Collaborating with longline fishers to improve post-release survival of mobula rays

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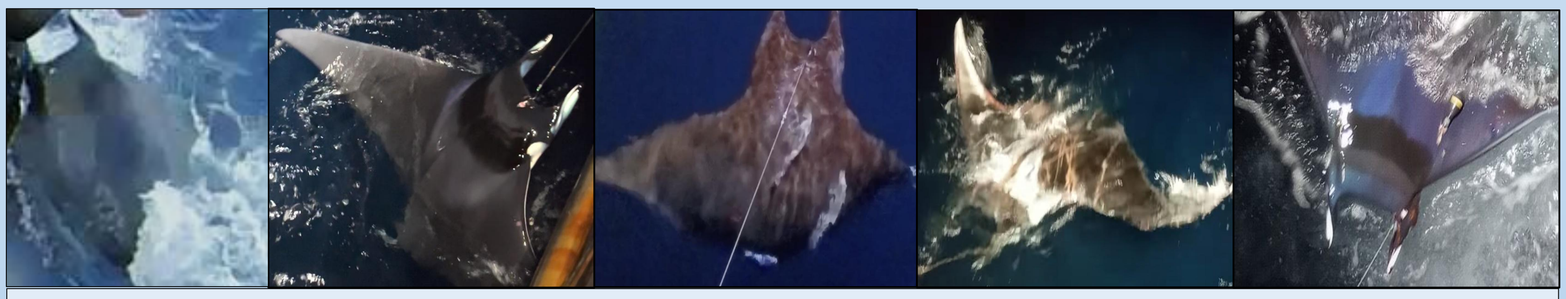
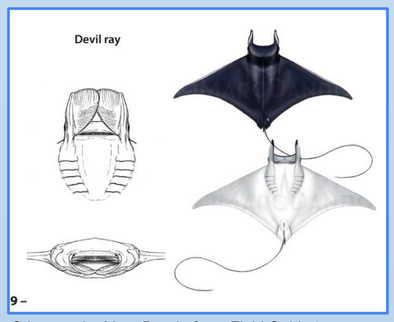


Spinetail devil ray *Mobula eregoodoo* | Spinetail devil ray *Mobula mobular* | Sicklefin devil ray *Mobula tarapacana* | Giant manta ray *Mobula birostris* | Bentfin devil ray *Mobula thurstoni*

Figure 1 – Mobula ray species identified in Hawaii longline fishery by genetics or from EM footage using new ID guide.



Background

- Post-release survival rates and species-specific catch data are not available on mobula (devil and manta) ray interactions in Hawaii longline fishery.
- Mobula ray interactions are rare in Hawaii longline fishery but conservation concern as mobulas have long lifespan and low fecundity.
- Most mobula rays listed as vulnerable or endangered on IUCN red list.
- Giant manta ray listed as threatened under US ESA since 2018.

Objectives

1. Collect species-specific catch data in Hawaii longline fishery.
    - Genetics study
    - New identification guide .
2. Post-release survival rates and best handling practices for mobula longline interactions.
    - Pop-off archival satellite tags deployed by fishers.

Free online mobula ray ID Guide for the Pacific ocean:
https://www.sharktagger.org/mobulid-id-guide

Methods/Results

- 37 Genetics samples collected by observers with 24 analyzed to date.
- 22 Mobula ray interactions reviewed from EM footage for species ID and at-vessel data that could affect survival.
- 5 different species of mobula rays identified from genetics or EM review (Figure 1).
- At-vessel data and tag fate collected during tagging study to determine post-release survival rates and best handling practices. Eleven tags deployed so far (Table 1).
- At-vessel data collected in tagging study and EM review: condition, hook/entanglement location, handling, trailing gear, length, leader material.

Figure 2 – Images showing examples of at-vessel data collected from tagging study and EM footage. Left and middle show hooking location in head aand right shows fisher cutting line to release animal.

Table 1 – At-vessel data and tag fate for mobula rays tagged in the Hawaii longline fishery. Tags are wildlife computer pop-off survival tags programmed to 60 days.

Species	Hook /entanglement location	Release condition	Remaining line	Tag fate
M. birostris	Hooked multiple locations, fisher reported entanglement	Good	unknown	Full deployment
M. tarapacana	Hooked head	Injured, heavy bleeding from tagging	~4 ft	Full deployment
	Hooked head	Good	~3 ft	At-large
M. mobular	Entangled around body	Injured, entangled line cut tissue	None	Mortality
	Hooked head	Injured, bleeding at tag site	~2 ft	Detached early, 52 days
M. thurstoni	Hooked head, base cephalic fin	Good	~3 ft	Full deployment
	Hooked mouth	Injured gill, bleeding gills and mouth	~3 ft	Full deployment
	Hooked head	Good	~2 ft	Full deployment
	Hooked head	Good	~4 ft	Full deployment
	Hooked mouth	Alive	~3.5 ft	Full deployment

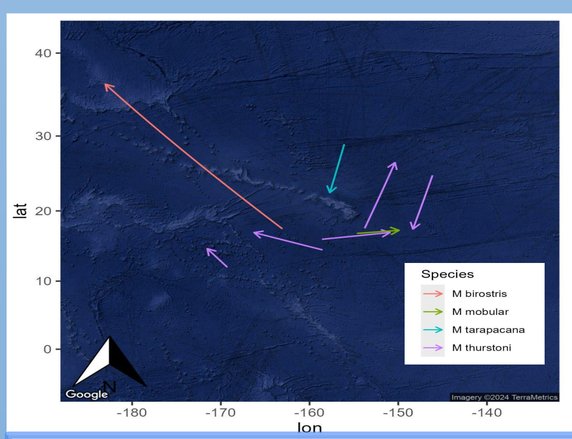


Figure 3 – Minimum distance travelled for mobula rays during tag deployment.

Table 2 – The greatest minimum distance travelled and maximum depth recorded for each species tagged.

Species	Distance travelled (km)	Maximum depth (m)
M. birostris	2872	1106
M. tarapacana	733	1201
M. mobular	506	929
M. thurstoni	1058	558

Take Home Messages

- Vertical movements suggest role in nutrient cycling from epipelagic to mesopelagic.
- Movements overlap pelagic fisheries operating from surface to depths of ~1000 m.
- Mobula may survive longline interactions if best handling practices followed, but more data needed.
- Species-specific catch information can improve stock assessments.
- Fishers provide opportunities for data collection of rare species difficult to study.

Future Work

- Deploy more tags to estimate species-specific post-release survival rates.
- Incorporate collection of species-specific catch and other data that may affect survival in observer and EM monitoring programs. Observer training in progress.