

## Final Evaluation Report

---

Your Details	
<b>Full Name</b>	Imran Samad
<b>Project Title</b>	Life in the Fast Lane: Understanding the Interactive Effects of Two Major Anthropogenic Stressors – Tourism and Fisheries – On the Indian Ocean Humpback Dolphin
<b>Application ID</b>	41484-1
<b>Date of this Report</b>	15 <sup>th</sup> September, 2024

**1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.**

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To develop novel methods to estimate dolphin mortality from vessel / fishing gear interactions using available dead animal stranding database, ocean circulation models and remote sensing data.				We recorded 178 IOHD carcasses between 2017 and 2022 (35.6/year). Our drift models suggest that these may represent about 65% of all dolphin mortality. We were unable to obtain carcass necropsy reports from the Forest department and therefore could not quantify the proportion of unnatural mortality.
To estimate the Indian Ocean Humpback dolphin population size in Goan waters and assess their habitat use in the presence and absence of vessel disturbance.				During our seven-day survey in December along the Goa coast (effort ~300 km), we encountered 278 individuals (min: 228, max: 346). The mean pod size was 3.6 individuals and most animals, including the largest pods (32 individuals), were encountered in Northern Goa near the Chapora, Aguada, and Mormugao bays
To quantify and understand how prey distribution, fisheries, and tourism impact dolphin behaviour and mortality rates and dolphin-fisheries interactions.				We sampled for dolphin-human interactions on 104 days between November 2023 and April 2024, of which dolphins were observed on 72 days. Human interactions were recorded on 42 days (26 days with tourist vessels, 8 days with fishing vessels, and 8 days with both simultaneously). We aim to process and analyse interaction videos in the coming months.
To engage with fishers, local community members and tourism				Our interactions with fishers and tour operators highlighted several shortcomings in achieving this objective. Specifically, fishers

<p>operators to develop</p> <p>a) a participatory network that helps in monitoring the dolphin population and b) bycatch mitigation strategies and eco-tourism guidelines.</p>				<p>perceived dolphins as competitors and were not interested in monitoring them while tour operators were hesitant in implementing dolphin-watching guidelines because other operators would not comply.</p>
--	--	--	--	--

## 2. Describe the three most important outcomes of your project.

- a) Validation of our drift modelling methods to estimate dolphin mortality from stranding data. Comparing annual IOHD mortality rates and their population size in Goa, we found that mortality may be high (>5%) in the region and is likely concentrated in central Goa where most fisheries and tourism activity occurs. Nevertheless, the higher number of dolphin carcasses observed in the monsoon may be strongly related to coastward ocean currents during the season. This underscores the importance of monitoring dolphin presence across seasons, which could be done passively using acoustics or remote cameras.
- b) Successfully recording dolphin-human interactions using drones. We observed that dolphin fisheries interactions are relatively rare and may increase in the summer season when fish-availability decreases. Dolphin interactions with fishing vessels were observed on fewer occasions and most interactions were with boats using purse-seine nets followed by gill nets. Not all instances where dolphins co-occurred with fishing boats translated to direct interactions, but interactions lasted for long times once initiated. On the other hand, dolphin-tourism interactions were common and occur daily in the Aguada bay. Fisheries and tourism overlap in this region for a short period in the morning where dolphins can interact with both simultaneously. Dolphins responded to tour boats by diving upon their approach and resurfacing further away. Their responses also varied depending on the number and type of boats surrounding them, the number of members in the pod, and the activity they were performing.
- c) A more nuanced understanding of fisher/tour operator perception of dolphins. Most fishers were averse to dolphin monitoring since they perceived dolphins negatively. A few fishers were favourably inclined to do so but could not due to a lack of tools to report sightings. Several fishers also operated tour boats in the morning and advocated for a better, holistic approach towards dolphin watching with rules applied to all operators.

## 3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

We had planned for boat-surveys in two seasons along the Goa coast but were able to conduct only one survey (two replicates) during December. This was due to the higher costs of boat rent and hotels and difficulties in searching for

boats/captains in different regions of the state. Since previous surveys have been conducted in the same season, we would be able to compare dolphin densities across years. Nevertheless, our observations suggest that dolphin encounters decline during the summer season and that they may migrate out of the region. We hope to conduct more surveys in the future during October and April where we observed significant changes in dolphin encounter rates.

Before the start of the project, we had obtained permits from the forest department to retrieve necropsy reports of dead, stranded animals between 2017 and 2022 to distinguish patterns of natural and unnatural mortality in the state. We were unable to obtain these reports from the department, but locals suggest that unnatural mortality may be high. To overcome this challenge, we plan to partner with other local organisations in Goa that may provide us an insight into the frequency of dolphin bycatch.

Finally, while we regularly interacted with the fishing community, the tourism industry, and the forest department, we found it challenging to set up a dolphin monitoring network and discuss/implement eco-tourism guidelines for dolphin watching. Fishers perceive dolphins as competitors and are uninterested in their monitoring since it does not benefit them directly. However, two fishers in the Chapora bay were willing to aid in collecting dolphin sighting data but did not succeed due to lack of a simple data collection framework. We realised that setting up a WhatsApp bot that can automatically extract time and location from an image, and systematically ask questions in Hindi/Konkani about the observation would be an easy-to-implement approach towards solving this problem.

Since there are no dolphin-watching rules in operation, operators from different regions congregate near the Aguada bay with speedboats and catamarans. Operators from the local Sinquerim jetty were happy to help develop and comply with dolphin-watching guidelines but emphasised that without the rules being equally applied to all, it would be challenging for them alone to adopt. We realised that developing such guidelines requires inputs and agreement from all nearby operators/associations. But more importantly, this requires generating awareness about the impacts of current tourism practices on dolphins and tourists, and how moving towards an eco-tourism approach could help the tour operators as well.

#### **4. Describe the involvement of local communities and how they have benefitted from the project.**

We would not have been able to execute this project without support from local communities. Specifically, we were able to monitor fish-catch and learn about fishery dynamics by engaging with local fishers from our study sites. While discussing dolphin monitoring at Chapora bay, we spoke with fishers who were interested in the use of drones for studying dolphins and were happy to help with our project. Many locals aided in our project and discussed the use of technology and social media to promote eco-tourism practices. We rented and modified a local fishing boat for our surveys from North Goa and hired a local boat operator for surveys in the South. This led to informal conversations about dolphin occurrence in the region and their life-history that also allowed us to explain the importance of Goa for IOHD and the need to study them systematically over time.

Listening to local fishers/tour operators about dolphins and the challenges they face regarding their livelihood allowed us to better understand the socio-politics of dolphin conservation and potential roles that the forest department could play to help overcome these challenges. We will be reporting these to the

department and recommend actions for developing holistic and inclusive dolphin conservation plans.

### **5. Are there any plans to continue this work?**

Yes, we would like to survey the coastline during two different months to better understand seasonal occurrence and movement of dolphins. Our results suggest that Goa is a hotspot for both dolphin occurrence and mortality and we would therefore like to continue monitoring the coast for understanding long-term population dynamics. We realised that working with fishers and tour operators to conserve dolphins also requires longer term commitment and an expansion of the current sites to include operators from nearby regions. Importantly, there is need for creating simple and engaging outreach materials for operators as well as tourists for better explaining the impacts of human disturbances of dolphins.

Our dolphin observations were mostly limited to a few areas in central Goa. Other regions, specifically parts of south Goa, have lower human disturbance and may act as good control sites to understand how dolphins may have learned to adapt to the two anthropogenic pressures i.e., fisheries and tourism.

### **6. How do you plan to share the results of your work with others?**

The results from our study will be shared with the Goa Forest department in the form of a report and a presentation. Through this, we would emphasize the importance of long-term dolphin research and conservation in Goa, and how it could act as a blueprint for managing dolphin tourism across the country. By combining this and outreach plans with fishers, tourists, and locals in the form of meetings, focal group discussions, and other media, we hope to generate awareness about the importance of dolphin habitat in Goa, issues surrounding their conservation, and potential measures to resolve them.

I have already published one article illustrating the nuances of dolphin-fisheries interactions in Goa titled 'Part of the platter: Dolphin decision-making and the fish on your plate' in the magazine Current Conservation. We also plan to publish popular articles in local newspapers and media outlets soon.

Finally, we will publish our results in the form of at least two research papers focusing on a) assessing dolphin mortality using drift models, and b) understanding the impacts of tourism and fisheries on humpback dolphins, to make our results available to the larger scientific community.

### **7. Looking ahead, what do you feel are the important next steps?**

Our results and discussions with local stakeholders provided us with interesting insights into the dynamics of dolphin-human interactions in Goa. Fishers generally suggested that their interactions with dolphins were common, but we found otherwise. Dolphins were averse to the presence of fishers but interacted for long periods at a time. Sometimes, dolphins were seen foraging close to fishing nets but without directly approaching them. This is an important finding that we would like to present to the fishers and understand the reasons for their perception, which could help us bilaterally design bycatch mitigation guidelines. Several fishers reported that dolphin interactions are more common during dusk/dawn or even at night. So it could be that dolphins are interacting more with fishers during this time, which we would like to systematically test using drones with thermal image sensors. At the same time, we also want to expand our study site to include regions in the South and/or North Goa, where fishing pressures are relatively low, to assess how these interactions may vary by fishing intensity.

We found that dolphin encounter rates decline significantly in the summer, coinciding with a decrease in fish availability. We would like to conduct systematic surveys of the entire Goa coastline across seasons to better understand these dynamics. In addition, we are developing machine learning methods to analyse dolphin-interactions from drone footage. These methods can be used to monitor real time dolphin movement by installing cameras near points of interest where deploying acoustic devices is challenging due to fishing activity.

Finally, we would like to engage with the larger stakeholder community through a combination of mass media (including documentaries, popular articles) and focused meetings to mutually develop dolphin watching and reporting guidelines and training modules.

**8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?**

The Rufford Foundation's support will be acknowledged in all reports and publications that will come out of our project. We have currently used the Rufford Foundation logo in the report sent to the forest department. I have also acknowledged the foundation's support on my personal website.

**9. Provide a full list of all the members of your team and their role in the project.**

Harshal Patil is an M.Sc. graduate who interned with me during this project. He was instrumental in speaking with fishers, collecting dolphin-human interaction data, conducting boat surveys (alongside Maia Dsouza), and helping with other logistical challenges. Harshal continued field work during days when I had to travel outside Goa and ensured there was no significant gap in our research. He also helped brainstorm research ideas and helped in finalising survey protocols for drone surveys.

Puja Mitra has been working with the Forest Department and local stakeholders on dolphin conservation for over ten years. She has trained boat operators in promoting eco-tourism and improving tourist experience/knowledge of humpback dolphins. Puja helped our project by connecting us to key people including fishers, lifeguards, and tour operators throughout Goa. She was involved in sorting logistical challenges associated with boat surveys and provided us with guidance in selecting study sites and approaching officials for study clearances. She also led stakeholder meetings helped us understand the challenges associated with forming dolphin-monitoring networks.

Dr. Dipani Sutaria is a conservation biologist who has been working on humpback dolphins and other cetaceans of India over the past twenty years. She brought valuable conceptual and practical inputs into this project by helping design boat surveys and discerning dolphin behaviours.

**10. Any other comments?**

I thank the Rufford Foundation for their support, quick and easy management of fund transfer and resolution of issues pertaining to fieldwork and budget changes. I am grateful to the Dakshin Foundation for providing me with institutional support, easy resolution of issues and for handling the funds in an efficient manner. I also thank all locals and students who were involved at any given time in the project including Mayur Pagi, Samer Morje, Maia Dsouza, Monali Patre, and Sakshi Gawade.