

The broad-nose sevengill shark, also known as cow shark, has seven gill slits.

Text by Jamie Watts  
and Malcolm Nobbs  
Photos by Malcolm Nobbs  
and Andy Murch

It certainly looks “prehistoric”—whatever that means. Cigar-shaped, blunt-snouted, with that slightly “sock-puppet-looking” smirk, the overall look of this big beastie is very much that of an ancestral shark, like some of the deep-water dogfishes, the sleeper sharks and others. Indeed, fossil remains similar to modern sevengills and sixgills are known from the Jurassic and perhaps much earlier. And the way this shark is built, as far as we can tell from an incomplete fossil record, is very much how the first sharks were put together. Jamie Watts and Malcolm Nobbs have the story.

Hexanchiformes is the tiny order of just one family and five species that includes sixgill and sevengill sharks with (as their name suggests) six or seven pairs of gill slits, as opposed to the five pairs that almost every other

shark and ray has. Hexanchiformes also have just a single dorsal fin (most sharks and many rays have two), and the “ancient, dead-eye” look is perhaps enhanced by the lack of nictitating eye membranes. Also known

as “cow sharks,” these sharks have simple, unspecialised skeletons and digestive systems, with none of the evolutionary fine-tuning seen in many of the sleeker, “fancier” shark families.

#### Behaviour

We were warned that they were not shy and could be “nippy,” especially if there was bait in the water. And they are sizeable, solidly built sharks, two metres or more in length as

adults. Pretty widespread and found in temperate regions around much of the world, they are not shy of cruising kelp forests in shallow water and are curious about—and not intimidated by—divers.

# Sixgill & Sevengill

— Ancient Sharks in the Kelp

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Sevengills can be found in temperate kelp forests around the world, except in the North Atlantic.

scavengers, as well as predators of quite large fishes and invertebrates.

### Extra gill slits

A couple of species of rays (of the thousand or so species known) have extra pairs of gill slits, as do three others of the 500 known spe-

cies of sharks, including the two species of bizarre eel-like and snaggle-toothed frilled sharks, and the sixgill sawshark. Evolutionarily, it is relatively simple to “add” another gill slit. As best as we understand it, one gill slit is simply the appendage that the segment-

ed-wormlike ancestor of all vertebrates had at the sides of its head segments.

Eventually, some of these gill support segments (or something very like them) evolved and differentiated into jaws, jaw supports, spiracles and pectoral and pelvic limb girdles. It does not take much of a genetic change to “add” an extra one—or in the case of the sevengill, two—segments, but it does seem odd that it only happened a handful of times. Evolution seems to have given five as the most successful number.

### Where to see them

Of the five members of its family, the broadnose sevengill is by far the easiest for divers to encounter. They come up shallow into temperate kelp forests around



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Malcolm found them to be “sneaky sharks, appearing from all points of the compass as well as above and below.” They nibbled on his first stage and camera housing, apparently exploring with their mouths, much like a seal. Not surprisingly, they are frequent



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The bluntnose sixgill shark (above and left) is the giant of the *Hexanchidae* family, and is rarely seen by divers but may be spotted in night dives off Vancouver Island in Canada.



much of the world (although not the North Atlantic).

Simons Town in South Africa was long regarded as the best location to see them, although in recent years, orcas moving in to predate these sharks have been blamed for their absence from this area for a couple of years. It appears that they are back, albeit in small numbers.

Three other members of the family are rarely seen by divers, as they spend much of their time below diving depths, and are rather smaller, slimmer and shyer. Then there is the giant of the family, the bluntnose sixgill, which was recently brought to wider public attention by some spectacular footage in the BBC's *Blue Planet II*, with some huge specimens jostling with each other and the film crew's sub while feeding on a whale carcass.



Broadnose sevengill sharks (above and left) have large, thick bodies, with broad heads and blunt snouts.

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Spending most of their time far deeper than diving depths, bluntnose sixgills can nonetheless be seen in a handful of places in shallow water, and have been encountered on night dives off Vancouver Island for many years.

### Sixgill characteristics

Sixgill sharks are one of the biggest non-planktivorous sharks. As adults, they probably average almost the same length as great whites, although nothing as heavily or powerfully built. An adult bluntnose sixgill may weigh half a tonne, with the largest females probably well over a tonne; they are bigger than the largest tiger or hammerhead sharks, and similar in size to the big sleeper sharks.

Like sleeper sharks, these deep-water giants seem to live less active lives than those of the familiar shallow-water requiem or mackerel sharks, probably

scavenging more and preying on a range of slower-moving animals, and none of the cow sharks are considered a threat to humans. ■

*The sevengill and sixgill sharks photographed for this article were all encountered with Big Fish Expeditions, at Vancouver Island and in South Africa.*

*Jamie Watts is a marine ecologist, expedition leader and naturalist guide. Logging more than 290,000 sea miles on 2,300 days at sea and 145 expedition voyages, he has worked in the planet's most spectacular marine ecosystems, including two years with the British Antarctic Survey, ten summers shipboard in the Antarctic Peninsula, and nine northern summers around the High Arctic and northern Atlantic islands. In addition, he has also led and guid-*



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Sevengill sharks are scavengers but also prey on large fishes and invertebrates.

*ed expeditions through Indonesia, Papua New Guinea, the Solomon Islands and Vanuatu.*

*Based in Nelson Bay in New South Wales, Australia, UK native Malcolm Nobbs is a widely published underwater photographer and regular contributor to both Australian and dive magazines around the world. Formerly an active member of the British Society of Underwater Photographers (BSOUP), he moved to Australia in 2009, after penning his first underwater magazine article. Teaming up with Jamie Watts in 2013, the pair have produced a constant stream of articles. Over the years, Nobbs has steadily expanded his website into one of the world's largest scuba-related websites, with over 10,000 categorised and searchable marine life images, numerous dive site location reports, published works and videos. Visit: [malcolmnobbs.com](http://malcolmnobbs.com)*



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Tiger beach, Bahamas. Are sharks getting bigger because of tourists, or is it the bigger sharks that are interacting with tourists?

## Tiger sharks that interact with tourists are larger, study shows

**Female tiger sharks that frequently visit Tiger Beach, a popular dive spot in the Bahamas, are larger and have higher hormone levels than other individuals of the same species that spend less time there, researchers find.**

That feeding or attracting wildlife with food to enable better viewing opportunities by ecotourists (i.e. provisioning tourism) has the potential to alter the natural behaviour and physiology of animals has long been well established. But how the physiological state of wildlife might be related to the nature and magnitude of these effects remains poorly understood.

However, as regards tiger sharks, a group of scientists in Brazil and the United States have discovered that females that frequent Tiger Beach in the Bahamas are larger and have higher hormone levels than other individuals of the same species that spend less time there. Tiger Beach is world-renowned for its tiger shark diving encounters, making it one of the premier dive destinations in the world.

### Harmful or not?

The findings point to possible effects of mass tourism on these sharks, but it is not clear whether it is overall positive or negative.

"We can't say whether tourism is or isn't harming these animals, as we were unable to collect material for testing be-

fore and after interaction with divers, which would have been ideal. However, we now have a body of evidence that will be helpful for future evaluations," said Renata Guimarães Moreira, second author of the article and supervisor of the study.

### Cause or effect?

While more studies are needed to explore whether sharks are making these decisions because of their physiological state or whether spending more time at provisioning sites results in an altered physiological state, the findings highlight the importance of considering animal life stage, endocrine regulation and nutritional condition when evaluating the biological impacts of provisioning tourism. ■

SOURCES: ANIMAL BEHAVIOUR

## More than 50 species of sharks given further protection

**Landmark decision limits or regulates the commercial trade in 54 shark species of the requiem family, including tiger, bull and blue sharks.**

The 186-nation Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has voted for the first time to regulate the trade that kills millions of sharks every year.

The measures regulate the commercial trade in 54 shark species of the requiem family,

including tiger, bull and blue sharks, which are the most targeted in the fin trade. Most requiem sharks are threatened with extinction, according to the International Union for Conservation of Nature Red List.

Six small hammerhead shark species were also listed for protection, along with 37 types of guitarfish, which are shark-like rays.

Together, the new regulations place nearly all shark species traded internationally for their fins under CITES oversight and controls, up from only 25 percent prior to the CITES CoP19.

The shark species proposals were keenly anticipated. Many marine species have seen large drops in their numbers either due to overfishing or being caught as by-catch where another species is being targeted. The proposal on requiem sharks included a number of species, not necessarily endangered but for the reason that they are hard to tell apart from other species that are endangered. The recommendation to include all such species is to try to conserve those at risk. ■

SOURCE: CITES



The lemon shark (*Negaprion brevirostris*) is classified as a Vulnerable species.



## Largest known manta ray population is thriving off the coast of Ecuador

Scientists have identified off the coast of Ecuador a distinct population of oceanic manta rays that is more than 10 times larger than any other known subpopulation of the species, Oregon State University reports.

Although manta rays are readily capable of long-distance movements of hundreds if not thousands of kilometres, most populations appear to be philopatric (tending to return to or remain near a particular site or

area — ed.) with few examples of long-distance dispersal.

Oceanic manta rays, the largest ray species, were listed as threatened under the US Endangered Species Act in 2018. In 2019, their threat category increased from vulnerable to endangered on the International Union for the Conservation of Nature's Red List.

Population dynamics are, however, notoriously difficult to study because the rays tend to spend their time in offshore locations that are hard for re-

A manta ray near Isla de la Plata, off the coast of Ecuador (right); Graphic showing the demographics and dynamics of the world's largest known oceanic manta ray population in coastal Ecuador (bottom left)



FUNDACION MEGAFUNA MARINA DEL ECUADOR / PRESS RELEASE

searchers to access, and their visitation patterns can be unpredictable.

But in the late 1990s, it was discovered that a population of oceanic manta rays aggregate in August and September each year around Isla de la Plata off the coast of Ecuador, where they are relatively easy to locate and study. It is also a popular diving area, and visitors take numerous photographs of the animals, providing researchers with a trove of data.

rays and estimate a total population of more than 22,000. The researchers' findings suggest that conditions in the region are particularly favourable for a large, healthy manta ray population.

*That is significantly larger than what we've seen in oceanic manta ray populations elsewhere. This is by far the largest population that we know of.*

— Guy Stevens, chief executive and founder of The Manta Trust

### Unique pattern

As each manta ray has a unique spot pattern on its belly, photos of individual rays taken by researchers and scuba divers made it possible for scientists to identify individual animals and track their movements and locations over time.

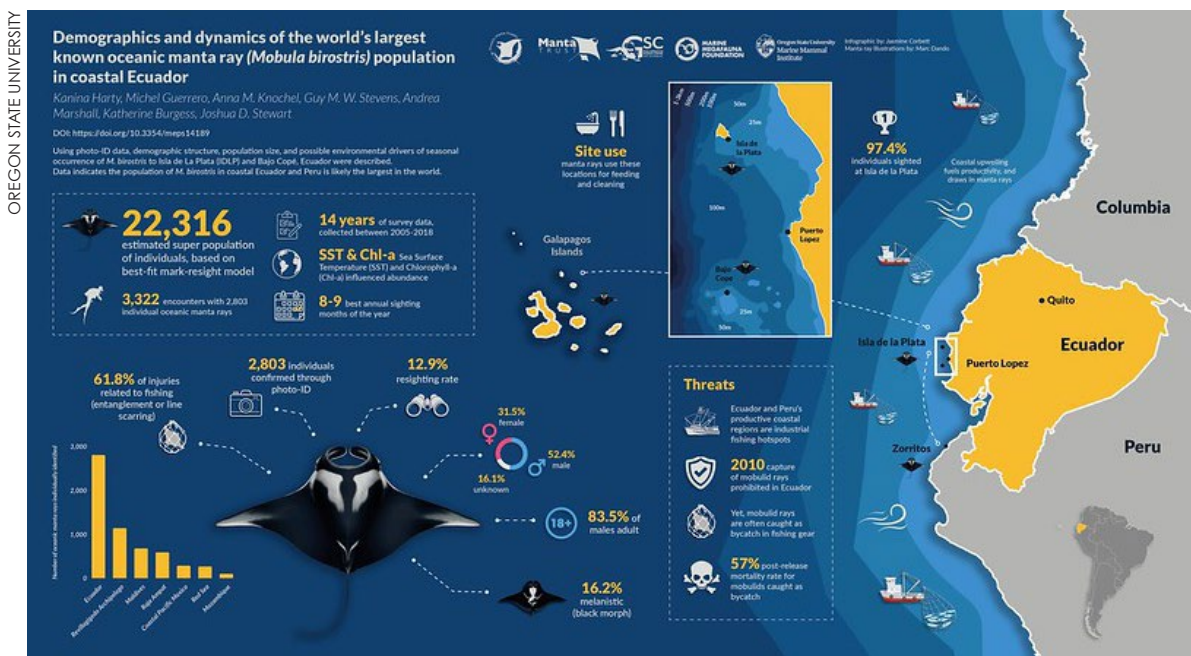
Data collected between 2005 and 2018 enabled the researchers to identify more than 2,800 individual

### Facts

The best-fit mark-resight model estimated a super-population size of 22,316 individuals, with annual estimated abundances of 949-7,650 females and 5,226-9,340 males. A localised sampling of this highly mobile species limits the interpretations of mark-resight analy-

ses, but provides lower bounds for total abundance that indicate the population of *M. birostris* in coastal Ecuador and Peru is likely the largest in the world. ■

SOURCES: OREGON STATE UNIVERSITY, MARINE ECOLOGY PROGRESS SERIES



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