
MANTA RAYS: THE STATE OF KNOWLEDGE

BY SIMON PIERCE

Most divers will have seen, or at least heard of manta rays. They're huge, charismatic, and the very possibility of their presence makes for an exciting dive. You'd be forgiven then for thinking that scientists are equally familiar with their lives.



IN FULL FLIGHT // SIMON PIERCE

In fact, we're rather in the dark. We know that there are 11 species in the family (counting both manta and mobula rays). Manta rays were only split into two species in 2009, and there's probably a third one in the Atlantic. Only a few people in the world can actually distinguish the nine mobula species - and even they have their doubts.

Unfortunately, these poorly-known rays are now amongst the world's most threatened fishes. With all this in mind, Lydie Couturier - a PhD student from Project MANTA at the University of Queensland - recently brought together a group of her colleagues, including Dr Andrea Marshall and myself from the Marine Megafauna Foundation, to assess the knowns and unknowns of the manta ray world.

Manta and mobula rays share a fairly similar body plan. Two of their more notable features are the cephalic fins on either side of the head, which are used to funnel plankton-rich water into their mouths while feeding. These fins gave them the common name of 'devil rays', although you wouldn't know it from the way they behave. Some animals have tough-as-nails common names - killer whales, hellbenders and woodchucks spring to mind - but devil rays don't live up to their moniker at all, threatening only zooplankton and the occasional small fish.

The fossil record suggests that devil rays have been around in their modern form for at least 20-25 million years. They originally evolved from stingrays, and a 'sting' is still present at the base of the tail in some mobula species. True manta rays first appeared in the fossil record approximately 4.8 million years ago. Recent genetic work by Tom Kashiwagi (Project MANTA) and co-authors, estimated that the two contemporary manta ray species split approximately three hundred thousand years ago - a blink of the eye in evolutionary terms.

This split occurred during recent glacial cycles, when there were some major changes going on in ocean circulation and global geography. To give you some idea of how much the world was changed, at that stage hyenas, rhinoceros and elephants still roamed the British countryside. It appears that ancestral reef manta rays

may have preferred to remain close to the coasts of these ancient seas, while giant manta rays became more oceanic.

If that was the case, the difference still persists. Giant manta rays appear in far-flung places such as southern Brazil and northern New Zealand each year, suggesting that long journeys or significant ocean crossings are no barrier to these enormous rays. Giant manta rays (*Manta birostris*) reach up to around seven metres in width - much larger than reef manta rays (*Manta alfredi*) (hence the name). This size increase is likely to be related to the improved swimming efficiency that larger size confers - it may be worth noting here that Michael Phelps is 193 centimetres and Missy Franklin is 185 centimetres!

This behavioural difference probably explains why giant manta rays are found in the Eastern Pacific, whereas reef manta rays stop at Hawaii and French Polynesia. This is not to say that reef manta rays, which grow to around five metres width, are inadequate in the swimming department. Tagging studies in Mozambique have shown that individuals can move 70 kilometres in a single day during normal activities, and they migrate at least 500 kilometres along the eastern Australian coast each year.

So, just how many manta rays are there? Counting them is made easier by the distinct spots and blotches on their stomachs. This allows each manta to be photo-identified, the results of which can then be used to generate estimates of population size. At the moment, the largest documented population of manta rays is in the Maldives, where over 2,400 individuals have been photo-identified. The new global manta ray database, powered by an algorithm developed specifically for manta-matching by Dr Chris Town and his team at the University of Cambridge, will make this job a lot easier.

Manta (and mobula) rays have the largest brains of all the approximately 32,000 species of fish known to date. At first glance, this seems rather odd; how smart does one need to be to outwit plankton? Actually, it appears that animals - especially primates - don't become more intelligent to

catch prey so much as to outsmart each other. Recent studies have even shown that monkeys placed in larger groups increase their brain size to compensate. Could manta rays be the Einsteins of the fish world? They certainly display some behaviours that could suggest this, such as coordinated and cooperative feeding behaviours.

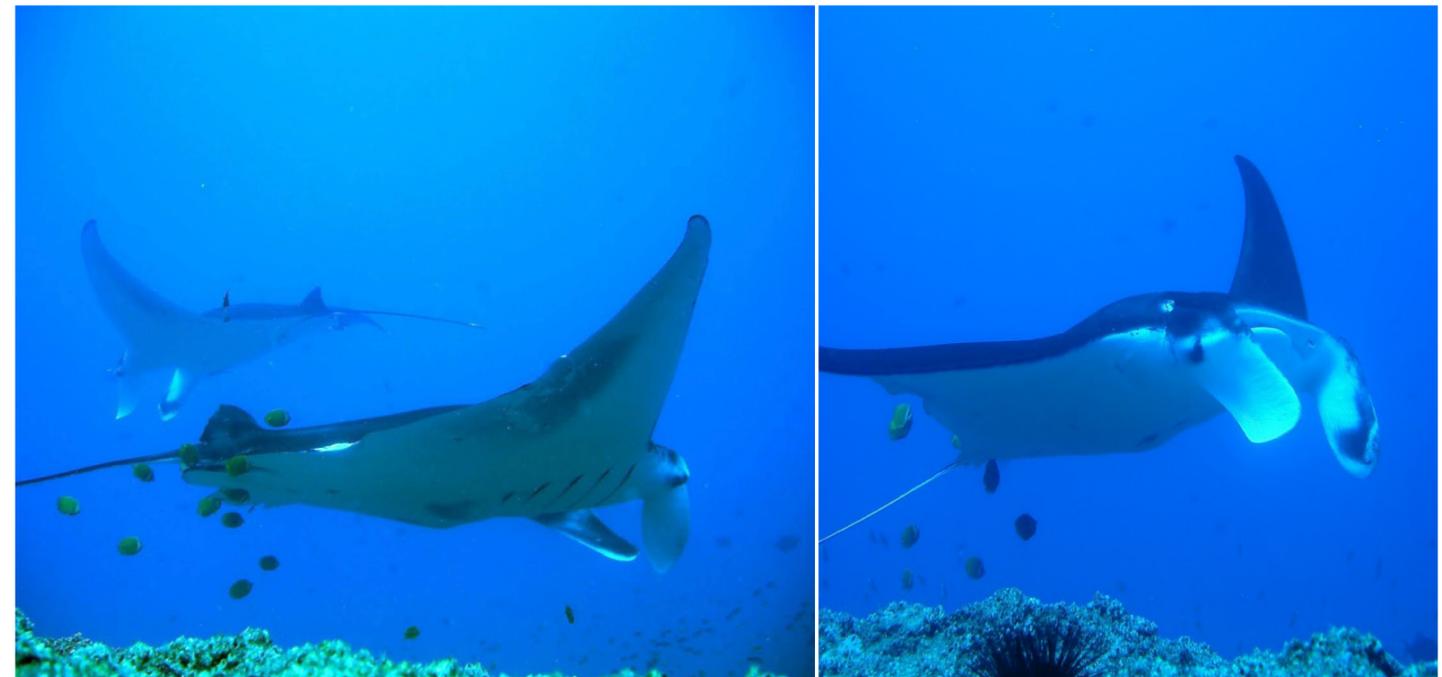
We're also becoming aware that giant manta rays, in particular, are truly deep-divers. And it's cold down there. To keep these large brains warm, and possibly the rest of their body too (as in some mobula rays), these rays have an amazing counter-current heat exchange system going on with their veins and arteries to become effectively warm-blooded, or at least keep their temperature more stable than most fish.

Sadly, manta rays face a very uncertain future. The global catch of manta and mobula rays has dramatically increased over the last decade due to demand, from China, for their gill rakers, which are sold as medicinal products. Catches from the major existing fisheries are not even close to sustainable.

Few species are as vulnerable to overfishing as manta rays. We know that they have a very slow reproductive rate, producing only one large baby on average every one to three years. They also appear to be slow-growing and long-lived, with some wild manta rays being resighted over 30-year periods.

There is hope. Giant manta rays were added to the Convention on Migratory Species (CMS) in 2011, which is sparking coordinated national efforts toward protection of the species and their key habitats within member countries. Next year, the entire group is up for listing on the Convention on International Trade in Endangered Species (CITES). A listing on CITES would be an acknowledgment that the gill raker trade is a significant threat to manta and mobula rays, and would help encourage more effective conservation legislation.

Manta rays are amazing fish. The more we know about them, the more interesting they become. Let's make sure we keep them around!



MANTA PLAY // SIMON PIERCE



A SAD ENDING // SIMON PIERCE