CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Sixty-second meeting of the Standing Committee
Geneva (Switzerland), 23-27 July 2012

Interpretation and implementation of the Convention

Compliance and enforcement

Review of Significant Trade

POPULATION STATUS AND MANAGEMENT PLAN OF THE AFRICAN GREY PARROT IN CAMEROON

(Full report)

The attached document has been submitted by Cameroon in relation to agenda item 27.3 on *Population status and management plan of the African grey parrot in Cameroon*[*].

[*] *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

POPULATION STATUS AND MANAGEMENT PLAN OF THE AFRICAN GREY PARROT

Psittacus erithacus erithacus

IN CAMEROON

Simon A. Tamungang & Robert A. Cheke

Ministry of Forestry and Wildlife, Cameroon

University of Dschang, Cameroon

LORO PARQUE FUNDACION Tenerife·Spain

May 2012

POPULATION STATUS AND MANAGEMENT PLAN OF THE AFRICAN GREY PARROT

Psittacus erithacus erithacus

IN CAMEROON

Being a report prepared by

Ministry of Forestry and Wildlife, Cameroon

For

CITES Secretariat, Geneva, Switzerland

Contracted institution

GIE-University of Dschang, Cameroon

Research team leader

Simon A. Tamungang

PARROTPRO Research Group, Biology & Applied Ecology Laboratory

University of Dschang, E-Mail: atamungang@yahoo.com

Technical collaborator

Robert A. Cheke

Natural Resources Institute, University of Greenwich, United Kingdom

Financial support from

Ministry of Forestry & Wildlife
Cameroon

Loro Paque Fundación
Tenerife, Spain

Report Reference N°. 002/2008

May 2012

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS

- AGP: African Grey Parrot
- A-Level GCE: Advance Level General Certificate of Education
- ANOVA: Analysis of Variance
- BA: Bachelors of Arts degree
- BSc: Bachelors of Science degree
- CAR: Central African Republic
- CBCS: Cameroon Biodiversity Conservation Society
- CBO: Community Based Organisation
- CBNRM: Community Based Natural Resource Management
- CDC: Cameroon Development Cooperation
- CES: Cameroon Ecological Society
- CFA: French Community of Africa.
- CIG: Common Initiative Group
- CITES: Convention on International trade in endangered species
- CV: Coefficient of Variation
- DFAP: Department of Wildlife and Protected Areas
- DMRT: Duncan Multiple Range Test
- DMS: Decimal, Minute and Second
- DRC: Democratic Republic of Congo
- EU: European Union
- FCFA: Franc de la Confédération Française Africaine
- Fig: Figure
- Frs: Francs
- FSLC: First School Leaving Certificate
- GCE: General Certificate of Education
- GIS: Geographical Information System
- GP: Grey Parrot
- GPS: Global Positioning System
- GTZ: Germany Technical Cooperation.
- ICH: Information Centre Hypothesis
- IUCN: International Union for the Conservation of Nature

- $Km^{2:}$ Kilometre squared
- LAGA: Last Great Apes Organisation
- LPF: Loro Parque Fundación
- LWC: Limbe Wildlife Centre
- MINEF: Ministry of Forestry and Environment
- MINFOF: Ministry of Forestry and Wildlife
- MSc: Master of Science Degree
- NGO: Non-Governmental Organisation
- NRI: Natural Resource Institute
- PARROTPRO: Cameroon Parrots Project
- Photo: Photograph
- PROFORNAT: Protection des Forêts Naturelles
- RCA: République Central Africaine
- SIGIF: Système Informatisé de Gestion des Informations forestières
- SNEFCAM: Syndicat Nationale des Exploitation de la Faune vivant au Cameroun
- SOCAPALM: Société Camerounaise des Palmeraies
- SONARA: National Petroleum Refinery
- SPSS: Statistical Package for Social Science
- STBK: Société de Transformation du Bois
- TNS : Tri-national de la Sangha
- TRIDOM: Trinational of Dja, Odzala and Minkebe
- USD: United States Dollar
- UDs: University of Dschang
- UFA : Unités Forestières d'Aménagement
- UK: United Kingdom
- UNEP: United Nations Environmental Programme
- USA: United States of America
- WCMC: Word Conservation Monitoring Centre
- WCS: Wildlife Conservation Society
- WWF: World Wide Fund for Nature

SUMMARY

*The African Grey Parrot (*Psittacus erithacus erithacus*) is a threatened bird species of high ecological and socio-economic significance. The Grey Parrot is harvested for many reasons including, subsistence, pet-trade, damage control and scientific research. This study was carried out to determine the conservation status and harvesting quota of the Grey Parrot in the light of ecological and socio-economic pressures on the bird species and to propose viable solutions for the sustainable conservation of the species in Cameroon. Parrots demographic data were obtained using the point count method while socio-economic data were collected using questionnaire and interviews. From the results, the geographic range of the parrot was found in the rainforest belt dominating the southern part of the country with bigger populations' located south-east wards. Nests were dominantly found on secondary forest trees of 25 - 45m high and nest density ranged from 0.034 – 0.373 nests/ha. For the first time, the intrinsic rate of natural increase (r) was calculated for both Grey Parrots in the wild and in captivity. The values of r in Cameroon range from 0.51 - 0.56 in captivity and 0.38 in the wild. Parrot densities ranged from a low value of 0.49 Grey Parrots/km^2 in the South West Region to a high density of 2.16 Grey Parrots/km^2 in the South Region. From this data, the national population size was estimated at 200778 Grey Parrots, and with a 95% confidence limit range of 199390 – 202171 parrots. Seven out of ten regions in the country harbour the species with varying population sizes. Five major threats to the parrot were identified with habitat degradation (32%) and the pet-trade (31%) at the forefront; both factors having a combined threat value of 63%. It was evident that low level conservation education in the rural communities contributed highly to parrot population attenuation in the country. The harvesting quota proposed seeks to harmonize sustainable parrot population conservation and exploitation equity. To this end, an annual sustainable harvest quota of 4000 - 5000 parrots is feasible. A maximum harvest quota 6000 parrots is plausible if proposed projects in the management plan are to be fully implemented, to ensure a steady population growth rate. Based on regular monitoring data, allowable harvest should be adjusted after every five years to reflect change in population size and habitat improvement. Above all, dismantling the illegal parrot trade remains a big challenge to the Government of Cameroon and this can best be accomplished through regional collaboration in the harmonisation and enforcement of trans-border parrot trade policies.*

RESUME

*Le perroquet (*Psittacus erithacus erithacus*), oiseau à importance socio-économique, est une espèce menacée en Afrique. Plusieurs raisons justifient sa capture; ce sont entre autres les besoins de subsistance, la limitation des dégâts, la vente pour usage domestique et la recherche scientifique. La présente étude a été entreprise dans le but d'apprécier sur la base des pressions écologique et socio-économique, l'état de la conservation ainsi que le quota de capture du perroquet, et de proposer des solutions adéquates pour une conservation durable de ces espèces au Cameroun. Les données démographiques ont été obtenues par la méthode de comptage ponctuel tandis que l'usage des questionnaires et la pratique des interviews a permis de collecter les données socio-économiques. Il ressort des résultats que l'aire géographique principale de distribution des perroquets était la ceinture de la forêt tropicale dominant la région Sud du pays avec une forte densité dans les zones sud-est. Les nids étaient abondamment dénombrés dans les forêts secondaires ayant des arbres d'une hauteur de 25 – 45m et une densité de 0.034 – 0.373 nids/ha. Le taux intrinsèque de croissance naturelle (r) a été calculé pour la première fois pour les perroquets sauvages et pour ceux en captivité. Au Cameroun, la valeur de r était de 0.51 – 0.56 en captivité et 0.38 à l'état sauvage. La densité des perroquets variait d'une faible valeur de 0.49 perroquet/km^2 dans la Région Sud-Ouest à 2.16 perroquet/km^2 dans la Région Sud. Sur la base de ces données, la population nationale était estimée à 200778 perroquets; avec un intervalle de confidence (95%) de 199390 – 202171 perroquets. Sept régions sur dix au pays hébergent cette espèce avec des effectifs variables. Cinq menaces majeures du perroquet ont été identifiées avec notamment la dégradation de l'habitat (32%) et le commerce pour usage domestique (31%) comme principales menaces; ces deux facteurs ayant une menace commune de 63%. Il est évident qu'un faible niveau d'éducation à la conservation dans les communautés rurales a grandement contribué à la diminution de la population des perroquets dans le pays. La proposition de quota de capture ci-dessous indiquée cherche à harmoniser la conservation durable de l'effectif des perroquets et son exploitation équitable. A cet effet, une capture annuelle d'un quota de 4000 - 5000 perroquets est possible. Une capture maximale de 6000 perroquets n'est envisageable que si les éventuels projets de gestion sont appliqués en vue d'assurer une régulation ferme de la population. Sur la base des données régulières de contrôle, les autorisations de capture devraient être ajustées tous les cinq ans afin de permettre une amélioration de la taille de la population et de l'habitat. En outre, le démantèlement du commerce illégal des perroquets demeure un grand défi pour le Gouvernement du Cameroun; ce démantèlement peut se réaliser à travers une collaboration régionale en vue de l'harmonisation et de l'application des politiques transfrontalières relatives au commerce des perroquets.*

PART I

INRODUCTION AND METHODOLOGY

1. INTRODUCTION

1.1. Context and justification

Wildlife resources are increasingly used with increasing human population and advances in technology (Richardson, 1998; Snyder *et al*. 2000; Buckley *et al*., 2008; Nasi *et al*., 2008). This high demand is the precursor of an international trade in biodiversity resources and is estimated that the trade in wildlife generates 5 to 8 billion USD annually (Kock, 1995; Chardonnet *et al*., 2002); Bazilchuk, 2006). Most of the wild specimens traded are extracted from developing countries of Africa, Asia and Latin America, which interestingly harbour most of the world's biodiversity (Beissinger, 1992; Hills *et al*, 2005, Wright *et al*, 2001). The ever increasing pressure on these resources coupled with their misuse, led to the establishment in 1980 of the World Conservation Strategy Project. The strategy was founded on the conviction that people can alter their behaviour when they see that it makes things better and can work together when they need to. The strategy goes further to emphasize that humanity exists as part of nature and has no future unless nature and natural resources are conserved (IUCN/UNEP/WWF, 1991). Similarly, the Convention on Biological Diversity (CBD: UN-Earth Summit, 1992) has three main goals: conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits from the use of genetic resources. Although many forms of life are yet to be exploited by humans, it is no easy task to ensure that this happens in sustainable ways. Biological signs that wild species are being exploited unsustainably in many parts of the world today include a decline in the overall population, local extinctions and fragmentation of the geographic distribution, and demographic imbalances observed over time (Wright *et al*, 20010). The successful conservation of such biological resources requires an accurate assessment of such parameters as population size and range to determine which conservation strategy to apply and also as a means to measure success of previous strategies (Snyder *et al*. 2000; Beissinger, 1992).

Unsustainable exploitation of our biodiversity in general and wildlife resources in particular remains a complex and challenging phenomenon for governments and international organizations to tackle (CITES, 2005: Hills *et al*, 2005; IUCN, 2010). The need to reverse the negative impacts led to the idea of international cooperation regulating the trade in wild specimens of biological resources. The corollary of this was the drafting of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which came into force in 1975. Today, CITES is a legally binding international agreement, with 175 parties and offering varying degrees of protection to over 30,000 species the world over, through the regulation of trade by means of controls and licensing regimes (CITES, 2010). CITES exerts

levels of regulation of its listed species based on the level of protection that a species needs through three appendices (Appendix I, Appendix II and Appendix III). However there are still many challenges that CITES faces in controlling illegal trade in some highly valued wildlife species (CITES, 2010).

Parrots (Order *Psittaciformes*) are one group of bird species that are heavily exploited for the international pet trade (2000Beissinger, 2001; Traffic, 2008). Many species of parrots are exploited within their range states for the pet trade, both locally and internationally. The capture and trade of wild parrots is a source or supplement of livelihood for a not easily quantified but probably a substantially large number of people. Most opponents of the trade argue that the suffering and extent of mortality of wild-caught parrots are unacceptable. Some opponents of the trade further argue that the capture and trade of wild parrots can threaten their existence in the wild, and that there are many indicators to demonstrate that the exploitation is not sustainable. Africa is a major source of wild-caught parrots in the International pet trade. Popular African parrots in the trade include the African Grey Parrot (*Psittacus erithacus erithacus, Psittacus erithacus timneh*), Lovebirds (*Agapornis* spp) and members of the genus *Poicephalus* (e.g. Senegal Parrot, *Poicephalus senegalus*; Meyer's parrot, *Poicephalus meyeri).*

The African Grey Parrot is one parrot species which has attracted high interest in the international market (BirdLife International, 2010; BBC, 2004; Juste, 1996; Mulliken *et al*, 1992). Stemming from an assessment that 21% of the global population is harvested yearly, it is currently assessed as Near Threatened on the IUCN red data list (IUCN, 2010; Birdlife International, 2010; Birdlife International, 2011). The Grey Parrot's longevity, intelligence and ability to mimic human voices and other sounds within its vicinity make it a highly sought-after pet in the international trade (Pepperberg, 2007). This trade brings in high returns to those involved in it (Chupezi and Ndoye, 2004). Although an internationally protected bird species, the Grey Parrot (*Psittacus erithacus erithacus*) is highly traded in Cameroon and other African countries within its range (Traffic, 2008). The recognition of these debilitating factors on the natural populations of the Grey Parrot became the basis on which the animal committee of CITES in their 22nd meeting in 2006, recommended the categorization of the Grey Parrot's range countries, based on the severity of the negative impacts. On their list, Cameroon, Côte d'Ivoire, Guinea, Liberia and Sierra Leone were placed under the *Urgent Concern* category; then, Republic of Congo, Democratic Republic of Congo and Equatorial Guinea were under the *Possible Concern* category, with almost the rest of the other range countries listed under *Least Concern*. Furthermore, a two year moratorium which started on 1st January 2007 was placed on countries in the *Urgent Concern* category, who were also asked to carry out some outlined measures to forestall the negative situation (CITES,2007; CITES, 2006; CITES, 2005). The need

for such scientific data on the Grey Parrot for informed management decisions by the government and the need to forestall the negative situation in the range states recommended by CITES formed the basis of this study.

1.2. Background of the situation in Cameroon

The Republic of Cameroon is geographically located between the western and central parts of Sub-Saharan Africa, from Latitude 2° N to 13° N and longitude 8°25' E and 16° 20' W. The country is bordered by Nigeria, Chad, the Central African Republic, Gabon, Congo and Equatorial Guinea. Cameroon has some of the most spectacular and finest wildlife species found in Africa. The country is endowed with varied wildlife habitats and ecosystems, which explain the reason for the diversified wildlife resources. These assets represent the country's biological diversity, which is a representative of Africa's biological heritage.

Incidentally, one of the most important goals of the Cameroon Government is to conserve its biodiversity (Tamungang and Cheke, 2009; Nforngwa, 2010). In this direction, the Government is making efforts to modernize the laws and policies on biodiversity conservation at the pace of the current wind of change in biodiversity conservation both locally and internationally.

Efforts to manage the exploitation of wild parrots on a rational basis as an integral part of wildlife resources are one of the major concerns of the government of Cameroon. The practice in Cameroon in the past three decades was to capture thousands of parrots for local consumption and for export, both legally and illegally (Tamungang, 2004). Cameroon ranked first as world exporter of this species with a CITES annual export quota of 12000 birds (from 1994-2006) and about 80% sent to European countries (Tamungang and Cheke, 2009). According to MINFOF 2010 (unpublished information), the exploitation of the parrot contributed about 120 millions FCFA (USD 246,510) annually to the Special Wildlife Funds (that was 25% of its budget) and about 70 million FCFA (USD 143,893) to the public treasury. On the other hand, about 30% of the active traders in the sector employed about 300 families who received revenues which went to the national macro-economic circuit. Other economic impacts included national and international travels, manufacture of cages, and services of veterinary doctors.

The last population evaluation study which permitted the exploitation of the 12000 parrots export quotas was endorsed in 1998 (Fotso, 1998). The permissible trade remained at the same level until the onset of the avian influenza (H5N1) outbreak in 2005 (BBC, 2004; EU Wild Bird Declaration, 2004). The illegal trade in particular developed during this period with an increase in fraudulent cases and illegal exports. To this end, it is necessary to include the potential loss in habitat due to deforestation phenomena. All these factors caused CITES through Resolution 12.8 and the Committee for Animals to classify the Grey Parrot in Cameroon as << *a species to*

be given urgent attention>>. This declaration was confirmed during the 22nd CITES meeting held at Lima in Peru in July 2006 and by CITES' Review of Significant Trade-document SC55 Doc.17 of 2 June 2007. Thus, Cameroon was suspended from exporting parrots since January 2007 until issues of sustainable management of the species are clarified. Among the listed measures are:

- ✓ Harmonization of management issues in the country and the establishment of a management plan for this species.
- ✓ Habitat, factors affecting population and measures to be taken that will lead to long term conservation of this species of great significance.

The Government of Cameroon through MINFOF arranged for an inventory of the Grey Parrot to be carried out in Cameroon. Results of the data collected are presented in this report to fulfil the above mentioned CITES requirements.

1.3. Mission and objectives of the study

The mission of this study was to gather information that will be used to determine CITES annual export quotas and to ensure long term sustainable conservation of the Grey Parrot in Cameroon. This mission is in compliance with the resolutions of CITES as cited above.

The following objectives were realized to fulfil the mission of the study as stated in the terms of reference (TDR N°. 72) submitted by MINFOF:

I. To carry out a population census of the Grey Parrot in Cameroon,
II. To identify potential sources of threats that can disrupt the sustainable conservation of the Grey Parrot and propose viable solutions to them,
III. To propose sustainable exploitation quotas and accompanied measures to ensure continuous survival of the bird species,
IV. To produce a Management Plan for the Grey Parrot in the country

Our efforts to realize this mission and objectives are presented the next sections of this report.

Photo credit: LAGA

Photo.1.1. The international press, diplomatic missions and conservation NGOs watched the Minister of Forestry and Wildlife, Elvis Ngolle Ngolle release the first consignment of confiscated Grey Parrots in Limbe in 2008.

Photo.1.2. Rehabilitation of rescued Grey Parrots in the Limbe Wildlife Centre. From 2007 to 2010, about 5000 parrots were confiscated from illegal traders in Cameroon, most of them rehabilitated and released.

Photo.1.3. Members of the Vigilance Platform of the Santchou Wildlife Reserve display material given by the government as an incentive to conserve the reserve. The population of Grey Parrots in this reserve is threatened with extinction. The West Regional Delegate of MINFOF is present with other government officials.

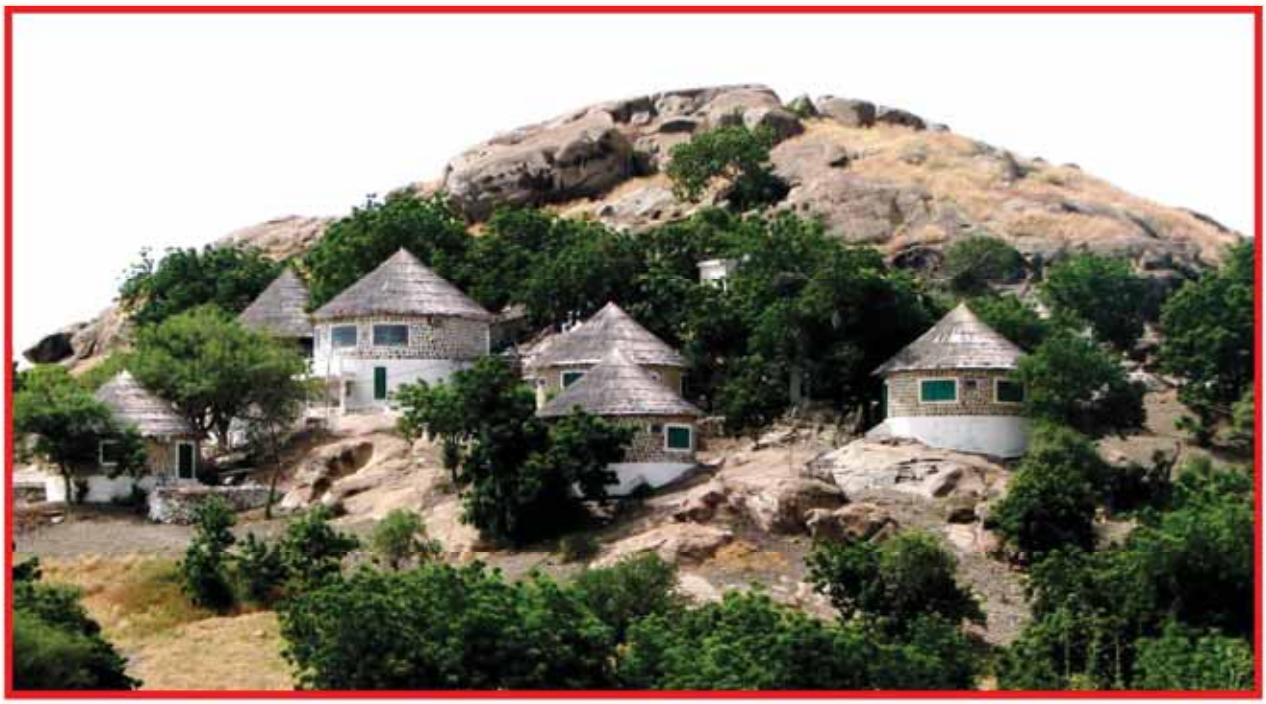


Photo. 1.4. Increasing efforts of the government to promote wildlife tourism. Partial view of the tourists camp in the Waza National Park. Similar camps have been built in the Benoue and Lobeke National Parks. The six parrot species including the Grey Parrot are endemic to Cameroon and have big touristic potentials to be fully exploited by both the Government and the private sectors

2. MATERIALS AND METHODS

2.1. Field methods, identification and standardization

Preliminary work on the field study started with a workshop which identified and standardized methods to be used for data collection. A total of thirty-three persons drawn from various professions (Wildlife Management, Forestry, Agriculture, Sociology and Geography) attended the two day workshop at the French Cultural Centre in Dschang. After the opening ceremony of the workshop by the Rector of the University of Dschang, participants listened to a lecture on the theme of the workshop. This was followed by a question and answer session which enabled participants to further understand the problems and goals to be accomplished during the workshop. Participants were then divided into three work groups, each group was asked to work out standard field methods that could be used to realize the objectives of the workshop. By the end of the two days of the workshop, each group worked out solutions to the task, then presented them to the assembly for questioning and standardization. A second workshop was organised in MINFOF-Yaounde and the methods for data collection for this study were validated

2.2. Study design

The overall study site design adopted for ecological data collection was Stratified Random Sampling (Williams, 1991; Usher, 1991; Sutherland, 2006). Stratified Random Sampling is the optimum survey design to use when there are two or more distinct habitats, or when a cursory assessment has shown a variation in population density in a given study area.

This design was best for this study because of the many varied eco-regions that give rise to varied vegetation types, and the ten government administrative regions. For the purpose of easy demarcation of each stratum, the administrative regions of the country were chosen as strata, which were further subdivided into sub-strata using protected areas or important bird areas outside protected areas. A total of thirty-two sub-strata were identified in the whole country in which all the ecological zones and administrative regions were represented (Fig 2.1). The expected natural range of the Grey Parrot was then traced on the map and sites that fell within this range area were randomly selected by region for actual sampling.

The three northern regions (Adamaoua, North and Extreme North) were not

Map source: www.world.gazetteer.com

Fig.2.1. Design of study area (Cameroon) for data collection

selected for the wild Grey Parrot population census. However, all regions of the country were included in the parrot trade survey.

2.3. Ground team travels

A survey was carried out from 2008-2011 involving collection of nationwide geo-spatial data on parrot population distribution and abundance, habitat threats and socio-economic use. Data on socio-economic use of parrots were collected nationwide. All the ecological regions of the country were also sampled. Raw data for sampled points are given in appendix II. The

research to the field was made up of two wildlife biologists, an environmental geographer, a rural sociologist and a driver). The team usually set out for data collection as early as 4h00–5h30 for each trip and upon arrival in a region, the Regional Delegate of MINFOF was contacted and a brief meeting was organised for mission presentation, problem identification and possible orientation. Other members of staff of the delegation, especially the Chief of Service for Wildlife were also invited for meetings. During such meetings, we obtained general information on protected areas and important parrot/bird areas found in the region as well as potential dangers and difficulties we could encounter in the region. These usually included security, state of the roads, behaviour of the inhabitants to visitors and lodging facilities.

In most cases, the regional delegate of MINFOF contacted his representatives at the divisional or sub-divisional level to inform them of our presence and mission in the region or gave us their contact numbers to get in touch with them as the need arose. From the regional delegation, we confirmed where to continue the trip and the road to take. If we arrived in a town and had to spend the night, a courtesy call was made to available public security offices for security reasons or to seek information for orientation. Upon arrival in a village, the village head was equally contacted in the palace for information.

Upon arrival in a conservation area, the conservator or his representative was contacted for introduction, presentation of mission order and consultation for partnership on work programme. They were very valuable in giving us information on general conservation problems of the area, past and present activities of parrot conservation and exploitation, and potential sites that could be visited for the census and habitat assessment. Where possible, we continued and spent the night in the village in order to observe parrots early in the morning as they left their roosts. Where impossible, probably due to late arrival, we made other arrangements on lodging and feeding facilities, got eco-guard(s) and porter(s) ready for travelling into the forest the next morning.

If a river/stream flooded its banks and could not be crossed by using a rope or swimming, we waited until it was safe to cross. In some of the areas visited with big rivers like the Ntem, Nyong, Sanaga, Wouri, Mbam etc, we used hired boats or canoes and ferries to cross the river in order to survey parrot activities along the banks of the river.

2.4. Population data collection

2.4.1. Distance Sampling could not be used

Distance sampling (Buckland *et al*. 1993) was initially chosen to be used for this study. This method is based on the accurate determination of the distance from the observer to the bird when it is first detected. There are several critical assumptions that must be met if bird density

estimates derived from Distance sampling must be meaningful. Marsden (1999) critically assessed the utility of Distance sampling for determining population densities of some parrots in Indonesia and he realised that it was not very credible. Similarly, McGowan (2001) assessed the utility of this method on the Grey Parrot in Nigeria. We reviewed the critical assumptions and concluded that they could be seriously violated for the study of the Grey Parrot in Cameroon, because of the behaviour (mostly mobility) and the dense nature of the rainforest. This method was therefore not used for this study.

2.4.2. Roost Counts could not be used

Roosts Count was another method selected for this study, but we could no use it finally because of the difficulties encountered. However, the method was used to estimate populations at specific roosts but not used in national count estimates. We ran into problems when larger flocks came to roost. They were either very fast to perch or were obstructed by trees and it was difficult to count them. Some roosts were in marshy sites and it was difficult for an observer to go into the site to count the birds. Other roosts were on small islands on rivers, banks of rivers, very tall trees in dense forests with interwoven canopy etc, with difficult accessibility and visibility.

Other researchers have had similar difficulties when trying to count birds at roosts. According to Clemmons (2003), counting Grey Parrots at roost is feasible when they are widely distributed and of low density. Grey Parrots in Cameroon occur usually in high densities at roosts and are therefore difficult to count. Some of the birds arrived at the roost as late as 20h00 and others leave roosts as early as 5h30, when it is dark and this poses a counting problem. Feasibility and accuracy of roost counts for estimating Grey Parrot populations have been criticized. McGowan (2001) stated that before settling down to roost, the parrots fly back and forth around and among the roosting trees making it difficult to count them. Furthermore, all the major roosts in the area will need to be located and surveyed to obtain reliable population size estimates. McGowan (2001) further provided critical questions that must be answered for roost counts to be converted to population estimates:

- What is the size of the area being sampled?
- What is the proportion of the population in the area being counted?
- What proportion of roosts in the area used is being counted?

Other questions from other studies include:

- Do birds move from one roost to another?
- What is the frequency of change of roost?
- Is the flock size stable or unstable as a result of bird migration?

Furthermore, Synder *et al*. (2000) gave other conditions to be fulfilled if parrot counts at roosts have to be used for density estimation:

- It is important to have a knowledge of all the roosts in the area being surveyed so that the number of birds missed is small;
- All roost counts should be carried out at the same time in the area in case there is movement between roosts.
- The time of the year for carrying out the survey is important. This means that counts should be carried out regularly and in specific months of the year.

The above field difficulties show that roosts may not be reliable enough to provide estimates of absolute numbers of parrots. Roosts may however, be reliable in giving relative changes in population size at given locations from year to year and seasonal changes.

2.4.3. Point count

The point count with two counting bands was finally used for counting Grey Parrots for this study. This method is widely used to sample bird communities in tropical forests from which changes in bird abundance over time are calculated, notably: Volpato *et al*., 2009; Hill *et al*., 2005; Seavy *et al*., 2005; Hutto *et al*., 1986 and Dawson, 1981a. Point counts are similar in conception and theory to transect-based counts (Bibby *et al*., 1992; Blondel *et al*., 1970; Hutto *et al*., 1986). Its efficiency and accuracy are influenced by observer effort, which may affect information obtained such as species abundance (Rosenstock *et al*., 2002; Bart &Earnst 2002; Betts *et al*., 2005). If well spaced, a sample series of points in an area will provide more representative data than a few transects. The point count therefore has an advantage over transects of being easier to incorporate into a formally designed study. However, both transect and point counts require high levels of observation skills. Although a plausible method for the study of Grey Parrots, relative density estimates from point counts are more susceptible to errors that can arise from inaccurate distance estimates or from the violation of basic assumptions when counting birds.

2.4.3.1. Sample point selection and layout

The advantage of the point count method over other traditional methods is that it needs a large area for sampling layout. The larger the study area, then the better results from this method. The Grey Parrot population censused area covers the whole of the southern part of Cameroon where rainforest exists. Its vastness makes it suitable for the point count method, especially for sample points spacing and layout. Sample points were randomly selected within each sample site (protected area or representative of a vegetation zone outside a protected area). This means that a cross-section of the major vegetation types in the geographic range of the Grey

Parrot was sampled.

Accessibility in the rainforest was a major problem for choosing counting points. Prior to data collection, we made random trials of choosing counting points in the Campo National Park, using a compass to trace the direction of movement. Sixteen points were chosen for randomly selected parts of the park for an arbitrary distance of 4km. The same distance was used but this time following a footpath in the forest. When we compared the two trials, results showed that the time for tracing the trail and direction of movement using the compass was almost three times that of following an existing footpath. There were many obstacles to overcome such as lianas, windfalls, big buttresses of giant trees, streams and rivers with no crossing points or places to escape. For these reasons and in most cases, we used footpaths, existing transects, and roads in the forest. These routes led us into both open and closed habitats and so reduced the bias for bird detectability.

Each point consisted of a circle made up of two counting bands or radii (Bibby *et al*., 1992). The first band had a radius of 25m (r = 0-25m). Any other parrot that was detected outside the 25m radius was recorded in the second band with radius set as infinity (r = 25m - ∞). Considering the dense and complex nature of the rainforest habitat of the Grey Parrot, it was difficult to go beyond two counting bands. As the radius increased, the probability that Grey Parrots would be detected increased, both on the number of birds detected and on a series of point counts. The goal was to use a radius as large as possible, but within which detection of all parrots could be reasonably assured, both in open and dense vegetation types. Thus the 25m radius was a compromise between the open and closed habitats.

2.4.3.2. Distance estimate

Accurate distance measurements between counting points is very important in this method since bird detection is associated with a certain distance. All walked distances were measured using two pedometers (Scanner Mark II). A simple bird count without distance estimation produces biased results. All efforts were made to ensure that individual parrots fit in the bands as much as possible. For this reason, at least two independent observers in the research team gave their estimates when a bird was detected and the better estimate from our judgement or average was recorded. All members of the research team were drilled on distance estimation prior to point data collection to reduce the bias of distance estimates in the field. In every instance of bird detection, we checked to ensure that it was within the 25m radius or beyond it.

The distance between two adjacent points on the same path was 250m. This was arrived at after giving consideration to the vegetation types and associated structures. This distance of 250m was then chosen to ensure that the detection from different points remained statistically

independent (Reynolds *et al*., 1980). The distance also represented a compromise between the sample size and parrot conspicuousness in the dense tropical rainforest. Before starting bird counting proper, two observers were trained in distance estimate between points using a metric ribbon tape and each of them with a pedometer. A 250m distance was measured in the open and then in closed vegetation using the tape. Pedometers were adjusted to the normal strides of the observer and he walked the 250m distance. Adjustments were made on the pedometer until the distance measure of the tape and the pedometer coincided. For each distance measured during data collection, the two pedometers were used by two observers and they were always cross-checked to reduce distance-measuring bias. We realised that there were always small and negligible differences in distance estimates between the two observers. They arose from the fact that there were many obstacles on the routes travelled and they were circumvented in differently ways. Generally, distance measurement was difficult in the closed forest because of the obstacles to overcome between points.

However, the point count was still better than the mapped census and transects method in terms of data collection per unit effort in the rainforest. 1km produced 4 points with 250m between them and this was reasonable to enhance the rate of parrot encounters per counting session. For sample plot, a minimum of 10km was covered, thereby producing a minimum of 40 counting points per plot per visit. The 32 sampled sites produced a minimum of 1280 counting points per one round visit. Both dry and rainy seasons' data were collected separately per year and this produced a minimum of 2560 samples of counting points per year.

Measuring accurate distances was particularly taken seriously since errors arising from such measurements are squared in population density estimates. To reduce this bias in estimating the 25m radius, two independent observers measured distances between points using two pedometers. Results were compared and exaggerated estimates adjusted. GPS distance estimates were not used for calculating parrot population estimates since they are usually given in straight lines. Routes used were not in all circumstances straight because of the many obstacles that had to be dodged. Where possible, we did everything in the field to establish straight routes in order to estimate distances accurately.

2.4.3.3. Duration of Count

Because of the intelligent and agile nature of the parrots, counts began as soon as we arrived the point, in case the birds saw us close to them and were flying away. Counts were delayed on arrival at the point if the parrots sensed our presence but were not sure of the direction of disturbance. We delayed for 1-2 minutes while hiding to allow the birds to settle down. Reynolds *et al*. (1980) suggested waiting until after a 1 minute equilibrium period before

recording detections, but this does not necessarily assure the return of birds that have been flushed upon the observers' arrival at the point.

The duration of data recording at a point was 10 minutes. Longer durations than 10 minutes were more likely to record birds making long movements (from previously sampled points) which could invalidate the critical assumptions of the method. Shorter durations of 5 minutes would not have allowed much time to detect parrots that were not stable at counting points. 10 minutes was therefore the best compromise between the shorter and longer durations. Simple habitat parameters were also recorded at each sample point and classified as primary forest, active farmland and secondary vegetation.

2.4.3.4. Recording Procedure

The objective of the point count is to record individual birds once only. The birds were classified into three categories using means of detection. Parrots detected within the 25m radius were recorded as "inside 25m" while those outside the radius were recorded as "beyond 25m". Flying birds were not counted but were recorded as present at the site. Detections between count points were recorded as "present", but were not used in the final calculation of population size. Therefore, these data were only used to show the presence/absence of birds at the sampling site. Parrots were recorded as individuals for recording purposes: numbers in pairs and flocks were noted but were counted finally as individuals. During breeding seasons, Grey Parrots appeared more in singles and in pairs but during non-breeding seasons, they occur in large flocks' more often than in pairs. For faster counting, flock sizes were counted in 2s, 3s and results recorded for individual birds. While at each count point two or more observers counted individually and results standardized before recording. Another advantage with the point count method is that it can be used for both breeding and non-breeding seasons (Hutto *et al*. 1986). GPS coordinates of all parrot detections were recorded for subsequent spatial distribution analysis.

2.4.3.5. Time of data collection

To minimize variations associated with indices of abundance, the counting of parrots was conducted at times when there were little changes in conspicuousness of birds (Dawson, 1981). Generally, Grey Parrots are known to be more active in the mornings and evenings than mid-days and afternoons (Tamungang and Cheke, 2009; Clemmons, 2003). Data collecting periods were therefore standardized to fit peak periods of activity of the birds. Data were collected from 6h00-10h00 and from14h00-18h00 each day and for both dry and rainy seasons. It is known that activity patterns of Grey Parrots change with seasonality (Tamungang *et al*. 2003). We therefore collected data in both dry and rainy seasons to reduce bias that could be caused by seasons.

2.4.3.6. Consideration of observer's bias assumption

The following assumptions were considered on the field while applying the point count method:

1. **Parrots do not approach the observer or flee**

This assumption did not hold in all situations, for example, when counting parrots in open forest habitats such as farmland where visibility was better than in closed forest. It also depended on whether we heard the calls or songs of the birds and was aware of their presence while approaching a counting point. If this was the case, we did not go too close but ensured that the birds were within the 25m radius of detection. It also depended on the distance of 250m from the previous counting point.

The critical assumption is that fleeing parrots did not move from the 25m band to the next band. If a parrot moved during counting, the distance we recorded was the point where the bird was first detected. We considered that the 25m band was large enough to embrace the abundance of parrots that have fled a short distance during counting. Although a larger radius was generally required for more open habitats, we did not vary the 25m radius in any habitat type. Hence, the assumption is that the data from the too open and too closed habitats cancelled each other out during analysis and therefore reduced the bias.

2. **Birds were 100% detectable**

We used pairs of 8 x 56mm binoculars to improve on visibility on the field. Various assumptions were made about the rate at which detectability changed with distance but we assumed that all parrots were fully detectable at the observer's location. This assumption could be violated for very quiet and skulking birds, but Grey Parrots are generally noisy and hardly pass unnoticed, except when disturbed by an animal of a different species. The unmistakable red-tail feathers and white face of the Grey Parrot makes it easy to be identified. Its silhouette and fast beats of wings while in flight are also unmistakable for persons who are used to the wild Grey Parrot behaviour. We tried as much as possible not to violate this assumption during data collection. However, it is likely that parrots in the canopy of trees in the high forest that were not making noise for the ten minutes counting period were left out. Violation of this assumption can lead to underestimation of parrot density.

3. **Parrots did not move much during counting periods**

This assumption will hold for bird species that are highly mobile and hardly perch like swallows. In this circumstance, it would be difficult to count individual birds in large flocks. Fortunately, Grey Parrots are not such very mobile species. They are relatively mobile early in

the morning when out of their roosts to foraging areas and late in the evening when going back to roost. When foraging and feeding, they are hardly very mobile and individuals in a flock can be counted easily. If we stayed longer than 10 minutes at a point, there was a high probability that parrots could fly from the previous counted points to the current one.

2.5. Breeding ecology

Other ecological data were collected on nesting ecology and behaviour. Systematic searches for Grey Parrot nests were carried out. Line transects were used to search and locate nest cavities in sample plots. Two groups of two people searched on one side of a transect within a 0.25 km width from its centre. A pair of binoculars was used to observe details for nest suitability when a cavity was identified. When a suitable nest was found, a volunteer climbed the tree to observe the nest contents for active or abandoned activities. If it was an abandoned nest, clues such as loose feathers, egg shells or even abandoned eggs were further searched for. If it was an active nest, we revisited it to confirm and monitor nesting activities.

2.6. Socio-economic data collection

2.6.1. Questionnaire and interviews

Structured questionnaires and interviews were administered to collect data on trapping and transportation techniques, parrot trade and deforestation activities. Groups of persons contacted for data collection were:

1. Trappers in villages and urban areas;
2. Parrot exporters and local traders;
3. Consumers (parrot pet owners, villagers and town dwellers);
4. Government representatives (MINFOF) in the central administration in Yaounde and the Regions.
5. Selected NGOs (LAGA, IUCN, WWF, WCS and SNEFCAM);
6. Law enforcement agents (customs, gendarmes and police).

Efforts were also made to gather documented literature on past activities of the parrot trade in and out of Cameroon. Notably, prices of African parrots were obtained from Europe and the United States of America using the internet and contacted persons. Data on socioeconomic activities were collected all year round with no particular seasons or months discriminated. Whenever possible, it was important for investigators to monitor trapping and transportation activities on a particular set of parrots from trapping grounds to evaluate the methods used, as well as their health and handling conditions. On arrival in a village, if the person(s) could not read or write a literate native of the village was hired to translate the questions and the answers.

2.6.2. Workshop

Workshops were other methods used for data collection from focus groups. In this light, a one day workshop was organized by PARROTPRO at the Mvog-Betsi Zoological Garden with members of the association of wildlife exploiters of Cameroon (SNEFCAM). The goal of the workshop was to share experiences on sustainable exploitation of parrots in Cameroon. At the end of the workshop, delegates identified the successes and challenges for the sustainable conservation and exploitation of parrot resources in Cameroon and proposed short term and long term solutions.

2.7. Appraisal of the 1994 Forestry and Wildlife Law

An Appraisal of Law No. 94-01 of January 1994 to lay down Forestry, Wildlife and Fisheries Regulations in Cameroon was carried out as a case study for the conservation of parrot species in Cameroon. A multidisciplinary committee of seven persons (lecturers from four departments of the University of Dschang) brought out strengths and weaknesses that can be used to enhance parrot species conservation in Cameroon.

2.8. Data Analysis and population Modelling

2.8.1. Estimation of population size for Grey Parrots

Datasets were synthesized for quantitative and qualitative analysis using relevant statistical packages (SPSS, Map Info, Microsoft Excel, ArcView GIS, and ArcGIS).

The Point Count formula for calculating density of counts within and beyond a fixed radius was used for calculating Grey Parrot densities and numbers for each region of the country.

The formula for Counts Within and Beyond a Fixed Radius (Bibby *et al*., 1992) is as follows:

$$\text{Density} = (\text{Log}_e (n/n_2) \times n/m(\pi r^2)$$

Where:
n is the total number of birds counted
n_2 is the number beyond the fixed radius
n_1 is the number counted within the radius (r) so that $n = n_1 + n_2$
m is the total number of counts
r is the fixed radius

Tables and graphs were used to organize and display relevant results. ANOVA was used to test for any significant differences and relevant results were then used for determining sustainable harvest quotas.

2.8.2. GIS mapping and distribution of parrots

Geographic coordinates (longitude & latitude) and altitude of each site where field data were collected were taken. The data were stored under the following columns; dates, localities, latitudes, longitudes, altitude, forest type, number of parrot sighted, observations and any other information (Appendix II).

2.9. Some difficulties encountered during field data collection

Difficulties encountered during field data collection are summarized as follows:

2.9.1. Communication difficulties

One of the major problems we encountered in many regions was communicating with the local villagers. These are localities which are under-scholarised in the country. Many villagers we contacted for information were not able to understand French or English or express themselves in either of these languages. They could express themselves only in their local dialects which we could not understand.

2.9.2. Scepticism on giving information

Some of the villagers were sceptical about giving information to members of our team or strangers. This posed a big problem on time and financial resources allocated for the trip. In some villages, we were compelled to report first to traditional rulers with lots of gifts before we could be received in the village. Not all of the detailed information we wanted was obtained due to this problem.

2.9.3. Time of data collection

The time of the day used for data collection in some places was a problem. Some localities for data collection needed that we visit them in the evening or early in the morning to observe parrot activities. It was not easy to get to these places for many reasons, such as the need for a local guard to take us to the place and none was available at that time. We arrived at certain villages at periods that people were reluctant to meet us and give information. We could not stay longer in some of the places due to financial and overall time constraints. The time of the season we went out for data collection also influenced the nature of data collected. Movements of parrots are generally influenced by seasonality associated with climatic conditions and fruiting activities of plants. We arrived in certain localities and were told to come back at specific months to observe parrots.

2.9.4. Bad roads

Some sections of the road network were very bad. In some places we had to deviate from the main road into the bush path with our vehicle because one section of the road was totally impassable or it was blocked by a truck or a bridge was broken. In some places, the bush road we used was very slippery for our vehicle to ply and in other places broken down timber trucks had blocked the road. We were forced to spend night(s) waiting for the problem to be solved or we went to a different locality.

2.9.5. Expensive accommodation

In certain towns and parks accommodation was very expensive or available accommodation was full. This problem was recurrent in localities that usually have a high inflow of tourists or in localities that have only a few hotels.

2.9.6. Aggressive wilderness

We experienced weather conditions that were very different from those we are used to. In some places the air was too dry and arid and the environment very hot. In other places, it was too humid and hot. We encountered aggressive insects such as blood sucking flies and wild mammals that posed danger to us. For example we ran into a herd of elephants *Loxodonta africana* at about 19h00 in the Lobeke National Park. Human threats to our research team and property were also prominent in many places.

Photo. 2.0.
Domestic accident with Peggy, the Grey Parrot.

Photo. 2.1. Participants at a two days workshop in Dschang to adopt the methodology used for the study

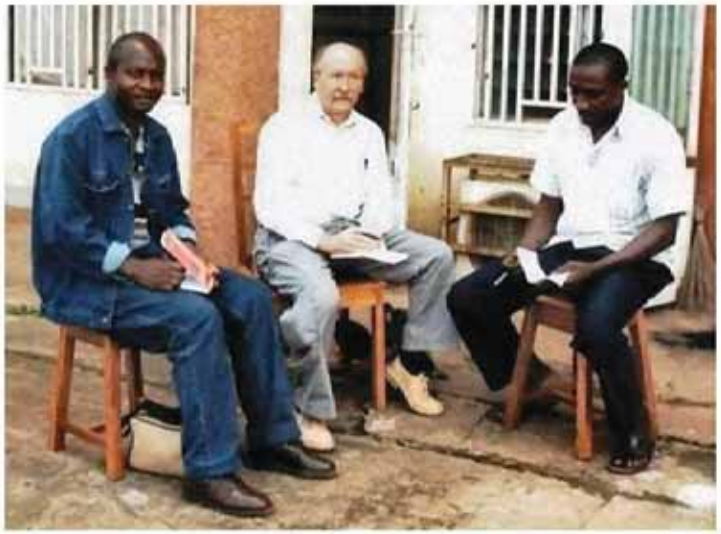


Photo. 2.3. PARROTPRO researchers (left) interviewing a parrot trapper in Yaounde

Photo. 2.2. Group discussions during the workshop in Dschang

Photo. 2.4. Focus group village meeting for data collection in a village near Bafia. Research team members are standing

Photo. 2.5. Research team lead by a local guide in the forest in Mebang, South Region

Photo. 2.7. Timber trucks had accidents and blocked roads thereby delaying data collecting activities

Photo. 2.6. Partial view of a Grey Parrot roost at the banks of River Mbam. The research team used a canoe to get to the roost for data collection

Photo. 2.8. Collecting field data during the rainy season was sometimes very difficult due to flooded rivers and streams. Here the research team is seen crossing such a body of water

Photo. 2.9. An abandoned poacher's camp in the Lobeke National Park

Photo. 2.11. An abandoned cage in a private home near Kribi, due to the CITES ban on the parrot trade in Cameroon

Photo.2.10. Cutting road blocks in the Dja Reserve for the research vehicle to have access into the reserve with workers

Photo. 2.12. Research team having a working session with pygmies in the neighborhood of Yokadouma, South-eastern Cameroon

Photo. 2.13.. The research team frequently had impromptu meetings to take consensus resolutions on some field observations. For example, to take parrot census resolutions or plan for next activity

Photo. 2.14. Poaching is the greatest threat to sustainable parrot/wildlife conservation in Cameroon. Some ammunitions seized from poachers in the Korup National Park area

Photo. 2.15. Two research team members with Eco-guards after a meeting in the Campo Ma'an National Park headquarters. Note the Eco-guard whose arm was chopped of by poachers when they were resisting arrest.

Photo 2.16.. Thousands of hectares of rainforest trees are destroyed yearly for subsistent

farming. This is not a major threat to parrot/wildlife habitats when compared to commercial logging and agro-industrial plantation exploitation

PART II

RESULTS:

Trends and threats

to population sustainability

3. GEOGRAPHIC DISTRIBUTION AND ABUNDANCE

3.1. Range identification and delimitation

The originally predicted endemic range of the Grey Parrot is relatively wide in Cameroon but limited to the rainforest and associated transitional vegetation of the Cameroon greenbelt, which dominates the grand southern part of the country as shown in deep blue colour in Fig. 3. The predicted range falls within the original range of the rainforest in the country. This area includes the low and highland rainforests and wooded savannah vegetation. From a regional standpoint, the natural range falls in major parts of the South West, Littoral, South, Centre and East Regions and small parts of North West, and West Regions. This range harbours about sixteen national protected and four important non-protected areas.

3.2. Historical versus current distribution

The original range of the Grey Parrot is large (Fig.3.1) but it is being contracted by land-based socioeconomic activities as years go by. Information we gathered from old and retired civil servants in many parts of this range shows that Grey Parrots are rare or completely absent in some parts of the range where they used occur in abundance some 30-50 years ago. This means that the original range is gradually being reduced and fragmented through agricultural activities, urbanization, infrastructural development and timber exploitation. What remains of this original vegetation and how parrots are distributed in it is shown in Figure 3.2. The map was produced from above-ground biomass images of Cameroon of 2000-2003, with a range of 0-356 Mg/Ha. This output map was produced after plotting the GPS coordinates of sites where Grey Parrots were observed onto the shape file of Cameroon in ArcGIS 9.3.1. From these two maps (Figs.3.1. & 3.2.), it is seen that the range of Grey Parrot occupies the southern part of the country. The map (Fig.3.2.) also shows that Grey Parrots are roughly evenly distributed within this range in Cameroon though with severe habitat fragmentation and gradual contractions in many parts of it.

3.3. Distribution according to ecological regions

Data were further analysed to show the distribution of Grey Parrots in the study area with respect to the ecological regions of Cameroon (Fig. 3.3.). There are seven eco-regions in the country and three of them harbour Grey Parrots in significant numbers. In order of decreasing abundance of Grey Parrots, they are Northwestern Congolian Lowland Forest, which is a typical lowland rainforest; Atlantic Equatorial Coastal Forest, which is made up dominantly of mangrove swamp forest; and the Cross-Sanaga-Bioko Forest, which is made up of a mélange of lowland, and highland rainforest.

Fig. 3.1. Original range of the Grey Parrot in Cameroon

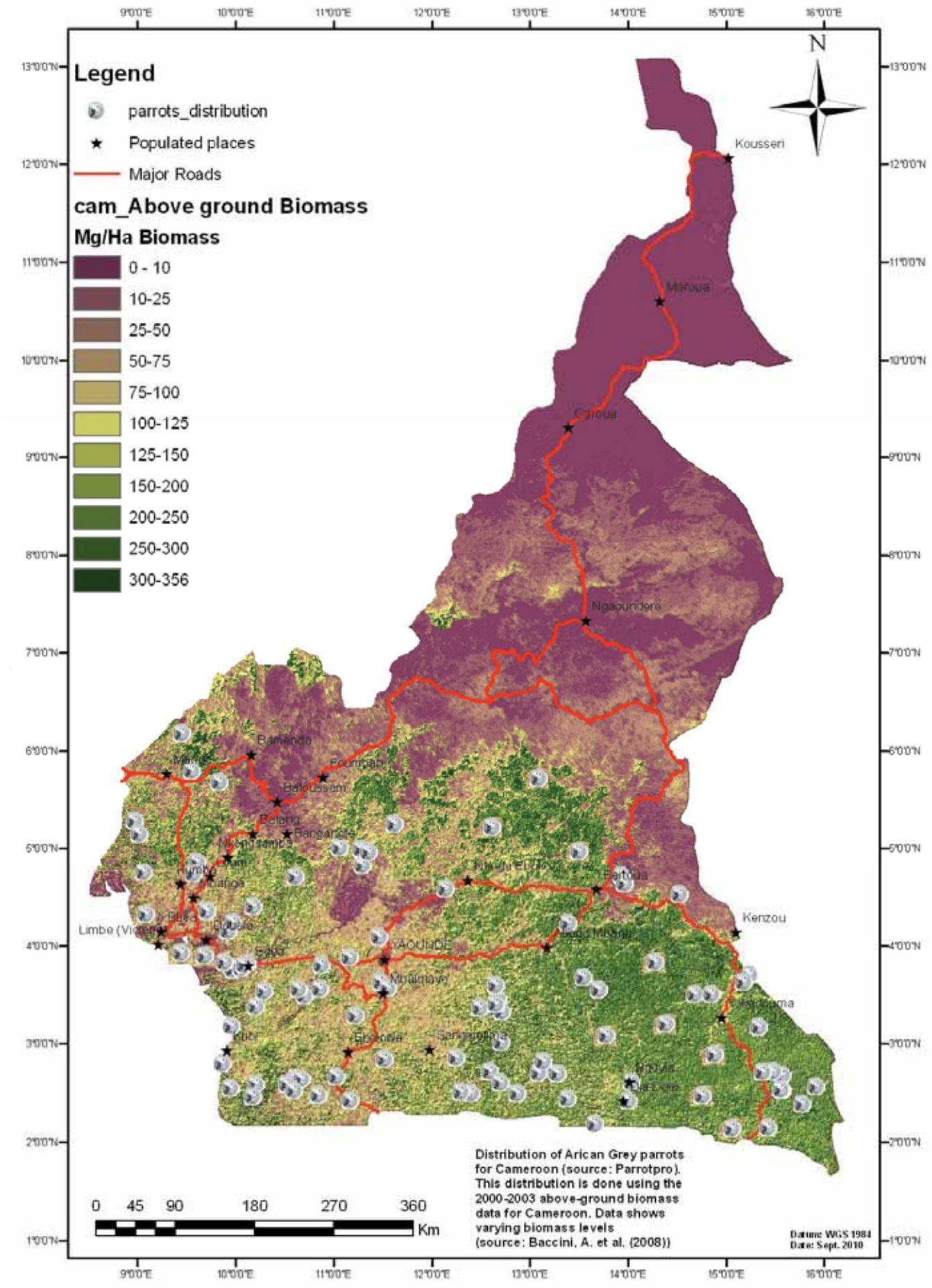


Fig.3.2. Distribution of Grey Parrots in Cameroon in relation to above-ground vegetation biomass

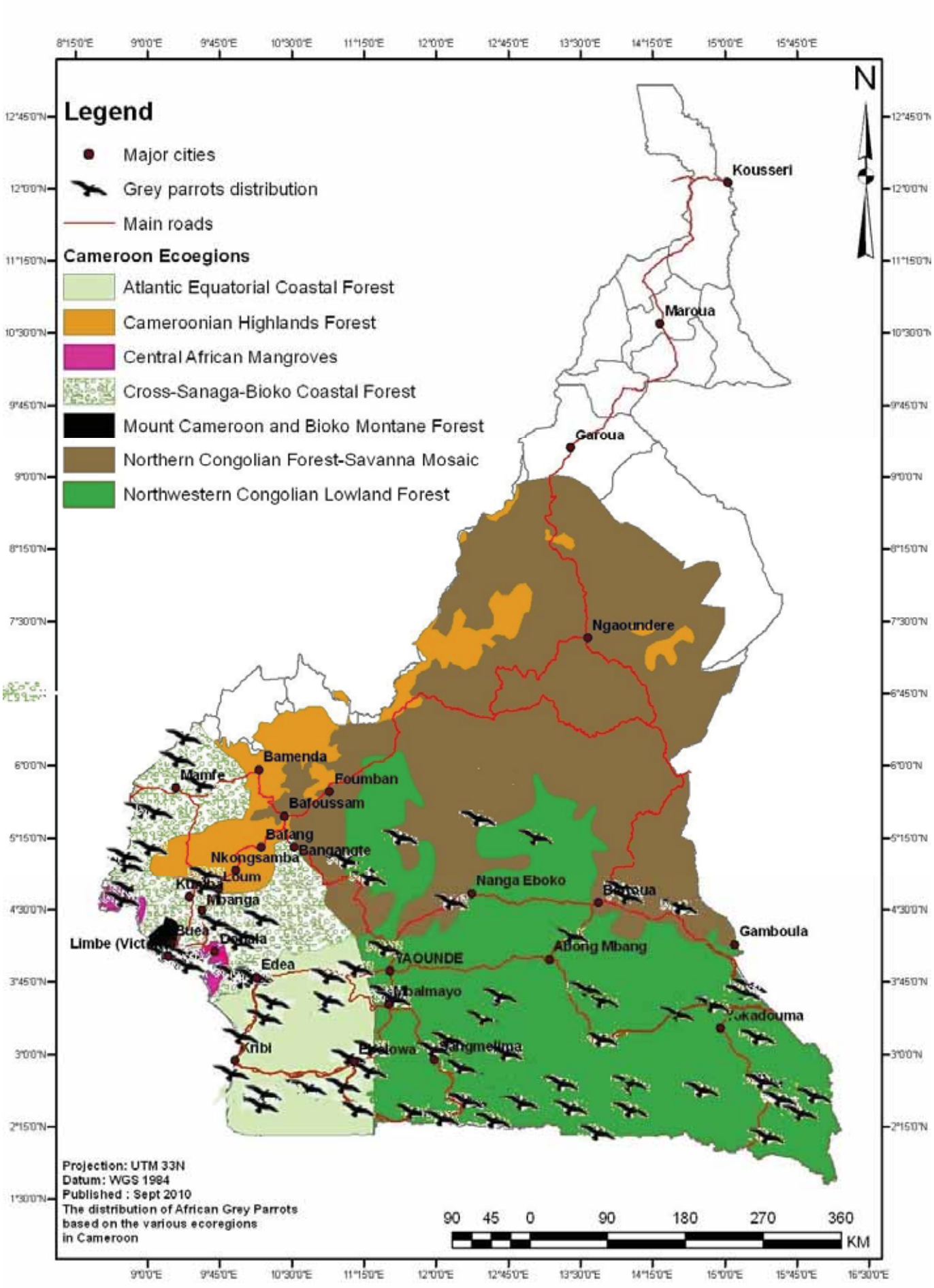


Fig.3.3. Distribution of Grey Parrots in the Eco-regions of Cameroon

Two eco-regions that share boundaries with the Grey Parrot's range identified above are the Cameroonian highland forest and the Northern Congolian Forest-Savannah Mosaic. These eco-regions form an ecotone with the two vegetation types and can provide rare habitat resources of food diversity and nest sites to the parrot. A more detailed look at the rainforest (Fig.3.3 and Fig. 3.4.) shows that it covers the low coastal region (parts of Littoral, South West and South) and a large part of the Southern plateau (parts of Centre, East, South West, Littoral and West Regions). This vegetation type is also known as evergreen forest. It is luxuriant and has a continuous canopy of leaves, thereby forming a carpet-like structure when viewed from above. It has tall trees about 40m high and struggles for sunlight all the time. In places where light does not reach the ground, it becomes dark, gloomy and sometimes with scanty undergrowth. The Grey Parrot prefers to use more of the open parts of the vegetation than the close counterparts.

There are many types of trees with different heights and sizes in this forest type. Some are closed up or open at the base and other trees shed their leaves at one or other period of the year. This forest provides many tree species to the economy, medicine and traditional domains and also serves as a valuable food source to the parrot. The abundant tree species here include *Protomegaboria macrophylla,* Hutch; *Anthonotha fragrans,* Bak. f. Exell and Hillcoat; *Erythropheleum ivorensis,* A. Chev; and *Xyopia aethiopica* (Dunal) A. Rich. Also present are species that occur only in Eastern Nigeria, West across the Congo basin such as *Oubangia alata,* Bak.f.; *Dichostemma glaucescens,* Pierre; *Strombosiopsis tetrandra,* Engl.; *Afzelia bipindensis,* harmand; and *Enantia chlorantha,* oliv. There are endemic species of Korup such as *Hymenostegia baberiana,* Hutch and Dalz; *Globulostulis talbotii* Wenham; and *Soyauxia talbotii* Bak.f. Other endemic species of the river banks include *Camphyospermum dusenii,* (Gil) D.W. Thomas; *Deinbollia saligna,* Keay, (Sapindaceae); and *Eugenia dusenii* Engl (Korup Project, 1989). There exist also communities of succession that appear following limited amounts of forest clearing. These communities are to be found in areas of old volcanic soils. Species that occur here include *Ceiba pentandra* (Bombacaceae); *Cordia aurantiaca,* (Boraginaceae); *Portetrandia cladantha* (Rubiaceae); *Terminalia superb* and *T. ivorensis* (both Combretaceae); *Chlorophora excels* (Moraceae); *Musanga* cecropioides (Moraceae); and *Pycnanthus angolensis* (Myristicaneae). It is also worth mentioning that this forest is the richest in terms of species diversity and acts as a refuge for a variety of threatened animals like apes, monkeys, elephants, rodents, reptiles, birds, amphibians, fish and invertebrates.

Between the equatorial and tropical belts, there is transitional vegetation cover with characteristics similar to both rainforest and savannah (also called woodland, Fig.3.4.). In most of the cases, this zone is made up of semi-deciduous or mixed forest containing some evergreen and some deciduous trees. This transitional zone is more or less tempered with by both human

activities and bush fires. In Cameroon, as one travels from the South to the North, the rainforest gradually gives way to savannah except in those mountainous regions found in the southern part of Cameroon.

The next vegetation to the rainforest is the mangrove forest, mostly found at the coast of swampy areas in Cameroon with its specific flora (Fig. 3.3). From one end, it stretches within two main regions which run from the coast of Rio-del-Ray and extends to the foot of Cameroon Mountain and stretching down to the coast. To the other end, it is found within Bimbia through Tiko to Modeka and further to Douala or Wouri Estuary. The mangrove forest is characterised by swamps, creeks, estuaries and raffia palms. Indicator plant species of the mangrove are *Rhizophoria* and *Aurcerinia*. These tree species generally possess breathing roots that are stilted from mud and are saltwater tolerant. This mangrove forest is an exceptionally rich habitat for a variety of fauna and is considered to be a nursery to most aquatic and semi aquatic species. Many Grey Parrots use the mangrove as roosting and playing sites. They were observed in the mangroves of Tiko (about 20-50 individuals per visit), Wouri Estuary (about 80 individuals per visit), Mouanko (400-600 individuals per visit) and in Campo, about 200-400 individuals. The mangrove forest in Cameroon is being threatened by frequent harvesting for socioeconomic benefits such as fuel wood, and fencing and house-roofing sticks.

3.4. Distribution according to vegetation types

Climatic factors and relief features predominantly influence the nature of vegetation distribution in Cameroon. The factors vary in many parts of the country and have given rise to many vegetation types. Various authors have classified the various vegetation types perhaps to suit their various needs. For example, Figure 3.4 shows the rainforest vegetation classified into two vegetation types: the Evergreen Broadleaf Forest and the Deciduous Broadleaf Forest. These vegetation types occupy major parts of the East, Centre, South and Littoral Regions and harbour large populations of Grey Parrots. Minor parts of this vegetation are found in the South West, West and North West Regions. The third vegetation type that harbours minor populations of Grey Parrots is the woodland savannah, also known as the Guinea savannah and is a transitional vegetation type between the rainforest and the grassland. Guinea savannah vegetation is prominent around Kenzou through Garoua Boulai to Meiganga, North of Nanga Eboko, and Bangante through Tonga to Bafia, Ngambe Tikar through Bankim to Mayo Banyo and from Magba towards Foumban. The continuous fragmentation of the endemic range of the Grey Parrot has also influenced the dispersal pattern of the species. As presented in Fig.3.3 and Fig.3.4 the vegetation has been fragmented in many places by anthropogenic activities. When this happens, the habitat range is broken and the bird is forced to shift to adjust to live in the

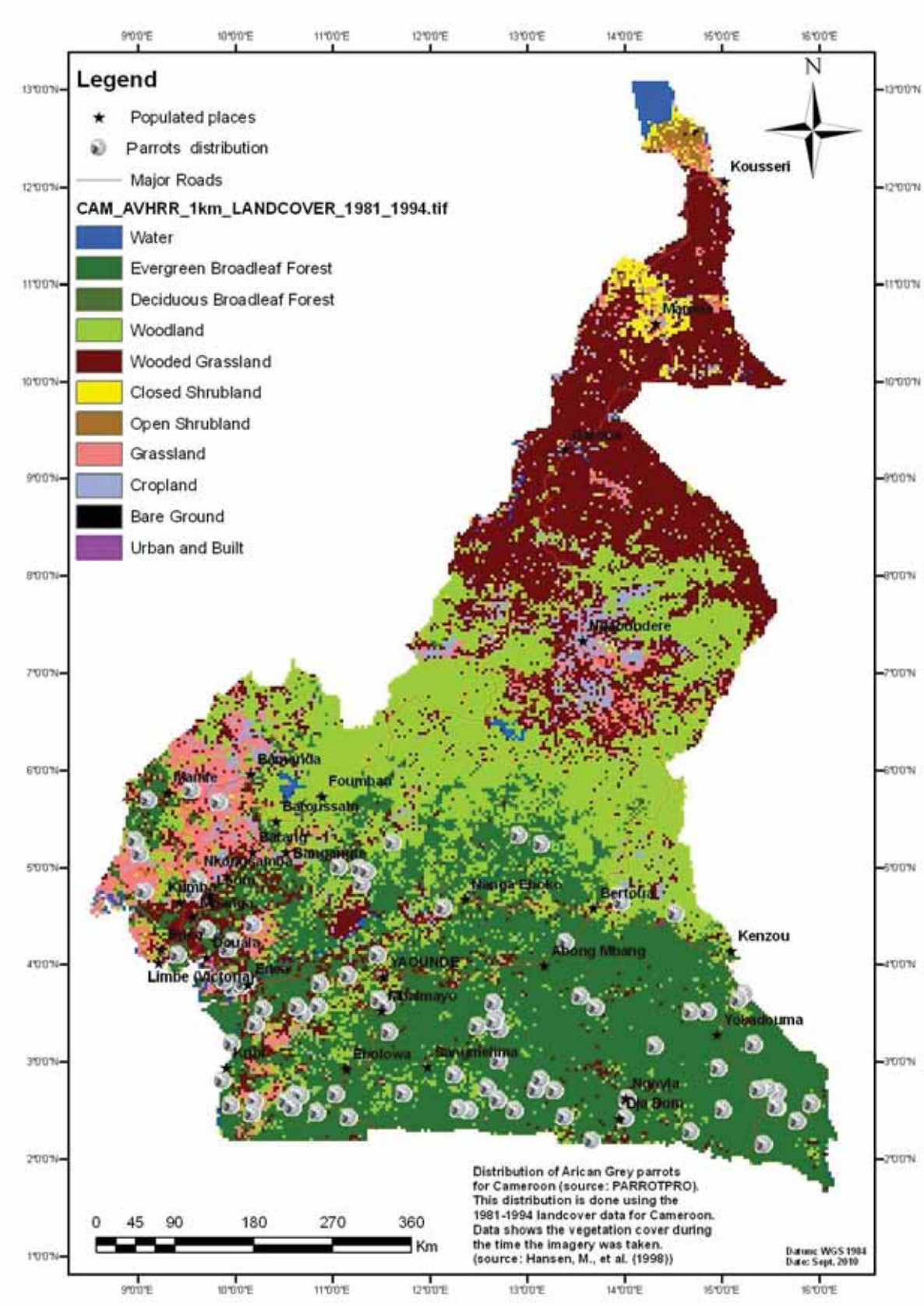


Fig. 3.4. Distribution of Grey Parrots and vegetation types in Cameroon

available patch of forest or it migrates to more suitable and secured sites. Urbanization brings continuous pressure on the land as the town continues to expand yearly. As such, the parrot population of that locality is lost to housing, road building, and farming etc.

Major towns and cities like Douala, Yaounde, Ebolowa, Bertoua, Sangmelima, Kribi, Kumba and Limbe have lost their parrot populations for development. Data from the field indicate that the bigger a human settlement area, the more it will tend to lose its natural habitat and therefore equally lose its wildlife. The probability of seeing Grey Parrots in villages was generally higher than in semi-urban or urban areas. Parrot populations have dwindled rapidly in the past thirty years in the south of the country, as the research team was informed by older people: 'hundreds of them used to be seen in the mornings and evenings, every day flying across villages and towns but nowadays these experiences with Grey Parrots are rare'.

3.5. Home range and habitat requirements

The African Grey Parrot is a very mobile bird in the rainforest environment. As a fruigivore and a cavity nester, it moves intensively in search of rich food sources and suitable nesting sites. Distances covered are determined by the seasonal distribution pattern of the needed habitat resources in the forest. In a related study, an average home range of the parrot was estimated at 10.27 km^2 with a home range area of 283.25 km^2 in Cameroon (Tamungang, *et al*. 2001). Feeding, breeding and roosting activities are major parameters that determine the home range of the African Grey Parrot in a given place and time. Shorter ranges were observed during the rainy season, implying that habitat resources were readily available. Related studies have indicated that animals occupying deteriorated habitats acquire larger home ranges than those in good habitat conditions (Owen, 1971). In Guinea Bissau, flocks of 6-10 African grey parrots flew up to 5 km across the sea to feed on a neighbouring island (Fry, *et al*. 1988). Skead (1974) had estimated that the Brown-necked parrot (*Poicephalus rubustus*) could fly up to 90 km from its roost to feed on a coastal bush.

The home range of the Grey Parrot is threatened in Cameroon by socio-economic activities that destroy tree species used by the bird. Habitat contraction and complete loss in some places mentioned above implies that:

- the bird is more vulnerable to trappers and predators,
- it has to travel longer distances to look for food and nest cavities, thereby being exposed to more trappers and/or predators,
- the bird may be forced to migrate to richer habitats elsewhere and this may be even out of the country.

Socio-economic activities that preserve the life of tree species known to be frequently used by

the parrot (such as *Ceiba pentandra, Terminalia superba, Millia excelsa, Pycnanthus angolensis,* etc.) especially in the support zones of protected areas can be carried out with parrot/wildlife conservation programmes. We observed that most of these tree species grow abundantly in the secondary vegetation.

For habitat requirements at a regional scale, we can compare the percentage of forest to total surface area in each region (Table 3.1). The values range from 20.40% in the Centre to 57.08% in the East and South Regions. Coincidentally, the East and South had the same percentage of forest to the surface areas and forest areas are not the same. This means that the amount of forest in the two regions is almost the same for Grey Parrot conservation.

Table 3.1. Forest area as a percentage of total surface area of each region

Region	Forest Area /km^2	Total area of region /km^2	% of forest to total surface area of region
Centre	14058.47	68915.50	20.40
East	62559.15	109595.57	57.08
Littoral	6973.58	20134.06	34.64
South	27275.43	47786.22	57.08
South West	9893.17	24968.81	39.62

However, we expect to see a difference between the two regions in terms of tree species composition and diversity, which are important factors that determine the natural parrot distribution and abundance. The Littoral and the South West Regions have almost the same percentages of 34.64 and 39.62 respectively. Table 3.1 therefore compares forest cover available for parrot conservation as well as similarities between them for policy formulation and parrot and habitat conservation. We can then conclude that the major problem with current parrot conservation in Cameroon is not lack of forest space for parrots but habitat fragmentation and rapid diminution of vital habitat resources of the bird species. If adequate measures are not taken to ensure sustainable habitat exploitation to safeguard continous parrot survival, this situation can lead to a dry forest syndrome in the near future.

3.6. Distribution according to altitude

The altitude of points at which parrots were sighted were recorded using a GPS handset. The data was analysed and results compared ANOVA, but no significant difference was found between the altitudinal ranges of these points. The points ranged from Lake Mbouli (05m) in the Littoral Region, Mangroves of Ekondo-Titi (07m) in the South West Region, Nkoelon Village (16m) in Campo through Eseka(228m) in the Centre Region, Mebang Village(637m) in the

South Region, Ndikinimiki (829m) in the Centre Region to Nkolakie Village (1038m) in the Centre Region. A majority of the birds were sighted below 650m of altitude, which is usually made up of lowland rainforest.

3.7. Population abundance

Data on the population sizes and ecological requirements of parrots in Cameroon are limited. At the same time concerns about the potential impacts of off take for pet trade are of increasing interest to ecologists, wildlife managers and policy makers. In this era of increasing human modification of the ecological landscape, biologist can no longer exclude the threats posed by anthropogenic activities on bird species in any population assessment attempt. There is no existing monitoring scheme for parrots in Cameroon and most of the parrot species records are only erratically recorded during baseline surveys (Fotso *et al*., 2001). This section of the study summarizes our current knowledge of the Grey Parrot densities at the regional and at the national levels in Cameroon.

3.7.1. Sample plots distribution for population size determination

The 32 sample plots described in chapter 2 of this study for counting Grey Parrots produced a minimum of 1280 counting points per round visit. Both dry and rainy seasons' data were collected separately per year and this produced a minimum of 2560 samples of counting points. Thus, for the two years, a minimum of 5120 parrot counting points were visited. Results presented below (Table 3.2) show counting points with bird detection. It should be noted that flying birds were not included in the dataset but were simply recorded as present at the site. The number of points was analyzed from the raw dataset using MapInfo.

Scenario 1: This scenario represents the frequency of occurrence of points where parrots were detected beyond the 25m radius. The highest number of times (points) where the birds were detected beyond this radius was in the East Region (134 points) and closely followed by the Centre (86) and Littoral (85) Regions. The region with the fewest points was the North West with 18.

Scenario 2: This scenario represents the distribution of points where parrots were detected within the 25m radius. The highest number of points was recorded in the East Region (44 points) and was followed by the Centre Region with 28 points. The lowest number of points was recorded in the West Region with 09. The Sum of sub-totals of the two seasons, that is, total parrot detections for the whole study showed that the North West and West Regions had very

low data entries. This observation reflects the low level of parrot activities and detections in the regions.

Table 3.2. Total number of sampled points in sample plots for the different scenarios during the rainy and dry seasons

Region	*Scenario 1:* Beyond 25m radius	*Scenario 2:* Within 25m radius	**$Total_1$**
Centre	86	28	114
East	132	44	176
Littoral	85	27	112
North West	18	12	30
South	56	18	74
South West	69	22	91
West	22	9	31
$Total_2$	468	160	628

These two regions had only remnant rainforests like in Santchou, Ngambe –Tikar and Magba for the West Region; Wum, Nwa and parts of Widikum for the North West Region. From a regional standpoint, the East had the highest parrot detection in 176 points, followed by Centre (114) and then Littoral (112). Out of the 5120 points visited in 4 seasons of the study, parrots were detected in 628 of them.

3.7.2. Determination of Grey Parrot densities

Various parrot densities were calculated using the formula by Bibby *et al*. (1992) as stated in the chapter 2. Densities derived from this formula were in m^2 and later converted to km^2. Parrot population densities for regions in the rainforest zone for rainy and dry seasons' are presented in Figure 3.5. The East region had the highest parrot density (2.18 GPs/km^2), followed by the South (1.48 GPs/Km^2). The lowest densities were obtained from the Littoral (0.33G Ps/km^2) and the South West (0.32 GPs/km^2) Regions.

A closer look at the results shows that dry season densities were lower than their rainy season counterpart. This difference was associated with seasonal differences in the ecology and behaviour of the Grey Parrot during the seasons. From field observations, encounter rates of the Grey Parrot were generally higher in the rainy season than the dry season. Bigger flocks were observed in the rainy season in non breeding periods than the dry season. Food scarcity can be a limiting factor in the dry season, which causes the birds disperse in search of rich patches of food. In the dry season more birds are seen in the mornings and evenings than the afternoons due to the usual hot mid-day to afternoon sun.

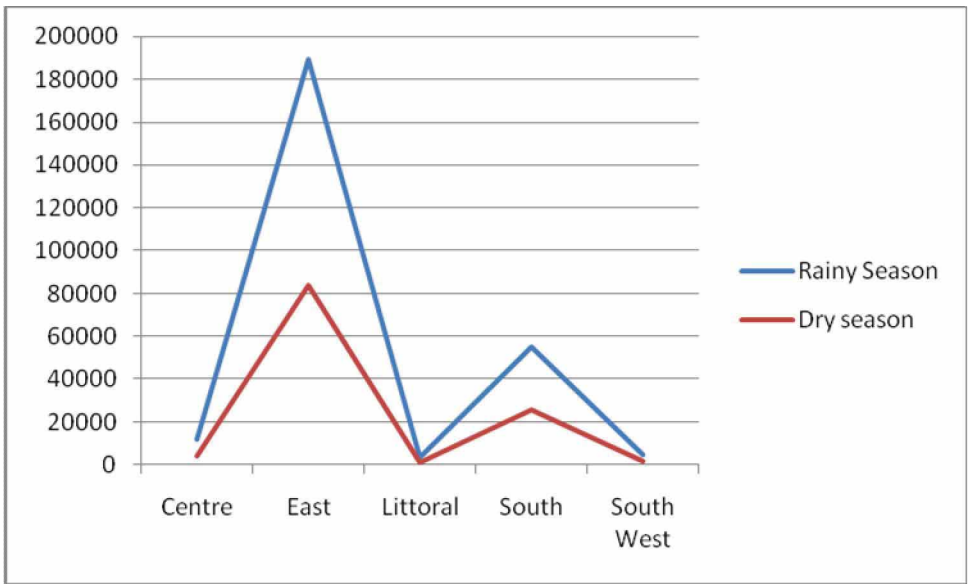


Fig.3.5. Comparison of mean Grey Parrot population size for rainy and dry seasons

During this period, the parrots usually rest under tree canopies to run away from the hot sun and to conserve energy for evening feeding in preparation for roosting activities (Tamungang & Ajayi, 2003; Tamungang *et al*. 2001).

Mean Grey Parrot densities per season were calculated from the total densities for the study period and results presented for each region (Table 3.3). The South West Region had the least density of 0.49 parrots/km^2 and closely followed by the Littoral region with 0.50 parrots/km^2.

Table 3.3. Mean Grey Parrot densities

Population density of parrots/km^2			
Region	**Total**	**Mean/year**	**Mean/season**
Centre	2.94	1.47	0.74
East	8.63	4.32	2.16
Littoral	1.98	0.99	0.50
South	6.87	3.44	1.72
South West	1.95	0.98	0.49

The highest value 2.16 parrots/km^2 was obtained from the East Region followed by the South Region with 1.74 parrot/km^2. Therefore regional parrot densities in Cameroon ranged from 0.49 -2.16 parrots/km^2/season, and the national mean density value was 1.12 parrots/km^2.

3.7.3. Translating densities into populations

Total surface area (size) occupied by rainforest within the endemic range of each region

was obtained from MINFOF. Similar information was also obtained on the total surface area of each region of the country. Parrot densities were obtained from the formula,

Density = Number of individual animals/Surface area occupied

From this equation, we obtained the number of parrots from the densities and the total humid forest size of each region as presented in table 3.4. It should be noted that the number of parrots obtained from each region is a function of the available forest cover, the assumption here is that Grey Parrots live in most sections of the available forest in each region. This assumption can lead to over estimates of population sizes in each region but it is a better option than extrapolating the densities to cover the total surface area of each region.

Table 3.4. Regional Grey Parrot population sizes

Region	Forest Area /km^2	GP Density /km^2/season	GP population size
Centre	14058.47	0.74	10403.27
East	62559.15	2.16	135127.77
Littoral	6973.58	0.50	3486.79
South	27275.43	1.72	46913.74
South West	9893.17	0.49	4847.65

The least parrot population size was recorded in the Littoral Region (3487 GPs) and the highest in the East Region (135128 GPs). The second position from the top was occupied by the South Region with 46914 GPs and the third position by the Centre with only 10403 GPs. These densities are justified when we consider the levels of land based socio-economic activities, urban areas, and human population size in relation to the remaining forest in each region. The South West Region is expected to have more parrots than presented but considering the long border it has with Nigeria and the poaching and trafficking pressures this region suffers from this neighbour, the number of parrots is reduced. It is also worthy to note that many parrot poachers in Cameroon come from far away Ghana through Nigeria into the South West Region.

The national point estimate of the parrot population size was 200779 GPs, determined by the sum of regional population sizes. This point estimate can be a limitation to the point count formula used to calculate the bird densities: it does not give the result in the form of a range. To resolve this problem, we calculated confidence limits of the national population, using the regional population sizes.

3.7.4. Confidence limit to population size

A confidence limit (CL) of the parrot population could improve on the reliability of the results. CL at 95% was used to calculate the lower and upper limits to the population size, using a

dataset with entries as:

Sum of population = 200779.22GPs; N=5; Mean = 40155.844 GPs; Std.dev = 223.79 and Variance = 5008361.

Partial results obtained gave the mean population sizes of:

Lower 95% CL= 39878.014 GPs; Upper 95% CL= 40433.674 GPs

The above limits were multiplied by 5 to obtain the values for all the regions as 199390 – 202170 GPs. Therefore, the population size of Grey Parrots in Cameroon as a point count was 200779 GPs and as a range was from 199390 – 202170 GPs.

3.8. Conclusion

The natural range of the Grey Parrot in Cameroon falls in major parts of the South West, Littoral, South, Centre and East Regions and small parts of North West, and West Regions. This range of the parrot is relatively large compared to the size of the country but it is gradually being reduced and fragmented through agricultural activities, urbanization, infrastructural development and timber exploitation. There is complete loss of parrot habitats in some parts of its range, especially for urbanisation and agro-industrial plantations. Out of the seven eco-regions present in Cameroon, three of them harbour Grey Parrots in significant numbers. In order of decreasing abundance of Grey Parrots, they are North-western Congolian Lowland Forest, which is a typical lowland rainforest; Atlantic Equatorial Coastal Forest, which is made up dominantly of mangrove swamp forest; and the Cross-Sanaga-Bioko Forest, which is made up of a mélange of lowland, and highland rainforest.

Trends in Grey Parrot populations varied with season and habitat type/location. Generally, seasonality places a major role in determining the presence or absence of the Grey Parrot in a locality. The major threat to Grey Parrot distribution in its range in Cameroon is habitat fragmentation, contraction and complete loss of some habitats to land-based socio-economic activities. The East region had the highest parrot density (2.18 GPs/km^2), followed by the South (1.48 GPs/Km^2). The lowest densities were obtained from the Littoral (0.33G Ps/km^2) and the South West (0.32 GPs/km^2) Regions. Similar trends were obtained for regional parrot population sizes. However, the population size of Grey Parrots in Cameroon as a point count was 200779 GPs and as a range was from 199390 – 202170 GPs. Concerns about the potential impact of off take of parrots from the wild for the pet trade are of increasing interest to ecologists, wildlife managers and policy makers.

Photos 3.1. Grey Parrots at a clearing (feeding site) in different scenarios in the Lobeke National Park, East Region

Photo. 3.2. A Grey Parrot guiding the entrance of its nest Compare the shape of the entrance into the nest with the normal one in photo. 3.4.

Photo. 3.3. A sick Grey Parrot picked from the rainforest floor. The bird got well after treatment with antibiotics

Photo. 3.4. Typical Grey Parrot nest on a *Terminalia superba.* Note the entrance of the nest.

4. ECOLOGY AND HABITAT THREATS

4.1. Roosting ecology

Over fifteen roosts were identified in five regions of Cameroon and some were found very close to human homes while others far into the forest. More detailed information on roosting ecology and behaviour was gathered principally in Nkoelon, Korup and Ndikinimeki areas. Information on the behaviour of the bird was gathered at these sites throughout many nights. This involved staying longer in the area concerned after counting the birds to monitor roosting activities. Additional information was obtained from villagers and parrot trappers. Aspects of interest in the latter source of information were traditional beliefs and cultural values attached to parrot roosting activities. It was interesting to learn that villagers usually gather under trees at the roosting site of Grey Parrots early in the morning to pick loose red feathers that fell from parrots the previous night. When a reasonable quantity of feathers was gathered, the villagers went to an urban market and sold them or used a phone to call a regular customer to come and buy them.

4.1.1. Characteristics of roosting sites

General Characteristics: In the Korup rainforest, Grey Parrots roost on oil palm trees (*Elaies guineensis*). Similar palm roosting sites were observed in Mebang, in the South Region. Here, the Grey Parrot roosts on wild palm fronts in similar positions to those observed in Korup. Both roosts were located in marshy sites. In other areas, Grey Parrots roost at the banks of rivers like the Rivers Dja, Ntem and Sanaga. They usually use palm trees and tall trees like the silk cotton tree (*Ceiba pentandra*) very close to the banks of the river for roosting. For more detailed information on roosting behaviour, observations were carried out between 18h00 and 7h00 in a few selected roosts.

In Nkoelon village in the Campo Ma'an National Park support zone, the situation was different. Grey Parrots roosted very close to human houses on the silk cotton tree (*Ceiba pentandra*) popularly called "baobab" although quite different from real baobab trees located about 200m from a human residential quarter. We spent the night at Nkoelon at the roosting site to observe their behaviour. Parrots began effective perching at their roosts between 18h30 and 19h00 and flew away in the morning around 5h30- 6h00. When roosting proper begins, noise stops and all become calm. From past 23h30, little cries are heard from time to time (may be birds fighting for roosting perch). Around 5h00, the cries become more and more frequent and intense. Around 5h30, the uproar is total (diverse kinds of cries are emitted). At 5h40, we observed the flight of the first flock towards the north; at 5h50 the second and the third flocks took off towards the west and south respectively, and at 6h00, the fourth flock emptied the site,

all towards the South but this time around in a more or less dispersed manner. More than 630 parrots were counted while in flight from the moment they left their roosts. This roost was later abandoned for unknown reasons.

4.1.2. Parrot population abundance at roosting sites

Abundance of population at the roosting sites varied from season to season. It was observed that parrots did not use the same roost throughout the whole year. Seasonal migration was noticed in the late dry season with the birds returning in the early rainy season. All the birds did not leave the roost at the same time. Some left earlier and others gradually followed until they had all left the roost. The same trend was observed when they were returning to the roosting site.

Table 4.1. Mean seasonal abundance of African Grey Parrots at the roosting site in Korup

Mean parrot abundance /season/ha	N	Duncan Grouping	Season
369.12	16	A	Late Rainy Season
326.87	16	B	Mid-Rainy Season
297.12	16	B	Early Dry Season
243.87	16	C	Early Rainy Season
168.44	16	D	Mid-Dry Season
0.00	16	E	Late Dry Season

Table 4.1 shows a general trend in seasonal abundance of the birds at the roosting site in Korup. Each season for data collection for this study was made up of two months; early-dry season was made up of two months (October and November), mid-dry (December-January), late-dry season (February-March), early-rainy season (April-May), mid-rainy season (June-July), and late-rainy season (August–September).

ANOVA results showed a significant difference ($P<0.01$) between seasons. The late-rainy season had an outstanding parrot abundance of 369.12parrots/ha. It was followed by mid-rainy season, with 326.87 parrots/ha, although this season had the same significant level with early-dry season. Mid-dry season had the smallest parrot population for the study period of 168.44/ha, as the birds started migration which culminated in the late dry season.

In Campo, the population size of the Grey Parrot at the roost ranged from 600 to 750 per season. In Ndikinimeki, the population size ranged from 700 to 800 parrots. In Mebang the population was very unstable due to disturbances by trappers but was estimated at 230 - 400 birds per season. Other roosts were on the banks of rivers Dja, Sanaga and Ntem but it was difficult for us to visit them. We, however, counted parrots on their flyways to the roost in the

evening on Rivers Ntem and Sanaga. On river Ntem we estimated 350 to 500 birds and on the River Sanaga, we estimated 300-400 parrots. A large roost with about 2000 parrots was reported in the Southern sector of the Mbam et Djerim National Park by Eco-guards of the park. Azobe Island on the River Nyong, had a bird population range of 56-74. Villagers told us that more parrots visit the island in the dry season, whereas our visit was in the rainy season.

4.1.3. Threats to roosting birds and sites

All the roosts identified so far by this study are threatened by anthropogenic pressure! Those that roost on domestic palm trees are at risk of losing the habitat to humans in two major ways: the branches on which the parrot roosts are frequently cut down (pruned) as a management measure by owners of the palms thereby depriving the bird of its roost. In another instance, the branches are cut down when the mature palm fruits are being harvested. All the palm trees on the site can also be destroyed and replaced by young ones planted by management, thereby depriving the parrots of their total habitat in the region. On the other hand, wild palm trees are felled and their young leaves harvested and used for household articles like mats. Those that roost on trees around human habitations are vulnerable to human predation and at the same time habitat destruction.

4.2. Feeding ecology

4.2.1. Diversity of food

Very little information has been documented on the foods and feeding habits of the African grey parrot in a wild state (Tamungang and Ajayi, 2003; Clemmons, 2003; McGowan, 2001; May, 2001; Dändliker, 1992b; Forshaw, 1989; Fotso, 1998). The most common documented food types are the oil palm (*Elaeis guineensis*), plum (*Prunus africanum*) and maize (*Zea maiis*) (Fry *et al.*, 1988). In all these places visited, parrots feed on a variety of plant species, which can be classified into leaves, flowers, fruits and barks of trees. Parrots were observed in the Lobeke National Park feeding on soils and weeds in marshy areas. The habit of feeding on soils (geophagy) by parrots is known in Cameroon mostly in the Lobeke area, but while in Mamfe, we gathered information about another area in Akwaya where parrots feed on soils, at the support zone of the Takamanda National Park. Feeding is usually carried out in flocks of up to about 300 birds in a feeding patch.

A diversity of food types on which the African Grey Parrots fed was identified in many regions of the country (Table 4.2). All the food types are trees and are made up of twelve families and fourteen species. Two tree species belong to the family Caesalpinioideae (*Daniellia ogea* and *Dalium guineense*) and two other species belong to the family Burseracea (*Dacryodes edulis* and *Dacryodes microphylla*). The rest of the families are only represented by one tree species. Some

food types were either suspected to be eaten by the African Grey Parrot or information about them was obtained from interviews with villagers and for this reason, more field observations are needed to ascertain whether the parrot feeds on the tree species or not. The African Grey Parrot was observed to feed on fruits, seeds and flowers. In fact, seven fruit species were identified, representing 50%, three flower species representing 21.42%, and four seed species representing 28.85%. However, it is suspected that the bird also feeds on buds of some tree species such as *Ceiba pentandra* and *Afzelia africana*. These also need further observations for confirmation. Height and girth size of fruiting trees visited by the African Grey Parrots varied. The shortest naturally occurring tree height was recorded on *Macaranga spinosa* (12m high). There was no upper limit to the height of fruiting tree visited by the bird. However, the tallest height recorded was on *Danielia ogea* (55m high). The range between the shortest and the tallest fruiting tree visited by parrots is 12-55m.

Table 4.2. Some food tree species of the Grey Parrot in Cameroon

No	Name of Tree	Family	Part Eaten
01	*Alstonia boonei*	Apocynaceae	Fruit
02	*Macaranga Spinosa* (Muell)	Euphobiaceae	Fruit
03	*Daniellia ogea* (Harms)	Caesalpinioideae	Flower
04	*Dalium guineense* (wild)	Caesalphinioideae	seed
05	*Albizia gummifera* (Gmel)	Mimodoideae	seed
06	*Dacryodes edulis* (G.Don)	Burseraceae	seed
07	*Elaeis guineensis* (jaccq)	Palmae	fruit
09	*Pycnanthus angolensis* (Welw)	Myristicaeae	fruit
10	*Blighia welwitschii (*Hierm)	Sapindaeae	fruit
11	*Spathodea campanulata* (P.Bea.v)	Bignoniaceae	flower
12	*Ceiba pentandra* (Linn)	Bombacaceae	seed/flower
13	*Symphonia globulfera* (Linn)	Guttiferae	seed
14	*Treculia africana* (Decane)	Moraceae	seed

4.2.2. Monthly/seasonal distribution of food sources

Food tree species were classified on the basis of months in which mature parts of the plant eaten by the parrot were abundant. The lowest number of food sources (three tree species) was obtained in August. It was closely followed by June and September with four different food sources each. May was the highest month with eight food sources. On a seasonal basis, the distribution of food resources was varied. A greater number of food sources are available to the Grey Parrot during the dry season than the rainy season. It should be noted that months of fruiting tree species vary from one part of the country to the other depending on regional and micro-climatic factors. For example, the fruiting season of *Dalium guineense* may be up to three months later in the South Region but much earlier in the South West Region. The birds were

noted to feed heavily on economic tree species such as plums, guavas, oil palm fruits etc, thereby reducing the economic yield of the farmer.

4.2.3. Flock size at foraging sites

Flock size varied with changing seasons depicting the varying nature of social cohesion

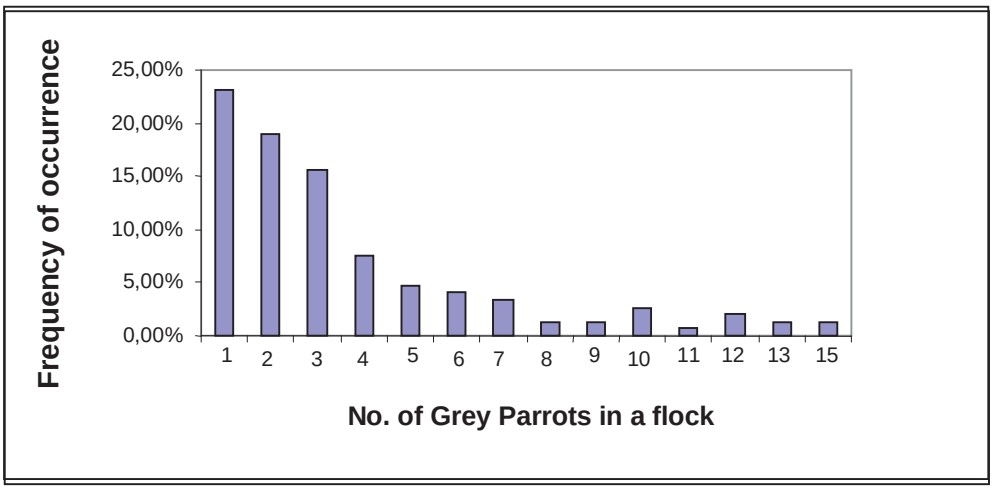


Fig.4.1. Flock size of Grey Parrots at a forest clearing in the Lobeke National Park, South-eastern Cameroon

in the birds with corresponding periods. Generally, bigger flock sizes were formed during non-breeding periods. Figure 4.1 gives the results of parrots in Boulou clearings between 6h00 and 7h30. This result shows the frequency of parrots per group as they flew over a foraging site or the forest clearings. This figure shows that the frequency of single parrots was much higher than paired groups. In turn, paired parrots groups were higher than those that came in threes, fours and so on. At this period of the year, smaller groups were more sustainable than larger groups. In the Mengame Gorilla Sanctuary, Grey Parrot flock sizes showed different trends (Fig. 4.2).

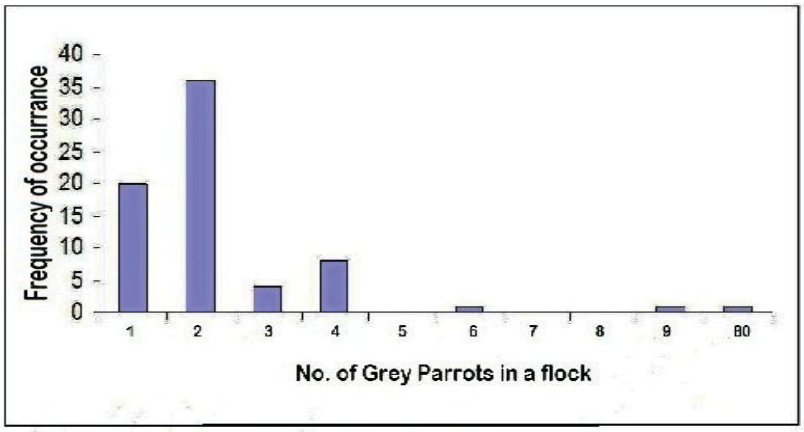


Fig.4.2. Flock size of Grey Parrots in the Mengame Gorilla Sanctuary

The number of birds observed in pairs was the highest and was almost double the number in singles. Flock sizes of threes and fours were hardly detected except one flock that had up to eighty birds. This very large flock was encountered at a feeding site and perhaps a rare fruiting site that could attract such a large number of birds. It could be concluded from this figure 4.2. that this period of observation in Mengame was representative of a typical breeding season as the birds occurred mostly in pairs. Some single birds observed might be non-breeding birds or it may be that the other partner stayed in the nest, probably, to take care of eggs or the fledglings.

4.2.4. Threats to foraging sites

The birds were noted to feed heavily on some economic tree species such as plums, guavas, oil palm nuts etc. thereby reducing the economic yield of the farmer. Various methods were adopted for chasing them away or trapping or killing the birds including shooting with guns and catapults. This is again another type of parrot-human conflict.

4.3. Nesting ecology

4.3.1. Distribution and abundance of nests

Both active and non active nests of Grey Parrots were observed in many sites in the field. Generally, there were no distinct variations in the characteristics of tree species used for nesting, except for one nest observed in Mambele (support zone of the Lobeke National Park) in a farm about 300m behind a human residence. The nest was made up of a hollow tree trunk and the entrance of the hollow was about 5m long and 0.5m wide but with an irregular entrance. One of the parent parrots stood directly at the entrance of the nest for many hours regarding it while the other parent perched on a tree branch just above the bottom of the nest. It was concluded that the parent bird could not fly away even when we were under the tree because of the open nature of

the nest which was susceptible to predation by hawks and squirrels. Judging from the structural characteristics of this nest, we could say that there was a scarcity of suitable nest sites in the area thus this being the best option for that couple. Apart from this strange case, similar nest structures were observed to be used by the Grey Parrot but the timing of nesting activities varied from region to region. In the East Region, notably the Lobeke National Park, Grey Parrots bred in the months August to October. In the Korup National Park area, they bred from June to early September. The peak period for fledging Grey Parrots seems to be in August and September, especially in Korup. This period also coincides with the peak of the rains or mid-rainy season in Cameroon and period of food abundance for the young birds. The nesting activities vary with regional micro-climatic conditions and seasonal availability of food for the nestlings. Weather data from most parts of the country reflect the micro-climatic differences. This is confirmed by the fact that the breeding period in the country is spread out from June to November.

4.3.2. Nesting site characteristics and abundance

Nests were found on very tall trees of 25 to 45m in the forest. A majority of tree species identified with parrot nests were usually found in secondary vegetation. The trees are *Terminalia superba, Terminalia ivorensis, Alstonia boonei and Vitex grandifolia*. Trees with nests were usually dominating in height, in the site where they were found. Although, climbers such as vines and lianes were usually found at the site, they were in most cases absent on crowns and stems carrying nests. The shortest height from the ground to the nest cavity was 24m for two nests and the longest height was 37m while the shortest circumference of these nesting trees was 180cm. A majority of them had circumferences ranging from 184 to 231cm. The longest circumference was 244cm and this record was obtained only on one tree.

It should be noted that trees such as *Terminalia* spp had most of their buttresses at breast height and their circumferences were measured above the buttresses using a ladder. All identified nests were found on the main stem or bole of the tree and a majority of them were found between 1-5m below the crown of each tree. Those found between tree branches were usually on old trees with no thick crowns. An attempt was made to calculate the density of nests from sampled data from the East, Centre and South Regions (Table 4. 3.). More nests were observed in the South than the East and Centre Regions, although more Grey Parrots were observed in the East Region. The density was calculated from GPS coordinates with upper and lower limits stated (Table 4.3). The density ranged from 0.055nests/ha in the Centre Region to 0.373nests/ha in the South Region. Generally the densities are very low, depicting the difficulty of finding a suitable nest by the Grey Parrot. There is a steady demand for those species of trees

that produce suitable nests for socio-economic activities.

Table 4.3. Density of Grey Parrot nests in sample plots in three Regions of Cameroon

Region	Survey limit	Latitude	Longitude	Area (km^2)	No. of nests identified	Density of nests (nests/ha)
Centre	Lower	03°24.631'	10°14.917'	10963.76	6	0.055
	Upper	04°06.887'	11°30.800'			
East	Lower	02°26.055'	13°20.153'	35205.37	12	0.034
	Upper	03°47.880'	15°25.314'			
South	Lower	02°36.95'	10°58.242'	4018.49	15	0.373
	Upper	02°21.605'	12°16.6'			

In Oveng locality, nine nests of Grey Parrots were found in active farmland. These trees were left standing by owners of the farms to provide shelter to the crops like cocoa or they were preserved for timber. The rest of the nests were found in fallow farmland which might have been left for at least ten years. Most of the trees with nests were found in valleys and hardly any on hilltops. Out of the thirteen trees identified with parrot nests in Lobeke area, only three were found in the National Park.

Lack of suitable nesting sites is a major limiting factor to population growth of parrots in Cameroon. Due to this scarcity of nests, parrots seemed to re-use their nests every year. However, more information is needed probably through marking techniques such as ringing of the birds to ascertain re-use of nests.

4.3.3. Threats to nesting sites

The cutting down of nest trees for timber exploitation, farming and infrastructural development brings about the destruction of nests which might be containing eggs or fledglings. One nest can be used for the reproduction of many generations of parrots. The scarcity of nesting sites could be due to forest exploitation activities. Scarcity of nest sites can result in the migration of the parrots of Cameroon to neighbouring countries thus reducing their number in Cameroon.

4.4. Protected area management and threats

We identified many problems in protected areas, some are complex and need further investigation, some need long term and some need short term solutions. Most of the problems can be solved by the Government while others can be solved by traditional and local leaders. They include insufficient personnel, working material and equipment, human-wildlife conflicts, cultural and traditional conflicts, rampant poaching and encroachment of farmers into protected

areas. These problems vary in intensity and priority in various places. The general assumption for protected areas wildlife management is that all animals in the protected areas are protected. This may not be true for birds in general and to parrots in particular which can easily move in and out of the protected area. Grey Parrots may have more habitat resources outside the protected area than inside it and spend more time outside than inside. In this way, they are more vulnerable to poaching and other human threats as observed in Korup (Tamungang, 1997).

One of the most important and urgent problems was insecurity in protected areas. For example, in September 2010, two protected area guides (Eco-guards) were killed in Bouba-Ndjida National Park by poachers. The poachers also killed ten elephants and escaped. In most of the protected areas located at the borders of the country (such as Lobeke, Takamanda, Korup, Campo Ma'an, Mengame, etc), most professional poachers come from neighbouring countries and they have far more advanced guns (used for war) than those owned by the Eco-guards.

4.5. Conclusion

All the roosts identified so far by this study were threatened by anthropogenic pressure! Those that roost especially on domestic palm trees are at risk of losing the habitat to humans. Those that roost on trees or palms around human habitations were vulnerable to human predation and at the same time habitat destruction. The birds were noted to feed heavily on some economic tree species such as plums and oil palm nuts thereby reducing the economic yield of the farmer. Various methods were adopted for chasing them away or trapping or killing the birds including shooting with guns and catapults. This is again another type of parrot-human conflict. Logging of nest trees for timber, farming and infrastructural development brings about the destruction of nests which might be containing eggs or fledglings. One nest can be used for the reproduction of many generations of parrots. The scarcity of nesting sites due to forest exploitation was seen as a major limiting factor on Grey Parrot population rate. One of the most important and urgent problems was insecurity in protected areas. A lot of infrastructural and security material procurement, recruitment of new staff, updating of training strategies for wildlife management remain to be improved upon by the Cameroon Government.

Photo. 4.1.. A fruiting plum tree with a red piece of cloth attached on it to scare away Grey Parrots (above). The parrots usually get habituated with the piece of cloth and then come to feed on the fruits

Photo. 4.3. Left over plum fruits from a meal of Grey Parrots. These birds have a wasteful habit of feeding on fruits in the wild

Photo. 4.2. Grey Parrots feeding on a fruiting palm tree around the banks of River Ntem (Below)

Photo. 4.4. Harvesting of mangroves for socio-economic activities is one of the causes for parrot habitat degradation

Photo. 4.6. Many parrot habitats have been lost to Commercial timber exploitation

Photo. 4.5. Concession into a forest to extract timber. During this process hundreds of useful trees to the parrot are destroyed

Photo. 4.7. An invasive plant species is fast spreading and taking over parrot feeding sites (clearings) in the Lobeke National Park

Photo.4.8. A typical roosting perch of a Grey Parrot on a palm frond.

Photo.4.10. Apart from using palms as a roosting site, Grey Parrots also feed on the oil palm nuts

Photo.4.9. Roosting Grey Parrots on palm fronds in Ndikinimeki

Photo.4.11. Villagers usually visit the roosting site of Grey Parrots in the morning to pick up feathers, especially the red ones for sale.

5. PARROT TRADE AND EMERGING CHALLENGES

5.1. Extent of the trade

Cameroon has been a melting pot for the commercialization of parrots for the past three decades until forced by the international community to slow down her parrot trading activities and justify the future sustainability of the remaining parrot population in the country. Generally, the legal trade in parrots has been drastically reduced throughout the national territory since 2006. Many parrot traders and trappers we met in the field were looking for alternative income generating activities such as farming and provision trading. The parrot trade begins with the trapping of the birds from the wild.

5.2. Trapping techniques

Parrots are captured all year round depending on the demand, parrot species behaviour and the trapping method. They are either captured in the day or night, depending on the site and method used. For example, villagers usually capture most parrots during fruiting periods of trees like the plum (*Prunus* spp.), which ripens during the rainy season, when they come in large flocks to eat plums. Capturing methods vary from one part of the country to another but popular techniques are the gum and stick and nets. Most parrot casualties are as a result of the trapping method used, poor handling and transportation difficulties. Parrots are captured both during the day and night and all year round, but the Cameroon Forestry and Wildlife Law forbids night hunting. Some of the techniques are forbidden by the Cameroon Forestry and Wildlife Law, such as the use of chemicals and explosives, which kill the birds indiscriminately.

5.2.1. Trapping methods

A summary of capturing methods is presented below:

1. *Glue and stick*:- The sap (latex) of some wild plants and broom sticks from palm trees are used for trapping the birds in two major ways.
    a. At roosts, using a long bamboo and glue on broom sticks to bind their wings thus disabling the bird from flying.
    b. At feeding sites, the broomsticks are rubbed in glue and placed on tree branches and they stick on the feathers of the birds. As such, they are not able to flap their wings and as such they fall from the tree. In this case, tree branches may be used to hold the broom sticks instead of bamboo.
2. *Nets:*- Fish nets are usually used and the bird gets itself entangled in them. They are used at:
    a. Feeding sites on groundnut farms and swampy areas where the birds usually feed on weed and soils (geophagy).

b. They are also used at roosts where they are pinned on two or more poles. The birds are then frightened from the opposite direction to the net. Due to fright they fly in the opposite direction and get entangled in the net.

3. *Thread and sticks:-*
   a. A nylon tiny thread is made in the form of a trap and tied to a stick and driven into the ground at feeding sites. This type of trap catches the bird on the leg.
   b. They are also used at roosts whereby the thread is trapped on the spot where the bird perches to roost. It catches the bird on the leg.
4. *Climbing a tree* to remove the young parrot from the nest. Existing known nests are monitored by observing activities of parent birds at the nesting site especially during the breeding season.
5. *Felling a tree* to remove juvenile birds from the nest. This method is rarely used because it is cumbersome to fell a tree. The method is frequently used when the tree can be felled and used for timber. In this case, the villagers wait until they are sure that there are chicks in the nest before felling the tree. Many drivers of timber exploitation companies have reported catching young parrots when the trees are being felled in the forest.
6. *Use of pepper* and some other natural products to suffocate a bird at roost. This method is not widely used and the use of chemical products to catch animals is banned by the 1994 Forestry and Wildlife law in Cameroon.
7. *Use of anaesthesia* and tranquillisers on birds at roost. The use of chemical products to catch animals is banned by the 1994 Forestry and Wildlife law in Cameroon.
8. *Use of catapult* to shoot the bird in flight or on a perch. This is a common traditional method used for catching bird for local use in villages. The bird is usually shot dead and it is eaten as food. Useful parts of the bird like the red feathers, head or legs may be removed and preserved for sale or used for traditional medicine. This method is not used for getting birds for commercial purposes because the output is very low. Most people use this method for pleasure (as a hobby).
9. *Use of a gun with cartridges*: - This is another traditional method for getting the bird in the village. Usually, it is the local or traditional gun (also called dane gun) that is used. A modern gun is hardly used and the bird is obtained dead, caused by the cartridges or pellet used for loading the gun. This method is mostly used by people who want to get the feathers and other body parts of the bird for traditional use. Some villagers told the investigators that it is not economical to use a gun to shoot a parrot because the price of loading the gun is higher than the benefit to be obtained from the dead parrot, if is to be used as food.

10. *Use of bow and arrow*:- This method is very rare in Cameroon though it was reported to be used in some villages especially during the fruiting season of plums, when the birds come around farms and human settlements.
11. *Picking them from the forest floor*:- In some parts of the South West, West and Centre Regions, it is believed that when a parrot's leg touches the ground, it cannot fly again. In this helpless situation, villagers can easily pick them up. They further believe that a parrot may be flying and lose its spittle to the ground. In an effort to pick up the spittle, its legs may touch the ground and such a parrot cannot fly again. The bird is then caught by a human. We got such a parrot from a teenager in a village in the support zone of the Korup National Park, he picked the bird from the forest floor and it was looking very sick. We treated it with antibiotics and multivitamins and the bird got well. This experiment is a clue to suggest that the parrot that is picked from the forest floor may be sick and not that it has lost its spittle as traditionally interpreted. Further research is needed on such parrots for more scientific conclusions.
12. *Use of hand held explosives:-* This is the most dangerous method of killing the Grey Parrot. It was reported in South and Centre Regions. The poacher uses hand held explosives to kill parrots that gather in large flocks at feeding sites. He then gathers them, chops off the heads, legs and feather and preserves them dried. The preserved body parts are sold locally and/or and smuggled out of Cameroon for sale. Such body parts are said to be used by traditional doctors. This method of catching parrots is the most dangerous ever employed in Cameroon on parrots and the culprit is seriously punished by the 1994 Forestry and Wildlife law of Cameroon.

5.3. Transportation

The method used for the transportation of wild parrots is a major factor that determines their survival rate for subsequent utilization. Generally, the shorter the distance between place of trapping to the aviary, the better the success rate. Unfortunately, parrots are nowadays mostly found in remote parts of Cameroon with difficult means of accessibility by road. Some trappers do not care much to reduce mortality (by taking good care of the birds before and during trapping) especially if they trap their birds illegally. As such, they can stuff as many parrots in a cage or box as possible, and place them in obscured and poorly ventilated places to pass through police checkpoints unnoticed. Some illegal trappers stuck live parrots in baskets covered with thick clothes or stuck them in spare tyres and other unfavourable means for transport to cities and towns. Many trappers hold parrots in a cruel and uncaring manner and do not bother about the agonizing cry of the bird. In most cases, the trappers lack the basic training and experience

in holding a wild bird well. Some of them say that "it is just a bird" and so, as such, can be held in any manner without caution or pity.

Some birds die in transit also from physiological stress, lack of food and drinking water. The trapper may introduce food items in the cage that the wild caught bird is not familiar with and it refuses to eat. All sexes and ages are captured and no breeding season is observed. This study estimated that 3-5 parrots die out of every 35 from the forest before arriving at the trappers' home. Therefore, out of 3500 trapped parrots, 300 - 500 (8.57 – 14.29%) of them were vulnerable to die. The more check points on the road and the longer the road, the more the likelihood that more parrots will die. There is also a possibility of disease transfer when sick birds are mixed with healthy ones. However, experienced trappers have a higher probability of their parrots having low mortality rates during transportation. People who transport parrots with their valid documents suffer fewer losses of parrots and their parrots experience less stress and as such are healthy.

5.4. Utilization methods

Parrots are widely used in many cultures and traditions in Cameroon. Methods of use vary from one culture to another depending on the objective of use, but it can be consumptive or non-consumptive. Non-consumptive use such as parrot tourism is highly encouraged because it is more conservation friendly. The use of this bird is evident in the many indigenous names by which the Grey Parrot is called in Cameroon.

Uses of parrots include the following:

1. *Companions or house pets*:- Parrots are widely used in more urban areas than rural areas as household pets and companion birds.
2. *Source of income/revenue*:- The government and individuals trade in parrots as a source of income or revenue. Millions of francs CFA are obtained yearly from the parrot trade in the treasury of the Cameroon government. Many family incomes were raised and jobs obtained through the parrot trade.
3. *Guards/security:*- Depending on how a parrot is trained, it can notify the owner of the compound when a stranger or a strange animal comes around at night or during the day. In Akoabas village in the South Region, a shop owner trained a Grey Parrot and kept it in his shop. During periods of few customer visits to the shop, he goes behind the building to do something different. When a customer comes into the shop, the parrot alerts him with a special call. He then comes around and attends to the customer.
4. *Reporters and Messengers*:- It is believed that Grey Parrots can report events that took place at home to the bird owner during his/her absence. Several stories and incidences

were narrated on the field of how the Grey Parrot reported events that took place in the compound in the absence of the master or mistress. We were also told that the bird can be trained to carry verbal messages to neighbours.

5. *Just for fun:*- Many people keep them in the house just for the fun of it. It is amusing to hear a parrot speak the local language of the owner or to greet its owner in the morning using the local language.
6. *Decoration:*- It is used as a decorative animal in the house, both alive and as preserved specimens.
7. *Symbol of affluence:*- It is believed (especially by Hausas in the northern regions) that only rich people can afford to keep parrots in their houses.
8. *Song composer:*- In certain parts of Cameroon like Douala, it is believed that musicians learn and compose songs from those of the Grey Parrot.
9. *Saviour bird:*- In some tribes like the Ngolo tribe in Ndian Division, the Grey Parrot is not killed or eaten (regarded as a holy bird) because it saved the life of a woman from a warrior-enemy.
10. *Use of body parts or whole body*:
    a. In Yabassi locality, feathers are used in traditional medicine to deliver a child who has mystical powers.
    b. Title holders (mostly men) use red feathers to indicate their positions in their villages or societies. This practice is more pronounced in the South West and Littoral Regions. In the North West and West Regions, the red feather of the Bannerman's Touraco is mostly used for the same purpose.
    c. In the East and South Regions, it is believed that if a person eats a whole parrot, he will become a stronger fighter, live longer and also become intelligent.
    d. The tongue of a Grey Parrot is used in traditional medicine to enable a child who does not speak well or fluently to improve in speech. Musicians also use this method to improve on their vocal acuity.
    e. The heart and brain are used similarly in traditional concoctions to improve intelligence.
    f. The eyes are also used in traditional medicines to enable a child to see beyond normal vision (having the *third* or *fourth* eye).
    g. The claws are used similarly to improve on the fighting ability of an individual especially warriors and wrestlers.

11. *Wisdom and mythical bird:* There are many stories, myths and wise-sayings told about the Grey Parrot in Cameroon. Most of the stories, myths and wise-sayings depict the wisdom, nobility and intelligence of the Grey Parrot.
12. *Food:* Parrots are eaten in a few villages in South Eastern Cameroon (mostly Pygmies) as a source of protein.

5.5. Stakeholders of the parrot trade

5.5.1. Trappers

Trappers are usually young men between the ages of 20-45, who have acquired experience on trapping techniques. The knowledge is usually acquired through going to the field with older trappers. Generally, most of the trappers live in villages, trap parrots and travel to urban areas to sell or supply to their masters. Two categories of trappers were identified:

Part-time trappers

They trap the birds seasonally when they are abundant such as during plum (*Dacryodes edulis)* harvesting seasons. They also carryout this activity when there is a special demand from a middle man such as an exporter. This type of trapper has an alternative and major source of income (such as a cocoa farm) on which he depends.

Full time or professional trappers

They trap all year round and have regular outlets for selling the birds. Most of them live in semi-urban areas but go to villages to trap. They have middlemen such as exporters or local sellers who buy the birds to sell. Questionnaire analysis shows that 54% of the trappers were married and 40% single, 94% of them were males and only 4% were females. This was the first time to document females as trappers in the parrot trade in Cameroon.

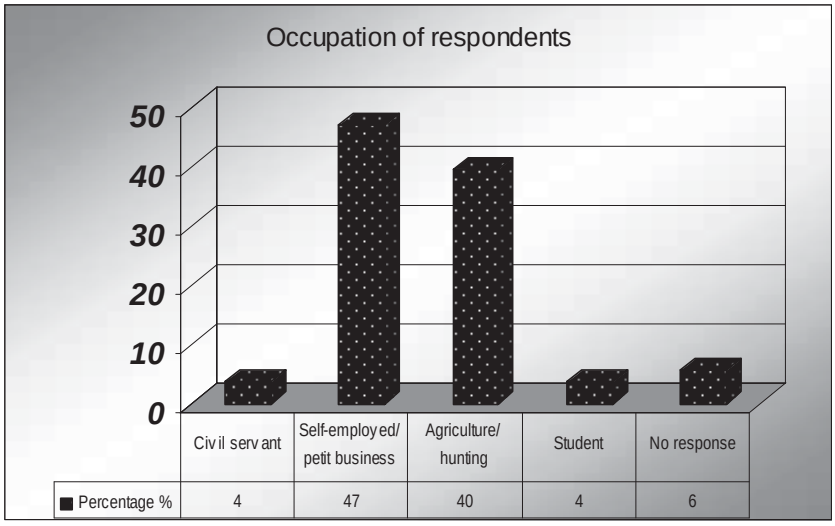


Fig. 5.1. Occupation of parrot trappers

The survey further revealed that 47% of the trappers were self-employed with parrot trapping and small businesses (Fig. 5.1.). Judging from the fact that 54% of them are married

with children and extended families to take care of, it is obvious that they must have an alternative means of generating income. This was the same situation with the second group (scoring 40%) who carried out hunting and subsistence agriculture. Civil servants (4%) were also involved in the trapping as a part time job to augment their low salaries. Students (4%) also found time during weekends and holidays to trap parrots as additional income to get school needs.

5.5.2. Village Communities

A majority of land space settled by people in Cameroon is occupied by rural communities. Most villagers depend on subsistence agriculture for a livelihood and revenue. Apart from raising domestic animals as a major source of protein and revenue, they also hunt for livelihood enhancement. In Cameroon, over 90 % of the wildlife resources are found in the rural areas and the villagers are the primary custodians of this national patrimony. Each forest belongs first to a village but the government can use it as a protected area or for any other development activity. In this way, the villagers remain stakeholders of any government project being developed in their community. The rural communities therefore have an important role to play as stakeholders in the sustainable parrot conservation and exploitation in Cameroon.

Communities are supposed to receive some royalties from the government and trappers for conserving parrots in their forests. This will go a long way to let them know that they are stakeholders in parrot conservation and this will also encourage them to take care of the wild parrots. 92% of the respondents indicated that parrot exploiters do not give them incentives for trapping their parrots (Fig.5.2).

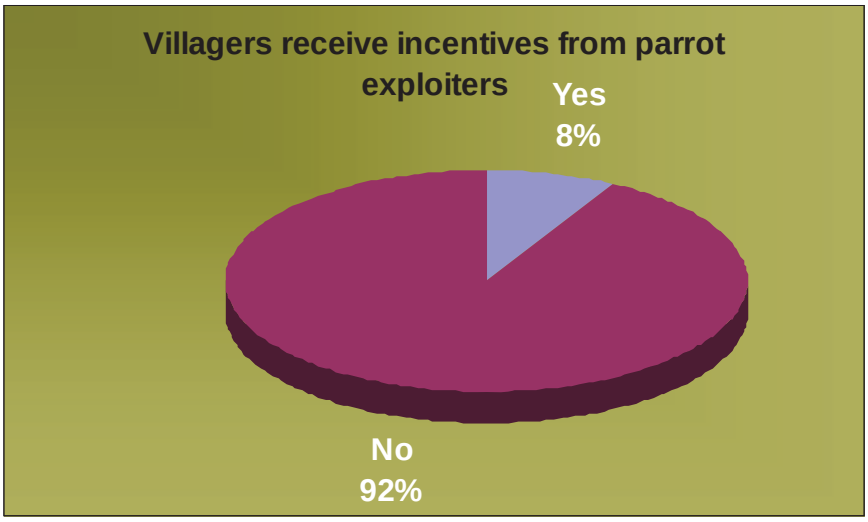


Fig.5.2. Distribution of responses on whether or not, parrot trappers give incentives to villagers

When asked whether parrot populations in their forests were increasing or decreasing over the year, 42% did not have an answer while 31% said that they were increasing and 20% indicated

that they were decreasing. Their answers are not based on any scientific judgment but they give an idea of what they have in mind about the parrot population trends in their regions. The number of Grey Parrots captured in an area over time can help wildlife managers and policy makers in taking management and policy decisions for the benefit of resources and the people. Fig.5.3 shows that 84% of the population did not know how many parrots were harvested from

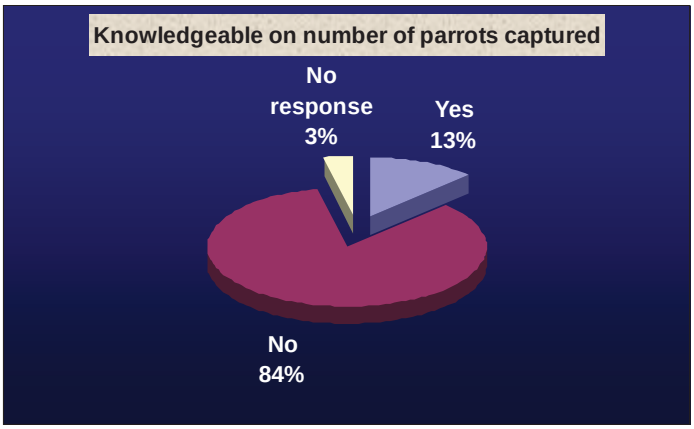


Fig.5.3. Knowledge on the quantity of parrots captured in forests in the country

their forest and only 13% had an idea. This is an indication that sensitization is needed for the parrots to continue to thrive in the forest under the protection of the rural communities. There is also need to revamp the channels for information flow from the government to the communities and *vice versa* as a sustainable parrot conservation tool in Cameroon.

5.5.3. Middlemen (Exporters and local traders)

The parrot trade is made up of a big network of people in Cameroon ranging from trappers in the villages through middlemen in urban areas to consumers both locally and internationally. Middlemen can either be people who buy to sell locally or who buy from trappers and export directly. Middlemen who sell locally do not usually buy many birds at a time because they want to reduce the risk of taking care of a large number of birds, which is usually very expensive in the event of them not having many customers. The local sellers are not many in Cameroon and they are not comparatively rich people like the exporters. The local sellers hardly get permits to operate their businesses except for KK Parrots (local seller) in Douala who wants to obtain legal documents for the business. Some local sellers sell to exporters when they have birds in large stock. All middlemen depend on trappers and some of them have up to 20 trappers spread in different parts of the country where there exist different species of parrots. They supply parrots to them on arrangements usually through mobile phone calls or particular periods of the month at particular prices.

Exporters cannot operate without permits or licences if they have to export their birds

legally. By virtue of their legality, they have certain basic standards to meet in preparing their birds for export as required by MINFOF and CITES. We had difficulties in meeting local parrot sellers except for KK Parrots. Most of the information was obtained from exporters.

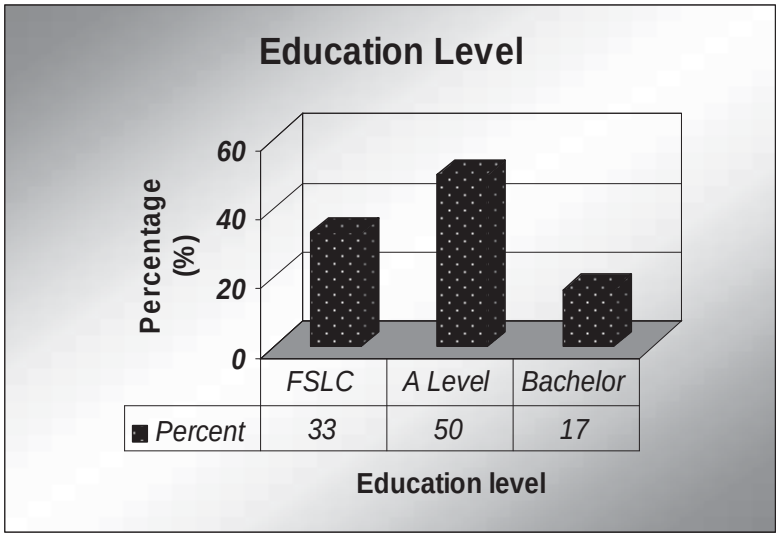


Fig. 5.4. Educational levels of parrot traders expressed in percentages

Nearly all the middlemen were married (83%), with children and extended family members to take care of. Some of them have children in universities in Cameroon and abroad. The few that were not married still promised to get married. Marriage in the Cameroonian tradition is acceptance of responsibility to take care of a larger family, which implies an improvement in the source of income. The parrot trade is a good source of income for many middlemen.

Trading the Grey Parrot by middlemen:- The most preferred age of parrots in the trade (according to middlemen) is the young ones (33%) followed by the rest of the age ranges with 20%. Their major reasons for preferring young parrots are that they are easily domesticated, less aggressive and can easily talk faster than the old ones. According to them, some customers prefer old parrots since they are more resistant to climatic and habitat changes and therefore have a higher probability to survive than the young ones.

The number of parrots that die (losses) with the middlemen prior to export was also of interest to the investigators. 33.33% of the respondents indicated that 0-3 parrots out of supply of 20-30 birds usually die. Another 33.33% of the respondents indicated that 3-5 parrots out of a supply of 20-30 birds usually die. This high mortality rate in this case is enhanced by capturing techniques, handling and transportation method and the domestication process. Unfortunately, the trappers and middlemen hardly have any formal training in trapping and handling of the birds.

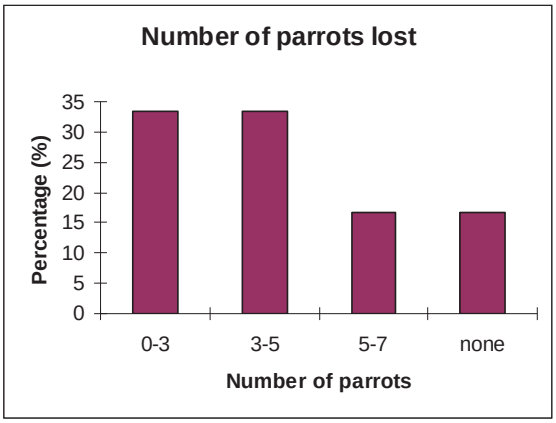


Fig.5.5. An estimate of the number of parrots lost per unit supply to a middleman

When the middlemen get the birds, they either export them or sell them locally. Customers in Cameroon come principally from Douala (20%), South West Region (Limbe, Buea, and Kumba) with 20%. However, 40% of them get customers from Douala, Yaounde and the South West Region. The Parrot trade is price driven. The higher the price, the more lucrative the trade and the more people will want to be involved. Parrot prices in the country are usually very low compared to prices abroad and as such, any middleman who has the opportunity of selling parrots abroad will not want to miss it.

The recent ban on parrot exports from Cameroon by CITES brought a lot of problems to exporters who had stocks of parrots in their warehouses. Over two thousand parrots were in captivity in Cameroon of which some had been in this condition for more than one year pending export conditions to be favourable for export. Some of these exporters approached MINFOF but the authorities were reluctant to refund their trading fees because all the money was deposited in the state treasury and was not easy to get back.

5.5.4. Government

The Government of Cameroon is in charge of the conservation and management of wild parrots in Cameroon. This is carried out directly through MINFOF or in collaboration with related ministries like the ministries of Finance, Tourism, Environment and Nature Protection, National Security, and Agriculture and Rural Development. MINFOF has a special department headed by a director, which is in charge of Wildlife Management, conservation and exploitation known as the Department of Wildlife and Protected Areas.

MINFOF also works with national and international NGOs such as LAGA, WWF, WCS, CWCS, IUCN, and CITES to implement policies and developmental projects in forestry and wildlife management.

5.5.4.1. Trade management and regulation in Cameroon

MINFOF is the major institution concerned with the management and regulation of the parrot trade in Cameroon. The major instrument used for trade management and regulation is the 1994 Forestry and Wildlife Law. Results of this study from the central administration, regional and Divisional delegations of MINFOF reveal the following:

i. Issue of permits

The licensing process is carried out in DFAP in Yaoundé. The number of legal exporters ranged from 10-20 for the past ten years. Some exporters have been in this business for over sixteen years. Though the law states that capturers are supposed to obtain licenses, this is not usually carried out regularly. Exporters also act as capturers and have their agents who act as their workers. In this case, they photocopy their licences and give to them to use for capturing parrots. The Forestry and Wildlife law does not permit this practice.

ii. Parrot traffic and poaching control

There are controls at checkpoints in most parts of the country, which are carried out regularly by MINFOF staff and other security departments such as police and Gendarmerie services. For controls of parrots in warehouses for exports, they said that this was carried out every three months.

iii. Litigation

Information from the field indicated that the number of offenders ranged from 0-2 occasionally per month. Most of the parrots were transported in public or private vehicles through checkpoints on highways by licence owners. Poachers may go through the bush to escape checkpoints. The offenders are punished using the provisions of the 1994 Forestry and Wildlife Law. Seized parrots from offenders (smugglers or poachers) are:

a. Sent to the Mvog-Betsi zoo in Yaounde or the Limbe wildlife Centre.
b. Publicly auctioned to legal exporters.
c. Publicly auctioned to the general public.

MINFOF works with non–governmental organisation in the country to handle the defaulters in wildlife products in general.

iv. Royalties paid to the rural communities

The government does not pay any royalties to the rural communities protecting and conserving parrots (in particular) in their forests. There is a global sum paid by government to communities for the exploitation of forestry and wildlife resources in their forests. The money for licences or permits and other levies are paid directly to the Ministry of Finance and such money is used for public expenditure.

v. CITES AND MINFOF partnership

The government of Cameroon is a member of CITES. Hence MINFOF works according to CITES rules and regulations in the parrot trade. The CITES yearly export quota for parrots was 12 000 from 1998 to 2006.

5.6. Parrot smuggling and trafficking networks

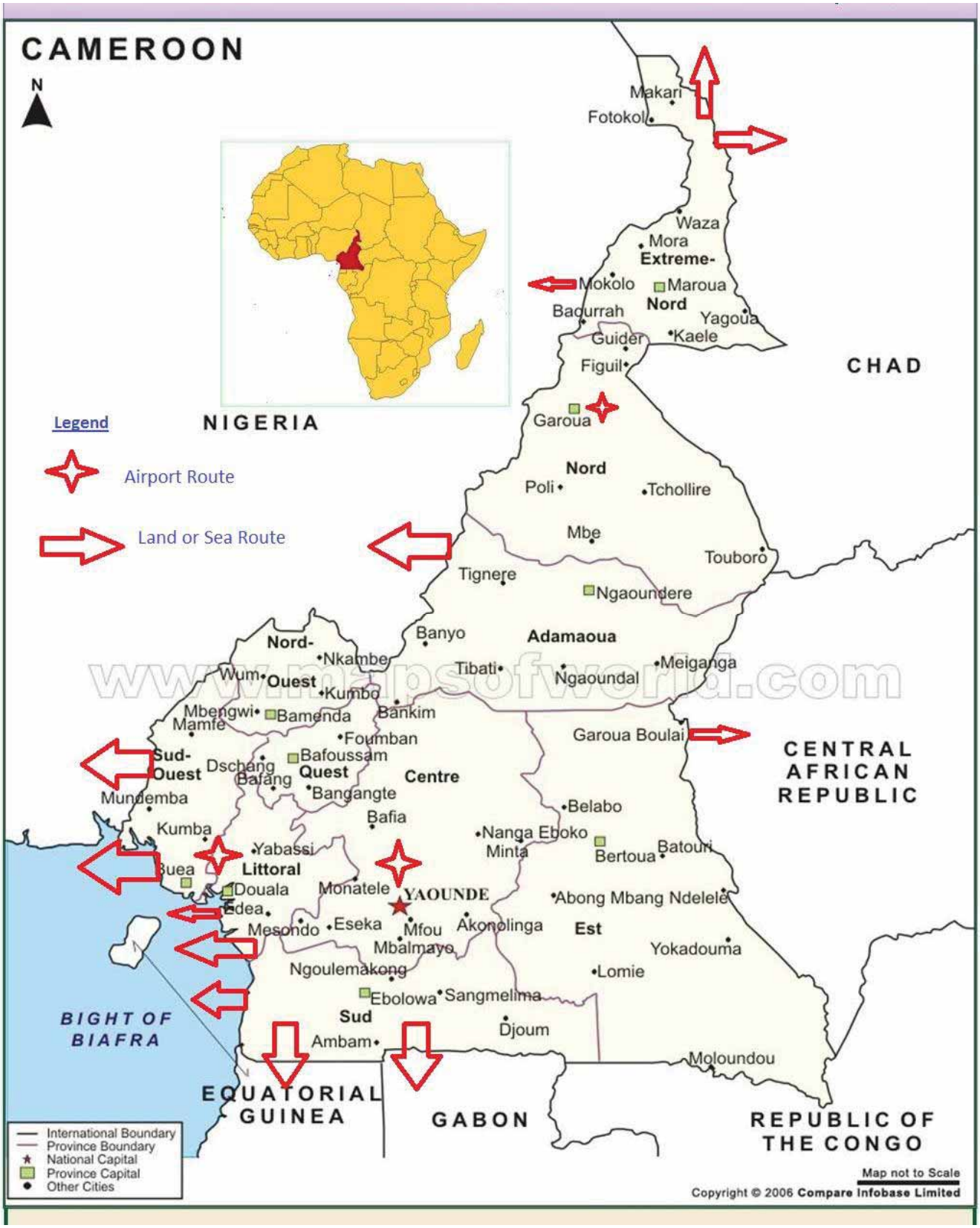
There are two types of smugglers in Cameroon.

Nationals: This category of smugglers does not have the legal documents. They believe that they can succeed in the trade without these documents. They smuggle and sell locally in big towns or export to neighbouring countries, where the birds are re-exported as parrots from that country.

Foreigners in the trade: A majority of foreigners in the trade in South-western Cameroon come from Nigeria and Ghana; in northern Cameroon, they come from Chad; and in the Eastern part, they come from Central Africa. They have agents in Cameroon who are nationals and collaborate with them to get the birds. They usually bring gifts as incentives to the village chiefs to obtain permission into their forests. Nigerians smuggle the poached birds to Nigeria by land or by vehicle or by sea and bribe their way through checkpoints. Ghanaians get into the Atlantic coast and go by boat to Ghana. This study discovered some of the routes used for smuggling and trafficking of parrots from Cameroon (Fig.5.6):

- From Magba and Bankim area to Kano in Nigeria. Nigerians who buy the parrots' are mostly Hausas. While in Nigeria they export the parrots as Nigerian parrots to Saudi Arabia, usually through the Kano Airport.
- From Douala and Tiko through the creeks by boat to Nigeria or to Ghana.
- From Mamfe, Kumba, Ekondo Titi and Mundemba by creeks and sea to Nigeria (Calabar Airport from where they are exported to Saudi Arabia) or to Ghana.
- From Lobeke, Moloundou to the Central African Republic.
- From Campo Ma'an, Kribi, Kye Ossi to Equatorial Guinea and Gabon.
- From Kousseri to Chad Republic.

These routes are also used to smuggle parrot body parts, especially to Nigeria, South Africa and Saudi Arabia. Smuggling of live parrots and parrot parts in the country is common along the Cameroon-Nigeria, -Chad, -Central African Republic and -Equatorial Guinea borders. When the parrots from Cameroon arrive in the transit country, a certificate of origin and other documents are established in the country as parrots from that country for re-export. This is a big loss to Cameroon for their resource to have a false identity in the international wildlife trade.



Map Source: www.mapsofworld.com

Fig. 5.6. Routes used for smuggling of parrots out of Cameroon

5.6.1. Summary of some problems of the parrot trade in Cameroon reported by legal parrot traders

4. Illegal trapping and trafficking of parrots in many parts of the country,
5. Clandestine exports of both live parrots and body parts,
6. Higher taxes in Cameroon compared to other African countries in the range states,
7. Unavailable statistics on trade dynamics for policy, management and conservation informed decisions,
8. Softer control laws in neighbouring countries thereby encouraging trans-border parrot smuggling from Cameroon,
9. Unpaid debts to traders by MINFOF accrued from the 2006/2007 trade session,
10. Tough export conditions on exporters imposed by CITES.

5.7. Export trade and implications on the wild parrot population

Border posts of Cameroon play an important role in controlling export and import of parrots. This study shows that the airports are major points in the parrot trade. There is no official parrot trade in parrots with neighbouring countries like Nigeria, Chad, Central African Republic etc. There are three international airports in Cameroon: Douala, Yaounde-Nsimalen and Garoua. However, the Garoua airport hardly deals with commercial export of parrots. Official sources have it that the few parrots exported from Garoua Airport are for personal use or are smuggled.

Parrots are rarely exported by ship since too much time will be spent on the way before arrival at their final destination. Parrots are hardly imported into the country but transit airlines do carry parrots and pass through the Douala and Yaounde-Nsimalen Airports. Even if these parrots spend a few hours or days at the airport, the Chief of Post for Wildlife at the Douala Airport told us that proper handling services are given to them as they do to those from Cameroon. From the statistics obtained from the airports, the species of parrots exported is hardly mentioned in their documents. They are just recorded as parrots. However, field survey of warehouses of exporters by this study show that about 90% of them were Grey Parrots.

Available statistics indicate that, 29,318 parrots were exported from 1996 – 2006 at the Yaounde-Nsimalen airport as opposed to 36,648 during the same period exported at the Douala Airport. Total number of parrots exported during this period of ten years is 65,966 (Table 5.1.), giving a yearly average of 6,597 parrots.

Table 5.1. Number of Parrots exported from Cameroon Airports from 1996 to 2006

YEAR	NSIMALEN	DOUALA	TOTAL
2006	0	2196	2196
2005	2368	486	2854
2004	?	4930	4930
2003	?	4721	4721
2002	1200	7780	8980
2001	3750	5110	8860
2000	5301	3340	8641
1999	10180	1050	11230
1998	5800	?	5800
1997	115	931	1046
1996	604	6104	6708
TOTAL	29318	36648	65966

The trade is becoming more popular for traders as they make more money out of it and at the same time more unpopular for conservation biologists and conservation NGOs. Conservationists argue that the trade is a potential threat to the continuous survival of wild parrots, especially in their range states. On the one hand, it is important to recognise and support the ecological role of the wild parrots in their various ecosystems. On the other hand, CITES in recent years has recognised the potential threat to wild parrots by the trade and has placed a lot of importance on the production of management plans to justify export quota determination.
As a result of these on-going conflicts of interests, parrot export quotas are being regulated and restricted in many exporting countries.

Further information was obtained from UNEP-WCMC to compare export values with the rest of the African countries, from 1990 –1996. Total export values for this period ranged from 12 parrots from Equatorial Guinea to 114,838 from Cameroon (Table 6.2.). Cameroon was closely followed by the Democratic Republic of Congo (DRC) with a value of 65,729. Cameroon had a mean export value of 16,405 between this period (1990 – 1996) with highest export values in 1991 (19,843) and lowest in 1996 (11,791). Mean export values from the rest of the African countries during this period were significantly different (P0<.001). Mean export value from Cameroon was compared with that of DRC and the rest of the 23 African countries. Results were significantly different (P<0.001).

It should be noted that export values among the 23 countries were not significantly different. Cameroon led in all the years except in 1994 when DRC had 13,380 (Table 5.2.). The sum of results from the above six countries (Cote d'Ivoire = 8%, Guinea = 7%, Democratic Republic of Congo = 27%, Togo = 5%, Senegal = 3%, and Ghana = 1%) gives 51% as compared

Country	Year							Total	% of total export
	1990	1991	1992	1993	1994	1995	1996		
Angola	2	6	16	14	17	16	27	98	0,04
Benin	507	7	306	33	5	0	18	876	0,37
Cameroon	18194	19843	18572	18538	12154	15746	11791	114838	47,94
CAR	1	1	1	6	30	42	0	81	0,03
Chad	2	0	0	0	9	25	201	237	0,10
Congo	41	47	25	25	310	4	2	454	0,19
Cote d'Ivoire	5603	3174	7524	1918	9	9	12	18249	7,62
Equ.Guinea	0	0	0	0	1	10	1	12	0,01
Gabon	35	0	15	2	25	28	20	125	0,05
Ghana	3439	2	2	4	5	10	2	3464	1,45
Guinea	9195	3260	2944	1	400	202	123	16125	6,73
Guin Bissau	1	0	1	6	2	2	2	14	0,01
Kenya	15	13	9	12	4	4	0	57	0,02
Liberia	59	0	0	0	0	0	0	59	0,02
Mali	70	0	0	1	0	3	45	119	0,05
Niger	0	5	8	11	2	1	2	29	0,01
Nigeria	19	25	39	14	9	11	15	132	0,06
Sao Tome	0	0	0	0	0	2	70	72	0,03
Senegal	1696	3090	135	1418	5	105	120	6569	2,74
South Africa	0	0	0	0	0	206	0	206	0,09
Tanzania	3	43	0	14	2	0	0	62	0,03
Togo	3833	3939	3195	783	105	40	13	11908	4,97
Uganda	6	7	2	3	1	0	2	21	0,01
Zaire	283	3859	17738	8983	13380	10324	11162	65729	27,44
Zambia	4	4	3	3	2	3	0	19	0,01
Total	43008	37325	50535	31789	26477	26793	23628	239555	100

Table 5.2. Yearly export of parrots from African countries from 1990 – 1996

to Cameroon alone with 48%. The mean export value of Cameroon (48%) was combined with that of Democratic Republic of Congo (27%) and that gave a total of 75%. So the two countries exported 75% of Grey Parrots from Africa from 1990 – 1996.

5.8. Economics of the trade and its impact on the wild population

Prices of parrots vary in different parts of the country and are principally controlled by the place of purchase of the bird, buyer's personality, seller's personality and time or season of sale. Apart from the Grey Parrot that is sold in most parts of the country, lovebirds are sold at roadsides in Adamaoua and Far North Regions, the rest of the species in the trade are predominantly sold in Douala and Yaounde. The mean price for a pair of lovebird was 31,998 FCFA (48.78 Euros). Mean price of Jardine's Parrot was 18000 FCFA (27.44 Euros). The Grey parrot accounted for over 90% in the trade in Cameroon. Mean price of the Grey Parrot was

40,000 FCFA (60.49 Euros), the lowest prices were recorded in the rural areas while highest prices were obtained in the cities.

Abroad, Cameroon parrots sold at about 200% of the price in the country. This is not the net price as other expenses were not deducted. Comparing these local and international prices of the Grey Parrot which accounts for 90% of the parrots in the trade, there is a large price margin and/or benefit to the dealers. Ironically, this study reveals that the high price margin is being exploited mostly by foreign partners in the trade. The local trader and exporter receive higher benefits from the trade than the trappers and villagers. The local custodian/trapper of the parrot therefore is just an onlooker in terms of the benefits from the trade. With this situation, the local trapper with all the risk involved in trapping will remain poor.

However, if good measures have to be put in place (see project 10 of the Management Plan) to harness the benefits to the benefit of the local dealer, they can go a long way to improve the living conditions of the poor communities. In this context, the Cameroon government is at the forefront through the MINFOF to facilitate the harnessing of the benefits of this trade via the scrupulous implementation of the suggestions at all levels of the business. This implementation will then shape the advantages of this trade thereby boosting the economic benefits of the local dealers, hence reducing poverty. Technically, the study revealed that about 33% of 20-30 parrots die in the course of trading i.e. from trapping to selling out of the country. This requires good trapping and handling techniques to be taught to those involved in the trade by MINFOF.

5.9. Wildlife law enforcement

Several NGOs and government agents and village communities are expected to enforce the wildlife law and regulations in Cameroon. Enforcement in this direction involves educating the people on the importance of the law and ensuring that the law is applied practically on the field. When applicable, arrest and prosecutions are mitted on persons contravening the law. Since 2007, MINFOF, LAGA, and WWF in collaboration with the National Security Forces have has been involved in tracking down parrot poachers and traffickers in the country (Table 5.3). From 2007 – 2010, over ten lawsuits on parrot trafficking have been examined and others are still awaiting judgement (Table 5.3). Parrot trafficking is a big international network in Cameroon and so far a majority of the foreign dealers identified come from Ghana and Nigeria with Cameroonian accomplices. All parrots confiscated so far have their origin from forests in various parts of Cameroon. Most confiscations were carried out when the birds were being transported from one part of the country to another or were being smuggled out of the country. The illegal trade activities have been more frequent since 2007 following the moratorium on parrot export by CITES from Cameroon. The government is increasingly tightening security against poaching in

protected areas and trafficking of wildlife in general in most parts of the country and border routes. This is evident from the fact that there has been no arrest of parrot poachers and traffickers in the past two years in the country.

Table 5.3. Arrest/prosecution of persons for parrot crimes by MINFOF, LAGA, national security and others from 2007 – 2010 in Cameroon

No	Date	Arrest/prosecution
01	July, 2010	3 parrot dealers of Ghanaian nationality arrested in Cameroon were tried in court and sentenced in Douala, Littoral Region.
02	May, 2010	A parrot capturer belonging to a trafficking network was arrested in Kribi, South Region, while trying to illegally trade in parrots
03	February 2010	3 international parrot traffickers were arrested in Douala, Littoral Region, with more than 300 parrots seized. This arrest also exposed more information on this illegal trade.
04	January 2010	Court case hearing started in Douala against 4 international parrot traffickers following the seizure of 1000 parrots from them
05	December2010	3 international wildlife traffickers arrested in Buea, South West Region with about 700 parrots. Corruption attempts were observed from the traffickers.
06	December 2009	-300 parrots were seized in Douala, littoral Region -Court hearing started against 4 international parrot traffickers arrested and detained in Douala
07	April 2008	A manager of a logging company of Greek nationality arrested with 2 live chimpanzees, 1 live De Brazza's monkey and 5 Grey Parrots in Cameroon.
08	November 2007	2 Ghanaians arrested in Douala Airport trying to export 500 parrots with falsified documents.
09	December 2007	An international Wildlife trafficker arrested in Douala with 720 parrots

Data source: www.laga-enforcement.org/

With the increasing trends in wildlife crimes associated with technological development, we need more NGOs in Cameroon, not only to enforce the law but also to raise the low level of wildlife conservation awareness. The 1994 Forestry and Wildlife law is relatively good but the level of public awareness and enforcement of the law is still low. Confiscated parrots are sent to zoos for rehabilitation and subsequent release.

5.10. Parrot rescue and management

The past three years have been problematic for Grey Parrots in Cameroon as five consignments of the birds were confiscated from illegal exporters by LAGA and law enforcement agents of the

government. All the five consignments were confiscated at the Douala Airport and four of them were being shipped to various destinations (Abidjan, Balrain, Mexico City and Kuwait).The last group was seized along the Douala-Tiko road destined to be shipped to Nigeria through the small seaport of Tiko. According to information from the LWC, two consignments were received in 2007 making a total of 1220 Grey Parrots. Out of this number, 261 (21%) of them died, 824 (68%) were released (Table 5.4). In 2009, one consignment of 503 birds was received and from that number, 134 (27%) died, 151 (30%) were released and the remaining stock that year was 218 Grey Parrots. In 2010, another consignment of 832 birds was brought to the Centre and added to the stock of

Table 5.4. Rescued Grey Parrots and management by the Limbe Wildlife Centre From 2007 - 2010

Date	GPs arrived	Old stock	Total	Died	% Mortality	Released	% Released	Remaining stock
12/2007	1220	0	1220	261	21%	824	68%	0
2009	503	0	503	134	27%	151	30%	218
O2/2010	832	218	1050	216	21%	834	79%	99
12/2010	618	99	717	321	45%	156	22%	240
Grand Total	3173	317	3490	932	27%	1965	56%	------

Note: % Mortality represents birds that were dead on arrival and those which subsequently died at the centre
*Last data collected 23/05/11 Data source: Limbe Wildlife Centre, Cameroon

the preceding year to make a total of 1050 birds. Out of this number of birds, 216 (21%) died, 834 (79%) were released and 99 of them were still in captivity by the end of the year. In 2010, two consignments were brought, one in February and another one in December with a total of 1,450 parrots for that year (Table 5.4). During these three years, a total of 3,490 parrots were confiscated, 932(27%) of them died and 1,965(56%) were released. Mortality rate per group ranged from 21% in 2007 to 45% in 2010. The report from the LWC explained that the high parrot mortality incurred with the last parrot consignment was as a result of bad trapping and handling techniques: many parrots died before and after arrival at the centre from multiple factors, including stress, poor feeding methods and glued feathers from trapping activities.

When the PARROTPRO team visited the centre a few days after the arrival of the parrots, many of them were observed to be sick, dirty and stressed. By 23 May 2011, about 240 Grey

Parrots were still in captivity at the centre pending treatment and subsequent release. The Centre management explained that those still held in captivity could not fly because their flight feathers were badly trimmed prior to their arrival. For some of the birds, they had to pluck the stem of the feathers to enable new and proper flight feathers to grow and this natural process takes time to be achieved. Other problems identified were lack of cages for rescued parrots, lack of funds for management of the parrots, lack of trained personnel for management of the parrots etc. MINFOF, some NGOs and associated government security (gendarmerie, police) personnel have been doing a great job to crackdown parrot traffickers in the country recently. Thanks to the efforts of the staff of the Limbe Wildlife Centre and its partner NGOs who worked hard to raise funds and prepare the birds for release. There would have been fewer problems if the sector was well organized and sustainably managed by the government of Cameroon and associated NGOs. It should be noted that the major goal of the LWC is tilted towards the rescue and management of apes rather than birds. The parrots were housed in cages designed for apes and not for birds. A lot of difficulties were faced in relocating apes to create space to house the birds when each consignment arrived. For future releases, it is important to monitor the fate of released parrots. Results could be used to improve on the strategies for further releases and the ecology and behaviour of the birds. There is more need for parrots to be released in protected areas in the interior of the country, as opposed to release at border or frontier sites. There is also an urgent need for specialized infrastructure for rescue operations and management, trained personnel and defined management strategies for rescued parrots in the country.

5.11. Comparison of exploitation related threats

Major threats to sustainable parrot conservation in Cameroon are directly linked to anthropogenic pressure either directly on the parrot or on its habitat. Five major threats to the parrot (Fig. 5.8) were identified from the questionnaire sampling: forest deforestation, trapping for food, diseases, trapping for trade and predation by wild animals.

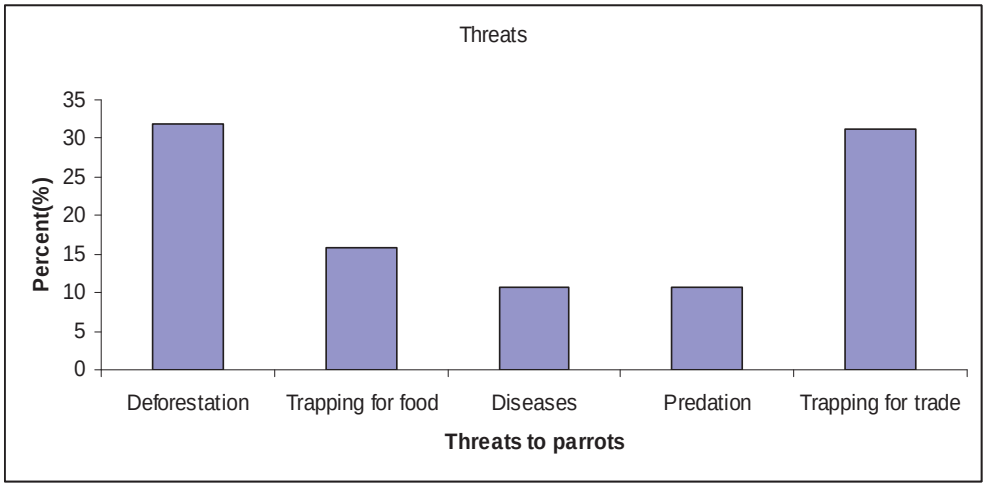


Fig. 5.8. Estimated threats to parrot conservation in Cameroon

Irrespective of region, deforestation and trapping for trade were the major threats of 31% and 32% respectively, with a combined value of 63%. Trapping for food is comparatively rare though with 15% occurrence, diseases and predation have been recorded in the field but their levels are sustainable and are not a cause for concern now. Deforestation and trade are factors which are of urgent concern for the survival of parrots in Cameroon.

Habitat and trade threats are the frontline threats to sustainable parrot conservation in Cameroon. The rainforest is the most exploited habitat in the country due to its richness in biological diversity. At the regional level, the South West, Littoral, South and East harbours the two largest cities (Douala and Yaounde) of Cameroon and many towns Ebolowa, Kribi, Kumba, Limbe, Bafia, Edea, Nkongsamba, Mamfe, Lolodorf, Bertoua, Yokadouma, Sangmelima and many satellite towns. With their ever expanding development activities, these urban centres have contributed immensely to fragment and degrade the surrounding forests. Other pieces of land have been taken up for large plantations of cocoa, coffee, rubber, banana and oil palm. Most of these plantations are owned by the government and multi-national companies, who build camps around them to lodge the ever increasing number of workers of the business. The construction of road networks, dams and electricity power lines add to the loss of the rainforest vegetation.

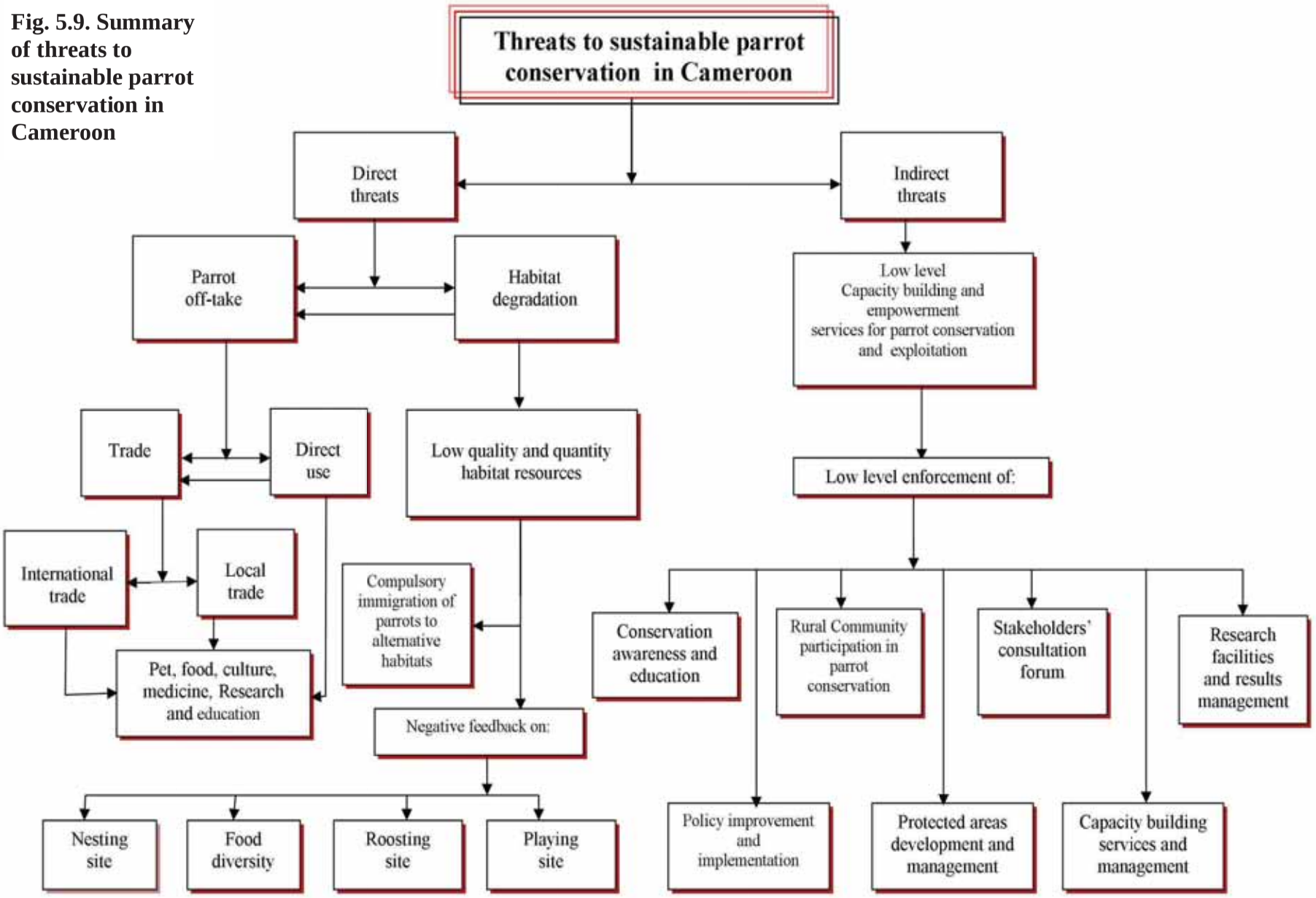
Timber exploitation is an old practice of the Government and the local population in this country. Since the Government uses timber as a source of national revenue, most of the thick forest areas have been exploited and some are presently undergoing exploitation. Once forest exploitation has taken place, parrot habitats are degraded or lost, causing the birds to migrate to other regions which may be out of Cameroon's territory. Apart from the companies exploiting timber, there is also the local population that exploits timber for the construction of houses. Most of the traditional houses in the rainforest areas are entirely made with planks; consequently, indigenous populations through this means destroy a few parrot habitats; but this destruction is about 10% of that carried out by timber exploitation companies. In most cases, traditional timber exploitation is illegally carried out. Commercial timber logging especially in the south-east forest which houses significant numbers of parrots has also been reported to encroach into protected areas. The felling of trees destroys the nesting sites of Grey Parrots which are normally found in holes in large and old trees. Together, these negative factors are causing population declines of Grey Parrots in Cameroon.

5.12. Major Challenges of the parrot trade in Cameroon

From questionnaire analysis, it is apparent that exploitation of parrots (legal and illegal hunting) accounts for about 32% of the conservation problems on this sector. Other problems associated with the parrot trade in Cameroon including the following:

1. *Non-respect of exportation quotas*;- Many instances were recorded where Cameroon did not respect the CITES parrot export quotas. CITES has reacted to this excess exports by sanctioning Cameroon.
2. *Non-regulation of capture*;- Non-regulation of capture for instance, one parrot trapper could operate in many localities with the same permit and could trap as many parrots as possible using as many trappers as he can. At the end of a trapping session, he only declares the number that he is permitted to export. The rest can be sold locally or smuggled out of the country.
3. *Corruption*;- Corruption cases were reported in the parrot trade sector and some government officials were implicated.
4. *Low level of local community involvement*;- There was low level empowerment of the local communities in parrot conservation and trade management.
5. *Too many permit holders*;- Too many permits were issued per year for parrot exploitation and there was insufficient monitoring of their trapping activities in the field. In most cases this deficiency leads to over harvesting and over exportation of parrots. We found out in the Mbang Sub-Division (Kadey Division) that about 84,000 parrots were captured in that locality from 1997 to 2007 (information given by a former parrot trapper). Suppose similar captures were carried out in all other localities of Cameroon where parrots exist, we would have exploited all parrots in this country.
6. *Insufficient staff personnel*;-There was insufficient staff personnel to carry out required level of law enforcement (especially to track down parrot smugglers at the frontiers with neighboring countries), inventories and administration
7. *Unqualified personnel;* Some important positions were occupied by unqualified personnel and this could result in low to poor output.
8. *Ignorant of the law:*- Most traders and government agents were ignorant of the relevant sections of the Forestry and Wildlife law related to their functions.
9. *Law is not adapted to realities*:- The Forestry and wildlife law and its instruments of application were not adapted to realities of sustainable exploitation of parrots in the country. There is therefore the urgent need of the law to include policies on parrot conservation and management
10. *Control posts lack relevant documents:*- Control posts did not have copies of signed authorizations with which to work on verification and control of transit parrot exploiters
11. *Insufficient information on International trade laws:*- The law on the international trade on endangered species and the different implementation acts were not available to many control posts and delegations in the country and so MINFOF and security agents found it difficult to carry out their related work effectively.

Fig. 5.9. Summary of threats to sustainable parrot conservation in Cameroon



5.13. Conclusion

The parrot trade is big business in the Cameroonian society involving the public and the private sectors. It begins with the capturers and villagers in the rural communities (who are custodians to parrot resources in the forests) and extends to the middlemen. MINFOF is the major arm of the government that implements laws and regulations concerning the parrot trade. MINFOF works with CITES to determine exploitation quotas of parrots for a given period, determines individual quotas to be exploited by middlemen and supervises export procedures in the country. The driving force behind the trade is poverty alleviation and unemployment. Major suppliers of Grey Parrots are those in the rainforest areas of Cameroon. At the regional level, three regions (South 31%; Centre and East, 23% each) are the major sources of Grey Parrots in the country. The international trade from Cameroon is financially motivated as exporters get much higher prices per bird abroad than their local counterparts. With the ban on parrot exports imposed by CITES since 2007, many exploiters in Cameroon have a problem of selling their birds locally because prices are very low. The Grey Parrot has been the most exploited and exported wild bird species in Cameroon. From 1981-2005, Cameroon exported 367,166 with a yearly average of 15,299. From 1990-1996, Cameroon exported 48% of the Grey Parrots in the 25 countries in Africa, thereby positioning itself as a leading exporter of the wild Grey Parrots in the world. Official figures do not account for parrots that are smuggled across borders into neighbouring countries; those that are consumed locally and those that die in the process of trapping and transportation. Parrots are smuggled across the borders of neighbouring countries and as far as Ghana. The illegal parrot trade remains a big challenge to the Cameroon Government.

Photo. 5.0.
Artistic Grey Parrot, carved out of the endangered Ebony tree in Cameroon

Photo. 5.1. Villagers releasing trapped parrots by poachers in Mebang forest

Photo. 5.3. Guards destroying an abandoned net used by parrot poachers in the Lobeke National Park

Photo. 5.2. Heads of Grey Parrots seized from poachers in south-east Cameroon. They used hand thrown explosives to kill the birds and chopped off the heads for sale. (left).
Red feathers of the parrots plucked and packaged in nylon bags , to be smuggled out of Cameroon (right)

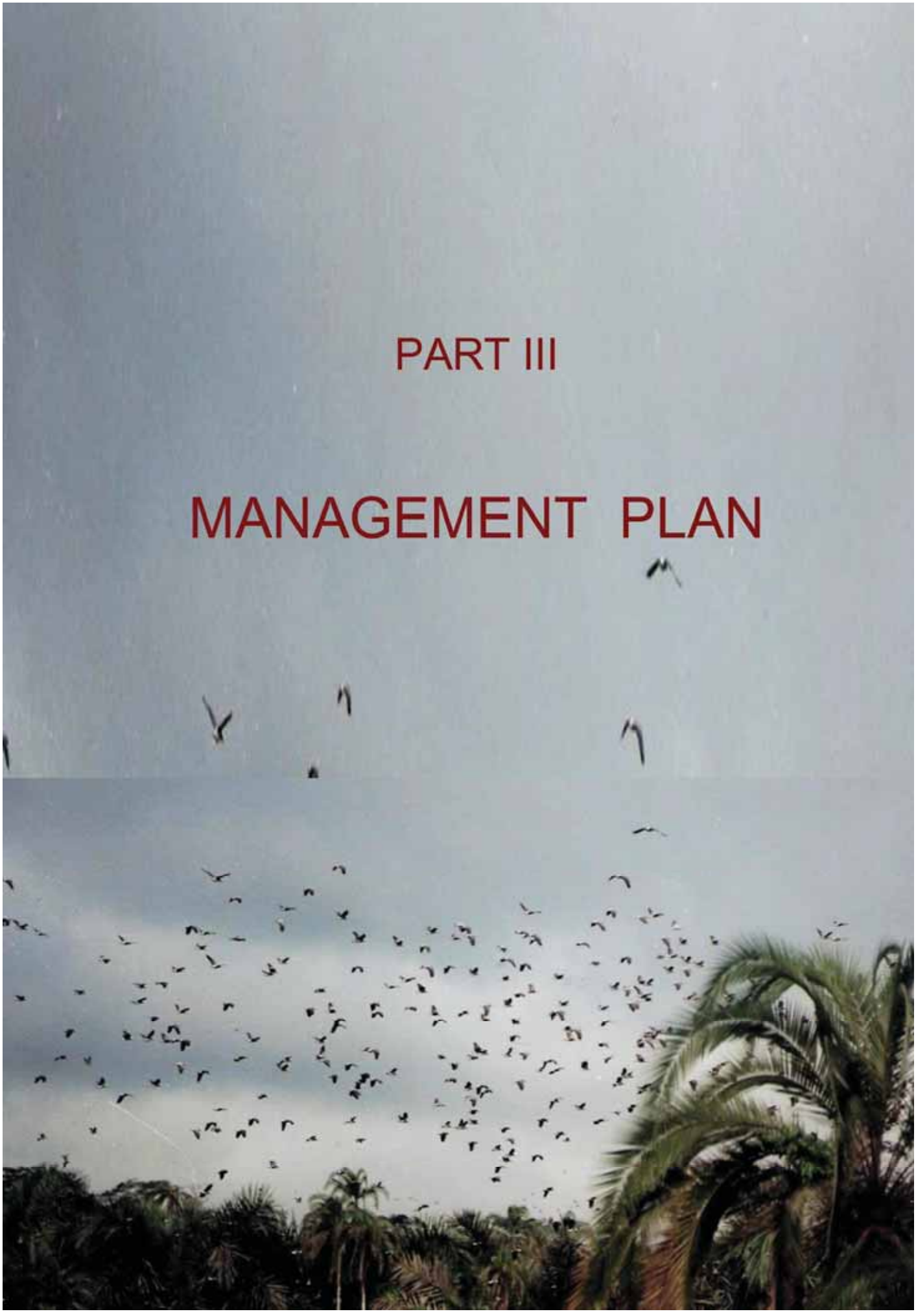
Photos Credit: WWF-Jengi Project, Southeastern Cameroon

Photo 5.5. An abandoned parrot cage at a feeding site in the forest by poachers

Photo. 5.6. A sample cage used for exporting Grey Parrots from Cameroon.

Photo. 5.7. Red feathers of Grey Parrots displayed in bottles in public markets for sale.

Photo. 5.8. A village title holder wearing red Grey Parrot feathers as a symbol of authority in Mundemba locality



PART III

MANAGEMENT PLAN

6. INTRODUCTION TO THE MANAGEMENT PLAN

6.1. Why a management plan for the Grey Parrot?

This management plan is a flexible strategy that provides guidelines to be used to enhance the development and sustainable conservation and exploitation of Grey Parrot resources in Cameroon. Real commercial exploitation of parrots started in Cameroon in 1981 and eventually this country became a leading country in the world in parrot export till 2006. Obviously, it is important to evaluate our successes and failures after about three decades, as a way forward to consolidate fresh impetus in this sector. Much success has been achieved within the said period and we can turn failures recorded so far into building blocks for future improvement of parrot resources management.

To this end, if the harvesting of parrots must be sustainable in Cameroon, it must be restricted to commercial traders with permits for both local and international markets. These traders must operate on the regional quotas prescribed by this study to make up the national quota. For this approach to be very effective, reliable markets must be identified and developed for legal parrot economic operators, as opposed to illegal ones. We should however, avoid falling into the temptation of overharvesting the parrots when the markets become more favourable. Another safety valve is that CITES should ensure that wild parrots are only imported from the range states that have certified their sustained yield programmes. This approach will go a long way to reduce the cost involved in sustainable harvest, eliminate most middle men and increase profit to commercial operators.

As it has been the case in most countries, it will always be easier to take parrots from the wild and sell them rather than to manage the population sustainably. This tendency stems from the fact that parrots are viewed as nobody's property (tragedy of the commons; Hardin 1968 and Beissinger, 1992) and their exploitation is hardly regulated by grassroot communities. Grassroot community empowerment and participation can mitigate this effect through sustainable conservation and regulation of the exploitation of their birds.

6.2. Objective of the management plan

To identify and implement projects that will increase the population of the Grey Parrot in Cameroon to its maximum sustained yield level, so as to enable harvesting of the surplus on a continuing basis.

6.3. Vision of the management plan

To increase the current population of Grey Parrots in Cameroon by 50% by the year 2016

6.4. Implementation strategy of the management plan

- An Integrated Management approach should be adopted and all stakeholders in the parrot sector should be involved at the level of implementation.
- Use the Management Plan during and after the period of implementation as an instrument of sensitization and conservation education on sustainable use of parrot resources thereby making parrot conservation more functional and profitable in Cameroon
- Use parrot conservation and management as a strategy to build technical and institutional instruments for sustainable wildlife management in Cameroon.

6.5. Scope and limitations of the management plan

All the sections of this plan have been identified to comply with the resolutions of the 22nd CITES Animal Committee meeting of July 2006 held in Peru and CITES Review of Significant Trade, document-SC55 Doc.17 of 2nd June 2007 (CITES, 2006; CITES, 2007).

Other features include the following:

- The plan is applicable in all regions of the country, and more particularly where parrots survive in captivity and in the wild.
- The implementation phase of the Plan is envisaged for five (5) years (2012-2016).

Photo. 6.1. Felling of trees for fuel-wood in Cameroon. The destruction of such trees without replacement easily leads to habitat loss for wildlife populations

7. HAVRVEST QUOTA AND GENERAL RECOMMENDATIONS

7.1. Modelling Grey Parrot harvest quota

Scientific research on parrots is generally a difficult domain to tackle (Wright *et al*. 2001; Bessinger and Bucher, 1992; Forshaw, 1989). This is perhaps one of the reasons why there is still a huge dearth of information on the natural history and population dynamics of African parrots (Clemmons, 2003; McGowan, 2001; May, 2001; Mullikan *et al*. 1992; Tamungang, 1996; Fotso, 1998 and Dandliker, 1992). This reason applies more to the African Grey Parrot, a leading bird-pet species in the world with high exploitation demands, but science is yet to uncover more scientific facts on its ecology, behaviour, rigorous population census and management methods (Tamungang, 1998 and Tamungang *et al. 2001*). The complexity of the moist rainforest habitat of the bird and its highly intelligent behaviour (Perperberg, 2007) coupled with a scarcity of resident African biologists willing to carryout studies on the parrot species are part of the problem.

Nevertheless, as a CITES requirement, we are called upon to provide a scientific and sustainable harvest quota for the Grey Parrot in Cameroon (CITES 2006; CITES, 2007). So far there is no published model for harvesting of the Grey Parrot anywhere. As a pioneer work on the development of such a scientific model for a harvest quota system on the bird, there are many challenges to overcome. A review of similar work carried out on other parrot species can throw more light on the extent of the challenges. Some attempts have been made to model the sustainable harvesting of neo-tropical parrots. A conservative sustainable yield model was proposed by Beissinger and Bucher for harvesting parrots in the absence of complete biological data (Beissinger and Bucher, 1992). The assumption underlying the model is that harvesting can be carried out when there is increase in population size, as a result of increased productivity and decreased mortality attributed to management of a local population. In another development, Rabinovich (2004) carried out a more detailed model for the sustainable harvesting of the Blue-fronted Parrot (*Amazona aestiva*) in the dry Chaco region of Argentina, using the logistic equation model. From data collected for thirty years, he estimated the intrinsic rate of natural increase (*r)* using six methods and the carrying capacity (*k)* using five methods. He also developed survivorship and reproductive curves to illustrate population and demographic trends of the bird. Furthermore, he incorporated environmental stochasticity into the model and ran it for different the parameters. Lastly, he presented the weaknesses inherent in the various methods used (Rabinovich, 2004).

Given the scope of this work, an attempt was made to produce a basic model for the sustainable harvesting of Grey Parrots in Cameroon, using the above theories and assumptions as

a foundation. However, we ran into difficulties due to insufficient data on the natural history and population dynamics of the bird. On one hand, we adopted the earlier approach of obtaining the harvest quota as a tiny proportion of the plausible wild Grey Parrot population (CITES, 2011b). On the other hand, we attempted a model for the intrinsic rate of natural increase for the Grey Parrot

7.2. Modelling the intrinsic rate of natural increase for the Grey Parrot in Cameroon

In order to inform policy on a sustainable harvest (offtake) of Grey Parrots, information is required on many parameters including; the intrinsic rate of natural increase (population growth rate), carrying capacity, age-specific fecundity schedule (maternity function), offspring age ratio, limiting factors to population growth, reproductive characteristics (age of first reproduction, annual rate of reproduction of mature females), age structure of the population, rate of survival, especially of juveniles. Field data on the above mentioned parameters have never been collected on the Grey Parrot and collecting such data is not an easy task. For example, it took more than thirty years of field work to obtain most of the above mentioned information for use in the management of the Blue-fronted macaw (Rabinovich, 2004). However, we can draw inspiration on the work carried out on the Blue-Fronted Amazon Parrot (*Amazona aestiva*) in the Dry Chaco region of Argentina to attempt the calculation of the intrinsic rate of natural increase (*r*) for the Grey Parrot in Cameroon.

Due to the absence of some information to be used for calculating '*r*' from wild Grey Parrots, we used information obtained from their counterparts in captivity. With available input data, Cole's formula (Cole, 1954) was used to estimate values of '*r*' for the Grey Parrot in Cameroon. The formula is given as:

$$1 = e^{-r} + be^{-r(\alpha)} - be^{-r(\omega-\alpha+1)},$$

Where *r* is the intrinsic rate of natural increase; α, is the age of first reproduction (4 – 6 years) in both captivity and wild. However, MacGowan (2008) estimated age of first reproduction to be 5 years in captivity; *b*, clutch size (2-4), MacGowan (2008) estimated 3-5 eggs and ω, age of last reproduction (30 – 60 years). Survey data from this study revealed that age at first reproduction could vary from 4 (under captivity) to 6 years (in the wild).

The solver procedure of Microsoft excel was used in estimating 'r'. Intrinsic rates of natural increase in different scenarios for Grey Parrots in Cameroon are reported in Table 7.1. Scenarios A, B and C show plausible estimates of the Grey Parrot in captivity while scenario D shows estimates in the wild. Results obtained show that 'r' varies from 0.51 to 0.56 under captivity and 0.38 in the wild.

Table 7.1. Estimates of intrinsic rate of natural increase (*r*) for the Grey Parrot in Cameroon, under different scenarios

Parameter	Scenario A	Scenario B	Scenario C	Scenario D
α	4	4	4	6
ω	60	30	60	30 - 60
b	3	4	4	3
r	0.51	0.56	0.56	0.38

Table 7.1., shows that the intrinsic rate of natural increase is sensitive to 'α' but does not change with changes in 'ω' between 30 and 60. Assuming that 'α' takes a maximum value of 6 years (under natural conditions), the intrinsic rate of increase for the Grey Parrot in Cameroon is 0.38. The higher intrinsic rate of natural increase in captivity is a significant indication that there is good potential to increase Grey Parrot population growth rate for conservation in the wild through mass breeding in captivity. This can constitute one of the strategies to be adopted in any Grey Parrot conservation programme in Cameroon.

In a similar study, Rabinovich (2004) estimated the intrinsic rate of natural growth for the Blue-Fronted Amazon Parrot in different scenarios and concluded that the range between 0.2 – 0.4 was sustainable around a carrying capacity of 20fledglings/km^2. Unfortunately such age structure data is not yet available on wild Grey Parrot populations for comparison.

7.3. Carrying capacity of the Grey Parrot population

The carrying capacity is the population level of the Grey Parrot that produces a maximum sustained yield at any given time. The carrying capacity estimates were approximated by considering actual density estimates as a baseline for carrying capacity (Rabinovich, 2004):

(*Density = Number of individual animals/Surface area occupied)*

We use parrot densities earlier calculated in section 3.7., to determine carrying capacities. From Table 7.2., the carrying capacity (*k*) ranged from 0.49 GPs/km^2 in the South West Region through 1.72 km^2 in the South Region to a maximum of 2.16 GPs/km^2 in the East Region.

Table 7.2. Carrying capacity of Grey Parrots as a percentage of available forest

Region	Forest Area/km^2	Carrying capacity. GPs/km^2
Centre	14058.47	0.74
East	62559.15	2.16
Littoral	6973.58	0.50
South	27275.43	1.72
South West	9893.17	0.49

It should be noted that the regional carrying capacities derived by this study are well below the ecological carrying capacities (Table 7.2). Therefore the carrying capacity of the available forest

in this study is not a regulating factor of demographic trends of the Grey Parrot in Cameroon. A major regulating factor is the scarcity of suitable nesting sites discussed in section 4.3.

7.4. Regional harvest quota determination

Harvest quotas for the different forest regions were determined taking into consideration factors that negatively affect the natural intrinsic growth rate of parrot populations in the country such as:

- habitat degradation which results in scarcity of nesting sites,
- poaching and trafficking of parrots for the pet trade.

It is difficult to quantify the above factors and as such makes the task of determining Grey Parrot harvesting quotas more difficult. Efforts to use harvesting models proposed by Beissinger and Bucher (1992), and Rabinovich (2004) were futile due to absence of sufficient data on natural history and population dynamics of the Grey Parrot in the wild. However, we adopted the approach used in the previous study of the Grey Parrot in Cameroon by Fotso (1998). He estimated that there were 300,000 – 500,000 Grey Parrots in Cameroon and proposed a harvest quota of 12,000 GPs per year which was endorsed by CITES. We took the median of this population size (400,000) and calculated the harvest quota (12,000) as a percentage of it. We obtained 3% as the proportion of that population size. Instead of also using the 3% as used in 1998 to determine the harvest quota, we used a lower sustainable limit of 2% and an upper maximum limit of 3 %. The assumption is that the above mentioned negative factors have affected the harvest quota in the country by 1% and will be corrected by carrying out the projects in the proposed Management Plan. We have also taken into consideration that the intrinsic growth rate of the wild parrot population in Cameroon is 0.38. The regional population sizes of the Grey Parrot derived earlier (see section 3.7.3) are used below to calculate harvest quotas for each region. We then used a range of 2% - 3% of the national parrot population to determine regional and national harvest quotas (Table 7.3).

Table 7.3. Harvest quotas of Grey Parrots for each region

Region	Grey Parrot population size	Parrot harvest quota/year	
		Sustainable limit	Maximum sustainable limit
Centre	10403	208	312
East	135128	2703	4054
Littoral	3487	70	105
South	46914	938	1407
South West	4848	97	145
Total	**200780**	**4015**	**6023**

The harvest quotas were made up of lower regional sustainable limits with range from 70–2703 GPs and upper maximum sustainable limits with range from 105 - 4054 GPs. At the national level, the lower limit was 4015 GPs and the upper limit was 6023 GPs (Table 7.3). The Littoral and South West Regions have very low harvest quotas reflecting the history of high anthropogenic pressure on both the bird and its habitat. Generally, the upper limit has more significance than the lower limit as population sustainability problems arise when the upper limit is exceeded. The regional quota approach has a major advantage over the previous national "global" quota approach in that harvesting is carried out as a proportion of the known population size in each region. The overall impact is a reduction in regional threats and extinctions that are plausible through over exploitation as practiced in the past. It also enables management to be aware of regions with endangered parrot populations such as the North West and West Regions, and take adequate management measures to develop them to sustainable levels.

7.5. National harvest quota versus national export quota considérations

It is important to make a distinction between a *national harvest quota* and a *national export quota*. For this document, a national harvest quota is the total number of parrots (both alive and dead) that is legally permitted to be removed from their natural habitat by man in the national territory. Similarly, a national export quota is the total number of parrots (both alive and dead) that is legally permitted to be shipped from the country. From these definitions, we can deduce that the national harvest quota for Grey Parrots in Cameroon will always be greater than the national export quota, as parrots that are consumed locally in the country are part of the national harvest quota. Local parrot consumption and illegal parrot harvesting are not taken into consideration when determining harvesting quotas. They constitute a problem for national harvest determination since it is never easy to quantify them.

7.6. National harvest quota determination

Considering the above factors which impede sustainable parrot population growth (with an intrinsic growth rate of 0.38) in the country and the management challenges that lie ahead to be tackled, we recommend as follows:

1. A national harvest quota of 2–3% (4000 - 6000 GPs per year) is possible in Cameroon from 2012 – 2016.

2. A national export quota of 4000 – 5000 of GPs is feasible in Cameroon from 2012 – 2016.

3. A maximum of 1000 GPs could be sustainably harvested for local consumption (used as pets, captive breeding stock, etc) in Cameroon from 2012 – 2016. It should be noted that the 1000 GPs are part of the 2-3% mentioned in 1 above.

4. In a year that harvesting quota for local consumption is not requested, a national export quota of 6000 GPs could be permitted.

5. The parrots should be harvested below regional maximum sustainable limits stated in Table 7.3., above.

Results on previous harvesting quotas on the Grey Parrot are rare and a few documented cases are not usually comparable. This stems from the fact that standardized methods for population studies of the Grey Parrot are not yet available and comparing such data does not make much meaning. However, it should be recalled that densities in the East and South Regions (where a bulk of the parrots would be harvested) were 2.16 and 1.72 GPs/km^2 respectively and the national intrinsic growth rate of the population was 0.38. In a similar study on the Blue-fronted macaw (*Amazona aestiva*), Robinovich (2004) showed that an intrinsic rate of natural increase between 0.2 to 0.4 and a carrying capacity around 20 fledglings/km^2 were most plausible for sustainable harvesting. He further suggested that if the Blue Macaw populations were maintained in stable densities of 6-8 fledglings/km^2, an average sustainable harvest of 0.8 to 1.96 fledglings/km^2 could be obtained. In another study on the Black Vulture (*Coragyps atratus)*, Runge *at al*. (2009) proposed a harvest programme for the bird species which sought an equilibrium population size on the conservative side of the yield curve and the rate of harvest recommended was less than that which achieved a sustained yield. In the same way, we strongly recommend that the harvesting quotas for the Grey Parrot should be carried out well below the maximum sustainable limit of each region. As scientific knowledge continues to accumulate on the Grey Parrot, we hope to use it to develope harvesting models which can be used to compare results with similar studies in other parts of the world.

7.7. Conservation status and limiting factors to population growth

The high variability in regional harvest quotas shown in table 7.3 is indicative of the variety of factors that influence parrot populations at different levels in the regions. Such factors include, past history of harvesting, distribution and abundance of habitat resources (in quality, quantity and diversity), and human influences (demographic pressure, forest disturbance as well as community awareness on parrot conservation, practices and participation in such programmes). We can adopt the Cameroon classification system of wildlife threats to describe the regional conservation status of the Grey Parrot. Thus, out of the seven regions that harbour Grey Parrot in

Cameroon, two regions (North West and West) were listed in Class A^+, two regions (Littoral and South West) listed in Class A^-, one region (Centre) listed in Class B, and two regions (East and South) were listed in Class C (Table 7.4).

Some explanations could be advanced for the seemingly high quotas in the Centre and South Regions irrespective of the many towns, cities and agro-industrial plantations within them. We observed relatively high level of public sensitization on parrot conservation in Campo (in the South), Ndikinimeki (in the Centre), where the bulk of the parrots roost in villages close to human houses and gain protection from the villagers. Although the parrot habitats were located around human settlements, there seemed to be a good level sustainable co-existence between parrots and the inhabitants. Some form of community participation in parrot conservation and human protection of parrots from poachers was much advanced in Campo. The creation of a tourism management committee and construction of camps for tourists to use while watching parrots especially at roost was illustrative of this fact.

Table 7.4. Regional conservation status of the Grey Parrot in Cameroon

Region	GP population size	Conservation status	Explanation
North West	Very low	Class A^+	Class A (upper division) means that the birds are threatened with extinction. It is strictly forbidden to carryout any harvesting activity. Urgent restoration programmes are needed to bring up the population to sustainable levels.
West	Very low	Class A^+	
Littoral	3487	Class A^-	Class A (lower division) means that the birds are endangered. It is forbidden to carryout any harvesting activity. Urgent restoration programmes are needed to bring up the population to sustainable levels.
South West	4848	Class A^-	
Centre	10403	Class B	Birds are vulnerable to threat and can be harvested under administratively supervised conditions. Harvesting should be carried out well below the prescribed maximum sustainable yield.
South	46914	Class C	Birds are abundant. Legal harvesting can be carried out, but the maximum sustainable yield should not be exceeded
East	135128	Class C	

NB: Conservation Status is adapted from the Cameroon classification system of Wildlife threats

On the other hand, low population densities and low harvest quotas for the Littoral and South West Regions can be attributed to consequences of indiscriminate harvesting and destruction of nesting sites. Grey Parrots are secondary civility nesters. They frequently nest in natural cavities in *Terminalia* spp. especially in *Terminalia superba* (popularly called *fraquet*), which is also of high demand in house construction. Many low income earners use '*fraque*t' in constructing

houses, market centres and cheap furniture. There is intensive exploitation of this resource to meet the needs of the increasing local population or by timber exploiting firms to establish low-cost houses (locally called *"Kara-boat")* for workers. By indiscriminate felling of the trees, potential nesting sites are destroyed. Destruction of nesting sites constrains natural increase in parrot numbers, moreso because trees that produce these nesting sites are of low species density. Apart from trapping parrots for trade (both legal and illegal), the second limiting factor to their population growth is the scarcity of nesting sites which is of particular importance to the Grey Parrot because it does not create a nest cavity (secondary cavity nester) by itself, like a woodpecker does (primary cavity nester). A strategy to increase nesting sites in over-exploited areas would be to train communities on the domestication of tree species with a high probability of nest cavity formation like *Terminalia* spp. and use in their farming systems. This would serve the dual purpose of biodiversity conservation and provision of building materials. The fast growing and shed provision attributes of *Terminalia* spp make them suitable choices for reforestation programmes. The status of the Grey Parrot in Cameroon therefore called for serious sustainable conservation and management attention.

7.8. General recommendations

7.8.1. Parrot welfare and general death rate reduction

Results of this study show that about 30-50 out of every 350 parrots (8.6–14.3%) die during trapping and exportation. This estimate may be higher when the birds stay longer in transit conditions due to bad roads or poor handling conditions. The estimate may also be much higher when the birds are captured illegally and the poachers have to transport them through the forest using very poor handling conditions in attempts to evade security check points. It is recommended that:

1.1. All parrot trapping activities at night be banned.

1.2. Transportation of parrots should be banned from 19h00 - 6h00.

1.3. Standard cages and minimum transportation conditions should be prescribed for transporting parrots from trapping site to aviaries. For exporters, standard aviaries and cages for transporting the birds in should also be prescribed.

1.4. Trapping methods that usually result in poor parrot health and high mortality rates such as the glue and stick, shooting with a gun, felling a nest bearing tree and the use of chemicals and explosives should be added to the list of banned methods.

1.5. Similarly, some of the parrots that are kept in the country as pets survive in very poor conditions. The birds suffer from poor caging, feeding and health conditions. These poor captive conditions result in high mortality rates of the birds. It is recommended that seminars and

workshops/short educational programmes should be organized for parrot trappers, traders and keepers at least once a year for capacity building. The contents of such courses should include: - health methods for treatment and handling of parrots during trapping, transportation, and housing (caging). The trainer should also provide basic knowledge on the ecological, behavioural and habitat needs of the parrot.

1.6. Standard cages design and dimensions should be prescribed for all parrot species endemic to Cameroon, to be used by parrot pet owners.

1.7. A basic qualification code (such as minimum training and basic academic certificate) should be established for potential trappers, traders and pet keepers in the country.

1.8. Minimum requirements (documents, health needs, and financial obligation) should be prescribed to potential keepers of parrot/wild birds as pets.

7.8.2. Need to restructure and harmonize the parrot trade

The sustainability of the parrot trade in Cameroon depends on its structure and function. A well structured and managed trade has a high probability to be profitable for the benefit of both the people and wild parrot populations. The current structure has many short-comings including, lack of understanding of procedures to be followed by both traders and administrators; problems of information flow; and lack of coordination of stakeholders to achieve common goals of the trade. It is therefore suggested that the trade should be made more integrative and dynamic by involving all major stakeholders.

It is recommended that a guideline-document be produced identifying the challenges in the sector and outlining possible solutions. For the trade to be more functional, integrative, dynamic and profitable, the following points should be considered in the guideline document:

2.1. *Alternative income for parrot traders*: A majority of parrot trappers and traders (exporters) depend on parrot trapping and trading activities as their major source of income. Wherever there is a problem with the trade (such as the current ban by CITES and the EU), they find themselves in serious financial hardship. It is recommended that these parrot economic operators diversify their sources of income. They can take trading in wild parrots as a hobby instead of a profession.

2.2. Trapping season:- Parrots should not be trapped during breeding seasons. These seasons slightly vary from the south West to the East Region but the peak period is from June to October in most parts of the country. Trapping should therefore be carried out from November to April each year. Trapping should be limited to fledglings.

2.3. *Identification of trappers and traders*: All parrot traders should identify their trappers with names, photographs and copies of identity cards as sub-permit holders. They should be issued original permits to show that they are working for the designated traders. This permit should be carried along at any time the trapper or trader is in the field.

2.4. *Assigned place of trapping*: The region of the country and period for trapping parrots should be stated on the permit.

2.5. *Original copies of permit sent to MINFOF delegations*: Original copies of all issued permits should be sent in PDF format by e-mail to MINFOF regional offices, security and law enforcement agents where parrot trapping will be carried out and related NGOs concerned with wildlife law enforcement for monitoring. Original hard copies should also be sent to the above mentioned partners for confirmation of the PDF copies, more so because the hard copies may take more time to arrive than the e-mail copies.

2.6. *Verification and control of trappers*: Effective means of verification and management of parrot trappers before, during and after trapping should be set up. This action will go a long way to ensure that trapping rules are obeyed for the benefit of all the stakeholders in the sector.

2.7. *Period for issue of parrot trapping permits*: All permits for commercial purposes should be issued only in January every year. Such permits should expire at the end of December in the year of issue. This means that parrots that have not been trapped or exported within the above period cannot be carried over to the next year. This measure will ensure that yearly export quotas are not exceeded.

2.8. *Records keeping by permit holders*: The permit holders should keep permanent records of bird casualties, welfare and health care activities carried out on the birds for verification by MINFOF and law enforcement agents. Such statistics should be collected and incorporated in the national parrot database, and annual reports, to be used for informed administrative decisions.

2.9. *Committee for management of the parrot trade in DFAP*: A five man committee including a permanent secretary should be formed for the management of parrot trade related issues all year round in DFAP. This permanent committee will replace the adhoc committee which used to sit only twice a year. This measure will enhance accountability, coherency and improve records keeping in the sector.

2.10. *Local parrot traders*: Parrot traders in Cameroon can be divided into local and international traders. The local traders sell their parrots locally to pet lovers in the country and may also use them as a breeding stock. Conditions for obtaining a permit and material requirements for the two groups of traders may not be the same. But all of them should ensure the smooth functioning of the trade.

2.11. *Parrot trapping in protected areas*: Parrots should never be trapped in protected areas even by valid permit holders for the trade, except for research purposes, but under supervised conditions.

7.8.3. Encouraging rural community participation in parrot conservation

Rural communities are the backbone for any meaningful wildlife conservation practice. They are the custodians of the parrots that thrive in their forests. They know where the birds are and can easily predict their ecological and social interaction with a high degree of precision. The integrated approach to parrot conservation in Cameroon cannot be successfully implemented without regarding the rural communities with reasonable parrot populations in their forests as major stakeholders. The government should provide incentives to galvanise these communities towards sustainable parrot conservation through community development projects. In this way they will have a sense of recognition and responsibility to be vanguards of parrot management programmes and can become strong government collaborators.

Enhancing community level participation in sustainable parrot management will be a major breakthrough for wildlife management in Cameroon, since the level of grassroot wildlife conservation awareness is currently very low. It is therefore recommended that:

3.1. Village communities with reasonable parrot populations in their forests should be identified in the national territory. Each community be encouraged and supervised by MINFOF to form a CIG or CBO for sustainable parrot exploitation and conservation. Such a CIG/CBO should have a legal status and work with the chief of the village/community and government representatives in the locality.

3.2. The community/CIG/CBO should be taught how to create income generating activities for sustenance of their annual programmes.

3.3. The community should work with parrot trappers/traders in their region to ensure that the laws and regulations in this sector are fully implemented.

3.4. The community should be encouraged to promote wildlife/parrot tourism and any revenue obtained from such activities should be used for the benefit of the whole community.

3.5. The community should be assisted by the government, at least once a year with a livelihood project and capacity building programmes.

7.8.4. Bringing administration and information closer to the people

One of the major weaknesses of the current approach in parrot conservation and exploitation is that important decisions taken by the government concerning this sector are not well disseminated and implemented at the local level. In fact, there are information gaps from top to bottom and vice *versa*, people hardly claim/recognize their responsibilities. This shortcoming can be improved upon by creating and developing a national platform for parrot conservation and exploitation. Membership in the platform should be representatives of

community groups, NGOs and governmental agents actively involved in the parrot conservation and exploitation sector. The platform meeting should be held at least once a year, during which educative lectures, discussions and important management and policy decisions concerning parrot welfare should be reviewed or taken. The representatives will in turn carry home information acquired for dissemination and implementation in their various groups/institutions.

7.8.5. Improving on policy and law enforcement measures

High level wildlife law enforcement has remained a major problem in Cameroon. The 1994 Forestry and Wildlife law is relatively a good document but implementing it effectively in the field is a problem. Many of its provisions are consciously/unconsciously violated. People actively involved in the parrot/wildlife sector are ignorant of some of its provision. There is an urgent need for people to be sensitized on the implementation instruments of the law. Effective implementation of the law will involve provision of more infrastructure, equipment and personnel to deter and combat wildlife crimes in general. It is then recommended that:-

5.1. Print and audio-visual media, public lectures and conferences should be used to raise more public awareness on the related instruments of the Forestry and Wildlife Law related to parrot conservation, management and exploitation.

5.2. The war against corruption in the parrot trade sector should be enforced at all levels by the government and the civil society.

5.3. The government should enhance the level of vigilance, patrols and monitoring of parrot/wildlife crimes in the country. While the legal trade can be controlled, the illegal trade remains a huge problem as witnessed in the past five years. Most international trade routes are now known through results of this study. The best way to reduce poaching and trafficking of parrots is to step up vigilance and patrols especially at the country's borders including the air and sea ports.

5.4. Mixed troops of security officers should be encouraged and equipped especially with advanced fire arms, means of transportation and security equipment. In Protected Areas that share borders with neighbouring countries such as Lobeke, Mengame and Korup, Takamanda etc, eco-guards complained that the guns they have are far inferior to the ones used by poachers from neighbouring countries. In such a situation, the eco-guards run for safety instead of confronting the poachers.

5.5 Field personnel involved in law enforcement should be motivated to encourage their efforts through promotion in career grades and duty allowances.

5.6. More in-service capacity building/training should be provided on how to use modern techniques in monitoring, investigation and arrest of poachers/criminals.

5.7 There should be urgent improvement on the provision of modern infrastructure, equipment and materials necessary for effective wildlife law enforcement for field activities.

5.8. The government should frequently encourage conservation oriented NGOs for improved service delivery activities.

5.9. Prosecutions on parrot crimes should be speedily carried out to save more time for field investigation and monitoring.

5.10. Whenever discovered, corruption practices should be severely punished especially when they involve government officials.

5.11. Persons caught using banned methods for trapping/killing parrots such as chemicals and explosives should be given exemplary punishment to deter potential criminals.

5.12. Control teams should target markets and localities previously known for parrot trading activities for more investigations.

5.13. Control teams should regularly visit bird stations/aviaries and transit facilities to control permits, number of birds permitted, health status of birds and caging conditions.

5.14. Frontier stations such as airports (Douala, Yaounde and Garoua); seaports (Douala, Kribi); fishing ports (Limbe, Idenau; Ekondo Titi, Mouanko, Tiko; Isangele, Campo,Manoka etc.) and frontier roads to neighbouring countries be regularly inspected by law enforcement officers and wildlife law enforcement NGOs.

5.15. Another method to stamp out corrupt practices with respect to confiscation of parrots is to publicise the event immediately it happens using print and audio-visual media, indicating the number of birds and place of confiscation.

7.8.6. Parrot rescue and management

From 2007 – 2010, about 5000 parrots were rescued and housed in the LWC and the Mvog-Betsi Zoo in Limbe and Yaounde respectively. Generally, no specialised infrastructure has been built for rescued parrots anywhere in Cameroon over the years. There used to be a cage constructed for parrots in the Nvog-Betsi zoo but it got dilapidated with age. The LWC has never had any cage for parrots; though it has used ape cages for up to 4500 parrots for the past four years. It was only in 2011 that a flight cage for rescued parrots was built in the LWC. Parrot rescue operations also need trained personnel to manage them, as well as their food and health. A parrot rescue budget does not exist in Cameroon and when a consignment arrives at the zoo or LWC, it takes time for adjustments to be made from other budget sources for necessary and urgent assistance to be given to the birds. This time lag can result in more bird casualties. It is therefore urgent to set up a more functional and efficient structure to take care of rescued parrots in the country by:

6.1 Training personnel in basic parrot handling and management techniques.

6.2 Building a parrot rescue and rehabilitation centre in Cameroon.

6.3 Opening a special account for parrots' rescue and welfare management in MINFOF and eventual transfer of the funds to the NGO managing parrot rescue operations.

6.4. Produce a handbook on procedures (guidelines) for rescue operations, transportation, management and release of such parrots. Funding of such operations should also be described in the document.

7.8.7. International consolidation of Parrot conservation efforts

One of the resolutions of the 22nd Animal Committee of CITES held in Peru in 2006 was to consolidate regional efforts in parrot conservation. In this context, a region can be taken to be an economic; political or geographic grouping; for example, in this study, Africa is considered as a grouping. Benefits for the consolidation of parrot conservation efforts can be realised in combating trans-border poaching and illegal trade, harmonizing research methods which can allow results to be compared, and making the export parrot trade more profitable by harmonising trade regulations. It is recommended that an international conference on parrot conservation in Africa be organised in Cameroon in 2012.

7.8.8. Scientific and research requirements

Field research on parrots is generally a difficult and specialised domain, especially on the Grey Parrot that thrives in the humid and dense tropical forest. For this reason, it is rare to find many researchers in this domain, especially Africans who are resident in Africa. Field equipment as a consequence is very scarce and expensive. Nevertheless, parrots constitute a major group of wild birds frequently exploited in Africa and consequently their long term existence is uncertain. Scientific research in this domain will offer capacity building services, sustainable protection of wild parrots', and informed management and policy decisions. It is therefore recommended that:

8.1. A parrot research centre should be created in Cameroon to handle more complex research and management problems in this sector.

8.2. A parrot GIS database be created and regularly updated in Cameroon. Uses of such a functional database are many including population monitoring and regulation; informed management and policy decisions; and trade regulation. More emphasis should be placed on demographic trends of parrots for long and short term analysis, reproduction, ecology and behaviour, radio-tracking studies to determine home range and seasonal movements and their effects on the birds and changes over time in habitat use etc.

8.3. Identify and develop priority areas for parrot conservation:

Habitats with reasonable parrot population should be identified and protected from socio-economic activities. Such targeted habitats include those used for nesting, roosting and feeding. An inventory of these sites should be carried out at regional levels and the village communities around them should be organised to safeguard their protection. The community should carry out the following responsibilities through the CIGs or CBOs.

8.3.1. Plant trees around roosting, nesting and feeding sites so that they can grow and eventually replace the old ones.

8.3.2. Protect these sites from poachers and unauthorised visitors.

8.3.3. Document seasonal use of the sites by the birds, migratory periods, feeding, roosting and nesting activities for further informed management decisions.

8.3.4. Protection priority should be given to the protection of sites found outside protected areas as they are more vulnerable to poaching activities.

8.3.5. Information on all the priority selected sites should be incorporated into the national parrot GIS database for easy updates, spatial analysis, geo-referencing and monitoring of changes.

8.4. Improving the breeding rate of Grey Parrots in the wild;

Breeding successes and frequency of breeding of the wild parrot population in Cameroon determine the natural intrinsic rate of increase in population size. Results of this study show that the scarcity of breeding sites is a major limiting factor to population increase. Breeding sites are scarce due to many factors including the following:

- The Grey Parrot is a secondary cavity nester and unfortunately, trees that produce the nest cavities are often felled and used for socio-economic activities.
- The population density of tree species that will produce suitable nests is low.
- The probability of finding a suitable nest by a potential breeding couple is low.
- Considering the high cost of parental investment in raising up chicks to fledging age, it may not be possible for a couple to breed twice a year.

Measures that can be taken to increase the rate of parrot population growth include the following:-

8.4.1. Encourage captive breeding of Grey Parrots in the country.

- Parrots from captive bred programmes can be used as pets locally or exported thereby reducing harvesting pressures on the population in the wild.
- Captive bred parrots can be released in the wild after long periods of acclimatization to boost wild population growth rates.

8.4.2. Provision of home-made nest boxes that have similar characteristics to natural nests should be encouraged to boost the number of nesting sites in the wild.

8.4.3. Studies on the breeding biology of the Grey Parrot should be carried out and results used to improve on captive breeding programmes.

8.5. Long term parrot population monitoring and management:

Information on population survivorship rates, abundance, distribution, movements and habitat needs is important for a sustainable harvest of parrots in Cameroon, is relatively scarce on the Grey Parrot. Long term population monitoring is valuable for determining the population trends of species for more reliable conservation programmes. This information can be collected at regional levels using methodologies which have been internationally standardized.

7.8.9. Reduce the general level of poverty and unemployment in the country

The major driving force behind the parrot trade in Cameroon has been the strive to curb poverty. Over 90% of the people involved in the parrot trade are self-employed. General poverty reduction in the country will have multiplier effects on many family members (like in education, good health, tourism, etc) and eventually result in the reduction of poaching on our parrot/wildlife resources.

There is the need for the exporters to come together and formulate a common strategy on how to maximize profits on parrots exported abroad. This may not involve only exporters in Cameroon but also from other exporting African countries.

The best approach for the Government to reduce anthropogenic pressure on parrot resources is to educate the people and provide alternative sources of income. Better still, Government should show them how to take care of their resources themselves, by prescribing mechanisms and processes for sustainable exploitation of their ecosystems.

7.8.10. Starting a new parrot trade session in Cameroon

The last parrot trade session ended in 2006/2007. Information gathered from legal parrot traders show that the session ended with problems including:

- Problems with parrots that were already in captivity and could not be exported before the start of the export ban in January 2007.
- Some permit holders claim that they paid trapping fees to the government treasury and could not get the equivalent birds for export.
- Other traders complained of irregularities and non-transparent methods in the issue of export permits and export quotas.

The above problems and many others have to be resolved before a new trade session is launched. The parrot trade should be restructured and harmonised to make it more functionally beneficial to all stakeholders. It is therefore recommended that the year 2012 be used to settle all the old

problems and restructure the parrot trade. A new trade session should be launched in January 2013.

7.8.11. NGO for implementation of Management Plan

Considering the big volume of work routinely carried out by MINFOF in the management and administration of the wildlife sector in the country, it is unlikely that this ministry will be fully committed to implement the parrot management plan proposed by this study. It is highly recommended that an NGO with long term experience in project management and parrot welfare should be selected to implement the parrot management plan. This NGO should be closely supervised by MINFOF. For the implementation process to be most effective, the government should give the NGO a free hand to raise supplementary funds for the realisation of outlined projects.

7.8.12. Projects evaluation and follow up

The projects' implementation NGO should report to MINFOF the level of project implementation. MINFOF should in turn report to CITES on the implementation activities of the project. Time table for mid-term and annual reports, and other obligations should be outline in the contract document to be signed by MINFOF and the NGO.

Photo 7.1. A pair of Grey Parrots at roost in the Centre Region of Cameroon

8. PROJECT IDENTIFICATION AND IMPLEMENTATION

8.1. Introduction to projects

Projects for implementation consist of decisions, analysis and action strategies to be carried out by the Government of Cameroon and/or the implementation partner with the single goal of revamping the parrot conservation sector. Our driving force in the conception and designing of the projects is to provide an adaptive management approach that is in unison with sustainable conservation and management ethics for the overall benefit of parrot resources over time in Cameroon. This vision is best achieved through the integrated management approach that consolidates human resources and directs their efforts towards the achievement of goals and objectives of each project. To ensure a greater achievement action, enough consideration has been given to all stakeholders in decision making process at all levels of project implementation. Each project is designed with a short term or long term prospective in mind. To this end, the first year of project implementation is devoted to short term projects with long term delivery effects on policy enforcement and regulation, with the prime goal of laying a concrete foundation for subsequent take-off of long term projects.

After a 5 year life cycle of project implementation, trends may emerge from results so far obtained. Such trends are then evaluated and used as cornerstones for building the next project cycle. Finally, there is the strong need for the project implementation institution to ensure consistency in the implementation of the vision and mission outline thereof since they collectively form a tangible hierarchy of goals for parrot population development and habitat conditions improvement in the country.

8.2. Projects for implementation

8.2.1. Section 1: Population monitoring and management

Project 1 (P1): Ecological Monitoring of Grey Parrot Populations

1.1. **Vision:** The point count with two counting bands is proposed for counting Grey Parrots as a means of obtaining population data that could be used for informed management decisions. This method is widely used to sample bird communities in tropical forests from which changes in bird abundance over time are calculated. The method has been used notably by Volpato *et al.*, 2009; Hill *et al.*, 2005; Seavy *et al.*, 2005; Hutto *et al.*, 1986 and Dawson, 1981a. Point counts are similar in conception and theory to transect-based counts (Bibby *et al.*, 1992; Blondel *et al.*, 1970; Hutto *et al.*, 1986). Its efficiency and accuracy are influenced by observer effort, which may affect information obtained such as species

abundance (Rosenstock *et al.*, 2002; Bart &Earnst 2002; Betts *et al.*, 2005). If well spaced, a sample series of points in an area will provide more representative data than a few transects. The point count therefore has an advantage over transects of being easier to incorporate into a formally designed study since it is more flexible to adopt prevailing habitat circumstances. However, both transect and point counts require high levels of observation skills. Although, a plausible method for the study of Grey Parrots, relative density estimates from point counts are susceptible to errors that can arise from inaccurate distances estimate or from the violation of basic assumptions when counting birds. Above all, the point count method is suitable for conspicuous birds in woody habitats such as the tropical rainforest and is more appropriate for this study than transects since accessibility to the rainforest is generally poor.

1.2. **Objective**: To collect data on Grey Parrot populations and habitat resources for their sustainable management and exploitation in Cameroon

1.3. **Strategy** (field methods):

1.3.1. *Study area selection and layout:*

The Grey Parrot population range covers the whole of the Southern part of Cameroon where the rainforest exists. Its vastness makes it suitable for the point count method, especially for sample points spacing and layout. Sample points should be randomly selected within each sample site (protected area or representative vegetation zone outside a protected area). This means that a cross-section of the major vegetation types in the geographic range of the Grey Parrot shall be sampled.

Accessibility in the rainforest can be a major problem for choosing counting points. There are many obstacles to overcome such as lianas, windfalls, big buttresses of giant trees, streams and rivers with no crossing points or places to escape. For these reasons and in most cases footpaths, existing transects, and forest routes can be used, where they exist into both open and closed habitats and so reduced the bias for bird detectability. A compass or GPS device should be used to create trails where routes and paths do not exist.

1.3.2. Data collection

Data recording procedure: See procedure under sections 2.4.3.1 – 2.4.3.6. The following headings are treated in these sections:

Sample point selection and layout, distance estimate, duration of count, recording procedure, time of data collection, and considerations of observer's bias.

1.3.3. Data manipulation procedure for Grey Parrot density and harvest quota

Density determination: See formula to be used for calculating parrot density under section 2.8.1. When the density of parrots is obtained, the method for analysing data generated from point count with fixed radius for both breeding and non-breeding seasons (Hutto *et al*. 1986) can be

used for further analysis. The advantage of this method is that it carries fewer assumptions than most popularly used methods for estimating bird densities.

Four indices can be used to test for abundance of Grey Parrots among vegetation types and/or regions.

(a) The mean number of detections within 25m radius of the observer.

(b) The frequency of detection within the 25m radius of the observer.

(c) The mean number of detections beyond the 25m radius of the observer.

(d) The frequency of detection beyond the 25m radius of the observer.

Significant differences in parrot abundance among regions and sites can be calculated using the non-parametric Mann-Whitney U-test (for a two-site comparison) or the Kruscal-Wallis one-way ANOVA (for for a multi-site comparison), using the mean detections per count. Dawson (1981) provides further information on analysis using relative indices.

Harvest quota determination: We propose a harvest model called Potential Biological Removal (PBR) as a starting point for the sustainable harvesting of the Grey Parrot in Cameroon. The model is grounded in harvest theory and decision analysis for assessing and setting sustainable levels of harvest. Furthermore, this model is flexible enough to allow decision makers/management to balance competing desires to reduce human-parrot conflicts and to conserve wild parrot populations, even at regional levels. This model can be used in the next two to three years in the projects implementation phase when more data on the natural history and management of the bird populations has been obtained. The model is adapted from Runge *et al*. (2009).

The fundamentals of harvest theory emerge from consideration of the simplest model for a population subjected to harvesting, the discrete logistic model is:

$$N_{t+1} = N_t + r_{max}N_t(1-Nt/K) - hN_t$$

Where N_t is population size at time t,

r_{max} is maximum growth rate,

K is carrying capacity, and

h_t is harvest rate over the time period between $_t$ and $_{t+1}$.

Under this model, an unharvested population that begins at a small fraction of K will grow quickly at first, then more slowly as it approaches carrying capacity. A sustained level of harvest has two effects: it slows initial growth of the population and it results in long-term stabilization at a population less than carrying capacity. At this equilibrium point (where population stabilizes), there is a sustainable annual harvest. The relationship between sustainable annual harvest and equilibrium population is known as a yield curve (Caughley 1977, Runge and Johnson 2002, Runge *et al*. 2006). All points along the yield curve are solutions for sustainable

harvest; a population can be held indefinitely at any population between zero and K by annually removing the corresponding level of harvest.

For the logistic model, this harvest is maximized (at $r_{max}K/4$) when the population is held at one-half the carrying capacity ($K/2$); the harvest rate at this point is $0.53r_{max}$ (Caughley 1977, Runge *et al*. 2004). A yield curve will show equilibrium points for a harvested population, but a harvest strategy also needs to specify harvest at points away from equilibrium. The fixed harvest-rate strategy is simple and surprisingly robust to uncertainty and stochasticity (Quinn and Deriso 1999). A fixed harvest rate strategy can be regionally dependent in the sense that each year, harvesting is based on current population sizes in each region, to maintain a constant harvest rate per year. Regional harvest-dependency allows the harvest-rate strategy to adapt to perturbations and avoid the population vortex that can occur with a fixed harvest-yield strategy programmed for the whole country as it has been the case with the 12000 parrot export quota.

However, a particular form of the fixed harvest-rate strategy known as potential biological removal (*PBR*) has received considerable attention, especially as a means of establishing incidental or allowable harvest in the face of uncertainty (Runge *et al*. 2009, Wade 1998, Milner-Gulland and Akc¸akaya 2001, Runge *et al.* 2004). Potential biological removal was described in the 1994 amendments to the Marine Mammal Protection Act (MMPA) as

> ‘‘the maximum number of animals that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population and is calculated as
>
> $$PBR_t = (r_{max}F_R)/2 \text{ x } N_{min,t}$$

where N_{min} is the minimum estimate of the current population size (e.g., min. no. known alive or else a lower bound of a CI; Wade 1998), and F_R is a recovery factor between 0.1 and 1.0.”

Potential biological removal is a fixed harvest-rate strategy, with desired harvest rate set to $r_{max}F_R/2$, and precautions taken in the face of uncertainty by using a minimum estimate, rather than a point estimate, for current population size. Temporal subscripts remind us that the harvest needs to be recalculated each year (or time period). The *PBR* framework can be adapted for use in a broader class of problems to include not only incidental harvest of depleted species, but also sport harvest and authorized harvest for management of nuisance wildlife (Runge *et al*.2009). For example,

$$PTL_t = F_o\,(\acute{r}_{max}/2)\;\grave{N}_t$$

where F_o is a factor that reflects management objectives and where $(\cdot)$ over r_{max} and N_t indicate that these values are taken from within the uncertainty distributions of these parameters. This version of the formula allows us to delineate the roles of science and policy in setting a level of

prescribed (or allowable) harvest. (1) Estimating r_{max} and N_t is a scientific exercise that should proceed by whatever method is best given available data. Because neither r_{max} nor N_t is typically known with certainty, the most appropriate output from scientific analysis is a distribution for each quantity that reflects uncertainty in its value. (2) The choice of a value from the uncertainty distribution for r_{max} or N_t is a policy decision, because it reflects the risk attitude of the decision maker or management (perhaps as guided by appropriate laws and regulations). For instance, in a setting where parrots are rare or declining, the decision-maker might be averse to the risk of local extirpation of the species, in which case choosing values from the lower tails of the uncertainty distributions would be appropriate. In a setting where the greater risk might be losing control of a population that is causing damage (for example), the decision-maker might wish to err on the side of greater harvest and choose values from the upper tails of the uncertainty distributions. (3) The choice of F_o reflects the overall goals of the decision-maker and is related to the desired long-term population size relative to the carrying capacity. Any value of FO between zero and 2 (i.e., harvest rate, *h*, between zero and r_{max}) produces a sustainable harvest strategy. With FO near zero (h near zero), a little harvest is allowed and the population is expected to equilibrate near its carrying capacity. With $F_o = 1$ ($h = r_{max}/2$), the harvest strategy seeks maximum sustained yield and holds the population at about half the carrying capacity.

With F_o near 2, the harvest rate is near r_{max} and the population is held at a small fraction of its carrying capacity. Equilibrium dynamics of the *PTL* framework can be expressed, in fact, in terms of the objective factor, F_o. If parameters r_{max} and N_t are known with precision, the desired harvest rate is

$$h = (r_{max}/2)\, Fo\ ,$$

equilibrium population as a fraction of carrying capacity is

$$N\text{eq}/K = 1 - F_o/2$$

and equilibrium annual take (*Y*) as a fraction of maximum sustainable yield (*MSY*) is

$$Y/MSY = F_o(2 - F_o)$$

In practice, r_{max} and N_t are not known with precision, so equilibrium conditions depend on how the decision-maker chooses values for these parameters given their uncertainty, but we believe that the above equations are nevertheless useful in helping the decision-maker to set F_o.

We can therefore use the *PTL* model as a default method for determining sustainable harvest in the face of uncertainty, with flexibility for application over a spectrum of settings. The PTL model requires estimates of r_{max} and N_t (or only r_{max} if eq 4 is used to set harvest rate directly) preferably with explicit articulation of uncertainty, and it requires the decision-maker (or management) to set an objective (F_O) and to determine how to set a harvest quota in the face of uncertainty about the parameters. The PTL model requires that management goals be explicit

and transparent; provide a clear explanation to the roles of policy and science that can be implemented in an adaptive manner.

1.4. Adaptive management of harvest

It is recommended that parrot harvest should be managed adaptively. In this case, the decision to harvest any quota is revised periodically and there are regular monitoring data in between, to provide feedback about effects of the harvest on the bird population. Monitoring should be carried out at least during the breeding and non-breeding seasons in a year. Information from regular monitoring can guard against effects of, and can reduce, uncertainty if management actions can be adjusted based on new information. For this to work well, harvest levels should be set in a regional-dependent manner, that is, based on annual updates of *N*, and other updates on the natural history data of the bird. As new information is required about r_{max} and *N* from field observations of the parrot population being managed, the parameters used to calculate sustainable harvest should be updated accordingly. Adaptive management is often applied to resolve uncertainty about parameters that are part of a scientific assessment. In this case and to arrive at a sustainable harvest quota, periodic review of the objectives of management (as expressed by *Fo*) and risk tolerance is appropriate and necessary (Runge *at al*. 2009)

1.5. Roost sampling

There are many controversies about sampling Grey Parrots at roost (McGowan, 2001), but they could be used to obtain a specific estimate of number of individuals that use the site. In this case it should not be used to calculate the density of parrots in the region. This involves searching for the different roosts and making counts in the evening when they come to roost. Five randomly selected counts can be made for each site in a month to obtain an estimate of the average number of individuals per roost and also determine sample variation (Marsden, 2004). Counts at roost should not be used to determine density of parrots in a region since they do not include information about the distance travelled by individuals to congregate in the roost and inter-roost movements.

1.6. Estimating the productivity of the population

Demographic parameters can be used to estimate reasonable harvest rates based on conservation efforts and sustainable use. The following methods should be used to determine productivity in each region of the country:

I. Use of a systematic transects method to count the number of nests in each site in a region.

II. Record characteristics of nests identified: (Tree species where nest is located, living tree or dead, tree diameter at breast height, height of cavity and habitat type).

III. For artificial nests, it is important to first of all study their natural characteristics and then use them for artificial nest placement. Such parameters include: height from the ground, shape, orientation, entrance, size, and depth).

IV. Clutch size (total number of eggs in each nest per breeding season). To calculate average clutch size, use data from several years. Compare differences in regions.

V. Nesting success: (proportion of successful nests (nest with at least one fledgling).

VI. Productivity: Number of fledglings per successful nest and number of fledglings per pair.

Data obtained for several years should be used to produce reasonable estimates of chick births and deaths. This kind of observations should be made during the breeding season. It is important to consider the average number of observed eggs and chicks during the systematic monitoring of nests. Fledgling success should be recorded after every breeding season and losses at each stage of development should be noted.

1.7. Monitoring habitat related parameters

Most important habitat components for the Grey Parrot include the following:

Home range:- This is the area used on daily to satisfy habitat based needs. It can vary from season to season depending on seasonal distribution of habitat resources. Tamungang *et al.* (2001) determined the mean home range in the Korup rainforest, Cameroon to be 10.27km and the home range area was 283.25sq km. The home range should be determined and results used to delimit the areas to be used for the conservation of the Grey Parrot

Nesting habitat: Nesting sites and tree species bearing them should be identified as stated under productivity. The obvious assumption here is that such tree species are known to be under socio-economic pressure in Cameroon.

Foraging habitat: Foraging sites occur in patches and their distribution and abundance are strongly influenced by seasonality (Tamungang and Ajayi, 2003).

Roosting sites: In Cameroon, roosting sites occur far in the forest and near human habitats. All roosts are used for capturing the birds and are also vulnerable to fragmentation and complete loss.

Playing sites: Playing sites constitute a major habitat requirement for the conservation of the Grey Parrot. The Grey Parrot is such a lively bird in the wild and devotes a lot of time in playing at particular sites and at particular periods of the day. Playing activities are influenced in most cases by prevailing weather conditions.

The following information should be obtained from the various habitat types identified above:

1) Estimate using a GIS package, the surface area of forest in each region occupied by the various habitat types and classify them into vegetation types (primary/secondary vegetation, degraded/ non-degraded vegetation and farmland).

2) Habitat characteristics should be monitored yearly using the following methods:

- Sample specific plots in each vegetation type using a compass and measure the area. Identify tree species names and characteristics (height, diameter at breast height, crown spread etc).

- Record changes in land use patterns in and around the plots and at a regional scale using high resolution GIS maps. Long term monitoring using this method can enable results to be compared, rates of habitat loss and fragmentation determined for informed management decisions.

3) Habitat improvement techniques should include the following:

- Reforestation with native species and especially tree species useful to the Grey Parrot.

- Forest area devoted to conservation can be increased depending on the home range and migratory patterns of the bird.

- Place and monitor artificial nests when it is observed that parrot productivity is low.

- Monitor and patrol the conservation area frequently to prevent nest poaching, illegal logging, and illegal trapping of birds in and around the conservation area.

Manipulation procedures for habitat data:-

Indices can be calculated to find out if habitat resources are used in proportion to their availability. For example, Neu's selection index can be used with simulated data, standard deviation, student's t-test, used to compare single habitat variables between sample units and ANOVA can be used to compare more than two regions or habitat types.

For multivariate analysis, habitat variables can be correlated with one another. Principal Component Analysis (PCA) is commonly used. The output is a small set of variables which are weighted sums of the original variables, used to explain a high proportion of the original variation and are independent of each other. PCA, logistic regression and other multivariate techniques are available in SPSS. Correspondence Analysis or Detrended Correspondence Analysis are related to PCA and can also be used. The latter is popular in ecology and is implanted by a computer DECORANA. In this case, the habitat data set can be simplified by

DECORANT before being entered into regression models.

All data analysis should be linked up to parrot population sustainability, habitat resources use and development.

1.8. Execution dateline: From 2012 onwards

1.9. **Success indicators:** Data collection is started in 2012 and there is evidence of data accumulation in subsequent years.

Project 2 (P2): Standardization and harmonisation of Grey Parrot research methods in the range states

2.1. **Vision:** The international trade in parrots remains a threat to regulating mechanisms at local levels in the sub-region. In terms of field research, it is not easy to compare results from various countries for informed common management decisions since methods used to carry out such studies vary from one country to another. A way forward is to standardize and consolidate research methods on the Grey Parrot as a first order priority for its sustainable management and conservation.

2.2. Objectives:

1. To organise an international conference that will be used to standardize and consolidate research methods on the Grey Parrot in Africa.

2. To use the conference to harmonize and form a network for parrot conservation and exploitation in Africa.

2.3. **Strategy:**

1. These objectives are in consonance with recommendations of the 22nd Animal Committee of CITES' held in Peru in 2006 to harmonise and standardize regional methods on parrot management and conservation. The conference shall be organised by MINFOF and partners involved in parrot welfare and conservation. Participation shall be opened worldwide, but presentation limited on the Grey Parrot species (*Psittacus erithacus erithacus* and *Psittacus erithacus timneh*). Proceedings of the workshop will be made up of the harmonised and standardized methods for parrot populations monitoring and management. This approach will enable research results to be compared and valorised for the sustainable conservation of the bird species in the wild.
2. At the end of the conference, an African parrot network shall be created to fight against trans-border parrot trafficking and also find possibilities to harmonise parrot trade policies in Africa.

2.4. Execution datelines:

1. Formation of organising committee: January 2013
2. Creation of conference website and call for participation: April 2013
3. Conference period: November 2013

3.5. **Success indicators:**

Conference is successfully organised with methods for Grey Parrot population census and monitoring methods standardized. Proceedings of the workshop are published and disseminated to workshop participants.

Project 3 (P3): Parrots Research Institute of Cameroon (PRIC)

3.1. Vision: Cameroon harbours eight parrot species in the wild. This is perhaps the highest number of parrot species to be harboured by a country in Africa. A specialised institution that can carryout and manage parrot resources and information in the country on long term basis will be more stable and efficient than co-opted non-specialised institutions.

3.2. Objective: To establish a reference institute for field research on parrot species in Cameroon.

3.3. Strategy:

1. The institute should carry out fine and specialised research, build capacity for continuity, and draw up strategic development programmes for the sustainable conservation and management of parrot species in Cameroon.
2. PRIC should be owned and managed by the Cameroon government and conservation NGOs, and their shares should be 50% each. This strategy will enable semi-autonomy in management and fund raising to enhance sustainability.

When functional, PRIC should:

3. Draw up strategic programmes, provide research facilities and manage results of field research on parrots in Cameroon and beyond.
4. Set up a database and carry out data updates through field research on parrot species in Cameroon
5. Handle most rescued parrot operations in the country.
6. Carry out advocacy on African parrot species' conservation and regulation.
7. Carry out breeding programmes on parrots of threatened parrot species and release them to relevant sites to boost wild population numbers.

3.4. Execution datelines:

1. Carry out feasibility studies and publish results, select site for institution, formalization process of documents and drawing up of construction and development plan: 2012

2. Tender and start construction work on permanent site of institute: 2013
3. Select temporary site for the institution, equipment, recruitment of staff and commencement of institutional activities: June 2013.
4. Inauguration and transfer to new and permanent site: 2015

3.5. Success indicators:

Evidence that major activities outlined above are carried out earlier or within the stated time.

Project 4 (P4): Development of a parrot data-base for Cameroon

4.1. Vision: Data on parrots in general and the Grey Parrot in particular is not readily available for informed management/policy decisions in Cameroon. The creation of a parrot database for the country will go a long way to provide information for both long and short term informed decisions.

4.2. Objectives:

1. To create a data bank on parrot species in Cameroon
2. To use information from the data bank to monitor and manage parrot populations and trade dynamics

4.3. **Strategy***:*

For long term monitoring and management of the country's parrot species, a data base should be set up which will enable management to evaluate management activities on the field based on data obtained to determine their sustainable levels. From results obtained, major management decisions can be taken and implemented as a way forward to maintaining a desired level of parrots or habitat improvement strategies. The setting up of the data bank implies that parrot ecological monitoring, socio-economic and trade programmes must be carried out on a regular basis to enable effective updates

4.4. Execution datelines:

- Creation of database: June 2013
- Draw up and implement specific field programmes for database updates: 2014

4.5. Success indicator:

The database is setup and is fully functional within the time frames mentioned above.

Project 5 (P5)*:* Important Parrot Areas of Cameroon

5.1. Vision: This study identified some sites with high parrot populations outside protected areas and close to human habitats. These parrot populations are vulnerable to poaching activities and habitat destruction and hence urgently need special protection measures.

5.2. Objectives:

1. Identify and raise the conservation and management status of important parrot areas of Cameroon (IPAC)
2. Enhance conservation activities of IPAC, especially those located outside protected areas.

5.3. Strategy:

1. Identify sites with reasonable parrot populations both outside and inside protected areas using results of this study and other sources.
2. Develop sites not protected into protected areas, community forests, village reserve areas etc., to save the parrot populations from unsustainable exploitation and habitat degradation.
3. An average of two sites should be developed each year beginning with sites that are threatened with extinction outside protected areas. Examples of such areas are Ndikinimeki in the Centre Region, and Mebang in the South Region. This effort should go a long way to reduce poaching activities on the birds and habitat degradation (habitat fragmentation and subsequent complete loss to land-based socioeconomic activities).
4. Implement tree planting programmes in IPAC outside protected areas suffering from serious habitat degradation

5.4. Execution dateline: 2015

5.5. Success indicaros:

1. IPAC sites are identified, conservation status of each site raised and necessary documentation and administrative measures carried out.
2. At least six sites are developed by 2015.
3. Progress in tree planting programmes in the country advanced by 2015

Project 6 (P6): Step-up the breeding rate of Grey Parrot populations

6.1. Vision*:* Results of this study show that a major limiting factor to population growth rate of the Grey Parrot is the scarcity of suitable nests. This is understandable since the parrot is a secondary cavity nester on a major tree species *Terminalia* sp that is highly exploited for socio-economic activities. The probability of finding a suitable nest can be enhanced by providing home-made nest cavity/boxes for the parrot as potential nesting sites. Detailed knowledge of the breeding biology of the parrot in the wild is scarce and if available can be used to improve on home bred specimens for subsequent release into the wild.

6.2. Objectives:

1. To study the breeding ecology and behaviour of the Grey Parrot in the wild and to use this knowledge to improve on breeding techniques of both captive and wild species.
2. To increase potential nesting sites of Grey Parrots in the wild by providing home-made nests in selected areas
3. To enhance parrot populations growth rate in the country by encouraging captive bred specimens.

6.3. Strategy:

A study on the breeding ecology and behaviour of the Grey Parrot should be carried out to obtain more detailed information on this subject. Knowledge acquired should be used to make nests boxes/cavities with specific dimensions and shapes and be tested in selected areas as a case study. The nests should be monitored for parrot breeding activities in seasons. Nest site characteristics and selection patterns, nesting success evaluated per season and conclusions made for further improvement.

Government should encourage corporate bodies or individuals who want to breed parrots by facilitating acquisition of official documents, giving grants for such a project. Such bred parrots can be released in parts of the country with local extinctions such as the Santchou Wildlife Reserve in the West Region, Southern Bakundu Forest Reserve in the South West Region etc. If well organised, the captive bred parrots can also be used to satisfy partial market demands for the species. The advantage with captive breeding of parrots for the trade is that it will reduce trapping pressure on their wild counterparts.

However, there is the tendency for some people to trap wild parrots and sell them as captive bred ones. Government must set up certification panels to check these excesses using, for example, DNA and ringing tests.

6.4. **Datelines for execution***:* 2015

Success indicators: Evidence of results from field studies and visit to nesting sites in the country.

8.2.2. Section 2: Biologically sustainable capture and/or export quota

Project 7 (P7): Parrot welfare promotion and death rate reduction

7.1. Vision: Results of this study show that 33% of parrots die during trapping and transportation from the forest under up to the period of export, for the legal trade. Casualties may be higher when the above activities are carried out illegally and because of arrangements to evade security agents, and also because the trapper is not well trained on techniques of trapping

and handling the birds. General Parrot welfare can be improved and death rates reduced in the country, if the sector is well coordinated and managed.

7.2. Objectives:

1. To improve on the quality of parrot trapping methods so as to reduce casualties to minimum level during and after trapping
2. To step-up the quality of transportation, handling and treatment of parrots in general

7.3. Strategy:

A document should be produced and should contain the following elements:

1. Basic qualification code (education and training) for potential trappers, traders and keepers (pet owners) of parrots in the country
2. Less harmful and standardized methods for trapping parrots. Harmful methods that should be added to the existing list include killing birds with explosives, chemicals, guns, trapping birds with glue and felling a tree to get nestlings. Trapping of birds in the night should be banned since it results in more casualties and injuries than during the day.
3. Standard facilities with dimensions (cage, house and transportation) and number of birds to be held in each facility per given time frame.
4. Standard methods for handling parrots during trapping, transportation housing (caging for pets) and exporting.
5. Define penalties for persons who fail to comply with the above mentioned strategies to reduce parrot mortality rate in the country.

7.4. **Execution dateline: 2012**

7.5. Success indicator:

Document is produced, and validated by stakeholders before 2012 ending.

Results of validated documents are published and distributed to stakeholders by end of 2012.

Project 8 (P8): Management of rescued parrots

8.1. Vision: There are no formalised procedures to be carried out when parrots are confiscated or rescued in Cameroon. In most cases, they are taken to the zoos (Limbe Wildlife Centre or Mvgot-betsi Zoo) for acclimatisation. Many of the birds die before, during and after the acclimatisation process. Such causalities can be prevented or reduced to a minimum, if there are laid down procedures on how to handle confiscated or rescued parrots. Some casualties recorded are due to the fact that there are no specialised personnel and structures to manage the birds.

8.2. Objectives:

1. Improve on management conditions of rescued and confiscated parrots as a means of reducing mortality rates.
2. Set up a more functional and efficient structure for determining of the final destination of rescued or confiscated parrots.

8.3. Strategy:

A document containing procedures for rescuing, confiscating, handling and treatment of parrots should be produced and made available to parties concerned with a detailed description and realisation of the following activities

1. A standard parrot rescue centre with free fly cages should be set up. The Limbe Wildlife Centre in the past has tried to solve these problems at its own level. There is an urgent need for a standard rescue centre to be built for such parrots in Cameroon, judging from the many rescue operations carried out from 2007 – 2010 with 3490 confiscated parrots and a few rescued cases.
2. There is also the urgent need for training specialised personnel to handle ecological, behavioural and health problems of such parrots.
3. Special funds for parrot rescue activities should be created and made operational as soon as possible.
4. A scientific committee should be set up; made up mostly of field ornithologists to determine when and where such parrots should be released. Efforts should be made to release rescued parrots into protected areas located far away from the border with neighbouring countries. There is a high probability that released birds at border localities can move to the neighbouring country and at such Cameroon losses the right of ownership.
5. Released birds should be monitored with standard scientific methods like radio tracking for a specified time and results used for improvement on future release strategies.

When operational, the Parrot Research Institute of Cameroon (PRIC) will handle all problems of parrot rescue and confiscations.

8.4. Execution datelines:

1. Creation of a special account for parrot rescue operations: 2012
2. Production of a manual for parrot rescue, confiscation and management operations: 2013
3. Feasibility study and construction of parrot rescue centre: 2013.
4. Training of staff of rescue centre: 2013

8.5. Success indicators:

Major activities outlined above are carried out earlier or within the stated time frame.

Project 9 (P9): Community empowerment with respect to parrot conservation

9.1. Vision: The level of wildlife conservation education in rural Cameroon is generally lower than in urban areas. About 95% of Grey Parrots are found in the rural areas and so need protection from poaching and habitat degradation. Generally, prices of parrots are lower in rural communities than the urban centres since most rural dwellers do not attach much value to parrots. Most trappers (both legal and illegal) frequently arrive at a village that harbours wild parrots and present a small gift to the village head, who will in turn authorize them to go into the forest and trap as many parrots as they can. The gift is consumed by the village head in most cases without any community benefit attached to it. In some instances, the trappers negotiate with a few villagers (without passing through the village head) who guide them to where parrots roost in their forest. After trapping, they leave the village unchecked and can come as many times as possible. This practice can result in high mortality rate since methods used are not monitored and controlled. The village or community derives little or no general benefit from the parrots in their forests. This practice constitutes a major source of unsustainable capture of parrots in the country.

There is an urgent need to set-up a system of parrot conservation education, communication and information for rural community actors that will help towards attitude change and therefore contribute towards sustainable parrot resources exploitation. If these communities are empowered and educated to be involved in conservation of parrot resources, they will derive more social benefits from them and will tend to have a sense of recognition by the government. All these activities will add up to long term value to parrots in the rural communities.

9.2. Objectives:

1. To empower rural communities (villages) at the level of decision making, management and exploitation of parrots in their forests
2. Promote the value of parrot conservation and ecosystem services through attitude change in rural communities.

9.3. Strategy:

1. Identify villages or communities with reasonable parrot populations and encourage them to form CIGs or CBOs for parrot conservation in particular and wildlife resources in general. Such groups should work with government officials concerning conservation and exploitation issues and should also serve as liaison between the village(s) and the government.

2. Parrot trappers/traders must pass through the CIGs/CBOs to ensure that laws and regulations on the trade and exploitation are enforced.
3. MINFOF should determine royalties (for conserving parrots in their forest) to be paid per parrot by a trapper to the deserved community during a trapping session.
4. The CIGs/CBOs should be encouraged to promote parrot/wildlife based tourism activities in their communities. This can be carried out by providing basic logistics and amenities for tourists such as transects, camping areas/logging facilities, electricity/current generators, etc.

MINFOF and development partners should:

5. Look for means to develop livelihood improvement projects as another direct benefit for parrot/wildlife conservation by rural communities. Due to limitation of funds, it may not be possible to start livelihood and tourism projects on a large scale. A few communities could be selected and developed as pilot centres. Such pilot centres could be located in the following communities identified by this study: Nkoelon, Mebang, Ndikinimeki, Lobeke (Mambele), Mengame, Dja, Lake Ossa and Douala-Edea, and Korup. A typical example of such a group (though needs empowerment) is found in Nkoelon. This group already has camping/lodging facilities for tourists and Grey Parrots roost near human houses. Tourism facilities also exist in Lobeke (Mambele) and Lake Ossa but lack community empowerment.
6. Organize public meetings, lectures, capacity building workshops, etc, with targeted groups (CIGs/CBOs) on importance of parrots/wildlife to ecosystems stability and productivity, use and misuse of parrot resources, government conservation efforts on policy and regulation, and trade related issues etc.
7. Use printed and audio-visual media for conservation education dissemination on parrot conservation and trade (flyers, logos, newsletters, public posters and bill boards).
8. Create an information line (infoline) to the general public for specific inquiries and exchange of information on parrots and related resources.
9. Create parrot conservation lobbing groups at the international level to solicit counterpart funding and technical assistance from the foreign governments and non-governmental partners.
10. Celebrate parrot/wildlife/environment related national and international days to create public awareness on the importance of parrots in our ecosystems.

9.4. Execution datelines:

1. Formation and putting into function of CIGs and CBOs for parrot trade and wildlife Management in villages: 2013
2. Empowerment of communities for sustainable parrot/wildlife conservation and exploitation: 2014.
3. Carryout livelihoods and developmental projects in selected communities: 2015

9.5. Success indicators:

1. Evidence to show that CIGs/CBOs have been formed in most communities which harbour reasonable parrot populations in the country within the time frame.
2. Evidence of empowerment activities (development projects, workshops, poverty alleviation strategies etc) to the communities within the time frame.
3. Field reports and visits to sites of activities for first hand information.

8.2.3. Section 3: Prevention of illegal capture and trade in parrots

Project 10 (P10): Restructuring policies and harmonising the parrot trade

10.1. Vision:

Results of the present study show that one of the major problems of parrot conservation in this country lies in trade regulation and management. While the legal trade can be controlled to some extent, the illegal trade remains a huge problem as witnessed in the past four years. In fact, current laws are inadequate to protect and sustain domestic and international trade in CITES species like the Grey Parrot. The laws are unfocused and lack provisions on habitat degradation and biological productivity of the Grey Parrot, which are estimated at 63% of the total conservation problems faced by the parrot in the country. The policy should include provisions for parrot resources (human, financial and operational) needed for its effective application and to ensure the continuation of population monitoring studies with a view to finding solutions for better management and sustainable harvest quotas, and with community participation as a major input.

10.2. Objectives:

1. To draw up a parrot trade policy and law containing the species sustainability prospects, non-detriment findings, fairness and viable financial mechanism for all stakeholders.
2. To step up vigilance and security measures against poaching and trafficking of parrots and other wildlife resources all over the national territory and especially at the frontiers
3. To enhance the general management of protected areas as insurance for improved parrot conservation and management

10.3. Strategy*:*

1. *Structure and functioning of the Parrot trade in Cameroon:* The restructured policies and harmonised trade procedures shall be written out in a handbook to be called *"Structure and functioning of the Parrot trade in Cameroon"*. The Document shall be written in French and English languages and made easy for understanding by persons with basic levels of education.
2. *Enforcing vigilance and patrols against parrot/wildlife crimes*: Most international trade routes are now known through as a result of this study. The best way to reduce poaching and trafficking of parrots is to step up vigilance and patrols especially at the country's borders including the air and sea ports. Enforcing the war against corruption in the parrot trade at all levels is a major concern and any government officials caught in any corrupt practices should receive more severe punishment than an ordinary citizen. Mixed troops of security officers should be encouraged and well equipped especially with transportation means and advanced fire arms (especially in protected areas at the frontiers of the country). There is a scarcity of material and equipment, for example uniforms, means of transportation and security equipment in Protected Areas that share borders with neighbouring countries such as Lobeke, Mengame and Korup, Takamanda etc. Eco-guards complain that the guns they have are far inferior to the ones used by poachers from neighbouring countries. Thus, when confronting situations arise, the eco-guards run for safety instead of confronting the poacher. The poacher takes advantage of their escape to trap or kill as many parrots and large mammals as possible. All penalties for parrot crimes enforcement and procedures should be clearly stated for practical use on the field.
3. *Improve on infrastructure:* In some protected areas such as Kimbi, Takamanda and Mengame, infrastructural problems are acute. Where projects existed and then folded up, the acquired infrastructure such as vehicle and buildings have become seriously dilapidated and some are reportedly misused. A typical example was observed in the Korup National Park in the South West Region. Government should come out with a procedure to be used to improve on wildlife management infrastructure in the country.
4. *Motivation for field work:* Good motivation packages of various categories (such as promotion in grade) should be given to security agents who arrest poachers and traffickers or discover an important illegal trade network or corrupt practice. Corrupt practices should be seriously discouraged in the prosecution of arrested of suspected poachers and traffickers. Some MINFOF staff complained of irregular payment of salaries/allowances. This problem made some of them to be irregular at their stations, in search of alternative sources of income. Government should endeavour to pay

salaries/allowances regularly to keep law enforcement officers in focus. International NGOs concerned with wildlife law enforcement like LAGA should continue to be encouraged by the Government in the country

5. *Provide possibilities and incentives for in-service training*: Organise intensive training on non-detrimental techniques for harvesting and training on parrots. Provide in-service training (capacity building) workshops and seminars for protected areas personnel on parrot population monitoring techniques. Capacity building facilities should be provided to enable MINFOF staff to set up data-bases for parrot population monitoring at regional levels to facilitate national population censuses.
6. *Resolve the 2006/2007 parrot export problems:* It is highly recommended that all problems arising from the 2006/2007 export quotas with parrot traders should be resolved before new session begins. This strategy will prevent many carried over problems from the old session to the new session, which may prevent a smooth start. Moreover, roles and regulations of the trade will definitely change and so may not be compatible with previous ones.
7. *Start of a new trade session:* Considering the large volume of work to be carried out in 2012 in restructuring and harmonising the parrot trade in the country, it is proposed that a new parrot trade session should start in January 2012.
8. *Alternative income for parrot traders*: A majority of parrot trappers and traders (exporters) depend on parrot trapping and trading activities as their major source of income. Wherever there is a problem with it (such as the current ban by CITES and the EU), they find themselves in serious financial hardship especially in coping with family financial obligations. They can take trading in wild parrots as hobby instead of a main profession. It is recommended that these parrot economic operators diversify their sources of income and this should be one of the requirements to be considered when issuing a parrot capturing permit.
9. *Integrated management approach*: The management and trade of parrots in the country should adopt an integrated management approach to ensure sustainability at all levels of the society. This approach will enable all stakeholders to be responsible for the smooth functioning of programmes in which they are involved. In this approach, the expected role of each group of persons (local communities, capturers, traders, government ministries, NGOs, CBOs, security forces, CITES representatives) should be clearly stated.

10. *Procedure for obtaining permit:* The procedure and requirements to obtain a permit to capture and trade in parrots should be spelled out with due considerations given to the following elements:

a) Parrots should not be trapped during breeding seasons.

b) In most cases and where possible, fledglings should be trapped rather than adults.

c) Each trapper should be identified by his/her boss and his/her name written on the original copy of the permit which should be used in all field activities for identification.

d) For identification of trappers/traders in all circumstances, only the original copy of a permit should be used. However, a certified-true copy of a permit should be used when compiling official documents.

e) All permits should be computerized and should carry a recent passport sized photograph of the permit holder and names and passport sized photographs of all potential trappers for each permit holder.

f) Trappers should be given some basic training on how to reduce bird mortality during trapping and handling.

g) The region of the country where parrots should be trapped and the number to be trapped should be clearly stated on the permit as well as the duration of the permit.

h) PDF copies of each permit should be posted to LAGA and other NGOs in charge of law enforcements, the regional delegate of MINFOF, who should in turn give copies of the permit to the divisional delegates and chiefs of posts of MINFOF, security heads, conservators of protected areas and community representatives(NGOs/CIGs/CBOs) for regulation enforcement.

i) On arrival in the village for trapping of parrots, the permit holder should report to the divisional delegate or the chief of post of MINFOF who will sign his/her permit and transit form, thereby permitting the trapping actively to be carried out. Afterwards, the permit holder meets the chief/Fon of the village who will in turn call the representative of the community (CIG/CBO) and present the trapper to them, and then assign a person who will supervise the trapper in the forest. Number of parrots harvested should be strictly limited to the number started on the permit.

j) On return from the forest, the parrots are counted and royalties paid, the transit form signed by the chief of post/divisional delegate of MINFOF and the trapper leaves the village.

k) At every check point or control post, the number of parrots, transportation method and caging conditions should be verified; and the transit form signed, stamped and dated until the trapper or trader arrives his destination.

l) While the parrots are in transit, the permit holder should inform the LAGA office and the regional delegate of MINFOF by phone of the quantity of parrots in transit, area of capture and destination of the parrots. This information will help to track and distinguish legal and illegal trafficking of parrots.

m) Any security personnel who disturb the smooth and fast transportation of the birds at any checkpoint (outside his official duties) should be reported to the relevant quarters for immediate investigation and severe sanctioning

n) Within three (3) days of arrival at the final destination in the region, the permit holder should report to the nearest MINFOF regional office or DFAP in Yaounde for final endorsement of his transit form and confirmation of number of parrots brought home.

o) The permit holder should keep permanent records on the number of casualties of parrots and difficulties encountered in the field and at home for future verification by administration.

p) MINFOF/LAGA personnel should carry out impromptu visits to bird stations (aviary) to access the number of birds and their health conditions. The permit holder should show proof of follow-up of the health of the birds by registered veterinary personnel.

q) When the birds have been prepared for export, they should be exported as soon as possible without any administrative hurdles especially when the documents of the permit holder have been verified and endorsed.

r) All permits for parrot commercialisation should be issued in January every year. Parrots not captured and not exported by the permit holder before the expiration of his permit in December of the current year are lost. This measure will ensure smooth permit monitoring and management in the country. It will also solve the problem of not exceeding yearly exports recommended by CITES.

s) A five (5) man committee and a secretary for issuing permits and managing problems of parrot exploitation in real time and documentation should be created in DFAP. This is opposed to the ad-hoc committee which used to sit only twice a year (March and June)

t) Each permit holder must show proof of a standard bird house (station or aviary) and registered veterinary personnel as a prerequisite for owning a permit.

u) Standard cages with specific dimensions and materials, and number of birds per cage should be prescribed to exporters. Each cage should be certified with an official label or stamp of Cameroon by MINFOF personnel. This label will go a long way to distinguish cages of legal exporters from illegal exporters from Cameroon.

v) For parrots that are to be used as pets, research and breeding in the country, the owner of the birds must carry out the following obligations:

I. Have standard cages for a prescribed number and species of parrots.
II. Have a certificate of origin of birds or ownership permit issued by MINFOF office
III. Show proof of good health status of birds during any impromptu check.

Any bird without the three items mentioned above should be seized and taken to a rescue centre

11. *Number of permits issued per year:-* Number of permits issued per year for trapping parrots for commercial purposes should be limited to a maximum of ten. This will ease monitoring, control and management by the administration. It will also enable permit holders to have more chances of having a larger quota of birds, hence making more profits.
12. *Centralisation of the office issuing permits:* The office in-charge of issuing permits should be centralised by MINFOF to reduce management and monitoring irregularities.
13. *Revision of export procedures:* Export procedures should be revised and made more acceptable to all stakeholders.
14. *Punishment in the parrot trade sector:* Nature of punishment meted out to defaulters in the parrot exploitation sector should be revised and made more severe. Special and severe punishment should be given to people who are caught transporting parrots across the borders to other countries and people who use dangerous methods like hand-thrown explosives to kill parrots.
15. *Role of security officers and MINFOF staff at checkpoints*: The role of security officers (gendarmes and police) and MINFOF staff at checkpoints should be specified and made known to the general public. High level collaboration should be encouraged between MINFOF staff and security personnel especially when they are on duty.
16. *Excerpt of Cameroon Forestry and Wildlife Laws:* Relevant extracts of the latest version of the Cameroon Forestry and Wildlife Laws and instruments related to parrot conservation, management and exploitation; and with relevant explanatory notes should be prepared and added as a supplement to the handbook prescribed above.
17. *Cameroon Parrots Network:* Set up a platform that shall be called Cameroon Parrots Network which will serve as a veritable forum for collaboration amongst stakeholders of parrot conservation and development sectors. Apart from ensuring that parrot conservation and management programmes are fully implemented, this network will also serve as a watch-dog against parrot/wildlife crimes in the country. To be more functional:
    a) this network should meet periodically to identify and implement results and resolutions of the platform to make them far reaching to all parts of the country and beyond.

b) Membership of the platform should be limited to corporate bodies such as government and private institutions (NGOs, CBOs, and CIGs).
c) Representatives of various bodies should in turn disseminate the resolutions of the forum to their members and the grassroot communities.
d) Efforts should be made to ensure that membership is drawn from major ecological zones/regions of the country where parrot species survive in the wild.

10.4. Execution datelines: 2012

10.5. Success indicators:

1. Handbook is produced containing all the above elements and validated by the stakeholders within the specified time.
2. A hitch-free new parrot trade session is started in January 2013.
3. Cameroon Parrots Network is created and registered, management team elected and installed, constitution of network validated and published, and action plan (for at least one year) elaborated and validated.
4. Implantation of the policies and regulations in the handbook is fully started in 2013

8.2.4. Section 4: Non-detrimental levels of export quota

Making non-detriment findings on parrot species with very little available data on the natural history and previous sustainable levels of harvest can be a daunting task. Lack of understanding of the population dynamics of the natural populations of the Grey Parrot and absence of data on the traditional harvest by villagers, illegal export quotas and mortality rates make non-detriment findings difficult.

Perhaps the best way is to show by argument that the proposed Grey Parrot export quota and projects proposed for implementation by this report are non-detrimental. It is plausible to argue that the previous export quota of 12000 GPs per year was sustainable, if adequate measures were taken by the government to nurture its sustainability. For example export quotas were in some years exceeded by up to 24000 GPs. Many cases of illegal trapping and trade were reported in the country during this period and from 2007 to 2010, about 5000 GPs were confiscated from illegal dealers in the country. There was no parrot population monitoring and habitat improvement projects implemented for the benefit of species during this period. In fact, if a few of the above measures were taken to save-guard sustainability of the 12000 export quota, the population would not have dropped from 300,000 - 500,000 in 1998, to 199390 – 202170 GPs in 2011.

Assurance of non-detriment export quota for the Grey Parrot in Cameroon in the future will be linked to effective implementation of the projects outlined above, control of harvest and export quotas. Resilience to harvest is a paramount factor and it depends on the age/sex ration in the parrot population. From past experience, it can be very difficult to adopt an age/sex selective option for harvesting the Grey Parrot in the wild. The trapper takes all that comes into the trap and it is very difficult to let it free. However, trapping can be limited to non-breeding seasons to ensure that breeding adults are not captured. As seen above, the existence of an illegal harvest makes it difficult to determine the total sustainable harvest per year. Illegal harvest also makes it difficult for the investigator to obtain accurate data on the trade and natural population dynamics. Therefore for sustainable export quota to be feasible, high level law enforcement and population monitoring system must be applied alongside with the dismantling of corrupt practices at all levels of the Cameroonian society. At our level, this report has provided adequate measures to ensure non-detrimental harvest and export quotas in Cameroon through the following ways:

I. Regional fixed quota harvest system should be implemented and reviewed after every five years.
II. A tiny part of the population (2-3%) is feasible for harvesting in two regions of the country, while populations in the other three regions shall be developed to reach sustainable levels.
III. It is highly recommended that MINFOF selects an NGO and gives a free hand and adequate funds to manage the implementation phase of the management plan.
IV. It is strongly recommended that a CITES mission should visit Cameroon yearly from 2012 – 2016 to control and validate the implementation of the projects outlined in the management plan. If this approach is adopted, projects implementation success rate can go up to 80%.
V. If the projects outlined in the management plan are implemented, the sustainability of the export quota will be guaranteed.

8.3. Log-frame for project implementation and management: 2012 – 2016

Project code	Main objective	Strategy	Execution dateline	Success indicators
P1	To monitor and sustainably manage parrot populations and their habitat resources	Collect data on population dynamics, analysis data and use trends obtained for informed management decisions	2012 onwards	Evidence of data collected and field activities as required
P2	To standardize and consolidate research and trade in Grey Parrots in Range states	Organise an international conference and use it to produce standard research methods and harmonised policies in Africa	2013	Proceedings of the conference are produced and validated
P3	To establish a specialized and vibrant institution monitoring and management of parrot resources in Cameroon, to be called PRIC	Set-up a committee to establish PRIC and make it functional	2012 -2015	Evidence of major activities carried out leading to the establishment of PRIC
P4	To create a databank to be used for sustainable management of parrot species in Cameroon	Set-up databank and gather documented information on parrot species in Cameroon as a starting point. The databank will eventually be handed over to PRIC when it becomes functional	2014-2015	Data base is set up and documented information gathered as a start off point.
P5	Identify and raise conservation status of important parrot areas	Carry out an inventory of important parrot areas of Cameroon (IPAC) and make a long term plan for their development especially for the benefit of parrot resources.	2015	IPAC sites are identified and developed for the benefit of parrots
P6	To increase the breeding rate of Grey parrots in the country	Study breeding biology of the bird in the wild and use acquired knowledge for captive specimen. Use fledglings for the trade and/or release into the wild	2015	Captive bred parrots are released in to the wild or used for trade as required
P7	To improve on parrot trapping and handling methods so as to reduce their general mortality rate	Produce a document specifying the procedures and requirements for trapping, handling and keeping parrots	2012	Document is produced, validated and made public.
P8	To improve on the general welfare of recued parrots	Produce a code of procedures for managing rescued and confiscated parrots	2012 -2013	Document on rescue and management procedures is produced and validated
P9	To enhance the involvement of rural communities in sustainable parrot management and exploitation	Promote the value of parrot and ecosystem services through attitude change in rural communities by creating and empowering CIGs and CBOs	2013-2015	CIGs and CBOs are created and are fuctional
P10	To draw up a parrot trade policy and law containing the species sustainability prospects, non-detriment measures, fairness and viable financial mechanism for all stakeholders	Revise and harmonise policies and law on parrot trade to make them more productive and functional to all stakeholders	2012	Handbook on parrot trade policies and law is produced, validated and made available to stakeholders

8.4. Yearly datelines for project implementation and management

Year	Project code	Event	Dateline
I	P1	Parrot population census	2012 onwards
	P3	Carryout feasibility study, select site, formalize documentation process and draw up development plan of PRIC	2012
	P7	Parrot welfare and death reduction in the country	2012
	P8	Creation of a special account for parrot rescue operations	2012
	P10	Restructure policies and harmonize parrot trade	
II	P1	Parrot population census	2013
	P2	Formation of organizing committee for the conference	January 2013
		Creation of conference website and call for participation	April 2013
		Conference period	November 2013
	P3	Tender and start construction work on permanent site of PRIC	2013
		Select temporary site and make PRIC functional	2013
	P4	Creation of parrot database	2013
	P8	Production of procedural manual for parrot rescue, confiscation and management operations	2013
		Feasibility study of rescued parrots centre	2013
		Training of personnel for parrot rescue and management operations	2013
	P9	Formation of community CIGs and CBOs	2013
III	P1	Parrot population census	2014
	P4	Draw up field programme for database updates	2014
		Projects implementation for empowerment of CIGs and CBOs	2014
VI	P1	Parrot population census	2015
	P3	Inauguration and transfer to the permanent site of PRIC	2015
	P5	Implementation of IPAC initiative	2015
	P6	Set up captive breeding programme	2015
	P9	Continue with livelihoods and developmental projects in selected communities	2015
V	P1	Parrot population census	2016
	Final evaluation and validation of all projects implemented		2016

8.5. General Conclusion

With the enforcement and regulation of the parrot trade in Cameroon since 1981, the Grey Parrot has remained a species of great biological interest as well as socio-economic and political importance to Cameroon. The sustainable conservation of the bird and its habitat resources through the mitigation of emerging challenges should be a top priority to the Government of Cameroon. The management plan is a flexible strategy that provides guidelines that can be used to enhance the development and sustainable conservation and exploitation of Grey Parrot resources in Cameroon. An integrated management approach should be adopted and all stakeholders in the parrot sector are expected to be involved at the level of implementation. The South West Region had the least density of 0.49 parrots/km^2 and was closely followed by the Littoral region with 0.50 parrots/km^2. The highest value 2.16 parrots/km^2 was obtained from the East Region followed by the South Region with 1.74 parrot/km^2. Therefore regional parrot densities in Cameroon ranged from 0.49 -2.16 parrots/km^2/season, and the national mean density value was 1.12 parrots/km^2.

The least parrot population size was recorded in the Littoral Region (2301 GPs) and the highest in the East Region (136379 GPs). The population size of Grey Parrots in Cameroon as a point count was 200779 GPs and as a range was from 199390 to 202170 GPs. Harvest quotas for the different forest regions were determined taking into consideration factors that negatively affect the natural intrinsic growth rate of parrot populations in the country such as, habitat degradation which results in scarcity of nesting sites, poaching and trafficking of parrots for the pet trade. A national harvest quota of 4000 - 6000 GPs per year and a national export quota of 4000 – 5000 of GPs is feasible in Cameroon from 2012 – 2016. A maximum of 1000 GPs could be sustainably harvested for local consumption in Cameroon from 2012 – 2016.

The regional quota approach has a major advantage over the previous national "global" quota approach in that harvesting is carried out as a proportion of the known population size in each region. The overall impact is a reduction in regional threats and extinctions that are plausible through over exploitation as practiced in the past. It also enables management to be aware of regions with endangered parrot populations such as the North West and West Regions, and take adequate management measures to develop them to sustainable levels. Out of the seven regions that harbour Grey Parrot in Cameroon, two regions (North West and West) were listed in Class A^{+}, two regions (Littoral and South West) listed in Class A^{-}, one region (Centre) listed in Class B, and two regions (East and South) were listed in Class C. The status of the Grey Parrot in Cameroon therefore called for serious sustainable conservation and management attention.

Photo 8.1. Grey Parrots stocked in a container in an effort to smuggle out of Cameroon

REFERENCES

Alcock J. (1979). *Animal Behaviour- An Evolutionary Approach*. Sinauer Asso. Inc. Pub. Sunderland, Massachusetts.

Anderson M., Golmark F. and Wiklund C.G. (1981). Food information in the black-headed gull, *Larus ridibundus*. *Behav. Ecol. Sociobiol*. 9: 199-202.

Anderson S.H. and Shugart H.H. (1974). Habitat selection of breeding birds in an east Tennessee deciduous forest. *Ecology* 55: 828-837.

Alatalo R.V. (1981). Habitat selection of forest birds in the seasonal environment of Finland. *Ann. Zool. Fenn*. 18: 103-114.

Bazilchuk, N. 2006. Border control: wildlife Interpol cracks down on organized crime. *Conservation Magazine*, **7**(2). http://www.conservationmagazine.org/2008/07/border- control/. Accessed on 17th November 2009.

Beissinger S.R. and Bucher E.H. (1992). Can parrots be conserved through sustainable harvesting? *BioScience* 42: 164-173.

Beissinger, S.R. (2001).Trade of live wild birds: potential, principles and practices of sustainable use. In *Conservation of Exploited Species*: J. D. Reynolds, G. M. Mace, K. H. Redford, J. G. Robinson (eds), pp. 182-202. Cambridge University Press, Cambridge, UK. http://www.cnr.berkeley.edu/~beis/Pubs_PDF/pub_docs/Bird%20Trade%20Potential.pdf Accessed on 1st May, 2011.

Bibby, C.J., Burgess, N. D. and Hill, D. A. (1992) Bird Census Techniques. Academic Press, London. Pp 256

BirdLife International (2006). BirdLife International's review of the status of the African Grey Parrot and proposal to CITES for its conservation, 22nd meeting of the Animals Committee. http://www.birdlife.org/action/change/cites/grey_parrot_cites_2006.pdf. Accessed on 10th January, 2010.

BirdLife International (2010). CITES and the wild birdtrade. http://www.birdlife.org/action/change/cites/index.html. Accessed on 10th May, 2010.

BirdLife International (2011) Species factsheet: *Psittacus erithacus*.: BirdLife International 2011) IUCN Red List for birds. http://www.birdlife.org Accessed on 24/05/2011.

Bolden, E.G., Robinson, W.L. (1999), *Wildlife ecology and management* 4th ed. Prentice-Hall, Inc. Upper Saddle River, NJ. ISBN 0-13-840422-4

British Broadcasting Corporation (2004). Wild bird trade. http://www.bbc.co.uk/insideout/yorkslincs/series6/parrot_trade.shtml. Accessed on 19th May, 2010.

Buckley, R., Robinson, J., Carmody, J. and King, N. (2008). Monitoring for management of conservation and recreation in Australian protected areas. *Biodiversity Conservation*, 17: 3589-3606. www.springerlink.com/index/23742n5214887624.pdf. Accessed on 14th January, 2010.

Buckland, S.T., Anderson, D.R., Burnham, K.P. and Laake, J.L.(1993) Distance Sampling: Estimating abundance of biological populations. Chapman and Hall, London.

Caughley, G. 1977. Analysis of vertebrate populations. John Wiley & sons, New York, USA

Chardonnet, Ph., ders Clers, B., Fischer, J., Gerhold, R., Jori, F. and Lamarque, F. (2002). The Value of wildlife. *Scientific and Technical Review,* **21**(1), 15-51. http://www.oie.int/boutique/extrait/phchardonnet.pdf. Accessed on 21st November, 2009.

Chupezi, T.J. and Ndoye, O. (2004). National analysis of trade-related instruments influencing trade inAfrican cherry (*Prunus africana*) and the African Grey Parrots (*Psittacus erithacus*): applications and impacts on poverty alleviation and sustainable forest management in Cameroon, prepared for The Food and Agricultural Organization of the United Nations (FAO) Non-Wood Forest Products Programme. ftp://ftp.fao.org/docrep/fao/010/k0457e/k0457e00.pdf. Accessed on 20th December, 2009.

Chupezi T. J., Ndoye, O. and Mpele, T.O. (2006). Commodity-chain analysis for the capture and trade in the African Grey Parrots (*Psittacus erithacus erithacus*) in Cameroon. Prepared for Policy and Distributional Equity in Natural Resource Commodity Markets: Commodity Chain Analysis as a Policy Tool Project. http://www.indiana.edu/~iascp/bali/papers/Chupezi_Tieguhong_Ndoye_Mpele.pdf. Accessed on 20th December, 2010.

Clemmons J.R. (2003). Status survey of the African Grey Parrot (*Psittacus erithacus timneh*) and development of a management program in Guinea and Guinea Bissau. Unpublished report to the CITES Secretariat, Geneva, Switzerland.

CITES (2011a). CITES and Livelihoods. 61st meeting of the standing committee (SC61Doc.), Geneva, Switzerland, 15-19 August 2011.

CITES (2011b). Lessons Learnt from Non-detriment Findings. 19th meeting of the Plant Committee (PC19Inf.10), Geneva, Switzerland,16-21 April 2011.

CITES (2010). What is CITES? http://www.cites.org/eng/disc/what.shtml. Accessed on 16th July, 2010.

CITES (1998). Cameroon: Lifting of standing committee suspension on imports of specimens of *Psittacus erithacus.* Notifications to the Parties, No. 1998/05, Geneva. http://www.cites.org/eng/notif/1998/05.shtml. Accessed on 15th November, 2009.

CITES (2007). 55th Meeting of the standing committee. The Hague, Netherlands, 2 June 2007. Review of Significant trade. SCSS Doc. 17.

CITES (2006). Summary records of the twenty-second meeting of the Animals Committee, Lima (Peru), 7-13 July 2006. http://www.cites.org/eng/com/ac/22/E-AC22-summary-record.pdf. Accessed on 10th July, 2011

CITES (2005). Review of Significant Trade in specimens of Appendix-II species: report on progress in the implementation of the review of significant trade: species based review of significant trade. *Twenty-first meeting of the Animals Committee Geneva* (Switzerland), 20-25 May, 2005, AC 21, Doc. 10.1.1, (Rev.1). http://www.cites.org/eng/com/AC/21/E21-10.1.1.pdf.

Accessed on 3rd May, 2010.

Dandliker G. (1992). *The African grey parrot in Ghana: a population survey. A contribution to biology to the biology of the species. A study of its commercial exploitation and management recommendations.* Unpublished report to the CITES Secretariat, Geneva.

Cody M.L. (1981b). Habitat selection in birds: The role of habitat structure, competition and productivity. *BioScience* 31: 107-113.

Cole, L.C. (1954). The population consequences of life history phenomena. *The Quarterly Review of Biology*, **29**(2), pp 103-137. http://biopopliteratura.tripod.com/sitebuildercontent/sitebuilderfiles/cole.pdf. Accessed on 30th July, 2010.

Dawson D.G. (1981). Counting birds for a relative measure (index) of density studies. *Avian Biol.* 6: 12-16.

Duncan T. (1993). Vegetation zones of Korup Project Area- Preliminary analysis of the existing vegetation map. Unpublished report to the Korup Project, Cameroon.

EU Wild Bird Declaration (2004). An NGO Call to Halt Wild Bird Imports into the European Union. http://birdsareforwatching.org/WBDecFinal.pdf. Accessed on 16th July, 2010.

Flemming T.H. (1981). Winter roosting and feeding behaviour of pied wagtail near Oxford, England. *Ibis* 123: 463-476.

Forshaw J.M. (1989). *Parrots of the world*. Lansdowne Editions. Willoughby, Australia.

Fotso Roger. (1998). Survey status of the distribution and utilization of the Grey Parrot (*Psittacus erithacus*) in Cameroon. Unpublished report to the CITES secretariat, Geneva, Switzerland.

Fotso Roger., Dowsett-Lemaire F, Dowsett R.J., Cameroon Ornithological Club, Scholt P., Languy M. and Bowden C. (2001). Cameroon Important bird areas of Africa and associated islands: Priority sites for conservation. Birdlife conservation series No 11 (ed. By LDC Fishpool and M.J. Evans). Pp 133-159. Pisces Publications and Birdlife International, Newbury and Cambridge, UK.

Frigg, R. and Hartmann, S. (2006). Models in Science. http://plato.stanford.edu/entries/models-science/. Accessed on 4th June, 2010.

Graham, M. (1935), Modern theory of exploiting a fishery, an application to North Sea trawling. *Journal de Conseil International pour l'Exploration de la Mer* 10**:** 264-274.

Graziele Volpato, E.V. Lopes, L.B. Mendonca, R. Bocon, M.X. Bisheimer, P.P. Serafini and L. dos Anjos, (2009). The use of point count method for birds and survey in the Atlantic forest . *Zoologica* 26: 74-78.

Hill, D., Fasham, M., Tucker, G., Shrewry, M. and Shaw, P. (2005). *Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring*. Cambridge University Press. http://lib.myilibrary.com?ID=43656. Accessed on 17th June, 2010.

Hutto, R.L., Pletschet, M. and Hendricks, P. (1986). A fixed radius point count method for non-breeding season use. *Auk* 103: 593-602.

IUCN, UNEP, WWF, 1991. *Caring for the Earth. A strategy for sustainable living*. Gland Switzerland

IUCN (2010). International Union for Conservation of Nature (IUCN) Red List of Threatened Species. IUCN 2010. IUCN Red List of Threatened Species. Version 2010.2. Downloaded in August 2010.

Jackson, L.J., Trebitz, A.S. and Cottingham, K.L. (2000). An introduction to the practice of ecological modelling. *BioScience*, 50: 694-706. http://math.sfsu.edu/meredith/biomath/Jackson%20%202000%20%20Intro_to_the_practice_of_ecol_modeling.pdf. Accessed on 4th April, 2010.

Juste, J.B. (1996). Trade in the Gray Parrot (*Psittacus erithacus*) on the Island of Principe (São Tomé and Principe, Central Africa): Initial assessment of the activity and its impact. *Biological Conservation*, 76: 101-104.

Kiss A. and Moller A.P. (1986). A field test of food information transfer in communally roosting green finches. *Animal Behaviour* 34: 1251-1255.

Kock, R. A. (1995). Wildlife utilisation: Use it or lose it-A Kenyan perspective. *Biodiversity and Conservation*, 4: 241-256. www.springerlink.com/index/M2588W172368JH35.pdf. Accessed on 10th January, 2010.

Limbe Wildlife Centre, (2010). African Grey Parrots, the illegal trade continues.http://limbewildlifecentre.wildlifedirect.org/2010/02/02/african-grey-parrots-the-illegal-trade-continues/. Accessed on 4th July, 2010.

Mace, P.M. (2001), A new role for MSY in single-species and ecosystem approaches to fisheries stock assessment and management *Fish and Fisheries* 2: 2-32.

May, D.L. (2001). Grey Parrots of the Congo Basin Forest. *PsittaScene*, 13: 8-10. http://www.parrots.org/pdfs/our_publications/psittascene/excerpts/grey_parrot/PS%2013%202%20May%2001%20DM.pdf. Accessed on 14th February, 2010.

Marsden, S.J. (1999) Estimation of parrots and hornbill ensities usung a point count distance sampling method. *Ibis*141: 377-390.

Matthews, M.R. (2007). Models in science and in science education: An introduction. *Science & Education*, 16, 647-652. www.springerlink.com/index/72652Q046W1L101P.pdf. Accessed on 10th July, 2010.

McGowan P. (2001). Status management and conservation of the African Grey Parrot, (*Psittacus erithacus*) in Nigeria. Unpublished report to the CITES secretariat, Geneva, Switzerland

MacGowan, P. (2008). African Grey Parrot *Psittacus erithacus* case study. NDF workshop case studies.WG6-Birds, Case study 1. Psttacus erithacus, Country Guinea. pp 1-9.

Milner-Gulland, E.J. and Mace, R. (1998). *Conservation of Biological Resources*. Blackwell Sciences Ltd., UK, 404 pp.

Milner-Gullard, E.J., and H. R. Akcakaya. Sustainability indices for exploitated populations. *Trends in Ecology and Evolution* 16:686-692.

Mulliken, T. A., Broad, S.R. and Thomsen, J.B. (eds) (1992). The wildlife bird trade: an overview. *Perceptions, conservation and management of wild birds in* trade. TRAFFIC Int, pp 1-42. www.traffic.org/species-reports/traffic_species_**birds**4.pdf. Accessed on 7th March, 2010.

Nance J., Keithy W., Caillouet C., Cole J., Gaildry W., Gallaway B., Griftin W., Hart R. and Travis M. (2006). Estimation of effort, maximum sustainable yield and maximum economic yield in the shrimp fishing of the Gulf of Mexico. Report to the Gulf of Mexico fishery council.

Nasi, R., Brown, D., Wilkie, D., Bennett, E., Tutin, C., van Tol, G., and Christophersen, T. (2008). Conservation and use of wildlife-based resources: the bushmeat crisis. Secretariat of the Convention on Biological Diversity, Montreal, and Centre for International Forestry Research (CIFOR), Bogor. *Technical Series no. 33*, 50 pp. http://www.cifor.cgiar.org/publications/pdf_files/media/cbd-ts-33-en.pdf. Accessed on 23rd November, 2009.

Nforngwa, E. (2010). Illegal trade threatens Grey Parrots in Cameroon. http://www1.voanews.com/english/news/environment/Illegal-Trade-Threatens-Grey-Parrots-in-Cameroon--95418029.html. Accessed on 4th July, 2010.

Ngenyi, A. (2002). African Grey Parrot trade in Cameroon. *PsittaScene*, 14: 2-3. http://www.parrots.org/pdfs/our_publications/psittascene/2002/02May51.pdf. Accessed on 10th February, 2010.

Ngenyi, A. (2003). The African Grey Parrot (*Psittacus erithacus)*: status and commercial exploitation in Cameroon. *Report for WWF, Jengi SE project*, 40pp. http://cameroun-foret.com/system/files/18_13_29.pdf. Accessed on 10th April, 2010.

Pain, D.J., Martins, T.L.F., Boussekey, M., Diaz, S.H., Downs, C.T., Ekstrom, J.M.M., Garnett, S., Gilardi, J.D., McNiven, D., Primot, P., Rouys, S., Saoumoé, M., Symes, C.T., Tamungang, S.A., Theuerkauf, J., Villafuerte, D., Verfailles, L., Widmann, P. and Widmann, I.D. (2006). Impact of protection on nest take and nesting success of parrots in Africa, Asia and Australasia. *Animal Conservation*, 9: 322-330.

Pepperberg, I.M. (2007). Individual differences in Grey Parrots (*Psittacus erithacus*): Effects of training. *Journal of Ornithology*, **148** (Suppl 2), S16-S168. DOI 10.1007/s10336-007-0162-0. www.springerlink.com/index/4171827223567565.pdf. Accessed on 5th July, 2010.

Primack, R.B. (2002). *Essentials of conservation biology.* 3rd edition. Sinauer Associates Inc Publishers, USA, 679 pp.

Quinn, T.J., and R.B. Deriso.1999. Quantitative fish dynamics. Oxford University, New York, USA.

Rabinovich, J. (2004). Modelling the sustainable use of the Blue-Fronted Parrot (*Amazona aestiva*) in the Dry Chaco region of Argentina. A Report to the Wildlife Service of the Secretary of the Environment and Sustainable Development of Argentina.

http://www.ambiente.gov.ar/archivos/web/ele/File/Modeling%20the%20sustainable%20use%20of%20the%20Blue-Fronted%20Parrot.pdf. Accessed on 8th April, 2010.

Richardson, J.A. (1998). Wildlife utilization and biodiversity conservation in Namibia:conflicting or complementary objectives? *Biodiversity and Conservation*, 7: 549-559. www.springerlink.com/index/t1q57370k7134658.pdf. Accessed on 3rd March, 2010.

Runge, M. C., J.R. Sauer, M.L. Avery, B.F. Blackwell, M.D. Koneff, (2009). Assessing allowable take of migratory birds. *Journal of Wildife Management*, 73(4) 556-565.

Runge, M.C., F.A. Johnson, M.G. Anderson, M.D. Koneff, E.T. Reed, and S.E. Moott (2006).The need for coherence between waterfowl harvest and habitat management. *Wildlife Society Bulletin* 34:1231-1237.

Runge, M.C., and F.A. Johnson. 2002. The importance of functional form in optimal control solutions of problems in population dynamics. *Ecology* 83:1357-1371.

Seavy, N. E., S. Quader, J, D. Alexander, C. J. Ralph, 2009. Generalized linear models and point count data: Statistical considerations for the design and analysis of monitoring studies. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191

Skutch A.F. 1940. Social and sleeping habits of Central American Wrens. *Auk* 52: 293-312.

Smith G.A. 1971 The use of foot in feeding with special references to parrots. *Avicult. Mag*. 77: 93-100.

Snyder, N., McGowan, P., Gilardi, J., and Grajal, A. (eds.) (2000). General principles for parrot conservation. *Parrots. Status Survey and Conservation Action Plan 2000–2004*. IUCN, Gland, Switzerland and Cambridge, UK. 180 pp. http://www.parrots.org/pdfs/our_publications/pap/chapter2.pdf. Accessed on 1st July, 2010.

Tamungang, S.A. and Cheke, R.A. (2009). Annual technical and financial progress reports being field activities report from PARROTPRO, Cameroon to Loro Parque Fundación, Spain, 2008/2009.

Tamungang, S. 2004. Dschang Varsity celebrates World Parrot Day. Press Interview reported by Peter Mu-Nyete. *The Post Newspaper*. June 20, 2004.

Tamungang, S.A. and Ajayi, S.S. (2003). Diversity of food of the Grey Parrot *(Psittacus erithacus*) in Korup National Park, Cameroon. *Bulletin of the African Bird Club*, 10**:** 33-36.

Tamungang, S.A., I.A. Ayodele, and Z.E. Akum, (2001). Basic Home Range for the Conservation of the African Grey Parrot in Korup National Park, Cameroon. *Journal of Cameroon Academy of Science*. 1(3):155-158.

Tamungang, S.A. (1998). Habitat utilisation by the African Grey Parrot (Psittacus erithacus) in Korup National Park and environs, Cameroon. *Malimbus* 20**:** 65-66.

Tamungang S.A. 1996. The Vanishing Grey Parrots of Cameroon: Conservation Prospects. *Malimbus*18.pp70-71.

TRAFFIC (2008).The illegal trade in wild birds for food through south-east and central Europe. www.traffic.org/species-reports/traffic_species_birds2.pdf. Accessed on 15th May, 2010.

UNEP-WCMC (2006). UNEP-WCMC Species Database: CITES-Listed Species. http://www.unep-wcmc.org/isdb/CITES/Taxonomy/tax-species-result.cfm/isdb/CITES/Taxonomy/tax-species-result.cfm?Genus=Psittacus&Species=erithacus&source=animals. Accessed on 15th November, 2009.

Wade, P.R. 1998. Calculating limits to the allowable to the allowable human-caused moetality of cetaceans and pinieds. Marine mammal Science 14:1.37.

World Wildlife Fund for Nature (2008). Cameroon: the battle for parrot souls in South-east. http://wwf.panda.org/who_we_are/wwf_offices/cameroon/news/?135201/Cameroon-The-Battle-for-Parrot-Souls-in-Southeast. Accessed on 10th December, 2010.

Wright, T.F., Toft, C.A., Enkerlin-Hoeflich, E., Gonzalez-Elizondo, J., Albornoz, M., Rodríguez-Ferraro, A., Rojas-Suárez, F., Sanz, V., Trujillo, A., Beissinger, S.R., Berovides, A.V., Gálvez, A.X., Brice, A.T., Joyner, K., Eberhard, J., Gilardi, J., Koenig, S.E., Stoleson, S., Martuscelli, P., Meyers, J.M., Renton, K., Rodríguez, A.M., Sosa-Asanza, A.C., Vilella, F.J. and Wiley, J.W. (2001). Nest poaching in Neotropical parrots. *Conservation Biology*, 15: 710-720. http://nature.berkeley.edu/~beis/Pubs_PDF/pub_docs/PoachCB.pdf

Yapp W.R. (1970). The life and organization of birds. Edward Arnold Ltd., London.

APPENDIX I

ACKNOWLEDGEMENT

In order to realise this work, the PARROTPRO research team worked with many individuals and institutions, both in and out of Cameroon. We are indebted to all our resource persons who provided information, transport, accommodation and guidance during data collection sessions, organisation of focus groups, workshops and conferences, secretariat services, data analysis and GIS, editing and proof reading services at all levels. Profound gratitude to all our resource persons whose names, we regret, have not been mentioned below.
Special thanks to the following institutions:

- Ministry of Forestry and Wildlife, Cameroon,
- Loro Parque Fundación, Spain,
- GIE, University of Dschang, Cameroon,
- NRI, University of Greenwich, United Kingdom,
- Last Great Apes Organisation (LAGA), Cameroon,
- Wildlife Conservation Society(WCS), Cameroon,
- Limbe Wildlife Centre (LWC), Limbe, Cameroon,
- Mgvot-Betsi Zoological Garden, Yaounde, Cameroon
- WWF Jengi Project, South-Eastern Cameroon
- Cameroon Wildlife Conservation Society (CWCS) Project, Mouanko

Immense thanks to the following persons:

- Abagui Lucien, Ecoguard, Lobeke National Park, East Region. Tel: 94 39 56 53
- Abang-Minko, Security Frontier Post, Kyo-Osse, South Region
- Abessolo Eyi Fridolin, MINFOF, Ambam, South Region. Tel: 99 05 20 68/76 69 42 94
- Abessolo Mervie, Farmer in Mebang Village, South Region
- Aboulou Garoua, Gendarme Brigade, Oveng, South Region
- Abua Daniel Ndiaka, Ecoguard, Forestry Control Post, Mbonge. South West Region
- Achu Ernest, Professional driver, PARROTPRO Staff,
- Adolph Nwesse, Chief of Ekokola Village, KREO/KOGAN, Mundemba
- Afuh Benedict, Former parrot trapper. Tel: 76 30 65 43.
- Agbor Delphine, Conservation Adviser, DED, Takamanda-Mone TOU. Tel: 77 12 50 62.
- Ajaga Nji (Prof), Department of Rural Sociology, FASA, University of Dschang

- Ajonina Gordon N. (Dr), National Coordinator Cameroon Mangroove, Network Douala-Edea Wildlife Reserve, BP 54 Mouanko
- Ajonyi George Awah, Centre Zootechnique et vétérinaire, Isanguele, South West Region
- Akum Zacharias Enow, Freelance Environment Consultant, BP 894 Limbe
- Aladji Robert, Divisional Delegate of Forests and Wildlife of Faro Division
- Alkassoum, Tibati town. Tel: 79 15 81 59 / 77 19 36 12.
- Amang Françis, Divisional Delegate of Foresry and Wildlife, Mbam and Inoubou
- Ambassa Linus, Accountant, Waza National Park. Extreme North Region
- Ambeno Emmanuel, 2nd Deputy Mayor of Isangele, South West Region
- Ampoam Kanga Emmanuel, Forestry and Wildlife Technician, Divisional, MINFOF, Upper-Nyong.
- Amvouna Daniel (77 58 29 22), Elogbatindi, Océan Division
- Andrés Gomez Alonso, M.Sc student, forest ecology and management, University of Freiburg, Germany.
- Angouzoa Martin (Adjutant), 62nd MIB (Mobile Intervention Batallion) of Nkambe, on a special mission to the lake (20th April to 20th may 2009)
- Angyie Peter, Senior Lecturer in Economics, University of Dschang
- Anicet Ngomin, Chef service régional de la promotion et de la transformation des produits forestiers de l'Adamaoua
- Atanga Ekobo, Programme Coordinator, Coastal Forest Programme (SAWA).
- Ateba Ngoa Michel, SDO, Oveng-Fang Sub-division.
- Atef Martin, Forestry and Wildlife Technician, Tel: 77 83 90 73.
- Atou'ou Martin, Nkeolon Village, Secretary of CODEVIECOTOUR.
- Ayire M S Henri, Ecoguarde stagiaire à Malentouen. Tel : 97 60 50 99.
- Ayisssi Isidore, Service de la conservation, Réserve de Faune de Douala-Edea
- Ayuk Edward Takor, SDO of Akwa,. Ndian Division,.
- Azemte Mbemo Alain Patrice, Waza National Park. Tel : 74 93 62 02/99 49 44 82.
- Bache Jean Marie, trapper et hunter, Makenene
- Bailabar Therese, Forestry Officer, WWF/PSSN Garoua
- Baka Kengwa Emmanuel, Acha-Annex Eye services, BP 149 Bafoussam
- Bala Shehu Garba, Factory manager at NHTE.
- Balinga Victor, Wildlife Consultant, BP 111 Limbe
- Balla Ottou Appolinaire, Chief of Section, Wildlife and Protected Areas, Boumba and Ngoko Division.
- Balla Philippe Bertrand, Soldier, 62nd MIB of Nkambe, on mission to the lake Nyos.

- Bambot Grace M (Dr), Lecturer in Botany, University of Dschang
- Banvele Gilgert, Divisional Delegate of MINFOF, Meme Division, South West Region
- Bate Samuel, WWF, Campo, Campo Ma'an National Park, Tel: 96 81 89 39
- Battokock Emmanuel, Instructor and Ornithologist, Wildlife School, Garoua
- Bawack Egbe Harmlet, Forestry Technician, Banyang-Mbo Wildlife Sanctuary, Nguti
- Bawak Christian, Support Staff, Regional Delegation, MINFOF, North West Region
- Benedict Okon, Akwa. Ndian Division, Tel: 77 08 49 47
- Bertrand Lipot, Guide éducateur, Mefou National Park, Centre Region
- Bessala Hubert, Brigade Commander, Gerndamerie Nationale, Oveng-Fang
- Bikadal Emile, TPEF, Chef de Poste des forêts et faune, Lolodorf
- Bilonga Mengue Gabriel, agent communal à Aboulou, South Region
- Bissa Beatrice, Agent d'entretien/DFAP. MINFOF Tel : 75 57 00 89
- Biyidi Mathieu, Ebogo touristic site, Mbalmayo. Tel : 74 30 05 54
- Bohim Cyrille, Farmer, Ndikinimeki, Tel:79 71 93 13
- Bondoa Bondoa Pierre, TSEF, Chief of Forestory Post, Mbang, Kadey.
- Bongalembe family of Lolabe III
- Boudou Salomon of Touki village
- Boyim Martin, Chef de groupement, Ndikinemeki, Centre Rigion
- Che Louis F, Ecotourist Guide, Tri-National of Sangha. Tel: 77 69 88 92
- Chia Walters (alias Rector), Photographer University of Dschang, Tel: 7776983
- Chin Emmanuel M, Regional Chief of Wildlife and Protected Areas, North-West Region
- Chuyeh Vitalis Tuncha, Ecoguard, Kimbi Game Reserve, Tel : 99 84 39 68/75 13 59 69
- Daniel Rémy Zé Atangana, Sub Divisional Officer of Mbang.
- Diffo Joseph Le Doux. Tel: 77 66 90 08. jdiffo@gvfi.org
- Djawi Thomas, Baka pygmy, Mambele, Lobeke, East Region
- Djeumeli Maurice, Regional Chief of the Fauna section at the WRD/MINFOF
- Djibrila Hessana, SDAP/MINFOF. djihessa@yahoo.fr, Tel: 94 33 14 91
- Djieto Lordon, Senior Lecturer, Faculty of Science, University of Yaoundé I
- Djomba Innocent, Carrier, Lobeke National Park, East Region
- Djopgang Joel, Policier au poste frontière de Kye-Ossi, South Region
- Djoumessi Pierre, Regional Chief of the Forestry, MINFOF, West Region
- Dombou Celestin, Baka pygmy, farmer at Mambele..
- Dong A'Tchike, Botanist at the Wildlife School, Garoua, North Region
- Dongmo Jean Benard, Cadre, DFAP, MINFOF, Yaounde

- Dongmo Lekeng Narcis, FASA, University of Dschang, on internship in the Lobeke National Park, Tel : 75 46 68 97
- Dongmo Pascal, Conservator of the Korup National Park, .South West Region
- Doumbé Alexandre, MINFOF, guide, Douala-Edea Reserve, Mouanko
- Ebo'o Ebo'o Benjamin Aimé, Inspecteur de Police, Commissariat de l'immigration, Aboulou, South Region
- Ebune Harry, Field Assistant, PAMOL-Ndian. Tel: 75 23 51 71.
- Ejake henriette, CSRS/DFAP. Tel : 77 73 16 37, henejake@yahoo.fr
- Elamenye Modeste, Farmer in Mebang Village, South Region
- Ella Emmanuel, Farmer in Mebang Village, South Region
- Enow née Esther Obi, SDCF/DFAP. Tel : 77 66 64 75
- Enow William Tabe, Project Secretary, Mengame Gorilla Sanctuary. Tel: 99 00 72 48
- Eric Siaw Ntiri, School of Science, Natural Resources Institute, University of Greenwich, United Kingdom
- Essama Pascal, Technicien des Eaux et Forêts au poste de contrôle forestier de Sereré
- Essimbi Emmanuel Péguy, Délégué Départemental, MINFOF, Vallée du Ntem
- Essomba Henri II, CSC/DFAP. MINFOF
- Essomba Jean B, Ecoguard, Dja Biosphere Reserve. Tel: 99 21 81 40
- Etah Lucas Agbor, Ecoguard, Korup National Park, Mundemba. Tel: 74 77 39 52
- Etoundi née Malla Léonie, Délégation Départementale, MINFOF, Mbam et Inoubou
- Ewoudou Eloundou Pius, chasseur, planteur et pisteur, Nkolakié
- Eyambe John, Akwa. Ndian Division, South West Region, Tel: 96 94 52 84
- Eyinga, tourist guide, Farmer, Oveng-Fang, Tel: 74 50 11 48/22 99 20 05
- Fai Cornelius (Prof), Dept of Physics, University of Dschang
- Father Lenda, Nkoteng Village, Tel : 96 42 87 58
- Fidelis Orock Tanyi, Ndawara Tea Estate, North West Region, Tel: 77 59 17 72
- Fobo Alphonse, Former parrot trader, Mbang Sub-Division
- Fobuzie Pricelia, Senior Lecturer in Wildlife Management, University of Dschang
- Fofack Pierre Marie, Support Staff at the WRD/MINFOF. Tel : 99 37 73 70
- Fofung née Mba Elisbeth, Cadre/DFAP, MINFOF, Yaounde
- Fokit Fokit Martin Ulrich, Adjoint du Conservateur, Réserve de Faune de Douala-Edea
- Foko Casimir, Regional Chief of transformation, MINFOF, West Region
- Fomba Vincent, Conservator, Limbe Wildlife Centre, P.O.Box 878 Limbe
- Fomethe Anaclet, Rector, University of Dschang
- Fopa Sammuel, MINFOF, West Regional Office. Tel: 77 12 68 18

- Fotso Roger (Dr), Director, WCS, C. B. P., BP 3055 Yaounde
- Fouelefack Gilbert, Technicien supérieur des eaux et forêts, MINFOF, Mbandjock
- Gao Jean, Chef de poste de contrôle forestier et chasse, Guidiguis, Tel: 75 98 72 31
- Gapessié Levis, student, 'University of Dschang, on internship in Bafia.
- Ghogomu Julius (Dr), Vice Dean, Research and Cooperation, Faculty of Science, University of Dscahng
- Ghogomu Richard T. (Prof), Dean of the Faculty of Science, University of Dschang
- Gwa Gabriel, Baka Pygmy, touristic guide, Lobeke National Park, East Region
- Hamayero Ardo, Chef de Brigade de Contrôle, MINFOF, North Region
- Hot Hot M Alain Roger, MINFOF, Ambam, Vallée du Ntem
- Housséimi Bouba, Support Staff, Divisional Delegation of MINFOF, Mayo-Banyo
- Isaih Bangeh, Farmer, Ngolo – Mundemba, Ndian Division, South West Region
- Isidore Ayissi, Cameroon Wildlife Conservation Society Project, Douala-Edea Reserve, Mouanko
- Joseph K., Chief of Nelenya Village, KREO/KOGAN, Mundemba, Ndian Division
- Kamgang Serge Alexis, FASA, University of Dschang Tel: 96 35 27 65/75 38 24 40
- Kembi Louis, ERUDEF Coordinator. Tel: 99 12 29 04
- Kembou Albert, Conservator, Waza National Park, Tel: 77 64 55 42
- Kenneth Khan Asobo, Cameroon Radio and Television Douala
- Khan Francisca, City College of Commerce, Mankon, Bamenda
- Khan Nelson Ndoh, trader Ngaoundal, Tel: 77 83 12 57
- Koissou Jean, Regional Chief for Wildlife, MINFOF, Extreme North Region
- Kombus Germain, Ecoguard, MINFOF, Dizangue, Tel: 94 56 35 58
- Kougoum Ghislain P. N. Department of Animal Biology, University of Dschang
- Kuhn Matthew, Assistant Conservator, Lobeke National Park, Mambele
- Kum Cletus, Senior Lecturer, Department of Mathematics, University of Dschang
- Kwati Evalyn B. Epse Aske, Faculty of Law and Political Science, University of Dschang
- Laka Emmanuel, Support Staff, Kimbi Game, Reserve. Tel : 74 78 77 58
- Leonard Usongo (Dr), WWF "Jengi" Coordinator, Yokadouma
- Likam Nkot Roger, Elogbatindi, Océan Division, Tel: 99 99 07 54
- Linjouom Ibrahim (Dr), SDCF/DFAP., Yaoundé, Tel: 77 72 66 28
- Lontchui Pierre, Divisional Deleguate , MINFOF, Mifi Division, Tel: 77 49 74 56
- Lucas Bache, Chief of Omungo Village, H/M-GS, Vikuru. Tel: 76 57 33 35
- Lyounga Emmanuel, RD/MINFOF, South-West, Tel: 77 31 20 44
- Mangue Brice Jeraude, Boumba-Bek National Park, East Region, Tel : 97 84 62 84

- Mani Onana Benjamin, Farmer in Mebang Village, South Region
- Manu Ibrahim (Dr), Senior Lecturer in Sociology, University of Dschang
- Mathias Ngassi, Regional Chief of Service, MINFOF, Adamaoua Region
- Matthew Lebreton, Ecology Director. Tel: 96 27 19 89. mlebreton@gvfi.org
- Mba Elizabeth, Department of Wildlife and Protected Areas, MINFOF, Yaoundé
- Mba Grace Nyieh, Regional Delegate, MINFOF, South-West Region
- Mbahea Gaston, (Adjudant) CB de Ngambe-Tikar. Tel : 97 67 54 64
- Mbakwa Robert, Douala-Edea Reserve, B.P. 54 Muanko, Littoral Region
- Mballa Félix Achille, Ecoguard, MINFOF, Mamfe, Tel: 75 44 63 98
- Mbanchem Joseph, Pigmy representative in Nkoelon Village, South Region
- Mbandja Gaston, catéchiste, Mambelé, South-eastern Cameroon
- Mbang Nvondo Maginot, farmer in Ebomane, Oveng-Fang Sub-Division
- Mbarga Joseph Gabriel, Divisional Delegation, MINFOF Mbam et Inoubou Division
- Mbassa Ongono Edgar Désiré, Mbam & Djerem National Park, Tel : 79 79 01 33.
- Mbawa Albert, Ecoguard, MINFOF, Nguti
- Mbekum Angeline & Emmanual (Dr), KK Parrots Douala
- Mbemekou Mossus Joseph Leopold, DDFOF/MINFOF, Kadey, Tel: 99 80 21 48
- Mbenbe Théophile, Chief Section of Forestry, MINFOF Kadey, Tel: 99 01 80 22
- Mbetiji Michel, Lecturer in Environmental Law, University of Dschang
- Mboh Patrice L., Ministry of Finance, Yaoundé
- Mbohli Sammy, trader in Ngaoundal, 77 57 13 98
- Mbombo Idrisse, Regional Controller, WRD/MINFOF., Tel: 77 45 00 69
- Mbuh Tennu (Dr), Faculty of Arts, University of Yaoundé I, Yaoundé
- Mbuko Victor and wife (Evelyn), PDO, Yaoundé
- Mebere Serges, Assistant Conservator, Campo-Ma'an National Park
- Medou Leopold James, Banekock. Tel : 96 12 18 40 or 96 26 16 09
- Mejo Innocent, President, CIG, CODEVIECOTOUR, Nkoelon Village, Campo
- Mendi Grace M. (Dr), Senior Lecturer in Botany, University of Dschang
- Mengi Gideon, Chief of Forestry Post, MINFOF, Oveng, South Region
- Mengue Ndjeng Rosine, MINFOF, Vallée du Ntem, South Region
- Mengue, Chief Adjutant, CB of Akwa, South West Region
- Messie A Charly, Cadre/DFAP. MINFOF Tel : 79 20 98 06
- Mezama Aba'a Roger Adelin, MINFOF,Vallée du Ntem. Tel: 96 31 65 52
- Mfiekwe Olivier Waveh, Conservator of the Kimbi Game Reserve. Tel: 77 94 54 67
- Mfonfu Vincent, communication Officer, LAGA

- Mfou'ou Mfou'ou Bruno, Regional Delegate MINFOF, East Region
- Mindoum Menom Pascal, Biosphère du Dja-Lomié. Tel: 99 25 22 11/76 11 63 51
- Mintya Etienne, Nkeolon Village, South Region
- Mirabel Egbe, MINFOF, West Regional Office, Tel: 75 36 68 70
- Mngo Genesis Nonki of Endone Village, Tel: 76 94 20 17
- Mofor Gilbert, Dept of Geography, Faculty of Arts, University of Dschang
- Mokwe Bridget, WRD/MINFOF, Tel: 77 61 39 40
- Mongwa Teneng (Ta'a), Zion Hotel, Etoudi, Yaoundé,
- Mossus Djende Achille, Ecogard, Boumba-Bek National Park, Tel: 96 96 60 35
- Motale Trevor, student, Dschang of Dschang, Native of Mundemba. Tel : 75 58 11 19.
- Moto Joseph Mohngo, teacher and native of Meka Ngolo, Ndian Division
- Mounga Abana Albert, Conservator of Lobeke National Park
- Moussa Glory, CEA2/MINFOF. Tel: 96 94 55 50.
- Mpoame Mbida (Prof), DAAC, Head of the Applied Ecology Research Laboratory, Dept of Animal Biology, University of Dschang
- Munchuo Vincent Mongoh, Ecoguard, Waza National Park. Tel: 74 35 19 89
- Mvessa Blaise, Divisional Delegate, MINFOF, Lom & Djerem, Division
- Mvondo Annicet, Réserve de Biosphère du Dja
- Nang Laurencin, Parrot trapper, Uppert-Nyong Division
- Nankia Hilarion, DD/MINFOF, Nyong and So'o. Tel: 75 37 35 58.
- Nchang Oliver, Chief of Service for Records, Faculty of Science, University of Dschang
- Ndambo Celestine, tourist guide in Mambele, South Region
- Ndenwe Moïse, Trader in Makenene town
- Ndikadjo Richard, fisherman and touristic guide at Yoyo II. Tel : 94 28 50 79
- Ndikum, Pascaline L Senior Lecturer in Biostatistics, University of Dschang
- Ndingoua Ngoua Jacob, Chief of Control Post, MINFOF, Malentouen, Tel: 99 73 70 37
- Ndjama Laurent, Chief of Section for Wildlife, Kadey Division, Tel: 75 18 17 70
- Ndjobdi Seïni, Conservator of the Faro National Park, Tel: 99 83 24 38
- Nfoung Nfoung Philemon, Conservator of Lake Ossa Wildlife Reserve, Tel: 96 28 37 02
- Ngachou S Ines, Cadre SDAP/DFAP, MINFOF, Tel: 99 59 87 70
- Ngalla Patrice T, National Expert, TRIDOM Project, South–eastern Cameroon
- Ngangon Carolle, Assistant Secretary WWF Projet-Campo, Tel: 96 85 86 51
- Ngatat Christian, Mbam & Djerem National Park, Tel: 96 41 59 88
- Ngom André of Mvimi village
- Ngomb Jean Blaise, Elogbatindi, Océan Division, Tel: 94 90 17 03

- Ngomika Ivone, Forestry and Wildlife Technician, Control Post of Missole II
- Ngomo Valentin, Ebogo Touristic Site ,Mbalmayo, Tel : 94 34 58 45
- Ngong Langha Samuel, Fonfuka Council, Bum Sub-Division, North West Region
- Ngono Alex Donatien, Boumba-Bek National Park, Tel : 76 87 22 11
- Nguetti Romuald, Ecoguard at Lobeke National Park , East Region
- Ngwene Thiophile, Site Manager, Coastal Forest Programme, Nyassosso
- Njiang A, CSPN/DFAP, MINFOF, Tel: 75 16 80 52
- Njieh Peter, Farmer at Matamani II, Mundemba, Ndian Division
- Njilah Isaac Konfor, National Coordinator, Cameroon Ecological Society
- Njoh Ebongo, Divisional delegate /MINFOF, Lebialem Division
- Njoh Pierre, Beedy Village, e-mail: djohpierre2000@yahoo.fr
- Njukeng, Patrick (Dr), Lecturer in Botany, University of Dschang
- Nkam Micheal and wife (Bridget), PDO Yaoundé
- Nkengla Jerry Penn, Divisional Delegate of MINFOF, Bui Division
- Nkiangnyi Lawrence, Divisional Delegate, MINADER, Manyu Division
- Nkie Martin Cyrille, CA, CT1/MINFOF, nkie.martin@yahoo.fr
- Nkomo Bile Jean Yves, MINFOF, Ambam, South Region
- Nkouellé Alexis, University of Dschang,Student on internship in Ebolowa
- Nkouola Gaspard, Bienemma Village
- Nkwetisama Carlos, Lecturer, ENS, Maroua. Tel: 77 19 95 83 / 22 16 64 29
- Nkwetisama John, Custom Officer, Douala Airport
- Nkwetisama Pascaline, DAAC Office, University of Maroua
- Nna Durand Francis, Delegate of Forests and Wildlife, Ocean Division. Tel: 94 75 46 64
- Nongowe Tick Sept Pascal, MINFOF Control Post, Bonepoupa. Tel: 76 58 89 37
- Nounga Njiha Jean, Parrot Exporter, Douala
- Ntabe Eric, Senior Lecturer, Dept of Forestry, FASA, University of Dschang
- Ntemfbet Martin, MINFOF Control Post, Bayomen
- Nutoto Godfred A., Regional Delegate of Agriculture, North West Region
- Nwese Cletus, KREO/KOGAN, Mundemba, South West Region
- Nyem Nyem II, Parrot Exporter Douala
- Nyemga Yara Cyrille, Mbam et Djerem National Park
- Nyoungou Aloys, Farmer in Elongango Village (Nsenpe)
- Nzana Célestin Lucien, SG/SNEFCAM. Tel : 96 30 81 14
- Nzeutio Albert of the WRD, Tel : 99 60 98 53
- Nzooh Zacharie. WWF Jengi Project, South-east Cameroon

- Oban Oban Pierre, Divisional Delegation, MINFOF, Ndian Division
- Obate Paul, pygmy representative at Nkeolon village
- Ofeh Moses A, Senior Lecturer in Economic, University of Dschang
- Ofir Doris, Director, the Last Great Ape Organisation (LAGA), Cameroon
- Okoudou Mazé, Cadre SDAP/DFAP, MINFOF, okomaze@yahoo.fr
- Onambelé Ngah Alain, Boumba-Bek, National Park, Tel : 75 26 29 11
- Ondongima Corneille, Farmer in Mebang Village, South Region
- Ondoua Jean Claude of Ebogo Touristic Site, Mbalmayo, Tel : 96 05 13 30
- Ondoua Mboh Cyrille, Eco-guard,Mbam & Djerem National Park, . Tel: 75 66 91 45
- Ondoua Simon, Farmer in Mebang Village, South Region
- Ossok Christian, student in Ndikinimeki Town
- Oumarou, Maire de la Commune Rurale de Mbe, North Region, Tel : 96 29 51 07
- Pandong Eitel, DD/MINFOF , Boumba and Ngoko. Tel: 94 52 64 91
- Parfait Ngouh, Parrot Exporter, Kamerun Aquarium, Douala
- Payne Vincent, (Dr), Head of Department of Animal Biology, U&niversity of Dschang
- Pegue Manga Fidelis, Communication Officer, WWF Jengi.
- Pem Simon Pierre, Maloumbe Village.
- Penn Edwin Khan, Department of Political Science, University of Dschang
- Pentuepemwue Nicodème, Chied of Control Post, MINFOF, Massangam. Tel: 74 90 36 76
- Pevo Meyong Janvier, DDFOF, MINFOF, Upper-Nyong Division, Tel: 77 32 03 61
- Pewo Victor, CSAIF/MINFOF, Yaounde
- Pezoh Stephan, Teacher in GBHS of Garoua. Tel: 77 18 18 72
- Robert Mbakwa, Cameroon Wildlife Conservation Society Project, Douala-Edea Reserve, Mouanko
- Sah Christopher, Manager at the NHTE (Ndawara Highland Tea Estate)
- Sainge Nsanyi Moses, M.Sc student, University of Buea
- Sakoue Isaac, DD/MINFOF, Ndian Division, Korup-Ndongore Project
- Sama Aloysius (Lawyer), Loyalty Chambers, Bamenda.
- Sama Jonathan, President of SNEFCAM , Parrot Exporter, Yaounde
- Sama N Esther, Agric Engineer, SDDARD Bamenda, BP 224 Bamenda
- Samba L Beatrice, CRTV South Region. Tel: 75 82 11 57
- Sambou Mamballa, Cadre/DFAP, MINFOF, Yaounde
- Sanda Micheal and wife (Beatrice), PDO, Yaoundé
- Seino Richard, Senior Lecturer in Genetics, University of Dschang
- Simo Gabriel (Pastor), The Apostolic Church, Dschang, Tel: 7571112

- Sunday Eric, Farmer at Meka Ngolo, Ndian Division
- Sunday Khan (Dr), Senior Lecturer, Dept of Economics, University of Yaoundé II
- Tabi Tako-Eta Philip, Director, DFAP/MINFOF, Yaounde.
- Tafa Edocat(Prof), Vice Rector In-Charge of Research and Cooperation, University of Dschang
- Tafon Godwin, Manager, Veterinary Services, Mvog-Betsi Zoo/CWAF
- Tagne Joseph, Chief of Section, MINFOF, Nkam Division
- Tah Eric Agwe, DED National Expert for mount Cameroon TOU. Tel: 77 12 63 59
- Taihkefum Peter, Chief of Forestry Control Post, Misaje, Donga & Mantong Division
- Takam Marcel, Divisional Delegate, MINFOF, Mayo Kani. Tel : 77 27 64 93.
- Taku Awa II (Dr), Lecturer, Department of Animal Biology, University of Dschang
- Taku Awa II(Dr) and Wife (Ngwie), Dept. of Animal Biology, University of Dschang
- Talla Cécile, Cadre d'Appui à la DFAP, MINFOF, Yaoundé
- Tamo Dilice, Quality Controller of tea taste at the NHTE
- Tamungang Estella (Dr), Department of Chemistry, University of Dschang
- Tamungang Eugene(Pa), Cameroon GCE Board, Buea
- Tamungang Richard, GIS Officer, WWWF Jengi Project, Yokadouma
- Tamungang Thomas, trader in Ngaoundal. 74 60 96 75
- Tar Stephan, trader in Ma'an locality
- Tchakep Luther, Eco-guard, Campo Ma'an National Park
- Tchamba Martin (Prof), Director, GIE-University of Dschang
- Tchebayou Celine, Parrot Economic operator in Douala
- Teikeu Claude, Regional Controller, West Regional Delegation, MINFOF
- Tekoh Daniel D, Chief of forestry Post, Kimbi Game Reserve, Tel: 77 43 40 47
- Temgoua François, Divisional Delegation, MINFOF, Manyu Division
- Tende Augustin, Divisional Delegate, MINFOF, Manyu Division, Tel: 75 03 55 99
- Tenm Bar Jonas, Superviseur général en langue locale à Mbé, North Region
- Tetang Nathanaiel, Chief of Forestry Post, Ngambe-Tikar. Tel : 97 37 06 33
- Thia Katou Ndengue, Hunter in Serere Village
- Thierry Ontcha Mpele, Divisional Delegate, MINFOF, Upper-Nyong Division
- Tiawoun Sylvain, Responsable du suivi écologique, WWF/PNSS Garoua
- Tiebouh Joseph, DFAP, Ministry of Forestry and Wildlife, BP 3099 Yaounde
- Tita David, Veterinary Nurse, NHTE. Tel: 74 65 26 66
- Tonye Badjang, Divisional Delegate, MINFOF, Lekie Division, Tel: 77 91 72 57
- Tsague Louis, Directeur Adjoint-Amenagiste, Ecole de faune de Garoua
- Tsoyi Jean Pierre, Technicien des Eaux et Forêts. Tel: 74 45 11 90

- Yerima Benard.(Prof), Department of Soil Science, University of Dschang.
- Youndek Romi Franco, Ministry of Environment & Nature Protection, Bankim
- Zah André Leopold, Biosphère du Dja-Lomié. Tel: 97 61 46 39
- Zé Ephraim, Support Staff at Forestry Control Post, Djaposten, East Region
- Zoulla Edouard, Divisional Delegate, MINFOF, Logone and Chari Division
- Zourmba Juoullier, Regional Delegate, MINFOF, North Region

Appendix II

GPS Coordinates of some sampled points

Month	LOCALITY	Sub-Division	Division	Region	LAT North	LONG. East	ALT. M
April	Mebang	Ma'an	Ntem Valley	South	02°19,406'	10°55,922'	637
April	Grand dang	Ma'an	Ntem Valley	South	02°24,962'	10°58,242'	625
April	Ma'an	Ma'an	Ntem Valley	South	02°22,410'	10°37,825'	601
April	Esseng-Ma'n	Ma'an	Ntem Valley	South	02°25,852'	10°31,351'	566
April	Nsebito	Ma'an	Ntem Valley	South	02°26,571'	10°29,144'	444
April	Nnemeyong	Ma'an	Ntem Valley	South	02°25,835'	10°27,802'	465
April	Nyabessang	Ma'an	Ntem Valley	South	02°24,466'	10°23,763'	466
April	Endengue	Mvanga	Dja and Lobo	South	02°36,946'	12°05,601'	704
April	Oveng-Fang	Oveng-Fang	Dja and Lobo	South	02°25,298'	12°15,571'	719
April	Akoabas	Oveng-Fang	Dja and Lobo	South	02°21,605'	12°05,782'	727
April	Andoung	Oveng-Fang	Dja and Lobo	South	02°27,994'	12°20,938'	730
April	Nkolenyeng	Djoum	Dja and Lobo	South	02°25,681'	12°33,548'	726
April	Elong	Djoum	Dja and Lobo	South	02°26,242'	12°38,875'	697
April	Avobengono	Djoum	Dja and Lobo	South	02°40,147'	12°52,819'	744
April	Dembo'o	Djoum	Dja and Lobo	South	02°42,445'	12°56,730'	725
May	Djoum	Djoum	Dja and Lobo	South	02°45,963'	12°29,829'	748
May	Nyabizou		Dja and Lobo	South	03°19,058'	12°27,966'	752
May	Bissombo		Dja and Lobo	South	03°16,366'	12°29,025'	725
May	Bitong		Dja and Lobo	South	03°15,768'	12°29,704'	747
May	Metoum cr4	Dja reserve	Dja and Lobo	South	03°22,155'	12°26,815'	735
May	Bembis	Bembis	Dja and Lobo	South	03°26,614'	12°26,815'	738
July	Kribi (town centre)	Kribi	Océan	South	02°56,916'	09°55,160'	28
July	Lolabe III	Kribi	Océan	South	02°39,551'	09°51,064'	37
July	Tondenfom	Campo	Océan	South	02°23,354'	09°50,035'	17
July	Campo (MINFOF-WWF)	Campo	Océan	South	02°22,682'	09°50,424'	21
January	Nkoelon	Campo	Océan	South	02°23,763'	10°02,624'	100
January	Après 2km de Nkoelon	Campo	Océan	South	02°23,516'	10°04,087'	100
January	After 4km of Nkoelon	Campo	Océan	South	02°22,875'	10°05,842'	102
January	Mvini	Campo	Océan	South	02°22,366'	10°06,266'	96
January	Park Entrance	Campo	Océan	South	02°22,139'	10°06,431'	85

January	Akak	Campo	Océan	South	02°22,542'	09°57,808'	64
January	Ebodjé	Campo	Océan	South	02°33,826'	09°50,042'	22
February	Bivouba	Kribi	Océan	South	03°19,238'	10°05,458'	46
February	Elogbatindi	Lokoundjé	Océan	South	03°26,390'	10°07,629'	49
May	Bokito	Bokito	Mbam and Inoubou	CENTRE	04°44,337'	11°13,297'	1619
May	Bayomen		Mbam and Inoubou	CENTRE	04°54,352'	11°04,755'	561
August	Likouk	Messondo	Nyong and Kellé	CENTRE	03° 25,454'	10° 20, 295'	105
August	Ntogo	Messondo	Nyong and Kellé	CENTRE	03°26,214'	10°26,971'	152
August	Song-Mbong	Messondo	Nyong and Kellé	CENTRE	03°27,066'	10°30,215'	130
August	Maloumbé	Messondo	Nyong and Kellé	CENTRE	03°27,442'	10°33,336'	118
August	Bodié	Messondo	Nyong and Kellé	CENTRE	03°29,586'	10°40,125'	157
August	Ngoktos (Near Nyong)	Messondo	Nyong and Kellé	CENTRE	03°34,005'	10°42,576'	175
August	Eséka (rail station)	Eséka	Nyong and Kellé	CENTRE	03°39,557'	10°46,386'	228
August	Makénéné	Makénéné	Mbam and Inoubou	CENTRE	04° 52, 627'	10° 48, 814'	690
August	Obala	Obala	Lékié	CENTRE	04° 09,823'	11° 30,116'	567
August	Batchenga	Obala	Lékié	CENTRE	04° 16,602'	11° 37,539'	499
August	Mbanjock	Mbanjock	Upper sanaga	CENTRE	04° 26,794'	11° 54,338'	580
August	Nkoteng	Nkoteng	Upper sanaga	CENTRE	04° 30,294'	12° 07, 106'	600
August	Nanga-Eboko	Nanga-Eboko	Upper sanaga	CENTRE	04° 37,697'	12°16,033'	585
August	Minta	Minta	Upper sanaga	CENTRE	04° 33,542'	12° 50,027'	708
September	Akonolinga	Akonolinga	Nyong & Mfoumou	CENTRE	03° 46,19'	12°14,576'	690
September	Ayos	Ayos	Nyong & Mfoumou	CENTRE	03° 54,377'	12° 31,336'	680
April	Ngah	Ngambé-Tikar	Mbam and Kim	CENTRE	05°46,457'	11°21,778'	701
April	Nkambé-Tikar	Ngambé-Tikar	Mbam and Kim	CENTRE	05°47,368'	11°29,387'	708
September	Nyokon	Makénéné	Mbam and Inoubou	CENTRE	04°55,752'	10°45,214'	818
September	Ndikinimiki town	Ndikinimiki	Mbam and Inoubou	CENTRE	04°45,950'	10°49,894'	829
September	Mbam river (Guerima)	Bafia	Mbam and Inoubou	CENTRE	04°47,345'	11°17,775'	428
September	Ngoro	Ngoro	Mbam and Kim	CENTRE	04°57,631'	11°23,456'	526
September	Sereré	Ngoro	Mbam and Kim	CENTRE	05°01,857'	11°23,853'	541
September	Bafia	Bafia	Mbam and Inoubou	CENTRE	04°45,784'	11°13,500'	437
September	Ombessa	Ombesa	Mbam and Inoubou	CENTRE	04°36,059'	11°15,414'	449
September	Nkolokossi	Monatelé	Lékié	CENTRE	04°16,655'	11°16,601'	420
September	Monatelé	Monatelé	Lékié	CENTRE	04°15,513'	11°12,234'	413
September	Elig-Ambassa	Monatelé	Lékié	CENTRE	04°10,912'	11°13,374'	540
September	Okok	Evodoula	Lékié	CENTRE	04°06,173'	11°15,00'	510

September	Ebougsi	Okola	Lékié	CENTRE	04°06,887'	11°18,119'	518
September	Okola-Evodoula junction	Okola	Lékié	CENTRE	04°04,931'	11°18,119'	517
September	Okola centre	Okola	Lékié	CENTRE	04°01,331'	11°13,001'	618
September	Zamengoe		Lékié	CENTRE	03°55,104'	11°26,674'	792
September	RF Mbalmayo	Mbalmayo	Nyong and Soo	CENTRE	03°23,905'	11°28,049'	663
September	Island on Nyong river	Mbalmayo	Nyong and Soo	CENTRE	03°24,631'	11°27,358'	635
September	Ebogo-Ebolowa junction	Mbalmayo	Nyong and Soo	CENTRE	03°26,332'	11°30,800'	681
September	National park of Mefou	Mfou	Mefou and Afamba	CENTRE	03°37,576'	11°34,831'	672
September	Nkolakié	Okola	Lékié	CENTRE	03°58,460'	11°22,348'	658
September	Nkolakié G S	Okola	Lékié	CENTRE	03°57,445'	11°23,041'	1038
September	Mbankomo	Yaoundé	Mfoundi	CENTRE	03°47,325'	11°24,053'	778
September	Nkeng-Likock			CENTRE	03°45,847'	11°11,484'	733
September	Lamal-Pougue	Matomb	Nyong and Kelle	CENTRE	03°51,123'	10°56,826'	395
April	Tonga	Tonga	Ndé	West	04°58,215'	10°41,960'	947
April	Malantouen	Malantouen	Noun	West	05°42,954'	11°05,008'	715
August	Batoum III	Bangangté	Ndé	West	05°02,758'	10°41,997'	990
April	Bafoussam	Bafousam	Mifi	West	05°28,460'	10°25,065'	?
April	Noun bridge	Foumbot	Noun	West	05°28,725'	10°33,538'	1474
April	Foumbot centre	Foumbot	Noun	West	05°30,717'	10°38,774'	1078
April	Mewoul		Noun	West	05°28,732'	10°45,473'	972
April	Malanden	Massangan	Noun	West	05°25,656'	10°50,137'	921
April	Massangan	Massangan	Noun	West	05°25,780'	11°00,877'	773
April	Malantouen	Malantouen	Noun	West	05°42,954'	11°05,008'	715
April	Magba	Magba	Noun	West	05°58,381'	11°14,257'	705
April	Crfr Mange-Magnit	Malantouen	Noun	West	05°46,349'	11°08,890'	730
April	Bac de Manso	Malantouen	Noun	West	05°45,861'	11°12,437'	671
April	Manki I		Noun	West	05°49,824'	11°00,309'	688
April	Njimoun	Foumban	Noun	West	05°49,675'	10°55,214'	1232
April	Foumban	Foumban	Noun	West	05°44,690'	10°52,796'	1131
April	Santchou	Santchou	Ménoua	West	05°16,750'	09°58,470'	716
March	Fongo-Tongo	Fongo-Tongo	Ménoua	West			
September	Maham	Bangangté	Ndé	West	05°01,353'	10°41,822'	866
March	Kekem	Kekem	Upper Nkam	West	05°09'44,8"	10°01'16,3"	727
March	Kekem-Banwa		Upper Nkam	West	05°10'08,3"	10°04'21,8"	743
March	Avt Bafang		Upper Nkam	West	05°09'09,4"	10°07'37,9"	1078

March	Bafang	Bafang	Upper Nkam	West	05°08'59,3"	10°09'04,1"	1096
March	Bandja	Bandja	Upper Nkam	West	05°15'54,8"	10°13'43,9"	1275
March	Coline Batié	Batié	Upper Nkam	West	05°18'28,0"	10°16'23,0"	1407
March	Batié	Batié	Upper Nkam	West	05°18'17,8"	10°18'59,7"	1587
March	Baham	Baham	Haut-Plateau	West	05°20'03,6"	10°21'20,5"	1610
March	Bandjoun	Bandjoun	Koung-Khi	West	05°22'59,3"	10°25'26,7"	1530
August	Bertoua	Bertoua	Lom and Derem	East	04° 34,535'	13°40,978'	667
August	TouKi	TouKi	Kadei	East	04° 30,487'	13° 57,072'	652
August	Gati	TouKi	Kadei	East	04° 30,487'	13° 57,072'	652
August	Pt Kadei	Batouri	Kadei	East	04° 25,392'	14°15,514'	603
August	Batouri centre	Batouri	Kadei	East	04° 25,403'	14° 21,643'	632
August	Mbang	Mbang	Kadei	East	04° 25,403'	14° 21, 643'	643
August	UFA10 051	Ndelele	Kadei	East	03° 29,093'	14°40,077'	664
August	Mbol	Ndelele	Kadei	East	03° 29,093'	14° 36,939'	588
August	Biennema	Yokadouma	Mboumba & Ngoko	East	03° 31,437'	15° 00,649'	562
August	Yokadouma	Yokadouma	Mboumba and Ngoko	East	03° 30,820'	15° 02,895'	540
September	Ngatto	Yokadouma	Mboumba and Ngoko	East	03° 16,301'	14° 57,605"	495
September	Adjela	Yokadouma	Mboumba and Ngoko	East	03° 02,906'	15° 05,179'	472
September	Bangué	Yokadouma	Mboumba and Ngoko	East	03° 00,644'	15° 07,800'	463
September	Solapoumbé	Solapoumbé (district)	Mboumba and Ngoko	East	02° 37,242'	15° 22,759'	525
September	Goumela	Solapoumbé (district)	Mboumba and Ngoko	East	02° 31,052'	15° 22,759'	554
September	Mboli	Solapoumbé (district)	Mboumba and Ngoko	East	02° 29,863'	15° 26,180'	553
September	Mambele	Yokadouma	Mboumba and Ngoko	East	02° 26,376'	15° 26,460'	550
September	pte clai Dj PNL	yokadouma	Mboumba and Ngoko	East	02°17,545'	15°42,946'	412
September	grde clai Dj PNL	Yokadouma	Mboumba and Ngoko	East	02° 18,974'	15° 46,569'	390
September	clai Boulou	Yokadouma	Mboumba and Ngoko	East	02° 09,871'	15°43,226'	450
September	Kika	Yokadouma	Mboumba and Ngoko	East	01° 56, 325'	15°37,919'	545
September	Zega	Yokadouma	Mboumba and Ngoko	East	02° 02,389'	15° 37,655'	429
September	Moloundou	Moloudou	Mboumba and Ngoko	East	02° 02,429'	15 12, 844'	416
September	Tingadi	Yokadouma	Mboumba and Ngoko	East	02°39,232'	15° 21,111'	438
September	Gari-gombo	Gari-gombo	Mboumba and Ngoko	East	03° 55,874'	14 05,788'	620
September	Ndélélé	Ndélélé	Mboumba and Ngoko	East	04°02,614'	14° 55,470'	596
September	Dimako	Dimako	Upper Nkam	East	04° 22,714'	13° 34,324'	640
September	Tunkreulu	Dimako	Upper Nyong	East	04° 21,282'	13° 31,718'	644
September	Abong-Mbang	Abong Mbang	Upper Nyong	East	03° 58,952'	13° 10,835'	694
September	Mbama	Abong Mbang	Upper Nyong	East	03° 58,626'	12° 45,592'	701

September	pt, Nyong				03° 54,377'	12° 31,336'	680
October	Garoua Boulaï	Garoua Boulaï	Lom and Djerem	East	05°53,831'	14°32,926'	1042
October	Gado-Badzere		Lom and Djerem	East	05°44,920'	14°26,485'	1028
October	Borongo		Lom and Djerem	East	05°29,938'	14°17,989'	926
October	Dokayo		Lom and Djerem	East	05°31,025'	14°07,183'	920
October	Garga-Sarali		Lom and Djerem	East	05°19,484'	14°02,868'	850
October	Tongo-Gandima		Lom and Djerem	East	05°10,719'	13°59,971'	857
October	Guiwa-Yangamo		Lom and Djerem	East	04°58,761	14°02,606'	802
October	Letta	Mandjou	Lom and Djerem	East	04°55,696'	13°50,530'	783
October	Mboulaye I	Mandjou	Lom and Djerem	East	?	?	
October	Djaposten	Mindourou	Upper Nyong	East	03°25,520'	13° 31,682'	688
October	Mindourou II	Mindourou	Upper Nyong	East	03°33,464'	13°24,541'	692
October	Ampel		Upper Nyong	East	03°31,705'	13°26,312'	674
October	Kanyol		Upper Nyong	East	03°45,742'	13°21,149'	730
October	Nkouack		Upper Nyong	East	03°52,450'	13°18,714'	
October	Sakamalam		Upper Nyong	East	03°58,112'	13°15,425'	678
March	Alou	Alou	Lebialem	South-West	05°30,438'	09°56,432'	1602
March	Fotabon Lewoh	Alou	Lebialem	South-West	05°30,570'	09°54,255'	1054
March	Menji	Fontem	Lebialem	South-West	05°29,321'	09°51,040'	774
March	Nsoko	Fontem	Lebialem	South-West	05°31,676'	09°49,661'	238
March	Bridge Lebialem-Manyu			South-West	05°31,832'	09°49,564'	207
March	Ejuingang		Manyu	South-West	05°34,408'	09°45,301'	173
March	Tinto		Manyu	South-West	05°32,745'	09°35,334'	200
March	Bakebé		Manyu	South-West	05°33,432'	09°33,651'	161
March	Bachuo-Akagbé		Manyu	South-West	05°41,367'	09°26,261'	147
March	Mamfé	Mamfé	Manyu	South-West	05°45,178'	09°18,907'	95
March	Nfainchang		Manyu	South-West	05°37,661'	09°30,151'	200
March	Ashum			South-West	05°29,859'	09°31,240'	174
March	Nguti	Nguti	Kupe and Manengouba	South-West	05°20,146'	09°25,202'	174
March	Menyemen		Kupe and Manengouba	South-West	05°13,027'	09°23,774'	343
March	Mbakwa supe	Konye		South-West	05°01,490'	09°25,300'	314
March	Dikomé			South-West	04°57,819'	09°27,656'	300
March	Konye centre	Konye		South-West	04°56,024'	09°28,550'	251
March	Ikliwindi			South-West	04°42,969'	09°29,309'	243

March	Kumba centre	Kumba	Meme	South-West	04°38,839'	09°24,761'	278
March	Lac Barombi	Kumba	Meme	South-West	04°39,156'	09°24,582'	311
March	Small Ekombe	Kumba	Meme	South-West	04°36,497'	09°23,418'	252
March	Maromba		Meme	South-West	04°34,306'	09°20,559'	145
March	Bole	MBonge		South-West	04°32,871'	09°14,940'	79
March	Mbonge town	Mbonge		South-West	04°32,086'	09°06,486'	20
March	Lobé-PAMOL			South-West	04°	09°	
March	Ekondo Titi	Ekondo Titi		South-West	04°36,436'	09°02,107'	38
March	Mundemba	Mundemba	Ndian	South-West	04°58,102'	08°54,242'	42
March	MINFOF Mundemba	Mundemba	Ndian	South-West	04°59,206'	08°54,683'	184
March	Moriba river	Mundemba	Ndian	South-West	05°00,77'	08°55,07'	117
March	Ikondo-Kondo	Mundemba	Ndian	South-West	05°02,243'	08°54,993'	135
March	Fabé	Mundemba	Ndian	South-West	05°04,768'	08°58,027'	316
March	PNK transect	Mundemba	Ndian	South-West	?	?	?
March	Iriba camp PNK	Mundemba	Ndian	South-West	05°00,540'	08°51,608'	109
March	Mana bridge	Mundemba	Ndian	South-West	05°00,490'	08°52,283'	
March	Funge	Mundemba	Ndian	South-West	04°44,066'	08°55,535'	10
March	Ekondo Titi beach	Ekondo Titi		South-West	04°36,429'	09°00,333'	7
March	Etam I	Tombel ?		South-West	04°44,025'	09°33,058'	171
March	Ebondji	Tombel		South-West	04°	09°	
March	Tombel mile 20			South-West	04°43,941'	09°39,201'	387
June	River Manyu		Manyu	South-West	05°43,300'	09°30,145'	98
June	Etoko village		Manyu	South-West	05°43,051'	09°35,100'	156
June	Bokwoa		Manyu	South-West	05°42,830'	09°38,016'	181
May	Bambili us	Bali Tubah	Mezam	North-West	06°00,142'	10°16,738'	1717
May	Sapga	Bali Tubah	Mezam	North-West	06°01,185'	10°20,285'	1693
May	Ndop center	Ndop	Ngoketunjia	North-West	05°59,063'	10°25,557'	1201
May	Babongo	Babessi	Ngoketunjia	North-West	06°05,205'	10°23,854'	1635
May	Ndawara	Belo	Boyo	North-West	06°05,324'	10°22,733'	1868
May	Mbi Crater	Belo	Boyo	North-West	06°05,899'	10°20,652'	2181
May	Baba I			North-West	06°02,146'	10°30,438'	1192
May	Jakiri center	Jakiri	Bui	North-West	06°04,986'	10°88,027'	1208
May	Kumbo center	Kumbo	Bui	North-West	06°12,475'	10°41,112'	1208
May	Tatum	Nkum	Bui	North-West	06°20,988'	10°46,320'	2027
May	Ndu	Ndu	Donga-Mantum	North-West	06°25,580'	10°47,712'	2090
May	Binka	Ndu	Donga-Mantum	North-West	06°32,271'	10°45,311'	1774

May	Nkambé center	Nkambé	Donga-Mantum	North-West	06°34,938'	10°42,287'	1742
May	Misaje	Misaje	Donga-Mantum	North-West	06°35,113'	10°33,039'	921
May	Mungong	Misaje	Donga-Mantum	North-West	06°36,344'	10°29,604'	910
May	Kimbi center	Bum	Boyo	North-West	06° 36,278'	10 26,233'	
May	Kimbi river bridge	Bum	Boyo	North-West	06°36,027'	10°25,242'	870
May	Kimbi bridge to Wum (end reserve)	Bum	Boyo	North-West	06°31,703'	10°21,867'	851
May	Sub-Bum	Bum	Boyo	North-West	06°31,192'	10°21,518'	814
May	Nyos carrefour	Fungom	Mentchum	North-West	06°27,866'	10°17,428'	840
May	Weh	Wum	Mentchum	North-West	06°27,893'	10°07,966'	1083
May	Wum center	Wum	Mentchum	North-West	06°22,745'	10°04,418'	1081
May	Befang		Mentchum	North-West	06°19,375'	10°00,385'	1069
May	Benakuma	Mentchum valley	Mentchum	North-West	06°24,724'	09°55,154'	1068
May	Ebiatié mile 37	Mentchum valley	Mentchum	North-West	06°16,561'	10°01,915'	478
May	River Mezam	Bafut	Mezam	North-West	06°08,829'	10°05,695'	586
May	Bafut center	Bafut	Mezam	North-West	06°05,045'	10°07,572'	1133
May	Bamenda	Bamenda	Mezam	North-West	05°57,669'	10°08,970'	1117
June	Nkendem			North-West	05°43,552'	09°41,016'	2075
June	Bator Numba 42			North-West	05°47,588'	09°42,179'	288
June	Widikum market	Widikum	Momo	North-West	05°51,699'	09°45,832'	534
June	Batibo town	Batibo	Momo	North-West	05°50,362'	09°51,582'	1085
August	Nalassi		Lekié	CENTRE	04° 16,602'	11° 37,539'	499
August	Avangang	Nanga-Eboko	Haute sanaga	CENTRE	04° 37,697'	12°16,033'	585
December	Melong centre	Melong	Moungo	Littoral	05°07,462'	09°57,150'	835
September	Missole II	Dizangué	Maritime Sanaga	Littoral	03°55,867'	09°54,095'	34
September	Mbongo-SOCAPALM		Maritime Sanaga	Littoral	03°53,943'	09°52,544'	38
September	Ndogbom		Maritime Sanaga	Littoral	03°44,961'	09°52,447'	6
September	Mouanko	Mouanko	Maritime Sanaga	Littoral	03°38,451'	09°47,694'	11
September	Yoyo II	Mouanko	Maritime Sanaga	Littoral	03°40,619'	09°37,983'	6
September	Dizangué	Dizangué	Maritime Sanaga	Littoral	03°44,331'	10°01,369'	80
September	Nsenpe	Mouanko	Maritime Sanaga	Littoral	03°38,507'	09°58,329'	50
September	Mariemberg	Dizangué	Maritime Sanaga	Littoral	03°36,754'	09°52,806'	19
September	Lac Mbouli	Dizangué	Maritime Sanaga	Littoral	03°42,391'	09°57,673'	5
September	Ngoma			Littoral	04°06,645'	09°48,788'	34
September	Mangoule I		Nkam	Littoral	04°09,786'	09°55,120'	34
September	Bonepoupa		Nkam	Littoral	04°08,992'	09°59,716'	14

September	Ndokama I	Yabassi	Nkam	Littoral	04°15,170'	10°04,486'	60
September	Yabassi	Yabassi	Nkam	Littoral	04°27,864'	09°58,646	74
September	Douala		Wouri	Littoral	N:04°03,680'	E:09°45,812'	40
September	Bonaberi		Wouri	Littoral	N:04°06,942'	E:09°35,443'	10
September	Beedy			Littoral	N:04°03,680'	E:09°45,812'	
2005	Monatele				4 10	11 10	
2005	Sakbayeme			Littoral	3 59	10 40	
2005	Massok Songloulou			Littoral	4 03	10 35	
2006	30 km SE of Douala			Littoral	3 54.209	9 53.290	
2006	Mpongo			Littoral	3 55	9 50	
2006	nr Muanko			Littoral	3 54	9 48	
2006	Muanko			Littoral	3 38.410	9 47.295	
2000	Mbam&DjeremNP			Centre	5 45	13.00	
2009	Douala			Littoral	4 05 16.9	9 45 30.7	
2009	Mentom				2 22 6.78	9 15 17.8	
2009	Nkoelon			South	2 23 6.07	10 04 6.4	
2009	Biaonba			Littoral	3 19 21.5	10 05 43.4	
2009	oil palm Edea				3 35 6.52	10 06 7.95	
2009	Liboum	Tibati	Djerem	Adamaoua	06°25,725'	12°42,155'	887
October	Boneting	Tibati	Djerem	Adamaoua	06°22,382'	12°45,333'	861
October	Brge Mbakaou	Tibati	Djerem	Adamaoua	06°18,521'	12°48,103'	824
October	Ngatt	Tibati	Djerem	Adamaoua	06°34,033'	12°46,905'	883
October	Kandjé		Djerem	Adamaoua	06°35,822'	12°52,769'	875
October	Danfili		Djerem	Adamaoua	06°36,455'	13°00,684'	898
October	Djerem bridge		Djerem	Adamaoua	06°34,916'	13°11,515'	891
October	Ngaoundal	Ngaoundal	Djerem	Adamaoua	06°28,133'	13°16,130'	970
October	Ferdadi cr4		Djerem	Adamaoua	06°35,72'	13°04,296'	979
October	Beka-Goto		Djerem	Adamaoua	06°44,972'	13°06,606'	1015
October	Gotaga		Djerem	Adamaoua	06°52,008'	13°08,415'	1092
October	Louga-Tawadi		Djerem	Adamaoua	07°06,235'	13°12,220'	1079
October	Anam		Djerem	Adamaoua	07°07,763'	13°14,687'	1079
October	Likok-Saba		Djerem	Adamaoua	07°15,367'	13°15,756'	1095
October	Toubouroum		Vina	Adamaoua	07°19,943'	13°24,838'	1085
October	Ampana		Vina	Adamaoua	07°19,756'	13°29,600'	1167
October	Ngaoundéré	Ngaoundéré	Vina	Adamaoua	07°19,653'	13°34,661'	1121
October	Moundou junct	Ngaoundéré	Vina	Adamaoua	07°26,703'	13°33,276'	1098

October	Wack II		Vina	Adamaoua	07°41,600'	13°32,714'	704
October	Mbe	Mbe	Vina	Adamaoua	07°50,977'	13°35, 533'	607
October	Gamba		Vina	Adamaoua	08°05,543'	13°35,724'	548
October	Osseregadourou	Ngaoundéré	Vina	Adamaoua	07°10,200'	13°37,400'	1189
October	Belel Dibi			Adamaoua	07°04,441'	13°43,132'	1248
October	Mangoli			Adamaoua	07°01,985'	14°00,236'	1473
October	Mbéré village		Mbéré	Adamaoua	06°58,227'	14°02,652'	1341
October	Nyambaka		Mbéré	Adamaoua	06°54,342'	14°05,308'	1238
October	Babongo		Mbéré	Adamaoua	06°48,413'	14°10,875'	1155
October	Roblin		Mbéré	Adamaoua	06°35,306'	14°15,329'	1076
October	Meiganga	Meiganga	Mbéré	Adamaoua	06°31,122'	14°17,152'	1025
October	Meidougou		Mbéré	Adamaoua	06°25,453'	14°13,245'	1021
October	Dana		Mbéré	Adamaoua	06°23,790'	14°18,439'	1013
October	Lokoti		Mbéré	Adamaoua	06°22,264'	14°19,727'	1026
October	Djouzami		Mbéré	Adamaoua	06°12,829'	14°23,365'	1011
October	Banda			North	08°11,925'	13°38,470'	475
October	Guidjiba			North	08°29,566'	13°44,079'	382
October	Gouna			North	08°31,435'	13°34,062'	357
October	cr4 Poli	Poli	Faro	North	08°32,011'	13°31,770'	402
October	Poli	Poli	Faro	North	08°28,547'	13°14,468'	459
October	Penchouba			North	08°29,433'	13°26,011'	351
October	Bouki			North	08°43,037'	13°33,012'	402
October	cr4 Lagdo		Benoué	North	08°59,343'	13°31,606'	309
October	Garoua	Garoua	Benoué	North	09°17,927'	13°28,209'	170
October	Sorawel	Mayo-Oulo	Mayo-Louti	North	09°47,056'	13°51,623'	321
October	Mayo Oulo	Mayo-Oulo	Mayo-Louti	North	09°41,740'	13°50,550'	257
October	Figuil	Figuil	Mayo-Louti	North	09°45,795'	13°57,842'	276
October	Guider	Guider	Mayo-Louti	North	09°55,943'	3°57,287'	359
October	Lagdo	Lagdo	Benoué	North	09°03,878'	13°39,866'	207
October	Bouri			North	08°30,382'	13°39,166'	289
October	Pt Mayo-Rey		Mayo-Rey	North	08°32,630'	13°54,639'	294
October	PN Benoué		Benoué	North	08°11,357'	13°43,435'	481
October	Cmpt PN Benoué		Benoué	North	08°07,007'	13°49,868'	480
October	Nkonkong			Far North	10°02,947'	14°10,453'	439
October	cr4 Kaelé	Kaélé	Mayo Kani	Far North	10°06,278'	14°11,084'	438
October	Salak			Far North	10°26, 611'	14°15,147'	398

October	cr4 Mokolo			Far North	10°31,414'	14°15,881'	418
October	Maroua	Maroua	Diamaré	Far North	10°36,060'	14°21,006'	389
October	Lalawaï	Maroua	Diamaré	Far North	10°46,114'	14°14,895'	415
October	Palbara			Far North	10°55,901'	14°12,796'	412
October	Mora	Mora	Mayo Sava	Far North	11°02,853'	14°08,943'	431
October	Magdimei		Mayo Sava	Far North	11°10,233'	14°14,037'	340
October	Kangaroua			Far North	11°18,453'	14°24,580'	309
October	National park of Waza	Waza	Logone et Chari	Far North	11°23,957'	14°33,600'	311
October	Zigague		Logone et Chari	Far North	11°40,902'	14°38,853'	296
October	Dabanga		Logone et Chari	Far North	11°55,055'	14°38,684'	299
October	Tildé	Logone et Birni	Logone et Chari	Far North	11°55,055'	14°38,681'	314
October	Pt sur l'Elbeid	Logone et Birni	Logone et Chari	Far North	12°07,453'	14°44,419'	293
October	Maltam		Logone et Chari	Far North	12°10,572'	14°49,008'	299
October	Kousseri	Kousseri	Logone et Chari	Far North	12°05,283'	15°00,303'	304
October	Poukalé	Kaélé	Mayo-Kani	Far North	10°06,259'	14° 22, 878'	412
October	Kaélé	Kaélé	Mayo-Kani	Far North	10°06,167'	14°26,873'	372
October	Kake I		Meme	South-West	04°36,979'	09°24,815'	219
October	Nake	Bole district	Meme	South-West	04°33,721'	09°16,320'	203
October	Mosongi Seli		Ndiang	South-West	04°54,200'	08°45,538'	24
October	Idibanyanga		Ndiang	South-West	04°51,565'	08°42,127'	49
October	Isanguele	Isanguele	Ndiang	South-West	04°46,862'	08°40,706'	31
October	Okonte		Ndiang	South-West	04°47,454'	08°38,029'	9
October	Akwa	Kombo Abedimo	Ndiang	South-West	04°48,731'	08°36,957'	1
October	KNP		Ndiang	South-West	04°53,417'	08°45,538'	219
October	Matamani 2	Mudemba	Ndiang	South-West	04°59,421'	08°56,469'	240
October	Meka Ngolo	Mudemba	Ndiang	South-West	04°55,608'	08°56,449'	231
October	Mana Camp	Mudemba	Ndiang	South-West	04°59,129'	08°52,265'	98
October	Mudemba (Boseme Cafe)	Mudemba	Ndiang	South-West	04°57,791'	08°54,440'	151
October	Ndiki	Ndiki	Mbam and Inoubou	Centre	04°46,638'	10°50,669'	780
October	Nkoteng	Nkoteng	Upper Sanaga	Centre	04°30,303'	12°07,102'	601
July	Mbanjock	Mbanjock	Upper Sanaga	Centre	04°26,805'	11°54,411'	562
July	Nanga Eboko	Nanga Eboko	Upper Sanaga	Centre	04°40,541'	12°22,155,	626
July	Minta	Minta	Upper Sanaga	Centre	04°33,661'	12°49,590'	711
July	Batchenga	Obala		Centre	04°17,581'	11°39,201'	759
July	Cr4 Obala	Obala		Centre	04°09,822'	11°30,143'	766
July	Ebangal		Upper Sanaga	Centre	04°35,250'	12°55,758'	720

July	Avangane		Upper Sanaga	Centre	04°37,721,	12°15,589'	635
July	Ndjore			Centre	04°24,152'	11°48,990'	566
July	Awae			Centre	03°54,288'	11°52,692'	703
July	Elat			Centre	03°55,586'	11°43,543'	743
July	Ayos		Nyong and Mfoumou	Centre	03°54,112'	12°31,583'	681
July	Nika	Diang	Lom and Djerem	East	04°35,715'	13°13,098'	664
August	Ngeun	Diang	Lom and Djerem	East	04°36,631'	13°07,278'	692
August	Diang	Diang	Lom and Djerem	East	04°35,012'	13°19,750'	650
August	Bouam		Lom and Djerem	East	04°34,049'	13°26,441'	724
August	Bazzama		Lom and Djerem	East	04°32,383'	13°53,328	700
August	Gadji		Lom and Djerem	East	04°29,004'	14°03,087'	656
August	Kadey river	Batouri	Kadei	East	04°25,393'	14°19,515'	605
August	Cr4 Ngoura	Batouri	Kadei	East	04°23,947'	14°33,863'	609
August	Nambalo	Batouri	Kadei	East	04°16,107'	14°37,491'	611
August	Mbang junct		Kadei	East	04°11,987'	14°40,999'	588
August	Ngotto		Kadei	East	04°11,301'	14°45,378'	610
August	Banga	Ndelele	Kadei	East	04°07,284'	14°52,104'	590
August	Ndelele center	Ndelele	Kadei	East	04°02,582'	14°55,635'	609
August	Yola			East	04°01,446'	15°01,336'	600
August	Gari Gombo	Gari Gombo	Mboumba and Ngoko	East	03°55,839'	15°06,770'	618
August	Ngoundi 2	Gari Gombo	Mboumba and Ngoko	East	03°51,499'	15°05,082'	626
August	Kongo		Mboumba and Ngoko	East	03°40,289'	15°06,200'	638
August	Yokadouma	yokadouma	Mboumba and Ngoko	East	03°30,814'	15°02,900'	531
August	Parry vlge		Mboumba and Ngoko	East	03°27,534'	15°01,017	526
August	Ngolla 20	yokadouma	Mboumba and Ngoko	East	03°24,128'	15°00,128'	540
August	Banekock	yokadouma	Mboumba and Ngoko	East	03°13,584'	15°00,376	495
August	Simbot	yokadouma	Mboumba and Ngoko	East	03°07,701'	15°03,536	517
August	Bangue		Mboumba and Ngoko	East	03°00,653	15°07,473	454
August	M'Kel		Mboumba and Ngoko	East	02°49,601'	15°13,824	458
August	Salapoumbé	Moloundou	Mboumba and Ngoko	East	02°37,285'	15°22,746'	520
August	Goumela	Moloundou	Mboumba and Ngoko	East	02°31,039'	15°24,647'	536
August	Kombo Camp	Moloundou	Mboumba and Ngoko	East	02°27,249'	15°25,262'	459
August	WWF Mambele	Moloundou	Mboumba and Ngoko	East	02°26,497'	15°26,166'	540
August	BC LNP(Djangui)		Mboumba and Ngoko	East	02°18,904'	15°46,445'	404
August	Transect LNP						
August	LNP Djangui entrance		Mboumba and Ngoko	East	02°17,182'	15°40,505'	404

August	Cr4 Lokomo	Moloundou	Mboumba and Ngoko	East	02°40,603'	15°20,145'	417
August	Koomilet		Mboumba and Ngoko	East	03°10,528'	15°02,450'	?
August	Biennema	yokadouma	Mboumba and Ngoko	East	03°31,393'	14°57,730'	536
August	Mbol 12	yokadouma	Mboumba and Ngoko	East	03°31,370'	14°56,950'	569
August	Mwapak		Mboumba and Ngoko	East	03°27,408'	14°43,124'	579
August	Mbol 2		Mboumba and Ngoko	East	03°26,670'	14°37,612'	585
August	Man Kaka		Mboumba and Ngoko	East	03°19,204'	14°03,575'	594
August	Mbang Kobera		Mboumba and Ngoko	East	03°17,795'	14°03,575'	594
August	Zoulabot 1		Upper Nyong	East	03°16,067'	14°02,583'	627
August	Echambor	Lomié	Upper Nyong	East	03°08,851'	13°46,394'	613
August	Abiere vlge		Upper Nyong	East	03°26,032'	14°23,365	596
August	Ashib vlge		Upper Nyong	East	03°32666'	14°13,53'	670
August	Londo vlge		Upper Nyong	East	03°22,744'	14°10,687'	669
August	Ngola Baka		Upper Nyong	East	03°13,777'	13°58,318'	684
August	Yokongo		Upper Nyong	East	03°11,743'	13°51,850'	615
August	Payo		Upper Nyong	East	03°08,736'	13°42,444'	683
August	Djenon vlge		Upper Nyong	East	03°16,383'	13°35,999'	645
August	Kassa Afam		Upper Nyong	East	03°24,358'	13°33,147'	700
August	Medjo		Upper Nyong	East	03°27,213'	13°27,719'	680
August	Lomié	Lomié	Upper Nyong	East	03°09,618'	13°37,078'	616
August	Mindourou	Mindourou	Upper Nyong	East	03°33,751'	13°24,330'	687
August	Djolempoum		Upper Nyong	East	03°42,662'	13°21,711'	749
August	Djouyaya		Upper Nyong	East	03°47,880'	13°20,153'	705
August	Djaposten		Upper Nyong	East	03°24,585'	13°32,868'	674
August	Abong Mbang	Abong Mbang	Upper Nyong	East	03°59,149'	13°10,810'	686
August	ENEF	Mbalmayo	Nyong and So'o	Center	03°29,746'	11°30,266'	674
August	Mengueme	District	Nyong and So'o	Center	03°14,518'	11°23,728'	672
August	Ngoulemakong	Noulemakong	Mvila	South	03°05,150'	11°25,397'	665
August	About		Mvila	South	02°54,339'	11°12,888'	631
August	Ebap		Mvila	South	02°57,400'	11°25,992'	704
August	Nemmeyong III			South	02°59,641'	11°36,726'	711
August	Zo'Ebefam			South	02°57,518'	11°42,206'	712
August	Mekom I			South	02°53,454'	11°51,943'	710
August	Akoolui		Dja and Lobo	South	02°53,781'	11°54,905'	704
August	Sangmelima		Dja and Lobo	South	02°57,171'	11°58,564'	681
August	Cr4 Olounou		Dja and Lobo	South	02°48'36,7"	12°07'37,5"	710

August	Cr4 Endengue		Dja and Lobo	South	02°36'56,5"	12°05'36,5"	627
August	Ekong		Dja and Lobo	South	02°31'16,8"	12°11'11,5"	585
August	Ngoudjen	Oveng-Fang	Dja and Lobo	South	02°30'23,2"	12°11'39,7"	632
August	Oveng-Fang	Oveng-Fang	Dja and Lobo	South	02°25'12,3"	12°15'42,3"	647
August	Mvam II	Oveng-Fang	Dja and Lobo	South	02°23'02,0"	12°14'00,2"	606
August	Ebomane	Oveng-Fang	Dja and Lobo	South	02°24'07,6"	12°09'38,1"	620
August	Akoabas	Oveng-Fang	Dja and Lobo	South	02°21'26,0"	12°05'48,3"	631
August	Mebang-Oveng	Oveng-Fang	Dja and Lobo	South	02°19'21,6"	12°05'44,3"	631
August	Aboulou	Oveng-Fang	Dja and Lobo	South	02°17'31,1"	12°03'21,5"	595
August	Endone	Oveng-Fang	Dja and Lobo	South	02°23'49,5"	12°10'56,2"	599
August	Meyo-Center			South	02°34'07,1"	11°01'56,0"	584
August	Mbeleman			South	02°39'05,3"	11°03'35,1"	619
August	Meyo-Elie			South	02°25'29,2"	11°13'58,5"	598
August	Ambam	Ambam	Ntem Valley	South	02°23'12,1"	11°16'56,6"	571
August	Ntem bridge		Ntem Valley	South	02°18'07,4"	11°18'13,1"	553
August	Kye-Ossi	Kye-Ossi	Ntem Valley	South	02°11'20,7"	11°20'20,9"	585