PART III

KALEIDOSCOPE / 183

APPENDIX

1. SOIL PROPERTIES
2. FOOD PLANTS

PART III – KALEIDOSCOPE

The essence of the Gorongosa ecosystem is the constantly changing kaleidoscope of the physical and living components in different rhythms directed from below by the constraints or opportunities presented by changing edaphic properties.

Kaleidoscope used here in an ecosystem context, is made up totally of moving parts; the two rotatable pieces of the tube comprising (a) climatic controls (particularly of precipitation in the tropics), and (b) the edaphic or substrate control. Each is subject to a different rate of movement due to lag effects, relative quiescence or rapid change in counter or empathetic responses. The two parts of the tube thus show reciprocal interactions (eg. the influence of changes in relief, or precipitation inhibitory effect of bare, or denuded, landsurfaces due to their high albedo).

Within this tube are the coloured chips which represent the living components that form different patterns of recombination with every movement of either one or both the tube parts. As well as adjustments from their own interactions. Amongst the chips are some brighter than others which represent the prime mover components or dominants, their brightness altering in each adjustment where others become dominant.

Of all the envrionmental factors at play, in the southern tropics between the west coast Namib Desert and the east coast Mocambique Plain, the master factor is edaphic – soil moisture balance, which even over-rules frost effect where trees occur in frost hollows on moist soils. Climatic influences are thus in high measure expressed through the properties peculiar to each substrate. This has a parallel in a unique property of the Earth which acts as a black body radiator of the Sun's radiant energy, without which no weather as we know it could be generated. Thus the solar radiation, or climate in the ecosystem context, is expressed through its translation via the Earth or edaphic medium.

The differential edaphic properties orchestrate the ecological dynamics and influences the sociobiological expression possible in different circumstances, and thus the evolutionary consequences by determining the spatial and temporal make-up of ecosystems or communities. This in turn affects the ecological interdependence exhibited by a particular situation including prey-predator and social relationships.

In landscape evolution the most important geomorphic dynamic is scarp retreat (King 1962), in ecology the key geomorphic process as highlighted by this thesis is the development of nickpoints. The formation of a nickpoint alone alters the soil moisture balance of landscapes of all dimensions, from the microscale to continental proportions, determining the kinetics of ecological succession.

Under an unchanging local or regional climate large changes in habitat structure, relative plant and animal biomass, species composition and complete community replacement are wrought over contemporary time (3 to 50 years) by normal geomorphic succession. This succession is either a spatial replacement of landsurfaces by erosion (sheet, donga, slumping or pipe erosion) and deposition, ie. older landsurfaces being replaced by younger, or ***in situ*** change due to increased runoff from either a reduction in plant cover, incised local base levels and headward migration of nickpoints, or a combination of these altering the soil moisture content.

These changes in the landscape are inexorable processes, damped or slowed down by the presence of resistant rock, highly cohesive clay soils or dense plant cover. Any factors altering the efficacy of these controls act essentially as accelerator factors, increasing the velocity of the successional sequences often long since initiated. In many sites poor land use practises can in fact initiate a train of new geomorphic changes. In the biological field, succession is usually thought to be a dynamic feature of plant communities only. There are in fact three principal kinds of kinetic multi-directional successions with feedbacks between each:

(1) Substrate Succession
   (a) Geomorphic surface replacement
   (b) Edaphic changes ***in situ***

(2) Biotic Succession & Opportunism
   (a) Spatial, on new surfaces
   (b) ***in situ*** succession within a community or a system.

   (responding to physical changes and the influences of biotic dominants and prime mover components).

(3) Evolutionary Succession

   On a longer time scale and as a result of the preceding features including diastrophic changes, climatic change, systems and species changes resulting in dispersal, contraction, kaleidoscopic recombinations, speciation and extinction.

Unless the intrinsic dynamics of ecosystems, and the successional stage and tendencies of processes are taken into account most management activities to save rare or endemic species and ecosystems are pointless in the face of the inexorable natural or accelerated changes or fluctuations over the short term, outlined above. Indeed we may only disrupt the species succession best adapted to the new changes of, say, scrub encroachment for example. A refreshing example of a geoecological holistic approach to management problems is provided by a unique paper on cyclical ecosystem changes in the Amboseli endoreic basin related to climatic fluctuations on Mt. Kilimanjaro nearby (Western & Van Praet 1973), in many ways analagous to the relationship between the Urema basin and Gorongosa Mountain.

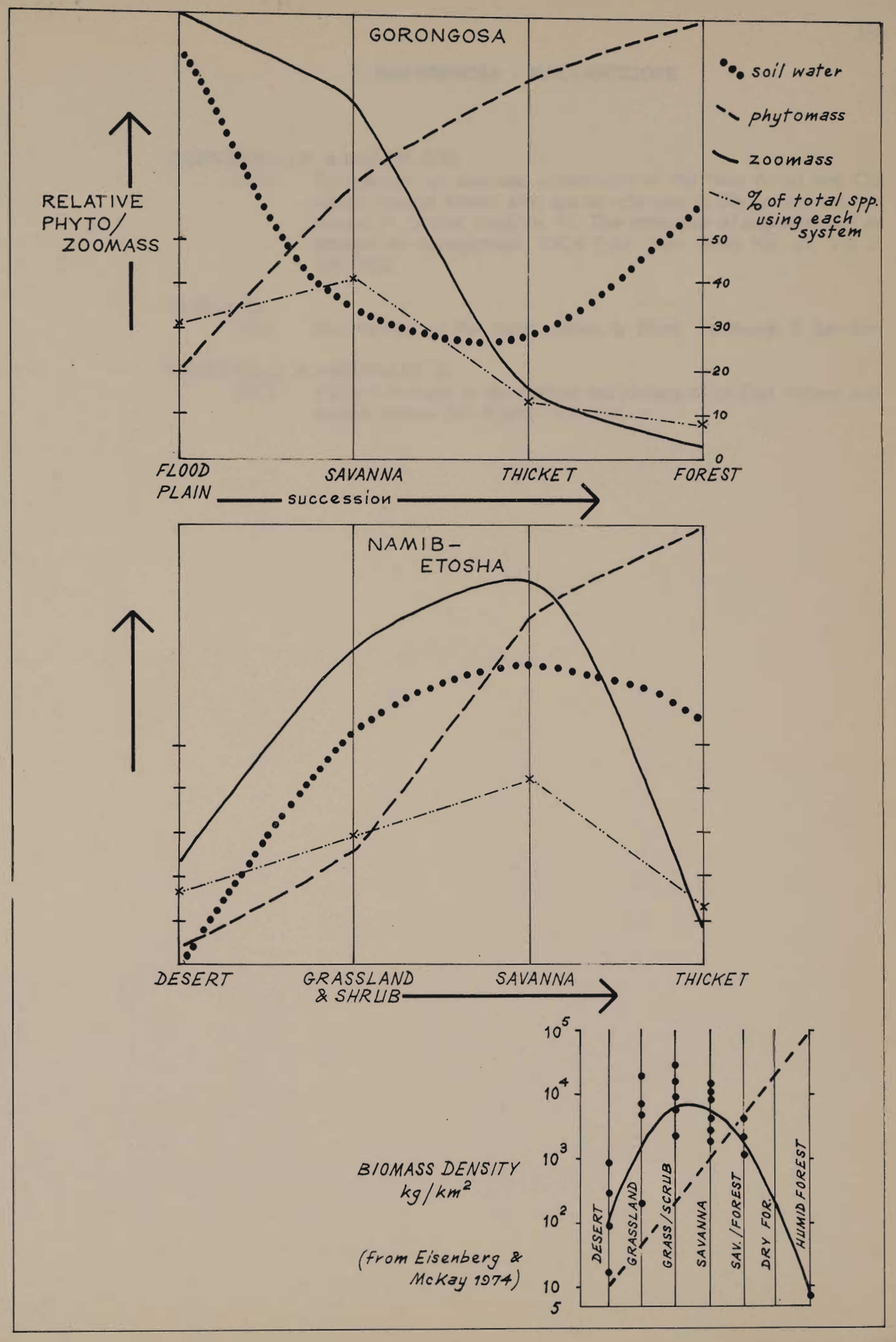

FIGURE Part III

Generalised mass relationships of plant and animal (wild ungulates) communities and ungulate diversity to climo-edaphic (soil moisture balance) regimes on the same latitude in the southern tropics of Africa (cf. inset from Indian and Central American data).

Some simple fundamental questions require to be asked so that we can maintain or reinstate the natural controls or dampers in the system: (a) which geomorphic processes are active in a system, (b) what are the successional stages of these surfaces, (c) which are the key factors controlling the velocity of these changes, (d) which factors influence soil moisture content, (e) if local base level sills are the controlling features, are they durable or friable and if the latter can they be reinforced or reinstated, (f) which biotic components are dominants or prime movers in ecological dynamics in a particular area, (g) are the prime mover components responsible for damping or accelerating geoecological succession, (h) what is the successional status, trends or tendencies in various communities or ecosystems.

The far reaching implications of these natural or accelerated successional changes which do not require any regional change in climate, require a re-evaluation and re-interpretation of the following aspects in the field of ecology:

(1) complete revision of many ecological principles
(2) the time factor in geomorphic succession (erroneously thought to be purely of geologic-time scale)
(3) age of ecosystems or major plant formations and their evolutionary status (eg. "oldest" forest formations on youngest geomorphic surfaces, and "derived" grassland and savanna formations on the oldest planation surfaces).
(4) biogeographic dynamics
(5) palaeo studies
(6) edaphic and pedological change
(7) management and planning
(8) relative ratio changes between phyto and zoomass
(9) exclusion (extinction) of certain animal components by habitat occlusion and the spread of others
(10) dynamics, structure, diversity and richness of ecosystems.

The successional relationships of plant and animal communities (wild ungulates in this example) to contrasting climo-edaphic (soil moisture balance) controls in the Gorongosa ecosystems, and that of the desert and arid savannas at the same latitude on the west coast, are depicted in simplistic and generalised form in the accompanying figure. In each case the greatest diversity of coincident parameters is associated with the duplex savanna ecosystems which is a superimposed combination of grassland and woodland. As the systems on either side of it have a relatively homogenous structure and physiognomy, are savannas therefore not the true "climax" ecosystem or community in the kinetic sequence?

REFERENCES / KALEIDOSCOPE

EISENBERG, J.F. & McKAY, G.M.
1974 Comparison of ungulate adaptations in the New World and Old World tropical forests with special reference to Ceylon and the rain forests of Central America. In: ***The behaviour of ungulates and its relation to management.*** IUCN Publ. New Series No. 24, Vol 2: 585–602.

KING, L.C.
1962 ***Morphology of the Earth.*** Oliver & Boyd, Edinburgh & London.

WESTERN, D. & VAN PRAET, C.
1973 Cyclical changes in the habitat and climate of an East African ecosystem. *Nature* 241 (5385): 104–106.

APPENDIX 1 SOIL PROPERTIES

Analytical data for representative soil profiles from the Gorongosa – Cheringoma area

GORONGOSA MOUNTAIN & MIDLANDS

Vb

Depth Cm	0–30	30–100
Texture	Sa	ClLm
Stru/Cons.	Bloc/H	Pris/H
Mottling	none	none
Permeability	good	good
pH (H_2O)	5,8	5,7
Salinity (C)	0,2	0,1
$CaCO_3$ (HCl)	0	0
P (Extr. ppm)	11,0	10,0
Colour	Brownish black	Dark red brown

Lb

0–40	> 40
SaCl	Cl
Wk/S	Bloc/H
none	none
poor	res.
5,1	5,4
0,3	0,1
0	0
9,0	8,0
Brownish black	Reddish brown

Cvb

Depth Cm	0–20	20–120
Texture	ClLm	Cl
Stru/Cons.	Mod/S	St/H
Mottling	none	none
Permeability	good	g–p
pH (H_2O)	6,0	5,5
Salinity (C)	0,3	0,1
$CaCO_3$ (HCl)	0	0
P (Extr. ppm)	62,5	10,5
Colour	v. Dark reddish brown	Dark reddish brown

Cpg

0–25	25–100	100–140	0–20
SaLm	SaLm	stony	SaLm
None/S	None/S	compact	Mod/S
none	none	none	none
rapid	rapid	rapid	good
6,3	6,1	6,3	6,6
0,4	0,2	0,2	0,4
0	0	0	0
5,5	1,4	1,0	26,6
Dark brown	Dull yellow brown	Brown	Black

Cpv

Depth Cm	0–20	20–60	60–100
Texture	SaClLm	SaClLm	stony
Stru/Cons.	Mod/S	Mod/S	compact
Mottling	none	none	none
Permeability	good	good	good
pH (H_2O)	7,0	6,8	6,2
Salinity (C)	0,4	0,2	0,1
$CaCO_3$ (HCl)	0	0	0
P (Extr. ppm)	10,4	3,3	3,6
Colour	Brownish Black	Dark reddish brown	Reddish brown

Vtc

0–10	10–40	40–80
ClLm	Cl	
Mod/H	Pris/vH	
none	none	
good	poor	
6,4	6,9	8,9
2,8	2,6	5,7
0	5%	> 10%
36,0	25,0	1,4
Brownish black	Dark reddish brown	Brownish red

Pg

Depth Cm	0–25	> 40
Texture	Sa	stony Sa
Stru/Cons.	Non/S	Non/S
Mottling	none	none
Permeability	rapid	rapid
pH (H_2O)	5,9	5,8
Salinity (C)	0,3	1,8
$CaCO_3$ (HCl)	0	0
P (Extr. ppm)	2-64	2-12
Colour	Brownish grey	Dull yellow brown

Pgh

0–25	25–60	>60
Sa	Sa–SaCl	SaCl–Cl
Non/S	Non/S	St/vH(Fe concs)
none	mod.	strong
rapid	res.	sev.res. (G)
6,2	5,8	5,4
0,3	0,2	0,2
0	0	0
7,0	3,4	4,3
Brownish black	Greyish yellow brown	Brownish grey

RIFT VALLEY

Ah

0–90	90–120	0–40	40–70
Cl	SaCl	SaCl	SaCl–Sa
Bloc/H	Pris/H	Wk/S	Mod/H–S
none	strong	none	none
poor	res. (G)	res.	p–g
5,7	6,8	6,4	6,5
4,2	13,1	0,4	0,1
0	0–concs.	0	0
15,4	3,4	16,3	3,8
Black	Grey	Greyish Brown	Brown

A

70–120
SaCl–Sa
Mod/H–S
dist.wk.
p–g
6,6
0,1
0
2,9
Brownish orange

Cd

20–40	40–100	0–20	20–50
SaCl	SaClLm	SaCl	SaCl–Cl
Mod/H	Cem/vH	Mod/S	Pris/H
none	none	none	strong
poor	good	poor	p–g
6,9	7,0	6,1	6,0
0,1	0,4	0,4	0,2
0	0	0	0
14,8	17,7	19,7	16,8
Greyish yellow brown	Dark brown	Black	Brownish black

Chd

50–120
SaCl
Cem/H(Fe concs)
strong
p–g
6,6
0,2
0
15,1
Dark brown

Cp

20–50	50–120	0–20	20–40
Sa–SaLm	Sa	SaLm	SaLm
Non/S	Non/L	wk./S	Non/S
none	none	none	strong
rapid	rapid	good	good
5,3	6,1	6,1	7,1
0,1	0,1	0,5	0,2
0	0	0	0
0,3	0,0	6,1	5,0
Greyish yellow brown	Brownish grey	Brownish black	Greyish yellow brown

Chp

40–60
SaClLm
Pris/sH
strong
sev.res. (G)
8,6
1,3
0
2,9
Greyish yellow brown

Chc

0–30	30–60	60–120
Sa–SaCl	SaCl	SaCl
Mod/S	Pris/vH	Pris/vH
none	strong	strong
g–p	sev. res.	sev. res.
6,1	6,9	8,3
0,4	0,4	1,5–5,0
0	5–10%	> 10%
5,8	3,2	6,2
Black	Brownish black	Yellowish brown

APPENDIX 1 (continued)

CHERINGOMA PLATEAU

Vp			*Vcd*	
0–20	20–80	80–140	0–30	30–70
Sa	Sa	SaLm	SaClLm	SaCl
Non/L	Non/L	Wk/sH	Mod/S	Mod/S
none	none	none	none	none
rapid	rapid	good	good	good
6,1	5,7	5,3	6,3	5,9
0,3	0,1	0,1	0,4	0,1 (C)
0	0	0	0	0
2,5	0,5	2,0	3,7	3,2
Dark red brown	Dull redbrown	Red	Brownish black	Dark red brown

Bp			*Pd*		
0–30	30–100	120	0–15	15–40	40–120
Sa	Sa	SaCl	Sa	Sa	SaCl
Non/L	Non/L	Non/S	Non/S	Non/S	Pris/vH
none	none	strong	none	none	strong
rapid	rapid	sev.res.	rapid	rapid	sev.res. (G)
6,0	5,7	5,4	6,4	5,7	5,4
0,2	0,1		0,3	0,1	0,2 (C)
0	0	0	0	0	0
3,6	1,2		4,0	0,5	0,3
Brownish grey	Dull yellow orange		Brownish grey	Brown	Brownish grey

Pcm			*Nd*		
0–25	25–75	75–120	0–50	50–90	90–120
SaClLm	SaCl	Cl	SaCl	SaCl	SaCl
Bloc/S	St/sH	St/H	St/sH	Pris/vH	St/vH
none	none	none	none	none	strong
rapid	good	poor	g—p	poor	res.
6,6	6,2	8,1	6,4	5,4	5,8
0,4	0,2	0,3	0,4	0,2	0,2 (C)
0	5%	10%	0	0	0
3,3	3,4	0,5	2,7	3,1	0,3
Black	Brown		Black	Brownish grey	v. Dark red brown

CHERINGOMA COAST*

Dambo Grassland				Fynbos Scrub-thicket				
0–25	25–45	45–70	70–120	0–7	7–45	45–60	60–80	Depth Cm
Sa	Sa	SaLm	SaLm (Ort)	Org.Qrtz	Sa	Ort	Org. Sa	Texture
Non/L	Non/L	Non/S	St/Fe pan	Non/L	Non/L	St/vH ind.	Non/S	Stru/Cons.
none	none	mod.	strong	none	none	strong	strong	Mottling
rapid	rapid	good	res.	good	rapid	res.	good	Permeability
5,6	5,7	5,4	5,6	5,0	5,8	5,4	5,4	pH (H_2O)
6200 (R)	9600	9300	12400	3150	15600	12200	1100	Salinity (R)
0	0	0	0	0	0	0	0	$CaCO_3$ (HCl)
Black	Dark redbrown	Greyish brown	Dark grey yellow	Black	Brownish grey	Reddish black	v. Dark brown	Colour

Androstachys Thicket on termite hill pediment				Mesic Evergreen Forest *(Hirtella, Pseudobersama, Pachystela, Manilkara, Olea)*				
0–5	5–40	40–50	50–60	0–12	12–35	35–135	135–180	Depth Cm
Org. Qrtz	Org. Sa	Sa	Sa	Sa	Sa	Sa	SaCl	Texture
Non/L	Non/L	Non/comp.	Non/S	Non/L	Non/L	Non/L	Non/comp.	Stru/Cons.
none	none	strong	strong	none	none	none	strong	Mottling
good	rapid	poor	good	rapid	rapid	rapid	res.	Permeability
4,4	5,1	4,8	5,1	6,4	6,7	6,8	5,4	pH (H_2O)
1060 (R)	2080	1300	2500	1200	5200	8300	2850	Salinity (R)
0	0	0	0	0	0	0	0	$CaCO_3$ (HCl)
Reddish black	Brownish black	Reddish black	v. Dark reddish brown	Black	Brownish black	Brown	Dull red brown	Colour

Diheteropogon Alluvial Grassland				*Brachiaria* Alluvial Grassland			
0–5	5–10	10–25	> 25	0–10	10–25	> 25	Depth Cm
ClLm	ClLm	ClLm	SaLm	SaLm	ClLm	Cl	Texture
Mod/sH	Mod/sH	Pris/S	Mod/S	Non/S	Pris/S	Pris/sH	Stru/Cons.
none	none	none	none	none	weak	strong	Mottling
good	good	good	good	good	res.	sev. res. (G)	Permeability
5,6	5,4	5,5	5,0	4,7	4,5	4,4	pH (H_2O)
1540 (R)	1180	1200	500	920	350	160	Salinity (R)
0	0	0	0	0	0	0	$CaCO_3$ (HCl)
Black	Black	Yellowish grey	Dull yellow brown	Black	Black	Brownish black	Colour

KEY TO ABBREVIATIONS

Texture: Sa – Sand; Lm – Loam; Cl – Clay; Org – organic matter; Ort – ortstein (cemented iron and organic matter in subsoil of podzols); Qrtz – pure quartz.

Sturcture (Stru): Bloc – blocky; Pris – prismatic; St – strong; Mod – moderate; Wk – weak; Non – none.

Consistence (Cons): vH – very hard; H – hard; sH – slightly hard; S – soft; L – loose; ind – indurated; Cem – cemented; conc – concretions; pan – subsurface impermeable horizon compacted and/or indurated.

Permeability: rapid, good (g), poor (p), res – restricted, sev. res. – Severely restricted, g–p = good to poor, (G) – gley horizon. (terminology from Loxton 1962)

Salinity (C): Conductivity (mmhos/cm at 25°C) > 4,0 saline; < 4,0 non-saline

**Salinity* (R): Resistance (Ohms) < 250 saline; > 250 non-saline (only Cheringoma Coast)

P (Extr. ppm): Extractable phosphorus (P in mg/kg). Colorimetric method using molybdenum blue, extracted in alkaline medium with sodium hydroxide (Fernandes 1968b: 33)

Colour: Terms derived from *Revised Standard Soil Colour Charts* by M.O.H. Takehara 1967. For original Munsell colour notations for Gorongosa see Fernandes (1968 a, 1968b).

APPENDIX 2 – FOOD PLANTS

Food plants of larger mammals recorded in the Gorongosa ecosystem by direct observation of feeding and from dung (1968–1973). Except where specifically noted all feeding records refer to grazing or browsing utilization. Species are listed alphabetically.

ba = bark, cu = culms, gu = gum, fl = flowers,
fr = fruit and seeds, ro = roots and tubers.
\+ = in addition to browse.

BABOON

WET SEASON (Nov–Apr)

Grasses

Echinochloa sp. nr. haploclada fr
E. stagnina fr
Eriochloa stapfiana fr
Panicum coloratum fr
P. maximum fr
Paspalidium obtusifolium cu
Paspalum scrobiculatum fr
Urochloa mosambicensis fr
Vossia cuspidata cu, ro

Sedges

Cyperus esculentus ro

Forbs

Abutilon spp. fl
Ludwigia stolonifera

Woody Plants

Acacia sieberana gu, fr
A. robusta gu, fr
A. xanthophloea gu
Annona senegalensis fr
Artabotrys monteiroae fr
Berchemia discolor fr
Borassus aethiopum fr
Capparis erythrocarpos fr
Cleistochlamys kirkii fr
Diospyros mespiliformis fr
D. usambarensis fr
Drypetes mossambicensis fr
Ehretia amoena fr
Ficus sycamorus fr
Kigelia africana fr
Manilkara mochisa fr
Mimosa pigra fr
Strychnos potatorum fr
Thilachium africanum fr
Vangueria infausta fr
Xeroderris stuhlmannii fr
Ximenia americana fr
Xylotheca tettensis fr
Ziziphus mucronata fr
Z. pubescens fr

DRY SEASON (May–Oct)

Grasses

Vetiveria nigritana ro
Vossia cuspidata ro

Forbs

Eichhornia crassipes ro
Ludwigia stolonifera ro
Pistia stratioites

Woody Plants

Acacia albida fr
A. sieberana fr
A. robusta fr
Albizia harveyi fr
Boscia salicifolia fr
Brachystegia glaucescens fr
Capparis erythrocarpos fr
Diospyros mespiliformis fr
Ficus sycamorus fr
F. zambesiaca fr
Friesodielsia obovata fr
Hyphaene benguellensis fr
Kigelia africana fr
Mimosa pigra
Mimusops fruticosa fr
Piliostigma thonningii fr
Salvadora persica fr
Sterculia appendiculata fr
Tamarindus indica fr
Thilachium africanum fr
Trichilia capitata fr
Xanthocercis zambesiaca fr
Ximenia americana fr
Ziziphus mucronata fr

BUFFALO

WET SEASON (Nov–Apr)

Grasses

Brachiaria deflexa
Cymbopogon excavatus
Dactyloctenium geminatum
Digitaria milanjiana
D. swazilandensis
Eragrostis atrovirens
E. superba
Echinochloa nr. haploclada
E. stagnina
Eriochloa stapfiana
Heteropogon contortus
Leptochloa panicea
Panicum coloratum
P. maximum
Setaria eylesii
Sporobolus pyramidalis
Urochloa mosambicensis
U. pullulans
Vossia cuspidata

Sedges

Cyperus digitatus
C. esculentus
C. sphacelatus
Cyperus tenuispica
Mariscus hemisphaericus

Forbs and Suffrutices

Aeschynomene indica
Ageratum conyzoides
Corchorus olitorius
Enicostema hyssopifolium
Melochia corchorifolia
Sesbania mossambicensis
Sesbania sesban
Solanum panduriforme
Tephrosia pumila
Vernonia kirkii

DRY SEASON (May–Oct)

Grasses

Brachiaria deflexa
Digitaria milanjiana
Echinochloa stagnina
Eriochloa stapfiana
Hemarthria altissima
Panicum coloratum
P. maximum
Paspalidium obtusifolium
Phragmites mauritianus
Setaria eylesii
Urochloa mosambicensis
Vossia cuspidata
Vetiveria nigritana

Woody plants

Acacia albida fr
Hyphaene benguellensis fr
Tamarindus indica fr

BUSHBUCK

WET SEASON (Nov–Apr)

Grasses
- Urochloa mosambicensis

Sedges
- Mariscus hemisphaericus

Forbs and Suffrutices
- Abrus precatorius
- Abutilon spp.
- Acalypha senensis
- Achyranthes aspera
- Aerva leucura
- Ageratum conyzoides
- Amaranthus graecizans
- Anisotes spp.
- Astripomea malvacea
- Barleria spinulosa
- Boerhaavia diffusa
- Capsicum frutescens
- Ceratotheca sesamoides
- Ceropegia sp.
- Cissempelos mucronata
- Cleome gynandra
- Commelina spp.
- Corchorus trilocularis
- C. olitorius
- Crotalaria poysperma
- Hoslundia opposita
- Ipomoea coptica
- Lippia javanica
- Poedaria foetans
- Solanum panduriforme
- Vernonia cinerea
- Vigna unguiculata

Woody Plants
- Antidesma venosum
- Combretum microphyllum
- C. mossambicense
- Deinbollia xanthocarpa
- Grewia sulcata + fr
- Kigelia africana fl
- Tricalysia jasminiflora
- Ziziphus mucronata + fr

DRY SEASON (May–Oct)

Forbs and Suffrutices
- Ceropegia sp.
- Cissempolos mucronata
- Indigofera spicata

Woody Plants
- Acacia robusta
- Allophylus alnifolius
- Capparis erythrocarpos + fr
- Commiphora schimperi
- Deinbollia xanthocarpa
- Diospyros mespiliformis + fr
- D. usarnbarensis + fr
- Hyphaene benguellensis fr
- Kigelia africana fl
- Landolphia kirkii
- Markhamia acuminata
- Mimosa pigra + fr.
- Phyllanthus reticulatus + fr
- Poederia foetans
- Securinega virosa + fr
- Steganotaenia araliacea
- Trichilia capitata
- T. emetica
- Vangueria infausta + fr
- Ziziphus mucronata + fr

CIVET
(fruits eaten as determined from seeds in dung)

RIFT VALLEY	CHERINGOMA CUESTA
Acacia albida	Cleistochlamys kirkii
A. nilotica	Diospyros natalensis
Cassia spp.	Erythroxylum emarginatum
Cordia goetzei	E. gerrardii
Cassine schlechterana	Ficus spp.
Cissus spp.	Friesodielsia obovata
Cleistochlamys kirkii	Hirtella zanguebarica
Diospyros mespiliformis	Manilkara discolor
D. usambarensis	Olea capensis
Ficus spp.	Pachystela brevipes
Grewia spp.	Parinari curatellifolia
Manilkara mochisia	Pseudolachnosylis maprouneifolia
Mimusops fruticosa	Rhus spp.
Securinega virosa	Syzygium guineense
Strychnos potatorum	Uapaca spp.
Tamarindus indica	Vitex doniana
Ximenia americana	Ximenia caffra
Ziziphus mauritiana	
Z. mucronata	

ELAND

WET SEASON (Nov–Apr)

Grasses
- Urochloa mosambicensis

Forbs
- Tephrosia pumila

Woody Plants
- Mimosa pigra

DRY SEASON (May–Oct)

Grasses
- Heteropogon contortus
- Panicum maximum
- Sporobolus pyramidalis

Woody Plants
- Acacia albida fr
- Combretum fragrans
- Kigelia africana fl
- Lonchocarpus capassa

ELEPHANT

WET SEASON (Nov–Apr)

Grasses
- Brachiaria deflexa
- B. sp. nr. glauca
- Dactyloctenium aegyptium
- Eriochloa fatmensis
- Panicum coloratum
- P. maximum

(ELEPHANT continued)

Chloris virgata
Cymbopogon excavatus
Cynodon dactylon
Digitaria swazilandensis
Echinochloa sp. nr. haploclada
E. stagnina
Seteria eylesii
Sorghum verticilliflorum
Sporobolus pyramidalis
Urochloa mosambicensis
U. pullulans
Vossia cuspidata

Sedges

Cyperus esculentus

Forbs

Blepharis caloneura
Commelina spp.
Heliotropium ovalifolium
Indigophera astragalina
Nymphaea spp.
Sesbania sesban
Solanum panduriforme
Tephrosia pumila
Tiliacora funifera

Woody Plants

Acacia borleae ba
A. galpinii ba
A. nigrescens + ba
A. polycantha
A. robusta + ba
A. xanthophloea + ba
Afzelia cuanzensis
Albizia harveyi + ba
Allophylus alnifolius + ro
Brachystegia spiciformis + ba
Capparis erythrocarpos
Cissus integrifolia + fr
Cola greenwayi
Colophospermum mopane + ba
Combretum imberbe
Craibia zimmermannii + ro, ba
Dalbergia arbutifolia
Drypetes mossambicensis
Ficus sycamorus + fr
Grewia sulcata
Holarrhena pubescens
Hyphaene benguellensis + fr
Kigelia africana
Lecaniodiscus fraxinifolius
Maerua angolensis
Markhamia acuminata
Newtonia hildebrandtii ba
Oncoba spinosa
Piliostigma thonningii + fr
Salvadora persica + fr
Sclerocarya caffra + ba, fr
Trichilia capitata
Vitex doniana + fr
Xylia torreana + ba
Ziziphus mucronata + fr

DRY SEASON (May–Oct)

Grasses

Cynodon dactylon
Digitaria milanjiana
Heteropogon contortus
Hyparrhenia rufa
Ischaemum afrum
Panicum coloratum
Panicum maximum
Setaria eylesii
Urochloa mosambicensis
Vetiveria nigritana
Vossia cuspidata

Sedges

Cyperus esculentus

Forbs

Abutilon spp.
Achyranthes aspera
Ctenolepsis cerasiformis
Sida acuta
Sida alba

(ELEPHANT continued)

Woody Plants

Acacia albida + fr, ba
A. galpinii + ba
A. gerrardii
A. nigrescens ba
A. polyacantha
A. nilotica + fr
A. robusta + fr, ba
A. sieberana fr
A. welwitschii ba
A. xanthophloea + ba, ro
Adansonia digitata fr
Afzelia cuanzensis
Albizia anthelmintica ba
A. glaberrima ba
A. versicolor ba
Ambligonocarpus andongensis ba, fr
Annona amoena
Antidesma venosum + ba
Balanites maughamii fr
Bauhinia petersiana
B. tomentosa
Berchemia discolor
Borassus aethiopum fr
Brachystegia boehmii + fr
B. spiciformis ba
Burkea africana ba
Capparis erythrocarpos + fr
C. sepiaria
Cardiogyne africana (Maclura a.)
Cassia abbreviata ba
Cissampelos mucronata
Cleistochlamys kirkii + fr
Colophospermum mopane + ba
Combretum apiculatum ba
C. fragrans + ba
C. hereroensis + ba
C. imberbe ba
Commiphora pyracanthoides
C. schimperi
Cordia goetzii
Cordyla africana ba, fr
Crossopterix febrifuga
Dalbergia arbutifolia ba
D. melanoxylon + ba
Deinbollia xanthocarpa
Dichrostachys cinerea + fr
Diospyros mespiliformis fr
D. mossambicensis
D. senesis
D. quiloensis
Diplorhynchus condylocarpon + ba
Euphorbia halipedicola
Erythrina livingstoniana ba
Erythrophleum africanum ba
Ficus sansibarica + fr
F. stuhlmanii + fr
F. sycamorus ba, fr
F. zambesiaca + fr
Hunteria zeylanica
Hymenodictyon parvifolium
Hyphaene benguellensis + fr
Julbernadia globiflora ba
Khaya nyassica ba
Kigelia africana
Lannea stuhlmannii ba
Lonchocarpus bussei + ba
L. capassa + ba
Manilkara mochisia
Markhamia acuminata
Maytenus senegalensis
Milletia mossambicensis
M. stuhlmannii
Mimosa pigra + fr
Mimusops fruticosa
Monotes africanus
Ozoroa sp.
Piliostigma thonningii + ba, fr
Pseudolachnostylis maprouneifolia ba
Pterocarpus angolensis ba
P. antunesii
P. brenanii
P. rotundifolia ba
Ricinodendron rautanenii fr
Sclerocarya caffra + ba
Sterculia africana + ba
S. appendiculata ba
Stereospermum kunthianum ba
Strychnos madagascariensis + ba, fr
S. mitis
S. potatorum + fr
S. spinosa + fr
Swartzia madagascariensis fr
Tabernaemontana elegans ba
Tamarindus indica + fr, ba
Tarenna neurophylla
Terminalia mollis ba
T. sericea ba
Thilachium africanum
Trichilia capitata + ba, fr
Turrea nilotica
Xanthocercis zambesiaca + fr
Xeroderris stuhlmanii ba
Ximenia americana + fr
Ziziphus mucronata + ba, fr

HIPPO

WET SEASON (Nov–Apr)

Grasses

Cynodon dactylon
Digitaria swazilandensis
Echinochloa stagnina
Eragrostis atrovirens
Heteropogon contortus
Panicum coloratum
Paspalidium obtusifolium
Urochloa mosambicensis
U. pullulans
Vossia cuspidata

Sedges

Cyperus esculentus

Forbs

Commelina sp.
Ipomoea aquatica

DRY SEASON (May–Oct)

Grasses

Cynodon dactylon
Digitaria swazilandensis
Echinochloa stagnina
Eriochloa fatmensis
Haemarthria altissima
Hyparrhenia dichroa
Ischaemum afrum
Panicum coloratum
Panicum maximum
Paspalidium obtusifolium
Setaria eylesii
S. sphacelata
Urochloa mosambicensis
Vetiveria nigritana
Vossia cuspidata

Sedges

Cyperus esculentus
Mariscus hemisphaericus

Forbs

Alternanthera sessilis
Amaranthus graecizans
Bergia mossabicensis
Coldenia procumbens
Euphorbia minutiflora
Glinus lotoides
Glinus oppositifolius
Heliotropium indicum
H. ovalifolium
Ludwigia stolonifera
Polygonum plebium
Rorippa micrantha
Sida alba

Woody Plants

Acacia albida fr

IMPALA

WET SEASON (Nov–Apr)

Grasses

Chloris gayana
Cynodon dactylon
Digitaria milanjiana
D. swazilandensis
Eragrostis aethipica
Panicum coloratum
P. maximum
P. sp. (KLT 1760)
Sporobolus ioclados
S. kentrophyllus

IMPALA (grasses continued)

E. atrovirens
Echinochloa sp. nr. haploclada
E. stagnina
Eriochloa fatmensis
S. pyramidalis
Urochloa mosambicensis
Tragus berteronianus
Vossia cuspidata

Sedges

Cyperus esculentus
Mariscus hemisphaericus

Forbs and Suffrutices

Abutilon spp.
Acalypha senensis
Achyranthes aspera
Aeschynomene indica
Ageratum conyzoides
Amaranthus graecizans
Ceropegia sp.
Cleome gynandra
Commelina sp.
Corchorus olitorius
C. trilocularis
Ctenolepis cerasiformis
Heliotropium indicum
H. ovalifolium
Ipomoea aquatic
I. coptica
Ludwigia stolonifera
Melochia corchorifolia
Monechma tettensis
Neptunia oleracea
Sida acuta
S. alba
Tephrosia pumila
Trianthema portulacastrum
Vernonia cinerea

Woody plants

Acacia albida
A. xanthophloea
Capparis erythrocarpos
Cleistochlamys kirkii
Commiphora pyracanthoides
Grewia sulcata
Mimosa pigra
Phyllanthus recticulatus
P. niruri
Securinega virosa
Ximenia americana
Ziziphus mucronata

DRY SEASON (May--Oct)

Grasses

Brachiaria deflexa
Digitaria milajiana
D. swazilandensis
Echinochloa stagnina
Eragrostis atrovirens
Eriochloa fatmensis
Hyperthelia dissoluta
Panicum coloratum
P. maximum
P. sp.(KLT 1760)
Setaria nigrirostris
Urochloa mosambicensis
Vossia cuspidata

Sedges

Cyperus esculentus
Mariscus hemisphaericus

Forbs and Suffrutices

Abutilon spp.
Alternanthera sessilis
Gomphrena celosioides
Oldenlandia corymbosa
Side acuta
Sida alba
Tephrosia pumila
Tricalysia jasminiflora
Vernonia cinerea

IMPALA (continued)

Woody plants

Acacia albida + fr
A. nigrescens fl
A. robusta fr
A. sieberana fr
A. xanthophloea + fl
Asparagus spp.
Capparis erythrocarpos + fr
Cleistochlamys kirkii
Combretum mossambicense + fl
Deinbollia xanthocarpa + fr
Lencaniodiscus fraxinifolius
Lonchocarpus capassa fl
Mimosa pigra + fr
Salvadora persicia + fl, fr
Tamarindus indica + fr
Xanthocercis zambesica fr
Ximenia americana + fr
Ziziphus mucronata + fr

LICHTENSTEIN'S HARTEBEEST

WET SEASON (Nov–Apr)

Grasses

Cymbopogon excavatus
Heteropogon contortus
Themeda triandra
Urochloa mosambicensis

DRY SEASON (May–Oct)

Grasses

Chloris gayana
Digitaria milanjiana
Echinochloa sp. nr. haploclada
E. stagnina
Enteropogon macrostachyus
Heteropogon contortus
Hyparrhenia dichroa
H. dissoluta
H. rufa
Panicum coloratum
P. maximum
Paspalum scrobiculatum
Setaria eylesii
Sporobolus pyramidalis
S. ioclados
Themeda triandra
Urochloa mosambicensis

Sedges

Mariscus hemisphaericus

Woody Plants

Maerua brunnescens

ORIBI

WET SEASON (Nov–Apr)

Grasses

Cynodon dactylon
Digitaria milanjiana
D. swazilandensis
Echinochloa stagnina
Eriochloa stapfiana
Panicum coloratum
P. sp. (KLT 1873)
Urochloa mosambicensis
U. pullulans
Vossia cuspidata

Sedges

Mariscus hemisphaericus

ORIBI (continued)

Forbs and Suffrutices

Aeschynomene indica
Heliotropium ovalifolium
Melochia corchorifolia
Neptunia oleracea
Sesbania sesban fr
Sida alba
Tephrosia pumila

Woody Plants

Acacia xanthophloea
A. robusta
Mimosa pigra
Ziziphus mucronata

DRY SEASON (May–Oct)

Grasses

Brachiaria deflexa
Cynodon dactylon
Digitaria swazilandensis
Echinochloa stagnina
Eragrostis lappula
Eriochloa fatmensis
E. stapfiana
Heteropogon contortus
Panicum coloratum
P. infestum
Setaria eylesii
Vetiveria nigritana (post-fire flush)
Vossia cuspidata

Sedges

Mariscus hemisphaericus

Forbs

Abutilon spp.
Achyranthes aspera
Amaranthus graecizans
Duosperma quadrangulare
Gomphrena celosioides
Heliotropium indica
H. ovalifolium
Indigofera microcarpa
I. tinctoria
Sida alba
Solanum panduriforme
Tephrosia pumila

Woody Plants

Acacia albida + fr
A. robusta
Capparis erythrocarpos
Mimosa pigra + fr
Ziziphus mucronata

RED DUIKER

WET SEASON (Nov–Apr)

Forbs

Dicliptera mossambicensis
Justicia flava
Psilotrichum scleranthum

Woody Plants

Acacia kraussiana
A. welwitschii
Berchemia discolor fr
Landolphia kirkii
Phyllanthus kirkianus
Sloetiopsis usambarenses
Strychnos mitis

RED DUIKER (continued)

DRY SEASON (May–Oct)

Woody Plants

Acacia nigrescens fl, fr
Alchornea laxiflora
Boscia salicifolia fr
Cassine schlechterana fr
Coffea racemosa
Hippocratea spp.
Xanthocercis zambesiaca fr
Xylotheca tettensis

REEDBUCK

WET SEASON (Nov–Apr)

Grasses

Cynodon dactylon
Digitaria swazilandensis
Eriochloa stapfiana

Forbs

Sesbania sesban

DRY SEASON (May–Oct)

Grasses

Panicum coloratum
Paspalum scrobiculatum
Setaria eylesii
Urochloa mosambicensis
Vossia cuspidata

SABLE

WET SEASON (Nov–Apr)

Grasses

Chloris gayana
Hyparrhenia dichroa
Hyparrenia filipendula
Panicum maximum
Sporobolus pyramidalis

DRY SEASON (May–Oct)

Grasses

Bothriochloa glabra
Choris gayana
Digitaria milanjiana
Heteropogon contortus
Hyperthelia dissoluta
Hyparrhenia rufa
Ischaemum afrum
Panicum coloratum
P. maximum
Paspalidium obtusifolium
Phragmites mauritianus
Themeda triandra
Urochloa mosambicensis
Vetiveria nigritana (post-fire flush)

WARTHOG

WET SEASON (Nov–Apr)

Grasses

Digitaria swazilandensis
Echinochloa stagnina + ro, fr
Panicum maximum + ro, fr
Paspalidium obtusifolium
Sporobolus pyramidalis
Urochloa mosambicensis + ro, fr

Woody Plants

Diospyros mespiliformis fr
Kigelia africana fl

DRY SEASON (May–Oct)

Grasses

Cynodon dactylon + ro
Digitaria milanjiana
Echinochloa stagnina
Panicum coloratum
Urochloa mosambicensis
Vossia cuspidata

Sedges

Mariscus hemisphaericus ro

Woody Plants

Acacia albida fr
Borassus aethiopum fr
Hyphaene benguellensis fr
Tamarindus indica fr

WATERBUCK

WET SEASON (Nov–Apr)

Grasses

Brachiaria sp.
Cynodon dactylon
Digitaria milanjiana
D. swazilandensis
Echinochloa stagnina
Eriochloa fatmensis
E. stapfiana
Panicum coloratum
P. maximum
Paspalidium obtusifolium
Setaria eylesii
Urochloa mosambicensis
Vossia cuspidata

Sedges

Cyperus esculentus

Forbs

Cissempelos mucronata
Eichhornia crassipes
Hibiscus cannabinus
Ludwigia stolonifera
Sesbania mossambicensis
Tephrosia pumila

DRY SEASON (May-Oct)

Grasses

Chloris gayana
Cynodon dactylon
Digitaria swazilandensis
Eragrostis atrovirens
Echinochloa stagnina
Panicum coloratum
Paspalidium obtusifolium
Paspalum scrobiculatum
Setaria eylesii
Sporobolus pyramidalis

WATERBUCK (grasses continued)

Eriochloa fatmensis
E. stapfiana
Heteropogon contortus
Urochloa mosambicensis
Vetiveria nigritana (post-fire flush)
Vossia cuspidata

Sedges

Cyperus esculentus
Cyperus michelianus
Mariscus hemisphaericus

Forbs and Suffrutices

Aeschynomene indica
Amaranthus graecizans
Basilicum polystachyon
Gomphrena celosioides
Heliotropium indicum
Sida acuta

Woody Plants

Mimosa pigra

WHITE RHINO

WET SEASON (Nov–Apr)

Grasses

Cynodon dactylon
Digitaria swazilandensis
Echinochloa sp. nr. haploclada
Echinochloa stagnina
Eriochloa fatmensis
Vossia cuspidata

Forbs

Sida alba
Tephrosia pumila

WILDEBEEST

WET SEASON (Nov–Apr)

Grasses

Bothriochloa glabra
Brachiaria deflexa
Chloris gayana
Cynodon dactylon
Digitaria milanjiana
D. swazilandensis
Echinochloa sp. nr. haploclada
E. stagnina
Eragrostis atrovirens
Eriochloa stapfiana
E. fatmensis
Panicum infestum
P. sp. (KLT 1873)
Paspalidium obtusifolium
Sporobous pyramidalis
Urochloa mosambicensis
Vossia cuspidata

Sedges

Cyperus esculentus
C. digitatus
Mariscus hemisphaericus

Forbs

Aeschynomene indica
Heliotropium ovalifolium
Tephrosia pumila

WILDEBEEST (continued)

DRY SEASON (May–Oct)

Grasses

Chloris gayana
Cynodon dactylon
Digitaria aethiopica
D. milanjiana
D. swazilandensis
Echinochloa stagnina
Eragrostis atrovirens
Eriochloa fatmensis
E. stapfiana
Heteropogon contortus
Panicum coloratum
P. maximum
P. sp. (KLT 2016)
Setaria eylesii
Sporobolus iocladus
S. pyramidalis
Urochloa mosambicensis
Vetiveria nigritana
Vossia cuspidata

Sedges

Cyperus tenuispica
Mariscus hemisphaericus

Forbs

Alternanthera sessilis
Heliotropium indicum
Heliotropium ovalifolium

Woody Plants

Hyphaene benguellensis
Lonchocarpus capassa

ZEBRA

WET SEASON (Nov–Apr)

Grasses

Brachiaria sp. nr. glauca
Chloris gayana
Cynodon dactylon
Dactyloctenium aegyptium
Digitaria swazilandensis
Echinochloa sp. nr. haploclada
Eriochloa fatmensis
Panicum sp. (KLT 1738)
Panicum sp. (KLT 1734)
P. coloratum
P. maximum
Sporobolus ioclados
S. kentrophyllus
Urochloa mosambicensis
Vossia cuspidata

Sedges

Cyperus esculentus
Cyperus tenuispica

Forbs

Alternanthera sessilis
Caperonia serrata
Eichhornia crassipes
Sphenoclea zeylanica

ZEBRA (continued)

DRY SEASON (May–Oct)

Grasses

Bothriochloa glabra
Chloris gayana
C. pycnothrix
Cynodon dactylon
Digitaria milanjiana
D. swazilandensis
Eriochloa fatmensis
Hyparrhenia dichroa
Panicum coloratum
Panicum maximum
Paspalum scrobiculatum
Setaria eylesii
Sporobolus ioclados
S. kentrophyllus
S. pyramidalis
Urochloa mosambicensis
Vetiveria nigritana