

Ituri Forest Dynamics Plots, Democratic Republic of Congo

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Site Location, Administration, and Scientific Infrastructure

The Ituri Forest Dynamics Plots were established in 1994 in the 1,350,000-ha Okapi Faunal Reserve (OFR), Eastern Province, Democratic Republic of Congo, which extends from 1° to almost 3°N latitude and from 28° to almost 30°E longitude (Hart and Carrick 1996; fig. 28.1). Declared a reserve in 1992, the OFR is located in the Ituri River basin, whose forest covers approximately 60,000 km².

Among this project's specific goals is to compare the mixed and monodominant forest types and their dynamics on a scale that will facilitate an understanding of their distributions. Despite numerous smaller scale studies, this understanding has remained elusive (Hart et al. 1989; Hart 1995; Torti 1998). To achieve this goal, the Centre de Formation et de Recherche en Conservation Forestière (CEFRECOF) established four 10-ha (200 × 500 m) Forest Dynamics Plots, instead of a single 50-ha plot, in the Okapi Faunal Reserve. Two of the 10-ha plots were placed in mixed Caesalpiniaceous-dominated forest with a base camp on the Egoro Stream, 20 km northwest of OFR's administrative center in the town of Epulu. The other two 10-ha Forest Dynamics Plots were situated in monodominant mbau forest approximately 10 km to the southeast, near a camp located on the Lenda Stream. The four plots are located approximately 150 km from the transition to anthropogenic fire-interface savanna (Makana et al. 1998).

Prior to the establishment of the large plots, twenty-four 625-m² small plots were established in both mixed and monodominant forest in 1981–82 to investigate differences in diversity and dominance between the two forest types (Hart et al. 1989).

CEFRECOF's headquarters, located between Lenda and Egoro camps, is constructed of permanent materials and has independent lodging and limited dormitory space. The two camps have simpler accommodations—small tin-roofed rooms of local materials. For the last 15 years, CEFRECOF personnel have received basic support from the Wildlife Conservation Society along with operating funds for the camps, main center, and associated infrastructure.

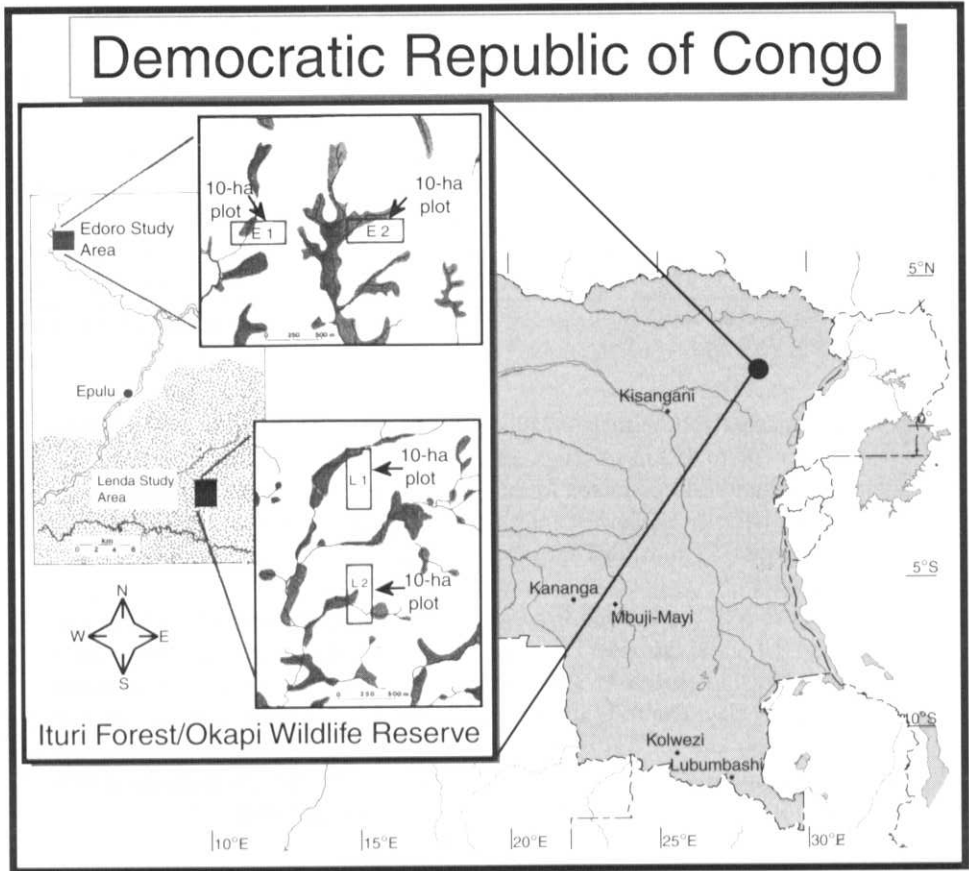


Fig. 28.1. Locations of the four 10-ha Ituri Forest Dynamics Plots. The stippled area in the inset represents monodominant forest. The black areas in the secondary insets represent swamps connected by rivers and streams.

Climate

Over a 9-year period (1987–95), the average annual rainfall recorded at the administrative center of the OFR was 1682 mm, with a maximum of 2085 mm and a minimum of 1304 mm. The dry season lasts 3–4 months. The average annual maximum temperature was 25.5°C (Hart and Carrick 1996; table 28.1).

Topography and Soil

The topography of the area is gentle, with occasional rolling hills containing exposed patches of shallow rocky soils (Hart et al. 1996). The Ituri Forest Dynamics

Table 28.1. Ituri Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total/ Averages
Edoro:													
Rain (mm)	32	80	103	183	186	152	195	183	192	205	194	80	1785
ADTMx (°C)	25.4	25.2	26.9	27.5	28.3	24.4	24.1	25.8	24.7	24.3	24.4	24.4	25.5
ADTMn (°C)	16.5	17.1	18.1	18.5	18.5	18.3	18.1	18.1	17.9	18.1	18.2	17.8	17.9
Lenda:													
Rain (mm)	51	41	90	195	168	152	165	165	161	226	172	88	1674
ADTMx (°C)	27.9	27.3	28.7	29.0	29.3	29.9	27.7	26.1	27.3	27.0	26.3	27.0	27.8
ADTMn (°C)	17.7	17.3	17.8	18.8	18.9	18.8	18.5	18.4	18.2	18.5	18.6	18.2	18.3

Notes: Mean monthly rainfall and average daily temperature are based on readings taken during 1991–1995 at Edoro and Lenda base camps (Hart and Carrick 1996).

Plots are located approximately 750 m above sea level (asl), with an elevational range from 700 to 850 m asl (figs. 28.2 and 28.3). Both the Lenda (monodominant forest) and Edoro (mixed forest) study areas are relatively flat. Differences in elevation between the lowest and the highest points within the 10-ha plots are 24 m for Lenda-1, 16 m for Lenda-2, 14 m for Edoro-1, and 21 m for Edoro-2 (Makana 1999).

The area's soils are derived from granitic pre-Cambrian shield rock (Laveau 1982) and fall under the order Oxisols, which dominates most of the Congo basin rainforest block in central Africa (Brady 1990). Their texture ranges from loamy sand to sandy clay. The soils are very acidic (mean pH values at 20 cm are 3.96 in mixed forest and 4.17 in monodominant mbau forest) and low in available phosphorus and nitrogen (Hart 1985). Mean soil sand content at Epulu is 64% in mixed forest and 72% in monodominant forest (Hart 1985).

Forest Type and Characteristics

The vegetation in the Ituri forest is composed of two principal types of tropical moist forest: mixed-canopy semievergreen forest (mixed forest) and single-canopy dominant evergreen forest (monodominant forest). There are also small areas of specialized vegetation such as swamp forest that occurs along streams in areas of poor drainage and a xerophyllous flora found in isolated patches such as the dry hilltops in the northern forest (Hart et al. 1996). The canopy in mixed and monodominant forests reaches a height of 30–40m. The dominant species of the monodominant forest is mbau (*Gilbertiodendron dewevrei* (De Wild.) Léonard [Leguminosae (Caesalpinioideae)]), which comprises up to 90% of the large trees in pure stands and forms a homogeneous and continuous canopy. In the mixed forest, the canopy is more heterogeneous and frequently broken by emergent trees more than 40 m in height (Hart et al. 1989). Two species, *Cynometra*

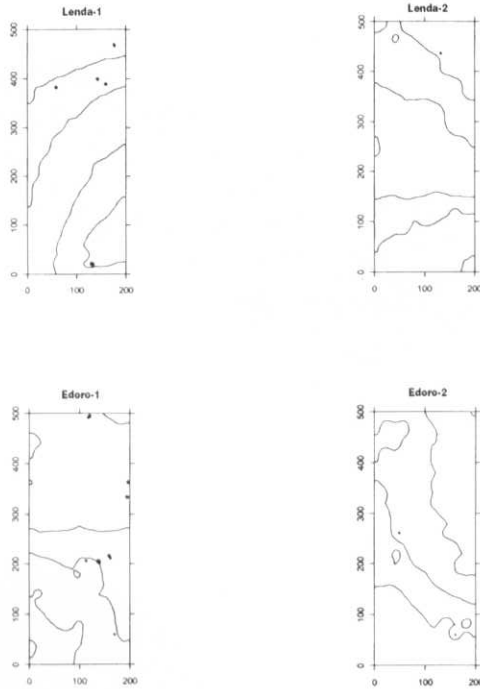


Fig. 28.2. Topographic map of the four 10-ha Ituri Forest Dynamics Plots with 5-m contour intervals (solid line) and intermediate 2.5-m contour interval (dashed line).

alexandri C.H. Wright [Leguminosae (Caesalpinioideae)] and *Julbernardia seretii* (De Wild.) Troupin [Leguminosae (Caesalpinioideae)] occur at high proportions in the canopy of the mixed forest and account for over one third of the basal area of trees above 30 cm dbh (Makana et al. 1998).

The two Lenda plots are dominated by *G. dewevrei* at the canopy level. One of these plots (Lenda-1), however, includes about 2.5 ha of mixed forest. The Edoro plots constitute mixed forest, with the exception of some small monodominant patches at Edoro-1. The most abundant canopy species at Edoro are *C. alexandri* and *J. seretii*. All plots at both study areas contain small patches of temporary or permanent swamp along streams (Makana 1999).

The Lenda monodominant forest and the Edoro mixed forest present different structures. The monodominant forest creates a more even, deep shade than the mixed forest. This results from significant differences in the distribution of free-standing woody stems between different diameter classes. The monodominant forest has more large trees, which result in higher basal area. The deep shade cast by a closed homogeneous canopy in the monodominant forest creates a sparse

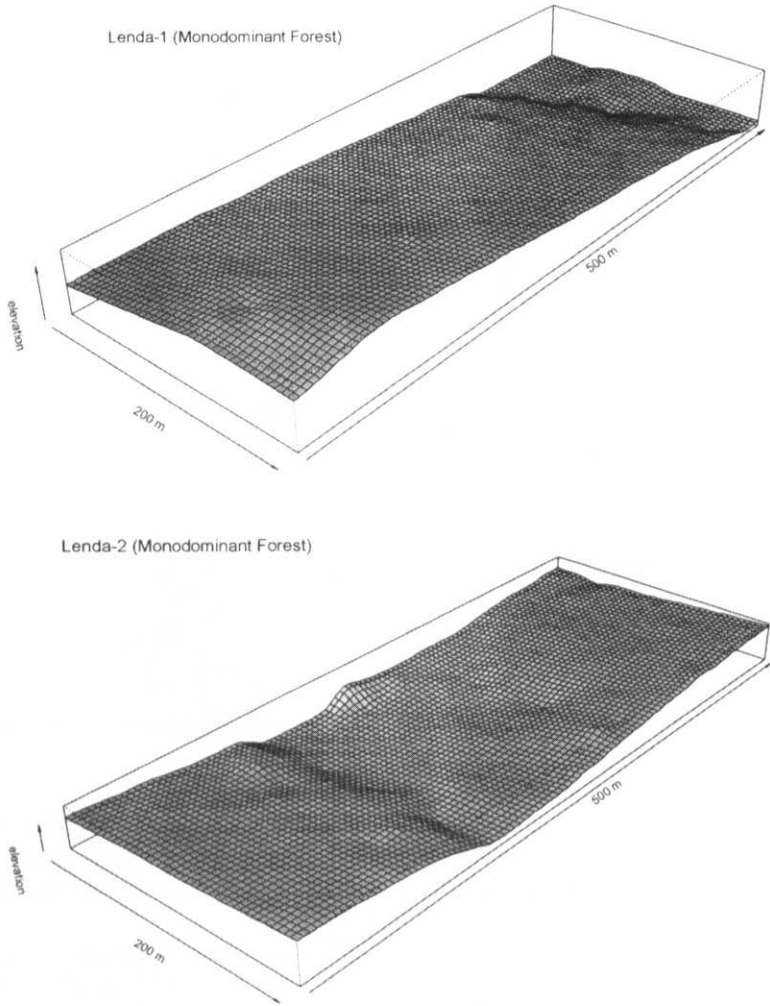
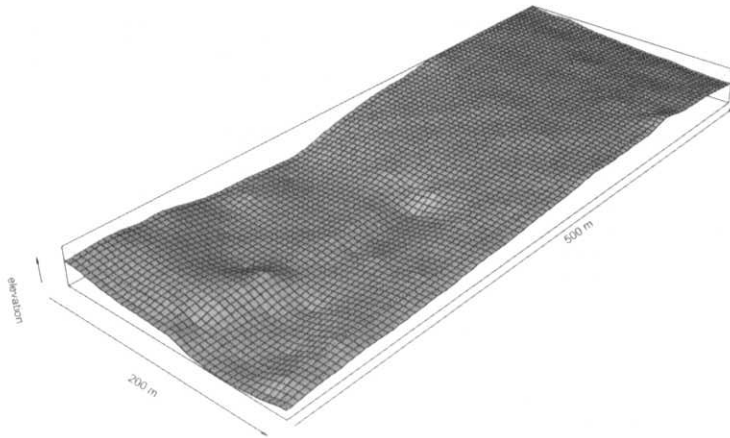


Fig. 28.3. Perspective maps of the four 10-ha Ituri Forest Dynamics Plots.

and open understory, whereas the understory of the mixed forest is more dense. Liana density is twice as high in mixed forest as in monodominant forest (Makana 1999; Makana et al. 1998). In spite of the significant differences in structure and the spatial segregation (Edoro and Lenda sites are more than 20 km apart), the two forest types are remarkably similar with regard to species composition. They share most of very common species in both the canopy and the understory. *C. alexandri* and *J. seretii*, which dominate the canopy of mixed forest, are the

Edoro-1 (Mixed Forest)



Edoro-2 (Mixed Forest)

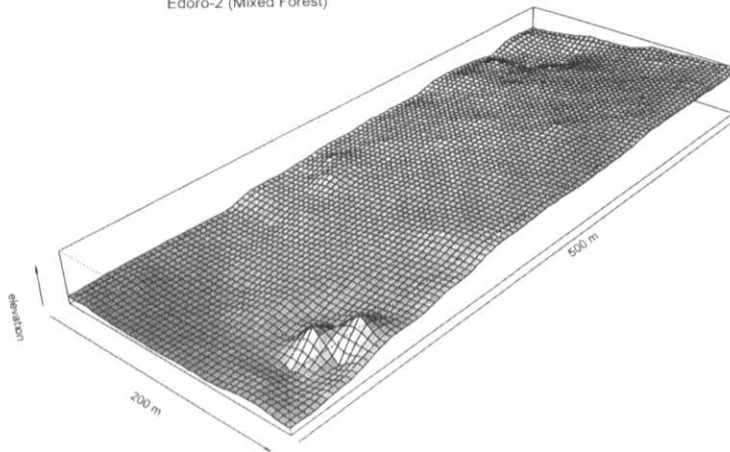


Fig. 28.3. (Continued)

second and third most common species in monodominant stands. *Scaphopetalum deweyrei* (Sterculiaceae) is a shrub species that represents more than 40% of all stems in each forest (chap. 12). For census data and rankings, see tables 28.2–28.9.

In addition to all tree stems ≥ 1 cm dbh, plot researchers censused all lianas ≥ 2 cm dbh. Phenological data, which have been collected for all major dominant tree species in both forest types since 1993, are not yet available.

Table 28.2. Ituri Plot Census History

Census	Plot	Dates	Number of Trees (≥ 1 cm dbh)	Number of Tree Species (≥ 1 cm dbh)	Number of Lianas (≥ 2 cm dbh)	Number of Lianas Species (≥ 2 cm dbh)	Number of Trees (≥ 10 cm dbh)	Number of Tree Species (≥ 10 cm dbh)
First	Combined	Feb 1994–Jun 1996	299,114	420	19,306	243	15,914	278
First	Lenda-1	Feb 1994–Aug 1995*	70,979	327	3,276	139	3,431	188
First	Lenda-2	Oct 1995–Dec 1995	65,893	302	3,162	134	3,721	161
First	Edoro-1	Apr 1994–Jul 1995	76,276	311	6,487	119	4,252	157
First	Edoro-2	Jan 1996–Jun 1996	85,966	312	6,381	146	4,510	146

*169 large trees with dbh > 30 cm were measured in July 1996.

Notes: The second census was completed in January 2002.

Table 28.3. Ituri Summary Tally

Size Class (cm dbh)	Average per Hectare							10-ha Plot				
	BA	N	S	G	F	H'	α	S	G	F	H'	α
Lenda-1 (Monodominant Forest)												
≥ 1	37.0	7097	161	109	37	1.08	29.5	283	179	50	1.13	37.5
≥ 10	32.0	343	57	46	22	1.07	20.2	168	114	39	1.32	37.0
≥ 30	26.5	90	13	13	8	0.55	5.1	67	55	22	0.81	16.7
≥ 60	18.1	34	5	5	3	0.38	2.0	22	21	10	0.56	5.3
Lenda-2 (Monodominant Forest)												
≥ 1	38.0	6589	157	106	38	1.16	29.0	260	165	49	1.20	34.4
≥ 10	33.2	372	48	40	20	0.82	15.3	149	102	33	0.96	31.1
≥ 30	27.5	106	13	12	8	0.39	4.2	62	50	22	0.49	14.4
≥ 60	16.8	33	4	4	3	0.25	1.5	24	22	15	0.33	6.0
Edoro-1 (Mixed Forest)												
≥ 1	32.7	7627	148	107	37	1.25	26.0	245	168	46	1.29	31.4
≥ 10	26.2	425	61	52	26	1.37	19.5	137	102	35	1.53	27.1
≥ 30	19.3	76	24	23	14	1.04	12.2	80	64	26	1.31	22.5
≥ 60	11.2	21	9	9	6	0.80	7.1	35	32	16	1.16	12.1
Edoro-2 (Mixed Forest)												
≥ 1	33.7	8596	150	107	37	1.08	25.9	259	170	43	1.12	32.9
≥ 10	26.4	451	67	55	26	1.41	21.9	164	116	38	1.56	33.4
≥ 30	19.4	78	27	25	16	1.13	15.6	102	78	29	1.41	31.3
≥ 60	11.6	23	11	10	7	0.83	7.6	45	39	19	1.16	16.6

Notes: For each of four 10-ha plots, BA represents basal area in m^2 , N is the total number of individual trees, S is the total number of species, G is the number of genera, F is the total number of families, H' is the Shannon–Wiener diversity index using \log_{10} , and α is Fisher's α . Basal area includes all multiple stems for each individual. Individuals are counted using their largest stem. All numbers are averages per hectare for 10-ha plots. In the Lenda plots 1 and 2, respectively, 11,380 and 2,507 individuals were not identified to species or morphospecies. In the Edoro plots 1 and 2, respectively, 12,290 and 2,516 individuals were not identified. Data are from the first census.

Table 28.4. Ituri–Lenda (Monodominant Forest) Rankings by Family

Rank	Family	Basal			Family	Trees	% Trees	Family	Species
		Area (m ²)	% BA	% Trees					
1	Leguminosae	552.5	74.4	11.3	Sterculiaceae	62,990	46.7	Rubiaceae	50
2	Sterculiaceae	40.6	5.5	46.7	Euphorbiaceae	19,950	14.8	Euphorbiaceae	37
3	Euphorbiaceae	25.8	3.5	14.8	Leguminosae	15,260	11.3	Leguminosae	31
4	Sapindaceae	22.7	3.1	6.6	Sapindaceae	8,942	6.6	Sapotaceae	25
5	Sapotaceae	12.2	1.6	2.3	Ebenaceae	4,398	3.3	Sapindaceae	20
6	Rubiaceae	9.5	1.3	2.5	Guttiferae	3,497	2.6	Annonaceae	15
7	Apocynaceae	9.1	1.2	0.6	Rubiaceae	3,318	2.5	Meliaceae	15
8	Meliaceae	8.8	1.2	0.7	Sapotaceae	3,099	2.3	Ochnaceae	12
9	Irvingiaceae	8.5	1.1	0.2	Annonaceae	2,785	2.1	Sterculiaceae	11
10	Annonaceae	7.3	1.0	2.1	Flacourtiaceae	1,245	0.9	Flacourtiaceae	10

Notes: The top 10 families for trees ≥ 1 cm dbh are ranked in terms of basal area, number of individual trees, and number of species with the percentage of trees in the combined two plots at Lenda monodominant forest (20 ha). Data are from the first census.

Table 28.5. Ituri–Edoro (Mixed Forest) Rankings by Family

Rank	Family	Basal			Family	Trees	% Trees	Family	Species
		Area (m ²)	% BA	% Trees					
1	Leguminosae	278.0	42.4	15.6	Sterculiaceae	70,615	44.3	Euphorbiaceae	57
2	Euphorbiaceae	50.8	7.8	9.7	Leguminosae	24,829	15.6	Rubiaceae	40
3	Sterculiaceae	48.0	7.3	44.3	Euphorbiaceae	15,403	9.7	Leguminosae	29
4	Sapindaceae	35.3	5.4	8.6	Sapindaceae	13,715	8.6	Sapindaceae	22
5	Rubiaceae	31.7	4.8	2.8	Rubiaceae	4,472	2.8	Sapotaceae	21
6	Rutaceae	26.2	4.0	0.1	Annonaceae	4,449	2.8	Annonaceae	17
7	Ebenaceae	20.1	3.1	2.7	Ebenaceae	4,320	2.7	Meliaceae	15
8	Sapotaceae	16.4	2.5	1.3	Tiliaceae	3,442	2.2	Flacourtiaceae	11
9	Tiliaceae	16.3	2.5	2.2	Flacourtiaceae	3,406	2.1	Ochnaceae	11
10	Meliaceae	14.5	2.2	0.7	Sapotaceae	2,004	1.3	Sterculiaceae	10
								Moraceae	9

Notes: The top 10 families for trees ≥ 1 cm dbh are ranked in terms of basal area, number of individual trees, and number of species with the percentage of trees in the combined two plots at Edoro mixed forest (20 ha). Data are from the first census.

Fauna

Biogeographical evidence suggests that the Ituri forest was an important Pleistocene forest refuge and a center of dispersal for many current east and central African vertebrate taxa (reviews in Thomas 1991; Hart et al. 1996). Presently, the Ituri forest is thought to be Africa's most species-rich area in mammalian fauna (Grubb 1982). In addition to an important number of endemic mammalian species such as the okapi (a forest giraffe, *Okapia johnstoni*), the aquatic genet (*Osbornictis piscivora*), and the owl-faced monkey (*Cercopithecus hamlyni*),

Table 28.6. Ituri–Lenda (Monodominant Forest) Rankings by Genus

Rank	Genus	Basal	% Trees		Genus	Trees	%	Genus	Species
		Area (m ²)	BA	Trees			Trees		
1	<i>Gilbertiodendron</i> (Leguminosae)	469.0	63.2	7.6	<i>Scaphopetalum</i> (Sterculiaceae)	61,385	45.5	<i>Drypetes</i> (Euphorbiaceae)	10
2	<i>Julbernardia</i> (Leguminosae)	44.2	6.0	1.7	<i>Drypetes</i> (Euphorbiaceae)	11,088	8.2	<i>Ouratea</i> (Ochnaceae)	10
3	<i>Scaphopetalum</i> (Sterculiaceae)	32.3	4.3	45.5	<i>Gilbertiodendron</i> (Leguminosae)	10,294	7.6	<i>Psychotria</i> (Rubiaceae)	7
4	<i>Cynometra</i> (Leguminosae)	18.0	2.4	0.3	<i>Alchornea</i> (Euphorbiaceae)	7,570	5.6	<i>Chrysophyllum</i> (Sapotaceae)	6
5	<i>Pancovia</i> (Sapindaceae)	16.6	2.2	5.3	<i>Pancovia</i> (Sapindaceae)	7,117	5.3	<i>Cola</i> (Sterculiaceae)	6
6	<i>Drypetes</i> (Euphorbiaceae)	10.4	1.4	8.2	<i>Diospyros</i> (Ebenaceae)	4,398	3.3	<i>Trichilia</i> (Meliaceae)	6
7	<i>Alstonia</i> (Apocynaceae)	8.4	1.1	0.0	<i>Garcinia</i> (Guttiferae)	3,361	2.5	<i>Rothmannia</i> (Rubiaceae)	5
8	<i>Cola</i> (Sterculiaceae)	7.6	1.0	0.8	<i>Julbernardia</i> (Leguminosae)	2,321	1.7	<i>Chytranthus</i> (Sapindaceae)	5
9	<i>Diospyros</i> (Ebenaceae)	5.8	0.8	3.3	<i>Aidia</i> (Rubiaceae)	1,545	1.1	<i>Albizia</i> (Leguminosae)	4
10	<i>Zanthoxylum</i> (Rutaceae)	5.7	0.8	0.1	<i>Manilkara</i> (Sapotaceae)	1,533	1.1	<i>Beilschmiedia</i> (Lauraceae)	4
								<i>Dialium</i> (Leguminosae)	4
								<i>Diospyros</i> (Ebenaceae)	4
								<i>Entandrophragma</i> (Meliaceae)	4
								<i>Garcinia</i> (Guttiferae)	4
								<i>Irvingia</i> (Irvingiaceae)	4
								<i>Rinorea</i> (Violaceae)	4
								<i>Rothmannia</i> (Rubiaceae)	4

Notes: The top 10 tree genera for trees ≥ 1 cm dbh are ranked by basal area, number of individual trees, and number of species with the percentage of trees in the combined two plots in Lenda monodominant forest (20 ha). Data are from the first census.

the forest is home to nine antelope species—including bongo (*Tragelaphus eryceros*), sitatunga (*Tragelaphus spekei*), Bates pygmy antelope (*Neotragus batesi*), and six species of duiker (*Cephalophus* spp.)—elephant (*Loxodonta africana cyclotis*), forest buffalo (*Syncerus caffer nanus*), water chevrotain (*Hyemoschus aquaticus*), African golden cat (*Profelis aurata*), leopard (*Panthera pardus*), giant ground pangolin (*Manis gigantea*), two species of tree pangolin (*Manis tetradactyla* and *M. tricupsis*), giant forest genet (*Genetta victoriae*), bush pig (*Potamochoerus porcus*), giant forest hog (*Hylochoerus meinertzhageni*), tree hyrax (*Dendrohyrax arboreus*),

Table 28.7. Ituri–Edoro (Mixed Forest) Rankings by Genus

Rank	Genus	Basal Area (m ²)	% BA	% Trees	Genus	Trees	% Trees	Genus	Species
1	<i>Cynometra</i> (Leguminosaeoideae)	150.2	22.9	2.9	<i>Scaphopetalum</i> (Sterculiaceae)	67,741	42.5	<i>Drypetes</i> (Euphorbiaceae)	10
2	<i>Julbernardia</i> (Leguminosae)	67.2	10.3	9.9	<i>Julbernardia</i> (Leguminosae)	15,847	9.9	<i>Ouratea</i> (Ochnaceae)	10
3	<i>Scaphopetalum</i> (Sterculiaceae)	32.3	4.9	42.5	<i>Pancovia</i> (Sapindaceae)	12,007	7.5	<i>Beilschmiedia</i> (Lauraceae)	6
4	<i>Pancovia</i> (Sapindaceae)	28.8	4.4	7.5	<i>Drypetes</i> (Euphorbiaceae)	7,631	4.8	<i>Trichilia</i> (Meliaceae)	6
5	<i>Zanthoxylum</i> (Rutaceae)	26.2	4.0	0.1	<i>Alchornea</i> (Euphorbiaceae)	6,005	3.8	<i>Chrysophyllum</i> (Sapotaceae)	5
6	<i>Diospyros</i> (Ebenaceae)	20.1	3.1	2.7	<i>Cynometra</i> (Leguminosae)	4,668	2.9	<i>Cola</i> (Sterculiaceae)	5
7	<i>Gilbertiodendron</i> (Leguminosae)	19.9	3.0	0.6	<i>Diospyros</i> (Ebenaceae)	4,320	2.7	<i>Synsepalum</i> (Sapotaceae)	5
8	<i>Erythrophleum</i> (Leguminosae)	17.5	2.7	0.1	<i>Polyalthia</i> (Annonaceae)	2,902	1.8	<i>Celtis</i> (Ulmaceae)	5
9	<i>Hallea</i> (Rubiaceae)	15.2	2.3	0.1	<i>Dasylepis</i> (Flacourtiaceae)	2,855	1.8	<i>Chytranthus</i> (Sapindaceae)	5
10	<i>Cola</i> (Sterculiaceae)	13.3	2.0	0.6	<i>Desplatsia</i> (Tiliaceae)	2,184	1.4	<i>Dialium</i> (Leguminosae)	5

Notes: Top 10 tree genera for trees ≥ 1 cm dbh are ranked by basal area, number of individual trees, and number of species with the percentage of trees in the combined two plots in Edoro mixed forest (20 ha). Data are from the first census.

at least four tree squirrels (*Paraxerus*, *Protoxerus*, *Funisciurus*, and *Heliosciurus*), and two species of flying squirrel (*Anomalurus* and *Idiurus*). There are many primate species in the area, 13 of which are anthropoid primates, including chimpanzee (*Pan troglodytes*), baboons (*Papio anubis*), blue monkeys (*Cercopithecus mitis*), red-tailed monkeys (*Cercopithecus ascanius*), mona monkeys (*Cercopithecus wolfei denti*), gray-checked mangabeys (*Cercocebus albigena*), agile mangabeys (*Cercocebus galeritus agilis*), red colobus (*Colobus badius*), Abyssian black and white colobus (*Colobus guereza*), and Angolan (*Colobus angolensis*). Total primate biomass is 710 kg/km² or 112 individuals/km². Overall primate density is quite low for Africa because of the relative scarcity of folivorous species and the low utilization of mbau forests by primates (Thomas 1991). Using transect survey data, researchers estimated the density of some of the mammalian species in the OFR (at a distance from human activity) as 0.79/km² for elephant, 0.89/km² for chimpanzee, and 0.48/km² for okapi (Hart and Hall 1996). Estimated densities have also been calculated for nine other ungulate species in the OFR (Hart 2001). The Ituri forest also hosts a large number of birds such as hornbills, turacos, flycatchers, bubuls, parrots, drongos, sunbirds, starlings, and warblers. At least 333 bird species are known to occur within the central sector of the OFR.

Table 28.8. Ituri–Lenda (Monodominant Forest) Rankings by Species

Rank	Species	Number Trees	% Trees	Species	Basal Area (m ²)	% BA	% Trees
1	<i>Scaphopetalum dewevrei</i> (Sterculiaceae)	61,385	45.5	<i>Gilbertiodendron dewevrei</i> (Leguminosae)	469.0	63.2	7.6
2	<i>Gilbertiodendron dewevrei</i> (Leguminosae)	10,294	7.6	<i>Julbernardia seretii</i> (Leguminosae)	44.2	6.0	1.7
3	<i>Drypetes bipindensis</i> (Euphorbiaceae)	8,128	6.0	<i>Scaphopetalum dewevrei</i> (Sterculiaceae)	32.3	4.4	45.5
4	<i>Alchornea floribunda</i> (Euphorbiaceae)	7,570	5.6	<i>Cynometra alexandri</i> (Leguminosae)	18.0	2.4	0.3
5	<i>Pancovia harmsiana</i> (Sapindaceae)	7,117	5.3	<i>Pancovia harmsiana</i> (Sapindaceae)	16.6	2.2	5.3
6	<i>Garcinia smeathmannii</i> (Guttiferae)	3,228	2.4	<i>Alstonia boonei</i> (Apocynaceae)	8.4	1.1	0.0
7	<i>Diospyros bipindensis</i> (Ebenaceae)	3,134	2.3	<i>Fagara macrocarpa</i> * (Rutaceae)	5.7	0.8	0.1
8	<i>Julbernardia seretii</i> (Leguminosae)	2,321	1.7	<i>Cola lateritia</i> (Sterculiaceae)	5.5	0.7	0.3
9	<i>Aidia micrantha</i> (Rubiaceae)	1,545	1.1	<i>Drypetes bipindensis</i> (Euphorbiaceae)	5.4	0.7	6.0
10	<i>Polyalthia suaveolens</i> (Annonaceae)	1,428	1.1	<i>Cleistanthus michelsonii</i> (Euphorbiaceae)	5.1	0.7	0.5

*Genus *Fagara* now changed to *Zanthoxylum* according to Mabberley (1997).

Notes: The top 10 tree species for trees ≥ 1 cm dbh ranked by number and percentage of trees and basal area in the combined two plots of the Lenda monodominant forest (20 ha). Data are from the first census.

Natural Disturbances

Ituri, as a midcontinent forest, is not subject to monsoons. Windfalls, ranging from single treefalls to strings of blowdowns of several hectares, create forest gaps of various sizes in the Ituri forest (Hart 1985; Hart et al. 1989). Frequency of disturbance combined with different tree longevities result in differing stand half-lives for the two forest types, the monodominant forest having a particularly long half-life (Hart 2001). Elephants frequently maintain or enlarge small-scale forest disturbances. There is also a historical record of small-scale fire disturbance; however, the impact of fire is inadequately understood (Hart et al. 1996).

Human Disturbance

Agricultural activities and extraction of nontimber forest products occur to a limited extent in the Okapi Faunal Reserve. Measures are being taken to control poaching and selective logging, though the overall impact of the latter activity has been limited up to the present. Logging is occurring on the forest edge and along the major navigable rivers, but because of lack of transportation and continuing

Table 28.9. Ituri–Edoro (Mixed Forest) Rankings by Species

Rank	Species	Number Trees	% Trees	Species	Basal Area (m ²)	% BA	% Trees
1	<i>Scaphopetalum dewevrei</i> (Sterculiaceae)	67,741	42.5	<i>Cynometra alexandri</i> (Leguminosae)	150.2	22.9	2.9
2	<i>Julbernardia seretii</i> (Leguminosae)	15,847	9.9	<i>Julbernardia seretii</i> (Leguminosae)	67.2	10.3	9.9
3	<i>Pancovia harmsiana</i> (Sapindaceae)	12,007	7.5	<i>Scaphopetalum dewevrei</i> (Sterculiaceae)	32.3	4.9	42.5
4	<i>Alchornea floribunda</i> (Euphorbiaceae)	6,005	3.8	<i>Pancovia harmsiana</i> (Sapindaceae)	28.8	4.4	7.5
5	<i>Cynometra alexandri</i> (Leguminosae)	4,668	2.9	<i>Fagara macrocarpa</i> * (Rutaceae)	24.7	3.8	0.1
6	<i>Diospyros bipindensis</i> (Ebenaceae)	4,316	2.7	<i>Diospyros bipindensis</i> (Ebenaceae)	20.1	3.1	2.7
7	<i>Drypetes bipindensis</i> (Euphorbiaceae)	4,282	2.7	<i>Gilbertiodendron dewevrei</i> (Leguminosae)	19.9	3.0	0.6
8	<i>Polyalthia suaveolens</i> (Annonaceae)	2,902	1.8	<i>Erythrophloeum suaveolens</i> (Leguminosae)	17.5	2.7	0.1
9	<i>Dasylepis seretii</i> (Flacourtiaceae)	2,855	1.8	<i>Hallea stipulosa</i> (Rubiaceae)	15.2	2.3	0.1
10	<i>Leptonychia multiflora</i> (Sterculiaceae)	1,832	1.2	<i>Cleistanthus michelsonii</i> (Euphorbiaceae)	12.1	1.9	0.5

*Genus *Fagara* now changed to *Zanthoxylum* according to Mabberley (1997).

Notes: The top 10 tree species for trees ≥ 1 cm dbh ranked by number and basal area of trees and basal area in the combined two plots of the Edoro mixed forest (20 ha). Data are from the first census.

civil strife, logging has not yet moved into the large blocks of eastern Congolese forest. This can be expected to change with peace and development.

Plot Size and Location

The Ituri study comprises four 10-ha plots, each 500 × 200 m. The two plots in the monodominant forest (Lenda-1 and Lenda-2) lie in a north-south line and are separated by 500 m. This configuration was replicated in the mixed forest (Edoro-1 and Edoro-2) with an east-west orientation (see plot layouts in Makana et al. 1998). Northwest corners of the four plots are as follows. Lenda-1 is north of Lenda-2: 1°19.134'N, 28°38.675'E and 1°18.609'N, 28°38.670'E. Edoro-1 is west of Edoro-2: 1°33.741'N, 28°30.778'E and 1°33.739'N, 28°31.314'E.

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