

## 14. Lopé-Chaillu-Louesse Landscape

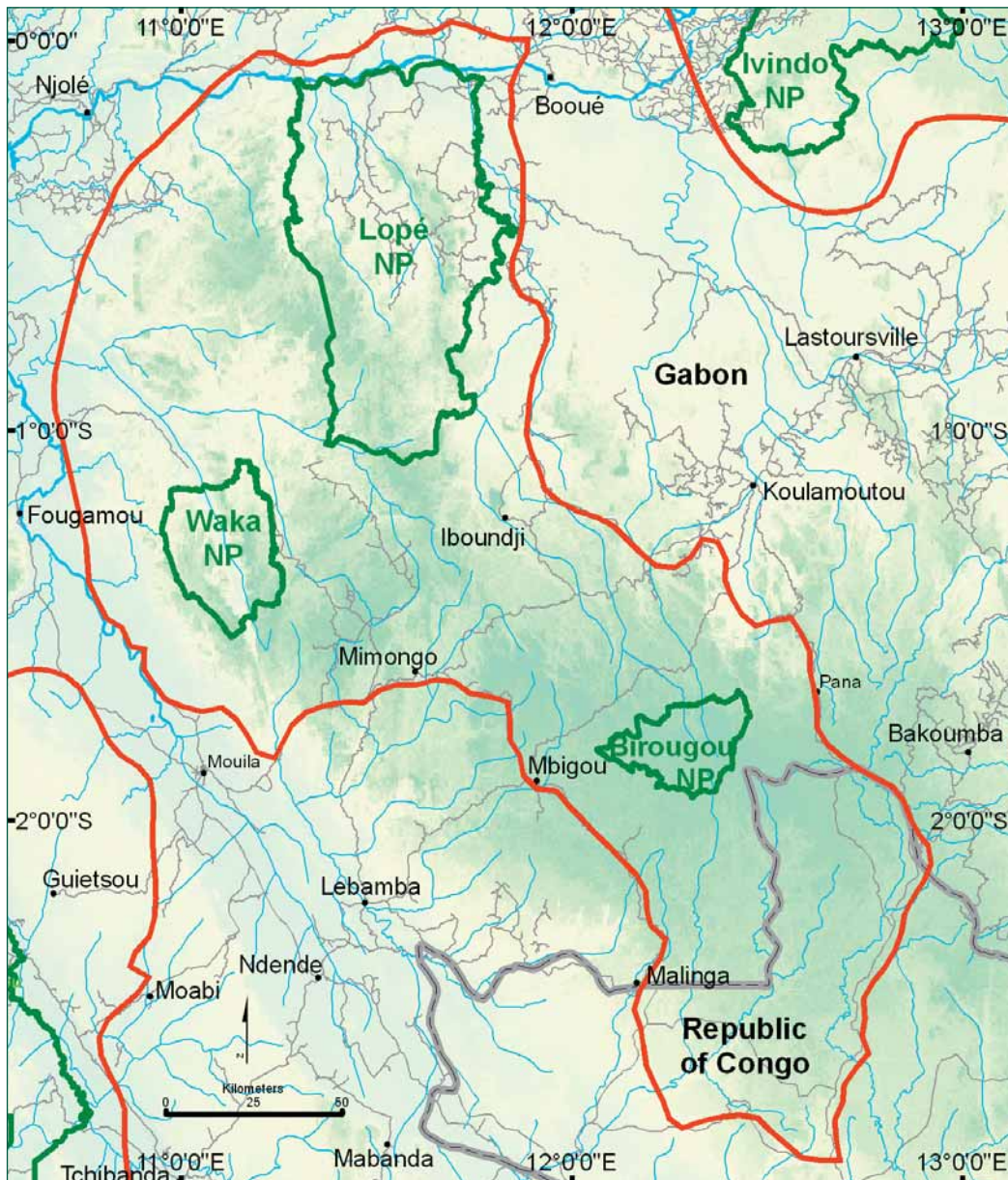


Figure 14.1. Map of Lopé-Chaillu-Louesse Landscape (Sources: CARPE, JRC, SRTM, WCS-Gabon).

<sup>1</sup> During the last glaciation of the Pleistocene the foothills of the Chaillu Massif seem to have been covered with savannahs and, contrary to the case in the Monts de Cristal, it is not certain that the highest areas were covered with dense continuous forests. Some people think that they were covered with a mosaic of plant environments and forest formations. Recent studies suggest, moreover, that even the forest galleries of Lopé National Park functioned as a refuge during the last glaciation for several species of Caesalpinioideae with very low colonization ability (Leal, 2004)

### Location and area

The Lopé-Chaillu-Louesse Landscape covers 35,000 km<sup>2</sup> and extends over 275 km from north to south, from the center of Gabon to 50 km inside the Republic of Congo (Figure 14.1). It centers on the Chaillu Massif, a mountainous region that is assumed to have sheltered one of the forest refuges of the Pleistocene<sup>1</sup>, explaining the presence of numerous endemic species. The Gabonese section of the Landscape includes Lopé, Waka and Birougou national parks.

### The landscape in brief

**Location:** 0°2'52"N – 2°52'16"S; 10°40'25"E – 12°55'8"E

**Area:** 35,000 km<sup>2</sup>

**Elevation:** 100-1,000 m

**Land ecoregions:** Congolese forests ecoregion in the northwest  
Atlantic Congolese forests ecoregion

Congolese forest-savannah mosaic ecoregion in the southwest

**Aquatic ecoregion:** Southwest equatorial coastal ecoregion

**Protected areas:** Lopé National Park, 497,000 ha, 1946/2002, Gabon

Waka National Park, 107,000 ha, 2002, Gabon

Birougou National Park, 69,000 ha, 2002, Gabon

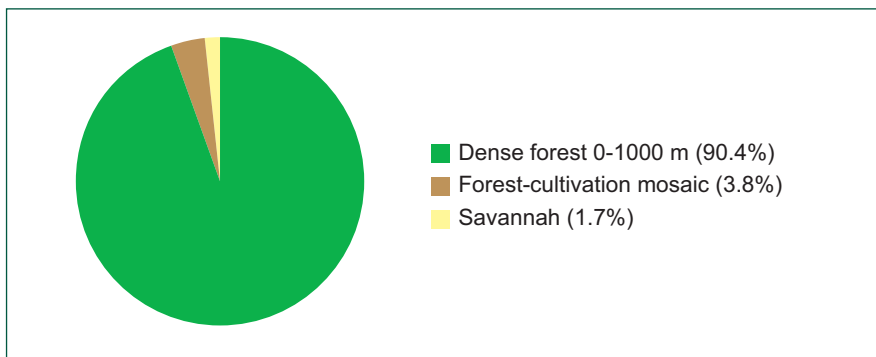


Figure 14.2. Main vegetation types (Source: JRC).



Figure 14.3. The forest-savannah mosaic in northern Lopé National Park.

## Physical environment

### Relief and altitude

The majority of the Landscape is made up of hills and mountains with a rather steep relief of between 100 m altitude at the Ogooué and 1,020 m at the summit of Mount Milondo (Figure 14.1). Nearly half the area of the Landscape is located above 600 m in altitude. With the Monts de Cristal in the north, the Chaillu Massif forms the ‘backbone’ of Gabon. In contrast to the Monts de Cristal, which are located only 100-120 km from the ocean, the Chaillu Massif is 300 km or more from the coast and is separated from the ocean by two intermediate ranges, the Doudou and Mayombe Mountain Range and the Ikoundou Range. These mountain ranges accumulate the clouds from the Atlantic and attenuate their effects.

### Geology and soils

The Landscape is characterized by a complex geological structure. The major part of the northern half of the Landscape, including Lopé

and Waka national parks, rests on the volcano-sedimentary and cristallophyllian rocks of the Ogooué system, dating from the Later Proterozoic and aged 2 to 2.5 billion years. A narrow eastern band, along the Offoué River, rests on the volcano-sedimentary rocks of the Booué Basin, a subset of the Francevillien, also dating from the Later Proterozoic and 2-2.1 billion years old. The two systems are separated by archean rocks, 3.2 billion years old, which form a north-south band with a maximum width of twenty kilometers connecting the archean formations of the north and south of Gabon<sup>2</sup>. In its northern part, at the height of the Lopé savannahs, the Landscape is characterized by the presence of isolated rocks made up of ultramafic formations of unknown age. The southern half of the Landscape, including the Chaillu Massif, chiefly rests on old undifferentiated archean gneiss that is 3.2 billion years old, interspersed with strands of granites and of calco-alkaline or alkaline granitoids that are 2.6 to 2.9 billion years old.

### Hydrology

The Chaillu Massif and the north of the Landscape include the sources of the Lolo, Offoué, Ikoy and Ngounié, all rivers that belong to the Ogooué Basin. The south, between Mouila and Mimongo, belongs to the basin of the Nyanga and the Congolese section drains toward the Niari.

### Climate

The annual average rainfall varies from 1,400-1,500 mm in the Lopé savannahs to 2,000-2,400 mm on the Chaillu Massif. The dry season lasts three months (June, July and August); the rainy season extends from September to May but it is interspersed with a season of less rainfall in January and February, which is extremely variable from one year to the next.

## Vegetation

The Landscape includes three main zones (Figure 14.2):

- the area of savannahs of the middle Ogooué, interspersed with forest galleries (Figure 14.3)
- the mature forest area of the Chaillu Massif (Figure 14.4)
- the area of pioneer forests of okoume *Aucoumea klaineana* and the Marantaceae forests of the Lopé that extends over a distance of 50 km to the south of the Ogooué (Figure 14.5)

<sup>2</sup> The savannah area north of Lopé National Park rests on this archean ‘tongue’, while the Brazza Mountain Range belongs to the cristallophyllian system of the Ogooué.



Figure 14.4. Mature forests in Waka National Park, centered on the Ikobé River.

The majority of the information known about the vegetation comes from Lopé National Park (White & Abernethy, 1996) and its immediate environs, where more than 1,500 species belonging to 710 genera and 120 families have already been identified. With 52 genera and 138 species, the Rubiaceae represent the most diversified family. Other important families are the legumes, with the Caesalpinioideae and the Papilionoideae, the Poaceae and the Euphorbiaceae. Ferns are also very well represented. Several species are endemic to the Landscape: notably the trees *Dialium Lopéense* (Caesalpinioideae) and *Cola lizae* (Sterculiaceae), the Zingiberaceae *Aframomum sericeum* and several species of Begoniaceae.

Studies carried out in the northern part of the park have shown a complex mosaic of plant communities: 17 habitats in the forest and 6 in the savannah (White, 1992). The diversity of these habitats plays an important role in maintaining a large biomass and animal diversity because it offers an enormous choice of nutritive resources with varied phenologic and temporal patterns. This vegetal mosaic reflects the very dynamic history of the Lopé region with a transition from open herbaceous formations, frequently burned, through various colonizing forest formations, dominated by the pioneer species *Aucoumea*



Figure 14.5. Marantaceae forest in Lopé National Park.

*klaineana* and *Lophira alata*, toward mature old-growth forests with a closed canopy and a great diversity of tree species. In certain low areas of the Landscape, *Sacoglottis gabonensis* makes up monodominant formations, which are frequented by a large number of elephants during fructification<sup>3</sup>. On the other hand, the majority of the Landscape has probably been influenced for centuries by moving islands of itinerant cultures that have locally rejuvenated the forest formations.

## Fauna

### Mammals

The mammalian fauna includes nine species of diurnal primates and six species of nocturnal primates, including four species that are among the most endangered on the continent: the western lowland gorilla *Gorilla gorilla*, the chimpanzee *Pan troglodytes*, the black colobus *Colobus satanas* and the sun-tailed guenon *Cercopithecus solatus*, a species that is nearly endemic to the Landscape<sup>4</sup>. Ungulates are represented by thirteen species, including *Cephalophus ogilbyi crusalbum*, a form endemic to Gabon. There are a dozen carnivore species, the largest one being the leopard, which achieves very high densities in the northern part of Lopé National Park. In the north of the Landscape, the very large mammalian biomass (White, 1994) is dominated by the elephant, although other species are also represented by large populations, notably the gorilla, the chimpanzee, the *Syncerus caffer* buffalo, the bushpig *Potamochoerus porcus* and several species of primates, especially the mandrill *Mandrillus sphinx*<sup>5</sup>. Toward the south the mammalian biomass decreases, probably in relation to the low productivity of the dense forests in the mountainous terrain. In all, the Landscape con-

<sup>3</sup> It has been estimated that all the elephants in a radius of 50 km are concentrated in these *Sacoglottis* forests (White, 1994).

<sup>4</sup> This monkey was described in 1986 after being 'discovered' in 1984 in the forest of Abeilles, located just to the east of the Offoué. Subsequently, it was also found in Lopé National Park, to the west of the Offoué, and more recently around the sources of the Offoué in Birougou National Park.

<sup>5</sup> The Landscape is at the center of the distribution of the mandrill which inhabits Lopé National Park in troops averaging 650. In the savannahs to the north, gatherings of more than 1,000 individuals have even been observed (Abernethy *et al.*, 2002).

tains 23 species that are considered endangered according to IUCN criteria (Annex C).

## Birds

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The avian fauna of the Landscape includes more than 400 species, 193 of them species typical of the Guinean-Congolese forests. Seventy-one species are residents of the savannah, in the forest galleries and copses in the north of the Landscape, which underlines the fact that the importance of these habitats is not limited to mammals. The forest avian fauna includes six species endemic to the forests of Lower Guinea: the grey-necked rockfowl *Picathartes oreas* and the forest swallow *Hirundo fuliginosa*, which depend on the rocks in the forest, the lesser bristlebill *Bleda notata*, the grey-headed puffback *Batis minima*, the black-necked wattle-eye *Dyaphorophya chalybea* and the Dja River scrub warbler *Bradypterus grandis*, a marsh species of Cyperaceae. In the forests around Birougou National Park, the pink-footed puffback *Dryoscopus angolensis*, a submontane or montane species, which has not been found elsewhere in Gabon, can be found (Christy, pers. comm.). This species had previously been observed in the Congolese part of the Landscape, along with another montane species, Crossley's ground thrush *Zoothera crossleyi* (Dowsett-Lemaire & Dowsett, 1991).

## Herpetofauna

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The reptiles and amphibians of the Landscape are not well known, but preliminary observations made in 2001 indicate a rich herpetofauna<sup>6</sup>: in 1995, *Leptodactylodon blanci*, a fast mountain stream frog, was described in the Lopé reserve; in 2001, the gecko *Hemidactylus kamdemtohami*, the burrowing snake *Letheobia pauwelsi* and the waterfall frog *Werneria iboundji* were described in Mount Iboundji, while the water snake *Hydraethiops laevis*, known only in Cameroon, has been found in the Chaillu Massif (Pauwels, pers. comm.).

## Ichthyofauna

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The majority of the Landscape is within the Ogooué Basin, which forms part of the southwest equatorial coastal ecoregion and houses more than 230 species of fish, 25% of which are endemic to the ecoregion. The Mormyridae and the Aplocheilidae are particularly diversified. The basins of the Nyanga and Niari form a transition with the basin of the Congo River, but the

Chaillu Massif has never really been investigated, and it is expected that numerous other small endemic species will be found in the mountain streams (Kamdem Toham *et al.*, 2003; Thieme *et al.*, 2005).

## Invertebrates

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The invertebrates are almost totally unknown, but a study of the social Hymenoptera of Gabon showed that the Chaillu Massif could be the region richest in species (Polly, pers. comm.). A preliminary inventory of the diurnal butterflies in the Lopé park (G. Vande weghe, in prep.) has so far revealed the existence of only 200 species, but these include two *Nymphalidae* with limited distributions (*Euphaedra dargei* and *Bebearia ore-mansi*) and one species new to science (*Bebearia Lopéensis*). A casual collection of Geometridae in 2000 led to the description of six new species in the *Zamarada* genus (Pierre-Baltus & Pierre, 2000).

## Humans in the Landscape

### Archaeology

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The savannahs of the middle Ogooué have been inhabited for at least 400,000 years and archaeological excavations have revealed a nearly continuous set of artifacts going back 100,000 years and covering the entire Paleolithic, the Neolithic and the Iron Age (Oslisly, 1994, 1998, and 2001). However, between 1400 and 700 BP, the region was depopulated<sup>7</sup>. Around 700 BP, the valley of the middle Ogooué was repopulated by new populations, most probably coming from the northeast, whose descendants today are the Okandé. Following the introduction of American plants and the development of the slave trade and a barter economy in the 17th century, the populations gradually moved their villages closer to the Ogooué, which had become an important trade route. More recently, they have moved closer to the Trans-Gabon Railroad.

### Density and distribution

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According to CARPE data, the average density of the populations in 1990 in the Landscape was 2.8 inhabitants/km<sup>2</sup>. This Landscape therefore has the second lowest population density among the Landscapes. Its populations are concentrated along the roads and the navigable watercourses. In the north, they are concentrated along the Ogooué and the railway line. In the south, they

<sup>6</sup> During a short investigation of Mount Iboundji, at least three new species were found, which underlines the biological importance of the submontane habitats in the south of the Landscape (Pauwels, pers. comm.).

<sup>7</sup> Radiocarbon dating shows an absence of human activity in a large part of Gabon and the Republic of Congo during this era (Oslisly, 1998 and 2001). The reasons are unknown.

are concentrated along the roads and certain pedestrian paths that cross the Landscape (above all the Mouila-Koulamoutou road, the Ndendé-Mbigou-Koulamoutou road and the Iboundji area). Between the two areas there is an enormous region with few inhabitants, where Waka National Park and the southern part of Lopé National Park extend. Koulamoutou, Mimongo and Mouila are the principal population centers in the south of Gabon, but they are located either just outside the Landscape or on its borders. All are major markets for bushmeat, as is Libreville, which is located at the end of the railway line. In the Republic of Congo, Mossendjo is located on the southern edge of the Landscape and Moyoko is the only other major population center located on the Franceville-Mossendjo road, the most important trade route between the two countries.

### Ethnic groups

The Landscape is occupied by eight Bantu groups. The Okandé and the Tsogo group, comprised of the Simba, Povi and Apindji, are more or less related<sup>8</sup>. In addition one finds Makina, Akélé, Mbahouin, Saké and Massango. In certain areas, groups of Bongo Pygmies remain, some of whom maintain a traditional hunter-gatherer lifestyle<sup>9</sup>.

### Activities

The primary traditional activities are subsistence agriculture, usually slash and burn, and hunting, but logging has become the most important activity over the last few decades. The construction of the Trans-Gabon Railroad in the 1970s triggered socio-economic development in the extreme north of the Landscape, with the creation of massive numbers of jobs and the construction of logistical base camps that later became the principal infrastructure of new and existing villages. This process was accompanied by the immigration of significant numbers of railroad workers, shopkeepers and hunters. With the end of work related to the railroads in the 1980s, the majority of these people lost their jobs. The more highly skilled left; the others remained in place without income or were hired by the logging industry. The establishment of the ECOFAC program in 1992 offered new employment opportunities<sup>10</sup>, but the interruption in the financing of this program once again increased unemployment. At present, the principal means of employment are logging, hunting and administrative tasks.

In the southern part of the Landscape, in Gabon and the Republic of Congo, the main ac-

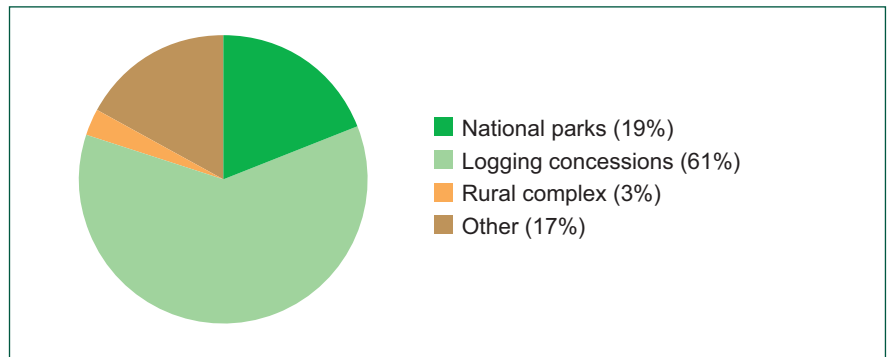


Figure 14.6. Land use types.

tivities remain agriculture, hunting and logging. The city of Mossendjo still houses the MEFE forestry school, but due to a lack of financing over the past fifteen years it hardly operates. The road that crosses the Landscape to the Republic of Congo can be traveled by 4x4 vehicles and serves as a commercial route to take agricultural products and bushmeat to the urbanized centers in the southern part of the country.

### Land use

Around 61% of the area of the Landscape is occupied by logging concessions (Figure 14.6). The protected areas cover 666,300 ha, making up 19% of the Landscape.

### Logging

In the Republic of Congo, a single concession, the UFA of Mossendjo, covers 1,170,000 ha and the entire Congolese part of the Landscape. It does not appear to be allocated at present. In Gabon, in 2004, the Landscape included 107 logging permits covering a total area of 1,934,888 ha. The average size of the permits was 18,000 ha. This difference necessitates very different approaches, both to the management of logging operations and to relations between operators and forest conservationists. In the Republic of Congo, conservationists have just one potential partner. In Gabon, they are confronted with a plethora of companies. These companies have different levels of skill, different levels of available financing, different length permits, and different objectives and interests as concerns the sustainability of the operations.

The relations between Leroy-Gabon and the Lopé reserve were extremely antagonistic up until 1997 after a very controversial FSC certification was withdrawn from the company at the beginning of the 1990s. Afterwards serious progress was made concerning sustainable operations. In 2001, Leroy-Gabon set up a protocol for manag-

<sup>8</sup> This group could be considered endemic to Gabon and the Chaillu Massif represents its 'homeland'. It is very important culturally because of the fact that it seems to have taken up many elements of the culture of the Pygmies and because it has strongly influenced other ethnic groups in the country, many of which have adopted elements of the Tsogo culture (among others the Bwiti ritual).

<sup>9</sup> All the Pygmies of the Chaillu Massif have base villages, usually in the region of Etéké-Massima, but they go away for long stays (up to six months) in the forest triangle: Sindara-Mimongo-South Lopé.

<sup>10</sup> The program made a point of recruiting workers from the villages located around the national park, but the number never exceeded 50.

ing the fauna in its concession that limited hunting in the concession, the transport of hunters, the use of firearms and the trade in bushmeat. Unfortunately, the company seems to have given up its sustainable management program and lost its certification in March 2005. Later in the year the administration withdrew its approval of the management plan. One of the weaknesses for this company in terms of long term planning is the fact that it has changed ownership several times.

The company SBL<sup>11</sup>, which operates between Lastoursville and Koulamoutou in the south of the Landscape, has terminated its management inventory, and its management plan, approved by the administration, is in the process of implementation. This company was selected by the Tropical Forestry Foundation (TFF) for the organization of a training program in reduced-impact logging (RIL) in which Form-International and WCS participated. The company SEEF also initiated the development of a management plan, but the company IFL, a company associated with SBL, which operates in the southwest of Waka National Park, has not yet initiated its management plan. The companies EGG, CFA and BSG—the latter operates in the BOFIGA concession which adjoins Lopé National Park—have also adopted a wait-and-see attitude insofar as development is concerned. However, Gabonese law stipulates that as of December 31, 2005 all companies will have to have implemented sustainable management. These companies are therefore in breach of the law and their operations have become illegal. They are probably counting on the ‘flexibility’ of the government.

The Malaysian company Rimbunan Hijau, the largest logging company in the world, operates to the southwest of Lopé National Park. It was established in Gabon after conducting aerial explorations and market studies. It was initially established in Lambaréné under the name of Bordamur, which has currently become the second largest forestry company in Gabon after Rougier. For the drafting of its management plan, Bordamur is working with the Sylvafrica office, whose principal shareholder is the French *Office national des forêts* (ONF).

All the companies cited have foreign roots and it is very difficult to generalize, since each company is a separate case with very different approaches and objectives.

## Reasons for the identification of the Landscape

- (1) The Chaillu Massif forms the heart of a biogeographical subregion of Lower Guinea, has many endemic species and is considered one of the priority areas for conservation (WWF, 2006).
- (2) The pioneer forests of the north of the Landscape provide a habitat for densities of large mammals that are among the highest in tropical forests.
- (3) The Landscape includes three national parks (Lopé, Waka, Birougou) in Gabon.
- (4) Lopé National Park is an important site for the conservation of birds (Fishpool & Evans, 2001).
- (5) Outside of the protected areas there are very rich sites, such as Mount Iboundji, which provides habitat for endemic species of reptiles and amphibians.
- (6) In its northern part, the Landscape harbors an intact transition between open savannah and dense mature forest, making it possible to study the dynamics of this transition, which has played a fundamental role in the phenomena of speciation.
- (7) The Landscape houses the oldest vestiges of human occupation in western Central Africa<sup>12</sup> and a set of engravings on rock that is unique in Central Africa, making it possible to follow in detail the interactions between human beings and their environment over the course of the last 50,000 years.
- (8) There are significant opportunities for conservation:
  - a. Huge areas of the Landscape are very sparsely populated with humans and free of access routes.
  - b. Lopé National Park has been protected for a long time and Waka and Birougou national parks are well accepted by the surrounding populations.
  - c. The region of Lopé National Park is well known, especially through the existence of a research station on gorillas and chimpanzees.
  - d. Lopé National Park has benefited from support for more than fourteen years through the ECOFAC program (EU) first and later on WCS.
- (9) The opportunities for developing tourism are significant and tourist accommodation infrastructures already exist in Lopé and in Mikongo in Lopé National Park.

<sup>11</sup> This French company was established in Gabon in the 1980s after the prospects for industrial exploitation of forests in Côte d’Ivoire were sharply reduced.

<sup>12</sup> At Elarmekora, in the savannahs of the middle Ogooué, located on the border of the Landscape, worked stones dating from at least 400,000 years ago have been found. These stones are associated with the presence of a population of primitive *Homo sapiens*.

- (10) In the Congolese section of the Landscape there are opportunities for creating a protected area — in the process of being examined by MEFE and WCS — but the animal population densities are very low; the renovation of the forestry school of Mossendjo could, however, revitalize an indispensable Congolese institution and offer combined training in forestry management and fauna management. The Landscape could serve as a site for field training.
- (11) The majority of the Gabonese section of the Landscape has been only slightly logged and there are still major opportunities for implementing sustainable logging.

## Conservation

### History

Pursuant to a decree of 1944 governing hunting in French Equatorial Africa, in 1946 the partial hunting reserve of Lopé-Okanda, Okanda National Park and the complete nature reserve of Offoué were created. The borders of these protected areas were determined provisionally and definitive borders were never published (Christy *et al.*, 2003). In 1960, all the protected areas were transformed into areas for the rational exploitation of fauna and a decree of 1962 classified an area of rational exploitation of fauna in Offoué amounting to 500,000 ha, including the fauna reserve of Lopé-Okanda (350,000 ha) and the hunting domain of Lopé-Okanda (150,000 ha). A decree of April 1971 defined the sectors of tourist exploitation of fauna and introduced the name of 'Lopé-Okanda'. In 1982, a brigade for regulating fauna was set up in Lopé. A decree of 1996 divided the whole into a 'central core' of 167,018 ha classified as an integral reserve and a 'peripheral zone' of 369,000 ha where economic activities, especially hunting, could be organized by decree and where logging retained its rights. This decree had the objective of regulating the logging concessions granted starting in 1971 in the form of lots in the catchment area of the railroad (Christy *et al.*, 2003). A decree of November 1996 increased the central core to 240,000 ha. Finally, in 2002, the national park was created. Currently under discussion are the creation of a Mount Iboundji sanctuary and the creation of protection series in several logging concessions, like the reserve of Mount Mimongo set up by SBL.

## Players

In Gabon:

- Conservation is managed by two governmental institutions: CNPN and MEFEPN, responsible outside the protected areas<sup>13</sup>.
- The ECOFAC program, financed by the European Commission, has developed conservation activities, including development of ecotourism with support for the hotel of Lopé, training of ecoguides, maintenance of infrastructure and connections with forestry companies. ECOFAC has also played an important part in the technical and administrative development of the national park, but is currently experiencing a break in financing while waiting for the start-up of their fourth stage 2006-2009. This interruption in financing has occurred in the past and has a very negative effect on the continuity of the program and the pursuit of conservation activities.
- Before the financing obtained within the framework of the CBFP, WCS was active at the level of the Landscape in the area of conservation-oriented research within the framework of the SEGC station. It set up basic research and applied research programs focused on large primates, in collaboration with CIRMF (*Centre International de Recherche Médicale de Franceville*). The scientific publications resulting from these research studies are among the most important in the area of forest ecology in Africa. Although these publications have contributed greatly to decision-making concerning conservation, WCS was not involved in the management of the protected area. WCS was, however, behind the creation of Waka and Birougou national parks.
- Since obtaining CBFP funds, WCS has played a more and more important role in the management of the Landscape and it is currently recognized as a partner of CNPN in the management of Waka and Birougou national parks. Its primary achievements are the delimitation of the three protected areas (nearly complete), the organization of meetings with the operators in the Landscape that have resulted in the drawing up of land use plans, ecological and socio-economic surveys, environmental education and setting up efforts to combat poaching throughout the Landscape.

In the Republic of Congo:

- The Landscape is managed by MEFE.

<sup>13</sup> During a recent ministerial reshuffling, the management of national parks was placed under the responsibility of the Ministry of Forest Economy, but the creation of a semi-public institution is under way.



Figure 14.7. The leopard orchid *Anselia africana* is widespread but not common.

## Direct threats

### (1) Logging

A large part of the Landscape is covered by logging concessions. The high rainfall and the irregular terrain make logging difficult and cause significant erosion with sedimentation of the rivers and disruption of the aquatic ecosystems. Logging also opens up the canopy, increases the amount of sunshine on the underbrush and affects plants that require shade and constant humidity, such as the Begoniaceae, Balsaminaceae (Figure 14.7) and Orchidaceae, many species of which are not found elsewhere. On the other hand, logging involves the harvesting of species whose fruit are used by the local populations, in particular the moabi *Baillonella toxisperma*<sup>14</sup>, the ozigo *Dacryodes buettneri*, the amvut *Trichoscypha acuminata* and *T. abut*, as well as wild mango trees *Irvingia sp.*

Indirectly, logging opens up the forests to hunters. In the Bordamur concession, a primary logging road is under construction. It will pass less than 1 km from Waka National Park and will climb back toward the north parallel to Lopé National Park at a distance of 10-20 km from the edge of the park. It will bring Waka National Park directly in contact with the Ndjolé market. It will break the connection between the two national parks, end the isolation of the whole region, which is currently difficult to access, and require major support at the management level.

### (2) Hunting for bushmeat

This represents a major threat throughout the Landscape and is facilitated by the proximity of markets such as those at Mouila and Koulamoutou, the construction of forest paths

and the presence of the railroad. Large mammals with a slow reproductive process are being hunted in a non-sustainable way and are becoming more and more rare near roads and residences. Hunting for ivory remains a problem and laws are not being applied. WCS's research studies have shown that hunters outside the concessions, more than those based in the villages, represent the major danger for the fauna. Therefore it is important to limit hunting in the concessions. Unfortunately, there is no consensus, even among conservation circles, on what must be given priority in the absence of data on the carrying capacity in the forest and the actual impact of hunting around base camps and felling sites. Many local communities in and around the Landscape still depend on forest resources, particularly bushmeat. In contrast to the more mobile commercial hunters, the villagers concentrate on areas close to home. This could lead to overhunting, but it also has the effect that villagers feel more concerned with the sustainability of their hunting. WCS's approach in the area of the management of renewable natural resources consists of applying advanced and participatory studies of the use of these resources, in particular hunting and agriculture.

### (3) Epidemic diseases

The Landscape is at the edge of the region that has been affected by epidemics of Ebola during the last few decades. In 1997, this disease was found in a dead chimpanzee near the Lopé research station, but it did not spread as it did in the Minkébé region. Nonetheless it remains a potential major threat, as much for the great apes as for humans. It will continue to be monitored by the WCS Field Veterinary Program in collaboration with CIRMF.

### (4) Invasive species

The savannahs of Lopé National park have been invaded by *Lantana camara*, a shrubby Verbenaceae originating in America, and the forests have been invaded locally by the ant *Wassmannia auropunctata*, also of American origin, which has a disastrous impact on the entomofauna<sup>15</sup>.

### (5) Brush fires

In the savannahs of Lopé National Park, brush fires are frequent locally. They degrade the plant cover and reduce its nutritive capacity.

### (6) Extraction of non-timber forest products

Many NTFPs are collected by the local populations, but in the majority of cases this use does

<sup>14</sup> This tree, which is nearly endemic to Lower Guinea, has a very late maturation (not before 70-100 years), but produces fruits which are highly appreciated by the local populations for the oil that can be extracted.

<sup>15</sup> This ant was introduced as a tool for biological control, but has now escaped and is out of control. Its colonies include satellite colonies that can replace the principal colonies in the event of destruction.



not endanger the species involved. The collection of 'bitter kola' *Garcinia kola* nonetheless has the effect of making this species rare<sup>16</sup>.

#### (7) Agriculture

The development of a nearly continuous strip of crops along the roads has intensified not only deforestation, but also fragmentation of the forests. Secondly, agriculture increases erosion and the disruption of aquatic ecosystems.

#### (8) Traditional mining activities

Panning for gold is practiced in the Etéké region between Waka and Lopé national parks. This causes serious disruption of aquatic ecosystems and a local increase in hunting pressure for bushmeat and ivory. Other mineral resources exist in the Landscape and could be worked in the future.

### Indirect threats

#### (1) Weakness of institutional capacity

CNPN was created in 2002 to manage national parks, but it possesses neither the technical nor financial resources necessary. In addition, there is a rivalry or lack of understanding between CNPN and MEFEPNN.

#### (2) Weak interministerial coordination

Between the Ministry with authority over the mines and the Ministry in charge of the environment and conservation there is little coordination and antagonistic actions are frequent.

#### (3) Economic slowdown

The decrease in oil reserves is increasing the pressure on forest ecosystems.

### State of the vegetation

In general, the forests are still in good condition and even though certain areas are made up of a mosaic of primary formations and secondary formations of different ages, enormous areas that are scarcely disturbed still remain. The savannahs of Lopé could be locally degraded by overly frequent fires.

### State of the fauna

The Landscape still has significant populations of large mammals, but the majority of large-sized species with slow reproduction rates have become rare or very rare in the proximity of villages and roads. The population of elephants

is suffering from ivory hunting and chimpanzees are suffering from the opening up of the forests by industrial logging. The invertebrate fauna are seriously disturbed locally by the presence of the ant *Wassmannia*.

### Increasing capacity

The training center in Lopé, financed by WCS, offers an excellent basis for training agents and local, national and international researchers in scientific field methods, including monitoring. This center was chosen by the MIKE program for the organization of a workshop on analyzing data from regional inventories of elephants, large apes and human impacts in a number of selected sites throughout the Congo Basin. More than twelve agents participated in this workshop, representing all the countries of the Congo Basin, with the exception of Equatorial Guinea.

Courses for governmental and non-governmental researchers are organized periodically. In 2004 and 2005, a course of 8-10 weeks was organized by WCS, entitled: '*Méthodes de conservation pour les inventaires et le suivi de la faune*'<sup>17</sup>. In 2003, the Lopé center was also chosen as a training base for the People and Parks Program, financed by NDF, which consisted of evaluating the impact of national parks on human wellbeing and the living standards of the populations. In 2005, a conceptual modeling course was organized for the commissioners of Birougou, Waka, Lopé and Batéké national parks, as well as seven agents of the Gabonese administration. The training center was used again for the organization of numerous short-duration courses in subjects, including: telemetry applied to fauna, methods of socio-economic surveys, the use of computers and GIS. Recently a course in ArcGIS was given in cooperation with the University of Maryland and OSFAC. The Lopé training center therefore has impacts considerably beyond the scope of the Landscape.

<sup>16</sup> To collect its bark, this tree is felled and even its roots are often used.

<sup>17</sup> In 2004, ten Gabonese students were trained, including three officials from the Ministry, a Cameroonian and two Europeans. In 2005, four Gabonese, a Nigerian and four Cameroonians were trained. One of the students trained in 2004 participated as a trainer in 2005.

## Management and governance in the field of renewable natural resources

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### (1) *At the scale of the Landscape*

Financing was recently granted by USFWS to set up a mobile unit for fighting poaching based in Libreville. In cooperation with WCS, this team has started to carry out patrols throughout the Gabonese section of the Landscape.

### (2) *In the national parks*

The prospects for developing ecotourism are being evaluated as an alternative for the economic development of natural resources. This program is well advanced in and around Lopé National Park and efforts have been undertaken by WCS and CNPN so that a larger share of the profits go to the local populations. Waka and Birougou national parks, because of their isolation, do not constitute immediate destinations for ecotourism, but potentially interesting sites continue to be catalogued.

The MEFEPN brigade based in Lopé has been involved for a great many years in the battle against poaching. Unfortunately, with the interruption of the ECOFAC program, the brigade has lost the major part of its financial resources and very few patrols could be organized in the course of 2005. WCS has contributed funds and equipment, but a conflict between the Ministry and CNPN created an obstacle to their use. These problems will have to be resolved in the near future.

### (3) *In the logging areas*

In Gabon, negotiations are under way between WCS and several logging companies with a view to implementing a reduced-impact logging (RIL) area in the Landscape and management of the fauna in the concessions. Discussions are under way to limit hunting by the workforces of the companies. The logging companies are also being encouraged by the Gabonese government to put 5% of the area of the concessions into a 'protection category'. WCS has offered its cooperation for the identification of these categories.

### (4) *In the rural areas*

A process is under way to define the needs of units for the community management of natural resources. It includes participatory mapping of the areas used by the villages: the agricultural areas, the hunting areas and the traditionally defined and accepted areas in the north of the Landscape<sup>18</sup>. Participatory maps have been produced for each village on the periphery of Waka and Birougou

national parks, and the formalization of community lands is under way. As a general rule, teams of social scientists work with the local communities to define their lands, as well as identify sources of conflict and ways to attenuate them.

## Monitoring renewable natural resources and their management

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### *Ecological monitoring*

In the Gabonese section of the Landscape, Lopé National Park has been selected as a MIKE site and a permanent MIKE agent is responsible for law enforcement monitoring in the national park and its environs. In 2005, inventories were designed and implemented in the three national parks; some are still being completed. In Lopé National Park these inventories include linear transects to estimate the densities of elephant dung and of great apes' nests. Financial limitations have reduced the Waka and Birougou inventories to simple reconnaissance missions.

In the Congolese section, basic inventories have been completed by WCS, by the *Centre d'inventaires et d'aménagement des ressources forestières et fauniques* (CNIAF) and by MEF teams. Follow-up inventories are planned for the first half of 2006. In parallel, botanical inventories have been performed by the *Institut de développement rural de Marien Ngouabi* of the University of Brazzaville. These inventories have revealed the presence of 299 plant species, five of which could be endemic to the Landscape. WCS and CNIAF have expanded their inventories between the Landscape into the fauna reserve of Mount Fouari, the fauna reserve of Nyanga-Nord, the hunting domain of Mount Mavoumbou and the hunting domain of Nyanga-Sud. In all, 19 species of large mammals have been found.

<sup>18</sup> In total, seven village use areas have been proposed in Lopé National Park, covering an overall area of 7,727 ha.