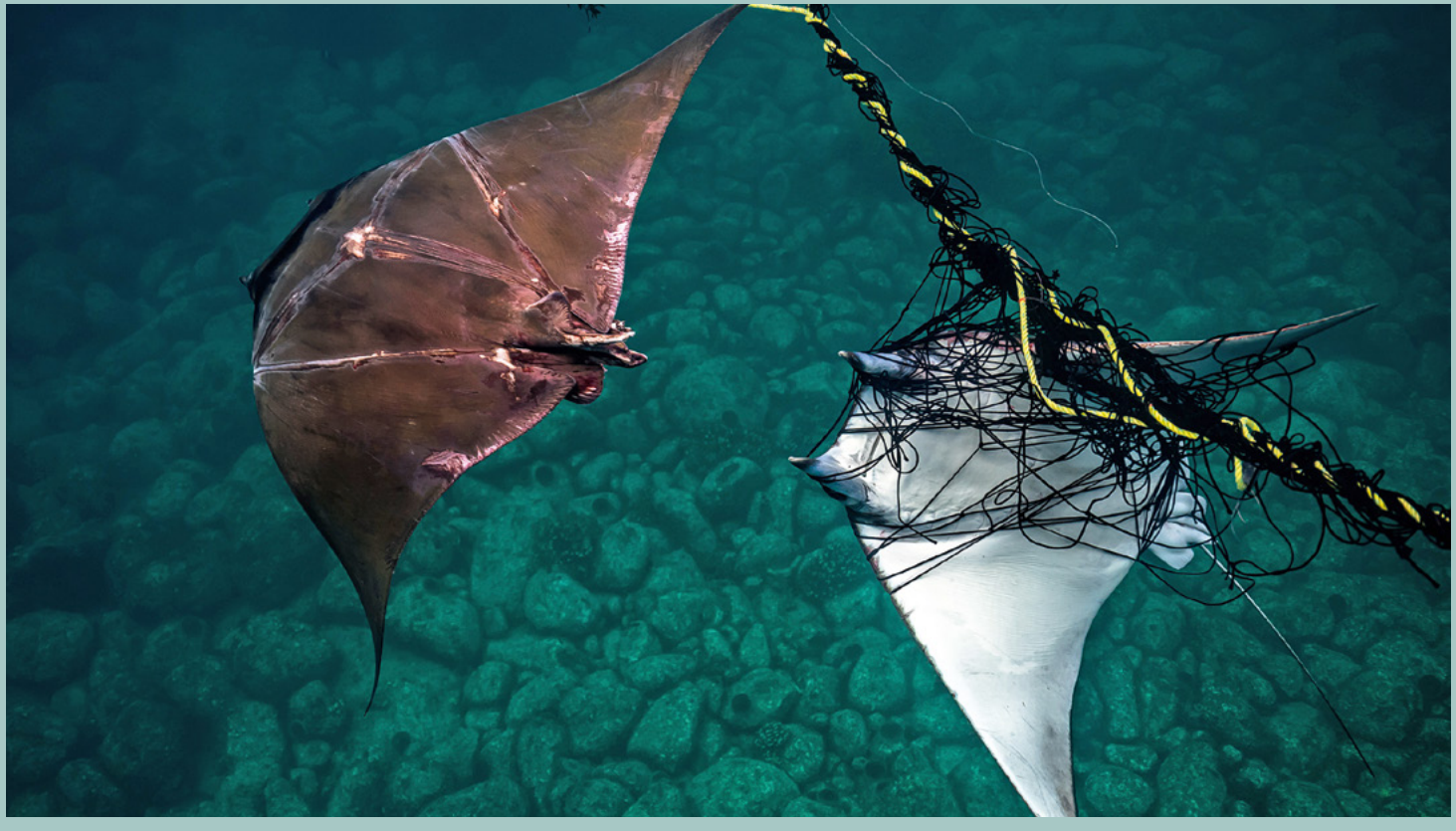
Field Guide to Manta & Devil Rays in Pacific Ocean Fisheries



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Cover photo: Corey Nevels

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Manta TRUST

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INTRODUCTION

Mobulid rays (manta and devil rays) are some of the ocean's slowest growing and most vulnerable species. They are all considered threatened or endangered with extinction primarily due to fishing mortality from capture in target and non-target fisheries. This guide was developed to improve species specific catch and landings data to improve population assessments, identify best handling and release practices that enhance post-release survival rates, and ultimately reduce the impact that fishing has on mobulid ray populations across the Pacific Ocean.

How to use this guide

This guide begins with a section that describes the morphology and reproductive characteristics of mobulid rays. A dichotomous key was created to simplify identification based on; **region** (Western Pacific Ocean and Eastern Pacific Ocean); **size** of the animal and, **coloration** or markings. The key then points the reader to primary characteristics and basic biology species cards for additional information. This guide also highlights the data that needs to be collected for each mobulid interaction and gives recommendations on how to safely release these rays in both longline and purse seine fisheries.

A glossary of terms can be found at the end of the guide (inside the back cover) on page 43.

Photos L to R:
Kaitlyn McQueeney;
Corey Nevels

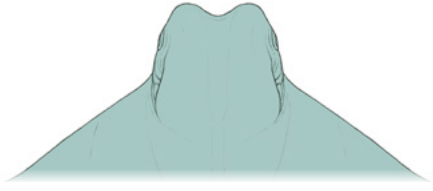
MORPHOLOGY

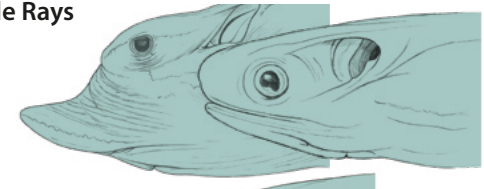
Head shape

This guide is focused on identifying manta and devil rays from the family Mobulidae. Head shape is the quickest way to distinguish between the different groups of rays and to identify mobulids. This guide is only useful if your ray has cephalic fins extending beyond the head as shown in the drawings to the right.

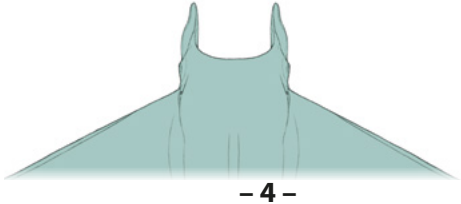
Round or pointed snout ➤ Stingray

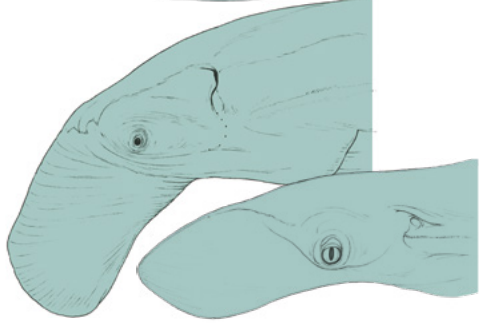
Broad, flattened snout (rostral fin) that extends beyond the head ➤ Cownose and Eagle Rays





Cephalic fins that extend anteriorly beyond the head ➤ Manta and Devil Rays

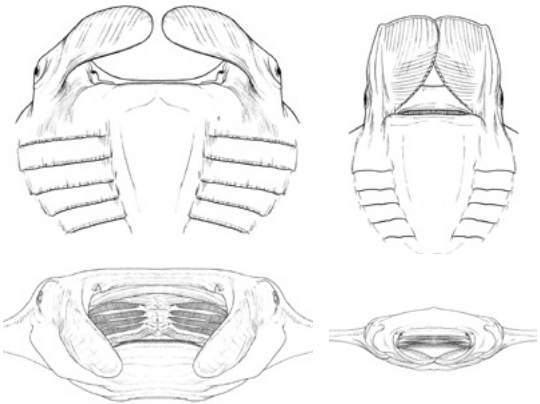




Mobulid morphology

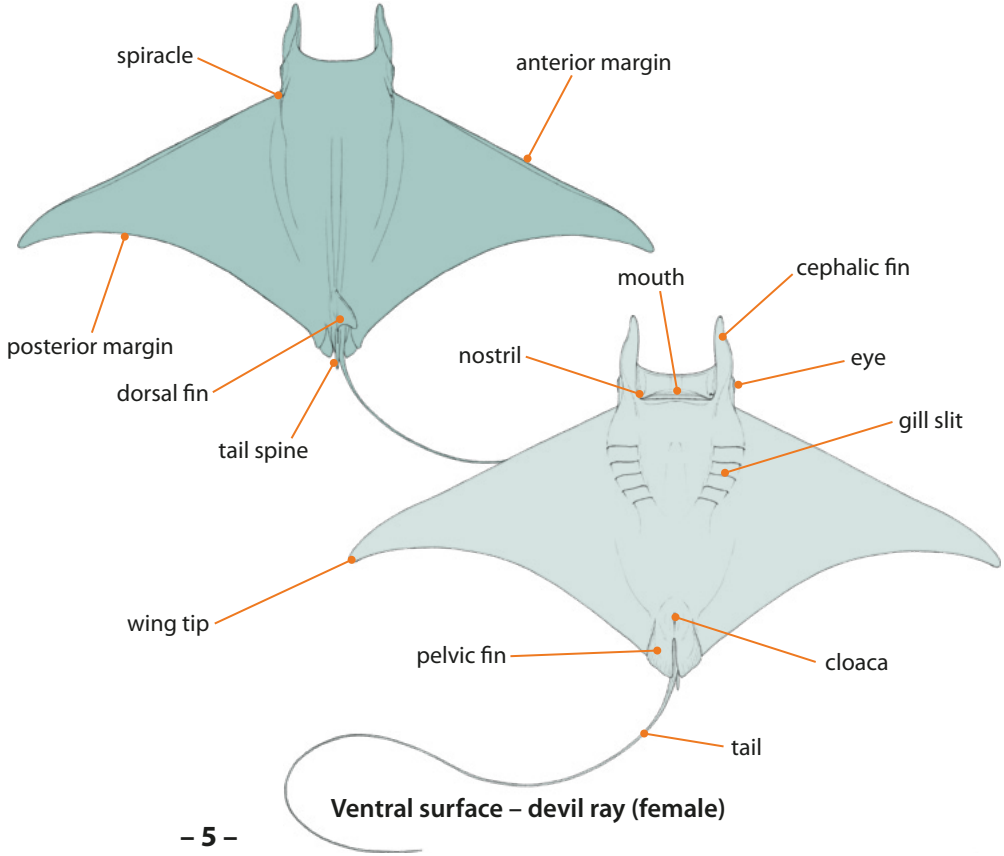
Mobulid rays

a) Manta rays **b) Devil rays**



All manta and devil rays from the family Mobulidae have cephalic fins that extend anteriorly beyond the head. They can be distinguished from each other by the orientation of their mouths.
Manta rays have terminal mouths that are forward facing at the end of the head (a). While devil rays have subterminal mouths, located on the underside (or ventral surface) of the head (b).

Dorsal surface – devil ray



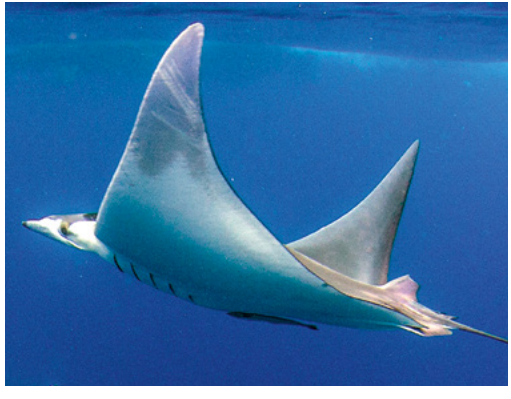
Ventral surface – devil ray (female)

REPRODUCTION

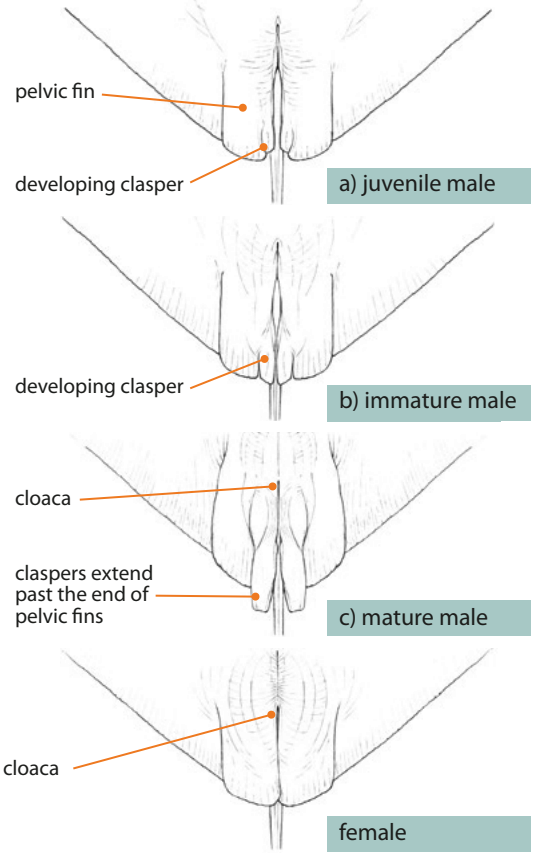
Determining sex

Mobulid sex can be determined by examining the external anatomy on the ventral side of the animal. In males, like in all sharks and rays, maturity stage can be determined by examining the size and hardness (calcification level) of their sexual organs, which are called claspers. When a male reaches sexual maturity, his small, soft, pliable claspers become enlarged, calcified and hardened for use in mating. The animal is considered mature when its claspers extend past the end of the pelvic fins (diagram C and lower left photo).

Female mobulids do not have claspers. Maturity can be determined externally through visible pregnancies, and through the presence of permanent mating scars on the pectoral fins (see lower right photo), although scarring caused by fishing gear may make observing these markings difficult. Any additional assessment of reproductive state requires internal inspection of reproductive organs.

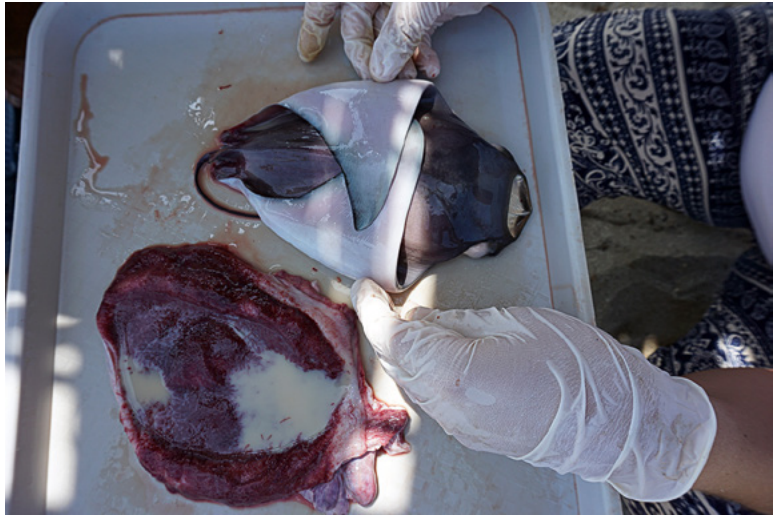


Ventral view of a mature male *M. munkiana*. Photos L to R: Manta Trust, Stefany Rojas; Duncan Murrell



Mobulid rays reproduce by ovoviviparity, meaning they give birth to live pups. However, unlike many placental animals the mobulid embryo hatches from an egg inside the female, and is initially fed by a yolk sack and later by a lipid-rich fluid called histotroph. Gestation periods (or the length of pregnancy) are long and can vary between 12–13 months for most species. They produce one live-born pup (rarely two) every 1–5 years, although the average time between pregnancies is unknown for most species.

These characteristics make mobulid ray populations extremely vulnerable to fishing mortality, since they cannot replace themselves rapidly. In the womb, manta and devil ray pups develop with their wings wrapped around their body. At birth they separate from their mothers, extend their wings and swim away. There is no maternal input or care for the pups after birth.



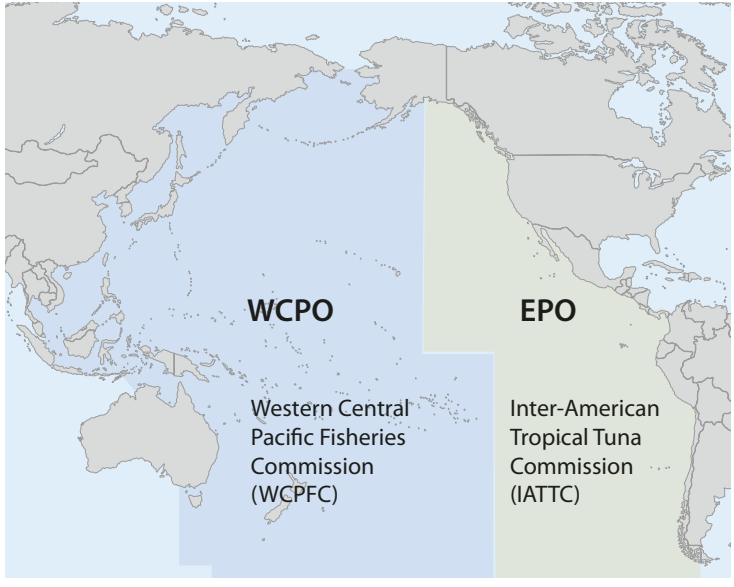
This *M. munkiana* fetus was at a late developmental stage. It shows how the wings are wrapped around the body in the uterus. In the photo above, the uterus and lipid histotroph (white fluid) are also visible. Photos: Manta Trust, Stefany Rojas

This *M. munkiana* fetus, a few months into development shows the yolk sack through which the embryo receives nutrition. After the yolk is resorbed, lipid-rich uterine 'milk' is secreted into the uterus. Photo: Manta Trust, Stefany Rojas

SPECIES BY REGION

WCPO
Western Central Pacific Ocean

Mobula birostris
Mobula alfredi
Mobula tarapacana
Mobula mobular
Mobula thurstoni
Mobula eregoodoo
Mobula kuhlii



EPO
Eastern Pacific Ocean

Mobula birostris
Mobula tarapacana
Mobula mobular
Mobula thurstoni
Mobula munkiana

Note that on species distribution maps (pages 23–37), darker blue areas indicate confirmed range; while lighter blue areas indicate expected range.

Of the eight mobulid species that occur in the Pacific Ocean, only four are found in tropical and sub-tropical waters across the whole ocean basin, *Mobula birostris*, *M. tarapacana*, *M. mobular* and *M. thurstoni*. While *M. alfredi*, *M. eregoodoo* and *M kuhlii* are only found in the Western Central Pacific Ocean (WCPO). *M. munkiana* is only found in the Eastern Pacific Ocean. Mobulids are often captured in tuna fisheries. In the Pacific Ocean, tuna and tuna-like fisheries are managed by two Regional Fishery Management Organizations (RFMO); Western Central Pacific Fisheries Commission (WCPFC; wcpfc.int) and the Inter-American Tropical Tuna Commission (IATTC; IATTC.org). The convention areas of these RFMOs are shown above. **Both RFMOs have recognized the vulnerability of all mobulids to overfishing and as such have implemented conservation and management measures that ban the retention of all mobulid ray species, and identified best handling and release recommendations for returning them to the sea unharmed.

SPECIES ID (EPO & WCPO)

1a **Terminal (forward-facing) mouth and large head to disc width (21–22% DW). (For disc width see page 12.)**

YES go to 2 (p.10)

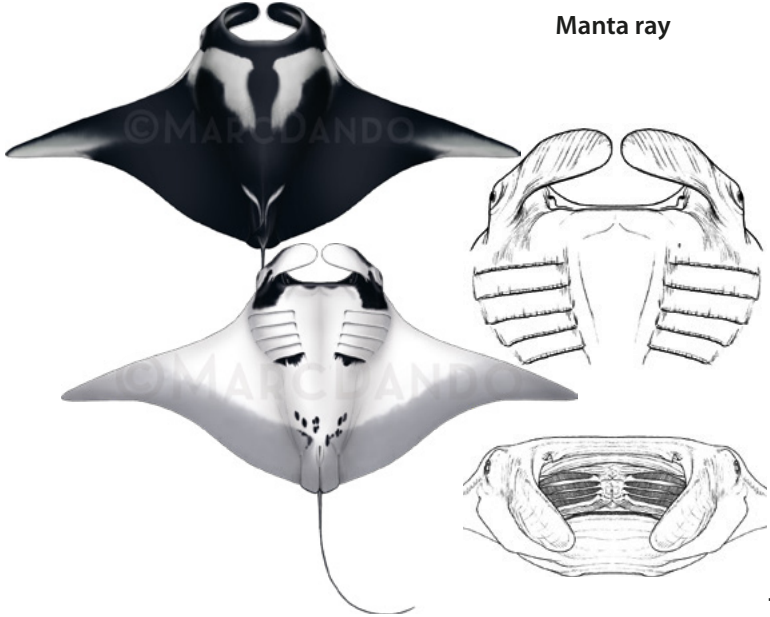
Ventral coloration either white with black spots, and/or dark shading on posterior margin of pectoral fins; or mostly black except for white patches over abdomen (melanistic).

1b **Ventral (downward-facing) mouth and narrow head relative to disc width (16–17% DW).**

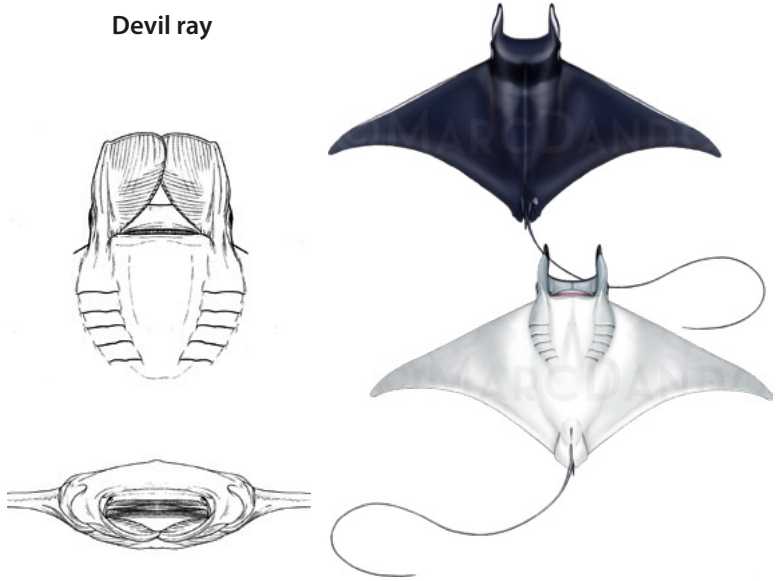
YES go to 4 (p.12)

Total disc width <380cm.

Manta ray



Devil ray



Region-specific Species ID

2a **In which region was this specimen caught?**

Western Central Pacific Ocean → 2b

Eastern Pacific Ocean → *Mobula birostris* (p.22)

2b **Fully black dorsally and ventrally, except for a white patch toward gill area ventrally.**

YES → 3 (p.11)

NO → 2c

2c **Dorsal white shoulder markings form two mirror image right-angle triangles creating a ´T´ in black.**

YES → *Mobula birostris* (p.22)

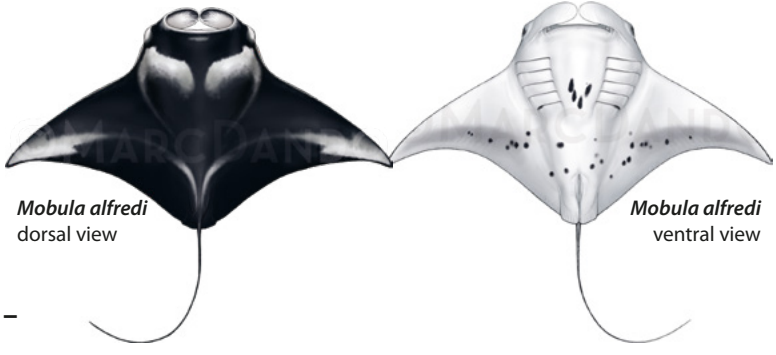
If present, ventral spots clustered around lower abdominal region. Gill covers (particularly 5th gill) usually with black shading/flaring. Knob-like bulge housing vestigial spine at base of tail. *Leucistic specimens have a lighter dorsal and ventral coloration (**see p.18**).

Mobula birostris
dorsal view

Mobula birostris
ventral view

NO → *Mobula alfredi* (p.24)

If present, ventral spots often between branchial gill slits and across trailing edge of pectoral fins and abdominal region. Dorsal white markings may fade rapidly after death. Trailing edge of pectoral fins falcate. Slight depression at base of tail, although occasionally a small bulge and vestigial spine present. *Leucistic specimens have a lighter dorsal and ventral coloration (**see p.18**).



Mobula alfredi
dorsal view

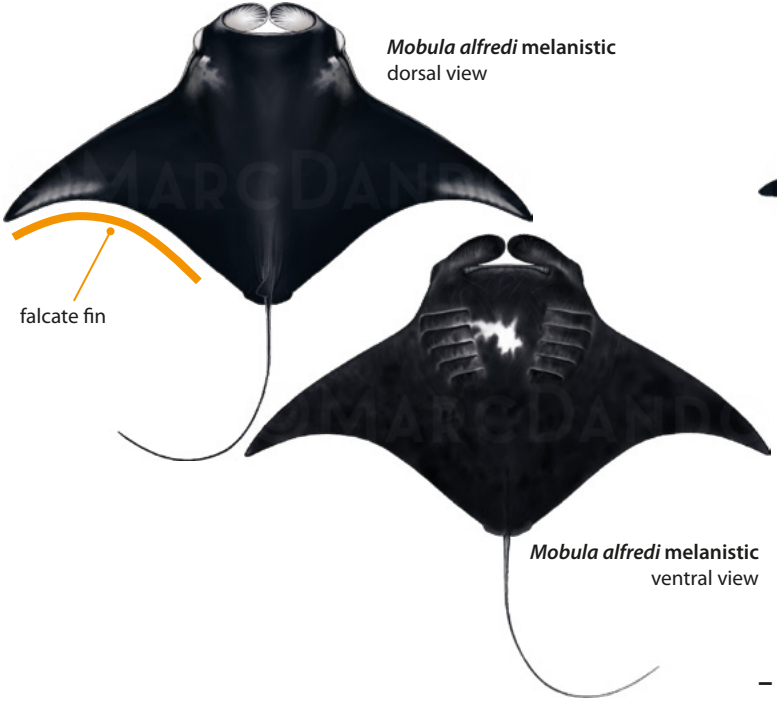
Mobula alfredi
ventral view

Melanistic manta rays

3 **Trailing edge of pectoral fins is falcate (curved).**

YES → *Mobula alfredi* (p.24)

Maximum DW < 500cm. Slight depression at base of tail, although occasionally a small bulge and vestigial spine present.

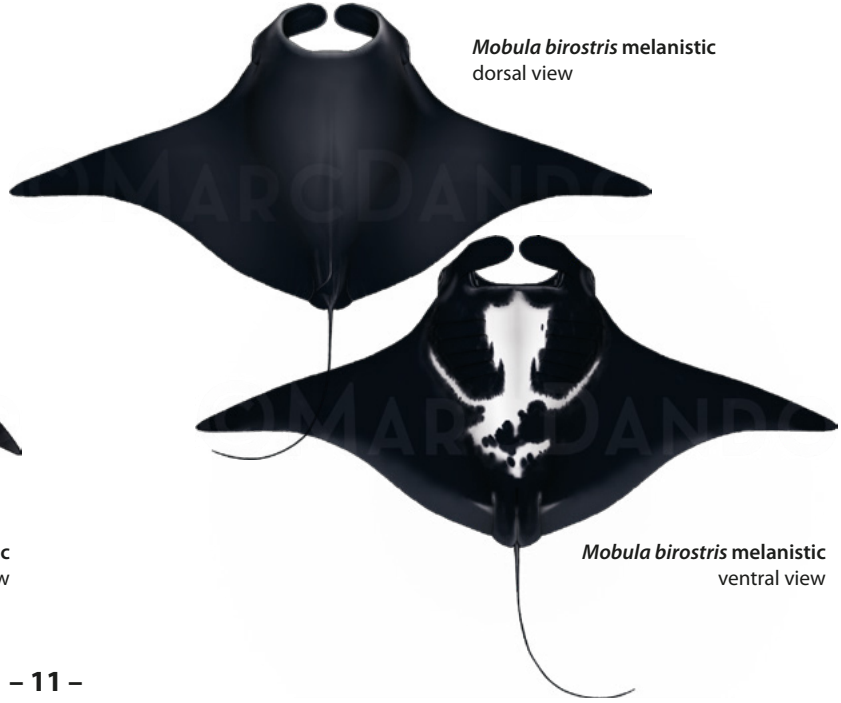


Mobula alfredi **melanistic**
dorsal view

Mobula alfredi **melanistic**
ventral view

NO → *Mobula birostris* (p.22)

Maximum DW < 700cm. Knob-like bulge housing vestigial spine at base of tail.



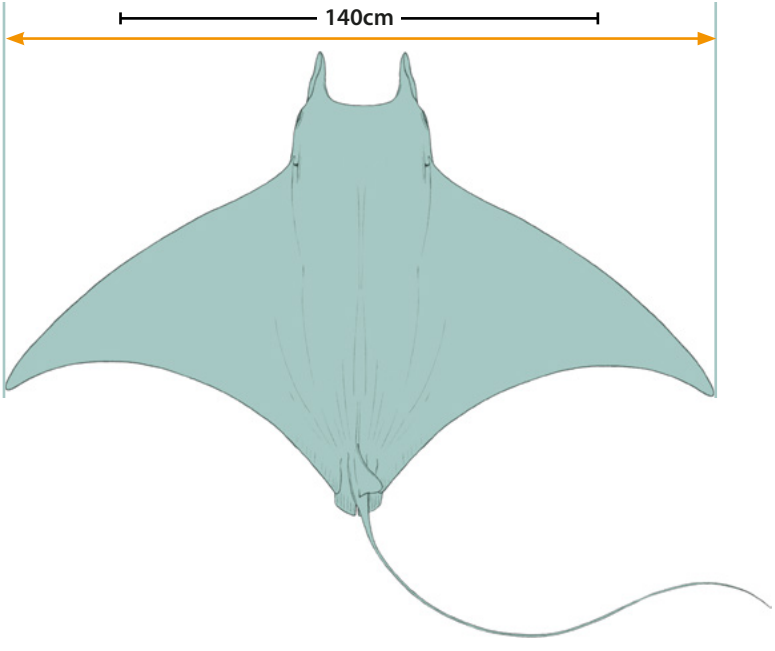
Mobula birostris **melanistic**
dorsal view

Mobula birostris **melanistic**
ventral view

4 **Total disc width (DW) is larger than 140cm.**

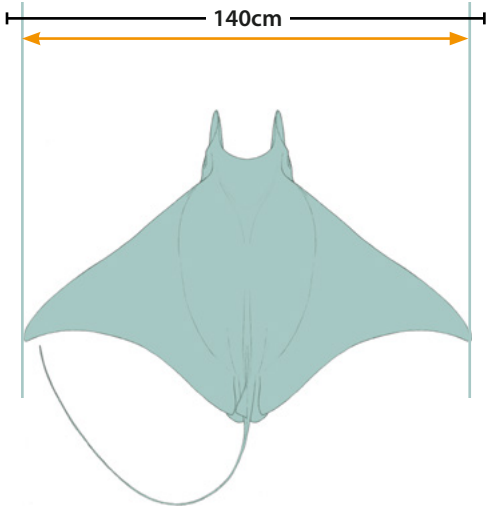
YES → 5 (p.13)

DW wider than 140cm.



NO → (p.15)

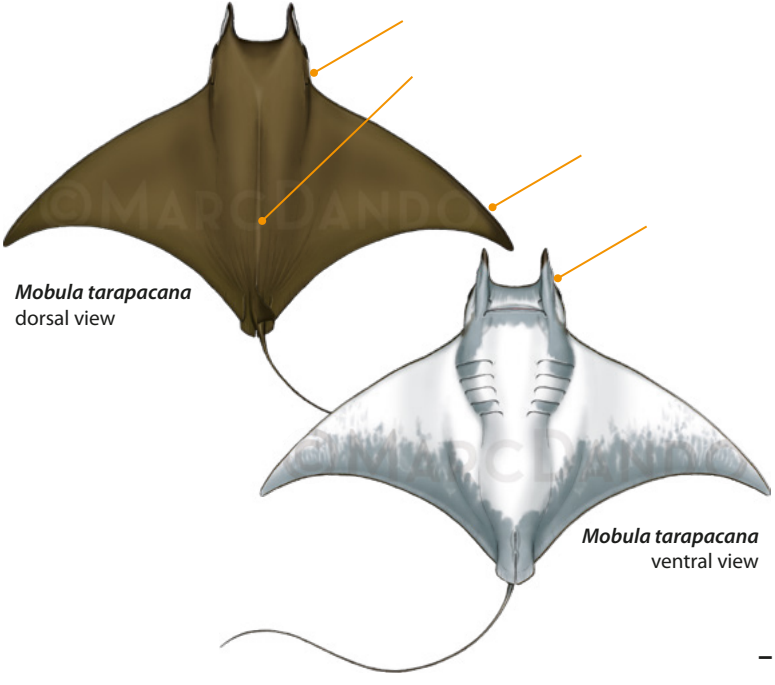
Small size, DW less than 140cm.



5 **Uniform brownish, or gray to olive-green dorsal color (no white fin tip). Gray ventral shading on posterior margin of pectoral fins, white anteriorly.**

YES → *Mobula tarapacana* (p.26)

Large: max. size > 380cm DW. Long-necked appearance; trailing edge of pectoral fins distinctly falcate; gray/silvery mouth and underside of head. Tail shorter than DW and covered in scales. Spiracle in an elongated longitudinal slit under a ridge above and behind margin of pectoral fin where it meets body. Distinctive pronounced ridge along dorsal midline.

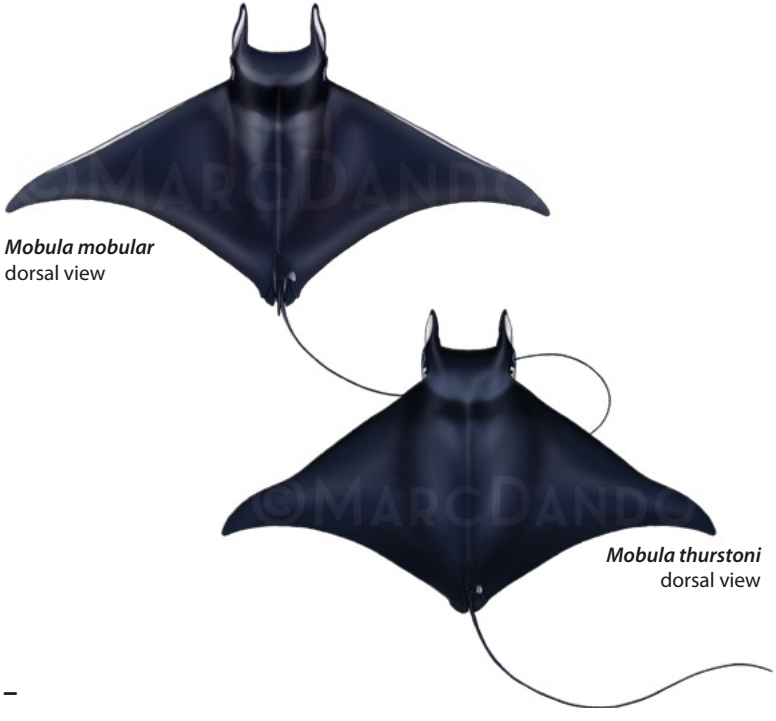


Mobula tarapacana
dorsal view

Mobula tarapacana
ventral view

NO → 6 (p.14)

Dark or bluish dorsal color, dorsally. White-tipped dorsal fin.



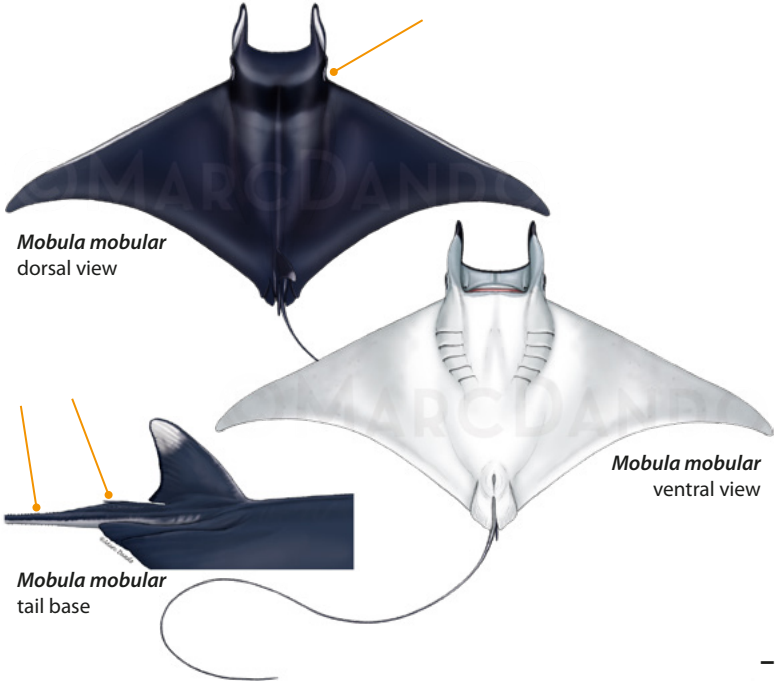
Mobula mobular
dorsal view

Mobula thurstoni
dorsal view

6 **Fully white ventral surface.**

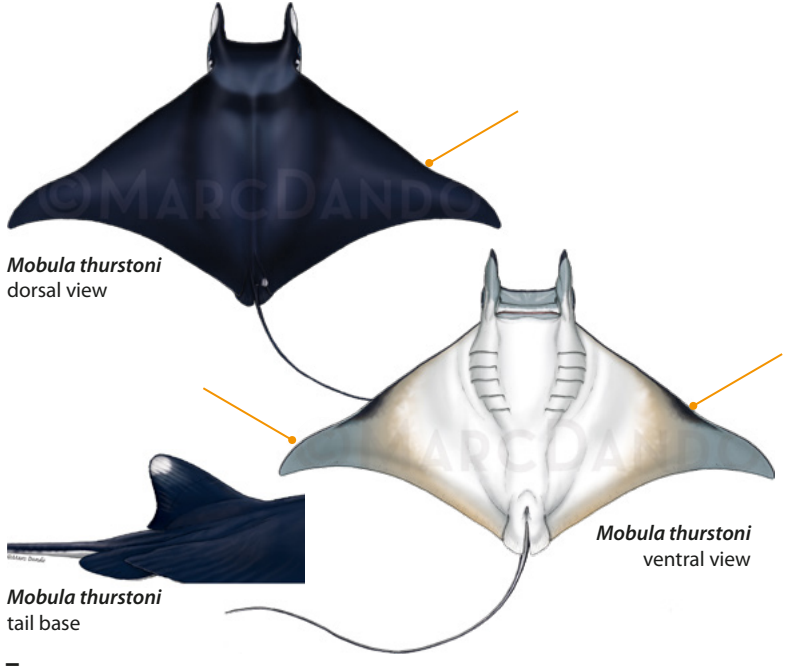
YES → *Mobula mobular* (p.28)

Max. size < 340cm DW. White ventral markings wrap-up behind eye and clearly visible when viewing specimen dorsally. Spine at base of tail. Long tail with tubercles. *Tail may get cut off or broken.



NO → *Mobula thurstoni* (p.30)

Light gray or silvery shading on distal ends of pectoral fins ventrally, darker band along leading edge, double curvature of pectoral fins along leading edge.

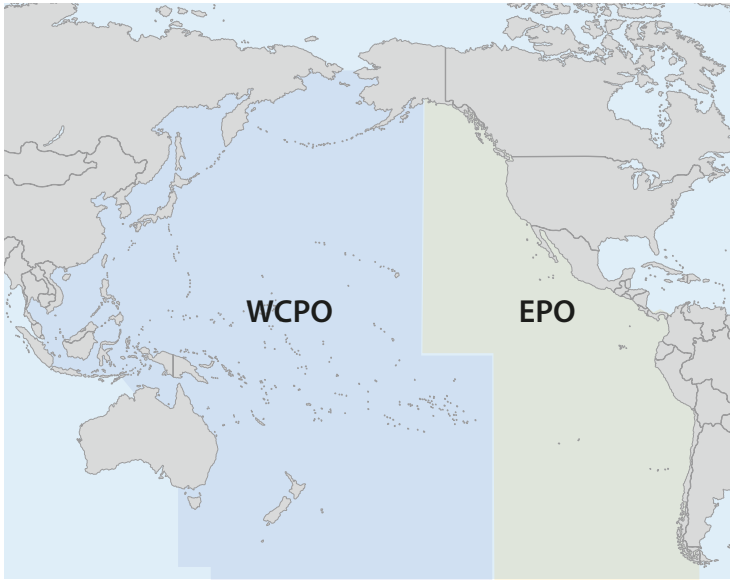


Region-specific Species ID

7a **In which region was this specimen caught?**

Western Central Pacific Ocean ➔ 8 (p.16)

Eastern Pacific Ocean ➔ 7b

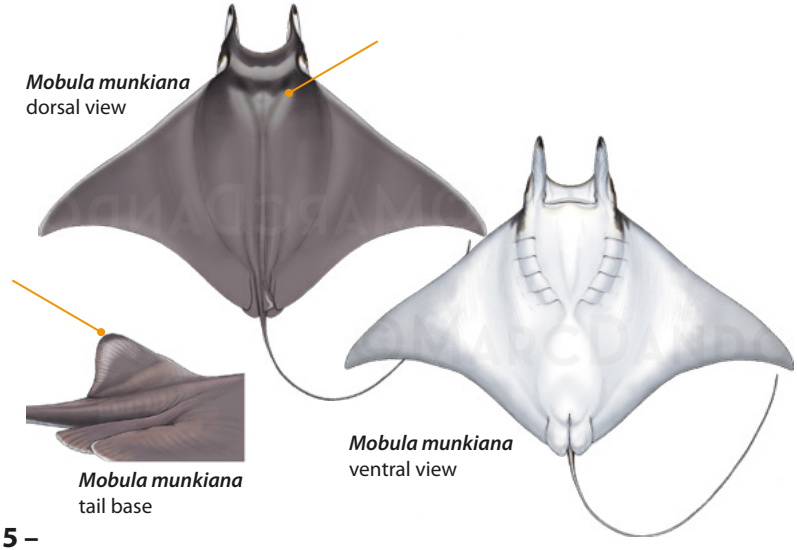


7b **Brownish-gray dorsal color that wraps around to above the 1st gill cover on the ventral surface.**

YES ➔ *Mobula munkiana* (p.32)

NO ➔ 6 (p.14)

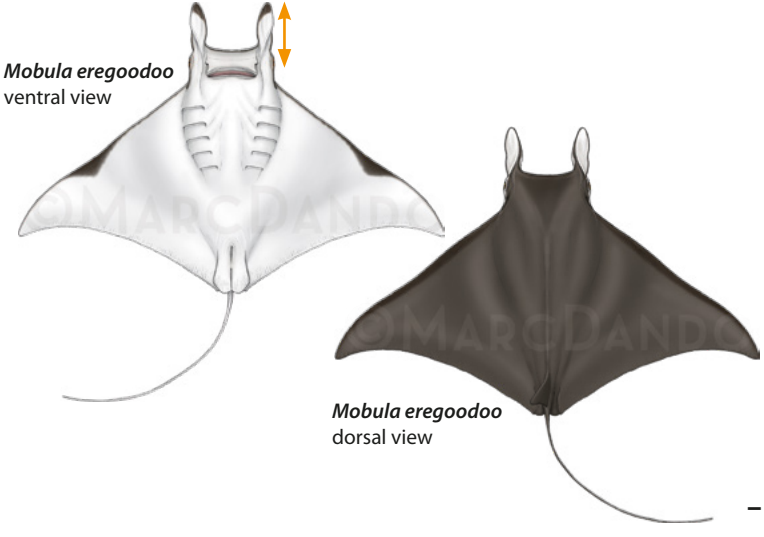
Max. size < 140cm DW. Darker head collar often visible. Dorsal fin with dark rim along margins, often with a lighter gray area in the middle.



8a **Distinct dark gray shading on leading edge of pectoral fins creating a triangular shape (ventral side) and long-necked appearance. Tail shorter than disc width.**

YES → *Mobula eregoodoo* (p.34) | **NO → 6** (p.14)

Max. size < 140cm DW. Brownish-mauve dorsally. Long cephalic fins, length greater than 16% of total DW.



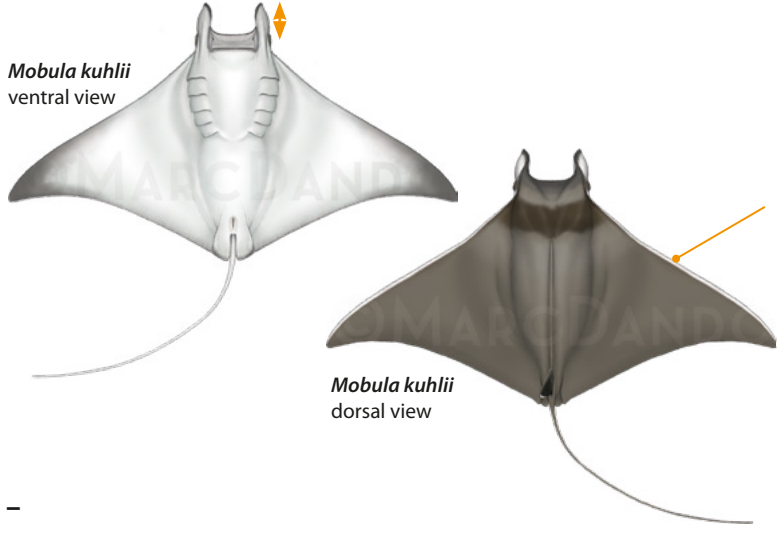
Mobula eregoodoo
ventral view

Mobula eregoodoo
dorsal view

8b **Short-necked appearance. Tail shorter than disc width. Either completely white, or with a dark gray-silvery sheen on distal ends of pectoral fins (ventral side).**

YES → *Mobula kuhlii* (p.36) | **NO → 6** (p.14)

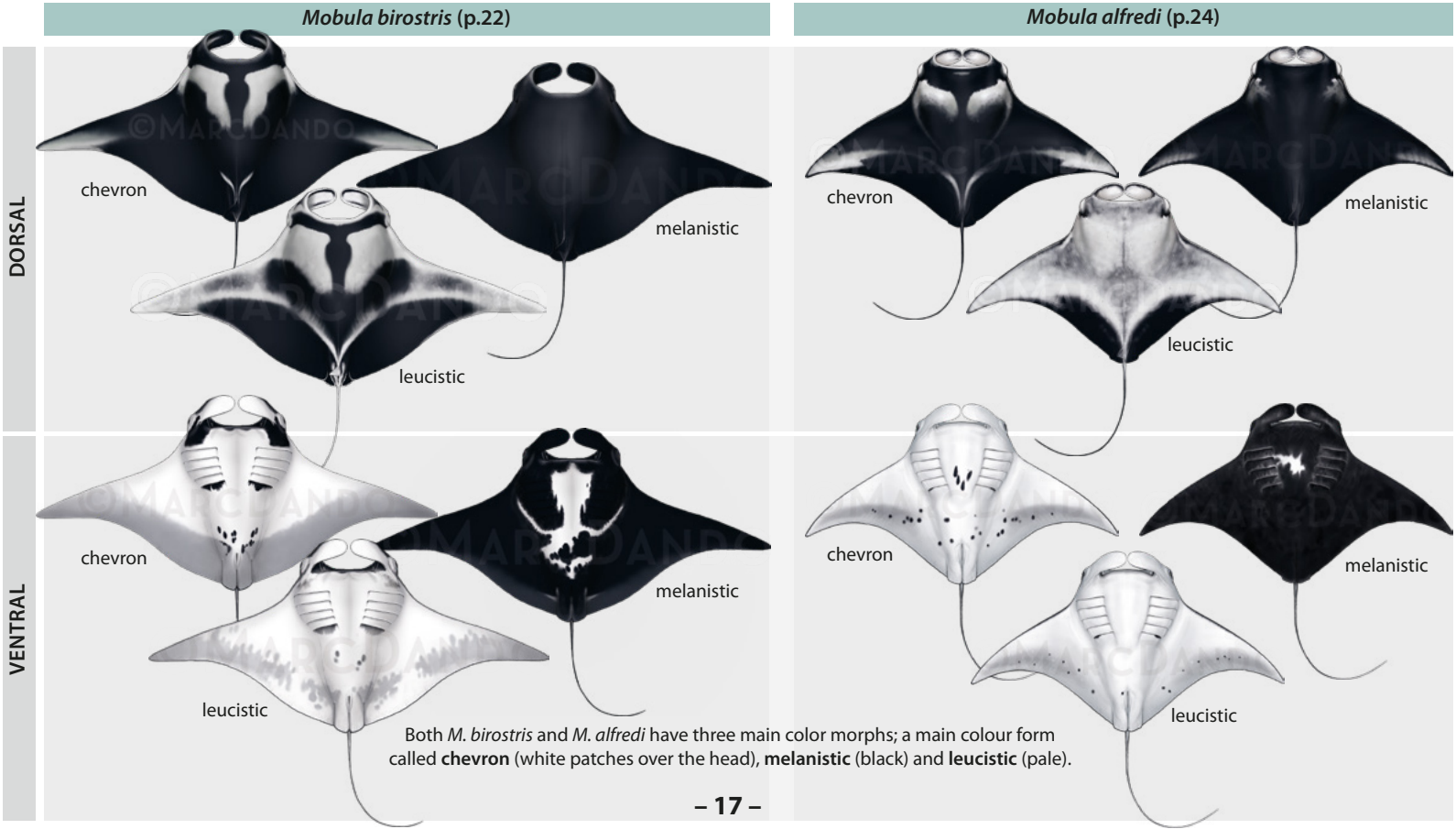
Max. size < 140cm DW. Mauve, brown, dark gray to black dorsally. Short cephalic fins, Length being less than 16% of total DW. Light gray stripe runs along anterior margin of pectoral fins (dorsal side).



Mobula kuhlii
ventral view

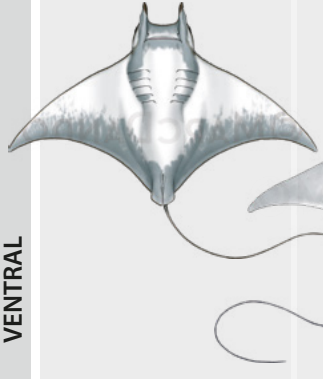
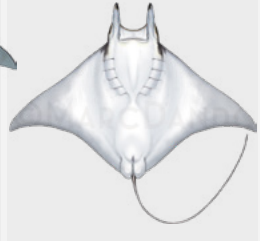
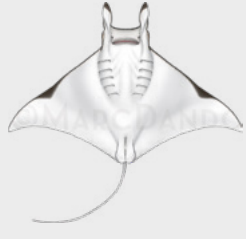
Mobula kuhlii
dorsal view

Manta ray comparison



Both *M. birostris* and *M. alfredi* have three main color morphs; a main colour form called **chevron** (white patches over the head), **melanistic** (black) and **leucistic** (pale).

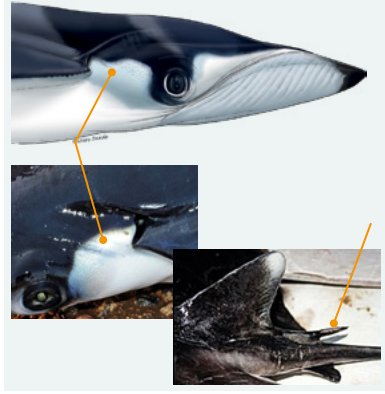
Devil ray comparison

Mobula tarapacana (p.26)	*Mobula mobular* (p.28)	*Mobula thurstoni* (p.30)	*Mobula munkiana* (p.32)	*Mobula eregoodoo* (p.34)	*Mobula kuhlii* (p.36)
DORSAL					
 **Olive-green** or **brown**	**Slate blue** (thick black head band with lighter background)  ***Variable!** (all black when dead)	**Dark mauve** to **blue-gray** (thick black head band)  ***Variable!** (black when dead)	**Mauve-gray** 	 ***Variable!** (brown; fades to light gray or black when dead)	 ***Variable!** (mauve, through dark to light gray and chocolate brown; fades to light gray after death)
VENTRAL					
		 ***Variable!** (gray or silver sheen can be faint)			 ***Variable!** (can be all white)

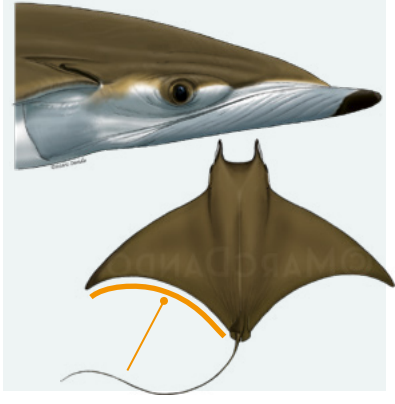
Head (lateral) and key features

Mobula birostris (p.22)

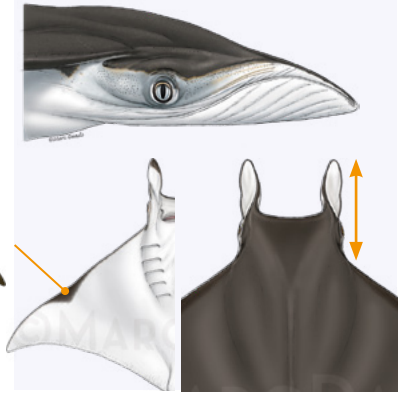
Mobula mobular (p.28)



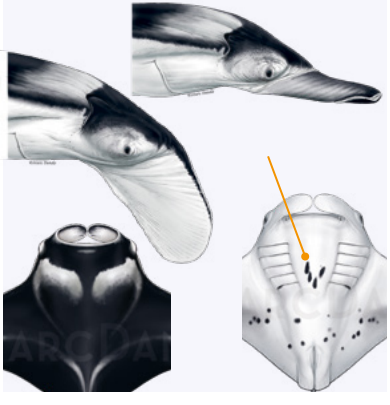
Mobula tarapacana (p.26)



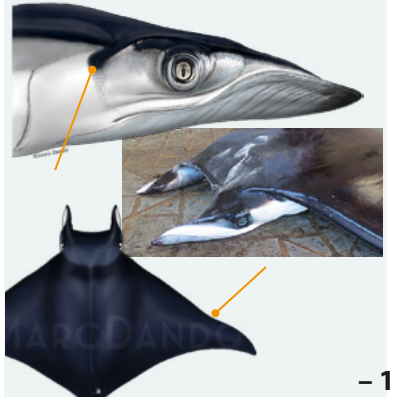
Mobula eregoodoo (p.34)



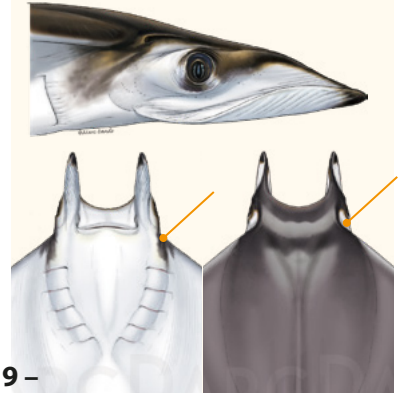
Mobula alfredi (p.24)



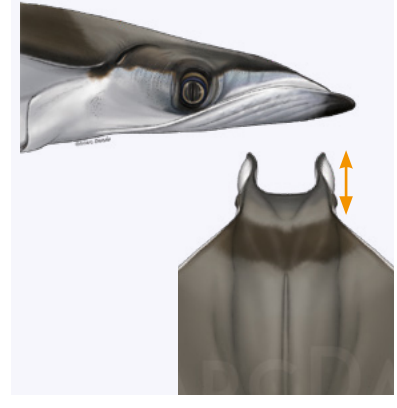
Mobula thurstoni (p.30)



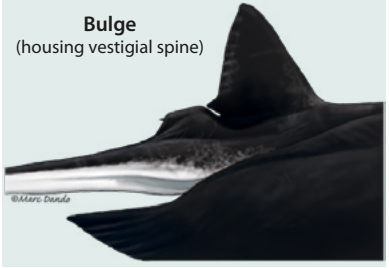
Mobula munkiana (p.32)



Mobula kuhlii (p.36)

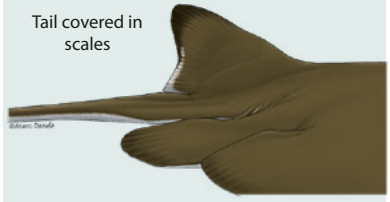


Mobula birostris (p.22)

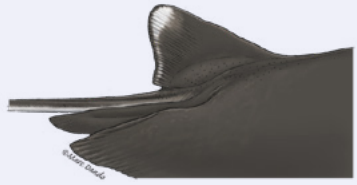


Mobula mobular (p.28)

Mobula tarapacana (p.26)

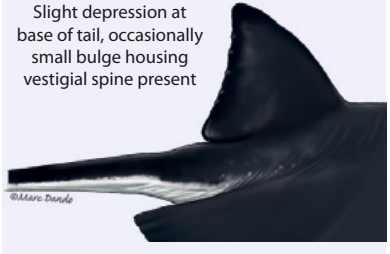


Mobula eregoodoo (p.34)



	Mobula birostris	*Mobula mobular*	*Mobula tarapacana*	*Mobula eregoodoo*
White fin tip?	✗	✓	✗	✓ ✗
Spine or bulge	✓	✓	✗	✗
Tail longer than DW?	✗	✓	✗	✗

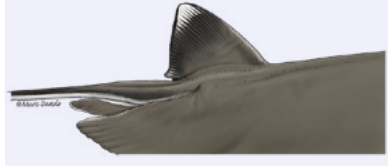
Mobula alfredi (p.24)



Mobula thurstoni (p.30)

Mobula munkiana (p.32)

Mobula kuhlii (p.36)



	Mobula alfredi	*Mobula thurstoni*	*Mobula munkiana*	*Mobula kuhlii*
White fin tip?	✓ ✗	✓	✓ ✗	✓ ✗
Spine or bulge	✗	✗	✗	✗
Tail longer than DW?	✗	✓	✗	✗

N.B. Tail can get damaged and cut off by fishing gear or predators in any species, making it appear shorter

Spiracles

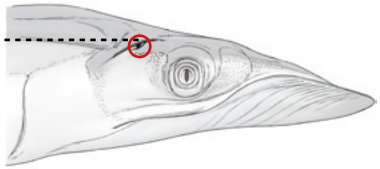
Because nearly all sharks and rays have their mouths on the underside of their heads and not in front, they have evolved small openings called spiracles, just behind the eyes, on either side of their heads. These spiracles allow the animals to draw in clean water without sucking up the sediment beneath them through their mouths. Mobulids still retain these spiracles, although there no longer appears to be any functional use for them in these constantly swimming species.

Shorthorned Pygmy Devil Ray
Mobula kuhlii

Spiracle very small, sub-circular and below the margin of the pectoral fin where it meets the body.

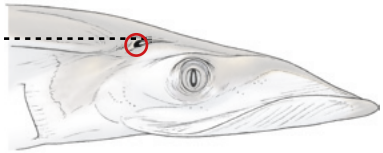
Longhorned Pygmy Devil Ray
Mobula eregoodoo

Spiracle very small, sub-circular and below the margin of the pectoral fin where it meets the body.



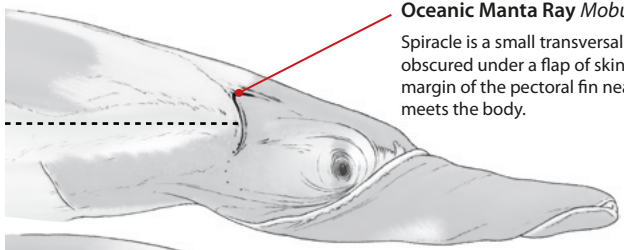
Bentfin Devil Ray *Mobula thurstoni*

Spiracle small, sub-circular and below the margin of the pectoral fin where it meets the body.



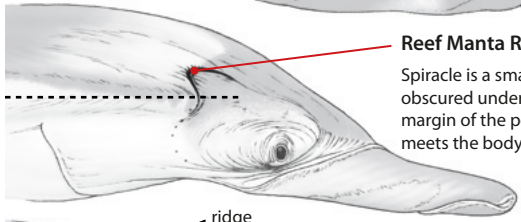
Munk's Pygmy Devil Ray
Mobula munkiana

Spiracle very small, sub-circular and below the margin of the pectoral fin where it meets the body.



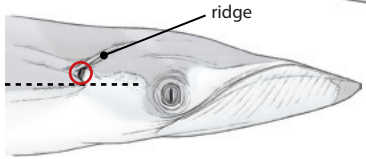
Oceanic Manta Ray *Mobula birostris*

Spiracle is a small transversal slit partially obscured under a flap of skin, above the margin of the pectoral fin near where the fin meets the body.



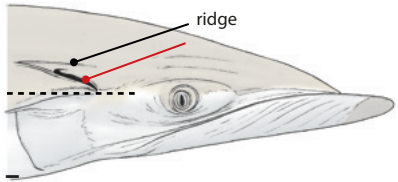
Reef Manta Ray *Mobula alfredi*

Spiracle is a small transversal slit partially obscured under a flap of skin, above the margin of the pectoral fin near where the fin meets the body.



Spinetail Devil Ray *Mobula mobular*

Spiracle is a short transversal slit present under a distinct ridge, above the margin of the pectoral fin near where the fin meets the body.



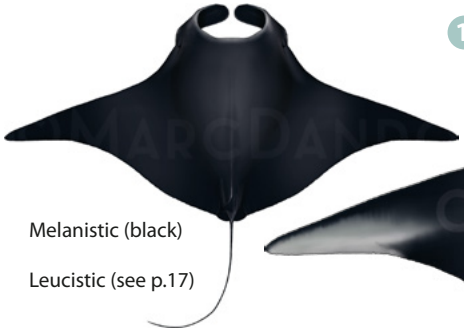
Sicklefin Devil Ray *Mobula tarapacana*

Spiracle in an elongated longitudinal slit under a ridge above and behind the margin of pectoral fin where it meets the body.

Mobula birostris Oceanic (Giant) Manta Ray

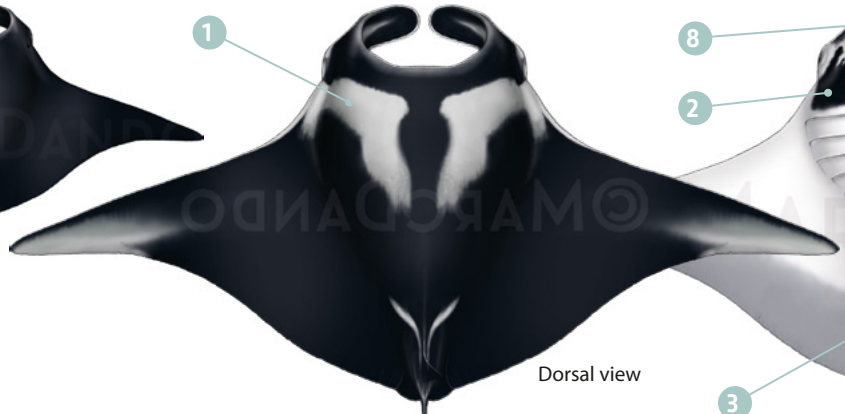
EPO & WCPO **No Retention WCPFC & IATTC**** FAO code **RMB**

Red List Status: **Endangered** **EN**

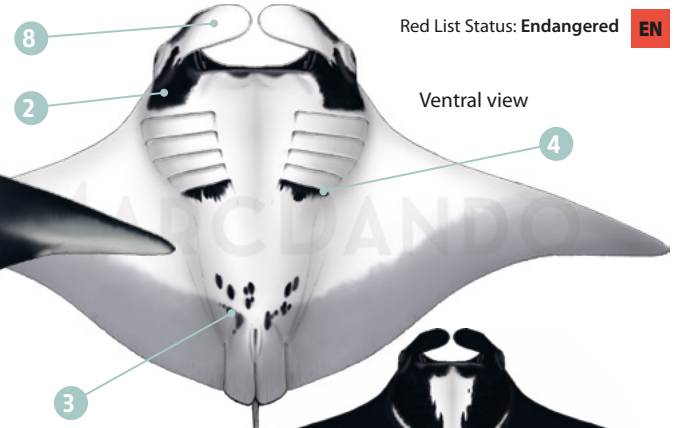


Melanistic (black)

Leucistic (see p.17)



Dorsal view



Ventral view

Melanistic (black)

Key features

1 Dorsal white shoulder markings form two mirror image right-angled triangles, creating a T-shape in black.

2 Inside of mouth and cephalic fins, and trailing underside edge of pectoral fins usually shaded black (excluding leucistic morphs).

3 If present, ventral spots clustered around abdominal region. Except in melanistic morphs which are all black with usually a small patch of white around the gill area on the underside.

4 Gill covers (particularly 5th gill) usually with black shading/flaring.

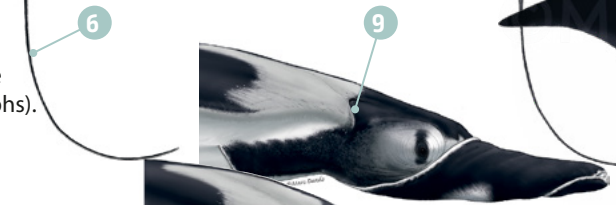
5 Uniform dorsal fin with no white tip.

6 Tail equal to or shorter than disc width.

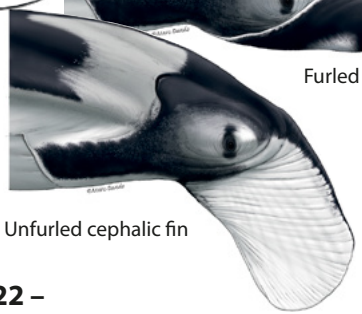
7 Knob-like bulge housing vestigial spine at base of tail.

8 Cephalic fins large, unfurling to meet together in center of mouth.

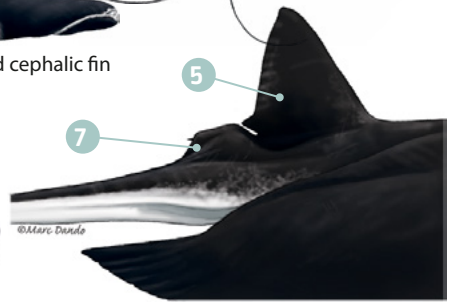
9 Spiracle is small transversal slit partially obscured under a flap of skin, above margin of pectoral fin near where it meets the body.

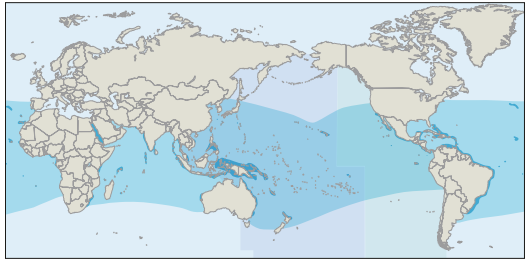


Furled cephalic fin

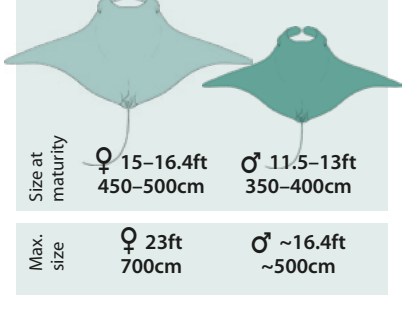


Unfurled cephalic fin



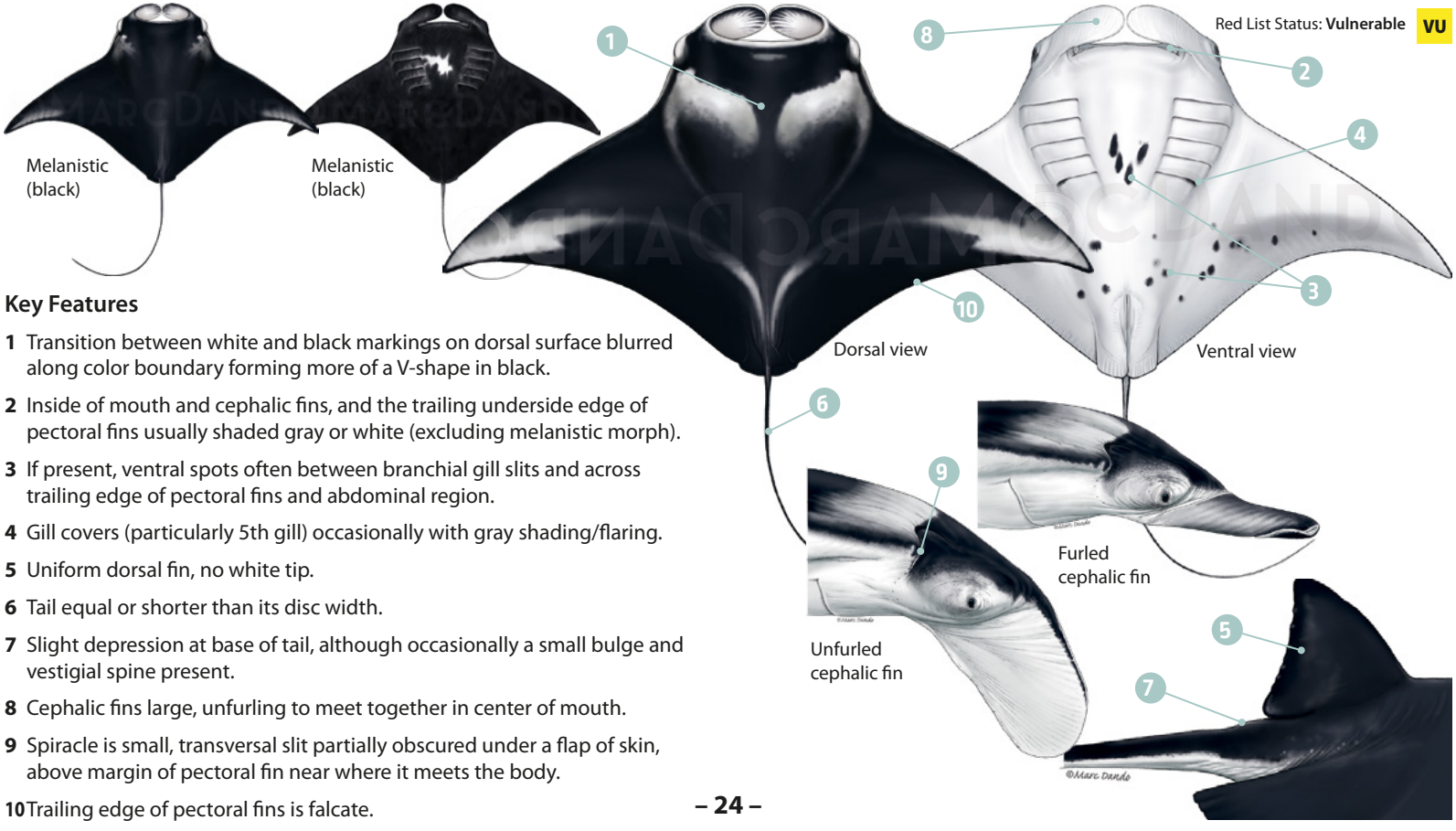


Oceanic or Giant Manta Rays are the largest species of ray and have the largest brain to body size ratio of all fish. They are highly migratory, traveling distances of over 1500km between feeding, mating and nursery areas. They feed on zooplankton, small fish, and squid – including from the deep-sea where tagged animals have been recorded diving to depths over 1000m. This species is listed as threatened with extinction under the US Endangered Species Act, and as Endangered by the IUCN Red List. They are targeted for their gill plates to be sold as a pseudo remedy despite the fact that the tissue of mobulid rays contains toxic heavy metals.



Photos: above both Manta Trust, Guy Stevens; below both Corey Nevels

Red List Status: **Vulnerable** **VU**



Key Features

1 Transition between white and black markings on dorsal surface blurred along color boundary forming more of a V-shape in black.

2 Inside of mouth and cephalic fins, and the trailing underside edge of pectoral fins usually shaded gray or white (excluding melanistic morph).

3 If present, ventral spots often between branchial gill slits and across trailing edge of pectoral fins and abdominal region.

4 Gill covers (particularly 5th gill) occasionally with gray shading/flaring.

5 Uniform dorsal fin, no white tip.

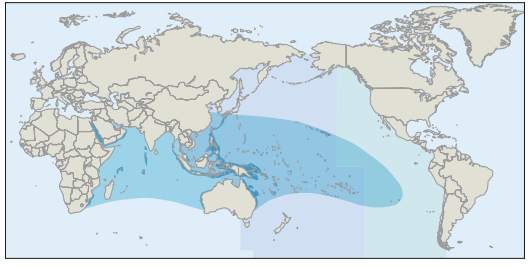
6 Tail equal or shorter than its disc width.

7 Slight depression at base of tail, although occasionally a small bulge and vestigial spine present.

8 Cephalic fins large, unfurling to meet together in center of mouth.

9 Spiracle is small, transversal slit partially obscured under a flap of skin, above margin of pectoral fin near where it meets the body.

10 Trailing edge of pectoral fins is falcate.

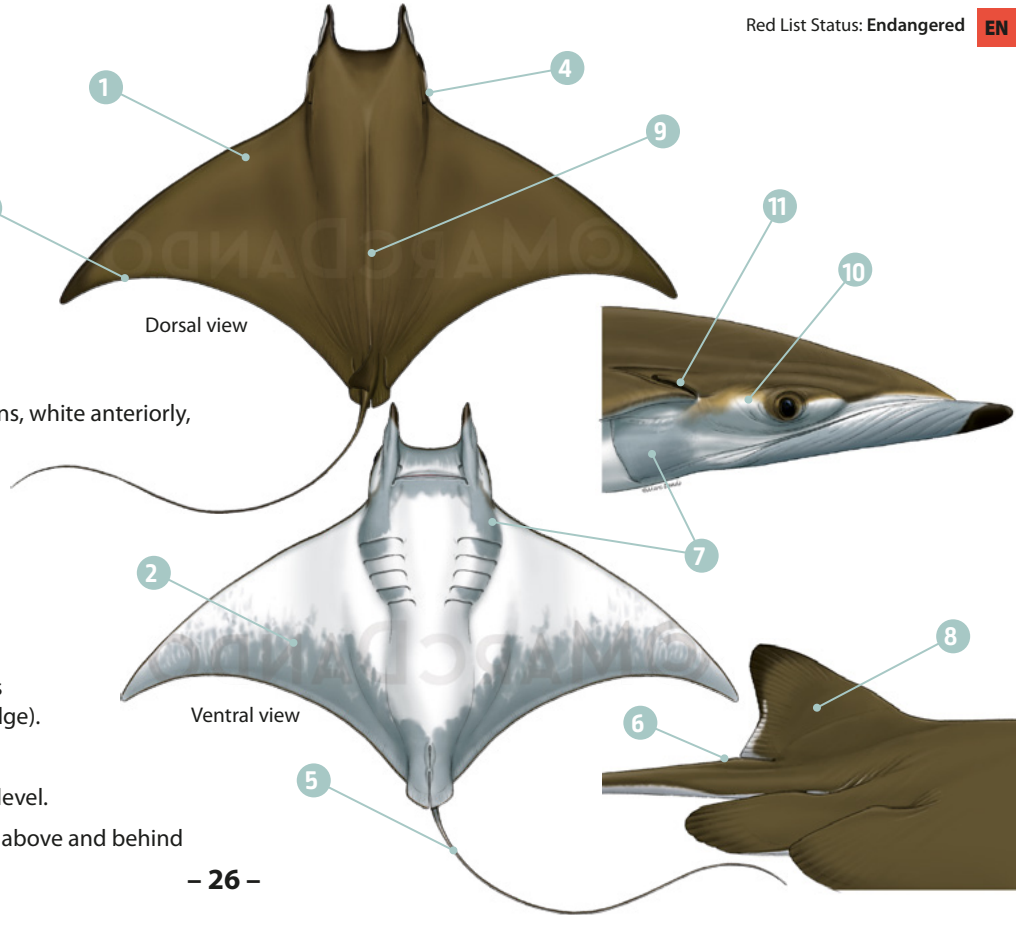


The Reef Manta Ray occurs in tropical waters across the Indian Ocean and in the western half of the Pacific Ocean. This species is typically found near reef slopes, spending most of its time at the surface to forage on zooplankton but has been recorded at depths over 600m. They frequently visit cleaning stations where parasites are removed by cleaner fish. They have unique spotting patterns which can be used to identify individuals. With one of the largest brain-to-body size ratios of any fish and their curious and social behaviors, these gentle giants may be among the most intelligent fish in the sea and are a favorite for divers and snorkelers.

Size at birth
4.3–5.5ft
130–169cm

Max. size
♀ 16.4ft
500cm
♂ 13ft
400cm

Red List Status: **Endangered** **EN**



Key Features

1 Olive-green or brown dorsal surface.

2 Gray ventral shading on posterior margin of pectoral fins, white anteriorly, with zig-zagged margin between both.

3 Trailing edge of pectoral fins distinctly falcate.

4 Long-necked appearance.

5 Tail shorter than its disc width and covered in scales.

6 No spine.

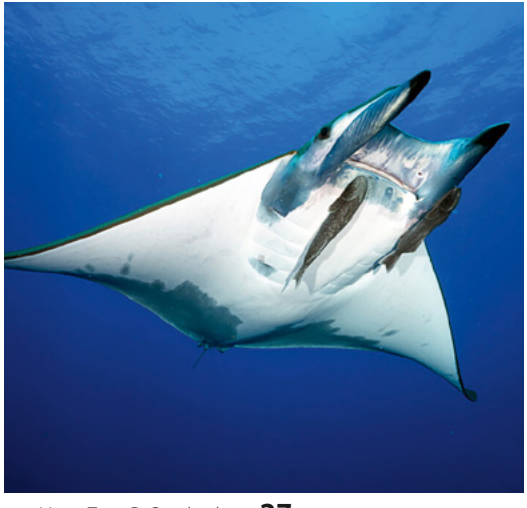
7 Dark gray shading on sides of first gill cover.

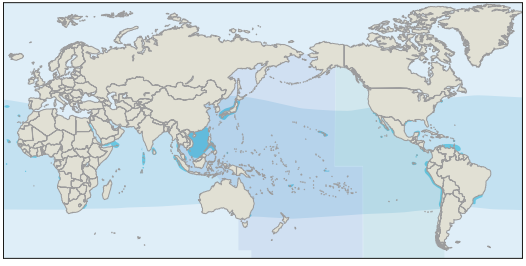
8 Plain coloured dorsal fin (with thin darker strip towards upper edge and thin lighter strip towards lower rear edge).

9 Distinctive pronounced ridge along dorsal midline.

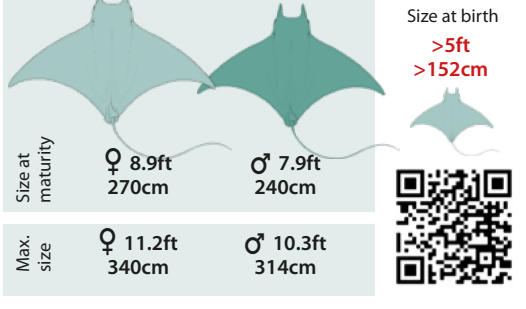
10 Gray-white ventral markings do not extend above eye level.

11 Spiracle in an elongated longitudinal slit under a ridge above and behind margin of pectoral fin where it meets body.





Sicklefin Devil Rays are the largest devil rays and found circumglobally in tropical and subtropical waters. This species is captured in purse seine, longline, and gillnet fishing gears worldwide. They are known to aggregate around seamounts, likely for reproductive activity. This is the deepest diving of all mobulid rays, reaching 2000m, most likely to feed on deep-sea fish, squid and zooplankton. They have unique adaptations to keep their brains warm while deep diving. They are usually solitary or found in small schools and can be individually identified by the unique gray shading patterns on their bellies.



Photos L to R: TunaCons; Manta Trust, D. Fernando; Manta Trust, B. Laglbauer; Manta Trust, D. Copeland

Mobula mobular Spinetail Devil Ray

EPO & WCPO No Retention WCPFC & IATTC** FAO code **RMM**

Red List Status: **Endangered** **EN**

Key Features

1 Thick black band on top of head that stretches from eye to eye, clearly darker than surrounding background colour. Head band is visible only on live individuals (and may not be when out of water).

2 Dorsal surface slate blue, with lighter gray colouring surrounding a black head band and fin edges. When dead, entire dorsal surface quickly fades to black.

3 Bright white ventral surface.

4 Tail equal to or longer than its disc width.

5 White-tipped elongated dorsal fin.

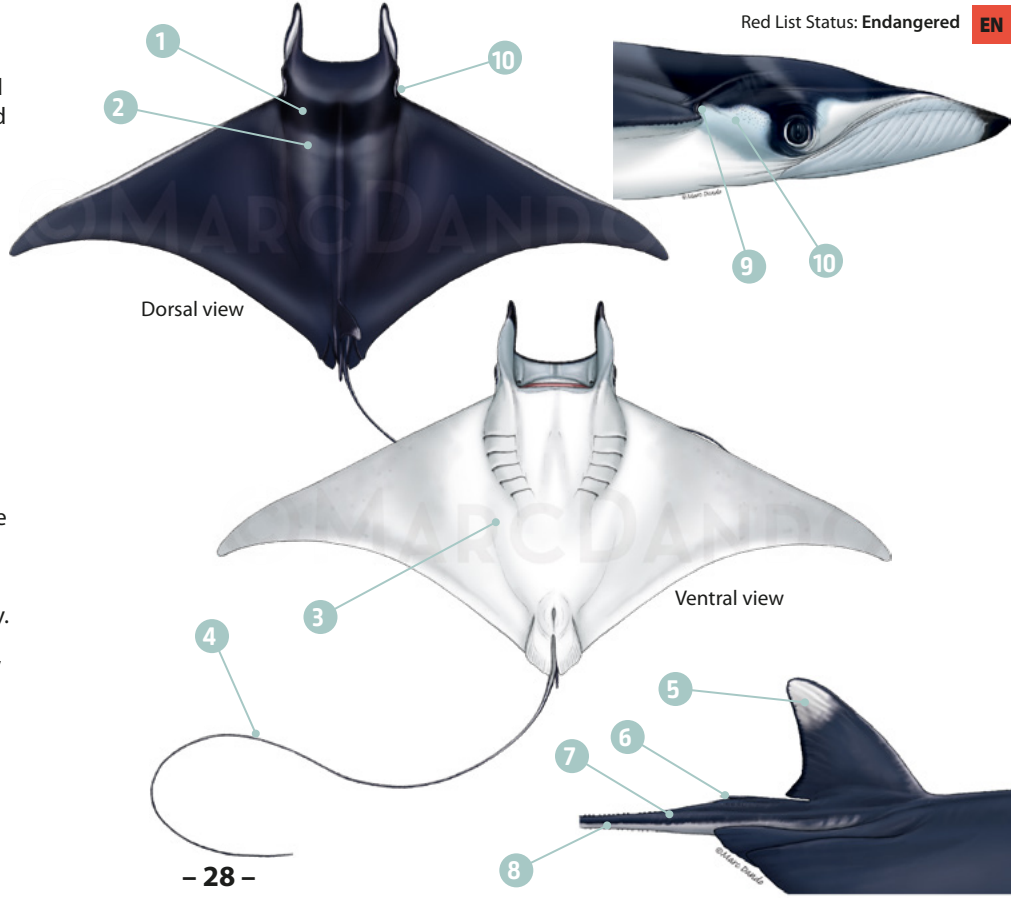
6 A caudal spine (often cut off by fishers).

7 Tail is ventrally flattened at the base of the dorsal fin, soon becoming roundish and very thin.

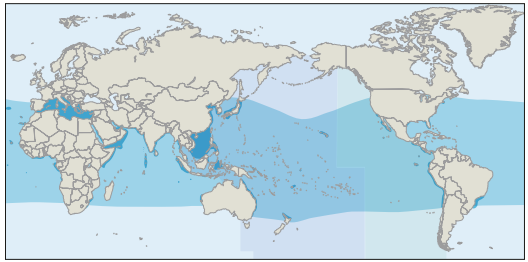
8 Row of small white tubercules running along either side of the tail.

9 Spiracle is a short transversal slit under a distinct ridge, above margin of pectoral fin near where fin meets body.

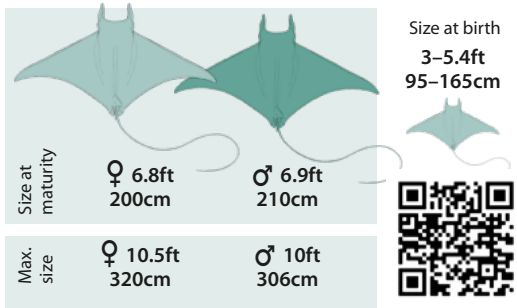
10 White ventral markings wrap up behind and above eye, just exceeding margin where pectoral fin joins body, to meet the black dorsal head band.



Photos L to R: Manta Trust, Daniel Fernando; Joost van Uffelen; Manta Trust, Muhammad G. Salim



Spinetail Devil Rays are listed as Endangered on the IUCN Red List and are the most commonly captured mobulid species throughout their range. They are found over deep water, circumglobally in tropical and subtropical oceans, adjacent seas and also uniquely found in the Mediterranean Sea. They can dive to over 1000m depth and feed on zooplankton. As their name suggests they are the only devil ray with a spine on their very long tails.



Mobula thurstoni Bentfin Devil Ray

EPO & WCPO No Retention WCPFC & IATTC** FAO code **RMO**

Red List Status: **Endangered** **EN**

Key Features

1 Dark mauve to blue-gray dorsally. Colour fading to black when dead.

2 Thick black band on top of head that stretches from eye to eye, clearly darker than surrounding background colour. This band is only visible on live individuals.

3 White ventral surface with silver-brown sheen on distal ends of pectoral fins.

4 Anterior margin of pectoral fins have a distinctive double curvature with black-gray shading on curve.

5 White ventral markings do not extend above eye level.

6 Short-necked appearance.

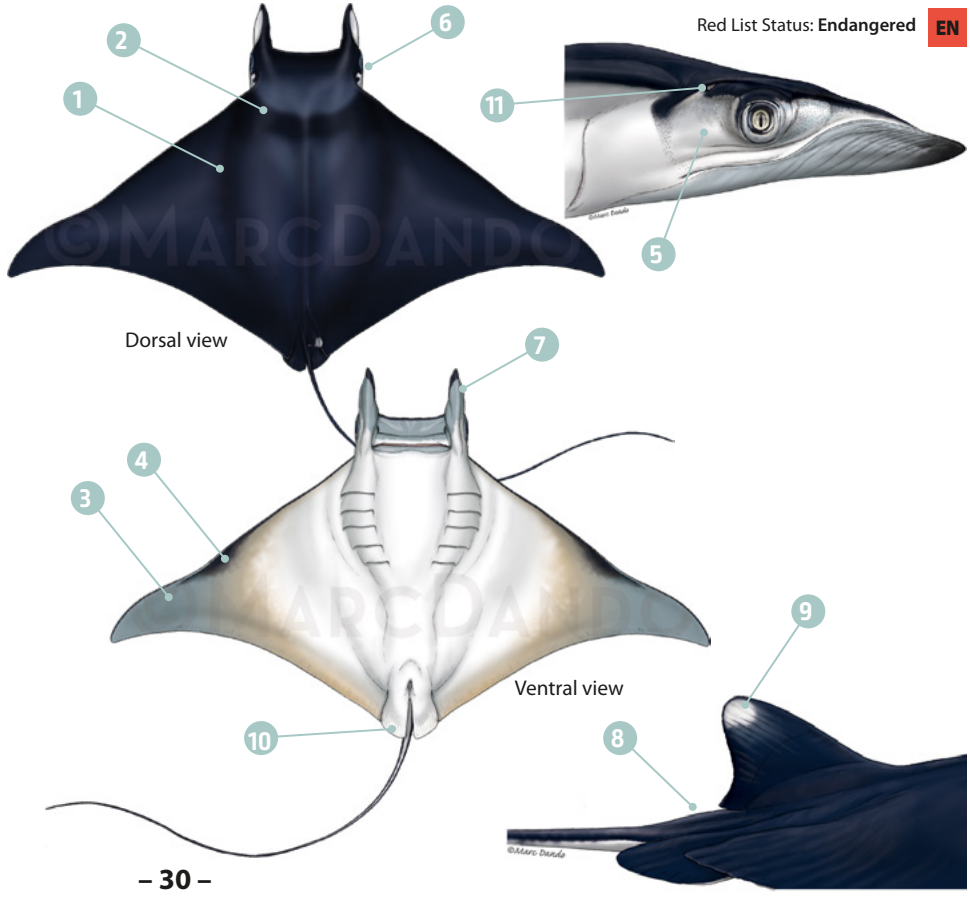
7 Short cephalic fins (<16% of total disc width).

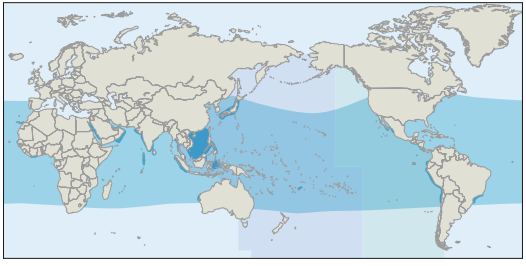
8 No spine. Tail equal to or longer than disc width in length when fully intact and dorso-ventrally compressed just behind dorsal fin for about one length of dorsal fin base.

9 White-tipped dorsal fin.

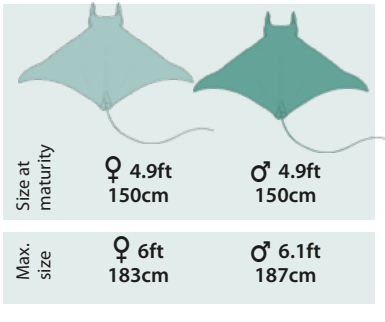
10 Long pelvic fins extend behind pectoral fin where it meets body.

11 Spiracle small, subcircular and below margin of pectoral fin where it meets body.





Bentfin Devil Rays have a distinct double curvature on the anterior margin of their pectoral fins and the undersides are a beautiful iridescent silver or gold color with very long tails. They are found circumglobally in tropical and subtropical waters and are frequently captured in Southeast Asian fisheries, and are the most frequently captured mobulid species in the ETP purse seine fishery. This species is usually observed individually but schools have been recorded. They feed on zooplankton, mainly krill.



Photos L to R: IATTC; Manta Trust, Daniel Fernando; Jason Isley

Mobula munkiana Munk's Pygmy Devil Ray

EPO No Retention IATTC** FAO code **RMU**

Red List Status: **Vulnerable** **VU**

Key Features

1 Brownish to mauve-gray dorsally.

2 A dark black head collar is visible in most specimens, with a lighter gray stripe often visible in front, sandwiched between the collar and a dark mouth strip.

3 Light gray stripe runs along anterior dorsal margin of pectoral fins.

4 Whitish ventrally, tending to increasingly dark gray coloration towards distal tips of pectoral fins.

5 Tail shorter than disc width.

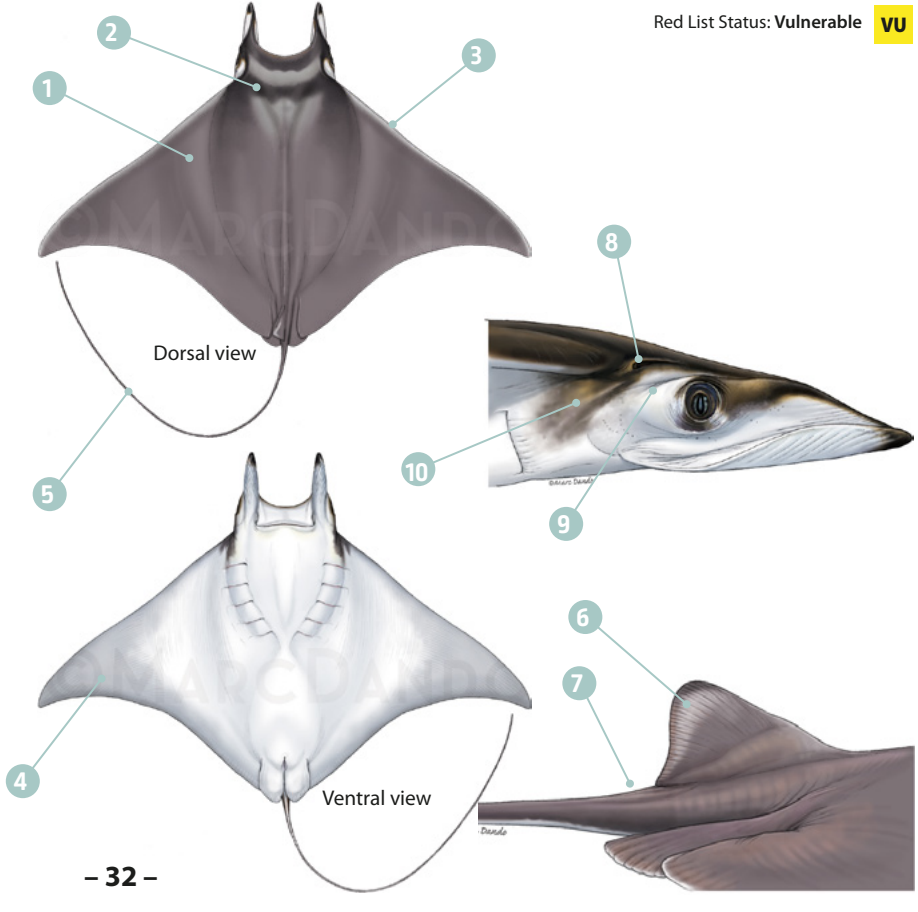
6 Dorsal fin with dark rim along margins, often with a lighter gray area in the middle.

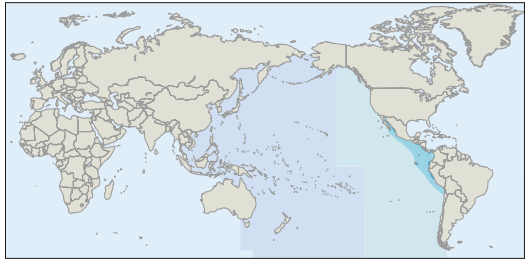
7 No caudal spine.

8 Small, round spiracle below margin of the pectoral fin near where it meets the body.

9 White ventral markings wrap up behind and above eyes, just exceeding margin where pectoral fin joins body, to meet the black dorsal head band.

10 Bronze-brown to gray shading extends ventrally onto anterior of first gill cover near margin where pectoral fins join body.





This species is named in honor of the oceanographer Walter Munk. Their distribution is limited to coastal waters of the Eastern Pacific Ocean from the Sea of Cortez (Mexico) to Peru. They are often found in large aggregations of thousands of individuals at certain times of the year in the Sea of Cortez. This species utilizes sheltered bays as nursery habitat and important nursery areas have been identified in Mexico. While aggregated, Munk's Pygmy Devil Rays are known to breach regularly, often leaping several meters out of the water. Their schooling behavior makes them particularly vulnerable to gillnet, trawl and purse seine net fisheries.

	♀	♂
Size at maturity	3.2ft 97cm	2.8ft 87cm
Max. size	4.2ft 130cm	3.8ft 115cm

Size at birth
1.1–1.3ft
35–40cm

Photos L to R: Blanca Garza; Josh Stewart; Manta Trust, Stefany Rojas; Manta Trust, Guy Stevens

Mobula eregoodoo Longhorn Pygmy Devil Ray

WCPO No Retention WCPFC** FAO code **RME**

Red List Status: **Endangered** **EN**

Key Features

1 Brown dorsal surface that fades to light gray or black soon after death.

2 Dark brown or gray stripe runs along anterior margin of pectoral fins.

3 White ventral surface with distinct triangular-shaped black to dark gray shading on leading edge of pectoral fin at the mid-point.

4 Angle of pectoral fins anterior margin sweeps back from head more acutely than in the other pygmy species.

5 Long-necked appearance.

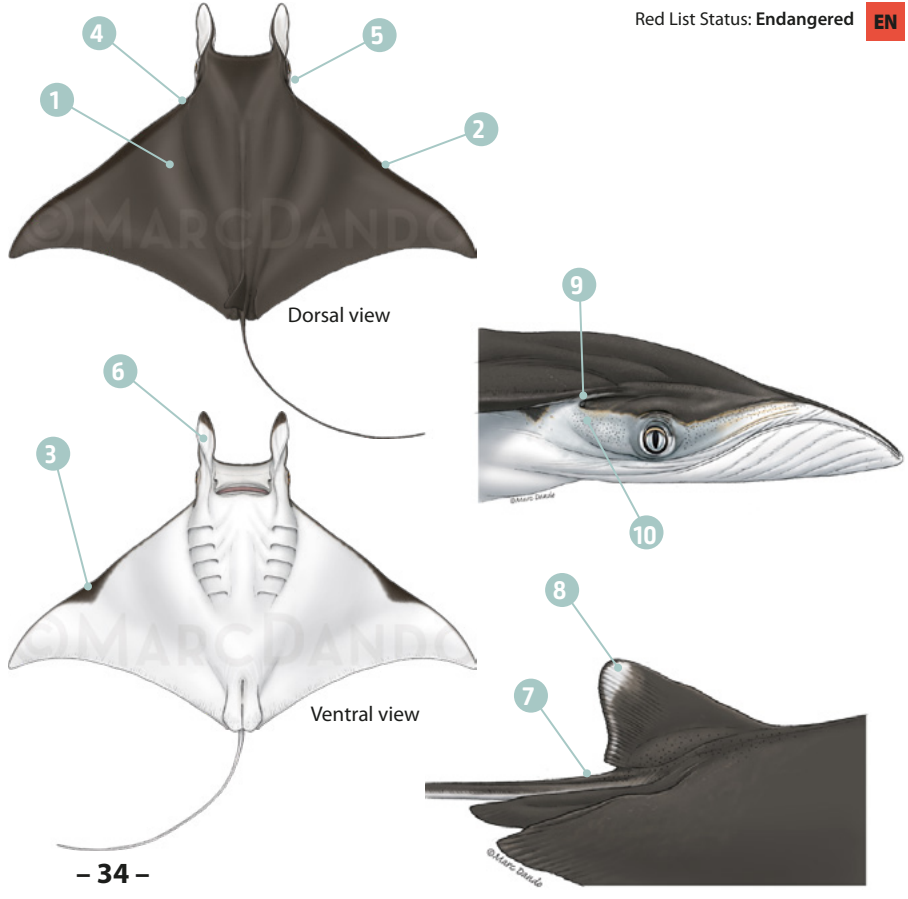
6 Long cephalic fins (>16% of disc width).

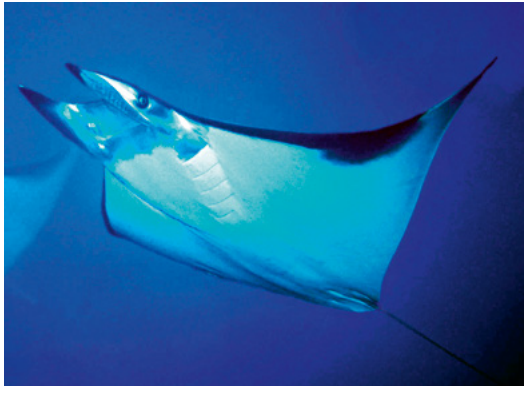
7 No spine. Tail shorter than disc width. Base of tail dorsally flattened and moderately compressed laterally (quadrangular in section).

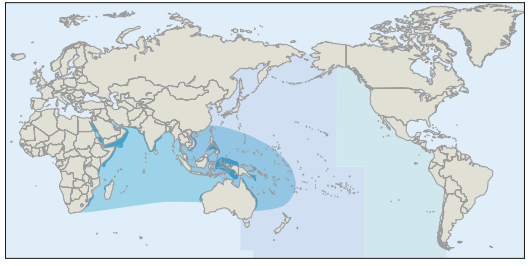
8 Often possessing a white-tipped dorsal fin.

9 Spiracle very small, sub-circular and below margin of pectoral fin where it meets body.

10 White ventral markings extend only slightly above eye level.







Found throughout the Indo-West Pacific Ocean they hunt shoaling bait fish like tropical anchovies and silversides. Their small size, body shape (long neck and backward sweeping pectoral fins) and gill morphology are optimized to make them fast and efficient predators. They are often found in schools of 12 or more individuals.

	♀	♂
Size at maturity	3.2ft 99cm	3ft 92.5cm
Max. size	4.3ft 130cm	4ft 123cm

Size at birth
1.1–1.4ft
35–42cm

Photos L to R: H. Sudarno; C. Beale; H. Osmani; J. Kane; A. Reeve

Mobula kuhlii Shorthorned Pygmy Devil Ray

WCPO No Retention WCPFC** FAO code **RMK**

Red List Status: **Endangered** **EN**

Key Features

1 Variable hues dorsally, from dark mauve, through dark to light gray and chocolate brown. All colours fade to light gray or black soon after death.

2 Dark collar in half-moon shape from side to side above spiracles. This band is only visible on live individuals.

3 Pale gray stripe runs along the anterior dorsal margin of pectoral fins.

4 Either a complete white ventral surface or with a dark gray-silvery sheen on distal ends of pectoral fins.

5 Anterior margin of pectoral fins smoothly falcate with no angular indentation.

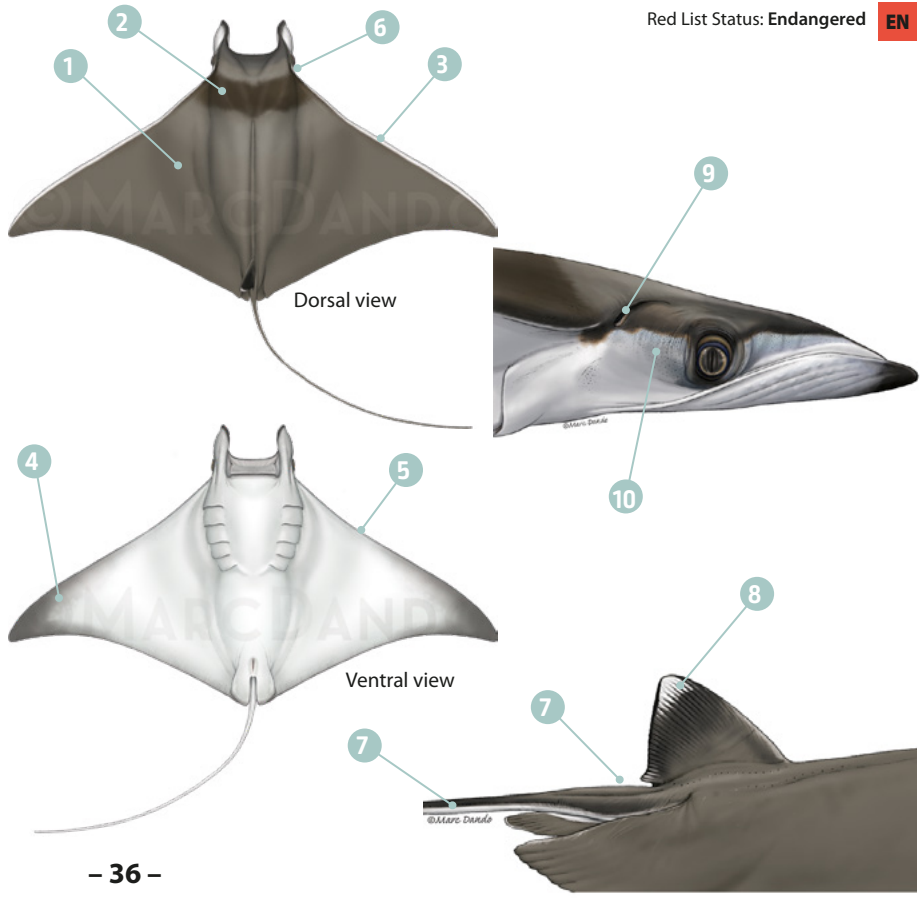
6 Short-necked appearance and short cephalic fins (<16% disc width).

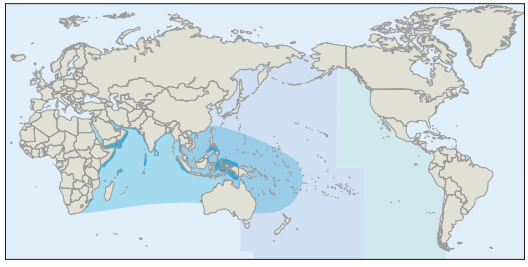
7 No spine. Tail shorter than disc width and counter-shaded throughout. Base of tail dorsally flattened and moderately compressed laterally (quadrangular in section).

8 Often possessing a white-tipped dorsal fin.

9 Spiracle small, sub-circular and below margin of pectoral fin where it meets body.

10 White ventral markings do not extend above eye level.





Shorthorned Pygmy Devil Rays are distributed across the Indo-West Pacific. They are one of the smallest mobulid rays and known for their agility to feed on small mysid shrimp and larval fish. Sometimes they are seen feeding near the sandy seafloor. They are known to form small feeding and reproductive (sometimes up to 50 individuals) aggregations and are one of the only devil ray species known to visit cleaning stations.

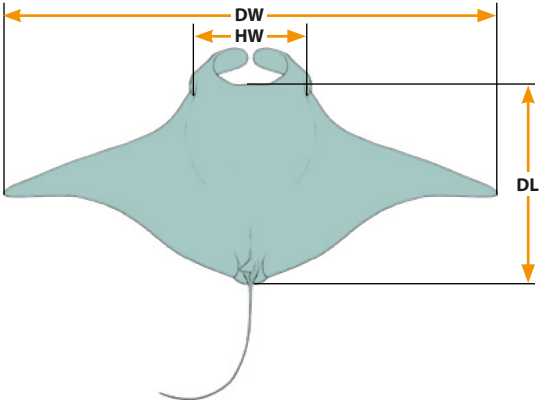
Size at birth
1–1.6ft
31–49cm

Photos L to R: T. Ko Gyi; Manta Trust, G. Stevens; H. Osmani; Manta Trust, S. Hilbourne; A. Reeve

Measuring and data collection

Disc width (wingspan), measured in feet or centimeters, in a straight line without following the curve of the ray´s body. It is measured (preferably) or estimated.

Photo: Manta Trust, Betty Laglbauer



Data collections:

1 **Species** (if unable to ID please take photos of spiracle location, tail, mouth position, dorsal and ventral views if possible)

2 **Disc width** (please indicate the unit of measure and whether or not it was measured or estimated)

3 **Sex** (for sex verification please see **page 6**)

4 **Hooking / entanglement** (hook and line fisheries)
   a Please indicate where on the body each animal is hooked or entangled

5 **Landing stage** (purse seine = entangled, brail, other)
   a For animals brought up through the brail, please indicate brail number

6 **Catch condition / disposition** (excellent, fair, injured, moribund, dead)

7 **Handling and release method** Please record the method used and any damage from the handling that may impact the animal's health

8 **Trailing gear** (hook and line fisheries)

9 **Release condition / disposition** (excellent, fair, injured, moribund, dead)

DW Pectoral fin tip to pectoral fin tip (total width of ray)

HW Maximum horizontal width of head (head width of ray)

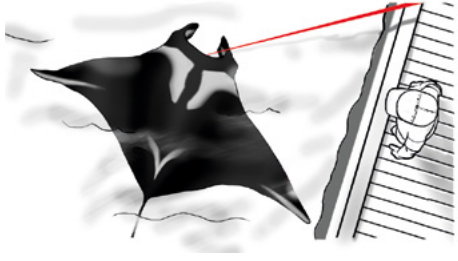
DL Tip of snout to posterior edge of pelvic fin (disc length of ray)

Best handling and release practices – longline and hook and line fisheries

1 Always **stop** the vessel to safely remove gear and release large rays.

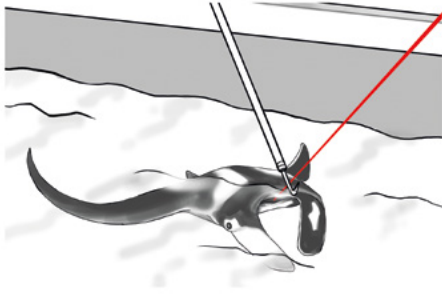
2 **Bring the ray alongside the vessel, if possible** Always leave the animal submerged in the water so that its chance of post-release survival will be much higher.

If the animal is not entangled and can be brought close to the boat, consider attaching a flyback prevention device to the branchline to reduce the risk of a lead (or hook) flyback accident.

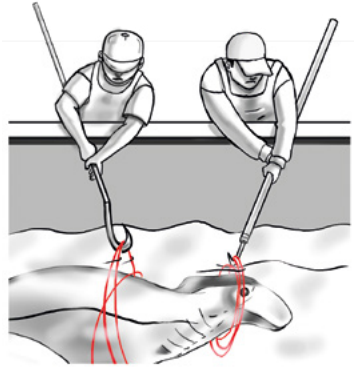


flyback prevention device

3 For animals that are hooked or have swallowed the hook please use a long-handled line cutter, to cut the line as close to the hook as possible.



4 For animals that are entangled, secure any excess tangled line with the long-handled gaff, while another crew member uses a long-handled line cutter to remove as much tangled line as possible. Do not use the gaff on the animal.



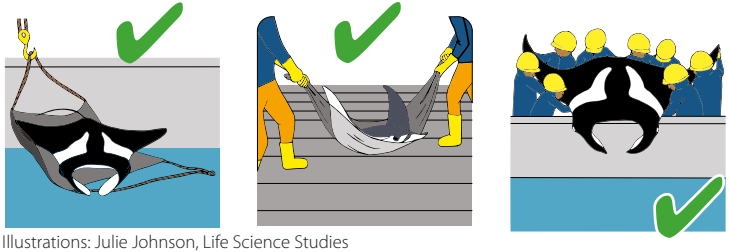
Figures taken from NOAA Pacific Island Regional Office, Protected Species Workshop: Handling, Release and Identification Guidelines
www.fisheries.noaa.gov/resource/document/handling-release-and-identification-guidelines-pacific-islands-pelagic-fisheries

Best handling practices – purse seine fisheries. **Acceptable practices (Do's)**

Photo: ISSF, M. Hutchinson

If mobulid rays are detected from the helicopter or by crew this should be reported to the captain so they can avoid encirclement and inform the crew to have a purpose built cradle/stretcher or netting available and ready, to return the animals to the sea as rapidly as possible.

1. Ideally rays should be released while they are still free-swimming (e.g. back down procedure, submerging corks, cutting net)
2. Rays that are too large to be lifted safely by hand should be brailed out of the net and released using a purpose built large-mesh cargo net or canvas sling or similar device
3. Small (< 30kg) and medium rays (30–60kg) should be handled by 2 or 3 people and carried by the sides of its wings or preferably using a purpose-built cradle/stretcher while ensuring the safety of the crew.
4. When entangled in netting, carefully cut the net away from the animal and release to the sea as quickly as possible while ensuring the safety of the crew.

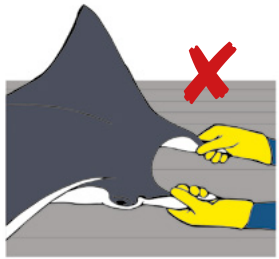


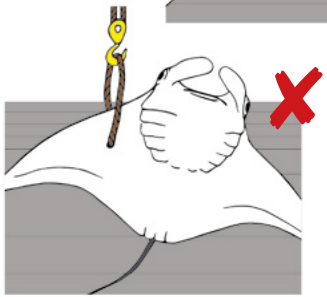
Illustrations: Julie Johnson, Life Science Studies

Photo: TunaCons

Photo: ISSF, M. Hutchinson

Best handling practices – purse seine fisheries. **Unacceptable practices (Don't do)**





Illustrations: Julie Johnson, Life Science Studies

1. Please **do not** leave a ray on deck until hauling is finished before returning it to the sea (release ASAP).
2. **Do not** gaff, drag, carry, lift or pull a ray by its cephalic fins or tail.
3. **Do not** insert hooks, gaffs or hands into the gill slits or the spiracles.
4. **Do not** punch holes through the bodies of rays (e.g. to pass a cable or line through for lifting the ray).

Photo: ISSF, M. Hutchinson

It may be possible to avoid encirclement of mobulid rays. A study has found that while searching for tuna schools, helicopter pilots and crew often see mobulid rays and can sometimes identify the species. In these cases the best practices are to:

Report sighting to captain/navigator so they can:

1. Try to avoid encirclement.

2. Inform crew to prepare gear used to rapidly return them to the sea.

3. Record species ID and location information.

Helicopter pilots use these key indicators to identify mobulids from the air:

- Schooling / aggregations
- Color (dark compared to surface)
- Size and shape / Fins
- Splashes from breaching
- Presence of birds flying above

M. mobular are usually found in small groups of 2–5 but sometimes larger. They are usually close to the surface and have dark coloration with a dark band behind the head.

All photos: Siddharta Velázquez Hernández, Ocean Life Flights

M. thurstoni are usually seen in smaller aggregations, have dark blackish coloration and do not stay as close to the surface as other mobulids.

M. munkiana are sometimes seen in large dense aggregations and have a gray/brown coloration.

M. birostris are usually seen alone or in small groups. They are distinct because of their large size and white shoulder markings.

GLOSSARY

Anterior – situated in the front of the body or near the head of the animal (as opposed to posterior)

Cephalic fin – the set of two fins that look like horns on either side of the broad head of a manta or devil ray

Claspers – a pair of penis-like organs that extend beyond the pelvic fins in adult male manta and devil rays

Cloaca – a single opening in the poster part of the body for both waste and mating

Disc width – the wingspan of an individual measured horizontally from wing tip to wing tip

Dorsal – back side of the animal (as opposed to the front or belly)

Leucistic – mantas that appear white or mostly white due to a reduction pigment making their skin appear lighter

Melanistic – mantas that appear black or mostly black due to increased pigment making their skin appear darker

Pectoral fin – the 'wings' on a manta or devil ray; fleshy enlarged fins that are effective for underwater 'flight'

Pelvic fin – small fins on either side of the cloaca in males in females

Posterior – toward the back of the body or near the tail of the animal (as opposed to anterior)

Spiracle – small hole behind each eye that opens to the mouth; can be used to aid species identification

Tubercules – small rounded projections or nodules found on the tail of some mobulid species

Ventral – front (belly) side of the animal (as opposed to the back)

Photo: Jay Clue