Assessment of Elasmobranch species status in Gabonese artisanal fisheries in Corisco Bay, Gabon

Study of Elasmobranch population by monitoring their capture in artisanal maritime fishing in Corisco Bay in Gabon

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Dates of internship: From 01/05/2021 to 28/02/2022
Location of internship: Corisco Bay, Libreville, Gabon

1- Executive Summary

The main objective of this internship was to elaborate a protocol and to start to conduct an inventory of Elasmobranch species (taxonomic group composed of sharks and rays) present in Corisco Bay, northern Gabon. This was the first study of this type in this geographical area. Thus, thanks to onboard missions carried out on the artisanal fishing boatsboat operating in this area, a team of observers was able to collect data on the catches of rays and sharks caught accidentally by the fishermen. The preliminary results of this study showed that the catches of Elasmobranchs were almost made up of rays, and that the dominant species were Daisy Whipray (*Fontitrygon margarita*) and Pearl Whipray (*Fontitrygon margaritella*), both of the stingray family. This was a first location of these species in this study area and this information confirms their presence in this area. Also, passive fishing gears can impact the populations of Elasmobranchs, as they tend to capture them in an accidental way. Unfortunately, some onboard missions on fishing boats could not be carried out because of the difficult collaboration of the fishermen. And to address with this issue, sampling was carried out at the fishing docks.

2- Introduction

The fishing of fish belonging to the subclass Elasmobranchs is quite particular, in fact, 70% of their global catches are made of by-catch (Sadili *et al*., 2015). It is therefore a group that suffers mostly from non-targeted fishing and need specific management policy and enforcement. These species are qualified as sensitive species, due to their own characteristics that make them more vulnerable such as long life span, low fertility, late maturity and generally small population sizes compared to teleost fish (Mourier and Planes, 2015).

Corisco Bay is a rather unique area in Gabon, it is located in north of Libreville, the country's capital, and is home to a national park, two marine protected areas and a RAMSAR site in its upstream portion. Thus, studying ray and shark populations living not far from these protected areas could be quite important, especially since they had never been studied in this area. In order to carry out such a study, it was considered useful to work with the fishermen who are the main local stakeholders of the project. Artisanal fishing dominates the fishing sector in Gabon in terms of catches and a number of active fishers with 6,020 fishers counted in 2011 (Hachim El Ayoubi and Failler, 2013).

The bay of Corisco
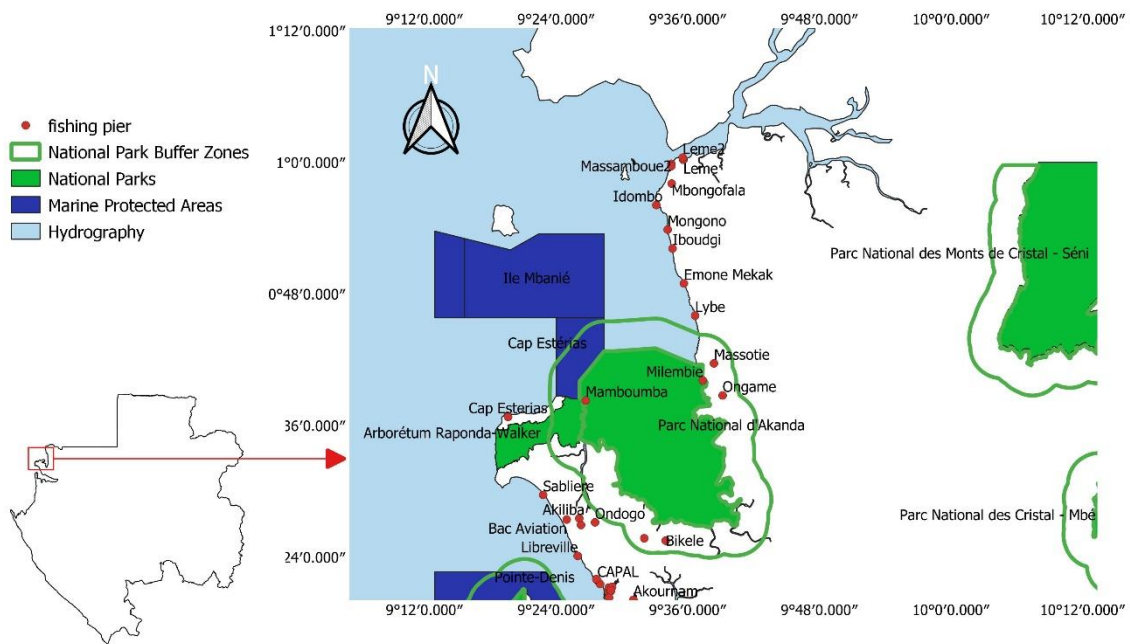
3- Aim and objectives

The main objective of this training course is to elaborate a protocol and to start to make an inventory of the catches of Elasmobranchs in the artisanal fishery that is occurred in Corisco Bay, in order to identify the different species present in the area and to see which are the most dominant in terms of abundance. This data collection will be the first in the study area and will be a very important indicator for other similar studies in Gabon. In addition, the capacity of the different fishing gears to catch Elasmobranchs will be analysed in order to assess their possible impact on this particularly sensitive group of animals.

4- Activities and Methodology

➤ **Sampling**

The sampling missions carried out during this study were to collect two main types of data: one type related to information on the characteristics of the fishing gear, the fishing area and the fishing effort of the boat. And another type on the description of the skates and sharks that were caught.

Sampling was mainly done on board with fishermen, but when this was not possible, sampling was done at the fishing docks. Data was collected mostly in waterproof notebooks in situ, to be later transcribed into specially designed data collection sheets. Another means of data collection was the use of KoboToolbox, an open-source system with an online database accessible to the entire study team.

- **On-Board Sampling**

The on-board observer followed the fishermen in their activities and recorded the presence of Elasmobranch species in their catch. On-board sampling provided information not available on the landing, such as precise fishing areas, presence of discarded by-catch, and how the fishing gear is used. The track of the boats and the GPS positions of the catches are also recorded. It should be noted that by-catches are sometimes not landed, which is why it is important to go on board in order to have a realistic characterization of the catch composition. Biometric values can also be taken on the boat for discarded species even if they are not landed.

- **Sampling at the Landing Site**

Sampling at the landing site consisted of the observer recording catch data for an entire day as the boats landed. The main limitation of this approach is that sharks and rays are often discarded or hidden (dead or alive) prior to landing and accurate details of the catch area will be missing.

➤ **Fishing trip data**

Data characterizing the fishing trip, such as dates, area, landing of origin, identity of the boat, fishing gear used and its characteristics (type of gear, dimensions, mesh size, etc.) were taken.

➤ **Biometric data for the Elasmobranchs**

Basic biometric measurements such as length and weight were collected by direct measurement when possible. Sexual maturity of male individuals was also assessed, as it is externally visible

by seeing if the clasper (male reproductive organ in Elasmobranchs) was long and calcified (case of adults) or small and elastic (case of juveniles). On the other hand, this information is impossible to take in females if they are not previously opened, in order to see the state of their gonads. Also, the state (alive or dead) of the captured and released individuals was also taken.

5- Outputs and Results

The data collected were carried out during onboard missions on fishing boatss and in the fishing landing zones, which represented 52.94% and 47.06% of the 17 field missions carried out respectively. The missions on board the boats could be carried out over several days, unlike the missions to the fishing docks, which were carried out in one day.

In total, 37 individuals belonging to the subclass Elasmobranchs were identified over a total of 37 days of sampling effort, or an average of 1 individuals per day. Of this sampling, only one individual belonging to a shark species, namely the tiger shark, of its scientific name Galeocerdo cuvier, was identified, the rest being ray species. The data showed that two species of rays dominated the catches in terms of abundance, namely Daisy Whipray (*Fontitrygon margarita*) and Pearl Whipray (*Fontitrygon margaritella*), which represented 27.03% and 32.43% of the individuals sampled, respectively. If the first species is considered as endangered, the second is not according to the IUCN, nevertheless, still according to the same organisation, the populations of these two species are decreasing in the world. This is the first official location of these species in this region of Gabon and therefore expands their area of occupancy at the local level.

With regard to the impact of the gear, two types were sampled: the gillnet specialised in sardine fishing and the bottom-set gillnet which targets all types of fish. The fundamental difference between these two nets is in their techniques of use. The gillnet is an active fishing gear and the bottom-set gillnet is a passive gear. With passive gear, fish are caught by moving the target species towards the fishing gear, whereas active gear goes after the target species (Bjordal, 2005). For example, of all the sampling missions done with the encircling gillnet, none had any by-catch of Elasmobranchs, while almost half of the missions done with the bottom gillnet (46.67% of the missions) had by-catch of Elasmobranchs.

6- Achievements and Impacts

There are very few studies on Elasmobranchs in the Central African sub-region. This internship will have contributed lay foundation for a long-term study in Gabon. As protocol has been

elaborated and tested, it was able to provide preliminary information on the geographical distribution of these sensitive species in Gabon and especially to know which species of this group were found in Corisco Bay, which is home to marine protected areas, a national park and a RAMSAR site. The data collected on the species Fontitrygon margarita and Fontitrygon margaritella could contribute to the evaluation of their conservation status within specialised groups such as the IUCN. It is important to remember that these species are not well studied in the world. Similar work, previously carried out by WCS and with the same team, had shown that in the Komo estuary and the Ogooué delta, which are almost in the north of the country, rays dominated the Elasmobranch population. While in the south of the country, sharks dominate this population. Thus, we have the confirmation that the rays have a preference for the northern coast in Gabon with regard to the data of this training course. We also see here that Gabon has a very important role for families of rays such as stingrays. This family of rays is one of the most fragile and least known, some of its species have changed names in recent years due to more refined analyses of their populations. It would therefore be interesting to study them in more depth in Gabon, in order to first evaluate their conservation status at the local level and to better understand what could justify their presence. Moreover, this could justify, among other things, the presence of marine protected areas in the country, in order to find a refuge for these sensitive species. Another confirmation made during this training course in relation to the work previously carried out by WCS is the impact of passive fishing gear on Elasmobranchs. This should lead to the study of having fisheries management policies at the level of these fishing gears, so that they can reduce their impact on this extremely fragile population. The sensitisation of the fishermen on this group of species proved to be more or less easy, due to the fact that the rays, and to a lesser extent the sharks, do not constitute a strong economic contribution for them and that also, the quasi majority of the sampled species are protected at the local level.

From a more personal point of view, this internship brought me important skills and knowledge that will help me in my career. First of all, through the field trips that I was able to make, there were 8 sampling missions, two of which were in fishing piers and six on board fishing boats. During these missions, I acquired an improvement in my ability to quickly identify species of Elasmobranchs, this acquired competence was also reinforced in a much more theoretical work that I carried out by contributing to the elaboration of an identification guide of sharks and rays of Gabon. Also, I was able to reinforce my attitude to manage a team of field assistants by planning their missions, which mainly involved negotiations with fishermen, and by making

sure that the data they collected corresponded as much as possible to what we wanted to analyse. Finally, my contribution to the design of data collection sheets and online data collection forms (available on https://kobo.humanitarianresponse.info/#/forms) allowed me to prepare a sampling phase and to anticipate in advance the information that we wanted to have during such a study.

7- CONCLUSION

The results of this training course show the very strong domination of the rays within the group of Elasmobranchs living in Corisco Bay, north of Gabon. Among these rays, two species were the most numerous in terms of abundance, namely Daisy Whipray (Fontitrygon margarita) and Pearl Whipray (Fontitrygon margaritella). This data confirms the strong presence of stingrays in Gabon, which could play an extremely important role in the ecology of this family of rays so little studied. Moreover, it is a species whose population is decreasing according to the data of the IUCN, which would thus come to implement all the necessary means to better protect them at the local level. And these protection measures should be accentuated at the level of passive fishing gear which has a capacity to impact negatively on the populations of Elasmobranchs.

More personally, the data from this internship will help me in the rest of my career, especially through my PhD that I am currently preparing. Indeed, this preliminary study will be extended on a national scale and data collected will be part of my PhD. Moreover, I will have learned to work better with fishermen, who are major actors in this kind of study and in the present and future projects that I will have to do.

8- Acknowledgements

9- Appendices

Appendice 1 : species, biometry, sex and maturity stage of the individuals sampled.

specie	sexe	maturity	total length (cm)	disc width (cm)	weight (Kg)
Mobula rochebrunei	female	adult	160	93	14,2
Mobula rochebrunei	female	adult	152	85	10,5
Sphyrna lewini	female	juvenile	56,7		0,755
Fontitrygon margaritella	female	adult	93,1	28	0,785
Fontitrygon margaritella	female	adult	105	30,3	0,99
Fontitrygon margaritella	female	adult	102	31	0,885
Fontitrygon margaritella	female	adult	100	28,3	0,75
Fontitrygon ukpam	male	adult	170	90	30
Fontitrygon margaritella	female	adult	95	25	0,722
Fontitrygon margaritella	male	adult	100	23,7	0,85
Fontitrygon margaritella	male	adult	103	27,5	0,89
Fontitrygon ukpam	male	adult	150	75	20,5
Fontitrygon margaritella	male	indeterminate		20	

Species	Sex	Maturity			
Fontitrygon margaritella	male	indeterminate		25	
Fontitrygon margarita	female	adult		37,8	1,955
Fontitrygon margarita	male	adult		29	0,77
Fontitrygon margaritella	indeterminate	indeterminate		20	
Fontitrygon ukpam	female	adult	220	83	21,2
Fontitrygon ukpam	female	adult	217	79	18,25
Fontitrygon margarita	female	adult		32,9	1,75
Fontitrygon margarita	female	adult		30,1	0,99
Fontitrygon ukpam	female	adult	140	60	19,3
Fontitrygon margaritella	male	adult	95	20,7	0,8
Fontitrygon margaritella	male	adult	101	25,4	0,87
Rhinoptera marginata	female	adult	132	80	20
Rhinoptera marginata	male	adult	135	90	22
Rhinoptera marginata	female	adult	143	93	26
Rhinoptera marginata	male	adult	122	73	14
Fontitrygon ukpam	female	juvenile	15	12	5
Fontitrygon margarita	male	adult	100	45	3
Fontitrygon margarita	male	adult	90	30	0,5
Fontitrygon margarita	female	juvenile	16	17	0,11
Fontitrygon margarita	male	juvenile	14	15	0,115
Dasyatis hastata	male	adult	29	31	0,75
Fontitrygon margarita	female	adult	28	31	0,79
Fontitrygon margarita	male	adult	103	31	2
Galeocerdo cuvier	male	adult	277		

**Appendice 2 : A. An individual of the species Pearl Whipray (*Fontitrygon margaritella*).
B : three individuals of the species Lusitanian cownose ray (*Rhinoptera marginata*). C : A
specimen of the Green stingray (*Dasyatis hastata*)**

Appendince 3 : Data collection sheets for sampling missions on board fishing canoes. A: Data on the mission and on the characteristics of the fishing gear. B: Data on the fishing operations

FICHE SUR LA SORTIE — Enquêteur à bord de la pirogue

Nom(s) et prénom(s) de l'enquêteur	Effort semaine

L'effort semaine = Nombre de jours que la pirogue était en mer la semaine passêe

Départ / Retour

Départ			Retour		
Date	Heure	Débarcadère	Date	Heure	Débarcadère

Pirogue

Nom et Immatriculation	Puissance Moteur	Zone de pêche	Ethnie des pêcheurs

Engin de pêche						Hauteur (m)	Longueur (m)	Maille min (mm)	Maille max (mm)	Nombre hameçons
Pal	LM	FMF	FMS	FME	STC					

Espèces cibles			
Mulet	Carangue	Sardine	Autres

Pal : Palangre FME : Filet maillant encerclant

LM: Ligne à la main STC : Senne tournante coulissante

FMF : Filet maillant de fond FMS : Filet maillant de surface

A

FICHE SUR LES ACTIONS DE PECHE — Enquêteur à bord de la pirogue

Nom et immatriculation :	Date de départ :

Action de pêche	Numéro de point GPS	Engin	Groupe			Embarqué	
			E	M	T	O	N

E : Elasmobranche (raies et requins)

M: Mammifère marin

T: Tortue marine

O: Oui

N : Non

B

Appendice 4 : Data collection sheets for sampling missions on board fishing canoes. A: Data on sharks and rays caught. B: Data on other fish caught by the fishermen.

A — FICHE SUR LES REQUINS/RAIES

Enquêteur à bord de la pirogue

Nom et immatriculation :   Date de départ :

Action de pêche	Espèce	Sexe		Maturité				Etat			LT (cm)	LD (cm)	TT (cm)	Poids (kg)	Action		Photos
		M	F	A	J	I		V	M	A					R	G	

M: Mâle
F: Femelle   V: Vivant
A: Adulte   M: Mort
J: Juvénile   A: Agonisant
I: Indéterminé   TT : Tour de taille
R: Rejeté
G: Gardé

B — FICHE SUR LES AUTRES POISSONS

Enquêteur à bord de la pirogue

Nom et immatriculation :   Date de départ :

Numéro du contenant	Poids du contenant(kg)	Espèce	%

Poids Total

Appendice 5 : Data collection sheets for sampling missions at fishing landings. A: Data on the exit of the boat and the fishing gear. B: Data on sharks and rays caught. C: Data on other fish caught by the fishermen.

A

FICHE SUR LA SORTIE — Enquêteur au débarcadère

Nom(s) et prénom(s) de l'enquêteur	Effort semaine

L'effort semaine = Nombre de jours que la pirogue était en mer la semaine passée

Départ / **Retour**

Date	Heure	Débarcadère	Date	Heure	Débarcadère

Pirogue

Nom et Immatriculation	Puissance Moteur	Zone de pêche	Ethnie des pêcheurs

Engin de pêche						Hauteur (m)	Longueur (m)	Maille min (mm)	Maille max (mm)	Nombre hameçons
Pal	LM	FMF	FMS	FME	STC					

Espèces cibles

Mulet	Carangue	Sardine	Autres

Pal : Palangre
LM : Ligne à la main
FMF : Filet maillant de fond
FME : Filet maillant encerclant
STC : Senne tournante coulissante
FMS : Filet maillant de surface

B

FICHE SUR LES REQUINS/RAIES — Enquêteur au débarcadère

Nom et immatriculation :	Date de départ :

Espèce	Sexe		Maturité				Etat			LT (Cm)	LD (Cm)	TT (Cm)	Poids (kg)	Photos
	M	F	A	J	I		V	M	A					

M : Mâle
F : Femelle   V : Vivant
A : Adulte   M : Mort
J : Juvénile   A : Agonisant
I : Indéterminé   TT : Tour de taille

C

FICHE SUR LES MAMMIFERES MARINS TORTUES MARINES — Enquêteur au débarcadère

Nom et immatriculation :	Date de départ :

Espèce	Sexe		Maturité				Etat			LT (Cm)	Poids (kg)	Photos
	M	F	A	J	I		V	M	A			

M : Mâle
F : Femelle   V : Vivant
A : Adulte   M : Mort
J : Juvénile   A : Agonisant
I: Indéterminé

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