

# THE CONTINUING THREAT TO MANTA AND MOBULA RAYS

---

2013-14 MARKET SURVEYS, GUANGZHOU, CHINA



SAMANTHA WHITCRAFT, MARY O'MALLEY, PAUL HILTON



**WILDAID**

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**REPORT WRITERS**

Samantha Whitcraft, Mary O'Malley  
John Weller (graphics, design, editing)

**PROJECT TEAM**

Mary O'Malley – WildAid  
Paul Hilton – WildAid, Paul Hilton Photography  
Samantha Whitcraft – WildAid  
Daniel Fernando – The Manta Trust  
Shawn Heinrichs – WildAid, Blue Sphere Media

## SUMMARY

Manta and mobula rays, the mobulids, span the tropics of the world and are among the most captivating and charismatic of marine species. However, their survival is severely threatened by growing fisheries pressure primarily driven by the increasing demand for their gill plates, which are used as a pseudo-medicinal<sup>a</sup> health tonic in China.

To assess the trade in dried mobulid gill plates (product name '*Peng Yu Sai*'), and its potential impact on populations of these highly vulnerable species, WildAid researchers conducted market surveys throughout Southeast Asia in 2009-10. This research, compiled in our 2011 report *The Global Threat to Manta and Mobula Rays*<sup>(1)</sup>, identified Guangzhou, China as the epicenter of the gill plate trade, representing over 99% of the market. In 2013, the same markets in Guangzhou were surveyed in more depth to update the earlier market estimates and begin to gauge market trends. Dried gill plate samples were also purchased and tested for heavy metal contamination. Additionally, in 2014 two baseline consumer awareness surveys were conducted in Guangzhou to gain a more complete understanding of *Peng Yu Sai* consumer profiles.

Our 2013 estimates reveal a market that has increased by 168% in value in only three years, representing a near threefold increase in mobulids taken, despite the listing of manta rays on Appendix II of the Convention on International Trade in Endangered Species (CITES). The observed increase in supply, coupled with evidence of increasing market demand for *Peng Yu Sai*, suggests that the market-based threat to manta and mobula populations from *Peng Yu Sai* consumption is still increasing and even more immediate today.

But it is not just the mobulids that are in danger. The people of Guangzhou are also at risk. *Peng Yu Sai* is now being marketed to a much wider audience, including targeted marketing to new mothers. Our chemical analysis detected Arsenic, Cadmium, Mercury, and Lead in all manta and mobula gill plates sampled from the Guangzhou markets, with Arsenic found at levels 20 times that permissible by the Pharmacopoeia of China, and Cadmium at triple the permissible levels.

WildAid is calling on Guangzhou authorities to end the mobulid gill plate trade for public and environmental protection as well as implementing CITES restrictions on mantas, and for more range states to join Indonesia in banning fishing of these highly vulnerable animals.

<sup>a</sup> Mobulid gill plates are not officially recognized as Traditional Chinese Medicine (TCM) by most TCM practitioners and hospitals, nor are they mentioned in any standard TCM medical guides.



# ATA GUANGZHO

## BY THE NUMBERS

US\$140 million	The estimated annual global tourism value of manta and mobula rays
US\$30 million	The 2013 estimated value of the gill raker trade in Guangzhou
US\$1 million	The estimated tourism value of a single manta ray over its lifetime, ALIVE
US\$40 – 500	The estimated fisheries value of a single manta ray, DEAD
147,000	The estimated number of mobulids killed to supply the Guangzhou market in 2013
600	The number of <i>Manta birostris</i> identified in the largest documented aggregation site
20x	The concentration of Arsenic found in gill plates above permissible levels
Zero	Locations where manta or mobula rays have been fished sustainably

Sources: *The Global Threat to Manta and Mobula Rays 2011*; O'Malley et al. 2013. *The Global Economic Impact of Manta Ray Watching Tourism*.



# 2013 MARKET ESTIMATE

## ESTIMATES AND TRENDS

In Guangzhou, we surveyed the Qingping and Yuexiu markets focusing on Traditional Chinese Medicine (TCM) retailers and dried seafood vendors. Overall, we estimated >1,100 dried seafood and TCM vendors, combined, across both market areas. We visually surveyed 783 stores and stalls for presence/absence of *Peng Yu Sai*, and systematically inquired about product availability in stores not displaying the product. We found 122 vendors selling dried gill plates. In both 2010 and 2013, the Qingping Lu market area appeared to have the most stores carrying *Peng Yu Sai*. In 2013, across all Guangzhou markets, we found an apparent consolidation with fewer vendors comprising a larger percentage of the market volume. Specifically, we estimate that almost 80% of the market volume was concentrated in 5 larger-volume vendors in 2013, compared to 2010 when the top 20 vendors comprised the same 80% of the market volume.

In each location, we visually identified mobulid species by the unique gill structures of manta species, *Mobula japonica*, and *Mobula tarapacana*.<sup>(2)</sup> Dried gill plates from both manta and mobula rays, as well as a very limited supply from whale sharks, were documented in the Guangzhou market in both the 2010 and 2013 surveys. Our estimates suggest a small increase in the number of manta ray gill plates and a substantial increase in mobula ray gill plates, primarily from sicklefin devil ray (*Mobula tarapacana*) and spinetail mobula (*Mobula japonica*). These data indicate a probable market shift from

*Peng Yu Sai* derived from manta species to a market more focused on mobula species, possibly due to increased difficulty in sourcing manta ray gills. This apparent shift also heightens the level of concern for mobula ray populations, particularly *M. tarapacana* and *M. japonica*, since these species share the manta rays' biological and behavioral characteristics that make them especially vulnerable to overfishing.

We also surveyed vendors about supply and demand trends, their estimated in-store and off-site stock, current prices, customer demographics, and perceived health benefits of the product.

A majority of vendors reported a steady increase in demand and a steady or decreasing trend in supply. Our research indicates a marked increase in demand, however, our observations strongly suggest that the vendors' perceived decrease in supply is a misconception based on possible competition for stock. Our 2013 estimates reveal a market that has, in only three years, more than doubled in volume, increased by 168% in value, and nearly tripled the estimated number of mobulids killed to supply the market. We also recorded a substantial increase in prices across the market.

While this dramatic increase in market volume may in part reflect conservative market estimates in 2010, there are undeniable indications that the *Peng Yu Sai* market has increased substantially over the past three years and is continuing to expand. Confirming the calculated trends from vendor-reported sales volumes, on-the-ground observations revealed a striking overall increase in *Peng Yu Sai* stock available for sale across the markets. In most shops, a few 5kg bags of *Peng Yu Sai* recorded in 2010 had increased to many bags in 2013. This obvious increase in inventory, combined with an increase in prices, further indicates a rapid and substantial growth in demand.

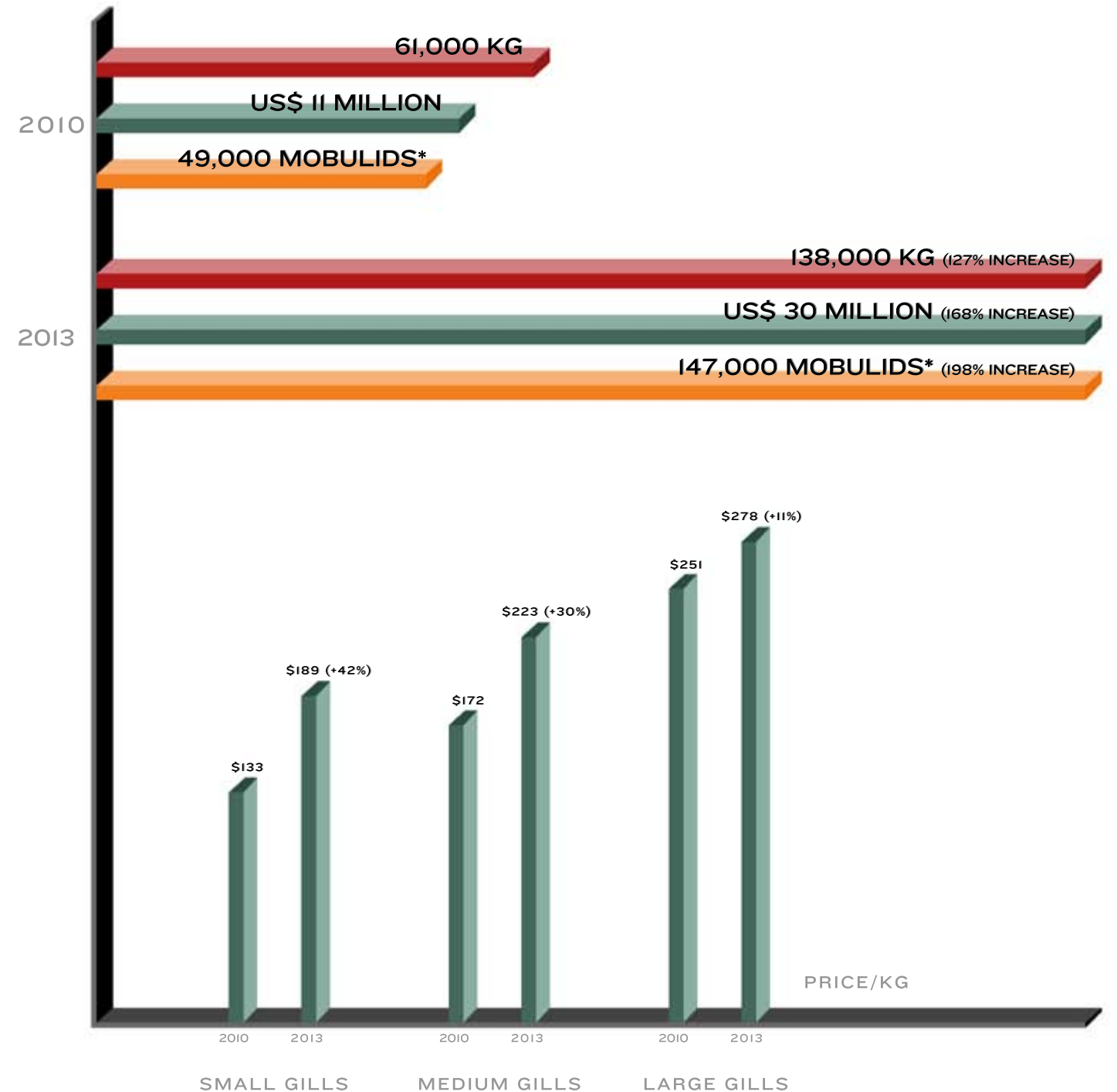
This conclusion is consistent with reports from vendors of increasing demand, while additional evidence suggests a much wider customer base. In 2010, *Peng Yu Sai* was marketed directly to consumers at stores. Now, *Peng Yu Sai* is visible in the mass media. In 2012, the product was even featured on a mainstream Cantonese television show. The show, entitled “Good Soup, Special Find,” featured a pharmacist from Guangzhou Provincial TCM Hospital

demonstrating cooking techniques and recommending the soup for general good health and to aid in recovery from a variety of illnesses. *Peng Yu Sai* is also now promoted for regular monthly use as a detoxifying health tonic.

Online visibility of the product suggests an expanding customer base. A 2013 Internet search, using the most popular Chinese online market site, TaoBao – estimated at twice the size of ebay and Amazon combined – revealed two pages of *Peng Yu Sai* for sale via 30 vendors. The products for sale included all three mobulid species commonly found in the Guangzhou markets – *Manta spp.*, *M. tarapacana*, and *M. japonica*. A Google search using the Chinese characters for *Peng Yu Sai* revealed 263,000 results including product preparation and recipe suggestions. This progression from niche marketing to mainstream promotion of *Peng Yu Sai* will likely result in continuing and more rapid expansion of demand for the product.

Manta gill plate for sale in a Guangzhou market

Figure 1: Guangzhou Gill Plate Market Estimates, 2010 and 2013 (Volume, Value, Number of Mobulids, Prices)



\*We estimated the number of animals represented by available market stock via ratio of body size to kilograms of dried gill plates determined from 2011 fisheries surveys in Indonesia, Sri Lanka and from a mobulid processing plant in China, which was then confirmed by weighing gill segments in the Guangzhou markets.

# TOXICOLOGY

Though not officially recognized as Traditional Chinese Medicine by most TCM practitioners, hospitals, nor in any recognized, standard TCM medical guides, industry marketing appears to be increasingly used to promote *Peng Yu Sai* for greater acceptance across a broader demographic as a 'healthy' soup. All interviewed vendors stated that they promote the product to their customers to remove toxins from the body, thus curing or aiding in recovery from a range of ailments, including cancer, acne, fever, chicken pox, and chronic cough – a common complaint in Guangzhou. Vendors further claim that the product boosts the immune system in general and recommend that their customers buy small but regular amounts of *Peng Yu Sai* monthly to maintain good health by reducing toxins in the blood, lowering body temperature, and aiding in blood circulation. Our 2013 vendor survey revealed a new finding: vendors recommend *Peng Yu Sai* to new mothers to aid in lactation.

Despite these claims, toxicology testing by an independent laboratory found **Arsenic, Cadmium, Mercury, and Lead** in all manta and mobula dried gill plates sampled. <sup>(3)</sup> The highest sampled levels of Arsenic and Cadmium were 40.20 mg/kg and 0.98 mg/kg respectively, far exceeding permissible limits for heavy metals in herbal medicines and foods as outlined by the Pharmacopoeia of China, the World Health Organization (WHO), the U.S. Food and Drug Administration (FDA), and Singapore's Health Sciences Authority (HAS).<sup>(4,5)</sup> The highest level of Mercury (0.19 mg/kg) found in the Guangzhou samples approached the 0.20 mg/kg permissible limit of the Pharmacopoeia of China. However, any exposure to Mercury – even small amounts – is a threat to the development of the child in utero and in early life. In adults and children, Mercury can have toxic effects on the nervous, digestive, and immune systems, and on lungs, kidneys, skin, and eyes. Mercury is considered by WHO to be one of the top ten chemicals of major public health concern.<sup>(6)</sup>

Although levels of Lead found in the samples did not exceed any published, permissible levels, the presence of Lead in food is a serious concern because of its acute toxicity even at trace levels. Numerous studies have revealed that Lead can adversely affect the central and peripheral nervous system, growth and cognitive development, the renal system, blood circulation, and can cause death.<sup>(7)</sup>

Importantly, there are **significant health risks associated with the ingestion of Arsenic at the high levels found in *Peng Yu Sai* samples – up to 20 times the permissible limit of Pharmacopoeia of China.** Arsenic targets widely dispersed enzyme reactions, affecting nearly all organ systems, and has been linked to various types of cancer. The association between chronic Arsenic exposure and cancer is strongest for skin, lung, and bladder cancer. Ingestion of high levels of Cadmium as found in *Peng Yu Sai* samples – more than triple the permissible limit of Pharmacopoeia of China – can also cause serious toxicological impacts on human health. The kidney, especially the renal tract, is the critical organ after exposure to Cadmium. Excretion is slow, and renal accumulation of Cadmium may result in irreversible damage.<sup>(8,9)</sup>

Given initial toxicology results from *Peng Yu Sai* samples taken in the Guangzhou markets, it is of particular concern that the product is currently promoted for consumption by lactating mothers and for children with chicken pox; and is promoted by vendors for consistent and continual consumption on a monthly basis. The presence of these toxins in *Peng Yu Sai*, at dangerously high levels in many of the samples tested, directly contradicts claims of the product providing health benefits via detoxification. Additionally, 99% of 1,000 respondents to a broad community survey in Guangzhou are currently unaware that heavy metals are found in *Peng Yu Sai*.

# AND USES

Table 1: *Peng Yu Sai* Toxicology Results, Guangzhou Markets 2013

Metal	Highest Measured Sample mg/kg	Maximum Permissible Concentration (mg/kg)			
		Pharmacopoeia of China	Health Science Authority (Singapore)	World Health Organization	US Food and Drug Administration
Arsenic	40.20	2.00	5.00	10.00	10.00
Cadmium	0.98	0.30	0.05	0.20	0.30
Copper	14.60	20.00	150.00	20.00	20.00
Lead	1.62	5.00	20.00	10.00	10.00
Mercury	0.19	0.20	0.50	1.00	1.00
Zinc	41.50	NA	NA	50.00	50.00

Maximum Permissible Concentrations Sources:

- (1) Li S., Fang Y., Ning H., and Wu Y. 2012. Heavy Metals in Chinese Therapeutic Foods and Herbs, *J. Chem. Soc. Pak.*, Vol. 34, No.5.
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# CONSUMER AWARENESS

A 2014 online survey of 1,000 Guangzhou citizens found that only 33% of respondents had heard of *Peng Yu Sai*, suggesting that the market has ample room to grow as the product becomes even more visible. An additional survey focused specifically on consumers of *Peng Yu Sai* in Guangzhou found that 92 out of 100 respondents learned of the product from friends or relatives, suggesting that primary marketing via mainstream media may have up to a tenfold reach when combined with subsequent word-of-mouth.

These surveys also suggest that a strategy to promote *Peng Yu Sai* for general health, rather than solely for specific ailments, may be succeeding: 95% of respondents stated a perception of general health benefits (as opposed to 37% that stated a perception that the product was intended to target specific illnesses), and most customers reported purchasing *Peng Yu Sai* on a monthly basis. The survey's results further revealed a demographic of *Peng Yu Sai* consumers comprised primarily of working mothers/wives, over 40 years of age, who are the primary purchasers for their households and who retain traditional living habits of Cantonese, especially cooking soups with different ingredients according to the season and physical condition of the family.<sup>(10)</sup>

Both surveys revealed specifics about the profound dearth of accurate, public information on the cultural origins (or lack thereof), dangers of consumption, and sources of *Peng Yu Sai*. Eighty-three percent of online survey respondents believe, incorrectly, that *Peng Yu Sai* is recognized by official TCM. Ninety-nine percent of surveyed *Peng Yu Sai* consumers are currently unaware that heavy metals are found in the product, and less than half of respondents who had heard about *Peng Yu Sai* knew the source of *Peng Yu Sai* itself. Only 6% of consumers were aware of manta rays' threatened status, or that China now has a duty to ensure sustainable trade in manta rays through the bylaws of CITES.

While the surveys demonstrate a marked lack of public awareness, they also suggest that market demand is potentially elastic with respect to new information, and that a targeted demand-reduction campaign is a viable and timely conservation strategy in that 97% of surveyed consumers stated they would purchase or consume less given knowledge of heavy metals in the product. Additionally, 91% of respondents expressed a willingness to reduce or stop consumption of *Peng Yu Sai* in support of wildlife protections.





# STATUS AND TOURISM

Global manta and mobula ray population numbers are currently unknown.<sup>(11)</sup> However, these species don't begin reproduction until 8-10 years+ of age, are long-lived at 40 years+, and reproduce slowly; for example, manta rays have a single pup every 2-5 years. Meanwhile, the estimated global landings of these rays, in 2010, were 94,000 mobula rays and 3,400 manta rays.<sup>(12)</sup> Additionally, "Factors including illegal, underreported, [unregulated] and unrecorded fisheries suggest that the total number of mobula rays landed in global fisheries is likely to be significantly greater than the 94,000 accounted for in the aggregate fisheries data."<sup>(13)</sup> In areas with targeted fisheries for manta rays, local population declines as high as 86%, over six years, were documented; and in areas of intense targeted fishing, such as Lamakera, Indonesia and the Sea of Cortez in Mexico, there is evidence of local, commercial extinctions.<sup>(14)</sup>

**Strict international regulation of trade in manta products under CITES Appendix II is scheduled to go into effect September 2014.**<sup>(15)</sup>

Currently, there are two recognized species of manta, *M. birostris* and *M. alfredi*, both classified on the International Union for the Conservation of Nature's (IUCN) Red List as 'Vulnerable' to extinction globally. Mobula species, specifically *M. japanica* and *M. tarapacana* are IUCN-listed as 'Near Threatened' globally/'Vulnerable' in Southeast Asia and Data Deficient, respectively.<sup>(16)</sup>

In March 2013, in response to evidence of increased market demand and local population declines, the Convention on International Trade in Endangered Species (CITES, CoP-16) voted to include manta rays (*M. birostris*, *M. alfredi*) on Appendix II – an action that means increased protection, but allows legal and sustainable trade. "Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival."<sup>(17)</sup> Giant manta rays (*M. birostris*) are also listed under Appendix I & II of the Convention Migratory Species (CMS) which applies to "migratory species that have been categorized as being in danger of extinction throughout all or a significant proportion of their range...[and therefore] states strive towards strictly protecting these animals, conserving or restoring the habitats in which they live, mitigating obstacles to migration and controlling other factors that might endanger them. They shall also prohibit the taking of such species, with very restricted scope for making exceptions."<sup>(18)</sup>

Several nations and territories now protect some or all mobulid ray species in their territorial waters. However, overall, these protections are likely inadequate to protect these vulnerable species throughout their circumglobal range. For example, legal protections of mobula species are far less common than for manta species, and most of the laws protecting manta rays only apply to one of the two manta species, *M. birostris*. New protections since the publication of *The Global Threat to Manta and Mobula Rays, 2011 Report* include CITES-Appendix II listing for both manta species, protections for *M. birostris* by the European Union and Australia, Palau's declaration to end commercial export of all fisheries products including rays<sup>(19)</sup>, West Manggarai/Komodo's establishment of a shark and manta ray sanctuary<sup>(20)</sup>, and most recently and significantly, Indonesia's national protection of both manta ray species announced in January 2014 (Fisheries and Maritime Affairs Ministerial Decree. [Permen No.04/2014] on Manta Ray Protection Status)<sup>(21)</sup>, following the full protection of all mobula rays throughout the 46,000 sq km Regency of Raja Ampat, Indonesia, enacted in late 2010.<sup>(22)</sup>

To date, a significant gap in international conservation and management persists because no Regional Fisheries Management Organization (RFMO) has passed any regulation to protect, manage, or monitor bycatch or directed catch of any mobulid species.

## 2013 TOURISM VALUE

Manta and mobula ray populations may also benefit from their increasing economic value, alive, in the ecotourism and scuba diver/travel markets. A 2013 study found that 23 countries in which manta ray watching operations met the research criteria, an estimated direct revenue to dive operators from manta ray dives and snorkels was calculated at over US\$73 million annually with associated tourism expenditures, comprising US\$140 million annually. The study further found that ten countries accounted for nearly 93% of the global revenue estimate; Japan, Indonesia, the Maldives, Mozambique, Thailand, Australia, Mexico, United States, the Federated States of Micronesia, and Palau. The study concludes that in many areas where directed fisheries for mantas are known to occur, they overlap with manta tourism sites or the migratory range on which these sites depend, and are, therefore, likely unsustainable and detrimental to economically and ecologically valuable manta ray watching tourism.<sup>(23)</sup>

**Table 2: Characteristics of the Family Mobulidae (IUCN 2011)**

Blue highlights signify species commonly encountered in 2011 and 2013 market surveys

Scientific/ Common Names	IUCN Classification	Distribution	Size (DW)	Population Trend	Fishery
<i>Manta birostris</i> Oceanic Manta Ray	Vulnerable	Circumglobal, tropical and subtropical	680cm	Decreasing	Target and Bycatch
<i>Manta alfredi</i> Reef Manta Ray	Vulnerable	Circumglobal, tropical and subtropical	450cm	Decreasing	Target and Bycatch
<i>Mobula eregoodootenkee</i> Long-horned Pygmy Devilray	Near Threatened	Wide, Tropical Indo- West Pacific	100cm	Unknown	Target and Bycatch
<i>Mobula hypostoma</i> Atlantic Devilray	Data Deficient	Western Atlantic	120cm	Unknown	Bycatch
<i>Mobula japanica</i> Spine Tail Devilray	Near-Threatened, Vulnerable in SE Asia	Circumglobal	310cm	Unknown	Target and Bycatch
<i>Mobula kuhlii</i> Shortfin Pygmy Devilray	Data Deficient	Indian Ocean and Western Central Pacific	119cm	Decreasing	Target and Bycatch
<i>Mobula mobular</i> Giant Devilray	Endangered	Mediterranean and possibly North At- lantic	520cm	Decreasing	Bycatch
<i>Mobula munkiana</i> Pygmy Devilray	Near Threatened	Eastern Pacific	110cm	Unknown	Target and Bycatch
<i>Mobula rochebrunei</i> Lesser Guinean Devilray	Vulnerable	Eastern and South- western Atlantic	133cm	Unknown	Target and Bycatch
<i>Mobula tarapacana</i> Sicklefin Devilray	Data Deficient	Probably Circumglobal, Indian, Pacific, Atlantic	370cm	Unknown	Target and Bycatch
<i>Mobula thurstoni</i> Bentfin Devilray	Near Threatened, Vulnerable in SE Asia	Circumglobal, tem- perate, and tropical	180cm	Unknown	Target and Bycatch

**Table 3: Protection Status Of Manta And Mobula Rays - National / State\***

Location	Mantas	Mobulas
Australia	M. birostris	
Australia - Christmas and Cocos (Keeling) Islands (Territories)	← All rays →	
Brazil	genus Manta	genus Mobula
Croatia (EU)		M. mobular
Ecuador	M. birostris	M. japanica, M. thurstoni, M. munkiana, M. tarapacana
European Union (EU) (all member States)	M. birostris	
Federated States of Micronesia (FSM) - Yap (State)	genus Manta	
Indonesia	genus Manta	
Indonesia - Raja Ampat (Regency)	genus Manta	genus Mobula
Indonesia - West Manggarai/Komodo (Regency)	genus Manta	
Maldives	← All rays product export ban →	
Malta (EU)		M. mobular
Mexico	M. birostris	M. japanica, M. thurstoni, M. munkiana, M. tarapacana, M. hypostoma
New Zealand	M. birostris	M. japanica
Philippines	M. birostris	
USA - Commonwealth of the Northern Mariana Islands (Territory)	← All rays →	
USA - Florida (State)	genus Manta	genus Mobula
USA - Guam (Territory)	← All rays →	
USA - Hawaii (State)	genus Manta	

**Table 4: Protection Status Of Manta And Mobula Rays - International**

Location	Mantas	Mobulas
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) - Appendix II	genus Manta	
Convention on the Conservation of Migratory Species of Wild Ani- mals (CMS) - Appendix I & II	M. birostris	
Convention on the Conservation of European Wildlife & Natural Habitats (Bern Convention)		M. mobular
Protocol concerning Specially Protected Areas and Biological Di- versity in the Mediterranean (Barcelona Convention) - Appendix II		M. mobular

\*As of May 2014. This is not a complete listing of all marine protected areas where mobulid species may be protected.

# CONSERVATION

**CRITICAL NEED:** Despite positive steps taken over the last few years, our current gill plate market survey results suggest an unsustainable trend of intensified marketing efforts by gill plate traders and increasing demand for *Peng Yu Sai* across a broader consumer base. The market is also putting customers at risk due to high heavy metal content detected in *Peng Yu Sai*. Given mobulids' slow reproduction, compelling evidence that fisheries are unsustainable, and the current market expansion, it is clear that immediate action to protect manta and mobula populations is an urgent priority. We recommend the following actions:

## I. TRADE MORATORIUMS

Given the difficulty in regulating fisheries and lack of management and financial resources in most mobulid range states, the single, most urgently needed measure that could substantially reduce pressure on mobulids is a moratorium on the import and sale of mobulid gill plates in China. With the vast majority of the trade centered in Guangzhou, China has an opportunity to make a profoundly positive impact on the conservation of manta and mobula rays by instituting a *Peng Yu Sai* trade moratorium. China has already banned the purchase and consumption of shark fins at official government functions, an action that may have contributed significantly to a decline in the trade of shark fins from imperiled populations, globally. By comparison, the trade in mobulid gill plates is only a small fraction of the shark fin trade – estimated at US\$11 to US\$30 million annually (WildAid 2014) as compared to US\$400 to \$US500 million for the shark fin trade.<sup>(24)</sup> A national proposal to ban the trade of all manta and mobula gill plates would have a nominal economic impact. Further, our online study strongly suggests that such a move could find rapid broad-scale acceptance: 95% of respondents agreed that conservation measures should be taken to protect mantas, and 94% agreed that the government should limit the trade of *Peng Yu Sai* to accomplish this protection.

## 2. CONSUMER EDUCATION

A WildAid consumer education, multi-media campaign – including a social media component via China's version of Twitter, Weibo – focused in Guangzhou, encourages the public to voluntarily reject *Peng Yu Sai*. Education and media outreach began in Guangzhou in May 2014, stressing the extreme vulnerability of manta and mobula rays, the lack of health benefits from *Peng Yu Sai*, alternative remedies, the dangers of toxic heavy metals found in *Peng Yu Sai* samples, and the protected status of Manta species. When the buying stops, the killing can too.

## 3. FISHERIES REGULATIONS

We recommend that all Regional Fishery Management Organizations enact a “no retention” policy for mobulids, along with mandatory bycatch reduction measures in regions where manta and mobula ray populations are found.

Globally, and especially in regions where manta and mobula rays are being targeted most intensively, nations should institute and implement regulations prohibiting the catch and trade of manta and mobula rays. Protection initiatives must be focused initially on the largest known fisheries, including Sri Lanka, India, Mozambique, and regions in Central and South America with particular focus on Peru. The newly enacted manta protection law in Indonesia must now be implemented and enforced effectively. Protection of critical habitats, particularly key aggregation sites, should be a primary focus, with seasonal regulations restricting all harmful fishing practices in or near any mobulid aggregation areas.

## 4. ECONOMIC ALTERNATIVES

Responsible dive tourism is often a viable and lucrative option that offers multiple conservation benefits, since it provides a long-term sustainable source of income as well as a strong incentive to protect charismatic mega-fauna.<sup>(25)</sup> Additionally, it provides an *in-situ* educational and transformative experience for participants. Coastal communities located along major pelagic migration corridors or aggregating sites for mobulid rays could benefit greatly from ecotourism development programs. Ecotourism development should include a code of conduct for operators to ensure that the manta and mobula rays are not harassed or negatively impacted by unregulated boat and tourist activities.

For example, in Lamakera, Indonesia, site of the largest known manta fishery in the world, taking between 600-1000 oceanic mantas each year, opportunities exist to transition to sustainable ecotourism focused on manta and mobula rays, whale sharks, whales and dolphins. With Indonesia's announcement of a full protection for manta rays in January 2014, outreach and coordination with Lamakera village leaders is crucial and now underway. WildAid's community outreach efforts include working directly with communities to facilitate transitions to sustainable alternative livelihoods, leveraging education and outreach films, imagery, and celebrity messaging, and engaging key Indonesian Fisheries Ministry personnel to ensure their full commitment to implementation of the manta protection law. This initiative sets the stage to move into substantive dialogue on transitioning what is believed to be the single largest manta ray landing site in the world from a fisheries income to a tourism-based income from manta rays, and may provide a model for other communities around the world.



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**POPULATIONS OF MANTA AND MOBULA RAYS ARE FACING EXTREME THREATS.**

**WE MUST ACT BEFORE THEY ARE LOST FOREVER.**

**WILDAID**