Gulf of Mottama Project

Integrated Approaches for Marine Mammal Research and Conservation in the Gulf of Mottama

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Gulf of Mottama Project

INTEGRATED APPROACHES FOR MARINE MAMMAL RESEARCH AND CONSERVATION

IN THE GULF OF MOTTAMA

TECHNICAL REPORT | 2022

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EXECUTIVE SUMMARY

In 2018, Dr. Tara Sayuri Whitty and the Myanmar Coastal Conservation Lab (MCCL) confirmed that the Gulf of Mottama (GoM) is home to threatened and endangered marine mammal species: the Irrawaddy dolphin (*Orcaella brevirostris*), Indo-Pacific finless porpoise (*Neophocaena phocaenoides*), and Indo- Pacific humpback dolphin (*Sousa chinensis*). The former is Endangered, and the other two species are Vulnerable (IUCN Red List). However, there is still widespread lack of data and conservation efforts on local marine mammal populations in the gulf.

The MCCL has implemented integrated approaches to conservation and research to address the data gaps and develop a sustainable model for continued research, capacity building, and community engagement in the conservation of small cetacean species in the GoM. This included estimating the population of the three cetacean species in the gulf through boat-based line transect surveys, establishing an acoustic monitoring program for *N. phocaenoides*, estimating bycatch rates in small-scale fisheries through Rapid Bycatch Assessments, refining our understanding of the current and past distribution of these species in the Gulf of Mottama through Local Ecological Knowledge surveys, and training community youths in research and community engagement skills. Throughout the process, communities participated in both research and conservation activities.

From 2018 to 2022, a series of marine mammal boat-based surveys were conducted, and a total of 60 sightings were recorded in opportunistic surveys and 57 sightings were recorded through systematic line transect surveys. In addition, local ecological knowledge and rapid bycatch assessment interviews were conducted in ten coastal villages of the GoM. The study recorded about 132 bycatch events in small-scale fisheries and indicated that marine mammals, including whales, were distributed up to Kyaik Hto in the gulf. The major threats of bycatch were posed by drift net, set bag net, and gill net, depending on the location in the area. The bycaught dolphins and porpoises are in high demand as consumables, particularly in Paung Township, and this demand may pose additional conservation threats to the local population of marine mammals if it increases. Regardless of the threats, the study with local communities suggested that the majority of the sample respondents preferred dolphins and porpoises and recognize the need for their conservation.

Furthermore, MCCL engaged with communities by collaborating in research activities and other awareness activities such as awareness campaigns, marine mammal stranding response training and develop educational materials to motivate the communities for participating in conservation activities. The whole process was conducted by youths in MCCL, and they were also trained in research skills and knowledge in conservation as well as provided opportunities to participate in hands-on activities through MCCL internship program and career advancement program.

This integrated approach allowed to collect fundamentally important data on the three cetacean species and implement key steps toward a regular and participatory monitoring program, while also building research skills among youths, and establishing community-based conservation programs in collaboration with local fishing communities for continued conservation efforts into the future.

ACKNOWLEDGEMENT

The MCCL @ Point B Design + Training would like to heartfully express our gratitude towards Dr. Tara Sayuri Whitty for bringing us the opportunity to be involved in such a meaningful project. This project allowed us to interact with amazing creatures dwelling in the Gulf and provided us with sincere guidance, trust, and support to MCCL. Her optimism, intelligence, bravery, boldness, kindness, and enthusiasm towards marine mammal and conservation as a whole always inspires the team. It is undeniable that her enlightened acts motivate us to achieve this far.

Furthermore, we would like to express our appreciation towards the Gulf of Mottama Project funded by Swiss Agency for Development and Cooperation (SDC) for supporting the generous funding. We would also like to thank all the staffs from consortium partners of the project for supporting the coordination of all the research and conservation activities achieved by the MCCL. Additionally, we would like to thank the Society of Marine Mammalogy for contributing funding.

We acknowledge the communities who participated wholeheartedly in the research and conservation activities. The community always teaches us new learnings and experiences which motivate us to further move forward for the conservation of marine mammals in the Gulf.

Our deep recognitions are dedicated to Dr. Louisa Ponnampalam and MereCet Malaysia team for always inspiring and supporting the MCCL and their sincere contribution to the project. We would also like to thank Cindy Peter of Sarawak Dolphin Project for hosting and giving us the opportunity to learn practical marine mammal boat-based survey in Sarawak, Malaysia.

Finally, we would like to acknowledge the participation of the MCCL team. We express our wholehearted gratitude towards all the young researchers from MCCL who genuinely and enthusiastically contributed to this project. You have created profound memories and friendship throughout the project.

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1 INTRODUCTION

Bycatch in small-scale fisheries is a global threat to marine mammals, complicated by its very direct yet complex linkages to livelihoods, governance, and challenging conditions for research, monitoring, and implementation (Brownell et al., 2019; Lewison et al., 2004; Moore et al., 2010). While the design and implementation of mitigation solutions is fraught with difficulties, another substantial challenge is the lack of basic data on marine mammal populations and bycatch rates in much of the world (Moore et al., 2010; Whitty, 2018). This information gap must be addressed, along with thoughtful, strategic efforts to meaningfully understand and engage communities at the conservation-livelihood interface while working with the local governance context (Brownell et al., 2019; Whitty, 2018).

Southeast Asia is home to threatened and endangered marine mammal species, including the Irrawaddy dolphin (*Orcaella brevirostris*), Indo-Pacific finless porpoise (*Neophocaena phocaenoides*), and Indo- Pacific humpback dolphin (*Sousa chinensis*). The former is Endangered, with six subpopulations assessed as Critically Endangered, while the other two species are Vulnerable (IUCN Red List). Though there is a strong community of local researchers and conservation groups whose efforts have substantially expanded in recent years, there is still widespread lack of data on local marine mammal populations, given the extensive coastlines in the region and logistical constraints (Ellen Hines et al., 2015). Bycatch in small-scale fisheries remains one of the top concerns in the region (Ellen Hines et al., 2015).

In the region, Myanmar is one of the countries with particularly sparse data (Ellen Hines et al., 2015). Work on coastal marine mammals has been limited to occasional surveys establishing species presence, without extending into further data collection, let alone dedicated conservation programs (Tint Tun personal communication). As of mid-2018, there were no active marine mammal research or conservation projects on Myanmar's coastline (Tint Tun personal communication).

For this reason, the recent designation of Important Marine Mammal Areas (IMMAs) resulted in no IMMAs declared for Myanmar, though the Myeik Archipelago was listed as an area of interest (IMMA e-Atlas). However, given the extensive coastline of Myanmar and the documented presence of marine mammals throughout, it is likely that there are multiple other potential IMMAs that need to be assessed.

Furthermore, during the significant changes to Myanmar in the past decade as the country opened up, impacts to coastal ecosystems intensified. The country is currently undergoing a military coup, as well as the struggling through the COVID 19 pandemic, which are slowing down such economically driven developments. However, this also signifies fundamental disruptions to conservation efforts, with defunct government agencies, international projects unwilling to fund engagement with governments, and depressed livelihoods pushing local communities to more direct exploitation of coastal resources (including illegal fishing). The education sector has also been severely disrupted, risking the loss of the next generation of skilled environmental leaders as vast numbers of university faculty and students are now boycotting the government-run university system. As such, establishing a sustained, locally focused program for marine mammal

research, conservation action, and young researcher training is even more critical now than in recent years.

1.1 Marine Mammals in the Gulf of Mottama

Prior to 2018, there had been no survey effort on marine mammals in the Gulf of Mottama, a turbid, shallow body of water east of the Ayeyarwady Delta and north of the Myeik Archipelago (Tint Tun, personal communication, (Holmes et al., 2014)). Through work on general fisheries management as part of the multi-sector Gulf of Mottama Project (working across natural resources and conservation, livelihoods, and governance), Dr. Tara Whitty learned from local fishers that they regularly saw small cetaceans in their fishing grounds. This prompted a series of Local Ecological Knowledge (LEK) surveys with villages along the Gulf of Mottama coast, conducted by Dr. Whitty with Wint Hte and Yin Yin Htay of the Myanmar Coastal Conservation Lab (MCCL).

During the initial 2018 LEK surveys, respondents described the presence of at least Irrawaddy dolphins and finless porpoises likely extending up to the Sittaung River. This includes two documented instances of capture (one deliberate, one bycatch) of finless porpoises along the Sittaung River, with one occurring near the river mouth and the other on a tributary.

Results from these LEK surveys led to the first boat-based marine mammal surveys in the area in late 2018 and early 2019, with sightings confirming the presence of Irrawaddy dolphins (*Orcaella brevirostris*), Indo-Pacific finless porpoises (*Neophocaena phocaenoides*), and Indo-Pacific humpback dolphins (*Sousa chinensis*). This broadened the scope of the Gulf of Mottama Project's (GoMP) conservation component, and MCCL was contracted by GoMP to lead marine mammal research and conservation efforts.

1.2 Critical Knowledge Gap

To move forward with meaningful coastal cetacean conservation in the Gulf of Mottama, we need to fill these key knowledge gaps:

- Population abundance for the three species in the Gulf of Mottama area
- Distribution of the three species in the Gulf of Mottama area, including identifying potential hotspots, and whether (and how) this has been changing with time
- Annual rate of bycatch of each of the three species in Gulf of Mottama small-scale fisheries
- Avenues for bycatch mitigation, including possible technological solutions (gear alterations or changes to gear deployment), research into feasible livelihood alternatives, and community- based momentum to avoid potential conflict through heavily top-down measures from the Department of Fisheries.

1.3 Goal and Objectives

To address these critical knowledge gaps, this project's integrated approach encompasses the following objectives:

- Estimate the population abundance of three cetacean species in the Gulf of Mottama through line transect surveys.

- Test and establish an acoustic monitoring program for Indo-Pacific finless porpoises in the Gulf of Mottama for future population monitoring work.
- Estimate the annual bycatch and bycatch mortality rate for the three species of coastal cetaceans in the Gulf of Mottama.
- Determine the current distribution of these three cetacean species in the Gulf of Mottama, including the Sittaung River, through expanded LEK survey efforts.
- Engage communities in the monitoring, stranding response, and conservation campaigns of Gulf of Mottama marine mammals.
- Assess the community potential, motivations, and interest to initiate community-based marine mammal conservation zones (especially in Chaung Zone EMU of GoM) and establish these zones in collaboration with local communities and stakeholders.

2 METHODS

2.1 Estimating Population Abundance of Marine Mammals in the Gulf of Mottama

2.1.1 Opportunistic Boat-survey

The initial boat-based surveys were designed and led by Dr. Tara Sayuri Whitty with three MCCL researchers in late 2019 to identify the distribution of marine mammals, especially dolphins and porpoises. Before the survey, the research team was trained in water safety to make sure the team was safe and secure during the survey. In this opportunistic survey, the study recorded the photo of the sighting animals, weather change condition, and the effort along the survey. The initial findings of the opportunistic surveys supported in designing the line transect boat-based survey method with the guidance of Dr. Louisa Ponnampalam from MereCet Marine Mammal Conservation and Research in Malaysia. and tested the line transect survey in the late 2019.

2.1.2 Boat-based Line Transect Survey

According to the opportunistic boat-survey, systematic line transects were identified in consultation with project advisors: Dr. Tara Sayuri Whitty and Dr. Louisa Ponnampalam for boat-based surveys along the coast of Chaung Zone, Mon State. The transects extend 12 km offshore with an interval of 4 km among transects perpendicular to the coastline to ensure the independence of habitat features and environmental gradients (See Figure 2.1). The survey applied a wooden vessel (equipped with 2 x 90 Hp diesel engines) with 5-6 researchers and 2 boat skippers onboard throughout the survey. A minimum of three observers stood on decks with an eye height approximately three meters above sea level. All three observers searched with both the naked eye and handheld binoculars (Bushnell MARINE™ 7X50 BINOCULAR), with one observer at the bow scanning a cone of about 30° and two observers on either side of the boat scanning arcs of approximately 90° to port and starboard (Minton et al., 2013; Smith et al., 2004). The survey along the transect lines followed guidance from project advisors as in accordance with (Thomas et al., 2002). The survey focused on visually detectable species mainly Irrawaddy dolphin and Indo-Pacific Humpback Dolphin. In addition, the fishing gears in the parameter of 5 m on the transect were observed by one of the observers. The data along the transect were recorded in survey log sheet and sighting sheet by the data recorder. The observers were to rotate every 30 minutes along the transect.

The collected data included the survey log, weather conditions, and sighting information of marine mammals. As weather conditions impact the probability of the sightings, they were recorded at the beginning and end of transect lines, or when a rapid conduction change and when the Beaufort Sea-states is four or higher. The sightings were recorded both on-effort and off-effort, but only sightings made on-efforts were applied for further calculation. In the event of sightings, the species were identified as well as estimated the group size by approaching the animals. Then, the behaviors were also recorded into classified categories: feeding (direct feeding observed, dive patterns consistent with feeding activity or fish observed at the surface near the animals), swimming/traveling, resting/ milling at the surface or unidentified behaviors. The turbidity and depth at locations of sightings were also recorded with secchi disk and handheld

depth sounder (HONDEX PS7) respectively. If the fishing activities occurred within 5 m of the location of sighting, these activities were also identified and recorded.

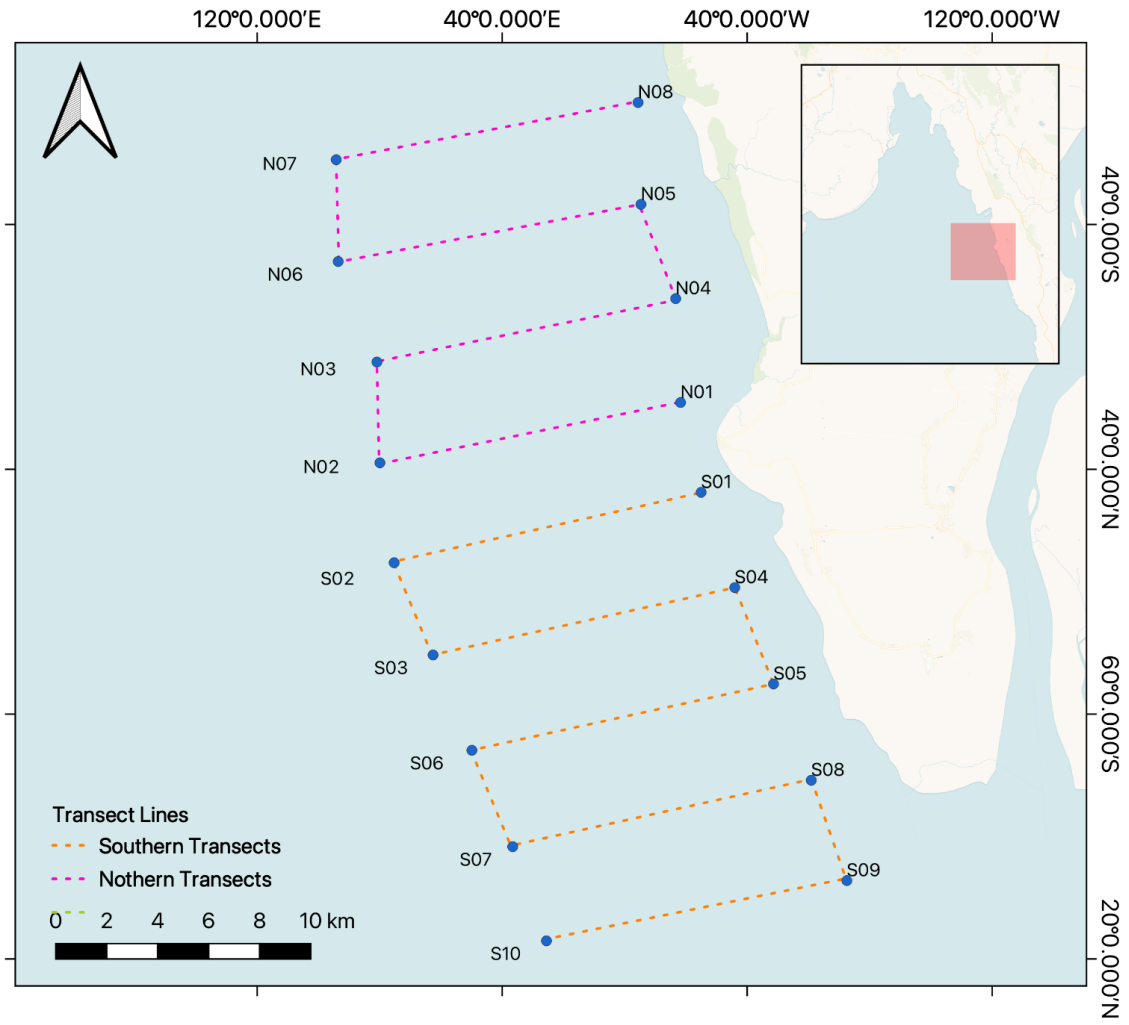

Figure 2.1. The systematic transects applied for line transect boat-based surveys in Zee Gone, Chuang Zone Township.

2.1.3 Photo-Identification

The study applied photo-identification by taking photos of the dorsal fins of Irrawaddy dolphins and Indo-Pacific humpback dolphins in the Gulf of Mottama (GoM) since 2018. This method can provide valuable insights into the residence patterns, population size, movements, and social structure of residing cetaceans in the area (Gomez-Salazar et al., 2011). It will enable a better understanding of these species within their natural environment which could be used to inform conservation efforts in order to protect them from potential threats or disturbances. in the GoM.

In the event of sightings, the transect survey was suspended and departed the transect line to approach the pod without disturbing their natural behaviors. Then, the left and right dorsal fins of as many individuals as possible in the pod were photographed by using two Canon DSLR cameras (Canon D80 and D70) with Canon EF 70-300 mm f/4-5.6 L IS USM Lens and a Canon EF 100-400 mm f/4.5-5.6L IS USM Lens respectively.

All the recorded photos were firstly manually reviewed and classified into a database according to specific criteria such as location, date, time, and sighting ID. Furthermore, the photos suitable for photo identification were manually selected based on photographic criteria including sides of the dorsal fins (left or right), quality rating 1-3 (poor to excellent) and presence or absence of natural marks and distinguishable features on the fins. Based on the analysis, the distinctive individuals were assigned a unique ID by matching with all recorded photos in the photo ID catalog. Starting in 2023, the further analysis will apply the Mark-Recapture method to estimate the population of Irrawaddy dolphins and Indo-Pacific humpback dolphins more accurately in the GoM.

2.1.4 Acoustic Monitoring of Finless Porpoises

The line transect surveys and photo-identification are widespread methods to assess the population of the marine mammals, but they imposed challenges to species such as Indo-Pacific Finless Porpoises, which are more difficult to visually detect. Passive acoustic monitoring methods were applied widely on the same species (Jefferson et al., 2002; Kimura et al., 2009) as well as the vaquita (*Phocoena sinus*) and Baltic Proper harbor porpoise (*Phocoena phocoena*) (Jaramillo-Legorreta et al., 2017; Owen et al., 2021). Therefore, in collaboration with Chelonia Limited, a pilot acoustic monitoring program for the finless porpoise is initiated in 2022 as part of Marine Mammal Conservation Grant from Society of Marine Mammalogy. The Chelonia Limited donated 3 F-PODs and shipped them to MCCL in January 2023. In 2023, MCCL will work with guidance from Dr. Nick Tregenza of Chelonia Limited and will collaborate with fishers in Chaung Zone and Paung Townships to deploy them off the coast.

The F-POD monitors the presence and activity of dolphins, porpoises, and other toothed whales by the detection of the 'trains' of echolocation clicks that they make (Chelonia Limited, n.d.). These FPODs will be deployed and hauled for data retrieval at roughly 6-week intervals (dictated by battery life) through collaboration with fishers, set up on weighted lines due to the lack of hard benthic structures. Deployment will start during the dry season of 2023 (February through April), as fishing boats do not go out during the rainy season due to inclement weather as well as fishing restrictions. The deployment will continue after the rainy season (October through April). Detection rates will be monitored to assess any potential variability across seasons and across sites, and to evaluate the suitability of these pilot sites for longer-term monitoring, as well as to evaluate possible expansion of acoustic monitoring in the area in future projects.

2.2 Local Ecological Knowledge and Rapid Bycatch Assessment (LEK & RBA)

As there is no marine mammal related research conducted in the Gulf of Mottama, information on distribution of marine mammals in the area is limited. For that reason, the study applied Local Ecological Knowledge and Rapid Bycatch Assessment to understand both historical and current distributions of marine mammals, annual bycatch rate from small-scaled fisheries, identify types of animals being caught, trends over the years, patterns of consumption and use of animals, and learn feelings and stories from local communities about marine mammals.

"*Local Ecological Knowledge (LEK) defines as knowledge and experiences that local communities have about the natural world around them and it is similar to Traditional Ecological Knowledge (TEK)- traditional information passed down through generation about the natural world, natural*

resources, and management of natural resources" (Whitty, 2020). A type of LEK, Rapid Bycatch Assessment (RBA), is a way to estimate the number of animals which are caught accidently each year, measured by doing the interview. RBA can be a sensitive topic, but it can help evaluate if bycatch is a major conservation threat for marine mammals. Through RBA interviews, the research estimates total bycatch accidents in an area by identifying the fishing gears causing the bycatch, the number of bycatches happen in the fishing gear, the number of people using these gears in the interview, and the number of people in the same area who are using the fishing gear.

2.2.1 Study Area

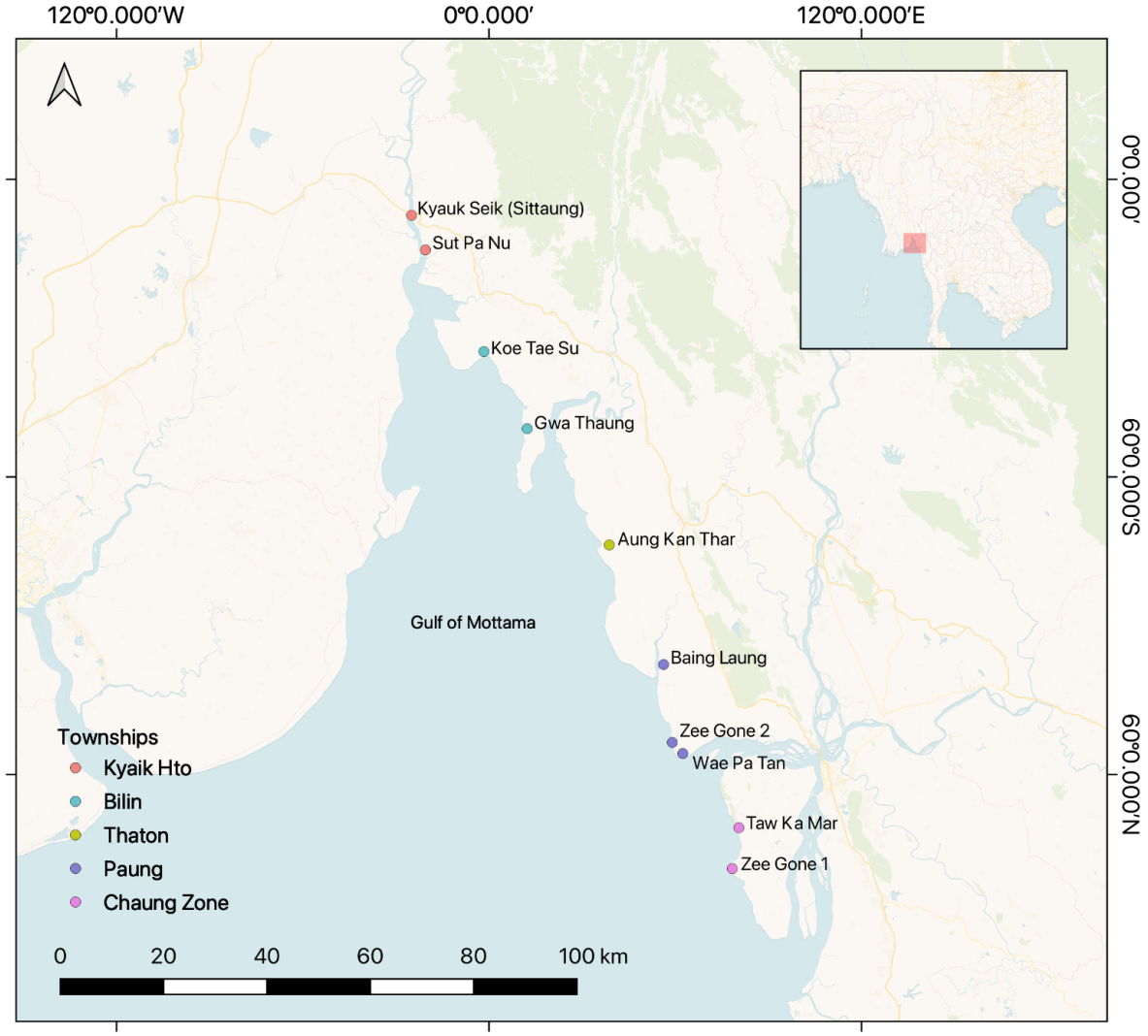

Figure 2.2. The map showing the villages where the LEK and RBA interviews are conducted from 2019-2022.

The pilot interviews were conducted in Zee Gone, Chaung Zone Township, Mon State in 2019. Following the pilot interview, the study extended to fishing villages along the coast (within 10 miles from the shore) of the Southern and Northern part of the Gulf of Mottama. The site selections were based on location of the villages on the map, suggestions from the pilot interviews, current and historical events of marine mammal sightings and strandings. From 2019 to 2022, the study accomplished interviewing 10 villages in 5 townships as shown in Figure 3.2. Villages in the Southern part of the coast include Zee Gone, Taw Ka Mar (Chaung Zone Township),

By Laung, Wae Pa Tan, Zee Gone (Paung Township), Aung Kan Thar (Thaton Township). The Northern part of the coast include Koe Te Su, Gwa Thaung (Bilin Township), and Su Pa Nu, Kyauk Seik (Kyaik Hto Township).

2.2.2 Field Interviews

The LEK and RBA interview consisted of both qualitative and quantitative questions, and they were conducted through Key Informant Interviews (KII) and Fisher Interview (FI).

Key Informant Interview (KII): The interviews were conducted with village leaders and/or experienced fishers in the community to understand the context and background of the target fishing community.

Table 2.1. Sample frame of LEK and RBA interviews in each study village.

Village	Township	Total fishing household (#)	Sample household (#)	Sample household (%)
Kyauk Seik (Sittaung)	Kyaik Hto	70	22	31.43
Sut Pa Nu	Kyaik Hto	50	20	40.00
Koe Tae Su	Bilin	46	8	17.39
Gwa Thaung	Bilin	10	6	60.00
Aung Kan Thar	Thaton	50	17	34.00
By Laung	Paung	68	10	14.71
Zee Gone 2	Paung	80	19	23.75
Wae Pa Tan	Paung	80	28	35.00
Taw Ka Mar	Chaung Zone	42	11	26.19
Zee Gone 1	Chaung Zone	65	37	56.92

Fisher Interview (FI): The in-depth interviews were conducted with active fishers by using purposive sampling method in the selected communities. The sample size for each village is tabulated in Table 3.1. Although it is expected to interview 25% of the total fishers in each community, some villages had higher percentages, but some had lower mainly due to availability of fishers to be interviewed. The questionnaire is composed of three main sessions such as: Respondent background and fishing effort, Marine Mammal Sightings/trends, bycatch, stranding, and perception about dolphins and porpoises included in the interview. Recognizing high biodiversity of the gulf, the interviews also integrated questions on stranding and bycatch of other marine megafauna including rays, sharks, and sea turtles. For identification of animals, the researchers applied identification cards. Each interview was facilitated by 2-3 researchers (at least one experienced researcher was included in each session) and took about 25-45 minutes.

2.2.3 Data Analysis

The field data were enumerated into Excel as soon as the data collection was completed. The quantitative data were analyzed in Excel using descriptive statistics. To analyze qualitative data, the team mainly applied thematic analysis by coding the data using Excel. For each piece of qualitative information, different codes were assigned from a standardized list of codes to identify the main theme covered by that piece of information. Then, they were quantified and evaluated the insights provided by the data. For spatial information, the estimated coordinates of events were identified on Google Map and then the maps were developed on QGIS (3.10.3-A Coruña).

2.3 Community Engagement for Marine Mammal Conservation

The MCCL @ Point B Design + Training applied human-centered and design thinking approaches to community engagement for conservation of marine mammals for developing creative problem-solving approaches by incorporating understanding of the different needs and experiences of a community. Through a five-step process including defining the problem, empathizing with challenges, ideating solutions, prototyping solutions, and testing preferred solutions, this approach aims to achieve conservation approaches which are innovative, inclusive, effective, and sustainable.

2.3.1 Community Awareness Raising Activities

Awareness raising activities to the community are essential for marine mammal conservation as may be catalysts for drivers of conservation threats (bycatch, direct hunting, etc.,) as well as there are opportunities for them to transform as front liners for its conservation. Therefore, it is important for fishing communities to understand the conservation status of marine mammals and empathize with them to recognize their existence values. In order to bridge this gap, Point B Design + Training and MCCL delivered training through Communication, Education, Participation and Awareness (CEPA) activities with community facilitators from Local CSOs and local communities from Mon and Bago Region under the guidance of Dr. Tara Sayuri Whitty during 2020 - 2021. The training included information on what is a marine mammal; why it's important to conserve them; and how people can help protect them in the Gulf of Mottama. After the training, the contents were developed into an interactive curriculum for "Facilitator Handbook for Communication, Education, Participation and Awareness (CEPA)". MCCL also provided training about facilitation of the curriculum to the local CSOs and youth facilitators to cascade information about marine mammals in the community through CEPA activities.

To spread the information about marine mammals, the team collaborated with Myanmar Ocean Project in 2021 and published online illustration material about marine mammals in the GoM through "Our Ocean, Out Home" project (which promotes the diversity of marine resources of Myanmar and alarm the conservation status of marine resources). In addition, the MCCL received a small grant (US$ 2,500) from The Young Southeast Asian Leaders Initiative (YSEALI) Marine Accelerator Program (MAP) and implemented two marine mammal conservation campaigns in By Laung and Zee Gone villages of Paung Township. Moreover, in order to support further conservation awareness in the region, the MCCL developed a storybook (a graphic novel about marine mammal conservation) with a storyline originating from local communities and illustrated in collaboration with local artist.

2.3.2 Marine Mammal Stranding Response Training

In late 2022, the team coordinated a virtual Training of Trainers (ToT) on "Marine Mammal Stranding Response Training" with regional marine mammal experts, Dr. Louisa Ponnampalam and Dr. Vivian Kit from MereCet Marine Mammal Conservation and Research in Malaysia. The team adapted the training into a pilot training under guidance from both consultants and Point B senior staff. After the designing and testing the training, the team organized and conducted training in villages under 3 Ecosystem Management Units (EMUs) of the GoM: By Laung (Paung EMU), Su Pa Nu (Kyaik Hto EMU), and Aung Kan Thar (Thaton EMU).

2.3.3 Social Media Engagement

As only one active marine mammal conservation hub in Myanmar, the team targeted Facebook (about 20,700,000 users in Myanmar (Napoleonchat, 2022)) and conducted social media engagement activities for general public awareness raising since 2019. The team is currently engaging with social media users through Myanmar Coastal Conservation Lab Facebook Page. The popular engagement activities include weekly pop quizzes (postponed after February 2022) and graphical information factsheets about marine mammals in the Gulf of Mottama and Myanmar. The factsheets provide valuable information portrayed in graphical contents on the different species of marine mammals present in this region as well as their behaviors, habitats, and conservation status. This engagement allows MCCL to reach a wider audience who may not otherwise have access or knowledge about marine mammals and promote the public to become aware of them and participate in conservation activities.

2.4 Social Media Research for Distribution of Marine Mammals along the Coast of Myanmar

Facebook is one of the most popular social media applications in Myanmar with over 2 million of the population actively using the platform (Napoleonchat, 2022). Therefore, MCCL applied the platform to monitor the distribution stranding of marine mammals by systematically recording social posts on events such as marine mammals stranding, trading and sightings.

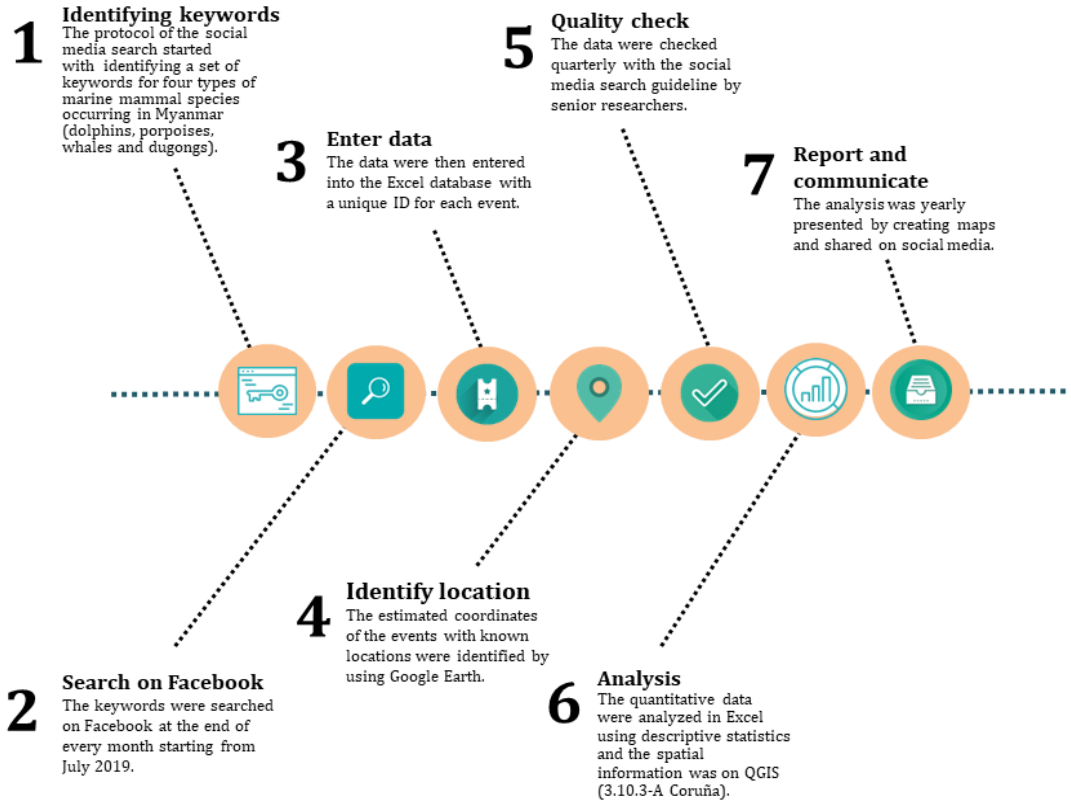

Figure 2.3. Diagram showing the process of recording marine mammals related posts on Facebook.

The process of the social media search is shown in Figure 2.3 and the process is as follow:

1. **Identifying keywords**: The protocol of the social media search started with identifying a set of keywords for four types of marine mammal species occurring in Myanmar (dolphins, porpoises, whales, and dugongs). As most of the Facebook users interact with Myanmar language, the key words were developed in both English and Myanmar. The target and event as combined keywords are as in Table 2.2. For example, by combining Dolphin (Target) and Strand (Event), the combined keyword was "Dolphin Stranded".
2. **Social Media Search on Facebook:** The keywords were searched on Facebook at the end of every month starting from July 2019. All the search directories were recorded in a log sheet for keeping track of the data consistency.

Table 2.2. Identified keywords for social media search of marine mammal related public posts in Myanmar.

Target	Event	Target (Myanmar)	Event (Myanmar)
Dolphin	Stranded	လင်းပိုင်	သောင်တင်ခြင်း
Porpoise	Stranding	လင်းရှူး	သောင်တင်ခဲ့ခြင်း
Whale	Beached	ဝေလငါး	ကမ်းတင်ခြင်း
Dugong	Sighting	ရေဝက်	မြင်ခြင်း
	Dead		သေဆုံး
	Captured		ဖမ်းမိ
	Caught		ဖမ်း
	Killed		သတ်
	Sold		ရောင်းချ
	Eaten		စား
	Market		ဈေး
	Dry		ခြောက်

3. **Data entry:** The extracted data were as follow:
    a. Date and time of the event
    b. Date of the search
    c. Location to the lowest administrative level (e.g., name of the village)
    d. Pictures of any posted media
    e. Status of the animal when it was found
    f. Condition of the animal when it was found
    g. Fate of the animal
    h. Measurements of the animal
    i. Involvement of community and/or government in response to the event
    j. Link of the posts

    The data were then entered into the Excel database with a unique ID for each event. For each event, the species of the animal were identified with support of marine mammal experts from Southeast Asia.

4. **Identify location of the event**: The estimated coordinates of the events with known locations were identified by using Google Earth.

5. **Quality check**: The data were checked quarterly with the social media search guideline by senior researchers.
6. **Analysis**: The quantitative data were analyzed in Excel using descriptive statistics and the spatial information was on QGIS (3.10.3-A Coruña).
7. **Report and communicate**: The analysis were yearly presented by creating maps and shared on social media.

2.5 Training of Young Researchers

Myanmar Coastal Conservation Lab (MCCL) is a unique, innovative group that builds youths skills and develops solutions for the future of coastal conservation in Myanmar. Thus, MCCL initiated an internship program in 2018 with university students and recent graduates from Mawlamyine and Bago Universities with the purpose to build capacity on research, conservation, and natural resource management in the Gulf of Mottama, Myanmar. However, this program paused the activities with the university due to COVID-19 outbreaks and political situation in 2022. Therefore, the team had evolved with a career advancement program for youths in conservation by recruiting three positions for the MCCL Alumni: research assistant, field researcher, and assistant facilitator in 2022.

The training to youths was majorly led by Yin Yin Htay, Project Officer of Point B, Wint Hte, Coastal Resources Programme Officer (CRPO) of IUCN with supervision from Dr. Tara Sayuri Whitty and coordination support from Point B and GoMP. The skills and capacity of young researchers were strengthened through the following key activities:

1. **Skill seminars and training:** provided skills and knowledge relevant to research, and conservation of coastal natural resources (with emphasis on marine mammals). The seminars and training also invited local and international experts.
2. **Reading discussion group (RDG):** the monthly RDG focused on reading academic journals related to coastal marine mammals and other resources to upgrade youths' skills in collaborative learning, critical thinking, and research communication.
3. **Experiential learning:** MCCL internship program and career advancement program provided opportunities for youths to participate in various research and conservation activities on marine mammals.

3 RESULTS

3.1 Estimating Population Abundance of Marine Mammals in the Gulf of Mottama

3.1.1 Opportunistic Boat-based Survey

A total of 65.12 hours was spent for 15 opportunistic surveys including pilot line transect survey efforts between November 2018 and March 2019 and the efforts are tabulated in Table 3.1. In total, 60 sightings of three cetaceans were recorded. The Irrawaddy dolphin was the most frequently sighted species (76%, n = 46), followed by the finless porpoise (22%, n = 13), and the humpback dolphin (2%, n = 1). Irrawaddy dolphins showed the overall highest encounter rate of 0.71 sightings per hour along the survey area, Zee Gone village, Chaung Zone township, followed by finless porpoises at 0.2 sightings per hour, and humpback dolphins at 0.02 sightings per hour. During 16 surveys for four months between 2018 and 2019, humpback dolphins were only sighted once in March 2019.

Table 3.1. Opportunistic survey including test line transect survey efforts and encounter rate per hours from 2018-2019 in Zee Gone, Chaung Zone Township.

Survey Date	Total Time (hr)	# Sightings				Encounter rate (sightings/ Hr)		
		Np	Ob	Sc	Total	Np	Op	Sc
04/11/2018	4.83	0	1	0	1	0.00	0.21	0.00
13/01/2019	8.03	0	0	0	0	0.00	0.00	0.00
14/01/2019	4.42	1	6	0	7	0.23	1.36	0.00
13/02/2019	4.08	0	10	0	10	0.00	2.45	0.00
14/02/2019	4.60	0	2	0	2	0.00	0.43	0.00
15/02/2019	3.75	0	4	0	4	0.00	1.07	0.00
27/02/2019	3.85	0	5	0	5	0.00	1.30	0.00
28/02/2019	2.18	0	2	0	2	0.00	0.92	0.00
01/03/2019	4.75	0	5	1	6	0.00	1.05	0.21
13/03/2019	3.98	4	0	0	4	1.00	0.00	0.00
14/03/2019	3.75	1	0	0	1	0.27	0.00	0.00
15/03/2019	4.77	0	6	0	6	0.00	1.26	0.00
29/03/2019	3.97	3	1	0	4	0.76	0.25	0.00
30/03/2019	4.52	1	2	0	3	0.22	0.44	0.00
31/03/2019	3.63	3	2	0	5	0.83	0.55	0.00
Total	**65.12**	**13**	**46**	**1**	**60**	**0.2**	**0.71**	**0.02**

Note: Np = Indo-Pacific Finless Porpoise, Ob = Irrawaddy dolphin, Sc = Indo-Pacific Humpback dolphin

3.1.2 Line Transect Survey

The systematic boat-based line transects surveys started in Zee Gone, Chaung Zone township in December 2020 and the latest survey was completed in January 2022. In total, the surveys took 105.48 hours and covered 1,069.41 km, of which 89.8 hours and 937.89 km were spent on-effort. A total of 57 sightings were recorded, of which 4 were unidentified. Finless porpoises were the most sighted animal (n =34) and found in all months of the survey, followed by Irrawaddy

dolphins (n = 17), and humpback dolphins (n = 2). The encounter rate of finless porpoise was 0.38 sightings per hour or 0.04 sightings per kilometer. Irrawaddy dolphins were sighted at a rate of 0.17 sightings per hour or 0.02 sightings per kilometer. The least sighted animals were humpback dolphins at a rate of 0.02 sightings per hour or 0.003 sightings per kilometer. The sighting and encounter rate in line transect surveys differed from opportunistic surveys. There were 60 sightings within 65.12 hours of the opportunistic survey and 57 sightings within 105.48 hours of line transect survey. Comparing these surveys, the sightings of Irrawaddy dolphins were higher in opportunistic surveys.

Table 3.2. Boat-based line transect survey efforts from 2019-2022 in Zee Gone, Chaung Zone.

Survey Date	Total* Time (Hr)	Total** Effort (Hr)	Total Distance (km)	Total Effort (km)	# Sightings				
					Np	Ob	Sc	UNID	Total
07/12/2020	4.30	3.08	38	31	2	0	0	0	2
08/12/2020	6.83	5.67	65	49	3	2	0	1	6
09/12/2020	7.18	6.30	80	77	1	0	0	0	1
27/10/2021	6.43	5.37	60.079	51.06	5	5	0	0	10
28/10/2021	9.18	8.30	93.35	85.43	3	3	0	1	7
29/10/2021	5.05	3.68	55.5	39.3	0	0	0	0	0
30/10/2021	7.17	5.67	65.8	53.6	6	4	0	0	10
10/11/2021	5.23	4.30	51.7	43.5	0	0	0	1	1
11/11/2021	7.70	6.83	75.1	72.3	2	0	0	0	2
12/11/2021	7.65	6.45	79.5	74.5	2	0	0	0	2
10/12/2021	5.87	4.78	49.98	38.6	1	0	1	0	2
11/12/2021	7.78	4.72	81.1	49.5	3	0	0	0	3
12/12/2021	4.62	3.55	55	43.7	0	0	0	0	0
25/01/2022	8.17	7.10	84.1	78	1	1	1	1	4
26/01/2022	7.62	8.43	80.1	88.7	2	2	0	0	4
27/01/2022	4.70	5.57	55.1	62.7	3	0	0	0	3
Total	**105.48**	**89.80**	**1069.41**	**937.89**	**34**	**17**	**2**	**4**	**57**

Note: Np = Indo-Pacific Finless Porpoise, Ob = Irrawaddy dolphin, Sc = Indo-Pacific Humpback dolphin, UNID = Unidentified animal

*Total time spent on boat during the survey

**Total time spent on effort observing marine mammals during the survey

Table 3.3. Encounter rates of three species of cetaceans during the transect survey.

Survey Date	Encounter rate (sightings/ hr)			Encounter rate (sightings/ km)		
	Np	Ob	Sc	Np	Ob	Sc
07/12/2020	0.65	0.00	0.00	0.06	0.00	0.00
08/12/2020	0.53	0.35	0.00	0.06	0.04	0.00
09/12/2020	0.16	0.00	0.00	0.01	0.00	0.00
27/10/2021	0.93	0.93	0.00	0.10	0.10	0.00
28/10/2021	0.36	0.36	0.00	0.04	0.04	0.00
29/10/2021	0.00	0.00	0.00	0.00	0.00	0.00
30/10/2021	1.06	0.71	0.00	0.11	0.07	0.00
10/11/2021	0.00	0.00	0.00	0.00	0.00	0.00

Survey Date	Encounter rate (sightings/ hr)			Encounter rate (sightings/ km)		
	Np	**Ob**	**Sc**	**Np**	**Ob**	**Sc**
11/11/2021	0.29	0.00	0.00	0.03	0.00	0.00
12/11/2021	0.31	0.00	0.00	0.03	0.00	0.00
10/12/2021	0.21	0.00	0.21	0.03	0.00	0.03
11/12/2021	0.64	0.00	0.00	0.06	0.00	0.00
12/12/2021	0.00	0.00	0.00	0.00	0.00	0.00
25/01/2022	0.14	0.14	0.14	0.01	0.01	0.01
26/01/2022	0.24	0.24	0.00	0.02	0.02	0.00
27/01/2022	0.54	0.00	0.00	0.05	0.00	0.00
Total	**0.38**	**0.19**	**0.02**	**0.04**	**0.02**	**0.00**

3.1.3 Key Findings

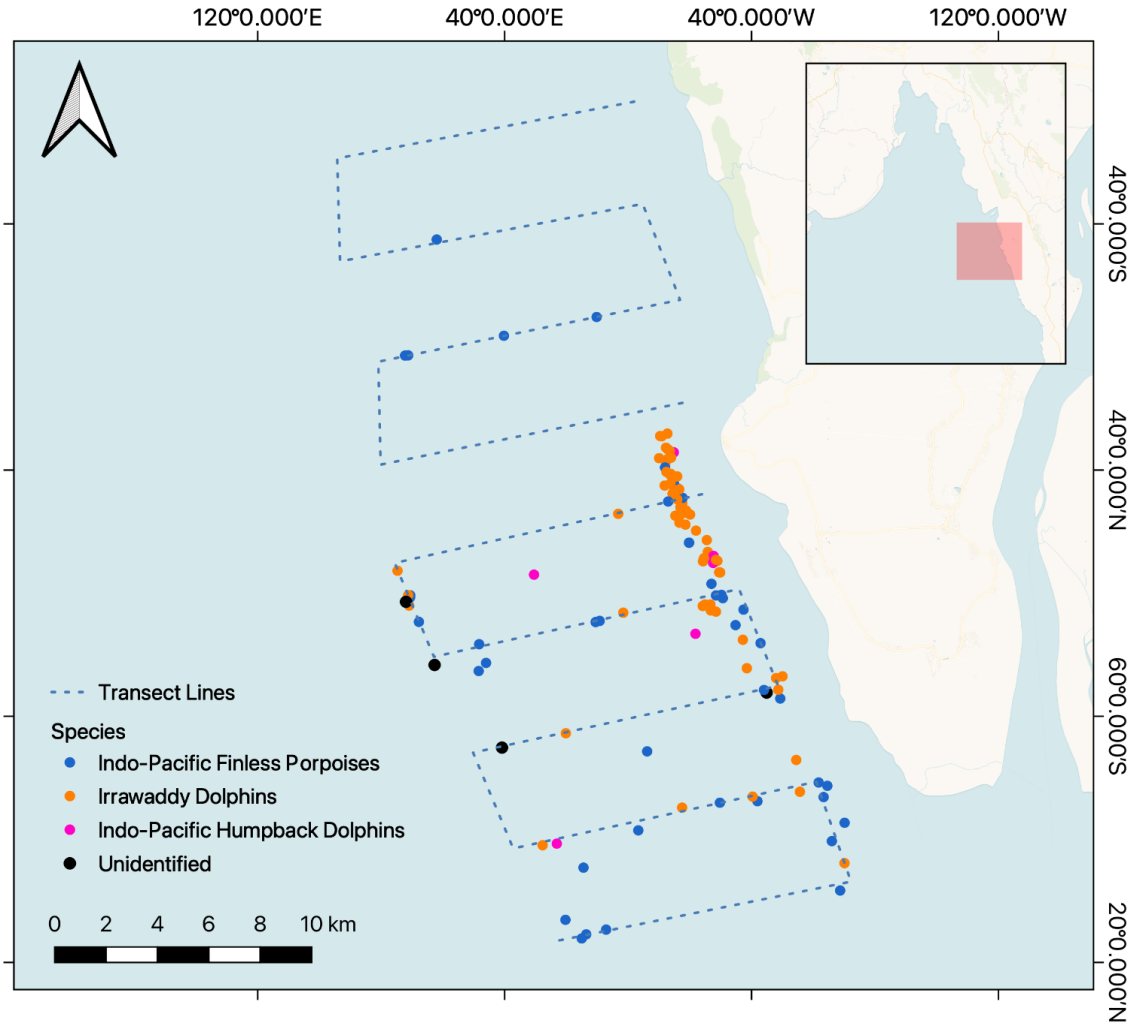

Figure 3.1. The map showing the sightings of three cetacean species (opportunistic surveys + line transect surveys) in the study area.

The total sightings of three cetaceans from both opportunistic surveys and line transect surveys were shown in Figure 3.1. In comparing the northern and southern transects, the sightings are significantly higher in the southern section of the study area. The lower sightings may be due to rougher sea conditions and existence of more extensive mudflats in the southern part of the area.

In terms of sightings, there were no records on sightings of interactions of two or more species in the area. The group size differed based on the species. The group size of humpback dolphins was the highest among three species which range from 5 to 28 individuals. However, it is common to sight individual or mother and calf pairs of finless porpoises, but the largest group record was 10 individuals. Similarly, Irrawaddy dolphins can be seen as one or two individuals or a group as large as 12 individuals in a pod. The group size of each sighting is illustrated in Figure 3.2.

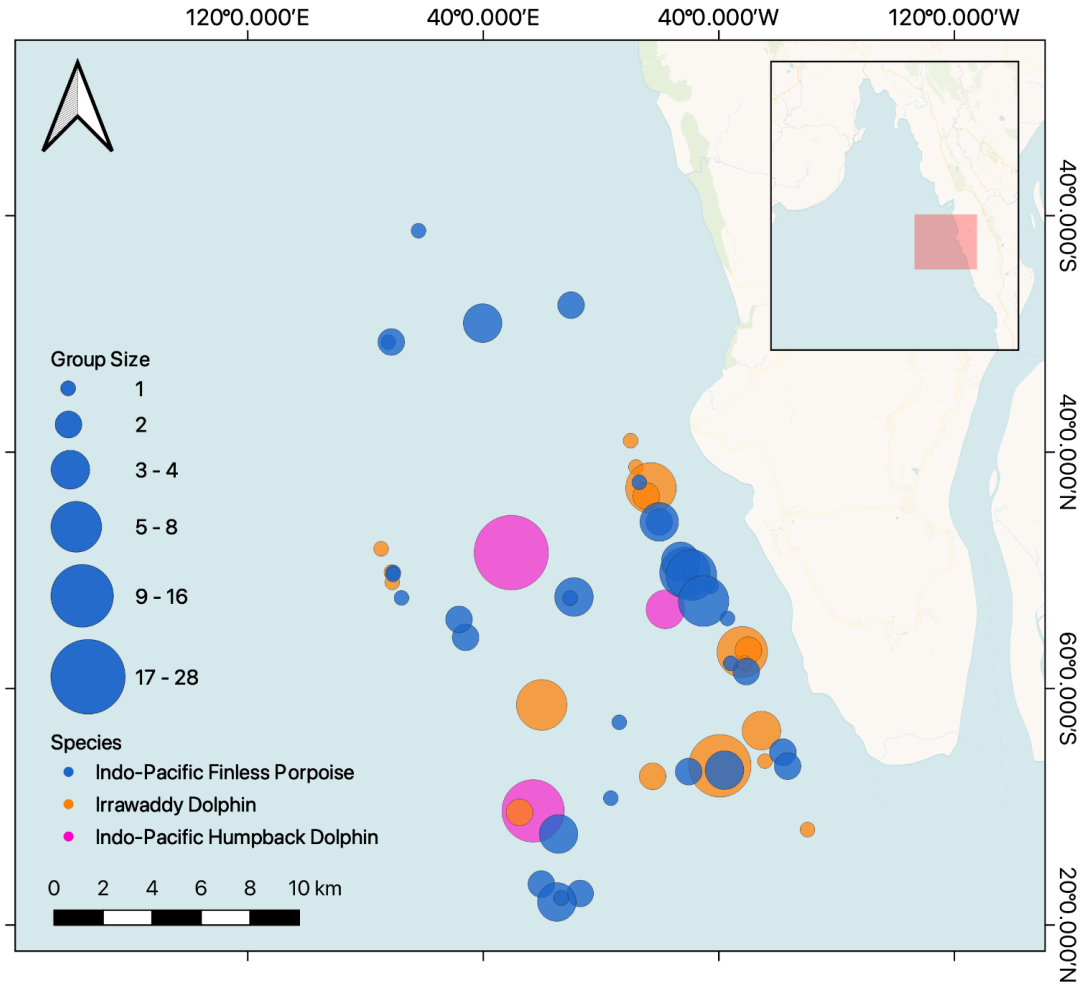

Figure 3.2. The group size of three cetacean species within the study area and locations of off-effort sightings during line transect surveys.

3.1.4 Interactions with Small-scaled Fishery (SSF)

The survey area is mainly congested with small-scaled fishing activities as in Figure 3.3. The major fishing gears in the area are set bag nets (common in deeper parts of the water body) and drift net (common in shallower parts of the study area). The overlapping habitat use of cetaceans and fishing gears can be seen in Figure 3.4. During the survey, the feeding of dolphins and porpoises close to the fishing gears were also visible. Therefore, the close interaction with SSF may impose higher bycatch of marine mammals in the study area.

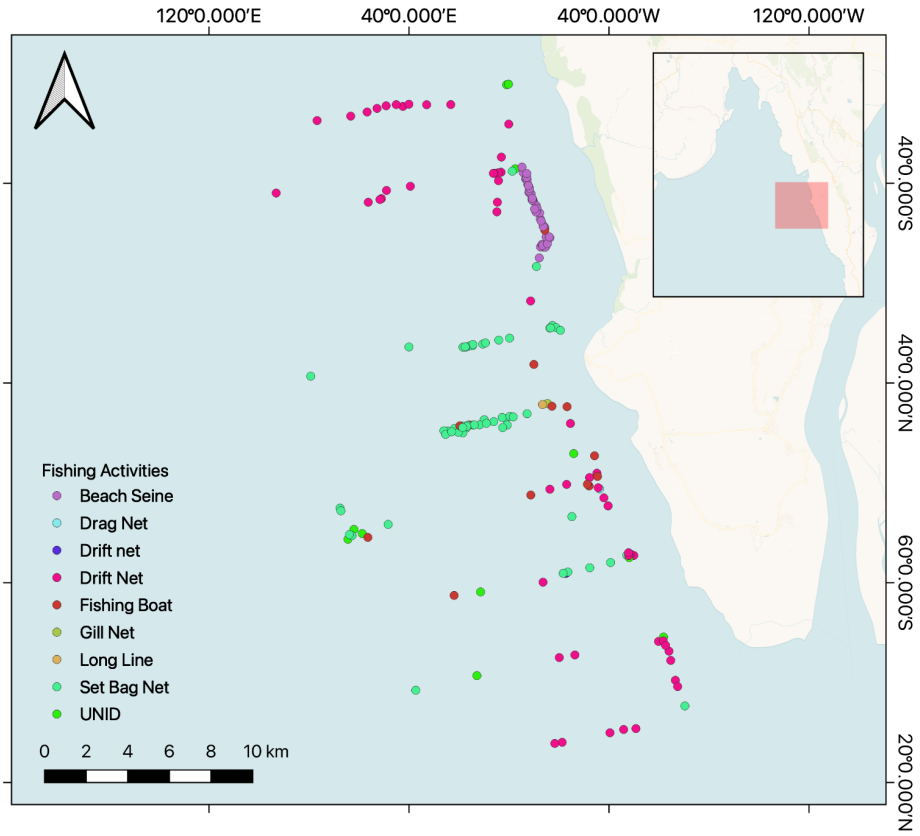

Figure 3.3. Recorded fishing gears with 1 km radius of the transect line in the study area.

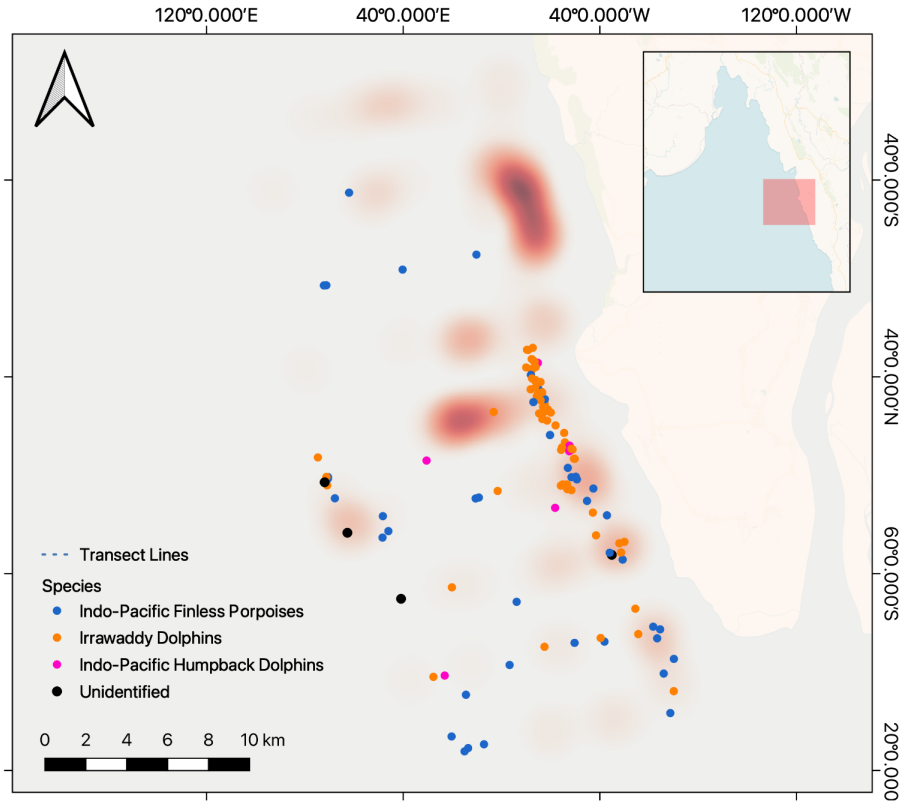

Figure 3.4. The heat map of fishing activities in the study areas with sightings of cetaceans in the area.

3.2 Local Ecological Knowledge and Rapid Bycatch Assessment

The local ecological knowledge and rapid bycatch assessment (LEK & RBA) interviews were conducted with 189 fishers from 10 coastal villages of the GoM. The overview of estimated bycatch events and historical distribution of marine mammals through stranding events reported in the interviews were mapped in Figure 3.5. In general, the marine mammals were distributed along the east coast of the gulf as well as accidental deaths from bycatch in SFF is recorded in the area except in the Bilin Township.

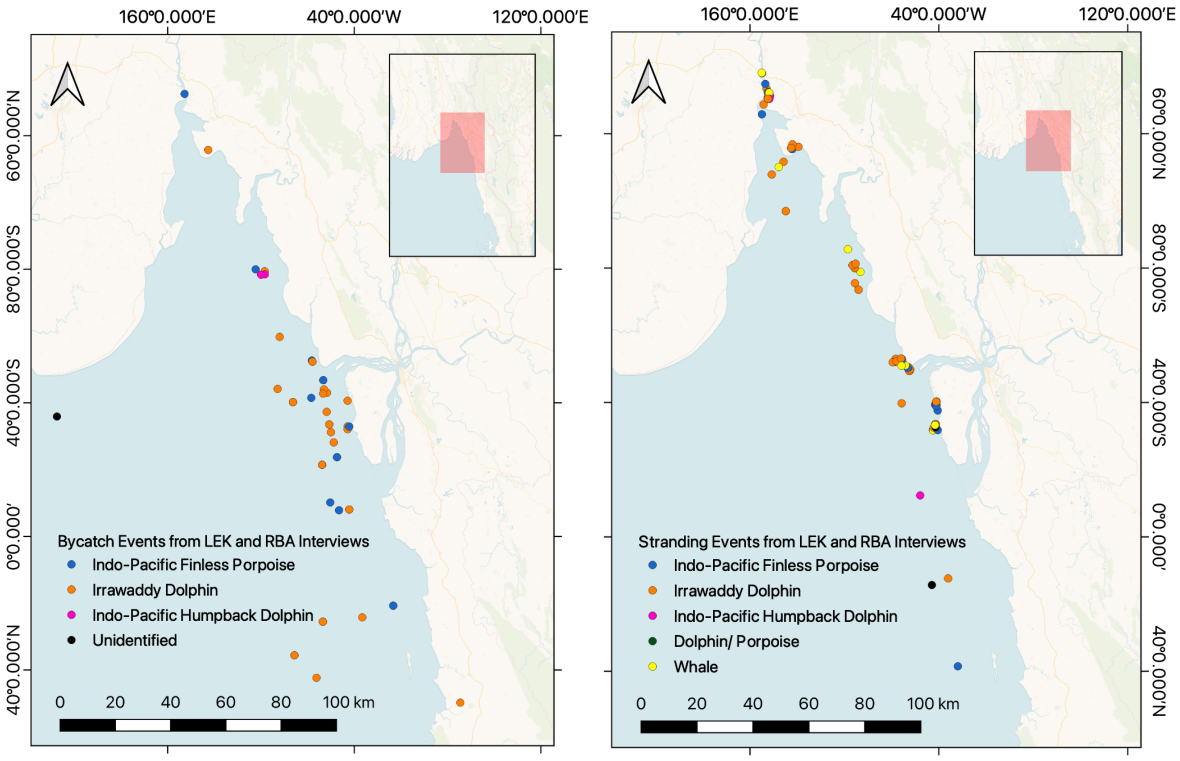

Figure 3.5. Estimated locations of bycatch and stranding events recorded in the LEK and RBA interviews from 2019 to 2022.

3.2.1 Marine Mammal Bycatch in the Gulf of Mottama

A total of 132 bycatch events were recorded through LEK & RBA interviews of which 71 were Irrawaddy dolphins, 44 were finless porpoises, 12 were humpback dolphins and 5 were unidentified species.

As shown in Table 3.4, the highest bycatch events (n = 42) were in Wae Pa Tan village (Paung Township) where both small and medium scale fisheries are operating in both nearshore and offshore fishing areas. It was followed by Aung Kan Thar village of Thaton Township with 26 events recorded, and Zee Gone with 23 bycatch events. In all villages except Kyauk Seik and Zee Gone villages, Irrawaddy dolphins were the most threatened by the incidental deaths in SSFs. However, the bycatch to finless porpoises is more common in Zee Gone and Kyauk Seik villages. Significant numbers of bycatch of humpback dolphins were recorded in Zee Gone and Aung Kan Thar.

Table 3.4. Rate of marine mammal bycatch of different cetaceans in each study village.

Village	Np	Ob	Sc	Others	Total
Zee Gone	**11**	8	3	1	**23**
By Laung	0	0	0	0	**0**
Kyauk Seik	**12**	4	1	1	**18**
Wae Pa Tan	8	**32**	1	1	**42**
Zee Gone (Paung)	4	5	0	0	**9**
Aung Kan Thar	7	**11**	**6**	2	**26**
Taw Ka Mar	0	6	1	0	**7**
Sut Pa Nu	1	3	0	0	**4**
Gwa Thaung	0	1	0	0	**1**
Koe Tae Su	1	1	0	0	**2**
Total	**44**	**71**	**12**	**5**	**132**

Note: Np (Indo-Pacific Finless Porpoise), Ob (Irrawaddy Dolphin), Sc (Indo-Pacific Humpback Dolphin)

The top three most important fishing gears for SSFs in the study village are tabulated in Table 3.5. The drift nets were most important fishing gears followed by set bag nets and trammel nets. The three major fishing gears which caused the accidental death of Irrawaddy dolphins were drift net (n = 54), set bag net (n = 6) and gill net (n = 5) as shown in Figure 3.6. For finless porpoises, gill net (n = 18), set bag net (n = 14) and trammel net (n = 10) were major causes of deaths from bycatch.

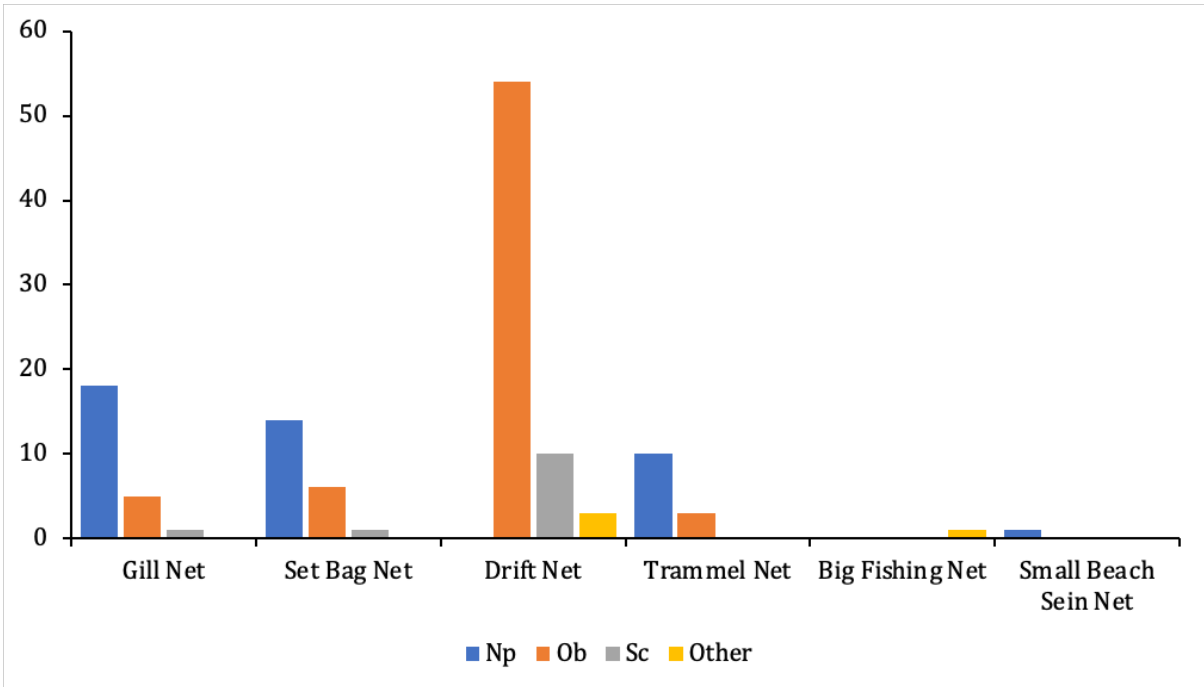

Figure 3.6. Major fishing gears contributing to the bycatch of marine mammals in the study area.

Table 3.5. Top 3 most important fishing gears in each study area.

Villages	Gear 1	Gear 2	Gear 3
Zee Gone	Set Bag Net	Gill Net	-
By Laung	Trammel Net	-	-
Kyauk Seik	Drift Net	Trammel Net	-
Wae Pa Tan	Drift Net	-	-
Zee Gone (Paung)	Set Bag Net	Drift Net	-
Aung Kan Thar	Drift Net	-	-
Taw Ka Mar	Drift Net	Long Line	Set Bag Net
Sut Pa Nu	Drift Net	-	-
Gwa Thaung	Drift Net	-	-
Koe Tae Su	Drift Net	Set Bag Net	-

3.2.1.1 Reported Consumption

The study recorded the consumption of bycaught marine mammals in the fishing communities on the eastern bank of the gulf. The highest consumption was in the form of food, which is highest in Wae Pa Tan (n = 25), Zee Gone (Paung) (n = 13) and Aung Kan Thar (n = 11). The consumption as food is not only within communities but also traded to other communities with high monetary values. Mostly, if the animals were caught far from shore, the fisher deskin and beheaded the animals to maintain the freshness of the meat. Traditionally, the meat is consumed by cooking raw meat or dried meat. In recent years, diverse dishes were created by the communities such as making salad with the fins, fermenting the head to last longer and taste better, and creating curry with internal organs. In addition, the unsaturated fatty oil produced from skin and bones of marine mammals are used for ointment and other medicinal purposes.

This consumption pattern is expected to be higher in demand as these dishes are also served in some local restaurants. Therefore, the study also recorded some anecdotal data indicating that there were target hunting of marine mammals in the area to fulfill the higher demands.

Table 3.6. Reported number of respondents on how the community consumes meat or parts of cetaceans in the study area.

Village	Use as medicine	Use as food	N/A
Zee Gone	7	7	3
By Laung	2	6	1
Kyauk Seik	1	5	0
Wae Pa Tan	2	**25**	2
Zee Gone (Paung)	0	**13**	1
Aung Kan Thar	1	**11**	0
Taw Ka Mar	0	2	5
Sut Pa Nu	0	0	6
Gwa Thaung	0	1	1
Koe Tae Su	1	2	11

3.2.2 Local Ecological Knowledge on Marine Mammal Distribution in the Gulf of Mottama

3.2.2.1 Marine Mammals Strandings in the Gulf of Mottama

According to the strandings and sighting records of marine mammals in the Gulf of Mottama, it is indicated that different species of marine mammals (as in Figure 3.5) in the past 20 years. Not only small cetaceans but also whales were recorded stranding in the area, and they are shown in Table 3.7. Zee Gone (Chaung Zone), Zee Gone (Paung), and Koe Tae Su (Bilin) were the villages where higher numbers of marine mammals were recorded. In addition, it is well-noted that the whales were traveled and/or stranded up to Kyaik Hto the uppermost part of the gulf.

Table 3.7. Recorded stranding events of marine mammals in the Gulf of Mottama.

Village	Np	Ob	Sc	Dolphins/ Porpoises	Whales	Total
Zee Gone	3	5	1	2	4	**15**
By Laung	0	0	0	0	0	**0**
Kyauk Seik	1	0	0	0	3	**4**
Wae Pa Tan	1	6	0	0	2	**9**
Zee Gone (Paung)	8	6	0	0	0	**14**
Aung Kan Thar	0	7	0	0	1	**8**
Taw Ka Mar	2	4	0	0	0	**6**
Sut Pa Nu	0	0	0	0	1	**1**
Gwa Thaung	0	0	0	0	0	**0**
Koe Tae Su	3	6	0	0	1	**10**
Total	**18**	**34**	**1**	**2**	**12**	**67**

3.2.2.2 Observed Trends in Abundance

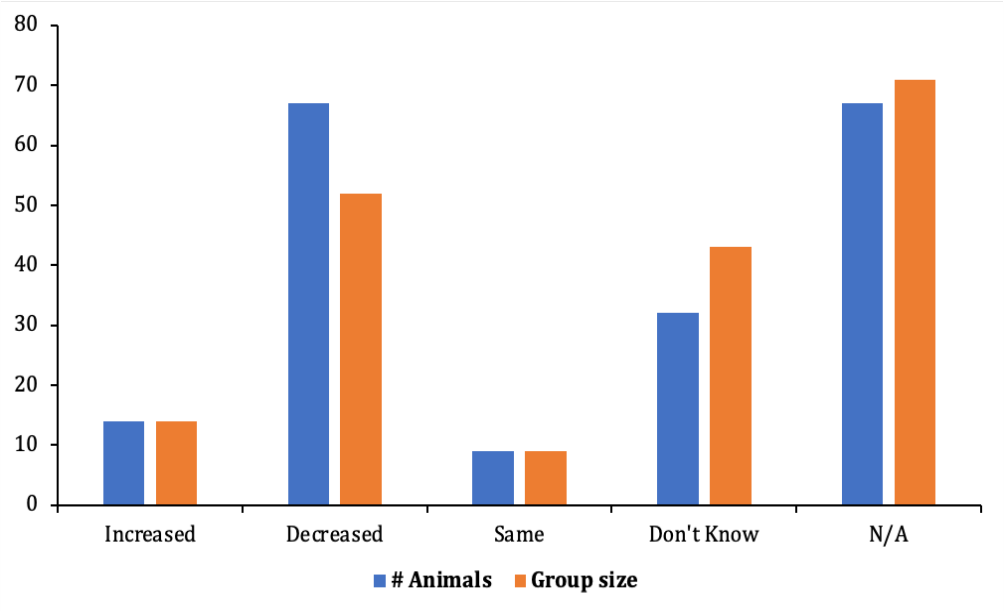

Figure 3.7. Response frequency on the trend of observation of marine mammals (number and group size).

According to the experiences of the respondents, the majority of the responses highlighted that the number of marine mammals and the group size were decreasing. The major causes assumed by the respondents were due to shallower water columns for the animals to travel to the upper part of the GoM as result of changes in hydrological process of the rivers and tidal systems in the gulf, heavy sedimentation process from erosion.

3.2.2.3 Feelings about Marine Mammals

According to the interviews, higher percentages of respondents stated they favored marine mammals as 51 respondents (27%) stated they like a lot and 83 respondents (44%) stated they just like them. There is no record of respondents who strongly dislike marine mammals but 11 (6%) disliked them. However, 22 (about 12%) stayed neutral on their feelings on the marine mammals.

The reasons for their preference are tabulated in Table 3.8. Most of the participants favor the dolphins and porpoises due to their aesthetic, adorable and charismatic behaviors (n = 96). The study also suggested some people (n = 20) believed that dolphins and porpoises save people in dangerous situations such as during storms or protected from predators like sharks. In addition, some of the respondents like the animals they felt emotionally connected with the dolphins (n = 17). Even the people who stated they did not care or like the marine mammals believed they have rights to survive as other animals and they key reasons they dislike is because they are scared of the animals.

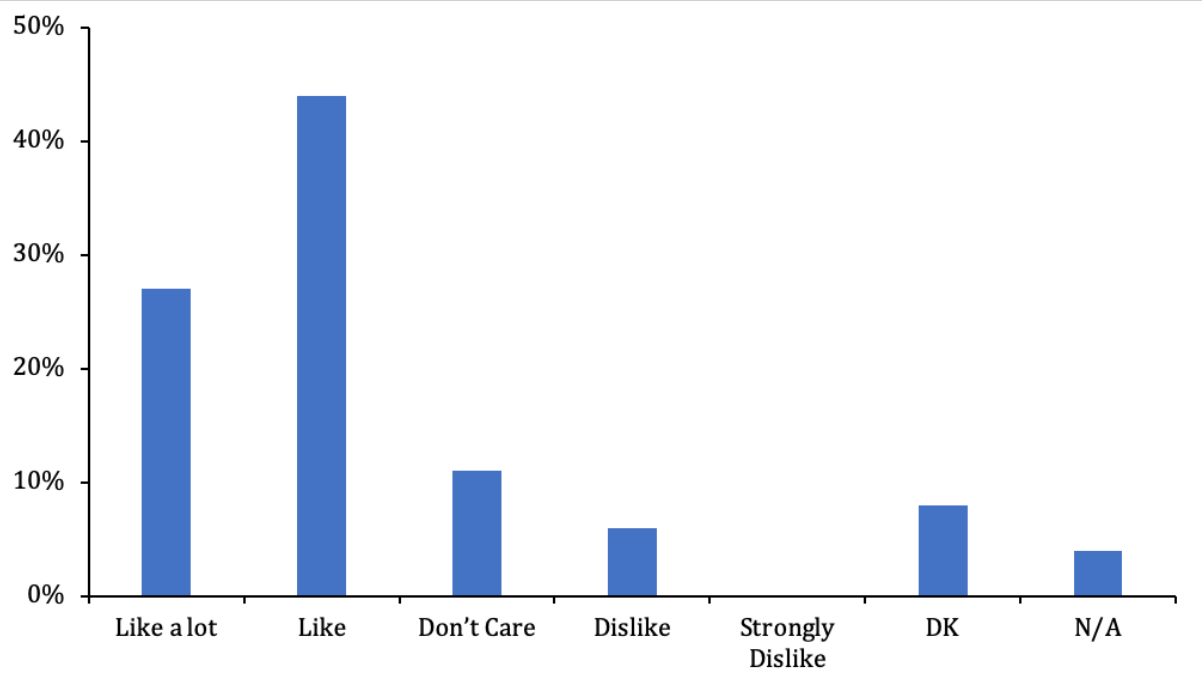

Figure 3.8. Percentage of responses on how the respondents feel about marine mammals.

3.2.2.4 Perceptions about Marine Mammals and their Conservation

In accessing the community perspectives on the importance of conservation of marine mammals, 46 of respondents (24%) presumed conservation is very important and 100 respondents (53%) stated conservation is necessary or important for the sustainability of marine mammals in the gulf. Only a few respondents do not recognize the importance of conservation as shown in Figure 3.8. Relatively high number of people do not have opinions on the questions mainly because they do not understand the terms conservation or have belief that they do not have enough information to provide their perspectives.

The arguments stated by the respondents are shown in Table 3.9. Similar to the respondent's reasons for the likability of the dolphins/porpoises, most of the people (n = 42) stated they want to conserve marine mammals because they are adorable, charismatic, and a pleasure to watch them swimming or living freely in the water. The cultural beliefs and folklore about dolphins saving people's lives, spiritual beliefs against killing dolphins motivate the community to protect marine mammals. Some of the participants recognized the animals as rare or endangered with various threats including bycatch and therefore, they felt responsibility to take conservation actions and some respondents stated they are willing to participate in such actions as well.

On the other hand, some of the respondents stated that unlike other fish, the dolphins and porpoises are large and strong creatures and so, they can protect against their danger without the need of conservation activities. In addition, some people think that conservation of the animals would not be effective as they are consumable goods with high demands in the communities. Therefore, there were diverse opinions of communities on the conservation of marine mammals but most of them have positive perspectives or acceptance on the needs of conservation interventions for the existence of marine mammals in the gulf.

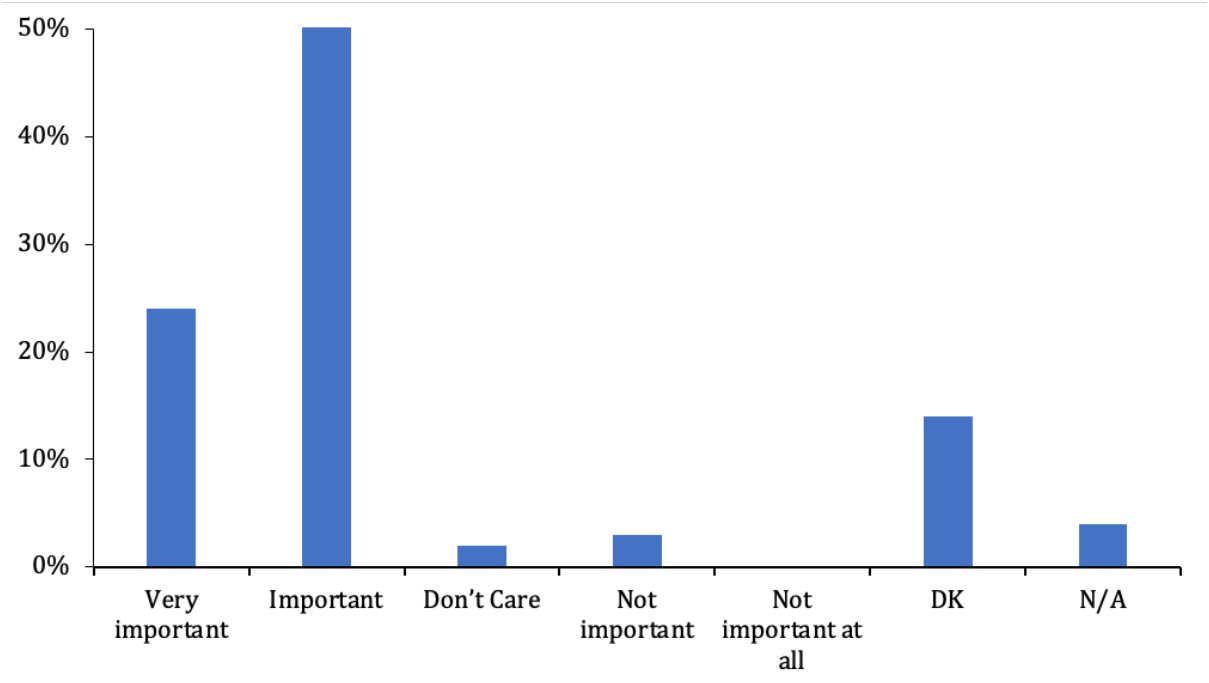

Figure 3.9. Percentage of responses on perception of the respondent on the importance of conservation of marine mammals.

Table 3.8. Arguments from the respondents on their feelings on marine mammals

Level of Feelings	Feelings on marine mammals: Arguments	Kyaik Hto	Bilin	Thaton	Paung	Chaung Zone	Total
Like a lot and like	Adorable behaviors	14	4	14	39	25	**96**
	Do not harm to human	6	2	0	6	11	**25**
	Save people lives	6	2	1	0	11	**20**
	Emotionally connected	4	1	3	1	8	**17**
	Similar to human	3	0	1	6	3	**13**
	Hesitate to harm the animals	3	0	0	4	3	**10**
	Rare species	3	0	2	1	0	**6**
	Like to interact with marine mammals (such as feeding fish)	0	0	1	3	1	**5**
	Wish to see them survive	1	1	0	3	0	**5**
	Indicators of the health of the sea	1	0	1	2	0	**4**
	Different from other marine species	1	0	0	0	2	**3**
	Like dolphin meat	0	0	1	2	0	**3**
	Charismatic and smart	2	0	0	1	0	**3**
	Spiritual belief (such as killing marine mammals will bring bad luck)	1	0	0	0	2	**3**
	Protect from danger (such as sharks)	0	2	0	0	3	**5**
	Big						
Don't care	Don't care	1	0	2	6	3	**12**
	Do not harm to human	0	0	0	5	2	**7**
	Only enjoy personally	1	0	0	0	0	**1**
	Save people lives	0	0	0	0	1	**1**
	Scared of marine mammals	0	0	0	1	0	**1**
	Like to eat dolphin meat	1	0	0	0	0	**1**
	Do not like to eat dolphin meat	0	0	0	1	0	**1**

Level of Feelings	Feelings on marine mammals: Arguments	Kyaik Hto	Bilin	Thaton	Paung	Chaung Zone	Total
	Wish to see them survive	0	1	0	0	0	**1**
	Emotionally connected	0	0	0	1	0	**1**
	Dolphin meats are demanding and higher prices	0	1	0	0	0	**1**
	No willing to kill dolphins	0	0	0	1	0	**1**
Dislike	Scared of marine mammals	3	2	0	2	1	**8**
	Wish to see them survive	0	1	0	0	0	**1**
	Do not like the dolphin meat	0	1	0	0	0	**1**

Table 3.9. Perceptions and arguments on conservation of marine mammals

Level of Perceptions	Perceptions on conservation of Marine Mammals: Arguments	Kyaik Hto	Bilin	Thaton	Paung	Chaung Zone	Total
Very important and important to conserve	Value the existence of marine mammals	12	3	3	11	13	**42**
	Do not harm the people	6	2	5	13	12	**38**
	Save or help people from dangers in the sea	9	3	5	15	4	**36**
	Rare or endangered species	9	3	4	9	6	**31**
	Emotionally connected	1	0	1	8	8	**18**
	Do not want to kill	3	1	4	1	5	**14**
	Important for the ecosystem	5	0	3	9	6	**23**
	Want to participate in bycatch response	4	1	0	3	1	**9**
	Do not like to eat dolphin meat	2	0	1	1	2	**6**
	Indicator of the health of the sea	0	0	3	0	0	**3**
	Threatened from bycatch in fishery	0	0	1	2	0	**3**
	Big and strong	1	1	0	0	0	**2**
	Spiritual belief on saving the animals	0	0	0	0	1	**1**
Don't care	Playful and charismatic	0	0	0	0	1	**1**

	Do not harm the human	0	0	0	0	1	**1**
	Do not want to kill	0	1	0	0	0	**1**
	Important for the ecosystem	0	0	0	0	1	**1**
Not important to conserve	Consumable animals are difficult of conserve	1	0	0	0	0	**1**
	Big and strong and do not need protection	0	1	0	0	0	**1**

3.3 Community Engagement for Marine Mammal Conservation

3.3.1 Participation of Community in the Research Activities

All the marine mammal conservation activities and boat-based surveys were conducted in collaboration and coordination with local communities. The boat-based surveys hired one boat skipper and one assistant from the village where the surveys were conducted. They were trained in using GPS for navigating through transects and basic behaviors to interact in sightings with marine mammals. They were also trained to identify marine mammals. The project team also built very strong relationships with community leaders, fishers, and women through regular survey activities.

3.3.2 Community Awareness Raising Activities

To support better contribution of MCCL for community awareness raising in terms of marine mammal conservation, Dr. Tara Sayuri Whitty developed a series of lectures on marine megafauna in 2019 and the training was provided to the MCCL team. In addition, Point B Design + Training also trained in the concept of community engagement through a human-centered design thinking approach based on empathizing the needs of the community. In combinations of these supports, the team contributed to community awareness raising activities and materials mainly in collaboration with GoMP.

3.3.2.1 CEPA

Firstly in 2020, the components on marine mammals from lectures on marine megafauna from Dr. Whitty were designed into online awareness training and the package was delivered in BANCA leading CEPA awareness online training to GoMP staff and CEPA focal from the community. The package was then developed into an interactive curriculum which covered a wide range of topics such as the importance of marine mammals as well as the needs of community participation on successful conservation of marine mammals. The curriculum was integrated into CEPA Facilitators' Handbook of GoMP, which aims for educating communities on conservation awareness through participatory learning experiences on natural resources in the GoM. On 21-27 March 2022, GoMP conducted a training for trainers (ToT) program in collaboration with Point B for CEPA youths and CSOs to conduct CEPA awareness activities in the community. During this event, 24 people including assistant facilitators from MCCL, trainers from 2 CSOs and CEPA youths from communities were trained. This training program has been successful in its aim of equipping 24 individuals with relevant information regarding marine mammal conservation so that they can share this awareness interactively to communities in the GoM.

In addition, the MCCL youths developed a CEPA comic book for school children as part of the CEPA program from GoMP. This storybook was designed to bring awareness to classrooms in an entertaining and engaging way so that students can easily relate to it, allowing them to develop empathy towards marine mammals and become interested in conservation actions.

3.3.2.2 Marine Mammal Story Book for Community Awareness

In 2022, the MCCL team collaborated with Myanmar Ocean Project on a storytelling project: "Our Ocean, Our Home". The MCCL supported a storyline for the project about marine mammals in the Gulf of Mottama. This collaboration resulted in raising awareness and prompting conversation amongst Myanmar society regarding marine mammals and conservation issues surrounding them. The comic also included the MCCL and real local community members in the storyline

highlighting the importance of local capacity for sustainable conservation efforts. These stories were published and available to users on Myanmar Ocean Project Website, Our Ocean, Our Home Facebook Page and Myanmar School application in both Myanmar and English languages.

Furthermore, MCCL youths have developed a story reflecting key messages from the fisher's experiences in the community based on local ecological knowledge interviews. The story was created in watercolor arts in collaboration with two women artists and follows experiences of a young boy called "Min Min'' from a fishing community who is curious about the marine mammals in the Gulf of Mottama. Therefore, the readers are able to learn about the charisma, intelligence of marine mammals, their similarities with humans in terms of communication and social behaviors, and the importance of these animals in supporting local fisheries. This creative piece from youths applying design thinking helps the readers to emphasize the marine mammals and motivate them to participate in conservation initiatives.

The story books were then distributed to 71 villagers (majorly fishermen) from three coastal villages. The reaction from the fishers is very positive as their experiences were applied in producing inspirational and educational purposes. Moreover, this activity also provided invaluable opportunities for youths who contributed to the development of story books as they experienced to listen to the perspectives from communities, interpret as insights and finally articulate as a story through creative process.

3.3.2.3 Marine Mammal Community Campaign

The project "Save Lin Shu Lin Paing" was conducted in 2022 with the funding from Marine Accelerator Program (MAP) of The Young Southeast Asian Leaders Initiative (YSEALI). It was about having community awareness raising campaigns with a mobile truck in two selected fishing communities: By Laung and Zee Gone villages in Paung Township. A total of 70 adults (Male = 8, Female = 62) and 195 children (Male = 102, Female = 93) participated in the events. The purpose of the project was that the locals could take part in the awareness campaign for the very first time in their lives and were able to get access to the awareness of marine mammal conservation through fun and simple activities as follow:

- **Photo booths:** designed for participants to experience the beauty of dolphins and porpoises and take photographs with them.
- **Games and activities:** provided fun games and interactive activities to understand the conservation threats and the needs of community participation for effective conservation.
- **Photo gallery:** showcased the different species of marine mammals in the GoM as well as visually presented the threats they are facing.

As part of the campaign, the merchandised materials such as tote bags and metal water bottles were provided as small gifts to the participants. According to the evaluation with the participants, they became knowledgeable about the three cetacean species, the conservation threats to marine mammals and more interested in conservation activities.

3.3.3 Marine Mammal Stranding Response Training

In 2022, a total of three marine mammals stranding response training were conducted in By Laung (Paung Township), Aung Kan Thar (Thaton Township) and Sut Pa Nu (Kyaik Hto Township). In total, 70 participants (Male = 47, Female = 23) participated in the three training

sessions. As part of the training, the marine mammal story books were also disseminated to the participants.

The training included the following 4 main themes which were delivered and disseminated by using interactive, participatory training methodology to ensure the participant understood the training concepts and its practices.

- Concepts of marine mammals (basic morphology and biology of marine mammal, the importance of conservation of marine mammals)
- Concepts of marine mammal stranding (types of strandings and causes of strandings)
- Good practices of stranding response, and
- Demonstration and simulated practice of a marine mammal stranding response.

According to the evaluation with the participants, the training supported to understand as follow:

- Understood the similarities between marine mammals and humans as well as differences with fishes.
- Developed greater knowledge of the importance of marine mammal conservation.
- Gained awareness of the causes of strandings.
- Familiarized with practices to avoid stranded animals through training and the demonstration.
- Demonstrated enthusiasm to participate in future intensive training and became more willing to support in marine mammal stranding events.

3.3.4 Social Media Engagement

MCCL has conducted social media engagement in raising awareness of marine mammal conservation in the Gulf of Mottama area. From 2019 to 2022, a total of 42 social media engagement contents were posted as factsheets, quizzes, and translations of literature associated with marine mammals. These posts have reached 76,253 Facebook users and their engagements are listed in Table 3.9. This demonstrates the effectiveness of using social platforms to foster an understanding for Facebook users on how the public can contribute to conservation efforts.

Table 3.10. Marine mammal social media engagement contents posted on Myanmar Coastal Conservation Facebook Page from 2019 to 2022.

Year	Total Posts	Reached	Engagement	Comments	Shares	Reactions	Link clicks
2019	3	85	326	12	76	231	6
2020	18	10,761	1,699	191	285	1,330	387
2021	3	23,911	1,671	5	76	722	1,079
2022	18	41,502	2,573	44	299	2,231	2,734
Total	**42**	**76,253**	**6,269**	**252**	**736**	**4,514**	**4,206**

3.4 Social Media Research for Distribution of Marine Mammals in Myanmar

3.4.1 Key Findings

The MCCL team conducted the social media search from 2019 to 2022 and a total of 79 events related to marine mammals were recorded in Myanmar. The estimated location of recorded

events was shown in Figure 3.9. Due to the similarity of whale shark with whale in key words, the events for whale shark were also collected. There were 4 events for dugongs, 3 for porpoises, 37 for dolphins, 19 for whales and 16 for whale sharks. Most of the events are stranding (n = 25) followed by sightings (n = 4).

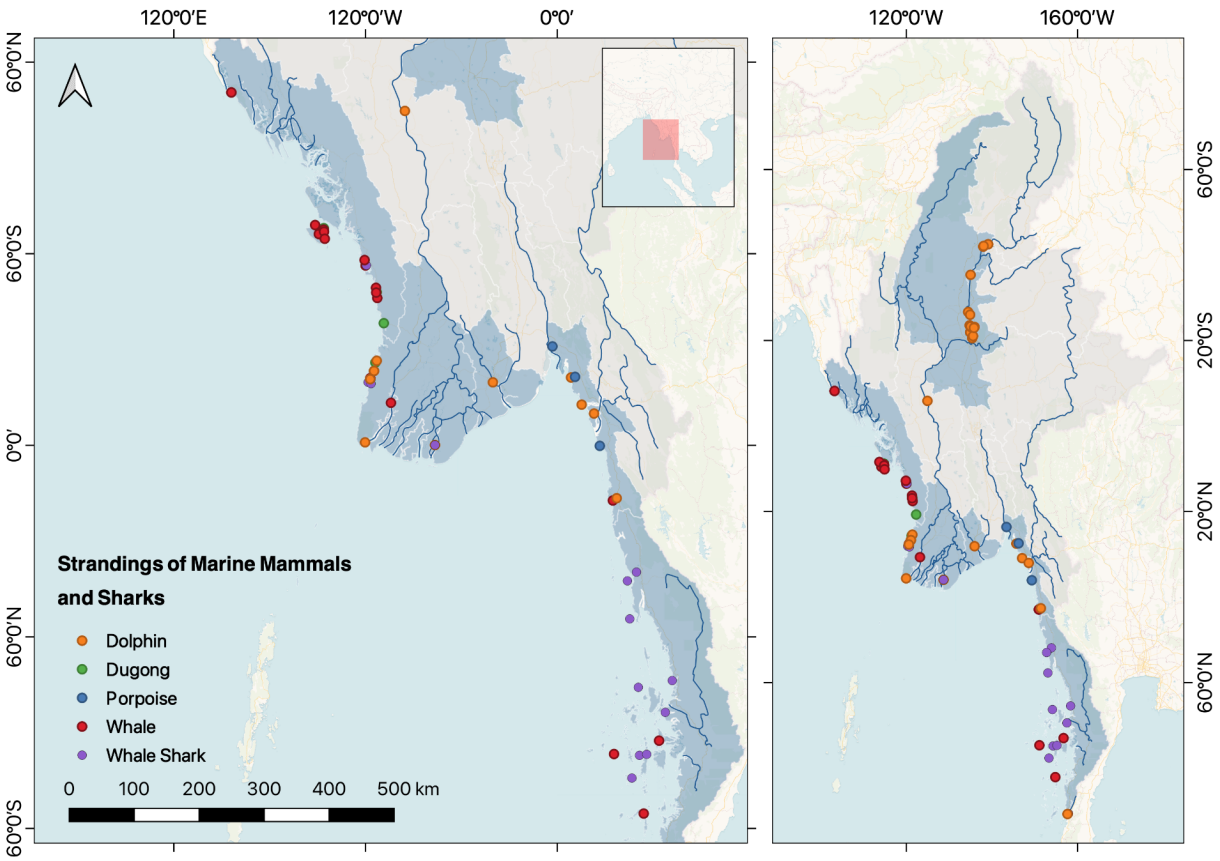

Figure 3.9. The map shows the estimated location of recorded events from social media search conducted from 2019 to 2022.

In Myanmar the highest recorded number from Facebook occurred in the upper region of Myanmar (in the Ayeyarwady River) due to mostly dead strandings of Irrawaddy dolphins. Along the coast, the highest number of cases in Tanintharyi were posted (n = 18), followed by Rakhine State (n = 17) and Ayeyarwady Region (n = 14) as in Table 3.10. Table 3.11 expressed the years of events that happened in each area and posted them on Facebook. The peak number of cases were reported in 2020 as in Figure 3.10.

Table 3.11. Different species of marine mammals recorded in different regions of Myanmar.

Species	Region						Total
	Rakhine	Ayeyarwady	Mon	Tanintharyi	Upper Myanmar	Unknown	
Dugong	3	1					**4**
Porpoise			1				**1**
Indo-Pacific Finless Porpoise			2				**2**
Dolphin	1	3		1			**5**
Common Bottlenose Dolphin		2					**2**
Indo-Pacific Humpback Dolphin			1				**1**
Irrawaddy Dolphin		2	3	1	19	2	**27**
Spinner Dolphin		1					**1**
Striped Dolphin		1					**1**
Whale	7	2		1			**10**
Baleen Whale	2			1			**3**
Bryde's Whale	2			1			**3**
Cuvier's Beaked Whale			1				**1**
Killer Whale				1			**1**
Omura's Whale	1						**1**
Whale Shark	1	2		12		1	**16**
Total	**17**	**14**	**8**	**18**	**19**	**3**	**79**

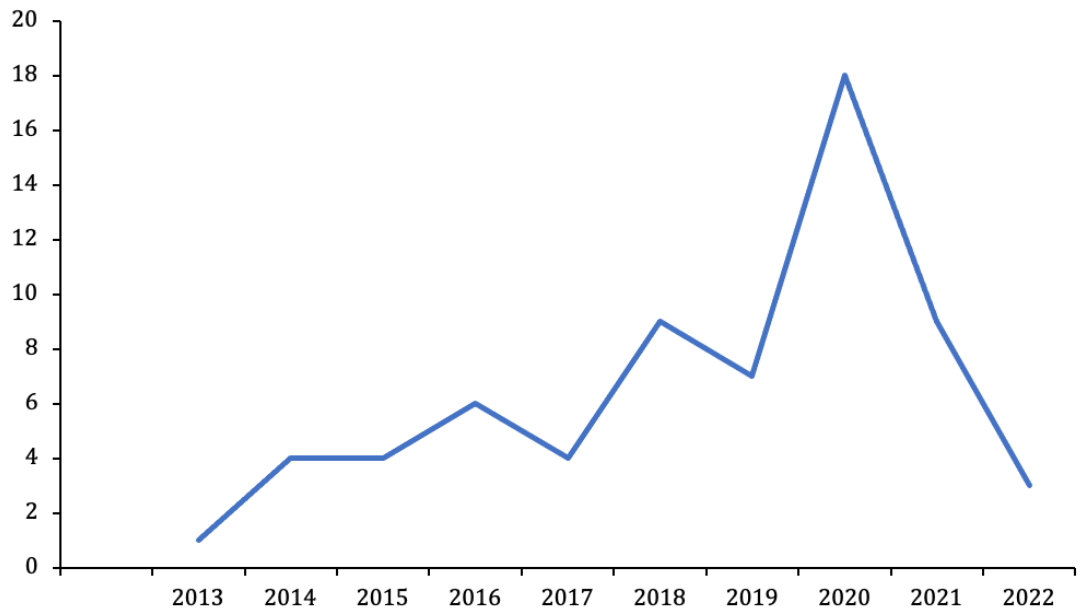

Figure 3.10. Trend of recorded events from Facebook per year from 2013 to 2022.

Table 3.12. Years of recorded events of marine mammals in different regions of Myanmar.

Year	Region					
	Rakhine	**Ayeyarwady**	**Mon**	**Tanintharyi**	**Upper Myanmar**	**Unknown**
2013				1		
2014	1			2	1	
2015	1	2				1
2016	3	1		1	1	
2017	2	1			1	
2018	2	1	3	1	2	
2019			3	1	3	
2020	6	2	1	1	7	1
2021		4	1	1	3	
2022	1	1		1		
Unknown	1	2		9	1	1
Total	**17**	**14**	**8**	**18**	**19**	**3**

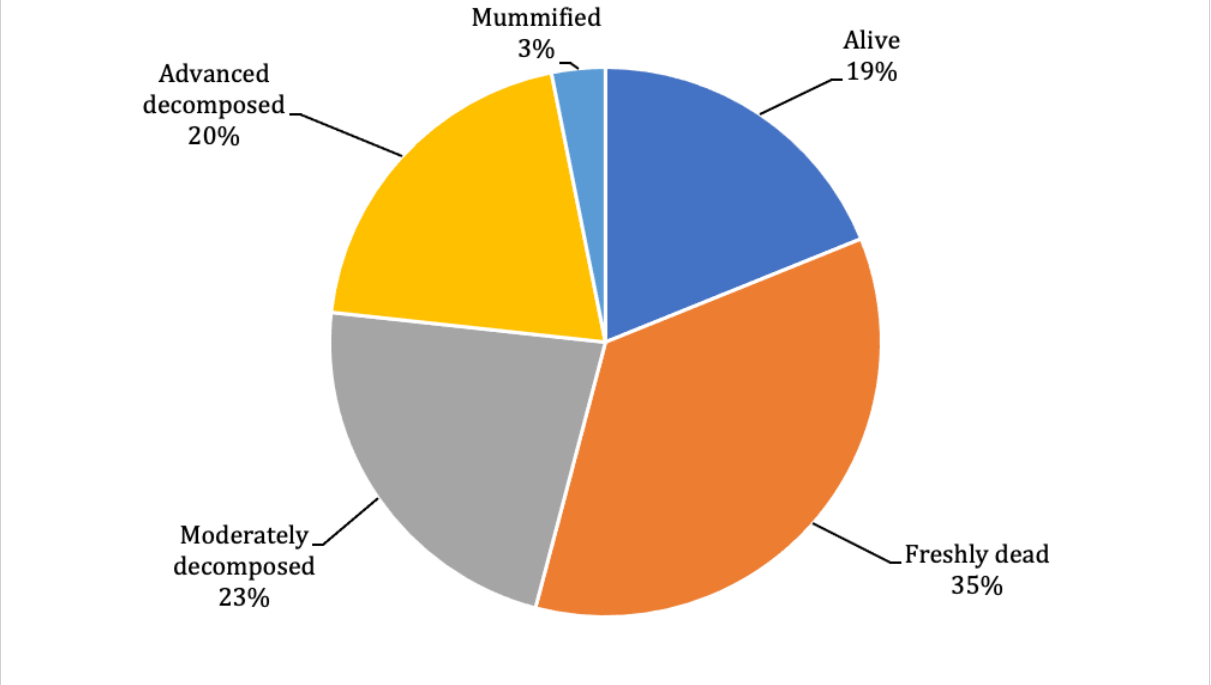

Figure 3.11. The conditions of marine mammals recorded from Facebook.

Out of the 79 recorded events, the highest number were freshly dead (35%) and about 19% were alive. Most of the cases of lived animals were sighted in the open water and some of them were stranded alive but released to the sea.

Except for upper Myanmar where the Irrawaddy dolphin conservation activities are active, most of the causes of strandings were unknown due to lack of investigation by the respective institutions. In the upper Myanmar, the major cause is bycatch by entangling in fishing gears and/ or electrified from electric fishing activities in the river.

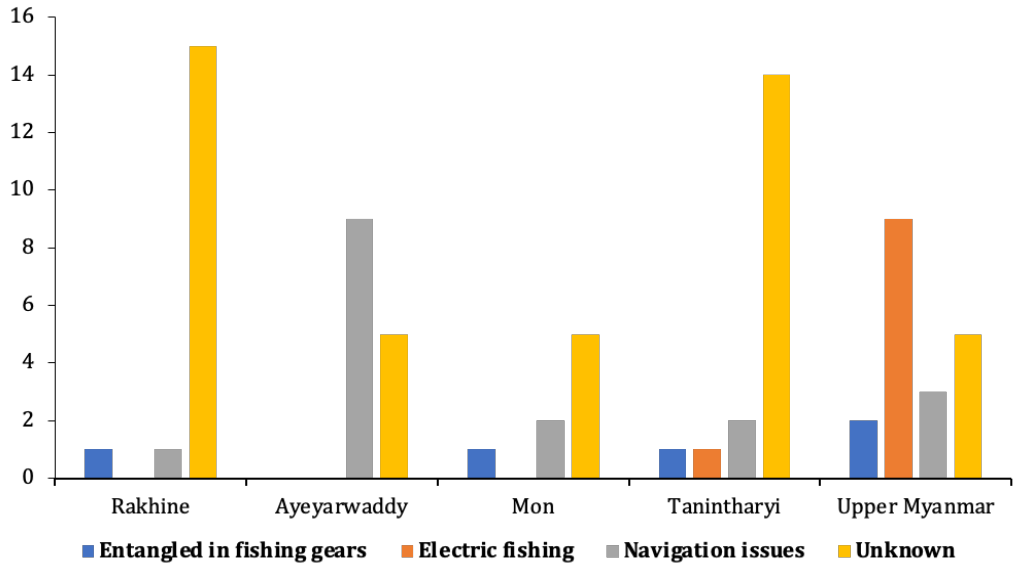

Figure 3.12. Causes of recorded stranding events as stated in the original posts on Facebook.

3.4.2 Responses to the Recorded Events

In all regions, the involvement from the government is very limited but the local people are more responsible for taking responses to the events. It also highlights the importance of building capacity for the local people in hotspots to respond to the events and collect citizen science data from the events.

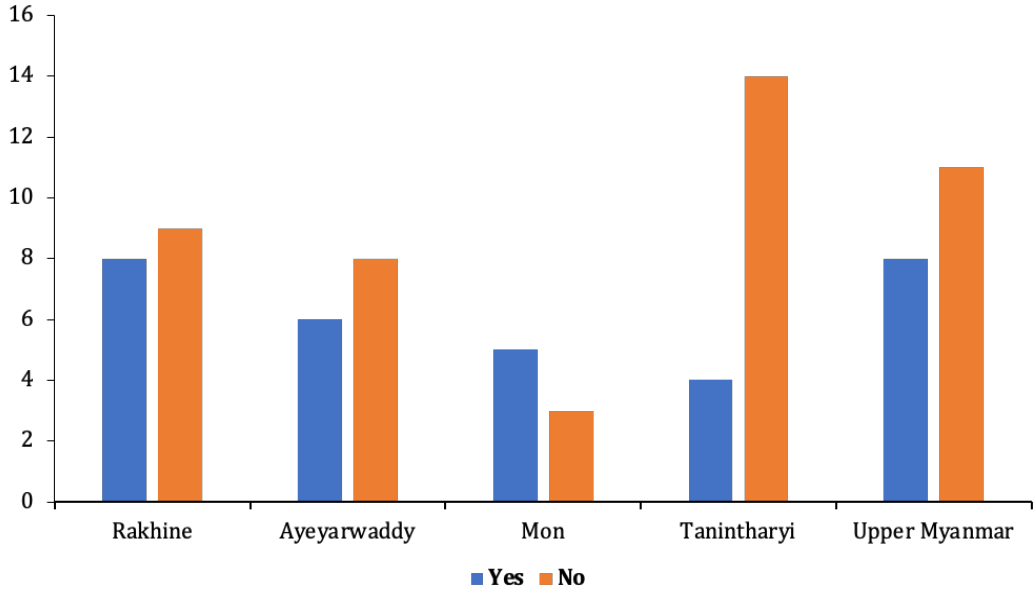

Figure 3.13. Involvement of local government institutions in response to recorded events in different regions of Myanmar.

3.4.3 Trading of Marine Mammals on Facebook

Starting in the pandemic in the mid 2021, the online live trading of various goods and products became an enormous trend in Myanmar. One of the popular goods is seafood products and the traders sell them via live sales and Facebook pages. Therefore, MCCL collected the sales of meat of marine mammals on Facebook as part of the social media search starting in the late 2022. From July 2022 - December 2022, a total of 3 live sales and 45 posts of dried dolphin meat (it is not possible to identify the species) were recorded. The price ranged from 16,000 - 30,000 MMK (~7.55 - 14.15 USD) per kilogram of dried meat. Although the killing and trading of marine mammals are prohibited by laws in Myanmar, these marketing and sales are increasing.

3.5 Training of Youths

In 2019, the MCCL partnered with the GoMP to launch the Conservation and Research Capacity Building Program at Mawlamyine and Bago University. This program aimed to enhance conservation and research skills and provide hands-on experiences for faculty, students, and young people within the institutions. One notable achievement of the program was the MCCL Internship Program, which offered recent graduates and current students the opportunity to work full- or part-time with MCCL and participate in GoMP-related conservation activities. Up until 2022, the MCCL successfully trained 27 youths (Male = 13, Female = 14) through this internship program. However, due to political changes, MCCL is no longer engaging with government institutions, including universities. Nevertheless, the team continues to work with young people, providing training and experiential learning opportunities.

3.5.1 Skill Seminars and Training

The three major components are: (1) cross-cutting research skills among faculty and students, including research design, proposal writing, budget preparation, data management and analysis, and presenting research to diverse stakeholders; (2) specific technical skills related to particular research topics/methods, through targeted advising by GoMP staff and other external experts to university research teams, graduate students, and MCCL; (3) core learning and research skills, including critical thinking, systems thinking, mindfulness. The major skill training related to marine mammal conservation and research and key outcomes were shown in Table 3.12.

Table 3.13. Key skill seminars and training related to marine mammals' conservation and research which were provided to the young researchers and youths in MCCL including Mawlamyine and Bago University.

Trainer	Topic	Key Outcomes
Dr. Tara Sayuri Whitty	General good practices for research Marine Megafauna (Lecture Series) System thinking for marine conservation Research proposal writing workshop Research communication (Report writing)	- Understood the whole process of research (writing proposal, research design, field data collection, analysis, and reporting) so that more confident to participate in diverse research activities. - Developed concrete knowledge on marine mammals and other marine megafauna. - Experienced the importance of system

Trainer	Topic	Key Outcomes
	General good practices for data management	thinking in considering the connection within social-ecological systems so that the participants better designed human-centered conservation interventions for marine mammal conservation with communities
MereCet	Introduction to marine mammal science and line transect survey ToT for marine mammal stranding response	- Understood the basic concept of marine mammal science. - Learned line transect survey to conduct field activities and applied the knowledge in field surveys in Zee Gone - Learned basic concept of marine mammal stranding. - Designed the stranding response training and conducted the trainings in three coastal villages
Center of Development and Environment	Data management and manipulation using Excel Basic QGIS	- More advanced in applying Excel for data management which supported in improving data quality for research activities. - Able to contribute more to analysis of field research data. - Capacitated to develop basic maps for research and conservation related activities
Point B	Introduction to Design Thinking and Human-centered research	- Supported the youths to become more comfortable in engagement with communities - Practiced human-centered values in creating conservation activities with the communities

The skill trainings were shifted as online seminars during pandemic and after the political transition, the MCCL stopped engagement with universities but continuously supported youths who are interested in conservation. According to the evaluation with the participants, it is majorly stated that they become more interested in marine mammals, more passionate to participate in conservation activities, become more confident in doing research and so on.

3.5.2 Reading Discussion Group (RDG)

Starting in 2020, the MCCL initiated a Reading Discussion Group (RDG) with university students from Mawlamyine and Bago Universities. The RDGs covered a wide range of topics from peer reviewed journals including conservation and research on marine mammals. A total of four research papers were discussed in RDG as in Table 3.13. About 50 participants were actively engaged and participated in different sessions of the following topics of RDG.

From evaluation with MCCL alumni, the RDGs supported them to improve critical thinking skills, build skills for English reading skills as well as be more confident in academic writing. In addition,

it fostered collaborative learning and they become more familiar with marine mammal related research and conservation activities through peer-reviewed literature.

Table 3.14. Marine mammal related peer reviewed journals discussed in MCCL reading group discussion.

Year	Author (Year)	Title	Key Learnings
2020	Ponnampalam *et al.* (2015)	Aligning conservation and research priorities for proactive species and habitat management: the case of dugongs (*Dugong dugong*) in Johor, Malaysia	- Methods to study the distribution of dugongs - Depicted how research activities link to conservation actions - Understood the need of system thinking in designing function species conservation program
2021	Smith *et al.* (2009)	Catch composition and conservation management of a human–dolphin cooperative cast-net fishery in the Ayeyarwady River, Myanmar	- Methods to study interaction of marine mammals in the small-scaled fisheries - Statistical modeling for collected field research data - Recommended conservation actions for Irrawaddy dolphin which may be suitable to apply in GoM
2022	Minton *et al.* (2011)	Distribution of small cetaceans in the nearshore waters of Sarawak, East Malaysia	- Methods to study small cetaceans including line transect surveys, photo-identification - Statistical modeling
2022	Mwang'ombe *et al.* (2021)	Cetacean research and citizen science in Kenya	- Multiple interdisciplinary approaches for marine mammal conservation - The application of citizen science and it may be replicated in Myanmar

3.5.3 Experiential Learning

In addition to training, the MCCL provided opportunities for youths and young researchers to participate in research and conservation activities. Most significant experience is the team provided hand-on training to the youths as marine mammal observers during the boat-based surveys. Prior to the survey, the required training on water safety, survey protocol and the responsibilities were oriented. Then, the youths collaborate with two lead investigators and conduct surveys. About 10 youths were trained as marine mammals observers for the survey. In addition, the youths applied a Design Thinking process to develop a community campaign to raise awareness of the marine mammals in the area. As a result, two community campaigns and two graphic materials were developed by youths to raise community awareness. Moreover, the youths applied the research skills in LEK & RBA interviews with fishers in the communities. In addition to field activities, the youths supported data management and analysis and also contributed by co-authoring technical reports for GoMP.

4 DISCUSSION

The session discussed on the key achievements, insights, limitations, and challenges in implementing of activities from 2019 to 2022. Then, the recommendations are provided and activities in the 2023 are also proposed in the session. The summary of the discussion is shown in Table 4.1.

4.1 Key Achievements

4.1.1 Research

- Established the first systematic monitoring program of small cetaceans in the Gulf of Mottama in collaboration with international experts and local young researchers.
- The historical distributions recorded from communities highlight the importance of the GoM for conservation of small cetaceans.
- The data gathered from social media on marine mammals provides conservationists with a better understanding of the distribution of marine mammals, allowing them to consider effectively in future endeavors.
- In application of local ecological knowledge or traditional knowledge, the accidental mortality rate of small cetaceans in the SFFs are recorded and it will support baseline information in implementing sustainable and ecosystem approached fishery management actions in the GoM.
- The research efforts were shared internationally and recognized by receiving an award in an international conference.

4.1.2 Conservation with Communities

- The team effectively communicated and built trust with local communities in the hotspots of marine mammals which are essential for further conservation activities.
- Developed innovative ways to visually engage or communicate about conservation of marine mammals with local communities through story books. The stories were informed by the research and community knowledge so that they are more inclusive and participatory.
- The community campaigns piloted by MCCCL youths highlight the importance of youths' participation in sustainable conservation and designing more innovative community awareness programs. The campaign raises the knowledge and conservation issues about marine mammals in the fishing communities.
- The pilot marine mammal stranding response workshops in the communities informed the importance local participation in conservation and motivate them to respond future marine mammal stranding events safely and ethically.
- MCCL Facebook page has more than 6,000 followers and it effectively catalyze in raising public awareness about marine mammals and other conservation issues in the Gulf of Mottama.

4.1.3 Training of Youths

- MCCL is the only active institution in the country which provide open space for local youths to participate in the conservation and research of coastal population of marine mammals.
- Youths are trained in various research skills and conservation activities. Eight young researchers were contracted part-time and full-time in 2022 and five of them were continuing to support conservation activities in 2023 as conservation and research associates.
- The youths from MCCL participated in different regional and international conferences and events. One significant achievement is the winning of Conservation Research Grant from Society of Marine Mammalogy which worth 15,000 USD.

4.2 Limitations and Challenges

4.2.1 Research

- Unfamiliarity with research methods and equipment used in the boat-based survey resulted in the quality of research in the beginning of the research activities. (e.g., coordination with boat skippers in applying GPS devices to accurately navigate the line transects)
- Limited facilities in conducting the surveys.
- The boat-based surveys depend on the conditions of the sea. The dynamic and unpredictable changes in sea conditions in the study sites impacted the delay of field works.
- Working together with the community is more challenging if there is not enough trust with the research team especially for sensitive issues such as bycatch in fishing activities.
- The synergic impacts of COVID 19 and travel restrictions from political instability, imposed delay in implementing research activities.
- Working with fishing activities needs extra efforts in coordinating with fishers as most of them are fishing year-round.

4.2.2 Conservation with Communities

- The communities were very busy with livelihood activities in the fishing villages and therefore, it was challenging for the communities to committedly participate in the conservation activities.
- Regarding current political landscapes, the community events need approval from local authority such as General Administrative Department (GAD). In addition, the approval need long process and it limit time to implement activities in the communities.
- In the GoM, the significant threats were identified to be bycatch in SFF and consumption of marine mammals by local communities. These issues may be very sensitive to discuss in the community as well as challenging for the community to directly report to the MCCL or relevant institutions.
- In Myanmar, the decentralization and bureaucratic government systems impose challenges in developing conservation initiatives without the involvement of the government. Therefore, it is constraining to initiate community-based conservation actions.

4.2.3 Training of Youths

- Due to political change, the MCCL no longer engage with students from the universities.
- The pandemic and political situation limited the in-person engagement and activities with youths. Therefore, the engagements were only via online platform.
- Due to current political transition, the younger generations are in crisis especially in accessing education (including university) as higher proportion of the youths are participating in civil disobedient movements. In such cases, it may be challenging to motivate youths to participate in conservation activities.
- From the perspectives of youths, there is very few opportunities or job security to extend and/or invest in conservation related trainings and practical experiences.

4.3 Key Insights

4.3.1 Research

- It is essential to estimate the population and abundance of small cetaceans in the Gulf of Mottama for effective monitoring and conservation of the animals against local conservation threats.
- Regular monitoring and longitudinal study of marine mammals are required to understand the population ecology of the identified population, habitat preferences are required to understand for better conservation management (especially for potentially habitat use of the upper part of the gulf by the animals)

- Required to identify hotspot areas to inform decision making for spatial management of the animals.
- The distinguishable conservation threats are identified as bycatch in SFFs and consumption of the marine mammals (which may drive forward target hunting if the consumer demands are higher). However, the threats are required to be quantified to effectively advocate for conservation actions.
- It requires active and meaningful participation of the communities in research and monitoring activities.
- Potential to intensify the application of local knowledge and participation of communities in further research and monitoring activities.

4.3.2 Conservation with Communities

- Community should be center of the conservation and therefore active and meaningful participation of communities from different background and social class is essential. In order for them to participate effectively, both soft skills and conservation knowledge should be supported for them to motivate to engage in conservation.
- Community needs incentives to commit to participate in conservation and therefore, the needs of the community should be assessed empathically and applied the needs in conservation planning.
- It is essential to have community focal for coordination with stakeholders outside the communities and therefore, the local capacity in collaboration and establishing conservation groups is required.

4.3.3 Training of youths

- The inclusive and meaningful participation of youths in conservation is essential. However, youths in the community are still limited in practical skills and knowledge to involve in conservation activities.
- The job opportunities and security to choose conservation as career pathway in the region is still challenging for the youths. In order to improve motivation for youths to learn and practice skills and knowledge in conservation, more job opportunities dedicated for early graduates or youths are required.

4.4 Key Recommendations

4.4.1 Research

- Continue the ongoing research activities and access the population estimates in the Gulf of Mottama to inform scientific knowledge of the animals in the area. It is also required to design more opportunities for participation of local communities and youths in the process.
- Apply passive acoustic monitoring for studying of species which are more challenging to visually detect.
- Develop affordable and low advanced but innovative and user-centered methods for sustainable and locally manageable monitoring initiatives of marine mammals in the area.
- Initiate user friendly citizen science and similar participatory monitoring programs for communities.
- Develop sustainable financing mechanisms for continuous research efforts.

4.4.2 Conservation with Communities

- There is an opportunity to work with existing community-based organization in villages in GoM such as LCGs, and Fishery Development Association (FDA). Therefore, collaboration with such institutions should be extended.
- Need to assess the needs of the community and motivations to participate in conservation activities.

- The marine mammal awareness in the community should be continuously conducted in more inclusive and innovative ways.
- As marine mammal stranding is the action can be responded by the communities, the standing response workshop should be organized. In addition, it is also needed to support materials required for the response team.

4.4.3 Training of Youths

- Continue the MCCL internship program especially with youths outside the university by providing part-time opportunities for underprivileged youths to participate in the conservation activities.
- The trainings and capacity building should also extend to wider youths. Alternative design and channels to involve more disadvantaged youths are recommended.

4.5 Outlook for 2023

4.5.1 Continuous Monitoring Efforts in the Gulf of Mottama

Continuous boat-based surveys: In 2023 and onward, the MCCL will facilitate and lead the line transect boat-based surveys in Zee Gone, Chaung Zone Township with the support from the GoMP. The survey will continue the systematic line transect conducted in previous years and as needed, some the of the line transects will be adjusted in consultation with experts in marine mammals in the Southeast Asia.

Piloting acoustic monitoring in collaboration with communities: With the grant from Society of Marine Mammalogy, the team will collaborate with local communities in Zee Gone and villages in Paung Township to deploy three F-Pods to passively study the presence of Indo-Pacific finless porpoises. It will be technically supported by Chelonia.Ltd as they donated the F-Pods to MCCL in 2022.

Estimate the populations of three cetaceans in the GoM: Based on the boat-based surveys and passive acoustic monitoring, the populations of three cetacean species will be identified. The three species will identify using distance sampling method and the two species (Irrawaddy dolphin and Indo-Pacific humpback dolphin) will also be identified by photo-ID.

Estimate annual mortality rate from LEK & RBA: In 2023, the LEK and RBA interview will be expanding to the southern part of the gulf. In completion of the study, the team will estimate the annual mortality rate of small cetaceans due to SSF. The results will then be share with different stakeholders and government institutions for advocating the conservation of marine mammals from bycatch imposed by SSF.

Assessment for mitigation of bycatch in SSF: The research data suggested that the SFF is impacting significant threats in bycatch of marine mammals in the fishing gears. Therefore, MCCL will develop assessment on opportunities to mitigate the bycatch and the community perceptions on such interventions.

4.5.2 Engaging with Communities for Effective Conservation

Community awareness campaign: In collaboration with GoMP, the MCCL will conduct three community awareness campaigns in Chaung Zone, Paung and Thaton townships. The awareness campaigns will highlight the importance of marine mammals in coastal biodiversity and

ecosystems of the gulf, inform conservation threats and identify potential participatory solutions to tackle these challenges.

Collaboration with LCGs: The conservation and research efforts in 2023 will collaborate mainly with local conservation groups (LCGs) in Chaung Zone, Paung, Thaton and Kyaik Hto Townships. In monitoring the security information, it is also possible to collaborate with LCG in Kawa Township in Bago. The major collaboration will be opening spaces for LCG to participate in marine mammal research, co-organize marine mammal related community awareness activities and develop the marine mammal stranding response team in each township.

4.5.3 Move Forward for Sustainability

Build capacity of youths and local people: As MCCL is envisioned to be an independent youth-based group of multidisciplinary youths which embraced diverse values and passions for conservation, the team will keep working more inclusively by providing opportunities to wider spectrum of youths. MCCL will continue to work with alumni of MCCL and open more spaces for local youths outside of the network. The youths will be opened to more opportunities to participate in research and community awareness activities.

Further funding opportunities for continuous efforts: The marine mammal research and conservation activities need sustainable funding support to implement the activities successfully and continuously. Therefore, engaging with different organizations and funding sources are one of the priorities in 2023.

Table 4.1. Summary of discussion on the three major components of the integrated marine mammal conservation and research program initiated by the MCCL in collaboration with GoMP

Components	Achievements	Limitations and Challenges	Key Insights	Recommendations
Research	● Established the first systematic monitoring program of small cetaceans in the Gulf of Mottama in collaboration with international experts and local young researchers. ● The historical distributions recorded from communities highlight the importance of the GoM for conservation of small cetaceans. ● The data gathered from social media on marine mammals provides conservationists with a better understanding of the distribution of marine mammals, allowing them to consider effectively in future endeavours. ● In application of local ecological knowledge or traditional knowledge, the accidental mortality rate	● Unfamiliarity with research methods and equipment used in the boat-based survey resulted in the quality of research in the beginning of the research activities. (e.g., coordination with boat skippers in applying GPS devices to accurately navigate the line transects) ● Limited facilities in conducting the surveys. ● The boat-based surveys depend on the conditions of the sea. The dynamic and unpredictable changes in sea conditions in the study sites impacted the delay of field works. ● Working together with the community is more challenging if there is not enough trust with the research team especially for sensitive issues such as bycatch in fishing activities.	● It is essential to estimate the population and abundance of small cetaceans in the Gulf of Mottama for effective monitoring and conservation of the animals against local conservation threats. ● Regular monitoring and longitudinal study of marine mammals are required to understand the population ecology of the identified population, habitat preferences are required to understand for better conservation management (especially for potentially habitat use of the upper part of the gulf by the animals) ● Required to identify hotspot areas to inform decision making for spatial management of the animals.	● Continue the ongoing research activities and access the population estimates in the Gulf of Mottama to inform scientific knowledge of the animals in the area. It is also required to design more opportunities for participation of local communities and youths in the process. ● Apply passive acoustic monitoring for studying of species which are more challenging to visually detect. ● Develop affordable and low advanced but innovative and user-centered methods for sustainable and locally manageable monitoring initiatives of marine mammals in the area. ● Initiate user friendly citizen science and

	of small cetaceans in the SFFs are recorded and it will support baseline information in implementing sustainable and ecosystem approached fishery management actions in the GoM. ● The research efforts were shared internationally and recognized by receiving an award in an international conference.	● The synergic impacts of COVID 19 and travel restrictions from political instability, imposed delay in implementing research activities. ● Working with fishing activities needs extra efforts in coordinating with fishers as most of them are fishing year-round.	● The distinguishable conservation threats are identified as bycatch in SFFs and consumption of the marine mammals (which may drive forward target hunting if the consumer demands are higher). However, the threats are required to be quantified to effectively advocate for conservation actions. ● It requires active and meaningful participation of the communities in research and monitoring activities. ● Potential to intensify the application of local knowledge and participation of communities in further research and monitoring activities.	similar participatory monitoring programs for communities. ● Develop sustainable financing mechanisms for continuous research efforts.
Conservation with Communities	● The team effectively communicates and builds trust with local communities in the hotspots of marine mammals which are essential for further conservation activities.	● The communities are very busy with livelihood activities in the fishing villages and therefore, it is challenging for the communities to committedly participate in the conservation activities.	● Community should be center of the conservation and therefore active and meaningful participation of communities from different background and social class is essential. In order for them to	● Continuous trust building and communication is required. ● The conservation research and impacts should be shared widely in the community.

- Developed innovative ways to visually engage or communicate about conservation of marine mammals with local communities through story books. The stories were informed by the research and community knowledge so that they are more inclusive and participatory.
- The community campaigns piloted by MCCCL youths highlight the importance of youths' participation in sustainable conservation and designing more innovative community awareness programs. The campaign raises the knowledge and conservation issues about marine mammals in the fishing communities.
- The pilot marine mammal stranding response workshops in the communities informed the importance local participation in conservation and motivate them to respond future
- Regarding current political landscapes, the community events need approval from local authority such as General Administrative Department (GAD). In addition, the approval needs long process and it limited time to implement activities in the communities.
- In the GoM, the significant threats are identified to be bycatch in SFF and consumption of marine mammals by local communities. These issues may be very sensitive to discuss in the community as well as challenging for the community to directly report to the MCCL or relevant institutions.
- In Myanmar, the decentralization and bureaucratic government systems impose challenges in developing conservation initiatives without the involvement of the government. Therefore, it is constraining to initiate community-based conservation actions.

participate effectively, both soft skills and conservation knowledge should be supported for them to motivate to engage in conservation.
- Community needs incentives to commit to participate in conservation and therefore, the needs of the community should be assessed empathically and applied the needs in conservation planning.
- It is essential to have community focal for coordination with stakeholders outside the communities and therefore, the local capacity in collaboration and establishing conservation groups is required.

- There is an opportunity to work with existing community-based organization in villages in GoM such as LCGs, and Fishery Development Association (FDA). Therefore, collaboration with such institutions should be extended.
- Need to assess the needs of the community and motivations to participate in conservation activities.
- The marine mammal awareness in the community should be continuously conducted in more inclusive and innovative ways.
- As marine mammal stranding is the action can be responded by the communities, the standing response workshop should be organized. In addition, it is also needed to support materials required for the response team.

	marine mammal stranding events safely and ethically. ● MCCL Facebook page has more than 6,000 followers and it effectively catalyze in raising public awareness about marine mammals and other conservation issues in the Gulf of Mottama.			
Training to Youths	● MCCL is the only active institution in the country which provide open space for local youths to participate in the conservation and research of coastal population of marine mammals. ● Youths are trained in various research skills and conservation activities. Eight young researchers were contracted part-time and full-time in 2022 and five of them were continuing to support conservation activities in 2023 as conservation and research associates. ● The youths from MCCL participated in different regional and international conferences and events.	● Due to political change, the MCCL no longer engage with students from the universities. ● The pandemic and political situation limited the in-person engagement and activities with youths. Therefore, the engagements were only via online platform. ● Due to current political transition, the younger generations are in crisis especially in accessing education (including university) as higher proportion of the youths are participating in civil disobedient movements. In such cases, it may be challenging to motivate	● The inclusive and meaningful participation of youths in conservation is essential. However, youths in the community are still limited in practical skills and knowledge to involve in conservation activities. ● The job opportunities and security to choose conservation as career pathway in the region is still challenging for the youths. In order to improve motivation for youths to learn and practice skills and knowledge in conservation, more job opportunities dedicated for early graduates or youths are required.	● Continue the MCCL internship program especially with youths outside the university by providing part-time opportunities for underprivileged youths to participate in the conservation activities. ● The trainings and capacity building should also extend to wider youths. Alternative design and channels to involve more disadvantaged youths are recommended.

	One significant achievement is the winning of Conservation Research Grant from Society of Marine Mammalogy which worth 15,000 USD.	youths to participate in conservation activities. ● From the perspectives of youths, there is very few opportunities or job security to extend and/or invest in conservation related trainings and practical experiences.

5 CONCLUSION

From 2018 to 2022, a project was conducted to survey marine mammal populations in the Gulf of Mottama (GoM) through boat-based and systematic line transect surveys in Zee Gone, Chaung Zone Township, as well as local ecological knowledge and rapid bycatch assessment interviews in 10 coastal villages. The project recorded a total of 117 sightings and identified small-scaled fishing as the main threat to marine mammals through bycatch events using drift net, set bag net, and gill net. Bycaught dolphins and porpoises were consumed as a delicacy, particularly in Paung Township. Despite the threats, the study showed that the majority of the sample population recognized the need for conservation of marine mammals.

The project also engaged with local communities in research activities and awareness campaigns, such as marine mammal stranding response training and developing educational materials, to motivate communities to participate in conservation activities. This approach involved youths in the MCCL organization who were trained in research skills and knowledge in conservation and provided opportunities to participate in hands-on activities through the MCCL internship program and career advancement program.

This integrated project for research and conservation of marine mammals in the Gulf of Mottama allowed for the collection of important baseline data on cetacean species and establishment of community-based conservation programs in collaboration with local fishing communities for continued conservation efforts into the future.

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