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**Developing best handling practice guidelines to safely release mantas and mobulids
captured in commercial fisheries¹**

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Introduction

The Family Mobulidae is represented by two genera and 11 recognized species, comprising the manta rays (*Manta* spp., n=2) and devil rays (*Mobula* spp., n=9). It is a diverse family of planktivorous elasmobranchs occurring worldwide in tropical, subtropical and temperate waters (Compagno and Last 1999). Mobulidae also contains the largest rays, reaching over 7 m disc width (Tremblay-Boyer and Brouwer 2016). Most mobulid species have been reported as bycatch by several fishing methods, including purse seine, longline, trawl and gillnets, and are also taken as target species (White et al. 2006, Couturier et al. 2012, Hall and Roman 2013, Mas et al. 2015, Tremblay-Boyer and Brouwer 2016, Francis and Jones 2017). Mobulids have life history characteristics (e.g. slow growth, extremely low fecundity, and delayed age of first reproduction) that make them exceptionally susceptible to overexploitation (Couturier et al. 2012, Croll et al. 2016). Most mobulid species that have been classified by the IUCN Redlist (IUCN, 2014) are listed as Near Threatened or Vulnerable. However, one mobulid species, (*M. mobular*), is listed as Endangered and three could not be assessed because of insufficient data (Couturier et al. 2012). The purpose of this document is to provide a comprehensive overview of available information on post release survivorship for mantas and mobulids captured in non-target fisheries to establish guidelines of best handling practices for release methods, to enhance survivorship of incidental rays.

Background

Purse Seine

Tuna purse-seine fisheries are one of the main contributors to mobulid bycatch with several of the larger species regularly caught in relatively large numbers (Romanov 2002, Couturier et al. 2012). Research from the Eastern Tropical Pacific indicates that non-associated or school-sets have higher mobulid catch rates than both dolphin-sets and FAD-associated sets (Hall and Roman 2013). In a recent study, Francis & Jones (2017) found high post release mortality (PRM) rates of the spinetail devil rays, *M. japanica* caught by purse seines in New Zealand. They found that mobulids brought onboard by brail net survived (n=3), while specimens entangled in the netting when brought on-board (n=4) did not survive, despite all tagged rays appearing healthy and lively with minimal superficial injuries. All mortalities occurred within 2-4 days of release. The authors of this study made recommendations for reducing purse seine mortality of mobulid rays by avoiding areas of high ray abundance, avoiding setting on ray-associated tuna schools, and adopting best-practice methods of returning rays to the sea from within the purse seine net or from the vessel (Francis & Jones, 2017). Best handling practice guidelines for discarding mobulids from commercial purse seine vessels have been developed and are included in the list of recommendations below (Poisson et al. 2014).

Longline

Several species of Mobulidae are encountered in longline fisheries across the Pacific Ocean. Observer data shows that most individuals are alive at the vessel and subsequently discarded in a weakened condition. Specifically, conditions at release are most often reduced from “alive” and “alive healthy” to “alive injured”, “alive but dying” or “dead” (Tremblay-Boyer & Brouwer, 2016). This indicates that the handling and discard practices utilized by fishers are inflicting injuries that compromise mobulid survival potential post release. Despite the need to understand the risk of capture on post-release survival for stock

assessment purposes, no empirical post-release data is known for mobulid rays discarded from longline fisheries (Mas et al. 2015). Because at-vessel mortality rates for mobulids in longline fisheries is relatively low; 1.4% to 5.2% (Coelho et al. 2012, Mas et al. 2015), the adoption of safe-release guidelines has the potential to greatly reduce the impact of the interaction on mobulid post release survival potential.

Recommendations of best handling practices for the safe release of mantas & mobulids

Purse Seine

Do's:

Release rays from the net while they are still free-swimming (e.g. back down procedure, dropping corks).

Release rays directly from the brailer.

Small (< 30 kg) and medium rays (30-60 kg) should be handled by 2 or 3 people and carried by the sides of its wings or preferably using a purpose built cradle/stretchers.

Larger rays (>60 kg) that end up on deck can be returned to the sea using a piece of net or a canvas sling that is gently placed under the animal and then lifted by the crane. [Note: The crew should store a piece of net (or a canvas sling) to prepare for the release of large animals prior to each set.]

Avoid areas with known or predicted high densities of rays ("hotspots").

Reduce soak times when rays are present and schooling.

When entangled in a net, carefully cut the net away from the animal.

Don'ts:

Do not leave a ray on deck until hauling is finished before returning it to the sea. Rays are obligate ram ventilators which means they must be swimming to 'breathe' and therefore may die if they remain on deck.

Do not use any wire to bind or insert into a ray in order to move or lift it. This will cause further harm.

Do not drag, carry, or pull a ray by its "cephalic lobes" or tail or by inserting your hands into the gill slits or the spiracles.

Do not cut the jaw to recover hooks.

Longline

Do's:

For small rays, gently bring on board and remove as much gear as possible by backing the hook out of its mouth. If hooks are embedded in the jaw, either cut the hook with bolt cutters or cut the line at the hook and gently return the animal to the sea.

For medium to large rays (>30 kg), leave the animal in the water and use a dehooker or a long-handled line cutter to cut the gear as close to the hook as possible (ideally leaving < 0.5 meters of line attached to the animal).

Avoid areas with known or predicted high densities of rays (“hotspots”).

Reduce soak times when rays are present and schooling.

Don'ts:

Do not hit or slam a ray against the side of the vessel in an attempt to get a ray off the line—this will cause severe damage and likely death to the animal.

Do not attempt to dislodge a deeply hooked or ingested hook by pulling on the branch line or through the use of dehooker.

Do not attempt to lift medium to large (>30 kg) rays aboard vessel.

Do not cut the tail.

Do not gaff a ray to bring aboard vessel.

Do not drag or carry a ray by its “cephalic lobes” or tail.

Do not carry or drag a ray by inserting your hands into the gill slits or the spiracles.

Appendix – Additional Recommendations

1. Knowing that any fishing operation may include catching large rays, several tools should be prepared in advance (e.g. canvas or net slings and or stretchers in purse seine fisheries, long handled cutters and de-hookers in longline fisheries).

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