

13. Gamba-Mayumba-Conkouati Landscape



Figure 13.1. Map of Gamba-Mayumba-Conkouati Landscape (Sources: CARPE, JRC, SRTM, WCS-Gabon).

Location and area

The Gamba-Mayumba-Conkouati Landscape is transnational and centered on the Loango, Moukalaba-Doudou and Mayumba national parks in Gabon, and Conkouati-Douli National Park in the Republic of Congo (Figure 13.1). Lying between the national parks in Gabon is a set of hunting areas - Ngové-Ndongo, Moukalaba, Sette Cama and Iguéla - plus the Ouanga Plain Wildlife Reserve. The Landscape extends over a total area of 34,258 km², of which approximately 75% lies in Gabon and 25% lies in the Republic of Congo, and stretches along the southwestern coast of Gabon and the western coast of the Republic of Congo. Mayumba and Conkouati-Douli national parks extend back 15 km and 22 km from the beach respectively, covering an area of 80,000 hectares in Gabon and 120,000 hectares in the Republic of Congo.

The Landscape in brief

Coordinates: 1°36'26"S – 4°26'26"S; 9°15'48"E – 12°24'28"E

Area: 34,258 km²

Elevation: 0-840 m

Land ecoregions:

Congolese Atlantic forests ecoregion

Southwestern forest-savannah mosaic ecoregion

Aquatic ecoregion:

Southernmost western equatorial coastal ecoregion

Protected areas:

Loango National Park *, 153,581 hectares, 2002, Gabon

Moukalaba-Doudou National Park *, 502,805 hectares, 2002, Gabon

Mayumba National Park, 80,000 hectares, 2002, Gabon

Conkouati-Douli National Park, 505,000 hectares, 1980/1999, Republic of Congo

Ngové-Ndongo Hunting Area*, 1956, Gabon

Moukalaba Hunting Area *, 20,000 hectares, 1962, Gabon

Iguéla Hunting Area *, 1962, Gabon

Ouanga Plain Wildlife Reserve *, 1962, Gabon

(*) protected areas located in the Gamba Protected Areas Complex



Figure 13.2. Along the coast of Loango National Park are several small cliffs, rich in cretaceous fossils.

Physical environment

Relief and altitude

The relief is quite varied, consisting of beaches and low dunes stretching along the Atlantic Ocean, coastal plains and low undulating plateaus of the coastal sedimentary basin, and the Monts Doudou Mountain Range in Moukalaba-Doudou National Park, which rises to over 800 meters and is a flank of the Mayombe Range. The Monts Kouboula Mountain Range in the Republic of Congo rises to over 800 meters. Mayumba National Park in Gabon and the nearby Conkouati-Douli National Park in the Republic of Congo each include a 60 km long, narrow strip of beaches and lowland areas between the ocean and lagoons. The terrain is flat, but near the Congolese border it gives way

Figure 13.3. The flood plains of the Ngové River in Loango National Park.



to low rising hills behind the beach, intersected by small lagoons and mangroves. The marine sections have a depth of 50 meters at their deepest, and the sea bottoms are sandy with scattered low-lying rocky outcrops (dolerites and gabbros) visible on the coastline.

Geology and soils

The Landscape comprises three geological entities. Most of it belongs to the coastal sedimentary basin, which narrows from 80-100 km wide in the north to only 10-20 km wide south of Mayumba. This basin is formed of sedimentary rocks from the Cretaceous-Tertiary period, resulting in heavily leached and poor sandy to sandy-clay soil. The entire coastline of older layers is covered by cirque series sand sheets of the Pliocene epoch. On the coast, in particular at Milango Point in Loango National Park, marine erosion has exposed rocks rich in marine fossils (fish, ammonites) dating from the second half of the Cretaceous period (Figure 13.2). Monts Doudou Mountain Range is composed of granite and compound gneisses of the lower Proterozoic, 2.2-2.5 billion years old, which result in ferruginous soils. Nyanga-Moukalaba Basin chiefly consists of 500-700 million year old Upper Proterozoic calcareous or dolomitic sedimentary rocks. The Landscape's present relief comes from the coastal basin land emergence caused by the uplift of the western margin of Central Africa during the Tertiary period.

Hydrology

The water system consists of the Nyanga River, the Ndogo, Ngové and Banio lagoons in Gabon, the Ngongo, the Conkouati Lagoon and the Noubi River in the Republic of Congo. The Nyanga is Gabon's second largest river in terms of flow and drains a 22,500 km² basin, of which 80% is located in the country. The Banio Lagoon divides Mayumba National Park from the hinterland. It is over 70 km long and runs parallel to the coast. The three large lagoons are supplied by rivers that drain the coastal basin and have a permanent outlet. Some of these rivers are surrounded by vast flood plains (Figure 13.3). In the Republic of Congo, the Ngongo River supplies the Tchibinda, Tchivoka, Tchimpa and Manzimanouvou lakes, all of which supply significant volumes of fresh water to the Conkouati Lagoon, creating highly fluctuating levels of salinity. The Noubi is the third largest river of the Republic of Congo after the Congo and Kouilou rivers. The coastline

is dotted with countless small lagoons that discharge into the sea during the rainy season. In the dry season, their outlet is blocked by a sand bar. Paradoxically, the level of these lagoons is highest towards the end of the dry season¹.

Climate

Annual rainfall averages from approximately 1,800 mm in the north of the Landscape to under 1,500 mm in the Moukalaba and Nyanga valleys. The dry season extends from June to September, but January-February represents a period of lower rainfall. During the dry season, low stratiform clouds, driven by the Atlantic winds, reduce solar radiation and lower the temperature by an average of 3°C, causing a sharp decrease in evaporation.

Vegetation

The Gamba-Mayumba-Conkouati Landscape is probably the most diverse of all Landscapes in Central Africa (Figure 13.4). The coastline vegetation consists of a succession of stands composed of sand-binding vegetation such as *Ipomea pescaprae*, coastal pastures of grasses and sedge, coastal thickets of *Dalbergia ecastaphyllum*, *Hibiscus tiliaceus*, *Phoenix reclinata* and *Hyphaene guineensis*² and the coastal sclerophyllous forest containing *Chrysobalanus*, *Manilkara* and *Fegimanra* (Figure 13.5). Further inland, there is a spreading mosaic of forest stands composed of pioneer forests, containing *Aucoumea klaineana* and *Sacoglottis gabonensis* of different ages, and mature stands, which are more diversified in *Aucoumea*, *Desbordesia glaucescens*, *Dacryodes buettneri*, *Tetraberlinia moreliana*, *Monopetalanthus pellegrini*, *Tessmannia africana*, *Odyndyca gabonensis*, *Lophira alata*, *Klainedoxa gabonensis* and *Librevillea klainei*. In addition, the Moukalaba Basin contains *Dialium pachyphyllum*, *Toubaouate brevipaniculata*, *Autranella congolensis* and *Dacryodes heterotricha*. Monts Doudou Mountain Range is clad in dense forests, which above 650 meters show submontane affinities. Cloud forests are found on the highest summits and peaks exposed to Atlantic winds. In the lower regions, terra firma forests are interspersed with raffia palm-groves and vast expanses of swamp or floodplain forests of *Alstonia congensis*, *Anthocleista vogelii*, *Anthostema aubryanum*, *Hallea ciliata*, *Syzygium sp.*, *Xylopa sp.*, *Lecomtedoxa biraudii* and *Gilbertiodendron unijugum*.

The forests are also interspersed with open, permanent or semi-permanent marshes, in particular papyrus swamps, and grass savannahs. In the coastal basin, the latter belong to three specific

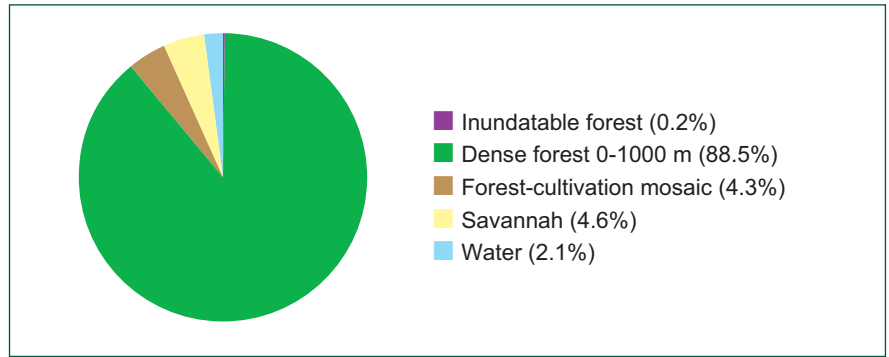


Figure 13.4. Main vegetation types (Source: JRC).

types: periodically flooded savannahs in the lowest-lying lagoon areas, steppe savannahs on white sand, and savannahs with denser herbaceous cover on sandy clay soil. In several spots, especially in Loango National Park, steppe savannahs are being colonized by thickets of *Chrysobalanus*. In the Nyanga and Moukalaba valleys, the savannahs consist of tall grasses and include a shrub stratum with *Nauclea latifolia*, *Bridelia ferruginea* and *Crossopteryx febrifuga*.

The low, periodically flooded savannahs are dotted by semi-permanent ponds with *Nymphaea* and *Utricularia*. The lagoon mouths are home to mangroves with *Rhizophora* and *Avicennia*, as well as relatively brackish floodplain grasslands.

The region's flora was little-known, but specimens collected over the past ten years by the University of Wageningen, the Missouri Botanical Garden, CENAREST and the national herbarium have considerably expanded the knowledge base³. A study of the orchid family revealed the presence of 73 species⁴. In the Monts Doudou Mountain Range, 991 species have been collected from 2,459 herbarium samples, including 5 endemic species and 9 restricted-range species⁵. Overall, 11% of species appear to be endemic to the biogeographic area, and the richest areas are situated at the medium and high altitudes. These findings support the theory that Monts Doudou Mountain Range was a forest refuge in the Pleistocene era. In the Republic of Congo, over 2,500 plant species have been recorded in Conkouati-Douli National Park and its surrounding environments.

Fauna

Mammals

At least 89 species of mammals inhabit the Landscape. Significant species include the forest elephant *Loxodonta africana cyclotis* (Figure 13.6), the buffalo *Syncerus caffer*, the hippopotamus *Hippopotamus amphibius*, the lowland gorilla *Gorilla gorilla*, the chimpanzee *Pan troglodytes*, the

¹These small lagoons are particularly important for populations of Nile crocodiles *Crocodylus niloticus*.

²The shrub *Tabernaemontana iboga*, of the dogbane family, widely used in Gabon in certain traditional rites for its hallucinogenic properties, is extremely abundant in these coastal thickets, which probably represent its original environment.

³At least 30 new plant species of the *Commitheca*, *Begonia* and *Impatiens* genera have been discovered, as well as a giant tree, *Xanthocercis rabiensis*, in the Rabi region (Hallé & Louis, 1989). More recently, detailed studies of 75 plots throughout the Gamba Complex have yielded information on 7,305 plants (Campbell *et al.*, 2006).

⁴Including 20 terrestrial and 53 epiphytic species; 3 species are new to science and still require description (Stewart & Droissart).

⁵The species endemic to the Monts Doudou Mountain Range or southwestern Gabon are: *Adhatoda le-testui* (Acanthaceae), *Anthonota trunciflora*, *Cynometra nyangensis* and *Isomacrolobium conchyliophorum* (Caesalpinioideae), *Begonia dewildei* and *B. gabonensis* (Begoniaceae), *Calpocalyx brevifolius* (Mimosaceae), *Commitheca letestuana* and *Tarenna jolinonii* (Rubiaceae), *Trichoscypha gambana* (Anacardiaceae), *Costus nudicaulis* (Costaceae), *Dichapetalum sp. nov.* (Dichapetalaceae), *Impatiens floretii* (Balsaminaceae) and *Trichostephanus gabonensis* (Flacourtiaceae).

Figure 13.5. Coastal thickets with *Fegimanra africana*.



black colobus monkey *Colobus satanas* and the collared mangabey *Cercocebus torquatus* (Figure 13.7), the Ogooué talapoin monkey *Miopithecus ogoouensis*, the mandrill *Mandrillus sphinx*, seven species of duikers, including the white-legged Ogilby's duiker *Cephalophus ogilbyi crusalbum*, and the defassa waterbuck *Cobus ellipsiprymnus*, the most important waterbuck in Gabon and probably the only one in the Republic of Congo. In April 2000, four species of bush babies (*Galago sp.*⁶, *Eutoticus elegantulus*, *Galagoides thomasi* and *Galagoides demidoffi*) as well as Bosman's potto *Perodicticus potto* (Bearder, 2000) were identified around Gamba. The side-striped jackal *Canis adustus* is found in all savannahs, while the manatee *Trichechus senegalensis*⁷ inhabits the lagoons and some rivers of both Gabon and the Republic of Congo.

Little research has been done on marine mammals, but a total of 17 species of cetaceans have been observed (Box 13.1) and 10 other species may be present, based on their known distribu-

tion (Findlay *et al.*, 2004). Most common are the humpback whale *Megaptera novaeangliae*, the common or saddle-backed dolphin *Delphinus delphis*, the bottlenose dolphin *Tursiops truncatus* and the Atlantic hump-backed dolphin *Souza teuszii*. The latter is a rare species, but it has been observed in great numbers in the southern part of Mayumba National Park. The Cape fur seal *Arctocephalus pusillus* has also been found on the beach (Thibault 1999a, Thibault, 1999b).

Twelve species of *Muridae* and 9 species of *Soricidae* have been collected in the Monts Doudou Mountain Range (Nicolas *et al.*, 2004). None of these represent mountain species.

Birds

In terms of bird life, Sargeant (1993) has inventoried 380 species in the Gamba region. The most recent inventory of bird life inhabiting the Gamba Protected Areas Complex lists nearly 500 species (Christy, pers. comm.). Christy and Goodman (2004) noted 230 species, including 161 typically forest species in the Monts Doudou Mountain Range, which is also home to little-known birds such as the African green ibis *Bostrychia olivacea*, the Bates' swift *Apus batesi*, the Angola pitta *Pitta angolensis*, the forest swallow *Hirundo fuliginosa* and notably the grey-necked rockfowl *Picathartes oreas*⁸. Two hundred bird species have been inventoried in Loango National Park. They include the loango slender-billed weaver *Ploceus subpersonatus*, a known coastal species ranging from Gabon to Angola. No inventory has been done in the Mayumba region, but it appears to be a major stopover site for Palarctic terns (*Sterna hirundo*, *S. paradisea* and *S. sandvicensis*) and the Damara tern *S. balaenarum*, an endangered species from southern Africa. Steppe savannahs in both the Republic of Congo and Gabon are nesting sites for the African river martin *Pseudochelidon eurys-*

⁶ A new, previously unrecognized species closely related to *Galago alleni* and *G. gabonensis*. The latter is found only in northern Gabon and southern Cameroon. All three were undifferentiated until recently and taxonomised as *G. alleni* generally.

⁷ This manatee population is the only one in the Republic of Congo.

⁸ The discovery of *Picathartes oreas* at 600 meters of altitude in the Monts Doudou Mountain Range considerably extended the south-westward distribution of this species.



Figure 13.6. Elephants in coastal vegetation.



Figure 13.7. The collared mangabey *Cercocebus torquatus*.

tomima and the rosy bee-eater *Merops malimbicus*. The *Hyphaene* coastal thickets are home to the rufous-tailed palmthrush *Cichladusa ruficauda*. Thickets in both the Republic of Congo and Gabon are inhabited by a Zambebian species, the black-backed barbet *Lybius minor*, while the wet coastal plains are also home to the saddle-billed stork *Ephippiorhynchus senegalensis*.

Herpetofauna

A total of 86 reptile species are known in the Gamba Complex: 11 chelonians⁹, 3 crocodylians, 2 amphisbaenians, 22 lacertilians (Figure 13.8) and 48 ophidians including 30 Colubridae (Pauwels *et al.*, 2006). Seven species are on the IUCN Red List: the four sea turtles (*Chelonia mydas*, *Eretmochelys imbricata*, *Lepidochelys olivacea* and *Dermochelys coriacea*), the turtle *Kinixys erosa*, and the crocodiles *Crocodylus cataphractus* and *Osteolaemus tetraspis*. The Nile crocodile *Crocodylus niloticus* is plentiful in lagoons and at sea. This important population is probably the last in Gabon.

Fifty-four species of amphibians have been found in the Monts Doudou Mountain Range - a relatively high abundance of species for an African site. They include 6 species new to Gabon; the *Hemisus* and *Kassina* genera were also previously unrecorded at this site (Burger *et al.*, 2004). Sixty-six species of amphibians have been found in the Gamba Complex as a whole (Burger *et al.*, 2006).

Ichthyofauna

Sixty-seven fish species have been found in the Rabi region (Mamoneke *et al.*, 2006), while in the Ndogo Lagoon more than 68 fish species belonging to 34 families have been inventoried (WWE, 1998). A rapid census of the Conkouati Lagoon in the Republic of Congo identified 55 species belonging to 31 families (Mamonekene, 2005). Industrial fishing, in practice since 1989, may have impacted these findings. In January and February 1989, a Norwegian team sampled a total of 354 marine species along the Gabonese coast between Pointe-Noire and Port-Gentil (Bianchi, 1992). An inventory is being done in Mayumba. Panga Bay, opposite the town of Mayumba, appears to be a major shark nursery and could be a significant feeding area for the manta ray *Manta birostris*.

Box 13.1: Marine mammals

Seventeen species of marine mammals have been recorded in Gabonese waters and ten other species are known to inhabit the Gulf of Guinea ecosystem or are expected to be found in the region based on their world distribution. This list includes seven species of large cetaceans (baleen or toothed whales). The whales are present in the area during the Antarctic winter and include populations that migrate between their warm or tropical water winter breeding quarters and their Antarctic or sub-Antarctic summer feeding quarters. Humpback whales are present from June to October, and the entire continental shelf area (up to a depth of 200 m) is critically important to the calving, nursing and mating of this species. There is little information on the distribution and abundance of other Cetacea in Gabonese waters, but Gabon's entire inshore area, near the beaches, is critically important for the Atlantic hump-backed dolphin (Findlay *et al.*, 2004).

Baleen whales

Humpback whale *Megaptera novaeangliae*
 Blue whale *Balaenoptera musculus*
 Fin whale *Balaenoptera physalis*
 Sei whale *Balaenoptera borealis*
 Bryde's whale *Balaenoptera edeni*
 Southern Right Whale *Eubalaena australis*

Toothed whales

Sperm whale *Physeter macrocephalus*
 Killer whale *Orcinus orca*
 False killer whale *Pseudorca crassidens*
 Melon-headed whale *Peponocephala electra*
 Short-finned pilot whale *Globicephala macrorhynchus*
 Risso's dolphin *Grampus griseus*
 Rough-toothed dolphin *Steno bredanensis*
 Bottlenose dolphin *Tursiops truncatus*
 Long-beaked common dolphin *Delphinus capensis*
 Common dolphin *Delphinus delphis*
 Atlantic hump-backed dolphin *Sousa teuszii*

Invertebrates

Data on invertebrates have been collected in the Monts Doudou Mountain Range for three groups of hymenoptera: ants, ichneumons and chaclid wasps, a group of small wasps that breed in figs, the fruit of *Ficus*¹⁰. The Smithsonian Institution's work has recorded over 1,500 morpho-species in Loango National Park.

⁹ Monitoring of 5.75 km of beach during the 2002-2003 egg-laying season found 607 traces of leatherback turtles with clutches and 71 traces of olive Ridley turtles, but no trace of the other two species which had previously been found (Billes *et al.*, 2006).

¹⁰ For the Formicidae (ants), 310 species belonging to 56 genera were found - the greatest number of species ever found in Africa (Fisher, 2005). Thirty species of Chalcidoidea (chaclid wasps) were found, 28 of them new for Gabon (van Noort, 2004b). Among the Ichneumonidae (ichneumons), 112 species were found; only 28 species had been recorded previously in Gabon (van Noort, 2004a).



Figure 13.8. *The chameleon* *Chamaeleo dilepis*.

Humans in the Landscape

Southern Gabon has essentially been populated over the past 300 years by Bantu populations from the south. These migrations are due in part to the upheavals created by contact with Europeans¹¹, but also because of the increase in certain populations in the interior of the continent.

Density and distribution

The estimated population in the Gabonese section of the Landscape is 15,000, with an average density of 0.5 inhabitants/km². These populations are grouped into three population centers with little communication between them: the Iguéla sector in the northwest; the Mourindi sector in the east; and the Ndogo Lagoon region, with Gamba and Mayonami, in the center. The Gamba Protected Areas Complex has a population of 9,500 people distributed between forty-odd villages. The largest of these is the town is Gamba, with a population of 7,500. Gamba developed around the Shell Gabon facility and its population includes both Gabonese and foreigners. Rural population density (2,300 inhabitants) is 0.2 inhabitants/km². The over-55 age group accounts for 29% of the population; fewer than 30% belong to the under-15 age group and the over-15 population is 59% female. These statistics reflect rural migration towards development centers, which has left several villages abandoned since the 1960s. The Landscape's second-largest town is Mayumba with 2,980 inhabitants.

The Congolese portion of the Landscape has a low population density - approximately 5,900 people are distributed between 25 villages in and around the national park. The total population size and distribution changes as industrial forest exploitation companies come and go. Between 1964 and 1984, the rural population of Kouilou (including Conkouati) was halved and, in 1990, the estimated density was 2.8 inhabitants/km². The population living in the vicinity of the national park in 1996 was half of that of 2005 (Paris, 1996; WCS, 2005). Migration towards Pointe-Noire has slackened in the last decade.

Within 40 km of the Landscape's borders there are four towns (Pointe-Noire, Dolisie, Loudima and Makabana) whose populations benefit from the Landscape's resources. Pointe-Noire, the economic capital of the Republic of Congo, has a population of close to a million inhabitants and is linked to Brazzaville by the railway, several daily flights and a road unfit for traffic. Railways and

aircraft are key means for transporting bushmeat away from the Landscape for sale in Brazzaville.

Ethnic groups

In Gabon, the ethnic groups of the coastal basin, from Rembo Ndogo to the Atlantic Ocean, are the Vili, Lumbu and Ngové. Those of the Moukalaba and Nyanga river basins are the Punu, Varama and Vungu. These ethnic groups belong to the Punu-Eshira group and originate in the Congo (Raponda-Walker & Sillans, 1995). At present, the Ngové mainly speak Nkomi, which is a Myene language. The ethnic groups form autonomous subdivisions - clans - that occupy a common territory and abide by the same traditions and taboos. Clan affiliation is established through matrilineal descent. The clan concept and its associated traditions are disappearing through acculturation, which is particularly marked in the Ndogo Lagoon region because of the town of Gamba.

The dominant ethnic groups in the Republic of Congo are the Vili and Lumbu. The Vili are coastal people who have been settled in the Conkouati region since the 13th century. The Lumbu are forest people from the Mayombe Mountains who moved into the Conkouati region within the past 100 years. Together with other ethnic groups, they were imported to construct the Pointe-Noire-Brazzaville railway, and more recently for industrial logging (Hecketsweiler & Mokoko Ikonga, 1991).

Social organization

Administratively, the Gabonese portion of the Landscape straddles three provinces: Ogooué-Maritime, Ngounié, and Nyanga. Each province is administered by a governor. Departments are run by a prefect and a departmental council. The prefect, assigned by the Interior Ministry and supervised by the provincial governor, is in charge of departmental administrative services. The prefect also oversees the budgets of the different central government agencies, the departmental council and the local town hall. The departmental council, composed of a leader, deputy leaders and councilors, is involved in infrastructure development, improving living conditions and forwarding local people's complaints to higher authorities. At the departmental level, deputies represent the population at the National Assembly. Each department is divided into cantons. The hierarchical organization of the local authority structure into canton, settlement and village leaders, a legacy of the co-

¹¹ The first exchanges between the Vili Kingdom of Loango and the Portuguese and Dutch date back to at least 1570. Trade originally centered around copper, ivory, raffia and redwood and then, as of the 17th century, slaves. The slave trade expanded rapidly under the English and then the French who founded the first European establishments. After the Congress of Vienna and the abolition of slave trafficking south of the equator (1836), trade declined despite persistent illegal trafficking. After 1883, European exploitation changed from a barter-based system to a colonial model of concessions. The establishment of French Equatorial Africa in 1910 led to a surge in economic activity and the development of forest exploitation (Blaney, 1998).

lonial period, is the framework within which the traditional forms of authority derived from customary law are exercised.

Activities

(1) Agriculture

As in the rest of Gabon, there is little tradition of agriculture in the Gabonese portion of the Landscape¹² (Figure 13.9). Farming is a predominantly female occupation. The women see to land clearing (June-July), sowing (September-November), weeding (December-February) and the selling of produce. Men take part in tree felling in the dry season. The main crops are cassava, plantains, corn, 'old' coco-yams (dasheen) and sugar cane. The per capita annual area under crop gives an indication of farming intensity: the Etimboué department has the highest value with 2,090 m²/person/year while elsewhere it ranges from 687 to 1,445 m²/person/year.

In rural areas, farming is primarily a subsistence activity. In Gamba, where 56% of urban families engage in agriculture (Blaney *et al.*, 1998), most production is sold to provide women with 'pin money' to supplement the head of household's income. Production from local agriculture still remains marginal in Gamba's overall supply. A relatively affluent, significant share of the population buys imported goods. In the surrounding Gamba region, agriculture is mainly reserved for indigenous ethnic groups; customary law restricts land tenure opportunities for immigrants, who form the bulk of Gamba's population. Landscape-wide, the pressure on natural environments by agriculture is minimal and is confined to populated areas.

Plantations are regularly devastated by elephants, which abound in the Gamba area. This is a problem throughout the Gamba Complex, and is the source of extreme discontent. The forest management agency, assisted by WWF, is supporting the installation of protection systems in the form of rope fences, to which empty drink cans filled with pebbles are attached in order to create noise.

(2) Fishing

Fishing is concentrated on the lagoons, lakes and main rivers, and is the main source of animal protein for lagoon and sea-side villages, as well as the towns of Gamba and Mayumba.

Recent studies have been done on fishing in the Ndogo Lagoon (Pinkston, 1997; Blaney *et al.*, 1998, Nteme Mba, 2001 and 2005). The gill net is the most common method used (85%

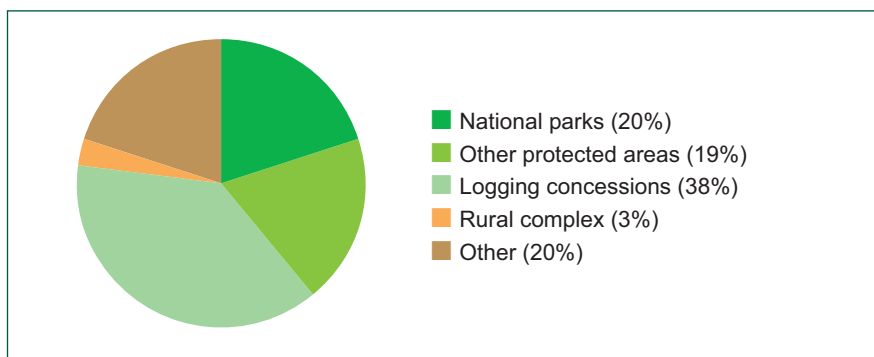


Figure 13.9. Land use types.

of fishermen), followed by seine nets (10%) and lines (3%). Apart from pot and barrier fishing in the dry season, both done by women, fishing is a male occupation carried out in paddled or powered dugout canoes. Approximately 40% of the lagoon fishermen are based in Gamba. The most common catches are 'tilapias' or carp, mullet, sea catfish, horse mackerels and sea-bream. April to September is the peak fishing season, but total catches do not satisfy local demand. With a total of 125 fishermen working the lagoon and Basse-Nyanga, the Gamba Complex's fishery resources are arguably under exploited. The traditional fishing business would therefore stand improvement. For this reason, the fishery management agency and WWF are helping fishing communities through capacity-building for the Ndougou department fishermen's association (APDN). A regular supply of fish to the towns could help cut the trade in poached bushmeat.

Fishing and the fish trade are the main activities in the town of Mayumba and the area around Mayumba National Park. In the villages surrounding the park, 90% of the population believes that fishing is 'very important' or 'essential'. Fresh water lagoon fishing is restricted to native Gabonese and prohibited to foreigners. Sea fishing is carried out only by West Africans, especially Beninese, who live in Mayumba. Overall, the resources are not being over-fished, and commercial trawlers pose a bigger threat.

(3) Game hunting and trade

Hunting is very widespread and goes well beyond the bounds of what is customarily allowed¹³. There is a profitable trade in game, with major flows to big town and city markets. Urban markets are supplied by well-equipped professional hunters taking advantage of the access routes opened up by the mining and oil companies. Since Waters and Forests (General Principles) Act No. 1/82 of 22 July 1982, this sector of activity, despite being given 'official status', has become illegal and equated to poaching. The Gabonese section of the

¹² Pre-colonization, hunting and gathering were the main means of subsistence. An agricultural development policy notwithstanding, only 10% of the population engage in farming. Twenty-five percent of the population's needs are met by food imports. The growth of a mining-based economy has been a major factor in the decline of Gabonese agriculture. Between 1961 and 1975, Gabon's 'area under crop' shrank by 32% while the number of farming households aged 50 and over rose from 30 to 52%. The appeal of urban jobs prompted a youth exodus to the towns, leaving the oldest family members to work the land.

¹³ Hunting is a very deep rooted tradition in Gabon. Country wide, it is the main source of animal protein, ahead of fishing and livestock production, which contributes only 5% of total requirements. So great is the sociocultural value of game to both rural and urban populations that no alternative solution has so far succeeded in limiting hunting and the associated game trade (Pfeffer, 1996). People are willing to pay premium prices to satisfy their food preferences, despite how hard it is to make a living.

Landscape is no exception to the rule. Some areas accessible via the old and new forest and oil roads in the Gamba Complex are a source of supply for the meat trade to Omboué, Port-Gentil, Mandji, Lambaréné and Libreville. Despite the presence of three teams of Ministry of Water and Forests wildlife rangers, quotas are being exceeded, protected species are being slaughtered and the hunting season periods are being breached. Spot checks on the Gamba, Tchibanga and Omboué markets over the past ten years clearly demonstrate the role that the Gamba Complex plays as a wildlife reserve for local hunters. The most populous species are duikers, water chevrotain, bushpigs, brush-tailed porcupines, crocodiles and mangabeys.

There are no villages or permanent encampments within Mayumba National Park boundaries, but they abound in the buffer zone. Three small encampments and two fishing villages located near the park's boundaries are used as bases for poaching. The villagers traditionally used the coastal margin to collect salt and turtle eggs. Salt collection is no longer economically viable, but there is fierce opposition to the ban on collecting turtle eggs. This ban and the crackdown on poaching are the main points of contention between the national park authorities and the villagers.

In the Republic of Congo, the Vili are traditionally fishermen, whereas the Loumbou are hunter-gatherers. Farming, fishing and hunting, along with public administration, are the main economic activities, and most of the population still depends on locally obtained naturally occurring resources. Shifting cultivation (cassava, bananas and corn) is practiced by women; fishing and hunting are carried out by men. Hunting is less important than fishing. Minor activities include the collection of firewood, marantaceae leaves for cassava preparation, mushrooms and other forest produce¹⁴.

(4) *Gold panning*

This is a rapidly expanding activity in the Republic of Congo: in 1996, it employed 40 people; in 2005, about 1,000, over 99% of whom are illegal immigrants from DRC. In this same area, the economic value of conservation is not negligible: the park employs 45 people full-time, and 20 for at least 7 months of the year for the monitoring and protection of sea turtles.

Development and public services

The exploitation of oil has provided a considerable development stimulus to the Gabonese

section of the Landscape, particularly in the Gamba region. The situation is very different in the Congolese section of the Landscape. Public service provisioning is lacking: there are only 5 health clinics, 15 primary schools and 2 secondary schools. Families who can afford it, send their children to Pointe-Noire or Brazzaville, but many children do not attend school because their parents cannot afford it. The regional capital, Nzambi, has a police station and national security station, but the police have no working radio, equipment or facilities. Nzambi is separated from the town of Pointe-Noire by the Noubi River and the Conkouati Lagoon, which can be crossed only by dilapidated ferries. For a civil servant to be posted to Nzambi is equivalent to a punishment. As a result, Conkouati often inherits 'disgraced' civil servants to represent the 'security' authorities.

Eighty percent of the water supply to villages in the Gabonese section of the Landscape comes from upwellings: streams and rivers. Very few villages have a well or power generating units. Health care services barely meet villages' needs: only 14.3% of localities in the Gamba Complex have a public health clinic staffed by qualified personnel¹⁵. Patients are often transported to one of Gamba's three medical facilities: a hospital and two private clinics. Villages with a school (40% of villages in the Gamba Complex) manage to support a population of children aged 6-14, and therefore retain families. Villages without a school do not.

The town of Gamba (meaning 'fog' in the Vili language and named after the lagoon on whose shores it lies) did not grow out of any indigenous settlement in the Landscape. In the 1960s, no one lived where Gamba now stands. The city was built from scratch by Shell Gabon when the first wells of the Gamba-Ivinga deposit came on line in 1963. Shell's employees were settled in Gamba with their families. Oil production and its accompanying economic development attracted a sizeable population. The town grew very rapidly from 1965 to 1974, despite its isolated position in the middle of inhospitable wetlands. General supply stores were created in 1966, and a primary school in 1969. By 1977, Gamba had a hospital, a cultural center, an outpost of Gabon's power and water company (SEEG), a police station, airport and post office. The secondary school was opened in 1983. Having become the departmental capital in 1966, Gamba was briefly (1970-74) assigned the status of an autonomous district by a government decision that curtailed the conflicts of interests between the Ogooué-Maritime and Nyanga provinces, which were trying to claim the 'oil

¹⁴ A family living in the area around the national park earns an average annual income of approximately 800,000 CFA francs from fishing and 200,000 CFA francs from agriculture. The total value of catch/produce harvested in the immediate periphery of the park is estimated at 250 million CFA francs per year.

¹⁵ Although it must be said that the localities are so small and scattered that it would be hard to deliver educational and health care services to them all.

city' as part of their territory. Gamba now has 3 health centers and 6 schools (4 primary and 2 secondary). Ndougou department, which includes Gamba and 13 villages distributed between three cantons, has 14 schools, 16 health centers and 13 communal TV/radio viewing and listening centers. The coming on line of Rabi in 1986 brought a new influx of labor, but the trend is now reversing as Shell Gabon gradually pulls out and the first big layoffs are made.

In the Gabonese section of the Landscape, telephone access is restricted to the urban centers of Gamba, Mayumba and Tchibanga, which have unreliable landline networks, but also mobile phone operators (Celtel and Libertis). Gamba and Tchibanga also have a cybercafe.

The main highways in the Gabonese section of the Landscape are laterite roads, sporadically maintained by the provincial public works department. Only the three towns have tarmac roads, maintained by the town councils. There is no road link between the Congolese and Gabonese parts of the Landscape. The town of Gamba is also very cut off from the outside world and only accessible by a sandy track, seasonally flooded over approximately 80 km and crossed by 2 ferries. The only way to the town of Mayumba is across the Banio Lagoon on the ferry operated by the public works department.

Logging

Four logging companies currently operate in the Gabonese section of the Gamba-Conkouati Landscape. In order of size, they are: *Compagnie des bois du Gabon* (CBG), Idriss Plantation Holdings Gabon (IPHG), *Société d'exploitation et d'aménagement forestier* (SEAF) and *Transformation et exploitation forestière* (TEF). Only CBG has two publicly approved forest working concessions (CFAD): one for 350,000 hectares in the north of the Landscape and one for 190,000 hectares close to Mayumba. The other forest companies operate under family felling operations or temporary operating licenses.

CBG's Mandji CFAD is in the northeastern tip of the Gamba Complex, north of Moukalaba-Doudou National Park. The company's management plan was approved by the forestry economy ministry in December 2004 and put into operation in January 2005. Despite its efforts, the company is finding it hard to implement the wildlife component of the management plan. Due to these difficulties, it began discussions with WWF (Gamba Project) in early 2005. These discussions resulted in WWF being given support by

the French Global Environment Facility (FFEM) under the CAWHFI program to provide technical support to the administration and CBG in implementing the wildlife management plan. The plan is that WWF will interface between the ministry for the forestry economy, the national park management authorities, the operating company and local communities.

In the Republic of Congo, the Landscape includes 4 large concessions (UFA): Pointe-Noire, Niari-Kimongo, Kayes and Kibango. At least 8 companies have operated in the Landscape since 1980, including in what is currently the national park. These areas were working concessions up until the war in 1997. Insecurity and the collapse of transport systems subsequently brought exploitation to a halt. In 1999, after the national park was created, the Asian company *My Fai Tai* started up operations in the Landscape and the national park. Despite national park status, this logging is still going on today over an area of 916,000 hectares. It has had serious consequences for the Landscape: it has changed the human population distribution, population processes, socioeconomic factors, and the composition and structure of forests; it has also left roads and skid trails everywhere. The impact on the national park is dramatic.

Oil extraction

Oil deposits in Gabon have been known since 1928, but they were not exploited prior to 1957. The oil industry developed rapidly in the 1960s and 1970s following the discovery of extensive reserves in the Sette Cama hunting reserve and offshore from Port-Gentil. Shell commenced explorations in the Gamba Complex in 1960 in the guise of *Compagnie Shell de recherches et d'exploitation du Gabon* (COSREG). In August 1963, COSREG found oil near Gamba, then in Ivinga. The Gamba-Ivinga oilfield was producing 50,000 barrels per day in the 1970s, but this fell to 7,000 barrels per day in 2001. As early as 1985, known Gabonese reserves had decreased, and production had fallen to 150,000 barrels per day. The effects of this decrease were compounded by falling oil prices. The discovery of the Rabi deposits in 1985 was providential, therefore, increasing production by 77%. Rabi was the biggest onshore oil field in sub-Saharan Africa, and came fully on line in 1987, achieving an output of 240,000 barrels per day in 1997 (60% of Gabonese production). In 2003, Shell Gabon's total output was 69,000 barrels per day.

Other onshore exploitations in the Gamba

Complex include Atora (Total Gabon), in production since 2001 (15,000 barrels per day), Echira, Moukouti and Niango (Perenco). The Bendé gas reserves (Shell) power Shell and the Gamba power company's (SEEG) turbines. Current exploration licenses in the Complex include those of Lotus (Sinopec), Eketamba (Transworld) and Nziembou-Dhighe (Perenco). Other companies present are operating individually or in joint ventures. They include Amerada Hess, Broken Hill Petroleum, Devon Energy, Energy Africa, Eni, Marathon, PanAfrican Energy, Petrofields, Petronas, Pioneer Natural Resources, Sasol Petroleum International, Vaalco and Vanco. The crude oil is shipped to the Gamba and Cap Lopez terminals.

Tourism

Despite its potentials, Gabon had remained virtually unknown as a tourist destination; however, recent years have seen the emergence of ecotourism schemes, especially around Petit Loango Reserve, now Loango National Park. Four lodges or tourist camps are now operational. The Iguéla area has Loango Lodge, operated by *Société de conservation et de développement* (SCD), with satellite camps at Akaka, Tassi, Pointe Sainte-Catherine and Petit Loango, as well as Ngavilo Lodge. SCD operates under the guise of Operation Loango and supports research through WCS, Apenheul and the Max Planck Institute. In Sette Cama, Africa Tours Operators (ATO) runs the Camp Missala Lodge and Sette Cama Safaris. The Ndougou departmental council runs a holiday lodge at Sette Cama in association with the village and technical and financial support from the European Union's Protected Areas Development Program (PSVAP). Shell Gabon runs a small private lodge at the southern end of the national park. A guide service and tourist reception center have been set up at the southern tip of the park with PSVAP support, and contracted out to the local NGO, Ibonga.

Tourist activities in the Loango National Park currently include sport fishing and photographic safaris from the four lodges established in the north and south of the park. The provision of tourist facilities and products make Loango National Park one of the primary destinations in Gabon and the whole of forested Central Africa.

Reasons for the identification of the Landscape

- (1) The Gamba region was identified as critical to conservation in Central Africa as long ago as 1990 (Wilks, 1990), partly for its unrivalled diversity.
- (2) The Gamba Complex has been identified as an important birdlife conservation area (Fishpool & Evans, 2001).
- (3) The Monts Doudou Mountain Range is a Pleistocene era forest refuge whose protection was called for in 1990 by the IUCN (Wilks, 1990), because of its tremendous botanical significance¹⁶ and the recent discovery of the white-legged Ogilby's duiker *Cephalophus ogilbyi crusalbum*¹⁷.
- (4) Unlike other lagoon systems in the Gulf of Guinea, the Gamba-Mayumba-Conkouati Landscape lagoons lie in an area of very low human population density, which helps preserves the integrity of their ecosystems. The large lagoons, as well as the countless small lagoons, are critically important to the development of commercially significant fish populations; not only in the lagoon waters, but also the contiguous inshore waters.
- (5) The Landscape is important for its near-intact large mammal populations.
- (6) Mayumba National Park is contiguous with Conkouati National Park in the Republic of Congo and both make up a transnational zone of 120 km of protected beaches comprising one of the world's two most important leatherback turtle egg-laying sites.

Conservation

History

Gabon's 250,000 hectare Ngové-Ndongo Hunting Area, and its 50,000 hectare Petit Loango National Park were created in 1956. The 700,000 hectare Sette Cama Wildlife Utilization Area was classified in 1962. The Ngové-Ndongo Hunting Area remained unchanged, but the Petit Loango National Park became the Iguéla-Petit Loango Wildlife Reserve and its area increased to 80,000 hectares. Three new entities - the 20,000 hectare Ouanga Plain Wildlife Reserve, the 200,000 hectare Sette Cama Hunting Area, and the 150,000 hectare Iguéla Hunting Area - were also added to the Sette Cama area. In 1966, the Iguéla-Petit Loango Wildlife Reserve became the Petit Loango Wildlife Reserve with a reduced area of 50,000 hectares, and the Iguéla Hunting Reserve was in-

¹⁶ Two endemic species of begonias - *Begonia dewildei* and *B. floretii* - had been just found there.

¹⁷ This form endemic to Gabon was discovered only in 1978, and at the time so little was known of its distribution that the Monts Doudou mountain range was thought to be essential to its conservation (Christy *et al.*, 2003).

creased to 180,000 hectares. In 1971, the areas remained unchanged, but the complex was split into three sectors: Iguéla, Sette Cama and Ouanga. The Moukalaba-Dougoua Wildlife Utilization Area was created in 1962 out of the Moukalaba-Dougoua Wildlife Reserve (80,000 hectares) and the Moukalaba Hunting Area (20,000 hectares). The 332,000 hectare Monts Doudou Mountain Range Wildlife Utilization Area was classified in 1998. The contiguous collection of protected areas has become known as the Gamba Protected Areas Complex, in which WWF has become the partner of the Ministry for Water and Forests. Loango, Moukalaba-Doudou and Mayumba national parks were the last to be created, in August 2002.

In the Republic of Congo, Conkouati Reserve was created in 1980 over a land area of 300,000 hectares. For a decade, it was under the sole management of the Ministry for Water and Forests and suffered from a lack of human and financial resources. In 1989, much of it was given over to industrial logging, reducing the reserve to 144,000 hectares. In 1994, the Republic of Congo secured GEF/PROGECAP funding to support a number of conservation-related activities in the reserve, while the IUCN was commissioned to provide technical assistance to the Congolese government. At the end of the GEF/PROGECAP program in the late 1990s, WCS became the MEFE's partner in the Landscape. In 1999, the wildlife reserve became the 505,000 hectare Conkouati-Douli National Park (approximately 25% of it marine) by Executive Order No. 99-136^{bis}.

Players

In Gabon:

- Natural resource management is the responsibility of the MEFEPNN, acting through the provincial water, forests and fisheries inspectorates in Tchibanga, the water and forest cantons in Mayumba, Ndindi and Mandji, the fisheries brigades in Mayumba and Gamba, and the wildlife brigades in Mourindi, Sette Cama and Iguéla.
- Protected areas are managed by the CNPN and the MEFEPNN's wildlife and hunting department.
- WWF (since 1989) and WCS (since 2002) are the main international NGOs supporting conservation.
- CI, ASF, the *Association des pêcheurs du département de Ndougou* (APDN), the *Comité de réflexion pour l'après-pétrole* (CRAP), Ibonga-ACPE (Association for Environmental

Knowledge and Protection), Nyanga-Tours and various European Union-funded programs (Cybertracker Monitoring Program, the '*Espèces Phares*' critical species program, the Kudu and Protomac programs) provide more case-specific support or are concentrating their work on particular aspects of management.

- The oil companies Shell Gabon and Total Gabon operate in the protected areas between Loango and Moukalaba-Doudou national parks to recognized environmental standards. Shell Gabon also supports the work done by the Smithsonian Institution and the Ndougou Department of Sustainable Development Support Program (PADDN). The PADDN program is also supported by the Shell Foundation and run by a steering committee that includes the National Employment Office (ONE), Omar Bongo University (UOB), the Expansion and Development Fund for Small and Medium-sized Enterprises (FODEX), the local authorities, Shell and WWF.
- The National Scientific and Technological Research Center (CENAREST), the national herbarium, the University of Wageningen, the University of Kyoto, the Smithsonian Institution and the Max Planck Institute are conducting research.
- Operation Loango (SCD) is working to develop tourism in the northern part of Loango National Park.
- The European Commission's Protected Areas Development Program (PSVAP) is active in the Gamba Complex.

In the Republic of Congo:

- The Ministry for Forestry Economics and the Environment (MEFE), formerly MEF, has had field operations in place since the Conkouati Wildlife Reserve was created in May 1980. There have been a conservation officer and assistant conservation officer since 2000.
- The NGO *Habitat Environnement et Liberté des Primates* (HELP) secured Ministry for Forestry Economics (MEF) authorization to establish a chimpanzee sanctuary on four islands in the Conkouati Wildlife Reserve in 1991.
- In 2000, WCS signed a draft agreement for management of the Conkouati-Douli National Park in partnership with the MEFE.

Direct threats

(1) *Hunting*

Illegal hunting is the main threat in both Gabon and the Republic of Congo.

(2) *Logging*

Non-sustainable logging is prevalent throughout the Landscape in Gabon, and even 'accidentally' overflows into the Gamba Complex. Instances of unlawful transnational logging have been recorded. Illegal logging is found in the very heart of the national park in the Republic of Congo.

(3) *Industrial fishing*

Illegal industrial fishing practiced by national and foreign trawlers is a major threat to marine biodiversity. Neither the Gabonese nor Congolese governments have the policing and enforcement resources to counter this threat. Trawlers regularly ply the no-fishing zone within 6 nautical miles of the beach. In the Republic of Congo, trawlers have even dynamited rock clusters, endangering the survival of local communities who largely depend on fishing for their subsistence, threatening resource sustainability, destroying bottom-dwelling communities and posing a serious threat to sea turtles from capture in nets. Indirectly, the decrease in fish supplies to local markets may increase pressure on land resources, in particular through an increase in hunting.

(4) *Traditional fishing*

Illicit lagoon fishing, practiced mainly by foreign fishermen, is a serious threat to lagoon ecosystems, as traditional methods have been replaced by new and potentially less sustainable techniques¹⁸ introduced by fishermen from West Africa, who are established and fishing illegally in the region, often under the protection of local political authorities. The main danger comes from the widespread use of nets in lagoons, especially banned monofilament nets, and the blocking of tidal waterways preventing any exchange of fish between ecosystem components.

(5) *Sport fishing*

In areas where codes of practice are not followed, this may also represent a threat: the regular catching of very large mature fish is not sustainable and threatens populations with regards to both population dynamics and genetics.

(6) *Oil exploration*

On and offshore oil exploration, including in the protected areas, constitutes a significant threat:

- Wells, roads and pipelines cover dozens of square kilometers, generate access and fragment habitats.
- Waste and/or accidental spillages are polluting. There are many offshore oil rigs, drowned springs and pipelines lying very close to the Landscape limits. So far, accidental pollution has not caused massive damage, but the threat of a major oil slick cannot be ruled out.
- The long term effects of low-level but constant petroleum hydrocarbon pollution are not yet known, but could be more significant than assumed.
- Human populations have been introduced into previously uninhabited habitats.
- Seismic studies have a negative impact on the whale population, especially on humpback whales during the breeding season.
- The declining output from old production licenses means that oil permits worked by large international companies with recognized environmental standards are transferred to small opportunistic operators. This threatens the medium and long term quality of environmental management systems.
- The decline in the oil business could also prompt many unemployed workers to join in the exploitation of wild resources, especially through hunting, as evidenced since the late 1980s¹⁹. It is therefore important to involve the oil companies in the planning and zoning of protected areas as part of their withdrawal strategy.

One deeply disturbing fact is that Loango National Park is included in the 'Lotus' exploration license - previously 'LT 2000' - recently sold to the Chinese oil company Sinopec. Likewise, the western part of Moukalaba-Doudou National Park straddles an exploration license.

It must, however, be acknowledged that Shell Gabon and Total Gabon have done much to support natural resource management and limit their environmental impact. Shell Gabon is not only ISO-14001 certified, but is developing its biodiversity action plan with scientific support from the Smithsonian Institution. In preparation for the post-oil era in the Gamba Complex, Shell Gabon and the Shell Foundation have also initiated the 'After Oil Development Support Program for the Ndougou Department' aimed at framing a development approach up to 2015 through a

¹⁸ Non-sustainable practises also include the capture of large numbers of immature sharks.

¹⁹ Commercial hunting began in the Loango National Park area in the late 1980s when the oil companies started to shed jobs. Hunters then came from Port-Gentil.

participatory process including local leaders and other players. At the same time, they are supporting small enterprise development.

(7) *Sea turtle egg collection*

This 'traditional' activity is not sustainable and is threatening these already vulnerable populations (Box 13.2).

(8) *Mining activities*

Gold panning destroys freshwater aquatic ecosystems and diminishes water quality. But over 1,000 gold panners are operating within the boundaries of Conkouati-Douli National Park. The Milingui zone iron deposit, towards the southern part of Moukalaba-Doudou National Park, could be worked in the future.

(9) *Pollution*

The beaches of southwest Gabon are badly polluted by waste from the Republic of Congo, DRC and Angola. Many lost logs wash up along the shores and represent a danger to sea turtles (Figure 13.10).

Indirect threats

(1) *Lack of managerial know-how*

The lack of an efficient management system, and a shortage of human, technical and financial resources, is a constant threat. In Gabon, the Gamba Complex is currently managed by the MEFEPN, but the CNPN, created by presidential order in 2002, has general oversight of the development of the national parks network. In the Gamba Complex, two park wardens have been appointed for Loango National Park and Moukalaba-Doudou National Park, but the MEFEPN seriously lacks the human, financial and technical resources to deal with inadequate, poorly-maintained facilities and equipment. Roles and responsibilities must be clarified, especially in the protected area located between the two national parks, which is what prompted WWF to initiate a study in December 2003 to come up with a new zoning and management methods for the Gamba Complex (Blom & Geerling, 2004). Park staff must be appointed, trained and equipped. Buffer zone management must also be clarified. A similar situation exists in the Republic of Congo.

(2) *Lack of transboundary coordination*

The lack of protected status for areas abutting Conkouati-Douli National Park in Gabon poses an indirect threat to the integrity of the national park in the Republic of Congo. Expelling

gold panners, illegal hunters and fishermen from Conkouati-Douli National Park has only moved the problem elsewhere. Some of those expelled have relocated close to Mayumba National Park and its buffer zone. A Landscape technical management committee was set up in 2005 to step up transnational collaboration. Two transnational meetings have been held so far between the wardens of the four national parks in the Landscape with representatives of the Gabon MEFEPN, WCS and WWF to map out strategies for working together on coast surveillance, industrial fishing, oil pollution monitoring, sea turtle monitoring and the exchange of information on other illegal transnational activities like poaching and logging.

State of the vegetation

In Gabon, most of the Gamba Complex forests have been logged at least once in recent decades. This activity has left disused access tracks, facilities, deserted villages and stumps *in situ*. But logging has had limited impacts on forest ecosystems, due to the selective logging method which focused only on a few commercially valuable species, chiefly okoume. Logging notwithstanding, the forests are still in good condition and vast tracts of primeval forests remain. Illegal logging has caused serious damage to the national park in the Republic of Congo.

State of the fauna

Gabon's terrestrial wildlife is abundant and no species is in immediate danger. There are concerns about the manatee, however, which despite being legally protected is still being poached. The Banio and Ndogo lagoon aquatic resources are currently being assessed by the MEFEPN, WCS and WWF. There is evidence that the Banio Lagoon is suffering from overfishing; the Ndogo Lagoon seems less endangered. As regards saltwater fishing, local fishermen complain of a sharp drop in catches, for which they blame industrial trawlers near or in their fishing areas. Targeted studies are essential to assess stocks of particular species, such as sharks. Controlling industrial fishing in the Mayumba and Iguéla zones, and in the future in Sette Cama and Nyanga, could substantially ease the pressure on fishery resources, but control of traditional fishing is also essential.

Recent estimates by WCS and MEFEPN in the Republic of Congo show a sharp decline in large mammal populations in the *My Fai Tai* concession.

Box 13.2: Sea turtle conservation

The conservation of sea turtles is the top priority in the Mayumba portion of the Landscape. The Pacific leatherback turtle population has declined by 90% over the past 20 years as a result of fishing, damage to beaches and egg collection. Atlantic turtles are now exposed to the same threats, but their populations remain relatively strong. This means it is essential to protect all egg-laying beaches, especially those in the Mayumba region where nest density is among the world's highest. Research is also starting to identify offshore sites that are important for successful conservation.



Figure 13.10. The lost logs on the beaches of the Gamba Complex of Protected Areas are a permanent threat to the marine turtles.

Management and governance in the field of renewable natural resources

(1) At the Landscape level

In 1995, WWF produced a first framework plan for the Gamba Complex, which was updated in 2001 and 2002. To catalyze this coordinated management strategy, the WWF Gamba project drew up and distributed a working paper to a number of key players at the end of April 2003. This document sets out a draft strategic management framework with proposals on key strategies and the different players' roles and responsibilities, on the basis of a comprehensive SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis. One of the most pressing needs is to review the status of the Complex's different protected areas, other than the two national parks. These include hunting areas and wildlife reserves that overlay oil exploration and extraction licenses, village territories and community farming, hunting and fishing lands, as well as the town of Gamba. As a result of consultations initiated by WWF in December 2003, recommendations on zoning, protected area management methods and future management structures were written and produced in April 2004 (Blom & Geerling, 2004).

In Iguéla and Mayumba, permanent monitoring camps have been set up along the coast to feed back information on illegal fishing activities, especially by industrial trawlers. An information system generates reports on illegal fishing and can launch boat operations using small crafts stationed in Iguéla and Mayumba to control or prevent contraventions. These measures will be strengthened by creating posts between the Landscape's northern and southern points²⁰. National park

staff work closely with MEFEPNN personnel, which strengthens mutual collaboration and support. The fisheries department lacks the technical and budgetary resources to police the fishing zones, but a partnership with the national parks and NGOs could help resolve this shortcoming.

Oil extraction is still taking place in the coastal waters of the national park in the Republic of Congo, even though prohibited by law. In 2005, new seismic prospecting took place unbeknown to the national park authorities²¹.

(2) In the national parks

In Gabon,

- CNPN has appointed four conservation officers, assigned to Mayumba, Tchibanga, Gamba/Sette Cama and Omboué/Iguéla. Total staff assigned to management and monitoring of protected areas is 0.76/1000 km² (Annex 1).
- Bases for developing management plans have been worked out for the national parks, and a first management plan has been developed for Loango National Park. It will be finalized in 2006.
- Substantial support is expected under a GEF program run by the World Bank and approved in May 2005²².
- Delimitation in Loango and Moukalaba-Doudou national parks is almost completed.
- Wildlife brigades have been set up in Iguéla and Sette Cama for Loango National Park and in Mourindi for Moukalaba-Doudou National Park. Surveillance stations have been built at Panga and Digoudou on the edges of Moukalaba-Doudou National Park.
- A total of 9 sworn agents, including the 3 park wardens supported by forty rangers and ecoguides paid for by government or NGOs and tourism operators, are responsible for running the Complex.
- In Loango National Park, cleaning up the waste littering beaches boosted the coastline's attractiveness and enabled a database of all the waste collected to be compiled, as the basis for an international waste pollution campaign.
- In the Mayumba region, NGOs and conservation officers are working to persuade MEFEPNN personnel to enforce forestry laws in the Landscape.

²⁰ These actions are vital to preserve fish stocks in Gabon and are in the immediate interest of the country's human populations who consume large quantities of fish as their main source of protein; agriculture and livestock production are under developed.

²¹ The company that carried out the explorations paid fishermen not to fish for a month.

²² This US \$10 million, 5-year program will swing into action only after Gabon has passed a new law on the national parks, and once the national parks agency - an MEFEPNN-supervised semi-public agency for the management of the national parks - takes shape.

In the Republic of Congo:

- Conkouati-Douli National Park has minimal facilities, which were substantially upgraded in 2005²³. The plan for 2006-2007 is to build visitor and researcher accommodations.
- When the national park was created in 1999, it was divided into ten areas with five different protected statuses: two fully-protected zones, two partially protected zones (former forest exploitations), two multiple use zones (ongoing forest exploitations), three sustainable development zones and a marine zone known as the 'marine extension'. These zones were ill-defined both geographically and in terms of authorized activities, and the legal bases of management remain unclear. The illegal presence of an industrial logging company in a fully-protected zone in the middle of the national park prevents any effective management. To address this zoning issue, WCS in partnership with the Conkouati park warden and assistant warden, developed clear rules and regulations, and a new development plan that divides the park into two zones with clearly-defined natural boundaries: (1) a fully-protected land and marine zone in which no human settlement is permitted; (2) a sustainable development zone in which the sustainable, controlled exploitation of natural resources by park residents will be permitted.
- Despite these problems, the MEFE warden, helped by 22 rangers, tries to enforce the laws. In 2005, a checkpoint was set up in Yanika to stem the bushmeat flow to Pointe-Noire. This checkpoint proved highly effective²⁴, and a second checkpoint has been set up at Youbi on the Gabon road²⁵. Within the park boundaries, anti-poaching patrols concentrated on clearing the park of traps²⁶.
- In 2004, WCS submitted a report to the government on the impact of industrial logging in Conkouati-Douli National Park and called for it to be banned from the park, but it still continues at the time of this writing²⁷.

(3) *In extraction zones*

A sport fishing company has set up in the Mayumba National Park buffer zone in Gabon, which might also in the near future consider starting up legal sport hunting for elephants and other large mammals. Efforts are being made to see that any such activity stays within strict quotas and that operating and monitoring procedures are established and complied with.

The forests situated outside the national park in the Republic of Congo are all included in con-

cessions, but there is no policing of wildlife management or even logging activities.

(4) *In rural areas*

- Mayumba National Park personnel and local fishermen are jointly studying sustainable salt-water and freshwater fishing. It is a highly participatory process using the PARFISH methodology developed by the United Kingdom's Department for International Development. The first meetings have been held and an initial period of basic data collection has been completed to draw up a long term follow-up program. The outcomes will be used to guide fishermen towards the adoption of the sustainable management measures suggested by the project.
- A study is also taking place on sustainable oyster fishing at Mayumba. The idea is to form a co-operative and find lucrative markets for the exploitation of a quality product, to avoid over-fishing and enable stock control.

Monitoring renewable natural resources and their management

A wide range of environmentally and socio-economically related activities are taking place. A large body of information is starting to materialize, but there is no harmonized Landscape-wide database as yet.

(1) *Fisheries monitoring*

Traditional fishing is a major economic activity for many villages, including Gamba and Mayumba, but the ecosystem's productive capacity is unknown and is certainly affected by industrial fishing. Therefore, fishermen must be given supportive guidance, their rights or obligations must be clearly defined, no-fishing zones must be delimited and catch monitoring introduced. Fisheries monitoring is also being set up in Mayumba, and the government department responsible for fisheries has shown a keen interest in the program. Should the early results be conclusive, the PARFISH method could be given official status across all Gabonese fisheries.

Inshore waters surveillance equipment and methods are being tested out in Iguéla and Mayumba. It is hoped that the surveillance network will be extended by NGOs and national parks managers, including Conkouati-Douli National Park in the Republic of Congo, as well as the MEFEPN's fisheries department. A new project supporting the fisheries sector and backed by the African Development Bank (ADB) is in

²³ These facilities include headquarters with 3 houses, 2 offices, a volunteer house, 2 stores, a generator room, a small port, a small boathouse, a sea-going boat, a garage and a workshop.

²⁴ 129 animals were confiscated in the first week of January, compared to just 8 in December 2005.

²⁵ 497 animals were confiscated from bushmeat traffickers in its first week of operation.

²⁶ More than 20,000 neck snares were removed and destroyed between January and December 2005.

²⁷ The company was fined 11 million CFA francs (US \$20 000) in 2005 for operating in the middle of the park's fully-protected zone. This is a paltry sum relative to the damage done.

its development period in Gabon, as part of the Forests and Environment Sector Program (PSFE). Building the institutional capacity for inshore waters surveillance through setting up forward surveillance bases and bringing high speed motorboats into service is planned for the Landscape's coastal zones. In Loango National Park, an ocean-going vessel - the Gemini - is already in service to support surveillance of illegally operating trawlers.

(2) Monitoring oil extraction

Standards and the practical implementation of standards have been considerably strengthened over the past two decades, albeit to different extents between the different companies. The standards applied by oil companies and their suppliers are mainly dictated by their sensitivity to international public attention, which is in turn determined by the company's size, the scale of its international presence, and the culture of its headquarter's country. In the case of large companies like Shell and Total, natural and human environmental aspects are addressed by health, safety and environmental management plans. Shell Gabon is ISO 14001 certified. But these procedures were not introduced when oil operations first came on line 40 years ago and they continue to be a work in progress. Where the Gamba area is concerned, the legacy of past practices is still visible as 'black spots'. A program has been implemented to deal with them.

In Mayumba, a coastal oil pollution monitoring system was initiated by WCS and is in the process of being given official status. Procedures have been developed to standardize surveillance and reporting for monthly or spot checks along beaches. Past oil slicks have received little attention and many surely went unnoticed. This failing has probably held back the development and introduction of a binding code for offshore oil exploitation similar to that in Europe or the United States. Therefore, standardized monitoring of beaches will not only enable rapid responses to major pollution incidents, but it will also force some companies to change their strategies for security/safety and reducing environmental impacts.

(3) Sea turtle monitoring

The study of sea turtles, commenced six years ago in Mayumba by ASE, *Gabon Environnement*, ECOFAC/Protomac and WCS, is ongoing. A research program has been conducted on the Gamba beaches by Ibonga, ENEF, Biotopic, the University of Glasgow, Protomac/Kudu and

WWF since 2002. Turtles in the north of Loango National Park have been monitored since 2003 by a team of Gabonese researchers from WCS. Two specialized aquatic ecology researchers are monitoring sea turtles in the Republic of Congo, aided by 20 temporary assistants.

The activities carried out by all these partners include using transmitters for the satellite tracking of females' movements during and after the egg-laying period, studies on turtle population genetics, studies on turtle health and monitoring breeding success. Standardized counts at seven points in the Landscape in both Gabon and the Republic of Congo are added to national and regional databases, and the exchange of data on tagged turtles gives a better understanding of their migration patterns.

Proposed new activities include a project to put NGO observers on selected trawlers to collect data on accidental turtle captures and a future workshop on trawlers' use of Turtle Excluder Devices (TED), to reduce accidental captures. Finally, regular boat-borne operations in the Mayumba region will be carried out to study turtle migrations, egg-laying sites and offshore abundance.

(4) Great ape monitoring

The first great ape studies were done in Loango National Park by the University of Kyoto in 1995. In 2004 and 2005, the Max Planck Institute in collaboration with WWF conducted a study of chimpanzee and gorilla densities and spatial distributions in Moukalaba-Doudou National Park. The data are currently being analyzed by the Max Planck Institute. In Loango National Park, another team from the Max Planck Institute has been studying gorillas since 2005 in order to habituate them to tourism. In Doussala, in the east of Moukalaba-Doudou National Park, the University of Kyoto has been running a gorilla habituation program since 2001.

(5) Elephant monitoring

Satellite tracking of elephants in the Gamba Complex is being done by WCS, SCD and SI. The data are available on the CARPE website (CARPE Mapper). The plans are to fit three more collars in August 2006 in the Akaka swamplands on the edge of Loango National Park. Plans are being developed to study the use of the environment by forest elephants in Loango National Park and to set up a tracking program based on individual identification.

(6) *Cetacean monitoring*

The WCS Cetacean Research and Conservation Group has been studying the migrating population of humpback whales off the Landscape's coast since 1999. In collaboration with Operation Loango, in Iguéla, briefly in Gamba and more recently in Mayumba, the research efforts have been focused on studying the size and structure of the population that visit Gabonese waters from June to October. Methods used include systematically photographing fin and tail details for individual identification and skin sampling for genetic studies. Toxicological analyses have also been done to assess petroleum hydrocarbon levels in whales. In 2005, research out of Mayumba was able to individually identify 245 whales in 105 groups in 28 boat days. Other species identified on these outings were the common or saddle-backed dolphin, the bottlenose dolphin, the Atlantic hump-backed dolphin, the killer whale, the leatherback turtle and the olive Ridley sea-turtle, with occasional sightings of hawksbill turtles and green turtles. In 2006, research will be done out of three sites - Iguéla, Mayumba and Conkouati - which should yield vital information for whale conservation worldwide. New initiatives also include a study of the hump-backed dolphin, a rare and elusive species about which little is known. The findings of research on humpback whales have been submitted to the International Whaling Commission.

(7) *Research on crocodiles*

Research into the breeding and egg-laying of the African Dwarf Crocodile *Osteolaemus tetraspis* has been ongoing since 2004. In 2005, nine crocodiles were fitted with telemetric transmitter units to determine their territory.

(8) *Botanical monitoring*

Botanical research has been done in the Gamba Complex, particularly in the Monts Doudou Mountain Range area, for twenty-odd years by the Gabonese national herbarium, the Meise Botanical Garden (Belgium), the *Institut de Recherche en Ecologie Tropicale* (IRET - Tropical Ecology Research Institute), the Universities of Wageningen and Gembloux, and the NGOs Nature + and WWF. In early 2003, botanists from Gabon's national herbarium working in close collaboration with the Missouri Botanical Garden, the Royal Botanical Gardens in Edinburgh and WCS, took a botanical inventory of Loango National Park. Over 500 species have been identified to date. More in depth historical research into the park's vegetation began in 2005, focused

on the diversity, abundance and distribution of plants of the *Chrysobalanus* genus.

(9) *Monitoring large mammals and human presence*

The first inventories of large mammals in the Gamba Complex were done by WCS and WWF in 1997 and 1998 (Thibault *et al.*, 2001). In 2004, an expert from the Max Planck Institute (MPI) helped the CNPN, MEFEPN and WWF Gamba teams develop an environmental monitoring procedure based on an innovative combination of point and line transects. The procedure was tested in 2005. With support from an MPI expert, attempts are now being made to harmonize the monitoring approaches between WWF and WCS. Joint monitoring of Loango National Park is planned to start in 2006. Vital information on the socioeconomic dynamics of villages in the Gamba Complex area has been provided by studies done by WWF since 1998.

In the Republic of Congo, environmental research done to collect source data includes a study on vegetation and large mammal inventories. Using 2004 data, a new method was designed by WCS statisticians and successfully applied in November 2005 to yield excellent source data on large and small mammals. The elephant population was estimated at 0.2/km² or 772 (± 189) elephants for the entire park. The data also enabled mapping on the distribution of human impact, and the following species: elephant, gorilla, chimpanzee, buffalo, sitatunga, bushbuck, bushpig, blue duiker, red duiker, and brush-tailed porcupine. Socioeconomic studies were completed in May 2005. They include censuses in the villages around the park, the collection of demographic data, the collection of employment status data, and gender-specific socioeconomic studies. Thus far, data has been obtained from more than 5,900 people. The monitoring personnel consists of: 2 researchers specializing in aquatic environments, 2 in socioeconomics and 2 in ecology.