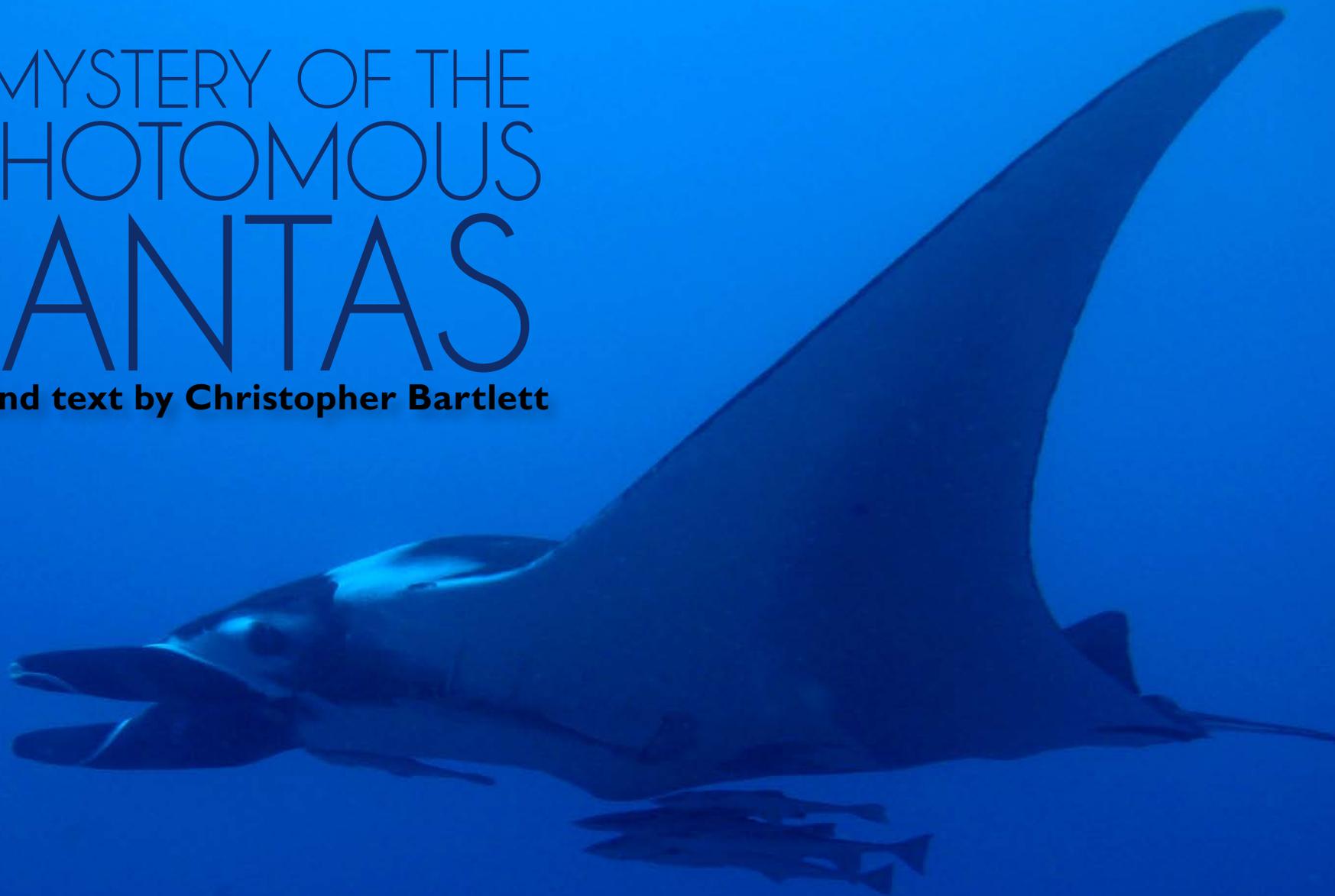


THE MYSTERY OF THE DICHOTOMOUS MANTAS

Images and text by **Christopher Bartlett**



The more work that I do on mantas the more I need to know...I can't help it. I don't know if I could stop even if I tried



MYSTERIES OF THE MANTAS – MAJOR DISCOVERY MADE IN MOZAMBIQUE

It took six years of hard graft, toil, and some tears, mainly with limited logistical and financial support and little understanding of and sympathy for the cause. Yet from the outset Californian Andrea Marshall, now Dr Marshall and recognized as the world's leading Manta Ray researcher, knew she had made a ground-breaking discovery about one of the oceans' emblematic species; that there was not one species of manta ray, but two clearly different species.

As astonishing as it may seem in this day and age, until November 2009 there was officially only *Manta birostris*, the manta ray, first scientifically described in 1798, swimming in various places around the world. Now there are two species, *Manta birostris*, the giant manta with a wingspan up to 9 metres, and *Manta alfredi*, the smaller 5.5-metre wide reef manta. It's akin to waking up to the news that there are in fact two lion species. It's not like mantas were new to us or hard to find. Every year countless scuba divers around the world get up-close and personal with these fine specimens of majestic marine megafauna. Yet, oddly, little research time had been dedicated to these magnificent subaquatic spaceships, and Andrea only discovered Mozambique's Tofo and it's mantas through word of mouth.

“After finishing one of my degrees in Australia I went to South Africa to find some inspiration and ended up working with a friend of mine on his great white shark project in Gansbaai. I went to Mozambique on a vacation purely because



a friend of mine told me of the large numbers of manta rays and whale sharks. When I went to see for myself I nearly died as it was a gross understatement. I quickly realized that this presented an unequalled opportunity to studies these species.”

In 2003, with the approval of the University of Queensland, Australia, she sold everything and moved to Jangamo, south of Inhambane, to start fieldwork for a PhD; the world's first doctoral thesis on mantas. She chose an institution in Australia over her native USA

students ... they are often more capable and creative than they are given credit for.”

Within six months of starting research, Dr Marshall noticed visual differences beyond size in the rays that she was observing but, sensing the reaction that a discovery of this magnitude could provoke, she didn't talk to anyone else about it for a year in order to compile more supporting arguments. Her first evidence came from a trip to a fishery in Indonesia, when she noticed that a giant manta that was being cut

you see things. But then people assumed that it was genuine, and just previously overlooked given that there was so little research done on manta rays worldwide. I know for certain that many scientists are excited about the discovery and see it as a very positive thing. Although many are equally as frustrated as now all of the known information has to be split, the mantas re-named, printed material and past scientific publications updated, and so on.”

However, before all that could happen, there was a lot of hard graft to put in. It took five years and



as she felt that they gave her the freedom and opportunity to do her own work, despite the greater risk involved, rather than be subject to the strictures of routine research.

“There were no guarantees that this project would work and on paper it looked a bit optimistic to say the least. But I think they saw that I was passionate and that I was dedicated and ambitious. They took a chance on me. They didn't need to ... but they did and I will always be grateful for that. I wish more institutions would take a chance on their

up had a vestigial spine absent in the smaller mantas. “All the little things started adding up; I knew in my heart that there was a difference. I wanted to push the boundaries of science.”

When she finally discussed her beliefs amongst the scientific community, she was initially met with doubt: *“It was no surprise as it is awfully rare to find new species of large charismatic megafauna. It is not really that common and people know that. So people were initially skeptical. I think that it was a little sensitive for people that had previously worked on manta rays; as pride can have an effect on how*

a worldwide study to eventually gather enough compelling evidence for the Californian to support her case, and many obstacles had to be overcome.

It was very hard to find living conditions that enabled her to focus on her work. Africa is not an easy place to work and live in, especially for a 23-year-old single girl and Mozambique provides an especially challenging environment; essentially due to a lack of resources and infrastructure. She began when the country was less than nine years out of the armed conflict which dates back to the early 1970s.



Basic utilities such as water and electricity were not constant, and sometimes just providing for herself was hard enough.

"I am only human and there were many times that I, my parents, my University advisors and my friends told me to get out. But what really kept me here was curiosity. I think that most scientists will tell you that the reason that you become a scientist in the first place is that you always want to know 'why'. You are obsessed even as a kid with understanding how things work. The more work that I do on mantas the more I need to know ... I can't help it. I don't know if I could stop even if I tried".

In March 2005 she met Malcolm Warwick, the owner of Casa Barry, a lodge in Tofo. Interested in her work and impressed with her drive and dedication, he offered her a base to live in and carry out her research within the lodge grounds. Working from a thatched hut, shared with Whale Shark researcher and fellow doctor Simon Pierce, the challenges have remained over the years and include natural hazards, such as

cyclones, as well as the lack of infrastructure and healthcare. However, the biggest threat to the on-going work is a lack of funding.

"Mozambique has limited capacity to fund marine conservation research projects through government bodies and very few companies invest here. Simon and I are not paid to conduct our research and rely on local sponsorship from NGO's and tourism operations." Yet Tofo is one of the few places in the world where both species are present, and the only one where they can be found year-round.

As well as working on proving to the world that there are two distinct Manta species, she has estimated many of the reproductive parameters for reef mantas in the wild; information that was previously unknown or unconfirmed.

"I am lucky enough to work in an area that is both a mating ground and birthing ground for mantas, and have found that although mantas can pup once a year, they tend to only reproduce every two years".

Considerable time has been spent examining

the population structure and dynamics of the Mozambican population (something that had been done in very few locations around the world then and now) and how photography can work as a scientific tool to aid with research in a non-intrusive way. Using photographs of the belly markings that are unique to each manta, Andrea has identified and named over 700 individual rays in the area, with 90% being the more sedentary reef mantas and 10% the more migratory, open ocean dwelling giant manta.

Randomly flipping through her files she can name almost all of the ones she opens. It's quite disconcerting to watch, like we're going through an extended family album or a facebook friends list (just that they are all giant fish); their names inspired by their markings.

"Your private life and your work tend to get a bit intertwined. It is no longer just a job for me. My research in Mozambique is my life and it becomes too difficult to leave particularly having worked so hard and having sacrificed so much."



As she goes through her files looking for individuals that will be available for adoption (see below), she comments on their different personalities. Mushroom is bashful, and took a while to warm to her, 50 Cent and Mr-T are gregarious and like to flirt, others like to have their bellies tickled by bubbles, and others dance and weave.

The combined 'super population' of both species has been scientifically estimated to be in the order of 1500 individuals, arguably now the largest in the world; because of the unfortunate destruction and demise of fishing practices elsewhere in the world. Defining the differences between the two species will be crucial in protecting the remaining giant and reef manta. Having found that the giant roams the open oceans and the reef manta prefers a more sedentary lifestyle, different strategies are required to protect them. In order to gain better understanding of their movements and habits, acoustic tags and accompanying listening stations have been set up, and satellite tagging of selected individuals is also in progress.

Installing an acoustic tagging program can cost anywhere from USD\$2,000 for one basic receiver and installation, a single tag up to USD\$30,000, and more for an elaborately set up 'meganet' system with multiple receivers and arrays over a significant amount of coastline (or critical habitats) which can have the ability to examine multiple species. Acoustic tags inform Dr Marshall's and Dr Pierce's Foundation for the Protection of Marine Megafauna when tagged individuals pass listening stations up and down the coastline, whereas the USD\$5,000 satellite

tags record speed, depth, and location data for a pre-determined period of time before breaking off, rising to the surface, and transmitting the data via satellites. The data gathered is shared with other researchers around the globe.

"It is almost as if it has brought the manta ray research community together, I feel as if I have gotten a tremendous amount of support from the majority of people and found that internationally people want to contribute and collaborate on research."

She is now working with colleagues in Madagascar, Kenya, and Tanzania and receives funding from Wildlife Conservation Society, Save Our Seas, and Vodacom Mozambique. It has also created great interest outside of the scientific community, with the BBC filming a one-hour special "Queen of the Mantas" documentary, which was broadcast in the United Kingdom in November 2009, to critical acclaim.

She has also done a considerable amount of work on manta predation by sharks and cleaning behavior of manta rays and cleaner fish at reef cleaning stations. Cleaning stations are pretty well known in the marine environment, but for manta rays it's an extraordinary place. Because they are so large, "cleaner fish" partition up the ray and clean different parts of the animal. It looks so co-operative and graceful.



Mantas have to eat 14 per cent of their body weight a week in plankton, so any time taken out from feeding has to be invested in something important. As they can spend up to eight hours having parasites removed and shark bite marks cleaned, it stands to reason that it must be detrimental if they are not groomed. Trying to understand the details is part of protecting mantas in the bigger picture.

Fishing licenses for long-lining are still being issued to local fishermen and there are talks about selling licenses to international operators. Long-lining both sharks and rays and local research should prove the unsustainability of this fishery. Dialogue is on-going with the authorities regarding the future use of these licenses and the Foundation's plans are two-fold. Firstly to work on getting both manta species and whale sharks protected nationally and then, with more directed research, they hope to set up a Marine Protected Environment, having proved both the environmental and, crucially, economic interest of a healthy and balanced marine environment.

As with all conservation issues, education is key, and Andrea spends considerable time educating locals and tourists alike, with twice-weekly talks at the lodge and frequent trips up and down the coast talking with fishing communities attempting to teach them the importance of selective and sustainable fishing, as well as co-coordinating monitoring of anti-turtle hunting laws.

Seven years of trials, one astounding discovery, and one PhD later and Andrea remains as lucid as ever in summing up her adventure.

“Starting this project in Mozambique was frightening. Even though I consider myself a good field biologist, I was taking a great professional risk, but as it turns out it paid off. However, if it had not I would still have no regrets. There are always inherent risks in trying to understand the natural world. Sometimes it pays off and sometimes it doesn't but ultimately you end up learning something. Besides, it is the journey and experience that makes it worthwhile. I lead an incredible life in an incredible part of the world; I am a very lucky girl. And I do acknowledge I was at the right place at the right time”.

REEF AND GIANT MANTA SPOT-THE-DIFFERENCE

The results of Andrea's study (published in a scientific paper by Zootaxa) redefining *Manta birostris* as the giant manta and describing *Manta alfredi* as the reef manta are visually remarkable and can be seen by any diver in the know.

From the top:

Divers often see mantas below them as they drop onto cleaning station dive sites. The giant manta has a clearly visible bold black T on its shoulders, with the vertical and horizontal sections being of a similar width. The reef manta's shoulder markings are more sloped, and could be likened to a large white bottom in a wide-banded black thong.

Front on: giant mantas have some charcoal grey to black markings on their mouths, whereas their smaller reef cousins have all-white mouths.

Belly views: When seen circling overhead, divers



should pay attention to the ventral markings. On the giant manta, there are no black markings between the five pairs of gill slits, but there is a large and often semi-circular spot coming from the rear-most gill slit, and a clearly visible dark marking along the entire pectoral fin margin. The reef manta has its ventral markings between the gill slits, a much smaller spot near the fifth gill slit, and has a fainter pectoral fin margin marking.

Laterally: Look closely where the tail joins the body behind the dorsal fin. On the giant manta there is often an egg-shaped lump on the top where the tail starts (though this can have been knocked or bitten off in some individuals). This is a calcified mass encasing the remains of a spine, showing the probable evolution of the giant manta from the stingray family. This lump is never present on the reef manta.

Look at	Look for	
	Giant	Reef
Top	Black T	White housewife's bottom
Mouth	Grey or black markings	All white
Belly	Nothing between gill slits	Markings between gill slits
Belly	Dark chevron on rear "wings"	Paler incomplete markings on rear "wings"
Side view	Egg-shaped lump behind dorsal fin	No lump

CONFUSING COUSIN

Many divers only get a fleeting glimpse of large rays cruising past in the distance, or fleetingly breaching the surface of the ocean with a balletic leap. With an almost identical outline and cephalic pods at the mouth, the devil ray (*Mobula japonica*) is often misidentified as either manta species. However, fully-grown devil rays are smaller than fully-grown reef mantas, attaining a maximum disc width of three meters and are easily identifiable by their all-white underside.

GET INVOLVED

It is uncommon for both species to be seen together and most tropical and sub-tropical regions of the world are thought to have either one or the other species. Yet research is scant in many places and your photos can help by becoming pieces in a giant jigsaw puzzle. Not only will they help build a more accurate picture of global distribution, but as each manta's belly markings are unique, they could enable individuals to be tracked. Prior to April 2009 there had been no confirmed sightings of giant mantas off the Tanzanian coast until yours truly provided a photo of one off the northeast coast of the island of Pemba.

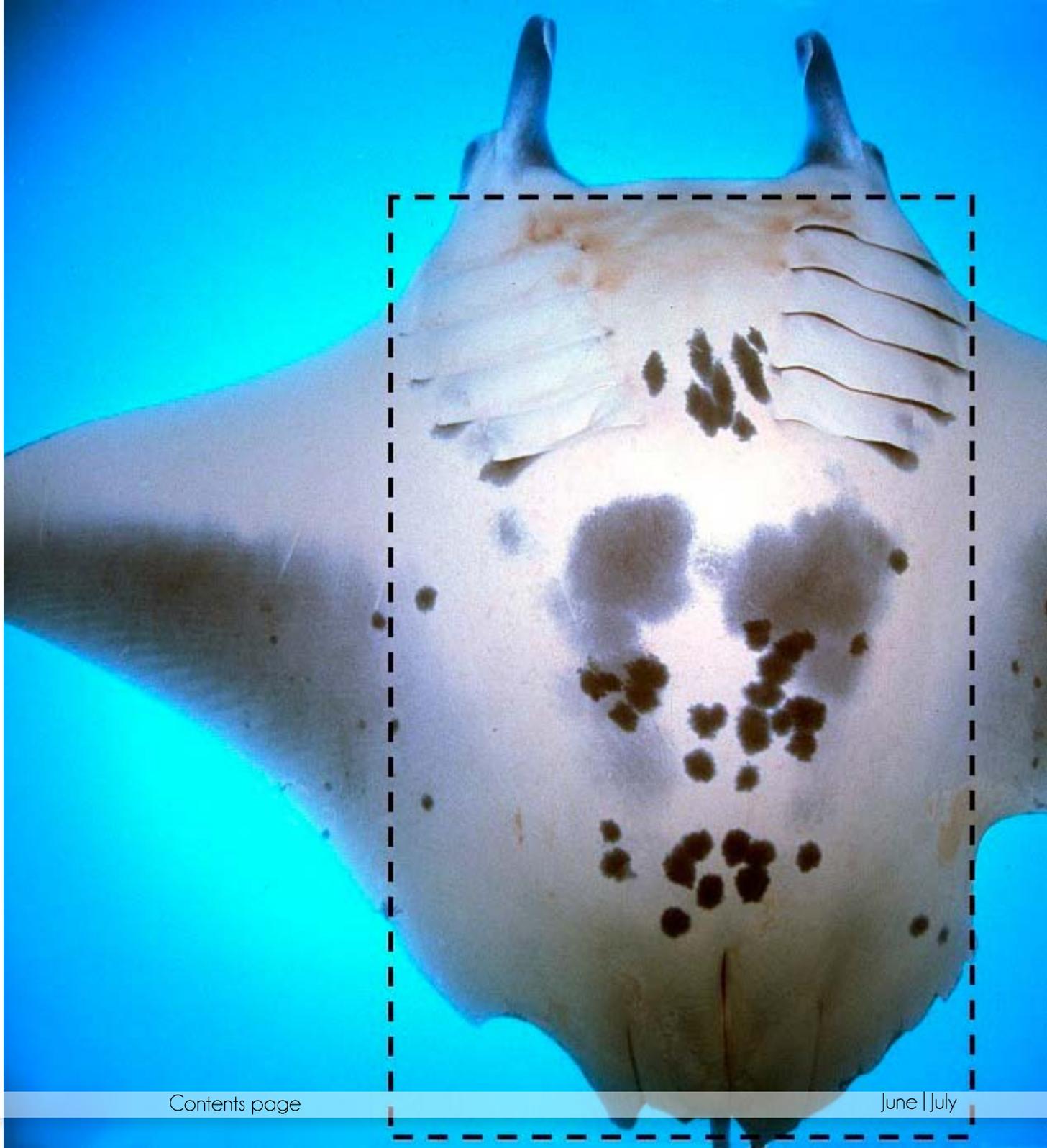
Belly shots showing the gill slits and the area between them are the best, but failing that, an image of the top of the manta is also useful. Images should be sent to: andrea@giantfish.org



If you're looking to give a novel and useful gift for friends or for yourself (you deserve it) for €5 you can adopt a manta through the Foundation for the Protection of Marine Megafauna. As well as contributing to keeping the research team out on the water, you'll receive a top-quality picture of "your" manta, and an update when it is resighted. One adoption provides two days fuel and maintenance for their dedicated research boat. The Foundation guarantees that your shark or ray will not pester you for cash, will not leave the house with its room untidy, will not dye its hair, and will not annoy you by communicating solely in grunts. Nobody's offering that deal for teenagers.



Go to
www.marinemegafauna.org
for more information.



MANTA RAY ADOPTION CERTIFICATE

This certificate certifies that CLIVE DICKENS

Has supported manta ray research and conservation by becoming the official guardian of
'KUTA'

Kuta is a 4.5m female ray first described off Tofo Beach, Mozambique



Dr. Andrea Marshall – Director of Research
Foundation for the Protection of Marine Megafauna
Manta Ray & Whale Shark Research Centre
Tofo Beach, Inhambane, Mozambique
Website: www.giantfish.org

Signature: *Andrea Marshall* Date: December 9th, 2008

Manta Ray Adoption Certificate

This certificate certifies that

DAVE MORGAN

Has supported manta ray research and
conservation by becoming the official guardian of

'MORGAN'

Morgan is a 3m male ray first described
off Tofo Beach, Mozambique

Signature: *Andrea Marshall* Date: March 25th, 2009

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