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Interactions between human activities and marine megafauna of the Caribbean: Progress made through the CAMAC project and potential for future actions

Minutes of the final CAMAC workshop

76th Conference of the Gulf and Caribbean Fisheries Institute

November 4, 2023 - Nassau, Bahamas

Written by
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The CAMAC project is co-financed by the Interreg Caribbean program under the European Regional Development Fund.



GULF AND CARIBBEAN
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Summary

The regional cooperation project CAMAC, for **CAribbean marine Megafauna and anthropogenic Activities**, started in 2023. Its first phase aimed to bring together stakeholders working on megafauna and human activities, and particularly fisheries, for reviewing available knowledge on interactions between species and activities, and for building regional workplans to better assess these issues. CAMAC levers of actions count knowledge enhancement, capacity building, standardisation of practices at the Caribbean scale, sensitisation, and finally concertation for developing regional management recommendations.

The **final workshop of the project for this phase 1** was held on November 4th, 2023, in Nassau, The Bahamas, jointly to the 76th conference of the Gulf and Caribbean Fisheries Institute (GCFI). Gathering numerous experts on megafauna and of fisheries, this workshop aimed at **presenting the major outputs of CAMAC phase 1 and discussing the scientific protocols and workplans to be implemented during phase 2**. After a morning dedicated to presentation sessions, attendees then split into thematic round tables in the afternoon.

Through the workshop and the following conference, the partners from the Wider Caribbean Region had the opportunity to deepen contacts, share their own experience, and to collectively reflect, announcing a **fruitful continuation of CAMAC actions**.

450

CONFERENCE PARTICIPANTS

52

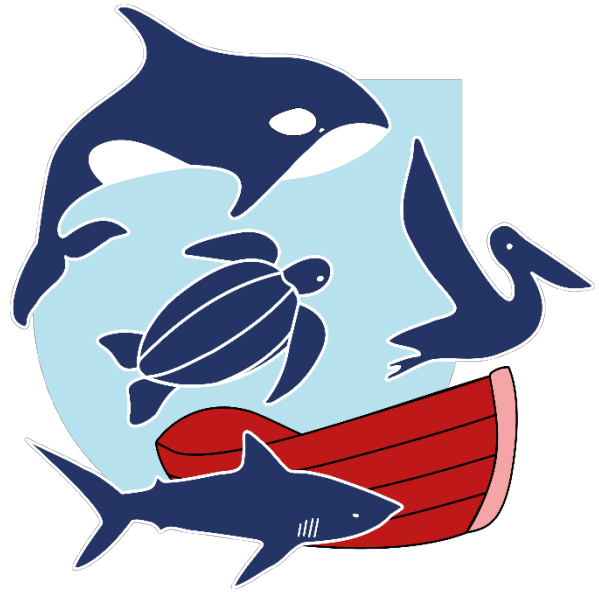
CAMAC WORKSHOP PARTICIPANTS

Representative of

25 CARIBBEAN COUNTRIES OR TERRITORIES

12

PARTNERS WHOSE PARTICIPATION WAS
FINANCED BY THE ERDF INTERREG FUNDS



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I. Context

The CAMAC Project

The habitats of most species of marine megafauna (sharks, sea turtles, marine mammals and seabirds) strongly overlap with human activities such as fishing, shipping, tourism and coastal development. These frequent interactions can lead to negative impacts on these vulnerable species, as well as socio-economic issues for human coastal communities. In the Wider Caribbean Region and the Guyana Plateau, these impacts remain poorly quantified and mitigated.

The regional cooperation project CAMAC, for **CAribbean marine Megafauna and anthropogenic ACTivities**, aims to improve knowledge and strengthen regional collaboration and stakeholder capacity around these issues. CAMAC will ultimately provide Caribbean governing bodies and environmental stakeholders with recommendations and tools to reduce the negative impacts resulting from the interactions between marine megafauna and human activities.

The CAMAC project is organized in four thematic work packages:

1. Interactions with fisheries: assessment of socio-economic and environmental issues in collaboration with Caribbean fisheries organizations;
2. Stranding networks: harmonization of protocols and capacity building;
3. Awareness raising strengthening of environmental education skills and creation of a school twinning program;
4. Knowledge enhancement: development of a scientific framework for regional megafauna assessment and enrichment of knowledge of poorly known areas or species through surveys.

The project is planned for 5 years (2023-2028) and is structured in 2 phases:

- ▶ **Phase 1 lasted one year and will end in December 2023.** It focuses on the review of available information and data, on the development of partnership with regional stakeholders, and on the determination of the protocols and needs for phase 2.
- ▶ **Phase 2 is expected to be confirmed in early 2024** and should take place from 2024 to 2028. It will be dedicated to the implementation of the protocols determined during phase 1, in collaboration with identified partners.

The CAMAC project is led by the Agoa Sanctuary/French Agency of Biodiversity (OFB) and the SPAW-RAC and is co-financed by the European Regional Development Fund (ERDF) within the framework of the INTERREG Caribbean 2014-2020 program up to 85% for a total estimated budget of 758 397 € in the first year (2023). INTERREG Caribbean, existing since 2000, is an interregional cooperation program aiming to strengthen cooperation between Caribbean European ultra-peripheral territories (Guadeloupe, French Guiana, Martinique and Saint-Martin) and more than 40 territories and states of the Caribbean. The estimated budget of CAMAC for the potential phase 2 (2024-2028) is about 4.5 million €.

The GCFI conference

The Gulf and Caribbean Fisheries Institute (GCFI) was founded in 1947 to promote the exchange of information on the use and management of marine resources in the Gulf and Caribbean Region. From its beginning, GCFI has endeavoured to involve scientific, governmental, and resource-use sectors in providing a broad perspective on relevant fisheries issues. The GCFI membership comprises over 40 nations and territories representing university faculty and students, governmental agencies, policymakers, private sector, fishers, non-governmental organizations, and other stakeholders.

The GCFI holds the most important annual gathering for technical and scientific stakeholders of the Caribbean marine environment. Initially focused on the fisheries of the region and their targeted species, its conference has opened up to other issues including marine protected areas, sensitive species such as megafauna, invasive species, sargassum, coral diseases, etc., in short, marine biodiversity issues shared by the Caribbean territories.

The 76th GCFI conference took place in Nassau, Bahamas, from Nov 4 to 10, 2023. Its theme was **“Linking science and society towards a vision for sustainable fisheries”**, highlighting the importance of engagement and dialogue among diverse sectors to ensure a sustainable future of the region’s fisheries and marine resources. The conference aimed to foster discussions on key topics for engaging in, and supporting, innovative approaches including ocean literacy, strengthening governance mechanisms, and developing inter- and transdisciplinary research. GCFI76 is an Endorsed Decade Action Program with the United Nations Decade of Ocean Science for Sustainable Development.

The participation of CAMAC at this conference enabled us to further develop our collaborations with fisheries experts for preparing phase 2 of the project. Further, it allowed the project team to be updated on scientific advances and current or projected initiatives on the Caribbean marine environment. The GCFI conference was also an excellent platform to reach a wide panel of representatives of both the territories and the marine expertise of the Caribbean. Finally, the event provided many opportunities to deepen contacts with CAMAC partners by organizing one-to-one meetings throughout the week.

II. Workshop objectives

The final workshop of CAMAC phase 1, entitled “Interactions between human activities and marine megafauna of the Caribbean: progress made through the CAMAC project and potential for future actions” took place for the full day on November 4. This workshop aimed to bring together the CAMAC partners and other Caribbean stakeholders working on fisheries, megafauna conservation, and environmental education, **to present the major outputs of CAMAC phase 1 and discuss the scientific protocols and workplans to be implemented in CAMAC phase 2.** After a morning dedicated to presentation sessions, attendees then split into thematic round tables in the afternoon (see program in Appendix 1).

The expected outcomes of this workshop for the attendees were:

- ▶ To gain knowledge on the CAMAC project, how it could benefit their territory/organization, and how to get involved;
- ▶ To express their willingness to be involved in the project;
- ▶ To make sure the protocols for phase 2 meet their needs;
- ▶ To strengthen networking with the other partners of the project.



III. Workshop proceeds and results

Participation

The workshop gathered 52 participants (23 in-person and 29 in videoconference), from 25 countries or territories of the Wider Caribbean Region and the Guianas Plateau (Appendix 2). Among them, 12 partners of CAMAC applied for a travel grant and had their participation financed by the ERDF Interreg funds.

Presentation sessions

The first three presentations reminded attendees about the context of CAMAC:

- ▶ A regional cooperation project co-funded by the Interreg Program of the European Union (video, Interreg Joint Secretariat, Région Guadeloupe);
- ▶ Contributing to the objectives of the SPAW Protocol for Caribbean megafauna conservation (Géraldine Conruyt, SPAW RAC);
- ▶ Various levers for actions, structured into thematic workpackages and with the collaboration of international partners (Magali Combes, Agoa Sanctuary).

Then, the presentations focused on three CAMAC workpackages: WP1, fisheries interactions, WP2, stranding networks, and WP4, knowledge enhancement. The main outputs of the work accomplished during phase 1 were presented, and then methods and recommendations that could be applied at the regional scale in phase 2 were showcased.

All the presentations are available in pdf and replay at: <https://drive.google.com/drive/folders/1XZ4-702wjbY1Hbl6tuU3eY8pqO2M8TsD?usp=sharing>.

Fisheries Interactions

Claire Pusineri (SPAW RAC) presented the main outputs of the scientific synthesis made by SPAW RAC this year. This presentation showcased the state of knowledge and data available on fisheries of the region (effort or landings by fishing gear), and the expert knowledge collected on interactions between 11 fishing techniques and the different megafauna taxa. This work involved many CAMAC partners from 24 territories (Figure 1). The results suggested that while the vast majority of Caribbean countries have long term fishery monitoring programs, it is difficult to access data and they are often incomplete; notably, bycatch is rarely monitored. Additionally, experts' knowledge highlighted that significant megafauna bycatch issues are observed in most CAMAC territories, with most fishing gear, and effect many species. Finally, most experts contacted showed a strong interest in working on bycatch issues.

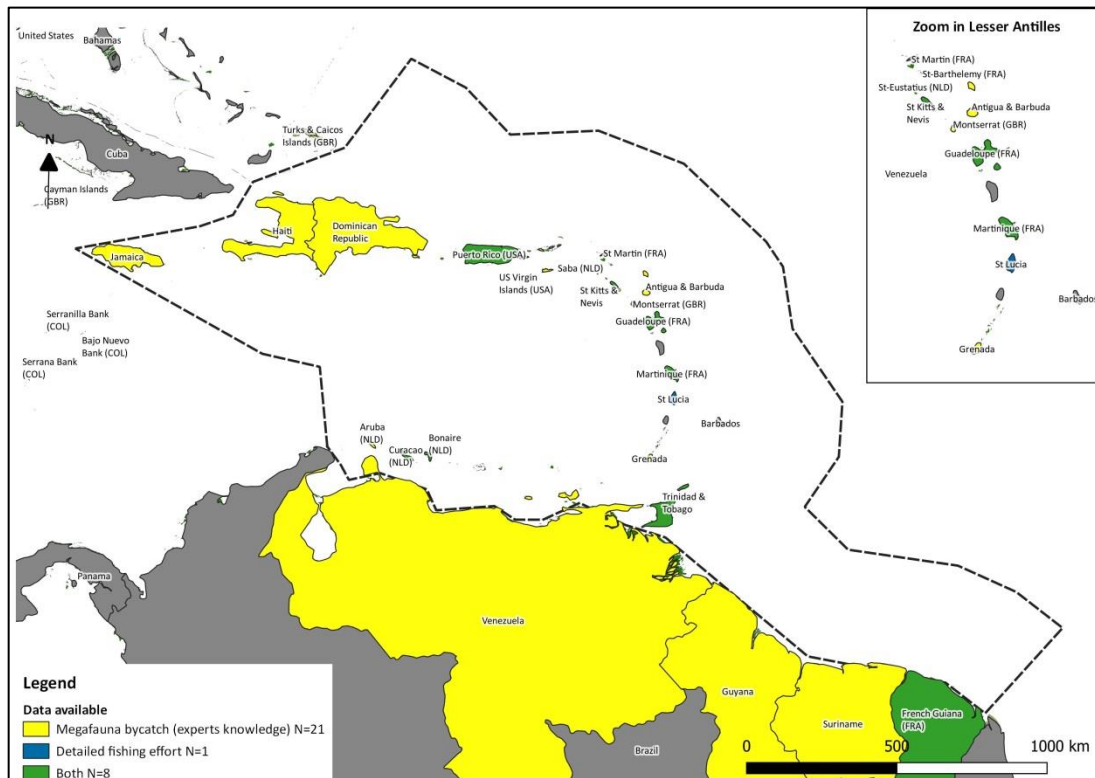


Figure 1. Countries and territories contribution to the fisheries interaction synthesis (SPAW RAC, 2023).

Ellen Hines, professor at San Francisco State University, presented the Bycatch Risk Assessment (ByRA) toolbox. This low-cost toolbox was especially designed to help developing bycatch risk maps for megafauna in poor-data areas. The method allows for a large range of information (from interviews of fishers to field monitoring) to feed the analysis, which results in risk maps to enhance bycatch mitigation and protected species conservation.

Michel (Tony) Nalovic, research fisheries biologist from the Guianas marine eco-complex (fishingcleaner.com), presented the Collaborative Fisheries Research (CFR) approach based on successful examples from around the world. The CFR approach promotes the active participation and integration of fishers in the decision-making process from the very beginning of a project and to assess fishing activities vulnerability to bycatch. Based on the results, fishers, scientists, and managers can discuss opportunities for active implementation leading to change in behaviours or fishing methods. In the megafauna bycatch context, CFR would for instance build on fishers ecological knowledge (FEK) (through interviews) and resulting collaborations would support the implementation of bycatch mitigation measures that would benefit both species and the fishing activity (win-win situation).

Stranding networks

Claire Pusineri briefly presented the actions conducted this year within CAMAC for strengthening marine mammal stranding networks: the development of a standard protocol for stranding response, the creation of a toolkit for stranding trainings, and the organization of training workshops. For phase 2, those actions will continue for marine mammals and will be extended to sea turtle stranding networks.

Gabriela Hernández Mora, a marine mammal veterinary expert from Costa Rica (SENASA), presented the regional stranding protocol developed with the CAMAC working group on strandings, and the associated tools developed in English, Spanish and French: the training material, the field guide and form, and the necropsy video and checklist. These tools were already used for the first training workshops and will be soon published online.

Emma Neave-Webb and Andrew Brownlow, from the Strandings Initiative of the International Whaling Commission (IWC), presented the training workshops organized through CAMAC in Haiti, St Kitts, Puerto-Rico, Dominican Republic, Jamaica, Aruba, Bonaire and Suriname, and totalling over 100 trainees (Figure 2). Based on their experience, they also provided recommendations for follow up regional actions.



Figure 2. Training workshop in Discovery Bay, Jamaica, 2nd November 2023.

Megafauna knowledge enhancement

Magali Combes presented the outputs of the work conducted this year with the CAMAC working group on marine mammals and seabirds' knowledge enhancement (example in Figure 3). The aim was to define a regional survey method and identify priority areas for collecting data on species distribution and abundance.

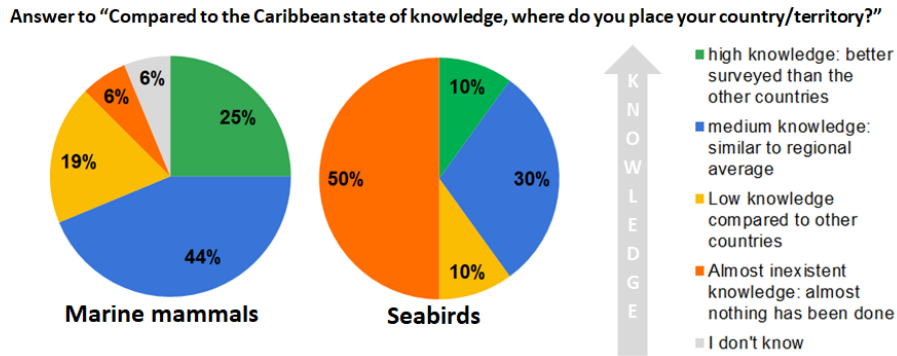


Figure 3. State of knowledge of the species groups in countries or territories of the Caribbean according to stakeholders.

Rocio Prieto Gonzalez, expert in distance-sampling modelling (Counting Whales), gave a presentation about the importance of survey design to estimate population abundance. She explained the general principles of designing survey, i.e., identifying prior to fieldwork the track to follow during the campaign, the different forms it can take, and what it allows in terms of analysis to reach the calculations of species abundance or density.

Finally, Irene Kingma, shark and ray expert from the Dutch Elasmobranch Society, presented the work achieved this year to build a CAMAC shark action plan based on literature review, interviews of local experts of the Caribbean and online workshops. The information collected revealed a lack of baseline data on species in the region. The review also highlighted discrepancies of conservation management implementation between countries, although many species could benefit from strong legislative and management frameworks at the regional scale. The results of this work fed into the development of an Action Plan with concrete research and conservation actions for elasmobranchs in the Wider Caribbean.

Round table “interactions with fisheries”

A total of 11 participants attended this round table, facilitated by Claire Pusineri (SPAW RAC) and Michel (Tony) Nalovic (fishingcleaner.com). The experts brainstormed on the protocols that will be implemented during CAMAC phase 2 to better characterize the interactions between megafauna and fisheries in order to make recommendations for efficient and collaborative mitigation measures. To organize the discussion, the attendees were asked to give their inputs regarding:

- ▷ WHERE, *i.e.*, which territories should be prioritized as pilot sites for knowledge enhancement;
- ▷ WHAT data and information should be collected;
- ▷ WHO should we collect data/information from;
- ▷ HOW, data/information should be collected, *i.e.*, with which approach.

The answers are compiled in the below paragraphs. These recommendations will serve as a framework for the development of phase 2.

WHERE

The attendees listed the main criteria that should be taken into account to identify the pilot sites where data and information should be collected:

1. territories where bycatch is a major issue and poorly regulated, but where both fishery management organizations and fishing communities are willing to work on this topic in the long term, and where there is potential for a successful deployment of mitigation measures (low hanging fruit);
2. the megafauna community observed in the respective territories is characterized by the presence of endangered species, high species abundance and diversity, and some reproduction sites have been identified;
3. the combination of all pilot sites as a whole should be representative of the Caribbean (*i.e.*, the main types of Caribbean fisheries are represented).



The following territories were already identified as good potential pilot sites: Puerto Rico (poor data and misinformation, major bycatch issues, some fishing communities, and local agencies show a strong interest in working on this issue), The Bahamas (bycatch is a major issue), Dominican Republic (large coastal area with a diversified fishing activity, megafauna community and interactions), Haiti (poor information on fisheries and none on bycatch, high megafauna species abundance and diversity, and nursery for Whitetip Shark) and Magdalena Colombia.

WHAT

Attendees listed the following data and information to be collected to better characterize interactions between fisheries and megafauna:

- ▷ challenges facing the fishing industry preventing bycatch mitigation
- ▷ type of interactions: target catch or bycatch, depredation, other;
- ▷ frequency of interaction, location, seasonality;
- ▷ characteristics of the animals involved in the interaction: species, sex, age class (length);
- ▷ fishing activity: fishing effort, fishing gears and techniques (*e.g.*, net setting time), exclusion devices used and their efficiency;
- ▷ link between stranding networks and fishery groups;
- ▷ use of bycatch: discarded, released, survival rate, consumed, sold..., economic value.

WHO

The attendees highlighted that information and data should be collected from the following organizations/entities: fishers associations, fishing communities (fishers, spouses, grandparents...), all competent/mandatory authorities in charge of data collection and fishery regulation, such as National fishery management organisations and ministry of environment.

It was also noted that all types of fisheries should be assessed, including offshore fisheries, but that a focus should be made on most impacting gears.

HOW

Experts highlighted that working on interactions between megafauna and fisheries should be built as a long-term project. Indeed, one needs to get familiar with fishers, to understand the local context, and to build trusting relationships with them.

Data should be collected from interviews and observations (on landing sites and onboard) and interviewers should preferably be someone from the fishing community that will be trained to the data collection protocol, and human dimensions.

A standard protocol should be built for all the territories from best practices, but adaptations should be made to each context, and it is very important that fishers are involved in all steps of the project with workshops and hands on activities in due time. In order to arouse interest of the fishing community, an interesting option is to organize exchanges with fishers that have contributed to successful bycatch mitigation projects from other countries.

The best practices for fishery data collection supported by the experts include the collaborative approach to fisheries science, IUCN guidelines and FAO guidelines:

- ▶ IUCN guidelines FEK (<https://www.iucn.org/resources/publication/iucn-guidelines-gathering-fishers-knowledge-policy-development-and-applied>)
- ▶ FAO protocol DCRF (<https://www.fao.org/3/cc5049en/cc5049en.pdf>)
- ▶ The Fisheries Co-Management Guidebook. Wildlife Conservation Society and WorldFish. <https://doi.org/10.19121/2023.Report.49580>

Attendees also stated that in conjunction with data collection in the field, the compilation of already available information initiated during phase 1 should continue.

Finally, attendees stressed that the standard protocol for data collection should be built upon lessons learned from past projects, such as the various successful projects on bycatch conducted in the French territories (e.g., PALICA, Active Fisheries for the Limitation of Interactions and bycatch, ARRIBA, development of a fisheries managed voluntary non fishing zone, or TOPASE, Sea Turtles and bycatch, towards efficient mitigation measures) or in Trinidad and Tobago. It is also important to seek synergy with existing projects, such as REBYC III (Strategies, technologies, and social solutions to manage bycatch in tropical Large Marine Ecosystem Fisheries), GEF Project Ecosystem Approach For Shrimp Groundfish.

Round table “stranding networks”

A total of 17 participants attended this round table, facilitated by Kimberly Stewart (WIDECASST) and Gabriela Hernández Mora (SENASA/IWC).

The objectives were the following:

- ▶ Provide feedback on the work performed during phase 1 to strengthen marine mammal stranding networks: development of a standard protocol along with the corresponding field guide and form, and organization of trainings for stranding response.
- ▶ Prioritize the action plan for phase 2 drafted following the various consultation workshops organized during CAMAC phase 1.

Feedback on phase 1

For the feedback discussion on the work performed during phase 1, the attendees were asked to answer several questions (see below). The answers are compiled in the below paragraphs. These recommendations will serve as a framework for the development of phase 2.

What did you like about the protocol and field forms developed for marine mammal stranding response?

- ▶ They clearly outline the steps and procedures that need to be followed and the data that need to be collected
- ▶ Diagrams and illustrations are very useful
- ▶ Easy to use

Your recommendations to improve the protocol and field forms for marine mammal stranding response:

- ▶ Having different levels of guides/quick reference materials for different levels of experience
- ▶ The field form should be simplified
- ▶ Split into two different forms (one for live strandings and the other for dead animals)
- ▶ An online repository for strandings data and a map
- ▶ Beach friendly waterproof field guide and forms
- ▶ ID cards would help in identifying animals
- ▶ A one-page instruction guide that could be placed in the stranding kits would help remind responders about what they need to do

What did you like about the training toolkit (videos and presentations) for marine mammal stranding response?

- ▷ Very thorough
- ▷ Clear and easy to understand

Your recommendations to improve the training toolkit (videos and presentations) for marine mammal stranding response?

- ▷ Split in shorter formats
- ▷ Design should be improved

What did you like about the marine mammal stranding training workshops

- ▷ The practical component was great and extremely hands on
- ▷ It really kept everyone engaged
- ▷ The facilitators were very helpful and answered everyone's questions
- ▷ The workshops were organized locally

Your recommendations to improve marine mammal stranding training workshops

- ▷ Trainings with real animals
- ▷ Organize more trainings in other locations
- ▷ Organize a training of trainers' program, featuring a more detailed content so that focal stakeholders of the Caribbean get the capacity for training themselves the local networks.
- ▷ A reasonable planning period to have time to organize things properly!

Prioritize the action plan for phase 2

The attendees were asked to give an index of priority, from 1 (highest) to 3 (lowest) to all actions listed so far for phase II, and a mean index was computed. The results can be found in the tables below and will be used to draft the CAMAC phase 2 project proposal.



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Table 1. Prioritized action plan to strengthen marine mammal and sea turtle stranding networks during CAMAC phase 2. The mean priority index was computed from the indexes provided by the workshop attendees (1=high priority, 2=medium, 3=low). NA was used for actions that were identified by sea turtle experts but not marine mammal experts, or conversely.

General objectives	Specific objectives	Actions	Mean priority index for sea turtle networks	Mean priority index for MIM networks
1-Strengthen sea turtle stranding networks	1.1-Strengthen capacity for stranding assessment and response	1.1.1 Identify key and secondary focal points in each territory and disseminate their contact information	1,0	1,3
		1.1.2 Develop standard protocols for sea turtle stranding assessment and response, based on existing best practices	1,0	NA
		1.1.3 Develop a stranding training toolkit (PPT presentations, videos, guidelines for fieldwork, field forms)	1,1	NA
		1.1.4 Review the field guide and form developed during phase 1 in light of feedback from the trainings	NA	1,3
		1.1.4 Train networks to the standard protocols	1,5	NA
		1.1.2 Organize a disentangle training	NA	2,4
		1.1.5 Train vets on live response (including trauma) and necropsy technique and reporting	1,4	1,0
		1.1.6 Buy additional material/equipment for stranding response	2,2	NA
		1.2.1 Develop simple outreach materials suitable for wide distribution (e.g., prevention of plastic pollution, avoiding boat strikes)	1,6	NA
		1.2.2 Engage practitioners, such as tourism operators	1,7	NA
		1.3.1 Disseminate the contact of key focal points among the regional community	1,1	1,5
		1.3.2 Create a regional WhatsApp Turtle Stranding Chat with a backup team service 24h	1,6	1,6
		1.3.3-Strengthen regional cooperation	3.1.5 Develop an Internet portal to disseminate protocols, results....	1,4

General objectives	Specific objectives	Actions	Priority index for sea turtle networks	Priority index for MIM networks
2-Analyze data and samples collected on stranded animals to make recommendations for species conservation	2.1-Review available data/samples	2.1.1 Draft a data/sample sharing standard agreement form	1,3	1,4
		2.1.2 Develop a regional and accessible standard database for data and available samples	1,3	1,7
		2.1.3 Define and secure a Secure a long-term management mechanism, including a regional stranding database host/coordinator	1,9	1,9
		2.1.4 Review available data and samples	1,7	1,5
	2.2-Assess regional capacity	2.3.1 Determine analyses to be conducted	1,4	1,5
		2.2.1 Review regional capacity for analyses	1,0	1,1
		2.2.2 Assess shipping potential for samples	2,0	2,0
	2.3-Organize the work	2.3.2 Collect additional data/samples	2,0	2,1
		2.3.3 Train people in sample analysis	NA	1,5
		2.3.3 Organize shipping of samples	2,3	2,3
	2.4-Perform analyses	2.4.1 Study genetic stocks, connection, and biodiversity (mitochondrial and nuclear DNA, stable isotopes, morphometry)	2,3	1,5
			2.4.2 Enhance knowledge on cause of death (histopathology, heavy metals, toxins, scars and wounds)	1,5
		2.4.3 Enhance knowledge on fibropapillomatosis (histopathology, PCR)	1,7	NA
3.1.1. Regional and integrative analysis of all results		2,0	2,0	
3.1.2 Draft recommendations for species conservation		2,0	1,5	
3-Make use of results	3.1 Make use of results	3.1.3 Scientific communication (scientific articles, conferences)	2,3	2,3
		3.1.4 Develop outreach materials	2,0	1,4
		3.1.5 Create a tissue/DNA repository for the Caribbean	NA	2,4

Round table "enhance knowledge on marine mammals and seabirds"

A total of 19 participants attended this round table, facilitated by Magali Combes (Agoa Sanctuary/OFB). The goal of the round table was to refine the operational workplan for scientific surveys for the inventory of marine mammals and seabirds in the Caribbean, to be implemented in phase 2 of CAMAC. Two activities were conducted with the participants:

- ▶ An activity on the design of survey protocols;
- ▶ An activity on priority areas to survey.

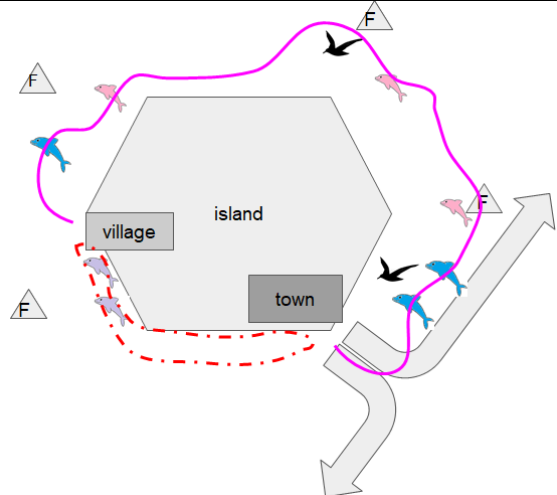
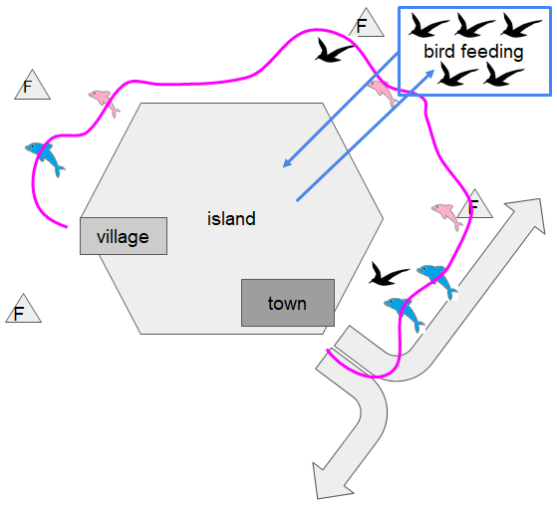
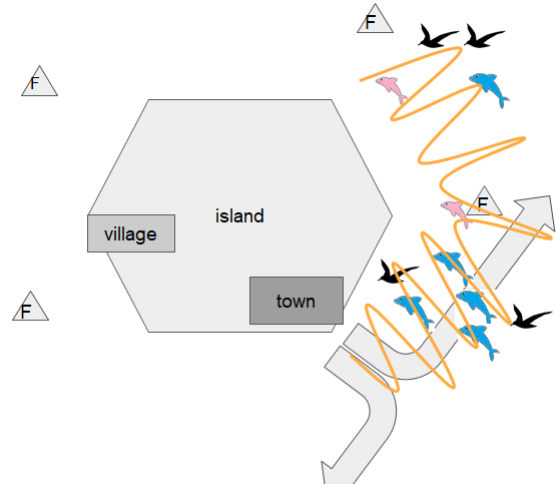
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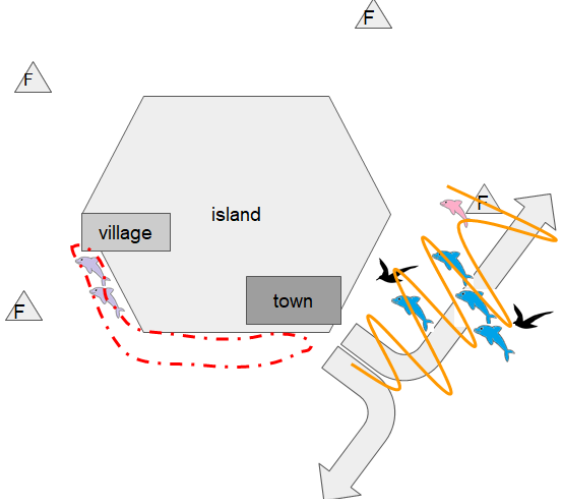
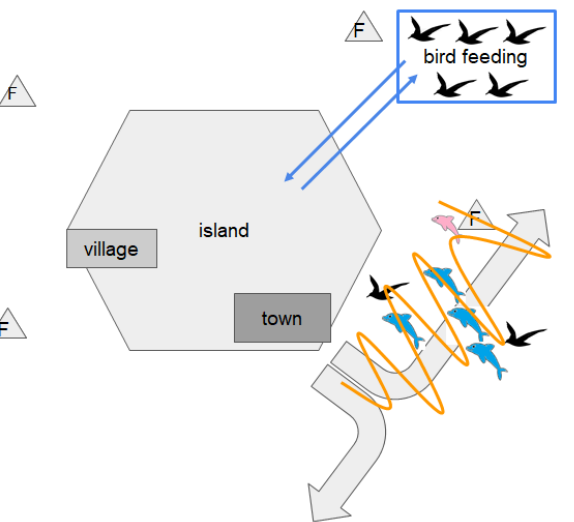
Design of survey protocol

After the morning presentations on the different protocols considered so far and the theoretical aspects of survey design, this activity encouraged the participants to project themselves in their Caribbean territory, to imagine the outcomes of potential survey designs in their local context. Through a narrative game, they had to choose between six potential survey designs and explain their choice. The suggested designs made them express themselves on the compromises to make between the spatial coverage of surveys, the data resolution, and the potential alternative methods that could be adopted for answering more specific objectives.

Table 2. Description of the different designs suggested to participants.

Design	Illustration
<p>N° 1. Simple survey:</p> <p>Pink track of the boat going all around the territory for inventorying "pelagic" species, without prior transect design.</p> <p>Features:</p> <ul style="list-style-type: none"> - covering all the territory - presence of species, identification or a rare species (yellow dolphin) 	

<p>N° 1.1. 75% of simple survey + drone survey</p> <p>The effort of the simple survey (pink boat track) is reduced, so we can add a drone survey for inventorying very coastal species (e.g., manatees) with a drone (red dotted line).</p> <p>Features:</p> <ul style="list-style-type: none"> - a reduced “pelagic” survey, including the missing of the rare species; - sightings of a “very coastal” species that cannot be detected through boat survey. 	
<p>N° 1.2. 75% of simple survey + bird tagging</p> <p>The effort of the simple survey (pink boat track) is reduced, so we can deploy tags on seabirds' colonies to investigate offshore movements and bird feeding areas (blue arrows and rectangle).</p> <p>Features:</p> <ul style="list-style-type: none"> - a reduced “pelagic” survey, including the missing of the rare species; - discovery of bird feeding habitats. 	
<p>N° 2. Zigzag survey on the eastern part</p> <p>Orange track of the boat focussing the effort on one part of the territory for inventorying “pelagic” species, with transect design.</p> <p>Features:</p> <ul style="list-style-type: none"> - effort focused on only part of the territory; - higher data resolution enabling to calculate densities of animals. 	

<p>N° 2.1. 75% of zigzag survey + drone survey</p> <p>The effort of the zigzag survey (orange boat track) is reduced, so we can add a drone survey for inventorying very coastal species (e.g., manatees) with a drone (red dotted line).</p> <p>Features:</p> <ul style="list-style-type: none"> - a reduced “pelagic” survey; - sightings of a “very coastal” species that cannot be detected through boat survey. 	
<p>N° 2.2. 75% of zigzag survey + bird tagging</p> <p>The effort of the zigzag survey (orange boat track) is reduced, so we can deploy tags on seabirds’ colonies to investigate offshore movements and bird feeding areas (blue arrows and rectangle).</p> <p>Features:</p> <ul style="list-style-type: none"> - a reduced “pelagic” survey; - discovery of bird feeding habitats. 	

After the presentation of the six designs, the participants, each representing a territory, voted for their favourite design and explained why they chose that particular design. The “simple survey” design was generally preferred because it provides a general overview of the species and potential interactions, especially in countries that do not have pre-existing knowledge. However, several participants insisted on the value of zigzag transects for calculating densities and for allowing replication of the survey following the same track. It was also mentioned that the design of transects needs to be done with caution and knowledge of the field, because the rough weather conditions can block track following in several places. As for the secondary methods, the bird tagging method was preferred to the drone survey, to orient data acquisition towards offshore seabird areas rather than on the coast, where monitoring initiatives are easier to deploy and often already ongoing (manatee or seabird colony census, etc.). Indeed, the use of marine habitats by seabirds, and in particular, their foraging hotspots that could interact with fisheries, remains largely unknown in most of the Caribbean. As well, all the territories of the region share the presence of seabirds and “pelagic” marine mammals, but that is not the case for “very coastal” and estuarine species such as manatees, Sotalia and Inia.

During the in-person round table, the participants had then a long discussion about the pros and cons of the different designs, and all agreed on an intermediate solution. They wish to have a transect design but with more loose transect lines so they can cover a larger part of the territory. This will allow to cover habitats more homogeneously, to calculate densities, and also, to be able to replicate the survey by following the same track, which was a very important aspect for participants. They also thought that bird tagging remained an important thing to do if the budget allows it. The discussion within the online round table did not reach such compromise.

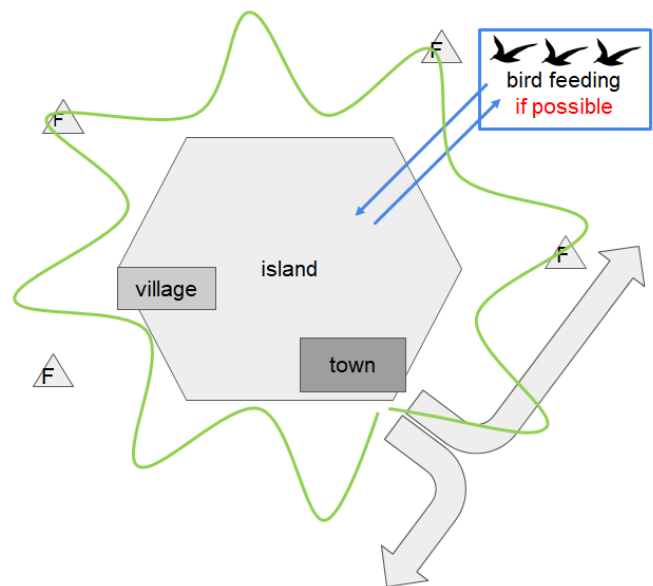


Figure 4. Intermediate solution designed by the in-person participants.

Based on these results, the survey design chosen for phase 2 will favour:

- ▷ a boat survey featured by:
 - > an effort covering large areas with relatively low data resolution, to get an overview of the distribution of species in the territories rather than focusing on specific small areas (such as the traffic lane in the zigzag example);
 - > a designed boat track with spaced transect lines allowing to cover homogeneously the habitats, to calculate densities and to be replicated, and adapted to local weather conditions;
- ▷ a bird tagging component if the budget allows it.



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Drawing priority areas to survey

This activity encouraged the participants to draw the areas of their territory that they considered as survey priorities. They were given maps together with area description forms, which contained fields relative to the criteria previously selected by the working group for rating the different areas submitted. Participants had one rule to follow: remain in the 30 NM footprint around the island, that corresponds to approximately six hours of navigation from the coast for a five knots speed.

An example of drawing and description form is provided below.

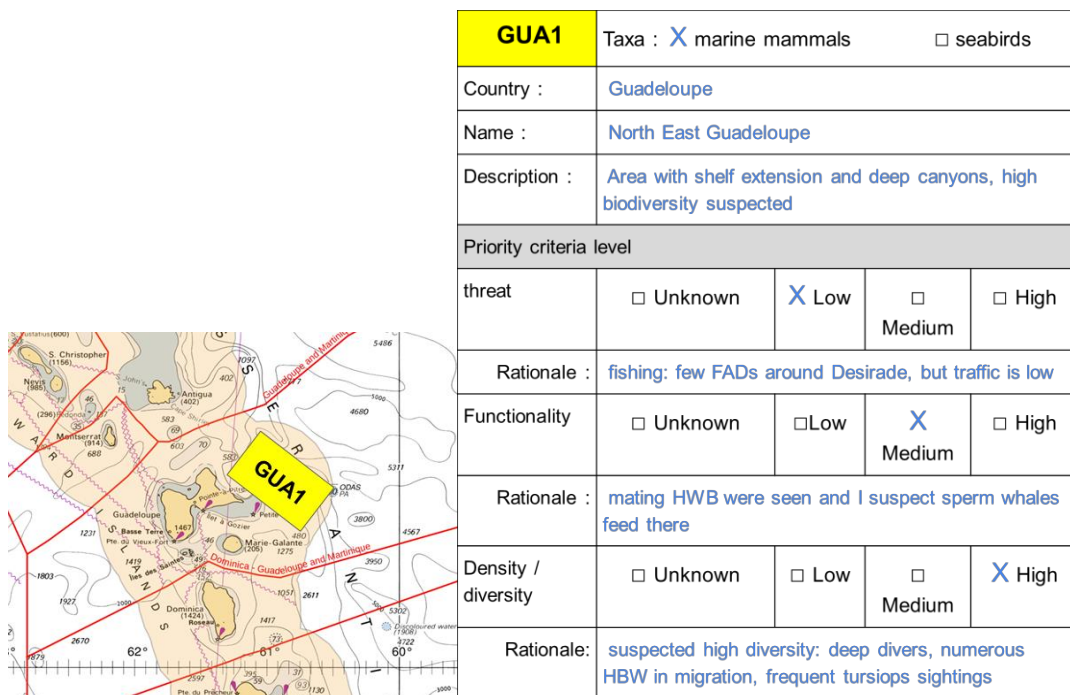


Figure 5. Example of a priority area and its description.

In total, participants shaped and described 29 areas in eleven countries or territories: The Bahamas, Puerto Rico, US Virgin Islands, British Virgin Islands, Jamaica, St. Kitts and Nevis, ABC islands (Aruba, Curacao and Bonaire), Venezuela, Guyana, Suriname and French Guiana. This map and description form will be shared with marine mammal and seabird experts from the territories that were not represented during the workshop, in order to get a comprehensive list of areas for the CAMAC footprint. Once completed, the areas will be prioritized according to the criteria previously defined by the working group.

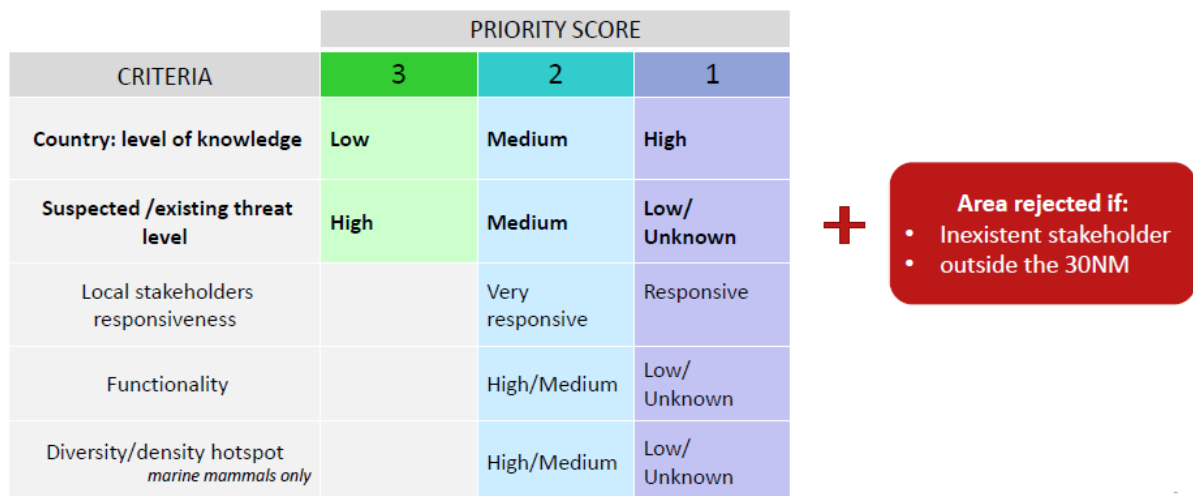


Figure 6. Prioritization framework for areas to survey with the boat campaign

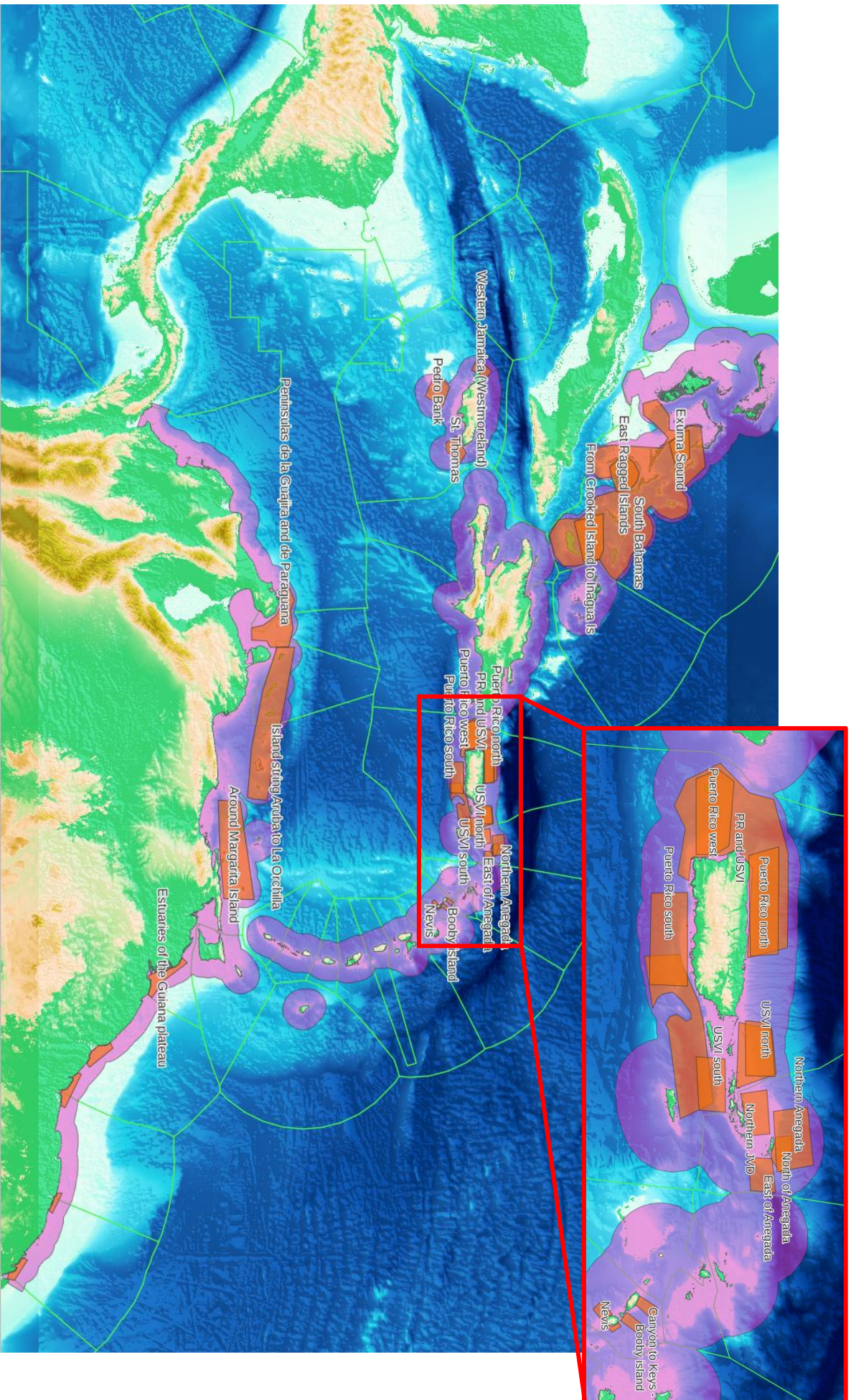


Figure 7. Map of the priority areas drawn during the Nov 4 workshop. The purple footprint represents the limits of potential areas to conduct campaigns.

Round table “enhance knowledge on elasmobranchs”

A total of 14 participants attended this round table, facilitated by Irene Kingma (Dutch Elasmobranch Society) and Tazio Bervoets (Ocean Future Foundation).

This round table fed into the work on an Elasmobranch (shark and ray) conservation and Action Plan for the Wider Caribbean with focus on the CAMAC area under WP4 of the CAMAC project. The development of the Action Plan consisted of two stages. In the 1st stage a gap analysis was carried out. In the 2nd phase regional shark and conservation experts were asked to help formulate possible actions to address the knowledge and conservation gaps identified in the 1st phase. The final part of the work on the Action Plan consisted of 4 round table sessions in which experts were asked to assign priorities to the actions formulated.

The first two sessions were held online in the week of October 30th. During the CAMAC workshop the final two round table sessions were held, one online and one in person.

During each of the round table sessions, the proposed actions were discussed in detail after which the participants had the opportunity to comment on the actions. Afterwards they were asked to assign priorities for future work in a spreadsheet with all the actions. The final table with prioritized actions will be presented in the Action Plan to be published soon.



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IV. Perspectives

The workshop successfully completed its objectives as the various round-table activities and discussions allowed a thorough consultation with participants to refine the protocols for phase 2. Based on those results, the CAMAC team will validate the final recommendations and workplans that will be showcased among the project reports to be published in December 2023/January 2024 on the project's websites (<https://sanctuaire-agoa.fr/editorial/camac-0> and <https://www.car-spaw-rac.org/?CAMAC-1363>). In parallel, those workplans and associated budget will be used to complete the CAMAC phase 2 proposal that will be submitted to INTERREG during the next call for projects in early 2024.

Overall, partners shared positive feedback regarding the CAMAC activities they participated in this year and about the workshop. Through the workshop and the conference, the partners from the Wider Caribbean Region had the opportunity to deepen contacts, share their own experience, and to collectively reflect, announcing a fruitful continuation of CAMAC actions.



V. Appendix 1: workshop program



Saturday, 4th of November 2023

8:30am – 5:30pm *Eastern Standard Time (EST), GMT/UTC-4*

Flamingo room - Comfort Suites Paradise Island

8:30am Welcome coffee

9:00am – 10:30am Presentation Session 1
Chair: Jamie Aquino, Haiti Ocean Project

Hybrid

Speaker	Presentation
Secrétariat conjoint INTERREG Caraïbe, Région Guadeloupe	Presentation of the INTERREG program
Géraldine Conrout, SPAW RAC	Conservation of Megafauna in the framework of the SPAW protocol
Magali Combes, Agoa Sanctuary	Overview of the CAMAC project
Claire Pusineri, SPAW RAC	Outputs of WP1, Interaction with fisheries
Ellen Hines, San Francisco State University	The Bycatch Risk Assessment (ByRA) toolbox
Michel Nalovic, fishingcleaner.com	Deploying the CFR approach at a coherent scale, a prim opportunity for megafauna bycatch mitigation in the lower Caribbean

10:30am – 11:00am Coffee break.

11:00am – 12:30pm Presentation Session 2
Chair: Yvan Satgé, Clemson University

Hybrid

Speaker	Presentation
Claire Pusineri, SPAW RAC	Outputs of WP2, Stranding networks
Gabriela Hernandez, SENASA	Presentation of the training toolkit for marine mammal stranding response
Emma Neave-Webb, IWC	Outputs of marine mammal stranding training workshops
Magali Combes, Agoa Sanctuary	Outputs of WP4, enhance knowledge on marine mammals and seabirds
Rocio Prieto, Counting Whales	The importance of survey design to estimate population abundance
Irene Kingma, NEV	Outputs of WP4, enhance knowledge on elasmobranchs

12:30pm – 2:00pm Lunch break



The CAMAC project is co-financed by the Interreg Caribbean program under the European Regional Development Fund.

2:30pm – 3:30pm Round tables Session 1
Moderators: Jérôme Couvat, Agoa Sanctuary for online sessions and Géraldine Conruyt, SPAW RAC for in person sessions.

Work package	Objective	Facilitator
WP1, Interaction with fisheries	Discuss protocols and priority areas for phase II	Claire Pusineri, SPAW RAC
WP4, enhance knowledge on marine mammals and seabirds	Discuss proposal and priority areas for phase II	Magali Combes, Agoa Sanctuary

simultaneous

In person

Work package	Objective	Facilitator
WP2, stranding networks	Prioritize actions to be implemented during phase II and lessons learned from phase I	Kimberly Stewart, WIDECAST
WP4, enhance knowledge on elasmobranchs	Prioritize actions to be implemented during phase II	Irene Kingma, NEV

simultaneous

Online

3:30pm – 4:00pm Coffee break

4:00pm – 5:00pm Round tables Session 2
Moderators: Jérôme Couvat, Agoa Sanctuary for online sessions and Géraldine Conruyt, SPAW RAC for in person sessions.

Work package	Objective	Facilitator
WP2, stranding networks	Prioritize actions to be implemented during phase II and lessons learned from phase I	Gabriela Hernandez, SENASA
WP4, enhance knowledge on elasmobranchs	Prioritize actions to be implemented during phase II	Irene Kingma, NEV

simultaneous

In person

Work package	Objective	Facilitator
WP1, Interaction with fisheries	Discuss protocols and priority areas for phase II	Claire Pusineri, SPAW RAC
WP4, enhance knowledge on marine mammals and seabirds	Discuss proposal and priority areas for phase II	Magali Combes, Agoa Sanctuary

simultaneous

Online

5:00pm – 5:30pm Closing session

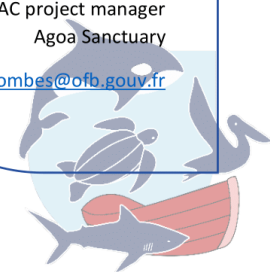
6:30pm – 8:00pm Dinner

Contact

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VI. Appendix 2: workshop attendees list

Name	Organization	Country or territory	Attendance
Alton Bertie	Beyond the reef	British Virgin Islands	Virtual
Andrew Brownlow	IWC / Univ. of Glasgow	UK	In-Person
Ann Sutton	BirdsCaribbean	Jamaica	Virtual
Autumn Zwiernik	University of Michigan, School for Field Studies	USA	In-Person
Cathy Bacon	HDR Inc.	USA	Virtual
Celia Galvani	Secretariat Conjoint INTERREG Caraibes	Guadeloupe	Virtual
Charlotte Dunn	Bahamas Marine Mammal Research Organisation	Bahamas	In-Person
Christine O'Sullivan	University of Technology	Jamaica	Virtual
Cleeford Joseph	Haiti Ocean Project	Haiti	In-Person
Courtney Vail	Lightkeepers Foundation	USA	Virtual
David Mahabir	Ministry of Agriculture, Land and Fisheries, Forestry division, Wildlife Section	Trinidad and Tobago	Virtual
Diane Claridge	Bahamas Marine Mammal Research Organisation	Bahamas	Virtual
Dilcia Gabriela Morales Benavides	Escuela de Ciencias Aplicadas del Mar (Universidad de Oriente), y Centro Nacional de Investigación de Pesca y Acuicultura (CENIPA)	Venezuela	Virtual
Ellen Hines	Estuary & Ocean Science Center, San Francisco State University	USA	In-Person
Emma Neave-Webb	IWC	UK	In-Person
Francis Staub	Ocean Governance	UK	In-Person
Francklin Barbier	Haiti Ocean Project	Haiti	In-Person
Grisel Rodriguez Ferrer	Department of Natural and Environmental Resources	Puerto Rico	Virtual
Héloïse Frouin-Mouy	UM (CIMAS) - NOAA	USA	Virtual

Table continued.

Name	Organization	Country or territory	Attendance
Irene Kingma	Dutch Elasmobranch Society	Netherlands	In-Person
Jaime Bolanos-Jiménez	Caribbean-Wide Orca Project (CWOP), SEA VIDA	Colombia-Venezuela	In-Person
Jamie Aquino	Haiti Ocean Project	Haiti	In-Person
Jean Luc Jung	MNHN	France	Virtual
Jeffrey Bernus	Caribbean Cetacean Society	Martinique	Virtual
Jennifer Wright	NOAA NCCOS	USA	In-Person
Jérôme Baudrier	Ifremer	Martinique	In-Person
Jonathan Cayet		France	Virtual
Karina Esther Hierro Santos	Acuario Nacional de Santo Domingo	Dominican Republic	Virtual
Kate Charles	Ocean Spirits	Grenada	Virtual
Katharine Hart	Department of the Environment and Maritime Affairs	Turks and Caicos	Virtual
Kelly Kingon	Centre for Maritime and Ocean Studies, University of Trinidad and Tobago / CHAPO	Trinidad and Tobago	In-Person
Kimberly Stewart	Wider Caribbean Sea Turtle Conservation Network (WIDECAST)	St. Kitts and Nevis	Virtual
Léa Dupont	Office français de la biodiversité	French Guiana	Virtual
Maria Gabriela Hernandez Mora	Servicio Nacional de Salud Animal (SENASA) de Costa Rica / IWC	Costa Rica	In-Person
Michel (Tony) Nalovic	fishingcleaner.com	French Guiana	In-Person
Monique S. Pool	Green Heritage Fund Suriname	Suriname	Virtual
Monique van de Water	WWF-NL	Bonaire	In-Person
Natascha Wosnick	The Bahamas Cape Eleuthera Institute	Bahamas	Virtual
Nicolas Paranthoen	Office National des Forets	Guadeloupe	Virtual
Nicole Fernandez	National Aquarium of the Dominican Republic	Dominican Republic	In-Person

Table continued.

Name	Organization	Country or territory	Attendance
Océane Beaufort	Kap Natirel	Guadeloupe	In-Person
Paddy Walker	Dutch Elasmobranch Society	Netherlands	Virtual
Rachel Plekaniec	FUNDEMAR	Dominican Republic	Virtual
Raven Hoflund	The Turtle Project	St. Vincent and the Grenadines	Virtual
Rocio Gonzalez Barrientos	Texas A&M Veterinary Medical Diagnostic Laboratory	Costa Rica	Virtual
Rocio Prieto González	Counting Whales	Martinique	In-Person
Russell Fielding	Coastal Carolina University	USA	In-Person
Ruth Ewing	NOAA	USA	Virtual
Stacey Mac Donald	WWF-NL	Dutch Caribbean	Virtual
Tadzio Bervoets	Ocean Future Foundation	Caribbean-Wide	In-Person
Yvan Satgé	BirdsCaribbean	USA	In-Person
Yvette DieiOuadi	COPACO /WECAFC - FAO	Barbados	Virtual

With the participation of our partners



~ Counting Whales ~



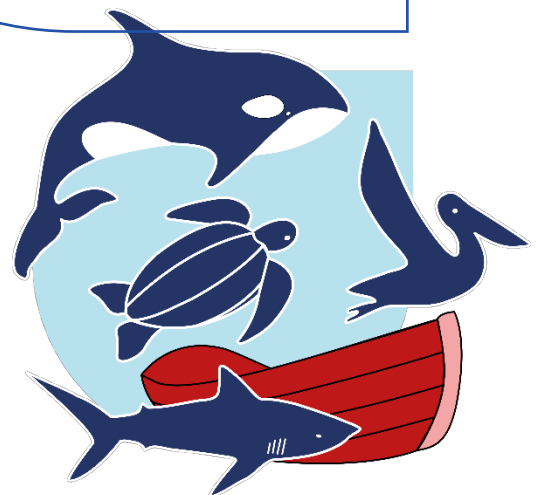
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