Notes on the presence of *Manta alfredi* in the Tubbataha Reefs Natural Park, Cagayancillo, Palawan, Philippines

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ABSTRACT

In 2011, a review of 33 photographs of mantas taken at the Tubbataha Reefs Natural Park (TRNP), Cagayancillo, Palawan, Philippines revealed that most of the mantas photographed were clearly reef manta rays (*Manta alfredi*) with only one photograph of *Manta birostris*. Previously identified in surveys within the park as oceanic manta ray *M. birostris*, the presence of *M. alfredi* has never been established until now. Using various parameters, the pictures in the Tubbataha Management Office (TMO) database were reviewed and noted. The identification of *M. alfredi* was more consistently based on the presence of black marks located posterolateral to the last gill slits and between the rows of gill slits. The identification of the species was further validated by experts after viewing three photographs from the said database. This represents a new elasmobranch species record for the TRNP and, technically, for the Philippines as well. Furthermore, the confirmed presence of both globally significant species of manta rays should have a strong bearing on the conservation policies of the park as well as that of the country. Further research on population dynamics, structure and abundance is recommended. Contributing to global efforts to generate better understanding of the species through partnership with international organizations is also recommended.

Keywords: *Manta alfredi*, Tubbataha Reefs Natural Park

INTRODUCTION

For quite some time in the past, the genus *Manta* was believed to be monotypic, represented only by the *Manta birostris*. All sightings of manta rays in the Philippines were attributed to this species, therefore no previous records of the presence of the *Manta alfredi* in the country existed. Because of this, the Philippine government protects only the species *M. birostris*. With recent studies resurrecting the *M. alfredi* as a separate species, a gap in the legal protection of the globally significant manta ray has come to light.

This paper aims to establish the occurrence of *M. alfredi* in the country by presenting evidence gathered in Tubbataha Reefs Natural Park

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(TRNP). Establishing its presence has implications on the conservation of the species because ignorance could lead to neglect and eventual loss of the population in the absence of conservation efforts. The Fisheries Code of the Philippines through Fisheries Administrative Order (FAO) No. 193 (DA-BFAR 1998) and the Palawan Council for Sustainable Development (PCSD) Resolution No. 04-226 protect the *M. birostris* but makes no mention of the *M. alfredi,* likely due to the taxonomic confusion involving the species at the time (PCSD 2004). This paper also aims to provide a basis for the amendment of FAO No. 193 to strengthen the protection of manta rays in the country.

Although Krefft has been credited with the discovery of the *Manta alfredi* (Figure 1) in 1868, it was not until several decades later that a description of the species was provided (National Library of Australia 2014). Stead (1906) first described the species, defining its head as truncated, free from pectoral flaps, and exhibiting horn-like accessories. He also noted a terminally-placed wide mouth unlike in most rays. Whitley (1932) further characterized the animal as large with its disc much wider than its length. He also pointed to one distinct dorsal fin without a spine at the base of the tail as opposed to that of the *M. birostris* which still retained a stinging spine. Schultz (1953) noted a V-shaped white shoulder patch on each side dorsally and several dark blotches on the ventral aspect of live specimens. He also found that his specimens differed with *M. birostris*.

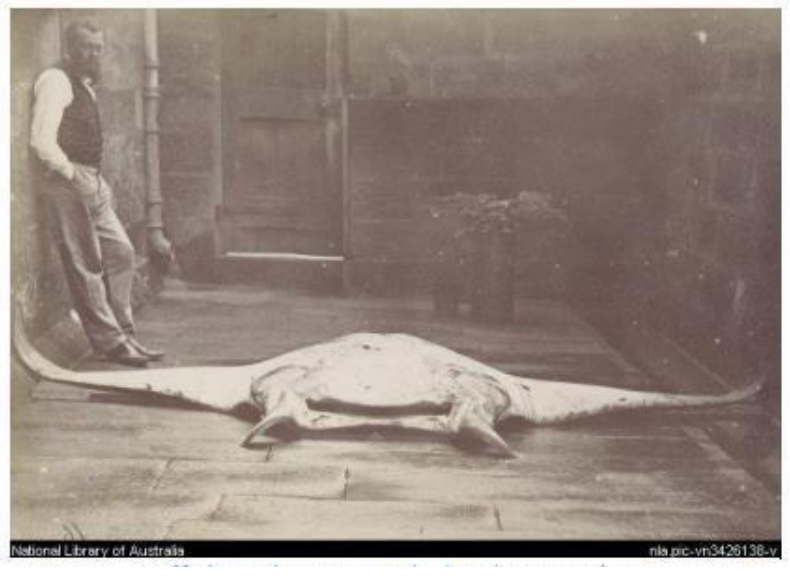

Figure 1. Krefft (1868) posing with the chirotype/type-specimen for the *Manta alfredi* which was not described until Stead in 1906 (National Library of Australia 2014).

Over the years, several specimens have been collected and studied further to yield more defining characters of the species. At the same time, a long debate ensued on the appropriate taxonomic classification of the *M. alfredi*. For a long while after the *M. alfredi* was fully described, the genus *Manta* was again considered monotypic with only one recognized species, the *M. birostris*.

Recent information, however, showed that there are two visually distinct species based on morphometric measurements, external characteristics, maturity, and maximum disc width – hence the resurrection of the species *M. alfredi* (Marshall et al. 2009). The distinctiveness of the species was further supported by a study on the genus done by Kashiwagi et al. (2012) which analyzed the genetic signatures of the two species of *Manta*. While the results showed that assay with mitochondrial DNA CO1 failed to distinguish the two species, it also revealed that they did not share haplotypes. Qualitative evidence and statistical inferences from "Isolation-with-Migration" models strongly suggested a recent post-divergence gene flow estimated to have occurred about 500,000 to one million years ago. The authors further attributed the species genetic difference to distinct habitat choices, i.e., near-shore and off-shore environments, which they believed to have occurred at an early stage of the speciation. The distribution of the *M. alfredi* has been described as circumglobal in tropical through subtropical seas (Eschmeyer 2012). The species is often found near productive coastlines, bays, and atolls with constant upwellings (Marshall et al. 2009).

Studies about *M. alfredi* in the Philippines are limited. The last inventory of elasmobranch species in the Philippines (Compagno et al. 2005) only recorded the presence of one *Manta* species, *M. birostris*. The Fishbase website, however, revealed three photographs of *M. alfredi*, supposedly taken in 1996 and submitted to the website two years later (Mr. Robert Yin, pers. comm.). These were reported as having been taken in the Philippines but the specific site is unknown. It was later verified and identified as *M. alfredi* in 2010 by Mr. John McEachran and Ms. Andrea Marshall (Fishbase 2012), a development possibly attributable to the recent resurrection of the *M. alfredi* in 2009 as a separate species (Marshall et al. 2009). Beyond these pictures, it appears that no other published documentation of its presence in the country is available. Thus there is no information on the distribution or location of populations of *M. alfredi* in the Philippines.

METHODS

The TRNP in Palawan, Philippines is located near the center of Sulu Sea and is composed of two atolls and a reef with bustling platforms that are mostly submerged. It is about 90 nautical miles south of the municipality of Cagayancillo and about 92 nautical miles east of Puerto Princesa City. TRNP is also significantly situated at the apex of the Coral Triangle, that area in the world with the highest level of coral and marine diversity. It was declared as a marine protected area (MPA) in 1988 and was recently expanded to include the Jessie Beazley Reef and a 10-nautical mile buffer zone in 2010. In recognition of its unique and highly diversed marine life, TRNP was inscribed in the UNESCO World Heritage List in 1993 and included in the Ramsar List of Wetlands of International Importance in 1999 (Tubbataha Management Office 2011).

The TRNP is also a globally renowned destination for scuba divers, researchers, and underwater photographers. Visitors often provide the Tubbataha Management Office (TMO) with copies of their photographs to be used in the various educational activities of the office. Such photographs are kept in a database for storage and easy access. In addition to this, the TMO conducts regular ecosystems research and monitoring activities together with its partner agencies. Thus the management has been well aware of the presence of manta rays in the park. Research reports, however, identified the species as *Manta birostris*, likely as a result of earlier taxonomic issues within the genus.

Thirty three photographs of manta rays kept in the database of the TMO were reviewed and evaluated for species identification. Three of these were sent to manta ray experts for confirmation. Sighting forms submitted by dive boat managers from 2008 to 2011 were likewise reviewed and entries of manta ray sightings were extracted. As a supplement, personal interviews with some dive masters that regularly visit the park were conducted.

The distinguishing characteristics used to identify photographs of *M. alfredi* followed those described in by Marshall et al. (2009) and were as follows:

- Y-shaped black on white shoulder patch on the dorsal aspect
- Light-colored mouth
- Predominantly white underside broken by its unique black spot and patch markings
- Presence of black spots between the columns of gill slits and/or on ventral aspect of the wings lateral to the body

- Small black pattern/blotch found on the posterolateral aspect of the last gill slit that is limited to only a fraction of the gill length
- Absence of a stinging spine or prominent bulge at the base of the tail

RESULTS AND DISCUSSION

Twenty-nine of the 33 photographs were deemed useful for species identification. Four were difficult to identify to the species level due to the angle of the shot or distance of the animal from the photographer. Of the 29 photographs used, 24 were clearly *M. alfredi*, exhibiting characteristics distinct of the species (Figures 2 and 3). Three of these 24 photographs were sent to expert for confirmation of species identification. Dr. William White (pers. comm.) concurred and remarked that the lack of any report in the country was likely because previous records were all combined with the *M. birostris*. In addition to this, it was later revealed that the photographs submitted to the Fishbase were actually taken in Tubbataha Reefs in the summer of 2006 (Mr. Robert Yin, pers. comm.)

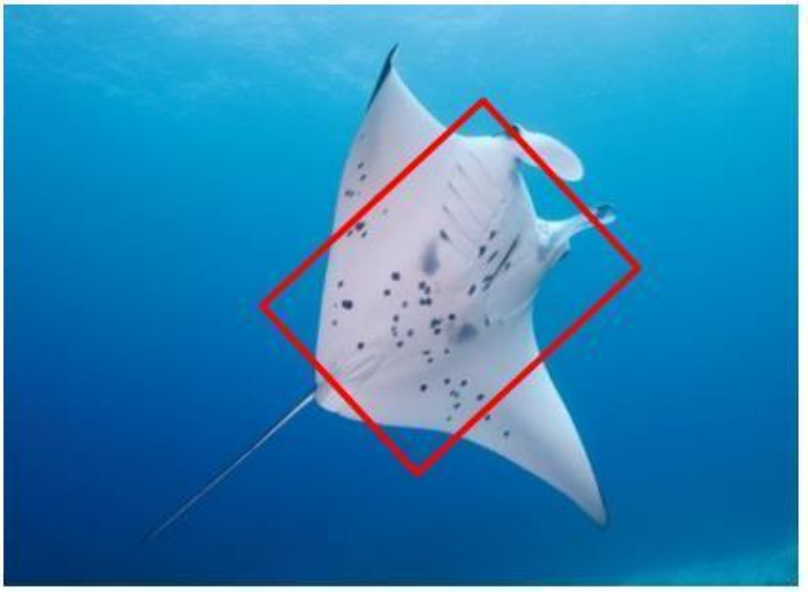

Figure 2. Presence of black spots and patterns medial to the gill slits and on the lateral aspects of the pectoral fins and the small black patch posterolateral to the last gill slits. Photo credit: Lene and Claus Topp.

The remaining five photographs have to be reviewed further because of the presence of a small bump at the base of the tail just posterior to the dorsal fin (Figure 4). Upon consultation with Dr. William White and Dr. Andrea Marshall, all five photographs were later confirmed to be that of *M.*

alfredi. It was further explained that some *M. alfredi* found in the South Pacific area apparently retain a very small bump at the base of the tail (Dr. Marshall, pers. comm.).

Figure 3. Y-shaped shoulder patch and absence of prominent bulge at the base of the tail (red circles). Photo credit: Lene and Claus Topp.

Figure 4. Some individuals were observed to have retained a small bump at the base of the tail. Photo credit: Heinz Rebmann.

A few other anatomical and color aberrations were noted (Figure 5). Two distinct individuals were photographed in 2006 and 2008 exhibiting contorted or helical tails. Another individual seen in 2011 displayed a predominantly black dorsal aspect. A year later, another individual was observed with a mouth darker than those of other *M. alfredi* seen in TRNP. All were nevertheless identified as *M. alfredi* based on predominantly white undersides, the presence of black patches between the columns of gill slits, and the small black blotch posterolateral to the last gill slits.

Figure 5. Other aberrations in conformation (tail: top left) and color pattern (top right and bottom photos) were observed in some individuals. Photo credits: Kai Ledesma (top left), Yvette Lee (top right) and Heinz Rebmann (below).

As part of the routine monitoring of TRNP, dive operators are asked to fill up sighting sheets for large predators on a voluntary basis and submit these to the TMO at the end of each dive season. Dive operators ask their guests to identify large predators sighted during their dives. Thus sighting data on manta rays, although sparse, has been recorded since 2008 (Figure 6, Table 1).

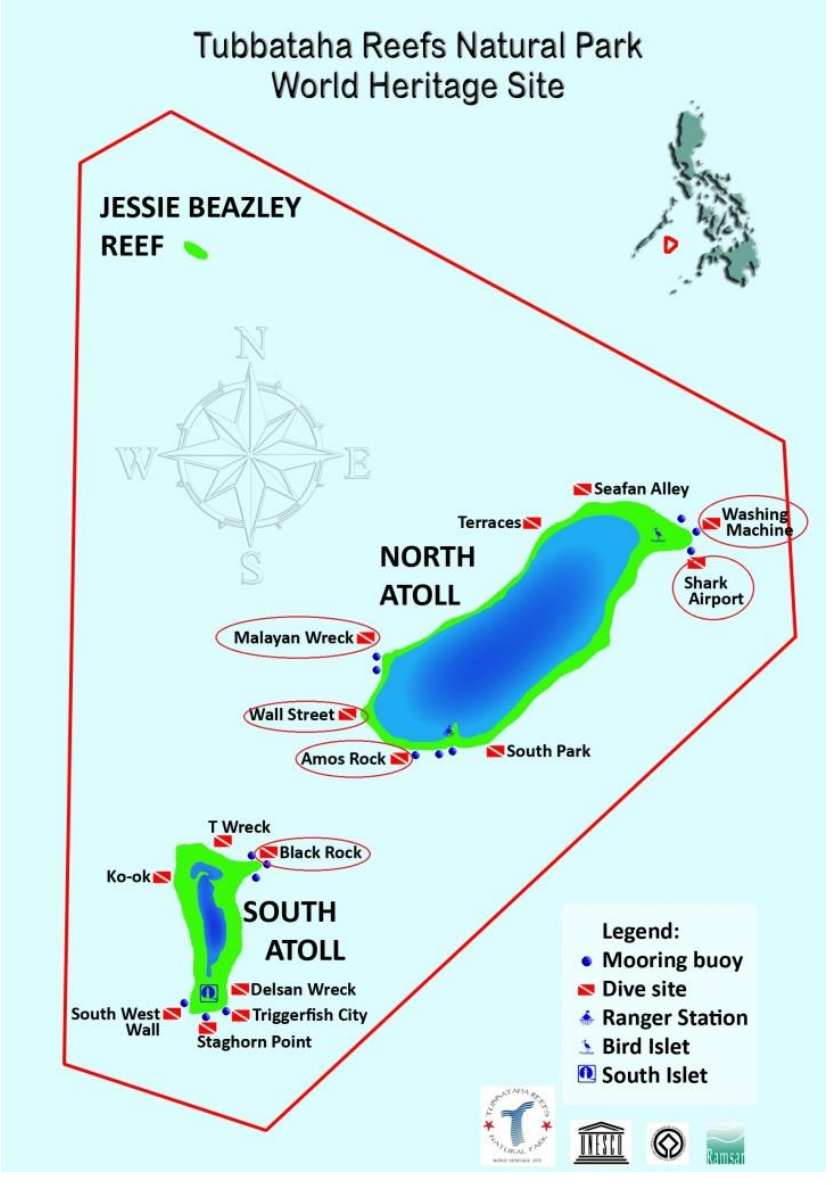

Figure 6. Map showing the various dive sites within TRNP. Dive sites where manta rays are frequently encountered are encircled in red.

Table 1. Excerpts of the results of manta ray sighting sheets of dive operators from 2008 to 2011.

Vessel Name	Date	Location	Group Size
Dschubba	1 May 11	Malayan	2
	1 May 11	Malayan	2
	1 May 11	Malayan	2
	2 May 11	Wall Street	2
	20 March 11	North of Wall Street	2
Expedition Fleet	7 March 11	Shark Airport	-
	12 March 11	Washing machine	-
	15 June 11	Wall Street	-
Sakura	13 May 09	Shark Airport	
Borneo	2 May 09	Amos Rock	1
Palau Sport	21 April 08	Washing Machine	1
	22 April 08	Black Rock	1
	7 May 08	Black Rock	1
	3 June 08	Shark Airport	2

According to divers' accounts, manta rays are encountered most often near the Bird Islet area and at the Black Rock dive sites. These areas are known to have strong water currents, characterized by upwellings, a habitat type preferred by the *M. alfredi*. The study by Villanoy et al. (2004), in characterizing the circulation in the reefs, proposed that the high productivity in these areas as well as the southwest portion of the North Atoll (vicinity of Wall Street and Amos Rock) was the effect of the nutrient-rich water from the lagoon flowing out in pulses, driven by wind and tide. Another study by Campos et al. (2007) on the distribution and dispersal of fish larvae further revealed that these dive sites overlapped with the areas that recorded some of the highest densities of fish larvae and eggs outside of the lagoons in Tubbataha. In 2012, sightings were mostly concentrated at the Washing Machine, Shark Airport, and the area in between although other divers reported encounters in other dive sites as well (Figure 6).

Almost all individuals observed were travelling except for one individual encountered at the Shark Airport, measuring about 3 m wide was being cleaned by a group of Bluestreak cleaner wrasses *Labroides dimidiatus* and a few other species. Group estimates ranged from 4-5 in 2012 which was higher than previous years (2008-2011) (Table 1).

No individuals were identified apart from two which had kinks in their tails so data on the length of their stay at the reefs could not be determined. Nevertheless, even the two individuals with bent tails were not reportedly sighted beyond one dive season, implying that the population is transient. It is thus presumed that the TRNP serves as a feeding and cleaning area for manta rays.

CONCLUSION AND RECOMMENDATIONS

The presence of the *M. alfredi* is noteworthy because it represents a new elasmobranch record for TRNP and possibly for the country given its absence from the elasmobranch species list for the Philippines compiled by Compagno et al. (2005). Confirmation of the presence of the *M. alfredi* in TRNP accentuates the value of the park for conservation. Although the population of manta rays in the park appears to be transient, it has also been noted as a cleaning station thus adding to the significance of this particular marine habitat.

Furthermore, the confirmed presence of the globally significant *M. alfredi* as well as that of the *M. birostris* would have a strong bearing on the formulation of national conservation strategies of the country and of TRNP. For starters, amendment of FAO No. 193 and PCSD Resolution No. 04-226 should be pursued to include the species in its protection. Further research on population dynamics, structure and abundance is recommended. Initiating a photo-catalog of individuals might also shed light on its life history and habitat range and use. Likewise, contributing images to the Ecocean Manta Matcher database would help improve understanding of the species.

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