NOAA Technical Memorandum NMFS-SEFSC-733

SAFE HANDLING AND RELEASE GUIDELINES FOR MANTA AND DEVIL RAYS (MOBULID SPECIES)

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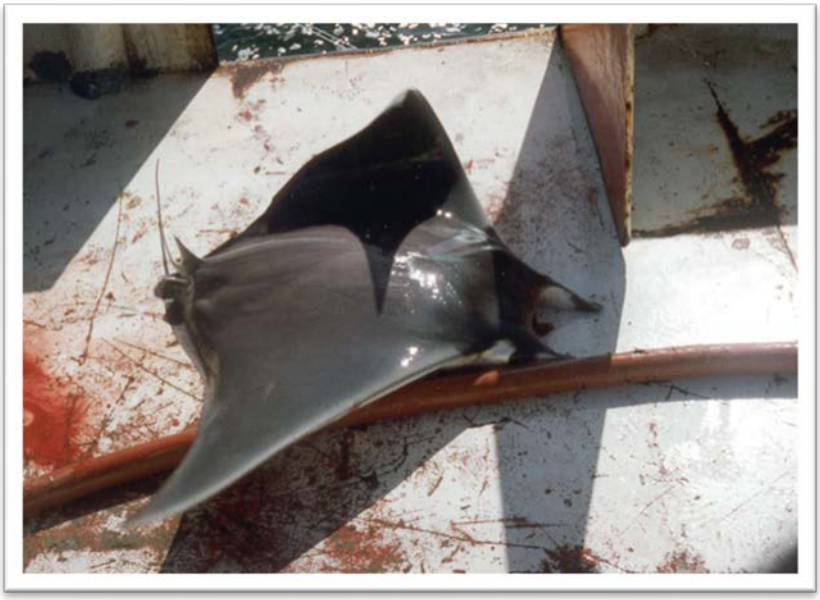

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Introduction

Manta rays and devil rays (*Mobulidae*) are a family of batoids that are highly mobile, circumglobal in range, broadly distributed, highly fragmented, and routinely cross international boundaries. The life history and ecological traits of mobulid species make them inherently vulnerable to overexploitation. Devil and manta rays have long gestation periods (Marshall and Bennett, 2010), and are thought to produce a single pup every one to three years (Notarbartolo di Sciara, 1988; Compagno and Last, 1999; Homma et al., 1999, Marshall and Bennett, 2010 Couturier et al., 2012). Their rate of intrinsic population increase is among the lowest of all elasmobranch species (Dulvy et al., 2014; Pardo et al., 2016).

Manta and devil rays are globally threatened by directed and non-directed fisheries that retain them for their gill plates, which are highly valued in Asian markets (Lawson et al., 2016). Historically, the majority of fisheries that target devil and manta rays were artisanal (Croll et al., 2015), harvesting them for their meat. However, since the 1990s, a market for mobulid gill rakers has significantly expanded, increasing the demand for manta ray products, particularly in China where they are believed to have healing properties (Miller and Klimovich, 2017). The use of gill rakers as a remedy, which was widespread in southern China many years ago, has recently gained renewed popularity over the past decade as traders have increased efforts to market their healing and immune boosting properties directly to consumers (Heinrichs et al., 2011). As a result, demand has significantly increased, providing incentive to fishers who once avoided capture of manta and devil rays to directly target them (CITES 2013), leading to significant concerns regarding these species imperilment.

The International Union for Conservation of Nature (IUCN) currently lists both manta species as Vulnerable and devil rays as Vulnerable, Near Threatened, or Endangered on the Red List of Threatened Species (Lawson et al., 2016). In 2016, all manta and devil rays were included in Appendix II of the Convention for the International Trade in Endangered and Threatened Species (CITES) - meaning that all Parties to the agreement must demonstrate that animals are sourced from legal and sustainable fishing operations. The giant manta ray (*Manta birostris*) was listed as a threatened species under the U.S. Endangered Species Act in 2018.

While regulating international trade is important, other issues of concern include incidental capture and low rates of post-release survival (Francis and Jones, 2017). Manta and devil rays are incidentally caught throughout their ranges in at least 30 large- and small-scale fisheries in 13 countries (Lawson et al., 2016).

As manta and devil rays are incidentally captured in a variety of commercial and recreational fisheries (driftnets, purse seines, gillnets, traps, trawls, and longlines), developing safe release and handling guidelines to increase their survivorship becomes imperative. Conditions faced during the different phases of capture in fishing operations include traumatic handling practices (lifting up by the gills, cephalic lobes, or dragging on the deck and/or towing). Manta and devil rays may also be exposed to physical contact with hard objects, the harsh harvesting process of removal from the fishing gear and water (lack of oxygen, exposure to the sun and organs crushed because of the weight of gravity). Because rays are large, they can be extremely difficult to lift back into the water and are commonly winched back into the sea slung from a hook inserted into

their gills or by a hole punched into their wing, procedures likely to be detrimental to survival. Although more research is needed, the few available studies on post-release survival on manta and devil rays show that handling following capture strongly influences post-release survival. Proper handling and release by fishers, therefore, are essential for ensuring their continued survival.

The National Marine Fisheries Service currently does not provide any guidance to fishers for safely releasing manta and devil rays caught in fishing gear. The only safe release guidelines currently available are for individuals captured in purse seines and longline fisheries of the Western and Central Pacific Fisheries Commission (Poisson et al., 2014; Hutchinson 2017). Herein, we outline guidelines for the handling and release of manta and devil rays that are incidentally captured in commercial and recreational fisheries.

Species Identification Issues

All manta and devil rays are characterized by diamond-shaped bodies, wing-like pectoral fins, and cephalic lobes. Distinguishing between species can be difficult and lead to misidentification. In general, manta and devil rays can be differentiated based on size, coloring patterns, and some anatomical features. To assist in species identification, we have created a simple identification sheet (Appendix 1). In addition, Stevens *et al*. (2018) provides detailed information on the identification and characteristics for all devil and manta ray species and it is publically available.

Gillnet and Trawl Fisheries

Disentangling a manta or devil ray from a net requires extreme caution. The animal may appear dead but is alive and fishers can be injured due to their large size. The manta and devil rays will likely need to be cut from the netting, depending on the size of the mesh (Figures 1-3).

Releasing a Manta or Devil Ray from the Side of a Vessel

The animal should be released quickly, but with care and kept in water to the maximum extent possible. Removing a ray from the water can increase the likelihood of injuries, because of lack of oxygen, exposure to the sun, and crushing the animal's organs due to the weight of gravity.

- Do not attempt to cut off the tail.
- Use the body of the net to maneuver the ray alongside the boat; care should be taken to minimize stress and/or injury.
- Cut away netting using a knife or cutting tool available, care should be taken to prevent injury to the animal while doing so. Every effort should be made to disentangle the animal from the net and remove the netting.
- Release the animal quickly, with as minimal injury as possible.

Bringing a Manta or Devil Ray Onboard a Vessel:

If it is not possible to remove netting while the animal is in the water, carefully bring it onboard without causing damage to the body. While bringing onboard, make every attempt to support the ray's weight by at least two points (*i.e.* one point of contact being the midsection, and the other being the posterior end of the body) or preferably have 2 or 3 people carry the ray by the sides of each wing.

- Do not gaff (using a hooked pole to move the animal)

- Do not lift, drag, or carry the ray by the gill slits or cephalic lobes; do not punch holes through the body in order to pass hoisting cables through it.

Once Onboard the Vessel:

- Do not cut off the tail.
- Carefully cut the mesh off the body. If possible, the mesh can be removed from one wing by carefully cutting a hole. The ray can then be disentangled and slid through the hole of the net.
- Remove as much of the netting as possible, and do not throw the netting remains overboard.
- Release. The ray can be handled by 2 or 3 people and carried by the side of the wings to release over the side of the vessel.

Figure 1: Cownose ray was used as a proxy to illustrate incidentally captured manta ray in a gillnet. Note that manta and devil ray's may roll and thrash in the net, similar to this cownose ray, further entangling itself. Every attempt should be made to unravel the net and release/untangle the animal while still in the water.

Figure 2: Cownose ray was used as a proxy to demonstrate disentanglement and line removal. Disentangle and cut away netting as needed without harming animal. NOTE: Do not turn manta or devils rays on their backs – as this can cause additional injury.

Figure 3: Cownose ray used as a proxy to demonstrate safe release. Several people should support the ray's weight and it should be gently release over the vessel's side.

Purse Seine Fisheries

Manta and devil rays have been documented interacting with purse seine fisheries and a manual has been developed to address these concerns and establish safe handling practices (Poisson et al. 2014). Several tools should be prepared in advance, and the crew should store a piece of net or sling to prepare the release of large manta and devil rays. Proceed with care as these steps are implemented following Poisson et al. (2014):

- Do not cut off the tail.
- Manta and devil rays should be released directly from the brailer (the scoop net that removes the fish from the purse seine), with care.
- Alternatively, they can be returned to the sea using a piece of net or a canvas sling that is lifted by the crane.
- Do not bind wire tightly around the animal's body or insert wire into their skin in order to tow or lift them.
- If the animal is boated, untangle any netting and release quickly. The ray can be handled by 2 to 3 people and carried by the side of the wings to release over the side of the vessel.

Longline Fisheries

Manta and devil rays may interact with longlines while swimming or feeding near deployed gear. Animals may get hooked externally or hooks may be ingested, and care should be taken to prevent injury to the ray while removing hooks (Figure 4).

Releasing a Manta or Devil Ray from the Side of a Vessel:

- Do not attempt to cut off the tail.
- Use the line and leader to maneuver the animal alongside the vessel.
- Keep the ray in the water to minimize further stress and injury to the animal.
- Do not attempt to pull the hook out as it will cause serious damage to the animal.
- Assess whether the hook can be successfully removed with the ray fully submerged in the water. If the ray has been hooked through the mouth with a barbed hook, it can safely be dislodged by using a turtle dehooker or by cutting the hook below the barb with bolt cutters.
- If the ray has swallowed the hook or has been "foul hooked" (i.e. hooked any place but the jaw), do not try to retrieve the hook. Cut the leader as close to the hook as possible and release.
- Animals should be released with no or little to no trailing line or hook.

Bringing a Manta or Devil Ray Onboard the Vessel:

It is highly recommended to avoid bringing a manta or devil ray onboard; however, if it is not possible to remove the hook while the ray is in the water (for example, if the animal has been hooked ventrally), carefully bring it onboard without causing damage to the body. While bringing onboard, make every attempt to support the ray's weight by at least two points (*i.e.* one point of contact being the midsection, and the other being the posterior end of the body) or preferably have 2 to 3 people carry the ray by the sides of each wing.

- Do not gaff (using hooked poles to move the animals) the ray.
- Do not lift, drag, or carry the ray by the gangion, gill slits, or cephalic lobes; do not punch holes through the body in order to pass hoisting cables through it.

Once Onboard the Vessel:

- Do not cut off the tail.
- Attempt to remove the hook. If the ray has been hooked through the mouth with a barbed hook, it can safely be dislodged by using a turtle dehooker or by cutting the hook below the barb with bolt cutters. If the ray has swallowed the hook or has been "foul hooked" (i.e. hooked any place but the jaw), do not try to retrieve the hook. Cut the leader as close to the ray as possible.
- The ray should be handled by 2 to 3 people and carried by the side of the wings and released over the side of the vessel.

Figure 4: Atlantic Devil Ray foul hooked by long-line gear.

Recreational Angler Interactions

Manta and devil rays are commonly hooked by recreational fishing gear. One of the more common species angler's target that interact with manta rays are cobia, *Rachycentron canadum.* Cobias are known to follow larger animals such as sharks and large rays to scavenge. Therefore, anglers targeting cobia will cast fishing lines in the direction of rays, and as a result, rays are often hooked externally Figures 5-6).

If Caught from a Vessel:

- Do not cut off the tail.
- The animal should be released quickly, but with care, do not gaff, lift or drag ray by gills or cephalic lobes.
- Bring the ray close to the vessel, but keep the ray submerged in water. Removal from the water can harm the animal. Never bring a manta or devil ray onto a recreational fishing vessel.
- Use the line and leader to maneuver the ray alongside the boat; care should be taken to minimize stress and/or injury.

- Do not attempt to pull the hook out as it will cause serious damage to the animal.
- Using a dehooker or long-nosed pliers remove the hook so it can be released, or cut the line as close to the hook as possible; leave as little/no line trailing from the animal as possible.
- Release as quickly as able, do not delay release just to take pictures. Rays are susceptible to post-release mortality due to stress caused by being removed or kept out of the water for extended periods.

If Caught from the Shoreline or Fishing Pier:

If caught from a pier, slowly guide and walk with the ray attached to the line down the pier until you reach the shoreline. From there, bring in the ray close to the shoreline. If caught from shore, slowly reel the ray in towards the shoreline.

- Do not cut off the tail.
- The animal should be released quickly, but with care; do not gaff, lift or drag ray by gills or cephalic lobes.
- Keep as much of the animal, especially gills, in the water as possible. Never bring a manta or devil ray onto a pier, bridge or onto dry land beyond the surf zone.
- Remove hooks and/fishing gear from the animal; care should be taken to prevent injury to the ray while doing so. If the hook has been swallowed, cut the line as close to the hook as possible, leasing as little trailing line as possible.
- Release as quickly as able, do not delay release just to take pictures.

Figure 5: Foul hooked giant manta ray (Photo credit: Bethany Augliere, Marine Megafauna Foundation)

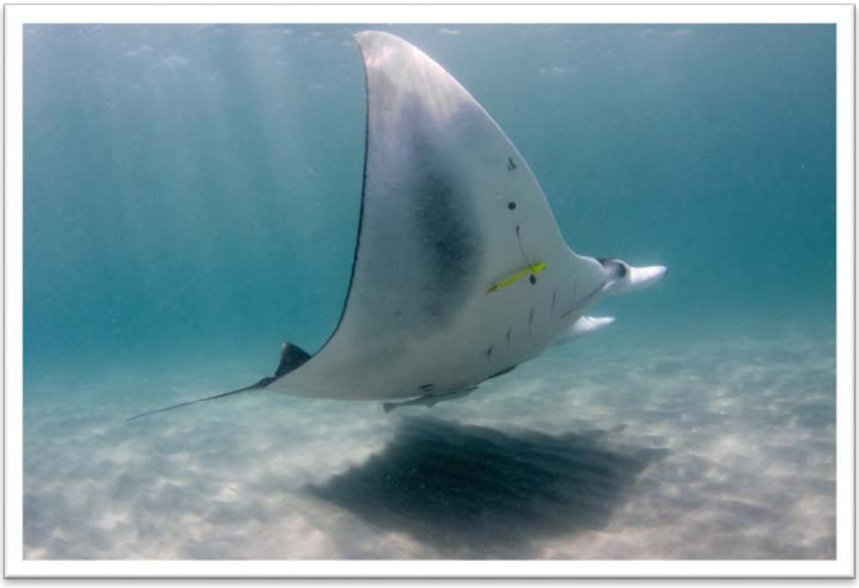

Figure 6: Foul hooked giant manta ray (Photo credit: Bethany Augliere, Marine Megafauna Foundation)

Acknowledgments

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Appendix I

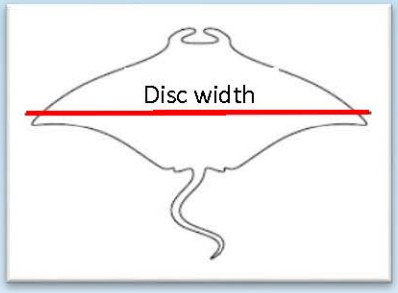
NOAA FISHERIES

Mobula Ray Identification Guide For Fisheries Observers

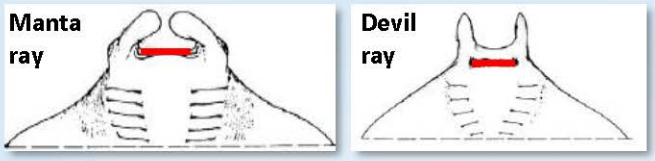
Purpose: This guide is intended to assist fishery observers in the visual identification of the giant manta ray and several devil ray species that occur in the Southeast and Mid-Atlantic.

General Observations: The size, coloring patterns, and a few morphological differences can be used to distinguish between species.

- Giant manta rays are larger than devil rays. Measurements should be taken by estimating the distance over their wingspan ["Disc Width" (DW)].



- Giant manta rays have a terminal mouth (i.e., mouth points straight forward, in front of the head); Devil rays have a sub-terminal mouth (i.e., mouth beneath the head).



Terminal mouth | Sub-terminal mouth

Manta birostris

Common Names: Giant Manta Ray, Oceanic Manta Ray

Status: U.S.: Listed as *Threatened* under Endangered Species Act.

Size: Up to 700 cm DW; appx. 200 cm DW at birth.

Dorsal Coloration: Black with distinct white patches creating a T-shaped shoulder pattern.

Ventral Coloration: White with dark spots; spots rarely found between gill slits. Dark shading along the posterior edges of the pectoral fins.

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Mobula mobular

Common Names: Giant Devil Ray, Spinetail Devil Ray

Status: U.S.: Not listed. International Union for Conservation of Nature (IUCN): *Endangered*

Size: Up to 520 cm DW

Dorsal Coloration: Predominantly dark gray; with a black (crescent shape) stripe that runs from side to side on upper shoulders. White tip on the dorsal fin.

Ventral Coloration: White.

Photo credit: Guy Stevens/Manta Trust

Mobula tarapacana

Common Names: Chilean Devil Ray, Sicklefin Devil Ray, Box Ray

Status: U.S.: Not listed. IUCN: *Vulnerable*

Size: Up to 340 cm DW

Dorsal Coloration: Golden brown to olive green.

Ventral Coloration: Predominately white with gray shading along the posterior margin of pectoral fins.

Photo credit: www.tomburd.co.uk

Mobula hypostoma

Common Names: Atlantic Devil Ray, Lesser Devil Ray

Status: U.S.: Not listed. IUCN: *Data Deficient*

Size: Up to 120 cm DW

Dorsal Coloration: Variable, brown, gray to black. Sometimes have a dark gray/black stripe that runs from side to side on the "neck" right behind the eyes.

Ventral Coloration: White.

Photo credit: Kim Basso-Hall/Mote Marine Laboratory