TÍTULO

DRAFTING OF A NON-DETRIMENT FINDING
CASE OF HIPPOPOTAMUS AMPHIBIUS IN CAMEROON

AUTOR

Faustin John Paul II Ntere Etoundi

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Tutores	Dra. Karen Gaynor ; Michael Philippe Bessike Balinga
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MASTER THESIS

DRAFTING OF A NON-DETRIMENT FINDING: CASE OF *HIPPOPOTAMUS AMPHIBIUS* IN CAMEROON

By

NTERE ETOUNDI Faustin John Paul II

TOTUr: Dr. Karen GAYNOR

Co-tOTUr: Michael Philippe BESSIKE BALINGA

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LIST OF ACRONYMS

NDF: Non-Detriment Finding

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CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

NGO: Non-governmental organization

IUCN: International Union for Conservation of Nature

SUMMARY

This study on Non-Detriment Findings (NDF) of Common Hippopotamus (Hippopotamus amphibius) in Cameroon was carried out between July 2022 and March 2023. The main objective was to develop a NDF for Hippopotamus amphibius in Cameroon. The methodological approach combined documentary research and interviews with field staff. The compiled dataset was analysed using the Checklist designed by IUCN to assist Scientific Authorities in issuing NDFs. The data compiled on the status of the species in Cameroon reveal that the species taken globally is stable in the country. Among the 25 criteria analysed, 7 have compromising effects on the management regime of the species. Between these 7 criteria, 3 are intrinsic to the species; the other 4 depend on the way the species is managed. Just make a few adjustments and improvements in the species management system and everything will be fine. The radar polygon generated during the analysis of the checklist is in favour of a NDF of the common hippopotamus of Cameroon. Although it has been demonstrated that the trade will not harm the species, efforts are still needed at the national level to correct the weaknesses identified during the analysis.

Recommendations have been made to reduce the effects of the 7 factors that, in the long term, can make the hippo trade in Cameroon represent a threat to the survival of the species.

ABSTRACT

Cette étude sur l'Avis de Commerce Non Préjudiciable (ACNP) des Hippopotames commun (*Hippopotamus amphibius*) au Cameroun a été réalisée entre juillet2022 et mars 2023. L'objectif principal était d'élaborer un ACNP pour *Hippopotamus amphibius* au Cameroun. L'approche méthodologique combinait la recherche documentaire et des interviews des personnels de terrain. L'ensemble de données compilées ont été analysé en utilisant la Check-list conçue par l'UICN en vue d'aider les Autorités Scientifique à émettre les ACNP. Les données compilées relatives au statut de l'espèce au Cameroun, révèlent que l'espèce prise globalement est stable dans le pays. Sur les 25 critères analysés, 7 ont des effets compromettant sur le régime de gestion de l'espèce. Sur ces 7 critères, 3 sont intrinsèques à l'espèce, les 4 autres dépendent de la manière dont l'espèce est gérée. Il suffit d'apporter quelques ajustements et des améliorations dans le système de gestion de l'espèce pour que tout aille pour le mieux. Le polygone radar généré lors de l'analyse de la check-list est en faveur d'un ACNP de l'Hippopotame commun du Cameroun. Bien qu'il ait été démontré que le commerce ne portera pas préjudice à l'espèce, des efforts sont tout de même à faire au niveau national pour corriger les faiblesses relevées lors de l'analyse. Des recommandations ont été émises afin de réduire les effets des 7 facteurs qui, à la longue, peuvent faire à ce que le commerce des hippopotames au Cameroun représente une menace pour la survie de l'espèce.

INTRODUCTION

Faced with the ever-increasing degradation of the environment and the erosion of biodiversity that the world has been undergoing since the late nineteenth century, in order to conciliate socio-economic development and the preservation of biodiversity, many tools and strategies for sustainable development and management of natural resources, as well as environmental protection, have been developed to remedy this situation (MINFOF, 2014). Among these tools and strategies, we have:

- The development of some concepts such as combating desertification, the sustainable management of natural resources, the sustainable development… etc.);
- The development of international agreements and conventions on various scales, as well as the adoption by States of laws for the protection of the environment;
- The preservation of nature, to name but a few.

Among the conventions that have been established, is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Since June 5, 1981, Cameroon has been a full member of CITES. It entered into force in the country on September 3, 1981; 4 months after its ratification. On this day, the country is experiencing some difficulties in the implementation of the convention, including bio-ecological studies and monitoring the application of the convention. (MINFOF, 2014 et PNUE-WCMC, 2010)

1.1. Problematic

Hippopotamus amphibius was included in CITES Appendix II in 1995, and in 1999 the species (from all range States) was included in the Review of Significant Trade, and recommendations were issued for Botswana, Democratic Republic of the Congo, Malawi, Mozambique, Rwanda, South Africa, United Republic of Tanzania, Zambia and Zimbabwe. The Standing Committee recommended that imports be suspended from the Democratic Republic of the Congo, Malawi and Rwanda in July 2001 owing to their failure to respond adequately to the Animals Committee recommendations. Then at AC23, it was selected as a species of priority concern and at AC24 all range States were reviewed. And the following range States were retained in the review: Benin, Burkina Faso, Cameroon, Central African republic, Chad, Côte d'Ivoire, Equatorial Guinea,

Eritrea, Ethiopia, Gabon, Gambia, Kenya, Mali, Mozambique, Namibia, Niger, Nigeria, Senegal, Somalia, South Africa, Sudan, Swaziland, Uganda. The full list can be found in the AC24 Summary record.

Of these species/country combinations, only two are relatively recent: Mozambique and Cameroon.

As regards Mozambique:

The Animals Committee selected Hippopotamus amphibius for RST at AC23, retained at AC24. At AC25, the Animals Committee determined that trade in H. amphibius from Mozambique was of "possible concern" and formulated recommendations. In the absence of a reply from Mozambique, the Secretariat, following consultations with the Chairs of the Animals and Standing Committees, determined that Mozambique had not complied with the recommendations. At SC62, the Standing Committee took the decision to suspend trade in H. amphibius from Mozambique, as of 7 September 2012 (Notification to the Parties No. 2012/057). The case was then reviewed at SC66 and at SC69, the trade suspension was removed.

As regards Cameroon:

The Animals Committee categorized Cameroon as 'of possible concern' and formulated recommendations at AC25. At SC62, the Standing Committee recommended that all Parties suspend trade in all specimens of H. amphibius from Cameroon if the recommendations of the Animals Committee were not implemented to the satisfaction of the Secretariat and the Chair of the Animals Committee. In response, the Management Authority of Cameroon provided information which met the recommendations of the Animals Committee in part, with the exception of the recommendation regarding quotas.

At SC63, the Standing Committee agreed that H. amphibius/Cameroon would be decided later by postal procedure, and the subsequent outcome was communicated to the Parties in Notification to the Parties No. 2013/049 of 8 November 2013. At SC65, the Standing Committee decided that Cameroon should: a) as an interim measure, limit the exports of specimens of H. amphibius for 2013, 2014 and 2015 to a maximum of 10 trophies per year, to be published on the CITES website; b) report at the 28th meeting of the Animals Committee on a national population survey of H. amphibius, and progress

with the establishment of science-based quotas and non-detriment findings for the species; and c) submit a report to the Standing Committee for consideration at its 66th meeting, on its compliance with Article IV, paragraphs 2 (a) and 3, of the Convention, including information on the establishment of non-detriment findings for trade in H. amphibius, and population status information.

At SC66, the Standing Committee endorsed a quota of 10 trophies for 2016 and agreed to reconsider this matter at its 67th meeting; a quota which SC67 recommended be maintained until Cameroon provides information substantiating a revision of this quota in compliance with Article IV, paragraphs 2 (a) and 3, of the Convention, including information on the establishment of non-detriment findings for trade in H. amphibius, and population status information.

1.2. Objective

The objective of this study is to elaborate a Non-Detriment Finding for *Hippopotamus amphibius* in Cameroon. Three specific objectives underlie it, in particular:

- Compile existing bio-ecological data on the common hippopotamus population in Cameroon;
- Provide a summary description of the harvest regime for the species in Cameroon ;
- Analyse the factors affecting the management of the said harvest regime ;
- Take a decision on the Non-Detriment Finding of the common hippopotamus in Cameroon.

1.3. Importance of the study

The export of a specimen of a species listed in Appendix II, according to Article IV.2 of CITES, requires the prior issuance and presentation of an export permit. Such a permit, in accordance with Article IV.2 (a) of the said Convention, may be obtained only if the scientific authority of the State of export has expressed the opinion that such export is not detrimental to the survival of the species concerned. To align with the texts of CITES, with regard to the export of common hippopotamus specimens, the State Party Cameroon, through the note of its scientific authority fauna must issue the opinion that the export of specimens of this specie does not represent a threat to its survival. To date, Cameroon has benefited from a maximum quota of 10 common hippopotamuses

trophies. The export of hippopotamus specimens from Cameroon has still not start again due to the lack of a NDF (MINFOF, 2014 et CITES, 2022). It is therefore important that a study be conducted with a view to issue, if necessary, a Non-detriment Finding for the common hippopotamus in Cameroon.

In addition, the situation of human-hippopotamus conflicts has become worrying in recent years with the upsurge and extent of damage to crops. There are also reports of physical attacks on peasants and fishermen resulting in serious injuries and occasionally by deaths of human.

There have also been reports of territorial conflicts within these pachyderms, sometimes resulting in the death of some congeners. One of the hypotheses on the cause of the upsurge of conflicts between man and hippopotamus and between hippos would be the overpopulation in the territories occupied by this specie in Cameroon (MAHA, 2012).

In view of the foregoing, without this being the ultimate solution to all this panoply of problems related to common hippos, start over with the trade in *Hippopotamus amphibius* by Cameroon would not only contribute to the economic and socio-cultural development of the local populations (through the paid shares to the local communities, the creation of jobs, the development of Income Generating Activities and the perpetuation of ancestral cultures based on hippos), but also to the regulation of the species populations through harvest in the population in excess. Harvesting in areas where hippos are overcrowded could contribute to decongest these sites, helping to reduce the risk of human-hippo conflict.

In view of the foregoing, this study will make it possible to compile the information necessary for the issuance of the Non-Detriment Finding, which should allow us to analyse the harvest regime for the common hippopotamus in Cameroon in order to show whether the export of common hippopotamus specimens may or may not harm the survival of the species in Cameroon.

CHAPTER I: PRESENTATION OF THE STUDY AREA

1.1. Location of Cameroon

Cameroon is a country with an area of about 475 000 km^2 located in Central Africa, at the bottom of the Gulf of Guinea. It is bordered to the north by Chad, to the east by the Central African Republic, to the south by Congo, Gabon and Equatorial Guinea, to the west by Nigeria (PRC, 2022).

Cameroon is a country that has several major cities including YAOUNDE, the political capital of the country with more than one million inhabitants, DOUALA, the economic capital with more than two millions inhabitants. Then come cities like GAROUA, BAFOUSSAM, MAROUA, BAMENDA, which are major urban centres (PRC, 2022).

1.2. Cameroonian official languages

French and English are the official languages of Cameroon. They are spoken by 70% and 30% of the population respectively. Spanish and German are also known by many city dwellers (PRC, 2022).

1.3. Climate

Cameroon, by its climatic, ecological and cultural diversity is assimilated to Africa in miniature. In terms of climate, the whole range of African climates marked by thermal constancy is there. The description of Cameroon's climate presented in this book is an excerpt from the document "The climate of Cameroon" published on the website www.mongosukulu.com).

1.3.1. Temperatures

Cameroon is located in the inter-tropical zone. It is therefore a warm country overall. Annual temperatures range from 20 to 28 degrees. The temperature rises from south to north. We have 23.5°C in Yaoundé, 28° in Kousséri. It decreases with altitude. Example: 20°C in Chiang and 21°C in Ngaoundere.

1.3.2. Precipitation

Precipitation varies with proximity to the sea, altitude, latitude. They decrease from sea to the interior and from south to north. Example: Kribi 3,000mm per year, Ebolowa 1,800mm per year, Garoua 1,000mm per year, Debundsha 10,000mm per year located at the foot of Mount Cameroon.

1.3.3. The winds

There are two types: harmattan (hot and dry wind) and monsoon (cool and humid wind).

In January the inter-tropical front ("FIT"), is towards the South and the Harmattan blows throughout the country (it's the dry season). From February to July, the "F.I.T" moves and reaches the North; the monsoon blows and brings rains (it's the rainy season).

From these general data, it was possible to distinguish 4 climatic regions divided into two main domains.

A. The equatorial domain

It extends to the 6th parallel and is divided between two types of climate.

a. The Guinean climate

It reigns over the entire southern Cameroonian plateau. It is characterized by abundant rainfall (more than 1,500mm of water per year). The temperature is constant 26° on average. Existence of 4 seasons: two rainy seasons and two dry seasons. Existence of several varieties in particular:

- The Kribian variety (abundant rainfall greater than 2,500mm of water);
- The Yaoundé variety (temperature attenuated by the relief);
- The Sudanese Guineo variety to the north of Yoko (existence of two seasons).

b. The Cameroonian climate

It reigns over the western high plateau and the Mount Cameroon region. It is characterized by:

- A climate with two seasons: a long rainy season of 9 months and a short dry season;
- Average temperature and low thermal amplitude;
- Existence of two varieties:
    - The Cameroonian climate of altitude with rains can important (the high plateau of the West)
    - The Cameroonian maritime climate with very abundant rains (Kribi, Limbe, ...)

B. The tropical domain

It reigns from the 6th to the 13th degree of north latitude in other words from Adamaoua to Lake Chad. There are two variants.

a. The tropical climate of Sudan

He reigns over the Adamaoua and the basin of the Bénoué. It is characterized by:

- The existence of two seasons.
- The rains are abundant between 900 and 1,500mm.
- The temperature is quite high around 28 ° C
- The existence of two varieties:
    - Sudanese climate of altitude (Adamaoua plateau)
    - The Sudanese climate of plains (6 months of rain and 6 months of dry seasons in Garoua with a high temperature)

b. The tropical Sahelian climate

It reigns north of the basin of the Bénoué and is characterized by:

- The existence of 2 seasons with a long and vigorous dry season greater than 7 months.
- Very low rainfall (less than 900 mm).
- Accentuated dryness.
- Very high thermal amplitude and high temperature.

1.4. Soils and geomorphology of Cameroon

According to studies conducted in 1967 by Pierre SEGALEN, of the Central Scientific Services of I'O. R.S.T.O.M., it appears that Cameroon has a number of erosion surfaces well individualized and described from the coast to the interior of the territory.

The coastal surface, mainly in the Douala region, gradually rises inland and reaches an altitude of 300-350 m. It is occupied by dense rainforest and highly desaturated ferrallitic soils of predominantly yellow colour.

The interior surface occupies a considerable area in the centre and south of the country; Its altitude is between 600 and 800 m. Soils are moderately and highly desaturated ferrallitic soils. They are very frequently reworked or indurated.

In the centre of the country, two rather different plateaus occupy the Adamaoua area. One at 1000 - l200 m is occupied by medium-saturated ferralitic soils. It can be compared to the Bamoun plateau at the West and the Kapsiki plateau at the N ord. The other at 1,200 - 1400 m carries often bauxite cuirasses. To this plateau we can compare that of Bamileke in the West.

North of Adamawa, extends the plain of Bénoué which drops from 550 to 180 m in Garoua. In this plain, the soils are tropical ferruginous, hydromorphic, holomorphic or vertisols.

To the north of the Kapsiki plateau, stretches the Chadian basin with soils similar to those of the Bénoué.

1.5. Hydrography and hydrology

The great variety of geographical regions gives Cameroon a hydrographic diversity through the hydrographic network and the hydrological regions. As presented in the MONGOSUKULU website, the hydrography and hydrology of Cameroon are as follows:

1.5.1 The main hydrographic basins

Most of the country's rivers originate in the Adamaoua and the southern Cameroonian plateau. These rivers are divided into 4 basins.

i. The Atlantic Basin

It is the most important. There are 3 groups of rivers:

- Western coastal rivers: They descend from the Cameroonian ridge and flow into the Atlantic, the most important are: The Mougo, the Wouri still called Nkam in its upper part, the Manyo also called Cross River when it enters Nigeria and the Dibamba.
- The Sanaga with 920 km, it is the most important river in Cameroon. It drains a catchment area of about 140,000 km^2, formed from the meeting of Djérem coming from Adamaoua. Its main tributary is the Mbam and 2 of its tributaries, the Noun and the Nkim. It is only navigable over a hundred kilometres, which is to say from Edéa to the ocean. It can alone produce 55,000,000,000 KWh watershed: it is a drained by a watercourse and its tributaries.
- • Southern coastal rivers. All originate in the South Cameroon plateau. We can cite the Nyong which has its source to the east of Abong-Mbang. It drains a

catchment area of approximately 29,000 km2. We can locate the Kienké and the Lobé, the Ntem which comes from Gabon and which is divided into 4 arms before flowing into the sea.

ii. Congo basin

It is represented in the southeast by the Kadéi and the Ngoko which have their source in the Adamaoua. Among the tributaries of the Kadéi we can mention the Doumé which joins the Mandéré to form the Sangha in the Central African Republic. As for Ngoko, it is made up of Dja and Lobo.

iii. Niger basin

To this basin belong the Bénoué and its tributaries, so its main ones are Faro and Déo which collect the waters of the Adamaoua, the Mandara and the Alantika mountains. The Bénoué measures 1,400 km, of which 400 km only for Cameroon, with a catchment area of 92,000 km^2.

iv. Lake Chad Basin

It is the least important. Its essential element is the Logone. Its main tributary is the Vina which rises north of Ngaoundéré, in this region the flow of water is endorheic. We note the presence of Mayos (small rivers) and lakes.

1.5.2 Hydrological regions

In Cameroon, we distinguish three hydrological regions:

i. The equatorial regime

It is distinguished by the presence of 2 floods from March to June and from September to December. The rivers concerned are: the Ntem, the Lobé, the Kienké, the Nyong, the Lokoundjé, Dja, Boumba. Here the water regime is regular.

ii. The tropical regime

The rivers are marked by a single flood and a single period of low water. This water regime includes 3 shades:

- The tropical transition regime. It concerns the northern tributaries of the Sanaga, the western coastal rivers and most of the Adamawa Rivers.
- The pure tropical regime. It concerns the Bénoué basin.
- The Sahel regime. It essentially applies to waterways located north of Maroua.

iii. The mixed regime or Guinean Sudanese

The Sanaga because it is takes birth in the humid tropical region crosses the Guinean region of transition and flows into the equatorial region.

1.6. Human populations

Cameroon's total population was estimated at 27.2 million people in 2021, according to the latest census figures and projections from Trading Economics. (INC-Cameroon, 2022)

Cameroon has 240 ethnic groups, divided into three main groups (Bantu, Semi-Bantu, and Sudanese) and corresponds to 240 national languages. The most representative ethnic groups are:

- -Bantu: Beti, Bassa, Bakundu, Maka, Douala, Pygmies;
- -Semi-Bantu: Bamileke, Gbaya, Bamoun, Tikar;
- -Sudanese: Foulbe, Mafa, Toupouri, Arabes-Choas, Moundang, Massa and Mousgoum. (PRC, 2022)

CHAPTER II: LITERATURE REVIEW

2.1. Definitions of some concepts

NDF (Non-Detriment Finding): A conclusion by a scientific authority that the export of specimens of a species will not adversely affect the survival of that species in the wild. [Resolution conf. 16.7 (Rev. CoP17)]

Range: Territory bounded by the shortest unbroken notional line that can be drawn around established, inferred or predicted areas in which a species occurs, excluding vagrancy and introductions outside its natural range. [Resolution Conf. 9.24 (Rev. CoP17), Appendix 5]

CITES / Convention on International Trade of Wild Fauna and Flora Endangered Species: It is an international agreement between states to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species to which they belong.

Trade: All exports, re-exports, imports and introductions from the sea. (Article I of the CITES text)

Review of Significant Trade: Review of biological, trade and other information on Appendix-II species in significant trade, with a view to identifying problems with the implementation of Article IV, paragraphs 2 (a), 3 and 6 (a), of the Convention, and finding solutions. (Resolution conf. 12.8 (Rev. CoP18))

Fragmentation: A case where most individuals in a taxon live in small, relatively isolated subpopulations, increasing the likelihood of extinction of these subpopulations and limiting their chances of recovery. (Resolution Conf. 9.24 (Rev. CoP17), Appendix 5)

Management Authority: National administrative authority designated in accordance with Article IX of the Convention. Definition adapted from Article I, paragraph (g), and Article IX, paragraphs 1(a) and 2.

Annual export quota: A limit on the number or quantity of specimens of a given species that can be exported from a country in a 12-month period. [Resolution conf. 14.7 (Rev. CoP15)]

Wild meat: The harvest of wild animals in tropical and subtropical countries for food and non-food purposes, including medicinal purposes, formerly called bush meat (CoP18 Doc. 95).

Vulnerability: The sensitivity of a species to intrinsic or external negative effects that increase the risk of extinction, even when mitigating factors are taken into account [Resolution Conf. 9.24 (Rev. CoP17), Appendix 5].

Recruitment: The total number of individuals added to any demographic class in a population by sexual reproduction or asexual multiplication [Resolution Conf. 9.24 (Rev. CoP17), Appendix 5].

2.2. Literature Review

2.2.1. Legal framework for wildlife management in Cameroon

Aware of the need to ensure its economic development and its duty to meet the needs and aspirations of current and future generations, Cameroon has not only appropriated international instruments for the protection of wildlife, but has also and above all adopted legal and regulatory texts in this area.

2.2.1.1. International instruments for the protection of wildlife and biodiversity

Cameroon has acceded to a number of international instruments for the protection of wildlife and biodiversity, among which we have:

- Convention on the Law of the Sea (Montego Bay, 1982);
- The Convention on Biological Diversity (Rio, 1992);
- Convention to Combat Desertification (Paris, 1994);
- Convention on Wetlands of International Importance (Ramsar, 1971);
- The Convention on the Protection of the World Cultural and Natural Heritage (Paris, 1972);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington, 1973);
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979);
- The Montreal Protocol on Biosafety (Montreal, 2000);
- The Nagoya Protocol (Nagoya, 2010);

- The Stockholm Declaration (Stockholm, 1972);
- The Global Conservation Strategy (Gland, 1980);
- The World Charter for Nature (Nairobi, 1982);
- The Strategy for the Future of Life (1991);
- The United Nations Framework Convention on Climate Change (1992);
- The Declaration of Principles on Forests (1992);

Cameroon has also adopted several African instruments for the protection of wildlife and biodiversity, including:

- The African Convention on the Conservation of Nature and Natural Resources (Algiers, 1968);
- The Lac Chad Basin Convention (N'Djamena, 1964);
- Protocol concerning the Conservation of Common Natural Resources (Khartoum, 1982);
- The Agreement on Cooperation and Consultation between the States of Central Africa on the Conservation of Wildlife (Libreville, 1983);
- The Yaoundé Declaration (Yaoundé, 1999).

2.2.1.2. National instruments

Wildlife protection laws and regulations in Cameroon include:

- Law No. 94/01 of 20 January 1994 on the regime of forests, wildlife and fisheries;
- Decree No. 95/466/PM of 20 July 1995 laying down the modalities for the application of the wildlife regime;
- Order No. 0053/MINFOF of 1 April 2020 laying down the modalities for the distribution of animal species into protection classes;
- Order No. 0056/MINFOF of 15 April 2020 laying down the procedures for the distribution of animal species of classes B and C into groups of slaughter latitude;
- Order No. 0221/MINFOF of 2 May 2006 setting the standards for inventories of wildlife species in Cameroonian forest areas;
- Order No. 0244/MINFOF of 23 May 2006 setting the standards for inventories of wildlife species in Cameroonian savannah zones;

- Order No. 0221/MINFOF of 12 May 2006 setting the standards for inventories of wildlife species in Cameroonian forest areas
- Decision No. 0068/D/MINFOF/CAB of 31 January 2023 appointing the staff of the Ministry of Forestry and Wildlife, in charge of monitoring the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Cameroon, on behalf of the Management Authority.

2.2.2. Institutional framework for wildlife management in Cameroon

International institutional cooperation in the field of wildlife protection has been necessary because of the very nature of the task. As environmental problems know no borders as defined by classical international law, the solutions must necessarily be cross-border.

At the global level, the United Nations (UN) has been interested in the environment since the late 60s. This interest has materialized in the organization in the space of forty years of four major summits for the protection of nature and its resources: Stockholm (1972), Rio (1992), Johannesburg (2002) and Rio+20 (2012).

This world organization in a logic of effective protection of nature and therefore of wildlife has created several bodies whose daily actions have an effect on the protection of wildlife and therefore hippos. These include:

- the United Nations Environment Programme (UNEP);
- the United Nations Educational, Scientific and Cultural Organization (UNESCO);
- the International Maritime Organization (IMO);
- the Food and Agriculture Organization of the United Nations (FAO);
- the International Atomic Energy Agency (IAEA);
- the World Meteorological Organization (WMO);
- the Commission on Sustainable Development (CSD).

Although legal production on wildlife protection at the African level is relatively low, it should be noted that the African Union (AU) and sub-regional organizations such as the Central African Forests Commission (COMIFAC), the Organization for the Conservation of Wildlife in Africa (OCFSA), the Lake Chad Basin Commission (LCBC) or the Niger Basin Authority (NBA) are not indifferent to issues related to the preservation of natural resources. Through its contribution to the elaboration of certain

African instruments relating to the environment (for example, the African Convention on the Conservation of Nature and Natural Resources of 15 September 1968 in Algiers, revisited in Maputo in 2003 and the Bamako Convention of 31 January 1991 on the Transboundary Transport of Toxic Wastes), the AU appears to be a competent structure in this area. The numerous resolutions adopted by the pan-African organization on environmentally sounding issues such as drought, desertification and famine underpin this assertion.

At the national level, several structures participate in the development and / or implementation of policies for the protection of the environment and its resources, whether under the legislative or executive power.

The management and protection of forest and wildlife resources in general and hippos in particular are the responsibility of the Ministry of forestry and wildlife. Conservation structures are housed at the Directorate of Wildlife and Protected Areas. This division is responsible for the management of protected areas, the conservation and enhancement of wildlife. It implements the national conservation policy. Hippos, which are generally conserved in situ in national parks and Areas of Hunting Interest, are in fact managed by conservators and sport hunting guides respectively. Capacity building for staff dedicated to wildlife management and protected areas is provided by the Garoua Wildlife School, which is also the CITES Scientific Authority for wildlife aspects in Cameroon.

There are platforms for collaboration with other stakeholders including the Ministry of the Environment, Nature Protection and Sustainable Development (MINEPDED), the Ministry of Tourism and Leisure (MINTOUL), the Ministry of Livestock, Fisheries and Animal Industries (MINEPIA), the Ministry of Defence (MINDEF), the Ministry of Justice (MINJUSTICE), development partners, Non-Governmental Organizations (NGOs) and research institutions, in order to avoid possible conflicts of competence and duplication of efforts.

2.2.3. General information about the common hippopotamus

Etymologically, hippopotamus comes from the Greek hippos which means, **horse** and ***potamus*** which means **river**. Therefore, it names **"river horse".** This comparison to the horse would not come from any first of progeny but rather from the appearance of the eyes, ears and nostrils when the animal is immersed which resembles at that time to the horse (Eltringham, 1999).

Currently, there are two genera of hippos in particular the genera *Hippopotamus* and *Choeropsis*. Each of the two genera is represented by a single species: the common or amphibious hippopotamus that lives in savannah (*Hippopotamus amphibius* Linnaeus 1758) and the pygmy hippopotamus found in the forest (*Choeropsis liberiensis* Morton 1844).

2.2.3.1. Systematic

From the animal kingdom, the hippopotamus belongs to the order of Cetartiodactyls, class of mammals and to the family of Hippopotamidae. There are two genera of hippos with only one species: the common hippopotamus (Hippopotamus *amphibius Linnaeus 1758*) and the pygmy hippopotamus (*Choeropsis liberiensis* Morton 1844).

Of these two extant hippo species, the common hippopotamus is widespread throughout sub-Saharan Africa, where daily and seasonal movements depend entirely on the availability of standing water. Hippos spend most of their day immersed in water due to thermoregulation requirements and only come out at night to feed in nearby grasslands within a radius of 1 to 3 km (Lewison 2011). They live in male-dominated herds ranging from a dozen during the rainy season to several hundred animals during the dry season. The genetic status of the population of this specie has remained understudied, in part due to difficulties in obtaining DNA off-take.

However, over the past two decades, the understanding of African biogeography, in particular the role played by Pleistocene rainfall-drought cycles on terrestrial vertebrates, has improved considerably, although the evolutionary history of semi-aquatic animals, which faced enormous challenges imposed by the unpredictable availability of water resources, remains poorly understood. The Late Pleistocene history of the common hippopotamus at the scale of its range reveals a global demographic and spatial expansion about 0.1 to 0.3 Ma ago, probably associated with an episode of massive drainage overflow (Stoffel et al. 2015). These events likely allowed a historic continent-wide gene flow among hippo populations where no clear genetic structure remains. Nevertheless, present-day hippos are genetically disconnected, likely due to acidification in the mid-Holocene and contemporary anthropogenic pressures (Stoffel et al. 2015, Baker et al. 2020).

2.2.3.2. Morphological features

The common hippopotamus is the third largest mammal after the elephant and rhinoceros. It can weigh 510 to 2500 kg for females and 650 to 3200 kg for males. Its

tail is 35 to 50 cm long and its height at the withers is 130 to 165 cm. It has short, sturdy legs, suitable for swimming and supporting its enormous body mass. During its evolution, the eyes, ears and nose migrated to the top of the skull. Sexual dimorphism is pronounced, males exhibit wider canines and incisors on thicker jaws and skulls. The size of the canines can reach 70 cm in some individuals. These canines do not play a large role in feeding but are rather used as formidable weapons in territorial struggles (Kanga et al. 2011). The smooth, bare skin is dark in colour and dotted with modified sweat glands that let out a reddish substance. The role of this substance remains poorly known but it is thought to protect the skin against the sun and water loss, that it is an antibiotic because it limits the development of bacteria and a social fragrance (Eltringham 1999).

2.2.3.3. **Sexual** dimorphism

Commonly associated with polygamous mating systems and greater sociality; many ungulate species exhibit high levels of sexual dimorphism due to the advantages obtained during sexual selection (Lammers et al. 2001). The common hippopotamus is an African mega-herbivore that exhibits highly competitive and aggressive social behaviours. Their polygamous and social nature predicts high levels of sexual dimorphism, with males being significantly larger than females. However, there has been a significant lack of research conducted on sexual dimorphism of this specie although when comparing lower jaw mass, males have on average 42% heavier lower jaws than females (Zorić et al. 2018, Sadler 2020). Indeed, it is suggested that male hippos invest more in the development of larger jaws, possibly to increase the success of sexual selection (Sadler 2020). This could be related to the semi-aquatic nature of the species as well as its vulnerability to periods of drought.

2.2.3.4. **Distribution**

At the beginning of the 20th century, the hippopotamus was found throughout Africa (Figure 1), from the Nile to Cape Town, wherever fresh water and pasture were in sufficient quantity, up to an altitude of 2000 m. During the last two centuries, it has disappeared from North Africa and the southern part of Africa (Eltringham, 1993; Kingdom, 1997). Its distribution remains quite extensive, but its habitat has become very fragmented due to enthronization. It now finds itself in small groups isolated from each other. Common hippos are absent from the forest area with the exception of the banks of large rivers.

Figure 1: Natural range of common hippopotamus. (source: IUCN, 2021)

The common hippopotamus is present in almost all regions of Cameroon. Although very few studies have really focused on the distribution of the hippopotamus in Cameroon, its range extends over a large part of the national territory and covers eight (08) of the ten regions of the country (Scholte et al. 2017b). The southern part of Cameroon, which includes the Centre, South, East, West, South-West, North-West and Littoral regions, contains only a very small proportion of the national hippo population. Very few studies have been conducted in this area due to small population sizes and difficulty observing hippos in forest environments.

On the other hand, hippos are very widely distributed in the three northern regions (Adamawa, North and Far North) where they have been the subject of several studies, particularly in the Faro and Bénoué National Parks and in the adjacent ICAs (Figure 2).

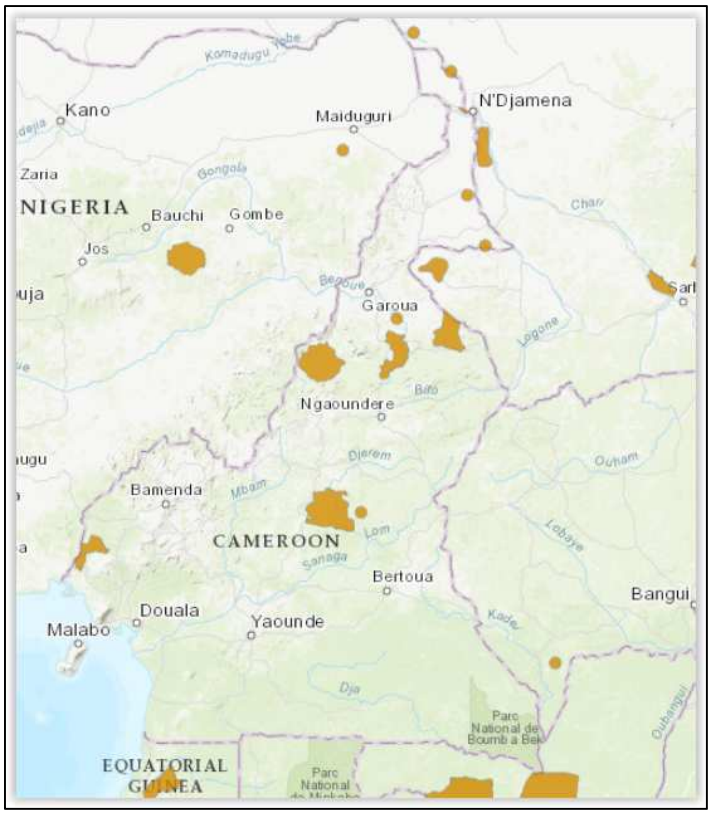

Figure xxx : Overview of hippo distribution in Cameroon and neighbouring countries. *(Source: IUCN, 2021)*

2.2.4. Classification of the common hippopotamus

2.2.4.1. Classification of the hippopotamus

Photo 2.1 : Common Hippopotamus (Source: www.pixel.com)

Reign	Animalia
Fork	Chordata
Subphylum	Vertebrata
Class	Mammalia
Subclass	Theria
Infra-class	Eutheria
Order	Artiodactyla
Family	Hippopotamidae
Gender	*Hippopotamus*
Species	*Hippopotamus amphibius* *Linnaeus, 1758*

2.2.4.2. **IUCN Reserve** Status

In the IUCN Red List, the common hippopotamus is classified as a vulnerable species (VU).

2.2.4.3. CITES status

The Convention on Trade in Endangered Species of Wild Fauna and Flora classifies the common hippopotamus as Appendix II (CITES, 2023). So, according to the text of the convention, it is a species that, although not necessarily threatened with extinction at present, could become so if the trade in its specimens was not closely controlled.

2.2.5. Morphology and anatomy of the common hippopotamus

The common hippopotamus is the third largest land mammal after the elephant and rhino. It can weigh 510 to 2500 kg for females and 650 to 3200 kg for males. Its tail is 35 to 50 cm long and its height at the withers is 130 to 165 cm. It has short, sturdy legs, suitable for swimming and supporting its enormous body mass. During its evolution, the eyes, ears and nose migrated to the top of the skull. Sexual dimorphism is pronounced, males exhibit wider canines and incisors on thicker jaws and skulls. The size of the canines can reach 70 cm in some individuals. These canines do not play a large role in feeding but are rather used as formidable weapons in territorial struggles (Kanga et al., 2011). The smooth, bare skin is dark in colour and dotted with modified sweat glands that let out a reddish substance. The role of this substance remains poorly known but it is thought to protect the skin against the sun and water loss, to be an antibiotic because it limits the development of bacteria and a social fragrance (Eltringham, 1999).

2.2.6. Sexual dimorphism in the common hippopotamus

Commonly associated with polygamous mating systems and greater sociality; many ungulate species exhibit high levels of sexual dimorphism due to the benefits obtained during sexual selection (Lammers et al. 2001). The common hippopotamus is an African mega-herbivore that exhibits highly competitive and aggressive social behaviours. Their polygamous and social nature predicts high levels of sexual dimorphism, with males being significantly larger than females. However, there has

been a significant lack of research conducted on sexual dimorphism of this specie although comparing lower jaw mass, males have on average 42% heavier lower jaws than females (Zorić et al., 2018; Sadler, 2020). Indeed, it is suggested that male hippos invest more in the development of larger jaws, possibly to increase the success of sexual selection (Sadler, 2020). This could be related to the semi-aquatic nature of the species as well as its vulnerability to periods of drought.

2.2.7. Ecology of the hippopotamus

The hippopotamus needs both deep enough water and a grazing place close enough to make the round trip at night. It avoids fast-flowing waters, preferring gentle slopes with firmer soil, where herds can remain half submerged. Mothers who have just given birth can breastfeed without swimming. The presence of water in depthis not essential, as animals can roll in the mud to cool off. However, they are forced to return to the water during the dry season. The key factor is that the skin must remain moist to avoid cracks if it remains exposed to air for too long periods of time. (MAHA, 201-2)

According to Batelière (1973), hippos were present throughout the Ethiopian region, in areas where there was water and 1 succulent pastures. The same author notes that, however, they never entered dense forest, because herbaceous vegetation is practically non-existent. Inside their vast, habitat, they stand in shady rivers and lakes because even submerged, they do not tolerate the sun very well, especially the small ones. Some also invade pools of fluid mud, called "hippo pool" where they pile up to spend the day in the mud. Besides, they are scarce in your clear rivers, where they do not find sufficient protection. On the other hand, in troubled waters, they can hide at leisure. This data on hippopotamus ecology can help wildlife specialists if the need to domesticate the species arises.

2.2.8. Diet

The diet of the hippopotamus is strictly herbivorous. The hippopotamus ingests, mainly at night, about 35 kg of grasses in the male against 38 in the female. This quantity, at first sight important, is actually very low if we compare it to the weight of the hippopotamus which, as a reminder, regularly exceeds 2 tons. The result is a stomach content equivalent to 0.95% and 1.3% of total body weight, respectively (Eltringham, 1999). It feeds, just like the white rhino (*Ceratotherium simum*), by pulling grass after pinching it with its lips. Without being a true ruminant, the hippopotamus still enjoys some of the benefits of these thanks to its compartmentalized stomach and

digestion by fermentation. The proportionally low amount of grass ingested by the hippopotamus during its night outings is compensated by an original energy strategy: a longer retention time and a very low rate of bacterial protein loss in the faeces (Schwarm et al., 2005). Since this type of digestion involves high-quality food, hippos feed only on short pastures (maintained by their own pasture) that have higher levels of protein and soluble carbohydrates (Eltringham 1999). This grazing technique results in the formation of characteristic "hippo lawns", as these pastures are kept short and resemble a manicured lawn (Oliver & Laurie, 1974; Eltringham, 1999). This need to frequent high-quality pastures therefore suggests effective selectivity in the pastures he frequents. However, it is obvious that the anatomical features of the hippopotamus jaw as well as its gripping technique refute any possibility of selection during the act of feeding itself. Indeed, its imposing and uniform lips hardly allow considering the choice between two species present in front of him. The selectivity of the hippopotamus will therefore be expressed in a "geographical" way, that is to say that it will select an area containing a sufficient quantity of appetizing species in which all species will be consumed rather than making an in situ selection in a given formation (Scotcher et al., 1978; Eltringham, 1999).

2.2.9. Social behaviour

The hippopotamus is said to be "socially schizophrenic" (Estes, 1992). Highly gregarious as well as relatively sedentary during the day, it tolerates much closer contact than any other ungulate. However, at night it functions as a free electron, being able to travel great distances to find its food. He spends most of his day in groups of 2 to 150 individuals (Kingdom, 1997). Groups are usually composed of females accompanied by their young under the territorial authority of a dominant male. The male is not directly related to the females but rather related to the territory. Territory which, depending on its attractiveness (proximity to grassland, depth of water), will attract more or less females. Young males who do not yet have territorial claims may form groups in their own right or become part of a social unit as described above, as long as they do not claim any rights to this territory and the females occupying it (Eltringham, 1999).

2.2.10. Reproduction

The hippopotamus is able to breed throughout the year, but most mating occurs in the dry season. Births are more numerous in the rainy season (Smuts and Whyte 1981),

when food is more abundant and of better quality. Mating takes place in the water, which allows the female not to have to bear the full weight of the male.

After a gestation of nearly 8 months, the female leaves her group and isolates herself in shallow waters to give birth to her young, weighing between 25 and 55 kg. For the first few days, the mother stays close to the new born in the water, feeding on nearby aquatic plants. It can thus keep it away from adult males and predators (crocodiles, lions, etc.) that could attack it. In fact, nearly 45% of young people die in their first year of life, and 15% in the second year.

The average age of sexual maturity is about seven to eight years for males, and seven to eleven years for females according to studies in Uganda, Zambia and South Africa.

2.2.11. Importance of the species

Hippos fertilize streams and lakes. When the animal deposits its feces in the water, it very quickly wags its short, flat tail and scatters the contents. This attracts many medium-sized fish, of the species *Labeo velifer*, belonging to the family Cyprinidae, which seem to feed to a large extent on hippopotamus waste (Batelière, 1973). The same author adds that this same species plays the role of hygienic service because it also travels slowly through the body of the large mammal, collecting both aquatic plants and detritus that can be deposited on the skin and in the natural orifices of the pachyderm.

The hippopotamus' excrement performs a very important function in the long run since, dispersed in the fluvial environment, it is an excellent nitrogen fertilizer, which allows the growth of an immense variety of aquatic plants, including tiny algae considered as basic nutrients. The hippopotamus thus promotes the proliferation of aquatic flora and fauna.

2.2.12. Predation of young hippos

Unprotected pups can fall prey to lions, hyenas and crocodiles. Staying next to the mother is a good safety because the jaws of a hippopotamus are able to cut a 3-metre crocodile in half (IUCN, 2006). Trampling is probably the main danger to young hippos during fighting, chasing or hasty escape, usually involving males (Batelière 1973).

2.2.13. Trade and management of the species

Hippopotamus amphibius was listed in Appendix III of CITES (Ghana) on 26/02/1976 and in Appendix II on 16/02/1995. International trade mainly involves ivory (canines and incisor teeth, often noted as tusks) for use in carvings (Weiler, 1994)

although the trade also included trophies, feet, skulls, bones, skins and leather goods. Tusks are as large as those of many elephants and may in some cases be more sought after since they do not turn yellow over time (Nowak 1991).

The main countries involved in the export of tusks/teeth are: The United Republic of Tanzania, Zambia, Zimbabwe, Malawi and South Africa. With the exception of South Africa, all these major exporters were eliminated from the proceeding on the basis of information provided by the Secretariat (AC24 summary report). The majority of trade in the species since its Appendix II classification has involved wild specimens (CITES, 2010).

2.2.14. Protection status of the hippopotamus according to the IUCN

The situation of hippos in the different ranges of the species is of concern to the authorities in charge of animal protection, including CITES. With this in mind, an IUCN Hippo Specialist Group has been created. Thus, in Appendix 4 of the report of this group, it appears that hippos are distributed in 36 countries currently in Africa. Zambia and Tanzania hold the records for these numbers with 40,000 and 30,000 individuals respectively while Somalia and Gambia have small populations of less than 50 and 40 individuals respectively. It also shows that concerns about pachyderm populations have been reported in 20 countries. The state of protection is total in 22 countries, partial in 8 countries and unknown in 5 countries. The hippopotamus is classified as Vulnerable in Cameroon by the IUCN.

CHAPTER III: METHODOLOGIE

3.1. Materials

To carry out this study, certain materials were necessary, in particular:

- IT equipment for data entry, printing, internet research (computer, printer and modem);
- Office equipment for taking notes (notebook, pens, document holder);
- A check-list used for exchanges with the heads of the decentralized services of the Ministry of Forests and Wildlife.
- The sheet for the summary description of the harvesting regime for animal species (designed by IUCN to help Scientific Authorities issue non-detriment findings);
- The analysis sheet of factors affecting the management of the harvest regime (designed by IUCN to help Scientific Authorities issue non-detriment findings).

3.1. Methodology

3.3.1. Data collection

3.2.1.1. Secondary data

The development of a Non-Detriment Finding is generally done on the basis of existing scientific data made available to the Scientific Authority by the Management Authority. To this purpose, given the many studies that have already been done on the common hippopotamus in Cameroon, it was a question of compiling the results of these multiple studies with the aim to exploiting them for the analysis of the common hippopotamus harvesting regime in Cameroon. A variety of documents were used to reach the results of this study, in particular:

- Master's theses;
- Publications by independent researchers;
- Publications of certain international organizations;
- Reports of studies commanded by the Ministry of Forests and Wildlife;
- The 2015-2025 Management Plan for the common hippopotamus in Cameroon.

The related documentation can be found in the library of the Garoua wildlife college (Cameroon Scientific Authority for fauna), on the internet and also in the archives of the central administration of the ministry in charge of forests and wildlife in Cameroon (Management Authority).

3.2.1.2. Primary Data

As for the primary data, they were mainly collected through interviews with officials and staff of the decentralized services of the ministry in charge of wildlife management and protected areas in Cameroon. The persons consulted for this work are as follows:

- The head office in charge of wildlife and protected areas at the Northern Regional Delegation for forests and wildlife;
- The Mayo-Danay Divisional Delegate of Forests and Wildlife;
- The Logone and Chari Divisional Delegate for Forests and Wildlife;
- The Conservator of the Kalamaloué National Park;
- The Far North Head of the Regional Office for wildlife and protected areas.

The meetings with these personnel were organized with the aim of supplementing some information on the relations between the local communities and the hippopotamuses which live in the surroundings, in particular:

- The probable causes of the conflicts;
- The consequences of these conflicts;
- The state of encroachments on wildlife territories;
- Poaching;
- Possible solutions.

3.3.2. Formulation of the Non-Detriment Finding

Two NDF formulation models recognized by CITES were discussed as part of our training, in particular:

- The IUCN model;
- The Cancun model (developed in Cancun, during the international expert workshop on CITES Non-Detriment Findings in November 2008 in Mexico.

The model used for this study is the one developed by IUCN to help Scientific Authorities formulate Non-Detriment Findings.

The IUCN model is a check-list comprising two tables that the country's Scientific Authority evaluators complete for each Appendix II species whose specimens are taken from the wild for export. The evaluation process is done in two stages, as follow:

- Preliminary examination of the probable effects of harvesting the species using the first table;
- Analysis of the vulnerability of the species to the effects of harvest and commercial use by filling in the second table.

3.2.2.1. Preliminary examination of the likely effects of harvesting on the species survival

Preliminary examination of the likely effects of harvesting on the species is done through a table helping to describe the type of harvest for the given species. Seven types of harvest are possible, that are:

- Captive breeding (line 1.1);
- Non-lethal harvesting for parts/products (line 1.2);
- Removal for ranching (line 1.3);
- Pests or problem animals control (line 1.4);
- Live capture (line 1.5);
- Killing of individual (line 1.6).

For each type of harvest applied for the species, the following information appear on the table:

- The main product;
- The degree of control (regulated / legal; unregulated / illicit);
- The demographic segment removed from wild population (juvenile, adult and sex);
- The relative rate of off-take (Low, medium, high or unknown);
- The reason for the off-take (subsistence, commercial or others);
- The commercial destination(s) (local, national or international).

Table 1 - Animals. Summary of Harvest Regime for Animal Species (or population of an animal species)

Species: _____ **Country (if applicable State or Province):** _____

Date (of making Non-detriment Finding): _____ **Period to be covered by finding:** _____

Name: _____ **Position in Scientific Authority:** _____

Is the species endemic, found in a few countries only, or widespread? _____

Conservation status of the species (if known): IUCN Global status: _____ **National status:** _____
Other: _____

1.1. Captive breeding		a) Regulated															
		b) Illegal or unmanaged															
1.2. Non-lethal harvesting for parts/ products		a) Regulated															
		b) Illegal or unmanaged															
1.3. Removal for Ranching		a) Regulated															
		b) Illegal or unmanaged															
1.4. Pest or problem animal control		a) Regulated															
		b) Illegal or unmanaged															
1.5. Live capture		a) Regulated															
		b) Illegal or unmanaged															
1.6. Killing of individual		a) Regulated															
		b) Illegal or unmanaged															

After filling in this first table, two scenarios are possible:

- ❖ If cases 1.1, 1.2 and 1.3 are found, the evaluator may conclude with a high probability that the exports will not harmfully affect the survival of the species.
- ❖ On the other hand, if boxes corresponding to lines 1.4, 1.5 and 1.6 are checked, the evaluator must also complete the second table before taking a decision on the NDF of the species.

In the case of this study, in making the evaluation, boxes corresponding to lines 1.4 and 1.6 were checked. This led to the transition to the second stage, which is the analysis of the vulnerability of the species to the effects of harvesting and commercial use.

3.2.2.2. Analysis of the vulnerability of the species to the effects of harvesting and commercial use

The analysis of the vulnerability of the species to the effects of harvesting and commercial use is done using a check-list of 26 questions grouped into 7 sections relating to:

- General biological characteristics of the species;
- Information on the status of the species at the national level;
- Harvest management;
- Control of the harvest regime;
- Monitoring of the harvest;
- Incentives and conservation benefits from harvesting; and
- Extent to which the species is protected from harvest.

The assessment consists of answering 26 questions by ticking one of the 5 answers suggested. For each of the 5 answers, correspond a given score comprise between 1 and 5 (1 = excellent and 5 = poor).

It is important to note that the checklist proposed in the IUCN model is not set in stone. So, it may happen that we do not do with all the 26 questions; such is the case in the present study. Indeed, the issue of harvesting under strong land tenure has not been addressed because this model of wildlife resource management does not suit the Cameroonian context. Reason why the checklist below has only 25 questions (see table 2)

Table 2. Factors Affecting Management of the Harvesting Regime

Biological characteristics		
2.1. Life history: What is the species' life history?	High reproductive rate, long-lived	1

	High reproductive rate, short-lived	2
	Low reproductive rate, long-lived	3
	Low reproductive rate, short-lived	4
	Uncertain	5
2.2. Ecological adaptability: To what extent Is the species adaptable (habitat, diet, environmental tolerance etc)?	Extreme generalist	1
	Generalist	2
	Specialist	3
	Extreme specialist	4
	Uncertain	5
2.3 Dispersal efficiency: How efficient is the species' dispersal mechanism at key life stages?	Very Good	1
	Good	2
	Medium	3
	Poor	4
	Uncertain	5
2.4. Interaction with humans: Is the species tolerant to human activity other than harvest?	No interaction	1
	Pest /Commensal	2
	Tolerant	3
	Sensitive	4
	Uncertain	5
National status: Animals and		
2.5. National distribution: How is the species distributed nationally?	Widespread, contiguous in country	1
	Widespread, fragmented in country	2
	Restricted and fragmented	3
	Localised	4
	Uncertain	5
2.6. National abundance: What is the abundance nationally?	Very abundant	1
	Common	2
	Uncommon	3
	Rare	4
	Uncertain	5
2.7. **National population trend:** What is the recent national population trend?	Increasing	1
	Stable	2
	Reduced, but stable	3
	Reduced and still decreasing	4
	Uncertain	5
2.8. Quality of information: What type of information is available to describe abundance and trend in the national population?	Quantitative data, recent	1
	Good local knowledge	2
	Quantitative data, outdated	3
	Anecdotal information	4
	None	5
2.9 Major threats: What major threat is the species facing (underline following: overuse/ habitat loss and alteration/ invasive species/ other: and how severe is it?	None	1
	Limited/Reversible	2
	Substantial	3
	Severe/Irreversible	4
	Uncertain	5
Harvest management		
2.10. Illegal off-take or trade: How significant is the national problem of illegal or unmanaged off-take or trade?	None	1
	Small	2
	Medium	3
	Large	4
	Uncertain	5
2.11. Management history: What is the history of harvest?	Managed harvest: ongoing with adaptive framework	1
	Managed harvest: ongoing but informal	2
	Managed harvest: new	3

	Unmanaged harvest: ongoing or new	4
	Uncertain	5
2.12. Management plan or equivalent: Is there a management plan related to the harvest of the species?	Approved and co-ordinated local and national management plans	1
	Approved national/state/provincial management plan(s)	2
	Approved local management plan	3
	No approved plan: informal unplanned management	4
	Uncertain	5
2.13. Aim of harvest regime in management planning: What is harvest aiming to achieve?	Generate conservation benefit	1
	Population management/control	2
	Maximise economic yield	3
	Opportunistic, unselective harvest, or none	4
	Uncertain	5
2.14 Quotas: Is the harvest based on a system of quotas?	Ongoing national quota: based on biologically derived local quotas	1
	Ongoing quotas: "cautious" national or local	2
	Untried quota: recent and based on biologically derived local quotas	3
	Market-driven quota(s), arbitrary quota(s), or no quotas	4
	Uncertain	5
Control of harvest		
2.15. Harvesting in Protected Areas: What percentage of the legal national harvest, occurs in State-controlled Protected Areas?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
2.16. Harvesting in areas with open access: What percentage of the legal national harvest occurs in areas where there is no strong local control, giving *de facto* or actual open access?	None	1
	Low	2
drw15	Medium	3
	High	4
	Uncertain	5
2.17. Confidence in harvest management: Do budgetary and other factors allow effective implementation of management plan(s) and harvest controls?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
Monitoring of harvest		
2.18. Methods used to monitor the harvest: What is the principal method used to monitor the effects of the harvest?	Direct population estimates	1
	Quantitative indices	2
	Qualitative indices	3
	National monitoring of exports	4
	No monitoring or uncertain	5
2.19. Confidence in harvest monitoring: Do budgetary and other factors allow effective harvest monitoring?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
Incentives and benefits from harvesting		
2.20. Utilisation compared to other threats: What is the effect of the harvest when taken together with the major threat that has been identified for this species?	Beneficial	1
	Neutral	2
	Harmful	3
	Highly negative	4

	Uncertain	5
2.21. Incentives for species conservation: At the national level, how much conservation benefit to this species accrues from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
2.22. Incentives for habitat conservation: At the national level, how much habitat conservation benefit is derived from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
Protection from harvest		
2.23. Proportion strictly protected: What percentage of the species' natural range or population is legally excluded from harvest?	>15%	1
	5-15%	2
	<5%	3
	None	4
	Uncertain	5
2.24. Effectiveness of strict protection measures: Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
2.25. Regulation of harvest effort: How effective are any restrictions on harvesting (such as age or size, season or equipment) for preventing overuse)?	Very effective	1
	Effective	2
	Ineffective	3
	None	4
	Uncertain	5

Once the table has been completed, the scores of the ticked answers are recorded in an Excel spread sheet designed for this purpose. A "Radar" polygon model contained in a disk of radius 5 (5 being the maximum value of a criterion) is generated by in Excel. This polygon has a coloured central area representing the responses.

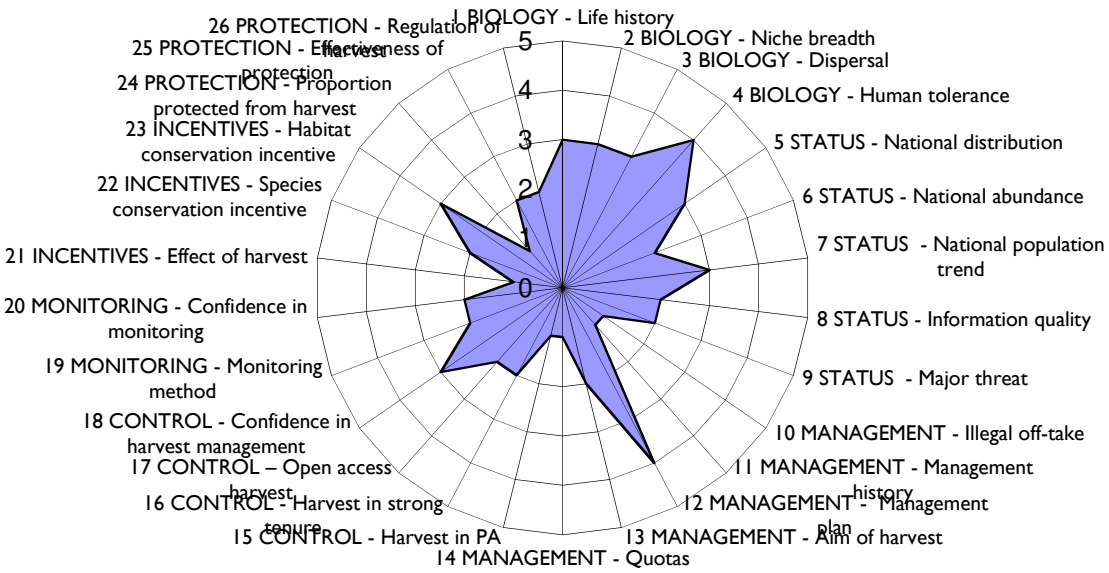

Figure 2 : Example of a radar polygon with 26 criteria.

As much as results are concentrated in the zone of confidence (near the centre of the circle), the probability that the harvest will not be detrimental to the survival of the species is strong. The points that are out of the confidence zone may indicate that the harvest is unlikely to be sustainable and should prompt the assessor to examine the corresponding answers more closely.

CHAPTER IV: RESULTS AND DISCUSSIONS

The work that led to the results presented in this document was carried out on the basis of check-list of information designed by IUCN to help Scientific Authorities issue non-detriment findings. The aim here is to decide on the possible NDF of Hippopotamus amphibius in Cameroon using the method developed by the International Union for Conservation of Nature (IUCN).

4.1.Preliminary examination of the likely effects of off-take on the survival of the species

On the basis of own knowledge and information gathered from the heads of the decentralized services of the Ministry of Forests and Wildlife of the North and Far North Regions, a detailed summary of the harvesting regime for the said species has been produced as presented on sheet n°1 below. The choice was made on these two regions because they are the ones that contain the largest population of common hippopotamus in the country. It is also in this part of these regions that hippopotamus hunting and administrative beats are particularly carried out.

From the preliminary examination of the probable effects of harvesting on the survival of the common hippopotamus in Cameroon, the following results were obtained:

<u>Sheet n°1:</u> Summary description of the *Hippopotamus amphibius* harvest regime *in Cameroon*

Tableau 1. Animaux. Description résumée du régime de prélèvement d'une espèce animale (ou de populations d'une espèce animale)

Espèce: Hippopotamus amphibius ..... Pays (le cas échéant, état ou province): Cameroun .....

Date (avis de commerce non préjudiciable): Mars 2023 ..... Période concernée: 2023 - 2024 .....

Nom: NTERE ETOUNDI FAUSTIN JEAN PAUL II ..... Poste au sein de l'Autorité scientifique: Expert .....

L'espèce est-elle endémique, présente dans quelques pays seulement ou largement répandue? ~~Espèce~~ largement répandue .....

Etat de l'espèce (si connu): Catégorie mondiale UICN: Vulnérable ..... Statut national autre: classe "A" (Intégralement protégée).

Type de prélèvement	Produit principal	Degré de contrôle	Segment démographique prélevé dans la population sauvage					Taux relatif de prélèvement (comprenant le nombre ou la quantité exact(e) le cas échéant)				Raison du prélèvement			Destination(s) commerciale(s) (nombre et pourcentage le cas échéant)		
			Oeufs	Juv	Mâles adultes	Femelles adultes	Non sélectif	Faible	Moyen	Elevé	Inconnu	Subsistance	Commerciale	Autres	Locale	Nationale	Internationale
1.1 Elevage en captivité		a) Réglementé															
		b) Illicite ou non réglementé															
1.2. Prélèvement pour des parties ou des produits n'entraînant pas la mort		a) Réglementé															
		b) Illicite ou non réglementé															
1.3. Prélèvement pour l'élevage en ranch		a) Réglementé															
		b) Illicite ou non réglementé															
1.4. Contrôle des ravageurs ou des animaux à problème	viande	a) Réglementé					X	X						X	X	X	X
	viande	b) Illicite ou non réglementé					X	X						X	X	X	
1.5. Capture d'animaux vivants		a) Réglementé															
		b) Illicite ou non réglementé															
1.6. Abattage de spécimens	Trophée	a) Réglementé			X								X				X
	viande	b) Illicite ou non réglementé					X	X					X		X	X	

The information provided on the summary description of the harvesting regime for Hippopotamus amphibius in Cameroon reveals that the species is exclusively off-taken from the wild. This is logical because, all the hippos found in Cameroon are from the wild.

Two types of off-take are known in the country: off-take for the control of pests and problem animals, and the off-take by killing of specimens through legal hunting and poaching.

4.1.1. Pest or problem animal control

The common hippopotamus is known to be very involved in the devastation of crops in the territories surrounding places where they live. In addition, the waterbody in which they live are full of fish and therefore attract many fishermen. For these reasons, the surrounding populations are always in conflicts with hippos.

The cohabitation of hippos with farmers and fishermen usually leads to conflicts that sometimes result in deaths on different sides. As for the deaths observed on the side of hippopotamuses, they are caused either by revenge on the part of the local populations, or by self-defence of the victims who protect themselves or their property, or by the administration in charge of forests and wildlife in the context of administrative slaughters.

Generally, harvest in the context of human-hippopotamus conflicts is intended to reduce the frequency and consequences of these conflicts. The animals being dead, we have to do something about them. It is in this mind-set that the products from these slaughters are valued. Three contingencies are possible: administrative slaughters, killing for self-defence followed by compliance with the administrative procedure and finally revenge and self-defence without compliance with the administrative procedures thereafter.

4.1.1.1. Cases of administrative off-take

During administrative slaughters, which are a legal procedure of managing human-wildlife conflicts, it is usually adult males who are targeted. But there are isolated cases where the animal involved in the conflict is a female, in this situation the administration is constrained to order the killing of a female. So, administrative off-take is not selective, according to the sex.

The trophies are collected and sold at national or international level while the meat is given to the local populations (victims of the damage caused by the slaughtered animal); failing that, they are deposited in the store of the zoo-botanical garden of Mvog-Betsi in Yaoundé. But there is the possibility of involving a professional hunter who pays for the taxes relating to the beat and the trophy in other to appropriate it. The main objective being to satisfy the victim populations, the emphasis is on the meat given to them as compensation, the recovery and sale of trophies come second. The main product in this case is meat.

4.1.1.2. Cases of self-defence with respect for administrative procedure

Off-take resulting from self-defence and which have been declared to the administration in charge of forests and wildlife so that a report in good and due form can be made, are acts legally recognized by forestry legislation in Cameroon. On the whole, killing resulting from self-defence are not selective, it is the animal involved in the affront that is killed.

The trophies of slaughtered animals are sold at auction or deposited at the store of the zoo-botanical garden of Mvog-Betsi in Yaoundé. The meat is given to the local populations.

4.1.1.3. Cases of revenge and self-defence without respect for administrative procedure

Killing from revenge and self-defence followed by failure to comply with administrative procedure are considered illegal. Revenge here is seen as the act of killing animals in the hope that they will no longer come to attack people and their goods without any official authorization. As for self-defence, it is considered legal in the case where the administration in charge of wildlife is seized immediately afterwards to make a report. When the latter have not been seized for this purpose, the act is considered to be illegal.

Like the previous types of harvesting, in this case too, off-takes are not selective.

The resulting meat is consumed and sold locally without the knowledge of forest administration agents. As for the trophies, there is practically no information about their future; they are most likely to be sold locally and nationally.

4.1.2. Harvest by killing individuals

In this framework, the killing of individuals refers to sport hunting which is authorised activity and poaching which is an illegal hunting.

4.1.2.1. Sport hunting

The common hippopotamus hunting is mainly for trophies purposes. Unlike slaughter organized by the administration, sport hunting of the common hippopotamus is aimed exclusively at adult males. The meat derived from it is sold locally and at the national market.

4.1.2.2. Poaching

Poaching is considered as a hunting act in violation of the law. Like other animal species, the common hippopotamus is also poached in Cameroon. Mainly it is poached for its meat, although the trophies are exploited in some cases. Animals are poached to supply the local and national market in bush meat. The argument made by field staff is that when a hippo-sized animal is poached for its ivory, it is common to find one or more carcasses devoid of trophies left behind. That is not observed with the hippopotamus. On the contrary, it happens to come across sites where hippopotamus meat has been smoked. (Maha, 2012). As for the trophies, for lack of a reliable source, we cannot say where they are sold.

4.1.2.3. Preliminary examination analysis

Following the preliminary examination, the observation made is that the hippopotamuses are taken on the one hand for the control of pests and problem animals and on the other hand for a hunting objective, legally as well as illegally. Some boxes corresponding to rows 1.4 and 1.6 have been ticked, for that reason and according to the IUCN NDF assessment method principals, the assessor must complete Table 2A before conclude if the trade of hippos in Cameroon is dangerous for the survival of the species.

For that reason, the evaluation continued with the second stage, that of the examination of the factors affecting the management of the harvesting regime. The second step is to complete Table 2A of the NDF guide developed by IUCN.

4.2.Factors affecting the management of the harvest regime

4.2.1. Biological characteristics

4.2.1.1. Life history

Common hippos living in the wild reach sexual maturity between the ages of 6 and 15 years. They have a lifespan of between 35 and 50 years. The gestation period is 8 months and females produce one young at a time (Eltringham, 1999). These characteristics make the hippopotamus a slow-growing species with a low reproductive rate.

It is therefore a "K" strategy species; reason why it is considered to have a low reproductive rate and a long lifespan. It is therefore sensitive to the effects of harvesting.

4.2.1.2. Ecological adaptability

To assess the ecological adaptability of the hippopotamus in Cameroon, two factors were taken into consideration: the diet and the habitat of the species.

- **Diet**

Food is an important aspect of the survival of any species. The hippopotamus has a wide variety of choices for food. It generally feeds on herbaceous plants and particularly grasses near the banks of rivers and lakes. But, at nightfall, he moves away from the water to reach pastures by specific paths, covering several kilometres for this. During its search for food, the hippopotamus often finds itself in the fields of local populations, causing enormous damages. It can consume until 40 kg of plant matter per day (Eltringham 1999). The plant species eaten by the hippopotamus are those listed in Table 4 below.

Table 4 : List of plant species consumed by hippos and inventoried at their habitat. (MAHA, 2012)

Families	Species
Amaranthaceae	*Amaranthus spinosus*
	Amaranthus viridis
Annonaceae	*Annona senegalensis*
Bignoniaceae	*Stereospermum kunthianum*
Choslospermaceae	*Cochlospermum tinctorium*
Commelinaceae	*Commelina nigritans bentham*
	Aneilema lanceolatum

Cyperaceae	*Bulbostylis barbata*
	Bulbostylis hispidula
	Cyperus esculentus
	Cyperus rotundus
	Kyllinga pumila
	Scleria gracillima
Ebenaceae	*Diospyros mespiliformis*
Fabaceae	*Pterocarpus lucens*
Hypericaceae	*Psorospermum senegalense*
Malvaceae	*AIDS cordifolia*
Mimosaceae	*Acacia ataxacantha*
	Acacia obtusifolia
Poaceae	*Andropogon canaliculatus*
	Andropogon gayanus var bisquamulatus
	Andropogon gayanus var gayanus
	Andropogon tectorum
	Bracharia jubata
	Cymbopogon giganteus
	Dactyloctenium aegyptium
	Digitaria horizontalis
	Eleusine indica
	Elymandra androphila
	Eragrostisa spera
	Hyparrhenia barteri
	Hyparrhenia involucrata
	Hyparrhenia rufa
	Imperata cylindrica
	Panicum pansum
	Panicum rupens
	Paspalum scrobiculatum
	Pennisetum polystachion var polystachion
	Pennisetum purpureum
	Pennisetum unicetum

	Rottboellia cochinchinensis
	Schizachyrium brevifolium
	Setaria barbata
	Sporobolus festivus
	Sporobolus indicus var pyramidalis
Rubiaceae	*Crosopterus febrífuga*
	Gardenia aqualla
Tiliaceae	*Grewia cisoides*

The great diversity of plants eaten by the common hippopotamus is an advantage for the species. The more a species has a varied diet, the more easily it adapts to changes in its environment. Based on the food criterion, the common hippopotamus is a generalist species.

- **Habitat**

Two types of environments are inhabited by hippos, closed environments, similar to forests, and open environments, similar to savannahs.

In a closed environment, that is to say in the forest, hippos are found in the Congolese forest (Ndélélé, Eastern Region), in dense semi-deciduous forest (Mbalmayo in the Center Region and Nyanon in the Littoral Region) and in dense evergreen forest (Massock in the Littoral region). Their living environments are large slow-flowing rivers (Kadey, Nyong, Sanaga) and sometimes rocky (Nyong, Sanaga). These rivers are generally deep and do not involve a low water period. Their banks have a few types of plant associations:

Bushy thickets, also called maquis, are made up of shrubs grouped together, forming a dense block that is difficult to penetrate. Species such as Chromolaena odorata, Vernonia sp, or even Uapaca paludosa and some herbaceous species are also present, such as Commelinaceae, Poaceae or Cyperaceae.

Open environments refer to savannahs which, like forests, include several types of formations in which hippos are found. Hippopotamuses are thus found in shrubby savannah (Birim, Marma in the Adamaoua Region; Kouoptamo and Njindoun, in the Western Region) and in herbaceous savannah (Nouldaïna, Maga in the Northern Region). Their living environments are lakes which are in fact extinct craters in the western zone (Lake Bamendjin, Lake Petponoun, Lake Monoun), large rivers (Bénoué, Djerem) and the Mayos (Mayo Rey, Mayo Bigoué) which are watercourses with a low

water level in the dry season. The banks of these different watercourses have several types of plant associations:

Gallery forests; these are the formations present along the rivers in the valleys with a more or less strong harvest. These are areas with high biodiversity due to the mixture of forest, savannah and mountain species.

Herbaceous formations; show the dominance of one family and species belonging to other families being poorly represented. They are widely present in the Far North region (Nouldaïna), and are only found in anthropized areas in the far south. The families generally present are the Poaceae (Gramineae) and the Cyperaceae.

Shrubby savannas; these are formations made up of a large herbaceous carpet dotted with a few shrubs. They are present on the Adamaoua plateau (Marma, Tibati), and also on the western highlands (Foumban).

Although it adapts to several different types of ecosystems, it should be noted that it is a species that is dependent on water. In view of the anthropogenic disturbances observed in its fragile environment, in particular the rivers, this situation means that we classify the hippopotamus among the specialist species.

4.2.1.3. Dispersal efficiency

Hippopotamuses are sedentary species living in herds of a few to twenty individuals (Eltringham, 1999). For the species, there is no known mechanism guaranteeing wide dispersal of individuals at a given moment in their life history. It is therefore difficult for the species to recolonize regions from which they have locally disappeared. The fact that the dispersal ability of this species is poor contributes to making it susceptible to the effects of off-take.

4.2.1.4. Interaction with humans

The home range of the common hippopotamus in many cases overlaps with the territories where humans carry out their activities particularly fishing and agriculture. These human activities do not pose are not direct threats for hippos. On the contrary, human lives are permanently threatened in these areas.

Hippopotamus grazing areas are usually converted to crops fields. Instead of hippos leaving the area to conquer other territories, on the contrary they settle to feed in the fields, thereby becoming pests for food crops.

In general, human activities, in particular agriculture, contribute to maintaining the hippopotamus populations on site; especially that it is during the dry season that the

peoples cultivate the wetlands. As the animals feed regularly in the fields, they are considered pests or animal problem. This is an advantage contributing to make them less sensitive to the effects of harvesting.

4.2.2. National status

4.2.2.1. National distribution

According to the study conducted by MINFOF in 2014, the common hippopotamus is currently found in almost all regions of Cameroon. Although very few studies have really focused on the distribution of the species in Cameroon. The range of the hippopotamus in Cameroon extends over all ecological zones and covers eight (08) of the ten regions of the country; hippos not found in the South and Southwest Regions. The southern part of Cameroon comprising the Centre, South, East, West, South-West, North-West and Littoral Regions contains a small proportion of the national population of common hippopotamus. Very few studies have been conducted in southern part of the country because of the small size of the populations and it is difficult to observe hippopotamuses in forest environment. They thus remain a mystery even for the local populations who assimilate them to totems. On the other hand, hippopotamuses are very widely distributed in the three northern regions (Adamaoua, North and Far North) where they have been the subject of several studies, particularly in the Faro and Bénoué National Parks and in the adjoining Hunting Zone s (MINFOF, 2014).

In Africa, common hippos are widely distributed. But in Cameroon, although the fact that the species is present in almost all regions the species distribution is not continuous. These are isolated communities that we observe as illustrated in the map of the overview of the distribution of hippopotamuses in Cameroon and neighbouring countries as drawn up by the IUCN.

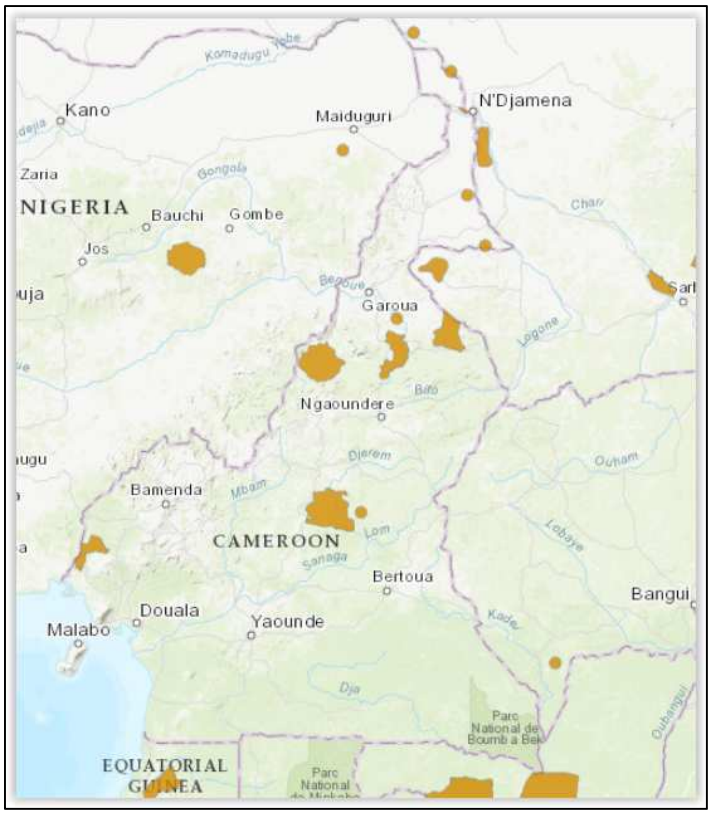

Figure xxx : Overview of hippo distribution in Cameroon and neighbouring countries. (Source: IUCN, 2021)

Although common hippos are widely distributed in Africa, the national population is fragmented.

4.2.2.2. National abundance

In Cameroon, hippopotamus populations are observed both in the areas belonging to the state property and these with open access, including savannahs and forests. This common hippo population diversity is spread over various Regions of the country. The following tables show the numbers of hippos according to the status of the different ranges (MINFOF, 2014a).

***Table 1*: Summary of numbers common hippo in Protected Areas in 2014**

Region	Division	Protected area	Watercourse	Hippo numbers	Spring
Far North	Logone-et-Chari	Kalamaloué NP	Logone and Chari	150	AAR, 2013
North	Bénoué	PN Bénoué	Bénoué	181	Iyah and Scholte, 2014
	Faro	PN Faro	Mayo Faro	681	Iyah and Scholte, 2014

Adamawa	Jerem	PN Mbam and Djérem	Jerem	79	Anthony, 2006
	Mbéré	Mbéré NP	Mbéré	84	Ecolo-consulting, 2012
Total				**1175**	

Source: MINFOF, 2014a

***Table 2**: Summary of numbers common hippo in Hunting Zone s in 2014*

Region	Division	N° HUNTING ZONE	Watercourse	Hippo numbers	Spring
North	Bénoué	14	Bénoué	2	AAR, 2013
	Faro	13	Mayo Faro	13	L.F.VEKO
		16	Mayo Faro	250	AAR, 2013
		18	Mayo Faro	700	AAR, 2013
		18 bis	Mayo Faro	80	AAR, 2013
	Mayo Rey	3	Mayo Odiri	170	AAR, 2013
		12	Mayo Rey	40	AAR, 2012
		20	Mayo Rey	30	AAR, 2013
		22	Mayo Rey	100	AAR, 2013
		26	Mayo Rey	50	AAR, 2013
		27	Mayo Rey	100	AAR, 2013
Adamawa	Vina	15	Vina	80	AAR, 2013
Total				**1615**	

Source: MINFOF, 2014a

Twelve Hunting Zone s, all located in the Northern and Adamaoua regions, bring together a potential of approximately 1,615 common hippopotamuses.

***Table 3**: Summary of number of common hippos in area with open access*

Region	Division	Localization	Watercourse	Hippo numbers	Spring
Far North	Mayo Danay	Wina	Mayo Danay	400	Surveys, 2014
		Kaikai		300	Surveys, 2014
		Maga	Lake Maga	200	Surveys, 2014
		Guéré	Lake Guéré	150	Surveys, 2014
East	Kadey	Ndélélé (Pana II)	Kadey	30	RAA forestry post Ndélélé, 2014
Center	Nyong and So'o	Mbalmayo (Ebogo)	Nyong	1	Comm pers, Ebogo site manager (MINTOUL), 2014
Littoral	Sanaga	Massock	Sanaga	25	Surveys, 2014

	Maritime	Nyanon	Sanaga	60	Surveys, 2014
West	Noun	Kouoptamo	Lake Bamindjin	20	Surveys, 2014
Northwest	Ndonga-Mantum		Vatouga	07	Anthony, Comm pers, 2012
Total				**1193**	

Source: MINFOF, 2014a

A potential of 1193 hippos was estimated in area with open access. Almost all of the hippos present in the southern part of the country are in area with open access.

The total number of hippos in Cameroon is between 3827 and 4424 individuals, this number is more concentrated in the northern part of the country. Hunting Zone s have the highest proportion (40.5%) of common hippos, while the lowest proportion (29.5%) is found in national parks where protection is complete. A no less significant proportion of hippos (30%) live in areas with open access (MINFOF, 2014).

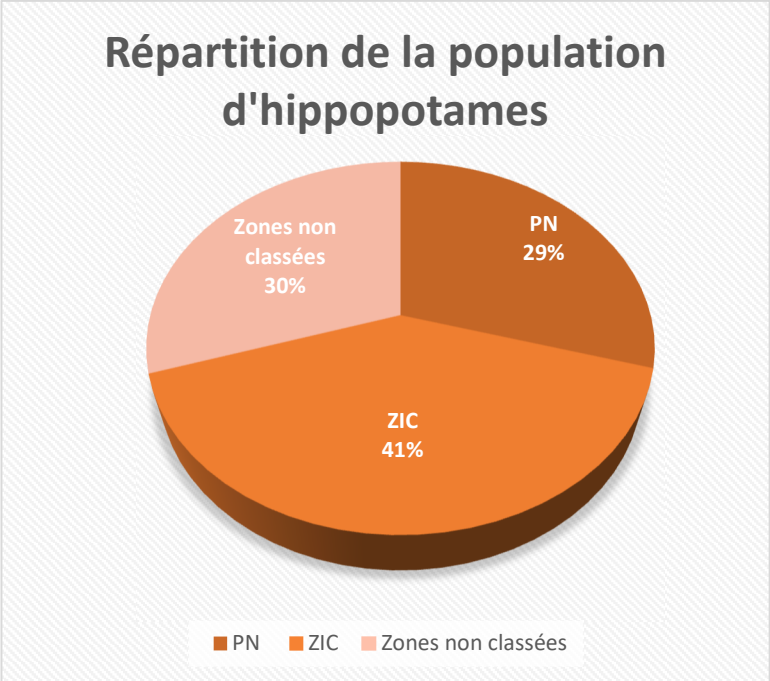

***Figure 2**: Distribution of hippo population by range status (MINFOF 2014)*

Figure 1 above shows that the highest proportion of common hippos is found in Hunting Zone s, yet the lowest proportion is found in national parks, where protection is strict. A significant proportion of hippos are found in areas with open access and face threats directly related to human activities. Abound seventy percent (70%) of common

hippopotamuses live in protected areas (national parks and Hunting Zone s) and the rest occupy areas with open access (MINFOF, 2014a).

Common hippos are not very abundant in Cameroon and their density is relatively low. For that reason, the species is considered to be an uncommon species and therefore the population of the country is susceptible to the effects of harvest.

4.2.2.3. National population trend

A total number of about 1175 hippos has been recorded in the 05 national parks of the northern zone of Cameroon. These are the Bénoué, Faro, Mbéré Valley, Mbam and Djerem and Kalamaloué National Parks (Nchanji and Fotso 2006, Scholte and Iyah 2016, Scholte et al. 2017a). While in twelve Hunting Zone s in the Northern and Adamaoua regions, around 1000 common hippopotamuses have been counted (Scholte and Iyah 2016, Scholte et al. 2017b). However, in the areas with open access, there is a significant population of hippopotamuses of about 1193 individuals (MINFOF, 2014a).

Overall, a population of approximately 3983 hippopotamuses was thus estimated over a major part of their range in Cameroon and distributed according to the conservation status of each area (Figure 4).

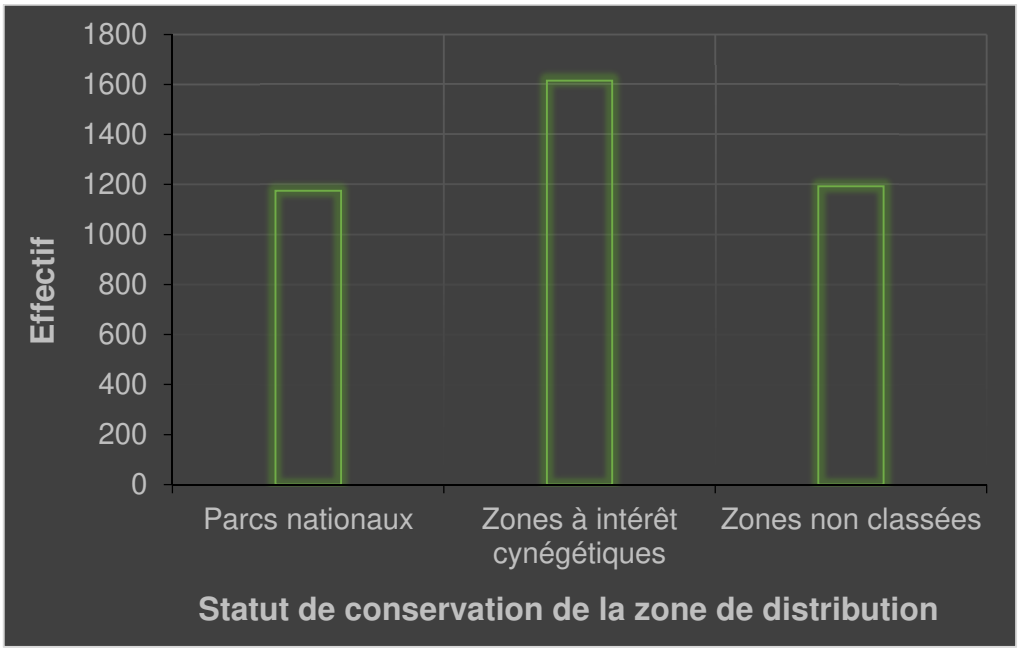

Figure 3: Distribution of the hippo population according to the conservation status of each area in their range. (MINFOF, 2014a)

Figure 4 shows that the Hunting Zone s hold a large population of hippopotamuses in Cameroon. These Hunting Zone s, contiguous to National Parks

constitute with them Operational Technical Unit (OTU). The Faro National Park and Bénoué National Park respectively with surround Hunting Zone s constitute the Faro OTU and the Bénoué OTU, two ecological zones which hold the largest and most stable hippopotamus population in Central and West Africa (Scholte et al. 2017b) (Conf. Tables 1 and 2 and Figures 5 and 6).

Table 4: Population dynamics of hippos in Cameroon (2000 – 2018) in OTU Faro in North Cameroon.

Period	Sites	Actual	Sources
2018	Faro + HUNTING ZONE (13, 1 18 and 18 Bis)	899	(EFG, 2018)
2017	Faro + all Hunting Zone s	865	(Scholte et al. 2017b)
2015	Faro + HUNTING ZONE (13, 1 and 18 bis)	685	(Scholte and Iyah 2016)
2011	Faro + HUNTING ZONE (13, 1 and 18 bis)	525	(Tsi et al. 2011)
2000	Faro + HUNTING ZONE (13, 1 and 18 bis)	647	(Zibrine and Gomsé 1999)

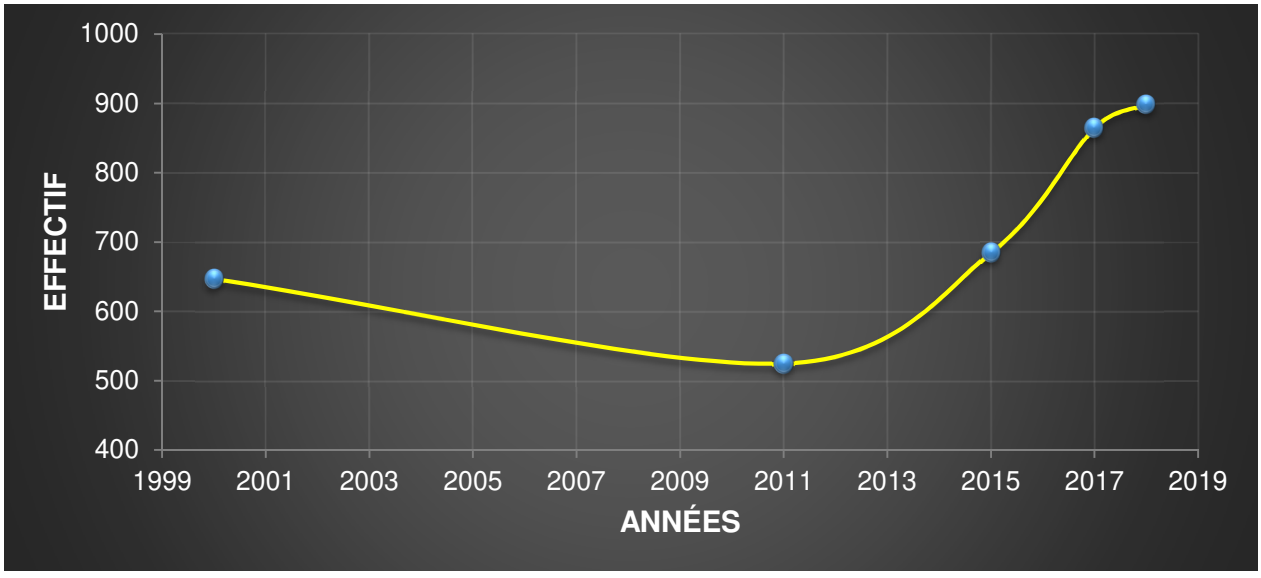

Figure 4 : Trend line of common hippopotamus population dynamics in OTU Faro. (MINFOF, 2014)

By observing the shape of the curve in Figure 5, it appears that the dynamics of hippopotamus populations in the OTU Faro shows a remarkable progressive trend between 2011 and 2018. This situation can be explained by the fact that since this period, the Faro National Park has benefited from the technical and financial support of the ECOFAC 5 program (Conservation and Rational Use of Forest Ecosystems in Central Africa - Phase 5).

Table 5: Population dynamics of hippos in Cameroon (1976 – 2016) in OTU Bénoué in North Cameroon.

Period	Sites	Staff	Sources
2016	Bénoué + HUNTING ZONE (9, 2, 3)	228	Scholte and Iyah (2017)
2013	Bénoué + HUNTING ZONE (9, 2, 3)	181	Scholte and Iyah (2016)
2011	Bénoué + HUNTING ZONE (9, 2, 3)	180	Maha (2012)
1999	Bénoué + HUNTING ZONE (9, 2, 3)	350	Zibrine and Gomse (1999)
1988	Bénoué + HUNTING ZONE (9, 2, 3)	400	NGOG NJE (1988)
1976	Bénoué + HUNTING ZONE (9, 2, 3)	306	Stark and Wit (1977)

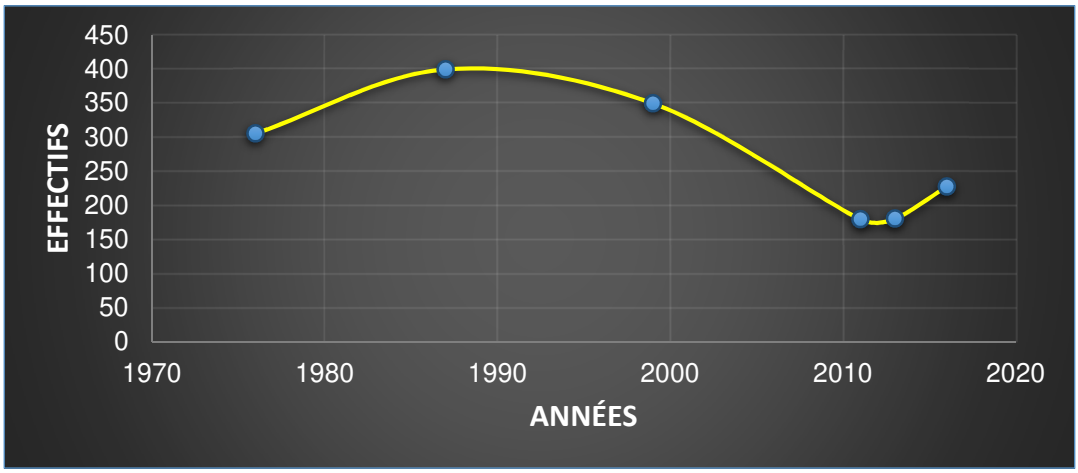

Figure 5: Trend Curve of Common Hippopotamus Population Dynamics in OTU Bénoué (MINFOF, 2014)

Figure 6 shows that the UTO Bénoué hippopotamus population declined considerably between 1999 and 2011, and then start increase again between 2013 and 2016. This regressive trend can be justified by the fact that, unlike the Faro National Park, this protected area does not benefit from the support of technical and financial partners, the State budget being insufficient. In the other hand, with the arrival of European Union-GIZ funding, in 2010, the growth of hippopotamus populations resumed in the Bénoué UTO. (Anonymous, 2023)

According to results of the various studies conducted in the North region on the evolution of hippopotamus populations, the general trend observed over the last decade is an overall increase in numbers. Moreover, the recurrence of attacks and exactions of hippopotamuses in the communities living in the surroundings reaffirms this trend of increasing numbers of hippopotamuses. Numerous cases of hippopotamus deaths as a result of fights between congeners are also observed from time to time. Given the regression observed between the 1990s and 2010, and by applying the precautionary principle, the recent trend of the national population of common hippos in Cameroon is considered to be stable.

4.2.2.4. Quality of information

The last study on the common hippopotamus nationwide dates back to 2013-2014. Nearly 10 years later, it is understood that the quantitative data that resulted from this and on which ours work is based are obsolete today. Never mind, opinions from forestry local staff indicate that, the trend in the field underlies an increase in number of hippos.

The fact that these data are considered obsolete has led us each time to apply the precautionary principle in the other sections.

4.2.2.5. Main threats

Throughout its African range, several factors of anthropogenic and natural origin represent threats to the survival of hippos. (Lewison, 2007; Michez and Vermeulen, 2010; Scholte and Iyah, 2016; Stommel et al., 2016; Baker et al., 2020; Utete, 2020).

i. Habitat loss in areas with open access

- **Gold panning**

Gold panning activities are threats to hippos. This very intense activity often favours the installation of villages that can hold hundreds of people. The miners turn over the soil, degrade the vegetation, pollute the water, modify and destroy the habitat of the

hippopotamuses. This activity brings people closer to hippopotamuses, increasing the risk of conflict with the following direct consequences:

- The migration of hippos to other ponds which may correspond either to areas of high human activity or areas where feeding becomes a difficult equation to solve;
- The death of animals trapped in holes dug by miners.

The proximity to these animals and the considerable number of people living in the miners' camps favours the poaching of hippopotamuses for the supply of meat and possibly the sale of hippopotamus canines.

Gold panning is widespread in almost all localities in the Northern Region, which does not spare the areas where hippos live.

- **Transhumance**

The phenomenon of transhumance is widespread in the northern part of the country because, it is the part of the national territory par excellence for cattle breeding. Shepherds in search of pasture go so far as to graze their animals on the banks of waterways. The lush cover of herbaceous vegetation in the Bénoué and Faro national parks is very often the target of the latter during the dry seasons, which generates competition for grazing. Even the hunting zones are not spared from this scourge.

Efforts are made by the Ministry in charge of wildlife in order to promote the regeneration of pasture and to fight effectively against transhumance, in particular through the effort of permanent patrols, the awareness of shepherds and the effective involvement of local populations in the management of protected areas.

- **Agriculture**

The range of the hippopotamus, more particularly in the area with open access, is very susceptible to this phenomenon. The populations there are perpetually looking for land for intensive agriculture (coffee, market gardening, millet, sorghum, rice, etc.) and for residential areas, which leads to conflicts with the hippos that live there (Michez and Vermeulen 2010).

ii. Poaching

Poaching remains the most important scourge that threatens hippopotamuses without distinction of sex and age. Common hippos are mainly poached for their teeth, which have great economic value and substitute for elephant tusks in the ivory trade.

Their meat is a great source of protein in many parts of Africa. Several indications of hippo poaching have been encountered, in particular active or abandoned camps and abandoned trophies in certain stretches of the Bénoué and Faro rivers (Scholte et al., 2016). On the other hand, in areas regularly monitored by ecoguards, few signs of poaching are recorded. The CITES report on trade in rare species shows that hippopotamuses are also poached for trophies and for their skin, which is used to make many goods (slippers, bags, etc.).

Cases of poaching have been recorded in the divisions of Noun, Faro, Mayo-Rey, and Bénoué. The canines of common hippos are substitutable for elephant tusks in the ivory trade and therefore have significant economic value. Although this trade is poorly documented, a few studies have highlighted it. Moreover, some field observations have mentioned hippopotamus meat found on racks in gold panning camps inside the Bénoué National Park, as well as hippopotamus carcasses without their canines in the Faro National Park (MAHA 2012).

iii. Human-hippo conflicts

Common hippos are very often mentioned in conflicts related to agriculture, and in attacks on humans, especially fishermen. The home range of hippos has been considerably reduced by humans in search of farmland and spaces for residential areas, which considerably increases the proximity of human territory to that of hippopotamus, and therefore the risk of conflict (Michez and Vermeulen 2010). Observations in the river Noun (Noun division), in the locality of Nyanon (Sanaga maritime division), in the Technical Operational Units (OTUs) Faro (Faro division) and Bénoué (Mayo-Rey division) and on the site of the Lagdo dam (Bénoué division) have shown that people live and cultivate directly on the banks of the waterbodies inhabited by hippopotamuses. The latter frequently cause significant damages to crops when feeding at night (Michez and Vermeulen 2010). The crops mostly at risk are those growing near rivers and lakes, such as rice, market gardening and flood recession crops. The victims of the damage complain to the competent local authorities who, under the terms of the procedures, sometimes decide to organize administrative beats (MAHA 2012, MINFOF. 2014a).

According to information gathered from the decentralized Forestry and Wildlife Services of the North and the Far North regions, several cases of attacks to fishermen's canoes by hippos during fishing trips are reported each year. It has also been noticed that the number of complaints for abuses by hippos has been increasing over the years.

For the year 2022 alone, two cases of death of men were recorded in the division of Logone and Chari and three cases in the division of Mayo Kani (Anonymous). As for the number of animals killed in human-hippo conflicts, three administrative beats were officially reported in the division of Mayo Kani. Unfortunately, in the case of killing animal orchestrated by the populations themselves, the information does not reach the competent services for fear of reprisals because, these are illegal killing as well as poaching. To find a solution to this problem of illegal killing of hippopotamuses in the context of human-wildlife conflict, MINFOF is hard at work to raise public awareness and also develop ecotourism around this species.

iv. Climate change

Global climate change represents a potential threat to many wildlife species. Indeed, the vulnerability of wildlife to climate change, combined with the intensification of anthropogenic pressures, is responsible for the decline of biodiversity in protected areas.

Despite evidence of changes in the geographic distribution of a range of terrestrial and aquatic organisms in response to global warming, little information exists on the direct links between intrinsic characteristics (including physiological traits, physiological tolerance limits and genetic diversity) and the vulnerability of species to climate change (Root et al. 2003, Calosi et al. 2008, Pacoureau, 2018). In hippos, reduced rainfall or a long drought can lead to increased mortality due to reduced pasture, heat stress and greater susceptibility to disease (Lewison 2007, Mallon et al. 2011).

Although the solution to climate change is not possible in the context of the management of common hippos, it is still important to take into account the fact that depending on the year, predictions should be made about the effects of climate change. For example, after an unusually long dry season, one should expect to see a decline in the hippo population.

In view of all these threats, hippopotamuses in Cameroon are not subject to overexploitation. On the other hand, we are witnessing the destruction and modification of their habitat. These threats are reversible, but serious enough to warrant appropriate action. Therefore the threats to the hippopotamuses of Cameroon are considered to be substantial.

4.2.3. Harvest management

4.2.3.1. Illegal off-take or trade

Illegal harvesting or trade in hippopotamus specimens is not enough documented at the country level. Discussions with field staff reveal that poaching is much more accentuated in protected areas dedicated to strict conservation and the area with open access (where people freely carry out their activities), especially in rivers serving as a natural border with neighbouring countries. These animals are generally not found in very large numbers on the different sites where they are encountered, it is possible for the field staff to estimate the trend of poaching of the species both in protected areas and in areas with open access. On the whole, the eco-guards and the heads of the decentralized Forestry and Wildlife services of the North and Far-North Regions believe that the illegal off-take or trade in the common hippopotamus in the northern part of the country is relatively low. They justify it by the fact that the numbers are increasing in the ponds where they live and that the surrounding populations also report it during awareness-raising meetings with local communities. The Divisional Delegate of Mayo-Danay went so far as to suggest that quotas be provided for areas with open access in order to decongest the territories occupied by hippos. Moreover, unlike other animal species, it is rare to seize hippopotamus specimens during roadside checks and patrols, unlike other animal species whose meat is seized each time.

For all of these reasons, it is clear that illegal taking or trade in hippo specimens is low.

4.2.3.2. History of management

In Cameroon, hunting is a regulated activity and is subject to obtaining a sport hunting license with defined quotas. With the exception of protected areas dedicated to strict preservation, hunting for partially protected animals is open throughout the national territory by ministerial decree each year. With the exception of administrative beats, sport hunting takes place in Hunting Zone s managed for this purpose. The first Hunting Zone s were created in 1998 in the Adamaoua and North Regions by “Order No. 0580/A/MINEF/DFAP/SDF/SRC, setting the limits of the Hunting Zone s in Adamaoua and the North regions”.

The creation of Hunting Zones is a continuity of the process initiated by the Cameroon Government to organize the forest and wildlife sub-sector. Other legislative texts were also adopted, including:

- Law No. 94/01 of January 20, 1994, on the forest, wildlife and fishing regime;
- Decree No. 95/466/PM of July 20, 1995, setting the terms of application of the wildlife regime;
- Order No. 0648/MINFOF of July 18, 2006, establishing the list of animals in protection classes A, B and C; amended by Order No. 0053/MINFOF of April 01, 2020, setting the terms for the distribution of animal species into protection classes.

Long before 1994, other legislative texts already existed, but the accent was placed on those adopted after the Rio summit of 1992, this famous summit which mark a step forward the sustainable management of natural resources as applied today.

Since Cameroon adopted the text setting the list of animals by class of protection, the common hippopotamus has always been in class "A". It is therefore a species that has been fully protected in Cameroon for several decades. Class "A" in Cameroon is the equivalent of Appendix I of CITES, except that the hunting, capture and keeping of these species living in the wild are possible, provided that it is by derogation duly granted to holders of hunting, capture or research licences for scientific purposes, to duly authorized wildlife operators, as well as in self-defence. (Art.2, al.1 of Order No. 0053/MINFOF of 01 April 2020).

According to Decree No. 95/466/PM of July 20, 1995, setting the terms of application of the wildlife regime, Hunting Zone s are considered as protected areas. As such, the managers of these areas dedicated to hunting are required to draw up management plans. Every 5 years, these management plans are updated on the basis of the results of a wildlife inventory previously carried out and validated by the administration in charge of wildlife. These management plans are also examined by MINFOF headquarter assisted by some conservation partners such as IUCN and WWF.

In addition, it should be noted that a mechanism has been set up within the Ministry of Forestry and Wildlife and the Ministry of Finance to ensure that revenue from hunting in general and from hippopotamus hunting in particular contribute to the conservation of wildlife species, communal and community development projects. Hunting guides with Hunting Zone s contribute enormously to the sustainable

management of wildlife species through anti-poaching actions, the harvest of ecological data and the carrying out of fauna inventories every 5 years in their respective areas.

In recent years, with the emphasis placed on the implementation of CITES at the Central Africa Sub-regional in general and particularly in Cameroon, the trade in the common hippopotamus has been fairly controlled in Cameroon, the volumes hardly exceeding 30 individuals per year. The following table xxx and yyy illustrate the legal commercial activity around the Hippopotamus for the period from 2005 to 2015.

Table xxxx: Summary of trade of common hippopotamus in Cameroon between 2005 and 2015

YEARS	QUANTITIES
2005	1
2006	6
2007	31
2008	19
2009	22
2011	5
2012	0
2013	0
2014	2
2015	1

(Source: MINFOF, 2015)

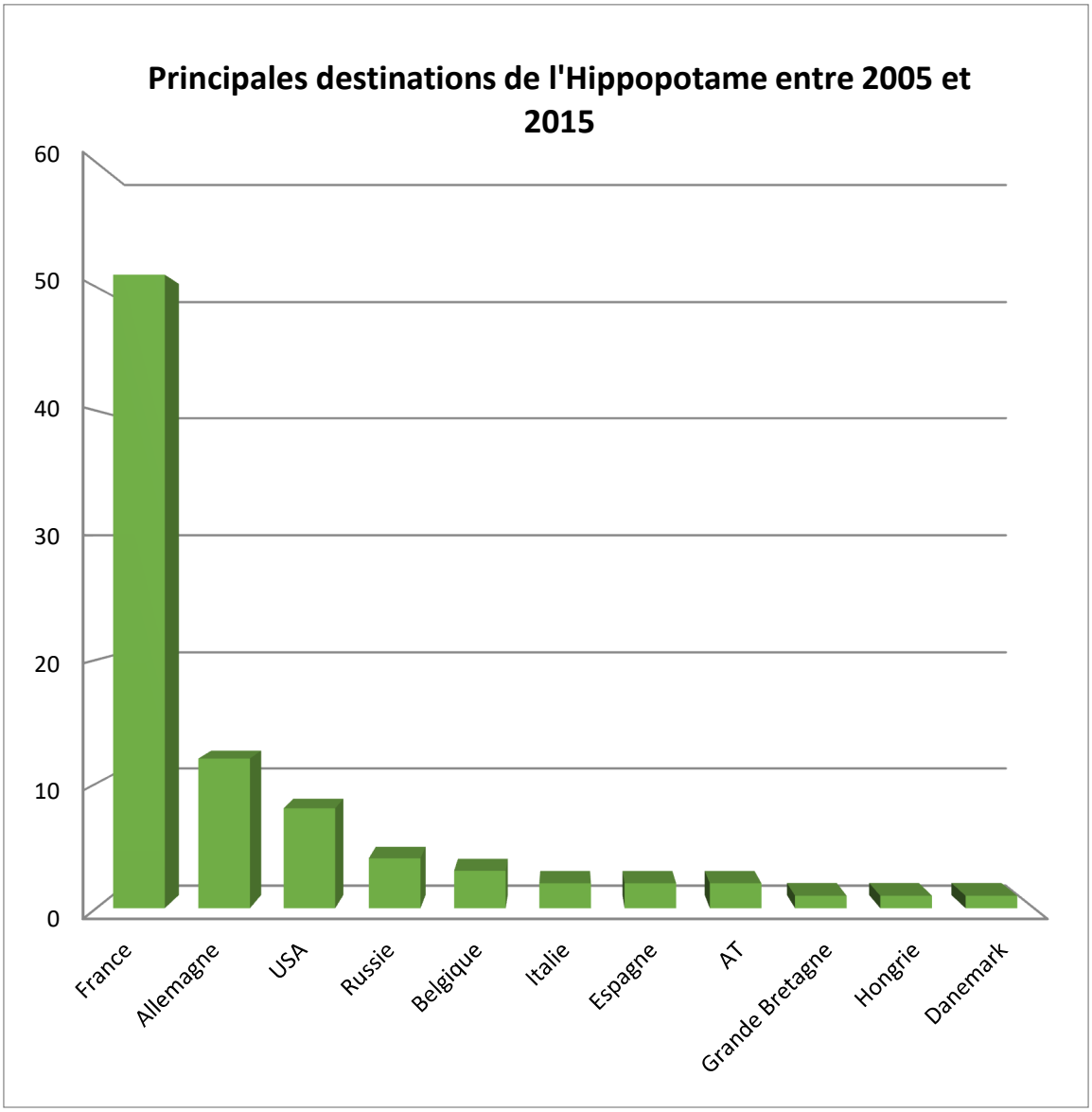

Figure 4.7 Commercial destination of hippos between 2005 and 2015 (MINFOF, 2015)

Tableau 4.7 : Status of hippopotamus trade in Cameroon between 2021 and 2022 extracted from the trade database (CITES)

Year	Importer	Quantity of Importer	Quantity of Exporter	Term
2002	DE		2	trophy
2002	ES		4	trophy
2002	ES	1		trophy
2002	FR	1	3	trophy
2002	IT		1	trophy
2002	PL	1	1	trophy
2002	PT		1	trophy
2003	BE	1		sculpture
2003	BE	1		peau
2003	BE	12		dent
2003	DE	1		queue
2003	DE	2		dent
2003	ES	9		trophy
2003	FR	1		trophy
2003	US	1		trophy
2004	BE		1	trophy
2004	FR		4	trophy
2005	AT		1	trophy
2005	BE		1	trophy
2005	DE	1		queue
2005	DE	2		dent
2005	DE	1		trophy
2005	FR	3	6	trophy
2005	RU		1	trophy
2006	AT	30		dent
2006	FR	14		dent

Year	Importer	Quantity of Importer	Quantity of Exporter	Term
2009	DE	1		queue
2009	DE	32	24	dent
2009	DE		4	trophy
2009	FR		75	dent
2009	FR		5	trophy
2009	GB		1	trophy
2009	IT		2	trophy
2009	NL		1	trophy
2009	RU		1	trophy
2010	DE	69		dent
2010	DE	3		trophy
2011	BE		1	trophy
2011	DE	12		dent
2011	ES	1		trophy
2011	FR		16	dent
2011	FR		1	trophy
2011	RU		1	trophy
2012	DE	36		dent
2012	US	1		trophy
2013	AT	36		dent
2013	DE	1		queue
2013	DE	10		dent
2014	FR		2	trophy
2015	FR		1	trophy
2015	US		1	trophy
2016	BE		1	trophy

2006	FR		5	trophy
2006	US	3	3	trophy
2007	AT		2	trophy
2007	DE		10	dent
2007	DE	1	1	trophy
2007	FR		26	dent
2007	FR		12	trophy
2007	RU		2	trophy
2007	US	2	2	trophy
2008	AT	1		queue
2008	AT	32		dent
2008	DE	33		dent
2008	ES	1		trophy
2008	US	3		trophy
2002	DE		2	trophy

2016	FR		3	trophy
2016	RU		3	trophy
2017	CH	5		trophy
2017	CH		1	trophy
2018	CH		12	dent
2018	DK		1	trophy
2018	FR		12	dent
2019	CH		1	trophy
2019	PL		1	trophy
2020	CH		1	trophy
2021	BE		1	trophy
2021	FR	1		trophy
2021	FR		1	trophy
2021	US		1	trophy
2009	DE	1		queue
2009	DE	32	24	dent

(Source : PNUE-WCMC, 2023)

DK: Denmark ES: Spain FR: France IT: Italy PL: Poland US: United States

AU: Australia BE: Belgium GB: Great Britain RU: United Kingdom NL: Netherlands

CH: China DE: Deutschland PT: Portugal

In view of all these elements, the management of Hippopotamus off-take in Cameroon is going quite well and efforts continue to be made for this purpose with other initiatives, in particular the 2015-2025 common hippopotamus management plan which was developed in 2014 and validated in 2015.

Therefore, the harvesting regime for common hippos in Cameroon is on-going and benefits from an adaptive framework. The quotas are set on a scientific basis and in compliance with the regulations. The management of harvest regime is coordinated in such a way that the national quota derives from the local quotas.

4.2.3.3. Management Plan

Long before 2015, the year of validation of the management plan for the common hippopotamus in Cameroon, the national quota was set on the basis of the local quotas proposed in the shooting plans estimated in the Hunting Zone management plans. The establishment of shooting plans takes into account data from inventories such as the biology of the species, age structures, threats to the species, etc. By adding up these local quotas, we obtained the national quota, which is basically a scientific process. This process is the proof that the hippopotamus quota in Cameroon has often followed a scientific process, although it does not take into account populations living outside Hunting Zones. To manage this species holistically, a national management plan has been established. Through this national management plan, particular emphasis is placed on ecotourism. It is an activity that will enable to better use hippopotamus populations located outside Hunting Zones for the benefit of local communities. The fallout from this form of enhancement contributes directly to the economic development of populations and also to the management of human-hippopotamus conflicts.

The exploitation of wildlife in hunting zones is done on the basis of management plans duly approved by a committee made up of experts from the Ministry of Forests and Wildlife and certain technical and financial partners such as UICN and WWF.

4.2.3.4. Aim of harvest regime in the management plan

The objective of the common hippopotamus management plan is to strengthen protection and management measures aimed at maintaining, if not improving, the hippopotamus population, as well as its contribution to the socio-economic development of Cameroon.

Specifically, these are:

- Increase the number of common hippos and preserve their habitat;
- Enhance hippopotamus in such a way as to contribute to the economic and socio-cultural development of populations. (MINFOF, 2015)

In this management plan, it is a question of improving the habitat of hippopotamuses, ensuring their further protection and developing income-generating activities other than hunting around these animals, so as to guarantee sustainable development and peaceful coexistence between them and humans. It is assumed, but with larger populations of hippos, and human population growth, there will also be more conflicts related to fishing and agriculture. In short, reconciliation would not be automatic without other measures to regulate the techniques and places of these human activities.

Overall, the objective of the harvest regime in the Cameroon Hippopotamus Management Plan is to manage and control hippopotamus populations.

4.2.3.5. Quotas

The common hippopotamus in Cameroon be part of animal's protection class "A". Therefore, according to Cameroonian legislation, the slaughter of a hippopotamus is only possible if you benefit from derogation from the administration in charge of wildlife, unless you find yourself in a situation of self-defence.

The quota set at the national level takes into account the quotas at the local level which, are themselves validated by the central administration. This centralized management of the quota system in Cameroon prevents harvest from exceeding the biological capacity of the species.

The determination of quotas at the local level is based on information relating to the biology, demography and reproductive capacity of the species. They are set on the basis of numbers estimated through inventories, biological knowledge and threats to the species. A Hippopotamus off-take quota is allocated after drawing up a shooting plan that sets the quotas for each species. For the past five years, the quotas have been as follows.

Table xxx: Quota provided for in the shooting plan from 2010 to 2015

Year	2010	2011	2012	2013	2014	2015
Quota provided for in the shooting plan	40	43	44	0	8	10

(Source: MINFOF, 2015)

Since 2015, a national quota has been allocated directly based on the overall number of hippos in hunting areas. Populations living in national parks and areas with open access are excluded from the quota estimation process. The hunting zones hold 41% of the total number of common hippos in the country, which means that 59% of the national population of hippos is spared from legal hunting.

Martin and Thomas method for estimating theoretical exploitation quotas sets a maximum exploitation rate for the hippopotamus at 10% of its total population. Harvest through legal hunting is estimated at 1% for stable or declining populations and 2% for stable or increasing populations (Booth and Chardonnet 2015). Referring to this, given that the hippopotamus populations in the Hunting Zones are stable or in increasing, for a number of **1 615** hippos in the Hunting Zones, we would obtain an annual quota of **32.3** animals.

In the pursuit of its conservation efforts for the said species, despite the overpopulation noted around the Faro National Park and which causes many human-wildlife conflicts, Cameroon proposes a quota of **25** hippopotamuses for the coming hunting season (MINFOF, 2014). This represents **1.55%** of the total number of hippos in hunting zones.

Because scientific data on the national population of common hippos is outdated, a quota of 25 hippos is considered conservative because the biological potential of the species allows for a quota of 32.3 hippos. The objective here is to ensure that the harvest will have the least possible effect on the species.

The national quota for common hippos in Cameroon is set on the basis of local quotas estimated using biological criteria.

4.2.4. Control of harvest

4.2.4.1. Harvesting in protected areas (PA)

According to the check-list of information developed by the IUCN to help Scientific Authorities issue non-detriment findings, harvesting in protected areas refers to those under State control.

In this category of land use, in Cameroon, we have Hunting Zones. The hippopotamus belongs to the species of class "A" and the majority of specimens legally slaughtered are found in Hunting Zones,

Cases of off-take for capture or scientific purposes are not known to date. On the other hand, sporadic administrative beats are authorized in regions where human-

hippopotamus conflicts are regularly recorded, outside protected areas. The number of individuals targeted by the administrative beat is minimal. So, the majority of the off-take occurs in protected areas; only a tiny part is done in areas with open access.

4.2.4.2. Harvesting in areas with open access

Human-hippo conflicts are usually occurred in areas with open access. Hippopotamus off-take in these areas aims to manage conflicts between wildlife and local populations. In these areas, administrative beats are sporadic and not permanent; they are only allowed when necessary. Therefore, the harvest legally made are relatively low. Based on this observation, off-take in areas where access is free has a minimal effect on the harvest regime of common hippopotamuses in Cameroon.

4.2.4.3. Confidence in harvest management

The common hippopotamus is protected by international and national laws because of the threats to the species and the decline in its numbers in certain areas. This species has been listed since 1995 in Appendix II of the Washington Convention on Trade in of wild Fauna and Flora Endangered Species (CITES). In addition, the International Union for Conservation of Nature (IUCN) in 2006, classified it as “Vulnerable”.

In Cameroon, the common hippopotamus is listed in class "A", which includes species fully protected, and whose capture or ownership is subject to obtaining an authorization issued by the Administration in charge of Wildlife.

Also, since 2014 Cameroon has had a hippopotamus management plan. At the level of the Regions and divisions, the Ministry of Forestry and Wildlife has services which are responsible for monitoring the control of hunting activities, in particular the Regional Services for Wildlife and Protected Areas, divisional Wildlife local branches and sub divisional checkpoints. The entire national territory is squared by all these decentralize services. These various decentralize services are provided with qualified personnel. Budgets are made available to them to carry out their sovereign missions. It is nevertheless important to note that, although the government is putting resources into the management of the harvest regime, these resources are not sufficient for staff to deploy effectively in the field. With the limited available resources, the staff is still permanently in the field. Due to the limited available resources, the reliability of the management of the harvest of the common hippopotamus in Cameroon is considered to be at the average level.

4.2.5. Harvest monitoring

4.2.4.4. Methods used to monitor harvest

Techniques for counting hippos across their national ranges still remain unharmonized in Cameroon. However, in the northern part of the country where the bulk of Cameroon's hippo populations are found, foot counting technique along stream banks is commonly used (NJE 1988, Scholte and Iyah 2016, Scholte et al. 2017b).

Observations are made in the morning between 7.30 a.m. and 12 p.m. and in the afternoon between 2 p.m. and 5.30 p.m. The work crew spends the night and rests at the stopping place. On the counting route (Figure 3), when a group of hippos is spotted, the team stops to make observations on the group size, sex, age, and behaviour of the individuals. This is relatively simple if the hippos are resting on the sandbank. On the other hand, when the animals are in the water, the team notes all the emerged individuals and repeats the counting for about 15 to 25 minutes, the time for the submerged individuals to rise to the surface (EFG 2018).

The figure 6 following is an example of a counting route in the OTU Faro

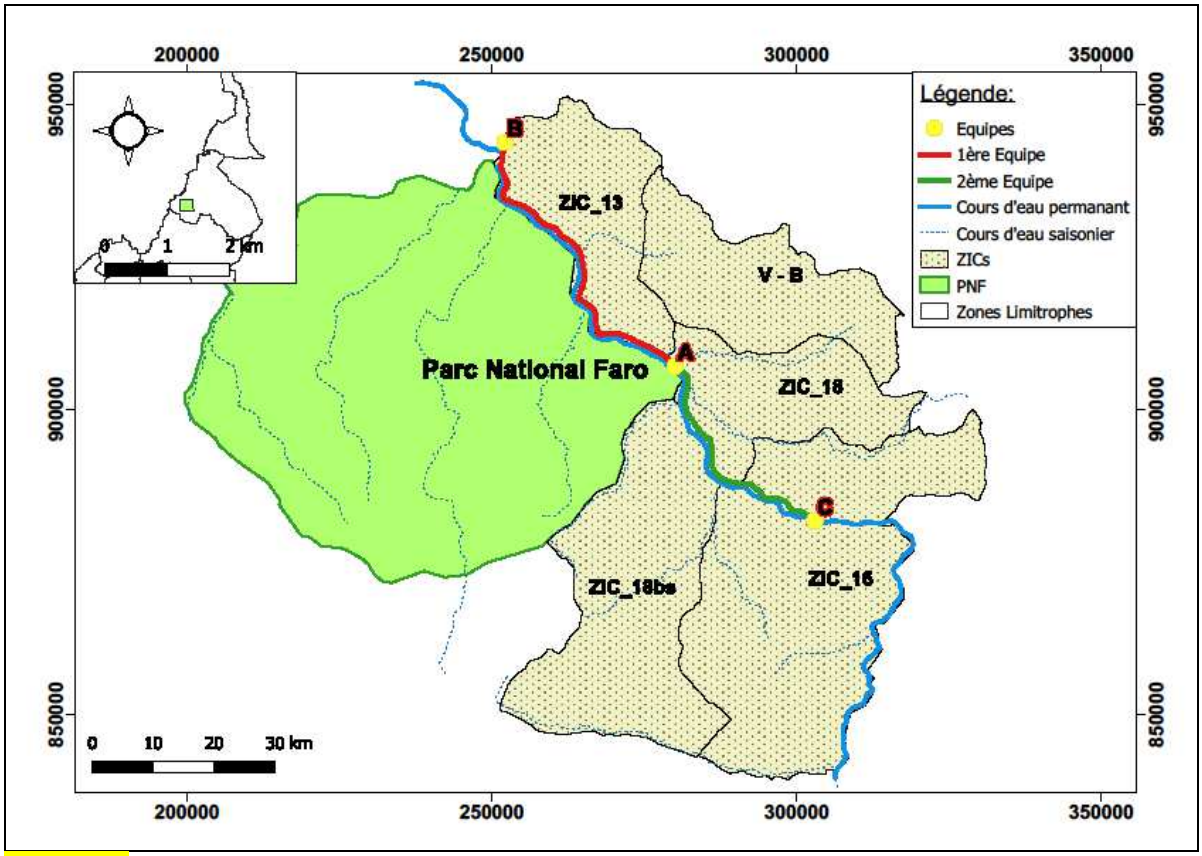

Figure 7 : Example of a counting route in the OTU Faro (EFG 2018).

Common hippopotamuses are very large mammals that spend most of the days either in the water or at the edge of the waterbodies where they nest. So, it is easy to count individuals directly. It is this technique that is used in hunting zones. Therefore, the method used to estimate the population concerned by harvest is the direct counting. This indicates that quotas are estimated based on the actual numbers and not through quantitative and qualitative estimates.

4.2.4.5. Confidence in harvest monitoring

As a hunting-related activity, fauna inventories are generally done every 5 years during the management plan review process. Actually, the quotas in the Hunting Zones are estimated over a period of 5 years. Meanwhile, during the surveillance patrols, the eco-guards collect data allowing ecological monitoring in the protected areas in general. In addition, studies are regularly carried out in protected areas by either the staff of the Wildlife School (Fauna Scientific Authority for Cameroon) or students. These studies provide an idea on the effects of harvesting to the species in these protected areas. Also, due to the lack of personnel, financial and material means to better ensure the monitoring of the abstraction, it is judicious to consider that the reliability of the monitoring of the abstraction is at a low level.

4.2.6. Incentives and benefits from harvest

4.2.6.1. Utilisation compared to other threats

Hippopotamus populations living in protected areas, especially those around the faro OTU, are considered to be overstaffed. When there is an overpopulation of hippos, the first thing to predict is increased competition between congeners both for territory and for access to females. These conflicts within the species are characterized by sometimes fatal clashes between rivals. In case they all come out alive, the loser is forced to stay away from the herd, or even withdraw to colonize new territories (MAHA, 2012). The conquest of new territories can cause other kind of problems such as conflicts against humans. if ever these are near the areas occupied by humans, although it is known that it is men who generally goes to the conquest of wildlife territories.

Clearly, harvest would contribute, among other things, to regulate population, thus reducing overstaffing among hippopotamus populations and human-hippopotamus conflicts. Moreover, being said that the available space is more and more limited, by regulating the number of hippopotamuses, we avoid that the carrying capacity exceeds the normal. This is because exceeding the carrying capacity can not only increase conflicts, but also lead to the degradation of the natural habitat of the species through overgrazing and increased trampling of the soil.

In short, harvesting really contributes to reducing certain threats to the survival of common hippopotamuses in Cameroon. So, compared to other threats, harvesting is beneficial.

4.2.6.2. Incentives for the conservation of the species

In accordance with Joint Order No. 076 MINATD/ MINFI/ MINFOF of June 26, 2012, in its article 8, the shares of the leasing tax on Hunting Zones consist of:

- 40% for the benefit of the municipalities concerned;
- 10% for the benefit of communities of neighbouring villages;
- 50% for public treasury.

Each year, at the beginning of each hunting season, the equivalent of 10% of the total amount of leasing taxes on Hunting Zones are paid directly to the populations living close the Hunting Zones concerned. This money is used to fund community projects. In addition to these shares of the leasing taxes paid to them, the specifications

of these Hunting Zones also provide for actions aimed at contributing to the economic and socio-cultural development of the local populations. Also, the management plan of hippopotamuses in Cameroon provides for the development of ecotouristic activities around the hippopotamus. These activities will further persuade the populations to become actively involved in the preservation of this species. In view of all these measures taken to support local communities, admitting that the process is still halfway through for certain actions, in particular the implementation of the management plan for hippopotamuses in Cameroon, it is prudent to situate the incentive for conservation of the species at the average level.

4.2.6.3. Incentives for habitat conservation

According to the study conducted by MINFOF in 2014, approximately, 41% of hippos are found in hunting zones, 29% in national parks and 30% in areas with open access. Populations found in hunting zones are those targeted by sport hunting. Those located in unclassified areas are subject to administrative search when necessary. On the other hand, those living in national parks benefit from full protection. Thus, at least 29% of the total number of hippopotamuses in Cameroon benefit from full protection.

4.2.7. Protection from harvest

4.2.7.1. Proportion strictly protected

According to the MIFOF study of 2014, the proportion of common hippos in the Hunting Zones is about 41%, that in the national parks is 29%, while in the areas with open access, it is 30%.

In accordance with Law 94/PM on the forest, wildlife and fishing regime of January 20, 1994, hunting is strictly prohibited in national parks, unless it is within the framework of the development of the protected area. Populations of common hippos found in Hunting Zones and areas with open access may be subject to sport hunting and harvest as part of pest control or human-wildlife conflict management.

Therefore, at least 29% of common hippos in Cameroon are fully protected. On the other hand, the 30% living in areas with open access can be considered being fully protected. The hippos found there are only slaughtered when there are serious problems (usually when human lives are threatened). So as long as there is no serious problem, any off-take cannot be authorised.

4.2.7.2. Effectiveness of strict protection measures

The national parks in Cameroon, like all the protected areas in sub-Saharan Africa, are facing a glaring lack of financial, material and human resources. The insufficiency of the means mentioned above is a hindrance to the security of our protected areas. So, cases of common hippo poaching occur from time to time. National parks function in such a way that, there are always patrols. The fact that in the protected areas all the resources found are fully protected, and that access without authorization is prohibited, constitute an important argument to justify that measures for integral protection are taken there. Despite their protected status and all the efforts made to preserve national parks, some cases of common hippos poaching are still known in these protected areas. For this disappointment, the integral protection measures can no longer be considered to be of high reliability. Nor can we say that this reliability is low, because an enormous amount of work is carried out in the field and bears fruit; therefore, the reliability of integral protection measures is finally be considered as medium.

4.2.7.3. Regulation of the harvest effort

Considering that hunting is a legal harvest, it is conditioned by obtaining a hunting license with definite quotas. Each year, with the exception of national parks, hunting for partially protected wild fauna is open throughout the national territory by a decree of the minister of forestry and wildlife. For common hippopotamus, hunting cannot be possible without obtaining a special authorization issued by the Minister (Law No 94/PM of May 20, 1994). Consequently, the regulation of the harvest effort is considered as being effective.

4.3.Second step of the Non-Detriment Finding

The information collected concerning the various factors capable of affecting the harvesting regime of common hippopotamuses in Cameroon, on a scale of "1" (perfect) to "5" (poor), made it possible to assign scores to each of the factors. studied.

Table xxx below is a summary of the scores for the 26 factors targeted.

Table 2: Results of the NDF of *Hippopotamus amphibius* in Cameroon

Results of NDF Table 2	**Species : *Hippopotamus amphibius***	
Question	**Criterion**	**Score**

2,1	**1** BIOLOGY - Life history	3
2,2	**2** BIOLOGY - Niche breadth	3
2,3	**3** BIOLOGY - Dispersal	4
2,4	**4** BIOLOGY - Human tolerance	2
2,5	**5** STATUS - National distribution	2
2,6	**6** STATUS - National abundance	3
2,7	**7** STATUS - National population trend	2
2,8	**8** STATUS - Information quality	3
2,9	**9** STATUS - Major threat	3
2,10	**10** MANAGEMENT - Illegal off-take	2
2,11	**11** MANAGEMENT - Management history	1
2,12	**12** MANAGEMENT - Management plan	2
2,13	**13** MANAGEMENT - Aim of harvest	2
2,14	**14** MANAGEMENT - Quotas	1
2,15	**15** CONTROL - Harvest in PA	1
2,16	**16** CONTROL – Open access harvest	2
2,17	**17** CONTROL - Confidence in harvest management	2
2,18	**18** MONITORING - Monitoring method	1
2,19	**19** MONITORING - Confidence in monitoring	3
2,20	**20** INCENTIVES - Effect of harvest	1
2,21	**21** INCENTIVES - Species conservation incentive	2
2,22	**22** INCENTIVES - Habitat conservation incentive	2
2,23	**23** PROTECTION - Proportion protected from harvest	1
2,24	**24** PROTECTION - Effectiveness of protection	2
2,25	**25** PROTECTION - Regulation of harvest	2

The IUCN model uses 26 criteria to generate a prototype "Radar" polygon contained in a disk of radius 5 (5 being the maximum score for a criterion).

The interpretation of the polygon helps the evaluator in his decision-making. The more the values of the different criteria are grouped towards the central point, the greater the probability that the harvest will not harm the survival of the species.

As far as this work is concerned, among the 26 criteria included in the IUCN model, only 25 have been analysed. One was excluded because it does not lend itself to the Cameroonian context. This is the criterion "Sampling in areas under land tenure or Strong ownership."

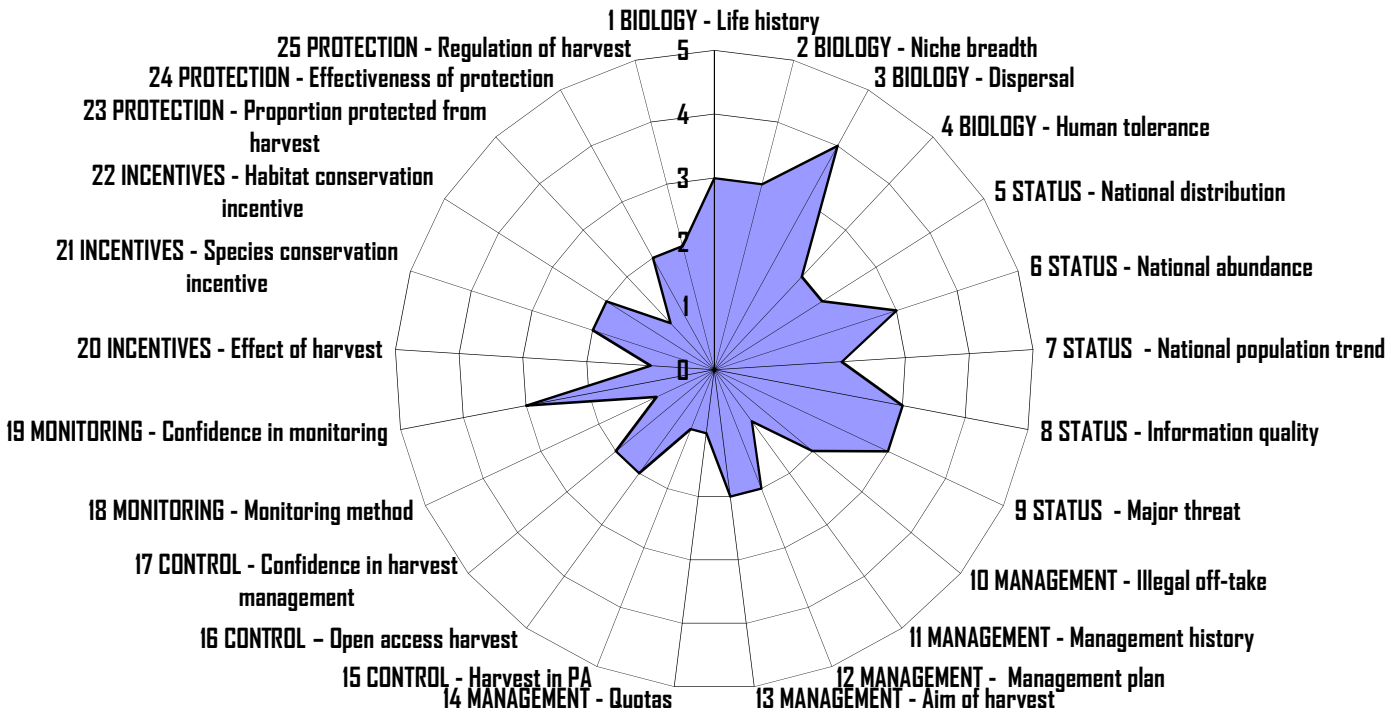

Figure XXXX: Hippopotamus amphibius NDF results radar in Cameroon

From the analysis of figure 4.8 above, it appears that the radar covers approximately 1/5 of the total surface. Amount the 25 criteria analysed, 07 have a score between 3 and 5. As a result, they constitute the weak points of the common hippo harvesting regime in Cameroon. It is:

i. **Life Cycle:** Despite its long life, the common hippopotamus has a low reproductive rate. This makes it sensitive to the effects of off-take. Therefore, it is necessary to be very rigorous in the control of harvest regime.
ii. **Ecological adaptability:** the hippopotamus spends a good part of its life in the water and goes on land much more to feed. Without these aquatic environments, it is no possible to ensure the survival of the species. The modification of the habitat can lead to its migration or its disappearance in certain localities. The main cause of the degradation of the aquatic environment of hippos is gold panning.
iii. **Dispersal efficiency:** Hippos are sedentary species and stay in small and isolated groups. They can survive away from water bodies. It is difficult for them to recolonize regions from which they have locally disappeared. This can be explained by the fact that, all of the rivers and lakes are not directly connected. The dispersal of the species not being effective, all measures must be taken to avoid occurrence of cases of disappearance where hippos are still encountered.
iv. **Abundance at the national level:** Unlike other countries in the range of the common hippopotamus such as Tanzania which in 2014 already had 31,086 ± 4,934 (IUCN & TRAFFIC, 2022), the number at the national level is very low. This requires that efforts be made to further involve all stakeholders, especially local populations, in the management of the species at the national level.
v. **Quality of information:** information on hippos in Cameroon is for some insufficient and / or obsolete and for others non-existent. Emphasis should be placed on research and the data collection on the species at the national level and systematically.
vi. **Main threats:** The species is under threat which may lead to new cases of disappearance in certain localities. Habitat degradation by gold panning, human invasion of the territories occupied by the species and poaching are all threats that need to be further addressed in the management of hippos in Cameroon.

vii. **Reliability of off-take monitoring:** Improvements should be made in the off-take monitoring system. It is critical that direct counts and monitoring of the effects of the annual harvest program be done on an ongoing basis.

The modelling is generally favourable to the development of the NDF for the common hippopotamus in Cameroon.

CONCLUSION

This study focused on the non-detriment finding of the common hippopotamus in Cameroon. To do this, we have compiled documentation on the conservation status of the common hippopotamus in Cameroon. The analysis of the factors that should enable the non-detriment finding to be issued was made using the method developed by the IUCN. To achieve this, 25 criteria likely to have effects on the off-take and commercial use of specimens of this species in Cameroon were analysed. Among the 25 criteria analysed, 18 have favourable effects while 07 are detrimental to the harvesting regime for common hippopotamus specimens in Cameroon.

Factors that may affect the harvest regime are: life history, ecological adaptability, dispersal efficiency, national abundance, national population trend, major threats and reliability of sampling monitoring. The mastery of the first three factors does not depend on human will, because being intrinsic to the species; it is enough to master the other 4 factors so that the survival of the species is guaranteed in the long term.

Efforts being made to further improve the situation of the common hippopotamus in Cameroon, a quota of 25 hippos for the next hunting season will not harm the survival of the species.

RECOMMENDATIONS

- Make a national inventory of the common hippopotamus population at least every 5 years, in order to update the report on the status of hippos in Cameroon.
- Conduct studies on the effects of hippopotamus population density on the behaviour of individuals.
- Deepen knowledge on the management of the fauna-population interface zone in the case of the hippopotamus.
- Provide the Wildlife Scientific Authority with a budget to carry out annual inventories of hippos in hunting zones.
- Relocate the local populations settled on the banks of the rivers sheltering the hippopotamuses.
- Develop partnerships with town halls for the development and management of hippopotamus ponds for tourism purposes in areas with open access.

- Develop in protected areas monitoring programs for hippopotamuses and other flagship species and mobilize personnel solely for the monitoring of these species.
- Ensure that wildlife taxes deriving from the protection of hippos are used directly for the benefit of local communities.
- Set up a system for monitoring hippopotamus poaching. A possible solution is simply to include the hippopotamus in the MIKE Program as far as pachyderms and ivory are concerned.
- Involve local populations as much as possible in the management and conservation of certain hippopotamus ponds.

The Garoua Wildlife School, which assumes the function of Scientific Authority for wildlife, could be of great help in the application of these recommendations through the continuous training of the personnel of the services in charge of wildlife management and also by putting its skill to the benefit of research and studies around the common hippopotamus in Cameroon.

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