

CARI'MAM scientific survey  
2021

Final report

**Agoa Sanctuary**  
December 2021

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# I. Introduction

## I.1 The CARI'MAM project

More than 30 species of marine mammals inhabit the waters of the Caribbean, which makes it a world hotspot. These highly mobile species are known to move between different Caribbean territories and beyond. Between 2018 and 2021, the CARI'MAM (Caribbean Marine Mammal Preservation Network) project was carried out to develop a network and foster collaboration between Caribbean actors involved in the conservation of marine mammals in the region. Co-funded by the INTERREG Caribbean Program from the European Union, it aimed at providing territories with various socio-economic, legislative and regulatory situations the opportunity to join forces to:

- Improve knowledge on the presence and movements of cetaceans in the Wider Caribbean Region (WCR);
- Develop MPAs' efficiency in managing marine mammals and their habitats within their borders.

This project was coordinated by four organisations:

- SPAW-RAC, the Regional Activity Center for the Specially Protected Areas and Wildlife from the Cartagena Convention;
- The St Martin Natural Reserve;
- The Grand Connetable Island Natural Reserve in French Guyana;
- The Agoa Sanctuary, which is the CARI'MAM project leader.

The CARI'MAM network grew all along the project, gathering more than 50 organisations from about 30 territories from Bermuda to French Guyana, Barbados to Jamaica and Central America.

The main objectives of the CARI'MAM project were to:

- Create a network of MPAs dedicated to marine mammals in the WCR and beyond;
- Building capacities and knowledge among MPA managers;
- Develop common management and evaluation tools;
- Supporting the development of a sustainable whale watching industry in the WCR and beyond;

Specifically, nine Work Packages were identified to reach those objectives. Work Package 2 (WP2), intitled "Data acquisition" aimed at acquiring knowledge on marine mammals and testing field methodology through several scientific campaigns at sea.

Therefore, two scientific campaigns were organized in 2021, covering the waters of Anguilla, St Martin, St Barthelemy, Saba, Statia, Guadeloupe and Martinique. The objective of this survey was to evaluate cetacean abundance and distribution during the dry season and the wet season respectively. This report presents the methodology and final results of this survey.

## II. Material and Methods

### II.1 Study area

The study was divided in two blocks: the Northern Islands, encompassing waters around Anguilla, St Martin, St Barthelemy, Saba and Statia and the Southern Islands covering Martinique and Guadeloupe (see Figure 2 and Figure 3).

### II.2 Period

Two campaigns took place to collect data in 2021 during the dry season and the wet season, as shown in Table 1 below. The dry season campaign lasted for 21 days, whilst the wet season campaign lasted for 48 days. During the dry season, both blocks were surveyed simultaneously by two different boats, whereas in the wet season areas were covered successively by the same research vessel. Hence the difference in the duration of the campaigns.

**Table 1. CARI'MAM campaigns survey periods**

Area	Dates	
	Dry season	Wet season
Northern Islands	9 April – 27 April	22 Sept. – 12 Oct.
Southern Islands	13 April – 2 May	19 Oct. – 9 Nov.

### II.3 Platform



**Figure 1. The crew on-board the catamaran in April**

During the dry season, the observation platforms used for the campaigns were catamarans: a Lagoon 39 in the Northern islands and a Catana 42 in the Southern Islands. This boat type was chosen because it is suited for navigation in the Caribbean as well as for boarding a crew of eight people. The roof is 3m high above sea surface which allows an observation distance of 4 to 5 NM on the horizon. It also offers a 180° observation platform at the front, suitable for the implementation of the protocol (Figure 1).

During the wet season, an 18m single hull sailing boat was preferred. It offered the same observation possibilities with better navigation properties, which made it more suitable for offshore waters.

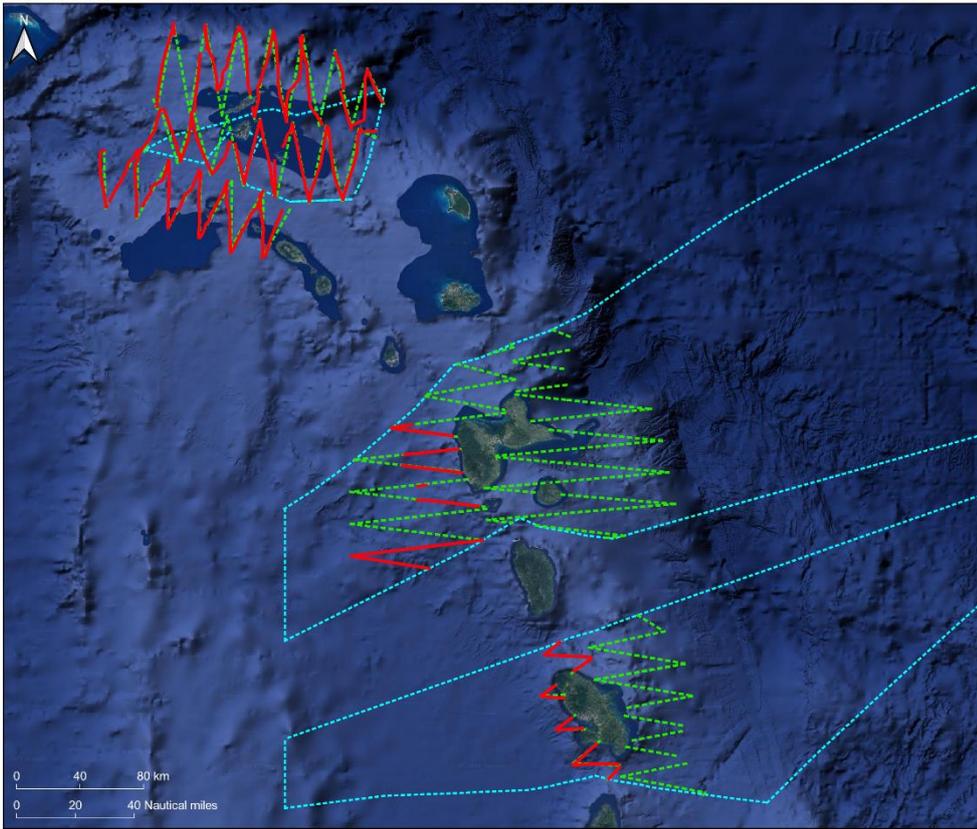
### II.4 Protocol

#### Survey Design

Survey design was carried out following the Distance Sampling methodology. Distance Sampling allows for the robust estimates of abundance and distribution in a defined area, provided that several assumptions are respected, especially at the design stage. A good survey design ensures equal coverage probability in the whole survey area, among others. Thus, transects have to be defined carefully and sometimes need to be adjusted so that theoretical requirements match field reality.

A first survey design was produced for the dry season campaign, and was adjusted for the wet season campaign following feedbacks from April (Figure 2 and Figure 3). These were calculated from the total estimated budget for this study, considering EEZ (exclusive economic zone) limits and bathymetry gradients. The total amount of theoretical effort is presented in Table 2.

**CARI'MAM campaign of April 2021**  
**Theoretical transects and transects in effort**

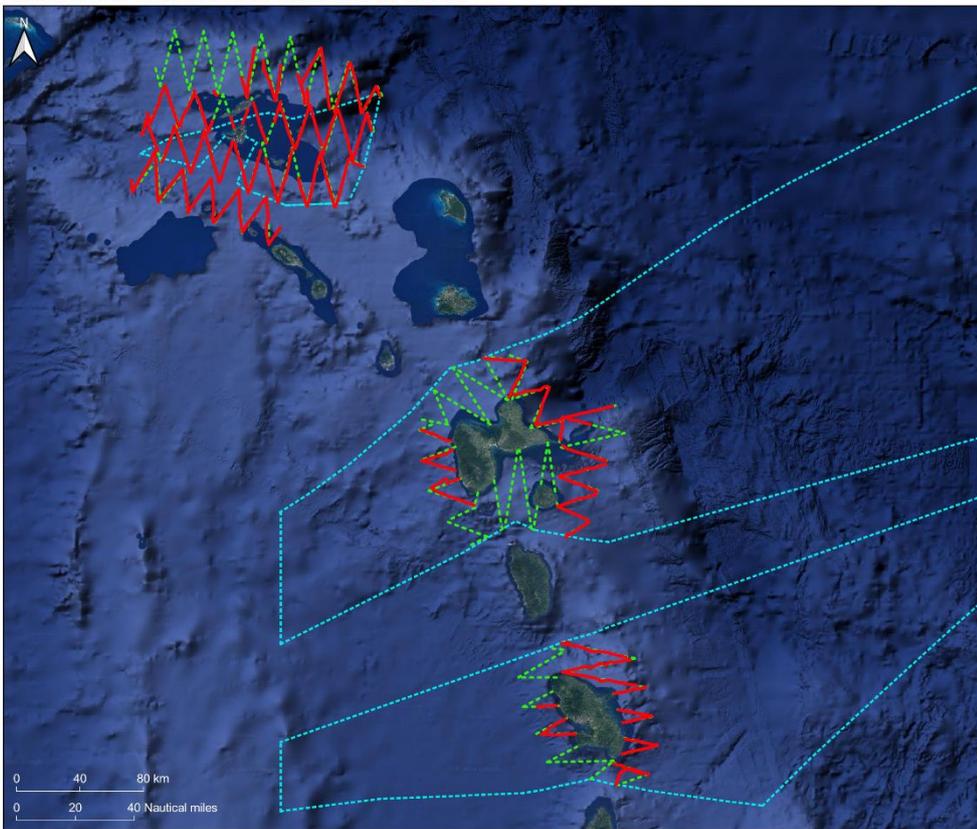


- Legend**
- Agoa Sanctuary
  - Theoretical transects
  - Transects in effort

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 Sources des données : CARIMAM, SHOM  
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Figure 2. Study area, theoretical transects and covered effort for the dry season campaign.

**CARI'MAM campaign of september-november 2021**  
**Theoretical transects and transects in effort**



- Legend**
- Agoa Sanctuary
  - Theoretical transects
  - Transects in effort

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Figure 3. Study area, theoretical transects and covered effort for the wet season campaign.

**Table 2. Theoretical transect lengths per area and per season**

Area	Total transect length in km		
	Dry season	Wet season	Total
Northern Islands	1,851	1,806	<b>3,657</b>
Southern Islands	2,594	1,542	<b>4,136</b>
<b>Total</b>	<b>4,445</b>	<b>3,348</b>	<b>7,793</b>

**Visual observation**

Along these transects, visual observations were recorded. The observation team consisted of four persons: a port side observer, a starboard observer, a person responsible for inputting the data and a person on a break. Rotations took place every hour so that each continuous observation time is a maximum of 2 hours per person. Observers surveyed between 0° and 90°, and focus their efforts on the front of the boat as far as was reasonable to detect animals. The observation effort was constant from sunrise to sunset.

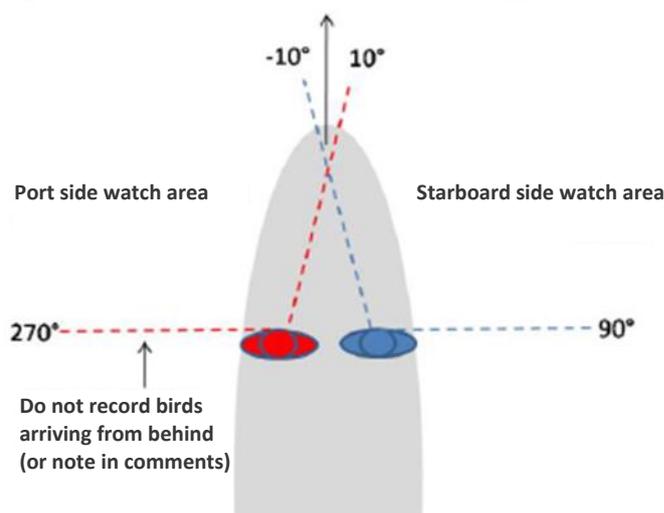


Figure 1: Schematic proposal of the sea observation protocol from the report “MEGASCOPE Programme – Pelagis”

The skipper followed the predefined transects, maintaining an average speed of 6-7 knots. The vessel only went out at sea on a Beaufort wind force scale <4. However, if the weather deteriorated along the way, it was recommended to continue observing beyond Beaufort 4, as long as this remained acceptable to observers.

Since photo-identification was not a major objective for this mission, observation of a marine mammal did not justify leaving the transect line. The transect was monitored and held in order not to bias data collection. In addition to marine mammals, all other bird and marine megafauna observations were collected, as well as sargassum, human activities and marine debris.

**Acoustic observation**

Listening points were carried out at least twice a day, in the morning before the start of the first transect and in the evening at the end of the last transect. Listening lasted for 10 minutes and was recorded for later analysis. During the wet season, an acoustic point was made after each transect, when possible. The start and end times as well as the recording conditions were accurately recorded in the environmental parameters.

### III. Results

#### III.1 Effort

Details about effort covered during the CARI’MAM campaigns are presented in Table 3 below. Effort coverage was good in the Northern Islands, during the dry season, and a bit lower during the wet season. Strong winds and rough sea conditions impeded data collection, especially in the North West around Sombrero Island. In the Southern Islands, effort very low during the dry season due to bad weather and mechanical issues (see Discussion). During the wet season, effort is average, also due to strong winds and rough seas.

**Table 3. Theoretical versus covered effort per area and per season.**

Area	Theoretical effort in km		Covered effort in km		Proportion	
	Dry season	Wet season	Dry season	Wet season	Dry season	Wet season
Northern Islands	1,851	1,806	1,623	1,378	88 %	76 %
Southern Islands	2,594	1,542	462	769	18 %	50 %
<b>Total</b>	<b>4,445</b>	<b>3,348</b>	<b>2,085</b>	<b>2,147</b>	<b>47 %</b>	<b>64 %</b>

#### III.2 Cetaceans

##### Visual observations

In total, 78 observations of cetaceans were made during the whole survey, representing 14 different species and higher taxa and 594 individuals (Table 4). The vast majority of observations were made during the dry season (n=62) and most of these are humpback whale sightings (n=37). Species diversity remains higher during the dry season (11 vs 8). The Atlantic spotted dolphin, the pantropical spotted dolphin, the Fraser’s dolphin and the common bottlenose dolphin were sighted during both campaigns (Figure 4 and Figure 5).

**Table 4. Summary of cetacean observations recorded during both campaigns. Numbers in brackets indicate the number of individuals.**

Species	Dry season	Wet season
Humpback whale ( <i>Megaptera novaeangliae</i> )	37 (58)	-
Dolphin sp.	6 (37)	2 (62)
Common bottlenose dolphin ( <i>Tursiops truncatus</i> )	4 (13)	2 (3)
Atlantic spotted dolphin ( <i>Stenella frontalis</i> )	3 (113)	6 (52)
Large cetacean sp.	3 (3)	-
Short-finned pilot whale ( <i>Globicephala macrorhynchus</i> )	2 (45)	-
Pantropical spotted dolphin ( <i>Stenella attenuata</i> )	2 (26)	2 (65)
Melon-headed whale ( <i>Peponocephala electra</i> )	2 (9)	-
Fraser’s dolphin ( <i>Lagenodelphis hosei</i> )	1 (80)	1 (20)
Dwarf sperm whale ( <i>Kogia sima</i> )	1 (1)	-
Cetacean sp.	1 (1)	-
False killer whale ( <i>Pseudorca crassidens</i> )	-	1 (1)
Cuvier’s beaked whale ( <i>Ziphius cavirostris</i> )	-	1 (4)
Kogia sp.	-	1 (1)
<b>Total</b>	<b>62 (386)</b>	<b>16 (208)</b>

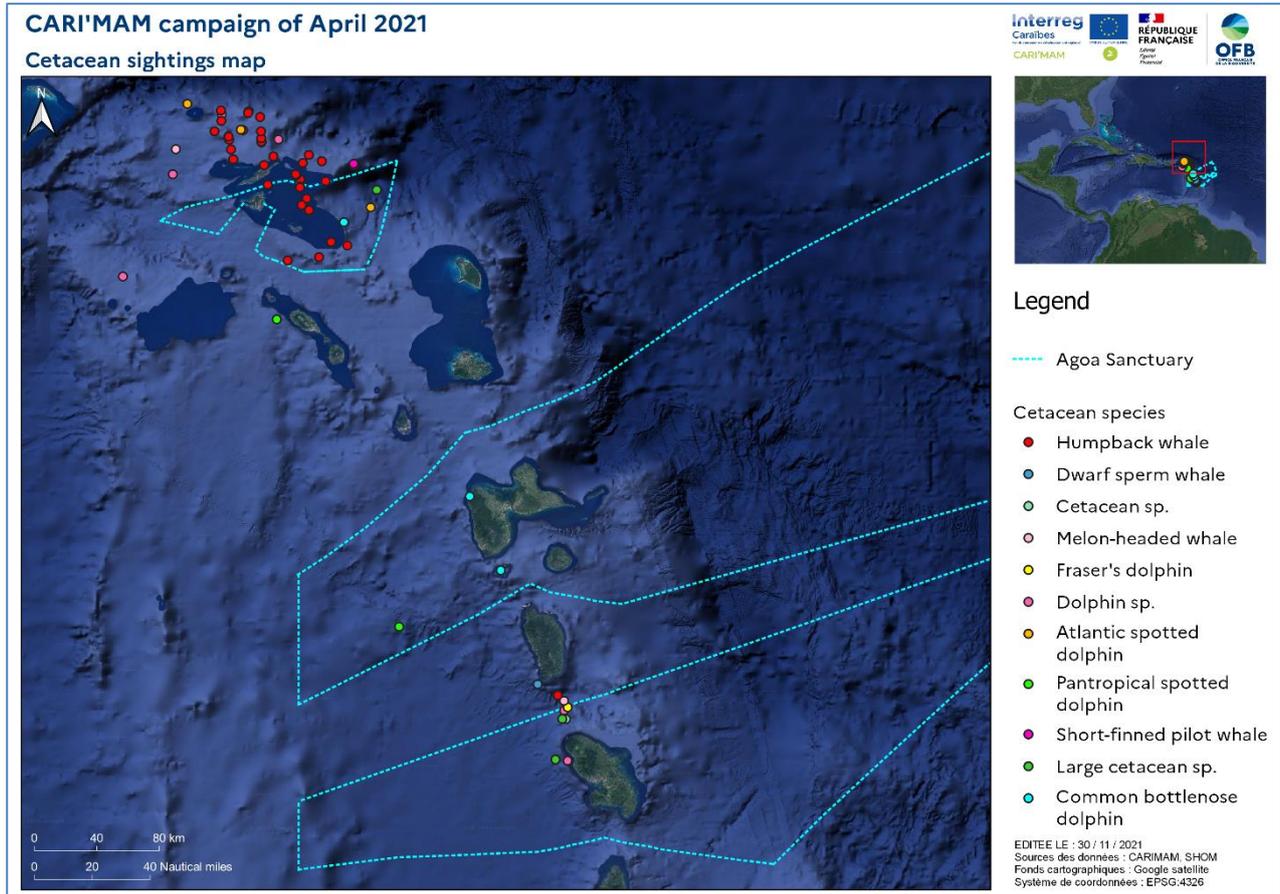


Figure 4. Map of cetacean observations during the dry season campaign.

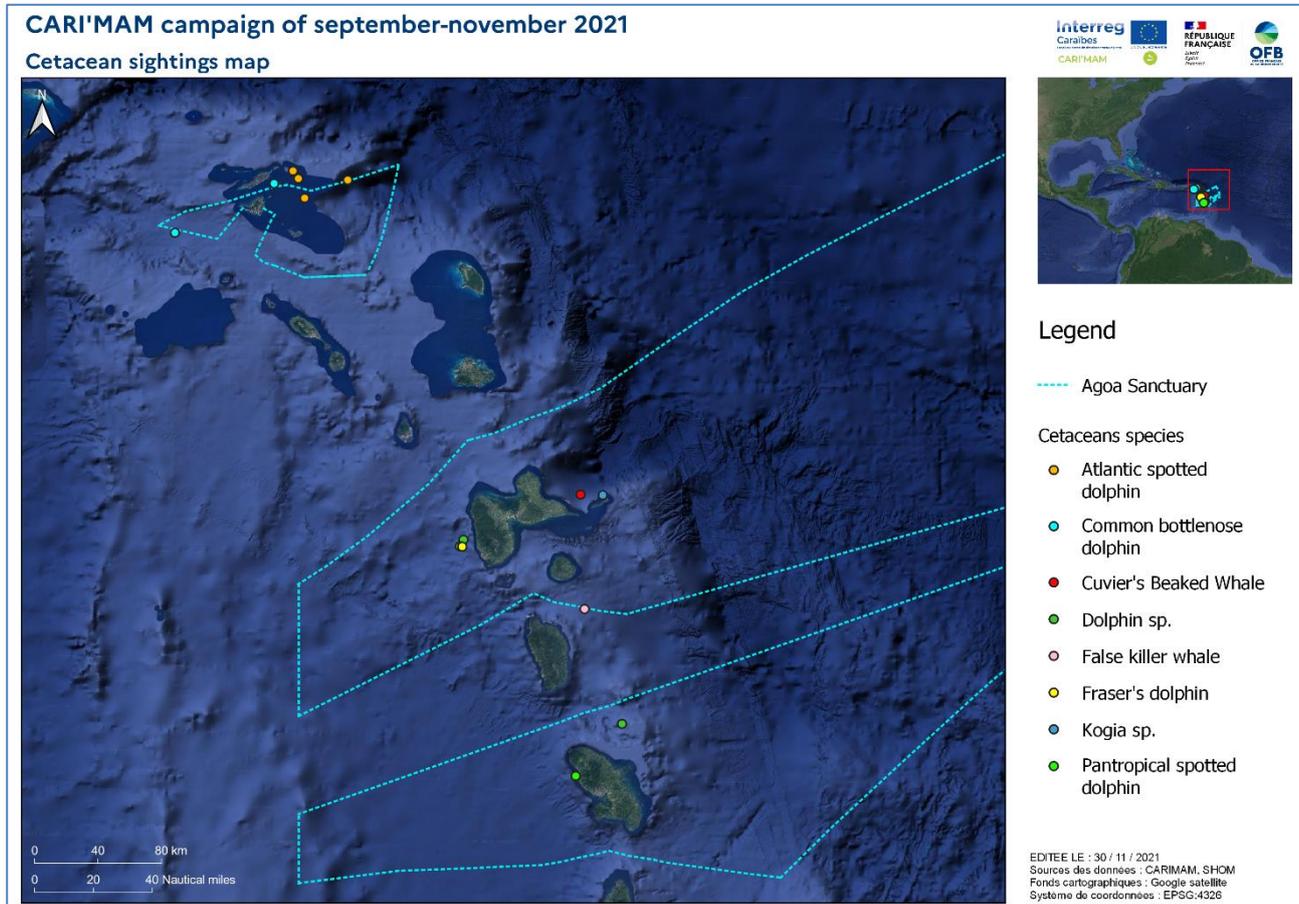


Figure 5. Map of cetacean observations during the wet season campaign.

### Hydroacoustic points

Ninety-five hydroacoustic points were made during the survey, 36 during the dry season and 59 during the wet season (Figure 6 and Figure 7).

During the dry season, 10 out of 36 points recorded humpback whale songs (Table 5). Only one detection of dolphins and pilot whales was made during the wet season.

**Table 5. Positive hydroacoustic points made during the campaign.**

Season	Day	Time	Results	Comments	Other	Duration
Dry season	10/04/2021	19:14:09	Humpback whale	Songs Humpback whale	Sperm whale	15 min
	11/04/2021	05:58:12	Humpback whale	Song	Delphinids	15 min
	11/04/2021	18:49:08	Humpback whale	Many songs		15 min
	12/04/2021	06:27:16	Humpback whale	Multiples Songs		15 min
	12/04/2021	18:30:06	Humpback whale			15 min
	13/04/2021	05:45:58	Humpback whale			15 min
	13/04/2021	16:59:16	Humpback whale			15 min
	14/04/2021	06:02:40	Humpback whale			15 min
	14/04/2021	07:38:36	Humpback whale	Singing in the distance		4 min
14/04/2021	17:48:48	Humpback whale	Away		15 min	
Wet season	26/09/2021	07 :44 :44	Dolphin sp.		Pilot whales	12 min

### III.3 Birds

Birds were the most observed taxon during both campaigns and were observed nearly all along the transects (Figure 8 and Figure 9). In total, 36 bird species or higher taxa were observed, accounting for 1,159 observations and 3,968 individuals (Table 6).

The number of observed species is also higher during the dry season (30 vs 25) and the composition of that diversity changes mildly. Some species regularly sighted during the dry season were little or not observed during the wet season (e.g. Sooty tern, *Onychoprion fuscatus*). Yet, Brown booby (*Sula leucogaster*) and Magnificent frigate bird (*Fregata magnificens*) were among the most commonly observed species during both campaigns.

### III.4 Other marine megafauna

**Table 6. Other species recorded during both campaigns. Numbers in brackets indicate the number of individuals when different from the number of observations.**

Species	Dry season	Wet season
Tuna hunt	5	4
Fish sp.	3 (5)	1 (1)
Tuna sp.	1	1 (1)
Stingray sp.	1 (1)	1 (dead)
Marine turtle sp.	1 (1)	-
Common dolphinfish	-	1 (1)
Shark sp.	-	1 (1)
Green sea turtle	-	1 (1)
Hawksbill sea turtle	-	1 (1)
<b>Total</b>	<b>13</b>	<b>11</b>

Only a few observations of marine megafauna other than cetaceans and birds were recorded during the campaigns (Table 6). The number of individuals were not systematically taken, or was recorded as a range of individuals when exact number was not possible to determine. Tuna hunts were accompanied by many birds, sometimes hundreds of birds, in the dry season.

Observations of marine megafauna in the dry season were almost all located in the Northern islands (Figure 10 and Figure 11), which is likely due to the difference of effort.

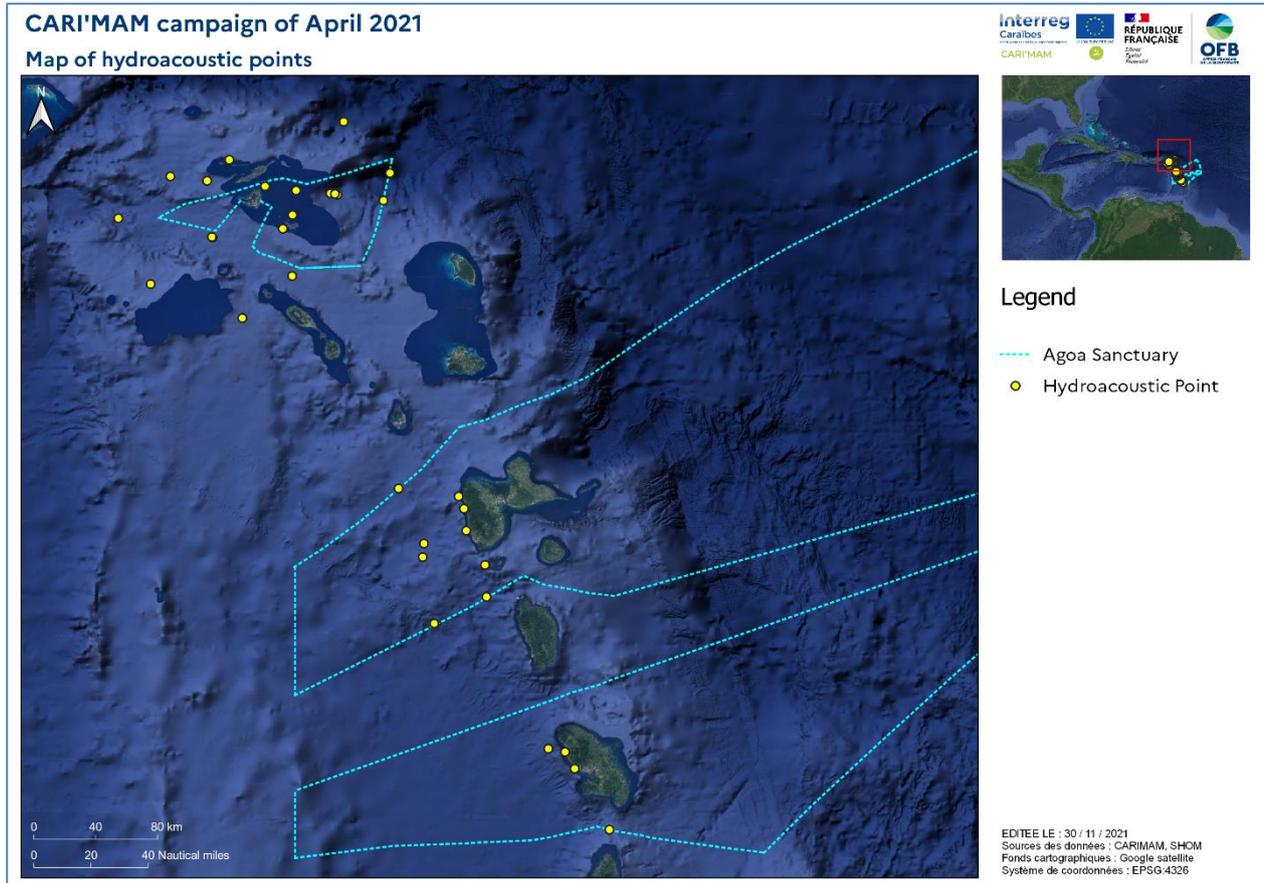


Figure 6. Map of the hydroacoustic points during the dry season campaign.

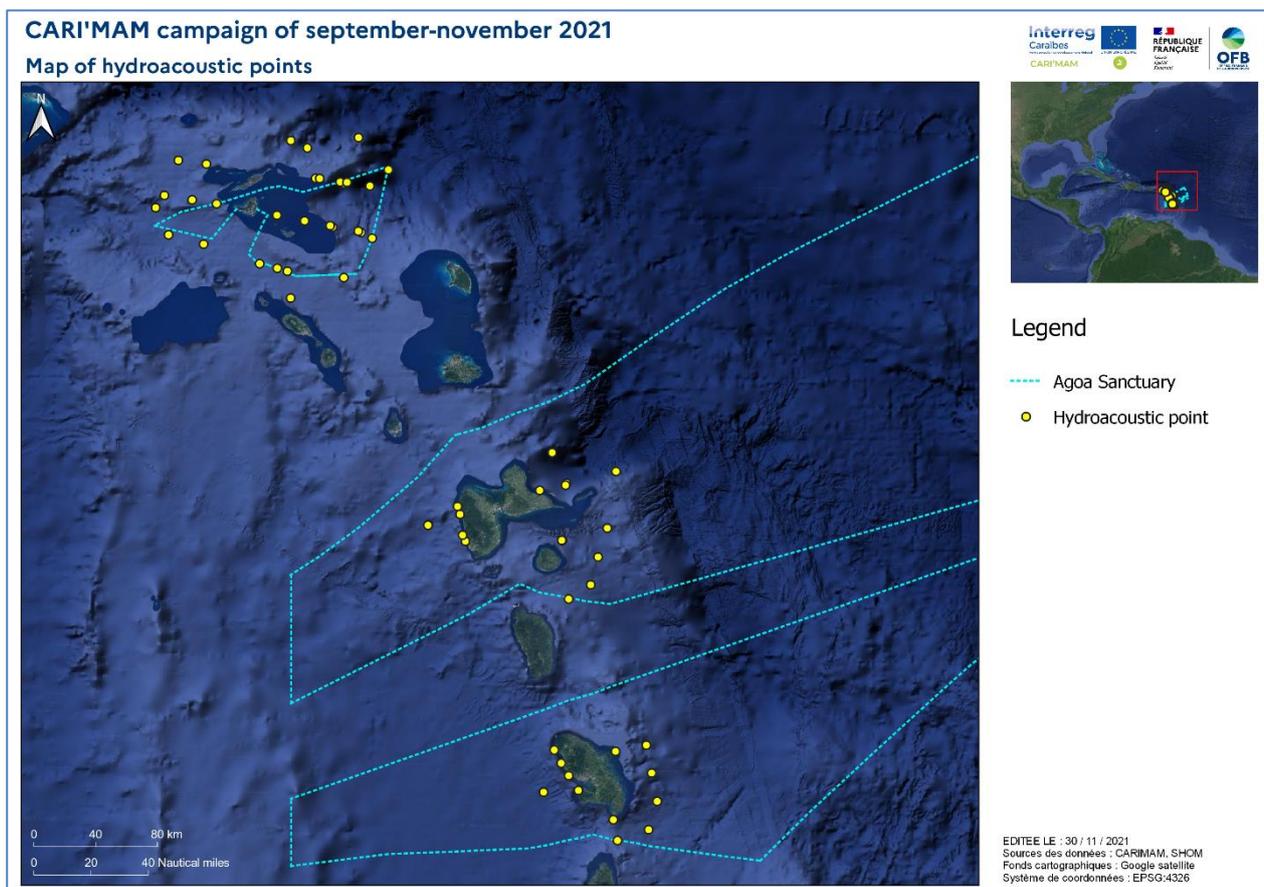


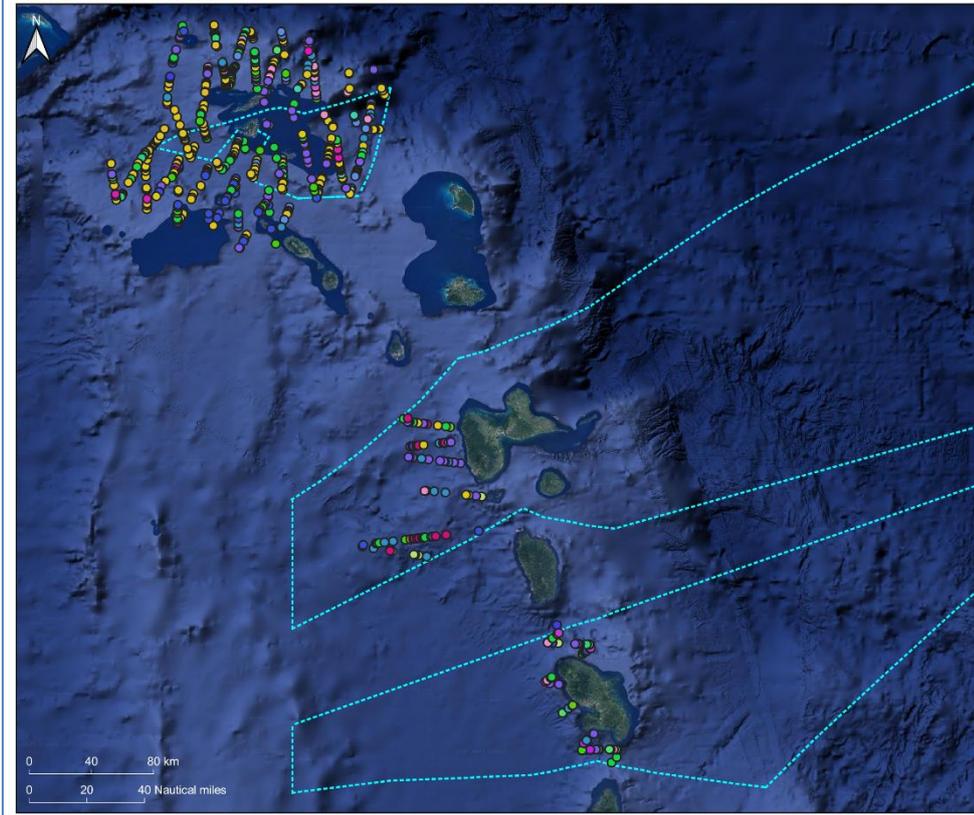
Figure 7. Map of the hydroacoustic points during the wet season.

**Table 7. Number of bird observations and number of individuals per species and per season.**

Group size Species	Dry season		Wet season	
	Number of observations	Number of individuals	Number of observations	Number of individuals
Sooty tern	230	708	-	-
Brown booby	73	1146	208	394
Magnificent frigate bird	70	90	88	114
Bird sp.	46	427	35	68
Red-billed tropicbird	36	154	39	55
Tern sp.	32	114	9	20
Storm petrel sp.	25	46	3	4
Shearwater sp.	24	126	12	14
Royal tern	24	32	16	32
Tropicbird sp.	24	24	6	6
Wilson's storm petrel	23	23	-	-
Masked booby	11	20	6	8
Red-footed booby	10	18	6	6
Brown noddy	9	26	11	25
Booby sp.	8	10	7	13
Laughing gull	5	6	2	2
Bridled tern	2	4	2	2
Skua sp.	2	2	6	8
Least Tern	2	2	4	4
Leach's storm petrel	2	2	-	-
Common tern	1	1	3	8
Thalasseus sp.	1	1	2	101
Sandwich tern	1	1	1	2
Great shearwater	1	1	-	-
Long-tailed jaeger	1	1	-	-
Manx shearwater	1	1	-	-
Osprey	1	1	-	-
Roseate tern	1	1	-	-
Brown pelican	1	1	-	-
White-tailed tropicbird	1	1	-	-
Larus sp.	1	1	-	-
Swallow sp.	-	-	13	40
Charadriiform sp.	-	-	7	18
Greater Yellowlegs	-	-	1	23
Spotted sandpiper	-	-	1	7
Semipalmmed sandpiper	-	-	1	2
Parasitic jaeger	-	-	1	1
<b>Total</b>	<b>669</b>	<b>2991</b>	<b>490</b>	<b>977</b>

### CARI'MAM campaign of April 2021

#### Observations of birds



#### Legend

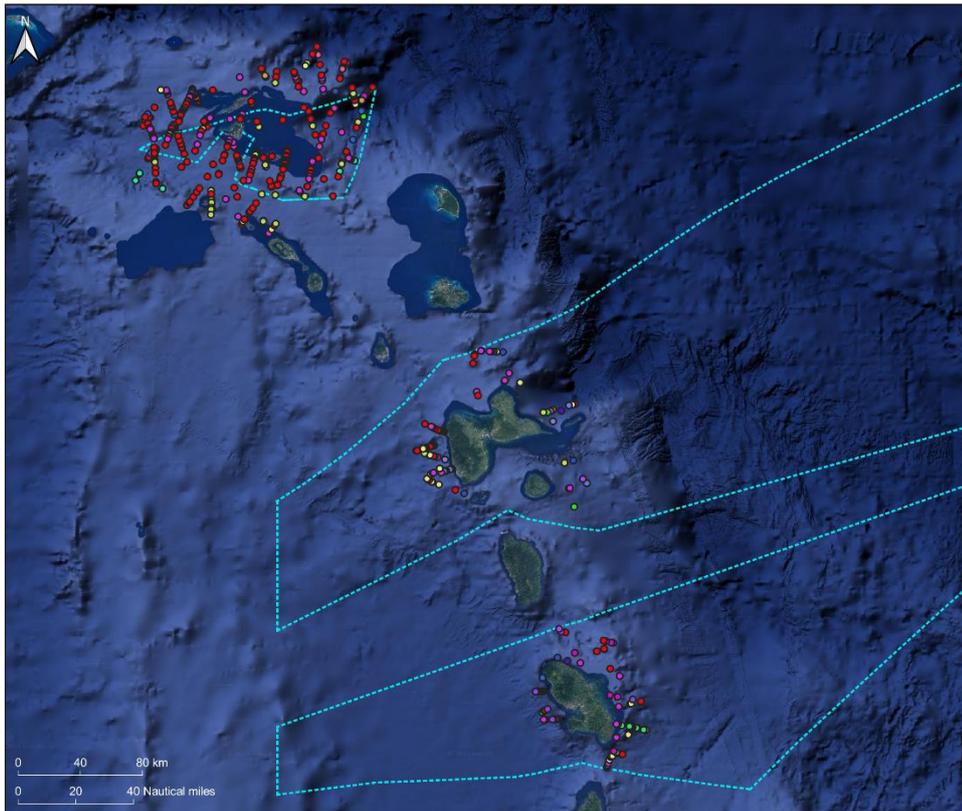
- Agoa Sanctuary
- Bridled tern
- Brown booby
- Brown noddy
- Laughing gull
- Leach's storm petrel
- Least Tern
- Magnificent frigatebird
- Masked booby
- Melon-headed whale
- Red-billed tropicbird
- Red-footed booby
- Royal tern
- Shearwater sp.
- Skua
- Sooty tern
- Storm petrel sp.
- Terns sp.
- Tropicbird sp.
- Undetermined bird
- Undetermined booby
- Wilson's storm petrel

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Figure 8. Map of bird observations during the dry season campaign. For visual purposes, species sighted only once are not represented on the map.

### CARI'MAM campaign of september-november 2021

#### Observations of birds



#### Legend

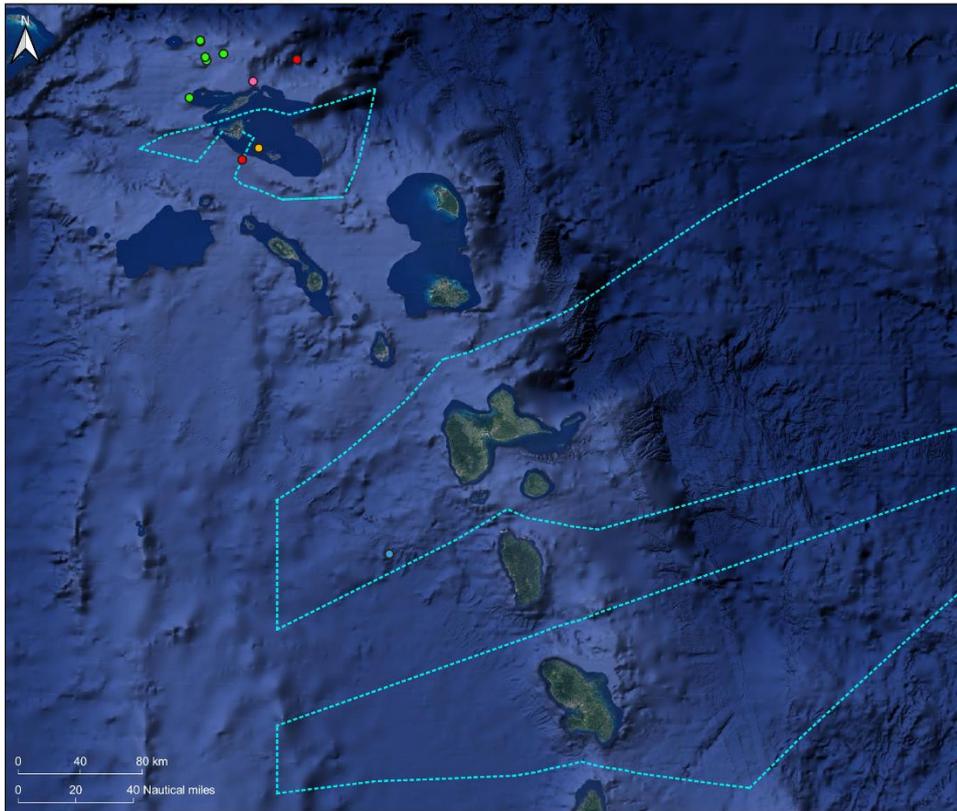
- Agoa Sanctuary
- Birds sp.
- Booby sp.
- Bridled tern
- Brown booby
- Brown noddy
- Charadriiforme sp.
- Common tern
- Laughing gull
- Least tern
- Magnificent frigatebird
- Masked booby
- Red-billed tropicbird
- Red-footed booby
- Royal tern
- Shearwater sp.
- Skua sp.
- Storm petrel sp.
- Swallow sp.
- Tern sp.
- Thalasseus sp.
- Tropicbird sp.

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Figure 9. Map of bird observations during the wet season campaign. For visual purposes, species sighted only once are not represented on the map.

### CARI'MAM campaign of April 2021

#### Observations of marine megafauna



#### Legend

----- Agoa Sanctuary

#### Marine megafauna

##### Fishes

- Fish sp.
- Tuna hunting
- Tuna sp.

##### Sharks and stingrays

- Stingray sp.

##### Marine turtles

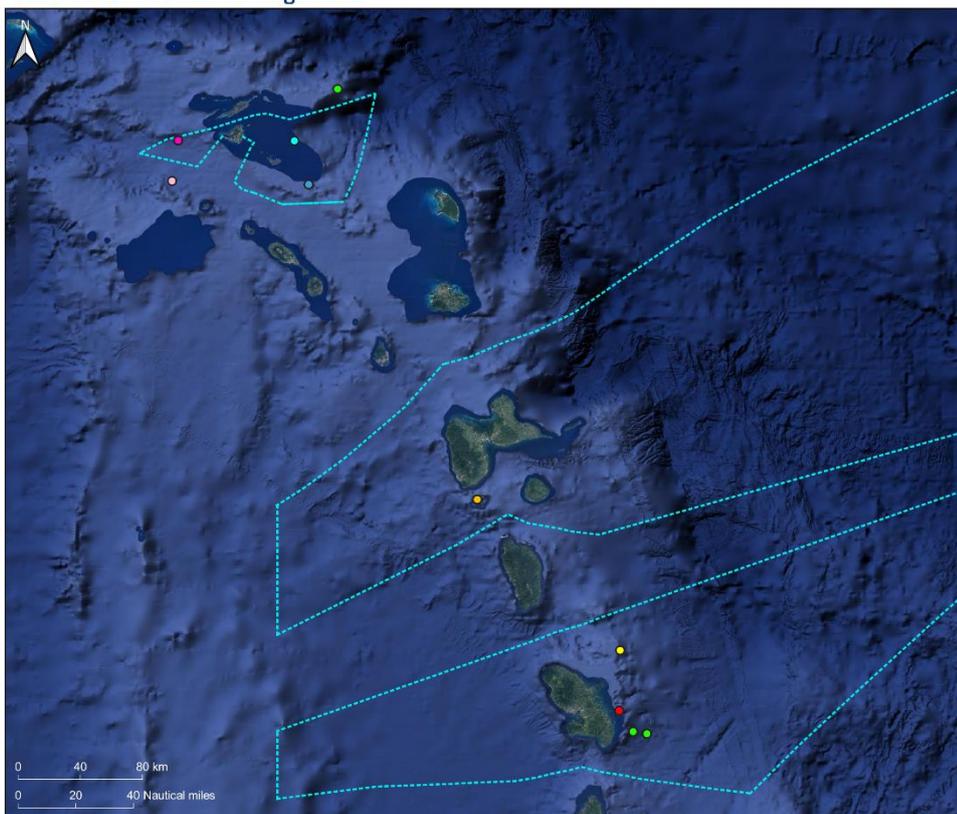
- Marine turtle sp.

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Figure 10. Map of marine megafauna observations during the dry season campaign.

### CARI'MAM campaign of september-november 2021

#### Observations of marine megafauna



#### Legend

----- Agoa Sanctuary

#### Marine megafauna

##### Fishes

- Common dolphinfish
- Fish sp.
- Tuna hunting
- Tuna sp.

##### Sharks and stingrays

- Shark sp.
- Stingray dead sp.

##### Marine turtles

- Green sea turtle
- Hawksbill sea turtle

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Sources des données : CARIMAM, SHOM  
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Figure 11. Map of marine megafauna observations during the wet season campaign.

### III.5 Algae

All observations of algae were identified as Sargassum, representing 155 observations. The size of the plate was noted as “Scattered” when the plate was less than 1m diameter as “Patch” when it was between 1 and 10m diameter, and “Raft” when the diameter of the plate was superior to 10m. During the wet season, “Cord” was added to record when sargassum formed a cord extending over tens or even hundreds of meters (Table 8, Figure 12 and Figure 13).

**Table 8. Number of sargassum formations observed per season.**

Sargassum formation	Dry season	Wet season
Scattered	67	16
Patch	10	14
Raft	12	1
Cord	-	35
<b>Total</b>	<b>89</b>	<b>66</b>

### III.6 Macrowaste

**Table 9. Number and nature of macrowaste recorded per season.**

Macrowaste	Dry season	Wet season
Plastic bottle	12	6
Other polystyrene plastics	6	2
Plastic container	6	1
Buoy	5	8
Plastic	5	1
Polystyrene box	5	1
Metal can	3	-
Mixed	2	4
Crafted wood	2	1
Plastic box	2	-
Object derived from fishing	1	-
Other macrowaste	1	-
Cardboard	1	-
Plastic sheet	-	2
<b>Total</b>	<b>51</b>	<b>26</b>

77 observations of macrowaste were made during both campaigns (Table 9). Macrowaste was encountered both close to shore and offshore. Debris was found on the leeward side, but also on the windward side of the islands (Figure 14 and Figure 15). The vast majority are plastic waste and only a limited number can be directly related to marine activities like fishing.

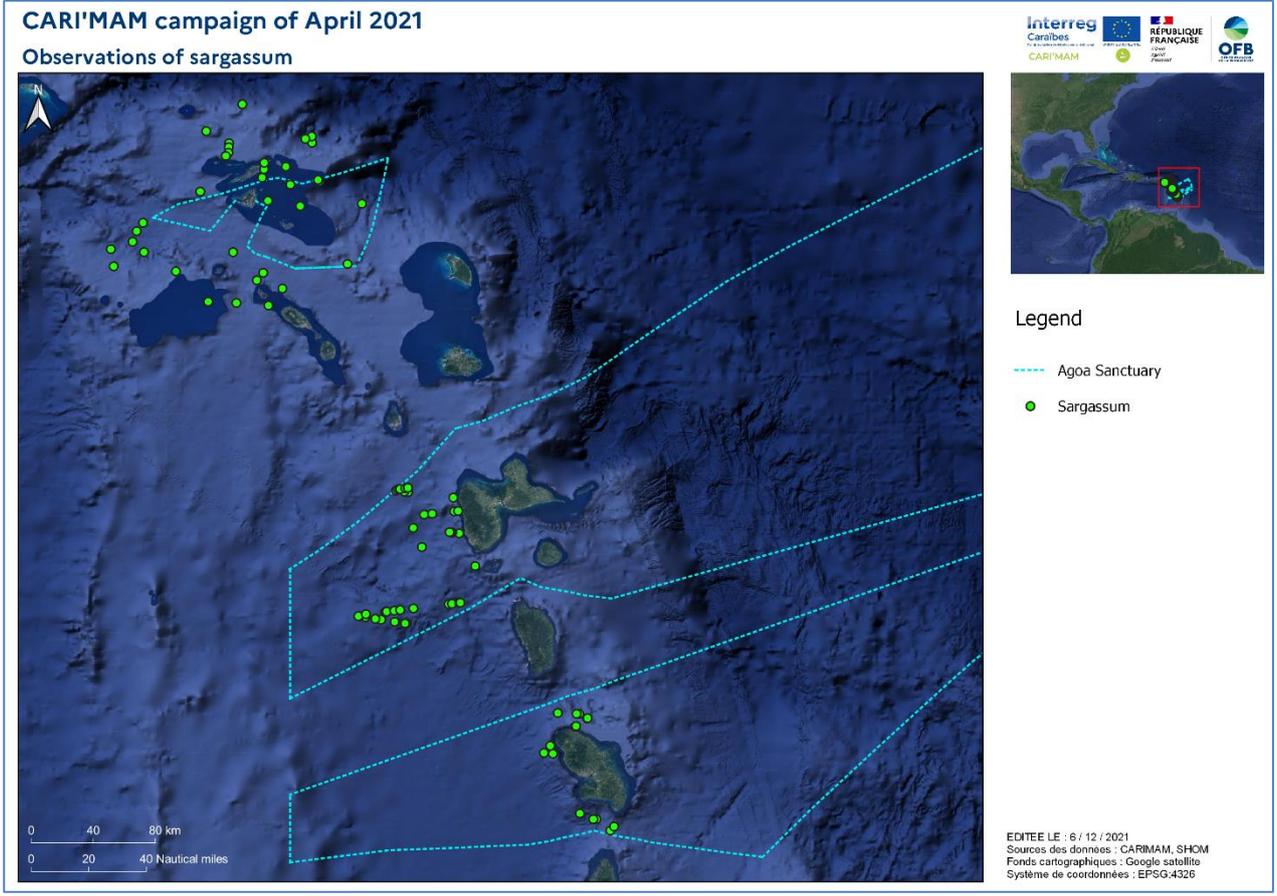


Figure 12. Map of sargassum observations during the dry season campaign.

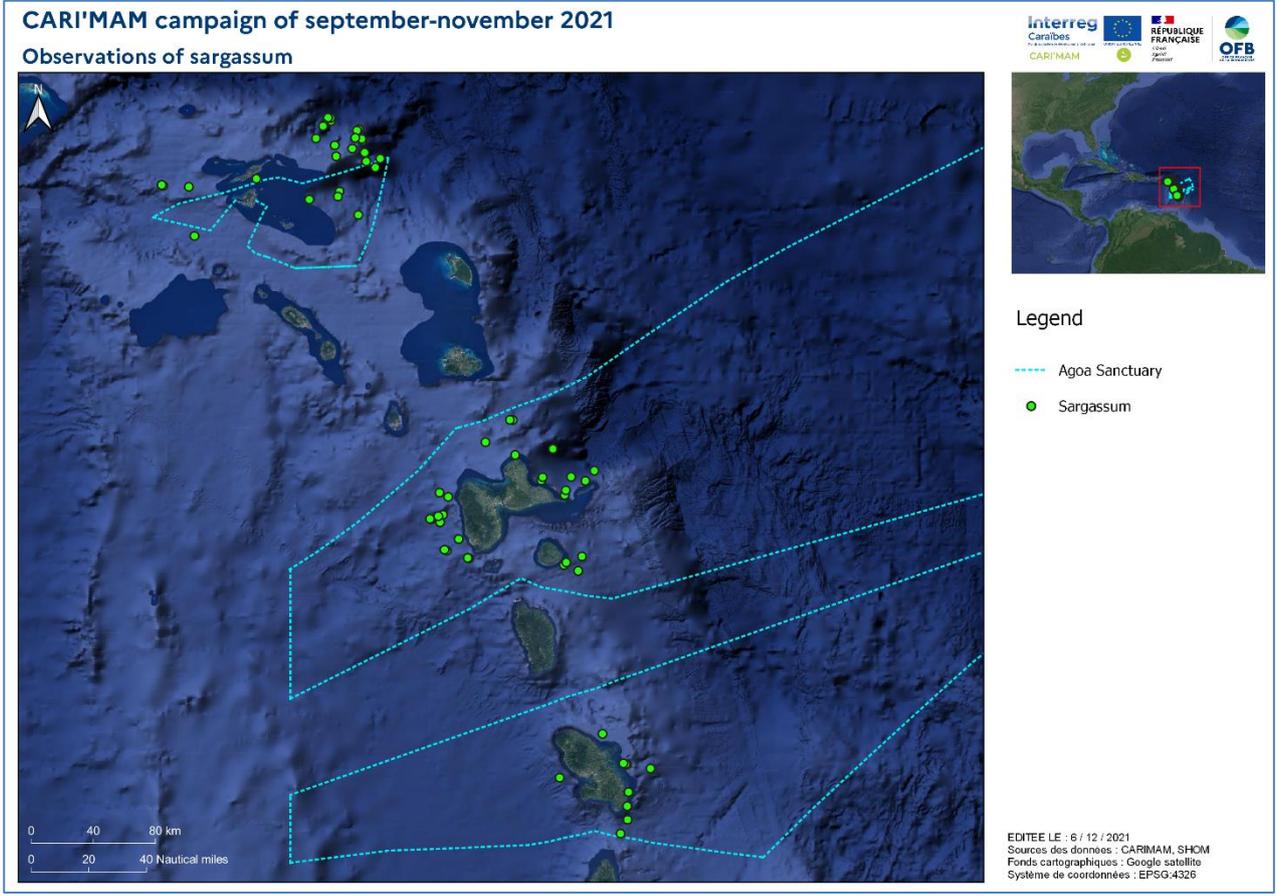
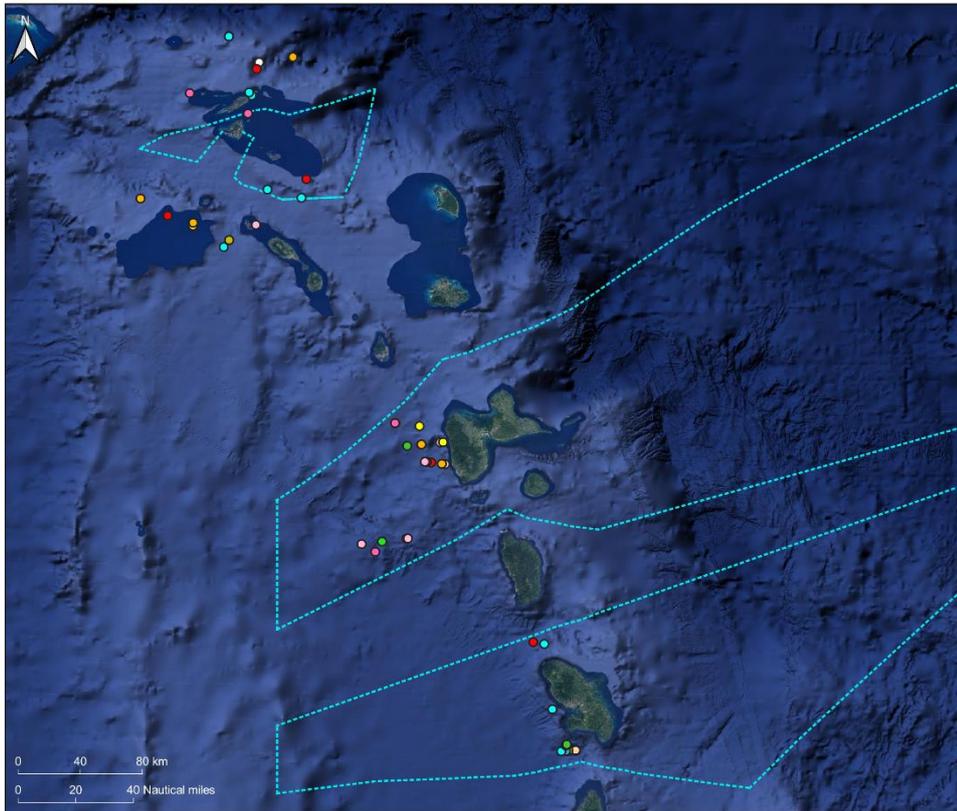


Figure 13. Map of sargassum observations during the wet season campaign.

## CARI'MAM campaign of April 2021

### Observations of macrowaste



#### Legend

--- Agoa Sanctuary

#### Macrowaste type

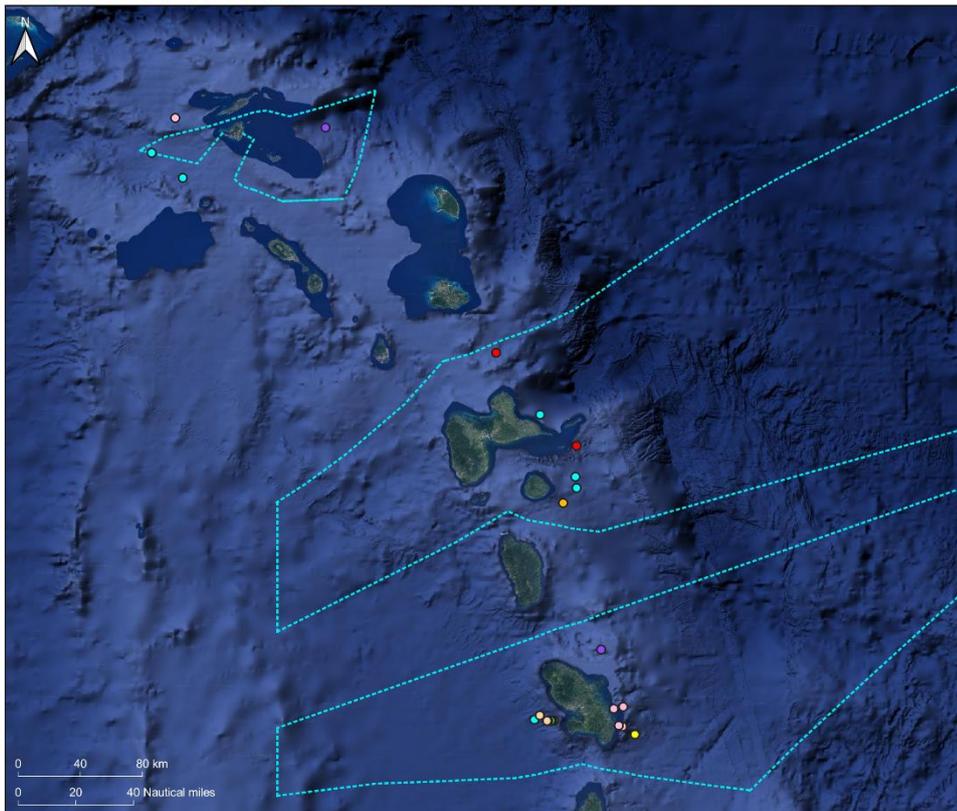
- Buoy
- Cardboard
- Crafted wood
- Metal can
- Mixed
- Object derived from fishing
- Other macrowaste
- Other polystyrene plastics
- Plastic
- Plastic bottle
- Plastic box
- Plastic container
- Polystyrene box

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Figure 14. Map of macrowaste observations during the dry season campaign.

## CARI'MAM campaign of september-novembre 2021

### Observations of macrowaste



#### Legend

--- Agoa Sanctuary

#### Macrowaste type

- Buoy
- Crafted wood
- Mixed
- Other polystyrene plastics
- Plastic
- Plastic bottle
- Plastic container
- Plastic sheet
- Polystyrene box

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Figure 15. Map of macrowaste observations during the wet season campaign.

### III.7 Human activities

The crew recorded 125 observations of 17 different human activities during the transects. Fishing-related vessels were more commonly observed overall, as well as during the wet season. During the dry season, sailing boats were the most recorded type of vessel (Table 10, Figure 16 and Figure 17).

**Table 10. Number of human activities recorded per season. Numbers in brackets indicate the number of vessels when different from the number of observations.**

Human activities	Dry season	Wet season
Sailboat to the sail	20 (23)	6
Small fishing boat	8	29
Merchant ship	7 (9)	5
Motorboat	2	7
Boater	2	5
Oil tanker	2	3
Sailboat to the engine	2	2
Artisanal fisherman	2	2
Fishing boat	1	6 (9)
Undetermined boat	1	4
Cruise ship	1	2
Deep-sea fishing	1	-
Fisherman boater	1	-
Fisherman liner	-	1
Military boat	-	1
Weather buoy	-	1
Whale watching	-	1 (2)
<b>Total</b>	<b>50</b>	<b>75</b>

### I.1 Fishing gear

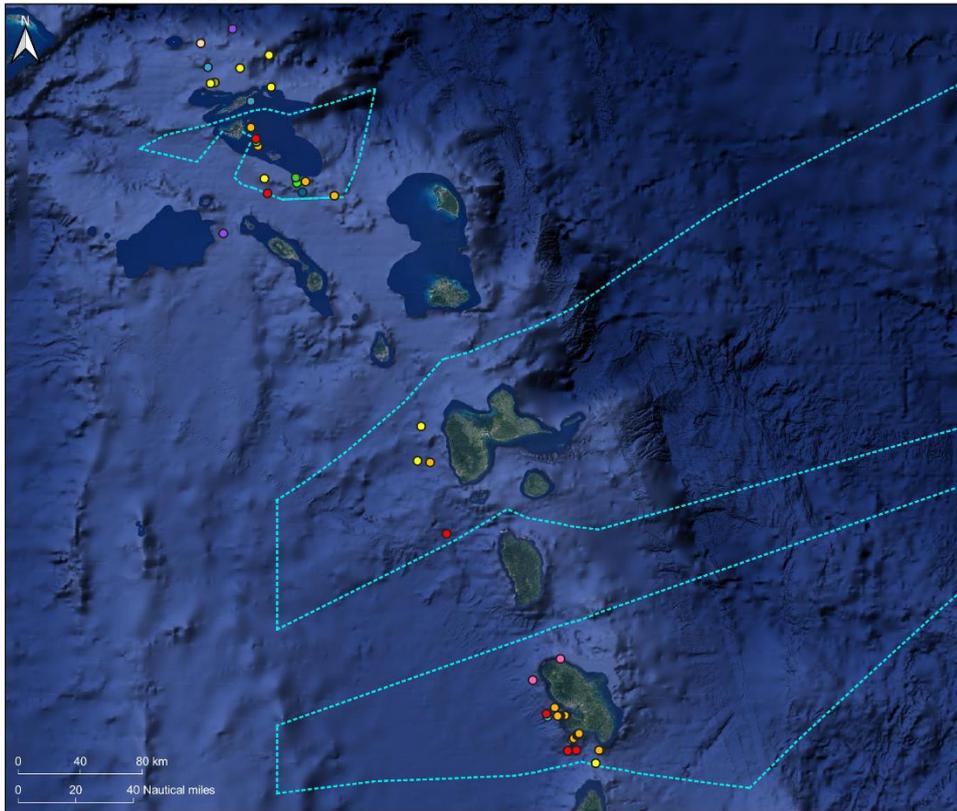
**Table 11. Number and nature of fishing gear recorded per season. The number in brackets indicate the number of gear when different from the number of observations.**

Fishing gear	Dry season	Wet season
Fishing trap still active	51 (114)	135 (298)
Fishing trap buoys	42 (296)	13 (26)
FAD	27 (32)	54 (55)
Fishing net	2 (2)	1 (1)
Fishing trap abandoned	1 (1)	1 (1)
Wreck net	-	2 (2)
Broken FAD	-	1 (1)
Marking buoys	-	1 (1)
<b>Total</b>	<b>123 (444)</b>	<b>208 (385)</b>

331 records of fishing gear were made during both campaigns, totalising 829 individual gear. Fishing traps were by far the most encountered type of gear (Table 11). Precise gear identification was not always easy, especially at a distance. In addition, defining state (active vs abandoned), particularly for fishing traps, was also a challenge (Figure 18 and Figure 19). Fishing gear were regularly encountered during both surveys. There seems to be a predominance of devices on the windward side of the Southern islands and in the North-East of the Northern Islands, on the Anguilla Bank.

## CARI'MAM campaign of April 2021

### Observations of human activities



#### Legend

----- Agoa Sanctuary

#### Human activities

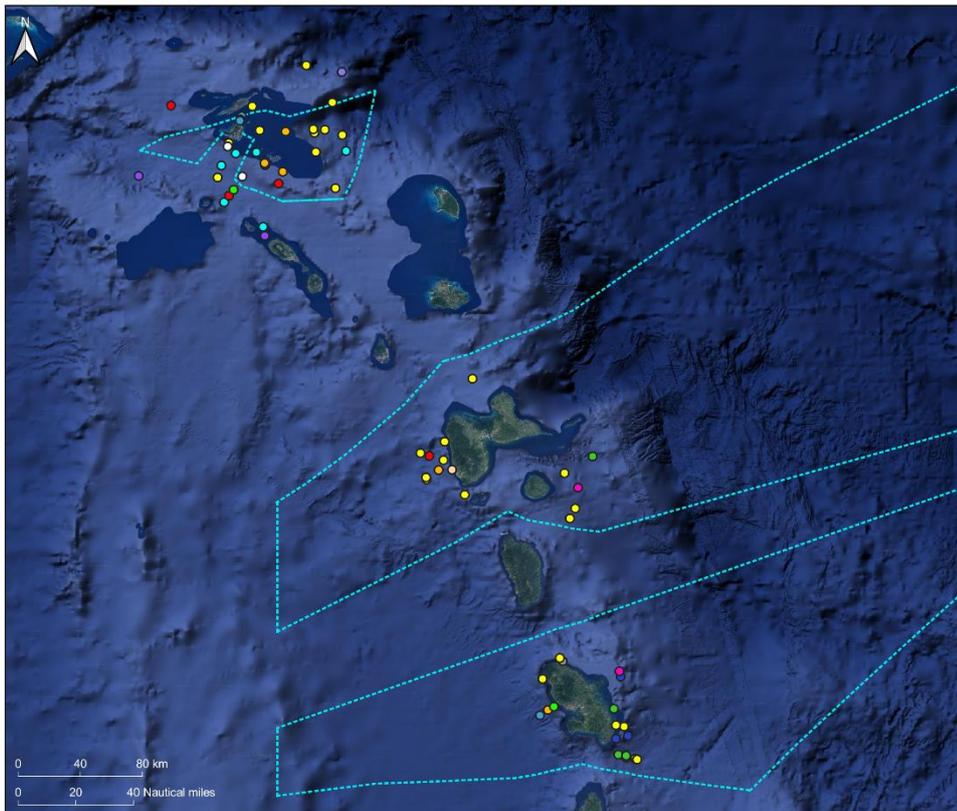
- Artisanal fisherman
- Boater
- Cruise ship
- Deep-sea fishing
- Fisherman boater
- Fishing boat
- Merchant ship
- Motorboat
- Oil tanker
- Sailboat to the engine
- Sailboat to the sail
- Small fishing boat
- Undetermined boat

EDITEE LE : 6 / 12 / 2021  
Sources des données : CARIMAM, SHOM  
Fonds cartographiques : Google satellite  
Système de coordonnées : EPSG:4326

Figure 16. Map of human activities recorded during the dry season campaign.

## CARI'MAM campaign of september-novembre 2021

### Observations of human activities



#### Legend

----- Agoa Sanctuary

#### Human activities

- Artisanal fisherman
- Boater
- Cruise ship
- Fisherman liner
- Fishing boat
- Merchant ship
- Military boat
- Motorboat
- Oil tanker
- Sailboat to the engine
- Sailboat to the sail
- Small fishing boat
- Undetermined boat
- Weather buoy
- Whale Watching

EDITEE LE : 6 / 12 / 2021  
Sources des données : CARIMAM, SHOM  
Fonds cartographiques : Google satellite  
Système de coordonnées : EPSG:4326

Figure 17. Map of human activities recorded during the wet season campaign.

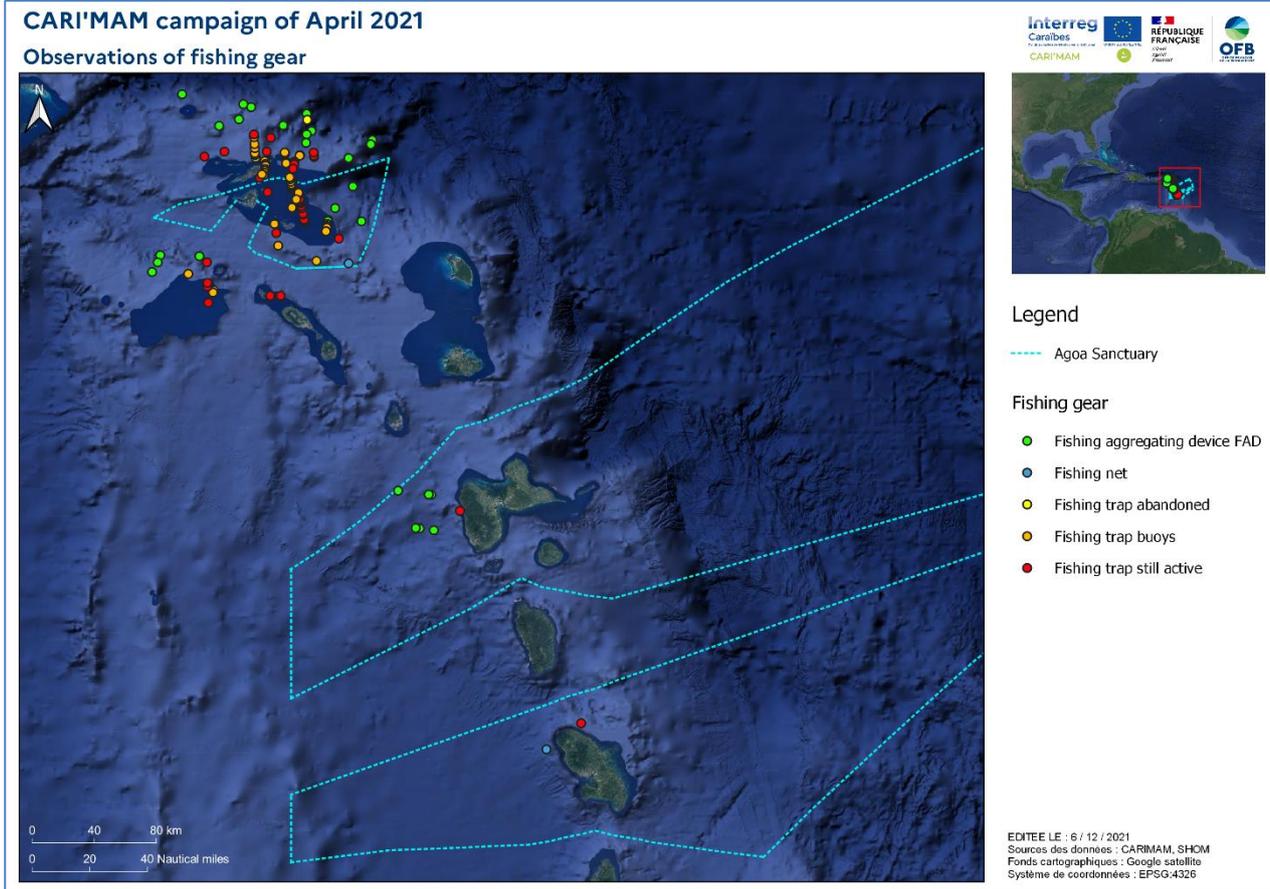


Figure 18. Map of fishing gear recorded during the dry season campaign.

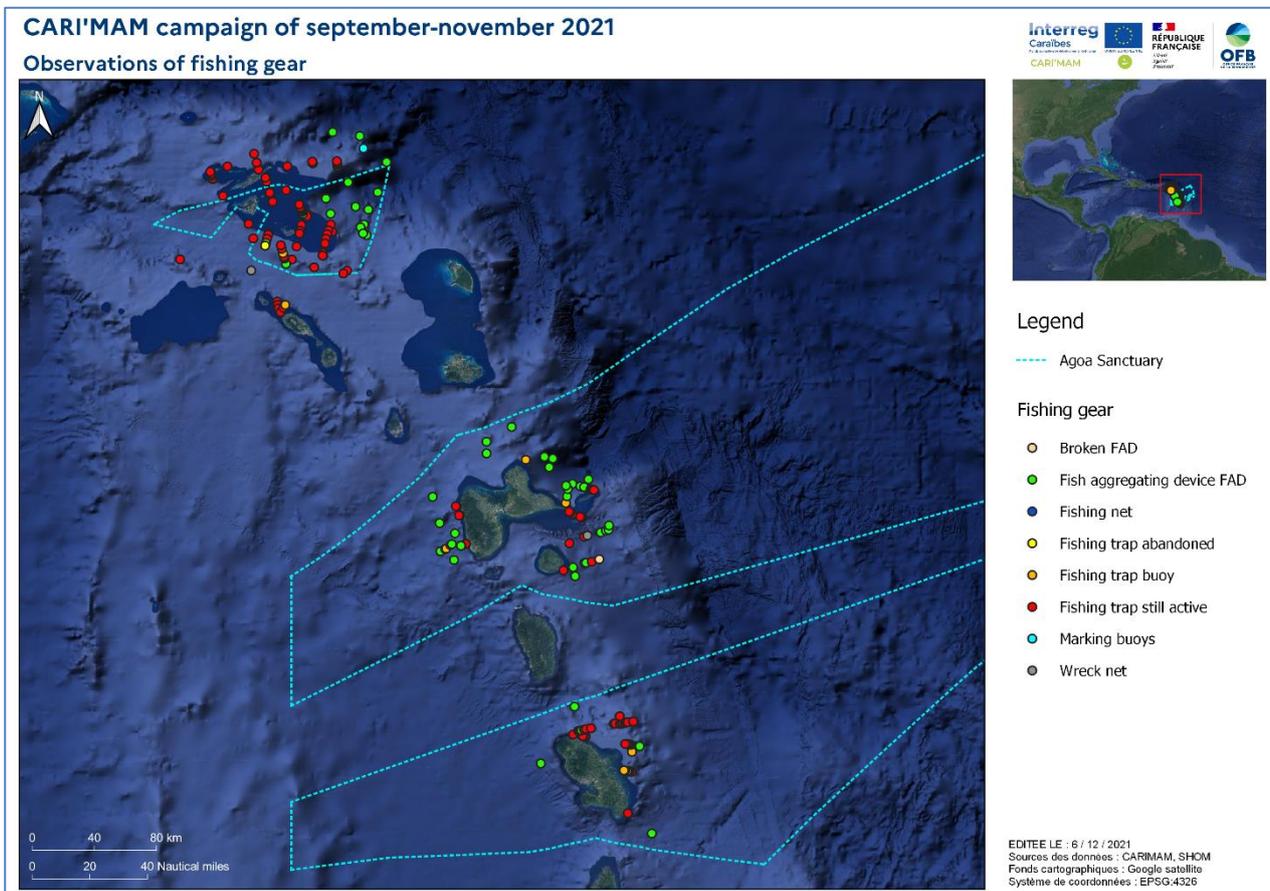


Figure 19. Map of fishing gear recorded during the wet season campaign.

## IV. Discussion

Cetaceans are highly mobile species and large-scale studies like the one presented here are essential to improve our knowledge on these animals. Although observations were collected for various groups, we will focus on cetaceans here since they were the target species of this survey.

### I.1 Effort

Theoretical effort was quite ambitious and coverage is quite good in the Northern Islands, rising up to 88% during the dry season. Unfortunately, strong winds and rough sea conditions prevented the complete coverage of the transects in this area and in the Southern Islands during the wet season (50% coverage). More severely, a mechanical issue on the research vessel in charge of data collection in the Southern Islands during the dry season led to the premature termination of the campaign after only 6 days out of 20, which explains the very low coverage (18%). Such disparity affects both the number of observations and their distribution. Therefore, some comparisons between seasons are provided below but should be taken with much caution. For the same reason, interpretations of the distribution of observations should also be considered with care.

### I.2 Cetacean observations

Still, the 4,232km of covered effort allowed to record 78 cetacean observations, representing 14 species and higher taxa. Although the number of observations is much higher during the dry season, most of the sightings are humpback whales. This species is not present in the Caribbean during the wet season, which explains that difference. Excluding humpback whale observations, the number of observations and species diversity remain higher during the dry season. Some species were only sighted during the dry season (e.g. pilot whale, melon-headed whale) and others during the wet season (e.g. false killer whale, Cuvier's beaked whale). Other species, like the bottlenose dolphin or the Atlantic spotted dolphin, were sighted in both seasons in the same area.

During the dry season, in the Southern Islands, most of the observations were made in the inter-island channels, mainly between Martinique and Dominica where some of them were recorded opportunistically. All but one observation of humpback whales were recorded in the Northern Islands, mostly on the Anguilla Bank, confirming the importance of this area as a breeding ground. The area between Guadeloupe and Marie-Galante is also known to be an important area but could not be surveyed.

This study also provided the opportunity to systematically survey the windward side of Martinique and Guadeloupe, which have been little surveyed in the past due to frequent difficult sea conditions. If mechanical issues prevented the area to be surveyed during the dry season (see above), the thorough prospection during the wet season did not collect a high number of observations, suggesting that the area might not be as frequented as the leeward side of these islands.

Except for the humpback whale, that migrates in high numbers for breeding between January and May, all other species have a low number of sightings. This confirms that species richness is high in the region, but numbers are low. However, in order to provide strong abundance and distribution estimates, Distance sampling analyses require a high number of observations per species (at least 60 to 80). Therefore, such analyses could not be performed. However, this data, associated with historical data, will be extremely useful for habitat modelling analyses that will be performed in 2022.

Combining acoustic to visual monitoring during transects through the use of a towed hydrophone array would likely increase the number of detections, but it will also significantly increase logistics, data processing and analysis time and, eventually, global costs.

### I.3 Birds

Birds were regularly recorded regardless of the area or the season. Species diversity and number of observations vary somehow but are consistent. The only major difference is related to Sooty tern sightings,

rising to 230 for a total of 708 individuals during the dry season, and none in the wet season. This species is known to remain in tropical latitudes all year round. Expertise from ornithologists could provide explanations for such differences.

#### **I.4 Other marine megafauna**

The number of observations of other marine megafauna (sharks, rays, large fish, marine turtles) is quite low. Except for tuna hunts that can be sighted from a far distance, these species have a low detectability which could explain these low figures that prevent any interpretation.

#### **I.5 Algae**

Sargassum were recorded in substantial amount during both seasons. In the Northern Islands, they were more widespread over the whole area, while during the wet season, they were mainly encountered in the North-East of the survey area. They were encountered all around Guadeloupe in the wet season, and mostly in the Atlantic coast of Martinique at that same period. The survey did not identify a clear seasonality in the presence of sargassum (4 obs/100km in the dry season, 3/100km in the wet season).

#### **I.6 Collaboration and companionship**

Another objective of this project was to welcome CARI'MAM members involved in cetacean conservation in the Wider Caribbean region. This was an opportunity to train them to cetacean surveys and data collection techniques. It also provided time to exchange ideas and discuss future collaborations between territories and countries. In total, 18 people from 11 organisations coming from 9 different territories joined the research team. Considering the international sanitary situation and travel restrictions, this is very positive and bodes well for a joint effort for the conservation of cetaceans in the Caribbean.

## **Acknowledgments**

The Agoa Sanctuary would like to thank all the people and organisations that made these campaigns possible. Among others, the Agoa Sanctuary would like to thank Aquasearch for organising and carrying out the survey as well as the authorities and environmental managers of Anguilla, Saba, St Eustatius, St Maarten and France for providing the required research permits in their respective jurisdiction.

Finally, the Agoa Sanctuary would like to thank the INTERREG Caribbean programme for co-funding the CARI'MAM project.



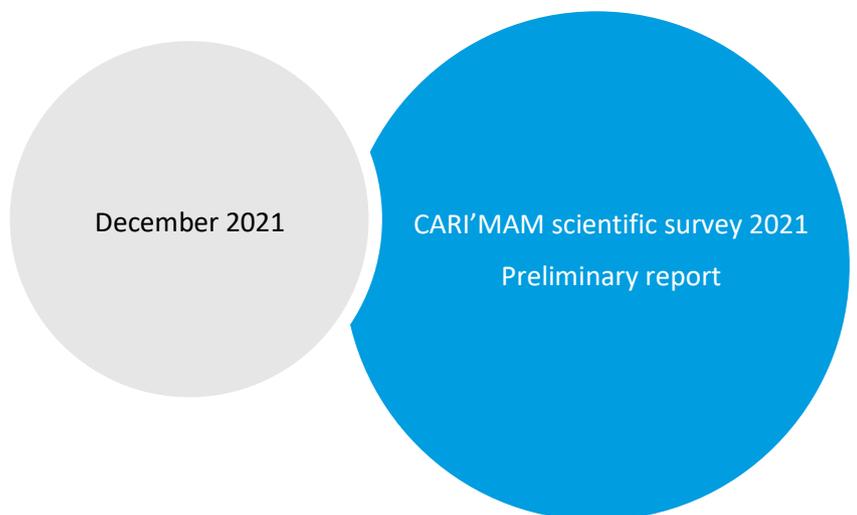
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