

1. Riverine Forest skirting the Ewaso Ngiro.

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This forest is intermittent in distribution and clings closely to the river banks indicating its dependence on the ground water. Few major tree species are represented. These include Acacia elatior elatior favourite habitat of the Vervet Monkey, the tall variety of Acacia tortilis spirocarpa, Aphania senegalensis, Hyphaene coriacea (Doum Palm), Lecaniodiscus fraxinifolius, Populus ilicifolia (Tana River Poplar), and an occasional Tamarindus indica (Tamarind). Understorey shrubs growing in the layered alluvium (mostly sandy or silty) include a large-leaved form of Boscia coriacea, Cadaba farinosa, Maerua sessiliflora and Wild Castor; and the herbs - Acalypha indica, Calotropis procera on high-lying sand banks, Sporobolus consimilis, and 3 sedges - Cyperus alternifolius flabelliformis at the water's edge, with C. articulatus and C. rotundus (onion grass) on higher ground.

2. Non-alkaline Silty Alluvial Terraces (Ewaso Ngiro left bank).

The lowest terrace is distinguished by bush thicket comprising either pure stands of a stunted variety of Acacia elatior (individuals deprived of ground water except during periods of high river flow), or mixed stands of Boscia coriacea with Lawsonia inermis (both characteristic of flood plains). The alluvial terrace immediately above this is dominated by thicket of Salvadora persica (Tooth Brush Tree) which may well be rooting into saline subsoil; and is appreciated by buffalo for midday shade. Associates of the Salvadora include Cadaba farinosa and Lycium europeum (very locally dominant), Acacia tortilis, Boscia coriacea, Cordia gharaf, Grewia tenax and a climbing Capparis. Herbaceous ground cover is mostly formed of Cenchrus ciliaris and Chloris roxburghiana.

3. Along the Lower Reaches of the Kiltaman Lugga.

Where this lugga (shallow stream bed with only seasonal flow) passes through the lower alluvial flats close to its confluence with Ewaso Ngiro, the low woodland along its banks

is dominated by Acacia tortilis with Acacia elatior, well grown near the confluence and more stunted farther upstream; accompanied by Cadaba farinosa, Cordia sp. near gharaf, Salvadora persica, Solanum aculeatum and Sphaeranthus ukambensis.

4. Saline and Alkaline Alluvial Terraces of the Ewaso Ngiro.

This soil is most extensively represented in the area between the aerodrome and the riverine forest, though occurring elsewhere. The slightly sloping (2 - 3% grade) riverine terrace is overlain with resorted dark brown sandy alluvium derived from the surrounding basement complex rocks. It is heavily impregnated with soluble salts becoming strongly saline and calcareous at a depth of 2 feet. The surface horizon comprises an almost structureless fine sand but below 8 inches there is a massive and hard alkaline fine loamy sand. The vegetation cover is composed, in places, of an almost pure stand of the "salt bush" Salsola dendroides dendroides, standing 3 to 5 feet high, often surrounded by local areas of bare soil and forming an occasional habitat for rhinoceros. Associated plants tend to assume a rather stunted form and include the grasses Enteropogon macrostachyus, Leptochloa obtusiflora and Sporobolus marginatus growing in the accumulating mounds of deeper soil round the base of the Salsola. The Lycium europeum is often abundant. A species of Pupalia together with Cenchrus ciliaris is locally dominant; close to the riverine forest, stunted Doum Palm and Salvadora persica may be included in the association. Scattered specimens of Acacia reficiens misera and stunted Acacia tortilis are occasionally found. Commonly associated herbs include Caralluma, Commelina albescens, Cyperus blysmoides, Dactyloctenium aegyptium, Ipomoea cicatricosa, Kyllinga odorata, Ruellia patula, Sporobolus spicatus and Talinum portulacifolium.

5. Reddish Brown Coarse Sandy Loams.

These are entirely derived from the basement complex hills and form extensive sloping colluvial fans (2% slope) beneath the base of the hills, covered in a very open bush.

This soil, varying from coarse sand to coarse sandy loam and with inclusions of common fine gravel, is well represented about 1/4 mile upslope from the lodge above the left bank of the Ewaso Ngiro. These sandy soils by virtue of their high receptivity contain relatively large amounts of soil moisture; due to the low concentration of electrolyte in these soils and their coarse texture a considerable proportion of this moisture is physiologically available to plants. As a result, the associated flora is peculiarly rich in herbaceous species.

The obconical Acacia reficiens may be considered codominant with the shrub Sericocomopsis hildebrandtii. The grasses of major importance are Cenchrus ciliaris and Latipes senegalensis. The squat Indigofera spinosa tends to dominate portions of ground cover. Other bushes of consequence include a very stunted form of Acacia tortilis (without a flat spreading top), Boscia coriacea, Commiphora africana, Cordia sp. near gharaf, Euphorbia cuneata, Grewia lilacina, G. tenax, Lycium europeum, and Salvadora persica. The long list of herbaceous associates includes Aristida hirtigluma, Barleria acanthoides, Blepharis linariifolia, Chloris roxburghiana, Cleome hirta, Commelina forskalei, Gloriosa sp., Gynandropsis gynandra, Heliotropium rariflorum, Lippia carviadora, Pavonia patens, P. zeylanica and Solanum dubium.

6. High - Lying Sheets of Coarse Sandy Loams, Sands and Gravels.

These coarse yellowish brown deposits are derived from basement complex and have undergone little weathering. The country is covered by low thickets and open dry bush, extending over a large area of the hinterland to the North of the Ewaso Ngiro stretching towards Ol Donyo Sabachi. This ecotype should be distinguished from the denser bush of the rocky knolls themselves (see (7) below); the sand and gravel sheets lap up against the base of these rock outcrops where there is a transitional vegetation type.

Bushes most commonly found on these soils are Acacia reficiens, A. senegal, Boscia coriacea, Commiphora spp., Delonix elata and Ipomoea donaldsonii. Bushes occurring frequently along shallow hinterland luggas include Acacia tortilis, Combretum aculeatum, Cordia crenata, Delonix elata and Fagara chalybea.

Other bushes recorded as occurring frequently in these hinterland habitats include Acacia horrida forming occasional pure stands, A. nubica, A. tortilis especially surrounding dry country water holes, Caucanthus albidus, Grewia tenax, G. villosa, Gyrocarpus hababensis, Lannea alata, Maerua endlichii, Opilia campestris, Sesamothamnus busseanus, and Wrightia demartiniana.

The major dominants of the higher-lying gravelly and fine stony areas are Acacia senegal, A. tortilis, Commiphora africana and C. rostrata. This association may form a distinct belt round the base of rocky hills. In some parts of the park pure stands of Acacia senegal may occur in this situation.

High-lying gravel ridges, especially towards Archer's Post, tend to have but a single dominant - Commiphora bush, accompanied by patches of Ipomoea cicatricosa and Indigofera spinosa.

Included amongst the wide range of herbaceous species that form an intermittent ground cover are Abutilon, Aerva persica, Barleria acanthoides, Digera muricata, Hibiscus vitifolius, Kyllinga alba, K. oblonga, Limeum praetermissum, Pentanisia curanogyne, Ruellia patula, and Solanum dubium; and the grasses Aristida hirtigluma, Bothriochloa radicans, Cenchrus ciliaris, Chloris roxburghiana, Digitaria pennata, Schmidtia bulbosa, Sporobolus angustifolius and S. pellucidus.

7. Rocky Hills.

These comprise the small tor-like (inseldberg) hillocks which are prominent on the circuits close to the Ewaso Ngiro to the West of the lodge; as well as high hill ridges like the Koitogorr. "Soils" constitute eroded gravels often covered by large boulders and slumped blocks of basement rocks. These rocky areas are covered to a greater or lesser extent by bush species, dominated by Acacia senegal (near the hill base), Commiphora africana, C. rostrata and C. spp., and Euphorbia cuneata. In gravelly drifts Indigofera spinosa may achieve a very locally complete ground cover. Ipomoea cicatricosa and Terminalia orbicularis are often associated and may locally dominate a ridge top. Ficus populifolia may also occupy a prominent site on a hill summit, growing in large crevices between boulders.

Other bushes of importance include Acacia reficiens, Boscia coriacea, Boswellia hildebrandtii, Caucanthus albidus, Dirichletia glaucescens, Euphorbia polyantha, Grewia bicolor, G. lilacina, G. villosa, Ipomoea donaldsonii, Premna resinosa, Sterculia africana, Strophanthus mirabilis, a new species of Turraea, and Wrightia demartiniana.

With the exception of the Indigofera spinosa, only a few herbs are to be found scattered amongst the rocks; these include Actiniopteris radiata, Aneilema petersii, Cardiospermum corindum, Cenchrus ciliaris, Cissus cactiformis, Cleome parviflora, Commicarpus stellatus, Diplostigma canescens, Enteropogon macrostachyus, Hermannia exappendiculata, Hildebrandtia obcordata, Kyllinga alba, Rhynchosia minima climbing on Commiphora, Friapis erlangeri, and Vernonia cinerascens.

Colonies of Adenium obesum (Desert Rose) sometimes form a striking hill silhouette; these plants are capable of anchoring their broad trunks to rock faces.

An interesting association was encountered on an isolated rock outcrop close to the aerodrome and only just lying above the alkaline terrace. This comprised groups of the Adenium on the boulders, surrounded by rather stunted specimens of Acacia senegal, Boscia coriacea, Combretum aculeatum, Cordia sp. near gharaf, Ipomoea donaldsonii and Maerua sessiliflora; with the herbs Dactyloctenium aegyptium, Ecbolium revolutum, Enteropogon macrostachyus, Farsetia stenoptera, Ipomoea obscura and Pavonia arabica.

Isiolo/Buffalo Springs Reserve.

Owing to lack of time, this area to the South of the Ewaso Ngiro was not so thoroughly investigated. The country may be divided into 3 distinct parts; viz. The ridges and valleys of the higher-lying plateau; the relatively steep and stony slopes down towards the Ewaso Ngiro; and the alluvial flood plains and levees of the Ewaso Ngiro.

With the exception of the alluvium, the soils are derived from Quaternary volcanics and are poorly developed (Lithosols) with little weathering in the solum. The separate origin of the soils to the South of the Ewaso Ngiro river may well account for the distinction between the plant communities North and South of the river with many fewer species in the latter.

(i) On the gravelly coarse loamy sands of the major plateau and upper slopes, there is a very open scrubland with low thorn dominated by Commiphora spp., accompanied by stunted Acacia tortilis and Sericocomopsis hildebrandtii. Other bushes of importance include Acacia nubica, Acacia reficiens, Caucanthus villosus, Cordia sp. near gharaf, Grewia tenax, Ipomoea donaldsonii, Panicum europeum, and Sansevieria sp. The normally sparse ground cover may consist solely of Indigofera spinosa. In places where herbs are able to gain a foothold, the two most important grasses are Aristida hirtigluma and Cenchrus ciliaris: Aerva persica, Heliotropium rariflorum and Pentonia ouranogyne are seasonally prominent herbs.

(ii) Flats of finer soil (loamy or even silty) cross the plateau from South to North and carry water during periods of considerable rainfall. Here young specimens of Doum Palm have succeeded in becoming established. Solitary Acacia tortilis of medium height tend to mark out the course of these alluvial flats. The sparse ground cover, possibly a consequence of subsoil salinity, is usually composed of one or more of the following grass species - Chloris roxburghiana, Chrysopogon aucheri, Chrysopogon plumis, Panicum subalbidum, or Sporobolus marginatus.

(iii) On heavier soils (with higher clay content) the otherwise predominant Commiphora/Sericocomopsis association tends to give way to one of Acacia reficiens/Cordia sp. near gharaf/ Panicum europeum/Sericocomopsis hildebrandtii.

(iv) Towards the South East of the park, it was observed that there was a general increase in the incidence of Acacia nubica, and in the average height of the Acacia tortilis. This may either be associated with the generally finer texture of soils towards the South East or may be related to the proximity to

seasonal supplies of ground water. Certainly in the extreme South East corner of the park, Acacia tortilis tends to form quite tall expanses of woodland which should probably be ascribed to the presence of ground water.

(v) On sloping sands and gravels (over 3% slope) where the plateau gives way to the flood plain, there is often a rather dense belt of Acacia reficiens.

Plant Records in Specific Localities; South of the Ewaso Ngiro.

1. Right Bank of the Isiolo River:

Here there are low-lying alluvial flats of silt loam. Doum Palm is the major dominant, accompanied by Acacia tortilis. Cadaba farinosa is prominent as an understorey shrub. Other plants recorded:- Capparis sp., Cenchrus ciliaris, Combretum aculeatum, Cordia gharaf, Cynodon dactylon, Enteropogon macrostachyus, Eragrostis cilianensis, Grewia villosa, Paspalidium geminatum, Pupalia sp., Solanum aculeatum, Sporobolus consimilis and S. phyllotrichus.

2. On a minor lugga between the Isiolo and the Ngaramara:

At the road crossing, the clays carry an open herbaceous cover of Cynodon dactylon, Indigofera schimperi, Lintonia nutans, Pennisetum mezianum, Phyllanthus maderaspatensis, Rhynchosia minima and Zaleya pentandra.

3. Left Bank of the Ngaramara River:

On a stony ridge close to the Ngaramara there is a considerable thicket of Euphorbia grandicornis.

Groves of Gardenia jovis-tonantis (Wild Gardenia) grow along the river bank together with the occasional Tamarinds, Acacia seyal and Solanum aculeatum.

On the associated clay and silty clay alluvial flats were recorded - Acacia mellifera, A. tortilis, Balanites orbicularis, Boscia mossambicensis, Cadaba glandulosa,

C. ruspolii, Coccinia adoensis, Cordia sp. near gharaf, Digera muricata, Dregea stelostigma, Jatropha spicata, and Lycium europeum.

4. Grasslands in the vicinity of Buffalo Springs:

Concentrations of plains game (including both types of zebra) are really only observed in large numbers on the open grasslands near Buffalo Springs. Grass accounts for over 90% of the ground cover and is dominated by Chrysopogon aucheri accompanied by Sporobolus fimbriatus and S. marginatus. The few scattered bushes are mostly Acacias - a squat form of Acacia etbaica platycarpa and stunted A. tortilis.

5. At Buffalo Springs:

Here Doum Palm dominates the landscape. The following species were recorded actually growing at the edge of the Springs - Capparis cartilaginea, Cynodon dactylon, Cyperus teneriffae, C. usitatus, Dactyloctenium aegyptium, Ficus sp., and Pupalia sp.

6. Upper and Lower River Circuits:

The lower sandy slopes, immediately above the flood plains proper, are covered by fairly thick Acacia reficiens.

On crossing the alluvial flood plains towards the right bank of the Ewaso Ngiro, one first encounters a heavy clay plain (haplud) which may suffer cracking in the dry season. This is covered by grassland accounting for very few species - predominantly Pennisetum mezianum and/or Sporobolus consimilis with scattered young doum palms and an occasional Cordia gharaf. This flood basin is in some places threaded by some abandoned meander or stream tributary, distinguished by a relatively dense line of stunted Acacia elatior, tall Acacia tortilis and Doum Palm.

seasonal supplies of ground water. Certainly in the extreme South East corner of the park, Acacia reficiens tends to form wide flat expanses of woodland which should probably be ascribed to the presence of ground water.

(v) On sloping sands and gravels (over 30 slope) there the plateau gives way to the flood plain, there is often a rather dense belt of Acacia reficiens.

Plant Records in Specific localities: South of the Ewaso Ngiro
1. Right Bank of the Jalo River:

Here there are low-lying alluvial flats of silt loam. Doum Palm is the major dominant, accompanied by Acacia reficiens. Cordia gharaf is prominent as an understory shrub. Other plants recorded: - Cyperus sp., Cenchrus ciliaris, Commersonia bartramia, Cordia gharaf, Cynodon dactylon, Chrysopogon ochroleucus, Brachiaria distachya, Brachiaria distachya, Brachiaria distachya, Pennisetum geminatum, Pupalia sp., Solanum nigrum, Sporobolus consimilis and S. phyllanthoides.

2. On a minor ridge between the Jalo and the Ngarama: At the road crossing, the clay carry an open herbaceous cover of Cynodon dactylon, Lobelia sp., Linum catharticum, Passiflora foetida, Phyllanthus madagascariensis, Rhynchosia minima and Lycium sp.

3. Left Bank of the Ngarama River: On a stony ridge close to the Ngarama there is a considerable thicket of Euphorbia grandiflora. Groves of Gardenia jovicornis (Wild Gardenia) grow along the river bank together with the occasional Panicum, Acacia seyal and Solanum scaberrimum.

On the associated clay and silty clay alluvial flats were recorded - Acacia mellifera, A. tortilis, Solanum, Brachiaria, Boerhaavia diffusa, Cordia gharaf, Cordia gharaf, Cordia gharaf.

The coarser textured, somewhat higher-lying alkaline river levees, which both surround the flood basin meanders and also lie on the inland side of the river bank, are covered by a somewhat sparse association of Lycium europeum/Pupalia sp./Salsola dendroides/Sporobolus marginatus. Where the river bank is high it is often dominated by Salsola dendroides; a line of Doum Palm and Acacia tortilis may be present on the inland side of the bank but at a lower level (where these plants are presumably able the more easily to tap the ground water). Where the river bank is low and well consolidated it may bear a stand of Acacia elatior, A. tortilis and Doum Palm. An occasional Tamarind occurs on the river side of the bank. Where the sandy river bank is ill-consolidated, a shrub thicket may develop, comprising Doum Palm, Wild Castor, stunted Acacia elatior, A. tortilis, Calotropis procera, Cordia gharaf, Gardenia jovic-tonantis, and Lawsonia inermis; accompanied by Aerva persica, Heliotropium steudneri, Sporobolus consimilis and Withania somnifera.

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