

Devil Ray Resources in Bohol Sea, Philippines

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A rapid resource assessment (RRA) of manta rays also known as devil rays or *Mobulas*, was conducted in Bohol Sea, Philippines from March to May 2010. Comparing with the catch data in a 2002-2003, results of the RRA showed that there was no decline in catch of the *Mobulas* amidst a maintained *Mobula* fishing effort. This suggested that the species is not yet overfished apparently because *Mobula* fishing is seasonal in the fishing area. Of the recorded *Mobulas* caught, 11% were identified to be immature based on the disc width. In addition, with a newly-born *Mobula thurstoni* among the catch in Bohol Sea, this fishing area could be a spawning ground for this *Mobula* species.

Devil rays (Family Mobulidae) comprise nine living species measuring from 1 to about 4 m of disc width (DW), and distributed worldwide in warm temperate and tropical seas (Notarbartolo-di-Scaria, 1987; Last and Stevens, 1994). Four species of this genus have been reported in the Philippines (Compagno *et al.*, 2005). As with sharks except for the piked dogfish *Squalus acanthus*, rays have also been generally considered by-catch of some major fisheries, especially from the late 1960s to early 1980s (Barut and Zartiga, 1997).

As a precautionary measure to ensure the sustainability and conservation of the *Mobula* species in the Philippines, Fisheries Administrative Order 193 (FAO 193) or the “Ban on taking or catching, selling, purchasing and processing, transporting and exporting of whale sharks and manta rays” was issued by the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) in April 1998. Moreover, as part of the measure and as requested by various communities and NGOs, rapid resource assessment (RRA) of the manta or devil rays in Philippine waters, particularly in Bohol Sea in Central Philippines, was conducted from April 2002 to March 2003. The results of the RRA suggested that the exploitation ratio (proportion of fishing mortality over the total mortality) of the rays has reached the critical level of 0.52. Of the total *Mobulas* caught during the study period, manta rays (*Manta birostris*) comprised 6% of the catch while the other species that include the bentfin devil ray (*Mobula thurstoni*), longfin devil ray, (*Mobula eregoodootenke*), and shortfin devil ray (*Mobula khulii*) comprise the remaining 94% (unpublished report).

Status of Devil Rays in the Study Site

Manta or devil rays are locally known as “sanga” or “pagi” (Ganaden and Gonzales 1999) in the Philippines while the rest of the members of the Family Mobulidae are called “*pantihan*”. Manta rays and the other Mobulid species are difficult to differentiate morphologically even by a shark and ray specialist. In such a situation, all Mobulid species had been included in the ban under the aforementioned BFAR FAO 193. In 2010, the landed catch and effort of the Mobulid species in Bohol Sea as well as some aspects of the biology of the species were collected, analyzed and compared with the study made in 2002-2003 to assess whether the issuance of BFAR FAO 193 is warranted. The results suggested that the population of Mobulids other than the manta rays appears to be in good condition apparently due to the very seasonal nature of the fishery and the fishing methods employed, considering that the area has also been established as a spawning ground of such species. In order to carry out the RRA, interview and landing surveys were conducted the Bunga Mar Fishport in Barangay Jagna, which is about 67 kilometers east of Tagbilaran City in Bohol, Central Philippines (**Fig. 1**).



Fig. 1. Site of *Mobula* study in Bohol, Central Philippines

For several generations, devil rays have been historically recorded and fished in Bohol Sea, Philippines (Alava *et al.*, 2002). Bohol Sea which is part of the Mindanao Sea, is located between Visayas and Mindanao, and connects the Philippine Sea through the Surigao Strait to the Camotes Sea through the Canigao Channel and Cebu Strait, and to the Sulu Sea through the strait between Negros Island and Zamboanga Peninsula. It is an ecologically-linked ecosystem and one of the major fishing grounds of the Philippines. The traditional way of catching rays in the country is through the use of a gaff hook locally known as “*pamilak*”. Nowadays, fishers use gill net as the main and primary gear in catching the Mobulas.

In order to obtain data on catch production of the devil rays in the study site, an interview survey was conducted with fisherfolks and financiers from March to May 2010 to obtain information on fishing practices, as well as the historical data on catch and utilization of Mobulas. Landing survey was also conducted and identification of the landed rays was based on published distinguishing characteristics (**Box 1**). The specimens were likewise measured for disc width (DW), weighed (by fishers) and properly recorded. All samples were photographed using a Canon Power shot A480. The sex of the surveyed Mobula species were identified and their gonadal maturity determined. Claspers were also used as primary indicators to determine the sex of the devil rays.

Utilization and Market of Mobulas

Normally, Mobula meat is consumed either fresh or dried. Mobulas had been fished in Jagna, Bohol Province for food starting in mid 1900s. The selling price for the fresh meat in Jagna is from PhP 80 to PhP 120/kg while the dried meat sells from PhP 300-400/kg (PhP 40.00 = US\$1.00). Some of the local recipes for Mobulas include “ginataang sanga” (Mobula meat cooked with coconut milk), “kilawin”



A gillnet boat (municipal type) in Jagna used for catching Mobulas in Bohol Sea

Box 1. Morphological characters used to differentiate *Mobula* spp.

<i>Mobula thurstoni</i> (bentfin devil ray or smoothtail devil ray: local name “pantihan”)	<ul style="list-style-type: none"> • spiracles - small, sub-circular, slightly below plane of pectoral disc • small species (1.0-1.8 m in width) • dorsal fin with white spot on the apex • cephalic fins short (less than 16% of disc width (DW)) • concave pectoral anterior margin • tail base depressed • tail, shorter than disc, with no spines • top: dark blue to black, bottom: white, with silvery pectoral fin tips
<i>Mobula eregoodootenke</i> (longfin devil ray or pygmy devil ray: local name “pantihan”)	<ul style="list-style-type: none"> • spiracle - small, sub-circular, slightly below plane of pectoral disc • small species (1.0-1.8 m in width) • long cephalic fins (16% of DW) • dorsal fin present • brownish-gray above, whitish below
<i>Manta birostris</i> (Manta ray: local name “sanga”)	<ul style="list-style-type: none"> • extremely broad head with long head fins, and a terminal mouth • upper surface of disc covered with denticles • tail usually without a spine • blackish above, sometimes with white shoulder patches • white below, with grey edging on disc • tail is whiplike but short

(fresh meat in vinegar), and “*inihaw*” (grilled meat). These Mobula recipes are usually sold in eateries near the public market of Jagna which is several kilometers away from the landing area in Bunga Mar Fishport. On the other hand, the tail is saved as it is thought to be aphrodisiac and also a lucky charm for houses and boats.

Catch and Effort

During the study period from March to May 2010, a total of 132 Mobulas were landed (**Table 1**), of which 128 were identified as bentfin devil ray (*Mobula thurstoni*) and 1 was identified as longfin devil ray (*Mobula eregoodootenke*). Surprisingly, 3 manta rays (*Manta birostris*) were landed during of the survey period in spite of the ban (BFAR FAO 193). About 15 to 20 municipal type of fishing boats are still actively fishing for Mobulas in Bohol Sea, using gillnet with an average mesh size of 24 inches, which is the main fishing gear used for catching Mobulas in the fishing area

According to Alava *et al.* (2002), the usual size of gill nets used in mobulid fisheries are 700 to 1000 m long and 35 m high, which are still being used until the present based on the respondents’ perceptions during the interview. The usual fishing operation starts at noon when fishing boats leave Bunga Mar and return the following morning at 0500-0630 hrs. Fishing for Mobulas is seasonal and usually occurs during summer (March to May) and again

Table 1. Mobulid species landed in various landing sites in Bohol Sea

Species	Month	Year		Total
		2002	2010	
<i>Manta birostris</i>	March	1	1	2
	April	5	1	6
	May	8	1	9
	Subtotal	14	3	17
<i>Mobula thurstoni</i>	March	10	98	108
	April	32	26	58
	May	5	4	9
	Subtotal	47	128	175
<i>Mobula eregoodootenke</i>	March	0	0	0
	April	4	1	5
	May	0	0	0
	Subtotal	4	1	5
Total		65	132	

* In 2002: total enumeration while in 2010: one week/month

in November-February (peak season). Once the fishing season for Mobulas is over, the fishers shift to flying fish fishing. The seasonality of Mobula fisheries is attributed to the annual cyclical weather patterns in the area.

In a previous study on rays conducted in 2002, several fishing boats from Pamilacan Island were known to catch devil rays from Bohol Sea. However, based on the latest study in 2010, fishers from Pamilacan Island no longer fish for rays in the area. Fishers and traders from the Island just buy rays from other fishers who land their catch in Bunga Mar, Jagna. The recorded catch (**Table 1**) seemed to indicate that the catch in 2010 (132 individuals) was significantly more than the 2002-2003 survey (unpublished report). The fishing effort also appeared to be constant since the early 2000. Taken together, such situation suggests that Mobulid stock in the area is still not yet overfished.



Gillnet for catching Mobulids in Bohol Sea



Mobula chopped upon landing and sold in Bunga Mar, Jagna, Bohol

Biological Information

Of the 128 *M. thurstoni* landed, 73 were females, 39 were males and 16 could not be identified because these were already chopped. The known length at first maturity for *M. thurstoni* is within the range of 150-154 cm DW. Based on this information, 15 of the 128 individuals or 11% were immature while the rest which measured at an average of 165 cm DW could be mature. Last and Stevens (1994) described that *M. thurstoni* has an average disc width of 100-180 cm with a maximum recorded at 220 cm (Eschmeyer *et al.*, 1983). From the results of the survey, 2 individuals (measuring 182 cm and 181.5 cm) had exceeded the maximum of 180 cm DW.

The presence of an immature *M. thurstoni* in the landed catch, one of which measured 82 cm DW suggested that Bohol Sea could be a spawning ground for this species. Notarbartolo-di-Sciara (1988) reported that a newly born *M. thurstoni* usually measure 65 to 85 cm DW. According to the fishers, it is not common to have immature *M. thurstoni* included in the landed catch since small-sized rays are usually thrown back into the sea by fishers when these are caught in their nets.

Way Forward

From the results of the survey, it can be concluded that Mobula fisheries still exist in Bohol Sea and that the fishery resource appears to be not overfished as yet due to the seasonal nature of fisheries. However, further studies should be undertaken, *i.e.* time-series stock assessment to verify such findings. Moreover, considering that Bohol Sea is likely a spawning ground for the species, appropriate

habitat conservation and management measures should be promoted in this area.

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Juvenile M. thurstoni caught in Bohol Sea

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