



Reducing Mobula Ray Bycatch Within Indonesia's Small Scale Fisheries Using Light

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“Evaluate the social and technical feasibility of using light to reduce bycatch in small scale fisheries”

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Project Partners and Collaborators

We are very thankful to Conservation Leadership Programme for funding this project, providing training and mentoring to the teams throughout this project, and gaining leadership and valuable skills in conservation management. We would like to thank the other donors for the funding and support us for reaching the final results. Many thanks for the SafetyNet who had provided us with the device and gave us insight of using the light on reducing Mobula Ray Bycatch. Many thanks to Andrew Harvey from MantaWatch who fully supported us since the beginning of the project. We are very grateful for the support from the Department of Food and Fisheries Banyuwangi who helped us on fishing port orientation and introduced us to the key persons in Muncar. Many thanks to Pak Dharmadi from Ministry of Marine Affair and Fisheries and Pak Donny Juliandri Prihadi from Universitas Padjadjaran for the kind support since the project initiation.

Section I

Summary

This project evaluated the feasibility of using light to reduce bycatch within Indonesia's remote, small-scale drifting gillnet fisheries, and contributes to efforts to reduce bycatch of five mobula species in Indonesia, and national shark and ray conservation strategies.

Fieldwork was completed in Muncar, East Java from September 2017 to March 2018. We selected 20 gillnet fishers at random to participate in a six-month randomized control trial. A "treatment" group of 10 fishers attached 10 red LED lights their gillnets, while a "control" group fished as usual. Fishers recorded daily catch and effort, with 3,620 logbook days record. We verified logbooks by port sampling 399 landings. The treatment group showed a reduction in mobulid catch per unit effort (CPUE) compared to the control.

We conducted 13 outreach events and one fieldtrip to fish market site. Those events were reaching 49 fishers, 96 women, and 410 high school and university students. Pre- and post-training evaluations indicated that 90% of fishers and women participants have increased knowledge about mobulid ray conservation and regulatory status, sustainable seafood markets, and bycatch mitigation technologies.

We have communicated project outcomes via two national conferences and one international conferences.

Introduction

Mobula ray fisheries are unregulated and unreported (Hall and Roman 2013). Global landings increased by an order of magnitude from 1998-2009 (Ward-Paige, Davis, and Worm 2013). Bycatch is a major component (Couturier et al. 2012; D. Croll et al. 2012; W. T. White et al. 2006; W. White and Dharmadi 2007; Dulvy et al. 2014), and Indonesia's small-scale drifting gillnet fisheries a significant contributor (Couturier et al. 2012; D. A. Croll et al. 2016; Lewis et al. 2015). Following international attention (e.g., CMS 2014; CITES 2016), conservation efforts have focused on target fisheries and illegal wildlife trade. Our project uses light (Jordan et al. 2013) to address bycatch mitigation within Indonesia's small-scale fisheries.

Muncar, Banyuwangi is a large fisheries industry also a rural area in East Java. This area has been known for their purse seine fisheries targeting sardines. However, Muncar also has large number of small-scale gillnet fishermen targeting neritic tuna and swordfish. The gillnet fishermen actively fish around Bali strait (Figure 1). Bali strait has been known for its rich fisheries productivity and has been identified as one of aggregation site of mobula rays (Laglbauer and Rosady, 2016).

Our project addresses bycatch mitigation within Indonesia's small-scale fisheries. Specifically, this project had conducted a pilot study to see the feasibility of using light as a tool to reduce mobula bycatch in Muncar, Banyuwangi, Indonesia. The project also addresses on the limited knowledge of the community about mobulid ray bycatch. Providing better knowledge to the community is important as currently the number of mobulid rays still remains unknown, both wild and landed. Thus, we worked together with 20 small scale gillnet fishermen to conduct the trial of using light to reduce mobulid bycatch. We also do the outreach program for the rest of fisheries community

including women and school students to increase their awareness about mobula ray conservation and regulation, bycatch mitigation technology and sustainable seafood market.

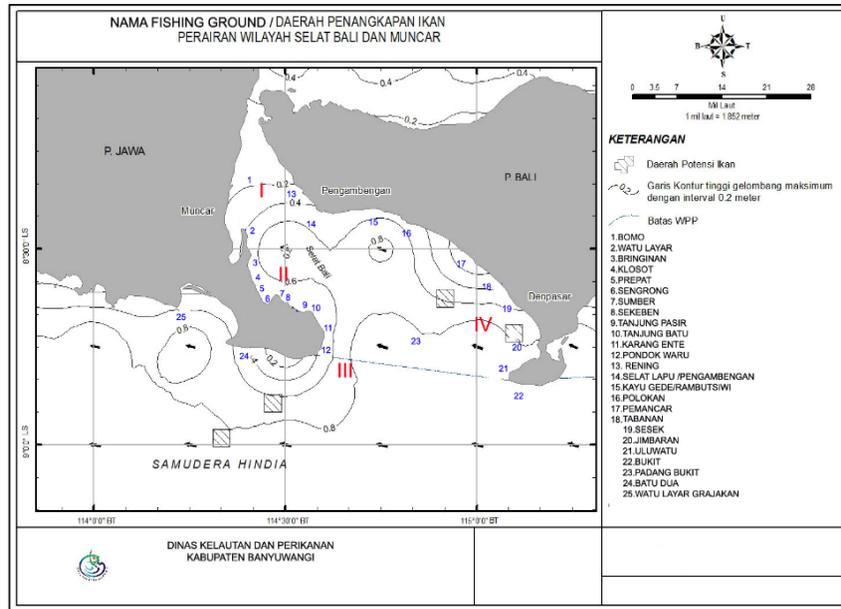


Figure I. Project site map

Project Members

Vidlia Putri Rosady has B.Sc Marine Science from Padjadjaran University. She has over four years' experience of mobulid conservation, including undertaking a baseline study of three of Indonesia's major mobula ray fisheries, developing mobulid bycatch reduction strategies, and being selected as for the 2013 MantaWatch Internship Programme. Vidlia led the implementation of this project, including managing milestones and deliverables, training and supporting team members, monitoring and evaluating project progress, and developing collaborations with stakeholders such as government, local community, and education institutions.

Retno Kusuma Ningrum is an expert communicator and was selected by the Embassy of Denmark to be an ambassador for Zero Ocean Waste in 2017. In 2016 she was selected for the MantaWatch Internship Programme, where she successfully developed communication and education programs for local schools. Retno developed innovative videos and animations to communicate conservation messages to coastal communities in Puntondo Makassar. She has B.Sc. Marine Science from University of Padjadjaran. During this project Retno create a range of education and awareness materials to communicate conservation messages to various audiences.

Amelia Setya Nur Kumala has B.Sc. Biology from the Univeristy of Diponogoro. She was selected for the 2016 MantaWatch Internship Programme, where she played a leading role in planning and implementing field surveys and communicating with government partners. She has successfully led field research, including behavior studies of Sumatran elephants as part of her undergraduate research. During this project she coordinated research activities, including recording fishers' logbooks, supervising port monitoring, and creating Standard Operating Procedures for deploying bycatch reduction device.

Niomi Pridina began her career in marine conservation in 2015, she had experience in designing and developing an internship program and collaborating with dive tourism to improve manta ray conservation at Komodo National Park. In 2016, she was selected to participate in the East-West Center Fellowship in Hawaii to learn about environmental issues with other ASEAN leaders. Since then, she has had experience working with international NGOs including, Rare and Conservation International Indonesia, where she worked to support programs that focus on the improvement of small-scale fisheries management in coastal communities around Indonesia.

Section 2

Aim and Objectives

This project will evaluate the technological, social and economic feasibility of using light-based bycatch reduction technologies within Indonesia's remote, small scale drifting gillnet fisheries. It will contribute to efforts to reduce bycatch of five mobula species in Indonesia, and inform national bycatch mitigation and shark and ray conservation strategies.

1. Ensure 75% of the local fishing community are aware of: (i) mobula ray conservation and regulatory status; (ii) sustainable seafood markets; and (iii) bycatch mitigation technologies.
2. Ensure that at least 20 fishers are engaged in a six-month randomized control trial to evaluate the feasibility and effectiveness of light-based bycatch reduction technologies.
3. Ensure that students from at least two fishery high schools, and national decision makers are aware about bycatch mitigation technologies and project findings.

We have successfully accomplished all objectives with some adaptation during the implementation. However, the outcomes from the activities are aligned with the project objectives.

Changes to original project plan

We aimed to cover two sites, Alas Purwo National Park and Ujung Kulon National Park. Both locations are known as sharks and rays landing site. However, we decided to only conduct the project at Alas Purwo National Park, considering the number of team members, time to settle our accommodation, and the cost in mobilizing the team.

We collected catch and effort data using logbooks, which we encouraged fishers to fill out independently. However, we encountered a few obstacles: fishers had low literacy; completing logbooks is not an existing habit; and fishers occasionally forgot the species and weights of their catches. To overcome this, we began supervising and assisting fishers to complete their logbooks every 2-3 days.

We made several adaptations due to changing conditions during this period, including changing fishing gears and the location of fishing ground. Due to these dynamics, we updated our logbooks to ensure that fishers were correctly recording their gears used. We used cell phones to maintain contact with fishers who had relocated to Pandean and record their catches.

Methodology

This project was conducted at Muncar, Banyuwangi, East Java from September 2017 until September 2018. Muncar is a fisheries area for both small-scale and industrial. The fishing ground of its fishermen are around the Bali Strait and it includes Alas Purwo National Park. This fishing ground is known for high productivity of sardines, big pelagic fish, and important aggregation site for mobula rays (W. T. White et al. 2006; Laglbauer and Rosady 2016).

Objective 1 and 3:

To achieve objective 1 and 3, the team had undertaken a wider education and awareness campaign to the local fishing community, local students and Marine Fishery Officers. Both objectives aimed to increased stakeholder knowledge about: (i) mobula ray conservation and regulatory status; (ii) sustainable fishery markets; and (iii) bycatch reduction technologies.

We have created different education materials based on our audiences. We conducted pre- and post-evaluations for every education and awareness event during this project. These evaluations allowed us to identify whether our bycatch mitigation and sustainable seafood market training materials helped in improving participant knowledge. We used this information to modify our materials, and to make them more relevant for the local context and the background knowledge of the participants. Understanding public perception had been critical to the long-term effectiveness of our proposed bycatch reduction strategies (Jefferson et al. 2015).

Communication had also been an important component throughout the project. We had communicated the project with local government and gained approval to conduct our work. We also communicated our work progress online, had develop links with media and presented the data result through meetings with stakeholders.

Objective 2: Elasmobranch and teleost fishes exhibit high levels of intra-species variation in spectral and visual sensitivity (McComb-Kobza 2009; Kalinoski et al. 2014). Light emitting devices fixed to fishing gears provides a means to reduce elasmobranch bycatch (Jordan et al. 2013). We collaborated with SafetyNet Technologies, a company that designs and builds devices to increase the selectivity of commercial fishing practices using light. While SafetyNet Technologies primarily focuses on products for large-scale industrial fisheries, our project will evaluate the feasibility of adapting and deploying these technologies within Indonesia's small-scale fisheries.

We selected 20 fishers to participate in the pilot evaluation. We had structured the study as a Randomized Control Trial to test the effectiveness of the pilot technologies (Sutherland et al. 2004; Pullin and Knight 2001). Half of participating fishers will use light-based bycatch reduction technologies, and half will act as a control group.

We implemented a fishery monitoring program, consistent with international best practices of fishery management (Cochrane 2002), to evaluate the impact of bycatch reduction technologies on the landed volumes and catch-per-unit-effort of target and bycatch species. We implemented a logbook program with participating fishers, and verified logbook data via port sampling of selected landings. We had undertaken a questionnaire and interview-based perception survey to evaluate fishers' opinions about and feedback on the piloted technologies.

Outputs and Results

Objective 1 and 3: Ensure 75% of the local fishing community are aware of: (i) mobula ray conservation and regulatory status; (ii) sustainable seafood markets; and (iii) bycatch mitigation technologies. Ensure that students from at least two fishery high schools, and national decision makers are aware about bycatch mitigation technologies and project findings.

At the early stage of our project, we had built communication with the Fisheries and Food Agency of Banyuwangi Regency. We were able to gain their trust and commitment to support our pilot project Muncar, Banyuwangi (Figure 2). Based on this, they are aware of mobula bycatch issue, bycatch mitigation, and alternative potential to manage marine biodiversity in their area.



Figure 2. Communication with the Fisheries and Food Agency of Banyuwangi Regency
 Objective one and three focuses on providing awareness on mobula ray conservation and regulatory status, bycatch mitigation, and sustainable seafood market. To achieve our goal, we implemented four steps, which includes the preparation stage, training workshop, frequent meeting with fishing community and conducting pre and post-test.

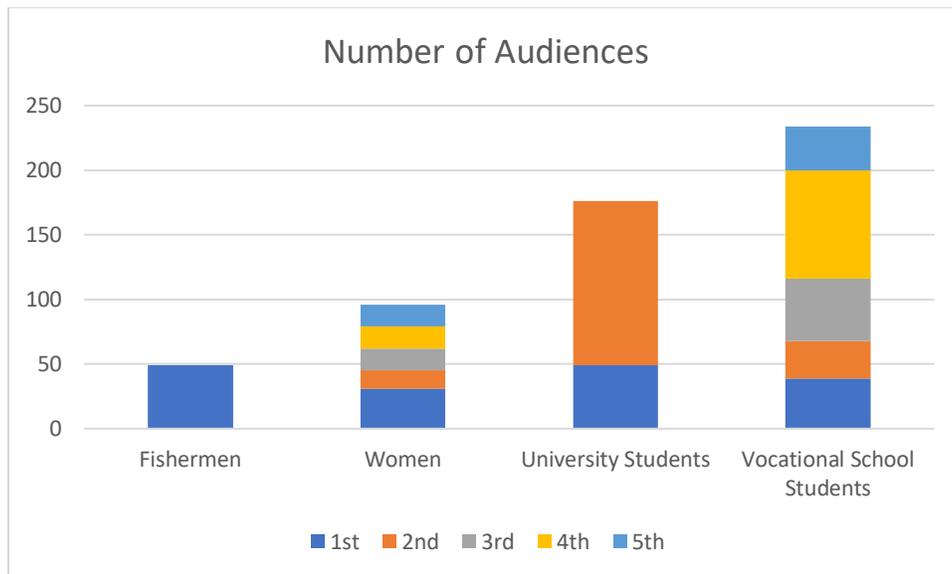


Figure 3. The number of each audience in every education and awareness activities

Overall, Muncar fisheries community are divided into three villages: Palodem, Kedung Rejo, and Kalimoro. We have reached 555 number of individuals from 11 groups (Figure 3) that are coming from the small-scale gillnet fishermen, women, fisheries vocational school students, and university students (Table 1 and Figure 4).



Figure 4. Highlights of Outreach and Training Activities

We have specifically conducted more outreach activities to the local woman group and the vocational students in Banyuwangi.

Table I. Detail Audience and Groups

Audience	Groups
Fishermen	<ol style="list-style-type: none"> 1. Kalimoro Villagers 2. Palodem Villagers 3. Kedung Rejo Villagers
Women	<ol style="list-style-type: none"> 4. Kalimoro Villagers 5. Palodem Villagers 6. Kedung Rejo Villagers
Vocational School Students	<ol style="list-style-type: none"> 7 SMK Miftahul Ulum, Muncar 8 SMK Darul Ulum, Muncar 9 SMK I Negeri Glagah, Banyuwangi
University Students	<ol style="list-style-type: none"> 10 Universitas 17 Agustus 1945, Banyuwangi 11 Universitas Banyuwangi, Banyuwangi

In each activity, we used powerpoint presentation (Appendix II) and poster as tools to deliver the awareness materials (Figure 5). The main topics of our outreach and training programs are mobula ray ecology and conservation effort, bycatch impact, and sustainable fisheries practice.

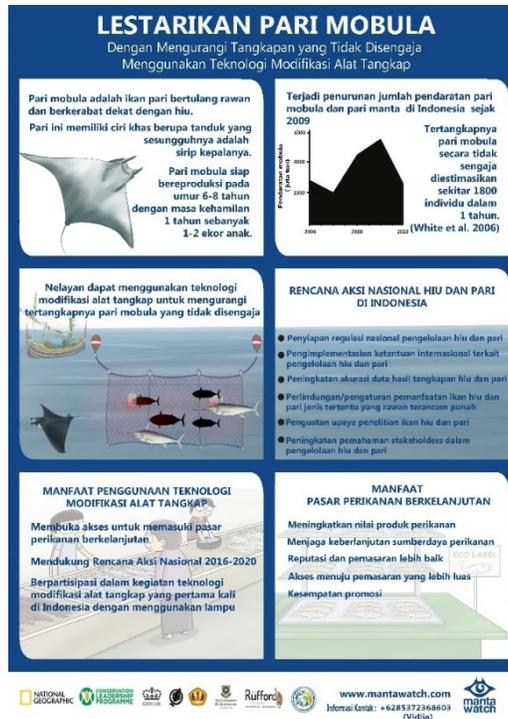


Figure 5. Poster that are used during outreach and training program

There was also discussion to get to know their story and perspective, and pop quiz to bring the excitement (Figure 6.a.). Our team also adapted on how we present the education and awareness materials based on the community environment (Figure 6.b)



Figure 6. (a) Fishermen discussing among themselves during training (b) outreach to women's community

To evaluate the success of both objective regarding increased awareness, we implemented the pre and post-test to our audiences. The pre-test evaluation was conducted before we delivered the presentation, and the post-test were conducted after the discussion. The questions are about

the three main topics of our outreach and training programs. In some case where the participants are not capable to read, we used printed questions and read through every question to the participants. Usually, the young participants will help the elderly. After each outreach program, we always evaluate the presentation that we deliver and the pre-post test question to make sure those are clear. The score on pre-post test and the active interaction on the discussion are our indicator whether our material is effective or need to be improved.

Below (Figure 7) shows that more than 65% of the total attendees of students had an increased their awareness on mobulid conservation. Most importantly, the fishermen and women have showed above 90% of them have an increased awareness on mobulid conservation.

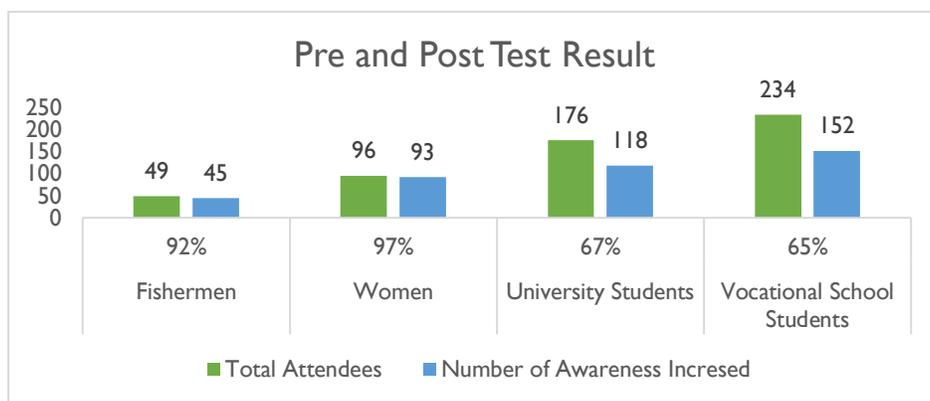


Figure 7. Pre and Post Test Result

The team had focused on publishing the project progress via mantawatch.com and mantawatch social media. We include our daily activities related to the project, local fisheries social and culture, and marine and fisheries issues that we encounter in the Muncar fisheries community. The preliminary result of this project has been presented in one national seminar and one international seminar.

Objective II: Ensure that at least 20 fishers are engaged in a six-month randomized control trial to evaluate the feasibility and effectiveness of light-based bycatch reduction technologies.

At the first stage of our project, we have identified 37 fishermen who expressed interest in participating in the project from our first workshop.



Figure 8. Fishermen Participants at Training Workshop

Based on these, we have selected 20 fishers at random to participate in the trial. These twenty fishermen have successfully completed training on operating the lights and filling in logbooks and have signed project participation agreements (Figure 8).

Between the six months of our trial, all fishermen have regularly provided us their logbook collection, in which we have also guided them to ensure the logbook had been correctly inputted. Port sampling surveys were also conducted within these months to validate the logbook information. Based on the data we have received within the past six months starting from September 2017- February 2018; we were able to obtain up to 3620 Logbook and 399 port sampling data. Through here, the team has analysed the data in which we could obtain the trend result of mobulid catches within the past six months. Based on these data, the total landed of mobulid rays for the “test” group is 47 individuals and 37 individuals for the “control” group (Appendix II). However, results of individual landings cannot be the only indication if the lights have an impact of reducing the catch of mobulid rays by dividing it with the effort to determine the value of catch per unit effort (CPUE).

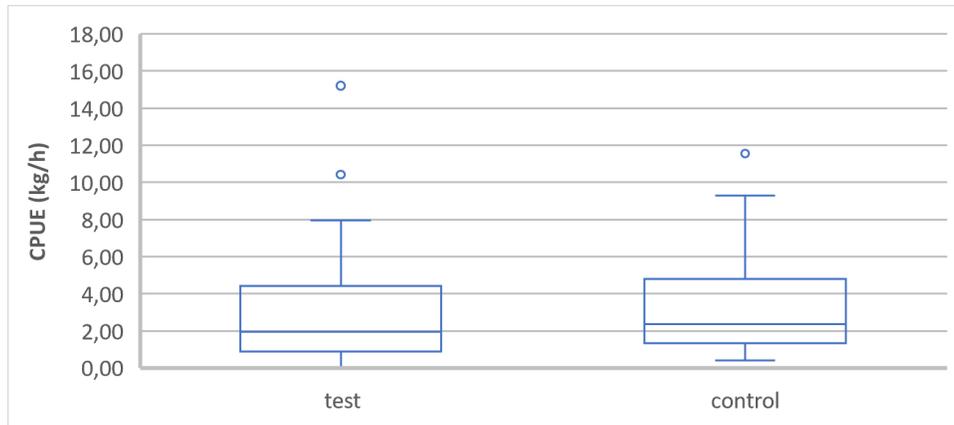


Figure 9. CPUE Data of Mobulid Rays

By using the modified fishing gears, the results shows that there is a decrease in mobula catch that indicate the potential effectiveness of this light device by comparing the catch per unit effort (CPUE) of the "test" group and the "control" group from 2,35 to 1,95 (Figure 9). This result shows that the difference of catch between the test and control group showing a significant decrease of 17%.

Moreover, based on the data obtained, the monthly catch data suggest no clear trend in seasonality. However, mobulid landings occurred throughout the trial period (Figure 10). With the highest occurrence of landings up to 28 individuals in September and the lowest occurrence is 5 during November 2017. These results can prove that the fishing areas are an aggregation site of mobulid rays, as similar studies have suggested (Laglbauer and Rosady 2016). Since the data collection is only six months, in the future, it is suggested to conduct continuous data collection to obtain more robust data.

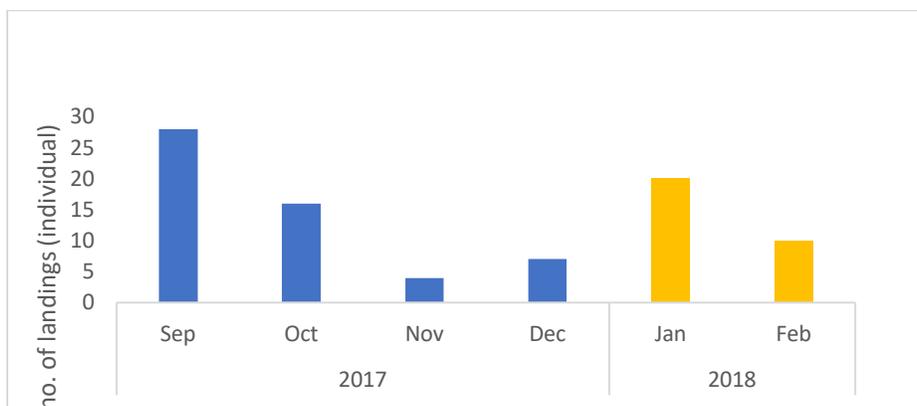


Figure 10. The number of landings

The team also received the fishermen's expression through a perception survey that had been conducted at the end of the project (Figure 11). The survey had been designed to provide information on their experience of using this light device from the economic feasibility, technical, and social aspects.



Figure 11. Our team interviewed one of the fishermen in Muncar

Overall, they highlighted that they think the device is considered useful but the price itself is too expensive to purchase (Figure 12).

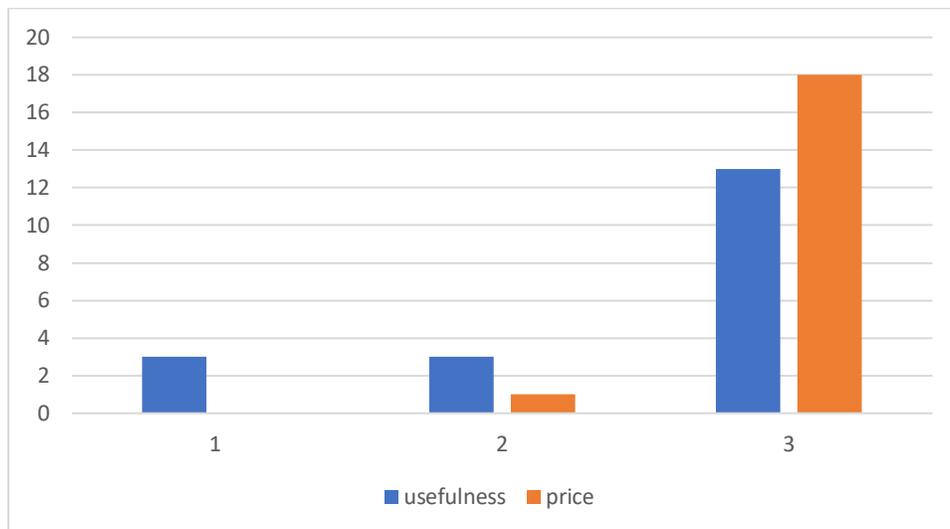


Figure 12. Results Perception Survey on using light
(Notes: 1: not useful/cheap, 2: neither useful nor useful/just right, 3: useful/expensive)

Although, based on the survey results, they have no problem with the handling process of the device and the price of the device's operational and maintenance cost (Figure 13).

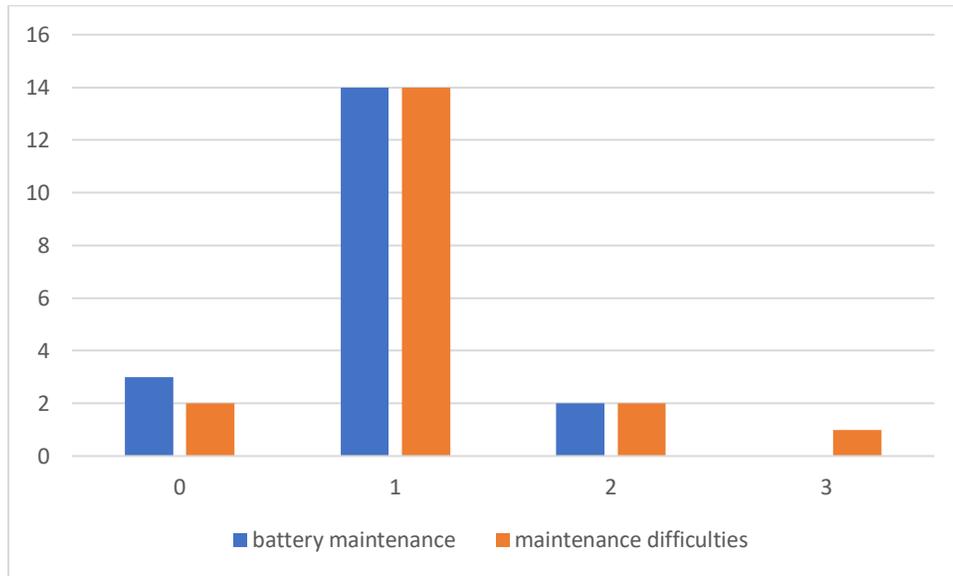


Figure 13. Results Perception Survey on Device Maintenance
(Notes: 0: don't know 1: easy, 2: just right, 3: difficult)

In more detail, the fishermen have expressed the device is technically appropriate to be deployed as the size and weight fit well with their fishing gears (Figure 14).

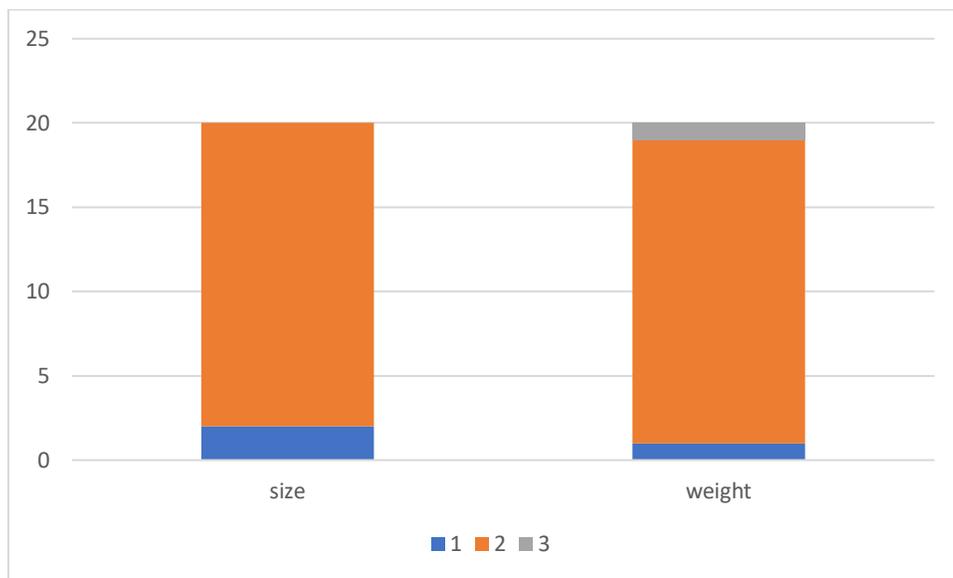


Figure 14. Results Perception Survey on the light device
(Note: 1: too buoyant, 2: just right, 3: too heavy)

This survey also showed which factor influences how many lights are appropriate to be regularly used during their fishing trips. Based on these results (Figure 15), the highest influence is other fishers' behaviour and boat traffic.

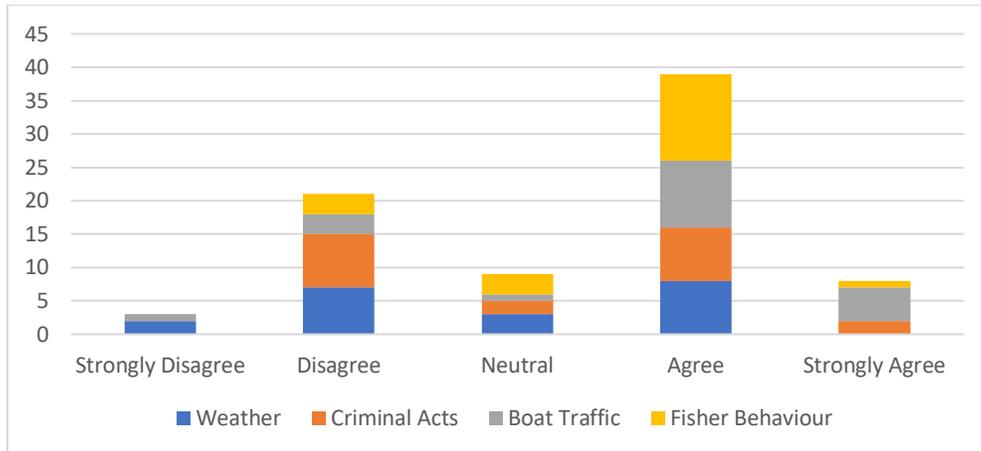


Figure 15. Results Perception Survey on factor influence

The results show that the social structure is highly important as they considered how these devices could affect other fishers during the deployment of the device. Moreover, it needs to be highlighted that generally, more than half of the fishermen who participated in this pilot program want to use this potential bycatch reduction device and are interested to be involve in future projects to improve this device (Figure 16).

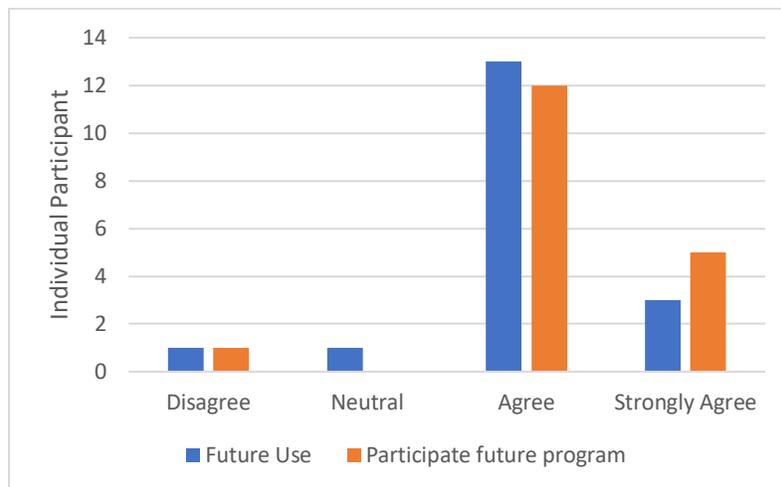


Figure 16. Results Perception Survey on future program

Communication & Application of results

We have regularly communicated project progress via weekly posts to mantawatch.com and social media on our activities, local fishery cultures and traditions, and fishing communities' issues. We announced the project, including the support of the Conservation Leadership Programme, via two university bulletins, and one of our outreach events was featured by local media (kompas.com, Banyuwangi correspondent). We have documented project activities via a series of mini-reports available to project partners (Appendix II). Meetings with fishermen and local government in Banyuwangi were held frequently since the initiation of the fieldwork (August 2017) until the presentation of project findings (October 2018).



Figure 17. Team Attended and Presented Results of the program 2nd Sharks and Rays National Symposium

The project results were promoted to the government, NGO, and academics for applying light technology has big potential to reduce bycatch.



Figure 18. The team attended the Symposium and Capture Fisheries Technology Summit. The presentation on the 2nd Sharks and Rays National Symposium (March 2018) in Jakarta (Figure 17), Technology Workshop on Ecofriendly Fishing Gear in Semarang (Figure 18), and 5th IMCC (July 2018) (Figure 19) in Malaysia accommodated our target audience that showed further interest on collaboration and scale-up the research.



Figure 19. Presenting Results of the program in 5th IMCC

Monitoring and Evaluation

Quantitative measures were used to monitor the impact on the raising awareness in local communities and with stakeholders, such as the number of individuals who participated in the awareness campaign, and the number of fishers participated in the training. Pre and post test were also part of the method that are implemented in this program to evaluate the effectiveness of training and awareness campaign. At the end of the program, a perception survey was also conducted to understand the fishermen's perspective and how this project had resulted based on their opinions.

Achievement and Impacts

The project successfully completed a preliminary evaluation of the feasibility of using light to reduce mobulid bycatch in small-scale fisheries. Using a randomized control trial design, we selected 20 fishers, divided into "treatment" and "control" groups. During the six-month trial, fishers used a logbook to record daily catch and effort, with 3,620 logbook days (1,737 active fishing days) recorded. We implemented a port sampling program to cross-check and verify logbook data, with 399 landings sampled. Fishers using LEDs showed a reduction in mobulid catch per unit effort (CPUE) compared to the control group.

Perception surveys revealed that fishers are keen to continue this trial and adopt more sustainable fishing practices. While our outreach and education programme initially targeted two vocational schools, we eventually delivered training to three vocational schools and one university. The outreach and education program had reached 410 students, 49 fishers, and 96 women. Pre- and post-training evaluations showed 65% of students, 90% of fishers, and women have increased knowledge about mobulid conservation and regulatory status, sustainable seafood markets, and bycatch mitigation technologies.

At the beginning of the project, the team have successfully signed a collaborative agreement with Banyuwangi Fisheries and Food Agency a regency authority to conduct this project. The initial project presentation made them aware of the mobula ray's existence in Banyuwangi (Bali Strait) and the accidental catch that occurred in the waters. At the end of our project, we delivered the

result to the local agency. At that time, they were willing to continue their support for any further research for bycatch mitigation and other alternative livelihood for small-scale gillnet fishermen.

We have communicated project results at two national workshops (2nd Sharks and Rays Symposium and Capture Fisheries Technology Summit) and one international workshop (5th International Marine Conservation The findings in the 2nd Sharks and Rays symposium will be used as one of the reference for the National Plan of Action (NPOA) for Shark and Ray in Indonesia as priority species in conservation, which are updated every five years. The current NPOA has been used since 2016 up to 2020 and the newest version of the Shark and Ray NPOA is in the development process.

Capacity Development and Leadership capabilities

The project training which took place after the CLP training attended by Niomi was beneficial for all team members. Specifically, it provided the lead trainer the chance to re-create training materials that fit with the team member condition.



Figure 20. Training Materials During Team Training

The training materials and case studies helped the team increase their individual skills (Figure 20). Specifically, the team learned how to take into account different opinions between team members

to achieve the project's objectives. Thus, it had helped in creating good teamwork among the members.

Throughout the program, the team had directly learned how to take into account different opinions and paradigms of different stakeholders to find better ways of sharing our knowledge and information more efficiently with different stakeholders. Thus, the team was able to develop varieties of creative communication materials and data sampling, including games used for different campaign awareness and training throughout the project timeline.

Section 3

Conclusion

The project has successfully conducted a preliminary evaluation of the feasibility of using light to reduce mobulid bycatch in small-scale fisheries in Muncar, Banyuwangi, Indonesia. The education and outreach program of our project had reached out to 410 students, 49 fishers and 96 women, in which they have shown an increased knowledge about mobulid conservation and regulatory status, sustainable seafood markets, and bycatch mitigation technologies. We also have successfully worked with 20 fishermen in Muncar to conduct our pilot study. Based on the results, it shows that there is a decrease in the mobula catch that indicates the potential effectiveness of this light device. Moreover, based on our analyze, the mobulid landings occurred throughout the trial period, which indicates that the fishing areas as an aggregation site of Mobulid Rays as a similar study have suggested. Our perception survey has also shown that more than half of the fishermen who participated in this pilot program want to use this potential bycatch reduction device and are interested to be involved in future projects to improve this device. Thus, this project has identified a potential solution to help in reducing mobulid bycatch in the small-scale fisheries sector but it is important to note that this was a very limited trial, which aimed to evaluate the feasibility rather than the effectiveness of these devices. Further work is needed to confirm findings and to refine the technologies.

Problems encountered and lessons learnt

Which project activities and outcomes went well and why?

We conducted pre-and post-evaluation for every education and awareness event during this project. These evaluations allowed us to identify whether our bycatch mitigation and sustainable seafood market training materials were not producing an increase in participant knowledge. We used this information to modify our materials and make them more relevant for the local context and the participants' background knowledge. Our pre-and post-evaluations showed that these modifications were successful at improving participant knowledge.

Which project activities and outcomes have been problematic and in what way, and how has this been overcome?

We collected catch and effort data using logbooks, which we encouraged fishers to fill out independently. However, we encountered a few obstacles: fishers had low literacy; completing logbooks is not an existing habit; and fishers occasionally forgot the species and weights of their catches. To overcome this, we began supervising and assisting fishers to complete their logbooks every 2-3 days. This also provided a good opportunity for use to strengthen our relationship with the fishers

Briefly assess the specific project methodologies and conservation tools used.

We conducted port monitoring for a sample of catches and used these data to cross-check and verify logbooks. However, we had inadequate tools to accurately measure catch weights. We used scales of local middlemen to weigh catches, but these were not calibrated. To improve analysis of catch per unit effort, future studies should ensure that accurate scales are available.

Please state important lessons which have been learnt through the course of the project and provide recommendations for future enhancement or modification to the project activities and outcomes.

The education outreach program reached our target number of different stakeholders, and was successful in raising the knowledge on mobula biology, ecology and conservation efforts to the local community, specifically for the fishers and women community in Muncar. Moreover, the project has successfully conducted the randomized trial method with the fishermen who have participated in this program. Although, more detail analyze are needed in measuring the impact results of these trial. It also needs to be highlighted; the main limitations of our project were the

delays encountered in the end of our program. Specially in finalizing our reports due to miss communication between the team members with the partner organization, which significantly impacted the submission deadline of our final report.

In the future

This project has successfully demonstrated the potential of light to reduce mobula bycatch within small scale fisheries. The fishermen also expressed their interest to continue the collaboration of this project. Therefore, there is a possibility to expand our work with the fishermen to improve the effectiveness of this device. In the future, scaling up the number of samples could help in creating a more statistically robust result. Upgrading the device could also be implemented in the future, specifically to provide a rechargeable device and adjustable colour, and to open opportunity to work with sensory biologist to define the effective colour to reduce mobula ray bycatch. It is also important, to upgrade the awareness program by creating more interactive material and expand to wider audience.

Financial Report

Itemized expenses	Total CLP Requested (USD)*	Total CLP Spent (USD)	% Difference	Details & Justification (Justification must be provided if figure in column D is +/- 25%)	Proposed Spending (Preliminary Report Only)
PHASE I - PROJECT PREPARATION					
Communications (telephone/internet/postage)	300,00	176,54	-41%	We used monthly subscription data plan instead of installing home WiFi or using internet café.	
Field guide books, maps, journal articles and other printed materials	300,00	30,32	-90%	The team only accessed the open source journals and articles. The paid journals can be accessed using personal MantaWatch account	
Insurance	0,00	0,00	#DIV/0!		
Visas and permits	500,00	93,06	-81%	We only need local permits in form of letter of support from Local Fisheries and Food Agency, Banyuwangi Regency. There was no international visa and national permit needed	
Team training	500,00	380,88	-24%		
Reconnaissance	0,00	0,00	#DIV/0!		
Other (Phase 1)	0,00	0,00	#DIV/0!		
EQUIPMENT					
Scientific/field equipment and supplies	0,00	0,00	#DIV/0!		
Photographic equipment	500,00	494,27	-1%		
Camping equipment	0,00	0,00	#DIV/0!		
Boat/engine/truck (including car hire)	1.000,00	295,97	-70%	The location of school, other fishing port, and authority office outside Muncar can be reached using public transportation. However, car hire was needed in several circumstances due to limited hours of public transportation availability.	
Other (Equipment)	0,00	0,00	#DIV/0!		
PHASE II - IMPLEMENTATION					
Accommodation for team members and local guides	1.500,00	923,58	-38%	Receive discount for rent a 3 rooms house for 18 months with renewed contract for every six months.	
Food for team members and local guides	2.700,00	4991,00	85%	Team members spent extra 10 months on the field to conduct the socio-economic survey and reporting the result to local stakeholders	
Travel and local transportation (including fuel)	2.000,00	1865,40	-7%		
Customs and/or port duties	0,00	0,00	#DIV/0!		
Workshops	1000	354,42	-65%	We were allocated the budget on venue rent for every outreach/meeting activity. But in the end, we had support from local village, school, and local stakeholder to held it in their venues or house. This budget was reallocated for team member to spend more time for data collection.	
Outreach/Education activities and materials (brochures, posters, video, t-shirts, etc.)	750,00	205,77	-73%	Several materials were designed to be reusable (flip book, banner, etc), hence we did not produce more printed material.	
Other (Phase 2)	0,00	0,00	#DIV/0!		

PHASE III - POST-PROJECT EXPENSES					
Administration	0,00	0,00	#DIV/0!		
Report production and results dissemination	500,00	486,07	-3%	This budget was spent to provide result dissemination meeting to local government, fishermen involved, ministry of marine and fisheries (MMAF/KKP), and other stakeholder. This budget was also covered from other resources	
Other (Phase 3)	500,00	47,63	-90%	At the end of project, our collaborator from Safetynt conducted a visit to collecting the feedback in technical aspect from the fishermen in Muncar who are aware of our project.	
Total	12.050,00	10.344,91			

*These figures should be the same as those listed in the original proposal

Section 4

Appendices

Appendix I: CLP M&E measures.

Output	Number	Additional Information
Number of CLP Partner Staff involved in mentoring the Project		
Number of species assessments contributed to (E.g. IUCN assessments)		
Number of site assessments contributed to (E.g. IBA assessments)		
Number of NGOs established	0	
Amount of extra funding leveraged (\$)	1	Funds received from Rufford to support the project in Muncar.
Number of species discovered/rediscovered		
Number of sites designated as important for biodiversity (e.g. IBA/Ramsar designation)	0	
Number of species/sites legally protected for biodiversity	5	Chilean devil ray, <i>Mobula tarapacana</i> (VU) Shortfin devil ray, <i>Mobula kuhlii</i> (DD) Spinetail devil ray, <i>Mobula japonica</i> (NT) Bentfin devil ray, <i>Mobula thurstoni</i> (NT) Pygmy devilray, <i>Mobula eregoodootenkee</i> (NT)
Number of stakeholders actively engaged in species/site conservation management	2	Fisheries and Food Agency of Banyuwangi Regency, Local Gillnet Fishermen Groups
Number of species/site management plans/strategies developed	0	
Number of stakeholders reached	8	Fisheries and Food Agency of Banyuwangi Regency, two local Gillnet Fishermen Groups, three Head of Villages (Kedung Rejo, Palodem, Kalimoro), Two Universities in Bayuwangi, three vocational school in Banyuwangi and Muncar.
Examples of stakeholder behaviour change brought about by the project.		
Examples of policy change brought about by the project	0	
Number of jobs created	0	
Number of academic papers published	0	
Number of conferences where project results have been presented	3	Indonesia's 2 nd Shark and Rays Symposium, IMMC5, Symposium and Capture Fisheries Technology Summit

Appendix II: Fields Data, Presentation Outreach Materials and Letter of Support

Data of Mobulidae Landings 2017-2018

Date	Family	Trial	cpue
10/09/2017	Mobulidae	test	5,53
10/09/2017	Mobulidae	test	4,44
12/09/2017	Mobulidae	test	1,67
13/09/2017	Mobulidae	test	2,08
13/09/2017	Mobulidae	test	0,67
14/09/2017	Mobulidae	test	2,00
14/09/2017	Mobulidae	test	3,33
15/09/2017	Mobulidae	test	1,39
17/09/2017	Mobulidae	test	1,90
18/09/2017	Mobulidae	control	3,55
18/09/2017	Mobulidae	test	1,58
19/09/2017	Mobulidae	test	10,42
19/09/2017	Mobulidae	test	0,88
19/09/2017	Mobulidae	test	7,50
19/09/2017	Mobulidae	test	2,65
20/09/2017	Mobulidae	control	2,77
20/09/2017	Mobulidae	control	9,28
20/09/2017	Mobulidae	control	3,75
20/09/2017	Mobulidae	control	2,86
21/09/2017	Mobulidae	control	2,35
21/09/2017	Mobulidae	test	7,50
22/09/2017	Mobulidae	test	0,83
24/09/2017	Mobulidae	control	1,94
24/09/2017	Mobulidae	control	5,00
24/09/2017	Mobulidae	test	7,94
27/09/2017	Mobulidae	control	2,08
28/09/2017	Mobulidae	control	0,41
28/09/2017	Mobulidae	test	2,39
01/10/2017	Mobulidae	test	72,00
06/10/2017	Mobulidae	control	11,56
07/10/2017	Mobulidae	test	2,38
10/10/2017	Mobulidae	test	7,38
11/10/2017	Mobulidae	control	33,75
11/10/2017	Mobulidae	test	2,85
12/10/2017	Mobulidae	control	8,33
14/10/2017	Mobulidae	control	2,11
14/10/2017	Mobulidae	test	4,71
15/10/2017	Mobulidae	control	1,43
15/10/2017	Mobulidae	control	4,24
15/10/2017	Mobulidae	test	4,36
16/10/2017	Mobulidae	test	4,80

21/10/2017	Mobulidae	control	1,11
29/10/2017	Mobulidae	test	3,60
31/10/2017	Mobulidae	control	0,67
06/11/2017	Mobulidae	control	2,17
28/11/2017	Mobulidae	control	1,00
29/11/2017	Mobulidae	test	1,06
30/11/2017	Mobulidae	test	1,68
10/12/2017	Mobulidae	test	2,06
10/12/2017	Mobulidae	control	3,64
14/12/2017	Mobulidae	test	0,65
14/12/2017	Mobulidae	test	0,31
16/12/2017	Mobulidae	control	1,25
16/12/2017	Mobulidae	test	0,94
25/12/2017	Mobulidae	test	1,11
07/01/2018	Mobulidae	test	0,69
10/01/2018	Mobulidae	test	5,53
14/01/2018	Mobulidae	test	1,67
17/01/2018	Mobulidae	control	0,69
18/01/2018	Mobulidae	test	0,41
18/01/2018	Mobulidae	control	1,55
18/01/2018	Mobulidae	control	2,33
19/01/2018	Mobulidae	test	2,14
20/01/2018	Mobulidae	control	1,06
21/01/2018	Mobulidae	test	1,79
22/01/2018	Mobulidae	control	4,59
23/01/2018	Mobulidae	test	0,79
23/01/2018	Mobulidae	test	0,30
23/01/2018	Mobulidae	control	1,75
24/01/2018	Mobulidae	test	2,36
24/01/2018	Mobulidae	control	7,12
24/01/2018	Mobulidae	control	2,63
24/01/2018	Mobulidae	control	2,71
24/01/2018	Mobulidae	test	0,63
26/01/2018	Mobulidae	test	0,00
03/02/2018	Mobulidae	control	0,93
04/02/2018	Mobulidae	test	0,63
05/02/2018	Mobulidae	test	1,08
07/02/2018	Mobulidae	test	15,21
07/02/2018	Mobulidae	test	1,11
07/02/2018	Mobulidae	control	6,17
08/02/2018	Mobulidae	control	5,82
10/02/2018	Mobulidae	control	2,00
13/02/2018	Mobulidae	control	6,25
3/02/2018	Mobulidae	control	0,63

Presentation Outreach Materials

SOSIALISASI KONSERVASI PARI MOBULA

PELABUHAN PERIKANAN MUNCAR

SUSTAINABLE FISHERIES TEAM
www.mantawatch.com

1

Pari pelagis yang bertulang rawan dan berkerabat dengan Hiu

Mobula spp.:
 M. tarapacana
 M. thurstoni
 M. kuhlii

M. japonica
M. eregodonteniensis

2

Bagian Bawah

Bagian Atas

3



4

Status populasi Pari Mobula yaitu Terancam Punah
(IUCN Red List)

Beberapa penyebabnya:

- PENANGKAPAN YANG BERLEBIHAN
- KERUSAKAN HABITAT ALAM DAN POLUSI

5

PENANGKAPAN YANG BERLEBIHAN

- 1 anak dalam 1 kali reproduksi (masa kehamilan 1 tahun)
- Membutuhkan waktu hingga 3 tahun untuk dapat bereproduksi kembali
- Ancaman Bycatch

Landings (MT)

Year	Landings (MT)
2006	~2000
2007	~4000
2008	~5000
2009	~4000
2010	~2000

6

Hukum Internasional yang Melindungi Mobula

- Konservasi hiu dan pari di ranah internasional (UN International Plan of Action (1996))
- Hewan yang BERMIGRASI jarak jauh (Appendix II CMS-2014)
- Hewan yang DIPERDAGANGKAN secara internasional (Appendix II CITES-2016)
- Hewan yang terkait dalam PERIKANAN TANGKAP komersial (RFMO : IOTC (2007) & WCPFC (2013))

7

Hukum nasional

Pari Mobula

- Rencana Aksi Nasional Hiu dan Pari (2016-2020):
- Belum ada peraturan dilarang tangkap
 - Tapi segera ! Bersiaplah !

Pari Manta
Dilindungi penuh di Indonesia (Keppres/Ko No. 4 Tahun 2014 Tentang Penetapan Status Perlindungan Penuh Ikan Pari Manta)

8



Mitigasi ByCatch

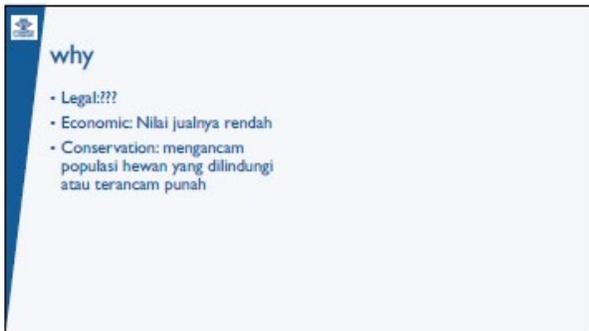
9



Apa itu ByCatch?

Penangkapan spesies bukan target yang **tidak disengaja**

10



why

- Legal:???
- Economic: Nilai jualnya rendah
- Conservation: mengancam populasi hewan yang dilindungi atau terancam punah

11



Apa yang perlu dilakukan industri perikanan?

1. Penanganan dan Pelepasan
2. Perilaku kegiatan perikanan yang selektif
3. Alat tangkap yang selektif

12



Pasar Perikanan Berkelanjutan

13



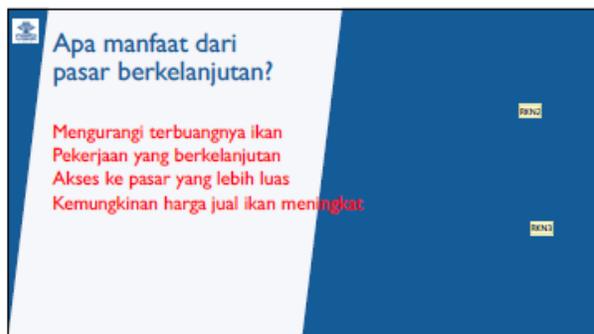
Pasar Perikanan Berkelanjutan

Kegiatan perikanan yang menjaga keberadaan sumberdaya perikanan di laut dalam jangka panjang dan meningkatkan kesejahteraan kehidupan para pelaku perikanan terkait.

14



15



Apa manfaat dari pasar berkelanjutan?

- Mengurangi terbuangnya ikan
- Pekerjaan yang berkelanjutan
- Akses ke pasar yang lebih luas
- Kemungkinan harga jual ikan meningkat

16

Letter of Support from Fisheries and Food Agency Banyuwangi

**PEMERINTAH KABUPATEN BANYUWANGI**
DINAS PERIKANAN DAN PANGAN
Jl. KH. Agus Salim No. 106 Telp. / Fax. (0333) 421418
http://www.banyuwangikab.go.id e-mail: disperipanganbwi@gmail.com
BANYUWANGI

Banyuwangi, 30 Agustus 2017

Kepada

Nomor : 523/ 1917 /429.120/2017
Sifat : Segera
Lampiran : -
Perihal : **Dukungan Pelaksanaan Penelitian
Pari Manta (Baycatch)**

Yth. Pimpinan Proyek Sustainable Fisheries
Team Mantawatch
di
TEMPAT

Berdasarkan hasil Forum Group Discussion (FGD) dalam program "Perencanaan Konservasi Mobula : Memperkuat Kapasitas Untuk Penghidupan dan Pengelolaan Berkelanjutan" tanggal 15 Agustus 2017 bertempat di Ruang Pertemuan Dinas Perikanan dan Pangan Kabupaten Banyuwangi dipimpin oleh Kepala Dinas Perikanan dan Pangan Kabupaten Banyuwangi diperoleh hasil sebagai berikut :

1. Dinas Perikanan dan Pangan Kabupaten Banyuwangi menyediakan ruangan yang berfungsi untuk sekretariat kegiatan dimaksud (Kantor Resort Perikanan Muncar)
2. Menyediakan data perikanan tangkap dan nelayan
3. Memfasilitasi/kolaborasi bersama dalam berkomunikasi dengan para nelayan dan stakeholder lainnya

Adapun lokasi kegiatan dimaksud berada di Kecamatan Muncar Kabupaten Banyuwangi.

Demikian, atas perhatiannya disampaikan terima kasih.



DIS. PARAGRANTO PURNOMO, M.Si
Pembina Utama Muda
NIP. 19610109 199103 1 005

Appendix III: Links to Published Newspapers and reports

(a) Links to Published Newspapers during fieldwork:

- Our team Retno Kusuma was interviewed by Kompas, a national online news media on [Mobulid Conservation](#)
- Our team Amelia S.N.K was interviewed by OkeNews, a national online news media on [Mobula Conservation](#).
- During the fieldwork, the team was interviewed by Kompas, a national online news media on [conservation issues](#) to remark the world oceans day.

(b) Link to reports relates to [our project](#).

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Address list and web links

- The Ministry of Fisheries and Marine Affairs of Indonesia
Address: Jalan Medan Merdeka Timur, DKI Jakarta / Website: kkp.go.id/
- Research Center for Oceanography and Fisheries, Indonesian Institute of Sciences
Address: Jalan Pasir Putih I, Ancol Timur, Jakarta / Website: oseanografi.lipi.go.id/
- Marine Agency of Banyuwangi, Indonesia
Address: Jl. Kh. Agus Salim, Mojopanggung, Kabupaten Banyuwangi, Jawa Timur
- MantaWatch- Website: mantawatch.com