

WILDLIFE CONSERVATION IN SOCIAL, ECONOMIC, AND
ECOLOGICAL CONTEXTS: MULTIPLE STAKEHOLDERS AND
EXTRAORDINARY RESOURCE VALUE IN A
CONGOLESE NATIONAL PARK

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Dedication

To my parents, who have always supported my improbable dreams

Abstract

Wildlife conservation in Central Africa is a challenging endeavor because protected areas exist in complex social landscapes. Conflicts between stakeholders with multiple interests over natural resources, land, and wildlife pose some of the difficult problems facing conservationists and require scientific, social, and ethical approaches for resolution. To protect wildlife, managers at Conkouati-Douli National Park in southern Republic of Congo use zoning and law enforcement strategies to legally dictate how stakeholder groups use the natural resources.

I examine these strategies and suggest that the ways stakeholders value and use the natural environment can elucidate conflicts surrounding wildlife conservation. Drawing from history, anthropology, and ecology, I examine conservation on both a macro and village level. At a macro level, stakeholder conflicts over industrial exploitation and hunting threaten zoning efforts to protect wildlife populations. Weak government authority to enforce zoning, coupled with divergent stakeholders aims and abilities, hinder effective conservation of the Park.

At a village-level focus, I examine the relationship between rural peoples, wildlife, and the National Park. People use wildlife for food and their livelihoods. Results from ecological surveys reveal human populations inside the Park negatively influence wildlife populations, and low overall mammal densities that declined with proximity to villages. A study on food consumption reveals that because the bushmeat trade is so lucrative, villagers have switched to fish proteins that come from either the Park or urban centers. Such a study provides insight into patterns and drivers of protein switching in tropical forests. It also reveals a generational change, which is behind the change in protein diets, and the over harvesting of wild proteins. Overhunting has induced Park management to engage in law enforcement, which adversely affects the livelihoods of rural families by reducing income, increasing women's labor demands, and reducing access to hospitals and schooling. Law enforcement appears effective in the short-term at reducing hunting and bushmeat trafficking, but it may also weaken prospects for long-term conservation because it increases local residents' animosity towards conservation initiatives, organizations, and personnel. The studies demonstrate the importance of understanding the values and uses of natural resources by other stakeholders, and the need to communicate in conservation efforts.

Table of Contents

Acknowledgements.....	i
Dedication.....	ii
Abstract.....	iii
Table of Contents.....	iv
Figures and Tables.....	vii
Acronyms.....	x
Introduction.....	1
Overview of the dissertation.....	3
Dissertation significance.....	3
Chapter description.....	4
Chapter 1.....	7
Abstract.....	7
Introduction.....	7
Protected Areas Zoning.....	8
Objectives.....	11
Methods.....	11
Context.....	16
Politics and economy of post-independent Republic of Congo.....	16
Ecological description.....	17
Management.....	19
Development of Conkouati’s current zoning plan.....	20
Stakeholders.....	25
Resource Use Conflicts.....	34
Foundations for Conflict: A history of exploitation.....	35
Current exploitation and challenges against Park zoning.....	47
Challenges to zoning: Weak institutions and multiple stakeholders.....	54
Effects on the Park.....	58
Reduction of Ecological Integrity at Conkouati.....	58
Reduced support for conservation.....	62
Considerations: Is there a place for zoning?.....	64

Outreach.....	66
Engagement	67
Enforcement.....	68
Chapter 2.....	71
Abstract	71
The Bushmeat Crisis.....	72
Objectives	74
Study site	74
Methods.....	76
Kitchen Survey	76
Ethno-historical research	82
Results and Analysis	83
Kitchen surveys	83
Ethno-historical analysis.....	93
Discussion	102
Change: Food commercialization and changing diets.....	102
Conclusion.....	108
Chapter 3.....	110
Introduction	110
Previous wildlife studies at Conkouati	113
Methods.....	115
Study area and wildlife species	115
Data Collection	119
Results	121
Regression Analyses.....	122
Distance Analysis	124
Hunting activity and spatial distribution of hunting and wildlife hotspots	128
Discussion	134
Wildlife abundance.....	134
Spatial factors	136
Conservation Implications.....	137

Chapter 4.....	139
Abstract	139
Introduction	139
Context	141
Methods.....	141
Results	143
Law enforcement activities.....	143
Positive and negative impacts of law enforcement on conservation	147
Influences of law enforcement on villages	157
Discussion	166
Conclusion	171
Benefits of an interdisciplinary approach.....	171
Suggestions for Conkouati-Douli National Park management	172
Overarching lessons	175
Appendices.....	177
Appendix 1.1 Species List for Conkouati National Park	178
Appendix 1.2 Stakeholders at Conkouati-Douli National Park	182
Appendix 2.1: Survey Sheet and Basket of Goods forms	190
Appendix 2.2 Food lists and categories before & after analysis.....	192
Appendix 3.1: Mammal list for hunted mammal surveys.....	194
Appendix 3.2: 2005 Pilot study for hunted mammal surveys.....	195
Appendix 3.3 Example data sheet for hunted mammal surveys	197
Appendix 3.4 Vegetation classification information for hunted mammal surveys....	198
Appendix 4.1 Hunter survey	199
Literature Cited	204

Figures and Tables

Figure 1: Map of Conkouati and study villages.	13
Figure 2: Map of villages and important social, political, and ecological features inside Conkouati-Douli National Park.	15
Figure 3: The changing of Conkouati's boundaries, from Reserve in 1980 and 1989 to National Park in 1999.	21
Figure 4: 1989 Reserve boundaries and the three timber concessions that lead to the change in boundary. Current Park boundary outlined in black.	21
Figure 5: Zoning at Conkouati-Douli National Park (1999).	22
Figure 6: Villages in and around Conkouati-Douli National Park by population size	25
Figure 7: Livelihoods of residents over 18 around Conkouati	26
Figure 8: Map of clan territories, superimposed by Conkouati National Park	28
Figure 9: Oil exploration, and timber and gold exploitation at Conkouati during colonial times.	38
Figure 10: Territories and villages around Conkouati in 2007.	43
Figure 11: Pre-Park industrial activities, 1960-1999.	45
Figure 12: Mining prospection permits overlapping Conkouati-Douli National Park	50
Figure 13: Oil exploration permits inside Conkouati-Douli National Park.	51
Figure 14: Forestry Exploitation and exploration at Conkouati-Douli National Park.	52
Figure 15: Fisheries exploitation by companies	53
Figure 16: Hunting areas of study villages.	60
Figure 17: Path network created by timber and oil companies in the Park with navigable rivers.	61
Figure 18: Map of Congo, Conkouati-Douli National Park and the distribution of villages.	75
Figure 19: Map of study villages at Conkouati	76
Figure 20: Food consumption across villages	84
Figure 21: Average monthly hearthhold consumption across villages.	85
Figure 22: Average meat and fish consumption by hunting, fishing, and mixed villages.	86
Figure 23: Average monthly hearthhold consumption across food categories and villages.	86
Figure 24: Fish consumption across villages.	87
Figure 25: Total meat consumption across villages by method of procurement.	88
Figure 26: Comparison of total animal protein consumption in each village by protein type.	89
Figure 27: Price (bars) and consumption rates (line) of selected protein species.	91
Figure 28: Map of Conkouati-Douli National Park, including the offshore marine zone.	113
Figure 29: Map of the ecological study area inside Conkouati-Douli National Park (CDNP).	117
Figure 30: Hunted species sign abundances across strata with standard error, pooled across years	124
Figure 31: Densities of duikers in three study strata over two years as based on dung encounters along line transects.	126
Figure 32: Hunting intensity within the study area	129
Figure 33: Average amount of hunting sign per transect as a function of distance from village.	130
Figure 34: Most frequently hunted species in Conkouati forests as represented by direct law enforcement seizures in the forest.	131
Figure 35: Kernel density estimates of spatial distribution of five different species groups based on total sign per transect.	133
Figure 36: Comparison of dung densities of seven species in areas with different hunting pressures from studies at Conkouati, from 1996 to 2007.	135
Figure 37: Map of Conkouati-Douli National Park, highlighting study villages (by village type), law enforcement guard posts, and the four major zones of the Park.	142

Figure 38: GPS tracks of law enforcement patrols at Conkouati from 2005-2007.....	145
Figure 39: Timeline series of seizures at Control Posts	146
Figure 40: Composition and numbers of bushmeat seizures at Yanika and Youbi posts in Conkouati from 2005-2007.....	147
Figure 41: Hunter estimates of the change in hunting offtake in three villages of different livelihood strategies after law enforcement activities.....	149
Figure 42: Comparison of currently-hunted areas with those abandoned by individual respondents after law enforcement activities began in the forest during 10 mapping exercises	150
Figure 43: Bushmeat trafficking after control posts were established.....	151
Figure 44: Revenue percentage totals from seven villages at Conkouati in 1996 and a comparison between two villages with different economic strategies.....	158
Figure 45: HELP's area of influence.	183
Figure 46: Map of Conkouati-Douli National Park buffer zone and Renatura.....	184
Figure 47: Map of Gecko's area of influence in Conkouati-Douli National Park.....	185
Figure 48: Map of communities worked with in the PMEDP project.	186
Figure 49: 2005 large mammal survey design.....	195

Tables

Table 1: Survey results of the differences in transport opportunities, access to services, and the cost of goods between villages.	83
Table 2: Species sign frequencies from hunted mammal survey.....	122
Table 3: Results from a multivariate regression	123
Table 4 : Dung abundance results from 197 1-km transects.....	124
Table 5: Dry season duiker dung deposition and decay rates in Central Africa	125
Table 6: Model parameters for Distance analysis.....	127
Table 7: Duiker densities and confidence limits by species group and stratum and year.....	127
Table 8: Average monthly counts of bushmeat exported from three Conkouati villages in 1995.....	132
Table 9: Major events impacting wildlife populations and protected area management.....	144

Acronyms

AME	Adult Male Equivalent
BGP	Bureau of Geophysical Prospecting
CAWHFI	Central Africa World Heritage Forest Initiative
CFA	Central African Franc
CIRAD	Development-Oriented Agricultural Research (Centre de coopération internationale en recherche agronomique)
COGEREN	Natural Resource Management Committee (Comité de Gestion des Ressources Naturelles)
DFAP	Department of Wildlife and Protected Areas (Direction de Faune et Aires Protégées)
EU	European Union
FAO	Food and Agriculture Organization
FFEM	French Fund for the World Environment (Fonds Français pour l'Environnement Mondiale)
GDP	Gross Domestic Product
GEF	Global Environment Fund
HELP	Ecological Habitat and Liberty of Primates (Habitat Ecologique et Liberté des Primates)
HH	Hearthhold
ICDP	Integrated Conservation and Development Program
IP	Integrally Protected
IUCN	World Conservation Union
Km4	Kilometer 4 (village)
MAB	Man and Biosphere Reserves
MEF	Ministry of Forestry Economy (Ministère d'Economie Forestière)
MPA	Marine Protected Area
PA	Protected Area
PMEDP	Sustainable Fisheries and Livelihood Program
PROGECAP	Conservation and Management of Protected Areas Project (Projet de Gestion et de Conservation des Aires Protégées)
SICOFOR	Sino-Congo-Foret
UFA	Forestry Management Unit (Unité Forestière d'Aménagement)
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
USFWS	United States Fish and Wildlife Service
UTM	Universal Transverse Mercator
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

Introduction

Wildlife conservation in Central Africa is challenging because protected areas exist in complex social landscapes. This complexity manifests itself through conflicts between diverse stakeholders with multiple interests over natural resources, space, and wildlife. For example, this conflict may exist within governments debating the best way to allocate land use; for industry, for conservation, or for agriculture. There are also many examples of conflict between local people living near or inside protected areas (PAs) and managers of those PAs (Brechin et al. 2002). This conflict may be overt. For example the creation of strict boundaries and rules which restrict or prohibit the use of resources once freely used by local people cause resentment and can lead to overt breaking of rules in protest. Conflicts can also be veiled, and result in continual degradation of natural resources (including wildlife and habitat), and mutual distrust between stakeholders inhibiting collaboration.

The success of conservation interventions depends in part on practitioners' abilities to accommodate the range of stakeholders' understandings of the landscape in management schemes, while at the same time maintaining biodiversity through scientific study, monitoring and protection. Unfortunately, conservation organizations do not always engage all stakeholders in meaningful ways. Such lack of engagement has severe consequences for the long-term sustainability of conservation projects that protect biodiversity and healthy ecosystems.

Differing uses of natural resources have often resulted in a failure to meet conservation objectives. Over the past century, scientists and managers have developed a number of strategies to address biodiversity loss by gaining control over ecosystems. One longstanding strategy, the protectionist model, was developed during the colonial era and forced many people off their lands to make room for game parks. Despite the growth and prevalence of this strategy, in the late 1980s the international conservation community warned that Africa's national parks were 'in crisis' and many shifted planning toward a

newer model, coined community conservation, to accommodate economic and social needs of local populations, and encourage them to protect wildlife. Contemporary conservation theory draws from social, economic, and ecological disciplines, but in spite of the varying themes on this newer model, many conflicts between stakeholders remain, over both natural resources and gaps in biodiversity protection (Oates 1999; Redford & Richter 1999).

Within the past few years, there has been a movement within the conservation community to address the social context of conservation initiatives. For example, McShane and Wells (2004) share a variety of projects and ideas which incorporate local needs and support into conservation planning, including the integrated conservation and development programs (ICDP) concept.¹ Maginnis et al. (2004) discussed conservation landscapes, understanding multiple ideas of landscape, and engaging all stakeholders in the conservation process. Other authors (Bauer 2003; Brechin et al. 2002; Brown 2003; Byers et al. 2001; Lawrence 2000; Thibault & Blaney 2001; Walpole & Goodwin 2001; Wilshusen 2002) have also argued for the need to include social sciences and local participation in conservation planning to steer away from strict protectionist strategies.

Despite literature and rhetoric calling for increased participation and understanding of local needs and concerns (Brechin et al. 2002; Ghimire 1997; Goodwin 1998; Lewis 1993; Western 1994), not much is seemingly done to understand the root causes of environmental conflicts--mainly, that different actors have fundamentally different approaches towards resource conservation and land use. Over and over again, parks across Africa face the same problems: local people have severe animosity toward managing bodies of parks. To understand what motivates peoples' use of the land, one must appreciate how they value the natural environment. For example, what social factors contribute to how people understand their surroundings? What historical factors have influenced how people use resources? How do people spatially use the landscape? Many of these authors fail to look at broader policies and uses of the environment; community use of natural resources do not occur in a vacuum, but rather are a part of

macro-economic policies, government institutions, international influence, and the ways in which each of these factors interact and influence conservation policies in protected areas. These considerations and questions are the kind my research attempts to answer.

Overview of the dissertation

This dissertation seeks to address some of the challenges of wildlife conservation through the context of multiple stakeholders using Conkouati-Douli National Park as a case study. I use various methods of inquiry to examine wildlife conservation from the perspective of competing land use, food consumption, wildlife population trends, and the impact of wildlife management on both conservation and villagers. My overall research question examines ways different stakeholders use (or act upon) and value the environment, and what implications these have for conservation initiatives. By examining how villagers, governments, industry, and the conservation establishment value, use, and have used the natural environment in and around the Park, this research will provide crucial information for conservation planning in Congo to protect intact ecosystems for both humans and natural biodiversity. Through the integration of social and natural sciences, I hope to create a distinctive interdisciplinary methodology that others can use to develop more effective and socially sensitive interventions.

Dissertation significance

The significance of this dissertation rests within the interdisciplinarity of the research. I focus on wildlife conservation from social, historical, and ecological contexts and in doing so, I combine qualitative and quantitative approaches. Although the weakness of this approach is that it cannot offer the depth that a purely historical or ecological study can provide, the breadth of incorporating different ways of knowing provides a type of insight that is rarely encountered in either.

Conkouati serves as an example of a park with extraordinary resource value, including oil, minerals, wildlife and fish that attract many stakeholders. It is a park with people

who live inside the boundaries, leading to a number of conflicts that typify the struggles between people and parks across Africa. The challenges that Conkouati faces from industry, from government ministries that have competing objectives, and from resource-dependent rural people are challenges that protected areas across Central Africa and beyond will increasingly face as increasing world populations come to compete for fewer and fewer resources. Conkouati is an opportunity to examine these international, regional, and local interests on a scale feasible to study.

Chapter description

The format of the chapters does not follow the traditional format of a dissertation. Although connected to one another, each is a stand-alone chapter. The idea behind this was to be able to reach a larger audience in the scientific community and make a feasible transition from dissertation to publication. Chapter 1 serves as the foundation for the dissertation. It provides political, economic, historical, and social context of the study, outlining all of the actors who are central to the conflicting valuation of Conkouati's resources. This chapter lays out the zoning and institutional challenges that the Park has as it attempts to accommodate the needs of these multiple actors. By setting the stage for the larger context, Chapter 1 provides a launching point for the rest of the dissertation. As I outline in the chapter, park management needs to better understand the stakeholders interested in Conkouati's resources. The rest of the dissertation focuses on the set of stakeholders that are most directly connected to the Park and its resources: local communities. The villages around the Park are arguably the most complex and multi-dimensional, and the least understood. It is for this reason that the rest of the dissertation focuses on them.

Chapter 2 uses food as a lens to better understand this local stakeholder group, and how they use the resources inside the park. Bushmeat is the major concern for Park management, and understanding the importance of wild foods like bushmeat and their role in the context of overall food consumption patterns will enable conservationists to

better understand protein dynamics and better target resource regulation and conservation management of those resources. But in the process, these patterns also provide insight into the heterogeneity of these communities.

As Chapter 2 reveals, bushmeat consumption in villages is lower than anticipated, but is a direct result of high levels of hunting for the bushmeat trade to urban markets. This trade is of utmost concern to Park management, and thus in moving from the consumption of bushmeat, Chapter 3 examines the populations of various hunted species that support this consumption and trade. The Government of Congo created the Park with people inside the boundaries, and thus the chapter examines how wildlife populations respond to overlapping hunting and conservation uses of the forest. This chapter uses distance sampling along transects to measure wildlife abundance and human sign at increasing distances from villages to better understand wildlife distributions in the Park and how Conkouati's human populations influence them.

Park management employs different strategies to protect Conkouati's threatened wildlife populations; the most noticeable one being law enforcement. At the same time, these wildlife populations have historically provided important sources of revenue, food, and fulfilled social and cultural roles to the rural peoples in the area. Chapter 4 examines how wildlife law enforcement strategies, specifically forest patrols and bushmeat control posts along roadways inside the Park, influence not only wildlife conservation, but how it affects the communities inside the Park who depend on wildlife.

These four chapters do not tell all of the stories at Conkouati, but they do provide insight into larger conservation problems which are of interest to broader audiences in the academic literature. Chapter 1 is a descriptive chapter and will not be published as is. Rather it will serve as the foundation for future work and as a potential book chapter. The interdisciplinary nature of Chapters 2 and 4 make publication challenging, but I aim to publish them in either Conservation Biology or Biological Conservation in hopes that

the editors will embrace interdisciplinary articles. Chapter 3 is a straightforward ecology article, and I plan to submit this to either the African Journal of Ecology or Oryx.

Chapter 1

Zoning, extraordinary resource value, and weak institutions: How current and historical resource conflicts in a Central African protected area compromise efforts to conserve wildlife

Abstract

In order to reduce threats to wildlife populations conservationists deploy many tools, including zoning, to dictate legally how stakeholder groups use the natural resources in designated spaces. Zoning can be imposed over very large areas, but often, conservationists zone on a smaller scale (i.e. parks) to accommodate multiple interests. The enforcement of zoning regulations at local, regional, national and international levels, however, requires strong institutional capacity. Conkouati-Douli National Park provides an example of a park with zoning that attempts simultaneously to protect both species and ecological interactions and to accommodate natural resource use by local villages and timber concessionaires. Anthropomorphic influences, including past environmental exploitation, present activities to ensure local livelihoods, industrial exploitation, and urban demands for forest products, undermine zoning efforts to conserve wildlife. This chapter documents these zoning efforts, the current and past inhabitants and users of the Conkouati forest and its resources, and contemporary resource conflicts there. It examines how these conflicts threaten zoning efforts to protect wildlife populations, and argues that weak government authority to enforce zoning, coupled with several different stakeholders with divergent aims and abilities to carry out these aims, hinder effective conservation of Conkouati-Douli National Park.

Introduction

The conservation of lands with extraordinary value, defined here as those harboring important species, natural resources with local, regional or even global commercial importance, and mineral wealth, is a challenging and conflict-ridden endeavor. While the goals of protecting specific regions may differ, they do share some commonalities. States, working alongside international institutions and conservation organizations, have designated protected areas (PAs) in lands with high biodiversity, ecological significance (such as watershed protection or carbon sequestration), or with socio-cultural importance.

These parks frequently coincide with areas of commercial importance; economic interests engaged in timber, bushmeat, fish, mineral, or oil extraction might thus relegate protected biodiversity to a much lower priority. State agencies must therefore uphold conservation efforts, but simultaneously juggle the multiple aims and resource uses of resource-dependent rural populations, outdoor enthusiasts, industrial/commercial interests, and other government sectors (Forster 1973).

In order to balance these diverse aims and uses, conservationists have appropriated zoning as a tool to reduce conflicts between goals of protecting nature and of exploiting its resources by diverse stakeholder groups. However, few states, particularly in Africa, possess sufficient political or economic authority to enforce zoning inside of PAs. In this chapter, the example of Conkouati-Douli National Park illustrates that weak state authority to enforce zoning laws, coupled with diverse stakeholders with divergent aims and abilities to carry out these aims, hinders the effective conservation of the natural resources in the Park.

Protected Areas Zoning

The general concept of zoning arose concurrently in different locations during the late 19th and early 20th centuries in Europe and the United States (Fischel 2004). As certain populations accumulated wealth in urban centers, they invested in urban properties and sought to mobilize the legal means to protect their investments. Local governments thus established zoning laws to restrict certain economic activities to specific zones, and to prohibit them from others (Soja 1971). Thus, local governments used zoning to protect the investments of particular (powerful) constituencies, but justified these interventions because it benefited broader social and economic interests.

This paradigm of land use made its way into conservation thinking during the early 1970s. International institutions such as the United Nations, as well as states, borrowed zoning from urban planners and promoted these legal measures to reduce land conflicts

between land use groups and conservationists¹ (Naughton 2007). Zoning promised to satisfy the disparate needs of social, economic, and political interests, and thus over the past three decades, was integrated into various conservation interventions. The early 1970s also witnessed the increasing popularity of ‘buffer zones’ in such projects as the Man and Biosphere Reserves (MAB). Two decades later, Integrated Conservation and Development Projects (ICDP) actively incorporated buffer zones into project planning. ICDPs recognized the needs of adjacent communities to use lands, but also the importance of protected areas to maintain ecological integrity (the long-term ability of an ecosystem to maintain species composition and functionality even during times of disturbance). Additionally, Marine Protected Areas (MPAs) have relied heavily on zoning to reconcile disparate uses of marine resources, including commercial, sport, artisanal, and subsistence fishing, tourism, and strict protection (Day 2002). All of these interventions (ICDPs, MPAs, and the like) use zoning systems to regulate resource use by different stakeholders and to delineate where specific activities—from exploitation to strict protection—may occur.

National parks, which frequently constitute the core component of larger reserve systems, are strictly protected by states. National parks may accommodate specific tourist or scientific research zones (see, for example, Parks Canada (1994)), but most often do not include zones for hunting or industrial exploitation. National parks occupy a central focus of this chapter (and dissertation) for two reasons: first, this land designation of strict protection has long been a source of heated conflict, especially in developing countries where more recent efforts to establish national parks have displaced much longer histories of resource use; and second, strictly protected national parks provide an important refuge for biodiversity. As one of six categories of protected areas designated by the World Conservation Union (IUCN), national parks aim to:

¹ The rise and expansion of national parks (and other PAs) since the 19th century, as both ecological and political endeavors, has been well documented (Adams & Hutton 2007; Anderson & Grove 1987; Grove 1995; Naughton-Treves et al. 2005). During the colonial era, governments created parks in Africa for the conservation of game and as a means to restrict resource use and to increase colonial control over land (Anderson & Grove 1987; Ghimire & Pimbert 1997; Neumann 1998). Today this legacy is reflected in state control of natural resource use, usually as a top-down intervention.

... (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible (Chape 2003)

In Africa states have sought to expand protected areas for international recognition, because of pressures exerted by international institutions, and for the promise of tourism revenues. But in doing so, they have had to grapple with conflicts between conservation efforts and existing land uses by rural peoples. Parks cannot support heavy resource use by villagers, industry or urban markets. But expanding demand for animal, timber, and mineral resources has rendered these strictly protected areas vulnerable to exploitation. To reconcile conflicts between protective and extractive agents, some states have developed multiple-use zoning to accommodate local populations' extractive and cultivation practices.

The IUCN ICDP project for the Conkouati Faunal Reserve in the Republic of Congo provides one noteworthy example of this multiple-use zoning design. The project, which developed the design for Conkouati-Douli National Park in 1999,² incorporated five different zone types so as to provide for local people's needs for food and building materials, to conserve wildlife and natural resources, and accommodate already-established forestry concessions within the Park's new boundaries. Yet villagers, industry interests (oil, timber, fishing, and mining), and other Congolese government ministries, have severely challenged this zoning system.³ Later I describe these stakeholders and their interests, examine their impacts on conservation zoning, and explore how current or future zoning may accommodate their divergent interests.

² Conkouati was changed from a reserve to a park through the pressure of government officials within the Ministry of Forestry Economy, according to a Ministry insider (Interview with D, Brazzaville, 6/8/2007),

³ Park management understands these challenges, and in response they plan to release a new zoning structure in the new management plan for the Park. However, as I will argue, this zoning system will encounter the same struggles as the existing zoning regulations.

Objectives

Drawing from in-depth interviews with stakeholders, historical inquiry, mapping exercises, and a spatial analysis, this chapter explores how villagers, oil and timber interests, and government undermine conservation efforts in their attempts to gain access to and control over these resources in the Park. Similar to many parks, the biological diversity and natural resources contributing to Conkouati's extraordinary value have also attracted many local and external stakeholders. These stakeholders deploy their own economic and political resources to pursue their own interests. While they sometimes share members and resources, they express and act upon different objectives, uses, and values of this forest and its resources. The Ministry of Forestry Economy⁴ (*Ministère d'Economie Forestière*, henceforth MEF;), which manages the Park, is part of the Congolese government, which has different and often conflicting objectives, uses, and values for Conkouati. Divergent state interests, compounded by poor financing and transparency, weaken the MEF's ability to enforce conservation zoning. Hence, protecting Conkouati's biodiversity is a very difficult task. Extraordinary resource value, strong local and external interests, and weak governance not only reduce the Park's ecological integrity, but also discourage some stakeholders' willingness to support conservation within the Park. Conservation efforts to zone for wildlife conservation thus face certain limitations and opportunities.

Methods

Methods used to collect data for this study (2005-2007) draw from both anthropology and history. I spent six months living in four villages either bordering or within the Park to add to existing socio-cultural data and conduct historical analyses. I chose these sites because they represented three distinct livelihood strategies across the Park (hunting, fishing, and mixed hunting/fishing), and they were of relatively equal size. The selected villages included: Kondi, a fishing village on the Atlantic ocean; Km4 (villagers' name

⁴ The Ministry of Forestry Economy has changed names several times over the past 50 years; for simplicity, I will always refer to it as MEF.

for Kilometer 4), a hunting village in the forest; and Mpella and Sialivakou, a pair of villages on the forest/savanna edge, referred hereafter as a single village (Mpella) since they are located only one kilometer apart and because their collective populations total the other two study villages (see Figure 1). Using an assistant from the region to translate and help me evaluate the socio-cultural context of my activities, I conducted 91 recorded, semi-structured, in-depth interviews with villagers and 83 informal, unrecorded discussions, all following IRB human subject protocols for social sciences research. I asked mostly the same questions in interviews focusing on similar topics; interviews were also structured similarly (for example, fishing interviews were worded similarly to hunting or gathering interviews). Topics included fishing, agriculture, hunting, food, history and change, industrial activity, religion and healing, territories and space.

I also developed six walking maps with village elders, in which I asked informants to guide me through the physical space for one to three hours and point out locations and geographical features that were important to them, and explain what these importances were. I also conducted twenty-five mapping exercises, to document important geographical locations and resource-use areas for residents. For these exercises, I brought with me geopolitical maps (similar to Figure 1) or satellite images, and after explaining them, asked people to name rivers and forests, then to point out places which had livelihood or social importance to them.

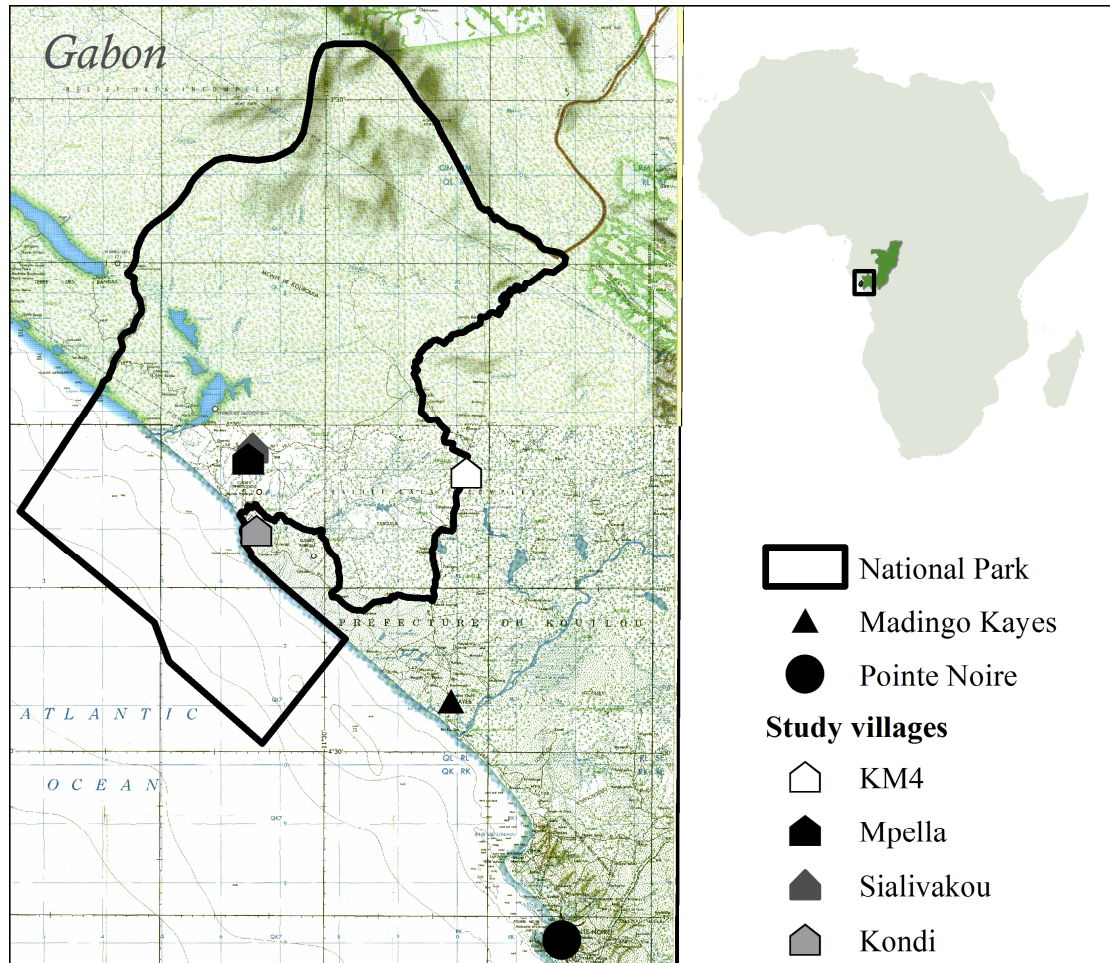


Figure 1: Map of Conkouati and study villages, the District capitol Madingo Kayes, and Pointe Noire, the economic capitol of Congo. Only 100 kilometers from Mpella, it takes 10 hours in public transport to get to Pointe Noire.

To understand the practice and significance of local environmental exploitation, I participated in 49 daily activities, including hunting, fishing, agriculture, and food and other resource gathering. I also organized two week-long trips with village leaders to visit ancestral areas deep inside the Park that people no longer visit. These visits provoked discussions about the significance that local people attach both to different ecological zones and to specific historical sites. Figure 2 shows important study sites and neighboring villages around Conkouati.

A significant amount of the data from this dissertation is derived from my interviews with people. Where possible I have corroborated evidence informants provided with other sources of material. On their own, the insights by fishermen, farmers, hunters, gatherers, the young and the elderly should be given weight—not because the information is always verifiably true, but because people’s ideas and recollections are valid interpretations of local history and local experience (Giles-Vernick 2002, White 2000). These first-person accounts exist in an area where history is not often recorded, and often times are bolstered by similar experiences across the region.

To learn about industrial activities and perspectives on resource use both in the Park and in Congo in general, I conducted (mostly unrecorded) interviews and discussions with oil industry representatives (14); and I observed and interviewed oil (2) and timber (1) operators as they conducted their work activities.

In order to gather the perspectives of state ministries and their employees, I conducted (mostly unrecorded) interviews with personnel in the Ministry of Forestry Economy (7), Ministry of Hydrocarbons (2), Ministry of Mines (3), Ministry of Agriculture and Fisheries (3), local school teachers (2), the Prefect of Kouilou (1), the Sub-Prefects of both Madingo Kayes and Nzambi, and one military representative. Finally, I led two group interviews with ecoguards (men forming anti-poaching units) at Conkouati in order to learn more about their perspectives on the Park. I also spoke frequently with Park managers, and interviewed individuals with non-governmental organizations operating within and around the Park (6).

Other historical evidence detailing maps and colonial economic and environmental activities was sparse, but came from the National Archives in Brazzaville, the Ministries of: Hydrocarbons, Mines, and Forestry Economy; the District headquarters of Madingo Kayes, Conkouati-Douli National Park’s research library, and the library of the *Institut de Recherche pour le Développement*. After locating maps, I scanned and digitized them using ArcGIS 9.2 to make them accessible for analysis.

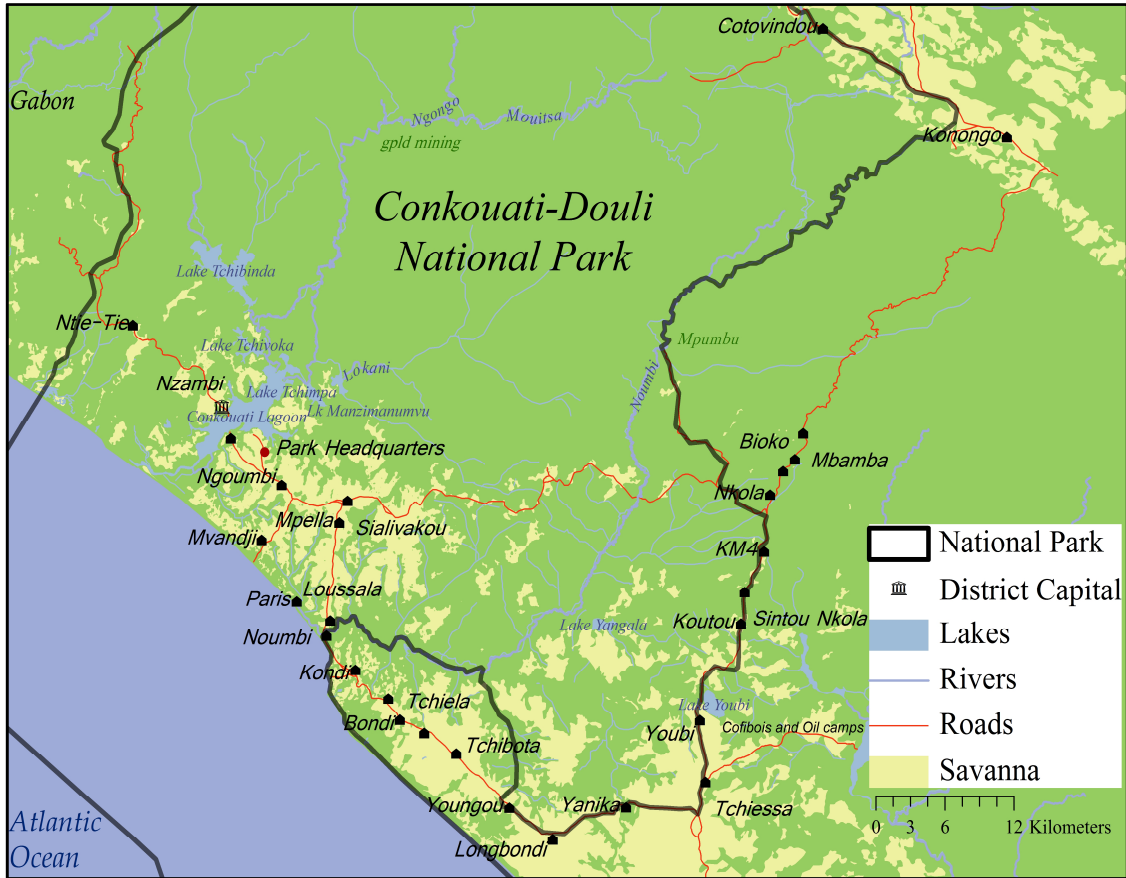


Figure 2: Map of villages and important social, political, and ecological features inside Conkouati-Douli National Park.

Throughout this dissertation, I use the word stakeholder to describe a person, a group of people, or a formal body of people that has an interest in the activities, space, biomass, or mineral resources in Conkouati. I use the term Conkouati to refer to the general place and environs which, after 1999, is now legally the Park. It includes the ocean, the savannas, the forest, the mountains, and the rivers. I employ it to describe the region both before the Reserve’s establishment and after the Park’s creation. And finally, I invoke the word ‘Park’ to refer to the area within legally-defined boundaries of Conkouati-Douli National Park or its management.

Context

Politics and economy of post-independent Republic of Congo

The Republic of Congo gained its independence from France in 1960. Previously, it was a colony of France, part of the vast colonial possession of French Equatorial Africa. In its early years, Congo's socialist-oriented leaders aligned themselves with communist-bloc countries, particularly from 1968 until the Soviet Union's fall in 1991. During this time period the government followed the socialist policy of 'everything for the people, just for the people'; land ownership was nationalized and resource use was opened up. In 1991, Congo 'democratized', characterized by an attempt to rehabilitate 'tradition' (Nguingiri 1996c) and a switch to a market economy (UNDP 2008). Since 1993, turmoil has dominated the country's politics. The political conflict in 1997 between then-president Pascal Lissouba and former president Denis Sassou-Nguesso led to armed conflict in Brazzaville and southern parts of the country from 1997-2000, culminating in the devastation of Brazzaville and southern Congo's infrastructure. The northeastern section of Conkouati (but not Pointe Noire) also saw violence during 1999-2000 when rebels and national troops fought, displacing thousands of people; including nearly the entire village of Cotovindou in the Park.

Congo's economy is shouldered mostly by industry (60%), the services sector (35%), and agriculture (5%), with oil exports accounting for over 52% of all GDP in 2007 (World Bank 2008). Congolese fair better socially than their other sub-Saharan counterparts; Congo is highly urbanized (60%); over 85% of the people are literate; and life expectancy is 55 years (average for Sub-Saharan Africa is 51). However, about half of Congo's 3.8 million residents live below the poverty line (ibid.). The GDP per capita is \$1,261; much lower than the sub-Saharan Africa average (\$1,998)(UNDP 2008).

In addition to the rate of poverty, Congo has one of the highest government deficits in all of Africa (Carcillo et al. 2007), caused in part by overspending in the 1980s, and the government's efforts to quell political violence and instability in the late 1990s. The

World Bank began new activities in 2001 to develop a new economic program after the civil conflict, and in 2003, it initiated this program to reduce the risk of future violence. One effort included “supporting the growth and diversification program for the Congolese economy and enhance the public sector” (World Bank 2007). Thus economic development within Congo, especially in the oil and timber sectors, its two top foreign earners (UNDP 2008), is one of the government’s top priorities.

The conflict, extreme poverty, and international pressures to exploit all have subtle and strong influences on the political and economic landscape of Conkouati. A meager lifestyle and political upheaval have caused rural exodus from villages, but have also brought in immigrants from elsewhere, escaping war and economic crises.⁵ These have increased the connection between rural and urban areas both socially and economically. The Congolese State, weakened by war, corruption, and indebtedness, must balance the needs of the poor and the demands of foreign donors and agencies with commitments it made of protecting national parks. This contradiction is no clearer than within its own ministry charged with creating and governing protected areas, which must balance conservation with exploiting resources to earn foreign capital.

Ecological description

Conkouati-Douli National Park, created by the Republic of Congo in 1999 and located in a region known for its biodiversity and endemism (WWF 2005), is Congo’s most biodiverse park (WCS 2003). Spanning 5,040 km² from the sea to the Mayombe mountains (~800m) in the Park’s northeastern reaches, Conkouati contains a diversity of habitats. The marine habitat accounts for some 1,202 km² in the Atlantic Ocean; another 995 km² includes both littoral and tall-grass savanna. Lakes and lagoons constitute some 45 km² of the park, and 2,798 km² of the Park is forest. As part of the Lower Guinea Forest Block of the Guineo-Congolian regional center of endemism (White 1983), the

⁵ The population in the Kouilou region and Conkouati have remained relatively stable (Fabing 2001), and according to villagers in Conkouati, has actually decreased (Interview with PP, Kondi, 1/28/2006)

forested lands include littoral and sublittoral forests, dense humid and swamp forests, and mangroves. There is a rich diversity of flora in the region (Doumenge 1992; Dowsett & Dowsett-Lemaire 1991; Hecketsweiler & Mokoko Ikonga 1991; Moutsambote & Sita 1996; Senechal et al. 1989; Sita 1996). In 1991, Hecketsweiler and Mokoko Ikonga (1991) documented over 398 species of flowering plants; others have estimated the numbers of species of upwards to 3000 (see Paris 1996). Doumenge (1992) has described major tree species, some of which include such commercially valuable species as okoumé (*Aucoumea klaineana*), and locally valuable ones including ilomba (*Pycnanthus angolensis*) and nioue (*Staudthia gabonensis*).

These diverse habitats host a number of important animal species. The Park's ocean sector contains humpback whale (*Megaptera novaeangliae*), four species of sea turtle (*Dermochelys coriacea*, *Lepidochelys olivacea*, *Chelonia mydas*, and *Caretta caretta*), various shark and ray species, as well as numerous fish species (see Schneider 1990 for a list of commercial species in the region). Similarly, the lagoons and rivers contain manatees (*Trichechus senegalensis*), dwarf crocodiles (*Osteolaemus tetraspis*), many freshwater fish (see (Mamonekene & Maloueki 1997), three freshwater shrimp species, and six crab species (Doumenge 1992). On land, Conkouati is home to 57 mammal species (Paris 1996), including: six duiker species, great apes (*Pan troglodytes* and *Gorilla gorilla gorilla*), ten smaller primates, elephant (*Loxodonta africana*), leopard (*Panthera pardus*), golden cat (*Felis aurata*), buffalo (*Syncerus caffer*), water chevrotain (*Hyemoschus aquaticus*), waterbuck (*Kobus ellipsiprymnus*), sitatunga (*Tragelaphus spekei*), and mandrill (*Mandrillus sphinx*). Conkouati is also an Important Bird Area (WCS 2003), with over 425 species recorded in the region (Dowsett and Dowsett-Lemaire 1991). Appendix 1.1 contains list of aquatic and terrestrial species adapted from Paris (1996) and Mamonekene and Maloueki (1997), and includes French, Vili, English and Latin names.

In addition to its importance as a site of biodiversity protection, Conkouati also contains various mineral resources, although their quantities are relatively insignificant or

unknown. Mineral resources include tin, bitumen, pot ash and gold (Direction Générale des Mines et de la Géologie 1970 and M. Matongo, pers. comm.). The French colonial administration and later the independent Congolese government commissioned several studies to evaluate mineral wealth in the Kouilou District, where the Park resides. Oil reserves have been studied both on and offshore at various times, beginning in 1929 (onshore), and most recently in 2007. Preliminary seismic tests by a subcontractor for an oil company inside the Park revealed an oil deposit (pers. obs.). Nevertheless, the company has not determined whether these reserves can be exploited viably, and are currently drilling exploration wells to find out. Similarly, the commercial viability of tin and potash extraction are not known.

Management

The Ministry of Forestry Economy (MEF) has legal oversight over Conkouati-Douli National Park. The Ministry's Division of Wildlife and Protected Areas (DFAP) manages the Park, receiving technical and financial support from the Wildlife Conservation Society (WCS).⁶ MEF has assigned three agents (the Conservator, his

⁶ Based out of New York, WCS has field projects across the globe, and is particularly visible in Central Africa. Their Congo Program was their largest funded country program during this study (B Curran, pers.comm.), with five projects spread across four protected areas. Their overarching goal within Congo is to "...to help conserve biodiversity in Congo by working with the Government, local communities and private sector partners to adopt a landscape scale management approach, establishing and maintaining a network of well-managed protected areas" (WCS-Congo 2007). WCS works to protect biodiversity inside Conkouati-Douli National Park through a number of objectives, including to: establish baseline monitoring, reconstitute wildlife populations through law enforcement activities, strengthen on-site management capacity, improve conservation initiatives through collaboration with government and community partners, and develop a new landscape management plan which includes community zoning. These objectives are reevaluated every year, and adapted to the situation on the ground. WCS-Conkouati receives most of its funding from the United States Agency for International Development (USAID), FFEM (Fonds Français pour l'Environnement Mondial), the US Fish and Wildlife Service (USFWS), and CAWHFI (funded by UNESCO)—all large Western donors. This funding helps pay for their mammal, marine turtle and fisheries research, agricultural activities, and Park logistics, but also makes the project subject to shifts in funding schedules and donor priorities. The project is headed by an expatriate director, and supported by Congolese staff, including ecological and social researchers, ecoguards, and administrative personnel. WCS provided me with logistical support for this research, including language training, housing, transportation, and three team leaders for ecological research.

Assistant, and the Patrol Chief) to supervise the staff and to collaborate with the WCS project director at Conkouati. The law enforcement staff consists of 21 ecoguards, most of whom come from local villages. The Park headquarters also house the Park's research and outreach activities, engaging four ecological research staff, an education assistant, and a socio-economic assistant. These employees receive their salaries from WCS. WCS conducts all research activities, but claims no legal authority to enact or enforce policy, since these responsibilities fall within the jurisdiction of MEF representatives at the Park. MEF assumes responsibility for enforcing Congolese law in the Park; it ensures compliance with different resource extraction laws (including hunting and timber), with zoning regulations, and with all Park rules (Chapter 4). MEF handles abrogation of these laws at various levels, depending on the infraction. While local personnel address hunting and local Park infringements at the Park level, senior administrators in Brazzaville handle conflicts with industry (oil, timber, and fishing) or international entities. Park staff and relevant agencies manage conflicts with police, local government, or military at the District level.

Development of Conkouati's current zoning plan

The history of the Park's development has importantly affected current zoning and the conflicts surrounding it. The Republic of Congo created the Conkouati Faunal Reserve in 1980 to protect the area's high concentrations of wildlife; in so doing, it ostensibly responded to a 1972 call to expand wildlife protection by the United Nations Conference on the Human Environment in Stockholm.⁷ Existing documentation also suggests that Congo justified the Reserve on the grounds that it would promote tourism (Lachiver 1975). The Reserve (see Figure 3) included three main villages, but hunting was strictly forbidden (Republic of Congo 1980). Because it had no permanent staff (Chatelain 1996), legal restrictions on hunting were only rarely and randomly enforced (D. Nsoso pers. comm.). The Reserve's 1980 decree stipulated its mandate would expire in five years. In 1984, the government renewed the decree for an indefinite period (IUCN

⁷ Interview with D. Nsoso, 6/8/2007

1999), although these protections expired after an FAO (Food and Agricultural

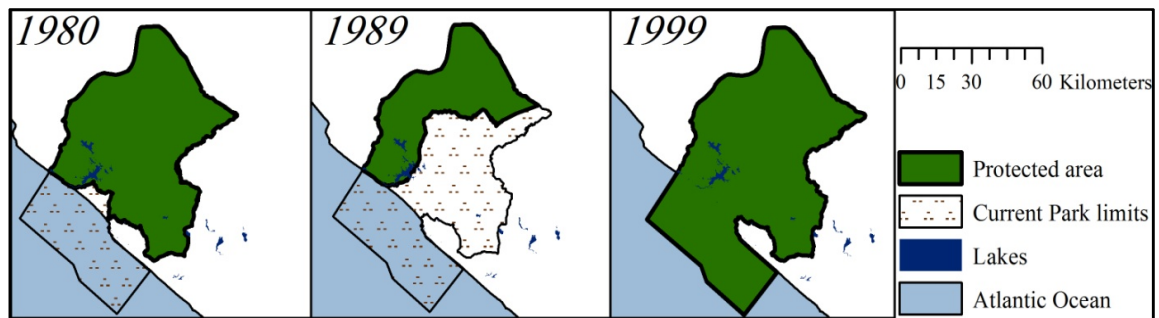


Figure 3: The changing of Conkouati's boundaries, from Reserve in 1980 and 1989 to National Park in 1999. Data from the Ministry of Forestry Economy.

Organization) Forestry Management report for the timber sector in southern Congo published its own recommendations, opening up the way for timber exploitation (Setzer 1988). In 1989, MEF delineated three timber concessions in the Reserve (Figure 4), resulting in the reduction of its protected area and, leaving only its 'integrally protected' section intact. Figure 4 shows the changing Reserve and Park boundaries, and demonstrates how the Government views them as fluid.

In 1994, a Global Environment Facility (GEF) project with the Government of Congo (GOC) conferred the management of the Conkouati Faunal Reserve to IUCN (PROGECAP-Congo 1999). IUCN's mandate was to assume management of the Reserve and to create a management plan that would transform the reserve into a national park and incorporate local participation in the management of biological resources. The Congolese government perceived the Reserve as a good candidate to transform into southern Congo's first national park, primarily because of a foreign agency and donor's

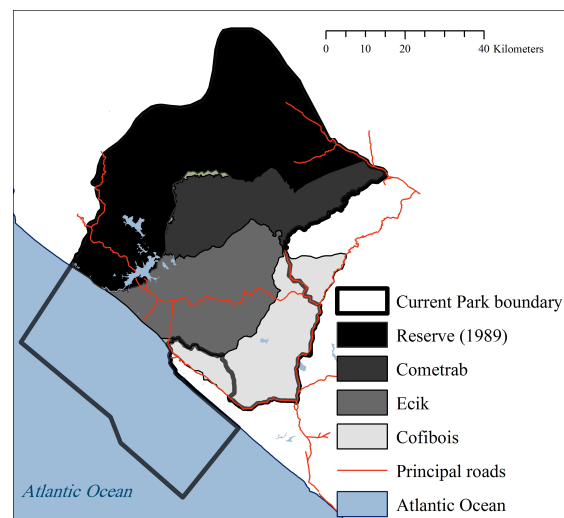


Figure 4: 1989 Reserve boundaries and the three timber concessions that lead to the change in boundary. Current Park boundary outlined in black.

(IUCN/GEF) involvement, but also because of the reserve's potential for tourism and biodiversity protection. In 1999, a presidential decree created Conkouati National Park (Republic of Congo 1999).

The IUCN Project subsequently created a management plan, which included a zoning plan (Figure 5). According to one project leader, Noe Mabiala, IUCN worked closely with local communities, specifically through the NGO COGEREN (*Comité de gestion des Ressources*

Naturelles de la Réserve de Conkouati, the Management committee of natural resources at Conkouati, which IUCN helped create), to design a zoning system that would meet with local acceptance.⁸ The result was a multiple-zone protected area.

The integrally protected area was located far from villages, but the

Park set aside an ecodevelopment zone for human use. The IUCN project intended to create a model based upon a community reserve in which the protected area remained a

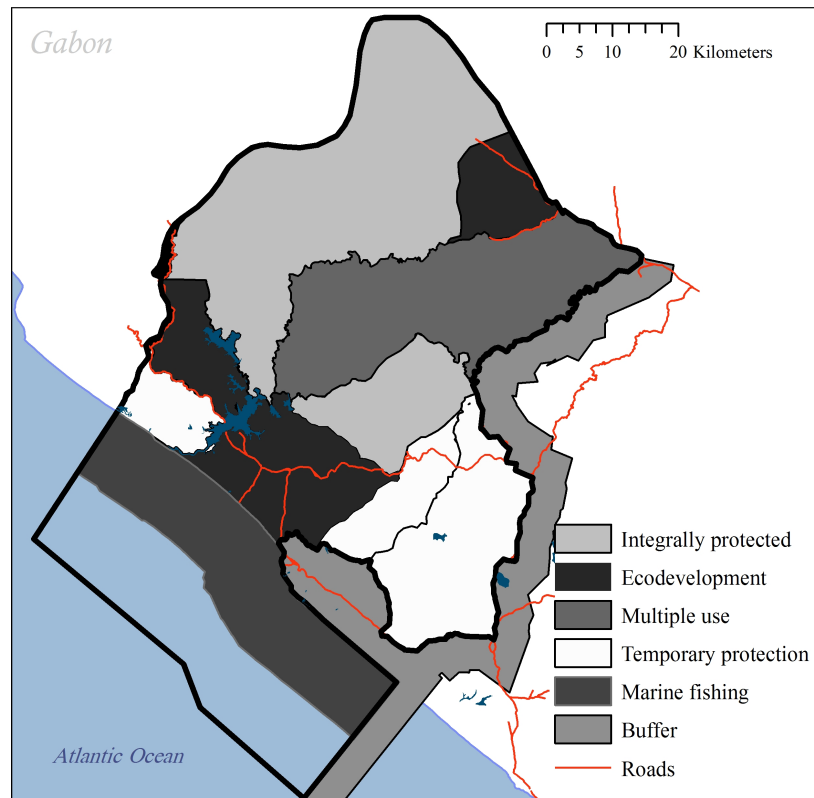


Figure 5: Four terrestrial and two marine zones in use at Conkouati-Douli National Park (1999): Integrally protected, Multiple use, Ecodevelopment, Temporary protection, Integrally protected Marine section, Artisanal marine, and Buffer zone (Adapted from WCS-Congo).

⁸ Interview with N. Mabiala, Brazzaville, 7/27/2007

reserve and was managed by local institutions such as COGEREN. The IUCN brought this management plan to the Congolese government, and after negotiation, the government accepted the plan, though it differed substantially from IUCN's original plans. Specifically, the Government altered the proposed boundaries of the protected area to incorporate an area that exceeded both the 1980 and 1989 Reserve boundaries (N. Mabiala, pers.comm.) (PROGECAP-Congo 1999).⁹ The Park reacquired all the area from the original reserve, in addition to a small area that included several villages (including Mpella, Sialivakou, and Mvandji), a 'temporary protection zone' which included areas slated for logging, as well as a new marine zone.

The current zoning system at Conkouati-Douli National Park is complex. Unlike most Western national parks that have zoning for tourism and research only, the Park allows for those, but also contains zoning for use by industry and villagers. Box 1 gives a description of the different zones from the management plan (PROGECAP-Congo 1999). This complex zoning structure in Conkouati was designed to protect biodiversity whilst concurrently honoring previous timber concession agreements and accommodating village resource needs through sustainable use zones. Thus, according to the Park decree, the stakeholders allowed to use the Park's natural resources included specific timber companies (Cofibois and Man Fai Tai), the 26 villages around or inside the Park, and left the door open for industries (only in the ecodevelopment zone). The intent of the decree was to restrict stakeholders to their respective zones and outline the rules that govern those zones.

⁹ Whereas IUCN worked with and conducted research in 8 villages for 5 years, the Park incorporated 26 villages, many of which had never been worked with other than a short consultation before the Park was created.

The use restrictions within each zone, especially the Park’s core areas (the integrally protected section), are designed to conserve biodiversity. All zones of the Park should abide by the IUCN guidelines for a Category II protected area. In practice however,

different interests use various zones in markedly different ways than originally intended by Park management. Hunting using illegal methods, for instance, persists in protected zones, and industrial exploitation activities take place in all zones. The zoning is complex and

Box 1: Zoning Categories at Conkouati –Douli National Park

Integrally Protected: For the exclusive use of scientific research activities

Multiple-Use: Containing two timber companies (Cofibois and Man-Fai-Tai), this area was incorporated into the Park to control activities and put in place Park surveillance, favor sustainable exploitation, and limit activities next to the integrally protected area. The permits run out at different times (2004 for Cofibois, 2011 for Man-Fai-Tai); these areas will be incorporated into other Park zoning at a later unspecified date. No hunting is allowed inside these concessions.

Ecodevelopment: For development activities which respect the environment and ecology of the Park. Activities foreseen include agriculture, animal husbandry, fishing, agroforestry, bee-keeping, village hunting, non-timber forest product gathering, and tourism.

Temporarily Protected: “Given the fragility and the degree of degradation in these zones, these are placed in partial or temporary protection in order for rehabilitation and to permit various threatened species to recuperate for awhile. The activities which can be carried out must be strictly regulated by Park Management in dialogue with local communities” (Ibid, p. 37, my translation).

Marine: Industrial fishing, ship traffic, and mineral prospection forbidden. Given that there are marine oil permits, this zone “should be managed in dialogue with economic operators active in this zone (oil companies), with the Merchant Navy, and the Department of Fisheries” (Ibid, p. 37, my translation).

Marine Ecodevelopment: Artisanal fishing only up to 6 marine miles

Buffer: To facilitate management and support conservation activities, it stretches 5km around the Park and includes all border villages

extremely confusing for those who have not read the actual Park decree, as the zones are not demarcated on the ground. The temporary zone is managed similar to the ecodevelopment zone, and the multiple use zone is used only for logging (not for

hunting). What is most confusing for stakeholders are the zone boundaries, which sometimes follow natural landscape breaks, and other times are arbitrary, which makes it difficult for anyone without a map to follow the zoning rules.¹⁰

The remainder of this chapter describes the different groups with interests in the Park's vast resources; examines past and current resource use conflicts and the influence of weak institutions in them; and finally, details the effects of these activities on the Park.

Stakeholders

Conkouati's resource richness—its abundant game and fish, valuable timber, gold, and oil—has attracted the attentions of local and regional economic interests, international companies and organizations, as well as various government ministries. In addition to MEF and WCS, the two management bodies inside the Park, are several other major stakeholders who participate in resource and zoning conflicts.

Villages

More than 5,500 people live in the twenty-six villages (WCS-Congo 2005) that depend directly on Conkouati-Douli National Park's natural resources. These villages occur along the region's two main roads (Figure 6)—one along the coast (National Highway 5) which continues into Gabon,

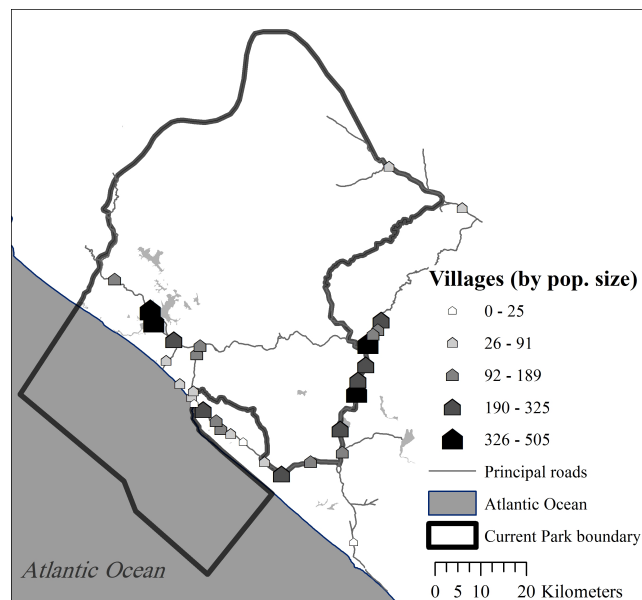


Figure 6: Villages in and around Conkouati-Douli National Park by population size. The total population in the 26 villages is roughly 5500 people (WCS-Conkouati 2005).

¹⁰ In fact, in my interviews with hunters, almost none of them could point out the boundaries of where they could and could not hunt, despite efforts by Park management to educate village leaders on this subject (H. Vanleeuwe, pers.comm.). This problem has serious consequences for hunters who may in fact want to obey the law.

and the other that forms part of the Park’s eastern boundary and serves as a major logging road for southern Congo. These two unpaved roads serve as the economic lifeline to the urban center Pointe Noire. The Congolese national and regional governments provide communities with very few basic services. There exist rudimentary health clinics and upper-level primary schools in the large rural centers of Nzambi and Nkola, as well as the district capital Madingo Kayes, about 50km south of the Park. Most residents travel 100km to Pointe Noire for major health care and secondary education. Pointe Noire’s markets also provide durable goods, foods, and medicine, although small entrepreneurs sell basic foodstuffs such as oil and beverages in nearly every village.

Villagers rely on resource extraction and agriculture for their livelihoods, although about 5% of the people have formal employment. The Park engages approximately 40 employees (H. Vanleeuwe, pers. comm.), and other main employment opportunities come from logging and oil. Figure 7 shows adult occupations as reported by villagers in the Park (data courtesy WCS-Congo 2005).

Village Livelihoods

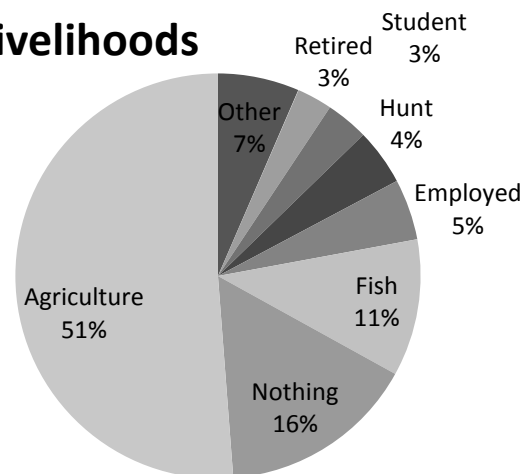


Figure 7: Livelihoods of residents over 18 around Konkouati (n=2660). Note that women comprise over 75% of all farmers and half of all those who responded that they had no formal livelihood strategy (totaling 90% of all women). The survey was conducted by WCS, who villagers know were funding law enforcement activities. This undoubtedly influenced responses; the number of hunters who stated their true livelihood activity is underreported, and those stating ‘nothing’ are over-reported. The ‘other’ category includes business, gathering, charcoal production, and others. (Source: WCS-Congo 2005).

Village compositions are highly varied, throughout the Park there are some 37 different ethnicities. This ethnic mix is the result of large-scale post-independence migrations.¹¹ Twenty-nine percent of people identify themselves as Lumbu (a group locally associated with forest hunting and agriculture), and 55% Vili (known locally as fishing people) (WCS-Congo 2005). Most people prefer to identify themselves by their clan affiliations, particularly because ethnic identities are colonial inventions, and thus have less significance than clan identities.¹²

The basic social unit in these villages is the family compound, (usually male-headed). A chief (president) serves as the village political leader and arbitrator. S/he is appointed by the prefect (not elected), usually comes from the political party in power nationally (see below). A village committee assists the president in making decisions for and administering to the village. This more contemporary political arrangement overlies an older albeit weaker political authority of the “traditional” land chief, or *fumu si*. The clan to which this chief belongs is the proprietor of a specific territory, and the chief assumes responsibility for distributing access to this land and for approving certain kinds of resource use and construction. Figure 8 below shows these different territories around Konkouati. Although these boundaries should not be taken literally (as we were unable to contact all *fumu si* to agree upon boundaries), it demonstrate how land retains a ‘traditional’ role in the lives of residents.¹³

¹¹ After independence from France, citizens were allowed to move around without restrictions. New opportunities with logging and oil industries in the south brought people from central and southern Congo. Some of these people went to work for logging companies in the area. Nguingui & Katz (1997) also refer to this movement as a result of immigrants seeking access to fish and wildlife.

¹² See Gray 2002 for a discussion of the importance of clans and French colonial construction of ethnic groups in southern Gabon, whose people share a common history through the 19th century.

¹³ The knowledge of these boundaries is not known by everyone in the village; nor was it by everyone in past generations because territorial boundaries are the domain of clan members, not average village members. As was clear from our mapping exercises though, even clan members today, especially younger ones find it difficult to outline their territory, as few people enter the Park and arrive to learn the boundaries of their territories

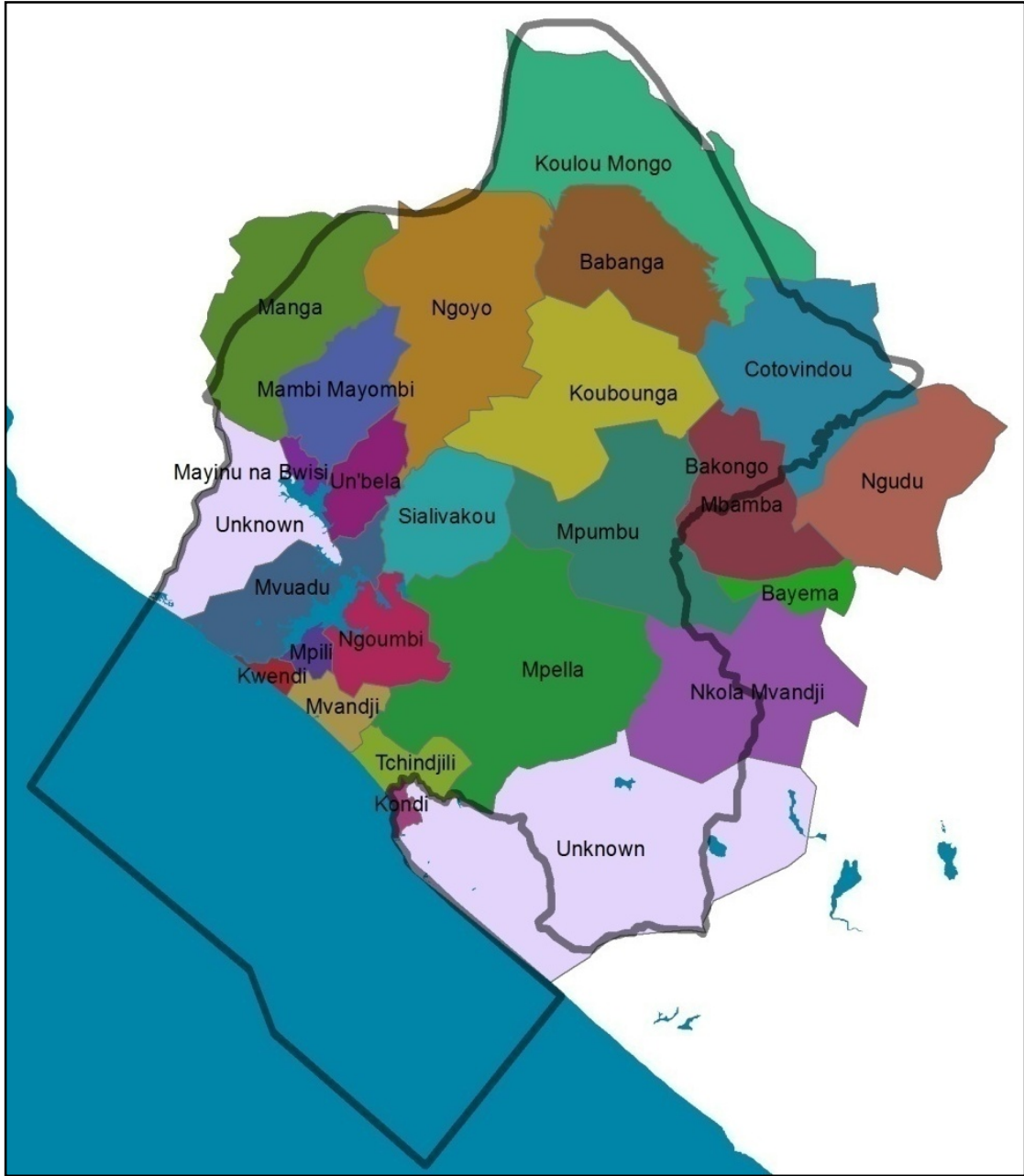


Figure 8: Map of clan territories, superimposed by Conkouati National Park. This map demonstrates how communities still remember historical ownership of, and access to, land and resources despite new zoning. Territory boundaries were described to the author and G. Tchitiamouna by various elders during several map exercises and mapping trips. Unknown areas have territorial owners, but we were unable to contact them. Although every effort was made to obtain ‘exact’ borders (through the confirmation by other sages), territory boundaries should be considered soft.

Local Government

Conkouati-Douli National Park is located in the Department of Kouilou, extending over two districts: Madingo Kayes and Nzambi. Local government thus constitutes an influential stakeholder in the Park, and it includes politically-appointed administrators and support staff, such as the police, gendarmerie, and local officials. These local authorities adjudicate local conflicts, assure order, and when necessary, communicate local concerns and grievances to authorities at higher levels of government).

The most local level of governmental authority is the village chief (locally named the 'president'). He mediates conflicts within the village, announces official decisions and policies from regional and national government to village inhabitants, represents the village in official delegations and government entities, and communicates village concerns or grievances to higher authorities. The village president reports to the Sub-Prefect, who intervenes in unresolved village conflicts, transmits official information from higher authorities to the village presidents, represents the district in official delegations, assures order in the district (or sub-prefecture), and acts as the eye for the State.¹⁴ S/he in turn reports to the Prefect, the government representative for the entire department (or prefecture) in official meetings with the press, industry, international organizations, other government offices, and citizens. The prefect maintains order in the Department of Kouilou, monitoring all districts (or sub-prefectures) and villages, and appoints village presidents. The Prefect has no official responsibilities in Conkouati but he does communicate with the different Park stakeholders.¹⁵ Local government thus serves as the State's administrative arm. With respect to Conkouati, its different representatives participate in multiple-stakeholder meetings, mediate conflicts between local inhabitants and Park management, file local complaints about Park management concerning conservation activities, and facilitate collaboration between stakeholders.

¹⁴ Interview with the Sub-Prefect of Nzambi, 8/23/2007

¹⁵ Interview with the Prefect of Kouilou, Pointe Noire, 3/14/2007

Elected Government

Two elected deputies in the Congolese National Assembly represent the two districts, Madingo Kayes and Nzambi, containing Conkouati –Douli National Park. The August 2007 elections voted out incumbents who had served for five years promoting economic development and arguing vociferously against Park activities. The newly elected deputies have not been as openly hostile to the Park's aims and activities.

Timber

The Ministry of Forestry Economy manages timber interests as well as protected areas. Timber is the second largest export industry in Congo after oil, accounting for about 8% of foreign revenue (World Bank 2008). MEF controls all industrial forestry activity. It awards concessions, calculates the amount of exploitable timber in concessions, determines annual harvests, supervises lumber transport, export and processing, levies fines for any legal violations, and collects revenue for the state. The Ministry oversees the current concession inside the Park held by Sicofor (Sino Congo Foret), a Chinese-Malaysian timber company that acquired control over forest exploitation in this concession from Man Fai Tai, a Malaysian company that went bankrupt in 2005. Sicofor also has legal, contractual obligations to train Congolese employees in forestry management, work with ministry officials to attain sustainable hunting levels in concessions (although according to MEF agents Sicofor is not allowed to hunt in the Park),¹⁶ finance anti-poaching units, and ensure benefits to government and local populations (Republic of Congo 2006).

Cofibois, a small Congolese-owned timber company, also held a concession inside the Park until 2004. One Park official suggested that financial problems forced Cofibois to stop its work there in 2002.¹⁷ After the Ministry rescinded Cofibois's permit inside the Park,¹⁸ they authorized the company in 2006 to harvest timber in the Park's buffer zone

¹⁶ Interview with P. Mingonga, Assistant Conservator, Conkouati, 6/30/2006

¹⁷ Ibid.

¹⁸ The reasons for this are unclear.

near Mpumbu¹⁹ (for all maps see the section on industrial use below). The company maintained a timber camp manager and one team of about 35 men at Youbi, on the Park's eastern boundary.

Mining

The Ministry of Mines maintains an active interest in the Park because of existing mineral deposits there. The ministry is in charge of developing and overseeing the exploration and exploitation of all solid minerals, such as gold, diamonds, copper, and tin. Over the past decade, ministry officials have visited the Conkouati area to collect mineral samples and to hold discussions with potential investors.²⁰ The Ministry in Brazzaville initiates these missions, which are frequently carried out by the regional geologist in Pointe Noire. Subsequently, the Ministry issues permits²¹ for prospection with various international mining companies.

Fishing

Numerous companies and individuals with trawlers and motorized boats from many different countries, including China and Benin, conduct offshore fishing. Foreigners (Chinese, Senegalese, or Beninese) often operate the fishing boats with Congolese crews of up to six to ten men²² with pelagic drift nets, bottom gill nets (3km long nets also used by Chinese), cast nets, or the occasional beach seine (Jul-Larsen 1993). Fishing boats normally spend two to three weeks at sea, and thus the companies employ provisioning boats to bring food to the crew and to haul the daily catch to Pointe Noire).²³

By Congolese law, this fishing is illegal, since only local fishermen are allowed to harvest fish in Conkouati's waters. The Department of Fisheries, housed within the

¹⁹ Interview with Cofibois camp manager, Cofibois concession, 6/24/2006

²⁰ Interview with R. Matongo, Ministry Geologist, Pointe Noire, 5/4/2007

²¹ These permits include prospecting (examining the topsoil without the use of any drilling or digging equipment), exploration (involving tests and earth-moving equipment), and exploitation (commercial activity to remove minerals).

²² Tchitiamouna interview with Hong-Chang employee 4/19/06

²³ Tchitiamouna interview with Agimex employee 4/19/06

Ministry of Agriculture, Livestock, and Fisheries and the Advancement of Women, regulates all fishing. Its mandate is to regulate fishing and to work with fishermen in all Congolese waters. In the Conkouati region, however, Ministry officials and personnel tend to work closely with commercial fisheries and to leave Park waterways within the MEF's jurisdiction.²⁴ The Department of Fisheries has no boats, hence it is entirely unable to regulate offshore fishing, monitor fishing practices, or measure offtake.

Oil

The Ministry of Hydrocarbons in Brazzaville manages oil exploration and exploitation, and it has a regional office in Pointe Noire. The ministry designs and develops permits, oversees and enforces laws for oil exploration and exploitation, awards concessions, levies fines, collects revenues, and facilitates the activities of the oil industry in Congo.

Congo's economically powerful oil ministry (accounting for 87% of Congo's exports; World Bank 2008) has been active in Conkouati for several decades. The ministry focuses its activities in southern Congo where all oil exploitation is currently conducted. Although oil exploitation previously occurred exclusively offshore, the Ministry is in the process of altering this paradigm. Over the past ten years, research has revealed that Congo's coastal areas contain valuable oil deposits.

Maurel & Prom and Perenco are two companies that actively explored oil reserves in Conkouati during this study (2005-2007). Maurel & Prom, a public French company, maintained two exploration²⁵ permits within Conkouati (Noumbi onshore and Marine III²⁶ (offshore) and two other sites in Congo. It conducted onshore exploration surveys in 2006-2007, and it plans to begin drilling for oil in coming months (H. Vanleeuwe,

²⁴ Interview with J. Ngomemouo, Department of Fisheries, Pointe Noire, 4/15/2006

²⁵ The process for producing oil is known as upstream production, and is composed of exploration and exploitation. Exploration includes using seismic research to determine where and how much oil is located beneath the ground, and the construction of exploration wells to ground truth positive results. Exploitation includes the construction of wells and the extraction of oil. During the study period, only exploration occurred at Conkouati, both onshore and offshore.

²⁶ Operated by Prestoil

pers.comm.). Perenco, an international company founded in Singapore, operates three offshore permits in Congo.²⁷ Perenco became the operator for the offshore exploration permit Marine IV inside the Park (see Figure 13 below for a map of this permit). In 2005, the company conducted 3-D seismic surveys there,²⁸ and in 2008 began drilling offshore exploration wells.

Conservation and Development Organizations

The Park is home to several non-governmental organizations (NGOs) in addition to WCS. The missions of these NGOs range from chimpanzee reintroduction and conservation (*Habitat Ecologique et Liberté des Primates*, HELP), reptile research and conservation (*Renatura*), sustainable resource use (Project Gecko), to community development (Food and Agriculture Organization, FAO). These various stakeholders have minor relationships with Park management, each pursuing its own goals; but in theory, no organization should work inside the Park without coordinating with Park management. The diversity of aims and activities among these NGOs and the lack of effective coordination among them have not facilitated conservation in Conkouati. Because their activities do not specifically relate to this chapter or the dissertation, they will not be discussed here (see Appendix 1.2 for a description and map locations of all of the NGOs and development organizations).

Other international bodies

Various Western governments have displayed an interest in the activities (particularly industrial) currently taking place in Conkouati. American and European governments have invested hundreds of thousands of dollars over the past 4 years (in addition to some \$2.4 million invested by the World Bank the 1990s (World Bank 2000)). These governments have expressed concern about the effects of industrial exploitation inside an internationally recognized national park, and they have thus sought to promote biodiversity conservation and forest protection in the Congo Basin while still maintaining

²⁷ Discussion with Perenco official, Pointe Noire, 5/8/2007

²⁸ Interview with L. Paka, General Services, Perenco, Pointe Noire, 4/30/2007

international cooperation and broader regional stability.²⁹ Investments specifically fund: 1) Wildlife Conservation Society activities inside the Park; 2) small development organizations to create local conservation and sustainable development projects; and 3) quiet diplomatic efforts to encourage the Congolese government to uphold national laws and international practices of nature conservation.

Tourism

The beaches of Conkouati are between two and four hours' drive from the urban center of Pointe Noire (in private vehicle). Within the southern region of Park, along the coast, there are three small beach hotels that have existed since the early 1990s. Their operations are so small, however, that they are not included in this study. HELP and WCS also have small tourist accommodations, and HELP actively invites local and international tourists to visit the chimpanzees with boat tours and camping trips to the forest at the Triangle. In 2005, the Congolese government invited Pioneer International Development to explore tourism operations in Conkouati and the two other national parks. Pioneer and the ROC signed a cooperative agreement to develop large-scale tourism inside the Park (Pioneer International Development 2007). The goal was to bring high-volume tourism to the Park and to diversify Pioneer's business portfolio to encompass 'green' activities.³⁰ These activities may include the construction of bungalows near a village sacred site at the Conkouati Embouchure, and a conference center and hotel at what Park Management considers an ecologically sensitive area. Other than the two preliminary visits and potential site placement at the mouth of the Conkouati Lagoon, no other activities as of December 2007 have taken place.

Resource Use Conflicts

Although the Park has sought to protect its biological diversity and to control resource exploitation, it has not achieved its goals, mainly because of the diverse interest groups discussed above. This section describes the processes by which resource use conflicts

²⁹ Interview with US Government source, 6/14/2007

³⁰ Interview with Pioneer officials, 3/18/2007

developed in the region, provides examples of direct confrontations between the Park and local resource users that subsequently develop, and demonstrates the weaknesses of MEF and the Park in protecting the Park from extractive activities.

Foundations for Conflict: A history of exploitation

Colonial environmental exploitation in Conkouati has strongly influenced the Park today. This influence is both physical and perceptual. Conkouati's eroded savannas caused by oil seismic lines,³¹ its absence of primary forests caused by nearly a century of harvesting large trees, and its extensive skidder tracks and logging roads (pers. obs.) all provide a physical testament to French colonial and recent exploitation.³² Colonial administrative and economic policies also physically relocated villages to current roads, leaving behind large expanses of relatively unpopulated forests, which the Park ultimately occupied. Colonial forest exploitation also helped to shaped how different stakeholders, especially local people, perceive the forest, savannas, ocean, and their resources.

Forest exploitation long predated the arrival of French colonizers. Historians have documented a vibrant trade among Africans, and between Africans and Europeans along the Atlantic coast beginning as early as 1570 (Martin 1972). By 1626, Vili traders at Loango (near present-day Pointe Noire) provided Portuguese and other European merchants with slaves³³ (which continued until the mid-late 1800s), padouk (redwood), okoumé (used for plywood), palm oil, salt, rubber, and ivory (Martin 1972; Vansina 1990), exchanging these commodities for manufactured European goods such as guns and cloth. African 'factories' stationed along the coast, including four in the Conkouati area, facilitated this trade (ibid.). At least one of these was staffed by Portuguese trader had a trading house at Conkouati and a residence in the area at Longbondi (a village in

³¹ When oil companies in the 1990s explored for oil in the savannas along transects extending kilometers, the result was a permanent mark on the savanna. In certain areas, this caused severe erosion with small gorges several meters deep.

³² Participant observation with A, Sialivakou, 5/2/2006, Participant observation with P, Km4, 6/13/2006

³³ Martin (1972) determined that from 1660-1793, almost one million slaves were trafficked along the Loango coast, including Conkouati (cited in Gray 2002).

the Park), which he subsequently sold to a Dutch company³⁴ in 1871. These factories at Conkouati were mainly producing large pirogues for this company in 1875 (Vennetier 1968). Elderly people in Conkouati's coastal villages possess only a faint historical memory of these activities; remembering one specific instance of a Portuguese trader living in Kondi, who hunted game (buffalo in particular) to subsidize his activities and to pay for agricultural goods and services (although informants could not recollect exactly what this man did).³⁵

Colonial exploitation

Colonial exploitation of Conkouati's resources most likely began in the early 1900s.³⁶ French control of the colony Middle Congo was not direct, but rather delegated to concessionary companies in 1899. In exchange for a yearly rent paid to the French state, these concessionaires harvested forest products, engaged in rubber tapping, mined its mineral resources, controlled all trade, commanded African labor, and de facto governed the new colony (Coquery-Vidrovitch 1972). During the concessionary period, central Africans had to submit to rapacious concessionary demands for forced labor (Giles-Vernick 2002). Companies not only failed to provide effective governance, but many went bankrupt (Coquery-Vidrovitch 1972). At Conkouati, colonial maps (ibid.) show that France divided Conkouati's forests into one large and one small parcel in 1899 for the concessionaires Bazenet and De Kergariou. The French government gave these companies 30-year leases on the land, but like so many concessionary companies who failed to survive, the De Kergariou lease (and perhaps that of Bazenet) was taken over by the *Compagnie de Kouilou-Niari* (CKN) in 1912 (ibid.), which became the *Compagnie Proprietaire de Kouilou-Niari* (CPKN). Elders have no recollections of these first concessionaires, and the MEF and Brazzaville archives do not possess documents on

³⁴ Nieuwe Afrikaanshe Handels Vennootschap

³⁵ Interview with BN, Kondi, 2/7/2006

³⁶ Archival sources in Congo were not complete, but may exist in Aix en Provence.

their activities.³⁷ By 1915, CPKN operated several sites around Conkouati, and engaged in rubber-tapping, pirogue production, and palm oil (Vennetier 1968).

In the late 1920s and 1930s, in the aftermath of an international scandal over French Equatorial Africa's concessionary system, the French government assumed greater control over its equatorial African possessions, ultimately doing away with the concessionary system (Coquery-Vidrovitch 1972). Concessionary companies more closely resembled private companies, whose presence increased. At Conkouati, timber and mining companies initiated operations in the 1930s (Afrique Equatoriale Français 1939; Coquery-Vidrovitch 1972). The first industrial-scale timber exploitation at Conkouati, according to Vennetier (1968), was in 1930 along the Noumbi River by Compagnie Industrielle du Congo (CIC). By 1939, both CPKN and Couderc (another timber company) were also operating, these focusing on forests around the lagoons and lakes of Conkouati.³⁸

At least two French companies (Ker, Baillet, Warnant, according to local sources) commercially exploited gold; villagers estimate gold mining began in the 1930s and persisted through the late 1940s,³⁹ possibly through 1950 when companies moved to richer deposits further east (Afrique Equatoriale Français 1950).⁴⁰ Colonial mineral researchers also discovered oil derivatives (bitumen) in Conkouati (at Mpumbu) in 1928 (Vennetier 1968), and although not exploited, continued to be of interest through the colonial period (Afrique Equatoriale Français Undated 1950s).⁴¹ Between 1954 and

³⁷Although Venetier (1968) provides some insight to early-colonial activity, colonial archival research concerning the activities and locations of company activities in Conkouati and of the effects of these activities on local populations is needed. I am especially interested in the first colonial post in the region (Madingo), in a village now known as Paris, where the Noumbi River meets the ocean.

³⁸ Both the Noumbi River and Conkouati Lagoon were valuable as they were two of three Congolese waterways that connected directly with the ocean, providing a source for which large timber could be loaded to boats and exported to Europe.

³⁹ Interview with CG, Km4, 6/22/2006

⁴⁰Ministry of Mines archives were severely damaged during the 1997 war, and thus data was difficult to obtain

⁴¹ Interview with M. Safou-Boulou, Chef de Service Exploration & Exploitation, Ministry of Mines, 4/26/2007

1959, the Société des Pétroles de l’Afrique Equatoriale Français (SPAEF) first explored for oil about 75km south of Conkouati (ibid.).

Oral and written sources have attested, however, to the much greater importance of timber companies, whose presence has been both longer-lived and more consistent over the past century than those of other industries. Exact dates and locations for companies such as CPKN, Robin du bois, and CFN are found in Vennetier (1968). Colonial extractive activities (Figure 9) demonstrate that even during the later colonial period, industrial exploitation and interests covered large expanses of at Conkouati, and these activities had a lasting influence on local stakeholders that continues today.

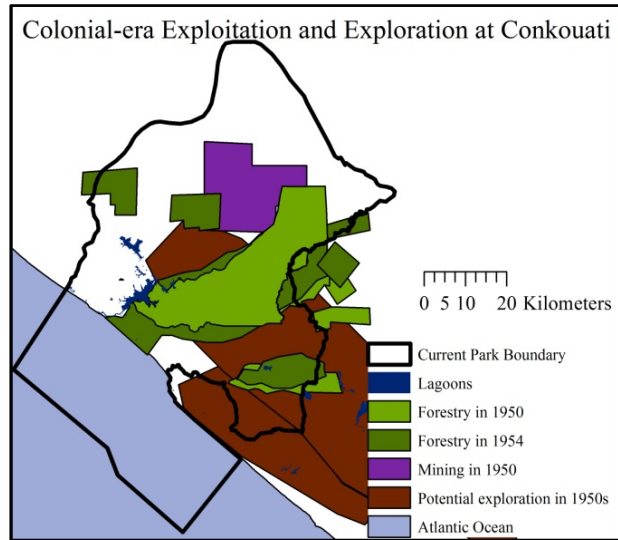


Figure 9: Oil exploration, and timber and gold exploitation at Conkouati during colonial times. Given the weak archival material in Congo, these maps are not exhaustive and may represent, especially for forestry, only a proportion of exploitation.

*Colonial policies and changing governance*⁴²

In order to understand how these colonial influences continue to influence the Park, it is important to examine the land-tenure and social organization of communities before colonization. In precolonial Conkouati, the peoples inhabiting the region organized

⁴² In understanding the system of governance at Conkouati prior to French colonization, it is useful to examine work conducted by Nguinguiri, an anthropologist focusing on the Vili, and Gray, a historian whose work focused on Southern Gabon, including the Mayumba area, which is directly north of the Park and contains several of the same ethnic groups (Vili, Punu, and Lumbu). According to Nguinguiri (1988), the territorial habits of the Vili differ very little from those of many other ethnic groups in Central Africa.

themselves into villages. Villages were based around a group of Houses, with a ‘big man’ and his house membership, comprised of dependants, including women, children, and young men (Gray 2002). Membership changed from time to time, and societies were not arranged around fixed spaces, but through social connections between matrilineal groups. My informants, who stated that settlements in the Conkouati area were fluid in both composition and in space, moving every ten to fifteen years, corroborate this.⁴³ Despite this fluidity, people did belong to a clan, which was (and remains) an alliance of various lineages with one founder. The head of the clan⁴⁴ then governed a larger *social* area encompassing these villages, known as a territory (ibid.). The *fumu si* controlled territories, which were associated with environmental exploitation, and also housed their ancestors, sacred forests, witches, and several territorially-based spirits from which members drew power and continuity.⁴⁵ The territorial boundaries were based upon the boundary of clan genies; spirits which inhabited the lands (Nguingiri 1988) and controlled the abundance of resources (Hagenbucher-Sacripanti 1973). It was in these territories that residents pursued their livelihoods, whether through agriculture, gathering, fishing, or hunting.

Villagers did not have to live within their respective clan’s territory to access resources; in fact most did not. People were able to remain socially connected, as lineages spanned villages, effectively connecting people to one another and to places. Those who did not live within their territory had to seek out members of the clan who owned the land.⁴⁶ Clan leadership, led by the *fumu si*, asserted their authority and regulated access to and use of forest, savanna, game, traded goods, and productive land and water resources (Nguingiri 1988).⁴⁷ Territorial owners required outside settlers, hunters, and traders

⁴³ Group interview, Sialivakou, 5/14/2006

⁴⁴ Nguingiri (1988) describes the head of the clan, *fumu-kaba* as the leader of the clan, whereas the *fumu si*, or clan members, are the ones that control the use of the land.

⁴⁵ Interview with *fumu si* of Mbamba, 4/24/2007. It remains unclear how colonial land policy may have affected the rights and obligations of *fumusi*.

⁴⁶ Interview with S., Kondi, 5/8/2006. Today, *fumu si* are known as the *chef de terre* or *proprietaire foncier*.

⁴⁷ See Nguingiri 1996 for a description of the *fumu si* and the loss of power to the colonial-imposed *chef de terre*.

(later on, Europeans) to pay tribute for use of land.⁴⁸ Figure 8 (above) shows how elders remember these territories and how access rights were spatially regulated across what is now the Park. However, clan claims to land ownership began to change with the imposition of colonial rule at the beginning of the 20th century.

Colonial activities changed the ways in which individuals exploited the forests, waters, and lands. Concessionary companies, with new authority based upon force, were able to demand labor of rural populations, control land, and take resources; all of which were formerly under the sole control of clan leaders. The colonial administration (after concessionaires) diminished further the powers of clan leaders—colonial policies of *regroupement* had an important influence on the residential patterns and clan control of lands.

As elsewhere in French Equatorial Africa, dispersed settlements made it difficult for French colonial administrators to tax their colonial subjects or to subject them to demands for forced labor. They consequently “regrouped” these scattered populations into new, larger villages next to roads; this regroupment enabled colonizers to better control their colonial subjects, to tax them and to conscript them for labor in timber and gold industries (Giles-Vernick 2002; Gray 2002). Colonial administrators forcibly relocated scattered populations in Conkouati onto road networks, concentrating populations along the two main roads and forestry access roads. Although very little information exists in Congo on the exact dates of *regroupement*, the French implemented these policies in southern Gabon (which borders the Park) and in the middle and upper Sangha during the late 1920s and early 1930s (Gray 2002). In order to oversee these new villages, French colonizers created Congolese district administrators (*chef de cantons*), regional (African) guards, and village liaisons (*chef de terres*).

The imposition of French colonial administration introduced a new authority and foreign capital to the region, and it undercut how big men and clan leaders asserted control over

⁴⁸ Interview with *fumu si* of Sialivakou, 5/8/2006

members of society and resources, from which they drew their power (Nguingui 1996). Colonial policies thus changed the clan's authority over natural resources, which effectively began the decline in local governance of these resource (ibid.). Concurrently, concessionary and other extractive companies introduced international capital; transforming how and where people worked in Conkouati's forested landscape. This was similar to the region of Gabon where historian Christopher Gray conducted his research.

In the colonial world of lumber camps, regrouped villages, and developing towns, the integrative functions of the clan were becoming increasingly irrelevant. The empty ethnic categories developed by the colonial administration started to fill in, as between 1920 and 1940 tens of thousands of men...felt the ties of clan and lineage loosen through work in the timber industry...(Gray 2002: 187,190)

Similarly in Conkouati, timber and gold industries employed young men as laborers, providing them with new sources of income independent from elder generations. This independence of younger generations, as elsewhere in Africa, facilitated the declining authority of clan leaders and elders over younger members of the community, and hence, the norms for regulating forest resources.⁴⁹

Regroupement also fixed colonial subjects to particular villages and land parcels.⁵⁰ Whereas the geographical mobility of pre-colonial equatorial Africans has long been discussed by historians (Giles-Vernick 2002; Vansina 1990), regroupement sedentarized populations and encouraged ecological deterioration (Gray 2002). More densely populated villages now saw their inhabitants cultivating the same lands without sufficient fallows, and overhunting in the forests surrounding their regrouped villages. According to informants in different villages, elderly and the disabled are obliged to cultivate less-fertile land parcels because they cannot travel greater distances to better arable land.⁵¹

⁴⁹ This decline continued after Congo's independence from France.

⁵⁰ Although regroupement fixed villages in certain locations, individuals retained considerable mobility. The death of a family member, especially the male head of household or the village leader, often meant the dispersion of a family or an entire village (Interview with S, Kondi, 5/8/2006). Conkouati savannas contain many abandoned old mango groves (one sign of previous human habitation), and villagers today throughout the area see these groves as memories of where generations past once lived. These groves, some over 100 years old according to villagers, are numerous across the southern savannas in the Park. Walking map with B, Kondi, 2/7/2006

⁵¹ Participant observation with HK, Kondi, 12/1/2005

Despite these colonial and economic influences on migration patterns and resource use, local populations in Conkouati villages still remember the particular forests that specific clans controlled during the pre-colonial era (Figure 8).⁵² Clan members, in recalling the specific boundaries of clan territories, vehemently assert that they retain rights to access and use of these lands and their resources. They mobilize these claims in contemporary conflicts with stakeholders, particularly with the Park and oil companies. For example, participants in the mapping exercises were very interested in obtaining the territorial maps (Figure 8Figure 10), which they planned to use with oil and phone companies who were operating on clan territory. Like past resource users, including hunters and concessionary companies, *fumu si* leaders demand current industrial exploiters to pay tributes for the use of resources.⁵³ However, this practice is not followed by the government. In Kondi, the construction of a Park camp for monitoring sea turtle populations was frowned upon by local villagers as the territorial owners were not given compensation or consulted:

Before, no matter whom, even companies who came to exploit oil, always passed in front of the population to see the village committee and the *fumu si*. But today, the Park comes and make decisions elsewhere; they write letters elsewhere, and they come to ask us to cheer; we are obliged to cheer; it's the only outsider who has come to influence the law; the law of the *fumu si* and the populations. But the Park came to implant the turtle site just there, without asking permission. Wait for the law of the ancestors and the miracles of the country [land] there; the day that the site will catch fire.⁵⁴

It was through coerced colonial policies and a new economic system based around road networks, which forced or drew local populations from the forest to the roads, and in so doing, opened up a large 'empty' space on the map of southern Congo (Figure 10) which the government views as its own to govern, but which residents do not believe it has the legitimacy to control.

⁵² The map was developed through mapping exercises with elders and *chef de terres* from many different villages. The territories which are now in the center of the Park were difficult to map, as some territory owners were not identified or have moved to Pointe Noire. The borders of clan lands are thus approximations.

⁵³ Interview with *fumu si* of Nkola Mvandji, 4/24/2007

⁵⁴ Group interview, Kondi, 12/5/2005

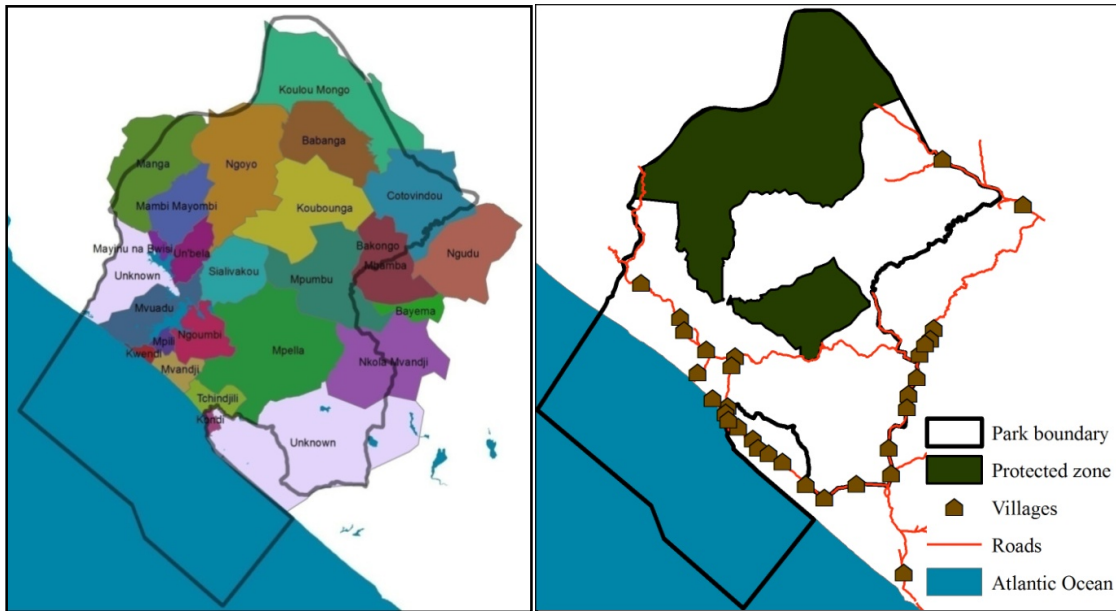


Figure 10: Territories and villages around Conkouati in 2007. People over the past 70 years have been translocated (by both economic and colonial forces) from dispersed territories to villages along roadways. It was this geographic ‘empty’ space that the Government converted to the integrally protected heart of Conkouati (in dark shade).

Thus, colonial interventions in and around Conkouati have subtle yet important influences today. First, regroupment displaced people from their territories and disconnected many from their ancestors and spirits who played a vital role in resource regulation. This has permanently weakened a ‘traditional’ system of resource management (Nginguiri 1996b). However more importantly, the memory of territorial ownership reminds people of autonomous resource regulation. Villagers are nostalgic for the ability to use resources (such as bushmeat) on their clan territories. They have not accepted the new system of governmental regulations and government defined resource use. Consequently, the desire of villagers for a return to traditional property rights and resource use leads to conflicts between the villagers and the Park. Secondly, the introduction of foreign capital and the growth of new markets and infrastructure which began in the colonial era laid the groundwork for a new era of exploitation. This has brought in more stakeholders wanting resource use rights to lands that traditionally belonged to clans.

Post-colonial exploitation 1960-1999

Exploration and exploitation activities for oil and mining companies intensified after independence in 1960 (Figure 11). Although industrial-level gold mining did not continue after 1955 (Vennetier 1968),⁵⁵ the Ministry of Mines continued to provide prospection permits to various companies interested in gold and tin, including a company that exploited tin until 1964 (ibid.). Oil exploration was not extremely fruitful despite the creation of concessions and repeated prospecting in Conkouati's oceans and onshore through the 1990s (Hecketsweiler & Mokoko Ikonga 1991). The oil companies did not detect any significant oil deposits prior to the establishment of the Park. Nonetheless, onshore explorations were important sources of employment for many villagers during this period.

Similarly, the Ministry of Forestry Economy expanded timber operations around Conkouati between 1960 and 1999. Timber companies provided temporary local employment and developed local markets for the region's inhabitants. They exploited timber over vast areas (Figure 11). However, the presence of these companies in specific locations was short-lived. As one forestry employee explained, companies across Congo often exploited their forest concessions for a few years, quickly cutting easily accessible timber and then declaring bankruptcy, either to avoid taxes or because of poor business practices.⁵⁶ Despite their instability, these timber companies left lasting impressions on village inhabitants, who recalled how companies employed local people and facilitated the creation of markets for agricultural goods and other products.⁵⁷

⁵⁵ Neither informants who were gold miners nor employees in the Ministry of Mines had any record of companies exploitation of gold.

⁵⁶ Interview with M. Jacques, Pointe Noire, 4/28/2007

⁵⁷ Gray 2002 also notes how timber companies in southern Gabon often purchased foods from local villages to feed their workers.

Post-Independence Exploration and Exploitation at Conkouati, 1960-1999

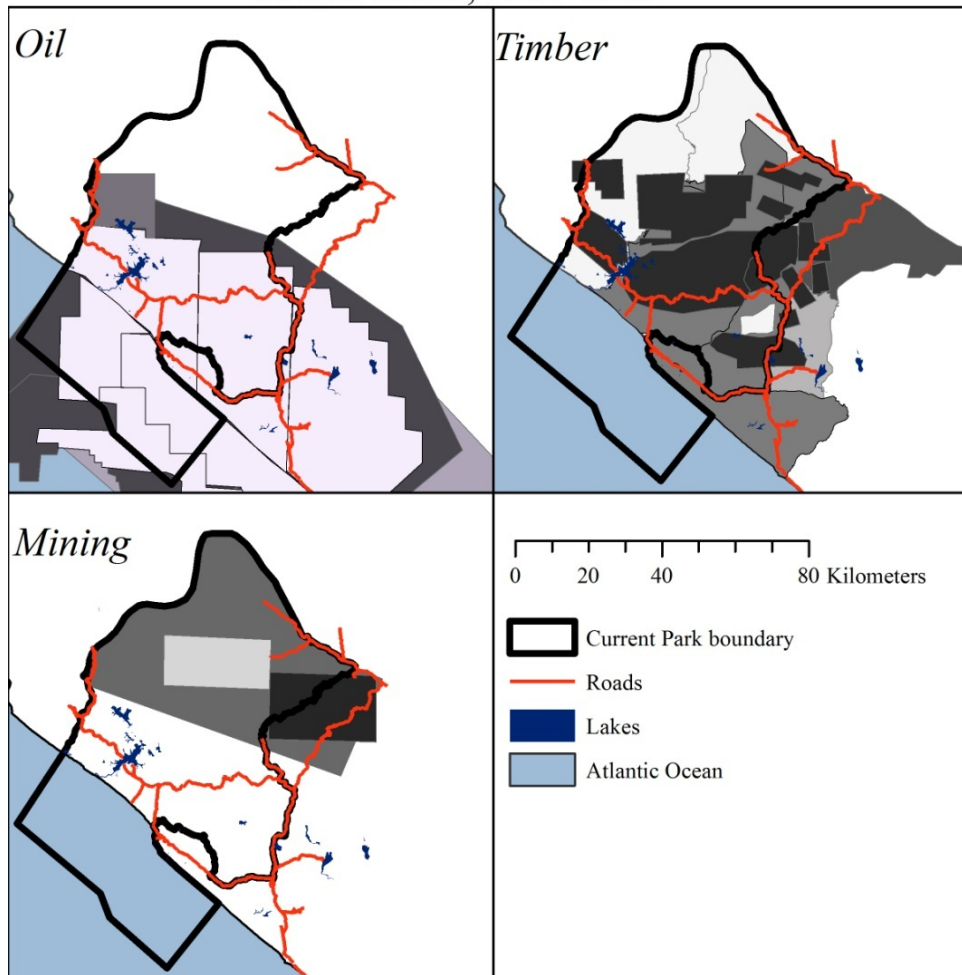


Figure 11: Pre-Park industrial activities, 1960-1999. Outlined blocks indicate prospecting, exploration, or exploitation. Although not all areas were exploited, areas were explored for resources by government or industry. These maps are meant to demonstrate the economic importance of Conkouati for the Government of Congo before it became a park; note that the maps are not exhaustive, as government records were not complete.

The first decades of independence also witnessed the increased activities of Congolese entrepreneurs who purchased PBOs (Permis de bois d'oeuvre), or public timber permits at Conkouati.⁵⁸ The Forestry Department assigned PBO entrepreneurs to operate in one of the government's large forestry management units (UFA), of which the area around

⁵⁸ Interview with A. Mouanga, Forestry Department, Brazzaville, 6/15/2007

Conkouati encapsulated one (UFA Sud2). They were allowed to operate anywhere within the UFA except in protected areas and in concession areas. They conducted their own prospecting and then sought the permission of forestry agents to exploit a certain number of trees. In 1962, forestry agents assigned 5 to 10 trees per individual. But by 1984, they approved the cutting of some 400 trees for each entrepreneur who requested permits. MEF put a stop to this permit system in 2001, citing over-exploitation of forest stands.⁵⁹

Following the closure of colonial mining operations, villagers learned about gold resources by former employees and many able-bodied men sought out these riches. One former miner recalled that in 1956, the government authorized gold mining permits (*permit d'exploitation d'or a titre de tacheron*).⁶⁰ Since then, gold mining in the heart of Conkouati has risen (Nguingui 1996a); the Park estimated that more than 1,000 miners were working there in 2005. A joint Park-Military operation in 2006 reduced the number of miners substantially by 2007⁶¹ (H. Vanleeuwe, pers.comm.). Gold panning, an activity introduced by colonial interests, continues today, despite military efforts to stop mineral exploitation (pers.obs).

Finally, many people continue to exploit fish and bushmeat for commercial purposes. These will be discussed in detail in subsequent chapters. But it is important to note that villagers and scholars (Katz et al. 1995) have stated that animal resource exploitation has increased dramatically since independence.

Resource exploitation within Conkouati's forests during the post-independence period continued economic, social and ecological transformations that colonial rule introduced.

⁵⁹ Ibid.

⁶⁰ Interview with CG, Km4, 6/22/2006

⁶¹ In addition to the Government seeing these gold miners (often from the Democratic Republic of Congo) as a security threat, the Ministry of Mines would prefer to see Conkouati being exploited by a company who could be formally taxed. In 1991, as a part of an IMF restructuring program, the Ministry of Mines lost a large portion of revenue and was forced to give up their program regulating individual miners such as those in Conkouati (Interview with M. Moumpassa, Ministry of Mines, 6/11/2007).

Large companies financed by foreign capital exploited forest resources, employed local inhabitants, dramatically altered forest cover, extracted valuable minerals, and reduced animal populations. In this post-independence era, individuals expanded into new markets that had been established by colonial capital. By using new public transport systems, Congolese migrated to Conkouati, and all residents were able to capitalize on the new access to Pointe Noire's markets to profit from Conkouati's extraordinary resource value. These new opportunities further reduced the power of former forms of resource and labor control by *fumu si* and clans, who by the end of the 20th century retained very little of their former powers over land, resources, and people.

Current exploitation and challenges against Park zoning

Conkouati's past has set the foundations for contemporary conflicts challenging the new Park and zoning implemented by the Congolese government in 1999. These conflicts emerge from three main sources: the demand for resources by regional markets; villagers and government officials seeking to protect their livelihoods; and industrial exploitation of Conkouati's extraordinary resources. The Ministry of Forestry Economy, specifically DFAP, is under heavy pressures from industrial interests within the government. By succumbing to these pressures, MEF not only violates international conservation guidelines, but also endangers the Park's integrity. The following discussion describes two current challenges to wildlife conservation: artisanal commercialization of resources and industrial exploitation.

Artisanal & semi-commercial exploitation

Local communities depend on fish, wildlife, and forest resources in the Park for their livelihoods. MEF, aware of these livelihood needs, designed the Park's zoning to accommodate local consumption of fish, bushmeat, and forest products, and local cultivation of agricultural lands. Local people may conduct these activities in a 'sustainable' manner and may sell their goods within the villages. Residents are also legally permitted to sell non-wildlife products to Pointe Noire, so long as they adhere to

Congolese laws. There is little conflict over most local extractive activities except for logging and hunting; the latter serving as the source of most heated conflicts between local residents and the Park (see Chapter 4). Many men from hunting and mixed-hunting fishing villages hunt for a living, and most hunt outside of the allowed hunting zones and use techniques forbidden by Congolese law. Some hunters belong to poaching or gold-mining networks financed by more wealthy people, including local government officials such as the police and military (Vanleeuwe 2006).

When the Park attempts to enforce wildlife laws and zoning, they encounter serious opposition and violence from the hunters, officials, and entire villages. The stories of hostile encounters are numerous: one ecoguard was stabbed by a villager; the military engaged in direct armed confrontation at Park installations; a WCS administrator was threatened by the police; and a WCS director was unlawfully jailed (resulting in the WCS's withdrawal from Conkouati in protest in 2003; *ibid.*).⁶² Park administrators have worked with different levels of government to resolve the specific conflicts over commercial poaching and gold mining rings, but Park personnel are subject to an exceptional sense of insecurity. The challenges that the Park faces from bushmeat hunting, and to a lesser degree gold mining, is that these individuals directly challenge the Park's authority by ignoring zoning and wildlife laws.

Industrial exploration & exploitation

The second major challenge to wildlife conservation at Conkouati is the pressure to exploit resources. This pressure comes from three sources: government, individuals, and industry. The state's governmental agencies seek to develop their sectors in part because of Congo's deficit and poverty. To enhance the public sector and rebuild Congo's economy, the government has the support of the World Bank, whose current initiative is to support "the growth and diversification...for the Congolese economy" (World Bank

⁶² This confrontation spilled over to include my ecological teams, who were forced at gunpoint out of the Park in 2006 by police who were involved with bushmeat trafficking and gold mining.

2007). Thus economic development within Congo, especially in the oil and timber sectors, is one of the government's top priorities.

The drive to exploit also comes from individuals interested in developing their country or enhancing their own interests. 'Development' is not just an economic policy, but also a patriotic conviction that runs through every agency, politician and citizen.⁶³ More sinisterly, industrial exploitation of oil and timber resources promises wealth for individuals and proves especially enticing for officials living in one of the world's poorest countries.⁶⁴

Thus the need for state revenues, international pressures, and the promise of individual (and kin group) advancement provide important motivations for tapping Congo's resources. The Congolese government awards concessions to companies who prospect, explore, or exploit the resources in their concessions. These companies are legally bound to meet the requirements of their contracts; failure to comply results in fines or expulsion.⁶⁵ However, companies themselves exercise considerable influence on government policy and practice within Conkouati. Sicofor, international trawlers, and mining/oil companies⁶⁶ have all gained access through alternative means and acquired agreements with the Government of Congo.⁶⁷ Regardless of the power that companies may have, the authority to permit exploitation ultimately rests with the government, and different ministries have specific mandates for managing land and resources. The following four examples demonstrate how government agencies, explicitly or implicitly enable industrial exploitation of Conkouati's extraordinary resources, and in doing so, they threaten zoning and hinder conservation.

⁶³ Interview with R. Matongo, Ministry of Mines, 4/26/2007

⁶⁴ Unicef ranked Congo #144 out of 177 in terms of human development (World Bank 2007)

⁶⁵ Interview with Director of Zetah (former Maurel&Prom subsidiary). A. Loemba, Pointe Noire, 2007.

⁶⁶ http://www.pid-us.com/Products_Hydrocarbons.htm; since this website was accessed in 2007, it has been removed

⁶⁷ I encountered the CEO and General Director of Pioneer International Development, LLC at the Park headquarters (3/17/2007). With no experience in conservation and none or little in ecotourism, the new company was awarded a 20-year agreement by the Minister of Forestry Economy (not the Minister of Tourism) to develop ecotourism at the Park. Their original plans included a high-rise hotel and casino inside the Park (Government of Congo 2007).

The Ministry of Mines, currently the weakest government stakeholder at Conkouati, has not succeeded in appropriating land for companies to exploit mineral resources in Conkouati. Specifically, the Ministry is interested in tin (cassiterite, SnO₂) bitumen, potash, and to a lesser degree, gold exploitation.⁶⁸ In 2005, the Minister of Mines signed a ministerial order permitting a Chinese company, Lulu, to begin prospecting for tin inside the Park. Although Park management stopped Lulu personnel when they arrived, according to the Director of Research for Mines, the reason Lulu was not subsequently permitted to conduct

prospection was that they did not produce an environmental impact statement for the road they would need to build to extract resources. He suggested that MEF rebuffed them not because they could not in theory mine in the Park, but because they did not follow the right procedures. This setback has frustrated but not prevented the ministry from developing

prospection zones in Conkouati for other companies (Figure 12). In April 2007, a ministerial order (*arrêté*) from MEF authorized Lulu to prospect, although the details have remained confidential. And finally, in late 2007, the company S.A.R.L.⁶⁹ was given a prospection permit for potassium salts (Ministère de Mines 2007) in a section of the

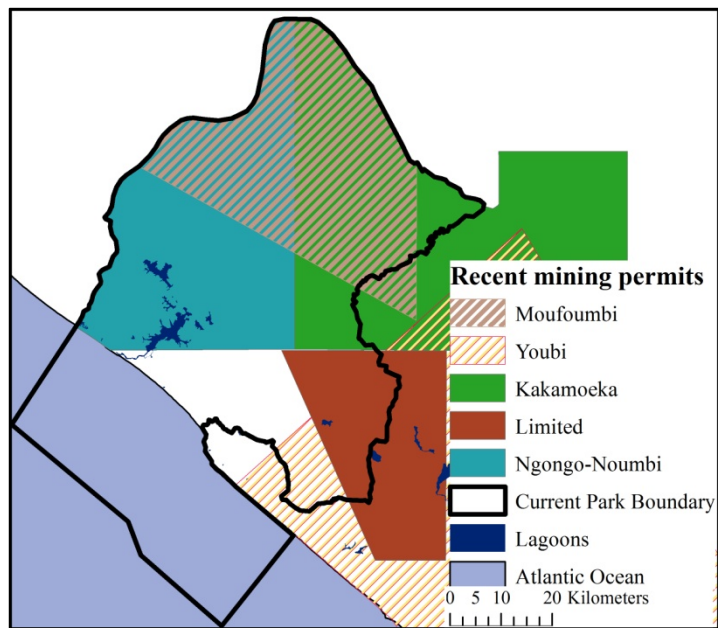


Figure 12: Mining prospection permits overlapping Conkouati-Douli National Park. Mining prospection permits cover over 80% of Conkouati's land but have not been successfully implemented.

⁶⁸ Interview with M. Moumpoussa, Director of Research, Ministry of Mines, Brazzaville, 6/11/07

⁶⁹ The documentation providing the company's full name was not available.

Park. The Ministry developed at least five different permits from 2000-2007 which have been designed for Conkouati,⁷⁰ and perhaps several more.⁷¹ Officials from the Ministry of Mines continue to enter the Park and conduct survey work,⁷² unbeknownst to Park management. However, no companies have successfully completed a prospection.

Since the Park was created in 1999, oil has continued to be of major interest to the Government of Congo, and thus the most powerful interest group at the Park (Figure 13).

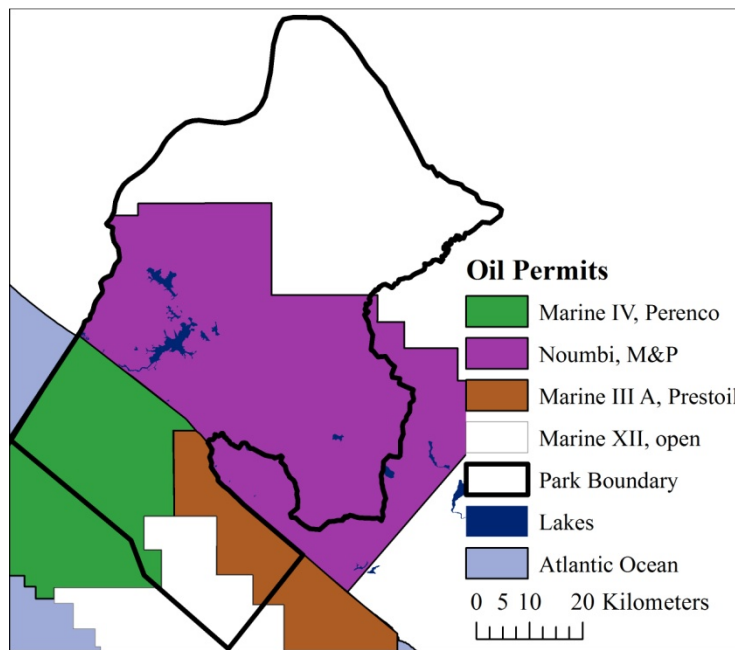


Figure 13: Oil exploration permits inside Conkouati-Douli National Park, operated onshore (2005-2008) and offshore (2005, 2008).

In 2003, the Ministry of Hydrocarbons put the Noumbi Permit up for bid. This exploration concession was purchased by Maurel & Prom and SNPC (Société Nationale des Pétroles du Congo), which began seismic exploration in 2006. A second permit, Marine IV, was also explored in 2005 for Perenco.⁷³ Perenco began an exploration well in 2008

⁷⁰ As of December 2007, there were no companies actively working inside Conkouati. However, several companies have been given prospecting permits with boundaries inside the Park. These include: Lulu, a Chinese company that has been interested in tin prospecting since 2005. Roc Gold, a South African company interested in gold, in 2007 was working in another area of Congo, there has been no official activity inside the Park. The ROC has given this company a ministerial order (*arrêté*) by the Ministry of Mines authorizing gold prospecting in the Ngongo-Noumbi and Kakamoueka-Poumbou concessions. The Ministry of Mines gave INL (International Negoce Limited) a ministerial order (*arrêté*) authorizing potash prospecting in the Tchissalamou Permit in October 2007 (Republic of Congo 2007). MagIndustries held the Youbi Permit for potash prospecting, but the status of this permit is not known at this time because of a second permit (Tchissalamou) covers some of the same area.

⁷¹ The Ministry of Mines archives were heavily damaged during the war of 1997 according to M. Moupoussa

⁷² Interview with employee in Ministry of Mines, Pointe Noire, 5/4/2007

⁷³ Interview with Perenco spokesman, Kondi, 12/3/2005

for Marine IV (Perenco 2008); Maurel and Prom will drill their exploration wells in late 2008.

A third extractive activity at Conkouati is commercial logging (Figure 14). When the Congolese government created the Park, it also permitted Cofibois and Man Fai Tai to keep their permits. The Minister of Forestry Economy, Henri Djombo, explained that MEF decided to do so because the

Government of Congo did not want to rescind

any existing agreements with companies.⁷⁴ The government nearly accorded a third concession in 2000 near the Gabonese border. This concession was controversial, because the government had already created the Park and many within MEF did not want to see another concession within its borders.⁷⁵ Finally, in 2006, MEF found a French company operating from Gabon poaching trees around Cotovindou, a very rich area of the Park. The Park seized the company's equipment (later returned) and forced the company to pay a fine. Perhaps the most controversial act was the addition of Sicofor as a stakeholder at Conkouati. Man Fai Tai (a Malaysian timber company) went bankrupt in

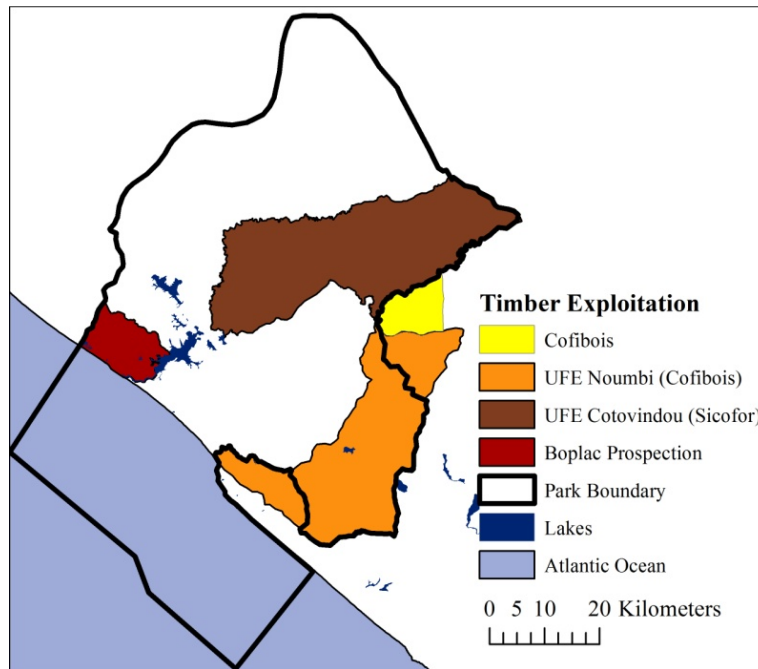


Figure 14: Forestry Exploitation and exploration at Conkouati-Douli National Park. Cofibois and Sicofor (Man Fai Tai) concessions were exploited since the Park was designated; the Boplac prospection area was explored by the Department of Forestry, but ultimately was not exploited.

⁷⁴ Interview with H. Djombo, Minister of Forestry Economy, Brazzaville, 9/10/2007

⁷⁵ Interview with D.N., Brazzaville, 6/8/2007

2005 and ceased almost all activity in the concession.⁷⁶ According to the decree creating the Park, once Man Fai Tai left, no other companies could assume control over its concession. But in October 2006, Sicofor obtained the Man Fai Tai permit (Republic of Congo 2006), and has received authorization to exploit timber through the end of the original contract (2011). Precisely how this company obtained the permit to exploit remains unanswered.

The fourth threat is that of commercial fishing (Figure 15). Chinese and Beninese boats enter the Park almost daily to exploit Conkouati's rich fish populations.⁷⁷ In addition, many villagers have complained that some fishing companies not only cut up their nets, but also use dynamite to blow up rocks where fish hide.⁷⁸

The Department of Fisheries has actively abetted such activities; they issued permits to these companies to exploit in all of Congo's waters.⁷⁹ One major conflict erupted over whether 'artisanal' fishermen with outboard motors and wooden boats could legally fish. Legal regulations stipulate that a portion of the Park's marine zone was open to artisanal fishing. Nevertheless, Park Management insisted that these boats

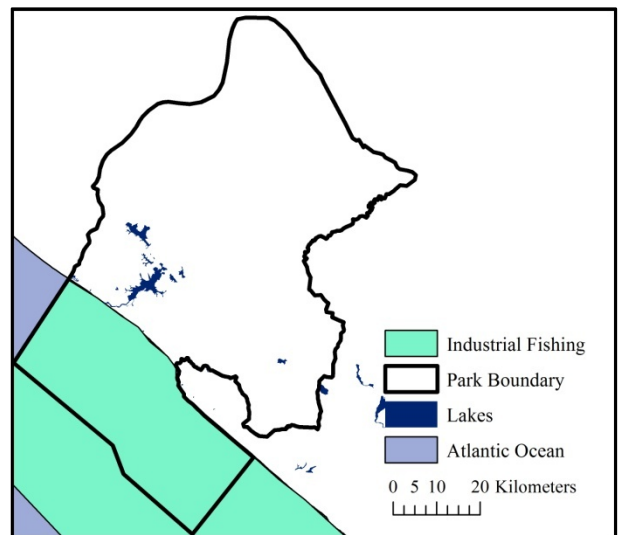


Figure 15: Fisheries exploitation by companies who were given permits for areas outside of Conkouati but poach inside the Park.

⁷⁶ There was some exploitation that occurred in 2006 with equipment from Taman, a large Chinese forestry company operating all over southern Congo. Whether or not this exploitation was for Man Fai Tai is debatable.

⁷⁷ The major species focused on include sardines, pid o pal, makwala, bar, and shark; however nets are indiscriminant and catch crustaceans such as shrimp and lobster, as well as sharks, turtles, dolphins, and a variety of scaled fish. Tchitiamouna interview with trawler employee, 4/19/2006

⁷⁸ Interview with AB, Kondi, 3/24/2006

⁷⁹ According to a local development project officer these fishing companies have artisanal fishing permits, but their methods of fishing reflect industrial fishing (Interview with P, Kondi, 1/28/06)

were not piloted by ‘artisans’, but by foreigners. After a verbal agreement between the Department of Fisheries and MEF agents, fishing is only open to local residents.⁸⁰ Illegal fishing continues to occur daily (pers.obs.), but the Park and Department of Fisheries, hampered by a lack of money and a marine police fleet⁸¹ cannot enforce the existing laws. Park management has attempted to rectify this through the purchase of a marine boat. They did capture a few trawlers and seize their goods, but the Park is plagued with operation challenges and thus the boat is rarely used. As a result, commercial fishers are rarely caught.

Challenges to zoning: Weak institutions and multiple stakeholders

These examples of five industrial and artisanal activities (hunting, mining, oil, logging, and commercial fishing), supported (sometimes implicitly) by government ministries, demonstrate that Park management faces challenges in protecting Conkouati. The inability of Park management to enforce zoning laws upon fishing companies and villagers, nor to stop other government ministries and departments from developing concessions demonstrate that the Park is weak. Barrett et al. (2001) in their essay on conservation in tropical areas have noted four characteristics that *strong* conservation institutions possess:

- (1) the authority, ability, and willingness to restrict access and use; (2) the wherewithal to offer incentives to use resources sustainably (which in some cases may mean no use at all); (3) the technical capacity to monitor ecological and social conditions; and (4) the managerial flexibility to alter the array of incentives and the rules of access so as to cope with changes in the condition of the resource or its users

I focus here only on the first, since the others go beyond the scope of this discussion. If a strong institution is defined as one that possesses the authority, ability, and willingness to restrict access and use, then a weak institution can then be defined as either not having the authority, ability, nor willingness to restrict access and use. I argue that MEF’s, ability and/or willingness to control access and resource use does not do enough to

⁸⁰ Interview with G. Bonassidi, Conservator, Conkouati, 3/29/2006

⁸¹ Interview with J. Ngomemouo, Department of Fisheries, 4/15/2006; personal observation

protect the extraordinary value of Conkouati's resources despite their legal authority (accorded by presidential decree (Republic of Congo 1999)). Their incapability is caused by three main factors: lack of funding; contradictory objectives within MEF; and most importantly, the inability to control other actors.

Conkouati-Douli National Park lacks the ability to effectively implement conservation in part because, like most parks in Africa, they do not have sufficient funds. From 2004 to 2007, WCS provided the Park with nearly two million US dollars to enforce wildlife laws, conduct research and operations, and maintain a presence in different sections of the Park. Nevertheless, the Congolese government's financial support of the Park remains low. Although the government remains one of the poorest in the world, MEF has responsibilities to ensure the protection of the Park. The result has been ineffective enforcement of existing laws (against trawling activity and illegal hunting), insufficient livelihood activities with communities around Conkouati (as a counter to the harm done through the loss of economic activity), and an insufficient environmental education effort. These factors weaken MEF's authority against those interests and activities that they *could* control.

The second factor that weakens conservation efforts are the contradictory objectives within the Ministry of Forestry Economy. Two different departments operate within Conkouati: the DFAP protects the forest (and wildlife), while the Forestry Department exploits it. Each has some authority over certain resources within the Park, but they operate at odds with one another. The timber company poaches in the Park and does not respect their terms of agreement with the Congolese government. The Department of Forestry does little to enforce these agreements, and the Park cannot obtain compliance from Sicofor to help fund anti-poaching efforts.

Internal communication problems also plague MEF and MEF/WCS. There are many examples of this lack of communication between national and regional levels, between the forestry department and the Park, and between MEF and WCS. Most of these come

from conflicts that arise over commercial interests inside the Park, including the new forestry company, the environmental impact statement from the oil company, and the insertion of a tourism company into the Park.⁸² These internal conflicts reflect competing mandates, internal competition, and the weak position of the Park within MEF; sometimes severely hampering the ability of the Park to manage stakeholder activities inside the Park effectively.

Third, the Government of Congo's multiple and conflicting objectives to conserve, drill, mine, and harvest simultaneously compromise MEF's ability to govern inside Conkouati. Congo's philosophy of New Hope (*la Nouvelle Esperance*) put forward by the President in 2002 has economic and social development as its top priority.⁸³ For a developing country with severe transparency issues and very powerful economic interests (oil and timber), the ability of the Park to effectively fight these is limited. Although the Minister of Forestry Economy has been able to stop the Ministry of Mines from exploiting within the Park, to stop the Boplac timber concession in the Park,⁸⁴ and has negotiated an understanding with the Department of Fisheries to better define existing laws⁸⁵ (albeit MEF is not able to stop fish poaching), MEF has not been able (or perhaps willing) to stop the Ministry of Hydrocarbons, nor has the Park been able to stop Sicofor from exploiting timber.

⁸² The Department of Forestry withheld information about the Sicofor permit in 2006, and failed to inform their MEF counterparts in the Park until months after the protocol had been signed (in fact, when a Park official asked Sicofor for their permit, they refused, citing it was a 'personal matter' with the Forestry Department; 3/13/2007). In December 2004 Maurel & Prom contracted a crude environmental impact assessment (EIA) before they began exploration, and eventually handed this over to MEF Ministry in either 2005 or 2006. However Park management (WCS and MEF partners) did not see this EIA from the Ministry until April 2007 (pers.obs. 4/6/2007). Finally, WCS was never informed about the MEF-Pioneer tourism management agreement until it happened, even though the management implications of this agreement directly impacted WCS (pers.obs, 3/27/2007).

⁸³ See the IMF publication, <http://www.imf.org/External/NP/LOI/2004/cog/02/index.htm>

⁸⁴ During the war in 2000, two government sources report that the president's office was pressuring MEF to exploit inside Conkouati, as the road infrastructure and abilities for industry to exploit in other areas of the country were compromised. This effort to exploit inside the new Park was criticized by environmental stakeholders and MEF itself. The Minister was able to prevent this exploitation in the Boplac concession (highlighted as the western 'temporary protection' zones in Figure 14).

⁸⁵ Interview with G. Bonassidi, Conkouati, 3/29/2006.

It is clear from my interviews and observations that inter-ministerial and intra-ministerial communication with the Park was limited, as departments within ministries do not contact outside departments and focus on their specific resource, whether it be people, agriculture, underground minerals, oil, or forests.⁸⁶ This secrecy and lack of communication with which companies and ministries try to subvert the authority of Park management demonstrates how these stakeholders attempt to marginalize the Park. The Park is therefore made into a weak institution by other powerful governmental ministries. To their credit, Maurel & Prom developed an open communication with the Park⁸⁷ (albeit under international pressures), however Perenco continues to explore without any contacts in the Park (pers.obs). Nonetheless, the concessions disregard Park boundaries, laws, and zoning of the integrally protected areas of the Park.

In short, the Park is a weak institution. The Park's zoning is intended to align different use groups into a mutual understanding of how the Park is managed. The weak authority of the Park to enforce zoning, coupled with a diverse set of stakeholders with varying means and different natural resource agendas, hinders effective conservation of Conkouati-Douli National Park.

⁸⁶ The examples of this are numerous. From the oil industry, it is clear that Perenco officials informed the Department of Fisheries and all local government of their offshore exploration in late 2005, yet did not contact the Park. For example during research I encountered a large delegation from the fisheries department, local government, and Perenco representatives in Kondi village handing out money to fishermen. They worked with the government to forbid fishermen from fishing during their most productive fishing month (12/2005) so that the oil company could conduct seismic surveys in the Park's marine extension. Not only did they not inform the Park about these surveys, but they also did not consider the social implications of how forbidding local men to fish might impact the village's ability to cope with the loss of a major source of food. Another example is the discovery of Maurel & Prom's subcontractor BGP (a subsidiary of the China National Petroleum Corporation) building a bridge in the integrally protected zone in August 2006 and their consumption of bushmeat, the Minister of Forestry Economy quickly wrote a letter to the Ministry of Hydrocarbons demanding a cessation of all exploration activities to discuss the issue (G. Bonassidi, pers.comm). Both companies continue to operate. Secondly, Maurel & Prom's construction of roads and bridges in the Park without involving the Park was remarkable (amongst several other activities which went uncoordinated; pers.obs.). The Ministry of Mines did not inform MEF about their numerous expeditions in the Park (Interview with MM, 5/4/2007). The Department of Fisheries never included Park management on their trip to Conkouati to examine the impacts of illegal trawling and dynamiting rocks around Kondi (Interview with J. Ngomemouo, 4/16/2006). These examples demonstrate the lack of communication between ministries, and between the Park and industry.

⁸⁷ Interview with M&P official, Conkouati

Effects on the Park

The Park is a new institution, competing with many government and local institutions with a long tradition of appropriating resources of extraordinary value. With its mandate, the Park has attempted to control resources that these institutions do not want to relinquish. The Park has little legitimacy in the eyes of government institutions to enforce laws or of external stakeholders who work with the government. Moreover, the Park has not earned legitimacy from local people. In the paragraphs below, I argue that these strong local and external interests, coupled with weak institutional governance not only reduce the ecological integrity, but also risk diminishing the effectiveness of conservation through the declining buy-in to the Park's objectives.

Reduction of Ecological Integrity at Conkouati

Extraordinary resources, strong local and external interests, and weak institutional governance reduce the ecological integrity of the Park through the continued use of the core zones, industrial exploitation (habitat degradation), and intense hunting and fishing. Extractive human activity is permitted in the ecodevelopment, temporarily protected, and multiple use zones (see Figure 5) of the Park (agriculture, fishing, hunting, and forest products), but according to the Minister of MEF, this potentially includes industrial activities in the future.⁸⁸ Although this industrial use in these zones is alarming to Park management, they are most concerned that external groups, interests, and institutions are affecting the integrally protected (IP) zone, the core areas of the Park (both Marine and terrestrial). Although there are no long-term studies to measure the effects of these groups, direct observation along with external studies conducted elsewhere can be useful for management decision-making. Below is a brief discussion of the major ecological impacts of human activity.

⁸⁸ Address to media and Park Management at Conkouati, 4/17/2006

Marine life

Illegal fishing by Beninese and Chinese operators is a great threat to Conkouati's marine life. Conkouati's waters are legally protected from such enterprises, yet due to the lack of enforcement capabilities, these companies fish at will. Given the importance of the Conkouati Lagoon and the Noubi River as breeding areas for marine fish (Mamonekene & Maloueki 1997), it is likely that the industrial-level fishing in these areas has a negative impact, not only for the local fisheries, but for the entire Congo region. The methods used by some companies are also cause for concern.⁸⁹ According to several local fishermen, foreign boats also use dynamite to destroy rocks that are important for breeding fish and crustaceans. Although the extent to which these activities are occurring has not been measured, any amount adversely affects breeding habitats. The haul of these companies is not well known, but their waste is noteworthy. Interviewed Hong-Chang trawlers admit they throw unwanted fish (usually dead) and the carcasses of internationally protected turtles overboard.⁹⁰ Conkouati contains important nesting sites for leatherback and olive ridley sea turtles. Fishing techniques employed (including purse seining) catches many breeding females, which drown in nets. WCS turtle research teams find carcasses every year along the beach (Bitsindou 2007).

Habitat degradation

The second significant ecological impact is habitat degradation by oil and logging activities. Although there have been relatively few examinations of the environmental impact of oil exploration, we can assume the road and path creation are relatively similar to that of timber activities. Seismic exploration in the ocean and on land (Compton et al. 2008; Gordon et al. 2003) may also negatively affect aquatic species, although the Park conducted no monitoring or supervision for these activities in the ocean (2005) and very little in 2006-7 on land. Logging however, has been monitored at Conkouati either directly or through its impacts on wildlife (Bitsindou 2003; Maisels & Onononga 2000; Nsoso 1999; Onononga 1998). Broadly, logging changes forest composition and is thus

⁸⁹ Interview with A, Kondi, 3/26/2006

⁹⁰ Tchitiamouna interview with Hong Chang employee, Pointe Noire, 4/19/2006

detrimental to many species (Chapman et al. 2000; Hall et al. 2003). Commercial logging has occurred since 1930, and forest communities have inhabited the region for millennia; hence, except for the highly mountainous regions in the north east, Conkouati contains nearly all secondary forests, which has undoubtedly influenced wildlife in both negative and positive ways. But continued logging after the Park's creation, most notably by Cofibois and Man Fai Tai (now Sicofor), has profoundly shaped forest structure inside the Park's logging concession (Bitsindou 2003).

Wildlife

Finally, and perhaps most importantly, Conkouati's terrestrial wildlife has been negatively affected by Pointe Noire's bushmeat markets, and by logging and oil companies (see Chapter 3). Although some hunting is legal in designated hunting zones (with registered firearms), in certain parts of the Park it is forbidden. But hunting persists in all zones of the Park, conducted primarily by local villagers, and facilitated by Pointe Noire traders, police, and military agents. The incentive to sell bushmeat to Pointe Noire is high; city prices for bushmeat can fetch 2

to 3 times village prices (see Chapter 4). To meet this demand, hunters use a large hunting area, which covers a significant proportion of the Park. Figure 16 shows the current hunting area for the study villages, collected through mapping exercises with hunters. This survey includes only 15% of the villages, thus the actual hunting area is much higher, likely covering over 75% of the Park. Indeed, before the Park enacted law

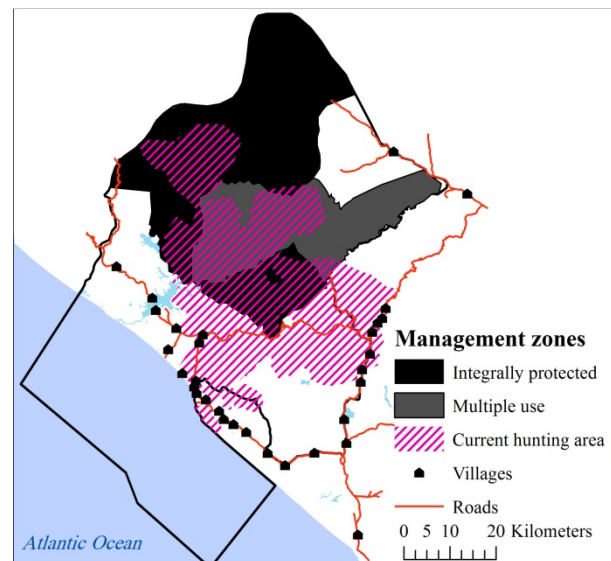


Figure 16: Hunting areas of study villages (in stripes). Areas overlap with IP (black) and MU zones (gray). This coverage was created by mapping use patterns only 4 of 26 villages.

enforcement measures (discussed in detail in Ch. 4), this hunting area was much larger. This map demonstrates how the economic forces and demand by markets in Pointe Noire continue to threaten Conkouati's biodiversity.

Logging and oil companies indirectly facilitate hunting; the impact of logging roads on wildlife has been well documented across Central Africa (Laurance et al. 2008; Laurance et al. 2006b; Malcolm & Ray 2000; Robinson & Bennett 2000; Robinson et al. 1999; Wilkie 2000). The creation of roads and paths by both oil and timber companies in the Park has left a network of paths used by hunters throughout the Park.⁹¹ Figure 17 shows just some of the paths created by industry.

The third influence of industry on wildlife is hunting to feed workers. In an interview with an upper level manager of the Sicofor/Man Fai Tai concession, he stated that the employees hunted for food inside the Park.⁹² Sicofor justified this because as the operator of this concession, they were under the jurisdiction of the forestry division. Because Sicofor's workers were 'local', they could conduct 'subsistence' hunting within their concession. However, hunting is an illegal activity in their zone (Republic of Congo 1999); in

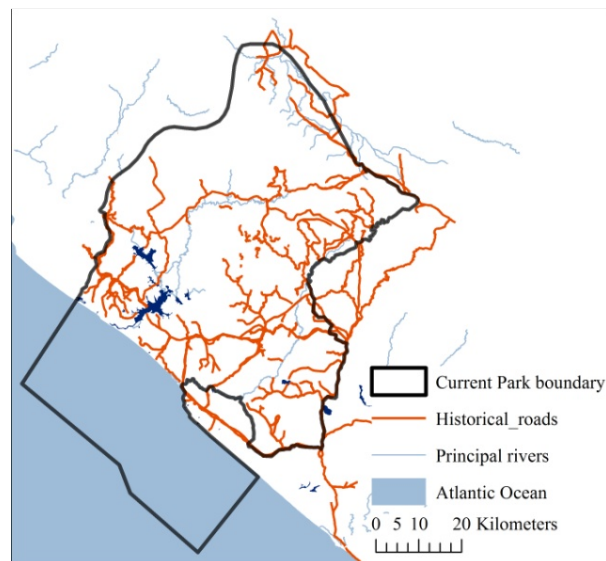


Figure 17: Path network created by timber and oil companies in the Park with navigable rivers. Note this does not include all skidder paths and detailed road networks by recent timber activity by Sicofor and Cofibois.

⁹¹ Participant observation with A. Sialivakou, 5/2/2006; also detected during my wildlife surveys in 2006 and 2007.

⁹² Interview with [withheld], Pointe Noire, 7/25/2007

fact, a freezer in the forestry camp was raided in 2007 by Conkouati's law enforcement officers, seizing several animals destined for bushmeat markets in Pointe Noire⁹³ (P. Mingonga, assistant conservator, pers. comm.). The behavior of this logging company demonstrates its disregard for wildlife law and the authority of the Park and warrants closer inspection by Park management.

Similarly, Maurel & Prom's oil exploration activities from 2005-2007 employed up to 500 at a time.⁹⁴ These workers would eat meals at local restaurants created specifically for the operation. These restaurants, operating within the jurisdiction of the Park, were in part supplied by local bushmeat hunters.⁹⁵ One camp (Faucon) was located inside the Park only 2km from the integrally protected zone, and contained many of these local restaurants (G. Tchitiamouna, pers. comm.). Although the impact on wildlife was not measured, it was assuredly significant. As one hunter described when asked about what change the oil company brought to the area, "they [the oil company] don't bring with them any change; only that their agents go to buy bushmeat at a reasonable price".⁹⁶ The problem was brought to the attention of the company in 2007, which then changed policies to bring in domestic meats from Pointe Noire and do random checks of these local restaurants. It is clear from these examples that left unchecked, industrial activities in the Park compound bushmeat hunting by local people that is already a problem.

Reduced support for conservation

Industrial stakeholders' and their government sector counterparts' disregard for zoning restrictions causes other stakeholders, including donor agents and villagers, to suspect the Park's goals and to question its integrity. The effects on conservation in Conkouati are profound.

⁹³ Photograph taken by [withheld], 4/11/2007;

⁹⁴ Interview with Y.Wang, BGP Logistics director, 6/22/2007

⁹⁵ Interview with H, Km4, 3/16/2007

⁹⁶ Interview with Km4 hunter, 4/27/2007

Donors (e.g. the World Bank, USAID, USFWS, and the European Commission) and international conservation organizations such as WCS are major stakeholders at Conkouati; they fund much of the Park's operations. Under international norms, national parks are meant to be free from industry. For conservationists, the idea of working and supporting a park that also includes considerable industrial exploitation challenges the very assumptions of what a park should be. Conservation dollars might be better spent elsewhere, where governments' commitment to conservation at least appears stronger. Despite these conflicting interests, international donors and governments (including the US, France, and the EU) still support Conkouati, but continued exploitation and the potential for new mining or oil drilling may cause donors or organizations to reconsider.

Secondly, and perhaps more important for long-term conservation at Conkouati, are the implications of conflicting valuation on village stakeholders. External interests both reduce and amplify the antagonism that has developed since the creation of the Park. For example, employment by oil companies from 2005-7 did reduce some tensions and raise village hopes for a return to historical industrial involvement in the area and the dissolution of the Park itself. However, these industrial interests have amplified the cynicism of hunters, fishers, and farmers about the Park. They see Park management as an enforcement agency with no power against rich stakeholders or powerful government officials, but with ample authority to prevent less powerful villagers from making a living.

The government does not take care of the population. The population itself must fend for itself...When one tries to take two animals (because the young men, adults, men in a word, are unemployed)...when you try a little to do something with the natural resources ... [the Park] takes it away. When it comes to the Park, no activity can be undertaken in the Park. The government itself does activities in the Park but the population does not have the right to do the activities in the Park. And the Park supports that. Thus, the Park does not help us.⁹⁷

The villagers are keenly aware of the Park's adverse consequences for local livelihoods

There is a lack of employment. Even if a child was at school and finished his studies, he will always be paralyzed as an unemployed peasant. It is a challenge

⁹⁷ Interview with H, Kondi, 12/5/05

for him to find work. He will always find himself in the village and he will always have to do the same activities because the Park has come into the entire zone. The Park has come to worsen the situation. The situation is now very alarming. No company can come here any longer; the biggest problem which preoccupies people is employment...basically money. It has really become *gymnastics*. We no longer have the possibility to have money even though money is the key to life.⁹⁸

Thus, when the Congolese government permits industry to operate in the Park, local inhabitants express considerable cynicism towards conservation efforts. They are delighted at the prospect of new employment opportunities (in the case of the oil company), but cannot understand why their own activities are forbidden. They perceive timber and oil exploitation and fishing trawlers as much more environmentally damaging than village subsistence activities; they question the government's intentions in allowing damaging industries into the Park itself.

Like the animals, [the government] is going to '*enpark*' the people. The Park should plainly be...30-50km away from the village! I know there are farm fields here [in the Park] pretty much everywhere. There are also businessmen who have entered everywhere. Additionally, there are many companies who have entered...to exploit...⁹⁹

The Congolese government doesn't know how to exploit themselves but how to exploit the people! If you want us to conserve the animals, then you must throw out the oil companies. With the oil companies, [Conkouati] is not a reserve!¹⁰⁰

Such views are widely held among inhabitants of the Park, and they illustrate how external interests and institutions can amplify tensions between rural peoples and the Park's management.

Considerations: Is there a place for zoning?

Despite efforts to protect wildlife through zoning, anthropomorphic influences constantly undermine these efforts. Conkouati has a zoning structure that is confusing at best and at worst ineffective in regulating use. The organization that governs the Park, DFAP, has

⁹⁸ Interview with FB, 5/8/2006

⁹⁹ Interview with R, Km4, 3/16/07

¹⁰⁰ Notes from interview with ST, Km4, 3/7/07 (my translation)

been unable to stop most external interests from exploiting. If it cannot enforce regulations, Park management should do a better job of understanding stakeholders and why they oppose Park aims and efforts. Management should modify its approach to convince stakeholders to buy into conservation plans. Although it is plausible that this will be possible with more powerful stakeholders like industry and other governmental officials, it will be more difficult for villagers who have very little to gain in the short-term from conservation. Long-term benefits for villagers are important, including securing the sustainability of food resources; especially fish, shrimp, and bushmeat (see Chapter 2). However, getting villagers to balance short-term needs with long-term benefits will be very challenging.

In a new management plan that may be implemented next year, the Park has proposed a new zoning structure that simplifies the Park into two areas: an ecodevelopment zone and an integrally-protected zone. This proposed structure would reduce confusion and facilitate law enforcement activities, because the proposed boundaries of these zones are natural features that will be difficult for people to mistake. This would be very beneficial for boundary confusions that happen between local people and the Park, as long as there is an effective outreach campaign. However, there are two flaws with this zoning approach. First, contrary to its own claims, Park management has not sufficiently discussed the proposed zoning structure with villagers who live inside and border the Park. I have shown villagers the proposed zoning system, and no one was happy with it; indeed, many became outraged when they realized what it entailed. They want a large zone for hunting, but the Park does not provide for such an extensive zone. The second shortcoming of the proposed zoning is that it contains no core area. It has a very large integrally protected zone, but in reality, logging and oil exploration already occur inside these zones, at it is quite possible that the government will insert mining interests. A gradation of zones (e.g. core, semi-core, ecodevelopment, and buffer) may have been a better structure to demonstrate the importance of the truly important areas for biodiversity conservation to external stakeholders, and provide the Park more leverage against more powerful stakeholders that wish to indiscriminately use all areas of the Park. This may be

a better approach because the issue here was not that the zoning was wrong; the problem is that it was not adequately enforced. Thus, a new zoning structure is not going to change much unless it is enforceable.

No matter what plans the Park develops, zoning cannot satisfy most stakeholder desires at Conkouati. Despite their failings, the current zones at Conkouati have been important in demonstrating to stakeholders core areas of the Park. If parks with extraordinary resources do *not* have zoning, they risk losing their high priority areas to extractive activities. Having a zoning strategy that clearly highlights critical areas and provides adequate space for minimal subsistence zones would be an important baseline tool for conservationists. Clearly, when the Park has not marshaled full support from its own ministry and is confronted with more powerful stakeholders, a zoning plan will not be sufficient to protect Conkouati. Park management needs to be proactive in developing a strategic plan of action with a comprehensive zoning plan supplemented with outreach, engagement, and enforcement of the zoning plan. These three approaches to reach effective zoning developed from my interactions and interviews with the various stakeholders at Conkouati, as well as observing actions and interactions between interest groups.

Outreach

Many parks currently have environmental education programs with local schools to teach students about the environment, but education at Conkouati needs to expand its focus. Adults in the village, especially influential citizens need to understand why the government wants to protect the resources, in particular about the key role ecosystems play in human health and the importance of wildlife and fish conservation. I argue that educational efforts need to expand further outside the Park to reach regional and national stakeholders. My interviews with ministry officials from Hydrocarbons and Mines, and to some degree politicians and regional and local government leaders, demonstrated they lacked environmental knowledge and had little understanding of sustainability. If these leaders and decision-makers do not understand the importance of wildlife or the

environment, and the impacts that resource exploitation has on them, these leaders cannot be effective partners in the conservation of Conkouati. Ministry officials I spoke with understood the general impacts of pollution, but had little comprehension of the impacts that oil workers and roads have on wildlife. Government is a critical constituency for making zoning more effective, and they at least need to understand the impacts that activities have on the National Park. The Park cannot assume that once educated, stakeholders will buy into their agenda, but education can help provide them with a better understanding of Park motives and the need for conservation activities.

Park management also needs to learn from stakeholders. The Park had very little understanding of stakeholder needs, desires, or activities. Part of this understanding can be accomplished through research, but the rest must be done through genuine dialogue. Direct conversations and observations can demonstrate to Park management the difficulties on the ground, such as crop raiding and problems with large sea turtles entangled in fishermen's nets, which cause real economic hardship for individuals. From these conversations, villagers may also learn about the challenges Park management faces, and humanize 'the Park' as a management team who is there, in part, to develop solutions to messy problems. Even conversation with no particular agenda, is important for learning about local culture and the values that both sides have for the environment.

Engagement

Park management needs to interact with these external stakeholders to develop plans together, or to help them make better choices about where they decide to operate, and what techniques they use inside the Park. This interaction may take outside pressure (such as was necessary with the oil company) and may not work with opposing stakeholders with strong political backing. However, my trips around the Park with exploration operators showed that oil company staff had no insight into the damage that their activities inflicted on wildlife. They constructed roads with no consideration of the environmental costs to forest cover and wildlife. The oil company cleared rivers with no recognition of the damage to the riverine ecosystem. Restaurants opened, but with no

reflection about how they encouraged wildlife exploitation. Nonetheless, the staff from industry was willing to listen and learn about how their activities affected the ecosystem, yet Park staff had no open communication with them. Park management must actively engage every day with these people, and to work constantly with them to show best practices. It is through this engagement that compromises can be made to mitigate the damage inflicted. Dialogue may not work with every problem, but it was clear that with some operators it brought about significant change.

Similarly, engagement with higher-level management and government officials can circumvent problems. The state is not by any means a monolithic entity, but rather constituted of different agencies with very different aims and ways of using Conkouati's resources. They have been able to undercut the zoning put into place. If these officials embrace conservation principles, there is room for negotiation, conflict management, or at least the acknowledgement of their impacts. In 2008, Park management developed a forum (*comité de gestion*) for all stakeholders to discuss concerns. In the case of Conkouati, government officials are constrained within their respective bureaucracies, and cannot necessarily engage other ministries. The forum has brought stakeholders together and engendered more collaboration by government agencies.

Enforcement

Effective enforcement of hunting laws and bushmeat trafficking is critical for wildlife conservation at Conkouati. Management focuses most of their efforts on this, as is seen by the control posts they established along the road networks leaving the Park (see Chapter 4). Their efforts have cut bushmeat traders out of Conkouati completely, thereby effectively reducing the force of the external market. However, the Park must not only conduct law enforcement against the least powerful stakeholders (villagers), as informants also pointed out (see above). Although extremely challenging, Park managers must be diligent at enforcing zoning regulations on external stakeholders. They must constantly watch loggers, not only to stop their illegal hunting, but also to ensure they are following forestry laws. Similarly, Park ecoguards must monitor oil workers to ensure

their activities minimally impact the environment and they respect Park zones. At Conkouati, for both timber and oil, zoning rules were not being followed. Park management used diplomatic pressures to enhance compliance with zoning and conservation. International pressures on international corporations can be an effective tool where image is important. Unfortunately these pressures do not work on Sicofor, which, given their candid talk about poaching wildlife in the Park, appears to have no image to protect, and thus to this day there are lapses in compliance and a lack of collaboration (Alden 2007).

National parks in developing countries face threats from many interests and institutions. In today's global economy, demand for resources and pressures on governments to improve the lives of citizens can challenge the tenure of national parks. External stakeholders pose particular challenges because they often wield strong economic powers, yet local stakeholders, with their proximate access to resources, are also important. Zoning was developed to manage the use of resources, but these external and local interests can trump efforts to zone inside parks for multiple-use. This creates considerable challenges for new parks and protected areas, especially where zoning is a historical anomaly in a landscape where multiple land uses are normal. The exploitation at Conkouati has been going on in different forms and under the auspices of different institutions (concessionary companies, colonial administrations, private enterprises, etc.).

In typical circumstances (and indeed under international norms) no highly extractive activity should take place within parks. Category II parks are strictly protected areas that *should* have no significant resource extraction, but in practice parks are sometimes used as resource banks by local communities and external stakeholders. Conkouati, with its oil and mineral potential and diverse biomass, exemplifies the threats facing parks with extraordinary resource value. Parks like these may be impossible to zone effectively, as zoning is impermanent and powerful stakeholders will compete for resources with parks. Yet zoning is an important tool for regulating use. International conservation organizations must support wildlife departments in their efforts to counter other

governmental departments who directly or indirectly challenge conservation zoning. In instances where interests that are more powerful trump this zoning, communication tools must be used to get stakeholders to abide by zoning regulations and to reduce the impacts of these groups. There are major conflicts of interests between local people, industry, government and conservation; talking to stakeholders will not solve all of the disparate valuations, but using those tools to aid the protection of critical areas is essential.

Chapter 2

Commercialized bushmeat, imported fish, and generational change: A regionally-integrated rural food economy and the implications for villages and wildlife conservation

Abstract

For rural areas in Central Africa that are connected to urban centers, bushmeat is not only a socially important food source, but trafficking is a major economic activity. Although supply chains and market studies have helped conservationists understand many of the mechanisms of the trade, rural consumption patterns are not fully appreciated. Understanding the importance of wild foods like bushmeat and their role in the context of overall food consumption patterns will enable conservationists to better understand protein dynamics and better target resource regulation and conservation management of those resources. This study quantified local food consumption in a protected area to examine the origins, seasonal and spatial heterogeneity, and relationships of different animal proteins in local consumption patterns. Focusing on three villages with varying livelihood strategies (fishing, hunting, fishing/hunting) in Conkouati-Douli National Park, Republic of Congo, we conducted 3342 hearthhold surveys over 12 months. All villages consumed significantly more fish (76%) than bushmeat (21%), and almost no livestock (2%). This phenomenon is mainly explained by economic incentives hunters have to sell lucrative species to urban markets where prices for bushmeat are two to three times higher than those in the village. The lack of available meat has driven villagers to import cheaper fish from other areas and adapt their consumption behavior accordingly. The results from qualitative interviews suggest villagers are not happy with the lack of bushmeat and are uncomfortable with the instability of fish supply. The study reveals generational change: elders and youth maintain different importances of forest foods, and value fish and bushmeat for different reasons. This generational tension is behind the change in diet, economic uses of wild food commodities, decline in value of forest fruits and vegetables, and the over harvesting of wild proteins. Although further studies of the social feasibility of alternative proteins are needed, high fish consumption in areas historically dominated by bushmeat provide insight into patterns and drivers of protein switching in tropical forests.

Don't speak anymore about meat. I don't even know if there is meat anymore; if there are any hunters who carry meat. I don't know otherwise. I think that even if there was meat, it would pass straight to be sold [in Pointe Noire]. But meat doesn't exist anymore; if the people live here it's with manioc. They buy fish, the Makouala that comes from Pointe Noire, and all they eat is that. But meat, it's a dream for me, and we shouldn't talk about it anymore.¹⁰¹

The Bushmeat Crisis

Numerous studies have demonstrated that wildlife populations in central Africa are under threat. Rural hunters are emptying the forest of wildlife, which is often destined for growing urban centers or regional markets. Some of this research points to the ecological consequences of the trade, which include loss of seed dispersers, disruption of forest ecology, and wildlife population instability (Blom et al. 2004; de Thoisy et al. 2005; Fa et al. 2005; Jerolimski & Peres 2003; Laurance et al. 2006b; Newing 2001; Noss 1998; Peres & Nascimento 2006; Stoner et al. 2007). Scientists estimate over 1 million tons of meat leaves the Congo Basin each year, and have quantified localized bushmeat production and consumption (Fa et al. 2005; Fa et al. 2006; Wilkie & Carpenter 1999a).

Bushmeat production is an important source of revenue for rural peoples (de Merode et al. 2004; Nasi et al. 2008; Nielsen 2006), as well as providing protein (Fa et al. 2003; Hill 2002; Rich 2007). Bushmeat has long been a staple in central Africa (Wilkie & Godoy 2001), and there have been numerous studies of household consumption of bushmeat in central Africa; see Wilkie & Carpenter (1999a) for a detailed list (de Merode et al. 2004; Fa et al. 2002). Many of these studies examine proximate factors affecting the consumption of bushmeat, including household income, meat prices and availability, alternative foods, as well as political status, gender, and ethnicity, among other factors.

In addition to a source of revenue, food (including bushmeat) is an integral part of daily life, political and social relationships, and cultural identity (Giles-Vernick 2002; Harms 1987; Kaltenborn et al. 2005; Rich 2001; Fieldhouse 1986; Richards 1939; Schenck et al.

¹⁰¹ Interview with S, Km4, 6/26/2006

2006). Because of the time and labor commitment involved in its procurement and preparation, food provides a window into gender, generational divisions of labor, income generation and socioeconomic differentiation, and the reinforcement and enactment of familial/kin ties. Food can also provide an historical perspective through which to view changing access to resources, shifting economies, and evolving relationships with the environment.

In comparison to research on the ecological impacts of the bushmeat trade, only a few published studies have examined the role that bushmeat plays in the diets of rural households (Apaza et al. 2002; de Merode et al. 2004; Schenck et al. 2006; Wilkie et al. 2005). But quantifying the amount of bushmeat consumed should also be situated in a broader context of protein and overall consumption. The relative importance that bushmeat has in comparison to fish and staple crops is important for understanding overall consumption patterns. De Merode et al.'s study (2004) of wealth and eating habits provides a window into the dynamics of wild food consumption and poverty in one village, and demonstrates the importance that wild foods play for rural household incomes. As food consumption may differ across villages depending on access to resources (Koppert & Hladik 1990), it is also important to examine variations across villages.

This study investigates to what extent people around Conkouati consume agricultural products, manufactured goods, and wild foods, including fish, bushmeat, and other forest products. Quantifying consumption patterns will help better understand the availability and seasonality of food resources, how they are distributed in and across villages, and the role of different foods in daily lives. From a conservation perspective, knowing the prevalence of bushmeat in diets of local people and how it varies spatially can help inform management practices and provide an estimate of the relative importance people put on it. But, I argue that *understanding* what they eat and why, and not just quantifying consumption, can help conservationists better comprehend those who most directly impact wildlife.

Objectives

The goal of this interdisciplinary study is to quantify what people eat in villages characterized by different protein procurement strategies. Such an analysis enables us to gain an understanding of the drivers of meat consumption. Longitudinal quantitative surveys provide a short time series of what is being consumed, and need to be understood within a historical and social context. Combining these surveys with ethnographical research allows for an examination of: how people use the environment; how consumption patterns differ from those in historical memory; and the reasons why people do what they do. These may help conservation practitioners to develop better-informed predictions of how villagers in protected areas could adapt with changes affecting food consumption and better target programs with local people.

The objectives of this broad study of food at Conkouati include:

1. To quantify and compare consumption patterns in three communities with different protein procurement strategies, paying close attention to:
 - a. Differences between villages
 - b. Seasonal patterns
2. To place these consumption patterns into a broader social and environmental context to explore:
 - a. Historical, social, and economic change
 - b. Non-economic social and cultural values around food consumption
3. To examine their implications for wildlife conservation

Study site

Conkouati-Douli National Park is an ideal location to study bushmeat on a variety of levels. It is a unique protected area (Figure 18) with dense humid and sublittoral forests, savannas, lagoons, and marine habitat. This diversity of habitats supports important fish and mammal populations, including elephants, gorillas, chimpanzees, 11 other primate species, six species of duiker, and various other ungulates and large rodents. Conkouati embodies the challenges with human populations that other protected areas across Central Africa face. In the Park, there are the 5500 residents in 26 villages which live in or directly border the park (WCS-Congo 2005). These rural peoples depend on hunting, fishing, and agriculture for their livelihoods and food.

Conkouati's proximity to Pointe Noire, a major urban center with nearly 725,000 (Centre National de la Statistique et des Etudes Economiques 2007) inhabitants also gives Conkouati an added role as a primary bushmeat source (Agnagna 2003; Doumenge 1992; Wilson & Wilson 1991). In fact, bushmeat (and fish) have historically provided some Conkouati residents with significant sources of income (Paris 1996c).

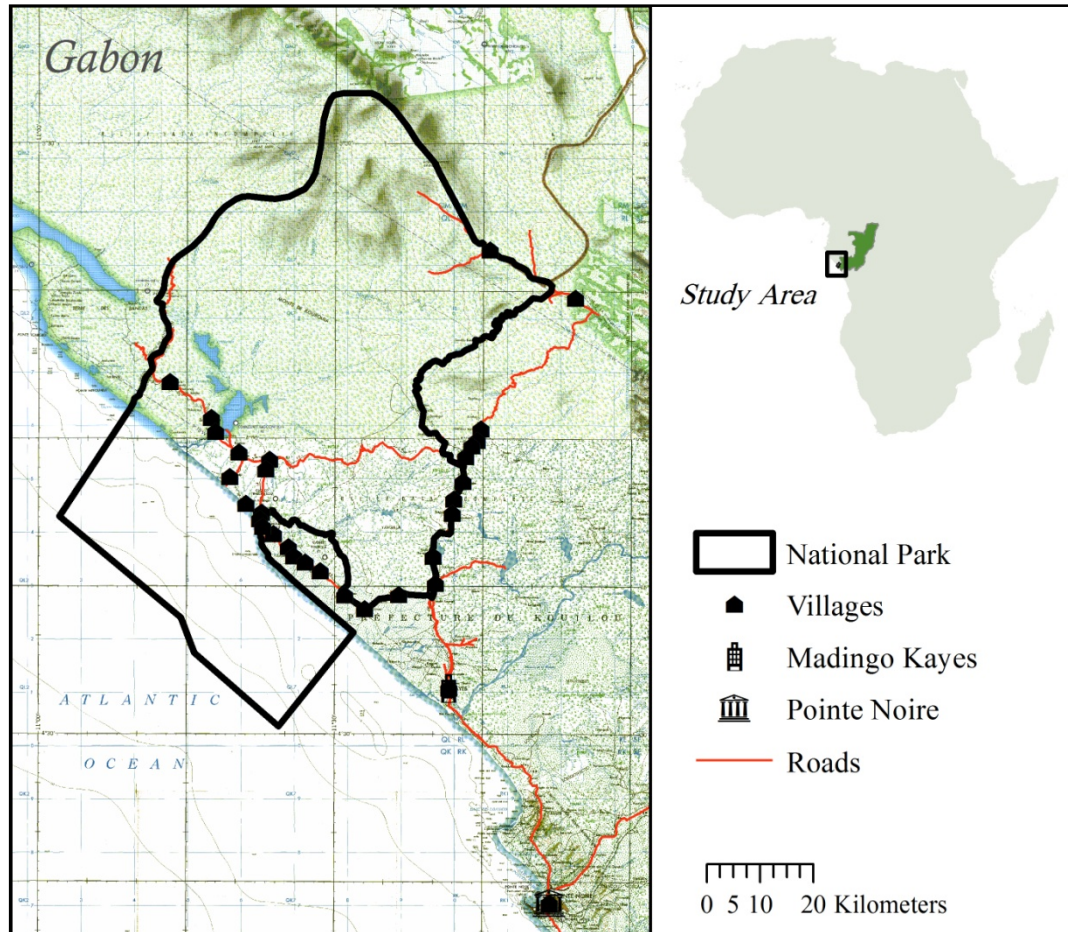


Figure 18: Map of Congo, Conkouati-Douli National Park and the distribution of villages. Pointe Noire, the economic capital of Congo, is about 70 kilometers from the boundary of the Park. The distance in time using public transport ranges from 3-12 hours for most villages.

All of these sources cited above highlight the importance of fish and wildlife in the diets and livelihoods of residents around Conkouati, but no formal studies have been conducted on food consumption, including fish or bushmeat. My research builds upon previous work at Conkouati and across the region by conducting a year-long study in a

heterogeneous landscape, and places consumption in a broader context. This interdisciplinary focus on food consumption explores how one group of stakeholders (villagers) utilize and value the Park's forests and waters, and thus improves understanding of Conkouati's social landscape for biodiversity conservation.¹⁰²

Methods

Kitchen Survey

Study villages

To ensure that the study obtained a representative sample of villages across Conkouati National Park, I

selected three villages, geographically spread across the park, with different major protein procurement strategies: each with varying degrees of reliance on bushmeat as a primary source of income. Men at Conkouati engage in hunting, fishing, or agriculture for their livelihoods, usually reflecting their

proximity to various resources. Because each village has equal access to agriculture, I

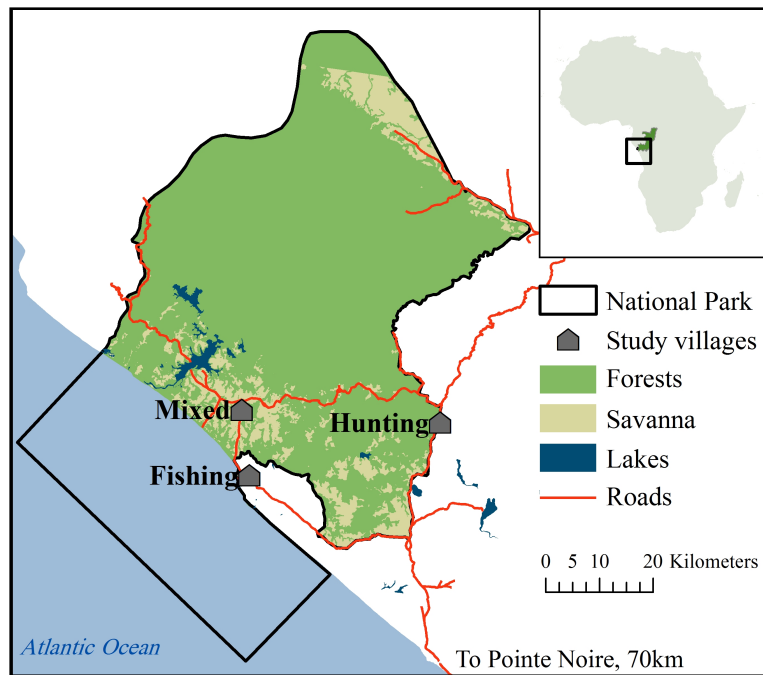


Figure 19: Map of study villages at Conkouati, where Km4 is the hunting village, Mpella the mixed village, and Kondi the fishing village.

¹⁰² It is important to make clear that Park management is not concerned with restricting local bushmeat consumption, rather only the bushmeat trade. However, given the Park is now enforcing trafficking laws, local bushmeat consumption may become a threat if hunters switched to local rather than urban markets.

labeled each of the villages hunting, fishing, or mixed villages. Although these categories are based on male livelihood strategies, which themselves are based partly upon access to resources, it is important to note that in all villages, women (and sometimes men) usually farm for their primary economic activity. These three villages are shown in Figure 19. Kilometer 4 (henceforth referred to as Km4, with 366 inhabitants), the hunting village on the eastern edge of the park, is situated in the forest. Since residents in Km4 have very limited access to rivers or lakes, Park officials and researchers assumed their major protein source was bushmeat. In the south, Kondi (265 inhabitants) is next to the ocean and is thus oriented towards ocean and river fishing. Mpella/Sialivakou (henceforth named Mpella, with 273 inhabitants) is located in the savanna, equidistant from hunting areas and the lagoons, and has both hunters and lake/river fishers. Before conducting the kitchen surveys I spent two months in each village, developing trust and working relationships that would facilitate this in-depth study of eating habits.

Hearthhold selection

I chose the hearth (or kitchen) as the unit of study because women are the primary food preparers and distributors of food. Hearths are nodes of food distribution, and represent a family consisting of a woman and her children who may or may not share a father with another hearthhold (Ekejiuba 1995; Guyer 2005). In central Africa, *hangars* (or outdoor shelters) are places of gathering of male kin, and often times have kitchens connected to them (Giles-Vernick 2002; Weiss 1996). Because more than one kitchen may provide for a *hangar* I chose to focus on women as the central component of the family. I thus assigned a number to every woman who had her own kitchen in each study village and refer to these from this point on as ‘households’. Polygamy is rare in the study area, but if a polygamous hearthhold participated, the man was included in the hearthhold.¹⁰³ As a general rule, male-run kitchens were not included because of the transient nature of single men in the region, who often travel to hunting and fishing camps for weeks at a time or

¹⁰³ During the study, this happened for only two hearthholds. Although the two wives lived in the same hangar, we recorded food that our participant prepared for herself, her children, and shared with her husband.

make frequent trips to urban centers.¹⁰⁴ From the assigned hearthhold (HH) numbers, ten women head of hearthholds from each village were chosen from a random number generator. Once women were selected, we approached hearthholds and asked if they wanted to participate. For those who declined, a replacement participant was randomly selected from her neighbors based on a coin toss, and the process of asking to participate was repeated. The year-long study was separated into four quarters, each three months long. Each hearthhold selected was asked to participate for one quarter, after which they were returned to the subject pool before the random selection process was undertaken for the future quarters of the project. Each participant provided us with an alternative hearthhold where children stay in case of her absence (usually a relative). During the study, if women were absent, we used these alternative hearthholds, and if they were also absent, the survey for that day was not conducted.

Hearthhold level data

Ten hearthholds were selected from each of three villages per quarter. After each quarterly selection, we held training workshops to inform participants about the study, what to expect, and how to quantify food consumption. Each participant received a plate/bowl set that were used in the survey to help them calculate quantities. Following this, we collected demographic and socio-economic data on each family, including the number and age of people in the hearthhold, the primary and secondary occupations of the female and male heads of hearthhold, ethnicity, the number of years established in the village, and a proxy measure of wealth (which was a qualitative category we calculated by combining their relative standard of living in the village with the occupation of male and female head of hearthholds).

Village level data

For each survey quarter, we collected data on transport availability, access to major social services, and the price of goods in order to assess relative differences between villages as

¹⁰⁴ In one selected hearthhold, the woman head of hearthhold left in a divorce, and the man head of hearthhold was kept as a participant

well as determine whether or not there were seasonal differences at the village level. Our methods are based on Wilkie et al.'s (2006) Gabon study on bushmeat.

Data collection

The research team, composed of a primary assistant and six village data collectors, gathered data at both the hearthhold and village levels. In each village two individuals (primary and secondary collectors) were selected by the villagers to collect data for the project. We trained them on data collection techniques, and the primary assistant followed them every month, visiting on random days to assure quality control and consistency amongst villages. Wilkie et al. (2005) noted in their study of household consumption that villagers' recollections of food were accurate only up to three days. Thus to avoid problems of recollection, we designed the study to have collectors visit the ten hearthholds randomly ten days per month and record information about food consumption for only that day.

Using data forms (Appendix 2.1), collectors recorded daily hearthhold composition, including the ages and sexes of each person eating at the hearth during the day. These data were used to calculate the Adult Male Equivalent (AME) of hearthholds. This enabled comparisons of consumption patterns across hearthholds with different family compositions using a weighted standardized measure (see Wilkie et al. 2005 and Wilkie 2006 for a detailed description of AMEs). Collectors then asked participants what they (and their family) ate throughout that day. The foods were categorized on datasheets by fruits, vegetables, proteins, starches, and an 'other' category. Some foods were easily quantifiable, such as a banana, fish, or ¼ porcupine. For foods that were not easily quantifiable (like manioc, rice, or palm gravy, *mwamba*) we standardized the measurements of each food to ease comparison across hearthholds. This standardization differed for each food, but was facilitated by the use of two plates that we provided every hearthhold with. One plate was 20cm wide at the top, 10cm wide at the bottom, and 20cm deep and was used specifically for *mwamba* gravy, and the other was 22cm in diameter and 2cm deep, used for all other foods. Participants were instructed to estimate their food

consumption based upon how many plates of each type of food were consumed. Next, collectors asked participants where they obtained their food (by themselves, from their husband, shared from a member of the community, or purchased in the village or Pointe Noire), and the price if purchased. Appendix 2.2 provides a list of foods, their categories, and method of measurement.

Data entry and analysis

Once the data were collected, the assistant entered them into Microsoft Access. To analyze data between villages, I created a data table calculating monthly consumption totals per hearthhold in cfa, the central African franc (500cfa=\$1). This table was exported to Stata 9.0 to perform analyses of variance and multivariate and linear regressions.

Imputed prices. One challenge in the analysis was developing a way to compare the various types of food with each other, as some goods were shared or procured by the families themselves and thus had no price. For those price-free items, we used average values of goods by village to impute prices; that is, the cost of an item if it was to be purchased. Fish was the most complex group of food to assign imputed prices, as various species have different weights and values, not all of them easy to tease out from the way we collected data. I examined the distribution of actual prices for each species group, and weighted imputed prices on that distribution. For example, if 40% of freshwater fish in the database *with* prices cost 300cfa, and 60% cost 500cfa, we then took those fish *without* price and assigned 40% with imputed values of 300 cfa, and the other 60% imputed values of 500cfa.

Food categories. After the initial survey, goods were re-categorized to develop a format which better reflects conservation interest, including: fish, wildlife, gathered goods, manufactured goods, crops, and livestock. All analyses are based upon these categories (see Appendix 2.2).

Limitations

There are some limitations in relying on data based on self-reported food consumption. Most important, will people reveal what they eat, and accurately report amounts, even if what they eat is illegal? In any study, one can never be certain that informants reported everything they consumed, but steps can be taken to assure one has the most robust study possible. To reduce the problem of fear of reporting illegal bushmeat (i.e. totally protected species) and help ensure the robustness of our data, the surveys were conducted by a trusted member of the village, who was monitored monthly by the research assistant. We assured participants of survey anonymity by separating hearthhold identification and details from surveys. In addition, surveys were conducted late in the afternoon when women were preparing meals, and thus data collectors often observed what women were preparing. On occasion the assistant or I accompanied data collectors to look for small errors in data collection. Our results demonstrate that participants revealed that they were consuming bushmeat, but very little meat from integrally protected species was recorded. This lack could be due to: 1) villagers did not hunt these species; 2) they hunted and consumed them but reported they ate more common species due to fear; 3) they hunted and consumed bushmeat but did not report their consumption; or 4) villagers did hunt rare species but preferred to sell to Pointe Noire. I believe the answer is a combination of all four, but most likely the latter. It is possible, if people are not reporting large quantities of protected species, then the role bushmeat plays in diets could be underestimated. As I will describe later I do not believe this to be the case, as rare species fetch high prices in Pointe Noire, and thus their presence in the village is extremely rare (hunters preferring to sell them in the city). However, this study was not intended to pick up on the consumption of illegal species, rather, the presence of bushmeat consumption as component in the broader diet. Despite these small challenges in reporting illegal bushmeat, which occur in any study on consumption, these data on hearthhold consumption appear to be robust.

The major limitation in this study was assessing exact quantities of foods, especially fish. We did not have weigh scales in the study because it would be expensive to furnish scales

for each family and would demand even more of their time to weigh all foods. Thus, fish quantities must be considered relative, and do not reflect weight measures. Imputed price, as explained above, was used as a proxy measure. Mammal quantity calculations are more standardized, as animals are either sold as whole, a proportion of the whole, or by kilogram. This study assumed all mammals of the same species are equal in size, and accordingly imputed prices were based on average prices paid in the villages.

I consider underreporting an issue for informal meals away from the house. This occurs during the day while adults are at work and children away from home. Foods which are often eaten at this time include various forest fruits, manioc tubers, corn, and on occasion leftovers from breakfast (pers. obs.). I also suspect that in the first two months food consumption by participants was slightly underreported in Mpella and in Km4 due to lack of follow-through by data collectors and our lack of follow-up on them. However, given our sample size and the length of our survey, I do not believe these problems to be significant.

Ethno-historical research

From November 2005 through August 2007, I spent six months in the three study villages. During this period I conducted 91, semi-structured, in-depth interviews with villagers and 83 conversations (with field notes) Questions were relatively consistent for same-topic interviews, and were of similar construction across topics. These topics include: fishing, agriculture, hunting, food, history and change, industrial activity, religion and healing, territories and space. To better understand local activities and the importance that individuals place on what they do, I participated on 49 occasions in daily activities, including hunting, fishing, agriculture, and food and resource gathering. Most discussions were conducted in local language; my assistant acted as translator during most of these conversations.

Results and Analysis

Kitchen surveys

A total of 3342 surveys of 120 hearthholds were conducted for the consumption study between October 2006-September 2007, with practice surveys taking place in August and the entire month September 2006.¹⁰⁵ The surveys provide longitudinal data for consumption over an entire year, and depending on the analysis we use either hearthhold month (n=342) or survey (n=3342) as the sampling unit. In our survey of differences between villages, we found in terms of the prices of goods, although there was variation, there were no significant price differences between villages. However, there proved to be very significant departures in access to both weekly transport and markets. Table 1 shows how the hunting village, because it is situated on a logging road, has more and closer access to goods and services than do both the fishing and mixed villages.

Table 1: Survey results of the differences in transport opportunities (in number of vehicles), access to services (in hours), and the cost of goods between villages.

Category	Hunting	Fishing	Mixed
Public transport (per week)	3.5	3	2.75
Private transport (per week)	22.5	2.25	3.5
Distance (in hours) to markets	5.25	9	10
Basket of goods	no significant difference		

General Consumption

Consumption of crops, fish and manufactured foods in all three villages accounted for over 90% of total consumption (Figure 20) averaged across hearthholds. Manioc and rice account for 62% of all crops consumed, with leafy greens and fruits only comprising 10%. The origins of fish consumption varied, but over 65% of the fish supply was from the ocean. Cheap fish species were clearly preferred, with makouala (*Sardinella maderensis*) and mbali (*Ethmalosa fimbriata*) accounting for 44% of all consumption. For manufactured goods, coffee, sugar, and bread were the most frequently consumed.

¹⁰⁵ During January 2007 data were not recorded in two villages due to communication and financial constraints.

The categories of food least consumed included gathered goods and livestock (including chicken, eggs, goat, and beef), which totaled less than 5% of the total.

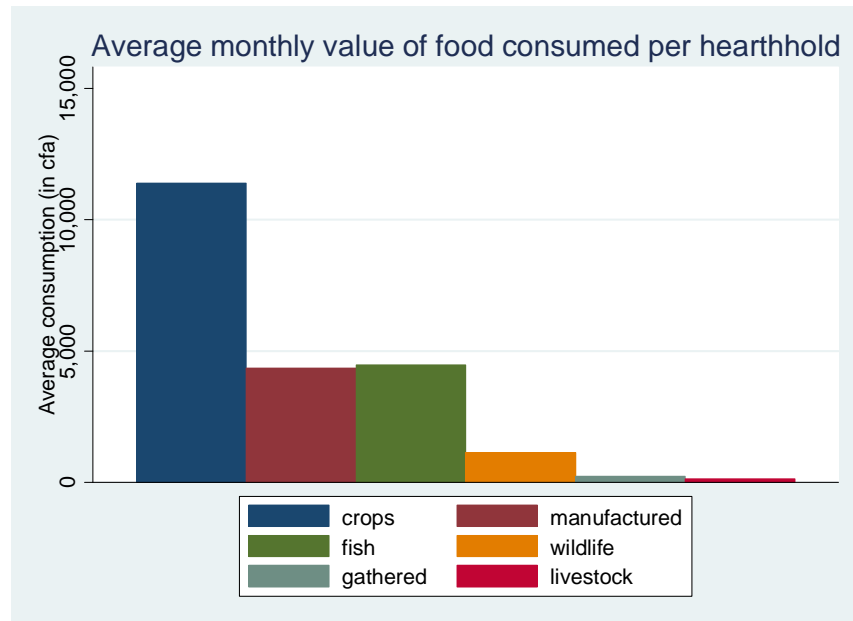


Figure 20: Food consumption across villages, weighted by hearthhold AME (n=342).

Chickens and eggs made up 85% of total livestock consumption, and fumbu (*Gnetum africanum*) accounted for 80% of all gathered goods. Bushmeat consumption in the villages, to be discussed in more detail below, consisted mainly of brush-tailed porcupine (*Atherurus africanus*), Gambian rats (*Cricetomys gambianus*), and blue duiker (*Cephalophus monticola*).

Village-level Consumption

Evaluating overall consumption by village (Figure 21) it is clear that the fishing village (Kondi) purchased statistically significantly more food than the villages with different livelihood strategies ($R^2=0.1105$, $p<0.000$). When we examine consumption within each village, the relative patterns remain the same as across-village trends (Figure 23). Gathered goods and livestock consumption remain low, and fish, crops, and manufactured goods are the highest consumed categories. However, there are some

significant differences between villages. Notably, hearthholds in Kondi (the fishing village) consume nearly 25% more crops and fish, on average, than their counterparts in other villages.

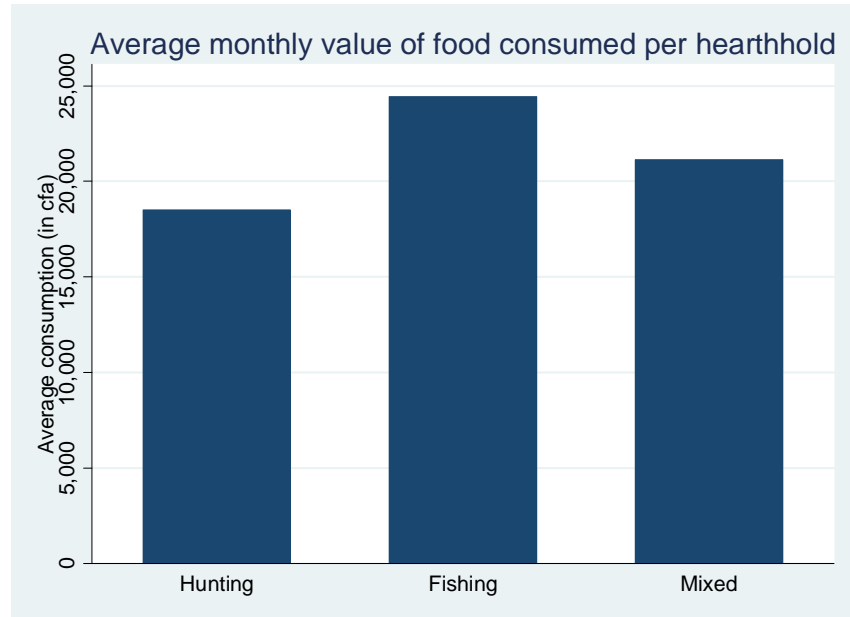


Figure 21: Average monthly hearthhold consumption across villages, weighted for hearthhold AME (n=342).

The most striking result between villages is the high level of fish consumption across all three village types. Figure 22 shows that even amongst protein consumption, Kondi still purchases more than the other villages. As expected, fish consumption in Kondi is high; 91% of all animal protein is from fish. However, one would anticipate this number to be much lower in villages with many hunters. Even in the hunting village, where one would expect to see more bushmeat consumption than fish, meat consumption is nearly half of fish consumption.

When conducting the surveys, we asked where people obtained their food and whether it was purchased or procured (caught or shared). Within the protein figures, the *purchase* of fish and wildlife are nearly equal across all villages. The differences in values of total consumption, as seen in Figure 22 reflect *procurement* rates. In other words, the differences between villages are determined by how hearthholds procure their own

bushmeat and fish, or by how they share it amongst village members, and not by what they purchase.

Breaking these two protein types down, the diversity of species which are consumed can be seen. Fish consumption (Figure

24) includes both marine (in blue) and freshwater (in green) species, and is dominated by 4 species: Makouala, a marine sardine, Bar, a large marine fish, Mbali, a freshwater sardine, and

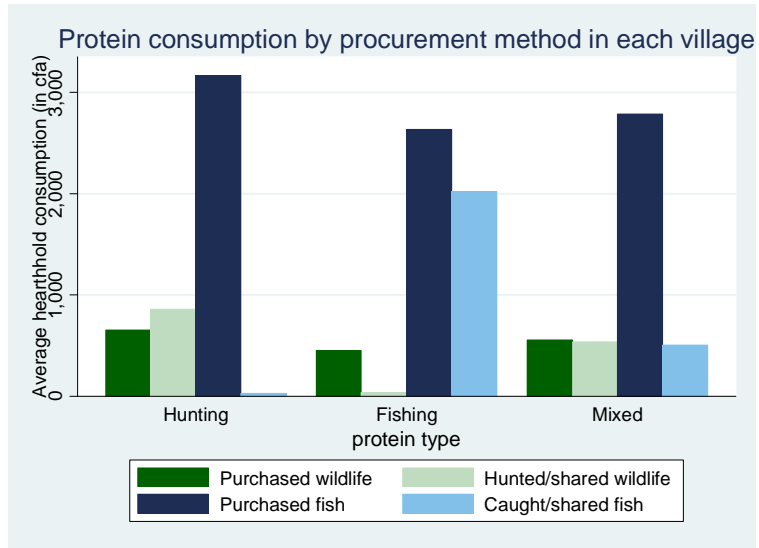


Figure 22: Average meat and fish consumption by hunting, fishing,

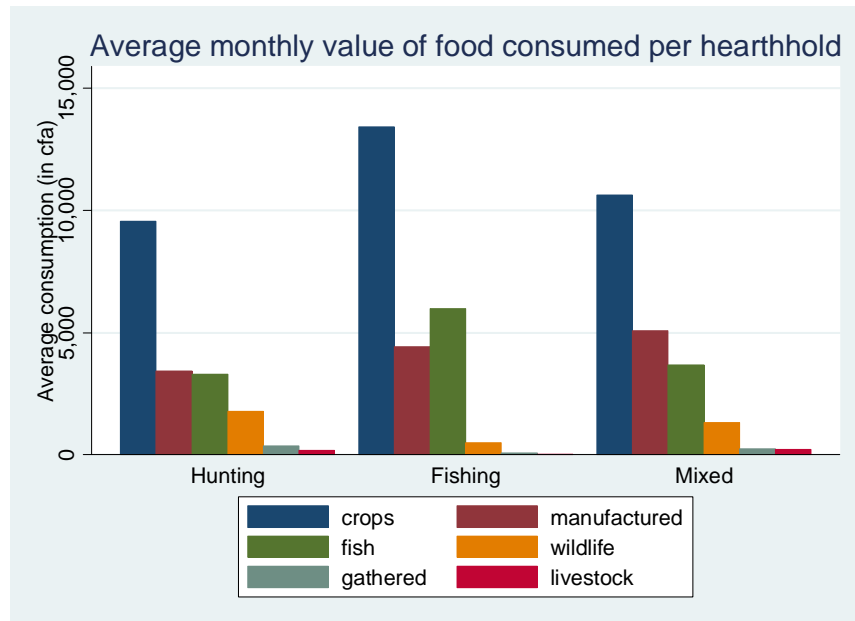


Figure 23: Average monthly hearthhold consumption across food categories and villages, weighted by AME (n=342).

freshwater shrimp (consisting of 3 different species found in the Park's rivers).¹⁰⁶

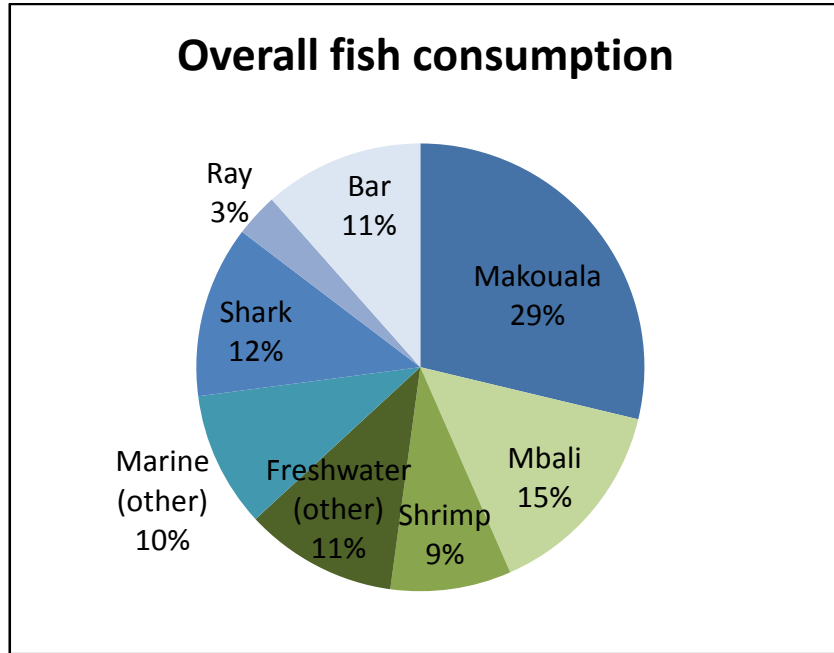


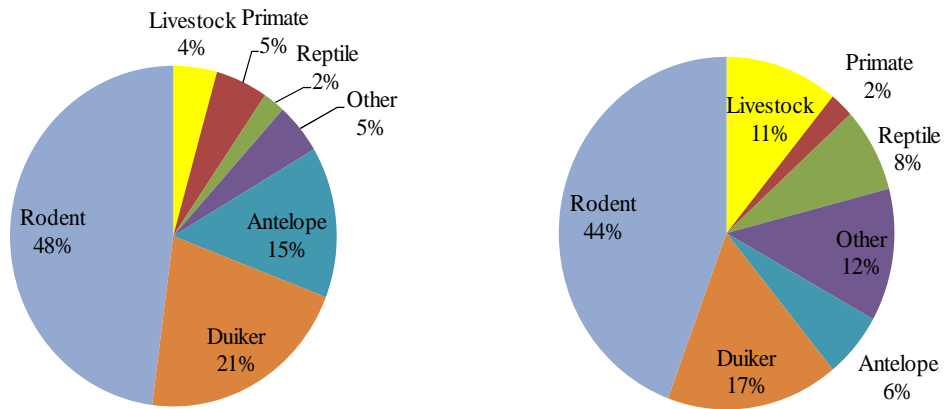
Figure 24: Fish consumption across villages. Marine species include Makouala, bar, ray, shark, and marine (other); and freshwater species include shrimp, mbali, and freshwater (other) (n=3342).

Two species groups similarly dominate Bushmeat consumption (Figure 25): rodents (brush-tailed porcupines and cane rats) and 6 species of duiker. Of this ungulate group, blue duikers contributed 71%, red duikers 28%, and yellow duikers only 1% of all duikers consumed. Antelope (bushbuck, water chevrotain, and sitatunga) are the third highest group, yet primates (primarily *Cercopithecus spp*) contribute only 3% of meat consumed. Interestingly, livestock made up only 8% of all animal meat consumption.¹⁰⁷

¹⁰⁶ Sharks were not included in this calculation because the shark category consists of several different species, and do not reflect a threat on a specific species. This does not diminish the real threat sharks face in Congo's waters. Many of the sharks caught in Kondi are young, and studies need to be done to determine which species these are, and whether or not various populations can withstand the harvest pressures.

¹⁰⁷ Because we are interested in conservation value we focus solely on animal proteins in this study. Other proteins that hearthholds consume include peanuts (3%), beans (4%), and canned meats (2%).

Consumption of purchased meat by species Consumption of procured meat by species



Total meat consumption by species group

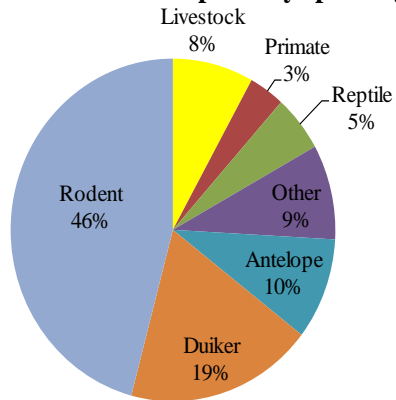


Figure 25: Total meat consumption across villages by method of procurement (Total, Purchased, or Hunted/Shared/Bartered) (n=3342).

When we examine protein consumption across and within villages, we see how prevalent fish consumption is (Figure 26), not only in Kondi but also in the hunting villages. Again, livestock consumption remains low in all villages.

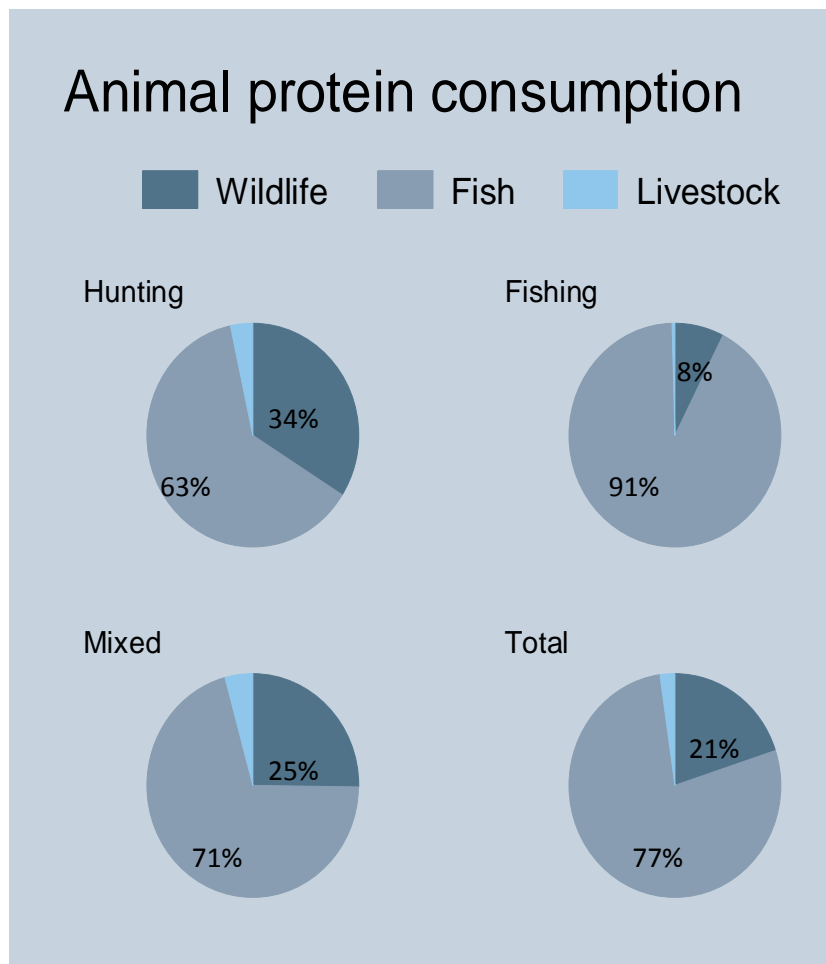


Figure 26: Comparison of total animal protein consumption in each village by protein type (non-animal protein, including peanuts and beans, accounts for 9% of proteins, and are not included in this graph). Livestock consumption is minimal compared to the importance of fish and bushmeat in the diet. Patterns are relatively equal across village types, with more bushmeat consumed in villages with hunters (n=3342).

Protein consumption and price

The prevalence of fish over bushmeat, coupled with consumption patterns overwhelmingly biased for a few species forced us to consider whether price influenced what was consumed. Although in surveys we did not ask about preference based on prices, we assume that households generally chose what was available and when given the choice they would choose the cheaper protein. Figure 27 contributes to our understanding of this pattern. The bar graph shows the price of a variety of meat and fish per kilogram, and is contrasted against the blue line which shows the number of times it was consumed.¹⁰⁸ Bushmeat and freshwater fish overall maintained a relatively steady price of 500cfa (\$1) per kilogram, with notable exceptions. There are a few species groups which are cheap, including mbali and freshwater shrimp, and those which are expensive, such as primates and livestock. This suggests that consumption seems to have a strong correlation with price—the cheaper it is, the more likely it is to be purchased, and vice versa.¹⁰⁹ Commonly purchased bushmeat species are relatively low priced, but cost more than shrimp and mbali fish. However, there are three groups of bushmeat species here which are not expensive and are not consumed (other mammals, birds, and reptiles). One of the difficulties with this type of analysis is that measuring availability of these species in the village is incredibly difficult. From observations while in the villages and interviews with hunters, these three groups of species are rarely captured, resulting in low availability for consumption, and thus their ratio of price/ purchase here is not representative of these overall trends.

¹⁰⁸ Average mammal weights were based upon published weights (Fa et al. 2005; White 1994). Fish weights come from unpublished WCS data collected at Conkouati in 2005. Weight data weren't available for marine species thus they were not included in this analysis.

¹⁰⁹ More study needs to be conducted on the true availability of livestock and primates, as domestic animals are common in the village, and monkeys were observed on several occasions.

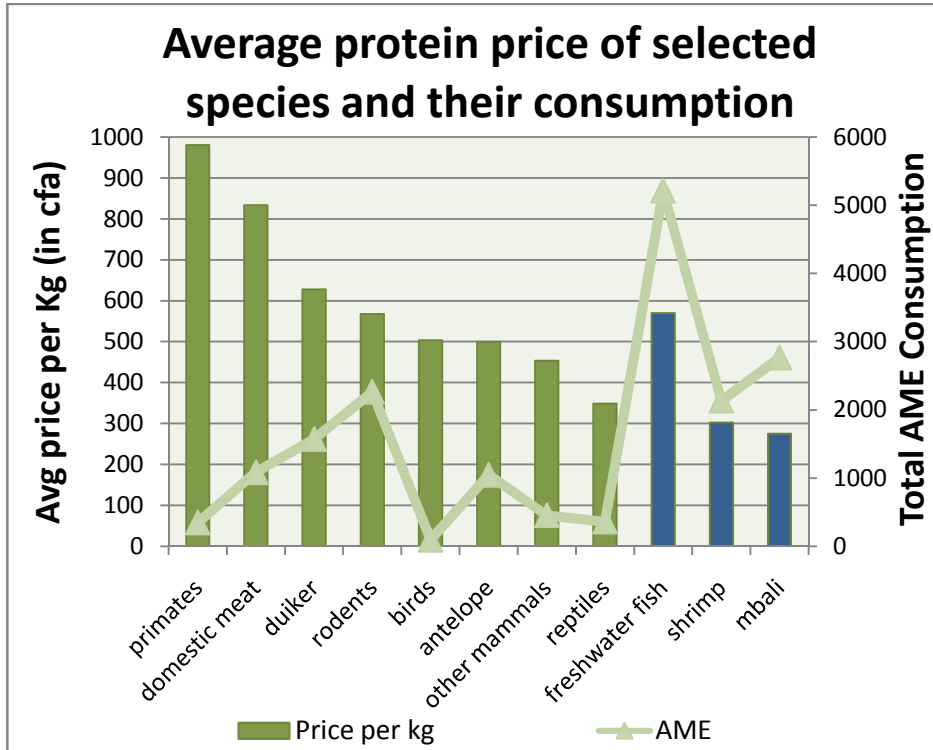


Figure 27: Price (bars) and consumption rates (line) of selected protein species. Note that marine fish weights were not available. Freshwater fish weight was determined based on 3 fish species whose data was collected by park researchers. Graph does not reflect availability in villages; birds, other mammals and reptiles are rarely available for purchase, and shrimp and mbali are only functionally available 5-7 months out of the year.

Food origins

The origins of these foods are critical for our understanding of the food economy in the Park. Our data provides this information for all foods consumed, with some surprising results. Not so unexpected were the origins of gathered goods and bushmeat, which come from the forests inside the National Park. Eighty-five percent of agricultural goods (which comprised 52% of total consumption) are also products of the village or other rural areas in the region (others, such as rice, originate from Pointe Noire). Manufactured goods come from either Pointe Noire or from village kiosks (originating from Pointe Noire). Livestock mostly originate from the village, but all goat and beef (14% of total livestock consumed) come from the city. What is most surprising, however, is the provenance of fish; 29% of all fish in the three study villages are Makouala, a fish

exclusively imported from Pointe Noire. We would expect that the hunting village imports almost all their fish, which they do (97%). For the mixed village, 23% are imported from Pointe Noire, plus another 8% brought from ocean villages. The rest (69%) originate from the Park, but perhaps not exclusively from Mpella (for example, a fisherman from a neighboring village may bring his catch to sell). At least 14% of fish in Kondi is imported from other villages (Makouala and mbali) and still more come from an internal trading network within Conkouati.¹¹⁰ This demonstrates the important role that external protein sources play and how food consumption depends on transport networks (both the roads and the vehicles that use the roads), which bring food not only from the lagoons, but also fish from Pointe Noire.

Seasonality

Many wild foods, including fish, bushmeat, fruits, and other gathered goods are seasonal. This is important because hearthholds must develop coping strategies during lean times. For example, in Mpella some residents switch from shrimping to fishing to hunting depending on the time of year. Thus, varied livelihood strategies are important for maintaining adequate levels of nutrition during different times of year. The waters are also seasonal around the Atlantic, and thus during lean months when there are no fish close to shore, fishermen either try their luck far at sea, move their fishing to local rivers and small lagoons, or engage in other activities. Because there is no fishing in Km4, there is little seasonality for hunting; however hunters with families often spend time clearing farm fields. This seasonality across villages is also visible in consumption and trade patterns, and is most evident with animal protein, particularly frequently-consumed aquatic species: mbali (from Conkouati lagoons), shrimp (from the Noubi River), and makouala (from industrial fishermen in Pointe Noire). Only during dry periods when fish are easy to catch are these species exported to other villages (such as mbali from the lagoon to the Km4 area between August-October).

¹¹⁰ The origins of freshwater species are sometimes difficult to determine, as participants did not always specify where the fish came from. Local sellers may purchase their fish from other villages or procure fish themselves. Since we know where certain species come from, such as mbali or shark, we can easily determine the exact origin.

Bushmeat seasonality is less clear. There are fluctuations in bushmeat consumption, and in Kondi and Mpella, these fluctuations are significant across months ($p < 0.0002$; $p < 0.004$, respectively). However, these significant differences may not necessarily be due to seasonal changes in abundance or availability of animals, but rather be based upon the labor that hunters allocate to different livelihood activities (for example, hunters may choose to clear farm fields rather than hunt in April). When all fish and bushmeat proteins are combined, the variability of monthly hearthhold consumption remains high in Kondi ($p < 0.0000$) and becomes significant in Km4 ($p < 0.0000$). However, in Mpella where they have a mixed protein livelihood strategy, combining fish and bushmeat smoothes consumption variability. This translates into no statistically significant difference between months, suggesting these protein sources are nutritional and possibly economic substitutes. It also demonstrates that even within one protected area, seasonality and heterogeneity amongst villages exists, and these differences are not equal across villages.

Ethno-historical analysis

Interviews with people in different villages revealed how people have adapted to a relatively new food economy, contextualizing our observed patterns of low bushmeat and gathered goods in local diets. People in this region have been connected to various markets over the past 500 years, yet the strong integration to a different regional economy in Pointe Noire has been an important change during the lives and historical memories of rural residents over the past 50 years. These interviews shed light on how people have adapted to this change through seeking to procure goods for fish, bushmeat and agricultural markets, and in turn have left behind most forest foods because they are not lucrative. This section describes the change in food economies and what this change means to villagers.

Historical change in food production

Precolonial and colonial trade

Communities around Conkouati, including the Vili (coastal people) and Lumbu (forest people) have had a strong system of trade for centuries (Martin 1972; Miller 1983). The Vili, with their sea salt and valuable fish sought forest products, especially woven clothing, wicker goods, ivory, and wild meats from Lumbu villages.¹¹¹ The scale of this trade around Conkouati is not well known, although the Luango Kingdom,¹¹² based only 100km from the lagoons, undoubtedly had a strong influence on the region.¹¹³ The Atlantic slave trade,(with tales of slave routes along the beaches of Conkouati), and a massive ivory trade conducted with Portuguese, Dutch, and English businessmen starting in the 17th century through the end of the 19th century (Martin 1972) demonstrate a long-standing economy with many actors, all of whom undoubtedly purchased or traded for food in addition to their other activities.

Trade in this manner continued until the beginning of the 20th century when the area came under the control of the French Government. Although colonization had many negative impacts on both existing trading systems (Coquery-Vidrovitch 1972) and rural societies, villagers adapted to access to these new markets. The colonial period brought new forestry and mining companies into Conkouati, whose workers, (such as CZ, below) needed food as they worked in the middle of the forest.¹¹⁴

The white man, he saw us, he came to see us before we started working. He came to see my grandmother. My grandmother told me, well go to see the white man, the director of SFN [a timber company]. They came to call me, thus, 'you are going to come with me'. I was there; they gave us money, wine, and salted fish. At this time, everything was [about] money. I went there, I started working.¹¹⁵

¹¹¹ Interview with YM, Kondi, 1/28/2006; Group interview, Km4 6/14/2006

¹¹² The Loango Kingdom arose from a province in the Kongo kingdom to its own sphere of influence after the rise of trade with Europeans in the mid-sixteenth century. Loango (based just north of Pointe Noire) continued to maintain influence over the region until its slow decline in the nineteenth century. There remains today a king, but he is just a ceremonial figure.

¹¹³ The home village of the current King of Loango is only five kilometers from Km4.

¹¹⁴ Some companies preferred to work near villages to profit from the labor force and food.

¹¹⁵ Interview with CZ, Kondi 12/18/2005

This statement provides an interpretation of the process in which colonial companies not only introduced a European capitalist system in which introduced money gained in importance, but also that timber companies fed workers fish, presumably collected from local villages. Village labor was exploited by these companies, however villagers themselves took advantage of the presence of these companies, by earning capital and by selling agricultural goods to companies. With money that they made, they were able to purchase goods from Pointe Noire.

A new market

Around the time of independence in 1960, new opportunities for selling foods arose. Forestry companies still dotted the landscape, which people profited from through the sale of manioc and various proteins.¹¹⁶ Before the availability of public transport that rural people were allowed to use, villages around Konkouati were relatively isolated up until the late 1950s. Although villagers had regular contact with extractive companies to whom they provided agricultural goods and (presumably) fish and bushmeat, these companies provided no transportation for people to the growing city of Pointe Noire. This situation changed as the roads improved;¹¹⁷ a Frenchman began a transport operation up to two villages between 1958¹¹⁸ and 1964,¹¹⁹ one on either side of what is now the park. He would transport both people and their products to Pointe Noire. This access to a new large market led to a distinct shift in the role of food products. Markets for bushmeat, fish, and manioc which were once too distant were now suddenly lucrative places for those not employed by large forestry operators.

¹¹⁶ The extent of this trade is unknown. Anecdotal evidence suggests French operators of timber companies hunted themselves, providing some meat to their employees.

¹¹⁷ This transport also may be aided by extractive industries in the region, including oil exploration (interview with CZ, 12/18/2005) and a new forestry operation which began at the same time, around 1958 (Interview with PY, 4/29/2006). Another reason that may contribute to this change to increased bushmeat commercialization was a shift of agricultural policy after independence. A study conducted in Ghana (Campbell 2005) found that hunting also increased after independence, which the author attributed to a decrease in agricultural incomes leading to increase in hunting.

¹¹⁸ Group interview, Mpella, 4/29/2006

¹¹⁹ Group interview, Km4, 6/20/2006

With this new transporter came Congolese immigrants and increased exploitation of Conkouati. Rumors of a virgin land full of game, fish, and forests brought hunters, fishermen, and farmers from Pointe Noire and other regions of Congo. Newcomers brought with them new techniques, including methods for salting fish, using coolers for preserving fresh shrimp and fish, as well as collecting fumbu leaves for sale in Pointe Noire.¹²⁰ The new Congolese government repealed colonial laws restricting the number of guns and ammunition available to Congolese, and sales of shotguns rose. These new technologies for resource exploitation, along with improved access to markets, helped strengthen the importance of this new market in Pointe Noire.

Beginning in the mid-1960s, hunting became a lucrative activity,¹²¹ and according to hunters it peaked around 1980.¹²² One possible reason is that Conkouati's accessible forests became depleted at this time and could not sustain further growth in bushmeat production. The growing city of Pointe Noire was a prime market for hunters' goods, and the increasing road traffic made it easier to hunt large quantities of animals (which was recorded as up to 30 at a time in 1996; Paris (1996)). The sale of bushmeat in Pointe Noire was lucrative because first, it was a market with many more buyers; and second, animals fetched nearly twice the price which could be made by selling in the village as the demand was high, and limited supply in the city (Paris 1996; see also Chapter 3 hunters surveys). Bushmeat traders, who often provided hunters with bullets, weapons, cash advances, and other material items often contracted with hunters to receive all of their offtake.

The switch to heavy bushmeat trafficking greatly reduced the sale and sharing of bushmeat in the villages. This commercialization was not restricted to bushmeat. Even fish species important socially to villagers in Kondi, such as tarpon and barracuda, became commercialized to the extent that villagers were rarely able to

¹²⁰ Interview with SP, Kondi, 1/23/2006

¹²¹ Interview with JH, Km4, 6/9/2006

¹²² Interview with EH, Km4, 6/22/2006

purchase them, but instead to traders destined for Pointe Noire.¹²³ Immigrants brought with them in the early 1980s techniques in salting fish and contributed to an increasing commerce between traders and fishermen in Kondi.¹²⁴ Despite this commerce, villagers still consume a great deal of fish, but usually of lower quality.

Similar to the increasing commercialization of fish and bushmeat in the 20th century, certain foods gathered by women's also increased in economic value. Certain women preferred to invest less in agriculture and home gardens, spending more time gathering highly-valued marantaceae (large strong leaves used as wrapping "paper") and fumbu leaves,¹²⁵ especially those in Km4 with easy access to the forest.

These insights by fishermen, hunters, gatherers, and the elderly provide insight into how food production and food economies have changed over their lifetimes. It is unlikely that strong evidence exists of how these foods were commercialized in past centuries. However, the claims that residents around Conkouati make about these patterns of increasing commercialization should be given credence for two reasons. Not because the information is verifiably true, but because people's ideas and recollections are valid interpretations of local history; they are first-person accounts of history in a region where history is not often recorded. These data are bolstered by their numbers; not only was one hunter in one village providing information about the increase in commercialization of bushmeat, but hunters, fishers and gatherers spoke of similar events, across all villages. These examples, placed within a larger context of European trade, demonstrate that although animal protein and other foods have long been a commodity around Conkouati, the connection to the urban markets of Pointe Noire after 1960, coupled with

¹²³ Interview with YM, Kondi, 1/28/2006

¹²⁴ Group interview, Kondi, 12/21/2005

¹²⁵ Interview with PS, Kondi, 1/30/2006

the introduction of new techniques in hunting and fishing distinguish this time period of commercialization.

A modified food repertoire

The commercialization of bushmeat has resulted in its diminished presence in the village as was demonstrated by our food surveys. Although there is no quantitative data showing how much bushmeat people consumed in the past, qualitative interviews can provide insight into this. Interviews with elderly women reveal the importance of bushmeat, as a protein which adds variety to their diet, as a food used for feasts, and as something they like to eat (see next section). Women talk about how fish has replaced bushmeat in their diets.¹²⁶ ‘Cheap’ fish, mbali from Conkouati and makouala from Pointe Noire, have become prevalent in their diets. Some refer to these species as ‘food when there is no money’; the price demonstrating the low value villagers give to these fish.

Villagers, mostly from Km4 and Mpella (the hunting and mixed villages), discuss this change in diet with regret. In the past, food, especially animal protein, was eaten in great quantities; now food is for selling. Villagers forego feasts in favor of increased profits through the sale of bushmeat. Food is eaten in private, and elders complain their children don’t share food, as was customary in the past. Some informants even confide in me (with shame) that they sometimes go without protein and vegetables with meals (eating manioc only with hot sauce). The lack of protein could be because now hunters sell it to markets in Pointe Noire, because there is less wildlife in the forest, because of the lack of transport to bring in fish, or some combination of those.

Gain, loss and adaptation to change

Villagers, especially those who have been able to watch this change happen, have noted both the negative and positive consequences. Forestry, mining, and oil companies from the 1920s through the present provided (albeit with much irregularity) salaried work for

¹²⁶ Fish did comprise part of the diets of hunting communities, especially in the dry season when women and men would trap/poison fish in the drying swamp forests (Group Interview, KM4, 6/1/2006)

some communities, which is what residents considered real ‘work’. Villagers lament the loss of these companies and the work they provide,¹²⁷ even though these extractive companies move from forest to forest over short periods of time. Because of this unreliable source of employment, villagers use Conkouati’s food resources as a substitute for the lack of work. The money that residents make from selling agricultural, fishing, and hunting products has enabled them to live, in their eyes, a better life.¹²⁸ Money gained from food provides healthcare and school fees (see Chapter 4), purchasing of material goods, and is often used to purchase land and construct permanent homes in Pointe Noire. Thus food, more than something to value as nourishment, is used both as a commodity to provide goods, but more importantly, as a way out of the village.

Contemporary life (in their words, *la vie contemporaine, le modernisme, le monde modern*), is an idea elders use to describe the world they find themselves in; highly economized and highly interconnected. It is, in their eyes, highly valued by youth, who will do anything to attain it (including sending away the village’s food). A generation that has been educated in schools that teach about ‘modernization’ (including different foods, urban life, and global society)¹²⁹ seems to embrace a new culture, where being learned and rich (and doing it quickly) is important; a get rich quick generation. Two of the food commodities at Conkouati, fish and bushmeat, fuel this desire, as large sums of money can be made in a relatively quick period. Young men often leave the village to sell their procured goods, only to return to Conkouati once their money runs out. Thus, according to both young and old, Conkouati’s food resources represent, for many of the region’s youth, a means to attain social status and become part of the ‘*ambience*’ (place with a lot of movement, music, drinking, dancing) scene in Pointe Noire.

¹²⁷ See also Giles-Vernick 2002. The very long history of movement toward and engagement with new people and new economic opportunities suggests that this contemporary sense of loss over departed companies would be entirely in keeping with historical practices.

¹²⁸ Interview with C&J, Km4, 6/22/06

¹²⁹ Interview with Sialivakou Elementary Principal, 5/22/2006

The commercialization of food for regional trade also has its consequences. There has been a loss in the knowledge required to find and process the many varieties of tubers found in the forest and the knowledge of how to make sustainable palm wine. Many wild forest foods, important in the past, have lost their value, and older recipes containing fruits and leaves from the forest have disappeared. Although those who have tasted them crave these foods and recipes, women today will not go to gather them, a trend also seen by Giles-Vernick (2002) in the Dzanga-Sangha region of the Central African Republic. The foods that have little economic value are being lost, in part because they are deep in the forest, cannot be harvested in valuable quantities, and are time consuming to collect. Younger and middle-aged women chastise those who want them, saying it is a waste of time to go collect those foods when they could be allocating their labor to income-generating activities such as collecting fumbu (which they sell to traders) or preparing manioc to sell. More than that, these foods have become rejected, even ridiculed by the younger generations, being referred to as 'dog food'.¹³⁰ People, young and old, see these foods as a connection to the past, a past younger people want to distance themselves from. These elder informants say that today women rely much more on manufactured goods than forest products. In their opinions, this is both good and bad. On one hand, not gathering as much food means there is much more time to do other things, including income-generating activities. In the end, this provides a much bigger selection of things to eat, including vegetable oils, msg, and even some cultivated crops. However, the lack of palm oil in the village today (because villagers report nobody wants to take the time to produce it anymore) helps demonstrate that this change has also resulted in a much smaller repertoire of historically-available foods.

The bushmeat trade at Conkouati emphasizes this pattern of commercialization. Not only are forest products diminished as sources of food,¹³¹ but there has been a concomitant decline of bushmeat and valued fish in the villages. At Conkouati, as in much of Central

¹³⁰ Interview with MT, Sialivakou, 5/4/2006

¹³¹ Gathered goods were not often consumed, in part because they are more time consuming to gather, and perhaps because it is a lower-status food. More research needs to be conducted on this subject to better understand the decline in forest food consumption.

Africa, meat historically played a valued social and cultural role. Even today, elders speak of the times when hunters and fishermen went out to sea or the forest and returned to feed the entire village. The roles of these men were strong; providers of protein were highly valued in the villages. Bushmeat is served for guests of honor, it is brought to Pointe Noire for relatives who no longer have access to forest foods, it is served at celebrations, is an indicator of the good life, and is considered an important category of food for variation in diet. Its importance is demonstrated through the ways in which people allocate different parts of the animals for different categories of people, restrict which species certain people are allowed to eat, and in the past tribute paid to clan leaders through the killing of an animal. In the fishing villages, certain species of fish, such as the capitains, tarpons, barracudas, and other large meaty fish are similarly valued, and elders explained how in their youth attaining one of these fish was cause for celebration in the village. The sharing of food, such as these large fish, has been socially important for smoothing consumption during shocks, and also to building alliances—whether it be through food donations during times of death, sharing meals between neighbors, or sharing food with ‘big men’.

Today, villagers rarely eat bushmeat in the village. Although some have gained economically from the presence of the urban market at Pointe Noire, the losses to rural society and individuals should not be dismissed.

During our days we ate meat, even an entire bush pig. Now, they [hunters] have discovered that meat, it is a productive activity, hunting. All hunting products make their way towards Pointe Noire and people regret it because there’s not enough food; people live only on Makouala [marine sardine]. Even if you have 100 francs, you are wanting to eat a piece of meat, they [hunters] can’t sell it to you because they are going to profit with it.¹³²

Meat, there was never a commerce of meat [in the past]. Even if it was a bush pig, it’s for eating, thus there were consistent meals. At present there are no consistent meals. Even if you killed a bush pig, you rush to go sell it; even if it’s a Gambian rat, you go to sell it to buy fish that comes from Pointe Noire. It’s

¹³² Interview with EH, Km4, 6/22/2006

completely changed, meals here, because you know, we have no more values over economic values... Thus, it's a big change.¹³³

Nguamba, or 'the hunger for meat',¹³⁴ is a Lumbu word used in the villages, and more broadly in Africa as a means of expressing the lack of bushmeat and fish in the village.¹³⁵ Meat is no longer prolific in the villages, and this loss is felt especially by elders.

Discussion

The observed patterns of low bushmeat and gathered goods consumption reflect a change in diet that results from market demands for bushmeat in Pointe Noire. These patterns reveal how people have adapted to changing markets; rural peoples have sought to procure goods for both bushmeat and agricultural markets, and have left behind most forest foods because they are not lucrative and are hard to procure or process, or that younger people prefer 'modern' foods. According to community members around Konkouati, drawbacks of this change include the instability of fish stocks (stability of proteins), the lack of protein variety, and for elders, a loss of forest dishes. The current shift in local diets away from bushmeat may provide conservationists with a means of reducing long-term bushmeat consumption if alternative livelihoods for hunters can be developed and village concerns about the consequences of switching can be addressed. However, the study reveals the need to better understand how availability, the commercialization of certain foods over others, socio-cultural needs for bushmeat, and taste preferences between fish and meat interact in and influence consumption patterns.

Change: Food commercialization and changing diets

The collection and consumption of gathered foods exemplifies the change which has occurred in the past three generations. Women have foregone the forest and focused on

¹³³ Group interview, Km4, 6/1/2006

¹³⁴ GT pers. comm. 4/2008

¹³⁵ See also Hladik et al (1990) and Richards (1939) for their descriptions of 'meat hunger' as it pertains elsewhere in Africa.

income-generating activities, such as marantaceae leaves and manioc. Quantitative data also reflect this change--the foods which were talked about by older women are not present in the survey data collected, and the frequency of consumption of gathered goods is minimal when compared to crops. Fumbu, which represented 80% of all gathered goods consumed, was eaten 60 times as compared to manioc leaves and spinach, which were each consumed around 500 times out of 3342 surveys. From a labor perspective, this is not at all surprising, as fumbu takes hours to gather in the forest, whereas manioc leaves and spinach is collected while farming. Whether or not preference is involved is unknown; further studies could examine this.

Male food production parallels this trend, most prominently in hunting communities. Although bushmeat was (and in some circumstances still is) important socially (for example, through feasts, as a traditional food, and as gendered food), its value by youth and some middle-aged residents as an important source of protein in the village has both diminished and has been trumped by high commercialization. Because of the high demand in Pointe Noire, selling meat at half its potential value to villagers is considered a big loss, thus it is rare to find bushmeat in the village. Bushmeat, once the dominant protein source in hunting villages, is now half or even less that of fish consumption in each of the villages. Our quantitative and qualitative data clearly demonstrate that people, particularly in the hunting villages, have adapted to this by importing fish from industrial fisheries in Pointe Noire as well as freshwater fish from the lagoons across the park. Even in Mpella, where hunting was balanced with fishing, hearthholds now consume twice as much fish as meat, including makouala, the imported fish from Pointe Noire. Indeed, cheaper proteins, when available, are heavily consumed, whereas primates and livestock, although perhaps animals of value, are not significant in daily consumption (as shown in Figure 27 above). These data, along with interview data, may suggest that high-valued species are exported for money rather than consumed in villages. However, to be able to verify this claim, future studies examining the true availability of these two important groups to village consumers are needed.

Interviews with community members reveal that there are more subtle influences that impact communities. Hearthholds are focused more on their own livelihoods, and share less than they historically have;¹³⁶ focusing most on their own extended households. One result of this is the weakening of the community fabric. Perhaps the most telling example of this change is the lack of cooperation in farming, which elders explain as being caused by a desire for working on economic activities such as hunting or fishing.¹³⁷

Conservation challenges & opportunities

Ecological sustainability

The appearance of makouala into the diets of rural hearthholds in Mpella and Km4 clearly demonstrate a dietary shift from bushmeat to cheap fish proteins. Mbali from Conkouati seem to have come to play a greater role in protein in the region, as it appears not only around the lagoon, but in villages far from the area. Four aquatic species (mbali, makouala, bar, and shrimp) encompass 64% of total fish consumption, two of which are highly seasonal species. Mbali and shrimp are exported during the high season, and make their way to villages on the eastern border of the park, such as Km4, as well as to Pointe Noire.

As with several places of the world, fishing is the only alternative/replacement animal protein to bushmeat consumption people at Conkouati use with any regularity. Concurrently, as the Park seeks to stop bushmeat trafficking, men in villages with access to water sources, such as Kondi or Mpella, have sought to diversify their livelihood strategies. Many hunters who have lost their livelihoods have switched to fishing (7 of 10 we interviewed in villages near water), and potentially put dramatic pressure on shrimp, mbali, and other freshwater species. According to one fisherman, effort for shrimp fishing has increased tenfold over the past 20 years, and catches in shrimp, as well as marine fisheries, have decreased dramatically over the past years. As such,

¹³⁶ Interview with T, Kondi, 2/1/2006

¹³⁷ Interview with Placide, Kondi, 11/28/2005; interview with ST, Kondi, 12/7/2005

conservationists need to be keenly aware of the probable unsustainability of this switch. Countries where bushmeat is a contentious issue need to monitor fish stocks—if they crash, what happens to villages that depend on them, and from a conservation perspective, what then for Conkouati's already-low wildlife populations?

Fishermen themselves note the change in intensity of fishing and shrimping, as the commercialization of these species have increased throughout the lifetimes of informants. Most fish and shrimp are harvested seasonally (like much of central Africa's food) (Hladik et al. 1990; Pagezy 1990), and historically, residents switched between hunting and fishing activities as different resources became available. Unfortunately, the pressure put on these seasonal species is growing. The concern is the sustainability of these activities, whether induced by economic markets or hunting restrictions, and the impacts they have for both conservation and food security.

Park researchers have examined mbali populations, but more research needs to focus on harvest rates and long-term projections on these key fish. No research has been done on shrimp populations, and given the amount of fishing effort, it is not hard to imagine a population crash in the coming years. Research in West Africa (Brashares et al. 2004) demonstrates the important relationship between fish and bushmeat, and as fish stocks decline, bushmeat consumption increases. If mammal conservation is a major objective of the Park, ensuring these fish stocks is critical, not only for fish conservation but for human consumption.

Reducing dependency on Park resources

High fish consumption in areas historically dominated by bushmeat suggests that if alternative economic activities can be found for hunters, rural populations might maintain lower levels of bushmeat consumption. Given that local bushmeat consumption is a contributing factor in wildlife declines, this switch in diet away from bushmeat may provide conservationists with a means of reducing long-term bushmeat consumption, with two main caveats. The first, which I will not discuss, is that conservationists need to

work with hunters to develop the skills for alternative livelihoods. The second caveat is addressing concerns about the consequences of switching. If a future conservation goal is to reduce dependency on the consumption and procurement of bushmeat, are the protein substitutes socially sustainable?

Villagers in hunting communities have, sometimes begrudgingly, accepted and adapted to the loss of bushmeat as their major source of protein. This process of substitution has been imposed by hunters within their own communities, and they have had several decades to make this switch. Despite the prevalence of imported fish, there is still a desire to eat meat. As addressed above, different species of wildlife still fulfill social roles: during times of celebration, for cultural identity, to satisfy meat hunger, and contributing to a varied diet. Thus, a nutritional regime consisting only of fish (or of excluding bushmeat) is probably not socially sustainable if conservationists were to set that as a goal. Management at Conkouati has been insightful in that it has not criminalized local bushmeat consumption; it is the trafficking and illegal hunting practices that are criminalized. Currently, 22% of protein consumption in the villages is still bushmeat, almost half of that being large rodents. If hunting could be focused on these smaller, fast reproducing species, this could benefit both the Park and its residents (although fulfilling the socio-cultural value of more rare species would need to be addressed). Observations in the village suggested that any meat sold in the village was purchased within an hour of arrival in the village, demonstrating the desire remains, despite claims from hunters to the contrary that the village is not a good market for them.

Conservationists should be concerned about fish consumption, and villagers are also concerned about the monotony of eating only fish (despite the fact that in overall diets bushmeat is still 22% of all protein sources). The switch to fish suggests that peoples' diets are flexible. So what about livestock as a substitute for bushmeat? The role of livestock, comprising only 2% of all protein consumption, was a surprising result of the kitchen surveys. Given the cost of production of livestock is higher than fish or bushmeat, it is understandable that families choose foods that are cheaper when available.

Like bushmeat, livestock are considered an economic commodity and are usually eaten for special occasions, but unlike bushmeat, they are not commonly traded. According to villagers, although in times past there were many types of livestock around,¹³⁸ the role of these animals has diminished in the recent past. Yet in villages lacking protein sources, why are chickens, goats, and pigs not raised and consumed more frequently? The answer may lie within the social significance and the economic culture of fishing and hunting. Although people have long kept domesticated animals, these animals aren't to be consumed on a daily or even weekly basis, but rather people keep them for special occasions (such as parties, funerals, and marriages). Secondly, fishing and hunting require very little inputs (especially if renting materials), and rewards are quick. One night in the forest may result in 10,000 cfa, whereas to make that much in raising chickens would take 6-9 months. In this 'quick cash economy',¹³⁹ activities which require temporal inputs (agriculture and livestock) are not, in the minds of younger people, advantageous. Conservationists in the area have a big hurdle in overcoming the ATM (quick cash) mentality currently linked to the exploitation of Conkouati's resources, but if successful, livestock would be a viable addition to diversifying proteins in the villages. However, to be effective at reducing bushmeat consumption, these projects would have to be widespread and affordable, i.e. cheaper than or competitive with bushmeat (Wilkie et al. 2005); but also changes in the way people think about livestock would be important for people to raise animals in large numbers. Finally, who should these protein projects be targeted at? Conservation organizations have limited resources. This research demonstrates that villages, and individual hearthholds, unequally share food security risks. Park programs should first target those most at risk. At Conkouati, hunting villages eat significantly poorer than fishing villages, so rather than targeting the relatively prosperous fishing village, the Park should target programs on hunting communities. Over the long term, all villages should be targeted for alternative protein projects, as our research shows that overall, wealthy families purchase more bushmeat.

¹³⁸ Group Interview, Mpella, 4/24/2006

¹³⁹ Interview with S, Mpella, 4/22/2006

Conclusion

This interdisciplinary study reveals that protein consumption in rural communities is complex. Communities, even within one protected area, have different access to resources and as a result, have varying access to different foods; most importantly, animal proteins. The implications of the consumption patterns point to the need for a serious examination of fish populations around Conkouati, but also more broadly for conservationists to examine food networks, and how the disruption of these networks (for example at Conkouati, the crash of Makouala populations) might impact conservation efforts. Food security is of the utmost importance to local communities.

Contextualizing the food survey with historical and ethnographical research was key in examining a different side of this story. Although the bushmeat trade did not start in the recent past (but in fact organized trade has been going on long before Europeans arrived), the recent commercialization in the bushmeat trade since independence has brought about considerable changes within the lifetime of people around Conkouati and undoubtedly Central Africa. The different valuations of foods between generations highlights the tensions within villages on the changes in diets, the declining economic value of many forest foods, and the hyper-commercialization of animal proteins.

Recommendations

This study reveals the need to better understand factors influencing consumption patterns. Knowing what people eat has provided a baseline for future studies which incorporates the mechanics of food availability and a deeper understanding of the social context. Our data show that there is a lot of variation across and within communities, including the availability of food sources. If fish food supplies were more stable, would that impact hunting? Secondly, it is important to understand how individuals commercialize different foods, and how poverty influences that. For example, do monkeys better serve hearthholds as a commodity because they can get more money when sold to urban

traders, which they can then turn into fish? Do parents buy more fish, even though bushmeat tastes better, because they know they can get better value and provide more children with protein with the same amount of money? Finally, conservationists need to better understand the importance of social and cultural roles of fish and bushmeat and the tradeoffs people are willing to make. A finer grained analysis to understand the social drivers which influenced participants' consumption behavior (such as why they bought bushmeat when they did) will help understand bushmeat consumption and the constraints to developing feasible alternatives.

It is important for conservationists to understand that foods are the most important resources villagers around Conkouati have. Economic factors have changed the way people eat, reducing the importance of forest foods and losing important foods to outside consumers. Unfortunately for all stakeholders, residents rely on the same forests and wildlife the government wants to protect. From a local perspective, the actions of the Park have threatened their access to those resources through the limitations on hunting, perceived threats to fishing and agriculture, and the protection of animals which most view as having a major economic impact on farming. Although people are legally allowed to protect their fields, most of them do not know it, and they are too afraid of ecoguards to do much about it. The biggest concern local people have is the current and future economic impact that the park has on their livelihoods. To improve relationships with local peoples, and concurrently protect wildlife populations, conservationists should address the economic impacts (perceived or real) the Park has on local people. People have already modified consumption behavior to adjust to changing economies, suggesting resilience and adaptability. Whether or not the switch from bushmeat will remain socially viable and alternative proteins readily accepted must be studied more. Demonstrating an understanding of the great societal changes and environmental valuation, working towards food security (both ecological and economic), and developing acceptance of alternative proteins to bushmeat will help to enhance collaboration with local people and protect wildlife populations.

Chapter 3

Human impact on hunted mammal community distributions inside Conkouati-Douli National Park

Abstract

Wildlife in and around Conkouati-Douli National Park (hereafter “the Park”) has historically been treated as a commodity. Commercialization of bushmeat intensified throughout the 20th century as access to urban markets and market size increased in the latter half of the 20th century. After decades of exploitation, the Government of Congo, with the help of foreign donors, created a national park to protect wildlife populations that were being negatively affected by this commercialization. To avoid human displacement, the Park boundaries included rural villagers, yet these were the very people whose hunting activities the Park was meant to protect against. This overlap of wildlife and people inside the Park has potential negative consequences for wildlife within the Park boundaries. Distance-based sampling was employed to estimate relative densities of duikers and other wildlife species along 1-km-long transects located throughout the Park at different distances from villages and other habitat features. Duiker densities were low overall and they declined with increasing proximity to villages. Examination of wildlife distribution revealed large spatial heterogeneity, the causes of which were mostly unknown but are undoubtedly related at least in part to habitat variation and historical land use. Human populations inside the Park negatively influenced wildlife populations, but the severity of this impact is unknown. These results suggest further studies are needed to identify the spatial distribution and trends of hunted mammal populations. This evidence can help to determine whether sustainable harvest levels can be developed for the Park’s human populations, who depend on bushmeat for food, livelihoods, and maintaining socio-cultural practices.

Introduction

Bushmeat Economies & Conkouati-Douli National Park

Wildlife is important to rural Central African economies (Campbell 2005; Croll & Parkin 1992; Harms 1987; Ingold et al. 1988; Maddox et al. 1996; Neumann 1998; Vansina

1990; Wilkie & Carpenter 1999a) and has also acquired social, political, and cultural importance among Central African populations (Giles-Vernick 2002; Hagenbucher-Sacripanti 1973; Harms 1987; Vansina 1990). Prior to European trade with African merchants beginning in the 1500s, a lively trade between coastal and forest communities existed (Martin 1972). As urbanization increased during the 20th century, people without daily access to forests provided a large market for bushmeat. This current demand has been met by hunters with better weapons and hunting gear, access to markets, and new road infrastructures and industry (such as timber companies) that have provided transport from the forest to urban markets (Wilkie 2000). The result of this bushmeat trafficking across Central Africa has been the overexploitation of many forest species (Blom et al. 2004; de Thoisy et al. 2005; Fa et al. 2005; Jerozolinski & Peres 2003; Laurance et al. 2006b; Newing 2001; Noss 1998; Peres & Nascimento 2006; Robinson & Bennett 2000).

Similarly in Conkouati-Douli National Park, southern Republic of Congo, bushmeat has gained in economic importance according to rural villagers. Drawing from oral histories of informants, villagers noted a significant change in their hunting and fishing practices with the arrival of French businessmen in the late 1950s who initiated motorized transport between remote Conkouati villages and Pointe Noire. This twice-weekly transport opened up a new market enabling villagers to sell both agricultural products and forest foods. They claim that during this period the very nature of hunting changed, from an activity that had generated meat for local consumption to a larger-scale commercial enterprise. Large public transport vehicles and trucks with bushmeat vendors began arriving in the 1960s to take Conkouati's wildlife to sell in the growing urban markets of Pointe Noire. Conkouati became one of the major supply regions to the city (Agnagna 2003; Wilson & Wilson 1991) and remained so until at least 2006 when law enforcement activities cut the supply chain (see Chapter 4). These factors were the foundation for hunters and traders in Conkouati to build and conduct a highly commercialized form of hunting in the latter half of the 20th century, which has continued until the present, despite the loss of bushmeat traders.

In part to counter the negative impacts of increased commercial exploitation of wildlife, African governments, with support of international non-governmental organizations (NGOs), have created nature reserves and parks (Anderson & Grove 1987). To make space for these protected areas across Africa and restore areas to 'natural' habitat, governments often removed human populations. The displacement of people caused by the creation of national parks has recently gained much attention in the literature about the politics of relocation (Adams & Hutton 2007; Curran et al. 2009; Redford & Fearn 2007; Schmidt-Soltau & Brockington 2007). Within the conservation community, some organizations have developed alternative models for protected areas that are more inclusive of human activity than more conventional forms of national parks, such as community reserves or Man and Biosphere reserves (Dyer & Holland 1991).

The creation of Conkouati-Douli National Park in 1999 by the Congolese government fused the competing models of a national park and a community reserve, and added to that a forestry concession. Not wanting to displace villages, the Government of Congo incorporated people inside the Park, contrary to the wishes of the local people and against recommendations of IUCN, the managing body of the protected area at the time. To conservationists and villagers alike, the overlap of people, industry, and wildlife within the National Park was a surprise. Indeed, under the IUCN guidelines for national parks (IUCN Category II protected area), human habitation and exploitation that interferes with wildlife conservation is not allowed. Conkouati thus challenges this traditional model; in total, nearly 1,800 people reside within the boundaries, and another 3,600 people live on the border in households that rest near or just within the Park boundaries (Figure 28). All of these people's activities remain within the jurisdiction of the National Park (unpublished data courtesy of the Wildlife Conservation Society (WCS)-Conkouati project). The ensuing regulations include hunting, one of the major activities conducted by residents. The imposition of hunting restrictions has been the largest source of conflict between the Park and its residents.

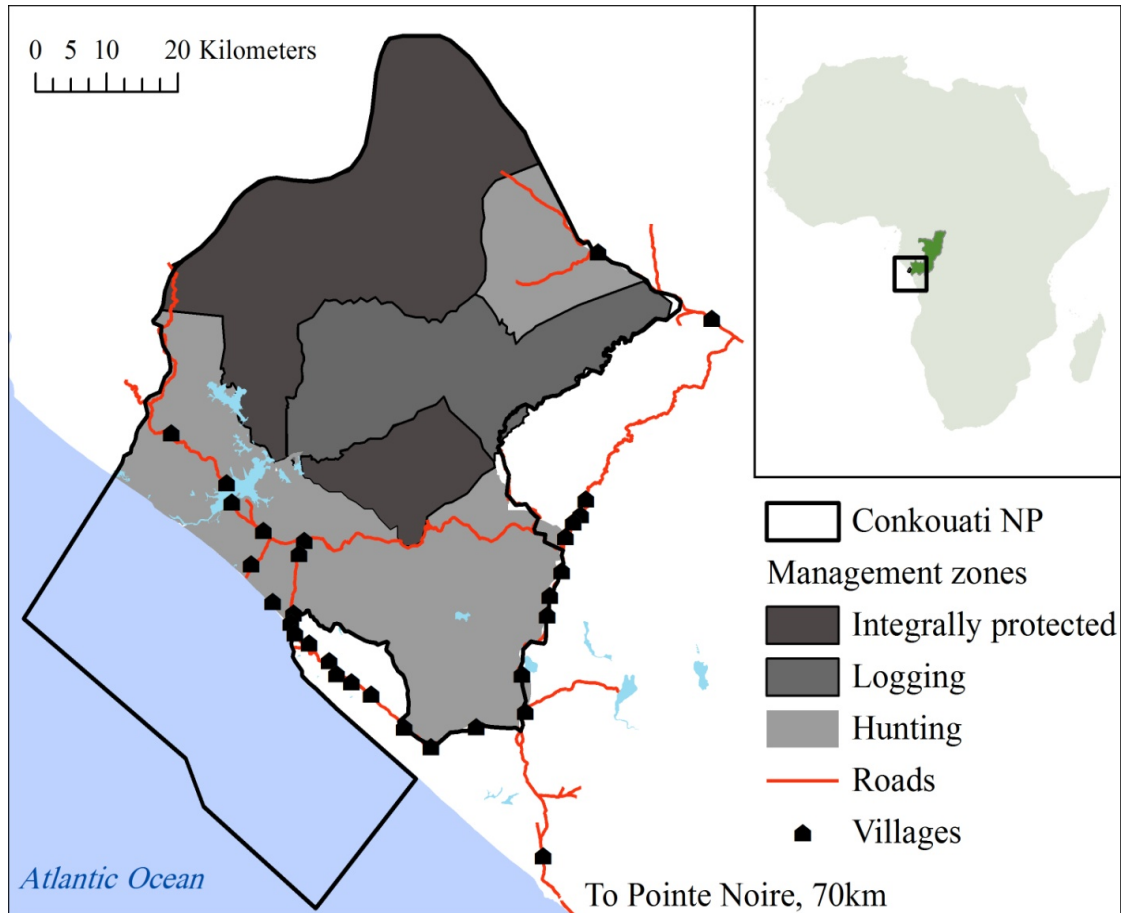


Figure 28: Map of Conkouati-Douli National Park, including the offshore marine zone. The current zoning system has three major use types: hunting, logging (no hunting allowed), and integrally protected (note these are simplified versions of Conkouati’s very complex zones). Villagers who live in and around the park are allowed to hunt, fish, and farm within the hunting zones.

Previous wildlife studies at Conkouati

In Central Africa, local access to bushmeat markets has caused a decline in large mammal populations in recent decades (Wilkie & Carpenter 1999a), including Conkouati (Agnagna et al. 1991; Maisels & Cruickshank 1996; Maisels & Onononga 2000; Wilson & Wilson 1991). Despite the ecological importance of wildlife at Conkouati, relatively few studies other than those by Maisels et al. (1996, 2000) were conducted in the area, although several descriptive surveys have been done (Dowsett-Lemaire & Dowsett 1989; Dowsett & Dowsett-Lemaire 1991; Hecketsweiler & Mokoko Ikonga 1991; Lachiver

1975). The major conclusions from these and other studies were that mammal densities were related to hunting pressure:

- Animal densities were highest in areas with the lowest hunting effort, deep inside the Park (Maisels & Cruickshank 1996);
- A preliminary qualitative study with local hunters (Paris 1996a) provided demographic tendency estimates that 25% of species were decreasing (including most ungulates), and half were thought to be stable. Hunters also stated that species with abundant populations (not related to their demographic tendency) included bush pig, blue duiker, cane rats, brush-tailed porcupines, and Gambian rats. Species that were common (but not abundant) included red and yellow duikers, both of which hunters noted had decreasing populations.
- Despite relatively stable ape populations between 1996-2000, two of three study areas in the Park were much less protected in 2000, and duiker populations remained low (Maisels & Onononga 2000)
- The forestry concession inside the Park negatively affected wildlife populations (Bitsindou 2003);

These studies suggest human impact at Conkouati is relatively high and wildlife was inversely correlated with hunting activity, however these surveys were primarily conducted in the northern zones of the Park far from villages. More studies need to be done to understand the status of hunted mammal populations around the Park, which many families depend on for protein and their livelihoods.

Study Objectives

Several studies have demonstrated the inverse relationship between roads (and other human activity) and wildlife populations (Laurance et al. 2008; Laurance et al. 2006b; Wilkie 2000); this study adds to this knowledge by examining the correlation between wildlife densities and distance from village and intensity of human activity. In Central Africa, several parks exist with human populations directly dependent on resources inside the park. The Park contains several different zones to accommodate this habitation, as subsistence hunting and fishing, agriculture and forest use are allowed in Conkouati's

hunting zones. Despite these efforts to promote coexistence between people and parks, the question remains, can a park ecologically support communities with members who are dependent on the bushmeat trade for their livelihoods? This study attempts to examine some of the consequences of including human habitation inside a national park.

This study focuses on populations of terrestrial mammals at Conkouati, which are the subject of intense conflict between villagers and the Congolese government. These populations are important for local consumption and trade, but the current ecological status of these mammals in the various Park management zones is unknown. The objectives for this particular study were to: 1) develop a baseline survey of hunted mammals to determine their relative abundances within the study zone; 2) explore differences in relative abundances as distance from village increases and potential hunters increases; and 3) examine implications for wildlife conservation at Conkouati, and propose recommendations for future research and management for human use of wildlife within the Park.

Methods

To address these questions, I surveyed 197 wildlife transects over a two-year period to estimate abundances of commonly-hunted prey species. Although I consider distance to villages and roads, fruit abundance, and human activity in my study, other, non-hunting anthropomorphic factors which may influence wildlife populations, but are not considered here include: past logging activity, an oil seismic survey conducted between field seasons, gold mining which occurs in the north-central part of the park (but not in the study zone), and agricultural activities that occur 0-4km from villages.

Study area and wildlife species

Conkouati, a forest-savanna mosaic, is comprised of dense humid and sub-littoral forests with nutrient-poor savannas situated in the southern third of the Park. Most large (>2kg) mammals (with the exception of jackals, bushbuck, and cane rats) mainly prefer the forests, where various fruits and forest vegetation make up the bulk of their diets. I therefore focused on forests for the study on hunted mammals. To define the study area,

I first used the two roads inside the Park as a cut-off point for inclusion in my study, to not only to streamline forest types (few species inhabit Conkouati's littoral forests), but also to concentrate on those forests on the same side of the road as the integrally protected area of the Park (Figure 29).

Hunting is a major concern to Park management, and therefore this study investigates the impacts of villages and hunting on wildlife. The Park contains several different management zones in order to regulate hunting throughout the protected area. However, despite Park management's efforts to create no-take zones, these are not well enforced, leading to hunting in vast sections of the Park. Although a comparison between hunted and non-hunted areas would have added to the study, logistical constraints prevented conducting the wildlife surveys deep within the Park where hunting does not occur.

Most species of large mammal (>2kg), with the exception of chimpanzees, are hunted at Conkouati. Interviews and previous studies (Maisels & Onononga 2000) reveal general hunter strategy is mainly focused on shooting the first prey seen. Very large mammals, although worth more in local and regional markets, are extremely difficult to transport, hunters therefore prefer to leave species like elephants and hunt more common smaller species. I decided to concentrate specifically on terrestrial species that are commonly

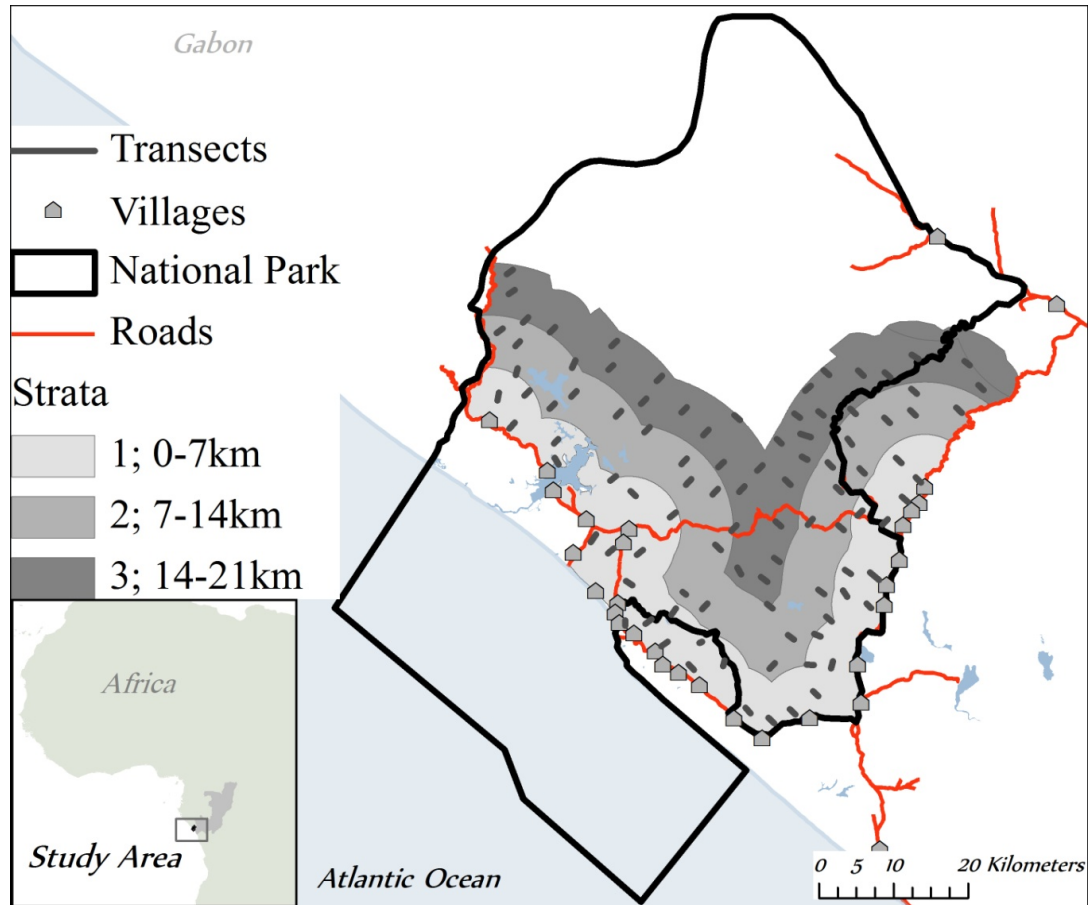


Figure 29: Map of the study area inside Conkouati-Douli National Park (CDNP), including the three strata (in shades of gray), the transects, and the road network along which villages occur. Transects were kept in the same general location from year to year, but teams did not follow the exact trajectory to avoid potential bias due to avoidance or preference for previously cut transect lines.

hunted, in order to ensure all observation effort was focused on the low-density terrestrial species between 2-150 kilograms. In addition species which spend a large proportion of their time in savanna habitat, particularly bushbuck (*Tragelaphus scriptus*) and cane rats (*Thryonomys swinderianus*) (Kingdon 1997), were not included because this study did not adequately sample their edge habitat. Although sitatunga (Starin 2000), buffalo (Blake 2002), and yellow-backed duiker (Wilson 2001) use savanna habitat, these species are present in the forest and thus I assumed they would be detected on forest transects. Finally, because of the difficulty in distinguishing between four species of red duiker (*Cephalophus nigrifrons*, *Cephalophus callipygus*, *Cephalophus dorsalis*, and

Cephalophus leucogaster), sightings and sign were counted as a single group, consistent with many previous surveys (Maisels & Onononga 2000; White & Edwards 1999). Appendix 3.1 lists mammal species included in the study.

Study Design

After conducting a pilot study to compare 25x25m quadrat plots versus 1-km-long transect methodologies (i.e, quadrat surveys vs line transect surveys) I decided to use distance-sampling methodology with a line-transect design (Buckland et al. 2001), as is common across forest habitats of Central Africa (White & Edwards 1999), and which is in use by WCS at Conkouati for elephant and great ape surveys (Maisels & Onononga 2000; H. Vanleeuwe, unpublished data). This sampling included 108 transects to be randomly placed within a stratified design to test for differences in wildlife distribution at increasing distances from the village. Along these 1-km-long transects, observers recorded all wildlife sign regardless of species, and recorded perpendicular distance measurements from transect lines to dung encounters (Buckland et al. 2001). We conducted the study in 2006 and repeated it in 2007 to examine annual variability and to provide data for a new hunted-mammal monitoring program for the Park.

Stratification: To explore the influence of humans on wildlife distribution, I designed a stratified survey that reflected different zones of human use within the Park. From interviews and participant observation, I ascertained that hunters conduct most of their daily excursions 0-7km from their villages, and most other village activities occur less than 5km from habitation (with the exception of fishing camps). Hunters operate less frequently between 7-14km from the village, and the least 14-21 km away (see also Chapter 4). Hunters' costs for traveling this latter distance are higher, as it requires camping, smoking animals, and transporting bushmeat long distances. Additionally, the ratio of risks/reward of having animals seized by Park management is much higher than in areas closer to the village. The underlying assumption for this stratification structure is that if a man wanted to hunt only for subsistence, he is not going to travel far—he would find the first animal he can and then return to the village. From this, I developed a

stratification scheme for zones of human influence of 0-7, 7-14, and 14-21km. Using ArcGIS software and treating the principal roads where villages were located as the origin (0), I generated strata boundaries for each of these three zones (Figure 29).

Transect placement: I used a stratified random design to place roughly 35 1-km transects in each of these three strata; for a total of 108 transects in 2006, and a subset of those totaling 100 in 2007 (Figure 29). All transects occurred in the Park or adjacent forests within the buffer-zone. Each was aligned perpendicular to bodies of water and roads to avoid bias which can occur when animals avoid or are attracted to these linear geographic features (Buckland et al. 2001). Using a random number generator of corresponding UTM (Universal Transverse Mercator) coordinates I randomly placed 40 transects in each of the three strata. Those were then cross-referenced with satellite imagery and maps to examine which transects were not viable (due to bodies of water, placement in village, etc). Because home ranges for frequently-hunted mammals like duikers are small compared to great apes and elephants (Kingdon 1997), distances between transects were a minimum of 2.5 km apart. On the ground, if teams determined the terrain was not practical for surveys (e.g. an impenetrable swamp) they moved the transect, shortened the length, or dropped it (a total of 11 transects were dropped due to unforeseen events or terrain difficulties). To displace a transect, teams moved up to 200 meters away from the obstacle and continued on their trajectory. If the team encountered savanna on a transect they stopped surveying, traversed the savanna to the next forest patch following the given compass direction, and then resumed their survey in the forested habitat. If teams encountered a farm field, it was up to the discretion of the team leader whether or not to bypass it.

Data Collection

Survey methodology closely followed White & Edwards (1999) and Kuhl et al. (2008). Transect start and end points from the design were marked using a GPS (global positioning system) with UTM coordinates. Teams operated between 8am and 4pm in

dry weather to ensure they could clearly see tracks under the dense canopy. Once teams found their given transect in the field, actual GPS coordinates of beginning and ends of transects were recorded along with time, weather, and observer names. To clear the transect path, a two-man team cut a straight, narrow line (< 0.5m) with a machete using a compass direction of either 45° or 135°. Each team also had three observers: one looking for sign to the right, one to the left, and the other along the centerline of the transect. When animal or human sign were observed team leaders recorded the distance along the transect line (0-1000m), the sign type and age, and if applicable they recorded the perpendicular distance from the transect centerline to dung.

Three categories of data were collected along the transect within 5m of the survey line; wildlife, human, and vegetation (see Appendix 3.2 for an example data sheet). Wildlife data collected included all prints, paths (in thick vegetation), feeding, dung, and sightings (all sign were indirect except for two sightings of animals). Perpendicular distances were measured for dung samples for developing density estimates. Human sign includes hunting and forestry activity such as cartridges, camps, carcasses, chain saw noises, and tree stumps, as well as miscellaneous human activity such as forest paths, sounds, oil industry activity, and agricultural fields. Vegetation was recorded at every change in vegetation type: swamp forests (inundated or periodically inundated), forest clearings, and secondary forests (young or mature). Ground cover density was recorded based on ocular estimates of percent cover: 0-25%, 25-50%, 50-75%, and 75-100% (see Appendix 3.3 for more vegetation information).

Team composition included one leader trained either by myself or WCS and four team members, mostly hunters from surrounding villages who could accurately identify sign. All leaders underwent a two-day refresher course at the beginning of each field season to discuss standardized reporting, difficulties in data collection, team building, and circumventing problems. I accompanied each team leader for one week into the forest during the study to improve data collection techniques and ensure that data recording was consistent. Teams conducted week-long missions of 5-6 transects and were

geographically shuffled around the Park to reduce geographic bias in surveys that could occur if each team was to focus on specific areas.

Different factors were developed for the analysis. First, villages were classified as either hunting or non-hunting villages (based upon their livelihood strategies) and the distance from each transect to the nearest village and distance to the nearest hunting village was calculated using ArcGIS. Similarly, this method was used to calculate distances to other factors, including distance to road, stream and river. Secondly, fruit abundance, human presence indicators, and hunting indicators were calculated for each transect based upon the number of sign per transect. Distance from road differs from distance from village or study strata as there is a public road that cuts across the park (and study area). Data were entered into an Excel spreadsheet and then analyzed using analysis of variance and regressions in Stata 9.0. For dung data, density estimates were developed using Program Distance (Buckland et al. 2001). A total of 197 transects out of 208 were completed for a total of 191.7km of surveys over 2006 and 2007.

Results

Results from the survey revealed high variability in detection of different mammals (Table 2). Traces from common species such as brush-tailed porcupine and various duikers were the most prevalent, but almost no sign of water chevrotain, pangolin, or mandrill were found across the 197 transects.

Table 2: Species sign frequencies from hunted mammal survey at Conkouati-Douli National Park, by year and strata. These values represent relative abundances and cannot be compared reliably among species.

Species	2006	2007	Strata 1	Strata 2	Strata 3	Total
Porcupine	4481	5413	3287	3150	3457	9894
Red duiker*	1785	1935	941	1194	1585	3720
Blue duiker	1467	1258	833	960	932	2725
Yellow duiker	307	665	452	194	326	972
Bush pig	258	264	169	238	115	522
Elephant	n/a	543	110	194	239	543
Buffalo	134	165	224	35	40	299
Sitatunga	53	130	98	60	25	183
Chev rotain	20	46	3	35	28	66
Pangolin	3	2	4	1	0	5
Mandrill	2	14	2	4	10	16
Total	8510	10435	6123	6065	6757	18945

* *Red duiker* includes 4 species of medium-sized duiker (*Cephalophus nigrifrons*, *Cephalophus callipygus*, *Cephalophus dorsalis*, and *Cephalophus leucogaster*)

Regression Analyses

Using five of the seven most abundant species, I conducted multivariate regressions to examine factors that influence hunted mammal species, including red and blue duikers (*Cephalophus* spp), bush pigs (*Potamochoerus porcus*), porcupines (*Atherurus africanus*), and buffalo (*Syncerus caffer*). (Elephant were not included because they are highly migratory).

Relatively few factors significantly influenced hunted mammal populations (Table 3). Fruit presence was positively correlated with several species (porcupine and duikers), which is expected given they are frugivorous.

Table 3: Results from a multivariate regression showing variables which significantly influence the presence/absence of wildlife sign along transects. All models include pooled data across years.

Species	Variable	Coef.	SE	R2	F	P
Buffalo	Distance from village	-0.173	0.076	0.096	4.998	0.025
Bush pig	Distance from hunting village	0.070	0.024	0.043	8.729	0.004
Porcupine	Fruit presence	2.529	0.506	0.114	25.023	0.000
Red duiker fruit and distance model	Distance from village (all years)	0.508	0.174	0.055	5.671	0.004
	Fruit presence (all years)	0.466	0.230	0.055	5.671	0.004
Blue duiker fruit and distance model	Fruit abundance (all years)	0.689	0.216	0.061	6.320	0.002
	Distance from village (all years)	0.322	0.164	0.061	6.320	0.002

What was unexpected is that hunting pressure and human presence (as measured by the number of signs, including empty cartridges, snares, machete marks, etc seen along transects) apparently had no direct impact on the abundance of wildlife. However, distance from village played a significant role in four of the five chosen species. Figure 30 shows differences in sign abundance across the different strata. Buffalo are negatively correlated with increasing distance from village, which may reflect the proximity of villages to savannas, where buffalo are often found grazing. Bush pig, red duikers, blue duikers, and porcupines were all found more frequently farther away from villages.

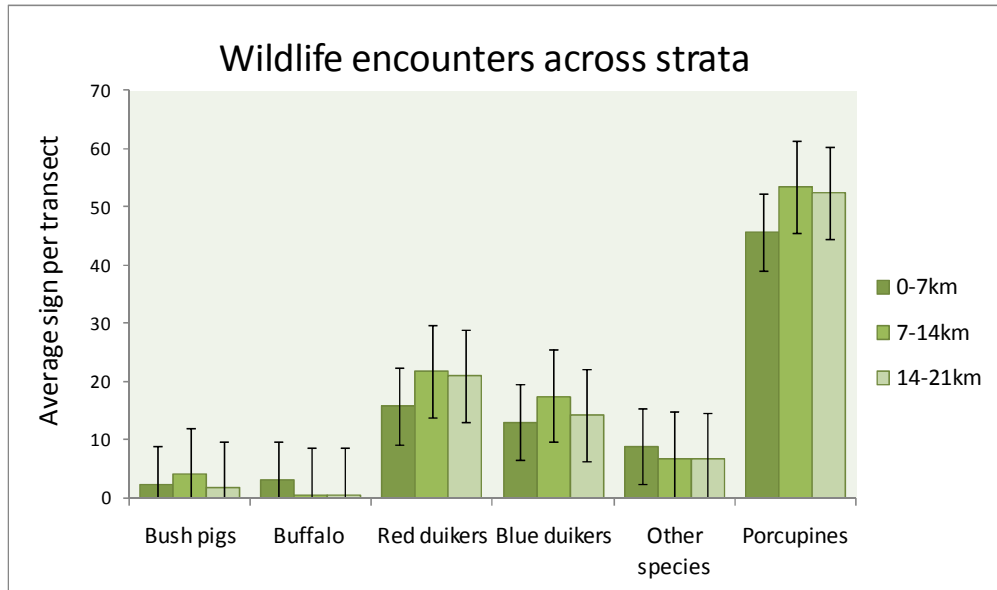


Figure 30: Hunted species sign abundances across strata with standard error, pooled across years. Note that relative abundances cannot be compared reliably among species. Using relative abundances of all sign (as opposed to dung) reveal no significant differences between strata, but suggest that species respond differently to distance from village.

Distance Analysis

Although the regression analysis is useful for a general examination of populations, a more robust analysis can be conducted using dung detections because sightability-adjusted population estimates can be developed. Data were entered into Excel and dung abundances were tabulated for each species (Table 4). I used Distance sampling (Buckland et al. 2001) to estimate absolute densities of dung along the transect. In order to use a species for the analysis, 60-80 dung samples were needed to produce a robust estimate (ibid.). As can be seen from Table 4, only the three groups of duiker were sufficient for Distance analysis, but yellow-

Table 4 : Dung abundance results from 197 1-km transects. Red and blue duiker species were chosen for analysis because their numbers reached the threshold of 60 observations per stratum for Distance sampling.

Species	2006	2007	Total
Blue duiker	313	412	725
Red duiker	184	259	443
Yellow duiker	58	92	150
Buffalo	36	14	50
Porcupine	29	19	48
Bush pig	13	2	15
Sitatunga	2	2	4
Chevrotain	0	4	4

backed duiker (*Cephalophus sylvicultor*) were later discarded because of the low sample size for analysis by stratum. Elephants also were abundant, but were not analyzed since these animals are rarely consumed or hunted and have unknown migratory patterns, which might confound a study examining relationships between villages and animal densities.

To develop accurate estimates for comparing across different protected areas, site-specific deposition and decay rates for duiker dung are necessary. Several studies have described dung decay rates in duikers, but these rates have been highly variable between seasons and across sites (van Vliet et al. 2008). Table 5 shows these decomposition and decay rates. Due to the lack of dung availability at Conkouati, I was unable to conduct estimates of a site-specific dung decay rate. To compare relative densities within Conkouati, I developed dung decay rate estimates based upon an average of M. Mockrin’s unpublished data from northern Congo, Koster & Hart’s (1988) study in DRC, and van Vliet et al.’s (2008) study in Gabon (Table 5).

Table 5: Dry season duiker dung deposition and decay rates from three studies in Central Africa.

Species	Deposition rate	Decay rates (in days)				
		Koster & Hart	Koster & Hart (1988)	Mockrin (unpub)	van Vliet (2008)	Conkouati Estimate*
Red Duiker	4.4 piles/day		21	14	23	19.3
				SE=0.996		
Blue Duiker	4.7 piles/day		18	9.3 days	n/a	13.7
				SE=1.971		

*The estimate for this study is based upon an average of Koster, Mocrkin, and van Vliet studies.

Several model inputs were tested to develop a Distance model which best fit the data for each species and each year. Covariates tested included ground cover (used in the final analysis), observer, and year, but because of Distance’s pooling robustness, only ground

cover marginally improved the model. Table 6 shows the model parameters used. Although covariates for observer, year, canopy cover were tested, only ground cover proved to improve model fit by reducing AIC slightly.

Table 7 provides the density results and confidence limits for each stratum. Across both species and both years, densities of duikers rose with increasing distance from villages (Figure 31). Although there are overlapping confidence intervals, the trends occur across all four data sets.

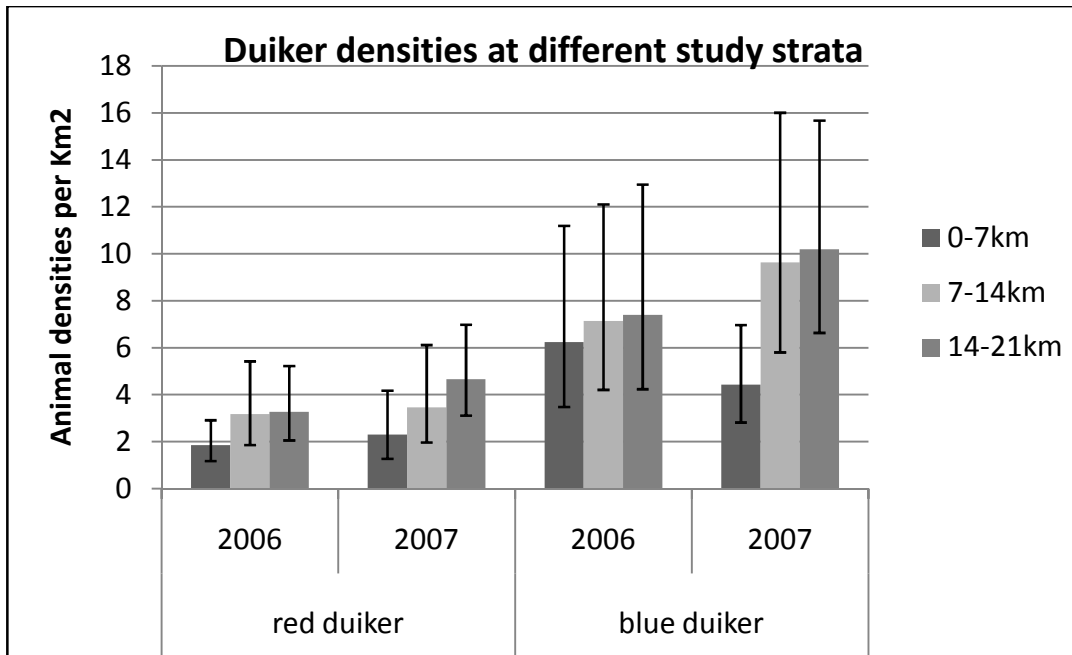


Figure 31: Densities of duikers in three study strata over two years as based on dung encounters along line transects. Results show increasing density with increasing distance from village. Error bars represent 95% confidence intervals.

Table 6: Model parameters for Distance analysis of blue and red duikers surveyed July-August 2006, 2007 in Conkouati-Douli National Park. Includes the probability of dung detection (P_a), strip width with a 5% truncation (in meters), covariates and functions used, goodness of fit values, and the dung rates used.

Species	Year	Detection probability P_a	P_a 95%	Truncation (5%)	Encounters (n)	Covariates	Key function	Cramer von Mises GOF	Dung prod.	Dung decay (in days)
Red duiker	2006	0.61	0.04	2.82 m	184	Ground Cover	Half-normal cosine	0.50	4.4	19.3
	2007	0.63	0.03	2.87 m	259	Ground Cover	Hazard rate simple	0.60	4.4	19.3
Blue duiker	2006	0.70	0.03	2.55 m	313	Ground Cover	Hazard rate simple	0.50	4.7	13.7
	2007	0.61	0.03	2.81 m	412	Ground Cover	Hazard rate simple	0.03	4.7	13.7

Table 7: Duiker densities and confidence limits by species group and stratum and year.

	Stratum 1						Stratum 2					Stratum 3					All Strata				GOF K-S p	Truncation	Covariates
	Year	Density	LCL	UCL	% CV	n	Density	LCL	UCL	% CV	n	Density	LCL	UCL	% CV	n	Density	LCL	UCL	% CV			
Red duiker	2006	1.85	1.18	2.91	23.0	42	3.17	1.86	5.42	27.2	61	3.27	2.05	5.22	23.7	72	2.85	2.09	3.88	15.7	0.61	5%	Ground Cover
	2007	2.30	1.27	4.18	30.6	58	3.46	1.96	6.12	29.0	74	4.66	3.11	6.98	20.5	114	3.58	2.66	4.83	15.2	0.63	5%	Ground Cover
Blue duiker	2006	6.24	3.48	11.19	29.9	95	7.14	4.21	12.10	26.9	93	7.41	4.24	12.95	28.5	109	6.99	5.04	9.71	16.7	0.14	5%	Ground Cover
	2007	4.50	2.85	7.09	23.1	80	9.70	5.83	16.14	25.8	149	10.09	6.59	15.42	21.5	178	8.43	6.29	11.28	14.8	0.03	3.5m	Ground Cover
Yellow duiker	2006	0.93	0.45	1.92	37.6	21	0.63	0.32	1.23	34.6	12	1.10	0.57	2.07	32.6	24	0.89	0.57	1.37	22.3	0.83	3 m	none
Yellow duiker	2007	0.91	0.52	1.57	28.2	29	0.85	0.45	1.59	32.2	23	1.09	0.63	1.91	28.5	34	0.95	0.67	1.35	17.7	0.15	3 m	none

Hunting activity and spatial distribution of hunting and wildlife hotspots

Combining the area of the Park's current hunting zones with the area that interviewed hunters reported using, I estimate that hunting occurs in at least 69% of the Park. This is an underestimate based upon interviews with hunters in only four of twenty six villages. Given the sensitive nature of hunting inside the National Park, we were unable to conduct a study on direct hunting effort by Park residents. As a substitute measure, I used hunting sign collected during the wildlife study to quantify and assign relative hunting values to each transect given that 78% of all transects contained some sign of hunting activity on them. Because new hunting sign had more relevance to the study than an older one, I weighted the value of each sign by the age that each observer gave it. For example, if the sign was fresh, it received a value of 1, recent, 0.75; old, 0.5, and very old, 0.25. The added value of all sign per transect was the value it received in the hunting intensity category. I then developed an average value per transect in each of the three strata of the study and projected hunting intensity using Kernel Density estimates in ArcGIS 9.2. Figure 32 maps these 'hotspots' of hunting distribution across the study area. As predicted, measures of hunting activity tended to be higher near villages, but it was not a perfect relationship.

I then analyzed hunting effort using a multiple regression to determine which factors were significant predictors of the amount of hunting activity on any given transect at Conkouati, and found two. First, hunting effort was significantly correlated with the presence of fruit that was in season during the surveys ($P < 0.002$, $R^2 = 0.048$). The low R^2 value most likely reflects the temporal and spatial variability of fruit abundance, as well as the diversity of other variables that influence hunter behavior. This relationship is logical given that many forest mammals are frugivorous, and thus hunters would want to focus efforts where they believed animals would be. This idea was corroborated during a participant observation with a hunter (NM, Ntie-tie 07/04). The second variable significantly influencing hunting sign presence was distance from village ($P < 0.000$

$R^2=0.088$). The results, shown in Figure 33, suggest significant differences in hunting effort within each of the study strata, corresponding with distance from village.

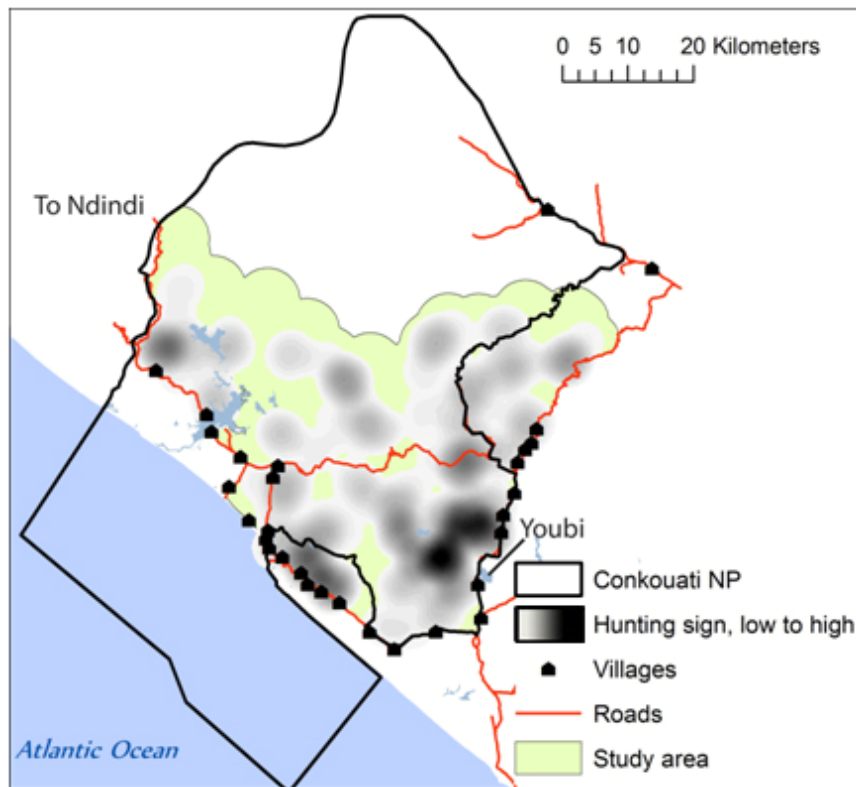


Figure 32: Hunting intensity (in shades of grey) within the study area (shaded), displaying 'hotspots' of hunting sign combined from 2006 and 2007 field seasons. Both Youbi (with oil and forestry workers) and Ndindi (district capitol in Gabon) have relatively large human populations.

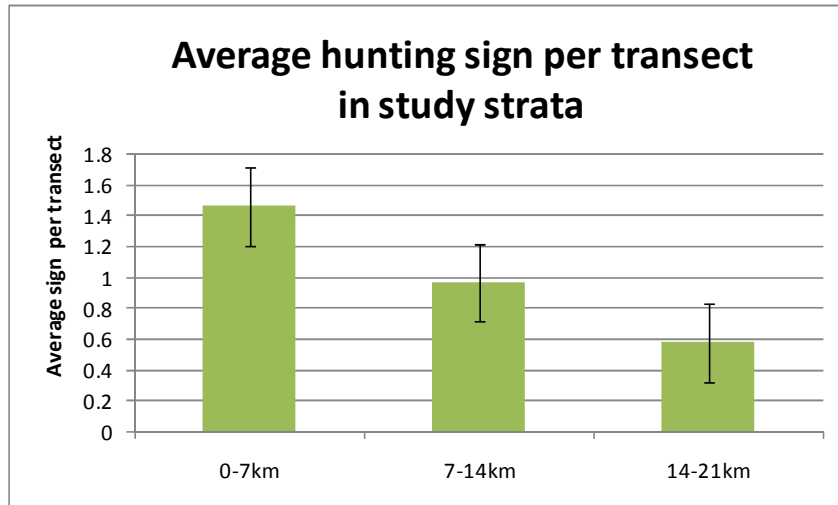


Figure 33: Average amount of hunting sign per transect as a function of distance from village. Brackets denote 95% confidence intervals.

These results provide clues as to where hunters conduct most of their activity, but they do not reveal what is being taken. Given the tensions between hunters and the Park, I was unable to directly quantify hunting offtake and determine which species are most hunted. However, Park management does quantify what their law enforcement personnel confiscate, providing an estimate of the composition of mammals taken out of the forest (Figure 34). These data demonstrate that duikers and porcupine are by far the most popularly hunted species. This composition also mirrors data on wildlife abundances that we collected along transects.

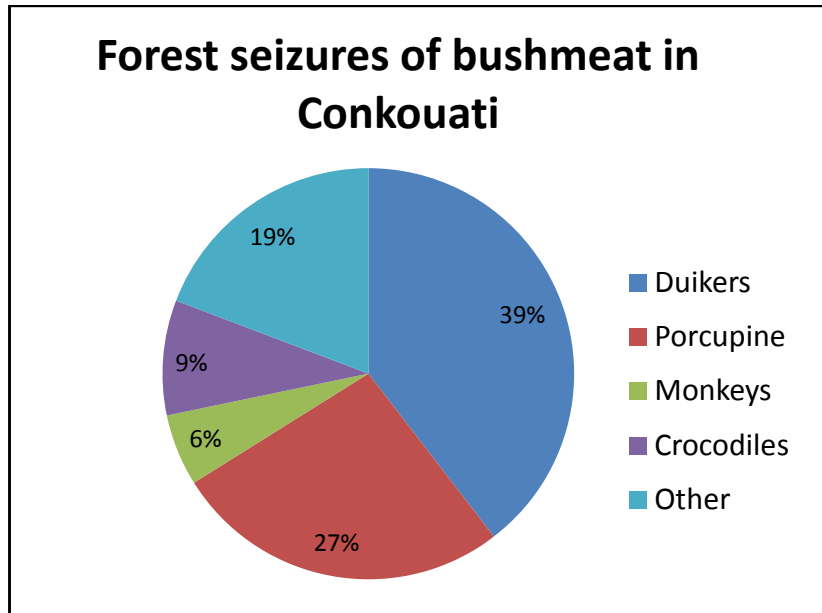


Figure 34: Most frequently hunted species in Konkouati forests as represented by direct law enforcement seizures in the forest (Data courtesy WCS-Congo and the Ministère de l’Economie Forestière). These data mirror overall sign data found along transects.

Currently there are no park-wide estimates of how many animals are hunted each year at Konkouati. Using data from the hunter survey (see Chapter 4), we developed an estimated of weekly offtake for four of the 26 villages. With 35 of 57 hunters responding, they reported harvesting a combined total of 160 animals per week, or about 4.5 animals per hunter per week (some of which they eat themselves, some they sell in the village, and the rest is sent to urban markets). Although these numbers are only estimates, they appear to be reasonable. A study conducted in three villages at Konkouati by Nguingiri (1996d) provides quantitative support for this claim. His results (Table 8) showed that three villages sent nearly 150 mammals per week to Pointe Noire. Both studies demonstrate the economic importance of wild species to communities, but also the vast quantities of animals that left the area, and represents only *three* of Konkouati’s 26 villages. In fact, pigeons and oysters are no longer sold in regional markets; overexploitation in previous past decades has reduced oyster populations to near zero and has rendered pigeons extremely rare.

Table 8: Average monthly counts of bushmeat exported from three Conkouati villages in 1995 (Adapted from Nguingiri 1996).

Blue duiker	Porcupines	Monkeys	Antelopes	Crocodiles	Pigeons	Oysters
228	209	127	27	19	658	774

What is disconcerting for wildlife conservation at Conkouati is that this value of 160 animals per week includes only 61% of hunters in only 15% of Conkouati's villages. A rough extrapolation over the entire Park puts weekly offtake at 1,700 animals [$160/(0.61 \times 0.15)$]. Even if this estimate is high, the numbers of animals being harvested per year is cause for great concern.

The density and distribution of wildlife sign varies significantly across the Park. Figure 35 shows predicted densities of selected mammals throughout the study area.

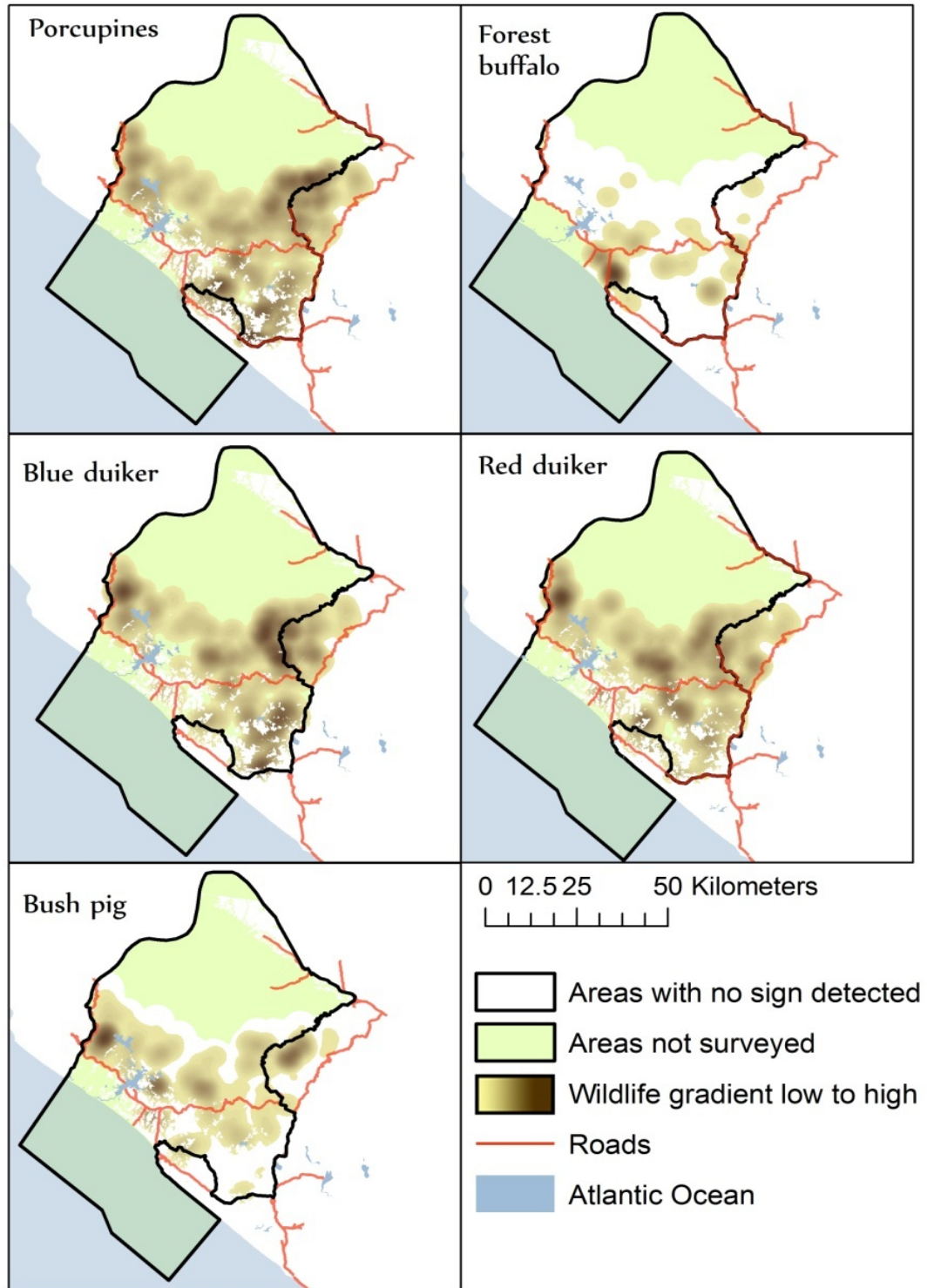


Figure 35: Kernel density estimates of spatial distribution of five different species groups based on total sign per transect. Dark shades represent abundance hotspots, whereas lightly-shaded areas have low densities. Areas in white are projected to have no sign based upon survey results.

Distributions are based upon signs along transects, then transformed within ArcGIS 9.2 using a kernel density model of nearest neighbor within five kilometers. Not all of the Park was surveyed (i.e. green areas were not surveyed), and areas inside the Park in white are where we found no trace of the particular species. These results, which only take into account sign density on transects (not habitat characteristics), suggest that common species, such as porcupines and blue duikers tend to have a more even distribution than forest buffalo and bush pig. Although this study set out to examine the relationship between wildlife and distance from road, these simple maps only vaguely demonstrate a visible gradient away from villages, suggesting that there are many additional factors that contribute to the spatial distribution of wildlife.

Discussion

Wildlife abundance

This study, which included nearly 197 kilometers of transect surveys, was an exhaustive examination of areas where villagers were known to hunt, and also areas where we did not anticipate finding much evidence of hunting. The study suggests that wildlife abundances were very low, given the lack of dung and other sign of large hunted species found along transects, including sitatunga, bush pig, and buffalo. Lawrence et al (2006b) conducted surveys in similar habitats in both hunted and unhunted areas of southern Gabon and were able to conduct density analyses on all of these species; however, we were not. At Conkouati, Maisels & Cruikshank (1996) noted that wildlife populations in the Park (then a reserve) were very low. Although we cannot directly compare their study with this one, Bitsindou (2003) who also conducted a study at Conkouati, developed a chart which compares wildlife dung abundances amongst areas of various hunting pressures. Figure 36 compares the Maisels & Cruikshanks' (1996) study of hunted versus non-hunted areas, the Bitsindou forestry concession surveys, and results from the present study. Although they do not involve the same sampling areas, all three studies used distance sampling methods. The data suggest that between 1996 and 2007:

- In heavily hunted areas, there are no significant differences between years, albeit wildlife densities are extremely low;
- In areas of medium hunting pressure, wildlife populations dropped over time;
- There are significant differences between the integrally protected area in the north in 1996 versus lightly hunted areas surveyed in 2007;
- Abundances of all three duiker groups decreased in all comparative areas

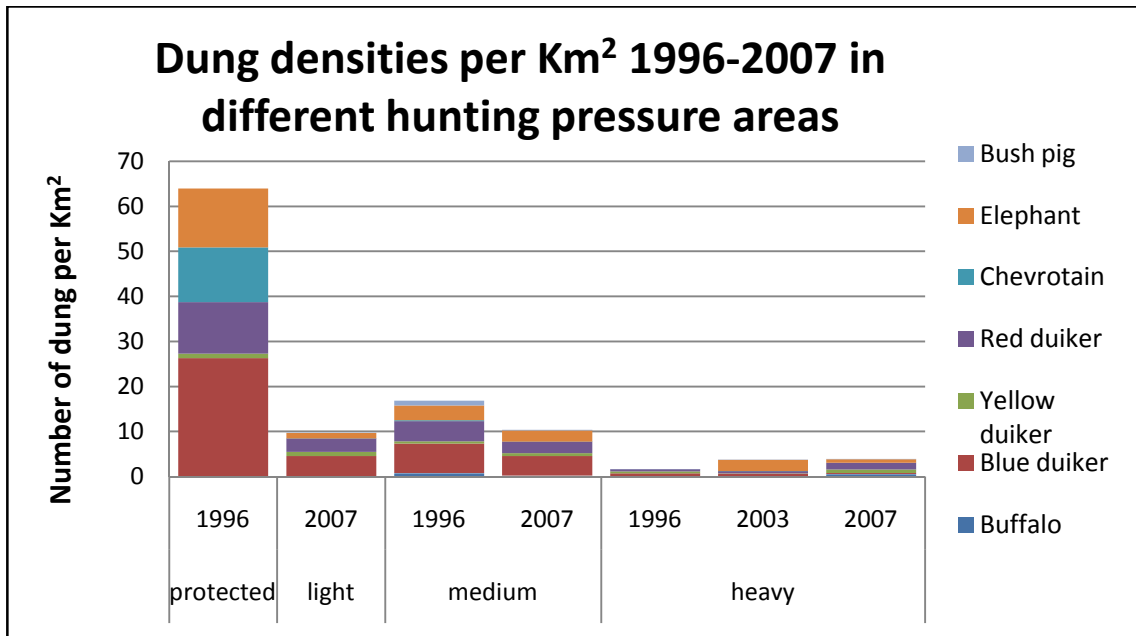


Figure 36: Comparison of dung densities of seven species in areas with different hunting pressures from studies at Konkouati, from 1996 to 2007. Data show that protected areas in the north of the Park have higher densities than areas with hunting, and dung densities of all species decreased over time in all but the most heavily hunted zones, where densities remained relatively stable. Adapted data from Bitsindou 2003.

These comparisons suggest that wildlife populations I observed in 2007 have not recovered from the very low densities that Maisels & Cruikshank (1996) observed. This is especially true for red duikers. Our data showed that relative densities of blue duikers were double that of red duikers. Although they are larger and slower-reproducing animals, it is important to reiterate that the ‘red duiker’ category is a group of four species, which indicates that their individual species populations are low. This should be cause for concern, especially as the Park data demonstrate that duikers are the most

hunted group of species in the Park. However, until dung decay rates at Conkouati can be accurately estimated, any comparisons with other protected areas should be treated with caution.

Spatial factors

In a study of wildlife populations, determining why animals are found where they are is critical for successful management. Although hunting and human habitation are significant determinants for four of the five hunted mammals we focused on, this study did not examine all factors which may cause variation in spatial distributions. These include the aforementioned anthropomorphic factors and ecological factors such as savanna location (buffalo), specific fruit availability, and forest fragmentation caused by natural savanna breaks. Spatial mapping allowed us to visualize the low and fragmented populations of bush pig and buffalo, suggesting they may be overhunted. It also clearly showed how red duiker populations reflected hunting pressures with a clear ‘hotspot’ furthest away from villages. Porcupine densities, portrayed in Figure 35, seemed to relate most strongly to current and former logging concessions (Laurance et al. 2008), but this hypothesis should be investigated further.

Bushmeat is an important commodity in the local economy, and Conkouati has served for decades as one of Pointe Noire’s most important sources for wild meat. This bushmeat trade supports not only hunters, but different sectors of the rural economy. But hunting for this trade also negatively impacts wildlife populations. The wildlife survey demonstrates hunting signs are significantly correlated with proximity to village. Spatial mapping pinpoints hunting hotspots (Figure 32), including one hotspot close to Ndindi, a Gabonese town and another near Youbi, a large village which, at the time of the study, was the base for a small logging company and an oil company. These close markets entice hunters, as their cost-benefit ratio is lower when there is a ready-market in or nearby the village, but are clearly part of a larger bushmeat market.

Conservation Implications

Conkouati National Park is an ideal place to conduct research on heavily hunted species. The human communities inside the Park depend on wildlife species for daily consumption, to fulfill social roles, and for economic livelihoods. Given the economic value of bushmeat for humans, the role of Park management in regulating animal offtake is challenging, and they themselves admit that people are their biggest threat (Interview with G. Bonassidi, Park Conservator, 3/29/2006). The intent of this chapter is not to criminalize hunters; none of them wanted their homes or their hunting grounds to be taken over by the government; indeed these were clan lands that were taken over by the Congolese state. Nor is it to chide conservationists (both international and Congolese) for pinpointing humans as the major threat to biodiversity conservation at the Park. The question is, can a national park accommodate both human livelihoods and conservation in a region where wildlife is highly commoditized?

The Park faces challenges in maintaining long-term ecological integrity and species conservation. This study provided intense transect coverage, yet there were insufficient data collected on many hunted terrestrial species (other than duiker) to be able to estimate relative abundance using the program Distance. The reduction in many wildlife populations over the past 10 years challenges the paradigm of human-wildlife coexistence within a protected area, especially where the wildlife propels rural economies. Although this paradigm requires some system of controls on hunting, demands by hunters seemingly exceed what the Park's resources can handle. Park management plans to introduce a new, simplified zoning system to reduce conflicts. Yet, the core integrally protected zones of the Park continue to be subjected to high hunting pressures and are surrounded by human-induced wildlife population sinks. Given this, the ecological integrity of the Park is questionable.

Despite the low densities of duikers and the insufficient data for other species, the outlook is hopeful. Research at Conkouati needs to continue to monitor these

populations, but also: examine the factors which influence spatial heterogeneity; develop locally specific dung decay rates; and also attempt to calculate species-specific offtake levels. Declining dung densities from 1996 to 2007 suggest that current offtake is not sustainable, and thus Park management needs to consider at what level hunters can use wildlife inside the Park. Small increases in both red and blue duiker populations between 2006 and 2007 suggest that management activities at Conkouati may have a positive influence, but these trends need to be monitored for several more years. The data suggest that blue duikers and perhaps brush-tailed porcupine populations (both r-selected, quick reproducing species) are faring better than other species. One potential mitigation solution could be to develop a legal hunting system on these two species. Given the data suggesting that these two species respond positively to fruit abundance, the Park should encourage villagers to protect native fruiting trees in the agricultural matrix around villages to increase wildlife food availability and thereby encourage wildlife production in heavily hunted zones. New thinking about providing tradable hunting permits should also be considered in order to legalize hunting of more common species. If the Government of Congo's policy of human-wildlife coexistence in the National Park is to remain in place, more research, active engagement with communities, and innovative actions need to happen to increase the Park's wildlife populations around villages.

Chapter 4

Imposing wildlife values on village stakeholders: The contrary impacts of bushmeat law enforcement

Abstract

In many places unsustainable hunting of wildlife for livelihoods and food is a more immediate threat to many animal species in protected areas than is habitat loss. Demand by urban consumers can be an important driver of this unsustainable harvest by rural hunters. Enforcing wildlife laws and zoning regulations in and around protected areas is one approach to reducing bushmeat trade to sustainable levels. Results of a hunter survey in the Republic of Congo show that wildlife law enforcement adversely affects the livelihoods of rural families by reducing income, increasing labor demands on women and children, and reducing access to social services such as hospitals and schooling. In terms of conservation, law enforcement appears effective in the short-term at reducing hunting and bushmeat trafficking. But, it may also weaken prospects for conservation in the long-term because it increases local residents' animosity towards conservation initiatives, organizations, and personnel. Law enforcement remains a critical tool for the protection of endangered and threatened species. To reduce the negative effects of this conservation strategy, conservationists should take additional steps to enhance dialogue with local communities and other government entities, as well as cultivate partnerships with organizations to develop alternative economic activities for those who bear the costs of conservation.

Introduction

Wildlife in forests provides a range of ecological and social values for various groups including conservationists, governments, tour operators and their clients, and urban and rural people. These values are often contradictory; achieving one may preclude attaining another. For example, unsustainable harvesting of wildlife as a short-term income source for some is likely to reduce long-term access to wildlife as food for others. Many studies have examined the negative ecological consequences of the bushmeat trade (Blom et al. 2004; de Thoisy et al. 2005; Fa et al. 2005; Jerozolinski & Peres 2003; Laurance et al. 2006b; Newing 2001; Noss 1998; Peres & Nascimento 2006). Others have explored

relationships among bushmeat consumption, livelihoods,¹⁴⁰ and preferences (Bowen-Jones et al. 2003; de Merode & Cowlshaw 2006; de Merode et al. 2004; East et al. 2005; Fa et al. 2003; Hill 2002; Kaltenborn et al. 2005; Nielsen 2006; Refisch & Kone 2005; Wilkie et al. 2005). Other studies focus more on improving household income, and raising awareness of the trade (Laurance et al. 2006a; Milner-Gulland & Bennett 2003; Wilkie & Godoy 2001; LeBreton et al. 2006). Finally, several authors suggest managing unsustainable bushmeat hunting through a combination of law enforcement, price manipulation, and protein substitutes (Nielsen 2006; Wato et al. 2006; Wilkie & Carpenter 1999b; Wilkie & Godoy 2001; Wilkie et al. 2005).

Law enforcement is an essential component of conservation projects (Fischer 2008; Keane et al. 2008), and several studies have examined its effectiveness (Bulte & Van Kooten 2001; Hilborn et al. 2006; Holmern et al. 2007; Jachmann 2008a; Milner-Gulland & Leader-Williams 1992; Rowcliffe et al. 2004). The implementation of law enforcement is extremely challenging, due to budgetary constraints, corruption, weak penalties, and incessant demands for wildlife products (Bulte & Van Kooten 2001; Jachmann 2008b; Keane et al. 2008; Milner-Gulland & Leader-Williams 1992). Although the demand for wild meats is usually from outside the Park, the target of wildlife law enforcement is most often local hunters or recent immigrants, who depend on bushmeat for their food and income. The broad impacts of conservation on local communities are often negative (Child 2004; Ghimire & Pimbert 1997; Neumann 1998; West et al. 2006; Wilshusen 2002), but few studies have examined the impacts of law enforcement on people. One such study is Giles-Vernick's work (2002) in Dzanga-Sangha, Central African Republic, which shows how conservation interventions and restrictions on hunting disrupted local peoples' practices and brought about a sense of deprivation and loss within the community. Thus despite its effectiveness, more studies are needed on the economic and social burdens law enforcement puts on rural peoples.

¹⁴⁰ The concept of livelihood is best described by Robert Chambers and Gordon Conway as: 'the capabilities, assets (including both material and social resources) and activities required for a means of living' (cited in Carney 1998:4).

Context

Situated in southern Congo, Conkouati National Park is an ideal location to study wildlife law enforcement on a variety of levels. It is Congo's most diverse protected area, harboring not only a diversity of large mammals, but also 5500 residents who live in or immediately adjacent to the border of the Park and directly depend on its resources for their livelihoods. Although wildlife plays a role in local consumption (see Chapter 2), the urban bushmeat market and its network of traders from the city have provided villagers around the Park with a significant source of income (Nguingui 1996d; Paris 1996c). Its proximity to Pointe Noire, a major urban center (750,000 inhabitants), has historically made Conkouati a top provider for the city's bushmeat demands (Agnagna 2003; Doumenge 1992; Wilson & Wilson 1991). Thus, to reduce the loss of wildlife at Conkouati, Park management developed a comprehensive anti-poaching strategy in 2004,¹⁴¹ which included forest patrols and the construction of bushmeat control posts in order to fully to implement wildlife laws that have rarely been enforced throughout Congo's history.

This paper uses results from a hunter survey and qualitative semi-structured interviews conducted from 2005-2007 to examine how law enforcement influences wildlife conservation and local livelihoods. The objectives were to: 1) broadly describe a two-pronged approach to law enforcement at Conkouati; 2) quantify how it has impacted hunting behavior; and 3) examine the social, economic, and conservation implications of the law enforcement activities.

Methods

I collected both qualitative and quantitative data from four target sources within and adjacent to the Conkouati-Douli National Park (Figure 37) between 2005 and 2007. First, I used unpublished law-enforcement monitoring information from the Park's management team—the Government of Congo's Ministry of Forestry Economy (MEF)

¹⁴¹ Law enforcement activities began in late 2000 (WCS (2001) and G. Bonassidi, Park Conservator, pers. comm.).

and the Wildlife Conservation Society (WCS), including ecoguard patrol geo-referenced tracks and seizures to assess law enforcement effort and trends in bushmeat confiscation. Secondly, we extracted quantitative, socio-economic data on resource use from Doumenge (1992) and Paris (1996) to provide insight into human population trends and revenue obtained from bushmeat hunting as compared to other village activities.

The second two methods involved data collection with residents in four selected villages representing hunting (Kilometer 4, hereby known as Km4), fishing (Kondi) and (two) mixed hunting-fishing villages (Mpella and Sialivakou, hereby combined as the mixed village Mpella) (Figure 37). These villages represent the range of livelihood strategies

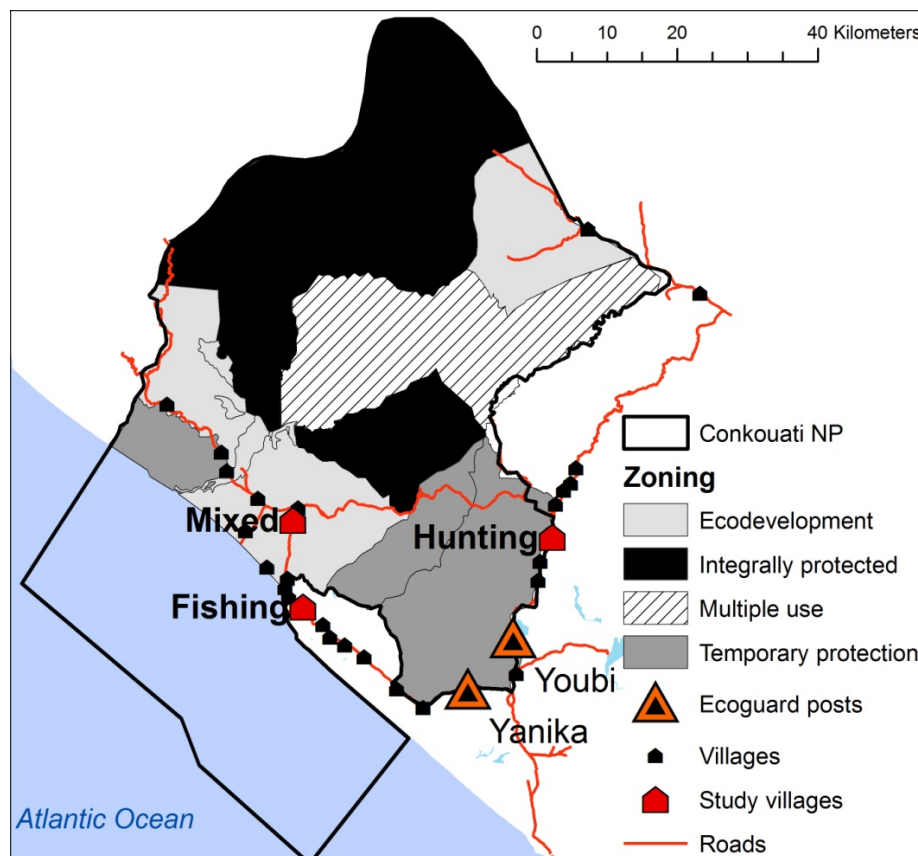


Figure 37: Map of Conkouati-Douli National Park, highlighting study villages (by village type), law enforcement guard posts, and the four major zones of the Park. Hunting is only allowed in the Ecodevelopment and Temporary protection zones.

and constraints typical of villages in or adjacent to Conkouati. I first conducted

qualitative research in villages, visiting each for at least two months during which their history, perceptions about the environment, livelihoods, and consumption patterns were documented. This totaled 91 semi-structured interviews as well as 47 participant observations, where I accompanied villagers on their daily activities such as hunting, agriculture, and fishing. Interviews focused on daily life, oral histories, resource use activities, and outside influences on local people. These interviews provided insights into how Park activities have affected daily life, social relations in the village, livelihoods and general attitudes towards the Park and conservation. Lastly I conducted a semi-structured questionnaire targeted towards hunters in the same study villages. The survey consisted of 39 questions regarding hunting practices, changes in these practices, and the impacts of law enforcement at Conkouati on hunter livelihoods (See Appendix 4.1 for the questionnaire). Of 57 available hunters in the three villages, 39 accepted to be interviewed (68% response rate). These four methods provide both qualitative and quantitative lenses to examine law enforcement and its impacts on wildlife and livelihoods in Conkouati-Douli National Park.

Results

Law enforcement activities

Serious law enforcement began in the Conkouati region long after the Government of Congo considered Conkouati an important wildlife area (Table 9). Although being designated as a faunal reserve in 1980, the Government of Congo had insufficient funds to control wildlife use. This lack of regulation continued during an IUCN GEF¹⁴² project; although they had ‘ecoguards’, these men more resembled wildlife educators than enforcers (as they had no weapons to enforce laws).¹⁴³ Thus during this time period, bushmeat trafficking to Pointe Noire continued without repercussion. Despite the creation of the Park in 1999 with its various management zones (see Figure 37), serious

¹⁴² IUCN is the World Conservation Union, who managed a Global Environment Fund (GEF) project at Conkouati from 1994-1999 with funding of \$2,475,837 (World Bank 2000). The goal was to set up a community reserve in which resources were to be managed locally.

¹⁴³ G. Tchitiamouna, research assistant, pers. comm.

shortages in law enforcement remained because of the lack of resources allocated to the Park. This changed with a new funding source provided by the Wildlife Conservation Society (WCS) in 2004 to increase research, community initiatives, and law enforcement.

Hunting for local consumption of bushmeat is legal in the ‘ecodevelopment’ (or hunting) zone (Figure 37), provided that there is no snare hunting and guns are legally registered.

Table 9: Major events impacting wildlife populations and protected area management at Conkouati.

Year	Event
1960	After independence, bushmeat trafficking accelerates
1980	Conkouati Faunal Reserve created
1989	Part of Conkouati declassified to permit logging
1994	IUCN's Global Environment Fund conservation project initiated at Conkouati
1999	IUCN leaves Conkouati; Conkouati-Douli National Park created
2000	MEFE-WCS begins low-level management activities
2004	MEFE-WCS begins major management activities, including forest patrols; Yanika control post constructed late in the year
2005	Youbi control post constructed late in the year
2006	2000 gold miners kicked out with military help
2006	Timber concession re-opened in the Park; Oil exploration begins, 500 workers installed in Park

Hunting in the integrally protected and logging zones is illegal, as well as the transport of bushmeat beyond the confines of the villages in and around the Park. To curb what the management team saw as rampant and illegal hunting practices, MEF, in collaboration with WCS, trained four

teams (twenty-two ecoguards) to patrol within the Park. Ecoguards were authorized to seize any bushmeat, weapons, and materials used for hunting during encounters if hunters were not following wildlife laws (which nearly all do not). During the first year (2004), ecoguard patrols seized more than 20,000 snares on 100 forest missions (H. Vanleuwe, WCS-Conkouati project director, pers.comm.). These forest patrols continue today (Figure 38), and are a major component of overall law enforcement strategy at the Park.

Determining that patrols alone were insufficient to curb the high volume of bushmeat traffic to Pointe Noire, Park management established two checkpoints to curb illegal exports of bushmeat from the Park. These two posts were constructed as road blocks, built inside the buffer zone and under the jurisdiction of the MEF. Park management established these posts at strategic points along two key roads (the only roads) in order to

stop all vehicle traffic in the region destined for Pointe Noire. Ecoguards stopped and searched vehicles that passed on these roads for bushmeat. Any bushmeat found was confiscated and burned, and traffickers given a statement of offence (*procès verbal*).

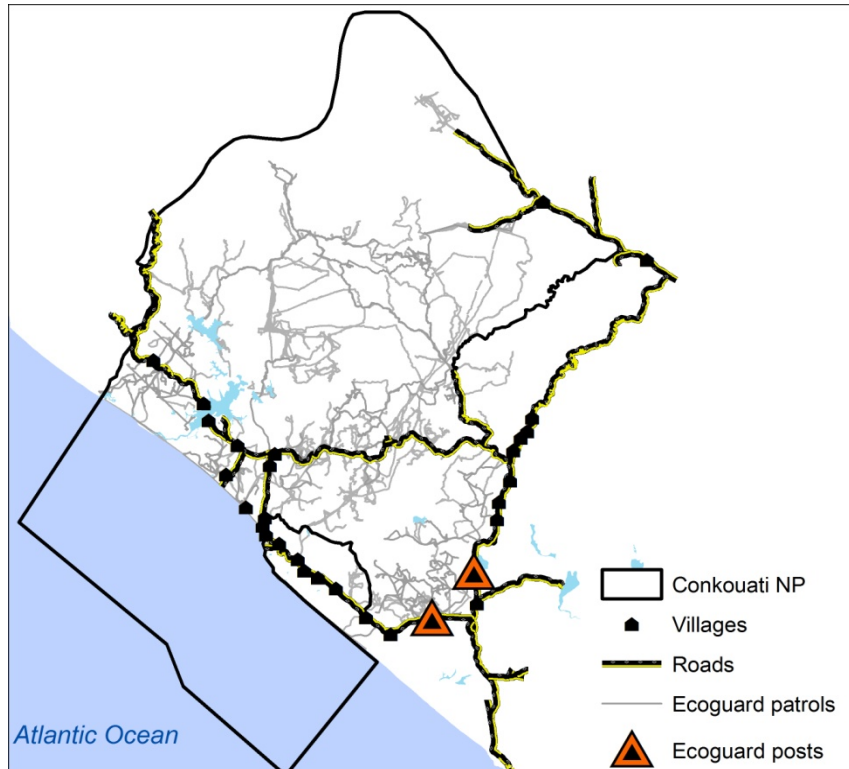


Figure 38: GPS tracks of law enforcement patrols at Conkouati from 2005-2007. Park management concentrated efforts around the posts, as well as what they perceived as high-poaching areas in the center of the Park.

In 2004 a guard post was established at Yanika (seen in Figure 37) on the southern road that runs east-west and connects villages primarily reliant on fishing and mixed hunting/fishing. One year later, MEF and WCS established the second post at Youbi on the road that runs south-north on the eastern edge of the Park and harbors hunting villages. As is shown in Figure 39, ecoguards at the first control post of Yanika confiscated hundreds of animals on the western half of the Park. On the eastern half, Youbi bushmeat seizures were much higher, in the thousands per year. These higher numbers may be caused by three factors. First, the hunting, or eastern axis of the Park has better roads due to logging, which facilitates access to Pointe Noire. Second, the logging in the area creates more jobs and, in general, more economic activity (including

hunting), and thus higher traffic volumes. Finally, there is some effect coming from outside, as logging trucks and private vehicles from the Niari region of Congo use the road, which borders the Park, to reach Pointe Noire, so not all confiscated carcasses come from Conkouati. Park management recently examined their confiscations at Youbi post and determined for the first half of 2008 (data not shown), 80% of bushmeat confiscations originate outside of the jurisdiction of the Park (H. Vanleeuwe, pers. comm.)

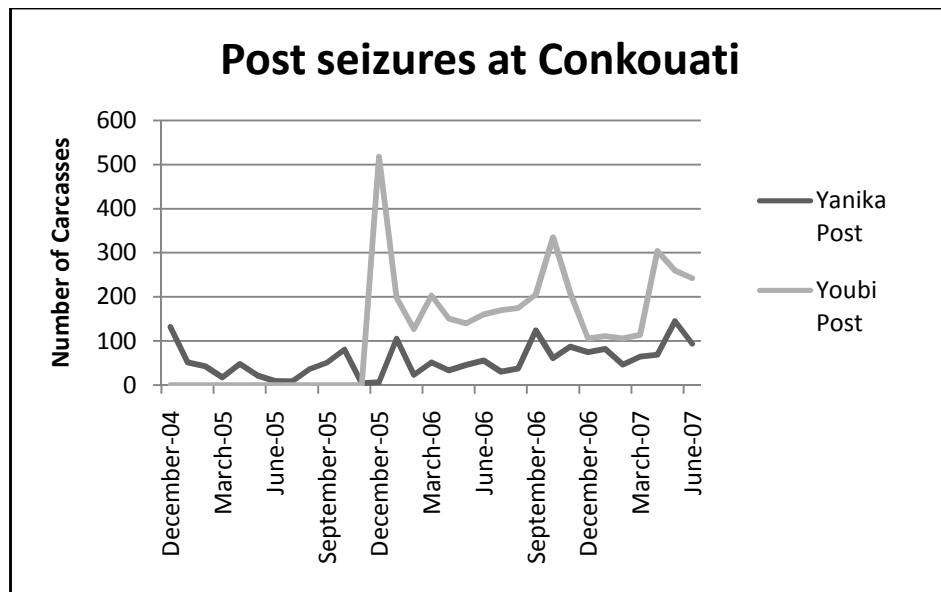


Figure 39: Timeline series of seizures at Control Posts. Yanika post was established first, and is located in the zone where both hunting and fishing are important economic activities. Youbi post, established in December 2005, is situated in a zone where there is no fishing, and hunting is a major source of revenue for local people. Youbi data also includes bushmeat seized from vehicles with origins outside the Park, and thus spikes in data may represent large seizures from unexpected traffickers. Raw data courtesy of WCS-Congo and MEF.

The bushmeat seized by ecoguards represents a range of species, including mammals, birds, and reptiles. Figure 40 shows this composition and the numbers of carcasses seized from 2005 through mid-2007. Duikers (6 different species) made up nearly half of those animals, with brush-tailed porcupine totaling nearly 30%.

These activities demonstrate a two-pronged approach to law enforcement at Conkouati. Ecoguard patrols in the forest intercept actively-hunting poachers, seizing bushmeat and

equipment. The two posts along the road target bushmeat commerce and networks, seizing bushmeat on its way to Pointe Noire.

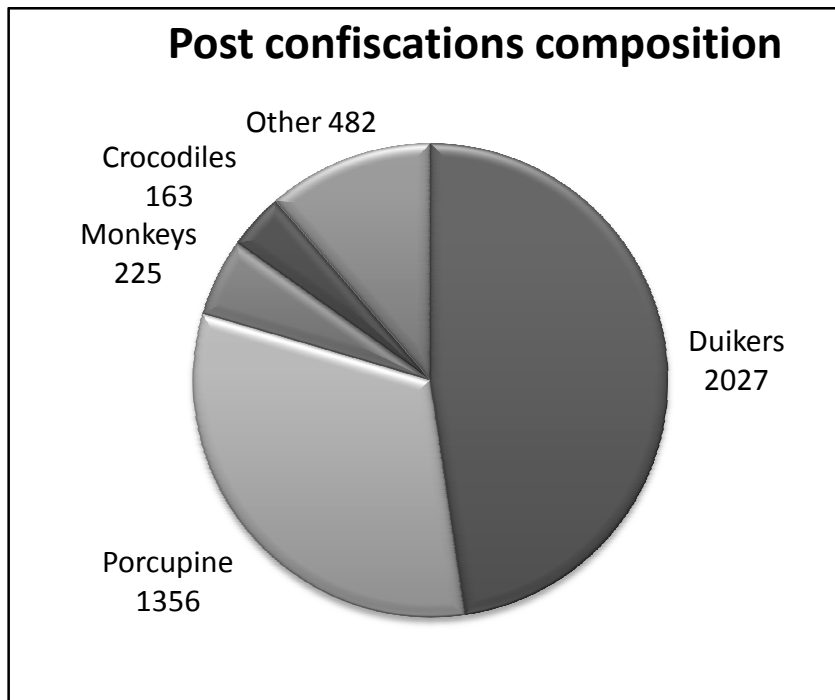


Figure 40: Composition and numbers of bushmeat seizures at Yanika and Youbi posts in Conkouati from 2005-2007. Data courtesy of MEF & WCS-Congo.

Positive and negative impacts of law enforcement on conservation

No quantitative evidence exists to demonstrate that wildlife populations have benefitted from intensified law enforcement. Nevertheless, anecdotal observations from local hunters and Park officials, as well as personal observations and preliminary ecological survey data suggest an increase in wildlife populations. Our survey of hunters reveals that 42% of hunters report seeing more animals since law enforcement activities started in 2004. Law enforcement data in 2008 report more duiker confiscations, suggesting to Park management that duiker populations are increasing (H. Vanleeuwe, pers.comm.). Two long-term monitoring surveys were established, one in 2005 (elephants and great apes) and the other in 2006 (hunted mammals) to examine wildlife population trends and determine densities of hunted mammal populations across the Park. Although the hunted

mammal survey suggests a 13% increase of blue duiker densities, and a 28% increase in red duiker densities across the Park from 2006 and 2007, two years of data are not sufficient to determine long-term trends that can be attributed to law enforcement activity.

Changes in hunting practices

Although Park management cannot yet determine wildlife population trends, one can gauge trends in hunting practices by drawing upon data from hunters, including six group and four individual mapping exercises as well as interviews with hunters. Although there have been a significant number of seizures (see Figure 39), available data do not show a significant decline in those seizures following the initial installation of the control posts. Hence, it appears that the control posts may economically harm both hunters and buyers, but they do not seem to have reduced overall poaching levels. The bushmeat seizure data does not reveal the intricate and complicated story between law enforcement and hunting; however, results from the survey illuminate how the two law enforcement strategies influenced hunting behavior overall.¹⁴⁴

The clearest example of how these law enforcement strategies reduce hunting is demonstrated in Figure 41, which illustrates a decline in hunting offtake from our study areas before ecoguard activity in 2004, and at the time of the survey in 2007. Hunters across all three village areas independently reported statistically significant decreases in offtake, averaging 72% fewer animals than before law enforcement.¹⁴⁵ Secondly, not only do men claim that they are hunting less, but 75% of them indicate that they are hunting closer to their villages. Ninety percent of our respondents (n=38) said that forest

¹⁴⁴ It could be that some hunters are now taking more, while others are poaching less; and those hunters who chose to participate in the surveys were overall more likely to be hunting less (whereas those who declined the surveys were more likely to be increasing their poaching).

¹⁴⁵ Although this data relies upon interviewees willingness to respond truthfully, we strongly believe that this data is robust for three reasons. First, hunters in all three villages site similar trends in hunting behavior even though the villages are distant and collaboration between hunters on responses is unlikely. Second, we had a history of working in the villages and developed individual relationships with hunters, which fostered trust and openness in their responses. Third, interviews were conducted by my research assistant Tchitiamouna, who as a former poacher and gold miner was in a position to attest to the veracity of responses.

patrols were a strong dissuasion to hunting and as a result they indicated that they hunt less because of that law enforcement strategy. Figure 43, developed from four single and six group mapping exercises, demonstrates areas that individual hunters in our study villages have abandoned because of patrolling efforts conducted by the Park. However, the abandonment of certain areas by individuals does not mean these areas are not frequented by others.

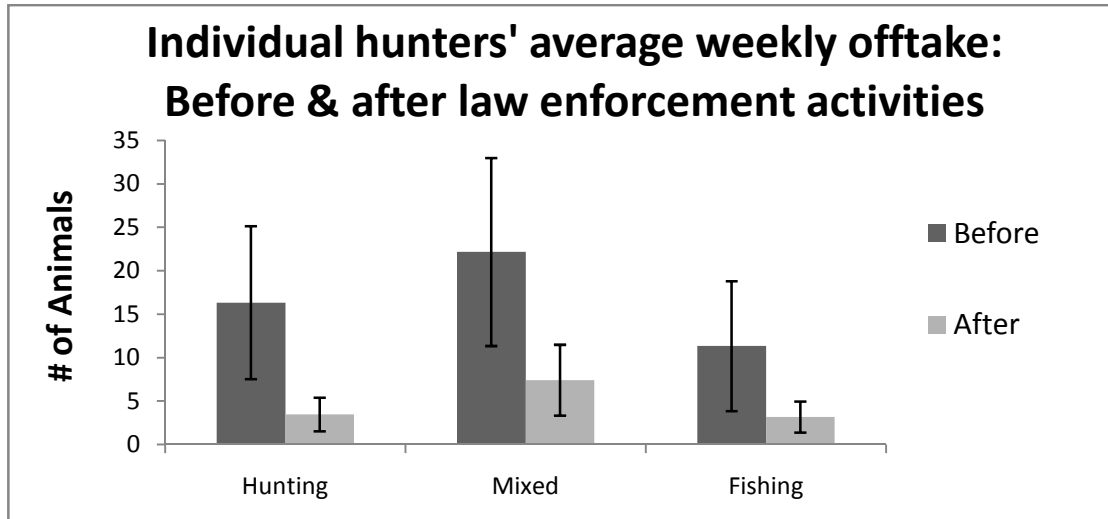


Figure 41: Hunter estimates of the change in hunting offtake in three villages of different livelihood strategies after law enforcement activities. The significant decline in the average number of animals decreased proportionally across all three village types ($p < 0.000$; $p < 0.000$; $p < 0.024$, respectively).

Finally, perhaps the most persuasive evidence of law enforcement's effects in the region, bushmeat trafficking has substantially changed at Conkouati since the upswing in law enforcement activities in 2004. Several of the 'professional' hunters (usually migrants who came to exploit the area's richness) have left the villages to seek their fortunes elsewhere,¹⁴⁶ and many of the local hunters have switched to alternative activities such as agriculture and fishing (see below). Thirty-one of thirty-nine respondents (79%) stated that the barriers strongly discourage trafficking, as 94% said that bushmeat hidden on public transport would be seized. The result has been that whereas in the past hunters sent 80% of their product to Pointe Noire, today this figure is now less than 20% in most villages (see Figure 43).

¹⁴⁶ Interview with HR, Km4, 3/16/2007

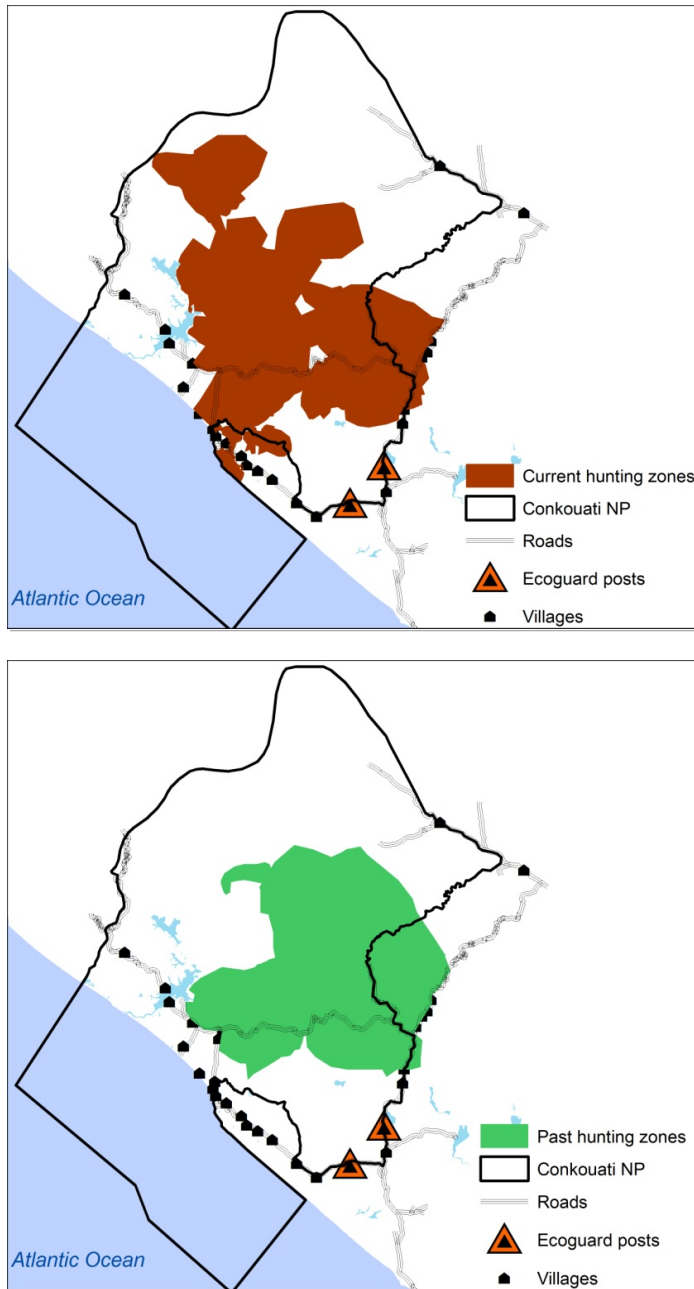


Figure 42: Comparison of currently-hunted areas (above) with those abandoned (below) by individual respondents after law enforcement activities began in the forest during 10 mapping exercises. Note that these data come from specific hunters, thus areas abandoned by some are not necessarily abandoned by others, nor are all hunting areas accessed by all hunters. These data represent information collected from hunters in our study, not all of Conkouati’s 26 villages, and give insight into the extent to which hunting dominates much of the Park.

The posts have effectively stopped bushmeat traders from operating in the area, and as a result, bushmeat trafficking must be done by hunters themselves (rather than outside traders), often on foot, thereby reducing the numbers of animals they can send to urban markets. The traders and hunters had a complex relationship, which one respondent described as the patron-client affiliation, where the trader (patron) provided many goods to the hunter (client). Traders brought shotgun shells, hunting supplies, food, and of course, money into the villages. In exchange, traders had strong and consistent access to bushmeat provided by hunters. Not only did the trader provide the hunter with a stream of income, s/he offered a level of insurance for the hunter in times of

need by giving cash advances. This safety net and stream of supplies and income allowed hunters to focus on taking wildlife rather than spending precious days on the road to reach urban markets to sell their meat.

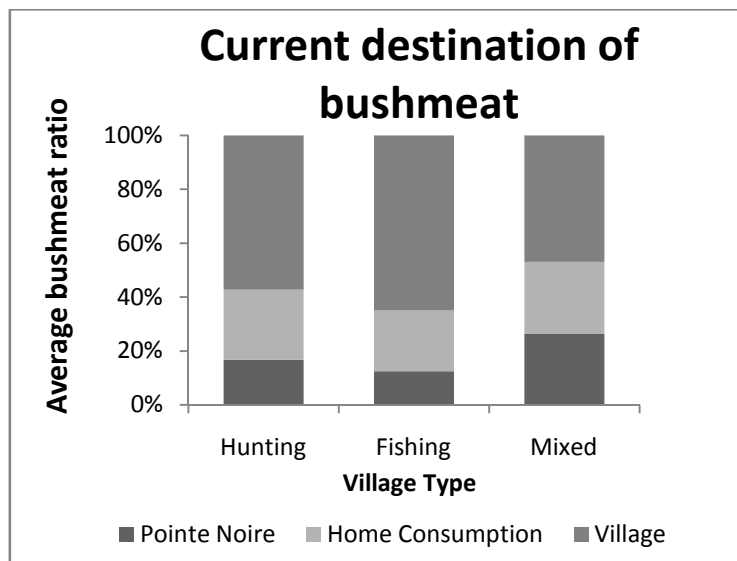


Figure 43: Bushmeat trafficking after control posts were established. Most hunters report they sell a majority of their bushmeat in the villages rather than to Pointe Noire, contrasted with the 80% which they reported sending to the urban markets in the past.

Increased pressure on fish resources

Although the law enforcement efforts at Conkouati seek to increase wildlife populations, they appear to also have unintended environmental consequences. Surveyed hunters state that ecoguard controls have, to some extent, resulted in a switch to other types of exploitation, including fishing and agriculture. Although there are no exact figures of how many hunters at Conkouati have switched livelihoods as a result of law enforcement efforts, seven of the ten interviewed hunters in the fishing and mixed villages responded that they now engage in alternative activities, mostly fishing. The effects of this increased pressure on fisheries at Conkouati are not currently known, but given that this study includes only one of the five mixed villages who fish in the lagoons, this trend warrants increased attention from Park management authorities (see below). According to fisherman, effort for freshwater shrimp fishing in the Noubi River has increased tenfold over the past 20 years, by some estimates, with hunters in Mpella increasing their

efforts to fish and shrimp in the past few years.¹⁴⁷ They report that catches in shrimp, as well as both freshwater and marine fisheries, have decreased dramatically over the past years.¹⁴⁸ This decline over two decades appears similar to that of wildlife, as fish were also transformed into a highly commercialized commodity, even more so since 2004. Fishing still remains a lucrative practice for many households, so sustainability is clearly an issue for Conkouati's fish populations as well as its wildlife.

WCS is conducting research on fish populations in the lagoons because of the concern of overfishing (the oyster populations in the lagoon crashed several years ago and have yet to recover). It is clear from qualitative interviews that research is also critically needed for both shrimp populations in the Noubi River and the shrimping dynamics within the Noubi. Many hunters from Mpella catch shrimp on this river, and as their revenues from hunting decline, one way they make this up is through increasing effort on the Noubi; it is reported that many men have between 200-300 shrimp traps on the river at one time.¹⁴⁹ Knowing how many men use this river, the number of cages each person has, and their catch rate would be very valuable for conservation of this important aquatic resource and habitat.

Declining support for conservation

The enforcement of Congolese hunting and anti-trafficking laws has led to increasing antipathy and conflict between people and the Park. Villagers invoke 'the Park' to personify the group of people and policies which affect them, encompassing Park management (MEF and WCS), ecoguards, Congolese wildlife laws, and the spatial extent of the Park. The relationship between the two groups has been tenuous since the Conkouati Faunal Reserve was created in 1980, and the situation has been exacerbated in

¹⁴⁷ However, some fishermen note that the pressure on shrimp was decreased by BGP (an oil exploration sub-contractor operating in the Park) in late 2006 when they took 10 hunter/fishermen to work on their teams. Because each person has about 200 cages, an estimated 2000 cages were taken off the waters, reducing pressure on the shrimp population.

¹⁴⁸ According to several fishermen (Group interview, Mpella, 4/29/2006) shrimp populations began declining in the early 1980s; not necessarily due to overfishing but 'nocturnal [witchcraft] practices' by some fishermen.

¹⁴⁹ Interview with ZT, Noubi

recent years as law enforcement efforts have increased (WCS-Congo 2001). Chatelain (1996) describes the difficulties the IUCN project faced during the installation of their project in 1994. The political climate around Conkouati, with a weak government presence in the area (including the sectors of agriculture, forestry/wildlife, and often times civil government), caused many challenges for IUCN. Residents saw the arrival of IUCN as a threat to their livelihoods, as people assumed the project was there not only to stop hunting and fishing, but also to eventually throw people out of their homes (ibid). As a result, there was destruction of project property, barricades, and even death threats against some members of the project as well as local supporters. Although Chatelain reports the IUCN project eventually saw a positive improvement in attitudes and a reduction in hostility, tensions remained. These conflicts continued after Conkouati became a National Park in 1999 and MEF/WCS co-managed the protected area (WCS-Congo 2001, 2002).

Conflict with 'the Park'

These sentiments have lingered, and have arguably intensified between 2004 and 2007. Examples include the WCS project director being threatened during a meeting in one of the villages in 2006, as well as a few occasions from the villagers where people talk openly about starting “wars” with the Park to force the government to leave the area.

We are coming out of a large war, not even 4 years, or 10 years ago. It's another war that they [the Park] are provoking. Be sure and certain, there will be a war that is already preparing itself, because we are fed up with those who have come here [the Park]. For us, the elderly, we are finished but for those young, [there is] no work; they have families, they keep going to maintain them. They must resort to that forest there that today, they [the Park] have taken...that's the beginning of the war! All those who go there [the Park], we don't hope for a success, but it's a defeat that will arrive soon!¹⁵⁰

There will be a war that starts here because they [the government] had a bad policy for implementing the Park. They came here to put the Park even inside our homes! It shouldn't be like that; they must agree with the population for placing the Park 50-60km away from human habitation. They brought the Park where there are people, to our sacred sites, and to our territories...almost all of

¹⁵⁰ Group interview, Km4, 6/20/2006

the territories are occupied. [If they continue] everyone will arise, and there will be no more of this business of the Park.¹⁵¹

The Park as an impediment

Outside of those who talk about war, most villagers interviewed spoke negatively about the Park, regardless of the economic activities that they pursue. For example, villagers complain primarily that law enforcement (the Park) has severely disrupted their livelihoods while doing nothing to provide alternative ways of making a living:

The Park has come to kills us. We no longer live well. Everything has become complicated...The people themselves cope through natural resources...We try to take one or two animals because young people, people, men in a word, are out of work. They don't have employment and when you try a little to get by using natural resources, you come to the [main] road. They [the Park] take it [bushmeat] from you. When it comes to the Park, no activities can be brought inside the Park. But the government itself brings in activities into the Park [oil and timber exploration], but the population doesn't have the right to do activities in the Park. And the Park supports that. Thus, the Park doesn't provide us any service.¹⁵²

The environment really hasn't changed...there isn't a serious change, but the environment has changed us; it's money that's lacking. Employment is lacking. Even if a child finished his studies, he will always be stuck as an unemployed peasant. It's doubtful he'll find employment. He will always find himself in the village and found always doing the same activities because the Park arrived in the entire area. There will be no more companies [extraction, thus employment]. There is unemployment that has already touched me, and is growing. The Park came along to make the situation worse. The situation is very alarming now. No company can ever come here; it's the thing that worries people the most—employment, unemployment, overall...money—the key to life.¹⁵³

We will not have a good collaboration with the Park because they don't bring a good life. People must find something [a living] with their own two hands. Now that the Park has come to block our work, we aren't able to develop. Now we're supposed to get along with the Park. How? A company even tried to come here just recently, and the Park again blocked it....¹⁵⁴

¹⁵¹ Interview with GC, Km4, 6/14/2006

¹⁵² Group interview, Kondi, 12/5/05

¹⁵³ Group interview, Sialivakou, 5/8/2006

¹⁵⁴ Interview with F, Mpella, 4/29/2006

The perception of economic loss for the benefit of conservation is pervasive amongst all villages, including those we classified as fishing villages (where there are very few hunters affected by law enforcement). In Conkouati, villages are connected to each other by both kinship and weak economic ties, and thus conservation strategies that impact one, affect all. Whether farmers, fishers, or hunters, villagers universally blame law enforcement activities (the 'Park') for the loss of access to social services, the loss of freedom, and the loss of the 'good life' during good economic times.

Conservation values diminished

Law enforcement activities have diminished the support of local populations. Villagers refused to cooperate with many conservation activities,¹⁵⁵ even if they agreed in principle with conservation.

We had too many hunters. We killed a lot, thus the Park is right to stop us hunting animals. We cannot even recognize the face of a duiker, porcupine, or even an elephant. It's very good; very good [hunting regulation], but it's because of the 'don't do this, don't do that, don't do that' [from the Park] that we are not happy. The Park should distance itself a little; to create laws over there, to get people [hunters] who are over there; that's good. There are poachers who are in the forest, and they always continue to hunt; even us locals are in agreement [with the Park]; but the poachers are always over there!¹⁵⁶

We are not against the Park. Because the Park, we have understood, that there used to be a reserve near Ngongo over there at the border between Congo and Gabon. They must continue to occupy those zones like that because there are Congolese territories that continue to be occupied by the Gabonese. But that which comprises the Park; that would be a good thing to re-conquer.¹⁵⁷

These viewpoints are not commonly expressed, but are commonly held (most often by elders and middle aged residents). They demonstrate a tolerance by the community for conservation activities but with a 'not in my backyard' position regarding the Park. In fact, results from the hunter surveys show that 59% of hunters are actually for

¹⁵⁵ Some notable exceptions to this are agricultural activities the Park has initiated with women in pilot programs in several villages.

¹⁵⁶ Interview with PY, Kondi, 4/29/2006

¹⁵⁷ Group interview, Km4, 6/20/2006

conservation,¹⁵⁸ although 83% say that the Park activities have started to change their opinions of conservation for the worse. “Repression without [economic] supporting measures has led me to detest the Park.”¹⁵⁹ “The Park authorities aren’t responsible; when they banned hunting, they should have replaced other economic activities for us, to permit us to live.”¹⁶⁰ And also, “I am against the activities of the Park, but I am not against conservation.”¹⁶¹

These views demonstrate that the Park has failed to convince villagers to support their conservation approach of core protected areas with village zones meant for local consumption of natural resources. The Park, rather than a benevolent government sector, is seen as a major obstacle to a better life, including barring exploitive companies, blocking individual enterprise, and a future threat to natural resource exploitation activities. The result of this is not only a constituency who doesn’t care about the outcome of the Park’s goals, but also hostility towards the Park’s social assistants and ecoguards, who bear the brunt of this conflict.

Peoples’ *perceptions* of the Park are real, whether or not the Park deserves the blame. Villagers use the bushmeat law enforcement as fodder against the Park, and they blame it for most if not all of their problems. Interestingly, the conservation practices at Conkouati are seen by local people as a greater evil than industrial extraction companies (who provide quick money for a short period to extract resources). They don’t understand why the Park wants to conserve ‘dead animals’ (bushmeat) along roadsides, and think the ecoguards should stay in the forest rather than bother people’s economic activities on the roads. There is a perception by many that the guards take the meat for themselves and eat (or perhaps sell) it, contributing to the negative feelings people hold towards law enforcement, and thus, the Park.

¹⁵⁸ We asked hunters, unprompted, their definition of ‘conservation’, and many (28 of 39) respondents stated, (paraphrased), that conservation is the protection of natural resources

¹⁵⁹ Survey with Kondi hunter, 3/27/2007

¹⁶⁰ Survey with Km4 hunter, 4/26/2007

¹⁶¹ Survey with Mpella hunter, 3/15/2007

People feel the direct effects of stopping bushmeat traffic, but rarely make a direct connection between the Park activities and the ecological services it provides. Villagers in the study area see themselves as bearing a substantial economic burden for ‘conservation’, but see little return for their economic costs. Indeed, as Chapter 1 helps demonstrate, the stakeholder conflicts surrounding resource use and weak governance institutions has resulted in ineffective enforcement of zoning, and a suspicious attitude of Conkouati by locals. I believe these attitudes can be explained by how law enforcement impacts individuals.

Influences of law enforcement on villages

Declining incomes

Law enforcement’s most important economic consequence for study informants was income loss. This loss resulted from the criminalization of hunting in the Park, manifested as both ecoguard confiscations and its indirect discouragement on hunting behavior. Because no long-term economic studies have been conducted at Conkouati, we cannot directly measure income loss in villages. But there are indirect ways to judge how local communities, and households, have been affected by enforcing laws against bushmeat trafficking and illegal hunting.

One can gain a relative measure of the importance of hunting in the economy based on past studies conducted at Conkouati during the IUCN GEF/PROGECAP project of the 1990s. One, for instance, quantified natural resource income and revenue in seven selected villages. I took selected data from this study by Paris (1996) of western Park villages (that depend both on hunting and fishing for a large percentage of income), and developed Figure 44. The top graph shows that in 1996, 22% of income from natural resources (including agriculture) across villages was derived from hunting (Paris 1996), totaling over 17 million cfa (Central African francs)¹⁶² over seven months in just seven

¹⁶² 500 cfa = \$1USD

villages. I then disaggregated data to examine village livelihood differences to convey the relative value of bushmeat in villages that rely on hunting as a major source of natural resource revenue. The two bottom graphs show a primarily fishing village (right) with a more mixed hunting-fishing village (left). These graphs demonstrate that income from hunting (and fishing) has a major role in the economy of villages inside the protected area.

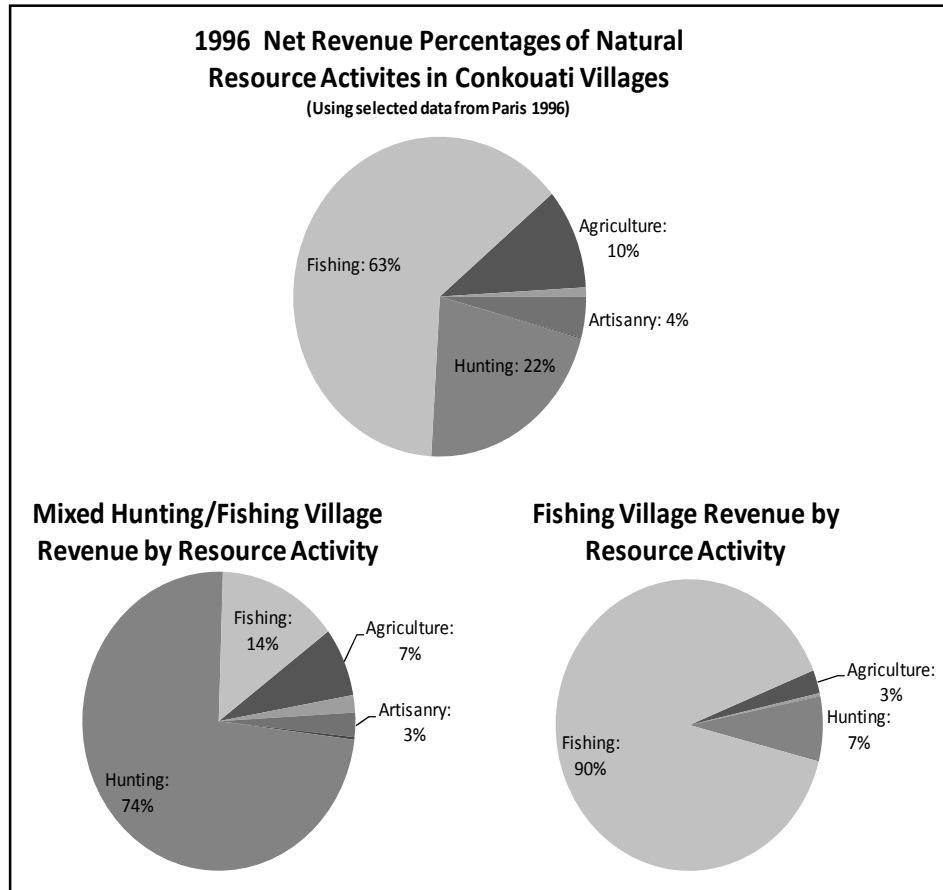


Figure 44: Revenue percentage totals from seven villages at Konkouati in 1996 (top), and a comparison between two villages with different economic strategies (below). (Artisanry includes activities selling or working non-timber forest products). Note the important role of hunting revenue in a village with a mixed livelihood strategy of both hunting and fishing (left).

These data are useful for examining how law enforcement activities, meant to reduce hunting, may impact different villages. Recall that in Figure 41, the amount of game that hunters report shooting has decreased by over 70% since law enforcement activities

began. When we asked them to calculate the differences between law enforcement strategies impacting revenue, 86% reported forest patrols and 72% said road barriers brought about losses in their revenue.¹⁶³ Within these figures are interesting dynamics between villages. The hunters in the strict hunting village reported their revenue being most impacted by patrols (59% decline) as opposed to the barrier (22%), whereas in the mixed hunting/fishing village, revenue lost by patrols (42%) was equal to that of the barrier (43%). Although these numbers are relative and based upon respondent recollection and may not represent *actual* values, it demonstrates that: 1) there are real economic losses due to law enforcement activities; and, 2) villages are impacted unequally.

The loss of income for hunters has consequences for other sectors depending on this activity, both within and between villages. Before law enforcement efforts, hunters usually sold meat to traders from Pointe Noire and used the money to buy manufactured food, alcohol, fish, and merchandise. When hunters in a village no longer have a steady source of income, the individual income losses affect other economic sectors in villages; decreased demand for goods imported into village means higher prices because the transportation costs for village business must be spread amongst fewer customers. Local food prices (like fish) might decrease as well because of reduced demand.

Labor

The loss of income from bushmeat in hunting households both drives hunters into different economic sectors and increases participation of women and children in income-generating activities. Of the hunters we interviewed, 49% stated they now take part in

¹⁶³ Although villagers attribute this loss to law enforcement activities, it is important to examine regional and national economic change. The survey only asks about revenue change from 2004-2007. During this period, Congo's economy was relatively stable, and experienced moderate growth (4.3% growth in 2004; 8.2% in 2005; 7.8% in 2006, and 6.4% in 2007)(La Banque des Etats de L'Afrique Centrale 2006, 2007), although the oil industry, which accounts for 88% of all foreign exports, did see a small decline in 2007 (International Monetary Fund 2008). The transportation sector in the Conkouati region, which impacts the ability of hunters to transport their goods, was very poor. However, these roads increased in quality, especially on the eastern half of the Park, during 2006-2007, when the oil company inside the Park re-graded all of the roads, increasing the traffic along roadways.

alternative activities to supplement their income, including fishing (9), artisanal logging (2), charcoal making (1), and agriculture (10). Overall 86% of respondents claimed their revenues have decreased by an average of 49% because of the patrols; 72% report an average of 29% income decline from the barriers (only 2 men reported no income loss at all, both of whom have switched livelihood activities). Because some hunters cannot bring in incomes comparable to pre-law enforcement levels for their families, 41% of surveyed hunters report their wives have increased their participation in certain income-generating economic activities. Children have done so as well. The collection of forest leaves (*Gnetum africanum* and *Marantaceae* spp.) for sale in the city has become a popular activity in the village Km4, as has increased agricultural activity amongst some women. During a participant observation event, a woman told me that because the Park has ‘stopped’ hunting, women need to help out their men to make money for the family.¹⁶⁴ With extra farm plots, the women can sell their manioc and earn money in order to compensate for the loss of income from hunting. Although this decreases their amount of free time, it may also have positive implications. This extra labor gives women some financial freedom, as they now have their own disposable income. One woman remarked that now that she was earning her own income, she was able to spend money for the family the way she wanted to, and didn’t have to depend on her husband’s contributions. Despite women’s increased labor activity, it is highly doubtful that income currently gained by the household has made up for the loss of bushmeat income; a day collecting leaves earns between 900-1200cfa per day, whereas one hunted animal fetches at least 2000cfa in the village (and between 3000-5000 in Pointe Noire).¹⁶⁵

Reduced access to educational and health care services

Income loss has 91% of surveyed hunters worried about two main concerns: access to health care and to education. Hunters use bushmeat as a quick source of money when

¹⁶⁴ Interview with E, Mpella, 4/5/06

¹⁶⁵ According to the hunter survey, the average hunter takes 0.75 animals per day, thus makes 1500-3800cfa per day

they need it.¹⁶⁶ The chief of one village explained that the loss of hunting had adversely affected access to the health care system. He said that when family members were sick, hunters could shoot or trap wildlife to earn money for clinic visits or medicines in Pointe Noire, a 6-12 hour ride on public transportation.¹⁶⁷ Ninety-four percent of hunters surveyed said their access to health care has been reduced because of hunting restrictions. During an interview with a prominent hunter he said:

“Let me tell you about the word suffering. Even today, before we could even go to Pointe Noire [hospital], if my wife is sick, or myself, or our child, before I could get into someone’s vehicle, I have to first give money. For the ticket. Myself, the child, and my wife; but I don’t work. Where am I going to get money for that ticket? I get into someone’s vehicle, I don’t have any means, I paid for the transport...As soon as I arrive at the hospital I have to bring my cup, my spoon, a small pot to the hospital. Then, the first thing is the prescription from the same visit just like that one must have the means, thus and for this is why I say we suffer. We suffer...in one week I have [spent] at least 10,000, 20,000, 30,000 francs [\$20-\$60]...Even more than that! See, well if I was to go to the store with four young hunters, great! Four helpers on the way back I have my 80 cartridges and I should have my 25 animals, I sell them or not, dispatched to Pointe Noire, the next morning I go to Pointe Noire, I will go anyways with a little means, I’ll have at least 10,000 francs, 15,000 francs; the child is sick, I will be able to save my child with [it]. Really but these days we suffer.¹⁶⁸

Bushmeat revenues also have paid for school fees. Although primary school fees are only about 5500cfa per year (\$11), secondary school fees are much higher because parents have to pay room and board to send their children to Pointe Noire or district capital schools. Eighty eight percent of hunters responded that they had difficulties paying these expenses: “To pay for school fees for the children, my wife must make more manioc, and I must also gather marantaceae leaves;”¹⁶⁹ “children must work to pay for their school fees;”¹⁷⁰ “Even school fees for children is also a serious problem.”¹⁷¹

¹⁶⁶ Indeed, the entire forest is perceived as insurance, as women noted that collecting leaves was also an activity that they did when there was a quick need for money (Participant observation with S, 6/8/06). Agriculture and other economic activities, on the other hand, are perceived as long term investments which are not as enticing to this quick-cash economy.

¹⁶⁷ Interview with M, Mpella, 4/8/06

¹⁶⁸ Interview with S, Mpella, 4/22/06

¹⁶⁹ Survey with MJ, Km4, 4/28/2007

¹⁷⁰ Survey with ST, KM4, 3/7/2007

¹⁷¹ Survey with MD, Mpella, 3/16/2007

Although the inability to pay for \$11 in school fees is probably overstated, people express a strong linkage, indeed, a kind of economic safety net that the forest has provided, and the Park's presence has severed that net. The president of the hunting village stated:

I was educated because of the forest. Without the forest, my parents wouldn't have had the money to pay for school fees; they used the forest to hunt, to make boards, and to live off of. What the Park is now doing is to cut off the ties with the forest; severing the relationship between people and their forest.¹⁷²

Stopping the bushmeat trade at Conkouati has not only reduced household incomes of hunters, but, in so doing, it has reduced access to health care, important for families far from hospitals, and education for children in hunting families, seen as important for providing youth a better life.

Nutritional changes

The effects of law enforcement on rural nutrition are not well studied or understood. During some of the in-depth interviews, several older residents indicated that the bushmeat trade resulted in substantially decreased consumption of meat in villages, not because of reduced wildlife populations, but rather because hunters preferred to sell bushmeat to urban markets where they could make more money. In my interviews with five older women about food, they lamented the decline of bushmeat in their diets (see also, Chapter 3). One respondent in a hunting village said that diets have changed since she was young; she noted they no longer eat different species such as bush pig like they used to; this sentiment about bush pigs were common. The new market economy means they must now sell food to make money, whereas before they would just eat it.

There never used to be commerce in meat-- now all meat in the village is sold. Even if it is a small rat; it will head to Pointe Noire! The diet has changed completely here; the value of money is now more important than the value of food. You must buy meat always now; and it is never satisfying.¹⁷³

¹⁷² Interview with J, Km4, 6/14/06

¹⁷³ Interview with E, Km4, 6/1/06

During the bushmeat trade boom, fishing and mixed hunting/fishing villages located close to the ocean were able to substitute salt-water fish for bushmeat. Participant observations suggest that villages in the forest interior were less able to substitute fish, as meals were often composed simply of starches flavored with hot sauce or with a very weak soup prepared with one or two small fish.

When we were children we ate bushmeat, even a whole bush pig. Now as they have discovered that bushmeat is a productive activity, all hunting products are taken towards Pointe Noire. People regret it because there is not enough food; people live with makouala [a sardine] that leaves Pointe Noire. Even if you have 100cfa, if you want to eat meat, they [hunters] can't sell you any because they make [more] money off it [elsewhere].¹⁷⁴

The shift in the bushmeat trade from villages around Conkouati to markets in Point Noire decreased wildlife consumption in rural households. In contrast, wildlife law enforcement, by discouraging the bushmeat trade, may reverse the tendency for hunters to sell all the wildlife they harvest, resulting in more being consumed by local families.

However, results from a year-long consumption survey (Chapter 2) demonstrate that meat consumption in villages is still well below that of fish (22% vs. 76%). The study, conducted after law enforcement activities had begun, demonstrated that people in fishing villages eat significantly better than other communities with larger numbers of hunters in the population. This reduced expenditure in food is also supported by the hunter surveys, in which 83% of respondents describe their level of nutrition as decreasing with ecoguard activity. Hunters noted that animals now ate their crops, their diets had much less variation because of the law enforcement, and most importantly, they had less money to spend on food. This latter point is also demonstrated in results from our kitchen study (Chapter 2), which show hunting households ate significantly less than fishing families (3802cfa less per month; $p < 0.041$), but amongst households with other occupations (around 59% of the kitchen survey families), monthly household food intakes were not significantly different. Households (on average) purchase about half of their food, including manufactured goods. Perhaps because hunting families have less disposable

¹⁷⁴ Interview with EH, Km4, 6/12/07

income to purchase food, hunters report this decline in nutrition. However, one potential improvement hunting restrictions could bring would be an increase in animal proteins in the village, if hunters eventually decide to sell more bushmeat in the village.

The losses that hunters and their families incur as a result of law enforcement activities described thus far are economic. This survey of hunters did not include direct measures of how people were impacted, yet from responses it is clear that these economic impacts are profound. Hunters clearly specify that the reduced access to health care in Pointe Noire, plus the reduction in disposable income has reduced an already-low quality of life.

Social and cultural impacts

In addition to livelihood and nutritional roles, wildlife in Conkouati has historically played important social and cultural roles. Bushmeat was important for defining individual, gender, and clan identities (Gami & Ngoma 1998; Hagenbucher-Sacripanti 1975). For example, women, pregnant women, boys and men each ate different types and pieces of meat which served as a marker of their status,¹⁷⁵ and each clan had specific species which they did not eat (doing so would cause severe punishment by clan genies; Gami & Ngoma 1998). Secondly, animal parts were (and continue to be) used for fetishes and medicine by healers and witches in magical and spiritual practices, as well as by artisans for drums (see Hagenbucher-Sacripanti 1975 and Gami & Ngoma 1998 for detailed descriptions of the uses of different species around Conkouati). Third, bushmeat was also used to maintain social and political ties through the sharing of hunted food with family and kin,¹⁷⁶ as well as to pay tribute to clan leaders (Nginguiri 1996c). In Central Africa, the practice of hunting itself also had significant value; raising an ‘esprit de corps’ during hunting expeditions in villages (Vansina 1990); maintaining a connection with ancestors (Giles-Vernick 2002); and providing ethnic identity.¹⁷⁷

¹⁷⁵ Interview with S, Km4, 6/27/2006

¹⁷⁶ Interview with GM, Kondi, 12/2005

¹⁷⁷ At Conkouati, individuals who identify themselves as Lumbu describe themselves as a hunting group, highlighting the importance of this. Interview with GC, Km4, 6/22/2006

However, whether or not these roles remain important today in the villages around Conkouati is questionable. Although scholars around Conkouati have provided information about the roles of wildlife, their relevance today remains unclear. For example, Gami and Ngoma (1998) note that young members of society are transgressing norms; which my informants also confirm.¹⁷⁸ Members of the communities around Conkouati have undergone significant changes during their lifetimes (See Chapter 1). This has undoubtedly affected how they view wildlife and the roles that wildlife play in their lives.

Given that hunters themselves prefer to sell their meats in urban markets rather than to villagers, many of the social roles of bushmeat have declined:

The first law is to go into the forest and kill an animal you must bring the meat, you must share it with everybody; everybody must eat and everyone is happy because you the hunter, you went to hunt an animal to feed the whole village. But now, it's no longer like that [as hunters now sell meat to urban markets]. But in the past if you had done that, if you didn't share your meat with the others...they will regret that.¹⁷⁹

This not only demonstrates that the important role of hunters in the village before bushmeat was highly commercialized, but also that the social role has diminished, not because of the Park, but because of the economic valuation of the bushmeat trade. Hunting was also associated with a sense of place and knowledge of the forest:

In the past, [hunters] were more intelligent than those today...Because today, a hunter goes into the forest here, for example, and he runs into a bend [in the forest path]; he gets lost and he doesn't know from what side he came from! But in the past, he [a hunter] knew that: 'I came in from there, I want to do this, I want to come out here on this path.'" In the past...In the past we went into the forest, killed at most two animals to eat; it wasn't for selling...but for today they are going to sell to Pointe Noire. They now have the love of money; they do business now, but then it was for eating.¹⁸⁰

¹⁷⁸ Interview with S, Km4, 6/27/2006

¹⁷⁹ Interview with EH, Km4, 6/22/2006

¹⁸⁰ Ibid.

One informant acknowledged the disappearance of healing practices that use animals. In the past, a healer would ask for animals; “‘You need to kill this or that animal, you must bring me the skin of that animal.’ I say no, that [practice] doesn’t exist anymore...The people are ok with that. We prefer that...because then was the time of our ancestors [elders]; they had another way of living, and now...we lead a different life.”¹⁸¹

The effects of law enforcement on social and cultural roles of wildlife at Conkouati are not clear, in part because of the difficulties I had in determining the current social roles that wildlife play. The bushmeat trade has changed people’s use of wildlife; meat is now sold as opposed to being consumed. However, the restriction of this trade (due to law enforcement) does not appear to be shifting people’s behaviors back to the ways things were before. Hunters still view meat as something to be sold, and younger people appear to be indifferent with the loss of wildlife use in healing practices, because they view this as something their ancestors did. This would suggest that law enforcement is not substantially affecting these particular views of wildlife. The social impacts of law enforcement may be strongest on the role of hunting as an act, as law enforcement criminalizes most forms of hunting, including trapping which has been used for many centuries (Vansina 1990), especially by the poorest members of the village (pers.obs.). Although undoubtedly wildlife still retains some non-economic value around Conkouati, more research needs to be conducted on what those values are, given the changes that many of the people have seen in their lifetimes.

Discussion

The objective of this essay is to contribute a more nuanced understanding of law enforcement activities and demonstrate impacts on rural livelihoods *and* conservation goals. These conservation strategies to decrease illegal hunting and stop trafficking negatively affect rural livelihoods by reducing income in hunting households, increasing participation of women and children in income-generating activities, lowering access to health care and education, and reducing household nutrition. This essay is not a critique

¹⁸¹ GM, Kondi, 12/2005

of bushmeat law enforcement strategies; indeed, they are a necessary component of any conservation toolkit in and around protected areas. Without action to combat illegal activities and enforce wildlife laws, conservationists have little chance to achieve their goals. Conservation organizations and governing bodies must continue to employ tactics to reduce poaching activities (Nielsen 2006). The road barriers have succeeded in breaking a bushmeat trade network in operation for decades. The patrols have also greatly reduced the extent to which hunters hunt, according to the hunters themselves. Thus, both of these approaches, especially when implemented in tandem, benefit wildlife.

However, by imposing police tactics to stop bushmeat trading, conservationists may achieve short-term benefits for wildlife, while simultaneously squandering the support of populations living with these conservation strategies. These attitudes are serious for the Park because they come from one of Conkouati's key stakeholder groups, who depend on the natural resources in the Park. Blunt law enforcement tools have undercut local communities that have, over time, developed strong economic ties to local and regional markets. A sudden rupture of these ties, with no alternatives or effective dialogue between stakeholders, can weaken, and I argue have weakened, conservation efforts over the long term, even when short-term prospects for wildlife are improving. Without the active participation and assistance of local populations, these conservation efforts may ultimately founder. Unfortunately, Conkouati faces constraints that inhibit socially-oriented projects, including: 1) inadequate training of the management team to recognize and deal with local residents who depend on natural resources; 2) lack of money to undertake development projects; and, 3) lack of personnel to effectively engage local partners.

Given the constraints noted above, how might conservationists circumvent these social and conservation costs to law enforcement? Some of the general problems discussed, such as access to social services (e.g. health care and education), may be one target that can quickly reduce the tensions and negative effects of law enforcement. A practitioner once commented, 'conservationists are not in the business of social welfare'; and in his

defense, most conservationists are not experts in development nor have the funding for such large projects. But what conservationists do have is the ability to develop partnerships with other conservation or development organizations with the social expertise needed to mitigate the effects of law enforcement, thereby reducing hostility towards conservation programs in the long run.

At Conkouati there are several possible approaches to reduce the negative impacts of law enforcement activities. To improve health care and education, the Park management team could engage in partnerships with health agencies or traveling doctors to provide health care services. In the event that tourism increases in the future,¹⁸² some of the revenues could be used to help villagers pay school fees. Park management could enhance relationships with development organizations currently working in the area to encourage them to be more active in affected villages. Agricultural projects to both reduce dependency on wildlife for income and improve nutrition are greatly needed¹⁸³, as is the development of constructive dialogue between government, conservationists, and villagers. During the study, Park management was engaged with interested villages through agricultural projects, an environmental education program in rural schools, and occasional visits to meet with community members. All of these activities need to be continued and expanded in order to improve relations with the local communities.¹⁸⁴

However, more needs to be done to encourage dialogue to further mutual goals; a dialogue that incorporates all parties. Communication doesn't require large financial investments, just time commitment, and it goes a long way in demonstrating dedication not only to wildlife, but also to the people in communities in and around protected areas. In the survey, hunters had varying opinions on how to reduce conflict between the Park

¹⁸² There are currently ecotourism operations by WCS and HELP (a chimpanzee conservation organization), and potentially another international company to invest in tourism at Conkouati

¹⁸³ Although this would expand the area of cultivation, this author does not believe it would cause a significant reduction in conservation value of the Park.

¹⁸⁴ The Park should be careful not promote activities that encourage immigration around Conkouati, but rather they should work on projects that will reduce the negative impacts of bushmeat law enforcement on rural communities.

and the people. Although some of them didn't have any ideas or wanted to maintain the status quo, several thought hunting should be moderated, and others thought that they should be given alternative economic opportunities. "My point of view is to ban hunters who come from afar. And for native hunters, they should hunt in a moderated manner or around two times per month." "You simply need to occupy hunters giving them work and other activities substituting hunting." "Hunters can't think about the existence and abundance of wildlife; when they have free access to natural resources. In sum, the Park needs to organize hunters in several interest groups to do conservation well." And finally, one alluded to the lack of communication between the people and the Park; "I don't have any thoughts, since the government never includes the peasants in decision making."

Government officials at Conkouati need to maintain open minds and flexible policies about ameliorating income decline and the limitations of current approaches. They believe villagers should be a part of the Park, as it is better to have them included than sitting on the sidelines; and they are keenly aware that there needs to be projects to help people.¹⁸⁵ Unfortunately they have not translated that awareness into projects. Outside of more traditional income generating activities, there might be an opportunity to develop a temporary system where each household is allocated a certain number of animals on a tradable permit. Hunters could then be permitted to sell these animals to Pointe Noire markets. This system could remain in effect until sufficient alternatives could be developed for Park residents.¹⁸⁶

Law enforcement efforts at Conkouati between 2004 and 2007 have been relatively successful in reducing threats to wildlife, but with hidden costs. Understanding these costs requires using social research techniques that include not only quantitative surveys, but qualitative inquiry. These methods may be time consuming, but conservationists can

¹⁸⁵ Interview with G. Bonassidi, Conkouati, 3/29/2006

¹⁸⁶ If this model proved sustainable and manageable, this permitting system may be an alternative in and of itself to maintain positive relationships between the people and the Park

use the process to both develop the relationships with village informants and learn more about the consequences of conservation activities on daily rural life, with the goal to reduce conflict resulting from law enforcement. The consequences of bushmeat law enforcement activities on livelihoods permeate entire villages, and thus understanding the varied and important roles of bushmeat in villagers' daily lives is critical. Reducing the economic consequences of law enforcement is important for developing and maintaining relationships with local stakeholders, especially in areas where the effectiveness of state governance is low. Conservation strategies result in contrary impacts on livelihoods and the environment we strive to protect. Because of this, conservation biologists must think not only of the immediate threats we address every day, but also of long-term strategies that will enhance the sustainability of our efforts.

Conclusion

In this dissertation, I set out to understand how different stakeholders in Conkouati-Douli National Park value and use the environment, and how those different uses influenced wildlife conservation efforts. The four chapters have outlined different ways in which various stakeholders use resources at Conkouati and to some extent, the motivations behind that use. These uses and valuation of resources at Conkouati have had a profound impact on the ability of managers at Conkouati to protect wildlife. Subject to intense poaching and fishing, industrial exploitation of forests, and explorations of mineral resources, the ecological integrity of the Park is under severe pressure. If following IUCN guidelines, Conkouati-Douli is not a national park. Whether or not it lives up to its appellation, and persists as a well-managed protected area is up to the Congolese government; not just MEF, but the combined authority of all ministries. It will also require support from the local people who live with the challenges and limitations that the Park imposes on their livelihoods.

Benefits of an interdisciplinary approach

Drawing from multiple tools of inquiry (historical analysis, ethnography, mapping, and mammal surveys) provided me with different vantage points from which to interpret my observations at Conkouati. These data, coupled with an analysis from both macro and Park-level scales, enabled me to go beyond an ahistorical focus on people-park relationships. For example, historical influences of resource use during the colonial era still shape the ways in which government, villagers, and industry use the environment; and also shapes how they treat the Park as an historical anomaly in nearly a century of extractive use in the area. The food study benefitted immensely from this multidisciplinary approach, not only in learning where households obtained their food, but in understanding large-scale protein switching from bushmeat to fish and the impacts of the bushmeat trade on diets, local food economies, and intergenerational change. The law enforcement study demonstrated that collecting different types of data allowed us to

see that even though the constant rate of barrier seizures may indicate that law enforcement isn't 100% effective in deterring hunters, interviews demonstrated that it in fact influences hunting behavior across all study villages. More importantly, it informs the Park management of the subtle (and not so subtle) impacts law enforcement has on households, local economies, and villages.

This interdisciplinary approach is important not only for academic research, but also for use in the field. The Park is engaged in not only ecological research, but also socio-economic *activities* with villagers; during the period of the study they had one full-time employee working to improve local livelihoods and communication with villagers. Relationships between these two groups are now improving, but much more work needs to be conducted to develop functioning relationships between the Park and the people. A strategy that involves simple dialogue sounds overly simplistic, but at least for some villagers who complained that upper-level Park management never talk to them, that is all they are asking for. In addition to their current activities, I argue that the Park should also consider more complex social *research*, such as examining the local efficacy of potential livelihood activities to avoid implementing unsuccessful projects.

Suggestions for Conkouati-Douli National Park management

The following are my recommendations for MEF and WCS for their efforts to protect wildlife and biodiversity, and enhance relationships with stakeholders that have developed from this research:

1. Communication
 - a. Continue to reinvigorate COGEREN, the local NGO with representatives in the villages that was created by IUCN to help manage natural resources. This relationship can help develop a more open dialogue between MEF, WCS, and local people.

- b. Hold annual visits for different stakeholders (community leaders, villagers, local government, industry officials, various government ministry officials, etc) to teach them about the biological diversity (for example, sea turtle nesting) and important ecological roles the Park holds. Experiential learning and direct stakeholder engagement with the Park is important in gaining a constituency of leaders and influential people to appreciate the goals and activities of the Park.
 - c. Upper-level management village visits on a regular basis
 - d. Build a stronger public support base, including in Pointe Noire, to build national pride in the Park and a regional constituency for conservation efforts
 - e. Re-communicate Park regulations and Congolese law to local people
 - f. Directly engage SICOFOR, Maurel & Prom, and Perenco executives to encourage good practice
2. Law enforcement and hunting
- a. Continue law enforcement strategy that includes bushmeat control posts and forest patrols
 - b. Serious and significant efforts need to be made now to encourage and help hunters who have suffered severe livelihood losses
 - c. Ensure that villagers understand and accept new zoning structure in order to ensure compliance by a majority of residents
 - d. Harness ideas of hunters for potential ideas for solutions to the conflict between hunters and the Park
 - e. Change the perception by villagers (especially held by women) around Conkouati that hunting in farm fields is a criminal offense; not only will this relieve crop damage from raiding animals, but it will also permit more families to have access to bushmeat
 - f. Until the Park can work with villagers to develop alternative livelihood strategies, *consider* legalizing the sale of quick-reproducing species through a permit system

- g. Working with Project Gecko, encourage farmers to develop a more dynamic network of forest farming techniques that retain a network of endemic trees and refugia to enhance bushmeat production for villagers
3. Stronger collaboration with other NGOs and development organizations to:
 - a. Explore environmental education opportunities in Pointe Noire (HELP, JGI)
 - b. Create or enhance cross-NGO education activities within the Park to demonstrate to residents that conservation activities are not just ‘the Park’
 - c. Conduct monthly tours of Conkouati’s river, marine, and lagoon habitats for selected residents to raise environmental awareness and promote goodwill
 - d. Promote agricultural and livestock development projects
 - e. Work with development organizations to explore the efficacy of alternative proteins through a long-term study
 - f. Encourage and help facilitate secondary education among Conkouati’s youth
 4. Social science team
 - a. Increase staff by 2 or 3 people, including at least one woman
 - b. Continue alternative livelihood projects
 - c. Examine local governance structures (for example, the *fumu si* or COGEREN) to determine the efficacy of any future Park programs which may seek to incorporate self-regulation of natural resources
 - d. Conduct bushmeat studies in the Park that examine not only what is consumed, but what is available and what is leaving for Pointe Noire
 - e. Food consumption surveys in tandem with livestock programs
 5. Ecological science team
 - a. Continue biennial hunted mammal studies to monitor the status of important wildlife species
 - b. Expand hunted mammal survey into areas where there is little hunting

- c. Continue freshwater fish studies in the lagoon, but also initiate surveys of shrimp populations, and consider inviting marine scientists to conduct studies on shark and other marine species

Overarching lessons

Conservation in areas of extraordinary resources is challenging. Conservation is not the top priority of developing countries (nor in many developed countries, for that matter). This translates into a lack of funding for protected areas, competition from other government agencies to appropriate their resources, and the lack of political power to enforce zoning regulations, national laws, and international treaties.

Protected areas across Africa are under intense pressures from government and industry as global prices for oil, timber, and mineral resources increase. The global population will reach nine billion by 2050 (United Nations 2004), and Africa's population will more than double during this time frame. Global and regional demands on governments to open up their resources, such as oil and minerals, as well as agricultural land will undoubtedly force governments to discuss or re-think their economic priorities and thus the level of importance they place on conservation areas.

Increased pressures on protected areas may also come from local populations close to growing urban areas that show ever-increasing demands for resources and bushmeat. This is exemplified by the generational changes present at Conkouati, which have strong implications for how parks work with populations, including uncertain land tenure issues, and changes in: social structure, in what people are eating, and what they are willing to eat. Conservation organizations and governments need to be not just oriented to solving crises, but also strategic in the partnerships and policies they employ to protect wildlife, not only in the short term, but also for decades to come. This includes promoting policies of collaboration and communication, something which many parks fail to achieve. Conkouati is an example of a park which does not effectively engage with its local communities. It is not because the Park doesn't want to, but rather a combination of

factors, including weak institutions, deficient funds, insufficient expertise, and the lack of government momentum to arrive at where the Park should be. If Conkouati is to exist 50 years from now, MEF needs to examine how its policies affect local populations and determine how to create a constituency for conservation. There are great transformations occurring; interdisciplinary approaches, now more than ever, are necessary for adapting to these changes if wildlife conservation is to be successful.

Appendices

Appendix 1.1 Species List for Conkouati National Park (Adapted from Paris 1996 and Mamonekene and Maloueki 1997)

Mammals

<u>English</u>	<u>French</u>	<u>Vili</u>	<u>Latin</u>
Giant otter shrew	Potamogale	Libingi	<i>Potamogale velox</i>
Straw-colored bat	Roussette pailée	Nguembo	<i>Eidolon helvum</i>
Potto	Potto de Bosman	Tchikanda	<i>Perodicticus potto</i>
Potto	Potto de Calabar	Tchikanda	<i>Arctocebus calabarensis</i>
Western needle-clawed galago	Galago élégant	Dibobou	<i>Galago elegantulus</i>
Allen's galago	Galago d'Allen	Dibobou	<i>Galago alleni</i>
Dwarf galago	Galago de Demitrov	Libobo	<i>Galago demidovii</i>
Mandrill	Mandrill	Nidumbou	<i>Mandrillus sphinx</i>
White-collared mangabey	Cercocèbe à collier blanc	Kakou	<i>Cercocebus torquatus</i>
Putty-nosed monkey	Hocheur	Mouidou	<i>Cercopithecus nictitans</i>
Mustached monkey	Moustac	Tchissemba	<i>Cercopithecus cephus</i>
Crowned monkey	Guenon couronnée	Kiniengou	<i>Cercopithecus pogonias</i>
Black colobus	Colobe noir	Mbondi	<i>Colobus satanas</i>
Chimpanzee	Chimpanzé	Kimpanzé	<i>Pan troglodytes</i>
Gorilla	Gorille	Mpoungou	<i>Gorilla gorilla</i>
Side striped jackal	Chacal flancs rayés	Mboulou	<i>Canis adustus</i>
Congo clawless otter	Loutre à joues blanches	Nyoundou	<i>Aonyx congica</i>
Spotted-necked otter	Loutre à cou tacheté	Nyoundou	<i>Hydrictis maculicollis</i>
Honey badger	Ratel	Mbakou	<i>Mellivora capensis</i>
Spotted palm civet	Nandinie	Mbala	<i>Nandinia binotata</i>
African civet	Civette africaine	Nzobo	<i>Civettictis civetta</i>
Servaline Genet	Genette servaline	Tsinzi	<i>Genetta servalina</i>
Rusty spotted genet	Genette tigrine	Tsinzi	<i>Genetta rubiginosa</i>
Poiane	Poiane	n/a	<i>Poiana richardsonii</i>
Black legged mongoose	Mangouste à pattes noires	Mobakou	<i>Bdeogale nigripes</i>
Large grey mongoose	Mangouste ichneumon	Mobakou	<i>Herpestes ichneumon</i>
March mongoose	Mangouste des marais	Mobakou	<i>Atilax paludinosus</i>
Spotted hyena	Hyène tachetée	Kimboundou	<i>Crocuta crocuta</i>
Leopard	Léopard	Nkou	<i>Panthera pardus</i>
Golden cat	Chat doré	Ndetsi	<i>Felis aurata</i>
African Manatee	Lamantin	Ngouloumassi	<i>Trichechus senegalensis</i>
Antbear	Oryctérope	Tsissi	<i>Orycteropus</i>
African elephant	Eléphant	Nzaou	<i>Loxodonta africana</i>
Western tree hyrax	Daman des arbres	Tchiwoto	<i>Dendrohyrax dorsalis</i>
Bush pig	Potamochère	Ngouloubou	<i>Potamochoerus porcus</i>
Giant forest hog	Hylochère	Ngouloubou	<i>Hylochoerus meinertzhageni</i>
Hippopotamus	Hippopotame	Nvoubou	<i>Hippopotamus amphibious</i>
Water chevrotain	Chevrotain aquatique	Founou nili	<i>Hyemoschus aquaticus</i>
Buffalo	Buffle	Pakassa	<i>Syncerus caffer</i>
Sitatunga	Guib d'eau	Mvouli	<i>Tragelaphus spekei</i>
Bushbuck	Guib harnaché	Nkabi	<i>Tragelaphus scriptus</i>
Blue duiker	Céphalophe bleu	Tsésé	<i>Cephalophus moticola</i>
Black-fronted duiker	Céphalophe à front noir	Tchigombi	<i>Cephalophus nigrifrons</i>
Yellow-backed duiker	Céphalophe à dos jaune	Nkouti	<i>Cephalophus sylvicultor</i>
Peter's duiker	Céphalophe de Peters	Nembé	<i>Cephalophus callipygus</i>
Bay duiker	Céphalophe bai	Litolo	<i>Cephalophus dorsalis</i>
White-bellied duiker	Céphalophe à ventre blanc	Mvémo	<i>Cephalophus leucogaster</i>
Waterbuck	Cobe onctueux (defassa)	Nsougou	<i>Kobus ellipsiprymnus</i>
Tree pangolin	Pangolin à écailles tricuspidés	Loukakou	<i>Manis tricuspis</i>
Giant ground pangolin	Pangolin géant	Mpissi	<i>Manis gigantea</i>

Long-tailed pangolin	Pangolin à longue queue	Louimbi	<i>Manis tetradactyla</i>
Gambian sun squirrel	Héliosciure de Gambie	Louvali	<i>Heliosciurus gambiansus</i>
Giant forest squirrel	Ecureuil géant de stanger	Louboukou	<i>Protoxerus stangeri</i>
Leconte's four-striped squirrel	Ecureuil à quatre raies	Binji	<i>Funisciurus lemniscatus</i>
Cuvier's tree squirrel	Ecureuil à pattes rouges	Kori	<i>Funisciurus pyrrhopus</i>
Small green squirrel	Ecureuil vert	Tchissimou	<i>Paraxerus poensis</i>
n/a	Funisciure nain d'Afrique	n/a	<i>Myiosciurus pumilio</i>
Flying squirrel	Ecureuil Volant de Beecroft	Mpekou	<i>Anomalorus beecrofti</i>
Flying squirrel	Ecureuil Volant de Derby	Mpekou	<i>Anomalorus derbianus</i>
Brush-tailed Porcupine	Athérure africain	Ngoumba	<i>Atherurus africanus</i>
Gambian rat	Rat de Gambie	Nkoumbi	<i>Crecomys gambianus</i>
Cane Rat	Grand aulacode	Sibissi	<i>Thryonomys swinderianus</i>
Cane Rat	Petit aulacode	Sibissi	<i>Thryonomys gregorianus</i>
Spotted grass rat	Rat rayé	Mbendé	<i>Lemniscomys striatus</i>
Mouse?	n/a	Ntoumbi	<i>Malacomys longipes</i>
Mouse?	n/a	Moukoussa	<i>Pelomys campanae</i>
Rat	n/a	Ndanga	<i>Rattus rattus</i>

FISH

<u>FAMILY</u>	<u>FRENCH</u>	<u>VILI</u>	<u>Latin</u>
DASYATIDAE	Raie	Tchibwele	<i>Dasyatis margarita</i>
ELOPIDAE	Guinée copace	Mveni	<i>Elops lacerta</i>
CLUPEIDAE	Ethamalose	Manzi, mbali	<i>Ethmalosa fimbriata</i>
CLUPEIDAE	n/a	Lilibi	<i>Odaxothrissa ansorgii</i>
CLUPEIDAE	n/a	Lilibi	<i>Pellonula voraxi</i>
CLUPEIDAE	Sardinelle	Lisunzi	<i>Sardinella aurita</i>
CLUPEIDAE	Sardinelle	Likwala	<i>Sardinella maderensis</i>
n/a	n/a	n/a	<i>Sardinella alba</i>
HEPSETIDAE	Brochet characin	Mwendji	<i>Hepsetus odoe</i>
CHARACIDAE	Characin	Tchivanse	<i>Brycinus longipinnis</i>
CHARACIDAE	Characin	Tchivanse	<i>Brycinus kingsleyae</i>
CHARACIDAE	Characin	n/a	<i>Nannopetersius ansorgii</i>
DISTICHODONTIDAE	n/a	n/a	<i>Distichodus notospilus</i>
CYPRINIDAE	Barbeau	n/a	<i>Barbus holotaenia</i>
CLAROTEIDAE	Machoiron	Tchingwa ndji	<i>Chrysichthys nigrodigitatus</i>
n/a	n/a	n/a	<i>Chrysichthys walkeri</i>
SCHILBEIDAE	Schilbe	n/a	<i>Paralia occidentalis</i>
BELONIDAE	Auiguille	mowe	<i>Strongylura senegalensis</i>
CYPRINODONTIDAE	Cyprinodone	n/a	<i>Aplocheilichthys spilauchen</i>
CARANGIDAE	Carangue	Tchinkum u-nwete	<i>Caranx hyppos</i>
CARANGIDAE	Carangue pompaneau	Nkufi	<i>Trachinotus teraia</i>
LUTJANIDAE	Capitaine rouge	Nkombi	<i>Lutjanus gorensis</i>
LUTJANIDAE	Capitaine rouge	Nsombi	<i>Lutjanus agennes</i>
GERREIDAE	Blanche drapeau	Nsoku	<i>Gerres melanopterus</i>
HAEMULIDAE	Diagramme	Tchinkulu	<i>Plectrotychus macrolepis</i>
HAEMULIDAE	Dorade grise	Tchikwata	<i>Pomadasys jubelini</i>
n/a	n/a	n/a	<i>Pomadasys senegalensis</i>
SCIANIDAE	Bossu	Tchivusu	<i>Pseudotolithus elongatus</i>
SCIANIDAE	Bar	Tchivusu	<i>Pseudotolithus senegalensis</i>
MONODACTYLIDAE	Breton africain	Tchilembe	<i>Monodactylus sebae</i>
CICHIDAE	n/a	Linganzi	<i>Hemichromis elongatus</i>
n/a	n/a	n/a	<i>Hemichromis faciatus</i>
CICHIDAE	Tilapia 'carpe'	n/a	<i>Sarotherodon melanotheron</i>
CICHIDAE	Tilapia 'carpe'	Tchale	<i>Tilapia cabrae</i>
CICHIDAE	Tilapia 'carpe'	n/a	<i>Tilapia guineensis</i>

n/a	n/a	n/a	<i>Tilapia heudelotii</i>
CICHIDAE	Tilapia 'carpe'	Tchale	<i>Tilapia zillii</i>
MUGLIDAE	Mullet	Sunza	<i>Liza falcipinnis</i>
SPHYRAENIDAE	Baracuda	Tombi	<i>Sphiraena guachancho</i>
n/a	n/a	n/a	<i>Sphyaena baracuda</i>
POLYNEMIDAE	Capitaine blanc	Mvuka	<i>Polydactylus quadrifilis</i>
PERIOPHTHALMIDAE	Sauteur de vase	Nkondjii	<i>Periophthalmus barbarus</i>
n/a	n/a	n/a	<i>Perophtalmus papilio</i>
GOBIIDAE	Gobie	n/a	<i>Gobionellus occidentalis</i>
ELEOTRIDAE	n/a	Livimbi	<i>Eleotris vittata</i>
ELEOTRIDAE	n/a	Livimbi	<i>Eleotris senegalensis</i>
ELEOTRIDAE	n/a	n/a	<i>Citharichthys stampflii</i>
CYNOGLOSSIDAE	Sole	Libondo	<i>Cynoglossus senegalensis</i>
n/a	n/a	n/a	<i>Clarias spp</i>
n/a	n/a	n/a	<i>Epinephelus faciatus</i>
n/a	n/a	n/a	<i>Ethmalosa fimbriata</i>
n/a	n/a	n/a	<i>Lichia amia</i>
n/a	n/a	n/a	<i>Trachionotus maxillosus</i>
n/a	Poisson de courant	Lideke	n/a
n/a	Crevette	Mikoso	n/a

REPTILES

<u>English</u>	<u>French</u>	<u>Vili (Loumbou)</u>	<u>Latin</u>
Python	Python	Mboma (mboume)	n/a
Viper	Vipère	(M)pili	<i>Bitis nasicornis</i>
Mamba	Mamba noir, couleuvre	Moubambe	n/a
Green mamba	Mamba vert	Bamba	<i>Dendroaspis jamesoni</i>
Gabon viper?	Vipère des colorations du milieu	(N)douère	<i>Bitis gabonica</i>
n/a	Vipère des plaines	Imbande	n/a
n/a	n/a	Loufifini (oupalou)	n/a
n/a	n/a	Moussande	n/a
n/a	n/a	Kouhi (kongui)	n/a
n/a	n/a	Ignenguili (inienguile)	n/a
n/a	Serpent d'eau	Dibomina (e)	n/a
n/a	Cobra aquatique	Ngomamba	<i>Boulengerina annulata</i>
n/a	Couleuvre	Mounangue somboule	n/a
(black turtle)	n/a	Tsevi	n/a
n/a	n/a	Ngongouani (ibongue)	n/a
(in Ngongo; can't retract head)	n/a	Mabansa	n/a
Tortoise	n/a	Dissekou (massekou)	n/a
Green turtle	Tortue verte	n/a	<i>Chelonia mydas</i>
Hawksbill turtle	Tortue Caret	n/a	<i>Caretta caretta</i>
Leatherback turtle	Tortue luth	Gnamou, iniamou	<i>Dermochelys coriaca</i>
Olive Ridley's turtle	Tortue olive de Ridley	(K)Itsiessi	<i>Lepidochelys olivacea</i>
n/a	Tortue à écailles	n/a	<i>Eretmochelys imbricata</i>
Nile crocodile	Crocodile du Nil	Ngandou	<i>Crocodilus niloticus</i>
Dwarf crocodile	Crocodile nain	Imbolo	<i>Osteolaemus tetraspis</i>
Slender snouted crocodile	Crocodile au faux gavia	Imbolo (imbolou)	<i>Crocodilus cataphractus</i>
Chameleon	Caméléon	Doungouéne	n/a

Nile monitor lizard	Varan	Mbambi	<i>Varanus niloticus</i>
n/a	n/a	Ignengou (niengou)	n/a
n/a	n/a	Digagala bongo	n/a
Gecko	Geko	Loufoulou nioundou	n/a
n/a	Lisard commun	Ississili	n/a

Appendix 1.2 Stakeholders at Conkouati-Douli National Park

Conservation and Development Organizations

Ecosystem centered approach

Wildlife Conservation Society

Species centered approach

HELP-Congo

Renatura

Development centered approach

GECKO

Food and Agriculture Org.

Adecor

Industry and Private Interests

Resource Based

Oil onshore Maurel & Prom

offshore Perenco

Timber Cofibois

Sicofor

Man Fai Tai

Fishing Agimex

Jeripeche

Hong Chang

Mining¹⁸⁷

Gold Lulu

Roc Gold

Service Based

Small-scale tourism/Vacation huts

Various operators

Large infrastructure tourism

Pioneer

Pot Ash MagIndustries

Limited

Government

Ministries

Ministry of Forestry Economy

Ministry of Mines

Ministry of Agriculture and Fisheries

Ministry of Hydrocarbons

Civil Government

Kouilou Prefecture

Nzambi Sousprefecture

Madingo Kayes Sousprefecture

International Government Entities

United States Government

French Government

European Union

Large-scale funding agencies

Rural Communities

Kondi (Fishing village)

KM4 (Hunting village)

Mpella/Sialivakou (mixed village)

¹⁸⁷ The mining companies listed are not currently active but are listed because the Congolese government has given them permits between 2003-2007

HELP Congo

The non-governmental organization HELP (Ecological Habitat and Freedom of Primates) was founded in 1991 by a French woman who has lived in Congo for the past 35 years.

The organization now has an international branch in France, which finances and provides scientific and technical assistance to HELP Congo, and conducts outreach to the French public about the organization. The organization seeks to protect chimpanzees, and until recently was the only group to successfully reintroduce them into the wild. Their area of focus includes their base camp, called the Sanctuary, their reintroduction camp at the 'Triangle', as well as an office in Pointe Noire (see map).

Funding Sources and Structure

The organization's activities in Conkouati are locally funded through tourism revenue at their rehabilitation camp and eco-volunteers who work at the project sites, and internationally through conservation grants from Western organizations and zoos (90%), as well as private donations (10%) (HELP 2007). Organization personnel include eco-volunteers from Europe or the United States, usually younger people interested in primate conservation; Congolese staff permanently based inside the Park; and support staff in Pointe Noire, including Aliette Jamart, the founder.

Goals

Once taken from the wild, chimps experience considerable difficulties when reintroduced there. Most are either too young to remember how to fend for themselves, or experience difficulties entering into a new social group. Often they are kept in cages or tied up, because mature chimps are strong and aggressive. HELP seeks to prepare chimps that were either abandoned or seized in Congo's bushmeat trade for life in a natural environment. Recently their objectives have expanded to promote environmental education and sustainable initiatives in villages, particularly because the organization sees forest destruction as a major threat to Conkouati's great apes.

Major Activities

Chimp rehabilitations. Feeding and health care for recovered chimpanzees on two small islands at the main camp, the 'Sanctuary'.

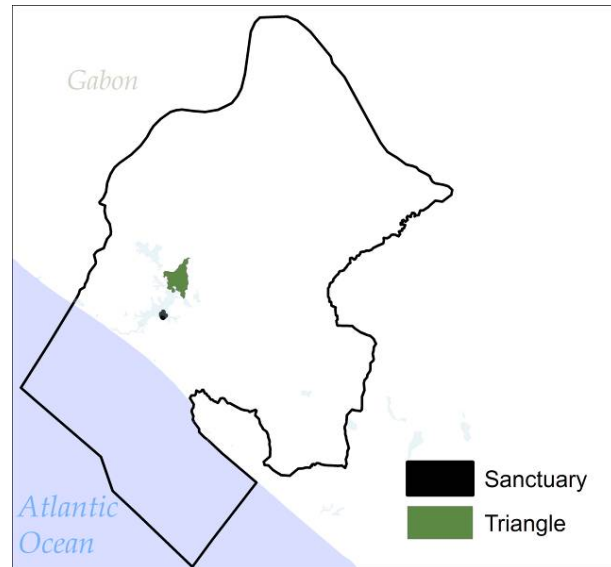


Figure 45: HELP's area of influence. The Sanctuary is the administrative camp; the Triangle is where chimpanzees are reintroduced.

Chimp reintroduction. Deeper in the forest surrounded by water, chimpanzees are released into the ‘Triangle’.

Chimp monitoring. Staff follow released chimpanzee groups, monitoring and recording their progress in adapting to their new environment.

Tree plantations. The organization has planted several hectares of native and non-native species to produce food for chimps, and to serve as a future demonstration plots so as to illustrate how degraded forests can be recovered and used a fuel wood source and agricultural land.

Environmental education center. Based in Pointe Noire, this center invites school groups and the general public to learn more about threats to great apes.

Watchdog and activist. This organization is critical of governmental and industrial activities in the Kouilou Prefecture that lead to environmental damage.

Renatura

This sea turtle organization was founded in 2000 by two French women who were former volunteers at HELP’s sanctuary in Conkouati. Observing the large harvest of sea turtle nests and the high level of conflict between artisanal fishermen and nesting females, the founders have created the only effort in Congo that focuses solely on the various species of sea turtles which frequent Congo’s coast (leatherback and olive ridley).

Funding Sources and Structure

This organization is funded through commercial donations from Congolese enterprises, Project GECKO (see below), FFEM, ECOFAC, PROTOMAC, Mag Industries, and the Marine

Conservation Society (Renatura 2007). Gaelle Bal and Nathalie Bréheret manage the organization and staff, who tag turtles and collaborate with fishermen along the coast. In addition, international researchers collaborate with Renatura to improve knowledge about Congo’s sea turtles.

Goals

Renatura’s goals are to reduce turtle mortality from fishing nets and nest predation by local peoples, to conduct environmental education in schools, and to increase knowledge about the importance of Congo’s beaches for the three species of sea turtles. In the past,

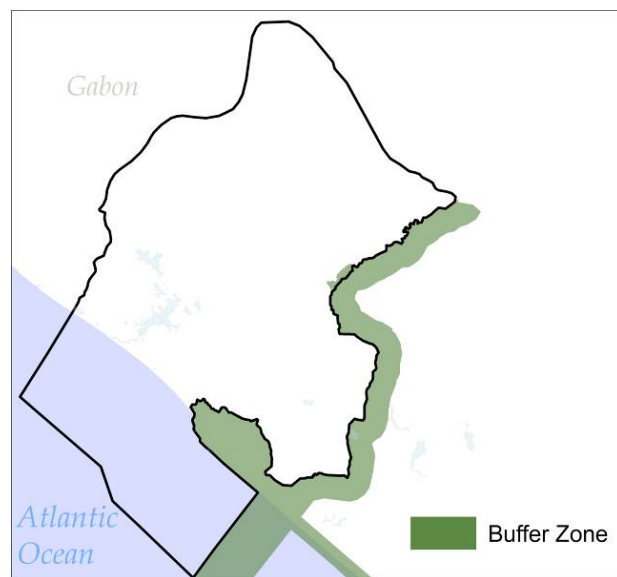


Figure 46: Map of Conkouati-Douli National Park buffer zone, where Renatura conducts selected research activities.

they conducted their activities along Conkouati's southern beach, but now focus outside of the Park.

Major Activities

Reparation. They distribute new fishing line to fishermen with turtle-damaged nets in order to off-set costs fishermen undertake.

Education. They teach sea fishermen and the general public, as well as rural and urban schoolchildren, about the importance of sea turtles . As a part of the Project Gecko (below), they teach about manatees in the southeast region of the Park.

Monitoring. Renatura monitors sea turtle populations; one staff member calculates numbers of sea turtles found in Pointe Noire markets.

Mediation. At Conkouati, this organization is occasionally invited to mediate conflicts and to speak with sea fishermen.

Project GECKO

The project, *Gestion des écosystèmes du Kouilou* (Management of Kouilou Ecosystems) began in 2005 with the collaboration of local and international NGOs and the private sector. It focuses on the southeastern corner of the Park, as well as areas to the south towards Pointe Noire.

Funding Sources and Structure

Total E&P Congo, a French oil company with heavy investments in the Congolese oil sector, provides some 50 percent of the project's

funding. In addition to this global funding for specific projects, each collaborating

organization has independent funds which they operate from. The collaborating organizations include :

SNR (Service National de Reboisement; a national reforestation organization);

IR2PI (Unité de Recherche sur la Productivité des Plantations Industrielles; a scientific forestry organization);

CIRAD (Le Centre de Coopération International en Recherche Agronomique pour le Développement; an international research organization) ;

MEF (Ministère d'Economie Forestière);

Renatura

CRFL (Centre de Recherches Forestières du Littoral)

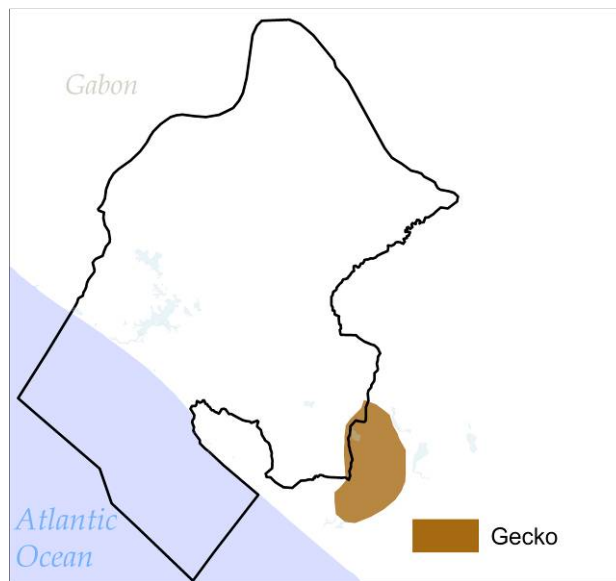


Figure 47: Map of Gecko's area of influence in Conkouati-Douli National Park

Goals

GECKO's seeks to bring together NGO's, government, industry, research laboratories, and local populations to conduct research and strive for sustainable development for communities in the Kouilou region (Pefac 2007). Although one goal was to collaborate with Park Management (WCS and MEF) to create sustainable development efforts in the Park buffer zone, these efforts were met with very limited success, because GECKO and the Park did not work together effectively.

Major Activities

Research. The project's several research projects include charcoal production, bushmeat and hunting in three villages.

Outreach. Manatee conservation and environmental education.

Reforestation. Replanting trees in old agricultural fields to enhance the regrowth of hardwoods and other valuable species to villagers.

FAO's PMEDP and Adecor

In 2003 the Food and Agriculture Organization (FAO) began a project titled the Sustainable Fisheries Livelihood Program (PMEDP-- *Programme pour des Moyens d'Existence Durables dans le Peche*) across several countries in four countries: Congo, Gabon, Mauritania, and Guinea (Republic of Congo 2005). The funding for this project comes from Great Britain's Department of International Development (DID). Following the results of a socioeconomic study from a member of the Ministry of Agriculture, the PMEDP study selected 13 coastal villages

based on poverty levels and women's marginalization (Interview with Placide, 1/26/07). Seven villages are located within the Park and buffer zone¹⁸⁸, and were included in the PMEDP work plan from 2005-2007. During this time, villages were added and others dropped because of lack of cooperation (ibid).

Structure

The FAO project operated through a local development organization called Adecor (*Association de developement de Communauté Rural*, or Association for Rural

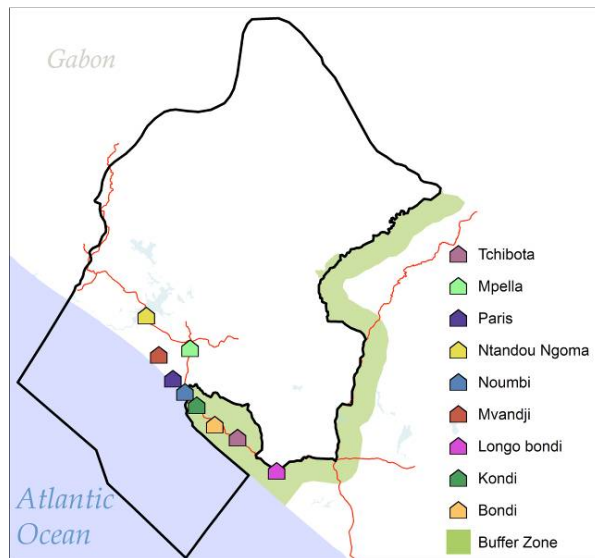


Figure 48: Map of communities worked with in the PMEDP project.

¹⁸⁸ Vandji, Noumbi, Kondi, Bondi, Tchibota, Tandou Ngoma, and Longbondi

Community Development). The seven villages had three resident coordinators, who sought to understand villages institutions, habits, activities, followed by the other major activities listed below. In 2007 a different group of coordinators began working directly on agricultural projects.

Goals

PMEDP believed that many coastal communities were entirely dependent on fisheries for their livelihoods, and thus sought to educate the population on the importance of sustainable fishing techniques, the diversification of their livelihood activities, including agriculture, business, and animal husbandry.

Major Activities

Research. Spend several months learning about villages

Outreach. Teach about ecologically damaging fishing techniques (burning mangroves, small nets, too many nets)

Theater. Theater animation to demonstrate the importance of incorporating women into activities through theater

Groups. Encourage communal activities through developing groups

Capacity building. Strengthen community groups' capacity to stand up to the government's stance (fisheries department) on the Chinese fishing companies

Projects. Develop small projects with individuals and groups (mainly gardening and animal husbandry).

Rural Inhabitants

To better understand local communities and their perspective, I chose to work in three different communities of roughly the same size. In order to sample the variety of livelihood activities and circumstances, I labelled villages according to their major activities. All villages participate in agriculture, so it was not a useful descriptor. Villages did however, have varying use levels of terrestrial and aquatic animals, thus I categorized villages as either hunting, fishing, or mixed hunting and fishing villages. To be clear, members in the community practice a wide range of livelihood activities, and are not confined to one particular activity.

Kondi (fishing village)

Kondi is located along the Atlantic coast, and local people consider it a typical 'Vili' fishing village. The village is growing as the village president has encouraged immigration from Pointe Noire, using agriculture as a selling point.

This village is unique in that a woman serves as village president. Her strength as a leader and motivator balances out the rather diffuse village committee. Kondi also has a traditional land chief, who controls a relatively small parcel of land but is responsible to a very powerful spiritual entity (*mami wata*) that controls fishing resources on the major river in the region.

Because of the village's strength and willingness to experiment with new political and economic arrangements, several development projects, including WCS, FAO, and Adecor, have chosen to work with it.

Major Activities

Agriculture. Swidden cultivation of manioc, chilies, and some corn

Ocean fishing. Many young men rent canoes and nets from village elders .

River fishing. An alternative, or sometimes supplemental, activity to ocean fishing.

Commercial gardening. Introduced by entrepreneurs and development organizations, gardening (tomatoes, peppers and cabbages) for sale in Pointe Noire has expanded considerably since the early 2000s.

Non-timber forest products (non-commercial). All families require roofing materials for their houses and marantaceae leaves for food preparation. Some fishermen also collect raffia to construct shrimp cages.

Development projects. This includes chicken and goat farming, peanut and savanna agriculture brought to Kondi by Adecor and WCS.

Plank fabrication (non-commercial). Needed by all households for construction.

Km4 (hunting village)

Located in the Mayombe forest, KM4 is a relatively new village, created in the 1980s by a regional immigrant. Most residents, except for the youngest come from throughout this region or from central Congo. KM4's richness in wildlife, gold, and timber, its openness to outsiders, as well as its relative easy access to Pointe Noire make it attractive to Congolese immigrants. Other distinguishing features of this village are its forest and nearby road. The forest allows for a higher production of wood products, and the major road near the village facilitates the movement of goods to Pointe Noire.

KM4's frequent past engagements with the timber and oil industries has contributed to a weak internal government structure. From 2006 to 2007, disputes erupted over leadership in the village (who was to hold the title of village chief, or president), causing a rift amongst different neighborhoods. As a relatively new village, KM4 has no family in residence controlling traditional rights to land; the traditional land chief resides in a neighboring village.

Major Activities

Agriculture. Swidden cultivation of manioc, chilies, bananas and squash.

Hunting. Conducted commercially prior to the Park, and currently contributes substantially to some families' income.

Charcoal production. Harvested from swidden fields, charcoal contributes more to some family incomes now, especially because of increased scarcity of this resource in the city.

Non-timber forest products (commercial). Women find plentiful quantities of foubou and marantacea leaves to sell to traveling merchants.

Plank fabrication (commercial). The road network in the area allows for large trucks to pick up planks and take to the wood-hungry market in Pointe Noire.

Lumber production. Again, the road network allows lorries to easily pick up lumber, the projects usually operated by outsiders.

Mpella/Sialivakou (mixed village)

The two villages originated in the Mayombe forest, but French colonial policies of *regroupement* moved the villages into the savanna along the main road.. Although Mpella and Sialivakou are two distinct villages, they are situated only one kilometer apart. They also share kin ties. But they have separate village committees and influential village presidents.

Unlike Kondi, Mpella and Sialivakou were historically ‘Loumbou’ (elsewhere you say “Lumbu” (the second largest regional ethnic group). Most inhabitants of the villages now identify themselves as Vili, either because they migrated to the village, because they believe themselves to be living in a traditionally Vili landscape, or because of marriage and kinship ties. These two villages are the most remote in the study; public transport is infrequent (two times per week at best). Selling products in local or regional markets remains difficult.

Mpella and Sialivakou inhabitants live in the Mpella territory, and thus must ask permission for resource use and construction from Mpella’s traditional land chief. The traditional land chiefs from both villages still attempt to exert control over territories deep in the forest.

Major Activities

Agriculture. Swidden cultivation of manioc, chilies, and some corn .

Lake and river fishing. Fishing is an important practice in the village; Sialivakou men fish in Lake Manzoumanoumvu, Mpella men in both the Noumbi river and Lake Tchimpa.

Hunting. Several younger men in the village practice shotgun and snare hunting . Hunting is far less common now than before the Park’s establishment .

Non-timber forest products (non-commercial). All families need roofing materials for their houses and marantacea leaves for food preparation. Many fishermen also collect raffia for constructing shrimp cages.

Development projects. This includes chicken and goat farming, peanut and savanna agriculture brought to Kondi by Adecor and WCS.

Plank fabrication (non-commercial). Needed by all households for construction.

Appendix 2.1: Survey Sheet and Basket of Goods forms

Fiche de données					
Catégories d'âges de tous les membres du ménage					
Sexes (M/F) Noter d'une façon chronologique l'âge et le sexe de chaque membre du ménage					
		Date:			
		Identité de ménage:			
		Nom du collecteur:			
		# des gens/ménage:			
Petit Déjeuner					
	Légumes	Fécules	Protéines	Fruits	Autres
Items de nourriture :					
Quantité :					
Méthode d'obtenir :					
Prix :					
Déjeuner					
	Légumes	Fécules	Protéines	Fruits	Autres
Items de nourriture :					
Quantité :					
Méthode d'obtenir :					
Prix :					
Dîner					
	Légumes	Fécules	Protéines	Fruits	Autres
Items de nourriture :					
Quantité :					
Méthode d'obtenir :					
Prix :					
Casse croûtes					
	Légumes	Fécules	Protéines	Fruits	Autres
Items de nourriture :					
Quantité :					
Méthode d'obtenir :					
Prix :					

Panier de Marchandise

Village _____

Date _____

1. La coute de voyage
 - a. Prix _____
 - b. Distance _____
2. L'enclavement
 - a. Sante
 - i. Hôpital _____
 - ii. Dispensaire _____
 - iii. Centre de soigné _____
 - b. Route _____
 - c. Ecole
 - i. Primaire _____
 - ii. Collège _____
 - d. Marche _____
3. Les marchandises
 - a. Les sardines (belmart) _____
 - b. Macarel (petit modèle) _____
 - c. Porc (boite) _____
 - d. Pétrole (1 L) _____
 - e. Bougie _____
 - f. Pain _____
 - g. Savon (fanico) _____
 - h. Sucre (3 morceaux) _____
 - i. Café (cuillère) _____
 - j. Papier hygiénique (lotus) _____
 - k. Piles crayons (vinnick) _____
 - l. Piles (grand modèle--vinnick) _____
 - m. Huile végétale (par quart) _____
 - n. Bière (Ngok) _____
 - o. Pastis (par quart) _____
 - p. Torche _____
 - q. Riz (verre bamboo) _____
 - r. Oignon _____
 - s. Cube maggi _____
 - t. Allumette _____
 - u. Tomate (boite) _____
4. Les produits
 - a. Fumbu _____
 - b. Epinard _____
 - c. Banane dessert (4-5) _____
 - d. Mbali (6) _____
 - e. Poulet bateke (femelle) _____
 - f. Atherure _____
 - g. Cephalophe bleu _____

Appendix 2.2 Food lists and categories before & after analysis

Catégorisation de Nourriture Étude d'Alimentation

Légumes		Fruits		Fécules		Autre	
Type	Mesure	Type	Mesure	Type	Mesure	Type	Mesure
Carottes	#	Papaye	#	Pain	#	champignons de savann	#
Tomates	#	Avocat	#	Riz	tasse	champignons de brousse	#
Aubergines violet	#	Safutier	#	Kwanga	#	mwamba	#
Aubergines africain	#	Oranges	#	Mayaka	#	citronelle	sachet
Piment	#	Mandrines	#	Tchingamu	#	sucre	#
Courge	#	Anana	#	tubercule	#	lait	sachet
Pate de courge	#	Ananasi	#	fufu	tasse	cube maggi	cube
Courgettes	#	Pommes	#	mbwata	assietes	sel	# cuilleres
Poivre	#	Guave	#	mbeda	assietes	huile vegetale	# sachet
Msozo	paquet	Tchimvuta	#	gari	tasse	huile de palme	litre
Milele	paquet	Citron	#	quacker	assietes	miel	tasse
Tchimbombolo	paquet	Pompelmousse	#	biscuit	paquet	Buku Tchikayi	#
Ngayi-ngayi	paquet	Bananes	#	spageti	paquet	M'pole	#
lindif	paquet	mangues	#	macaroni	paquet	liindi	#
hibiscus	paquet	Pastec	#	patates	#	Buku bulu vungue	#
saka-saka	tasse	Noisettes	#	plantains	#	Buku bu lombe	#
okre	#	Noire de coco	#	inyames	#	Buku bu mangue	#
foumbou	paquet	lusaka	#	ndolo	#	Buku bu nkane	#
ndongodongo	paquet	malombo	#	tarot	#	Passe unti	#
marimasanye	paquet	Un'bele fule	#	mbaka	#	Buku bu m'ba	#
haricots verts	tas	mvotchi	#			Buku bu sesse	#
oignon	#	tchimpokosa	#				
aie	#	biteke	#				
boite de tomate	#	bisyesi	#				
cibulettes	paquet	kola	#				
mais	#	anona	#				
tarot	#	tchisaka	#				
nkuta	#	igaye	#				
musambuta	#	tchinyeyi	#				
Mbambi	#	pava	#				
Tchiloti	#	minussubali	#				
Tchitandi	#	Chinjimu	#				
M'kayi m'lendji	#	Bintumbe	#				
M'kayi m'binde	#	Chinkumunu	#				
Bari(fauxlong)	#	M'ninguene	#				
Un'poku m'tame	#	Bigarade	#				
M'beble	#	M'kassu	#				
M'tube ndumbe	#	Bichechi	#				
M'kayi m'langue	#	Chintundu	#				
		Bitebe yinchitu	#				
		Mifombu	#				
		Miibe	#				
		Milunde midogui	#				
		Corossolle	#				

Méthode d'Obtenir

Son champ	
Son marie	pour le proteine, les achats
Elle meme	pour le poissons et le cueillette
Membre de famille-partager	
Membre de famille-acheté	
Acheté	par un pecheur, chasseur, cultivatrice, magasin, commercant, boulangerie, commande de PN

Divers Categories des Proteines
Étude d'Alimentation

Viande			Poisson de mer		Autre	
Type	vii/lumbu	Quantité	Type	Quantité	Type	Quantité
Vache	Ngombi	Kg toute demi cuisse tete morceau	Regarde le liste sur notez si c'est frais, salé ou Notez toujours l'espece	Kg toute demi cuisse tete morceau tas cuvette #	Oeufs	#
Cabri	Kombu/N'kombu				Haricots	tasse
Mouton	Dindombe/Limême				Arachides	tasse
Poulet	Tsussu/Sussu				Sardine	boite
Canard	Ivadangu/Tchivadangu				corned boef	boite
Athérure	N'gumbe				saucisson	boite
Aulacode	Tsibitsi/Chibichi				crevettes	tas
Gazelle	Tséssi				crab de mer	#
Chevrotain	Nili				langouste	#
Sitatunga	M'fuli/ M' vulii				calamari	#
Guib hamaché	Kabi/n'kabi				oiseaux	#
Cephalopem à ventre blanc	Un' vemu(Muagle) Un'vemu				*notez l'espece	
Cephalophe à front noir	In'gombi/Tchingombi				Pate d'arachide	paquet
Cephalophe Rouge	Ditolu/Litolu				Crab d'eau douce	#
Cephalophe à dos jaune	Mukuti/un'kuti					
Cephalophe à pattes blanche	Un' vemu(saabe) Un' vemo Un'nuku M'fubu					
Potamochère	Ngulubu/Nguluubu					
Pangolin géant	Pissi/M'pichi					
Rat de Gambie	Kumbi/N'kumbi					
Pangolin d'arbre	Dukageboniu/Kakeboni					
Daman d'arbre	Ihotu(m'boki)/Tchihotu					
Eléphant	N'tsahu/Zahu					
Léopard	Un'komu/Un'komuu					
Buffle	Pahesse/M'pakece					
Mandrill	Niumbu/Niumbu					
Chimpanzé	Iyangui/Tchiyandzi					
Gorille	Pungu/M'pungu					
Ecureils	un'bingui; Duvali; Dubuhu/unbindzi;					
Singe(Hocher)	Muidu					
Moustac	Issêmebe/Tchissêmebe					
Pogonias	Imêngue					
Toquatus	M'pundi					
Cercocebe a joues grises	Ibubuhu/Tchibubuku					
Tortues de mer	M'seku m'buu					
Tortues terrestre	Ibongue Issimu/M'sseku M'tandu					
Serpents	nyoka					
Autres						
			Poisson d'eau douce			
			Type	Quantité		
			Yale/Tchiale	#		
			N'gole/Ngohole	Kg		
			M'bile	toute		
			Mbikle nkoku	demi		
			Livandu	cuisse		
			Lufoli	tete		
			Ngussi	morceau		
			Unsongue	tas		
			Lilulu	cuvette		
			Luvalé			
			Tchivanze			
			Muindji			
			Linganze			
			Notez toujours l'espece			

Appendix 3.1: Mammal list for hunted mammal surveys

English name	Nom Français	Nkumbu Vili	Latin Name
Forest porcupine*	Athérure africain	Ngumba	<i>Atherurus africanus</i>
Blue duiker*	Céphalophe bleu	Tsésé	<i>Cephalophus monticola</i>
Black-fronted duiker†	Céphalophe à front noir	Tchigombi	<i>Cephalophus nigrifrons</i>
Yellow-backed duiker*	Céphalophe à dos jaune	Nkouti	<i>Cephalophus sylvicultor</i>
Peter's duiker†	Céphalophe de Peters	Nembé	<i>Cephalophus callipygus</i>
Bay duiker†	Céphalophe bai	Litolo	<i>Cephalophus dorsalis</i>
White-bellied duiker†	Céphalophe à ventre blanc	Mvémo	<i>Cephalophus leucogaster</i>
Water chevrotain*	Chevrotain aquatique	Founou nili	<i>Hyemoschus aquaticus</i>
Sitatunga*	Guib d'eau	Mvouli	<i>Tragelaphus spekei</i>
Bush pig*	Potamochère	Ngouloubou	<i>Potamochoerus porcus</i>
Giant forest hog	Hylochère	Ngouloubou	<i>Hylochoerus meinertzhageni</i>
Giant ground pangolin*	Pangolin géant	Mpissi	<i>Manis gigantea</i>
Gambian rat*	Rat de Gambie	Nkoumbi	<i>Cricetomys gambianus</i>
Anteater	Oryctérope	Tsissi	<i>Orycteropus</i>
African elephant*	Eléphant	Nzaou	<i>Loxodonta africana</i>
Buffalo*	Buffle	Mpakassa	<i>Syncerus caffer</i>
Waterbuck	Cobe onctueux (defassa)	Nsungou	<i>Kobus ellipsiprymnus</i>
Mandrill*	Mandrill	Nyumbu	<i>Mandrillus sphinx</i>

*Species recorded on transects

^γ Arboreal species such as *Cercopithecus* were not recorded but encountered on transects.

† These species were combined to constitute a 'red duiker' category; thus no specific references to individual species are found in the analyses.

†† Mongoose sign were not identified to the species level.

Appendix 3.2: 2005 Pilot study for hunted mammal surveys

In 2005 WCS researchers developed the first survey design at Conkouati which incorporated an even geographic distribution of samples around the park. This survey design using Distance techniques (Buckland et al 2001) included a dung/nest survey of large mammals, including elephants, great apes, and buffalo. One-kilometer transects were placed along a grid with 5 km between each transect and a higher density of transects in areas closer to villages (see Figure 1). This difference in transect densities was designed to better estimate wildlife populations given an estimated lower density of sign in areas with higher hunting pressure. Transects were conducted in both savannas and forest habitat. During this survey WCS incorporated my pilot study which included recording the sign of all mammals along the transects, most importantly, medium-sized mammals.

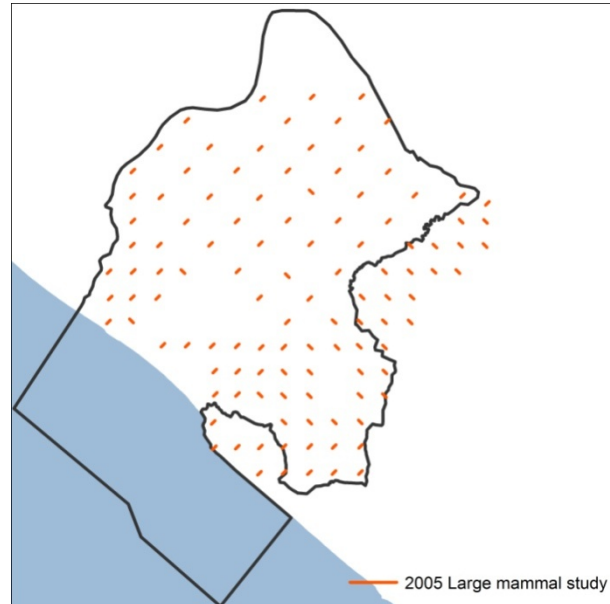


Figure 49: 2005 large mammal survey design (shapefile courtesy WCS-Congo). The pilot study used research teams from WCS and included 25x25m wildlife plots on either end of each transect.

Because sign for these smaller mammals is difficult to detect, I also explored the efficacy of plots, where 100% detection rates might increase the number of sign. I used an approach that included both transects and 25x25 m plots at either end of each transect to examine which of the two methods best sampled mid-sized mammals such as duiker, porcupine, and bush pig. Three observers stood 2 m apart and scanned the entire plot to ensure 100% detection. The results from this method proved slightly less effective than transects for several reasons. First, the survey was carried out during the rainy season, which meant dung decayed in about 4 days. Most of the plots surveyed had zero dung, which does not allow for an effective study of relative densities on a large scale. Secondly, the surveys of each plot took on average 2 hours, and caused significant fatigue in observers. From these pilot studies of plots and transects I learned:

1. The high degradation rate of small dung in the wet season contributed to the high number of transects and plots with zero observations
2. Given the high hunting rates across the area, 25m x 25m plots are not sufficient to capture an estimated low density population
3. The plot methodology required 1-3 hours per plot and resulted in heavy fatigue amongst teams, especially when coupled with transect work.

4. Given the transect method is be a long-term methodology for surveying large mammals, a second type of study using plots is less cost effective.
5. Logistics for a large survey during the rainy season was very challenging, coupled with plots, lead to low morale amongst teams, which contributed to the falsification of data on some transects and plots.

Appendix 3.3 Example data sheet for hunted mammal surveys

Transects de Mammiferes

Date:		Heure de duree:					Meteo: P Observateurs:					Commentaire	
ID	Long	Lat	Mammiferes		Vegetation		Fruits		Marantaceae		Especes		
			Espece	Signes	Age	Dist	Poist	Veg	V-type	Fruits	CS %	Marantaceae	Especes
Quel transect			Cep B	Crotte	Frais	Topofil	Centi-	FT (F terre ferme)	Jeune	Chivuta	0=0%	0=rien	marantace
			Cep R	Empreint	Recent		metre		Mature		1=1-25%	1=un peu	?
NT-1			Cep J	Vu	Vieille			FM (F marecageus)	Inondee		2=26-50%	2=beaucoup	
			Guib	Entendu	T Vieille				Per. Inondee		3=51-75%		
			Sitat	Piste					Mangrove		4=76-100%		
			Chev	Trou				S (Savane)	Arbustif				
			Buf	Carcasse									
			Pot					C (Champ)					
			Hippo	Coupes				CHAN (Chantier)					
			Ele	Piege				Chablis					
			Aula	Debardage				E (eaux)					
			Pang	Douille									
			Ather	Camp									
			Mang	Feu									
			panthere	Autre									
			Chim	Route									
			Mand										
			Primate										
			Gor										
			Horn										
			Orp										
			For										
			Chasseur										

Appendix 3.4 Vegetation classification information for hunted mammal surveys

Vegetation data was collected along the transect at each vegetation change along the transect. Although we collected marantaceae data, it was not used in the final analysis as this category positively correlated with ground cover.

Vegetation Category

1. Terra firme forest (Foret terra firma)
2. Swamp forest (Forêt maracageuse)
3. Savannah (Savane)
4. Forestry camp (Chantier)
5. Forest opening (Chablis)
6. Farm field (Champ)

Vegetation type

1. Young (Jeune)
2. Mature (mature)
3. Flooded (inondée)
4. Periodically flooded (periodiquement inondée)
5. Mangrove
6. Woody (arbustive ; for savannas)

Ground cover (Couverture de sol):

- 0; 0%
- 1; 1-25%
- 2; 26-50%
- 3; 51-75%
- 4; 76-200%

Marantaceae category (Catégorie de Marantaceae)

- 0 (none)
- 1 (some)
- 2 (a lot)

Appendix 4.1 Hunter survey

Les effets de l'application de la loi de faune sur les populations locales

Village : _____

Age : _____

Date : _____

Etat civil : « Marié » « célibataire »

De dépendants : _____

Type de chasse pratiqué : « câble/piège » « fusil » « les deux » « si fusil,
c'est leur propre ou loué ? »

Le % de revenue totale de chasse dans votre foyer avant le parc : « 0-24% » « 25-
49% » « 50-74% » « 75-100% »

Après le parc « 0-24% » « 25-49% » « 50-74% » « 75-100% »

Part 1: La conservation

C'est quoi la conservation pour vous ?

Etes-vous pour la conservation ? « oui » « non » Pourquoi ou pourquoi pas ?

Croyez-vous que la conservation peut amener les bénéfices pour vous ? « oui » « non »
Lesquelles ?

Est-ce que les actions du parc ont changé votre avis sur la conservation ? « oui » « non »

Lesquelles actions ? _____

Part 2 : La chasse

Savez-vous quand le parc a été créé ? « oui » « non » « _____ »

Savez-vous la différence entre la zone d'écodéveloppement et la zone intégralement protégé ? « oui » « non »

Expliquer _____

Savez-vous les limites du parc et la zone intégralement protégé ? « oui » « non »

Respectez-vous les limites ? « oui » « non »

Savez-vous les animaux intégralement protégés ? Lesquelles ? _____

Quand commence la période de chasse ? _____ Existe-ils des réglementations sur la chasse ici au Congo ? Lesquelles ?

Faites-vous une différence entre l'installation de *parc* et la construction des *barrières* du parc? « oui » « non »

quoi ? _____

Est-ce que les patrouilles des ecoguards sont une force de dissuasion contre la chasse? « oui » « non » si oui, « forte » « faible » Pourquoi (pas) ?

Est-ce que les barrières du parc, jusqu'à l'arrivée de BGP étaient-elles une force de dissuasion contre la chasse ? « oui » « non » si oui, « forte » « faible » Pourquoi (pas) ?

A cause du parc, faites-vous « plus » « pareil » « moins » de chasse ?

Depuis que le service d'ecogarde existe, rencontrez-vous « plus » « pareil » ou « moins » des animaux dans le forêt ? Lesquelles ?

Depuis que le service d'ecogarde existe, allez-vous « loin », « moins loin », ou « plus proche » au village pour trouver le gibier ?

Pourquoi ? _____

Part 3 : L'économie de chasse

Est-ce que les patrouilles ou la barrière vous ont amené de participer dans les autres activités économiques en dehors de la chasse ? « oui » « non » Lesquelles ? (liste toutes, avec

le % de revenue totale gagne par chacun)

Parmi le deux missions que les ecogardes ont accomplit (patrouille et barrière) lequel a vous amener de participer dans l'autre activité ? « Patrouille » « barrière »

Les patrouilles menées par les ecogardes ont-elles causé un changement sur les revenus de vos activités ? « oui » « non » A quel % pouvez-vous estimer cela ? 0-100%_____

Les barrières menées par les ecogardes ont-elles causé un changement sur les revenus de vos activités ? « oui » « non » A quel % pouvez-vous estimer cela ? 0-100%_____

Maintenant, envoyez-vous des gibiers à Pointe Noire ? « oui » « non » Combien sur 10 bêtes? _____ Quel % mangez-vous ? (sur 10 bêtes) _____ Quel % vendez-vous dans le village ? (sur 10 bêtes) _____

Pourquoi vous ne les vendez pas dans le village ?-

Si vous les envoyez à Pointe Noire, quel pourcentage échappent les barrières ? (combien sur 10)_____

Vous avez dit que XX% de vos gibiers sont saisis a la barrière. A quel % décideriez-vous de laisser la chasse ?_____

Si vous ne pouvez que vendre les gibiers au village, préférez vous de laisser la chasse ? « oui » « non »

Quel était votre relation avec des commerçants de viande avant l'installation des barrières du parc?

Cela a changé après l'installation des barrières ? « oui » « non » Comment ?

S'il y avait une perte de revenue, c'était vous ou eux qui l'avez perdu? « chasseur » « commerçant » « les deux » Expliquez..._____

**Est-ce que le manque de commerçants a des conséquences pour vous ? « oui » « non »
Lesquelles ?**

**Connaissez-vous des chasseurs qui sont quittés les villages à cause du parc ? « oui » « non »
Combien ? « ____ » Pourquoi ? « patrouilles » « barrières » « autres
raisons » _____**

Part 4 : Les Exploitants

Avant le service d'ecogarde, quel était le # de gibier que vous avez chasser par semaine ?

**Pouvez-vous nous dire le # de gibier vous avez chasser de que le service d'ecogarde a
commencé ? _____**

Quand BGP est arrivé, combien de gibier par semaine avez-vous vendu ? _____

**Si vous travailliez pour BGP, continuez-vous de chasser ? « oui » « non » Achetiez-vous de
viande de brousse quand vous travailliez ? « oui » « non » Combien de fois par semaine ?
« ____ »**

Quel changement apportent les pétroliers aux chasseurs ? _____

Les exploitants forestiers ? _____

**Est-ce que les exploitants peuvent compenser pour la perte de chasseur causé par la
barrière ? « oui » « non » Pourquoi ?**

Part 5 : Les services sociaux et alimentation

*Les questions suivantes ont pour but d'apprendre si, ou comment, le service d'ecogardes a
apporté un changement vers les services sociaux en milieu des chasseurs.*

**Votre femme et enfants travaillent « plus » « pareil » « moins » maintenant pour la famille
par rapport aux jours avant les ecogardes ?**

**Votre accès aux hôpitaux est « plus » « pareil » ou « moins » par rapport aux jours avant les
ecogardes ?**

L'accès aux écoles pour vos enfants est « plus » « pareil » ou « moins » par rapport aux jours avant des ecogardes ?

Mangez-vous « plus » « pareil » ou « moins » de viande qu'avant les ecogardes ?

Votre alimentation est « meilleure » « pareil » ou « pire » par rapport aux jours avant les ecogardes ? Expliquez

Constatez-vous une différence sur les services sociaux au moment de patrouilles de service d'ecoguard et l'implantation des barrières du parc ? « oui » « non » Lequel ?

Est-ce que les barrières du parc garantissent-elles l'abondance de la faune sauvage ? « oui » « non » Pourquoi ?

En tant que chasseur que vous êtes, quelle pensée avez-vous pour maintenir l'existence et l'abondance de la faune sauvage ?

Que pensez-vous des barrières ?

Sont-elles bonnes pour la conservation de faune ? « oui » « non »

Avez-vous d'autre commentaire ?

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