

An aerial photograph of a fishing vessel's deck, showing various pieces of equipment and a red net. In the background, a helicopter is on the water's surface. The text is overlaid on this image.

Exploring Helicopter-Vessel Communication for Mobulid Bycatch Avoidance in Tropical Tuna Fisheries

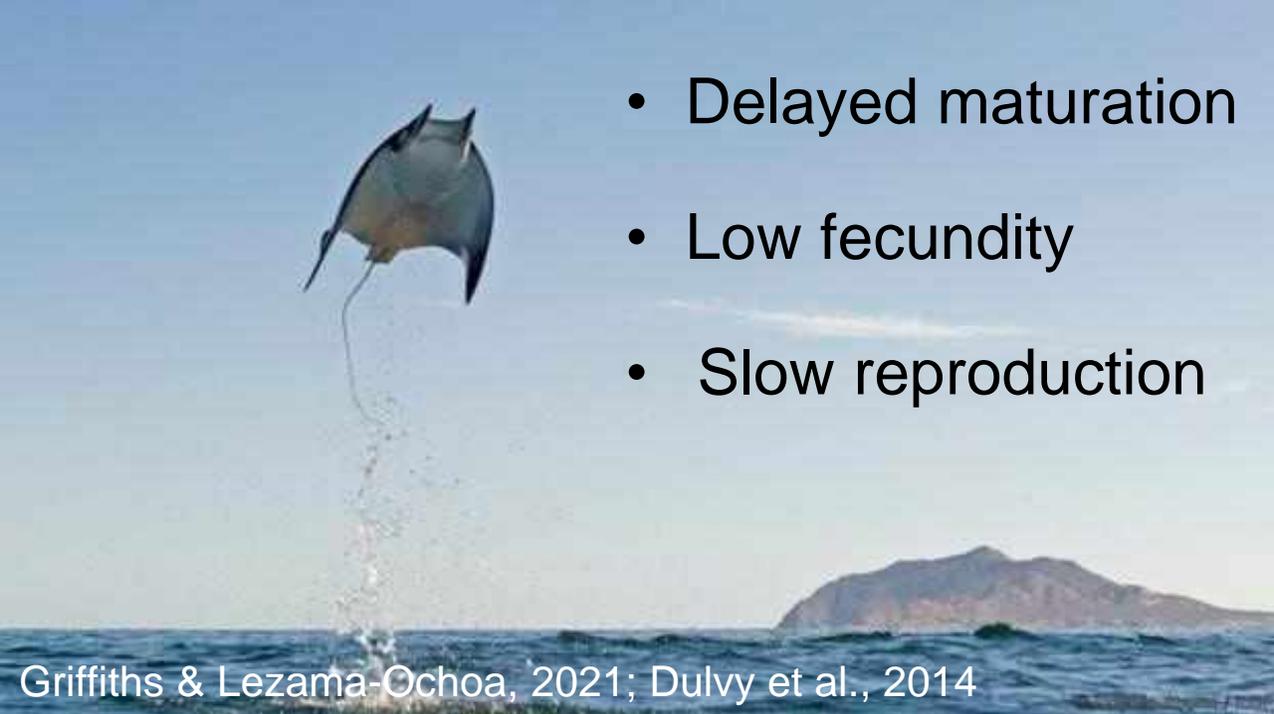
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May 11 & 12, 2023

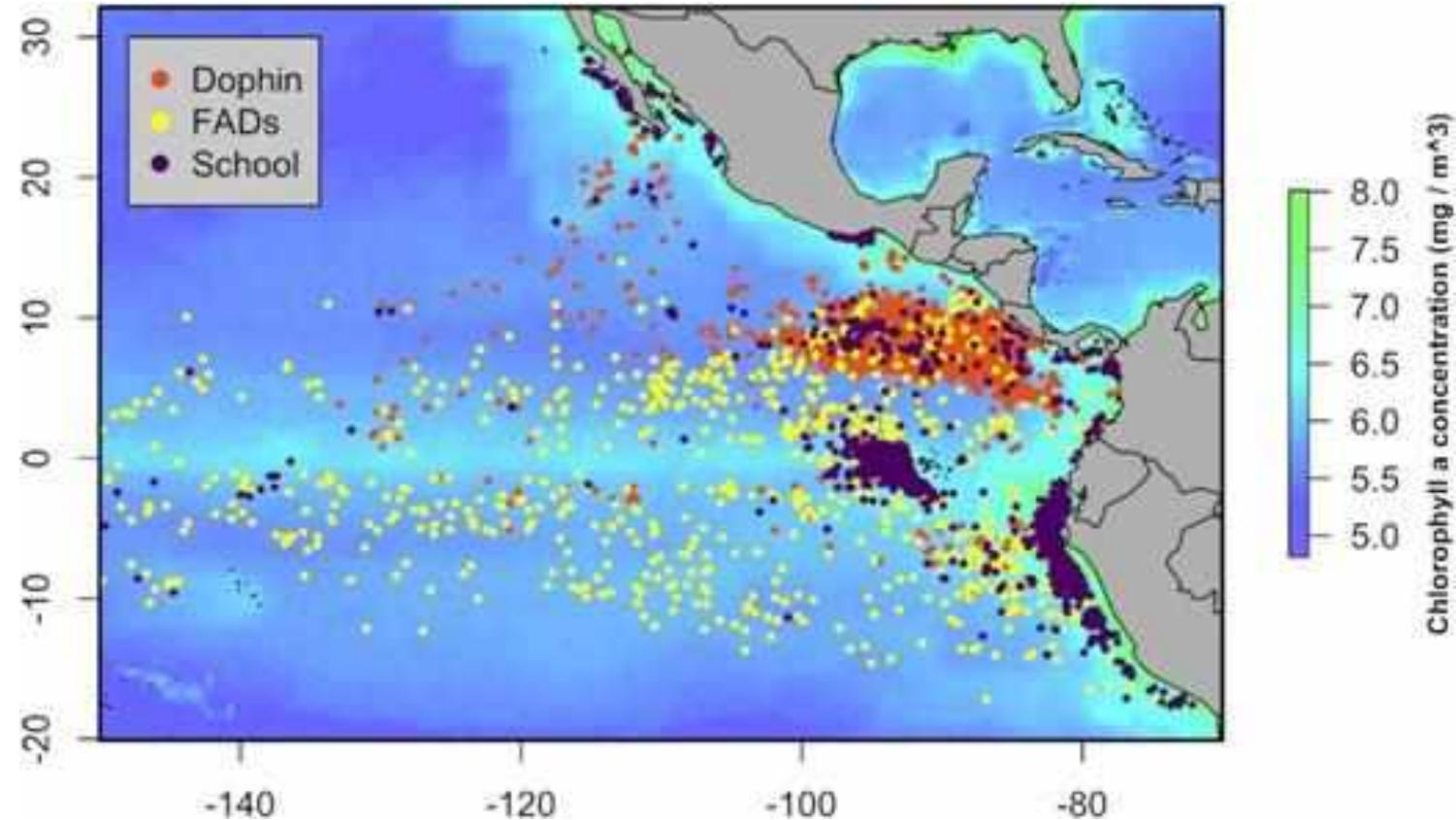
What are Mobulids?



- Delayed maturation
- Low fecundity
- Slow reproduction



~3,000 Mobulids bycaught annually in the Eastern Tropical Pacific purse seine fishery



Map from Cronin et. al, 2022

Over 58,000 Mobulids bycaught by purse seiners in the ETP between 1993-2014

Croll et al., 2016

Why is bycatch avoidance important for Mobulids?

- Mobulids are vulnerable to post-capture handling
 - Don't surface to breathe
 - Risk of crushing



Process of searching for tuna

- Visual cues of tuna schools
- Physical and environmental cues



Hypothesis: Helicopter-vessel communication could aid in bycatch data collection and bycatch mitigation

- Helicopter crew are sometimes aware of Mobulid presence before setting the net¹
- Unexplored population of stakeholders
- Unique view of the fishing operation





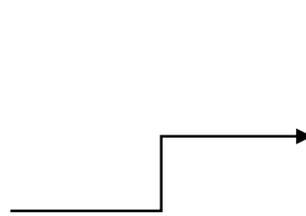
Research questions:

1. What indicators do fishers use to sight bycatch species?
2. Are helicopter crew better able to sight bycatch species compared to vessel crew?
3. What information is routinely communicated by helicopter crew to the vessel?

Survey Design & Distribution

Survey Questions:

- Participant demographics
- Indicators used to sight species
- Visual identification of species
- Communication with the vessel



- **Mobulids**
- Dolphins
- Sea turtles
- Sharks



Experience as a Pilot/Spotter on a Helicopter

	Yes (N=10)	No (N=23)	Total (N=33)
Occupation			
Fishery observer	0 (0%)	9 (39.1%)	9 (27.3%)
Spotter	2 (20.0%)	5 (21.7%)	7 (21.2%)
Navigator	0 (0%)	5 (21.7%)	5 (15.2%)
Captain	4 (40.0%)	1 (4.3%)	5 (15.2%)
Helicopter Pilot	2 (20.0%)	0 (0%)	2 (6.1%)
Helicopter Mechanic	1 (10.0%)	0 (0%)	1 (3.0%)
Deck crew	0 (0%)	1 (4.3%)	1 (3.0%)
Deck boss	0 (0%)	1 (4.3%)	1 (3.0%)
Missing	1 (10.0%)	1 (4.3%)	2 (6.1%)
Vessel Flag			
Ecuador	6 (60.0%)	19 (82.6%)	25 (75.8%)
Spain	0 (0%)	3 (13.0%)	3 (9.1%)
Mexico	2 (20.0%)	0 (0%)	2 (6.1%)
Panama	1 (10.0%)	1 (4.3%)	2 (6.1%)
United States	1 (10.0%)	0 (0%)	1 (3.0%)
Location when Searching			
Bridge	1 (10.0%)	14 (60.9%)	15 (45.5%)
Helicopter	7 (70.0%)	0 (0%)	7 (21.2%)
Crow's nest	1 (10.0%)	5 (21.7%)	6 (18.2%)
Main deck	0 (0%)	4 (17.4%)	4 (12.1%)
No response	0 (0%)	0 (0%)	0 (0%)
Missing	1 (10.0%)	0 (0%)	1 (3.0%)

Survey Respondents

- 33 responses
- Grouped respondents based on demographics
- 30% helicopter crew



Research questions:

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3. What information is regularly communicated by helicopter crew to the vessel?

What indicators do fishers use to sight bycatch species?



Schooling



Jumps and splashes

Marta D. Palacios

Color



- Environmental factors:
- Sea state
 - Time of day
 - Light conditions
 - Weather

Presence of birds

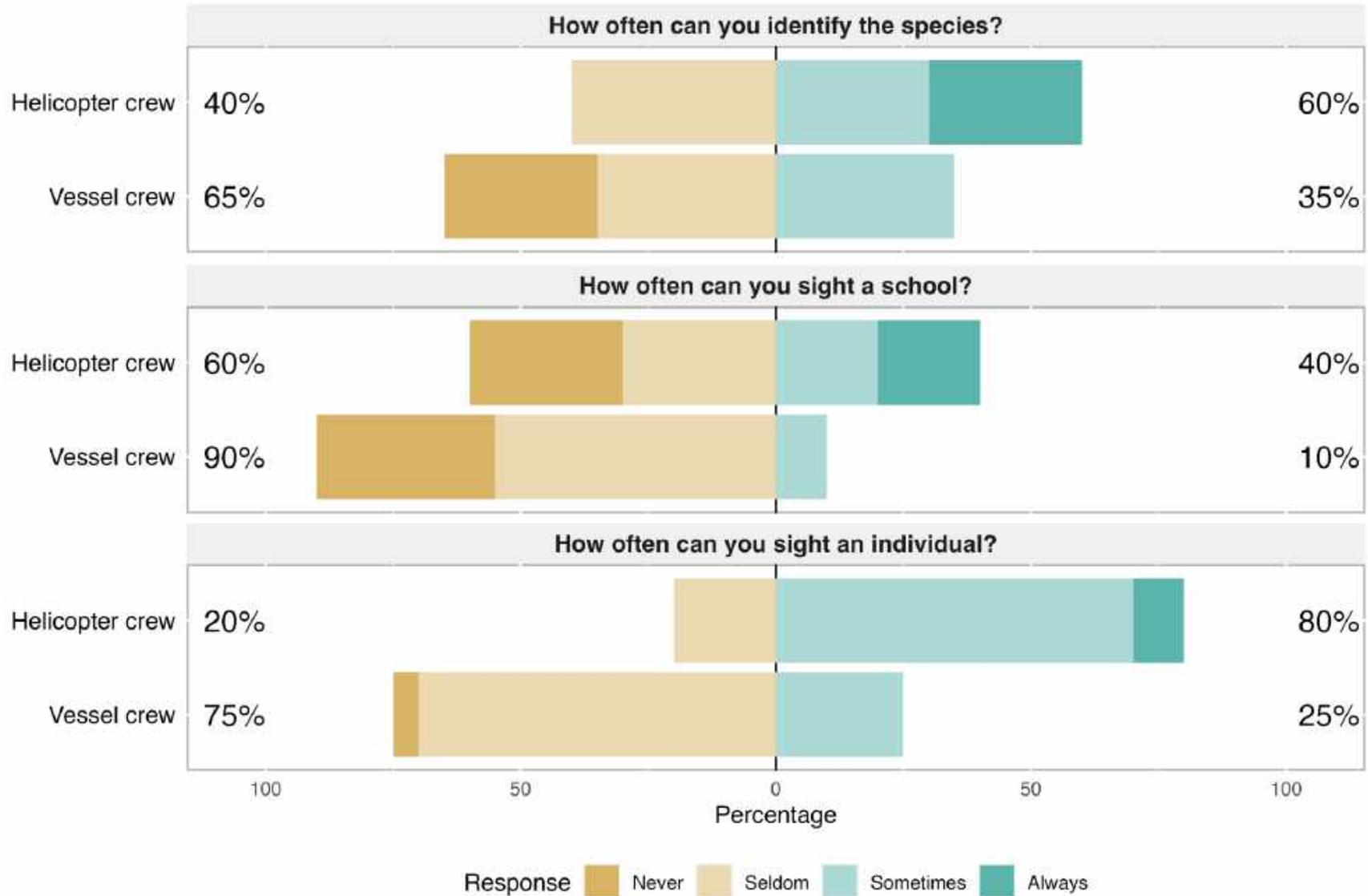




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Helicopter crew may be more likely to sight Mobulids than other crew

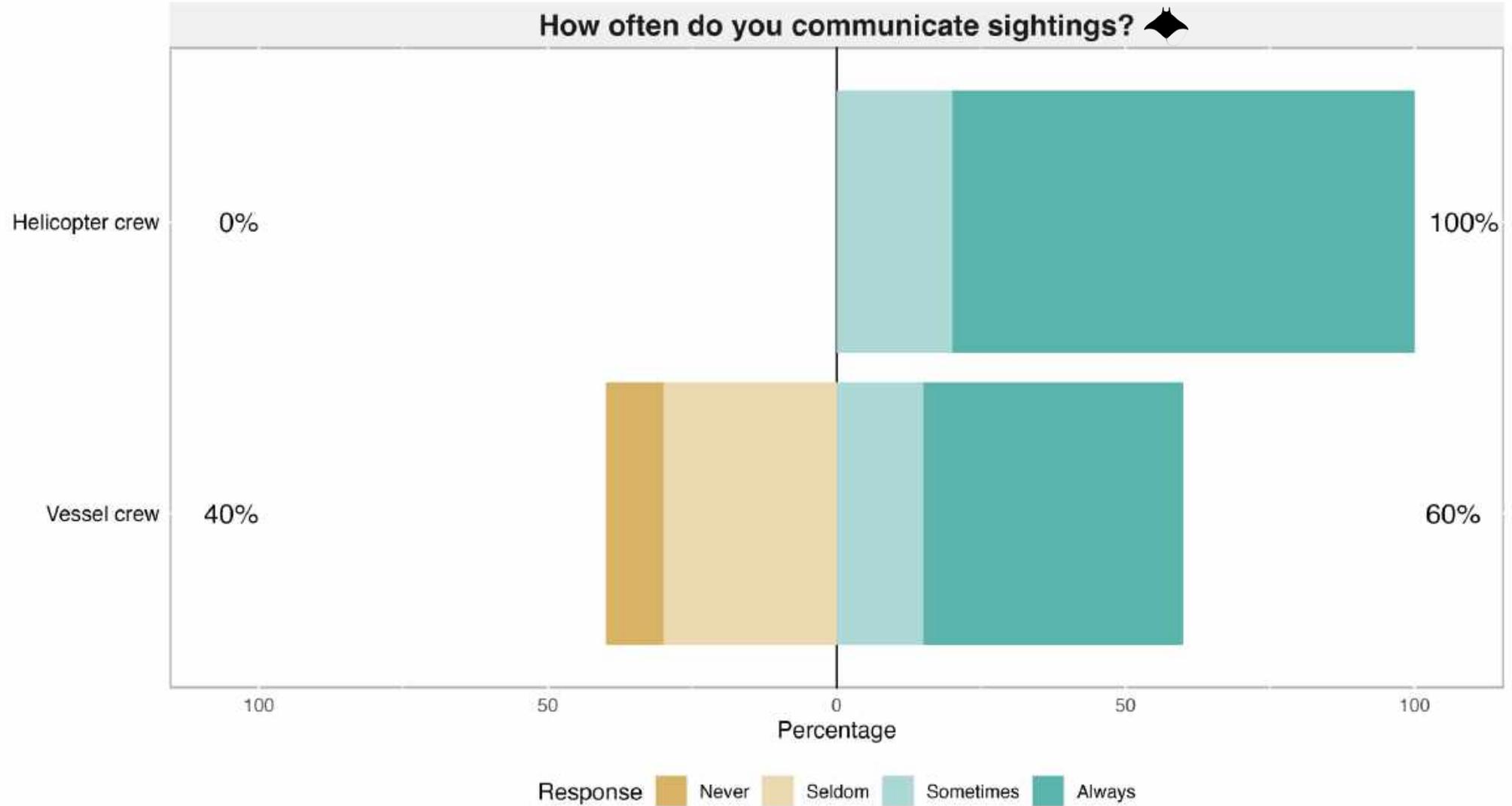




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Bycatch species information could be communicated like target tuna information



Info
rep

Summary of findings

1. Helicopter crew are more likely to sight Mobulids than vessel crew
2. Bycatch communication occurs frequently, but not at the same level of detail as communication about tunas
3. Communication as an early alert system for proper release



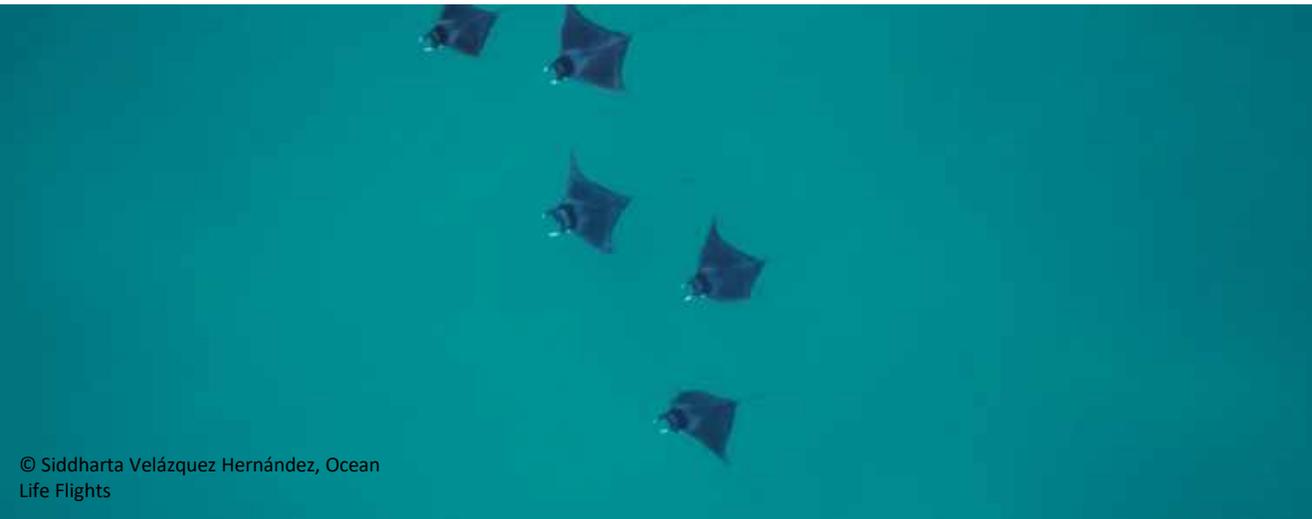
PHOTO BY MARTA D. PALACIOS



Melissa R. Cronin

Future directions

- Contribution of results to Mobulid identification guidebook
- Informal interviews with fishers/helicopter crew
- Participatory feedback from fishery



Acknowledgements

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UC SANTA CRUZ

Science

