



FISHERIES FACT SHEET

RAYs



Rays

Class Chondrichthyes

Photo: Shannon Conway

Winged wonders of the sea

With their wide wing-like pectoral fins, several species of rays can often be observed gracefully gliding through water close to shores and reefs in Western Australia. Yet we know relatively little about these fascinating 'sea angels'. Some fishers consider them pests, snaffling bait intended for species regarded as being more edible – but rays play an important role in our marine ecosystems as scavengers and predators, and warrant closer study.

A dazzling array of rays

Rays come from a diverse group of fishers called Chondrichthyes and are closely related to sharks. Like sharks, their skeletons are made from cartilage – which has strengthening properties like bone, but is lighter and more flexible. Though they vary in size and shape, they all have a flattened body with broad pectoral fins that in most species of rays form a rounded 'body disc'. Their gills are located under this disc. There is a vast array of ray species worldwide, with around 600 kinds identified to date. Western Australia is home to scores of these species including the manta ray – the largest species of ray in the world – with their disc measuring up to a staggering nine metres wide.



Like sharks, many rays give birth to live young (animals that do this are called 'viviparous').

Where are rays found?

Rays have adapted to live both inshore and far out at sea in depths of more than 200 metres. They are found in oceans throughout the world, from the tropics to the freezing cold waters around the Arctic and Antarctic. In Western Australia, species of rays can be encountered all the way along our coastline. Rays generally live and feed on the bottom or close to it – one notable exception is the manta ray, which is pelagic (swimming in the mid to upper levels of the water column), so glides through the open ocean feeding on plankton.

Around a ray

Spiracles: located behind the eyes, these openings can take in and expel water rapidly, clearing sand from gills and exposing prey.

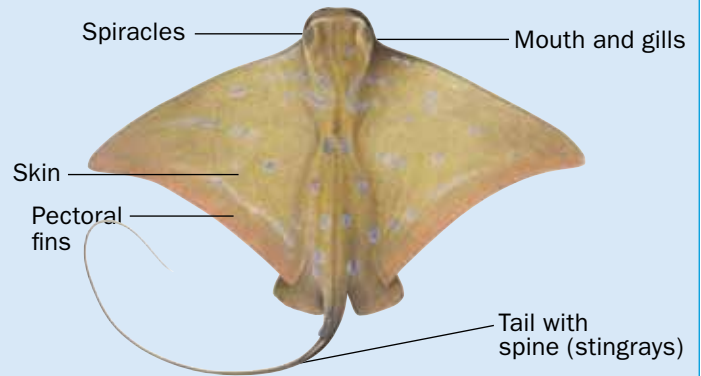
Skin: has a similar texture to the sandpaper-like skin of sharks and is covered with miniscule tooth-like scales called 'denticles'. Some species also have hard or soft bumps on their skin called tubercles.

Pectoral fins: in all species of ray, their pectoral fins are joined to the head and the trunk (their main body) giving them a flattened disc-like appearance.

Mouth: rays can be selective eaters, targeting very specific types of prey. Evolution has fitted different ray varieties with different mouths. Some rays, like eagle rays, have plate-like teeth used to crush molluscs, while other rays have rows of strong, pointed teeth to hold onto prey.



Gills: most rays have five pairs of gill slits (although one species has six) located on their underside.



Tail with spine (stingrays): most kinds of stingray have one or two venomous spines in their tails. Stingrays are generally not aggressive creatures, but they can whip their tails up and forward, flicking the spines to 'sting' would-be attackers.

Good vibrations

Rays eat molluscs, crustaceans, worms and small fish. Their mouths, located on their underside, make them well suited to 'bethnic' or bottom feeding.

But this feature, along with the common location of their food source beneath the sea bed, means rays are often unable to see what they are going to eat. To get around this, rays have developed highly sensitive sensory systems for detecting their prey.

These systems include the ability to sense minute water vibrations from a distance and a highly developed sense of smell.

Rays are capable of picking up the 'aura' of organisms buried under sand or mud. Using organs known as 'ampullae of Lorenzini', clustered around their heads and mouths, many rays are able to sense electric signals given out by the muscles and nerves of their potential prey.



Rays often pump water through their mouth and gills, and release jets of water through their spiracles, to expose sediments and uncover their prey. This behaviour often leaves a 'feeding pit', surrounded by small piles of crushed shells.

Water 'wings'

Many ray varieties bury themselves in the sand by flapping their pelvic fins and pumping sand out through their spiracles, stirring up a cloud



Photo: Gilbert Stokman

of sand over themselves that covers everything but their eyes, spiracles and sometimes their tail.

When rays move off, they can accelerate quickly through the water, especially if they need to get away from a threat – their preferred defensive action.

Some rays, such as the eagle ray, will flap their pectoral fins like a bird and others, such as the smooth ray, move them in a wave-like motion. This ability allows them to move both forwards and in reverse.

Shocking behaviour

Rays can generate electric jolts through specially adapted organs.

Electric currents produced by some ray species, such as the short-tail torpedo ray, are generated in cells called 'electrocytes'. When an electrocyte is stimulated, ions (electrically-charged atoms) shoot across the cell membrane resulting in an electric discharge.

Some rays, like the aptly named coffin ray, can give off shocks up to 220 volts – strong enough to fell a fully grown footy player!



Electric rays were used by the ancient Greeks as an anaesthetic to supposedly numb the pain of operations and childbirth. Interestingly, the Greek word for these rays is *narke*, from which the word 'narcotic' is derived.

A sting in the tail

Stingray stingers are razor-sharp barbed or serrated cartilaginous spines that grow from their whip-like tails (like a fingernail) and can reach up to 40 centimetres. On the underside of the spine are two grooves containing venom-secreting glands. The entire spine is covered with a thin layer of skin called the 'integumentary sheath', in which the venom is concentrated.

The venom's enzymes break down and kill cells, and provoke intense muscle contractions.

Although sometimes having a reputation for being hostile, stingrays are generally placid creatures and don't attack aggressively. When threatened, their primary reaction is to swim away. However, when confronted by predators or stepped on, rays whip up the barbed stinger in their tail. This attack is normally ineffective against their main predator – sharks.

Humans are usually stung in the foot or lower leg, although those who harass stingrays have been known to be stung elsewhere. The stinger usually breaks off in the wound, causing intense pain and swelling from the venom, and possibly later, bacterial infection. Fatal stings are very rare, but can happen.

One tragic example was the death of TV celebrity naturalist Steve Irwin, who was pierced in the chest by a stingray barb while snorkelling in very shallow water in Queensland.

Fishers should exercise extreme caution when any ray is hooked – avoid touching the ray by leaving the fish in the water and cut the line free at least 30 centimetres from the hook. The hook should eventually work its way out of the ray's mouth.

The majestic manta

The manta ray is the largest species of ray in the world. Disc widths in mantas have been measured up to an incredible nine metres across!

Mantas feed on plankton, funnelling it into their mouths through prominent fleshy extensions called 'cephalic lobes'. They still possess more than 300 rows of tiny peg-like teeth, which male fish use to grab on to the pectoral fin of females when mating.

Manta rays live in tropical marine waters worldwide, but are also found occasionally in temperate seas. In Western Australia, they aggregate (gather in numbers) at Ningaloo Reef, particularly between March and April.

Mantas can sometimes be observed leaping out of the water and crashing back down into the sea. The huge slapping noise made by this behaviour can be heard several kilometres away. A theory for this is that the rays are trying to clean themselves of parasites; another is that it is actually a form of play for the mantas.



A pair of manta rays glide gracefully through Ningaloo reef.
Photo: Carina Gemignani

Western Australian ray species spotlight

These are some of the more prominent species of rays found in WA coastal waters.

Smooth ray

Dasyatis brevicaudata

Distribution: Shark Bay, WA, to Maroochydore, Qld; also Tasmania, New Zealand and Southern Africa.

Habitat: Sand, seagrass and reef. Depth: zero to 100 metres.

Size: Length to 4.3 metres.

Diet: Molluscs, crustaceans, worms and occasionally small fish.



Photo: Gilbert Stokman

Australian eagle ray

Myliobatis australis

Distribution: Jurien Bay, WA, to Moreton Bay, Qld, and Tasmania.

Habitat: Sand, seagrass, reef. Depth: zero to 85 metres.

Size: Length to 2.4 metres.

Diet: Crustaceans, molluscs and worms.



Photo: Sue Barstow

Blue spotted fantail ray

Taeniura lymma

Distribution: Central coast of WA to northern coast of NSW.

Habitat: Sand and reef. Depth: zero to 15 metres.

Size: Length to 70 centimetres, width to 30 centimetres.

Diet: Worms, crustaceans and molluscs.

Defence: Can have two venomous spines on its tail.

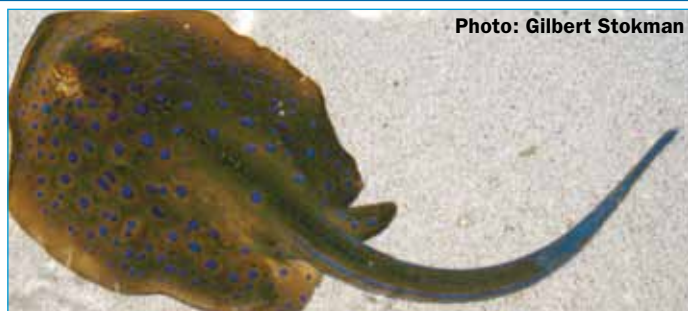


Photo: Gilbert Stokman

Coffin ray

Hypnos monopterygium

Distribution: Broome, WA, to Caloundra, QLD.

Habitat: Moderately exposed sand. Depth: zero to 220 metres.

Size: Length to 69 centimetres.

Diet: Comparatively large fish.

Defence: An electric centre behind the eyes allows them to deliver electric charges as powerful as 220 volts and to repeat the charges fifty times within 10 minutes.



Photo: © CSIRO Marine and Atmospheric Research

Hamelin Bay stingrays

One of the best locations in Western Australia to observe stingrays is Hamelin Bay near Augusta. Here, massive smooth stingrays and eagle rays regularly approach swimmers and fishers looking for a free meal.

This remarkable behaviour began in the area in the 1950s and 1960s when commercial fishers cleaned their catch and discarded the guts in the water, around 50 metres off the shore. The installation of a fish-cleaning table on the shore for recreational fishers brought the scrounging stingrays in even closer.

Stingrays in this area have shown no harm or aggression towards humans unless provoked.



Feeding rays in Hamelin Bay. Photo: Steve Foster



A group or collection of stingrays is commonly referred to as a 'fever' of stingrays.

Ray protection

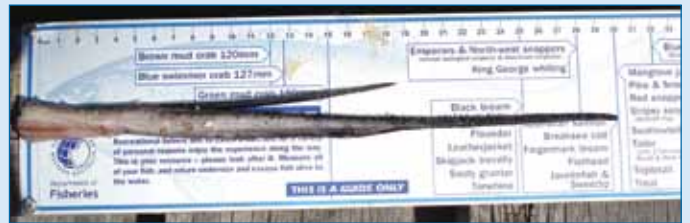
Together with sharks, all rays are commercially protected in Western Australia. This means that only a few commercial fisheries are authorised to keep their shark and ray catches for sale. One exception to this rule applies to the sawfish family of rays (see *Fisheries Fact Sheet – Sawfish*). Because of catastrophic declines in the numbers of sawfish populations around the world, all species are protected in Western Australia, where they are still relatively abundant.

Hacked off

Some fishers have been known to hack off stingray barbs due to the threat of being stung and through branding them a 'nuisance' fish.

This practice is not only cruel but leaves the animal defenceless in its natural environment.

As with electric rays, if stingrays are hooked, they should not be touched. See the 'Shocking behaviour' section overleaf for advice on releasing hooked rays.



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Glossary

Cartilage

Dense supportive tissue, which is heavily calcified in shark and ray skeletons

Chondrichthyes

The class of cartilaginous fishes which include sharks, rays, skates and chimaeras

Ecosystem

A dynamic complex of plant, animal and micro-organism communities and their non-living environment that interact as a functional unit

Plankton

Tiny plants and animals that live near the ocean surface and are carried by currents

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FURTHER INFORMATION

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