Harnessing local ecological knowledge to fill data gaps and support conservation of the Critically Endangered Atlantic humpback dolphin

FINAL REPORT

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Report to the Society for Marine Mammalogy Conservation Fund

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1- Acknowledgments

We extend our sincere gratitude to the fishermen who took the time to share their knowledge and insights through this questionnaire, as well as to the community members who provided invaluable guidance to our field teams.

We are deeply grateful to the Society for Marine Mammalogy for its financial support, without which this project would not have been possible.

Furthermore, we wish to acknowledge the following experts for their invaluable pro-bono contributions in technical guidance, training, and ongoing support in data analysis:

- Prof. Samuel Turvey, Institute of Zoology, Zoological Society of London, London, UK
- Dr. Gill Braulik, Research Fellow, University of St. Andrews, Scotland, UK
- Dr. Ellen Hines, Associate Director and Professor of Geography & Environment, Estuary & Ocean Science Center, San Francisco State University, USA
- Dr. Rima Jabado, Founder and Lead Scientist, Elasmo Project; Chair, IUCN SSC Shark Specialist Group
- Tim Collins, Wildlife Conservation Society
- Pauline Cueto, Biotope Guinea

Their support has been instrumental in our work, and we are profoundly appreciative of their commitment to advancing marine conservation efforts.

2- Summary

The Critically Endangered Atlantic humpback dolphin occurs in nearshore habitats along 7000km of coastline in Central and West Africa, a region heavily affected by human activities. While some populations within the species' 19 possible range countries have been studied with boat-based fieldwork and direct observations (e.g. Minton et al., 2022b), intensive boat-based surveys are expensive, and not practical in areas where the species' presence has not yet been confirmed or in locations where only a few anecdotal records indicate that the species may be present. Furthermore, boat-based surveys and direct observation methods of the dolphins themselves provide only limited information on the threats dolphins may be facing from human activities in their habitats. By contrast, fishers and members of coastal communities possess valuable local ecological knowledge (LEK) about dolphins, their habitats, their interactions with fisheries, and other perceived threats from which scientists and managers can learn.

For these reasons the Consortium for the Conservation of the Atlantic humpback dolphin (CCAHD) identified interview surveys to assess LEK as a top priority in its 2020 assessment of Short and Medium-term Priorities for AHD Conservation. Subsequently, the project '**Harnessing local ecological knowledge to fill data gaps and support conservation of the Critically Endangered Atlantic humpback dolphin'** was developed with the aim of pairing international expertise in interview-based studies to document local ecological knowledge with developing scientists in six AHD range states: Senegal, The Gambia, Liberia, Cameroon, Gabon and Congo. The project was launched in 2022 through virtual meetings that resulted in the development of a harmonized questionnaire by LEK expert Dr. Samuel Turvey, affiliated with the Zoological Society of London. The draft questionnaire was tested and refined through pilot studies in three range countries and a series of online meetings with project partners. In 2023, the consolidated final questionnaire, project manual, and additional support materials were made available to all partners. Training on best practices in interview techniques and data collection using Kobo-Collect on smartphones or tablets was conducted online through Zoom meetings in English and French for 27 members of the teams from six countries.

Almost 800 interviews in 58 coastal fishing communities were conducted during the first eight months of 2023. Regular online meetings throughout the data collection and archiving stages of the projects allowed partners to share experiences focusing on challenges faced and solutions. By early 2024, all teams had completed fieldwork and had archived and 'cleaned' their data in preparation for analysis. Some teams undertook initial analysis of the data identify the most salient results and trends, while other teams have made their data available for more centralized analysis. Each team compiled individual country reports (see Annexes 1-6), which in some cases provided information on AHD presence, relative abundance, bycatch hotspots, other threats, hunting prevalence, and cultural significance. In other cases, country reports focused on the process of the work that was conducted, and the collected raw data is still awaiting further analysis.

The data collected by the six partners involved in this SMM-funded project will be combined with the results of 587 interviews conducted under a separately funded project in Guinea, and will be analyzed in greater detail to draw out both country-specific and regional trends with the help of Dr. Samuel Turvey of the Zoological Society of London. It is anticipated that this will lead to one or more peer-reviewed publications in 2025. The CCAHD has obtained funding for the first in-person regional meeting of range-country partners in December 2024. All six project partners will be present, which provide an opportunity for further exchange and capacity building, as well as planning for the next steps of this project.

3- Introduction

The Critically Endangered Atlantic humpback dolphin (*Sousa teuszii*, or AHD) occurs in nearshore habitats along 7000km of coastline in Central and West Africa, a region heavily affected by human activities (Collins et al., 2017; Weir et al., 2021; Minton et al., 2022b). While some populations within the species' 19 possible range countries have been studied with boat-based fieldwork and direct observations (e.g. Minton et al., 2022b), intensive boat-based surveys are expensive, and not practical in areas where the species' presence has not yet been confirmed or in locations where only a few anecdotal records indicate that the species may be present. Boat-based surveys and direct observation methods of the dolphins themselves also provide only limited information on the threats dolphins may be facing from human activities in their habitats (Collins, 2015; Weir and Collins, 2015; Collins et al., 2017). Fishers and members of coastal communities possess valuable local ecological knowledge (LEK) about dolphins, their habitats, their interactions with fisheries, and other perceived threats (Hines et al., 2005; Hines et al., 2008; Turvey et al., 2015).

For these reasons the Consortium for the Conservation of the Atlantic humpback dolphin (CCAHD) identified interview surveys to assess LEK as a top priority in its 2020 assessment of Short and Medium-term Priorities for AHD Conservation (CCAHD, 2020). Subsequently, the project '**Harnessing local ecological knowledge to fill data gaps and support conservation of the Critically Endangered Atlantic humpback dolphin'** was developed with the aim of pairing international expertise in interview-based studies to document local ecological knowledge with developing scientists in six AHD range states: Senegal, The Gambia, Liberia, Cameroon, Gabon and Congo. The three main objectives of the project were as follows:

To collect data that would shed light on AHD distribution – both to refine understanding in countries where baseline data already exists (e.g. Congo, Gabon and Senegal – see (Collins et al., 2014; Weir, 2016; Minton et al., 2022a), and to provide initial insight into possible AHD presence in countries where no sightings have previously been recorded, or where only limited anecdotal evidence is available (e.g. Cameroon, Liberia and The Gambia – see Collins et al. 2015, Collins and Weir 2015).

1. To identify threats and to better understand AHD interactions with fisheries, including potential bycatch hotspots.
2. To enhance the capacity of AHD range country scientists to conduct social-science based research, and to apply it to conservation of AHD in their respective locations;
3. To begin a dialogue with coastal communities that (may) share marine resources and space with Critically Endangered dolphins, and explore their cultural perceptions of dolphins, and their potential willingness to engage in collaborative conservation research and/or threat mitigation.

These results of the project are intended to inform conservation planning, policy development, and management measures to address critical threats. It is hoped that this can lead to both top-down measures from government stakeholders and grass-roots collaboration with fishing communities, helping ensure long-term protections for Atlantic humpback dolphins across their range.

Figure 1: Interview teams in 6 participating countries

4- Methods

4.1- Survey locations

The project spans six West and Central African countries—Senegal, The Gambia, Liberia, Cameroon, Gabon, and Congo—covering a cumulative coastline of approximately 3,900 km, rich in unique biodiversity. Each country has diverse fishing communities, where fishers depend on coastal ecosystems for their livelihoods and possess ecological knowledge passed down through generations.

Senegal and **The Gambia** lie along the northern Atlantic coast of West Africa, with vibrant fishing communities in estuarine and mangrove-rich regions supporting marine life such as Atlantic humpback dolphins, various shark species, and sea turtles.

Liberia's 580 km coastline is known for its mangroves and barrier beaches, supporting coastal communities and a wealth of marine life, including dolphins, sea turtles, and commercially important fish.

Cameroon and **Gabon** boast biodiverse ecosystems, with Cameroon's coast providing critical habitats within the Gulf of Guinea. Gabon is particularly known for its marine protected areas, home to marine mammals, manatees, and numerous fish species.

Congo's coast, although relatively short, includes crucial mangrove habitats and supports diverse marine life, with communities engaged in small-scale fishing.

These regions form a rich marine corridor essential for biodiversity, providing critical habitats for Atlantic humpback dolphins and other species amidst growing environmental challenges.

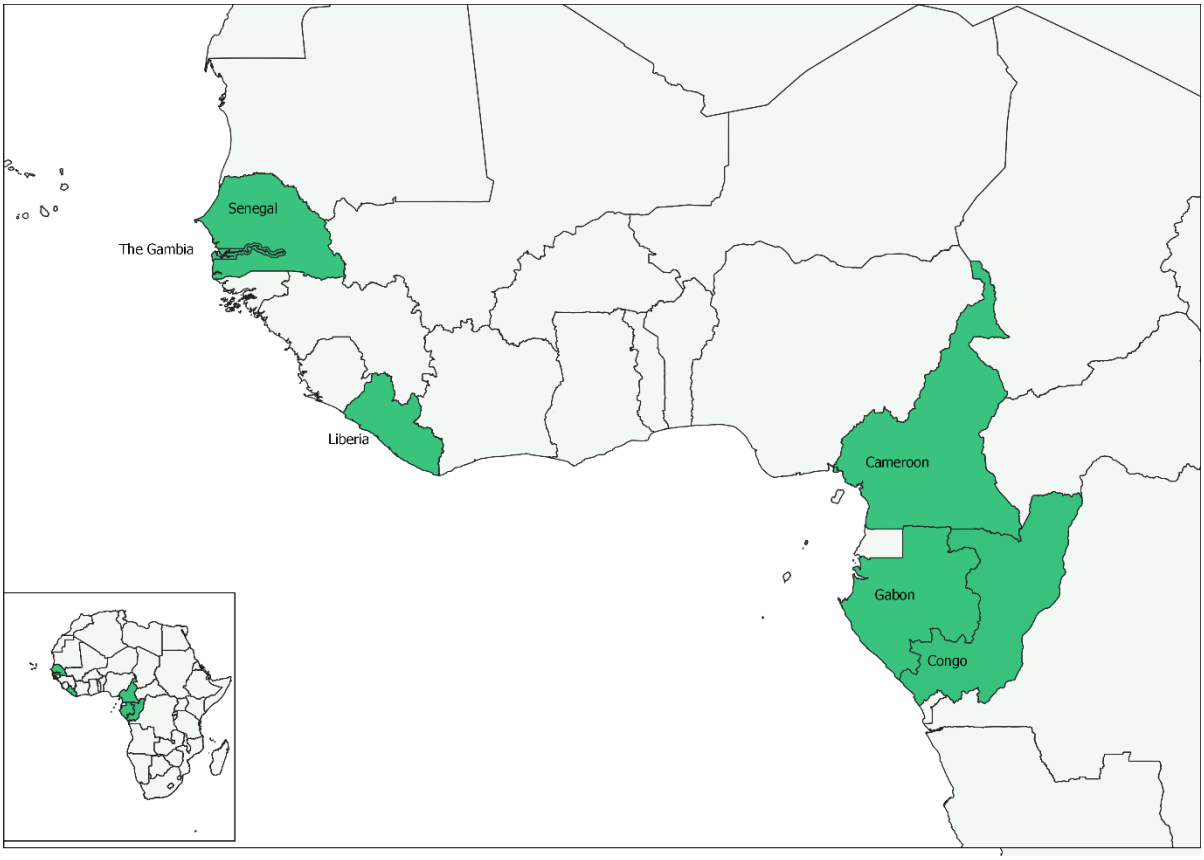


Figure 2: Project participating countries

4.2- Survey design and implementation

4.2.1. Pre-Project Planning and questionnaire development

Funds were not transferred for the project until September 2022. As such, fieldwork could not commence before that time. However, online meetings were held with project partners on January 7th, 2022, and October 19th 2022 to discuss the orientation of the project and to take advantage of the previous knowledge and experiences of each party (see minutes in the appendix 7). During the period between meetings, project partners exchanged multiple drafts and comments on a shared standardized questionnaire, a process that was led by Dr. Samuel Turvey of the Zoological Society of London, who specializes in LEK interview methodology.

Once the questionnaire was completed, it was submitted to the Ethics Review Board at San Francisco State University, who determined that the study did not require a full review because it met the following conditions:

1. *Research that only includes interactions involving educational tests, surveys, interviews, and observations of public behavior*
2. *Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation;*

This process was important to undertake before beginning any feasibility studies or trials in the field.

Following this approval, teams in Congo, Gabon and Guinea began to test the questionnaire in the field. Feedback was discussed with the wider project group. Fears that the questionnaire might be too long, for example, seemed unfounded, and a few other potential pitfalls were discussed. A major concern was that fishers will not be able to distinguish between AHD and bottlenose dolphins (*Tursiops*

truncatus), a species considered likely to occur in almost all the same areas as AHD. Based on trials in Guinea, the team revised a simple ID card used to help fishers indicate which species of the five most frequently expected coastal marine mammals they have seen (See figure 4).

In November 2022, AMMCO signed sub-contracts with each of the 5 additional project partners to ensure transparency and clarity of expected roles and contributions.

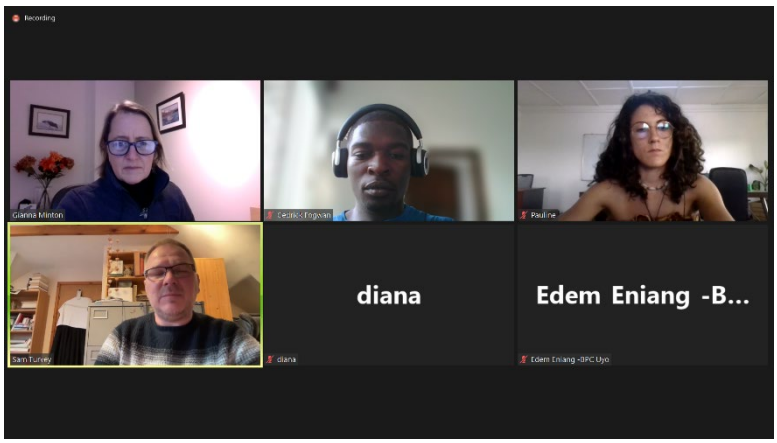
The project team in Guinea, which has a separate funding stream from the Mohamed Bin Zayed Species Conservation Fund (see https://www.sousateuszii.org/2023/04/05/fisheries-interview-surveys-underway-in-guinea-with-an-aim-to-improve-conservation-of-the-atlantic-humpback-dolphin/), used the results of the wider team meetings and example materials developed by Sam Turvey and colleagues for other projects to develop a full suite of materials that were shared with the 6 SMM project partners. These materials were made available for all partners to access in both English and French through a Google Drive Folder

(https://drive.google.com/file/d/1yU8IrUqoK7WmBvU0murKDluoMrD2lfKa/view?usp=sharing) and include:

- A final version of the questionnaire in French and English, which takes into account local contexts and addresses some of the questions raised by the wider group (see also Annex 8).
- A manual for interviewers that was adapted from a manual created for a terrestrial LEK project in Asia. This detailed document includes step-by step instructions, examples of 'tricky situations', examples of maps that can be used to support interviews, and hyperlinks to other support documents.
- A PowerPoint presentation that could be adapted to train local teams in each of the six SMM project locations.
- A simplified ID card with only the five most commonly occurring coastal marine mammal species in the region (AHD, Bottlenose dolphin, manatee, harbour porpoise and common dolphin) that can be used to assess whether interviewees are at all able to distinguish between different types of marine mammals and dolphin species. These five species were chosen because the first two are the most likely to occur in nearshore areas of our study area, and the last three have sharply contrasting features to AHD (e.g. no 'beak/snout for harbour porpoise, distinctive colouring for common dolphins, and entirely different body shape for manatee).
- A word template that can be used to characterize: a) boat types; and b) fishing gears in each project location.

4.2.2. Training of interview teams

Before fieldwork began, the project focused on comprehensive capacity building to ensure effective and standardized data collection across all participating countries. A series of online training sessions led by Pauline Cueto, the social scientist leading the Guinea fisheries interview project, equipped 27 field team members with essential skills in survey methodology, ethical interviewing practices, and data collection techniques using Kobo-Collect on smartphones or tablets. The training was also supported by Dr. Samuel Turvey of the Zoological Society of London, and included information



on the morphology, biology, ecology, and conservation context of AHD and other common cetaceans, ensuring that interviewers had the necessary scientific baseline to be able to understand what fishers might be describing. Additionally, the standardized questionnaire and support materials were reviewed and adapted to reflect local contexts, ensuring that each country team was well-prepared and unified in approach.

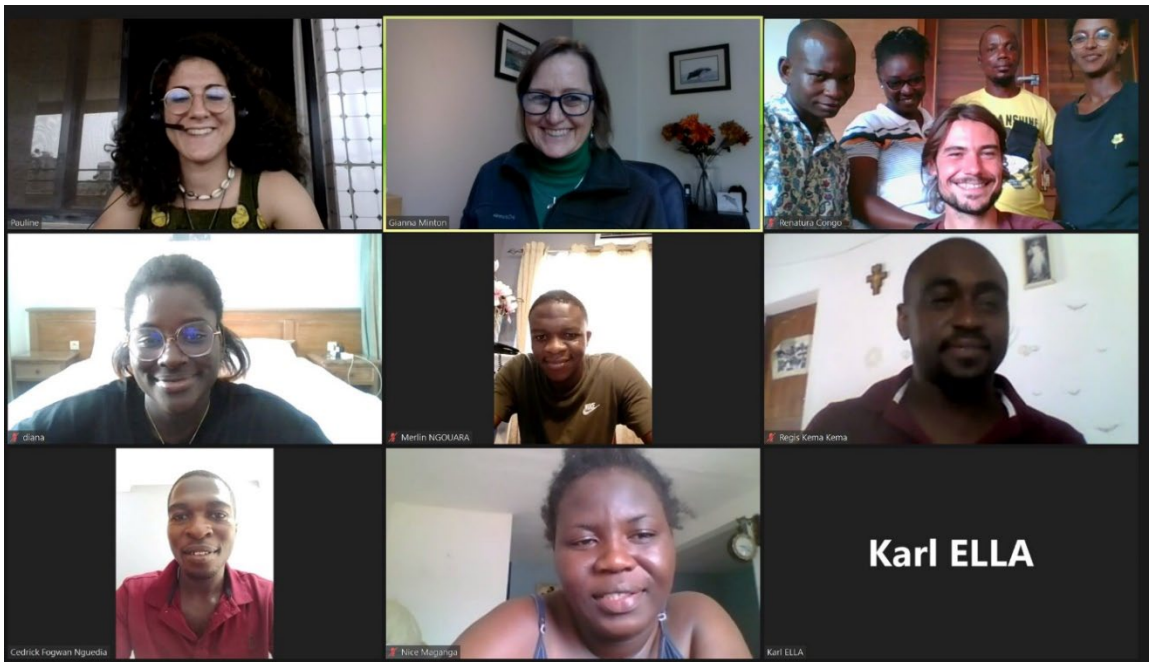


Figure 3: Online training session with project partners English (top) and French (bottom)

4.3- Field surveys

In each country, teams applied a semi-structured survey approach to gather detailed LEK from fishers and coastal community members. Project partners were asked to determine the optimum number of communities that could be sampled, and interviews that could be conducted with the funding available in each country. As a guideline, partners were encouraged to focus on communities engaged in small-scale artisanal fisheries, and to attempt to sample a minimum of 10% of the fishers in each community/fish landing site in order to obtain a representative sample.

Detailed methodology can be found in the project manual, and the questionnaire itself (Annex 8). Project teams always began work in a particular location by approaching the relevant authorities and introducing themselves and the project before seeking permission to engage directly with fishers. Fishers to participate in the interviews were identified by approaching one fisher, and then using a 'snowball' approach to ask him to help identify others that might participate.

During interviews, teams were careful to follow the carefully designed order of questions in the standard questionnaire, in order not to bias subsequent answers. Visual supports, like maps and marine mammal illustrations were also only shown to interviewees at the specific points in the sequence of the questionnaire in order not to bias their descriptions of dolphins or the locations where they are seen.

At the end of each interview, the interviewer thanked the fisher by sharing educational materials (calendars, flyers, fact sheets, etc.) or buying him a soft drink as a token of thanks for their participation, and then encouraged them to recommend other fishermen for future interviews. Teams deliberately provided these materials only at the conclusion of the interview, to minimize any influence on responses, ensuring that answers were based on actual experiences rather than the incentive received.

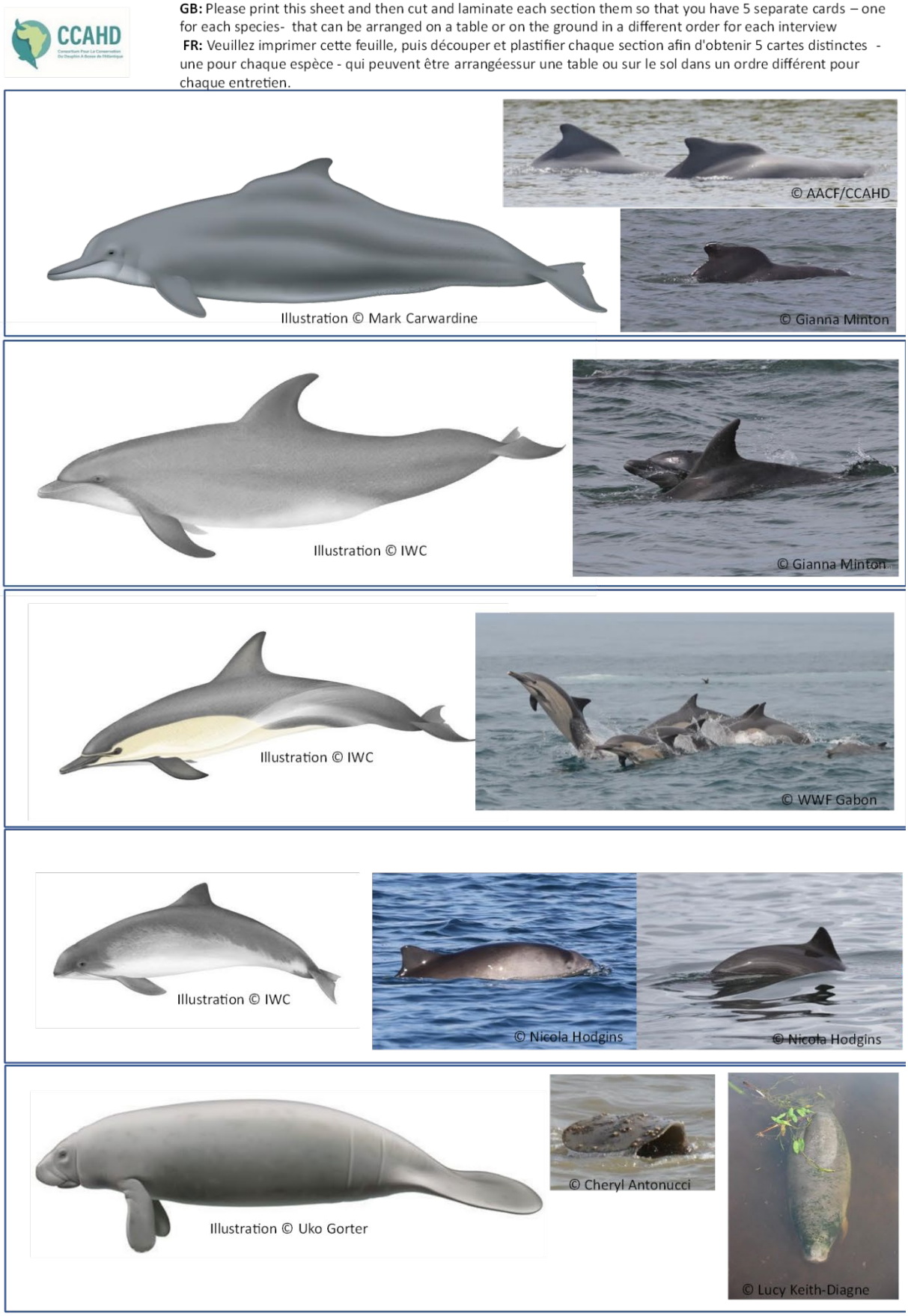


Figure 4: Atlantic humpback dolphin infographic

4.4- Post-Fieldwork Data Meetings and Data archiving

In July and October, 2023 following the (near) completion field surveys, project partners/team leads met with the project coordinators and data analysis analysts to review and refine data processing methods. These sessions provided opportunities to troubleshoot common challenges, clarify data coding techniques, and share preliminary findings across countries. The project lead in Guinea designed a comprehensive master Excel spreadsheet that allowed partners able to prepare cleaned, harmonized datasets for each country. The data has been archived in a standardized excel sheet format to facilitate analysis. In some cases, project partners (e.g. those in Congo, Cameroon, Gabon and Senegal) were able to conduct a preliminary analysis of their questionnaire results to draw out key trends and information related to reported distribution of Atlantic humpback dolphins dolphin bycatch, and patterns in human-dolphin interactions. The final data will contribute to national and regional conservation strategies and the development of targeted interventions for the Atlantic humpback dolphin's survival.

5- Results

At the time of reporting, all six project partners have completed their surveys and data archiving, and Excel sheet databases of survey results have been shared with the project coordinator, Cedrick Fogwan of AMMCO.

Table 1: Project partners and status of interview data collection and analysis

Country	**Country partner organisation and focal point name**	**Number of interviews conducted**	**Number of fishing communities sampled**	**Data shared in Excel database format**	**Preliminary country-level analysis conducted**
Congo (Republic)	Renatura Congo, Nathalie Mianseko	167	18	Yes	Yes
Gabon	ONG Aquatic Species, Regis Kema Kema	74	11	Yes	No
Cameroon	African Marine Mammal Conservation Organization, Cedrick Fogwan	239	16	Yes	Yes
Liberia	Save My Future Foundation, Ciapha Abule	142	5	Yes	No
The Gambia	Gambia Marine and Environmental Conservation Initiative, Yandeh Sallah-Mohammed	43	5	Yes	No
Senegal	African Aquatic Conservation Fund, Diana Seck	120	3	Yes	Yes
Total		**785**	**58**	**All complete**	**50% complete**

The detailed country level reports are included in Annexes 1-6, and reflect the level of analysis that each individual team was able to conduct on their data to date. A full suite of compiled data in an Excel format will be submitted with this report, and this will be analysed in greater detail at a regional level in collaboration with Dr. Samuel Turvey of the Zoological Society of London. The data collected by the six partners of this SMM-funded project will be combined with a much larger dataset of 587 fisheries interviews conducted in the Republic of Guinea under a separate funding stream (see https://www.sousateuszii.org/projects/research-capacity-building-and-conservation-for-atlantic-humpback-dolphins-in-guinea/ and https://www.sousateuszii.org/2023/04/05/fisheries-interview-surveys-underway-in-guinea-with-an-aim-to-improve-conservation-of-the-atlantic-humpback-dolphin/).

In the meantime, the brief summaries below highlight some of the main findings reported by project partners to date (with countries presented from south to north).

5.1- Congo

In Congo, fishing communities are predominantly Congolese, with some fishers from Benin, Angola, Togo, Ghana, and Rwanda. Techniques vary by village. Pirogues are typically used, and larger vessels are more common near the larger city of Pointe-Noire. The Congolese team undertook detailed analysis of the data collected, and provided tables and figures elucidating the demographic characteristics of the interviewees, the fish species targeted by the fishers that were interviewed, and the location of reported dolphin observations and bycatch events in relation to villages, landing sites and offshore oil installations.

Fishers reported a perceived decline in fish abundance, citing overfishing and Chinese industrial fishing as causes. Forty percent of respondents reported having experienced or heard about a bycatch event in recent years, with reported incidents increasing significantly from 2000 to 2023, and almost doubling in the reported time frame from 2020-2023 in comparison to 2015-2020. The interviews indicate that dolphins, especially common and bottlenose dolphins, are appreciated for their cultural and mythological significance. Over a quarter (28.7%) of fishermen stated that they had eaten dolphin meat, with most reporting that they had done so "once" or "rarely". On average, the year of last consumption was 2011 out of the 48 responses obtained. Only 3.8% of the fishermen interviewed said that dolphin was sold in their village and/or landing stage. Nine fishermen had already sold dolphin personally, with an average of less than one sale in the last 5 years.

Observations indicate seasonal variations, with dolphins more commonly seen in the rainy season. Analysis of 167 questionnaires revealed that artisanal fishermen do not intentionally fish for dolphins. While dolphins may become entangled in nets and occasionally consumed, targeting them is not a goal, as fishermen believe dolphins are too intelligent to catch. For many, especially those from the "vili" community, consuming dolphin meat is not considered (more details available in Annex 1).

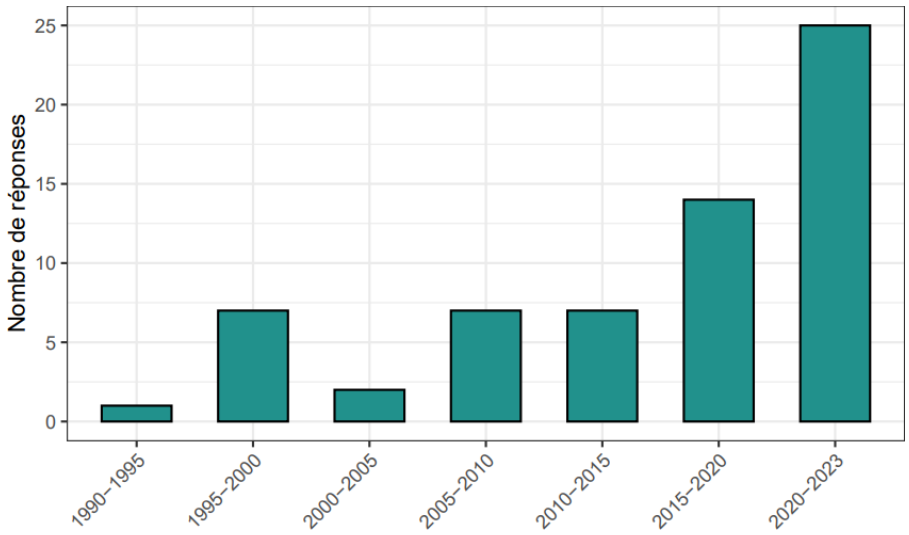


Figure 5: Time frames of 'the last time a fisherman had experienced or heard about a bycatch incident' in Congo.

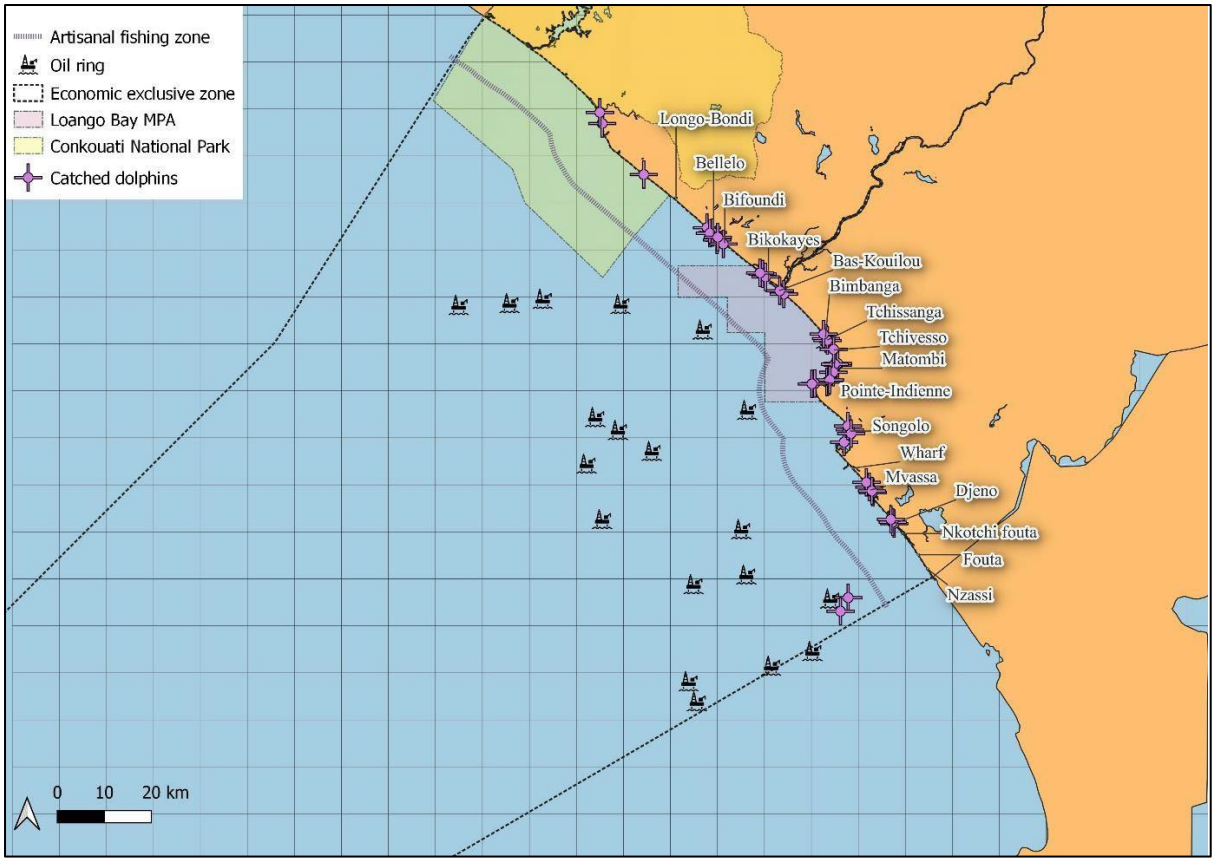
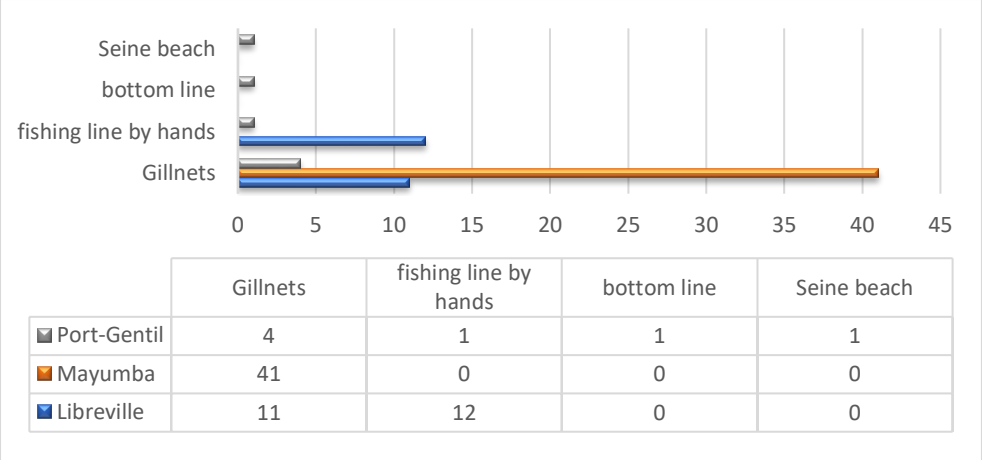


Figure 6: Locations of the last reported dolphin bycatch incident according to interview respondents in Congo.

5.2- Gabon

The team in Gabon interviewed 74 fishermen in three main regions, Libreville (the capital), Port Gentil, and Mayumba (in the south near the border with Congo). The most dominant nationalities were Beninese and Gabonese fishermen, with smaller numbers of Nigerian, Ghanaian and Santomean fishermen. Gillnets were by far the most commonly used fishing gear in all four regions sampled. Frustratingly 51% of fishers interviewed were reluctant to answer any questions about observed bycatch for fear of legal repercussions. However, in Mayumba, 7 fishermen mentioned having accidentally caught humpback dolphins, and 6 fishermen mentioned having observed humpback dolphin carcasses. Fishers did seem able to distinguish between humpback dolphins and other species, but 87% of the total sample interviewed reported that they had not seen an AHD.



	Gillnets	fishing line by hands	bottom line	Seine beach
Port-Gentil	4	1	1	1
Mayumba	41	0	0	0
Libreville	11	12	0	0

Figure 7. Distribution of reported fishing gear used by interviewed fishers in Gabon.

Fishers' responses were used to map fishing effort in each of the sampling regions based on fishers' descriptions of where they went in relation to known landmarks (see figure 8).

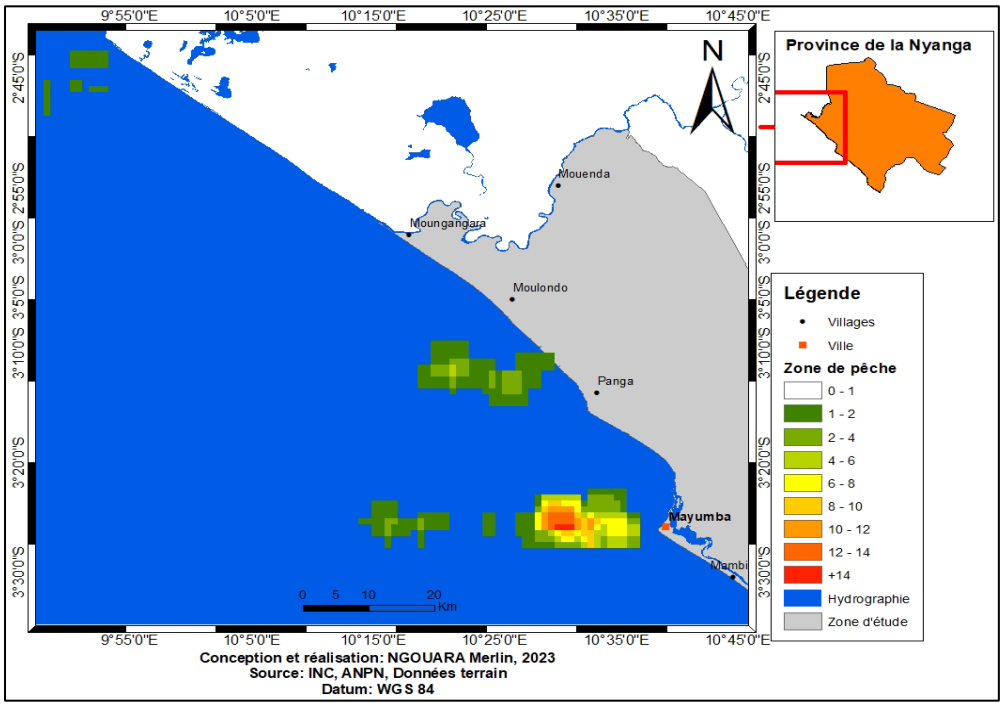


Figure 8. Mapping of fishing effort on the basis of fishers' reported fishing areas in relation to known landmarks.

The data collected under this project is undergoing further analysis by project Partner, Judicael Regis Kema Kema, who is pursuing a PhD focusing on cetaceans in Gabon through a collaboration between La Rochelle University and Omar Bongo University in Gabon.

(more details available in Annex 2).

5.3- Cameroon

In Cameroon, surveys revealed that fishers are mainly local (born and raised in Cameroon), with some from Ghana, Nigeria, Togo, and Benin. The dominant boat type is the monoxyl (small wooden pirogue,

most of the time used without the outboard engine), typically used close to shore due to its limited range. The gillnet is the most commonly used fishing gear, with fishers usually operating within 5 km of their landing sites. Dolphins are viewed positively and are seen as "helpful" or "harmless," with fishers associating dolphin presence with fish abundance.

Figure 9: Fishermen's perceptions about dolphins in Cameroon

Fishers identified three dolphin species—the common dolphin (*Delphinus delphis*) and the bottlenose dolphin (*Tursiops truncatus*), as well as the Atlantic humpback dolphin, with sightings of the latter mainly near estuaries during the rainy season. However, reported bycatch incidents have risen significantly in recent years. Mapping the most recent reported AHD sightings in relation to fishing villages and fishing effort indicated a high degree of overlap between AHD and small-scale artisanal fishing efforts using gillnets (more details available in Annex 3).

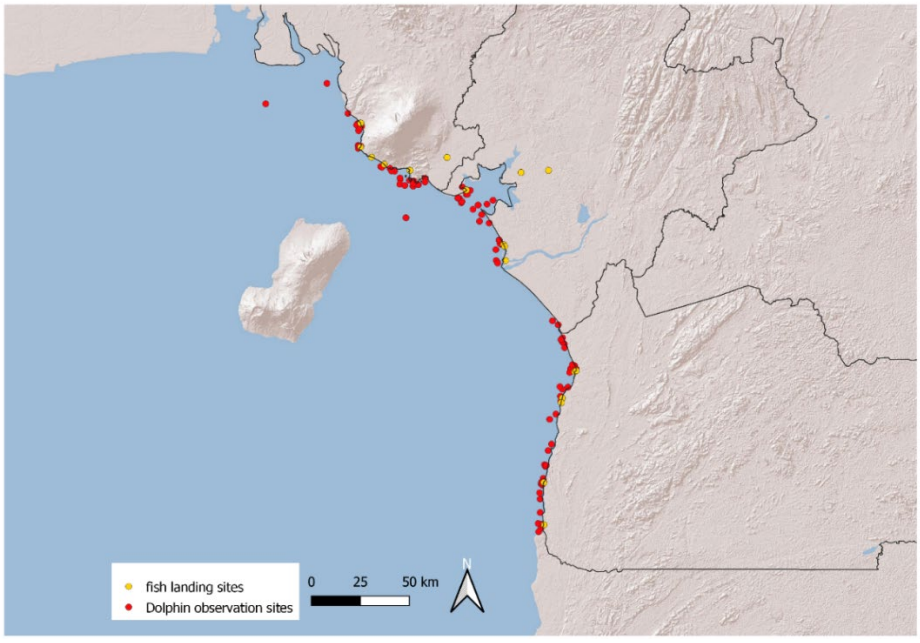


Figure 10: Distribution of dolphin according to interview respondents combined with fish landing sites in Cameroon coastline

5.4- Liberia

The Liberian partner report focused more on the interview process and challenges encountered in the field. Collected data has not yet been analysed or mapped. Liberian communities along the coast depend on fishing and small-scale agriculture. Fishermen were generally unfamiliar with distinguishing dolphin species and hesitant to participate in surveys due to concerns about enforcement by NAFA agents. Most fishers mentioned dolphin encounters, particularly by Ghanaian fishers. Additionally, fishers expressed frustration with regulations limiting dolphin catches and reported limited support from the government. Accessing community leaders before surveys was essential for smooth entry (more details available in Annex 4).

Figure 11: Interview survey team in Liberia.

5.5- The Gambia

The Gambia partners' country report focuses more on the challenges and solutions encountered during fieldwork, and data analysis and mapping is not yet complete. However, interview results indicate that gillnets are the most commonly used gear in the Gambia, and that fishers almost all report seeing common bottlenose dolphins rather than AHD. However, some fishers reported seeing AHD. Most of these were unsure whether AHD populations had increased or decreased over time, but those who did perceive a change, reported a perceived decline (92% - n=13). Of those who responded to the question asking whether they believed dolphins should be protected, 92% (n=36) responded that they strongly agreed, an encouraging indication that communities might be willing to collaborate on research and conservation measures. (more details available in Annex 5).

Figure 12: Gambian project partner interviewing a fisherman as he mends his net. Interviews indicate that the monofilament gillnet in the photo is the most typical gear used in the area. Right: Fisherman examining the CCAHD regional Dolphin ID card.

5.6- Senegal

Surveys in Senegal's Djiffer, Dionewar, and Bétanti villages involved 120 fishers, primarily of the Serere ethnic group. While fishers recognize dolphins, they find it challenging to differentiate between species. Approximately 60% noted seeing dolphins most often during the rainy season, while over 70% reported bycatch incidents. Only a few acknowledged trading dolphin meat, and ghost net entanglement was reported by 23% of respondents. Fishers noted a general decline in fish populations, attributing this to overfishing and environmental changes. The primary fishing methods are nets and traps, highlighting a preference for traditional techniques. Reported gear use in this study coincides with the types of fishing gears that were observed during boat-based dolphin surveys in the area (Minton et al., 2022a).

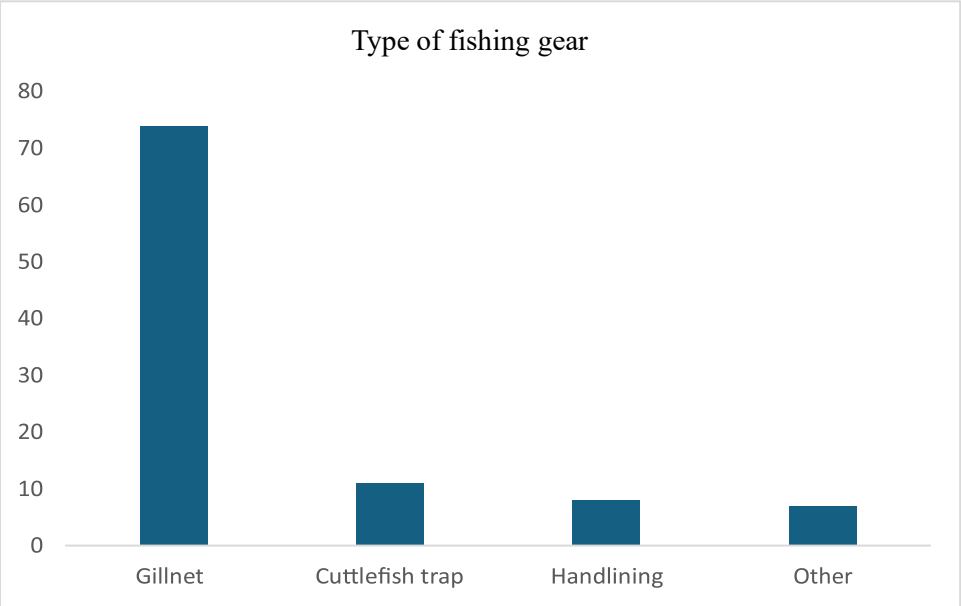


Figure 13: Fishing gears used in small scall fisheries in Senegal

6. Discussion

This study represents the first systematic fisheries interview survey effort across multiple AHD range countries since Moore et al.'s 2010 assessment of artisanal fisheries and bycatch in West Africa (Moore et al., 2010). The collected data still awaits a more formal systematic analysis, and the results presented here should not be cited. However, on a broad scale, there is already evidence that the project has been largely successful in achieving its three main objectives:

1. **To identify threats and to better understand AHD interactions with fisheries, including potential bycatch hotspots**: The initial results indicate that there is cause for serious concern and bycatch risk for AHD given that:
    - Gillnets are consistently reported to be the most common fishing gear used across all six participating countries. This is a gear known to be associated with the highest bycatch risk, particularly for some of the most threatened small cetacean species around the globe (e.g. Reeves et al., 2013; Brownell Jr et al., 2019; Ambie et al., 2023).
    - Where partners were able to map reported dolphin distribution in relation to fishing villages and/or fishing effort, there appeared to be a high degree of overlap.
    - In a number of locations, fishers reported that dolphin meat has value and can be sold.
    - A clear majority of those fishers who perceived a change in AHD abundance over time perceived a decrease and/or said they saw the species less frequently than they used to.

- However, these and other potentially relevant findings require more robust analysis and presentation in the next stage of this project in which the data from all six partners participating in this project will be combined with the data collected in Guinea.

2. **To enhance the capacity of AHD range country scientists to conduct social-science based research, and to apply it to conservation of AHD in their respective locations**: The six teams involved in this project gained formal training through the online sessions that were hosted at the start of this project, as well as hands-on experience in the field. As the next section shows, the teams were faced with a number of challenges, which were discussed during regular project meetings that allowed the project 'mentors' as well as other project partners to share suggested solutions that have worked for them in similar settings. As the individual country reports demonstrate, teams started the project with differing levels of experience in different aspects of fieldwork, data archiving and analysis. While some teams had 'in house' expertise to conduct preliminary analysis of trends in their data, and these are reflected in this report, others will require additional support for this final stage of the project in the coming months. The project coordinators also gained valuable experience in managing cross-country collaborative projects, including the organisation of team meetings, management of finances, and reporting.
3. **To begin a dialogue with coastal communities that (may) share marine resources and space with Critically Endangered dolphins**, and explore their cultural perceptions of dolphins, and their potential willingness to engage in collaborative conservation research and/or threat mitigation: The following section on Challenges and Solutions relates almost entirely to the ways in which scientists interact with coastal communities in order to share information and engage communities as partners in research and conservation. In many cases, fishers were initially reluctant to partake in interviews, and dialogues were required to gain their trust and willingness to engage. It will be important for project partners to continue this dialogue over time, and to be able to feed back the synthesized information from this project to community leaders and community members so that they can also gain further insight into the conservation status of AHD and the role that they can play in preventing further decline of the species (see more in the section below on next steps and recommendations).

6.1- Challenges and Solutions

Throughout the project, partner reported a number of challenges that may have affected the number of interviews conducted, and the quality of answers obtained. In each case, teams tried to mitigate the challenge, with mixed results, as reported below:

Challenge: The questionnaire with fishermen took approximately 30 minutes, which was deemed acceptable during the feasibility trials conducted in Guinea, Gabon and Cameroon at the start of the project. However, as the project progressed, many interview teams found that fishers were reluctant to spend time on the interviews when they were busy during landing times. Despite being about the questionnaire duration before agreeing to start, many fishers became impatient mid-interview, leading to incomplete responses.

Solution: Most interview teams offered small incentives to participate, such as a soft drink or educational resources, such as a dolphin ID guide or colouring sheets for their children. This partially alleviated the problem, but several interviews were incomplete due to fisher impatience.

Challenge: In some survey sites, language barriers were significant. Although an effort was made within each survey team to ensure that interviewers spoke as many of the indigenous and official languages used in each study area as possible, in some cases there were sub-sets of fishing communities that spoke different indigenous languages and/or had come from outside the host country. This was the case, for

example in some villages in Congo outside of Pointe-Noire, where some fishermen felt uncomfortable speaking French.

Solution: The presence of a field agent or local contact from the region in question helped facilitate communication and build trust.

Challenge: In some cases, fishers associated the interview team with the NGO to which they were affiliated, sometimes causing reluctance to provide honest answers, particularly on sensitive topics like bycatch.

Solution: Interview teams re-emphasized that responses would be entirely anonymous in order to create a more open environment.

Challenge: Interviews were ideally one-on-one, but in crowded settings, it was sometimes difficult to find a secluded place for an interview and by-standers would sometimes 'join' the interviewee, or looked over their shoulders while they answered, which may have biased their responses.

Solution: Interviewers were trained to try and detect any possible indications of dishonesty, and to note questions for which unreliable answers may have been supplied. These answers were discarded from the dataset that will be shared for final analysis.

Challenge: While fishers throughout the project range generally could describe a 'dolphin' accurately (before being shown any visual aids), a large portion of respondents in all six countries consistently appeared to have difficulty identifying dolphin species, particularly distinguishing between bottlenose dolphins and AHD.

Solution: This was noted in questionnaire results, and the questionnaire was designed to be able to determine what level of taxonomic certainty fishers' answers could be assigned. Even where results indicate uncertainty about which dolphin species was present and/or involved in bycatch or stranding events, the responses provide important insight into where ground-truthing and boat-based surveys may be merited to search for live AHD and/or evidence of bycatch of the species.

Challenge: In some cases local leaders were suspicious of the survey effort and/or prevented teams from Accessing fishermen in nearby villages.

Solution: Teams did their best to overcome these barriers by following local formal protocols and introducing themselves to local leaders and authorities to explain their aims and request permissions to work with local communities before starting their work.

Challenge: Some questions in the standardized questionnaire were perceived as too complex by some interview teams once they got into the field. Questions regarding personal perceptions of the dolphins (especially the request to say 'the first thing that came to their mind when they hear the word dolphin'), or interactions with dolphins particularly confused respondents in some locations. Interestingly, older fishermen generally provided more reliable information than younger ones.

Solution: Survey teams adapted questions to fit local cultural contexts, making them more relevant and understandable.

These strategies helped improve both the quality and quantity of responses collected in the field.

6.2- Lessons learned

The surveys highlighted the diverse stories and perspectives among fishermen in the participating AHD range countries. While there are shared lifestyles among fishermen in all six countries, significant differences exist between and within countries, offering valuable insights. For example, fishermen in southern Congo demonstrate an increased interest in dolphins due to repeated awareness campaigns, whereas Cameroonian fishermen report fewer conservation efforts, often viewing dolphins as

competition. Bycatch trends also vary: some Congolese and Cameroonian communities traditionally share dolphin meat from bycatch, while stricter regulations in other areas discourage this. Additionally, while fishermen in parts of Liberia and Gabon collaborate with conservation groups, others express concern about restrictions limiting their fishing practices without clear benefits.

A key lesson was the importance of patience and calm to navigate on-site challenges. Being prepared with a medical kit containing essentials like insect repellent was crucial. Flexibility in adapting to various lifestyles, languages, and cultural nuances, such as understanding local terms like "Obedje" for dolphin, proved essential. Establishing a friendly rapport was crucial for encouraging participation. Providing educational gifts fostered goodwill.

The project coordinators also learned that they had significantly underestimated the amount of time and effort that would be required to effectively coordinate all six teams involved in the project. While the funds available for fieldwork allowed the teams on the ground to collect a significant amount of data, the decision to allocate only limited funds to AMMCO for project coordination, and no funds to the CCAHD for support and coordination made it difficult for both project coordinators to find the necessary time to organise meetings, trainings, reporting, and, most importantly, support for each country team. The project would not have been able to proceed effectively with the fortuitous support from the parallel interview project being conducted in Guinea, which covered time for their project lead, Pauline Cueto, to develop extensive training and support materials, and also covered some of Gianna Minton's time for support to the project. Furthermore, many of the international scientists involved in the project as advisors found it more difficult to find time for the project than initially anticipated, due to demanding travel schedules and other work. Future projects will need to include more (compensated) time for project coordination and training.

7. Next steps and Recommendations

The data collected through the surveys is currently being harmonised between countries in order to ensure that categories, such as education levels, fishing gears, and other location/site specific information are described with a unified terminology. This requires a series of consultations with project partners for clarification. Once this has been completed, a master datasheet with the results from all six SMM project participating countries and the Guinea project will be shared with Dr. Samuel Turvey, who has committed to a meta-analysis at regional level. This will likely require a next level of follow-up consultations and clarifications through email exchanges and Zoom meetings.

Following those consultations, under Dr. Samuel Turvey's guidance, and with coordinating support from Dr. Gianna Minton, the project team will collaborate on a publication to be submitted to a peer-reviewed journal. The results of this range-wide analysis will also be communicated through more popular channels to draw attention to the AHD and the threats revealed in the study. Funding will also be sought to host targeted government, industry, and community workshops in each participating project country to explore ways that the project results can be integrated into local threat mitigation and conservation planning policies and practices.

Beyond the practical next steps for data analysis, the preliminary project results indicate that the following would be beneficial to advance understanding and conservation of AHD in the region:

1) Conduct interview surveys using the standardized CCAHD questionnaire in locations where these have not yet been conducted. Doing so will provide a more comprehensive range-wide overview of AHD status and threats. Funding has already been secured from the New England Aquarium to conduct the survey in three coastal states in Nigeria, and this work is currently underway.
2) Community Awareness Programs: Prioritize educational campaigns to improve fishermen's understanding of dolphin species and the importance of their protection. The study results indicate

that most fishers believe dolphins should be protected, and may thus be willing to contribute more to their study and conservation if they are given the knowledge and tools to do so.

3) Further investigate the scope and scale of dolphin bushmeat trade that may affect AHD, especially in those locations where these surveys indicated that there is a market for dolphin meat. Given the AHD's precarious conservation status, any trade that incentivises the use of dolphin catches (whether deliberate or accidental) could be detrimental to the species (Ingram et al., 2022)
4) Conduct Bycatch Risk Assessment in Congo and beyond: Conduct a comprehensive assessment of bycatch in Congolese waters where good baseline data already exists on dolphin distribution and fishing effort (Collins et al., 2014; Metcalfe et al., 2016). This assessment in Congo and other range countries could use the Bycatch Risk Assessment (ByRA) tool (Hines et al., 2020; Verutes et al., 2020).
5) Collaborate with local fishermen to design and implement dolphin conservation strategies, for example reduction of fishing effort, designation of no-go zones, or trialling alternative gears or medications to gears that have proven effective in reducing dolphin bycatch elsewhere (e.g. Sucunza et al., 2024).
6) Expand the scope of surveys to involve fish traders and community leaders for a more comprehensive understanding of the fishing economy's impact on dolphin populations.

8. Social media and communications

A total of 15 Facebook, Instagram and Twitter/X posts and two posts on the CCAHD website were created to highlight the launch and progress of this project.

Appendix 1: Country report Congo

See this link:

https://drive.google.com/file/d/1FMDMahTnhZEHBJkf9ssAxnch0zIdPJa6/view?usp=sharing

Appendix 2: Country report Gabon

See this link:

https://drive.google.com/file/d/1fvpis7y2gYBUCGmeJJOQJilyU3tI4LYx/view?usp=drive_link

Appendix 3: Country report Cameroon

See this link:

https://drive.google.com/file/d/1lvZv0mEyam9wAYoT2sxDyGTai48GBAlh/view?usp=drive_link

Appendix 4: Country report Liberia

See this link:

https://drive.google.com/file/d/1X8eLLDgc4egjsRKraBvoqDnMvjj8cQXk/view?usp=drive_link

Appendix 5: Country report The Gambia

See this link:

https://drive.google.com/file/d/1E5sQNNWTWnx5_UqguYZzIlNwiuZYWtk-/view?usp=drive_link

Appendix 6: Country report Senegal

See this link:

https://drive.google.com/file/d/1RX8Vxq2ylQoIzHFKDKK0Xk-SrAdhNm-q/view?usp=drive_link

Appendix 7: Example of Project meeting minutes

See this link:

https://drive.google.com/file/d/1ZDrdFV9Bjy_1wCaRsC-q3qMrSYLF_DGH/view?usp=sharing

Appendix 8: Standardized questionnaire

Developed by Dr. Samuel Turvey of the Zoological Society of London in collaboration with the members of the CCAHD Working Group on LEK and project partners (English version)

Questionnaire to support the CCAHD project on harvesting Local Ecological Knowledge from Fishers in the range of the Critically Endangered Atlantic humpback dolphin (*Sousa teuszii*)

Interview number:

Interview date (Year/month/day):

Village/port:

Municipality/commune:

District:

State/province:

Interviewer name (family name, given name):

Interviewee name (family name, given name)

Opening statement (*to be read to all prospective interviewees*):

We are local scientists from African Marine Mammal Conservation Organization (AMMCO). We are conducting a study on the marine life along this region of the coast, and we would like to ask you some questions for our studies, because you know a lot more about the environment here than we do. We have a questionnaire that takes about 30-40 minutes to complete. We will not write down your name or any information that will identify you, and we will not disclose any of your confidential personal details to anyone else – so we will minimize risk to you if you participate. We would be very grateful if you could stay and answer all of the questions if you can – but you can stop the interview at any time if you want, and can choose not to answer any question without having to give an explanation. We just want to try to learn more about the local environment from you. All the information you provide will only be used for research and analysis. If you do not know an answer, please say 'I don't know' – it is fine if you do not know the answer. There are lots of questions but each one is very important, so please be as accurate as you can.

[*Then ask the following questions in the same order in all interviews. Do not show the questionnaire to the person you are talking to.*]

Are you prepared to participate in this survey and answer the following questions? **Y/N**

[If the respondent answers no – discontinue the questionnaire]

A. BACKGROUND QUESTIONS

1. Are you a fisher? **Y/N**

[If the respondent answers no – discontinue the questionnaire]

2. How many years have you been fishing? (How old were you when you became a fisher)?

3. Are you retired (have you now stopped fishing)? **Y/N**
   If **YES:**

   a) When did you stop fishing?

4. Male/Female:
5. Age (in years – if not sure, approximate):
6. What is your nationality? *(teams should provide drop -down lists appropriate to their location)*
   a) Gabonese b) Cameroonian c) Nigerian d) Ghanian e) Togolese f) Other

6.2. What is your tribe/ethnicity ? *(teams should provide drop -down lists appropriate to their location)*

7. Education:
   a) No education b) Junior school (Primary) c) Middle school (Secondary) d) High school e) Graduate training

B: FISHING QUESTIONS

8. What type of boat do you go fishing on? *(teams should have pre-defined descriptions of boat types used in their area and use a drop-down list to ensure clear and consistent categories)*
9. What is its approximate length in metres?
10. How many crew members does the boat have?
11. Does your boat have a motor? Y/N

- If so, how many horsepower does the motor have?

12. Are you the owner of the boat on which you fish?
13. How many times do you typically go on fishing trips on your boat each week?
    14.1. If you fish less than once per week, how many times do you typically go on fishing trips on your boat each month?
14. On a typical fishing trip, how long are you usually away before coming back to land?
    Number of days: _____

    a) If less than one day, number of hours: _____
15. Do you fish more at particular times of year? **Y/N**
    If **YES:**

    a) Which months do you do the most fishing? b) Which months do you do the least fishing?

16. When do you usually go fishing: (*tick all that apply*)
a) Early morning
    b) Daytime c) Evening d) Night

17. Where do you usually go fishing? (*specify locations / types of habitat*) *(Interview teams should have printed maps with grids and clear indications of known reference points/landmarks that can be referred to)*
18. How far from shore do you usually go fishing? (tick which category best applies)
    a) Within the mangroves b) Within 500 m from shore c) Within 1 km from shore d) Within 5 km from shore
    e) Within 10 km from shore f) More than 10 km from shore
19. Have you always fished in this region / these regions? **Y/N**
    If **N:**

    a) Where did you used to fish?
    b) When did you change your fishing location? (how many years ago)
20. What is the main fishing gear that you use? *(Teams should refer to their predefined factsheets describing fishing gear used in the region and create a drop-down menu)*
21. What other fishing gears do you use?
22. Do you use different fishing methods in different places? (*describe*)
23. What are the main species that you try/want to catch? (Please list three main species, which can include fish, crustaceans, and/or cephalopods)
24. Has the number of people fishing around here changed over the past 10 years?
    Increase: _____ By approx. how much? _____

Decrease: _____ By approx. how much? _____

Stayed the same:

C. DOLPHIN QUESTIONS

25. Do you know what a dolphin is? (*use 'official' name and any relevant local names*) **Y/N**
If **YES:** ask the respondent to describe a dolphin, to see if they can describe it using clear morphological / behavioural differences from fish or other marine animals.

Can they describe it clearly? **Y/N**

If the respondent can describe a dolphin, ask the following questions (without showing any pictures/photos as prompts at this stage):

26. What is the first word you think of, that you associate with a dolphin? [this captures salience]
26.1. What is your opinion about dolphins?

greatly like / somewhat like / neutral / somewhat dislike / greatly dislike

26.2. Why do you have this opinion?

27. How many types of dolphins are there in this region?
- One single type.
- Two: What are these different types called locally?
- More than 2 (how many?): What are these different types called locally?
- Don't know

If more than one type of dolphin is reported:

a) How do these types differ from each other, with reference to local names for each type if they exist. *Write down any characteristics that the respondents might provide without prompting, including their appearance, behaviour, habitat, diet, etc.*

[*e.g. get the respondent to give an explanation like "the dolphin called XX is large and grey, whereas the dolphin called YY is smaller and white"*]

b) Which of these types is the most common? (*give name / description*)

28. Show the CCAHD 5-species ID card showing different species of marine mammals, and ask them which of these species occurs around here. Tick all that the respondent says live around here, and ask what its local name is:

Bottlenose dolphin: Humpback dolphin Common dolphin: Harbour porpoise Manatee:

a) Are there any types of dolphins that live around here, that aren't shown in these pictures? **Y/N**
If **YES:** show the CCAHD regional ID card, and record whether the respondent picks any of the species shown on the card:

29. Questions about the most common (or only) type of dolphin that occurs in this region:
a) What is the local name / description of this type of dolphin?
b) Have you ever seen this type of dolphin? **Y/N/Don't know**
If **YES:**

i) How many times a year do you see it?

ii) When did you last see it? (*try to get an answer in calendar years, if more than a year ago*)

iii) Where did you last see it?

c) Are there any other places where you have seen it? If **YES**, where? (*try to get localities / names of specific places*)
d) What do you think is the status of this type of dolphin in this region?
none / rare / uncommon / common / very common/ don't know

e) Have the numbers of this dolphin changed in this region during your lifetime? **YES/NO/Don't know**
If **YES:**

i) Has the number: **INCREASED / DECREASED**
ii) When did this change happen?
iii) What do you think caused the change?
iv) Are there any specific places in this region where this dolphin used to live, but where it's now disappeared? **YES/NO/Don't know**
If **YES,** describe where, and when they disappeared:

What do you think made them disappear from this location?

29.2 If the respondent describes a second type of dolphin, questions about this one:

a) What is the local name / description of this type of dolphin?
b) Have you ever seen this type of dolphin? **Y/N/Don't know**
If **YES:**

i) How many times a year do you see it?

ii) When did you last see it? (*try to get an answer in calendar years, if more than a year ago*)

iii) Where did you last see it?

c) Are there any other places where you have seen it? If **YES**, where? (*try to get localities / names of specific places*)
d) What do you think is the status of this type of dolphin in this region?
none / rare / uncommon / common / very common/ don't know

e) Have the numbers of this dolphin changed in this region during your lifetime? **YES/NO/Don't know**
If **YES:**

i) Has the number: **INCREASED / DECREASED**
ii) When did this change happen?
iii) What do you think caused the change?
iv) Are there any specific places in this region where this dolphin used to live, but where it's now disappeared? **YES/NO/Don't know**
If **YES,** describe where, and when they disappeared:

What do you think made them disappear from this location?

[*Repeat these questions for any other types of dolphins that are also mentioned*]

30. If the respondent hasn't already referred to dolphins with humps on their back, show the picture of a humpback dolphin, point out its hump on the picture, and ask the following question:
Do any dolphins round here have humps on their back like this? **Y/N/Don't know**

If YES:

a) What is the local name of this type of dolphin?
b) Have you ever seen this type of dolphin? **Y/N/Don't know**
If **YES:**

i) How many times a year do you see it?

ii) When did you last see it? (*try to get an answer in calendar years, if more than a year ago*)

iii) Where did you last see it?

c) Are there any other places where you have seen it? If **YES**, where? (*try to get localities / names of specific places*)
d) What do you think is the status of this type of dolphin in this region?

none / rare / uncommon / common / very common/ don't know

e) Have the numbers of this dolphin changed in this region during your lifetime? **YES/NO/Don't know**
If **YES:**

i) Has the number: **INCREASED / DECREASED**
ii) When did this change happen?
iii) What do you think caused the change?
iv) Are there any specific places in this region where this dolphin used to live, but where it's now disappeared? **YES/NO/Don't know**
If **YES,** describe where, and when they disappeared:

What do you think made them disappear from this location?

E. QUESTIONS SUR LES MORTS ACCIDENTELLES ET LA CHASSE DES DAUPHINS

31. Have you ever seen a dead dolphin on the shore (i.e. a stranding)? **YES/NO/Don't know**
If **YES:**

a) Which types of dolphins have you seen dead in this way?
b) When was the last time you saw one?
c) Where was the last place you saw one?
d) What type of dolphin was this?
e) How often have you seen dead dolphins on the shore?
f) What do people do with these dead dolphins?

32. Have you ever heard of dolphins being killed accidentally by fishing gear? **YES/NO**
If **YES:**

a) Which types of dolphins have you heard about being killed in this way?

b) When was the last time you heard of this happening?

c) Where was the last place you heard of this happening?

d) What type of fishing gear was the dolphin killed by?

g) What type of dolphin was killed?
h) How often have you heard about this happening in this region?
i) How many times over the past year?

ii) How many times over the past five years?

iii) Provide any details about other dolphin deaths in fishing gear (gear type, location / specific habitat, etc)

i) What happened to the dolphins that were caught in fishing gear?

33. Have you ever heard of dolphins being hunted? **YES/NO**
If **YES:**

a) Which types of dolphins are hunted?
b) When was the last time you heard of this happening?
c) Where was the last place you heard of this happening?
d) What type of dolphin was killed?
e) How often have you heard about this happening in this region?
i) How many times over the past year?

ii) How many times over the past five years?

f) Why do people around here hunt dolphins? (*What are they used for? Are they used locally, or traded?*)
g) Is hunting dolphins important to local culture? **Y/N/Don't know**

If **YES:** please elaborate / explain

34. Have you ever eaten dolphin meat? **Y/N/Don't know**

a) If YES, how frequently have you eaten it:
1) very often 2) often 3) sometimes 4) rarely 5) once

b) If YES, how many times have you eaten it in the last five years?

c) Which year was the last time when you ate it?

35. Have you ever used dolphin meat as bait during fishing? **Y/N/Don't know**

a) If YES, how frequently have you used it as bait:
1) very often 2) often 3) sometimes 4) rarely 5) once

b) If YES, how many times have you used it in the last five years?

c) Which year was the last time you used it?

D) Which species do you hope to catch with it?

36. Have you ever used any other dolphin body parts (e.g. bones, oil)? **Y/N/Don't know**

a) If YES, please describe what parts:

b) If YES, please describe what you used them for:

c) If YES, how frequently have you done this:

1) very often 2) often 3) sometimes 4) rarely 5) once

d) If YES, how many times have you done this in the last five years?

e) Which year was the last time you did this?

37. Do people around here sell dolphin meat? **Y/N/Don't Know**

a) If YES, how frequently do people sell it:
1) very often 2) often 3) sometimes 4) rarely 5) once

b) Have you ever sold the meat of this species? **Y/N**
c) If YES, how many times have you sold it in the last five years?
d) Which year was the last time when you sold it?
e) Who do you sell dolphin meat to?
f) How much does a kilo of dolphin meat cost?
g) Where does the dolphin meat ultimately get used?

38. What is your opinion about whether dolphins should be a protected species?
strongly agree / mildly agree / no opinion / mildly disagree / strongly disagree

Please explain your opinion:

39. Do you know of any dolphin skulls or other remains that are kept anywhere in the village? **Y/N/Don't know**

If **YES:** As the respondent if he can take you to see them, as it might be possible to use them to identify which species occur locally.

40. Do you know any legends or stories about dolphins? Describe them briefly:

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