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CAMAC phase 1

Overview of available information on interactions between fisheries and marine megafauna in the CAMAC area

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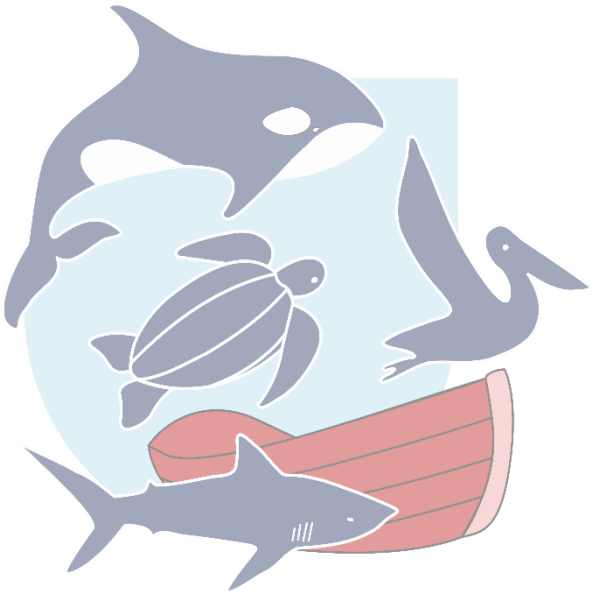

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CAMAC project

This report was drafted tin the framework of the CAMAC project. CAMAC stands for CAribbean marine Megafauna and anthropogenic Activities; it is a 4-year project (2023-2027) co-funded by the European Union and led by the Agoa Sanctuary and the SPAW RAC. It aims to strengthen knowledge, capacity, and regional collaboration in order to act together efficiently to strengthen the conservation of the threatened Caribbean marine megafauna (marine mammals, sea turtles, elasmobranchs and seabirds) and the sustainability of human activities which depend upon them.

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1 Executive summary

1.1 English

CAMAC stands for “Caribbean Marine Megafauna and Anthropogenic Activities”. This project is a response to a clearly observed need for strengthening knowledge, capacity, and regional collaboration in order to act together efficiently to strengthen the conservation of the threatened Caribbean marine megafauna (marine mammals, sea turtles, elasmobranchs and seabirds) and the sustainability of human activities which depend upon them. CAMAC focus area stretches from Jamaica to French Guiana, and includes 19 countries and 30 territories. The project is organised in seven work packages. In view of the lack of data available on megafauna and fisheries interaction, the first one is fully dedicated to this topic: develop and implement, in collaboration with Caribbean fisheries organisations, an assessment of the socio-economic and environmental issues related to interactions between fisheries and marine megafauna. To achieve this goal, three principal actions have been implemented during the first phase of CAMAC in 2023: 1) creating a scientific and technical advisory committee to support the actions, with notably fishing stakeholders; 2) reviewing available information and data on regional fishing activities and interactions with marine megafauna; 3) identifying priority areas for the knowledge enhancement actions planned in phase II.

This report is the main deliverable of CAMAC phase I for the workpackage on fisheries. It synthetizes the information we had access to regarding the main characteristics of the fisheries in the CAMAC area and their interactions with marine megafauna. Data were collected from scientific and grey literature, interviews of national fisheries departments, regional fishing management organizations (e.g., CRFM, WECAFC), NGOs, and an online survey. Accessibility to data was a major challenge of this work, as a consequence, the synthesis provided in the report should be considered as a first overview.

First of all, the information collected showed that fishing in the CAMAC region is mainly artisanal and small-scale, for local consumption. In most CAMAC countries and territories, fisheries contribution to the gross domestic product (GDP) is less than 1%. Most countries and territories of the area, have fishery production between 1 000 and 5 000 mt par an and the countries with the most important fisheries are Dominican Republic, Jamaica, and Trinidad and Tobago, with landings between 10 000 mt and 15 000 mt per year. However, the fishing activity employs many people, is an important source of income and food security for local communities and is culturally significant. In term of economic value for small scale fisheries, the main species are the spiny lobster and queen conch, which are caught mainly using traps and diving techniques. The other highly valuable species are reef fishes such as snapper, fished using gillnets, trammel nets, traps and hand lines mostly, and large pelagic fish such as tuna-like species, wahoo, dolphinfish and marlin, caught using mostly handlines and trolling lines on FADs. The industrial fisheries in the Caribbean are mainly pelagic and composed of pelagic trawlers, shrimp trawls and longliners; they are more developed in Trinidad and Tobago, Jamaica and French Guiana. Regarding monitoring programmes, the vast majority of Caribbean countries have long term fishery monitoring programs, but it is difficult to access data and they are often incomplete or not up to date. Besides, we identified very few long-term programs for bycatch monitoring, and few specific studies.

Regarding national regulations for marine megafauna conservation, 6 countries and territories of the CAMAC area still allow sea turtle captures. Legal fisheries typically mandate minimum size limits and a closed season. Shark and ray fishing is banned in 4 countries (7 territories) of the CAMAC area, and among the others, several prohibit the catch of some of the most endangered elasmobranch species. Shark finning is banned in 11 countries (19 territories). The EEZs of the Dominican Republic, some

British Virgin Islands, the Dutch islands of Saba, St Eustatius and Bonaire, and the Los Roques Archipelago in Venezuelan waters are shark sanctuaries. Shark target fisheries seem to be conducted in only few countries of the CAMAC area, but catch (target catch + bycatch) is significant in several of them, such as: Venezuela, Dominican Republic, Jamaica, Guyana, Trinidad and Tobago, and French Guiana. Marine mammals are fully protected in about half of CAMAC countries and hunting seems to be significant in three countries. Five countries have MPAs specifically dedicated to the conservation of marine mammals: the Dominican Republic (Sanctuary of Bancos de la Plata y la Navidad), France (Agoa Sanctuary), the Kingdom of the Netherlands (Yarari Sanctuary), Dominica (Sperm whale MPA), and United States (Puerto Rico). In addition to regulations specific to marine megafauna, most Caribbean countries have regulated and/or prohibited the use of fishing gears that have strong negative impacts on the environment and notably marine megafauna.

Regarding bycatch of marine megafauna, 19 experts from 14 countries (19 territories) in the CAMAC area responded to the online survey for marine turtles, 8 experts from 6 countries (9 territories) for elasmobranchs and 6 experts from 5 countries (7 territories) for marine mammals. The vast majority of experts that filled in the online survey identified sea turtle, elasmobranchs and marine mammal bycatch as a major issue to be mitigated and better assessed in their country/territory. Most impacting gears differed depending on the species group, but set gillnets were cited more often: sea turtle bycatch risk seems to be higher with nets and particularly set gillnets; for elasmobranchs, set gillnets and lines seem to have higher risks of bycatch; for marine mammals, bycatch mitigation should focus on for trammelnets, set gillnets and driftnets. Regarding species, bycatch was identified as an issue for all species groups, *i.e.*: all sea turtle species, sharks, *Mobula spp*., sawfish, whales, sperm whales, delphinids, and manatees. As expected, the number of experts that have identified bycatch issues is higher for the 3 sea turtle species most often observed in the CAMAC focus area (the green turtle, the hawksbill and the leatherback) than for the other sea turtle species (loggerhead and olive ridley). For sharks, the species most often cited as bycaught are: silky, tiger, mako, thresher, nurse and hammerhead sharks. For marine mammals, bycatch threat may be particularly significant for the endangered manatee. Some depredation issues have also been raised, notably the depredation of marine mammals on pots and traps in Jamaica and Puerto Rico, and several cases of depredation of sharks on various fishing gears in Puerto Rico, Saba, and the French Antilles.

Actions planned during CAMAC phase II (2024-2027) are the following: 1) Fine-tune the collection and compilation of available data; 2) In collaboration with national and regional fishery management organisations, conduct fishers interview surveys on pilot sites to characterise interactions between marine megafauna and the Caribbean fisheries; 3) In collaboration with national and regional fishery management organisations, based on the results of actions 1 and 2, and using ByRa toolbox, assess the interactions and make operational recommendations to mitigate the major negative impacts.

Hence, from the work conducted during CAMAC phase I and synthetised in this report, the following recommendations can be made for phase II:

1) Regarding the collection and compilation of available data: e-mail contacts with national fishery organisations has proved insufficient in collecting detailed and quantified data on fisheries. Hence, it is recommended for phase II to meet with these organisations, travelling to some territories and attending to regional workshops and conferences on fisheries.
2) Regarding priority areas/topics for the fishers interview surveys that will be conducted during phase II: the (limited) data collected during CAMAC phase I suggested that major bycatch issues exist for most species, territories and fishing gears, and no priority area/topic was identified apart from set gillnets. Consequently, recommendations for phase II are the following: fishers' interview surveys should be conducted in 4-6 sites where local communities

are willing to work on this topic, where the fishing activity is well developed and diversified and species diversity is high, so that they will make a representative sample of the region. In addition, a focus should be made on set gillnets.

3) Regarding collaborations with fishery management organisations: several interviewed experts highlighted that for our work to be successful, in addition to working in collaboration with national and regional fishery management organisations, local communities should be involved at each step of the project. Besides, as bycatch monitoring are rarely implemented in the region, it is very important that interview surveys are conducted by local agents, that will be trained.
4) Finally, several experts raised some issues that were not considered in CAMAC phase I, so we recommend to include them in phase II: 1) collect information on regulations regarding seabirds conservation and on their interactions with fisheries; 2) assess the impact of entanglements in ALDFG (abandoned, lost or otherwise discarded fishing gears), in collaboration with the leader of CAMAC workpackage on stranding networks.

Finally, it is important to note that additional recommendations for CAMAC phase II were given during phase I final workshop during the 76th conference of the Gulf and Caribbean Fisheries Institute (Combes & Pusineri, 2023), and must also be carefully looked at when phase II operations will start.

1.2 Español

El proyecto CAMAC, acrónimo de "Caribbean Marine Megafauna and Anthropogenic Activities", responde a una necesidad claramente identificada de reforzar los conocimientos, las capacidades y la colaboración regional con el fin de actuar juntos de forma eficaz para mejorar la conservación de la megafauna marina amenazada del Caribe (mamíferos marinos, tortugas marinas, elasmobranquios y aves marinas) y la sostenibilidad de las actividades humanas que dependen de ellos. La zona de captación del CAMAC se extiende desde Jamaica hasta la Guayana Francesa e incluye 19 países y 30 territorios. El proyecto está organizado en siete áreas de trabajo. Dada la falta de datos disponibles sobre las interacciones entre la megafauna y la pesca, la primera área está enteramente dedicada a este tema: desarrollar e implementar, en colaboración con las organizaciones de gestión pesquera del Caribe, una evaluación de las cuestiones socioeconómicas y medioambientales asociadas a las interacciones entre la pesca y la megafauna marina. Para lograr este objetivo, se implementaron tres acciones principales durante la primera fase del CAMAC en 2023: 1) crear un comité asesor científico y técnico para apoyar las acciones, con las partes interesadas en la pesca en particular; 2) sintetizar la información y los datos disponibles sobre las actividades pesqueras en la región y sus interacciones con la megafauna marina; 3) identificar las áreas prioritarias para las acciones previstas para la fase II.

Este informe es el principal producto de la Fase I del CAMAC para la línea de trabajo de pesca. Resume la información a la que hemos podido acceder sobre las principales características de las pesquerías en la zona CAMAC y sus interacciones con la megafauna marina. Los datos se recopilaron a partir de literatura gris y artículos científicos, entrevistas con organismos responsables de la gestión pesquera a nivel territorial, organizaciones regionales (CRFM, COPACO, etc.) y ONG, así como una encuesta en línea. La accesibilidad de los datos constituyó un reto importante para este trabajo, por lo que el resumen que se ofrece en el informe debe considerarse como una primera visión de conjunto.

La información recopilada mostró en primer lugar que la pesca en la zona CAMAC es principalmente artesanal y a pequeña escala, para consumo local. En la mayoría de los países y territorios, la contribución de la pesca al producto interior bruto (PIB) es inferior al 1%. La mayoría de los países y territorios de la zona tienen una producción pesquera de entre 1 000 y 5 000 toneladas anuales, y los países con las pesquerías más importantes son la República Dominicana, Jamaica y Trinidad y Tobago, con desembarques de entre 10 000 y 15 000 toneladas. Sin embargo, la pesca da trabajo a muchas personas, es una importante fuente de ingresos y de seguridad alimentaria para las comunidades locales, y tiene una gran importancia cultural. En términos de valor económico para la pesca artesanal, las principales especies son la langosta y el botuto, que se capturan principalmente con nasas y buceando. Otras especies de gran valor son los peces de arrecife, como el pargo, capturados principalmente con redes de enmalle, trasmallos, nasas y líneas de mano, y los grandes peces pelágicos, como las especies de la familia del atún, el peto, el dorado y el marlín, capturados principalmente con líneas de mano y curricán sobre DCP. La pesca industrial en el Caribe es principalmente pelágica, con redes de arrastre pelágico, redes de arrastre camaroneras y palangreros, y está más desarrollada en Trinidad y Tobago, Jamaica y la Guayana Francesa. En cuanto a los programas de seguimiento, la gran mayoría de los países caribeños cuentan con programas de seguimiento de la pesca a largo plazo, pero es difícil acceder a los datos y a menudo están incompletos o desfasados. Además, identificamos muy pocos programas a largo plazo para el seguimiento de las capturas accidentales y pocos estudios específicos.

En cuanto a la normativa nacional para la conservación de la megafauna marina, 6 países y territorios de la zona CAMAC siguen autorizando la captura de tortugas marinas. La pesca legal impone generalmente tallas mínimas y una temporada de veda. La pesca de tiburones y rayas está prohibida

en 4 países (7 territorios) de la zona CAMAC, y varios de los demás prohíben la captura de algunas de las especies de elasmobranquios más amenazadas. El cercenamiento de las aletas de tiburón está prohibido en 11 países (19 territorios). Las ZEE de la República Dominicana, algunas de las Islas Vírgenes Británicas, las islas holandesas de Saba, San Eustaquio y Bonaire, y el archipiélago de Los Roques, en aguas venezolanas, son santuarios de tiburones. La pesca dirigida a los tiburones parece practicarse sólo en unos pocos países de la zona CAMAC, pero las capturas (capturas dirigidas + capturas accidentales) son significativas en varios de ellos, como Venezuela, la República Dominicana, Jamaica, Guyana, Trinidad y Tobago y la Guayana Francesa. Los mamíferos marinos están totalmente protegidos en aproximadamente la mitad de los países de la zona CAMAC, y la caza parece ser significativa en tres países. Cinco países cuentan con AMP dedicadas específicamente a la conservación de los mamíferos marinos: República Dominicana (Santuarios Bancos de la Plata y Navidad), Francia (Santuario Agoa), Reino de los Países Bajos (Santuario Yarari), Dominica (AMP dedicada a los cachalotes) y Estados Unidos (Puerto Rico). Además de las normativas específicas para la megafauna marina, la mayoría de los países del Caribe han regulado y/o prohibido el uso de artes de pesca que tienen un impacto negativo significativo en el medio ambiente, especialmente en la megafauna marina.

Con respecto a la captura accidental de megafauna marina, 19 expertos de 14 países (19 territorios) de la zona CAMAC respondieron a la encuesta en línea para las tortugas marinas, 8 expertos de 6 países (9 territorios) para los elasmobranquios y 6 expertos de 5 países (7 territorios) para los mamíferos marinos. La gran mayoría de los expertos que respondieron a la encuesta en línea identificaron la captura accidental de tortugas marinas, elasmobranquios y mamíferos marinos como un problema importante que debe mitigarse y evaluarse mejor en su país/territorio. Los artes con mayor impacto variaron según el grupo de especies, pero las redes de enmalle calada fueron las más citadas: el riesgo de captura accidental de tortugas marinas parece ser mayor con las redes y, en particular, con las redes de enmalle caladas; en el caso de los elasmobranquios, las redes de enmalle caladas y los palangres parecen presentar mayores riesgos de captura accidental; en el caso de los mamíferos marinos, la mitigación de las capturas accidentales debería centrarse en los trasmallos, las redes de enmalle caladas y las redes de deriva. En cuanto a las especies, las capturas accidentales se han identificado como un problema para todos los grupos de especies, a saber: todas las especies de tortugas marinas, tiburones, Mobula spp. peces sierra, ballenas, cachalotes, delfínos y manatíes. Como era de esperar, el número de expertos que identifican problemas de captura accidental es mayor en el caso de las tres especies de tortugas marinas observadas con más frecuencia en la zona CAMAC (la tortuga verde, la tortuga de carey y la tortuga laúd) que en el de las demás especies de tortugas marinas (la tortuga caguama y la tortuga golfina). En cuanto a los tiburones, las especies más citadas como capturadas accidentalmente son: el tiburón sedoso, el tiburón tigre, el tiburón mako, el tiburón zorro, el tiburón nodriza y el tiburón martillo. En cuanto a los mamíferos marinos, los problemas de captura accidental parecen ser especialmente importantes para el manatí, que es una especie especialmente amenazada. También se han planteado algunos problemas de depredación, en particular la depredación de mamíferos marinos en las almadrabas de Jamaica y Puerto Rico, y varios casos de depredación de tiburones en diversos artes de pesca en Puerto Rico, Saba y las Antillas francesas.

Las acciones previstas durante la fase II del CAMAC (2024-2027) son las siguientes 1) Perfeccionar la recopilación y compilación de los datos disponibles; 2) En colaboración con las organizaciones nacionales y regionales de gestión pesquera, realizar encuestas a los pescadores en sitios piloto para caracterizar las interacciones entre la megafauna marina y las pesquerías del Caribe; 3) En colaboración con las organizaciones nacionales y regionales de gestión pesquera, basándose en los resultados de las acciones 1 y 2, y utilizando el conjunto de herramientas ByRa, evaluar las interacciones y hacer recomendaciones operativas para mitigar los principales impactos negativos.

Por lo tanto, basándose en el trabajo realizado durante la Fase I del CAMAC y sintetizado en este informe, se pueden hacer las siguientes recomendaciones para la Fase II del proyecto:

1) Respecto a la recopilación y compilación de los datos disponibles: contactar por correo electrónico con las organizaciones nacionales de gestión pesquera resultó insuficiente para recopilar datos detallados y cuantificados sobre la pesca. Por lo tanto, se recomienda que la fase II incluya reuniones con estas organizaciones, visitando determinados territorios y participando en talleres y conferencias regionales sobre pesca.

2) En cuanto a las áreas/temas prioritarios para las encuestas a pescadores que deben realizarse en la fase II: los datos (limitados) recopilados durante la fase I del CAMAC sugieren que existen importantes problemas de capturas accidentales para la mayoría de las especies, territorios y artes de pesca, y no se han identificado áreas/temas prioritarios fuera de las redes de enmalle caladas. En consecuencia, las recomendaciones para la fase II son las siguientes: las encuestas a los pescadores deben realizarse en 4 o 6 lugares donde las comunidades locales estén dispuestas a trabajar en este tema, donde la actividad pesquera esté bien desarrollada y diversificada y donde la diversidad de especies sea elevada, de modo que se obtenga una muestra representativa de la región. Además, la atención debe centrarse en las redes de enmalle caladas.

3) En cuanto a la colaboración con las organizaciones de gestión pesquera: varios expertos entrevistados subrayaron que, para garantizar el éxito de nuestro trabajo, además de la colaboración con las organizaciones nacionales y regionales de gestión pesquera, las comunidades locales deberían participar en todas las fases del proyecto. Además, dado que el seguimiento de las capturas accesorias apenas se realiza en la región, es muy importante que las encuestas sean llevadas a cabo por agentes locales, a los que se formará en estos métodos.

4) Por último, varios expertos han planteado cuestiones que no se tuvieron en cuenta en la fase I del CAMAC, por lo que recomendamos que se incluyan en la fase II: 1) recopilar información sobre la normativa relativa a la conservación de las aves marinas y sus interacciones con la pesca; 2) evaluar el impacto de los enredos en artes de pesca abandonados, en colaboración con el coordinador de la línea de trabajo del CAMAC sobre redes de varamiento.

Por último, es importante señalar que en el taller final de la fase I, celebrado durante la 76ª conferencia del Instituto de Pesca del Golfo y el Caribe (Combes & Pusineri, 2023), se formularon recomendaciones adicionales para la fase II del CAMAC, que también deberán tenerse en cuenta cuando comiencen las operaciones de la fase II.

1.3 Français

Le projet CAMAC, pour "Caribbean Marine Megafauna and Anthropogenic Activities", répond à un besoin clairement identifié de renforcer les connaissances, les capacités et la collaboration régionale afin d'agir ensemble de manière efficace pour renforcer la conservation de la mégafaune marine menacée des Caraïbes (mammifères marins, tortues marines, élasmobranches et oiseaux de mer) et la durabilité des activités humaines qui en dépendent. La zone d'emprise de CAMAC s'étend de la Jamaïque à la Guyane française, et comprend 19 pays et 30 territoires.. Le projet est organisé en sept axes de travail. Compte tenu du manque de données disponibles sur les interactions entre la mégafaune et la pêche, le premier axe est entièrement consacré à ce sujet : développer et mettre en œuvre, en collaboration avec les organisations de gestion des pêches de la Caraïbe, une évaluation des enjeux socio-économiques et environnementales liées aux interactions entre la pêche et la mégafaune marine. Pour atteindre cet objectif, trois actions principales ont été mises en œuvre au cours de la première phase de CAMAC en 2023 : 1) créer un comité consultatif scientifique et technique pour soutenir les actions, avec notamment les acteurs de la pêche ; 2) synthétiser les informations et données disponibles sur les activités de pêche dans la région et leurs interactions avec la mégafaune marine ; 3) identifier les domaines prioritaires pour les actions de renforcement des connaissances prévues pour la phase II.

Ce rapport est le principal livrable de la phase I de CAMAC pour l'axe de travail relatif aux pêcheries. Il synthétise les informations auxquelles nous avons eu accès concernant les principales caractéristiques des pêcheries dans la zone CAMAC et leurs interactions avec la mégafaune marine. Les données ont été collectées à partir de la littérature grise et d'articles scientifique, d'entretiens avec des organismes responsables de la gestion des pêches à l'échelle des territoires, des organisations régionales (CRFM, WECAFC…) et des ONG, ainsi qu'une enquête en ligne. L'accessibilité des données a constitué un défi majeur pour ce travail, par conséquent, la synthèse fournie dans le rapport doit être considérée comme une première vue d'ensemble.

Les informations collectées ont tout d'abord montré que la pêche dans la zone CAMAC est principalement artisanale et à petite échelle, pour la consommation locale. Dans la plupart des pays et territoires, la contribution de la pêche au produit intérieur brut (PIB) est inférieure à 1%. La plupart des pays et territoires de la zone ont une production de pêche comprise entre 1 000 et 5 000 tonnes par an et les pays ayant les pêcheries les plus importantes sont la République dominicaine, la Jamaïque et Trinidad-et-Tobago, avec des débarquements compris entre 10 000 et 15 000 tonnes. Cependant, l'activité de pêche emploie de nombreuses personnes, constitue une source importante de revenus et de sécurité alimentaire pour les communautés locales et revêt une grande importance culturelle. En termes de valeur économique pour les petites pêcheries, les principales espèces sont la langouste et le lambi, qui sont capturées principalement à l'aide de casiers et en plongée. Les autres espèces de grande valeur sont les poissons de récif tels que le vivaneau, pêchés principalement au moyen de filets maillants, de trémails, de casiers et de lignes à main, et les grands poissons pélagiques tels que les espèces de la famille du thon, le thazard, la dorade coryphène et le marlin, pêchés principalement au moyen de lignes à main et de lignes de traîne sur DCP. La pêche industrielle dans la Caraïbe est principalement pélagique et se compose de chaluts pélagiques, de chaluts à crevettes et de palangriers ; elle est plus développée à Trinidad-et-Tobago, en Jamaïque et en Guyane française. En ce qui concerne les programmes de surveillance, la grande majorité des pays de la Caraïbe disposent de programmes de suivi de la pêche à long terme, mais il est difficile d'accéder aux données et celles-ci sont souvent incomplètes ou non actualisées. En outre, nous avons identifié très peu de programmes à long terme pour le suivi des prises accidentelles, et peu d'études spécifiques.

En ce qui concerne les réglementations nationales pour la conservation de la mégafaune marine, 6 pays et territoires de la zone CAMAC autorisent encore les captures de tortues marines. Les pêcheries légales imposent généralement des tailles minimales et une saison de fermeture. La pêche aux requins et aux raies est interdite dans 4 pays (7 territoires) de la zone CAMAC, et parmi les autres, plusieurs interdisent la capture de certaines des espèces d'élasmobranches les plus menacées. Le prélèvement des ailerons de requins est interdit dans 11 pays (19 territoires). Les ZEE de la République dominicaine, de certaines îles Vierges britanniques, des îles néerlandaises de Saba, Saint-Eustache et Bonaire, et de l'archipel de Los Roques dans les eaux vénézuéliennes sont des sanctuaires pour les requins. La pêche ciblée des requins ne semble être pratiquée que dans quelques pays de la zone CAMAC, mais les captures (captures ciblées + captures accessoires) sont importantes dans plusieurs d'entre eux, tels que : le Venezuela, la République dominicaine, la Jamaïque, le Guyana, Trinidad et Tobago et la Guyane française. Les mammifères marins sont eux entièrement protégés dans environ la moitié des pays de la zone CAMAC et la chasse semble être importante dans trois pays. Cinq pays disposent d'AMP spécifiquement dédiées à la conservation des mammifères marins : la République Dominicaine (Sanctuaire des Bancs de la Plata et de la Navidad), la France (Sanctuaire Agoa), le Royaume des Pays-Bas (Sanctuaire Yarari), la Dominique (AMP dédiée aux Cachalot), et les Etats-Unis (à Porto Rico). En plus des réglementations spécifiques à la mégafaune marine, la plupart des pays de la Caraïbe ont réglementé et/ou interdit l'utilisation d'engins de pêche qui ont des impacts négatifs importants sur l'environnement et notamment sur la mégafaune marine.

En ce qui concerne les prises accidentelles[1] de mégafaune marine, 19 experts de 14 pays (19 territoires) de la zone CAMAC ont répondu à l'enquête en ligne relative aux tortues marines, 8 experts de 6 pays (9 territoires) pour les élasmobranches et 6 experts de 5 pays (7 territoires) pour les mammifères marins. La grande majorité des experts qui ont répondu à l'enquête en ligne ont identifié les prises accidentelles de tortues marine, d'élasmobranches et de mammifères marins comme un problème majeur à atténuer et à mieux évaluer dans leur pays/territoire. Les engins ayant le plus d'impact diffèrent selon le groupe d'espèces, mais les filets maillants fixes ont été cités plus souvent : le risque de prises accidentelles de tortues marine semble être plus élevé avec les filets et en particulier les filets maillants calés ; pour les élasmobranches, les filets maillants calés et les lignes semblent présenter des risques de prises accidentelles plus élevés ; pour les mammifères marins, l'atténuation des prises accidentelles devrait se concentrer sur les trémails, les filets maillants calés et les filets dérivants. En ce qui concerne les espèces, les prises accidentelles ont été identifiées comme un problème pour tous les groupes d'espèces, à savoir : toutes les espèces de tortues marines, les requins, Mobula *spp*., les poissons-scies, les baleines, les cachalots, les delphinidés et les lamantins. Comme prévu, le nombre d'experts ayant identifié des enjeux de prises accidentelles est plus élevé pour les trois espèces de tortues marines les plus souvent observées dans la zone CAMAC (la tortue verte, la tortue imbriquée et la tortue luth) que pour les autres espèces de tortues marines (la tortue caouanne et la tortue olivâtre). En ce qui concerne les requins, les espèces les plus souvent citées comme faisant l'objet de prises accidentelles sont : le requin soyeux, le requin tigre, le requin Mako, le requin renard, le requin nourrice et le requin marteau. En ce qui concerne les mammifères marins, les enjeux relatifs aux prises accidentelles semblent être particulièrement importants pour le lamantin, qui est une espèce particulièrement menacée. Certains problèmes de déprédation ont également été soulevés, notamment la déprédation de mammifères marins sur les casiers en Jamaïque et à Porto Rico, et

[1] Lorsqu'il est fait mention de captures accidentelles dans ce document, cela comprend aussi les captures accessoires.

plusieurs cas de déprédation de requins sur divers engins de pêche à Porto Rico, à Saba et dans les Antilles françaises.

Les actions prévues durant la phase II de CAMAC (2024-2027) sont les suivantes : 1) Affiner la collecte et la compilation des données disponibles ; 2) En collaboration avec les organisations nationales et régionales de gestion des pêches, réaliser des enquêtes auprès des pêcheurs sur des sites pilotes afin de caractériser les interactions entre la mégafaune marine et les pêcheries caribéennes ; 3) En collaboration avec les organisations nationales et régionales de gestion des pêches, sur la base des résultats des actions 1 et 2, et en utilisant la boîte à outils ByRa, évaluer les interactions et formuler des recommandations opérationnelles pour atténuer les principaux impacts négatifs.

Par conséquent, à partir du travail effectué au cours de la phase I de CAMAC et synthétisé dans le présent rapport, les recommandations suivantes peuvent être formulées pour la phase II du projet :

1) En ce qui concerne la collecte et la compilation des données disponibles : la prise de contact par e-mail avec les organisations nationales de gestion des pêches s'est révélée insuffisante pour collecter des données détaillées et quantifiées sur les pêcheries. Il est donc recommandé pour la phase II d'aller à la rencontre de ces organisations, en se rendant dans certains territoires et en participant à des ateliers et conférences régionaux sur la pêche.

2) En ce qui concerne les zones/sujets prioritaires pour les enquêtes auprès des pêcheurs qui seront menées au cours de la phase II : les données (limitées) collectées au cours de la phase I de CAMAC suggèrent que des enjeux majeurs de prises accidentelles existent pour la plupart des espèces, des territoires et des engins de pêche, et aucune zone/sujet prioritaire n'a été identifié en dehors des filets maillants calés. Par conséquent, les recommandations pour la phase II sont les suivantes : les enquêtes auprès des pêcheurs devraient être menées dans 4 à 6 sites où les communautés locales sont volontaires pour travailler sur ce sujet, où l'activité de pêche est bien développée et diversifiée et où la diversité des espèces est élevée, de manière à constituer un échantillon représentatif de la région. En outre, l'accent devrait être mis sur les filets maillants calés.

3) En ce qui concerne les collaborations avec les organisations de gestion des pêches : plusieurs experts interrogés ont souligné que pour s'assurer du succès de notre travail, outre la collaboration avec les organisations nationales et régionales de gestion de la pêche, les communautés locales devraient être impliquées à chaque étape du projet. En outre, comme le suivi des prises accidentelles est rarement mise en œuvre dans la région, il est très important que les enquêtes soient menées par des agents locaux, qui seront ainsi formés à ces méthodes.

4) Enfin, plusieurs experts ont soulevé des questions qui n'ont pas été prises en compte dans la phase I de CAMAC, nous recommandons donc de les inclure dans la phase II : 1) collecter des informations sur les réglementations relatives à la conservation des oiseaux marins et sur leurs interactions avec les pêcheries ; 2) évaluer l'impact des enchevêtrements dans les engins de pêche abandonnés, en collaboration avec le coordinateur de l'axe de travail de CAMAC portant sur les réseaux échouages.

Enfin, il est important de noter que des recommandations supplémentaires pour la phase II de CAMAC ont été formulées lors de l'atelier final de la phase I qui s'est tenu pendant la 76ème conférence du Gulf and Caribbean Fisheries Institute (Combes & Pusineri, 2023) ; elles devront également être prises en compte lorsque les opérations de la phase II commenceront.

2 Introduction

2.1 Fisheries and marine megafauna in the Caribbean

More than a third of total landings and almost half of the economic value of fish landed in Latin America and the Caribbean come from artisanal small-scale fisheries (Pauly and Zeller, 2015). Artisanal or small-scale fisheries are, according to FAO's definition, traditional fisheries involving fishing households, using relatively small amount of capital and energy and relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption. Artisanal fisheries can be subsistence or commercial fisheries, providing for local consumption or export. Subsistence fishing usually refers to non-commercial, direct consumption fishing. Because of richness and diversity of ecosystems and species in the region, another characteristic of the Caribbean fisheries is the diversity of fishing practices and techniques (Macchi et al. 2014). Consequently, a great variety of species is targeted in the region, including molluscs (e.g., bivalve, gastropod, cephalopods), crustaceans, echinoderms, demersal and pelagic fishes. Besides, a variety of gears are used (*e.g.*, bottom and pelagic trawls, hand and pole lines, trolling line, drifting line, pots and traps, trammelnet, set gillnets, driftnet, purse seine, beach and boat seine; CRFM, 2021). The ties between the social and natural environment and the long historical tradition of small-scale fisheries have also cemented the activity as an essential part of traditional livelihoods and a major source of income and food for coastal and riverine communities (de Oliveira Leis *et al.*, 2019). It contributes to the alleviation of poverty and malnutrition, as well as the food security of the region (Hanazaki *et al.* 2013). In this context, the concept of environmental stewardship has been widely acknowledged in the Latin America and Caribbean region, with communities expressing a sense of ownership and responsibility toward the marine environment and fisheries resources (de Oliveira Leis *et al.*, 2019).

Large pelagic fauna, including marine mammals, sea turtles, and elasmobranchs, in addition to its key role in the functioning of marine ecosystems, has always been a source of food, wealth and cultural inspiration for the inhabitants of the Caribbean. Six of the seven species of sea turtles, around 35 species of marine mammals, and more than 150 species of sharks and rays are present in the Wider Caribbean Region. Some are endemic, such as the Guiana Dolphin (*Sotalia guianensis*), the West Indian manatee (*Trichechus manatus*), and the Reef Shark (*Carcharhinus perezi*). All species of marine turtles and approximately 30% of marine mammals species observed in the Caribbean are classified in the global IUCN *Red List of Threatened Species* (status Vulnerable, Endangered, or Critically Endangered). For sharks and rays, a regional assessment across the Caribbean was carried out, which shows that 14% of species are threatened (Kyne *et al.*, 2012). Interaction with fisheries has been identified as the main threat to sea turtles (Eckert and Hart, 2021) and sharks (Kyne *et al.*, 2012) in the Caribbean and one of the main threats to marine mammals (Borobia *et al*, 2022).

Direct interactions between marine megafauna and fisheries can be classified into 3 categories: target catch (or hunting), bycatch in operational fishing gears, and depredation. Bycatch includes organisms that are outside legal-size limits, over quotas, threatened, endangered and protected species, and discarded for whatever other reasons, as well as non-targeted organisms that are retained and then sold or consumed. Depredation occurs when a predator partially or completely consumes an animal caught by fishing gear before it can be retrieved to the fishing vessel. Bycatch and depredation not only have a negative impact on marine megafauna but can also be detrimental to the fishing activity itself: they can cause degradation or loss of fishing gears (a major expense for fishers), can reduce yield and reflect badly on the fishing industry (Mitchell *et al.*, 2018; Temple *et al.*, 2021).

Although fishery data are recorded by Fishery Agencies in most Caribbean territories and reported to intergovernmental bodies like CRFM (Caribbean Regional Fisheries Mechanism) and/or FAO (Food and Agriculture Organization) (Table 1), challenges remain in terms of the lack of knowledge and understanding of small-scale fisheries due to poor institutional structure, and limited capacity, among other barriers (de Oliveira Leis *et al.*, 2019). The lack of data on species and threats prevents the complete assessment of the conservation status of marine megafauna in the Caribbean, as well as evidence-based policy and effective conservation and management measures.

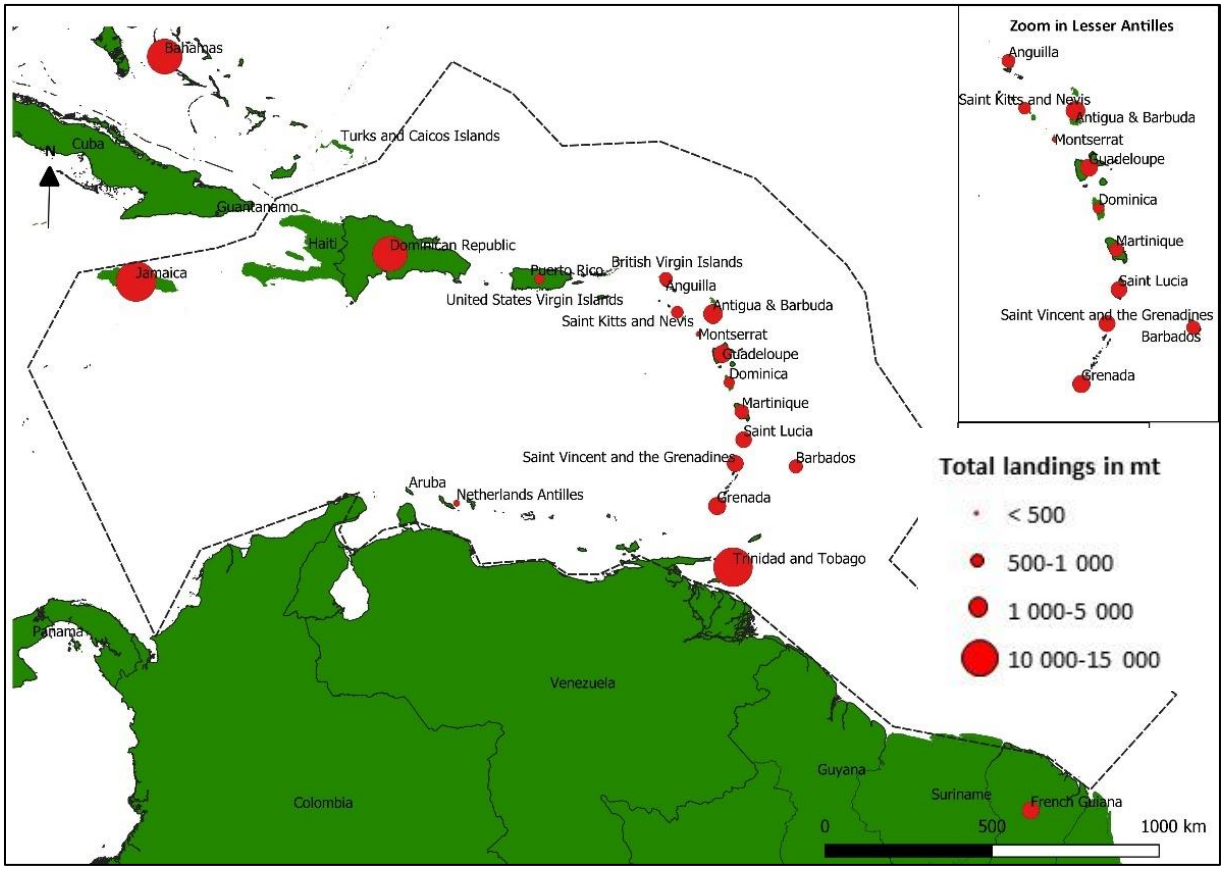


Figure 1: Annual landings of the fisheries of the countries and territories of the CAMAC project (see table 1 for references). The dotted line represents the focus area of CAMAC project. It includes 19 countries and 30 territories.

2.2 The CAMAC project

CAMAC stands for “Caribbean Marine Megafauna and Anthropogenic Activities”. This project is a response to a clearly observed need for strengthening knowledge, capacity, and regional collaboration in order to act together efficiently to strengthen the conservation of the threatened Caribbean marine megafauna (marine mammals, sea turtles, elasmobranchs and seabirds) and the sustainability of human activities which depend upon them. The general objective of this 4 years project is to provide the governing bodies and environmental stakeholders of the region with tools and recommendations aimed at strengthening the sustainability of human marine activities, by reducing their impacts on large marine fauna. It focuses on the Lesser Antilles and the Guianas (Figure 1), where knowledge is particularly lacking. The specific objectives are as follows: 1) enhance knowledge on the marine megafauna and the impacts of human activities on these species groups; 2) strengthen capacity of local NGOs and institutions in this field; 3) strengthen regional cooperation in this field via networking and the development of collaborative guidelines and platforms; 4) raise awareness of young people on these topics, improving their access to educational tools and programs; and 5) strengthen awareness and capacity of decision makers, with support tools developed from the project outputs. CAMAC project was submitted to INTERREG Caribbean fund, a cooperation program aiming at strengthening Caribbean cooperation between European French territories and other Caribbean territories and states, notably for protecting and promoting the natural and cultural environments.

CAMAC project is organised in seven work packages. In view of the lack of data available on megafauna and fisheries interaction, the first one is fully dedicated to this topic: develop and implement, in collaboration with Caribbean fisheries organisations, an assessment of the socio-economic and environmental issues related to interactions between fisheries and marine megafauna. To achieve this goal, three principal actions have been implemented during the first phase of CAMAC in 2023: 1) creating a scientific and technical advisory committee to support the actions, with notably fishing stakeholders; 2) reviewing available information and data on regional fishing activities and interactions with marine megafauna; 3) identifying priority areas for the knowledge enhancement actions planned in phase II.

This report is the main deliverable of CAMAC phase I, actions 2) and 3). The first chapter summarizes data collected from multiple national and regional reports and from experts’ interviews on the main characteristics of fisheries in the countries and territories of the CAMAC area. The second chapter is a literature review of existing measures and regulations regarding marine megafauna conservation in the CAMAC area. The last chapter presents the results of an online survey developed in the framework of CAMAC phase I to get a better overview of bycatch and depredation issues in the region. Finally, in the conclusion, some recommendations are provided for the knowledge enhancement actions planned in phase II.

Table 1: synthesis of the information available on the Caribbean Fisheries

Country	Nb Fishing vessels	Annual landings (mt)	Main target species	Main fishing gears	% contribution to GDP	Main References
Anguilla	153	1 310	Lobster, conch, large pelagic fish, sharks, reef fish, snappers	Pots and traps, lines, seine net	3.14	CRFM 2021
Antigua y Barbuda	332	3 164	Conch, reef fish, Lobster	Trap, hand and trolling lines, gillnet	0.95	CRFM 2021; FAO 2023a
Barbados	1146	1 436	Reef fish, large pelagic fish	Boat seine, traps, handlines, trolling lines, cast net, longline	0.14	CRFM 2021
Bonaire	100-130	102	Large pelagic fish, reef fish	Trolling line, handline	<0.1	De Graaf, 2016
Curaçao	294		Large pelagic fish, reef fish	Handline, trolling lines	<0.001	Marloes, 2016
Dominica	434	800	Mostly large pelagic fish	Handline & trolling lines on FADs	0.42	CRFM 2021
Dominican Republic	3361	11 000	Lobster, shrimp, conch, reef fish, large pelagic fish	Traps, gillnets and casting nets, bottom longlines, handlines, FADs	0.5	Herrera *et al.*, 2011
French Guiana	94	2 495	Coastal demersal fish, shrimps	Driftnet, Gillnet, shrimp trawl	0.5	IFREMER SIH 2022, INSEE
Grenada	2 028	2 636	Large migratory pelagic	Longline, trolling lines, beach seine	1.16	CRFM 2021
Guadeloupe	657	2 415	large pelagic fish, lobster, reef fish, conch	Trolling lines and longlines on FADs, traps, set gillnets, trammelnets	1.92	IFREMER SIH 2022, INSEE
Haiti	No data	No data	Reef fish, large pelagic fish	Gillnets, cast nets, handline, spear	No data	Aquino, pers. comm.
Jamaica	8 032	14 333	Reef fish, lobster, conch		0.49	CRFM 2021
Martinique	801	1 157	Large pelagic fish, lobster, reef fish	Trolling lines and hand lines on FADs, traps, set gillnets	1.1	IFREMER SIH 2022, INSEE
Montserrat	18	32		Beach seine, traps, lines, nets, spear…	0,24	CRFM 2021
Puerto Rico	956	609	Large pelagic fish, conch, lobster, octopus	Handline, trolling lines, traps, set gillnets	No data	Koeneke, 2011; Departamento De Recursos Naturales Y Ambientales, pers. com., 2018 data
Saba	10	135	Lobster, redfish	Traps	8	Brunel *et al.*, 2021; de Graaf *et al.*, 2017
St Eustatius	15	22,4	Lobster, reef fish, large pelagic fish	Traps, handlines, trolling lines	1	Brunel *et al.*, 2020
Saint Kitts and Nevis	221	1 047	Conch, reef fish, large pelagic fish	Traps, beach and boat seines, handline, trolling lines on FADs	0.5	CRFM 2021
Saint Lucia	891	2 148	Large pelagic fish, reef fish	Trolling, longlines, traps, gillnets	0.55	CRFM 2021
Saint Vincent & Grenadines	900	2 232	Large pelagic fish, reef fish	Longline, trolling lines, seines	0.6	CRFM 2021
Tobago	657	2 479	Large pelagic fish, reef fish	Longline, handline, traps, gillnets, beach seine	<0.1	Trinidad and Tobago Fisheries Division, Ministry of Agriculture, Land and Fisheries, pers. com., 2020 data
Trinidad	2 143	11 215	Shrimp, ground fish, large pelagic fish, snappers, sharks	Shrimp trawl, longlines, hand lines, traps, gillnets, beach seine		

3 Description of Caribbean fisheries

This review summarizes the data and information collected from literature, dedicated websites, and interviews of Fisheries Divisions and Officers from the countries and territories of the CAMAC area. Our main data sources are the report of 2021 from CRFM and data sent by the fishery divisions of Puerto Rico, Saint Lucia, Trinidad and Tobago, and the French Antilles (Table 1). Obtaining comprehensive and quantifiable data for all the CAMAC area has been a major challenge. As a consequence, the synthesis below should be considered as a first overview of the main characteristics of the fisheries in the countries and territories of the CAMAC area.

3.1 Antigua and Barbuda

In 2018:
332 vessels,
>30% use fish traps
3164 mt landed

Fisheries are mostly artisanal in Antigua and Barbuda. At the end of 2012, there were 1 635 registered fishers engaged in the sector, with 754 (approximately 46%) classified as full-time. Of the registered fishers, 849 were actively fishing, which is about 2% of the national labour force (FAO, 2023a). There are about 40 private sport fishing vessels operating in Antigua and Barbuda, including 10 commercial charters. Fisheries contribution to GDP in Antigua and Barbuda is 0,95% (Table 1).

Most of the wooden sloops and dories that dominated the sector in the 1970s have been replaced by modern fiberglass launches (up to 16 m) and pirogues (typically 7 m) with the latest fishing equipment (global positioning system, depth sounder, etc.). While there have been significant improvements in terms of vessel construction and fishing technology, traps or “fish pot” used to target the demersal species remain the dominant gear due to the extensive nature of the island shelf. In 2012, trap fishing vessels comprised 30% of the active fishing fleet of 332 vessels (Table 1, FAO, 2023a). Other important fishing gears include hand and troll lines and gill nets.

The main species targeted are conch (17%), reef fishes (Groupers, snappers, grunts, parrotfishes…; >60%) and lobster (10%;**Erreur ! Source du renvoi introuvable.** Capture production has been quite stable with around 3 000 tones between 2005 and 2016, with the year 2012 showing an outstanding production of 5 700 tones.

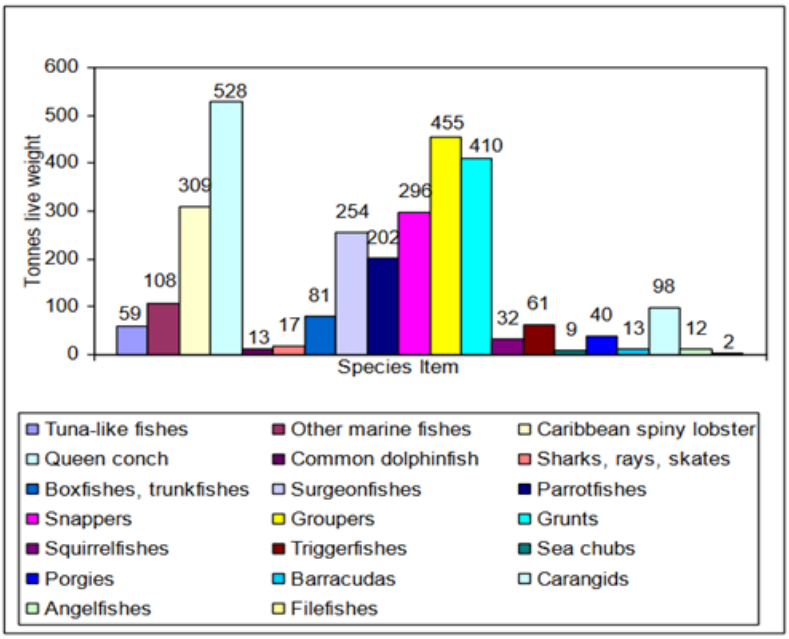


Figure 2: Capture production by fishery species item for Antigua and Barbuda in 2005 (Total: 2999t; FAO, 2007).

3.2 Barbados

> *In 2018:*
> *1146 fishing vessels registered*
> *1436 mt landed*
> *Coastal reef fishery dominated by boat seine*

The fishery in Barbados is mainly artisanal and coastal. In 2018, 1 146 fishing vessels were registered and the total landing was 1 436 mt (metric tons). Fisheries contribution to GDP in Barbados is 0,14% (CRFM, 2021).

The vessels comprising the Barbados commercial fishing fleet are typically divided into the following four main categories:

- "Moses" are undecked vessels of an average length of 5.5 m. In 2016, the Barbados registered fishing fleet included 672 Moses.
- "Dayboats" or launches, that do not carry ice holds and have a mean length of 7.7 m. In 2016, there were 234 of them.
- Iceboats are decked vessels of 11.2 m in average. In 2016, there were 193 of them.
- Long-liners carry ice holds and are 14.1 m in average. In 2016, there were 47 of them.

The fishing activity is dominated by coastal reef fisheries that occur in a narrow band generally within 2 km from shore around the entire island. They can be classified into 4 main categories (McConney, 2011):

- The shallow-shelf reef fishery is mainly conducted with moses and traps of various shapes. It targets reef fishes.
- The deep-slope and bank reef fishery is conducted mainly with dayboats. Handlines target queen snapper and vermilion snapper, and traps target silk snapper and some vermilion snapper.
- The coastal, reef fishery for small pelagic fish is the dominant reef fishery of Barbados. Both 'moses' and dayboats are used. Three different methods are used: boat seines, cast nets, and trolling. Seine fishing accounts for 65% of landings of this fishery.
- The sea egg fishery is conducted by snorkelling, but boats may also be used. The sea urchins are removed from the bottom by hand or metal scraper and are collected in a net bag.

The fisheries for conch and lobster are minor, and the sea turtle fishery is closed indefinitely. Other minor activities are the fisheries for flyingfish (mainly *Hirundichthys affinis*) and dolphinfish (*Coryphaena hippurus*), that are part of a multispecies offshore fishery.

The distribution of fishing intensity across the coast of Barbados is quite heterogeneous, with much more fishing effort concentrated on the leeward coast, near Bridgetown and Six Mens (Figure 3).

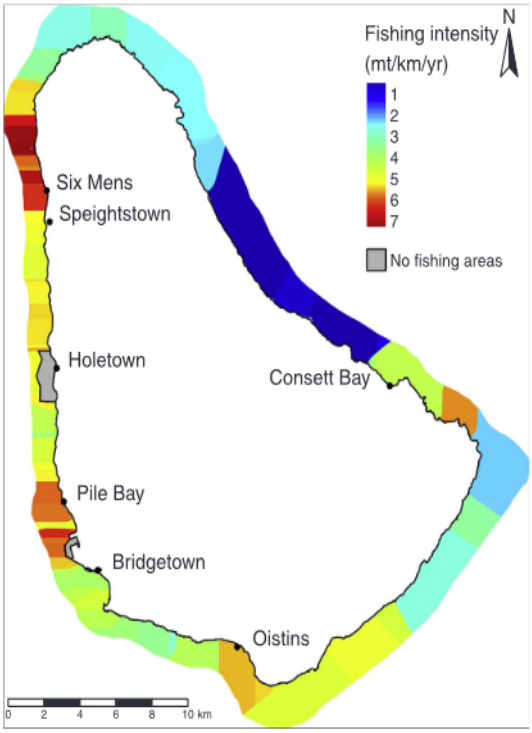


Figure 3: Variability in annual commercial fishing intensity (mt.km-2.yr-1) for reef-associated species on the nearshore shallow shelf in Barbados (Gill et al., 2017).

3.3 British territories

3.3.1 Anguilla

> *In 2018:*
> *153 vessels*
> *1310 mt landed*

Fishing in Anguilla is mostly artisanal and accounted for 153 vessels and a total landing of 1310 mt in 2018 (CRFM, 2021). In 1993 there were 400 fishers, and for the 2014 licensing period, this number fell to 130 licensed seasonal fishers (Gumbs, 2015). Anguilla has no industrial fishing company and fishing is often conducted on demand (Gumbs, 2015).

The fishery may be divided into two main sectors, directed at lobster or finfish. Both of these fisheries mainly use fish pots and traps, though finfish are also taken by lines and seine nets. Most fishing boats have a crew of two or three and operate within 40 miles from the shore (Hoggarth, 2001).

The other fishing methods employed are handline, spearguns, vertical longlines, FADS, and rods (Gumbs, 2015).

Anguilla's fishing activity is strongly driven by tourism (especially for lobster, snappers and queen conch fisheries), the first industry of the country. The hospitality industry prompted the fishing industry to fish for large pelagic fish, some of the targets being Tuna (various species), Wahoo, Blue Marlin and Dolphinfish (Mahi Mahi). Today, the main fisheries include Jacks/Scads, Sharks and mixed reef fish such as Hinds, Grunts, Parrotfish and Surgeonfish.

An estimated ten fishers in total, from Crocus Bay, Island Harbour and Forest Bay, directly target sharks around the coast using shark traps made with moored fishing line and baited hook. These traps are usually checked daily to prevent the Shark from drowning (Gumbs, 2015). Spearfishers when presented with the opportunity would target small Nurse, Reef and Blacktip Sharks (Gumbs, 2015).

3.3.2 Montserrat

> *In 2018:*
> *18 active fishing vessels*
> *32 mt landed*
> *Collapse of fisheries since the 1997 volcanic eruption*

Montserrat's fisheries are small-scale, employing a small number of full-time and part-time fishers. There has been a decline in the number of active fishers since the beginning of the volcanic activity: before 1995, there were as many as 250 full and part time fishers, compared to just 60 in 2000 (Volk *et al.*, 1993; CARICOM, 2011). Today however, the numbers have begun to recover: currently, there are an estimated 101 fishers active on Montserrat, including full-time, part-time, and recreational fishers (Ponteen, 2014). Between 2008 and 2018, Montserrat fisheries landed an average of 32 metric tons per year (CRFM, 2021). The fishing activity is estimated to contribute to only 0.3% of the gross domestic product (GDP), but is an important source of income and food security for local people and is culturally significant. (Granderson *et al.*, 2018).

About 90% of the fishing activity occurs in the nearshore area, within three miles of the coast, while the remainder takes place outside of Montserrat's territorial waters, including around the nearby islands of Antigua, Nevis, and Redonda (BOI, 2006; Ponteen, 2014).

Thirty-two boats were active in Montserrat's fishery in 2013, ranging in length from 12 to 30 feet (Ponteen, 2013; Ponteen, 2014). Most are open boats built of wood or fiberglass and powered by 20-25 horsepower outboard motors. There are a few larger boats with larger engines, and one or two use inboard diesel engines. In 2018, the Department of Fisheries Montserrat listed only 18 active boats.

According to Montserrat's national fisheries data (1994-2010), a variety of gear types and fishing techniques are used by Montserratian fishers, including beach seines, traps and pots, bottom lines, handlines, cast nets, gill nets, longlines, pole and line, rod and reel, and spearfishing.

3.4 Dominica

> *In 2017:*
> *434 active fishing vessels*
> *800 mt landed*
> *70% hooks and line on FADs*

Dominica's fishing industry can be described as artisanal and small scale, with most of the fish caught used for subsistence or sold domestically. The fisheries sub-sector provides direct jobs to 1 195 people, mainly in marine coastal fishing. Fisheries Gross Value Added is estimated at 0,42% GDP in 2011 (FAO, 2019).

In 2017, 912 people, were reported to be engaged in fishing (FAO, 2019). Fish landing fluctuated in the last ten years from about 500 T in 2013 to more than 1 000 T in 2014, with almost 800 T reported in 2017 (FAO, 2019).

The fishing fleet in 2017 consisted of 434 undecked multipurpose vessels, mostly motorized boats of less than 12 m, mainly ranging from 4.6 m to 7.6 m. Categories of vessels include fibreglass reinforced plastic vessels, keel-type vessels, pirogues and canoes. In terms of fishing gear, the majority of fishers use hook and line (70%), mostly surface drop line and trolling lines anchored around Fish Aggregating Devices (FADs).

Main fish species caught are tuna (mainly yellowfin), dolphinfish (mahi mahi), blue marlin, ballyhoo (*Hemiramphis brasiliensis*) and mackerels. Unlike other Caribbean countries, Dominica does not produce Queen conch or lobster.

There is a fishery targeting sea turtles with a closed season and minimum size limits (Eckert and Eckert, 2019). In addition, eggs and nesting females takes are prohibited.

3.5 Dominican Republic

In 2011:
3361 fishing vessels, 98% artisanal
11 000 mt landed
>2500 estimated FADs
Extensive use of traps, gillnets and lines

Fishing is mainly artisanal, with high levels of import accounting for more than 50% of local fish consumption. Fishing contributes approximately 0.5% of the country's GDP. The number of artisanal fishers has been estimated at 10 000 (Mateo, 2004). Most of the fishers are not dedicated full time to fishing. Overexploitation of resources has resulted in more and more fishers looking into alternative economical activities, making tourism (direct or indirect) related activities one of the most relevant options. The fishing fleet is comprised of more than 3 361 boats (98% of them being artisanal), 8 399 fishers, and has an average annual production of 11 000 T (according to the last SERCM census in 2004; Herrera *et al.*, 2011).

The spiny lobster fishery is the most valued in the Dominican Republic, and mostly uses traps. About 40% of the fishers at national level target lobster exclusively, therefore, it is estimated that 3360 fishers and more than 1500 boats are involved in this fishery (Herrera *et al.*, 2011). Moreover, the remaining 60% may occasionally catch lobsters and commercialize them.

The shrimp fishery is carried out with gillnets and casting nets, and according to recent data, catches an average of 184 T with important fluctuations between 1992 and 2003 (Herrera *et al.*, 2011).

Queen conch fishery is carried out by diving, so despite its strong fishing pressure, it has no bycatch.

Reef fishery is a coastal artisanal, small-scale fishery mainly directed to the local market, with a high tourism demand. Various fishing gears are used, which relates to the species diversity: traps, gillnet,

diving (including diving with compressor), and a variety of fishing lines (Herrera *et al.*, 2011). This fishery takes place year-round.

The ocean bank fishery (Navidad Bank & Silver Bank) is undertaken more than 90 miles from land, which makes it inaccessible to most artisanal fishers. FAO considers the ocean bank fishery as a semi-industrial fishery, in which boats with decks, diesel engines, freezing equipment and ice storage, and 5 to 25 crew members, make 7- to 10-day trips to the ocean banks. It usually uses bottom longlines and handlines, all year-round except during the hurricane season.

A pelagic fishery occurs along the south coast mostly, and fishes on FADs with troll lines and handlines mostly, and targets pelagic migratory species (Herrera *et al.*, 2011). It is estimated that more than 2500 FADs can be found around Dominican Republic.

A pelagic coastal fishery occurs particularly on the sea grass bottom in reef lagoons. Target species are numerous and are caught with gillnets, casting nets, hook-and-line, and occasionally traps.

Sharks are regularly bycaught in the pelagic fisheries. In the coastal area some juvenile sharks are caught, such as bull, blackfin, hammerhead, nurse, reef and lemon sharks. It is unregulated. (Herrera *et al.*, 2011). According to Talwar *et al.* (2022), since the 50's, catch of Sharks and Rays in Dominican Republic have been some of the highest in the region.

3.6 French territories

3.6.1 Guadeloupe and Martinique (French Antilles)

In 2020 in Guadeloupe:
498 active fishing vessels over 657 total
2 415 mt landed

In 2021 in Martinique:
801 fishing vessels registered
1 157 mt landed

Fisheries in the French Antilles share some characteristics: highly artisanal, mainly using nets and traps and with pelagic line fishing on FADs developing since the 1980's. The Guadeloupean fleet is about a thousand boats, with about 530 active boats, all of which are less than 12m and are multipurpose (Ifremer, 2022; Table 1). Fisheries contributed to 1.24% of GDP, and employed 1 299 people in 2014, which accounted for around 1% of total employment (INSEE). In Martinique, in 2020, IFREMER reported 801 boats smaller than 12m, 501 of which were active (Table 1). Fisheries contributed to 1.1% of GDP in 1999, and employed 1 127 people, which represented 0.98% of total employment (INSEE).

In Guadeloupe, the main fishing gears are various fish traps (used by 55% of all boats), trolling lines (41% of boats) and longlines on FADs (38% of boats), targeting large pelagic species, set gillnets (used by 28% of all boats) and trammel net (21%), targeting reef fish. Many fishers use several gears at a time. There is also a significant activity of snapper and small pelagic purse seine. Queen conch nets

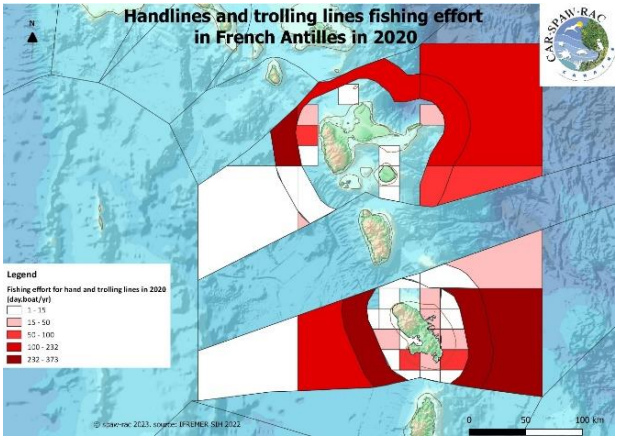
and apnoea is of high importance in Guadeloupe and is restricted with an open season from the 1st of October to the 31th of January (which can change like in 2022, when it closed 2 months earlier).

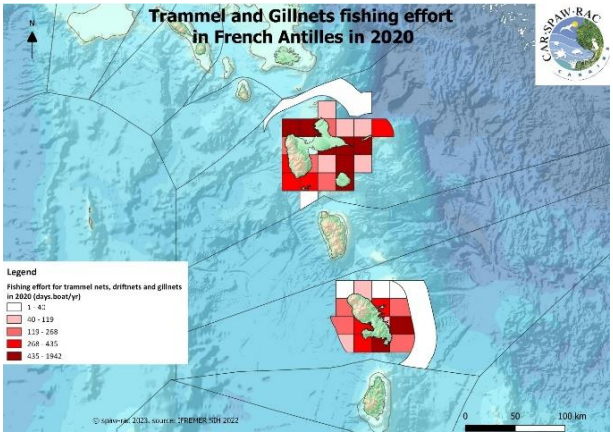
In Martinique, the main fishing techniques are fish traps (used by 60% of boats), trolling and hand lines on FADs (36%) and in open ocean (24%) and set gillnets (25%). Other important gears used are spearfishing/diving for conch and lobster (25% of boats), seine (10%), trammel net (9%), surface nets (7%). In terms of landings, lines on FADs are the most productive techniques (31,8% of landings), followed by seines (22,7%) and traps (12%). All nets together (set gillnets, trammel nets and cast nets) produce 16,2% of landing.

In Guadeloupe, the annual effort was 41 149 fishing trips in 2020. The five more landed species are: dolphinfish (707 mt), Yellowfin tuna (606 mt), parrotfishes (218 mt), spiny lobster (121 mt) and filefishes (104 mt) (Quentin *et al.*, 2021).

In Martinique, the corresponding annual fishing effort was estimated to be 21 774 (±25%) fishing trips, landing an average total of 1,491 (±46%) metric tons. The five more landed species in 2020 were: yellowfin tuna (561t), Atlantic blue marlin (247mt), dolphinfish (131mt), spiny lobster (62mt) and filefishes (46mt) (Quentin *et al.*, 2021).

Hand and trolling line fisheries are distributed near the slope and offshore, and are more present in the windward side of Guadeloupe near La Désirade island. In Martinique, the fishing pressure is higher and more evenly distributed (Figure 4). In both territories, net fishing effort is higher than lines, and well distributed all around the islands in the nearshore coastal areas. Similarly, pots and traps fisheries are distributed all around the two islands (Figure 4). There is a strong correlation between fishing distribution and the population distribution along the coasts.





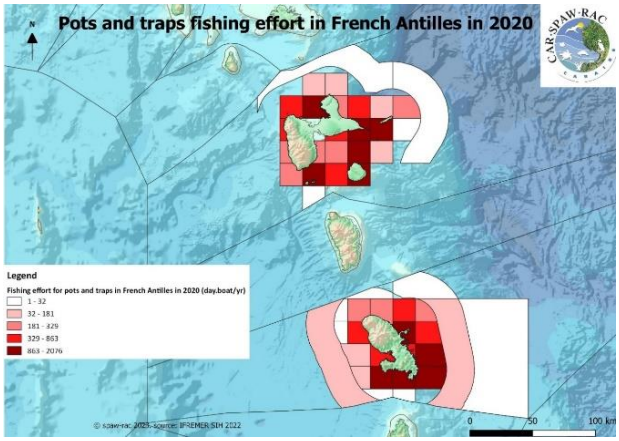


Figure 4: Fishing effort distribution in French Antilles territories for 2020 (day.boat). Data from IFREMER SIH 2022.

3.6.2 French Guiana

> *In 2021:*
> *80 artisanal and 14 semi-industrial vessels*
> *2 495 mt landed*
> *82% driftnets, 11% set gillnets, 7% shrimp trawl*

Fisheries contribution to French Guiana GDP is estimated to be 0,5% in 2012. The fishing sector employs around 800 direct jobs and 2400 indirect jobs. In 2018, fish products exports represented 8% of total Guianese exports, with around 10 million euros benefits (INSEE).

There are four main types of fishing boats in French Guyana:

- Canot créole: large marine pirogues, usually measuring around 9 m and fishing coastal-demersal fish mainly with gillnets. 10 canots créoles are listed in 2021.
- Improved canot créole: larger pirogue (around 10-12m), with outboard engine and ice compartment, but undecked. 70 improved canots créoles are listed in 2021.
- Tapouille: Fully decked wooden boat, with ice compartment and inboard engine. Mean length=11.9m. 7 tapouilles are listed in 2021. Tapouilles mainly use driftnets and catch demersal fish.
- Shrimp Trawlers: there are 7 shrimp trawlers in French Guyana, around 23m. They land around 162 mt of shrimps each year.

The first three types of vessels contribute to the coastal fishery, and landed around 2 330 mt in 2021, representing 93% of total French Guyana production (Ifremer, 2022). The shrimp trawls landed 162 mt in total in 2021, accounting for 7% of the landings only.

Although there are no fisheries directly targeting sharks in the territory, according to Talwar *et al.* (2022), since the 50's, catch of Sharks and Rays in French Guiana has been some of the highest of the region. The driftnet, the main fishing technique used, is the major risk for sharks like blacktips, smalltails, sharpnoses, hammerheads, daggernose and for highly endangered sawfishes (*Pristis and P. pectinata*) and oceanic manta ray (*Mobula birostris*). Lines can also catch to a lesser extent tiger, nurse, bull and silky sharks, but this is mainly the case of sport anglers.

3.7 Grenada

> *In 2018:*
> *2 028 fishing vessels*
> *2 636 mt landed*

In 2018, 2 028 fishing vessels were censused in Grenada and they landed 2 636 mt. The fishery sector was estimated to account for 1.16% of GDP (CRFM, 2021; Table 1).

Grenada's most important fishery targets coastal highly migratory pelagic fish within the country's exclusive economic zone, mainly with the use of surface longlines and trolling lines (Table 1, CRFM 2021). This fishery is essentially medium-scale commercial in which the entire catch is sold. Grenada's fishery does not record bycatch since there is a market for all species captured. Because the main species targeted are migratory pelagic fish, there is an element of seasonality both in effort and catches. Catches of pelagic species are most prevalent between October and July. CRFM (2021) reported that pirogues and small open vessels were the main types of vessels used in Grenada.

There is a fishery targeting sea turtles with a closed season and minimum size limits (Eckert and Eckert, 2019). In addition, eggs, nesting females and Leatherback takes are prohibited.

3.8 Haiti

To our knowledge, no data have been recorded on fish catch or production; thus, there are no fisheries statistics available. The information given bellow was collected by the NGO Haiti Ocean Project (HOP) and kindly made available to us.

Haiti is primarily a country of artisanal fishers. The main fishing methods include gillnets, cast nets, handline and spear fishing and the fisheries mainly target reef fish and large pelagic fish. Fishing techniques vary a lot between fishing villages, which are often specialized in one or two fishing techniques.

Vessels are artisanal vessels ranging from 3 to 6 meters. Main categories of vessels include:

- Rowboats; length 3.3 to 6 meters
- Flat-bottomed boats; length 3.3 to 5 meters
- Dugout wooden boats (pirogues); length 3.3 to 4 meters

Sharks, rays and sea turtles catch are not prohibited in Haiti. Although there is no targeted fishery, there seem to be frequent bycatch of these species. Major issues identified by HOP regarding sharks, are handlining on FADs (mainly for juveniles of Oceanic white tip, Silky, Tiger and Blue sharks). Sea turtles are the number one bycaught marine megafauna. The major gear impacting turtles are trammel and gillnets for green, loggerhead and hawksbill. Purse seine and beach seine are also of major concern for green and hawksbill turtles respectively. Loggerheads can be caught in pots and traps as well. Annual Sea turtle catch in Haiti is estimated to be between 500 and 1000 individuals per year (Humber *et al.*, 2014).

3.9 Jamaica

In 2018:
8 032 registered vessels
14 333 mt landed, 93% of which from artisanal fishery

The 2022 Jamaica Fisheries Quarterly Statistics Report listed 8 032 registered vessels and 14 333 mt landed. The fishery is mainly artisanal, and its overall contribution to GDP is around 0,5% (CRFM, 2021).

The data collection system for the artisanal fisheries is based on landings at individual beaches. The average number of days fished per month is twenty days. The artisanal fish production is diverse and includes reef species for 93% of the catch (such as snappers, parrotfish, jacks, and grunts), lobster, and conch (CRFM, 2021). Besides, according to Talwar *et al.* (2022), since the 50's, catch of Sharks and Rays in Jamaica have been some of the highest in the region.

The fishing fleet consists principally of open glass-fibre reinforced plastic canoes. Categories of vessels include:

- Dugout wood canoes and other small open canoes
- Open reinforced fibreglass plastic (FRP) canoes most of which are 8.5 metres, large size wooden boats locally called big head
- Fish trading vessels locally called packer boats
- Steel or aluminium hull vessels operating as "mothership" on offshore banks.

3.10 Netherland territories

3.10.1 Bonaire

In 2014:
102 mt landed
85% of large pelagic fish
Trolling line & handline predominant

Fisheries in Bonaire are mainly made of artisanal reef-related commercial fisheries and recreational fishery (Schep *et al.*, 2012). They are a great source of income and food supply for the local population, even if the commercial fisheries sector represents less than 0,1% of the Bonaire's GDP.

The total estimated annual landing of the Bonaire's coastal fishery in 2014 was around 102 mt with an average value of 0.7-1 million USD. The catch composition consisted predominantly of large pelagic species (85%) such as wahoo and tuna species (De Graaf, 2016).

In 2014, 84 small boats (<7 m) and 26 large boats (> 7m) were recorded. Both small boats (100%) and large boats (85%) conducted most of their fishing trips near to the shore (<400 m). The predominant gears in Bonaire are trolling lines, used to target large pelagic fish, and handlines for demersal reef fish (De Graaf, 2016).

3.10.2 Saba

In 2021:
10 licensed fishing vessels
83.6 mt of lobster & 41.3 mt of redfish landed
Mostly traps used

In the period 2012-2015, the total fishery landings grew from 78.4 mt to 135.2 mt and involved 10 boats. The fisheries represent around 8% of Saba's 15.7 million US$ GDP, which is a major contribution to the local economy (de Graaf *et al.*, 2017). The sector provides employment to a relatively large number of people (8% of the economically active population): about 20 people generate a living exclusively from the fishery, and approximately 30 people find part-time employment in it and so generate additional income in the fishery sector (Dilrosun, 2000).

The Saba bank supports two important long-time fisheries operating from Saba (Figure 5). These are a directed fishery for the West-Indian spiny lobster and a "redfish" fishery that targets an assortment of deep-water snapper species that is dominated by silk snapper, blackfin snapper, and vermilion snapper (Toller and Lundvall, 2008). Both fisheries are principally based on the use of traps. About 60% of the annual commercial effort (in terms of fishing trips) is directed towards the lobster and 40% towards redfish (Brunel *et al.*, 2021). The average number of traps is estimated at 300 per fisherman but can be very variable. In 2021, there were 10 licensed fishers for the spiny lobster fishery in Saba (Kingma *et al.*, 2021). Pelagic fishing for wahoo and dolphin fish is currently almost negligible, representing only about 2% of total landings by weight.

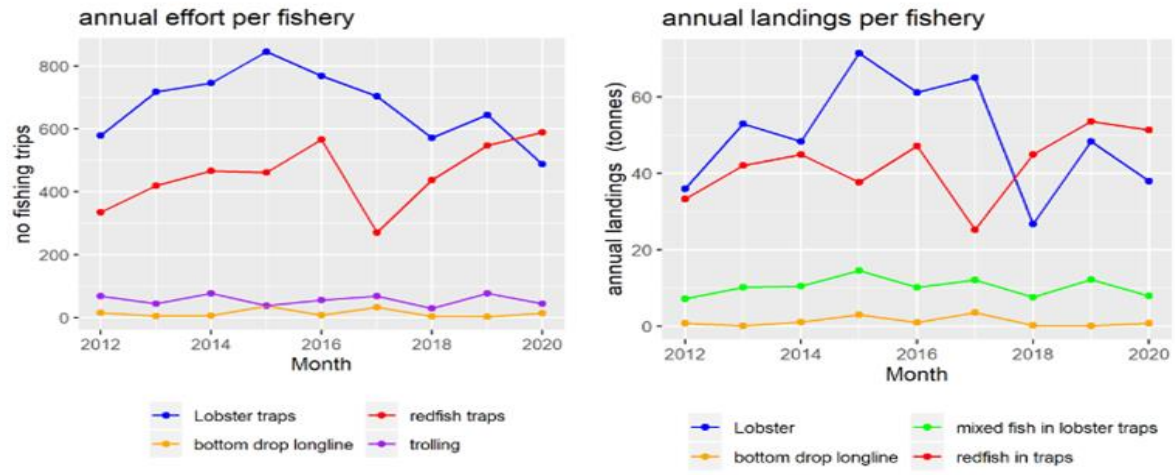


Figure 5: Saba's annual landed catch per group of species (in metric tons) and fishing effort per gear type in fishing days estimated from the port sampling and activity survey carried out from 2012 to 2020 (Brunel *et al.*, 2021)

3.10.3 St Eustatius

In 2018,
15 fishing vessels
6 mt fish + 16.4 mt lobster landed

There are about 24 fishermen on the island; most of them are part-time and have an on-shore fixed job (Amelot *et al.*, 2021). The fishing activity represents 1% of GDP.

There are 15 fishing vessels on St. Eustatius. They are all small open wooden hull fishing boats covered by fiber glass and are propelled by 1 or 2 two stroke gasoline engines. All vessels are moored at Gallows Bay, the only landing site on the island.

The lobster fishery is the most important fishery on the island. The lobster trap is consequently the most common fishing gear, responsible for almost 70% of the lobster landings in weight. Each fisherman has about 15-20 lobster traps (Dilrosun, 2004). Total lobster landings were 16.4 mt in 2018 (Brunel *et al.*, 2020).

Next to the lobster fisheries, different line fisheries are conducted around St. Eustatius. The handline fishery on reef fish has highly variable landings, usually between 1.2 and 4.3 mt of fish per year. Large pelagic fish are also caught by trolling (Amelot *et al.*, 2021).

3.10.4 Curaçao

In 2016:
294 fishing vessels
Spearfishing, beach seines and gillnets prohibited

While fishing contributed an average of 4% to the Curaçao's Gross Domestic Product in 1904, it has decreased to less than 0.001% in 2015 due to the low import prices for foreign fish and the decreasing CPUE (catch per unit effort, related to the efficiency on the fishery) which makes fishing largely unprofitable among other factors (Vermeij *et al.*, 2019). At this time, no systematic data on fishing intensity nor landings exists of the fisheries. There are 294 fishing vessels in Curaçao, but most vessels and fishers operate at such a small scale that they are exempt from existing licensing requirements.

Fisheries in Curacao are predominantly artisanal with reef fishing (mostly handline) for demersal species and trolling (handline dragged through the water) for pelagic species, being the two main types (Marloes, 2016).

Eighty-five percent of the vessels (in use) are motorized and the others are propelled with oars. Most vessels are located in the two main harbours of the island: Caracasbaai and Piscadera and are smaller than 7m (Marloes, 2016).

3.11 Puerto Rico

In 2018,
609 mt landed,
35% diving, 29% hook and line, 12% fish traps

The latest census of commercial fishermen reported that there were 868 active fishermen in 2008. However, the actual number of total fishermen (which includes full-time, part-time, seasonal, and "recreational/not licensed") probably lies between 1 500 and 2 000 since many fishermen do not hold a valid license and many seasonal fishermen were likely not included in the census (Koeneke, 2011). In 2018, 956 fishing boats were reported and the total landing was 609 mt (DRNA pers. com.).

According to the DRNA commercial fisheries statistics data (2018, pers.com.), the most important fishery in terms of landings are the conch and lobster fishery performed by divers (35% of landings) and the hand and trolling lines fisheries that targets mainly snappers (29% of landings). Other major fisheries are: the fish traps fishery for lobsters and reef fish (12% of landings), the trolling line fisheries for large pelagic fish (10% of landings), and the set gillnets fisheries that mainly targets snook fish (5% of landings).

Koeneke (2011) characterized the Puerto Rican commercial fisheries comprehensively. An example of fishing effort map for line gears is pictured in figure 6.

NOAA is in charge of conducting periodic assessments and evaluating Puerto Rico fisheries management.

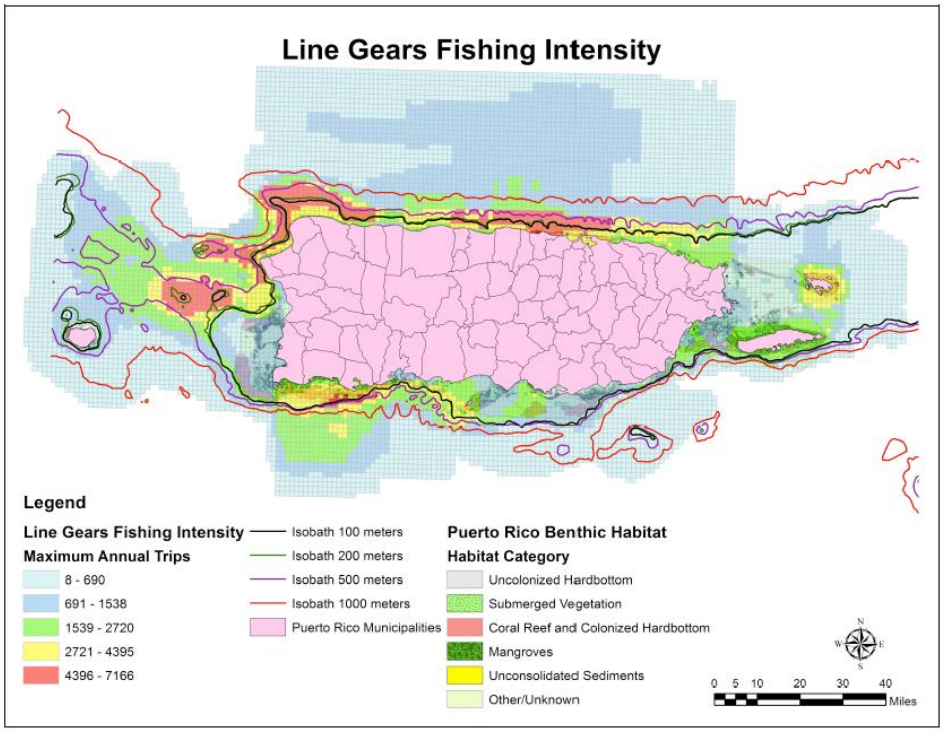


Figure 6 : example of fishing effort map from Koeneke, 2011.

3.12 St. Kitts and Nevis

In 2018,
1047 mt landed
221 fishing vessels

Total fisheries production in 2018 was 1047 mt and accounted for 0.5% of GDP (CRFM, 2021).

The landings are dominated by Queen conch (52% of total landings, CRFM, 2021). Fish landings represent 44% of total landings (FAO, 2019). The main fishes landed are snappers, groupers, parrotfishes and dolphinfish.

In 2018, 221 fishing vessels were censused (CRFM, 2021). Approximately 80% of the fleet are open pirogues between 5 to 12 meters in length.

The fishing gears utilized include pots, boat seines, some hand-lining and beach seining. Skin-diving is also practiced. Today, trolling near Fish Aggregating Devices (FADs) is the fastest growing fishing technique in St. Kitts, targeting medium and large pelagic fish such as dolphinfish and tunas (Ramdeen *et al.*, 2013).

There is a fishery targeting sea turtles during the open season, from October 1 to February 28th (Eckert and Eckert, 2019). Eggs and nesting females takes are prohibited. According to Humber *et al.* (2014), between 50 and 500 sea turtles are caught each year in the country. Most impacting fishing gears are gillnets specifically set for turtles during the open season. Boat seines are also known to take juvenile and adult hawksbills and juveniles green turtles, that are to be released even during open season. Adults are often taken by seines.

3.13 St Lucia

In 2018,
2 148 mt landed
~70% migratory pelagic fishes with trolling and longlines

In 2018, total landing was 2 148 mt, 891 fishing boats were recorded, and fisheries contributed to 0.5% of GDP (CRFM, 2021).

Vessels are ranging from 5 to 9 meters. They include: dugout wooden canoes and fiberglass reinforced pirogues (FRP), that land most of the catch, but also open yaule, decked shaloop, longliners, and whalers (JICA, 2009b).

Due to the very limited island shelf, catches are predominantly made up of migratory pelagics (dolphinfish, wahoo, tuna species and flyingfish), which comprise over 70% of total annual landings (CRFM, 2021). Gears used mainly include manually operated trolling gear and longlines (JICA, 2009b).

The nearshore fishery targets a variety of reef species; the catch can comprise some 40-60 finfish species, in addition to lobsters and octopuses. It mainly uses fish traps (wire mesh or bamboo

hexagonal mesh Z-traps, locally known as "fish pots") that are raised by hand. This fishery occurs in reef and shelf areas, usually in depths of less than 50 m. Alternatively, bottom-set gillnets are becoming more common, and spear guns and handlines are also used. Most pot fishing occurs during the off-season for coastal pelagic fishes (i.e., June to December yearly; JICA, 2009b).

Other fisheries include a small fishery for queen conch and sea urchins, as well as a currently moderately developed deep slope and bank fishery that targets snapper and grouper species (JICA, 2009b).

There is a fishery targeting sea turtles with a closed season and minimum size limits (Eckert and Eckert, 2019). Eggs, and nesting females takes are prohibited. According to Humber *et al.* (2014), between 50 and 500 sea turtles are caught each year in St Lucia.

There is also a fishery targeting several delphinid species (Borobia *et al.*, 2022).

3.14 St. Vincent and the Grenadines

> *In 2018,*
> *900 fishing vessels*
> *2 232 mt landed*
> *35% migratory pelagic fishes*

In 2018, 900 fishing vessels were recorded in St Vincent and the Grenadines. Landings were estimated to be 2 232 mt and the fisheries accounted for 0.6% of the GDP (CRFM, 2021).

The majority of fishing vessels are open and powered by outboard engines. In 2009, 89% of fishing vessels were between 3 m and 9 m in length. The largest boats are longliners, designed to operate up to 150 nautical miles from the islands, with 3 to 5 days at sea. They range in length from 10 to 20 metres (JICA, 2009a).

The SVG fishery may be divided into the following categories (JICA, 2009a):

- Offshore Pelagic fisheries, with longliners and trolling pirogues. The species include tuna, billfish, dolphin, kingfish, and contribute approximately to 35% of the total fish landed and marketed.
- Inshore Pelagic species include jacks and robin dodger. On average these species contribute approximately 45% of landings.
- Demersal species include rock hind, queen snapper, groupers, parrotfish. These species contribute approximately 10% to the local market.
- Shellfish (Lobster, conch, whelks') average annual contribution to landings is 5%.

There is a traditional significance to the harvesting of marine mammals in SVG. Presently, the whalers of Bequia island carry out their historical and cultural activity under the International Whaling Commission regime, with the quota of four whales per year since 2013 (Borobia *et al.*, 2022). Pilot whale, killer whale and small cetaceans are also targeted in Barrouallie and by some Kingstown Fishers (JICA, 2009a). In the period 2007-2017, between 203 and 927 cetaceans have been caught per year in the country (Fielding, 2022).

3.15 Trinidad and Tobago

In 2020,
2 800 fishing vessels
13 694 mt landed

Fisheries account for less than 0,1% of Trinidad and Tobago's GDP (Reid *et al.*, 2020). Most of the fish are marketed fresh and sold directly by the fishermen on the beach to private buyers/middlemen or to consumers. In 2020, there were an estimated 2 800 vessels in the marine capture fisheries of Trinidad and Tobago. Of these, the vast majority (over 96%) were artisanal (2 701 pirogues usually 7 to 12 m in length). The remainder (99 vessels) were non-artisanal, ranging from less than 12 m to more than 24 m in length, and included single and double-rigged trawlers, longliners and fish pot/line vessels (Trinidad and Tobago Fisheries Division, com. pers.).

Of the 2 800 fishing vessels, over 76% (2 143 vessels) were based in Trinidad and the remainder (657 vessels) based in Tobago (Trinidad and Tobago Fisheries Division, com. pers.). Fisheries resources off the two main islands of the archipelagic state differ because of significant ecological differences. Due to its location on the South American shelf, in Trinidad, the main fisheries are: the soft-substrate demersal fishery (shrimp and groundfish), the hard-substrate demersal fishery, the coastal pelagic fishery, and the oceanic (highly migratory) pelagic fishery. Off Tobago, the prevailing fisheries are coastal pelagic and hard-substrate demersal fisheries (Mohammed *et al.*, 2011). Some of these fisheries are further described below:

- The soft-substrate demersal fishery targets mainly shrimps and groundfish. Shrimps are caught mainly by trawls, while groundfish are either targeted by the artisanal multigear fleet, using gears such as gillnets, fish pots, demersal handlines and demersal longlines, or caught as bycatch in the trawlnets. To a lesser extent, shrimp are also caught by beach/land seines, as part of the artisanal multigear fishery.
- The hard-substrate demersal fishery targets mainly snappers year-round. The fishery is exploited by both artisanal and semi-industrial multigear fleets, using mainly fish pots and demersal handlines, with demersal longlines to a lesser extent.
- The coastal pelagic fishery targets small and large pelagic migratory species, mostly Scombridae in Trinidad, and Coryphaenidae, wahoo and scads in Tobago. Bycatch includes many Elasmobranch (e.g., *Sphyrna tudes, Rhizoprionodon lalandii, Carcharhinus porosus and C. limbatus*). These fisheries are targeted by the artisanal, multigear fleets in both islands using gillnets, beach or land seines (340 to 660 m long) and pelagic handlines (20 to 90 m in length, each line with one hook). Besides, the semi-industrial, multigear fleet (iceboats) in Tobago targets the fishery with pelagic handlines and gillnets.

There is an important sport fishery in Trinidad and Tobago, with regularly organized tournaments. In 2020, the fishery division estimated recreational fishing landings at around 1 231 mt (Trinidad and Tobago Fisheries Division, com. pers.). This fishery is most of the time conducted with hand and pole line and trolling lines.

Sharks comprise a major component of the landings in Trinidad and Tobago, with an average 500 mt of sharks being landed each year (Trinidad and Tobago Fisheries Division, com. pers.). Up to 34 species of sharks have been identified including two deep water species (Chan A Shing, 2005). Landings however generally comprise 15 species, five of which are very common. There are few shark targeting fisheries, so landings are primarily incidental catch. In the artisanal fishery over 90% of landings are by the gillnet fishery which targets *Scomberomorus brasiliensis*. In the offshore fishery, the most significant landings are by the industrial longline fishery which targets tuna and swordfish.

4 Review of management measures for marine Megafauna

4.1 Sea Turtles

All 5 sea turtle species native to the CAMAC region are listed on Annex 2 (full protection) of the SPAW protocol; Appendix 1 (full protection) of the CMS; Appendix 1 of CITES; and recognized as being in need of "protection, conservation and recovery" throughout the hemisphere by the Interamerican Convention for the Protection and Conservation of Sea Turtles (IAC).

Only few countries and territories in the Caribbean still allow turtle captures: Dominica, Grenada, Saint Lucia, Haiti, Turks and Caicos, Saint Kitts and Nevis and British Virgins Islands (Figure 7), all but one (Turks and Caicos) are located in the CAMAC area. Where turtles are not fully protected, legal fisheries typically mandate minimum size limits (by weight or shell length; Table 2).

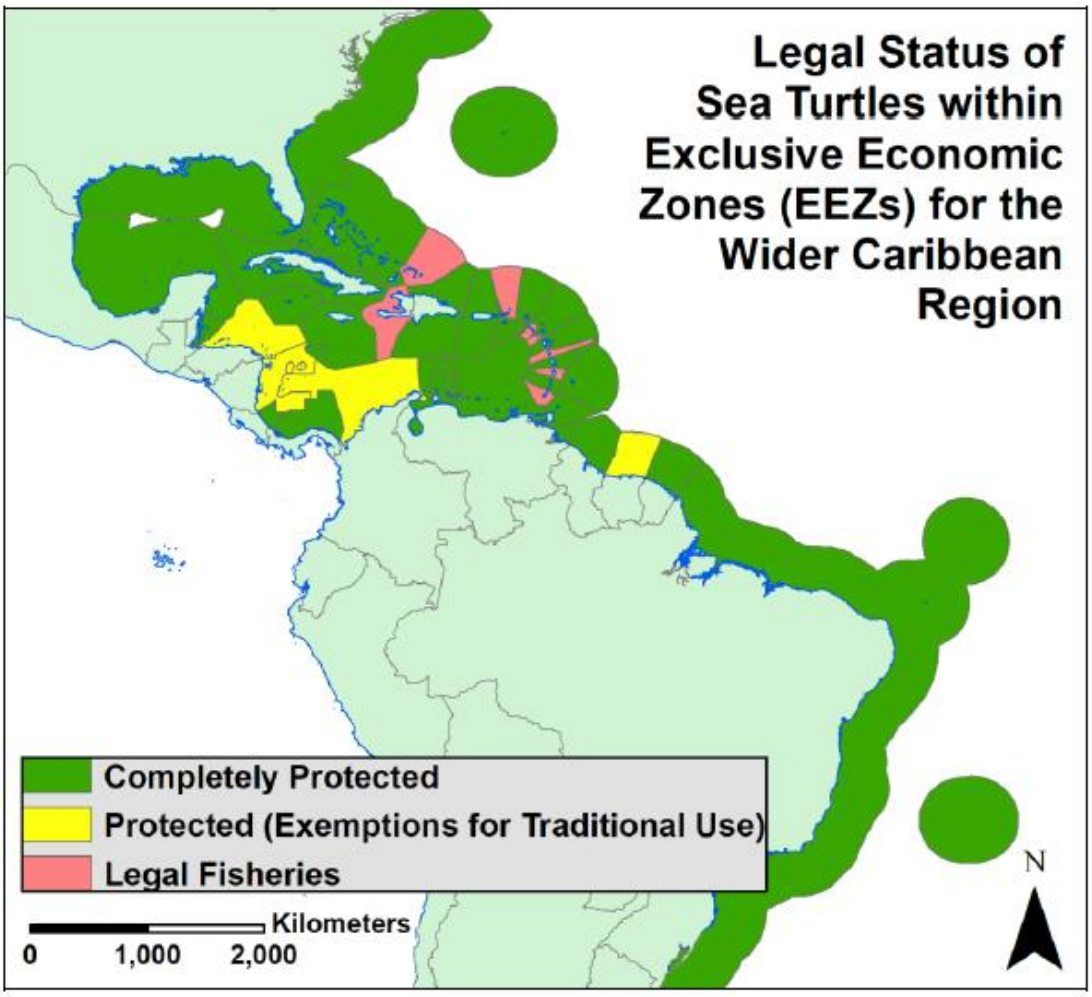


Figure 7: Summary of legal regimes protecting sea turtles in the Wider Caribbean Region, and including Bermuda and Brazil. Source: Eckert & Eckert, 2019.

Table 2: National policies for the protection of sea turtles in the CAMAC area.

(1) E = Eggs; N = Nests; NF = Nesting ; HB = Hawksbill; GT = Green Turtle; LB = Leatherback; LG = Loggerhead; I = Insufficient; Source: Eckert & Eckert, 2019.

Country	Complete (indefinite) protection	Moratorium (fixed period)	Prohibition(s) on take	Closed season	Minimum size limits	Maximum size limits	Annual quota
Anguilla	Yes	Yes					
Antigua y Barbuda	Yes					Yes	
Aruba	Yes						
Bahamas	Yes	-	-	-	-	-	-
Barbados	Yes						
Bonaire	Yes						
Curaçao	Yes						
Dominica	No	No	E, N, NF (1)	Yes	Yes	No	No
Dominican Republic	Yes						
Grenada	No	No	E, N, NF, LB (1)	Yes	Yes	No	No
Guadeloupe	Yes						
Jamaica	Yes	-	-	-	-	-	-
Martinique	Yes						
Montserrat	No	No	No	Yes	Yes	No	No
Puerto Rico	Yes						
Saba	Yes						
St Eustatius	Yes						
Saint Kitts and Nevis	No	No	E, N, NF (1)	Yes	Yes	No	No
Saint Lucia	No	No	E, N, NF (1)	Yes	Yes	No	No
St Maarten	Yes						
St Martin	Yes						
Saint Vincent & Grenadines	Yes						
Trinidad y Tobago	Yes						
Turks and Caicos Islands	No	No	E, N, NF, LB, LG (1)	Yes	Yes	Yes	No
US Virgin Islands	Yes						
British Virgin Islands	No	Yes (LB, LG)	E, LB, LG (1)	Yes	Yes	No	No

4.2 Elasmobranch

According to Talwar *et al.* (2022), the Western Central Atlantic Ocean, has been characterized by extensive shark and ray fisheries since the 50's, with catches around 50 000 mt in 2015. Most shark catches in the CAMAC region can largely be attributed to fishing by Venezuela, the Dominican Republic, Jamaica, Guyana, Trinidad and Tobago, and French Guiana (Talwar *et al.*, 2022).

All CAMAC countries are parties of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), that provides a legal framework to monitor and control the international trade in species that are overexploited by such trade (Table 3). Twenty shark and ray species are listed on CITES, two in Appendix I (prohibition of all trade except for scientific purpose) and 18 in Appendix II (trade allowed under authorization and with exportation permit).

The Convention on Migratory Species (CMS) provides a global platform for the conservation and sustainable use of migratory animals and their habitats. Within the CAMAC scope area Antigua and Barbuda, Dominican Republic, Grenada, Trinidad and Tobago, the Kingdom of the Netherlands and the EU are members. All shark and ray species listed in the CITES convention are also listed on the CMS: one in Appendix I (Migratory species threatened with extinction that need to be strictly protected) ; 9 in Appendix II (Migratory species that need or would significantly benefit from international co-operation); and 10 in both Appendices. A Memorandum of Understanding (MOU) on the Conservation of Migratory Sharks was negotiated under the auspice of CMS. it is the first global instrument for the conservation of migratory species of sharks. In the CAMAC area, 6 countries (15 territories), have signed this agreement.

Contracting parties and cooperating non-contracting parties to the International Commission for the Conservation of Atlantic Tunas (ICCAT) include the following countries in the CAMAC scope area: Venezuela, UK (overseas territories), EU, Trinidad & Tobago, Panama, Barbados, St. Vincent & the Grenadines, Curacao, Guyana, Suriname and the US territories. ICCAT has published a 'Compendium of Management Recommendations and Resolutions Adopted by ICCAT for the Conservation of Atlantic Tunas and Tuna-like-Species' which includes sharks and which can be sourced from the ICCAT website (ICCAT, 2024).

The Western Central Atlantic Fishery Commission (WECAFC) was established in 1973 by resolution 4/61 of the FAO Council under Article VI (1) of the FAO Constitution. Its main objective is to promote the effective conservation, management and development of the living marine resources in its area of competence and address common problems of fisheries management and development faced by its members. In 2022, the WECAFC adopted a Regional Plan of Action for the Protection of Sharks (RPOA). All CAMAC countries and territories are members of WECAFC.

Table 3: Overview of prevailing conservation treaties, management & legislation per country (Talwar *et al.*, 2022; Kingma *et al.*, 2024)

	Country	CITES - Party to the Convention	CMS - Party to the Convention	CMS MoU Sharks –	SPAW Protocol Ratified	WECAFC Member	ICCAT Contracting	NPOA adopted	Shark Fishing banned	Finning Ban	Shark sanctuary
	Antigua and Barbuda	X	X			X		X		X	
	Barbados	X			X	X	X				
	Colombia	X		X	X	X		X	X	X	
	Dominica	X				X					
	Dominican Republic	X	X		X	X		X	X	X	X
	Grenada	X	X		X	X					
	Guyana	X			X	X	C			X	
	Haiti					X					
	Jamaica	X				X					
	St Kitts and Nevis	X				X					
	St Lucia	X			X	X					
	St Vincent & Grenadines	X			X	X	X			X	
	Suriname	X				X	C				
	Trinidad and Tobago	X	X		X	X	X			X	
	Venezuela	X			X	X	X	X		X	
US territories	Puerto Rico	X		X	X	X	X	X		X	
	US Virgin Islands	X		X	X	X	X	X		X	
UK territories	Montserrat	X				X					
	British Virgin Islands	X		X		X		X	X	X	X
Dutch Carib bean	Saba	X	X	X	X	X		X	X	X	X
	St Eustatius	X	X	X	X	X		X	X	X	X
	Bonaire	X	X	X	X	X		X	X	X	X
	Sint Maarten	X	X	X	X	X			X	X	
	Curacao	X	X	X	X	X	X			X	
	Aruba	X	X	X	X	X					
French Antilles	St Martin (FR)	X	X	X	X	X	X	EU		EU	
	Guadeloupe (FR)	X	X	X	X	X	X	EU		EU	
	St Bart (FR)	X	X	X	X	X	X				
	Martinique (FR)	X	X	X	X	X	X	EU		EU	
	French Guiana (FR)	X	X	X	X	X	X	EU		EU	

The Protocol Concerning Specially Protected Areas and Wildlife (the SPAW Protocol), adopted in 2000, is the only binding tool for cross-border wildlife protection in the Wider Caribbean region. In the CAMAC area, 13 countries (22 territories) are Parties to the protocol. Ten elasmobranch species are listed on SPAW protocol: 5 in Annex II (species for which any shape of destruction or disturbance is forbidden) and 5 in Annex III (exploitation is authorized but regulated so as to ensure and maintain population at an optimal level).

Regarding national regulations, shark and ray fishing is banned in 4 countries (7 territories) of the CAMAC area (Table 3). The countries that are part of ICCAT all have finning bans in their waters, as do the French islands (under the EU finning regulation), the fully Dutch islands of Bonaire, Saba and Statia and the US islands because of US Plan of Action (in federal water). In addition, Antigua and Barbuda, the Dominican Republic and Sint Maarten have national finning bans (Talwar *et al.*, 2022). Through the establishment of shark sanctuaries, countries acknowledge the pivotal ecological roles played by elasmobranch species within its marine ecosystems. Within the CAMAC scope area, the EEZ of the Dominican Republic, the EEZ of some British Virgin Islands, the EEZ of the Dutch islands of Saba, St Eustatius and Bonaire and the Los Roques Archipelago in Venezuelan waters are shark sanctuaries. Sint Maarten's shark sanctuary is currently under review and will likely be reinstated in 2024. Finally, some countries have banned the fishing of certain species known to be endangered in their waters. For example, in Guadeloupe, silky, hammerhead, oceanic whitetip, thresher and whale sharks, as well as all manta and mobula rays fishing is prohibited. In Bonaire, the harvest of all sharks and 3 species of rays (*Manta birostris, Aetobatus narinari, Dasyastis ameri-cana*) is prohibited. In Puerto Rico fishing of several shark species such as the nurse shark is prohibited.

4.3 Marine mammals

Seven species found in the Widder Caribbean region are listed in Appendix I of the CMS and 7 in appendix II. All Mysticeti found in the region as well as the sperm whale and the manatees are classified in the Appendix I of CITES and all other taxa are in Appendix II.

All species of marine mammals are listed in Annex II of the Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartagena Convention. It means that the 18 SPAW Parties committed themselves to fully protect them on their territories. For these species, all forms of destruction and disturbance are prohibited. Their possession and trade are also prohibited. The same applies to products derived from these species. Any activity affecting their habitat is particularly regulated. Exemptions, that must be requested to the SPAW Parties, are possible for scientific, educational or management purposes necessary for the survival of the species. A SPAW marine mammal action plan was adopted in 2008 and a revised version has been available since 2023.

Table 4: Review of General measures adopted for marine mammal conservation by CAMAC countries that have ratified the SPAW protocol (Borobia *et al.*, 2022)

Contracting party	National legislation for marine mammal conservation	National action plan or species recovery, management plans	Hunting prohibited	Bycatch reduction or marine mammal component to fisheries legislation	Marine mammal MPA
Barbados	No	No	No	No	
Colombia	Yes	Yes	Yes	Yes	
Dominican Republic	Yes	Yes	Yes	No	Yes
France[1]	Yes	Yes	Yes	Yes	Yes
Grenada	No	No	No	No	
Guyana	No	No	No	No	
Kingdom of the Netherlands[2]	Yes	No	Yes	Yes	Yes
Caribbean Netherlands[3]	Yes	No	Yes	Yes	
St. Lucia	No	No	No	No	
St.Vincent and the Grenadines	No	No	No	No	
Trinidad and Tobago	Yes	No	Yes	No	
United States[4]	Yes	Yes	Yes	Yes	Yes
Venezuela	No	Yes	Yes	No	

[2]Aruba, St Maarten and Curaçao; [3]Bonaire, St Eustatius and Saba; [4]Puerto Rico and US VI

Around half of CAMAC countries have national legislation specifically dedicated to marine mammals or marine mammals are protected by a general law applying to the protection of wildlife (Table 4). The legislation applicable is mostly consistent with the SPAW status of marine mammal species: prohibition of the capture, disturbance, feeding, forced displacement, hunting, destruction or degradation of habitats and trade. However few countries do not yet enforce all of the above prohibitions in their territory, and the hunting of certain species of marine mammals continues to take place in some territories. Marine mammal hunting seems to be significant in at least three countries of the CAMAC area: St. Lucia, St. Vincent and the Grenadines, and Venezuela (Borobia *et al.*, 2022). Four countries of the CAMAC area have MPAs specifically dedicated to the conservation of marine mammals: the Dominican Republic (Sanctuary of Bancos de la Plata y la Navidad), France (Agoa Sanctuary), in the Kingdom of the Netherlands (Yarari Sanctuary), and in the United States (Puerto Rico).

4.4 Fishing gear regulation

In addition to regulations specific to marine megafauna, most Caribbean countries have set up regulations to minimize the impact of fishing gears on habitats and non-target species. For example:

- Antigua and Barbuda: A net cannot remain in place in the sea for longer than four consecutive hours to minimize drowning of nontarget species.
- Barbados: Traps mesh size is minimum 3 cm and they must be fitted with escape panel of approved size.
- French Guiana: All trawlers must be equipped with Turtle Exclusion Devices (TED) to limit the amount of bycatch.
- Grenada: Trammel nets and nets have a minimum mesh size.

In addition, some countries have prohibited the use of the fishing gears with strong negative impacts on the environment and notably marine megafauna. For example :

- Barbados: The use of dynamite, poisons and noxious substances, trammel and other entangling nets is prohibited.
- Anguilla: Gillnets are banned.
- Dominican republic: The use of dragging and gill nets are prohibited in Samaná Bay, where a high density of humpback whales is observed during their reproduction season.
- Martinique: The use of trammel nets (used extensively in conch fisheries) is prohibited.
- Yarari Sanctuary (EEZs of Bonaire, St. Eustatius and Saba): Fishing gears that can lead to captures of sharks and marine mammals are banned.
- Curaçao: Spearfishing, beach seines and gillnets are illegal.

5 Bycatch and depredation

As very little information was available in the literature on megafauna bycatch and depredation in the CAMAC area, an online survey was set up and sent to regional experts to get a better overview of these issues in the region. We created tables with 11 fishing gear categories, and we asked experts to assess the level of threat for bycatch and depredation, for the 3 groups of megafaunas (elasmobranchs, sea turtles, and marine mammals). The level of threats was defined as follows:

- level 1, bycatch is known to be a threat to the taxon, mitigation is a priority ;
- level 2, bycatch has not been assessed but the risk of interaction is high or unknown; assessment is a priority ;
- level 3, the impact of bycatch is known to be non-significant or the risk of interaction is low ;
- level 4, the fishing gear is barely used in my territory or the group of species is barely observed.

We sent this table to the WIDECAST network for sea turtles (more than 40 coordinators from 40 countries of the Wider Caribbean Region), to the marine mammal CAMAC expert (43 experts from 20 countries and territories), to the sharks and rays CAMAC expert group (19 experts from 12 countries and territories), and to the fisheries CAMAC expert group (28 experts from 21 countries and territories).

Table 5: Threat levels assigned by experts of the CAMAC area regarding sea turtle bycatch by the main fishing gear categories and for the different species

	Antigua & Barbuda	Aruba	Barbados	Bonaire	French Guiana	Guadeloupe	Grenada	Guyana	Haiti	Jamaica	Martinique	Montserrat	Sin Kitts	St Eustatius	Sin Maarten	Trinidad & Tobago	Suriname	US VI	Venezuela
FISHING GEAR																			
Bottom trawl																			
hand and pole line																			
trolling line																			
drifting longline																			
set longline																			
pots and traps																			
trammelnet																			
set gillnets																			
driftnet																			
beach and boat seine																			
Fish aggregating devices																			
SPECIES																			
Green turtle																			
Loggerhead																			
Olive Ridley																			
Hawksbill																			
Leatherback																			

Legend for fishing gears:

Threat level 1: bycatch of at least one sea turtle species by this fishing gear is known to be a threat to the species. Mitigation is a priority

Threat level 2: sea turtle bycatch has not been assessed for this fishing gear, but the risk of interaction with at least one sea turtle species is high or unknown. Assessment is a priority

Threat level 3: The impact of sea turtle bycatch with this fishing gear are known to be non-significant (not a threat to any species).

Threat level 4: The gear is not/barely used in the territory

Legend for species:

Threat level 1: bycatch by at least one fishing gear is known to be a threat to the species. Mitigation is a priority

Threat level 2: bycatch have not been assessed for this species but the risk of interaction with at least one fishing gear is high or unknown. Assessment is a priority

Threat level 3: bycatch is known to be non-significant for this species (not a threat to the species).

Threat level 4: The sea turtle species is not/barely observed in the territory

5.1 Sea turtle

Nineteen experts from 14 countries (19 territories) of the CAMAC area filled in the survey (Table 5). Sea turtle bycatch was identified as a major issue in all but one of these countries and territories: except for Montserrat, all experts assigned threat levels 1 (bycatch mitigation is a priority) and/or 2 (bycatch assessment is a priority), to several fishing gears and species.

Regarding fishing gears responsible for sea turtle bycatch, all fishing gears were given a threat level 1 and/or 2 by several experts, which suggests that they may all be a potential threat to sea turtles. The bycatch risk seems to be higher with nets, as they were given a threat level 1 more often than the other fishing gears. In particular, 11 experts answered that mitigation of bycatch (threat level 1) in set gillnets should be a priority. Finally, assessment of bycatch (threat level 2) in pots and traps, in hand and pole lines and in FAD was identified as a priority by respectively 9, 8 and 7 of the respondents.

Regarding species, except in a few cases (Table 5), the experts assigned a threat level 1 (i.e., interactions with at least one fishing gear is known to be a threat to the species, mitigation is a priority) or 2 (i.e., bycatch have not been assessed for this species but the risk of interaction with at least one fishing gear is high or unknown) to all species regularly observed in their territory. This suggests that bycatch may be an issue for all sea turtle species. As expected, the number of experts that have identified bycatch issues with the 3 species most often observed in the CAMAC focus (the green turtle, the hawksbill and the leatherback) is higher than for the loggerhead and the olive Ridley (Table 5).

5.2 Elasmobranchs

Eight experts from 6 countries (9 territories) of the CAMAC area filled in the survey (Table 6). Bycatch was identified as a major issue in all these countries and territories but Montserrat: except for this island, experts assigned threat levels 1 (mitigation is a priority) and/or 2 (assessment is a priority), to several fishing gears and at least one taxon (i.e. sharks, *Mobula spp*., sawfish).

Regarding fishing gears responsible for elasmobranch bycatch, all fishing gears were assigned a threat level 1 and/or 2 by several experts, which suggests that they may all be a potential threat to elasmobranchs. The bycatch risk seems to be higher with set gillnets (3 experts assigned a threat level 1 to this gear, and 2 experts a threat level 2) and lines: 2 experts assigned a threat level 1 and 3 experts a threat level 2 to set longlines; 3 experts assigned a threat level 1 and 1 expert a threat level 2 to drifting longlines; 1 expert assigned a threat level 1 and 5 experts a threat level 2 to hand and pole lines.

Regarding taxa, except in a few cases, the experts assigned a threat level 1 or 2 to all taxa they regularly observed in their territory (Table 6). This suggests that bycatch may be an issue for the 3 groups of elasmobranch species (i.e. sharks, *Mobula spp*., sawfish). The species most often cited as bycaught were: silky, tiger, mako, thresher, nurse and hammerhead sharks.

Depredation was identified as an issue in three cases: in Puerto Rico, depredation of sharks on drifting longlines, set longlines, trammelnet and set gillnet, was assigned a threat level 1. In Saba, depredation of sharks (notably nurse shark) on pots and traps was assigned a threat level 1 and depredation of sharks (notably tiger sharks and Caribbean reef sharks) on hand and pole line, and trolling lines, was

assigned a threat level 2. In the French Caribbean islands, depredation of sharks on hand and pole line and trolling lines was assigned a threat level 1 and depredation of sharks on drifting longlines and pots and traps, was assigned a threat level 2.

5.3 Marine mammal

Six experts from 5 countries (7 territories) of the CAMAC area filled in the survey (Table 7). All experts assigned threat levels 1 (bycatch mitigation is a priority) and/or 2 (bycatch assessment is a priority), to several fishing gears and group of species (i.e., whales and sperm whales, delphinids, manatees). This suggests that marine mammal bycatch was identified as a major issue in all these countries and territories.

Regarding fishing gears responsible for marine mammal bycatch, all fishing gears were assigned a threat level 1 and/or 2 by several experts, which suggests that they may all be a potential threat to marine mammals. The bycatch risk seems to be higher with nets, as they were given a threat level 1 more often than the other fishing gears. In particular, 3 experts answered that mitigation of marine mammal bycatch should be a priority with trammelnets, set gillnets and driftnets. Finally, assessment of marine mammal bycatch in hand and pole lines, trolling lines and drifting longlines was identified as a priority by 3 of the respondents.

Regarding taxa, except in a few cases, the experts assigned a threat level 1 or 2 to all taxa regularly observed in a territory (Table 7). This suggests that bycatch may be an issue for all marine mammal taxa (i.e., whales and sperm whales, delphinids, manatees). The threat may be particularly significant for the manatee, that was assigned a threat level 1 for 3 of the 4 territories that filled in the survey and where the species is still sighted.

Depredation was identified as an issue in three cases: in Puerto Rico, depredation of bottlenose dolphins on nets as well as pots and traps was assigned a threat level 1; in Jamaica, depredation of bottlenose dolphin on pots and traps was given a threat level 1; and in Dominican Republic, depredation of delphinids on FAD was assigned a threat level 2.

Table 6: Threat level assigned by experts of the CAMAC area regarding elasmobranchs bycatch by the main fishing gear categories and for the different group of species

	Puerto Rico	Saba Bank	French Guiana	Haiti	rinidad & Tobag	Curaçao	French Antillies	Montserrat
FISHING GEARS								
Bottom trawl								
hand and pole line								
trolling line								
drifting longline								
set longline								
pots and traps								
trammelnet								
set gillnets								
driftnet								
beach and boat seine								
Fish aggregating devices								
TAXA								
Sharks								
Mobula spp.								
Sawfishes								

Table 7: Threat level assigned by experts of the CAMAC area regarding marine mammal bycatch by the main fishing gear categories and for the different taxa

	Dominican Republic	French Antillies	French Guiana	Haiti	Jamaica	Puerto Rico
FISHING GEAR						
Bottom trawl						
hand and pole line						
trolling line						
drifting longline						
set longline						
pots and traps						
trammelnet						
set gillnets						
driftnet						
beach and boat seine						
Fish aggregating devices						
TAXA						
Whales and Sperm Whale						
Delphinids						
Manatees						

Legend for fishing gears:

Threat level 1: bycatch of at least one marine mammal/elasmobranch species by this fishing gear is known to be a threat to the species. Mitigation is a priority

Threat level 2: marine mammal/elasmobranch bycatch have not been assessed for this fishing gear but the risk of interaction with at least one marine mammal/elasmobranch species is high or unknown. Assessment is a priority

Threat level 3: The impact of marine mammal/elasmobranch bycatch by this fishing gear are known to be non-significant (not a threat to the species).

Threat level 4: The gear is not/barely used in the territory

Legend for species:

Threat level 1: bycatch by at least one fishing gear is known to be a threat to the taxon. Mitigation is a priority

Threat level 2: bycatch have not been assessed for this taxon but the risk of interaction with at least one fishing gear is high or unknown. Assessment is a priority

Threat level 3: bycatch is known to be non-significant (not a threat to the taxon).

Threat level 4: The taxon is not/barely observed in the territory

6 Conclusion

This report, drafted in the framework of phase I of CAMAC project, synthetize the information we had access to regarding the main characteristics of the fisheries in the CAMAC area and their interactions with marine megafauna (sea turtles, elasmobranch and marine mammals). Data were collected from scientific and grey literature, interviews of national fisheries departments, regional fishing management organizations, NGOs, and an online survey. Accessibility to data was a major challenge, as a consequence, the synthesis provided in the report should be considered as a first overview.

First of all, the information collected showed that fishing in the CAMAC region is mainly artisanal and small-scale, for local consumption. In most CAMAC countries and territories, fisheries contribution to the gross domestic product (GDP) is less than 1%. Most countries and territories of the area, have fishery production between 1 000 and 5 000 mt and the countries with the most important fisheries are Dominican Republic, Jamaica, and Trinidad and Tobago, with landings between 10 000 mt and 15 000 mt. However, the fishing activity employs many people, is an important source of income and food security for local communities and is culturally significant. In term of economic value for small scale fisheries, the main species are the spiny lobster and queen conch, which are caught mainly using traps and diving techniques. The other highly valuable species are reef fishes such as snapper, fished using gillnets, trammel nets, traps and hand lines mostly, and large pelagic fish such as tuna-like species, wahoo, dolphinfish and marlin, caught using mostly handlines and trolling lines on FADs. The industrial fisheries in the Caribbean are mainly pelagic and composed of pelagic trawlers, shrimp trawls and longliners; they are more developed in Trinidad and Tobago, Jamaica and French Guiana. Regarding monitoring programmes, the vast majority of Caribbean countries have long term fishery monitoring programs, but it is difficult to access data and they are often incomplete or not up to date. Besides, we identified very few long-term programs for bycatch monitoring, and few specific studies.

Regarding national regulations for marine megafauna conservation, 6 countries and territories of the CAMAC area still allow sea turtle captures (over the 19 countries and 30 territories in the area). Legal fisheries typically mandate minimum size limits and a closed season. Shark and ray fishing is banned in 4 countries (7 territories) of the CAMAC area, and among the others, several prohibit the catch of some of the most endangered elasmobranch species. Shark finning is banned in 11 countries (19 territories). The EEZs of the Dominican Republic, some British Virgin Islands, the Dutch islands of Saba, St Eustatius and Bonaire, and the Los Roques Archipelago in Venezuelan waters are shark sanctuaries. Shark target fisheries seem to be conducted in only few countries of the CAMAC area, but catch (target catch + bycatch) is significant in several of them, such as: Venezuela, Dominican Republic, Jamaica, Guyana, Trinidad and Tobago, and French Guiana. Marine mammals are fully protected in about half of CAMAC countries and hunting seems to be significant in three countries. Five countries have MPAs specifically dedicated to the conservation of marine mammals: the Dominican Republic (Sanctuary of Bancos de la Plata y la Navidad), France (Agoa Sanctuary), the Kingdom of the Netherlands (Yarari Sanctuary), Dominica (Sperm whale MPA), and United States (Puerto Rico). In addition to regulations specific to marine megafauna, most Caribbean countries have regulated and/or prohibited the use of fishing gears that have strong negative impacts on the environment and notably marine megafauna.

Regarding bycatch of marine megafauna, 19 experts from 14 countries (19 territories) in the CAMAC area responded to the online survey for marine turtles, 8 experts from 6 countries (9 territories) for elasmobranchs and 6 experts from 5 countries (7 territories) for marine mammals. The vast majority of experts that filled in the online survey identified sea turtle, elasmobranchs and marine mammal bycatch as a major issue to be mitigated and better assessed in their country/territory. Most impacting gears differed depending on the species group, but set gillnets were cited more often: sea turtle

bycatch risk seems to be higher with nets and particularly set gillnets; for elasmobranchs, set gillnets and lines seem to have higher risks of bycatch; for marine mammals, bycatch mitigation should focus on for trammelnets, set gillnets and driftnets. Regarding species, bycatch was identified as an issue for all species groups, *i.e.*: all sea turtle species, sharks, *Mobula spp*., sawfish, whales, sperm whales, delphinids, and manatees. As expected, the number of experts that have identified bycatch issues is higher for the 3 sea turtle species most often observed in the CAMAC focus area (the green turtle, the hawksbill and the leatherback) than for the other sea turtle species (loggerhead and olive ridley). For sharks, the species most often cited as bycaught are: silky, tiger, mako, thresher, nurse and hammerhead sharks. For marine mammals, bycatch threat may be particularly significant for the endangered manatee. Some depredation issues have also been raised, notably the depredation of marine mammals on pots and traps in Jamaica and Puerto Rico, and several cases of depredation of sharks on various fishing gears in Puerto Rico, Saba, and the French Antilles.

Actions planned during CAMAC phase II (2024-2027) are the following: 1) Fine-tune the collection and compilation of available data; 2) In collaboration with national and regional fishery management organisations, conduct fishers interview surveys on pilot sites to characterise interactions between marine megafauna and the Caribbean fisheries; 3) In collaboration with national and regional fishery management organisations, based on the results of actions 1 and 2, and using ByRa toolbox, assess the interactions and make operational recommendations to mitigate the major negative impacts.

Hence, in regard to the work conducted during CAMAC phase I and synthetised in this report, the following recommendations can be made for CAMAC phase II:

Hence, from the work conducted during CAMAC phase I and synthetised in this report, the following recommendations can be made for phase II:

1) Regarding the collection and compilation of available data: e-mail contacts with national fishery organisations has proved insufficient in collecting detailed and quantified data on fisheries. Hence, it is recommended for phase II to meet with these organisations, travelling to some territories and attending to regional workshops and conferences on fisheries.
2) Regarding priority areas/topics for the fishers interview surveys that will be conducted during phase II: the (limited) data collected during CAMAC phase I suggested that major bycatch issues exist for most species, territories and fishing gears, and no priority area/topic was identified apart from set gillnets. Consequently, recommendations for phase II are the following: fishers' interview surveys should be conducted in 4-6 sites where local communities are willing to work on this topic, where the fishing activity is well developed and diversified and species diversity is high, so that they will make a representative sample of the region. In addition, a focus should be made on set gillnets.
3) Regarding collaborations with fishery management organisations: several experts highlighted that for our work to be successful, in addition to working in collaboration with national and regional fishery management organisations, local communities should be involved at each step of the project. Besides, as bycatch monitoring are rarely implemented in the region, it is very important that interview surveys are conducted by local agents, that will be trained.
4) Finally, several experts raised some issues that were not considered in CAMAC phase I, so we recommend to include them in phase II: 1) collect information on regulations regarding seabirds conservation and on their interactions with fisheries; 2) assess the impact of entanglements in ALDFG (abandoned, lost or otherwise discarded fishing gears), in collaboration with the leader of CAMAC workpackage on stranding networks.

Finally, it is important to note that additional recommendations for CAMAC phase II were given during CAMAC final workshop during the 76th conference of the Gulf and Caribbean Fisheries Institute (Combes & Pusineri, 2023), and must also be carefully looked at when phase II will start.

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