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*Full Length Research Paper*

# The degradation of fauna diversity and its socio-economic impact: The case of Ndop Central Sub-Division, N.W. Cameroon

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**The need to protect the environment and biodiversity has often taken central stage in some major international conferences involving world leaders. Unfortunately, the high dependence on fauna diversity by humans through hunting and fishing as well as the competition for space has led to the extinction of fauna species in most local communities. N.C.S.D. is an example of a local community in the N.W. part of Cameroon which is no exception. Large scale landscape transformation in favor of agro-industrial rice farming led to wetland ecosystem destruction and intensification of hunting and fishing activities by a large migrant population. These resulted in biodiversity loss. The main question was therefore as follows: How has fauna degraded in N.C.S.D. and what are the socio-economic impacts? The methodology entailed qualitative interviews with 7 hunters from the region and consultation of secondary sources from archives. It was observed that the U.N.V.D.A. transformed over 3045 hectares of wetlands into rice fields and attracted over 7000 rice farmers into this region. Due to resulting habitat loss and pressure on the ambient ecosystem, most animal species were extinct. This led to the abandonment of hunting activities by most locals in favor of farming which unfortunately tends to fluctuate. There is therefore the need for adequate environmental policies in this region.**

**Keywords:** *Cameroon, fauna, environment, habitat loss*

## INTRODUCTION

The man/environment connection is a love/hate relationship in which human dominance makes them a quintessential element in its protection and/or destruction. Like Sherlock Holmes, perhaps man has identified leads to several unsolved mysteries connected to environmental degradation, yet his culpability in the case makes the protection debate difficult to arrive at a concessive conclusion. This unending debate has taken central stage in events like: the 1972 U.N. Conference on the Human Environment in Stockholm, the 1992 UN Conference on Environment and Development (UNCED) held in Rio de Janeiro (Muñoz and Najam, 2009) and more. The main issue among others has often been seeking ways of protecting biodiversity. The loss of biodiversity is generally attributed to man's activities which rely heavily on natural resources; hence his invasive tendencies have led to a disturbance of large expanses of natural ecosystems (as seen on table 1). Currently, Africa has the highest proportion of disturbed surfaces; one reason being that it has the highest rate of population growth. It is estimated to progress at 2.9 % and projected to hit 3 billion by the end of the next century (International Bank for Reconstruction and Development, 2000). Unfortunately, most African societies still heavily rely on their natural environment for subsistence through activities like hunting, fishing, gathering and agriculture. This makes them highly vulnerable (Titilola & Jeje, 2008); the only way out being seeking innovative and more intensive forms of subsistence. However, the marginal nature of natural resources still paints a Malthusian scenario as depicted by Urdal (2005), whereby inelastic supply from Mother Earth might lead to armed conflicts across different societies. Hence the current paper seeks to address resource depletion, particularly fauna in communities of Ndop Central Subdivision within the context of the problem statement that follows next

**Table 1**: Disturbed ecosystem surfaces by continent

| Continent | Total area (sq. km) | Undisturbed % | % partially disturbed | % human dominated |
|---|---|---|---|---|
| Europe | 5 759 321 | 15.6 | 19.6 | 64.9 |
| Asia | 53 311 557 | 43.5 | 27.0 | 29.5 |
| Africa | 33 985 316 | 48.9 | 35.8 | 15.4 |
| N. America | 26 179 907 | 56.3 | 18.8 | 24.9 |
| S. America | 20 120 346 | 62.5 | 22.5 | 15.1 |
| Australia | 9 487 262 | 62.3 | 25.8 | 12.0 |
| Antarctica | 13 208 983 | 100.0 | 0.0 | 0.0 |
| World | 162 052 691 | | | |

*Source: OECD(1996)*

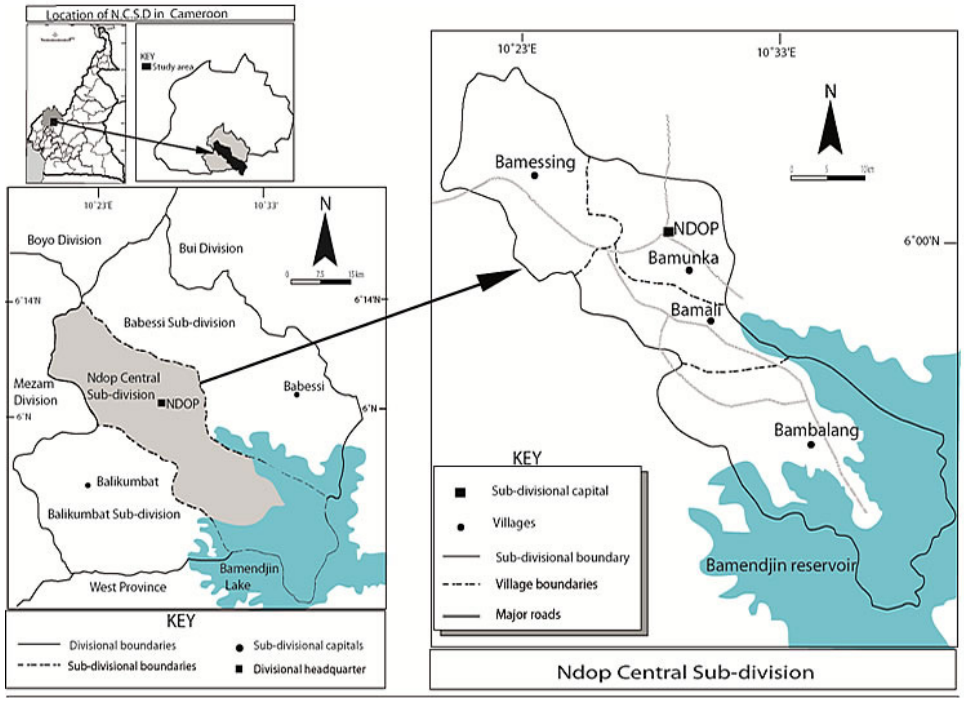


**Figure 1**: Location of N.C.S.D

## Problem statement

Ndop Central Subdivision (N.C.S.D.) is an administrative unit within the Upper Nun Basin, located in the North West Region of Cameroon (see figure 1). Its luxuriant vegetation and diverse wildlife prior to the 1970's is reflective of an environmental determinism orchestrated by geographic factors like the rich alluvial soils, flat terrain characterized by a vast expanse of flood plains and a long rainy season lasting for over 8 months (Nouvelot et al, 1975). Determinism also spanned across socio-economic and cultural aspects of N.C.S.D, for example it is estimated that over 80 % of the local population are farmers and about 40 % carry out hunting and fishing either as a full time or part time activity (Mphoweh, 2007).

The abundant natural resources of this region imbued it with a polarizing factor for a migrant population from neighboring villages mainly for agriculture, hunting and fishing (Akendo, 1998). However, the greatest turning point in this region began in 1970 when the Government started a massive agro-industrial rice cultivation scheme under the patronage of the *Bureau de Dévéloppement de Production Agricole* (B.D.P.A), currently transformed into the Upper Nun Development Authority (U.N.V.D.A). The objective of the U.N.V.D.A. was to convert over 3000 hectares of wetlands into rice fields, develop a dense road network in this region and promote agricultural innovations (Ngwa, 1975).

These objectives were met and N.C.S.D. thrived as a rice production hub. However, this was at the expense of

the natural habitat for fauna species that thrived in this region. In spite of the paucity of information relative to the evolution of the fauna biodiversity, authors like Koghan (2001) and Akendo (1999) noted the disappearance of a wide variety of animal species. This paper thus seeks respond to the following question: How has fauna degraded in N.C.S.D. and what are the socio-economic impacts? The next section will discuss some theoretical issues related to biodiversity.

## Understanding the concept of biodiversity

The word "Biodiversity" is a relatively new paradigm and a portmanteau word from 'bio' and 'diversity'. It is thought to have first been coined as a contraction of the term "biological diversity" in 1985. It is defined as '*the variety within and between all species of plants, animals and micro-organisms and the ecosystems within which they live and interact'* (Simpson, 2002). According to the Convention on Biological Diversity, "*biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*" (Hens &Boon, 2003). According to Swingland (2001), biodiversity comprises all the millions of different species that live on our planet, as well as the genetic differences within species. It also refers to the multitude of different ecosystems in which species form unique communities, interacting with one another and the air, water and soil. Biodiversity is often considered at three levels as follows: species diversity, genetic diversity and ecosystem diversity (WWF, 2011). In this study, the aspect of biodiversity considered is the different fauna species found in N.C.S.D.

## Major events related to biodiversity conservation

Rather than focusing on regional environmental problems like acid rain and smog in Europe, humanity at some stage decided to adopt a holistic / global solution to environmental problems (UN, 2015). This entailed solidarity on global discussions about the environment. To date, there have been six mega environmental conferences. These include: United Nations Conference on the Human Environment (UNCHE) 1972 (the Stockholm conference); UN Conference on Environment and Development (UNCED) 1992 (also known as Rio Conference or Earth Summit); UN General Assembly Special Session on Sustainable Development in New York 1997 (Earth Summit II) and World Summit on Sustainable Development (WSSD) 2002 in Johannesburg,World Summit on Sustainable Development (2002) and the UN Conference on Sustainable Development (2012). Prior and up to the 1960's there had been mounted pressure by activists in Europe for world leaders to collectively address trans-frontier problems like acid rain, air and water pollution. Given that during this time Sweden's government was under fire (from its citizens to tackle the issue of acid rain) a representative (during the Economic and Social Council Biosphere meeting hosted by the UN in 1968) proposed the idea of Sweden hosting a global event to target these problems. This led to the Stockholm Conference; the first global event convened to tackle problems with global repercussions. From this period, other conferences followed. However, repeated meetings over the years haven't yet solved underlying problems; recently attendees tend to be leaders from developing nations who are the victims while perpetrators from industrialized nations tend to stay away (WWF, 2012).

## Socio economic benefits of biodiversity

From the very definition of the concept, the importance of biodiversity to humans couldn't be over-stressed. However, Ash & Fazel (2007) opine that people rely on biodiversity in their daily lives, often without realizing it. The livelihood and wellbeing of humanity depends on biodiversity of some sort e.g. for providing products like food and fibres, wood, wildlife that serves for tourism, medicine from plants, honey, pollinating insects, agriculture and more.

There is an undeniable relationship between biodiversity and ecosystems and since humans are part of this system, it is worthwhile noting that their survival largely depends on exchanges with and without this network (Hens & Boon, 2003 & WWF, 2010). The socio-economic benefits of biodiversity is so important to some developing countries whose economies directly rely on it e.g. the economy of most Tropically located nations greatly relies on primary activities like agriculture, hunting, fishing and forestry. N.C.S.D. is no exception to the rule as will be seen later. Its economy greatly depends on the ambient biodiversity and environment.

## Major causes of biodiversity degradation and tradeoffs

The socio-economic benefits of biodiversity are ostensibly a double-edged sword since their existence is under great threat. Reports from WWF (2010) indicate that wild species and natural ecosystems are under pressure to a greater or lesser degree across all biomes and regions of the world. The main reasons identified are mainly anthropogenic and include amongst others: habitat loss, especially due to agriculture, overexploitation of species, especially due to fishing, pollution, the spread of invasive species or genes and

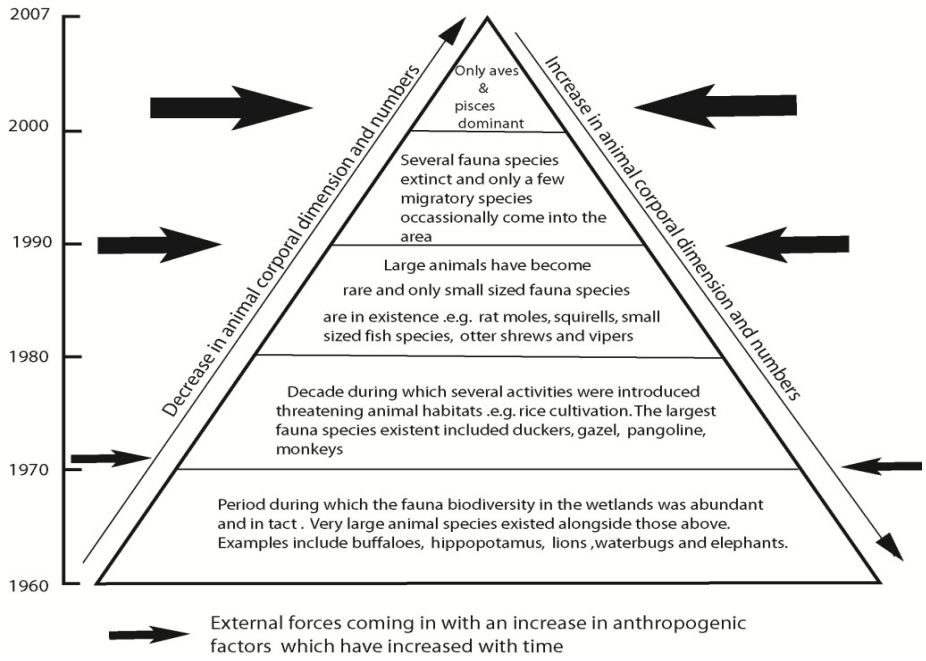


**Figure 2**: Fauna degradation in N.C.S.D from 1960 to 2007

climate change (WWF, 2010), (Hens &Boon, 2003) and (Ash & Fazel, 2007). Human populations across the globe keep increasing (OECD, 1996) in tandem with more demands from the environment. On the contrary, biodiversity reserves across the globe are in sharp decline; this scenario evokes an ominous Malthusian view on human survival; hence the tradeoffs. The loss of biodiversity will therefore diminish the capacity of ecosystems to provide society with a stable and sustainable supply of essential goods and services (Tilman, 2000).

By now the concept of biodiversity should have been understood and hopefully its socio-economic importance and tradeoffs for mankind. The next section with examine methods of data collection.

## METHODS

This study relied on a pragmatic approach (Morgan, 2007) which credits research methods that provide in-depth answers as per the interest of the study. Hence using mixed methods in researches like the current one lead to much reliable results in social sciences (Cresswell & Cresswell, 2005).Also, this study given its geographic limitation is a case study research. Case studies enable deeper understanding of phenomena and the objective is not necessarily to generalize findings (Yin, 2009). Furthermore, the case study dimension also involved the 7 hunters who were targeted for interviews as will be detailed next. Hence in this study, qualitative data and secondary sources of information about the study area were used. Qualitative data was obtained from open ended questions through an interview guide.

The aim was to obtain information related to fauna species available in N.C.S.D. It entailed in-depth interviews with 7 hunters who were also involved in fishing activities. The target was people who lived in this region prior to massive habitat destruction by the U.N.V.D.A. in the 1970's and are still living there up to date. These had a good chance of painting a picture of the changes on the biodiversity.

The challenge discussing with them was that sometimes the exact English names of some animals were unknown or they referred to some animals incorrectly. It is worth noting that English language is also spoken in this region. In such cases, we resorted to description of physical characteristics of animals in order to arrive at possible English names. Names in the locally spoken Bamunka language (used in this region) were also written down. The IUCN red listing criteria of species (IUCN, 2001) guided the classification of animals either as extinct (Ex) meaning never seen in the wild, critically endangered (CR) rarely seen, near threatened (NT) and least concern (LC). Other criteria exist on this list but were not relevant in the current case e.g. extinct in the wild (EW) which means they only exist in captivity did not apply since there was no evidence of any animals in captivity.

## RESULTS

### The degradation of fauna diversity in N.C.S.D.

In depth interviews with hunters and fishermen resident in N.C.S.D. for over decades painted a picture that served for diachronic analysis of the dynamics experienced by the fauna of this region (see figure 2). The figure illustrates a period from 1960 to 2007 marked by a

**Table 2:** List of bird species and their status in N.C.S.D.

| Phylum | Local names | Possible English name | Possible scientific name | Year lastly seen in N.C.S.D. / IUCN status |
|---|---|---|---|---|
| AVES | Bush fowl, Nyegomeh or Tehneh | Partridge | Perdix perdix | Seen in 2007 - E.N |
| | Ngu, Ngok | Turaco bird | Tauraco cyrythaix | Early 1990s - C.R |
| | Water dog fowl or Nwa zo'omeh | duck | Fratercular Spp. | Occasionally seen 2015 - C.R |
| | Cornemih | African fish Eagle | Haliaeetus vocifer | Early 1990s - EX |
| | "Buhnuh" | Doves | | Seen in 2015 - NT |
| | | -Green dove | Vinago australis | Seen in 2015 - NT |
| | | -Blue dove | Columba sjostedi | Seen in 2015 - NT |
| | | -Grey dove | Columba spp. | Seen in 2015 - NT |
| | "Ngo'kingeh" | Ostritch | Struthio camelus | Seen lastly about the early 1970s - EX |
| | "Nyawonahmeh", Poli poli | Cattle egret | Andeola spp. | Seen in 2015 - NT |
| | Ngodeh | Water duck | Fratercular spp. | Lastly seen in the 1970s - EX |
| | Waterbird | Moorhens | Gallinula spp. | Seen in 2015 - N.T. |
| | Choo'keh | Hawk | Polyboroides typus | Seen in 2015 - L.C. |
| | Palmbird | Weaver bird | Ploceus cucullatus | Seen in 2015 - L.C |

**Table 3:** Aquatic life and their status in N.C.S.D

| Phylum | Local names | Possible English names | Scientific name(s) | Year lastly seen in N.C.S.D. / IUCN status |
|---|---|---|---|---|
| PISCES | Bonga or mbo'oh | Tilapia | *Tilapia zilli* | Seen in 2007 - N.T. |
| | Va'abiteh | sardine | *Barbus spp.* | Seen in 2007 - N.T. |
| | Va'abiteneh | | *Barbus spp.* | Seen in 2007 - E.N. |
| | Njokum or Mudfish | Clarias | *Clarias spp.* | Seen in 2007 - E.N. |
| | Tiomeh | Not available | Not available | Common in the 1960s and early 1970s - EX. |
| | Va'ajileh | Not available | Not available | Common in the 1960s uptill 1980s - EX. |
| CRUSTACEA | Chobeh or Njangar. | Crayfish | *Astacus spp.* | Commonly caught on large quantities in the 1960s to 1990s. - EN. |
| | Congh | Land crap | *Carcinus maenas* | Seen in 2007 - N.T. |
| MOLLUSCA | N/A | Land snail | *Helix aspersa* | Seen in 2007 - E.N. |

progressive decrease in animal species, especially large mammals.

A much detail observation containing a list of animals was collected and represented on tables 2, 3 and 4: Although the list is not exhaustive of possible species found in this region and some English names were still hard to decipher, some key observations could be made from those listed on the tables. The most striking is the status of most mammals (EX); showing that most of them are now extinct from the wild (table 4).

The last time most of them were seen was around the 1980's (period when agro-industrial farming intensified). Most of these extinct species also correspond to the most hunted or fished animals in this region. More evidence of fauna biodiversity that once existed was observed from animal skins and skeletons that were preserved by hunters either as decorations at their homes or as a cultural sign of victory. Photo1 is a compilation taken while on the field.Over recent years, the fauna biodiversity is limited to relatively small rodents and birds whose socio-economic benefits tend to be undermined. Also,only fish like the *Clarias sp.* and *Tilapia sp.* are still available in this region.

**Causes of fauna degradation in N.C.S.D**

The main cause of animal biodiversity loss in this region is large scale agro-industrial rice cultivation that led to the transformation of ambient ecosystems in place of vast homogeneous expanses of rice fields. Equally, the transition to agriculture led to an influx of a large migrant

**Table 4:** Mammals and their status in N.C.S.D

| Local names | Possible English names | Scientific name | Year lastly seen in N.C.S.D./IUCN status |
|---|---|---|---|
| Nyokoh | Antelop | Alcelaphinae sp. | Seen in the 1990's - EX |
| Cutting grass, Nyaseh | Cane rat | Thryonomys sp. | Seen in the early 1990s - EX |
| Kah | Monkey | Colobus guereza | Seen in the late 1980s and few in the early 1990 - EX |
| Njung | Buffalo | Syncerus caffer | Lastly seen in the 1970s - EX |
| Bo'oh | Civet cat | Nandinia binotata | Lastly seen in 1989 in Bamuka -EX. |
| Bush dog or Nchoukeh | caracal | Felis caracal | Lastly seen in the late 1980s - EX |
| Be'eh | Lion | Panthera leos | Lastly seen in the late 1960s - EX |
| Nge'oh, bush goat | Black gazelle | Gazelle spp. | Lastly seen in the late 1980s and early 1990s - EX |
| Sho'eoh or njah | Grey fur gazelle | Gazelle spp. | Lastly seen in the late 1980s and early 1990s - EX |
| bu'hng | Brown land squirrel | Scuirus aberti | Seen in 2007 - NT |
| bo'oh | Tree squirrel | Scuirus spp. | Seen in the late 1990s - CR |
| mbu'oh | Rat mole | Cryptomys hottentotus | Seen in 2007 -NT |
| Nyasubngeh or chukuchuku beef | porcupine | Erethizon Spp. | Lastly seen in the early 1990s - EX |
| Nigeh | Hippopotamus | Hyppopotamus amphibius | Lastly seen in the early 1960s - EX |
| Nyamegengah | pangoline | Manis gigantea | Lastly seen in the 1980s ane early 1990s - EX |
| Water dog | Otter shrew | Potamogale velox | Lastly seen in the early 1990s - Ex |

**Source**: interview with hunters (2007 & 2015)

**Photo1**: Some fauna relics displayed by hunters in N.C.S.D. source: Mphoweh, (2009)

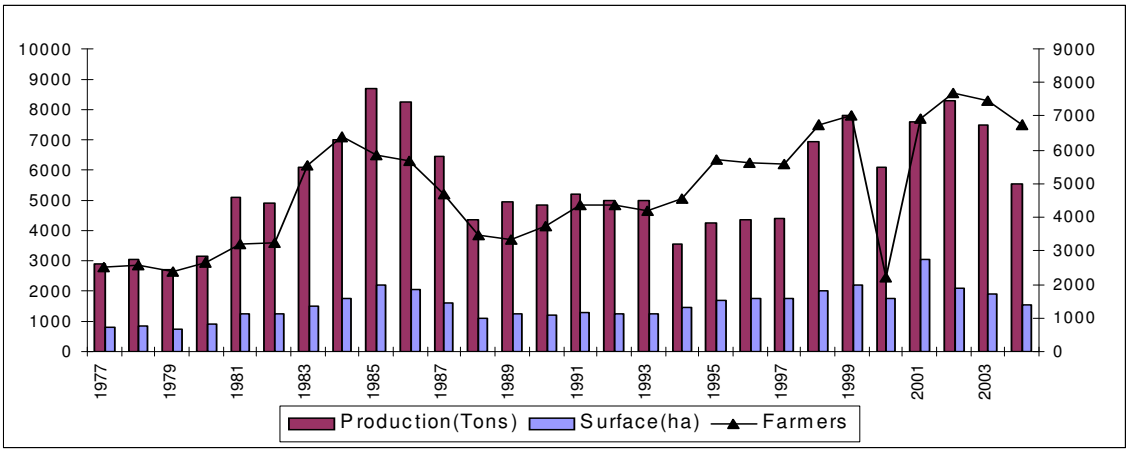


**Figure 3:** Evolution of surface areas cultivated, rice production and farmers employed by the U.N.V.D.A

**Photo 2:** Transhumance on the wetlands of Ndop Central Subdivision.
*Source: Bongadzem C.S (2006.)*

population from neighbouring villages in search of opportunities. From U.N.V.D.A archives (2004), data on the number of farmers and surface areas cultivated was represented on figure 3.

When the B.P.D.A. was transformed into the U.N.V.D.A., the main objective was to convert 3000 hectares of virgin wetlands into rice fields in this region. This meant wetlands which had existed for several generations undisturbed were for the first time going to experience severe and radical transformations. Back to figure 3, it can be observed that by 1977, over 824 hectares of land had already been transformed and by 2001, transformed surfaces had slightly gone over the target, estimated at 3045 hectares. At its prime, the U.N.V.D.A. employed over 7000 workers, some immigrating from neighbouring villages. A massive arrival of people in this region also meant more demand for resources like farmlands and animals that were hunted freely from the wild.

Another important activity that took advantage of the rice fields of the U.N.V.D.A. is transhumance. This entails free range cattle grazing on the hill slopes during the rainy season and migration towards rice fields during the dry season when hill slopes dry up (See photo 2). Generally by the dry season all rice is harvested, leaving behind rice stalk and fresh new vegetation. This attracts

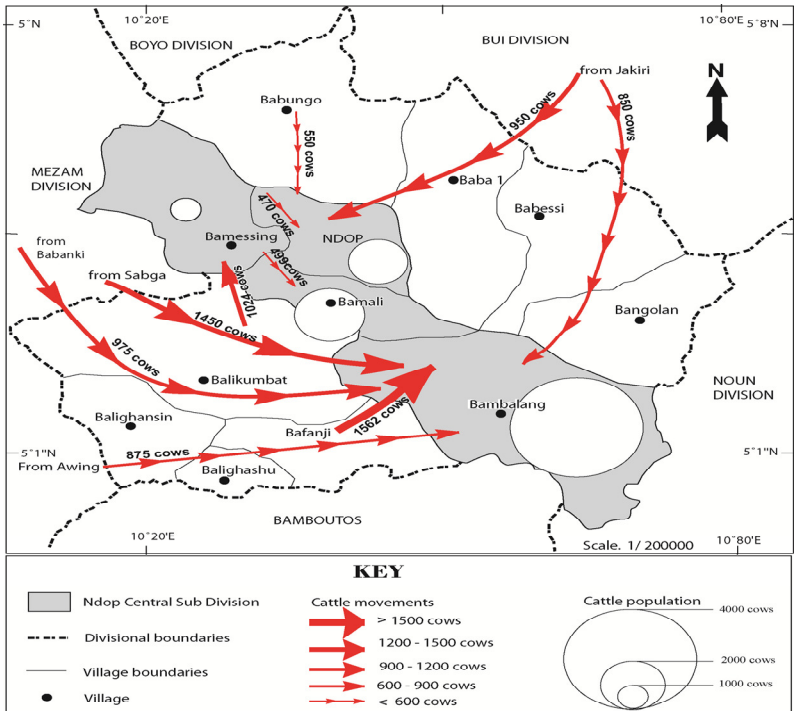


**Figure 5:** Transhumance into Ndop Central Sub-Division during the dry season
*Source: MINEPIA(2006)*

**Photo 3**: Bush fire incidence on a raffia palm bush in N.C.S.D
*Source: Mphoweh (2007)*

cattle graziers with thousands of cows from neighbouring villages (see figure 5), spending over 4 months preying on these wetlands. The outcome has often been more pressure on wetlands, destruction of the biodiversity and the arrival of invasive plant species as noted by Koghan (2004).

In addition to the above, the constant presence of man in the wetlands comes with malpractices like over fishing, hunting and agriculture which sometimes leads to accidental bushfires (see photo 3).
These activities have become rampant given the rapid rate of urbanization and population increase in this

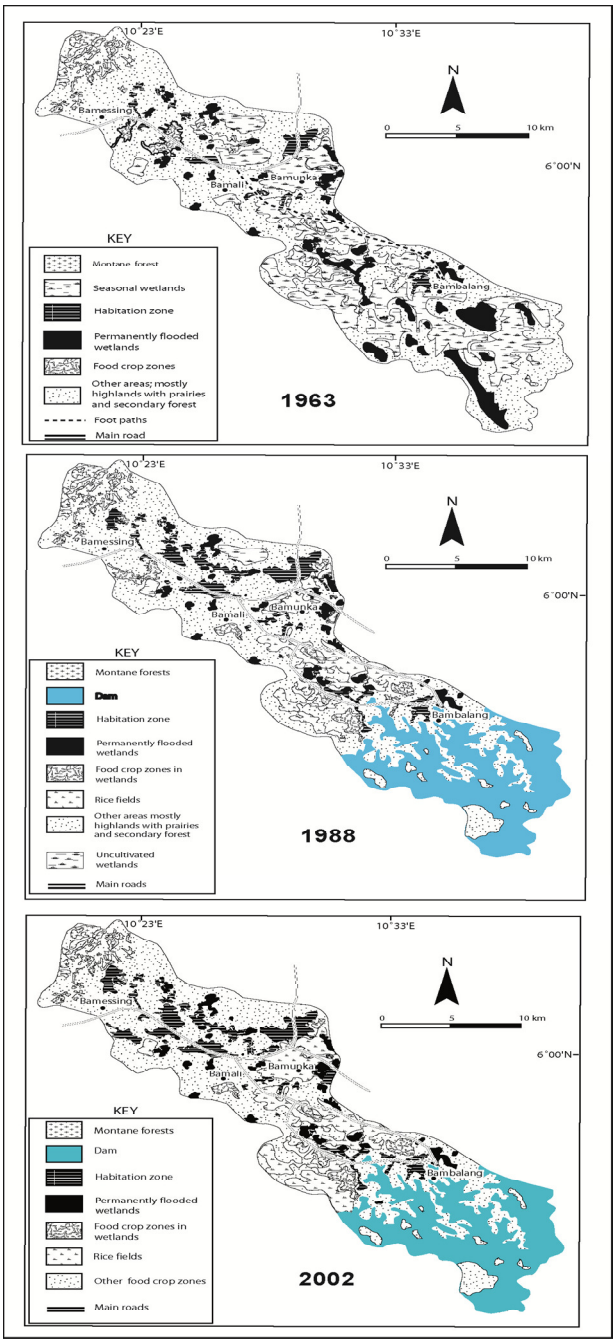


**Figure 6**: Landuse dynamics in N.C.S.D. from 1963 to 2002
*Source: Mphoweh (2007).*

region. These have significantly transformed the landscape from naturally occurring ecosystems to that characterised by anthropogenic installations. Figure 6 is evidence of land use dynamics in N.C.S.D. from 1960 to 2002.

Finally, the absence of any biodiversity and environmental protection policies in N.C.S.D. and no evidence of an environmental impact assessment for major projects in the area accounted for the rapid loss of the biodiversity and other ecosystems.

## Socio-economic consequences

The extinction of several fauna species in Ndop came with several socio-economic and cultural impacts. Fish

**Photo 4**: Tilapia sp. Caught from the wetlands during rainy season
*Source: Mphoweh (2007)*

and animals hunted in the wild served as the main source of protein intake for decades. Today, hunting has become reduced to small rodents and wild birds like ducks and partridges. The scarcity of these resources has increased their market value from almost nothing prior to the 1970's to significant amounts today. These animals have become delicacies in the rare event that they were hunted in the first place. Fishing is currently the only surviving activity. A lot of fish comes from the wetlands during the rainy season (see photo 4).

Another impact of biodiversity loss is the disappearance of some cultural practices. Hunting of large mammals like the buffalo and lion symbolized bravery in most societies in this region. Killing an animal of a certain size meant being knighted by the local chiefs of the villages. The skin and some body parts of the animal were preserved as evidence of bravery. This was the case with some of the animal skins photographed on the field. The relationship of this cultural practice with the biodiversity (now depleted) makes it obvious to understand why they have disappeared in the current traditions of the people of N.C.S.D.

Furthermore, the vulnerability of agricultural dependence in this region over the years has necessitated the thought of other strategies of survival. The activities of the U.N.V.D.A. and its short-terms economic benefits swayed the attention of the local people away from their traditional know-how of sustainable exploitation of their natural milieu. A lot of skills connected to handicraft, hunting and conservation (Wana, 2003) through sacred forests were abandoned. Unfortunately, the U.N.V.D.A. went close to bankruptcy in the 1990's when Cameroon experienced an economic crisis and the government cut back on subsidies usually granted to it. Many farmers lost their jobs, got stranded while some returned to hunting and fishing which unfortunately had also experienced destruction from agricultural activities. The consequence was severe poverty in this region and massive rural-urban migration (Canute, 2003).

Finally, biodiversity loss has been associated to the degradation of some ecosystems like the raffia palms found in this region. Animal mediated seed dispersal by rodents is primordial for raffia seed distribution. Authors like Koghan (2004) have identified this factor as one of the reasons for the decrease in wetland ecosystem functions.

## DISCUSSION AND CONCLUSION

Environmental discussions over the last century have repeatedly asserted man's destructive role in the functioning of the earth (Titilola & Jeje, 2008). However, human-induced degradation of natural resources is driven by man's need to survive (Urdal, 2005). This need however compromises the existence of several natural resources which serve as the bases of functioning of several ecosystems across the globe (Hens & Boon, 2003). Natural resources that seem severely affected are usually those that respond to the basic needs of man particularly food. In the current article, depleting fauna biodiversity was flagged at community level as an issue of concern.

This being so because village communities in N.C.S.D. have over the years been culturally and economically imbued with activities related to the fauna diversity of this region. N.C.S.D. was chosen as a case study given that this region had an abundance of fauna diversity up to the 1970's when the government initiated a massive agricultural campaign, creating the U.N.V.D.A. The latter transformed over 3000 hectares into rice fields and employed over 7000 workers at its prime. This severely affected the biodiversity of the region.

This research therefore sought to provide answers to the following question: How has fauna degraded in N.C.S.D. and what are the socio-economic impacts? Data collection entailed an interview with 7 local residents who practiced hunting and lived in this from the 1970's up to date. Secondary sources also complemented the

process. It was observed that N.C.S.D. right up to the 1980's was rich in a diversity of fauna species. There were several large mammals identified throw relics of animal parts presented by hunters. These served the bases of hunting and fishing as the prime activity prior to the 1980's. However, the arrival of the U.N.V.D.A. led to the destruction of the habitats of these animals and also to the influx of a large migrant population that also got involved in hunting and fishing to satisfy their needs.

These led to the extinction of several fauna species. It also led to the disappearance of several cultural values which were born out of the man/environment relationship that was forged over decades. The situation in N.C.S.D. warrants that when laying out development strategies, governments and practitioners should integrate biodiversity conservation and protection of local values. This could ensure sustainable development in the short and longrun.

The major limitation in this study was connected to the fact that the exact names of some fauna species that once existed in this region could not be exactly obtained, hence an informed guess was only made based on descriptions of physical characteristics. In some cases animal relics were examined for identification purposes. This could be inaccurate because in some cases the relics were not big enough to indicate what animal they came from.

The identification process was also challenging during interviews since some descriptions seemed exaggerated and sometimes did not reflect animal species which have ever been scientifically proven to exist in this region. These limitations did not however exclude the fact that large fauna species used to exist in this region. Although this paper focused only on fauna diversity, another study on the dynamics of the flora of this region is worth considering.

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