevity of the species remains unknown, photographic databases have re-sighted individuals up to a 20 year period (Rubin 2002, G. Kodja unpubl. data 2010). Natural mortality is thought to be low (other than in juveniles), although limited predation from large sharks does occur (Marshall 2009).

Generation time is suspected to be 25 years based on conservative estimates of life history parameters from the Reef Manta Ray. Female mantas are thought to mature at 8–10 years of age and longevity is estimated to be at least 40 years. Generation time is the average age of adults which can be approximated as halfway between age at first maturity and maximum age. Thus female mantas 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.

Copulation has been documented off the Ogasawara Islands, Japan and is believed to occur in the summer months (Yano *et al*. 1999b). Two pregnant individuals have been registered and photographed in southern Mozambique although a breeding season at this location has not been established (Marshall 2009). There is little information on the reproductive biology or ecology of this species although reports of litter size are consistently of a single offspring (Coles 1916, Beebe and Tee-Van 1941, Bigelow and Schroeder 1953).

For further information about this species, see Supplementary Material.

Systems: Marine

Use and Trade (see Appendix for additional information)

The meat is often sold as food, the liver for medicine and branchial filter plates (gill rakers) from *Manta* and *Mobula* spp enter international trade and fetch high prices in Asia where they are used for traditional Chinese medicine (Zhongguo yao yong dong wu zhi xie zuo zu bian zhu 1983). Meat from the Giant Manta Ray is also often used for shark bait or attractant in Mexico. Limited use of epidermis for leather products has been verified. Giant Manta Rays are sometimes caught and transported to aquariums for use in display tanks. The Georgia Aquarium, the Atlantis Resort in the Bahamas, and the Lisbon Aquarium have had or are presently housing wild caught Giant Manta Rays in their exhibits.

Some of these captive animals have been released into the wild.

Threats (see Appendix for additional information)

The main threat to both *Manta* species is fishing, whether targeted or incidental. Manta rays are currently killed or captured by a variety of methods including harpooning, netting and trawling. These rays are easy to target because of their large size, slow swimming speed, aggregative behaviour, predictable habitat use, and lack of human avoidance.

Manta species have a high value in international trade markets. Their gill rakers are particularly sought after and are used in Asian medicinal products. This market has resulted in directed fisheries for manta rays which are currently targeting these rays in unsustainable numbers. Over 1,000 manta rays are caught per year in some areas (Alava *et al*. 2002, Dewar 2002, White *et al*. 2006, C. Anderson and G. Stevens pers. obs.). Artisanal fisheries also target both species for food and local products (Essumang 2010, Marshall *et al*. 2011).

Aside from directed fisheries, manta rays are also incidentally caught as bycatch in both large-scale fisheries and small netting programs such as shark control bather protection nets (Carlson and Lee 2000, Young 2001). In some populations, such as the ones identified at Isla de la Plata, Ecuador, Laje de Santos, Brazil, and the Similan Islands, Thailand, high percentages of all individuals encountered or identified have evidence of entanglement or are dragging lines or nets (A. Marshall unpubl. data 2011).

As a result of sustained pressure from fishing (both directed and bycatch) certain monitored subpopulations appear to have been rapidly depleted (e.g., Gulf of California, Mexico; Indonesia; and, Philippines (Anon 1997, Alava *et al*. 2002, White *et al*. 2006)). Targeting either species of Manta at critical habitats or aggregation sites, where individuals can be caught in large numbers in a short time frame, is a particular threat. Regional populations of both species appear to be small, and localized declines are unlikely to be mitigated by immigration. This situation is exacerbated by the conservative life history of these rays, which constrain their ability to recover from a depleted state.

Cryptic threats such as mooring line entanglement and boat strikes can also wound manta rays, decrease fitness or contribute to non-natural mortality (Deakos *et al*. 2011). Many other threats have been postulated and identified such as habitat degradation, climate change, pollution (e.g., from oil spills), ingestion of micro plastics and irresponsible tourism practices.

Known directed fisheries:

Reported World Catch

Manta and devil ray catches increased from 900 tonnes to over 3,300 tonnes between 2000–2007 (FAO 2009, Lack and Sant 2009).

Trade-driven Fisheries

Manta rays, predominately the Giant Manta Ray, are currently taken in fisheries that have transitioned from bycatch fisheries to directed fisheries, with the birth of a market for manta ray products in Asia.

Chondrichthyan landings from drift gillnets were examined at four different sites (a total of 263 sampling days) in Indonesia from 2001 until 2005. Mobulid rays including manta rays were commonly represented

in the catch, which was estimated to be approximately 4,110 individuals annually, a biomass of approximately 544 tonnes of which manta rays (Giant Manta Ray) comprised 13.7% (White *et al*. 2006). Individual manta rays were worth up to $200 in the early 2000s. Dried filter plates were being exported to Hong Kong, Taiwan and Singapore (for up to US$30 per dry kilo) (White *et al*. 2006).

Manta rays (predominately the Giant Manta Ray) are taken in significant numbers as bycatch in the Pakistani, Indian and Sri Lankan gillnet fisheries, where they are used as shark bait, for human consumption and their branchial filaments are sold to Asian buyers (Anderson *et al*. 2010, P. Hilton pers. comm. 2011, G. Stevens unpubl. data 2010).

Artisanal Fisheries

Manta rays are caught in artisanal fisheries in Tanzania on longlines and in trawls. The meat is typically dried and consumed (Bianchi 1985, Iddawi and Stanley 1999, N. Iddawi, S. Yahya and S. Semesi pers. comm. 2010, A. Marshall unpubl. data 2011).

Both species of Manta (but predominately the Reef Manta Ray) are caught in artisanal fisheries in southern Mozambique for consumption. Manta rays are typically harpooned but also caught in nets with motorized boats. Approximately 50 individuals are taken per annum from a 50 km stretch of coastline (A. Marshall unpubl. data).

Isolated reports of fishing for mantas have continued in the Gulf of California. Artisanal pelagic gillnet fishermen throughout the Gulf of California have been observed to retain mantas as bait as well as utilize landed specimens for personal consumption and sale.

There is a seasonal fishery for manta rays along the Ghanaian coastline, particularly in Dixcove. Manta rays are targeted in this region for local food (Essumang 2010).

Bycatch fisheries

Manta rays are caught in gillnet and purse seine fisheries as well as netting programs throughout their distribution. Specific cases are outlined below:

Giant Manta Rays are caught in small numbers as bycatch in the European purse seine tuna fishery operating in the Atlantic Ocean. Observer data from 2003-2007, which corresponded to 2.9% coverage, recorded 11 individuals landed, a number that represented 17.8% of the total ray bycatch (Amande *et al*. 2010).

Incidental catches of manta rays in the protective shark nets off the beaches of KwaZulu-Natal, South Africa, peak in the summer months (49% of the total annual catch), although manta rays are caught throughout the year (Young 2001). Manta rays (both species but predominately the Reef Manta Ray) comprised 16.9% of the total historical batoid catches from these nets, with a mean annual catch of 60 individuals and an overall 33.7% mortality rate (Young 2001).

Giant Manta Rays are caught as bycatch or are killed in fisheries along the west coast of Thailand and Myanmar, including within the Similans National Park where evidence suggests that a high proportion of individuals visiting the area have been entangled by fishing line or nets. Incidental kills have also been reported in fishing nets, tackle and ghost nets (A. Marshall unpubl. data 2011).

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Giant Manta Rays are not generally directly targeted in Ecuador, although shark and ray catch data collected by the Subsecretaria de Recursos Pesqueros show occasional incidental capture and one small directed fishery since the mid-eighties. Many manta rays in the aggregation site around Isla de la Plata show damage received from fishing equipment, which occurs when artisanal fishermen use trawling tackle illegally within the Machalillia National Park boundaries to fish for seasonal aggregations of Wahoo (*Acanthocybium solandri*) which coincide with the seasonal aggregation of Giant Manta Rays (M. Harding unpubl. data 2010).

Although manta rays are not directly targeted by fisheries in southeastern Brazil, several reports of Giant Manta Rays being captured as bycatch show that local fishing poses a threat to manta rays (Zerbini and Kotas 1998). The Brazilian government is currently promoting a policy to boost commercial fisheries in the area, through financial incentives, raising concerns on the future of that manta ray population. Reports of individuals entangled within discarded fishing gear (e.g., 'ghost nets') are not uncommon (G. Kodja unpubl. data 2010). The main aggregation site for the Giant Manta Ray is located close to the Port of Santos, Latin America's largest seaport, increasing the risk of ship strikes.

Surveys made of the bycatch from 52 sets from the shark drift net fishery off Georgia and east Florida, USA from 1992–1995 included 148 rays, 14 of which were recorded as being the Giant Manta Ray (Trent *et al*. 1997). Another study of the bycatch in the directed shark drift gillnet fishery off the east coast of Florida and Georgia, which was set 4.8 km offshore in EEZ waters from 1998–1999, revealed that manta rays are still occasionally caught in this fishery (Carlson and Lee 2000).

Fisheries bycatch data collected from the U.S. tuna purse seine fishery in the central-western Pacific in 1999 listed the Giant Manta Ray amongst the species caught with a set frequency of 1.5%. A total of 18 mantas were caught (1.14 t) during the observed period, 100% of which was discarded (Coan *et al*. 2000).

Conservation Actions **(see Appendix for additional information)**

United States: In 2009, the Governor of Hawaii signed House Bill 366 creating Act 092(09) establishing criminal penalties and administrative fines for knowingly killing or capturing manta rays within State waters. This makes Hawaii the first state in the US union to protect manta rays. There have never been fisheries for manta rays in Hawaii, but this bill will protect all Manta species living in or passing through the island group from future fishing pressure.

Republic of Maldives: Since June 1995 there has been an export ban on all ray species and their body parts, effectively preventing any commercial fisheries from arising in this country, which has never targeted manta rays for local use in significant numbers. Furthermore, in June 2009 the Maldivian Government announced the creation of two new marine protected areas (MPAs), specifically identified for protection because of their importance as areas of critical habitats for the Maldives population of Reef Manta Ray and the occasional transient Giant Manta Ray.

Philippines: Fishing of manta rays was banned in 1998, but this ban was lifted in 1999 due to pressure from fishermen and lack of data on the fishery. During a year-long survey, from March 2002 to March 2003, 156 manta rays (the Giant Manta Ray) were caught, mostly in the months from November to January. Since the study, the ban has been re-established for manta rays. Mantas are now reported to be

rare in the Philippines, especially around the Bohol Sea where the fishery was focused.

Mexico: Fishing was banned in Mexico in 2007, when the Mexican Government issued "NOM-029 - PESCA RESPONSABLE DE TIBURONES Y RAYAS. ESPECIFICACIONES PARA SU APROVECHAMIENTO" (The Mexican Official Standard Rules that Regulate the Shark and Ray Fisheries in Mexican Waters). This made it illegal to capture or kill Giant Manta Rays in Mexican waters. NOM 029 provides specific protection for mantas and mobulids in all Mexican waters and prohibits their possession and trade (Norma Oficial Mexicana Nom-029-Pesc-2006, pesca responsable de tiburones y rayas. Especificaciones para su aprovechamiento, 2005). Mantas are protected in MPAs within Mexican waters, primarily in the Revillagigedo biosphere, following enforcement of a fishing closure, which began in early 2002. Enforcement for this protection has been somewhat suspect as many fishing boats have been observed and caught deploying longlines, gillnets and seines within the biosphere, which extends as a 12 mile buffer around each of the islands in the archipelago. Meanwhile, since 2004, in the Yum Balam protected area (Isla Holbox, Mexico) manta rays have been protected under strict no fishing laws. The Giant Manta Ray is only used here for tourism purposes, although this new activity could also be affecting the population, with many individuals exhibiting boat injuries.

Brazil: There is no legal action concerning manta ray captures in Brazil. The local population is benefited by the fact that their best-known aggregation site happens to be inside an established MPA. However, it is a tiny fraction of the range of this species, as they migrate during most of the year and other unprotected aggregation sites are likely to exist. The rise of a local NGO (Instituto Laje Viva), dedicated to protect them, had eventually culminated in the first efforts to gather formal scientific data from Brazilian manta rays. The manta ray is a highly promoted flagship species for dive tourism in the region and best practices for responsible tourism have been largely advocated.

Ecuador: On 26 August 2010, the Subsecretaria de Recursos Pesqueros declared "Acuerdo 093", a new law prohibiting all fishing of Manta and Mobula in Ecuador, that states 1). directed fishing for the Giant Manta Ray, and several mobulid species is now illegal via any form of fishing method whatsoever; 2). in the event of incidental capture any individuals must be returned immediately to their natural environment; 3). the species mentioned cannot be retained alive or dead, whole or in part, nor can they be kept for human consumption or owned, sold or transported. The law came in response to pressure to close a newly created directed fishery for *Mobula* that had arisen in a very short period via Peruvian buyers who were ordering the product for export.

Western Australia: Manta rays whilst not targeted, are protected from any fishing (Fisheries Act) and disturbance or harassment (DEC Act) within marine parks only.

New Zealand: Absolutely protected under the Wildlife Act 1953.

Credits

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Bibliography

Alava, M.N.R., Dolumbaló, E.R.Z., Yaptinchay, A.A. and Trono, R.B. 2002. Fishery and trade of whale sharks and manta rays in the Bohol Sea, Philippines. Pp. 132-148. In: S.L. Fowler, T.M. Reed and F.A. Dipper (eds). Elasmobranch Biodiversity, Conservation and Management: Proceedings of the International Seminar and Workshop. Sabah, Malaysia, July 1997. *Occasional paper of the IUCN Species Survival Commission* No. 25.

Amandè, M.J., Chassot, J.A.E., Delgado de Molina, A., Gaertner, D., Murua, H., Pianet, R., Ruiz, J. and Chavance, P. 2010. Bycatch of the European purse seine tuna fishery in the Atlantic Ocean for the 2003–2007 period. *Aquatic Living Resources* 23: 353-362.

A. Marshall. 2011. Unpublished Data.

A. Marshall *et al*. 2011. Unpublished Data.

Anderson, R., Adam, M., Kitchen-Wheeler, A. and Stevens, G. 2010. Extent and economic value of manta ray watching in Maldives. *Tourism in Marine Environments* 7: 15-27.

Anon. 1997. Fisheries conservation crisis in Indonesia: Massive destruction of marine mammals, sea turtles and fish reported from trap nets in pelagic migratory channel. URL: http://darwin.bio.uci.edu/~sustain/bio65/indonesia/indon97e.htm.

Beebe, W. and Tee-Van, J. 1941. Rays, mantas, and chimaeras In: Eastern Pacific Expeditions of the New York Zoological Society. XXVIII Fishes from the tropical eastern pacific. *Zoologica*: 245-278.

Bianchi, G. 1985. Field guide to the commercial marine and brackish water species of Tanzania. FAO Species Identification Sheets for Fishery Purposes. Project No. TCP/URT/4406. FAO, Rome.

Bigelow, H.B. and Schroeder, W.C. 1953. Sawfish, guitarfish, skates and rays. In: Tee-Van (ed.), Fishes of the Western North Atlantic, Part 2. Sears Foundation for Marine Research, Yale University, New Haven, pp 508-514.

Booda, L. 1984. Manta ray wings, shark meat posing as scallops. *Sea Technology* 25(11): 71.

Carlson, J.K. and Lee, D. 2000. The directed shark drift gillnet fishery: catch and by-catch 1998-1999. Sustainable Fisheries Division Contribution No. SFD-99/00-87.

Coan, A.L., Sakagawa, G.T., Prescott, D., Williams, P., Staish, K. and Yamasaki, G. 2000. The 1999 U.S. Central-Western Pacific Tropical Tuna Purse Seine Fishery. Document prepared for the annual meeting of parties to the South Pacific Regional Tuna Treaty 3-10 March 2000. LJ-00-10.

Coles, R.J. 1916. Natural history notes on the devil-fish, *Manta birostris* (Walbaum) and *Mobula olfersi* (Müller). *Bulletin of the American Museum of Natural History* 35: 649-657.

Compagno, L.J.V. 1999. Systematics and body form. Pp 1-42. In: W.C. Hamlett (ed.), *Sharks, Skates, and Rays: the Biology of Elasmobranch Fishes*. John Hopkins University Press, Baltimore.

Deakos, M.H., Baker, J.D. and Bejder, L. 2011. Characteristics of a manta ray *Manta alfredi* population off Maui, Hawaii and implications for management. *Marine Ecology Progress Series* 420: 245-260.

Dewar, H. 2002. Preliminary report: Manta harvest in Lamakera. Report from the Pfleger Institute of Environmental Research and the Nature Conservancy.

Duffy, C.A.J. and Abbott, D. 2003. Sightings of mobulid rays from northern New Zealand, with confirmation of the occurrence of *Manta birostris* in New Zealand waters. *New Zealand Journal of*

Marine and Freshwater Research 37: 715-721.

Essumang, D.K. 2010. First determination of the levels of platinum group metals in *Manta birostris* (manta ray) caught along the Ghanaian coastline. *Bulletin of Environmental Contamination and Toxicology* 84: 720-725.

FAO. 2012. FAO Fishstat Capture Production Database 1950-2010. Rome Available at: http://www.fao.org/fishery/statistics/global-capture-production/en.

G. Kodja. 2010. Unpublished Data.

G. Stevens. 2011. Unpublished Data.

Hinojosa-Alvarez, S. 2009. Ecología trófica de la Manta gigante (*Manta birostris*, Walbaum 1792) mediante el análisis de isótopos estables de δ15N y δ13C en las áreas naturales protegidas de Yum Balam e Isla Contoy, Quintana Roo. Tesis de Maestria. UNAM-ICMy L.

Ito, T. and Kashiwagi, T. 2010. Morphological and genetic identification of two species of manta ray occuring in Japanese waters: *Manta birostris* and *M. alfredi*. *Report of Japanese Society for Elasmobranch Studies* 46: 8-10.

IUCN. 2011. IUCN Red List of Threatened Species (ver. 2011.2). Available at: http://www.iucnredlist.org. (Accessed: 10 November 2011).

IUCN SSC Shark Specialist Group. Specialist Group website. Available at: http://www.iucnssg.org/.

Jiddawi, N.S. and Stanley, R.D. 1999. A study of the artisanal fishery landings in the villages of Matemwe and Mkokotoni, Zanzibar, Tanzania. In: Fisheries Stock Assessment in the Traditional Fishery Sector: The Information Needs.In: Jiddawi, N.S. and R.D. Stanley (eds), Proceedings of the National Workshop on the Artisanal Fisheries Sector, Zanzibar, September 22-24, 1997, Zanzibar, Tanzania.

Kashiwagi, T., Ito, T. and Sato, F. 2010. Occurrences of reef manta ray, *Manta alfredi*, and giant manta ray, *M. birostris*, in Japan, examined by photographic records. *Report of Japanese Society for Elasmobranch Studies* 46: 20-27.

Kashiwagi, T., Marshall, A., Bennett, M. and Ovenden, J. 2008. DNA evidence for cryptic species boundaries within *Manta birostris*? *Abstracts of Joint Meeting of Ichthyologists and Herpetologists, Montreal, Quebec, 2008,* 236.

Kashiwagi, T., Marshall, A.D., Bennett, M.B. and Ovenden, J.R. 2011. Habitat segregation and mosaic sympatry of the two species of manta ray in the Indian and Pacific Oceans, *Manta alfredi* and *M. birostris*. *Marine Biodiversity Records* 4: e53.

Lack, M. and Sant, G. 2009. Trends in Global Shark Catch and Recent Developments in Management. TRAFFIC International, Cambridge, UK.

Luiz, O.J. Jr, Balboni, A.P., Kodja, G., Andrade, M. and Marum, H. 2009. Seasonal occurrences of *Manta birostris* (Chondrichthyes: Mobulidae) in southeastern Brasil. *Ichthyological Research* 56: 96-99.

Marshall, A.D. 2009. Biology and population ecology of *Manta birostris* in southern Mozambique. PhD Thesis, School of Biomedical Science, University of Queensland, Brisbane.

Marshall, A.D., Compagno, L.J.V. and Bennett, M.B. 2009. Redescription of the genus *Manta* with resurrection of *Manta alfredi* (Krefft, 1868) (Chondrichthyes; Myliobatoidei; Mobulidae). *Zootaxa* 2301: 1-28.

Marshall, A.D., Dudgeon, C. and Bennett, M.B. 2011. Size and structure of a photographically identified

population of manta rays Manta alfredi in southern Mozambique. *Marine Biology* 158(5): 1111-1124.

M Harding. 2010. Unpublished Data.

Millessi, A.C. and Oddone, M.C. 2003. Primer registro de *Manta birostris* (Donndurff 1798) (Batouidea: Mobulidae) En el Rio de la Plata, Uruguay. *Gayana* 67: 127-130.

Notarbartolo-di-Sciara, G. 1987. Myliobatiform rays fished in the southern gulf of California (Baja California Sur, México) (Chondrichthyes: Myliobatiformes). Memorias del V Simposium de Biologia Marina. *Universidad Autónoma de Baja California Sur* 109-115.

Notarbartolo-di-Sciara, G. and Hillyer, E.V. 1989. Mobulid rays of the Eastern Venezuela (Chondrichthyes, Mobulidae). *Copeia*: 607-614.

Pillai, S. 1998. A note on giant devil ray *Mobula diabolus* caught at Vizhinjam. *Report of the Marine Fisheries Information Service*. No 152. Pp. 14-15.

Rubin, R. 2002. Manta rays: not all black and white. *Shark Focus* 15: 4-5.

S. Hinojosa-Alvarez. 2010. Unpublished Data.

Trent, L., Parshley, D.E. and Carlson, J.K. 1997. Catch and bycatch in the shark driftnet fishery off Georgia and east Florida. *Marine Fisheries Review* 59: 19-28.

White, W.T., Giles, J., Dharmadi and Potter, I.C. 2006b. Data on the bycatch fishery and reproductive biology of mobulid rays (Myliobatiformes) in Indonesia. *Fisheries Research* 82: 65-73.

Yano, K., Ito, T., Sato, F., Takahashi, T. and Shimizu, H. 1999a. Photo-identification of individual manta rays, *Manta birostris*, at the Yaeyama Islands, the Miyako Islands and the Ogasawara Islands, Japan. Abstracts of Joint Meeting of Ichthyologists and Herpetologists State College, Pennsylvania.

Yano, K., Sato, F. and Takahashi, T. 1999b. Observations of the mating behavior of the manta ray, Manta birostris, at the Ogasawara Islands, Japan. *Ichthyological Research* 46: 289-296.

Young, N. 2001. An analysis of the trends in by-catch of turtle species, angelsharks and batoid species in the protective gillnets off KwaZulu-Natal, South Africa. Thesis, University of Reading.

Zerbini, A. N. and Kotas, J. E. 1998. A note on cetacean bycatch in pelagic driftnetting off southern Brazil. *Reports of the International Whaling Commission* 48: 519-524.

Zhongguo yao yong dong wu zhi xie zuo zu bian zhu (ed.). (1983). *Zhongguo yao yong dong wu zhi Vol. 2.* (Chinese Medicinal Animals Vol. 2) Tianjin shi, China: Tianjin ke xue ji shu chu ban she : Tianjin shi xin hua shu dian fa xing.

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
9. Marine Neritic -> 9.1. Marine Neritic - Pelagic	-	Suitable	Yes
9. Marine Neritic -> 9.2. Marine Neritic - Subtidal Rock and Rocky Reefs	-	Suitable	Yes
9. Marine Neritic -> 9.3. Marine Neritic - Subtidal Loose Rock/pebble/gravel	-	Unknown	-
9. Marine Neritic -> 9.4. Marine Neritic - Subtidal Sandy	-	Marginal	-
9. Marine Neritic -> 9.5. Marine Neritic - Subtidal Sandy-Mud	-	Unknown	-
9. Marine Neritic -> 9.6. Marine Neritic - Subtidal Muddy	-	Unknown	-
9. Marine Neritic -> 9.8. Marine Neritic - Coral Reef -> 9.8.1. Outer Reef Channel	-	Suitable	Yes
9. Marine Neritic -> 9.8. Marine Neritic - Coral Reef -> 9.8.2. Back Slope	-	Suitable	Yes
9. Marine Neritic -> 9.8. Marine Neritic - Coral Reef -> 9.8.3. Foreslope (Outer Reef Slope)	-	Suitable	Yes
9. Marine Neritic -> 9.8. Marine Neritic - Coral Reef -> 9.8.4. Lagoon	-	Suitable	Yes
9. Marine Neritic -> 9.8. Marine Neritic - Coral Reef -> 9.8.5. Inter-Reef Soft Substrate	-	Unknown	-
9. Marine Neritic -> 9.8. Marine Neritic - Coral Reef -> 9.8.6. Inter-Reef Rubble Substrate	-	Unknown	-
9. Marine Neritic -> 9.9. Marine Neritic - Seagrass (Submerged)	-	Unknown	-
9. Marine Neritic -> 9.10. Marine Neritic - Estuaries	-	Marginal	-
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	-	Suitable	Yes
10. Marine Oceanic -> 10.2. Marine Oceanic - Mesopelagic (200-1000m)	-	Suitable	Yes
10. Marine Oceanic -> 10.3. Marine Oceanic - Bathypelagic (1000-4000m)	-	Marginal	-
11. Marine Deep Benthic -> 11.5. Marine Deep Benthic - Seamount	-	Marginal	-

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Food - human	Yes	Yes	Yes
Medicine - human & veterinary	Yes	Yes	Yes

End Use	Local	National	International
Wearing apparel, accessories	Yes	No	No
Pets/display animals, horticulture	Yes	Yes	No

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
4. Transportation & service corridors -> 4.3. Shipping lanes	Ongoing	Unknown	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale)	Ongoing	Minority (50%)	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale)	Ongoing	Minority (50%)	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale)	Ongoing	Minority (50%)	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Minority (50%)	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.1. Sewage	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.2. Run-off	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Land/Water Protection and Management
Occur in at least one PA: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection
2. Land/water management -> 2.1. Site/area management
4. Education & awareness -> 4.2. Training
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.1. International level
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level
5. Law & policy -> 5.1. Legislation -> 5.1.3. Sub-national level
5. Law & policy -> 5.2. Policies and regulations
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.1. International level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.3. Market forces

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.1. Taxonomy
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.5. Threats
2. Conservation Planning -> 2.1. Species Action/Recovery Plan

Research Needed
2. Conservation Planning -> 2.2. Area-based Management Plan
2. Conservation Planning -> 2.3. Harvest & Trade Management Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Lower depth limit (m): 1000
Upper depth limit (m): 0
Habitats and Ecology
Generation Length (years): 25
Movement patterns: Full Migrant

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