

THE VEGETATION OF THE S. A. LOMBARD NATURE RESERVE AND ITS UTILISATION BY CERTAIN ANTELOPE

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S.A. Lombard Nature Reserve, Bloemhof

INTRODUCTION

The S. A. Lombard Nature Reserve is situated about 12 miles west of Bloemhof, Western Transvaal (25° 30' E and 27° 35' S) at an altitude of 4,000 ft. The region has an annual rainfall of 15–20 inches (380–508 mm.), and precipitation is confined mainly to the period November to April. On the reserve the rainfall varied from 12 to 29 inches (305–737 mm.) over the 12 years 1952–63. In summer, day temperatures often exceed 27° C (80° F) but drop to 10° C (50° F) and less in winter. In June and July the temperature regularly falls below zero at night.

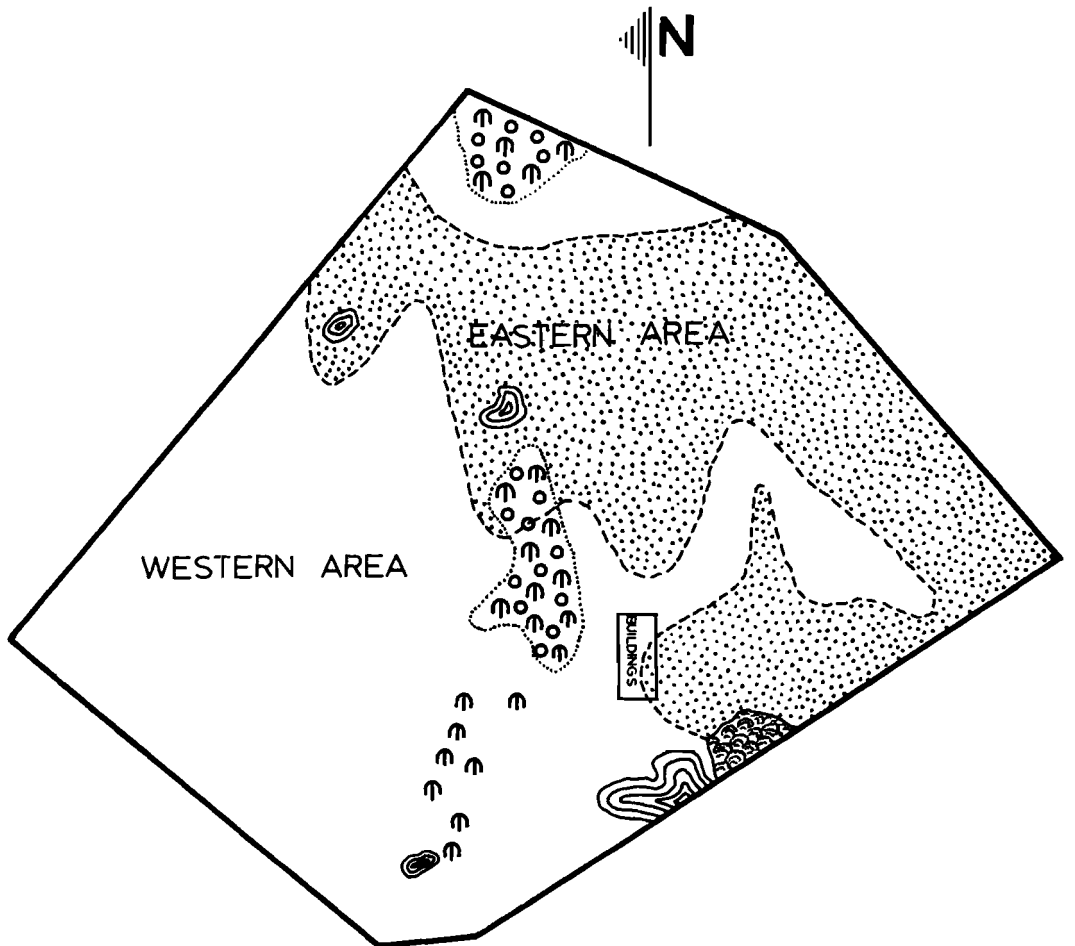
The reserve is flat open country with a gentle slope to the east and south. Abandoned alluvial diamond diggings which run from north to south divide the reserve into a western and an eastern area which are geologically different. The eastern part includes the wide shallow bed of a dry watercourse which nowhere forms a definite channel as it is nothing more than a slight depression. Numerous pans of aeolian origin are found in the eastern area but only a few in the west. Most of them are a few square yards in surface area and a few inches deep while the large dry pan south of the laboratory is about 300 by 800 yds. and 20 ft. deep.

The eastern area has a brackish type of soil, locally known as “brakturf”, which contains various thicknesses of diamondiferous gravel, while the western part is sandy loam. Soil varies from nil to six feet in depth and overlies a white calcareous formation which is in places exposed on the surface.

The history of the reserve from 1947 to 1955 was described by Van der Merwe (1955). During the Second World War it was used for breeding mules and taken over by the Nature Conservation Branch in 1950. At present the farm is 11,375 acres in extent of which about 7,000 acres was fenced with an eight-foot gameproof fence in 1952. This part is occupied by the animals on which this study was undertaken, together with about 20 Friesland cows and a few horses.

VEGETATION

The botanical survey of the fenced area was carried out by botanists from Potchefstroom University, the National Herbarium and staff of the reserve over a period of 10 years. Collected specimens are housed in a small herbarium on the station. The region is open grass land with small patches of bush, classified as dry *Cymbopogon-Themeda* veld (Acocks 1953), and the vegetation can be divided into five types as follows:









-  BLACK SOIL TURF VELD
-  DRY CYMBOPOGON THEMEDA VELD.
-  OLD DIAMOND DIGGINGS.
-  TREES & SHRUBS.
-  NATURAL BUSHVELD
-  PAN

FIGURE 1. The S.A. Lombard Nature Reserve.

Eastern alluvial area

A large part of this area consists of the wide shallow depression described earlier. It is flooded to a depth of up to two inches during heavy rains and also carries flood waters down to the Vaal River. The vegetation is characterised by patches of very short grass consisting almost entirely of either *Sporobolus ioclados* var. *usitatus* or *S. ludwigii*, interspersed with patches of *Cymbopogon-Themeda* associations. The latter grow on slight elevations, one to two inches high, which are not flooded except during very heavy rains. The height of these elevations is accentuated by the fact that the grass cover is much higher and denser than elsewhere in the depression. The *Sporobolus* in the depression proper forms a very poor ground cover and never grows high, even in the absence of grazing.

Various small karroid shrubs locally called "ganna" occur mixed with the *Cymbopogon* and *Themeda* grasses on the elevations but they are inconspicuous due to the dense grass cover. In parts *Lycium hirsutum* is common in the depression.



FIGURE 2. Eastern alluvial area showing short *Sporobolus* grass interspersed with patches of *Cymbopogon-Themeda* associations.

Western Dry Cymbopogon-Themeda Veld

About half of this area consists of old mealie lands where cultivation was discontinued in 1955, and the vegetation here is dominated by *Eragrostis lehmanniana* and *Aristida* spp.

On undisturbed parts *Themeda triandra* and *Cymbopogon plurinodis* are dominant, interspersed with patches where *Eragrostis lehmanniana* and *E. atherstonii* are also plentiful. Patches with poor grass cover support mainly *E. obtusa* and *Aristida*. Pure stands of *Enneapogon scoparius* occur on fairly large isolated areas. *Rhus lancea*, *Ziziphus mucronata*, *Diospyros licioides* and *Grewia flava* occur either isolated or in small clumps near the large dry pan.

Pans

The pans in the northern part of the reserve provide drinking places for game for as long as eight months of the year. They support a small aquatic plant *Marsilea macrocarpa* and the grass *Diplachne fusca*.

The pans south and west of the laboratory (which include the two biggest) are normally dry, except after heavy rains when their beds are temporarily flooded to a depth of a few inches. These pans are usually covered with *Sporobolus ioclados* var. *usitatus* with isolated tufts of *Eragrostis* along the edges. *Sporobolus bechuanicus* which is not elsewhere known from this



FIGURE 3. Abandoned alluvial diamond diggings.

region is restricted to the largest pan, the bed of which is about 20 ft. below the surrounding ground surface and covered with a pure stand of this grass.

Bushveld

A small portion of about 30 morgen on the south-eastern boundary is bushveld consisting predominantly of *Tarchmonanthus camphoratus*, with *Rhus lancea*, *Grewia flava*, *Diospyros lycioides*, *Acacia karroo* and *Ziziphus mucronata*. Open patches in this bush support karroid shrubs and *Aristida* grass.

Diggings

Digging for alluvial diamonds was done on the boundary of the eastern and western areas and discontinued about 1920. What was previously open grassveld was converted into numerous heaps of gravelly soil. As a result of the disturbance of the topsoil trees became established and today this area resembles rather open bushveld. *Rhus lancea* is dominant with numerous *Ziziphus mucronata* and an occasional *Diospyros lycioides*, *Acacia giraffae* and *A. karroo*. The grass cover consists mainly of *Cymbopogon-Themeda* associations mixed with *Cynodon dactylon* and *Pentzia viridis*.

TABLE I: A LIST OF THE PLANTS OCCURRING ON THE
S. A. LOMBARD NATURE RESERVE

a = abundant

c = common

r = rare

Acanthaceae:

- Barleria macrostegia* Nees (r)
- Blepharis squarrosa* (Nees) T. Anders (c)
- B. integrifolia* (L.f.) E. Mey. (a)
- Justicia orchioides* L.f. (r)
- Ruellia setosa* (Nees) C.B.Cl. (c)

Aizoaceae:

- Galenia prostrata* Schellenb. (c)
- Gisekia pharnacioides* L. (c)
- Hypertelis salsoloides* (Burch.) Adamson (r)
- Pharnaceum dichotomum* L.f. (r)
- Ruschia hamata* (L. Bolus) Schwant. (c)
- Trianthema* sp. nov. (Verdoorn) (r)
- Trichodiadema pomeridianum* L. Bolus (r)

Amarantaceae:

- Aerva leucura* (L) Moq. (c)
- Alternanthera repens* (L.) O. Ktze. (r)
- Amaranthus thunbergii* Moq. (r)
- Brayulinea densa* (H. & B.) Small (r)
- Cyphocarpa angustifolia* Lopr. (c)
- Gomphrena celosioides* Matr. (r)
- Sericorema remotiflora* Lopr. (r)

Amaryllidaceae:

- Nerine* sp. (not yet identified) (r)

Anacardiaceae:

- Rhus ciliata* Licht. (r)
- R. lancea* L.f. (c)
- R. pyroides* Burch. (r)

Boraginaceae:

- Heliotropium lineare* Wright (r)
- Trichodesma angustifolia* Harv. (r)
- Ehretia rigida* Linn. (r)

Campanulaceae:

- Lightfootia denticulata* (Burch.) Sond. (r)
- Lobelia thermalis* Thunb. (r)
- L. sp. nr. L. dregeana* Sond. (c)
- Wahlenbergia caledonica* Sond. (c)
- W. paniculata* A.DC. (r)

Capparidaceae:

- Cleome rubella* Burch. (r)

Caryophyllaceae:

- Dianthus burchellii* Ser. (r)
- Pollichia campestris* Ait. (c)

Celastraceae:

Maytenus cymosus (Soland.) Excell Gymnosporia
Hook F (r)

Chenopodiaceae:

Chenopodium album L. (c)
Salsola rabieana Verdoorn (c)

Commelinaceae:

Commelina karooica Clarke (r)
C. subulata Roth. (c)

Compositae:

Arctotis sp. sf. *A. staechadifolia* Berg. var. (r)
Aster muricatus Less. (a)
Berkheya pinnatifida (Thb.) Thell. s.sp. stobacoides
(Harv.) Roessler (c)
B. onopordifolia (DC.) O. Hoffm. ex B. Davy (c)
Cenia microglossa DC. (c)
Conyza podocephala DC. (c)
Cotula anthemoides L. (r)
Denekia capensis Thunb. (c)
Dicoma macrocephala DC. (r)
Epaltes gariepina (DC) Steetz (c)
Erigon bonariensis L. (r)
Flaveria bidentis (L.) O. Ktze. (r)
Gazania krebsiana Less. s. sp. krebsiana (r)
Geigeria burkei Harv. (r)
G. africana Gries (c)
Gnaphalium undulatum L. (r)
Helichrysum argyrosphaerum DC. (r)
H. caespititium Sond. (r)
H. declinatum (L.f.) Less. (r)
Lasiopogon muscoides (Desf.) DC. (r)
Nidorella resedifolia DC. (r)
Nolletia ciliaris DC. (c)
Osteospermum leptolobum (Harv.) T. Norl. (c)
O. muricatum E. Mey. (r)
O. scariosum DC. (r)
Pentzia calcarea Kies (a)
P. globasa Less. (a)
P. incana O. Ktze. (c)
P. viridis Kies (a)
Platycarpha parvifolia S. Moore (r)
Schkuhria pinnata (Lam.) O. Ktze. (r)
Senecio burchellii DC. (c)
S. inaequidens DC. (c)
Tarchonanthus camphoratus L. (r)
Venidium microcephalum DC. (c)
Xanthium pungens Wallr. (r)
X. spinosum L. (r)
Cirsium vulgare (Savi) Airy-Shaw (c)

Convolvulaceae:

Convolvulus boedeckerianus Peter (r)
C. dregeanus Choisy (r)
Falkia oblonga Bernh. (r)
Ipomoea bolusiana Schinz (r)

Crassulaceae:

Crassula muscosa L. (c)

Cruciferae:

Alyssum maritimum Lam. (r)
Capsella bursa-pastoris L. (r)

Cucurbitaceae:

Coccinia sessilifolia (Sond.) Cogn. (r)
Momordica balsamina L. (r)

Cyperaceae:

Bulbostylis sp. (c)
Cyperus difformis L. (r)
C. longus L. (r)
C. marginatus Thunb. (c)
C. rupestris Kunth (r)
C. usitatus Burch. (c)
Eleocharis limosa Schult. (r)
Juncellus laevigatus C.B.Cl. (r)
Kyllinga alba Nees (c)
K. erecta Schumach. (c)
Mariscus aristatus Rottb. (r)
M. congestus C.B.Cl. (r)
Pycneus angulatus Nees (r)
Scirpus dioecus Boeck. (r)
S. muricinus C.B.Cl. (r)
S. paludicola Kunth var. *decipiens* C.B.Cl. (r)

Dipsacaceae:

Scabiosa columbaria Linn. (r)

Ebenaceae:

Diospyros lycioides Desf. (c)

Elatinaceae:

Bergia prostrata Schinz (r)

Euphorbiaceae:

Phyllanthus maderaspatensis L. (r)

Geraniaceae:

Monsonia angustifolia E. Mey. (r)

Gramineae:

Aristida barbicollis Trin. et Rupr. (a)
A. congesta R. et S. (a)

- A. curvata* (Nees) Trin et Rupr. (c)
A. diffusa Trin. var. *burkei* (Stapf) Schweick. (c)
A. graciliflora Pilger (c)
A. scabrivalvis Hack. (c)
A. vestita Thunb. (c)
Brachiaria eruciformis (Sibth. et Smith).
 Griseb. (= *B. isachne* Stapf) (c)
Chloris virgata Sw. (c)
Chrysopogon montanus Trin. var. *tremulus* Stapf (r)
Cymbopogon plurinodis Stapf ex Burt Davy L. (a)
Cynodon dactylon (L.) Pers. (a)
C. hirsutus Stent (c)
Digitaria argyrograpta (Nees) Stapf (r)
D. eriantha Steyd. (r)
Diplachne fusca (L.) Beauv. (r)
Echinochloa holubii (Stapf) (r)
Eleusine africana Kennedy-o'Byrne (r)
Elyonurus argenteus Nees (r)
Enneapogon scoparius Stapf (a)
Eragrostis atherstonei Stapf (a)
E. bicolor Nees (a)
E. biflora Hack (r)
E. chloromelas Steud. (r)
E. ciltanensis (All.) Lutati (r)
E. curvula (Schrad.) Nees (c)
E. denudata Hack. (r)
E. echinochloidea Stapf (r)
E. gummiflua Nees (r)
E. homomalla Nees (c)
E. japonica (r)
E. lehmanniana Nees (a)
E. rotifer Rendle (r)
E. micrantha Hack. (r)
E. obtusa Munro ex Fic. et Hiern (a)
E. porosa Nees (r)
E. rigidior Pilger (r)
E. superba Peyr. (c)
Eriochloa nubica (Steud.) Hack. et Stapf
 ex Thell. (r)
Fingerhuthia africana Lehm. (r)
F. sesleriaeformis Nees (r)
Heteropogon contortus (L.) Beauv. (r)
Oropetium capense Stapf (c)
Panicum coloratum L. (c)
P. laevifolium Hack. (r)
P. stapfianum Fourc. (r)
Paspalum dilatatum Poir. (r)
Phragmites communis Trin. (r)
Pogonarthria squarrosa (Licht.) Pilger (c)
Rhynchelytrum villosum (Parl.) Chiov. (r)
Schmidtia bulbosa Stapf (r)
Setaria flabellata Stapf (c)
S. pallide-fusca (Schum.) Stapf et Hubb. (r)
S. verticillata (L.) Beauv. (c)
S. woodii Hack. (r)
Sporobolus discosporus Nees (r)
S. bechuanicus Goossens (r)
S. fimbriatus Nees (r)
S. ludwigii Hochst. (a)
S. ioclados Nees (a)
S. ioclados Nees var. *usitatus* (Stent) Chipp. (a)
Stipagrostis uniplumis (Licht.) de Winter var.
neesii (Trin. et Rupr.) de Winter. (r)
Themeda triandra Forsk. (a)
Tragus berteronianus Schult. (c)
T. racemosus (L.) All. (c)
Trichoneura grandiglumis (Nees) Stapf et Hubb. (c)
Urochloa panicoides Beauv. (r)
U. stolonifera (Goossens) Chipp. (r)
- Hydrocharitaceae:
Lagarosiphon muscoides Harv. (r)
- Iridaceae:
Homeria pallida Bak. (r)
Moraea polystachya Ker (c)
Syringodea linifolia Phillips (r)
- Labiatae:
Lasiocorys capensis Benth. (c)
Leucas sexdenta Skan. (r)
Mentha longifolia Huds. (r)
Salvia rugosa Dryand ex. Ait. (c)
S. stenophylla Burch. (c)
Stachys spathulata Burch. (c)
Teucrium capense Thunb. (r)
- Leguminosae:
Acacia karroo Hayne (r)
A. giraffae Willd. (r)
Cassia italica (Mill.) Lam. ex F. W. Andr. (c)
Indigofera alternans DC. (r)
I. cryptantha Benth. (r)
Listia heterophylla Mey. (r)
Lotonosis marlothii Engl. (r)
Prosopis chinensis (Molina) Stuntz (r)
- Liliaceae:
Aloe grandidentata Salm Dyck. (r)
Anthericum fasciculatum Baker. (r)
Bulbine narcissifolia Salm Dyck (r)

- Dipcadi marlothii* Engl. (r)
D. viride Moench. (c)
Schizocarphus rigidifolius (Kunth) v.d. Merwe (r)
Scilla sp. (r)
- Loranthaceae:
Viscum thymifolium Presl. (r)
- Malvaceae:
Hibiscus pusillus Thunb. (r)
H. marlothianus K. Schum (c)
H. trionum L. (r)
Pavonia patens (Andr.) Chiov. (r)
Sida chrysantha Ulbr. (c)
S. rhombifolia L. (c)
- Marsiliaceae:
Marsilia macrocarpa (DC.) Presl. (r)
- Nyctaginaceae:
Commicarpus pentandrus (Burch.) Heim. (c)
- Oleaceae:
Menodora africana Hook. (r)
- Oxalidaceae:
Oxalis depressa E. & Z. (c)
- Papaveraceae:
Argemone subfusiformis G. B. Ownb. (r)
- Pedaliaceae:
Pterodiscus speciosus Hook. (r)
Sesamum triphyllum Welw. ex. Asch. (r)
- Polygalaceae:
Polygala hottentotta Presl. (r)
- Polygonaceae:
Rumex crispus L. (r)
R. lanceolatus Thunb. (r)
Polygonum lapathifolium L. var. *glabrum* Burt
Davy. (r)
- Portulacaceae:
Portulaca oleracea L. (r)
P. quadrifida L. (r)
Talinum caffrum E. & Z. (r)
- Rhamnaceae:
Ziziphus mucronata Willd. (c)
Z. zeyheriana Sond. (a)
- Rubiaceae:
Kohautia cyananchica DC. (r)
- Anthospermum rigidum* E. & Z. (c)
Nenax microphylla (Sond.) Salter (a)
- Saxifragaceae:
Vahlia capensis Thunb. (c)
- Scrophulariaceae:
Aptosimum depressum Burch. (r)
A. lineare Marl. et Engl. (c)
A. indivisum Burch. (r)
Alectra pumila Benth. (r)
Limosella capensis Thunb. (r)
L. major Diels (r)
Striga bilabiata (Thunb.) O. Ktze (r)
Sutera aurantiaca Hiern (c)
S. pinnatifida O. Ktze. (c)
Walafrida sp. cf. *W. densiflora* Rolfe (r)
W. paniculata Rolfe (r)
- Solanaceae:
Lycium oxycladum Miers (c)
L. hirsutum Dunal (c)
Solanum supinum Dunal (c)
S. tomentosum L. (c)
Withania somnifera Dunal (r)
Datura sp. cf. *D. stramonium* L. (r)
- Sterculiaceae:
Hermannia comosa Burch. (c)
H. depressa N. E. Br. (c)
H. tomentosa Schinz (c)
- Tiliaceae:
Corchorus asplenifolius Burch. (c)
Grewia flava DC. (c)
- Thymelaeaceae:
Arthrosolen polycephalus C. A. Mey. (r)
- Umbelliferae:
Apium graveolens L. (r)
Berula thunbergii (DC.) Wolff (r)
Choritaenia capensis (Sond. et Harv.)
Pituranthos aphyllus (Cham. & Schldl.) Schinz (r)
P. burchellii (DC.) Schinz (r)
- Verbenaceae:
Chascanum pinnatifidum (L.F.) E. Mey. (r)
Lippia scaberrima Sond. (r)
- Zygophyllaceae:
Tribulus terrestris L. (c)

FOOD HABITS

Methods

The food habits of black wildebeest *Connochaetus gnou*, blesbok *Damaliscus dorcas phillipsi*, Cape eland *Taurotragus oryx*, Cape oryx *Oryx gazella*, impala *Aepyceros melampus*, red hartebeest *Alcelaphus buselaphus*, and springbok *Antidorcas marsupialis* were studied over the three-year period, 1958 to 1960. The plants eaten were determined by direct observation of isolated feeding herds or individuals of the various species, usually in the early morning or late afternoon, and observations were pursued for six-day periods at monthly intervals.

In the case of springbok and impala monthly observations were made continuously for two years, but the data were pooled, and represented as covering one year. Thus a plant eaten only in January of the first year but only in February of the second year is shown as having been eaten in both months. For other antelope, observations covered a period of three years, but were often interrupted, in which case a month missed in one year was covered in another. These data are again represented as covering one year.

The animals were approached closely and as soon as they made off the area was inspected very carefully and all freshly eaten plants were identified. It was sometimes necessary to follow a herd at a distance for hours to locate an area where they had undoubtedly just been grazing.

All the antelope on this reserve except gemsbok, feed by nibbling the plants here and there, and it was always a tedious task to trace the exact feeding spot. Then it was necessary to go down on hands and knees to inspect every plant in the surrounding area carefully, since the animals usually bit off only bits of leaves or flowers. Recognition of plants eaten was much easier in summer than during the winter. The work on gemsbok was easier because their feeding habits are similar to those of cattle and they leave behind an easily recognised feeding track. Their diet consisted of a relatively small number of plant species as compared with that of the other antelope.

In order to see whether feeding behaviour of game was affected by weather conditions, certain meteorological phenomena, e.g. wind velocity and direction, relative humidity, ground temperature (surface), air temperature (four ft. above the ground), and rainfall were recorded at each feeding observation. No obvious correlation could be found between weather and feeding and the results are therefore omitted.

Utilisation of plant species by antelope

With the exception of gemsbok and impala the game herds grazed alternately on the western and eastern areas, staying in one area from a few days to several weeks at a time. Gemsbok, of which there were only four, never left the western area while impala seldom penetrated more than 500 yds. into the eastern area. Impala normally inhabited the small patch of bushveld and the diggings, while eland also regularly visited these areas.

The importance of grasses

Fig. 4 shows that the greatest variety of grasses are utilised during the rainy season

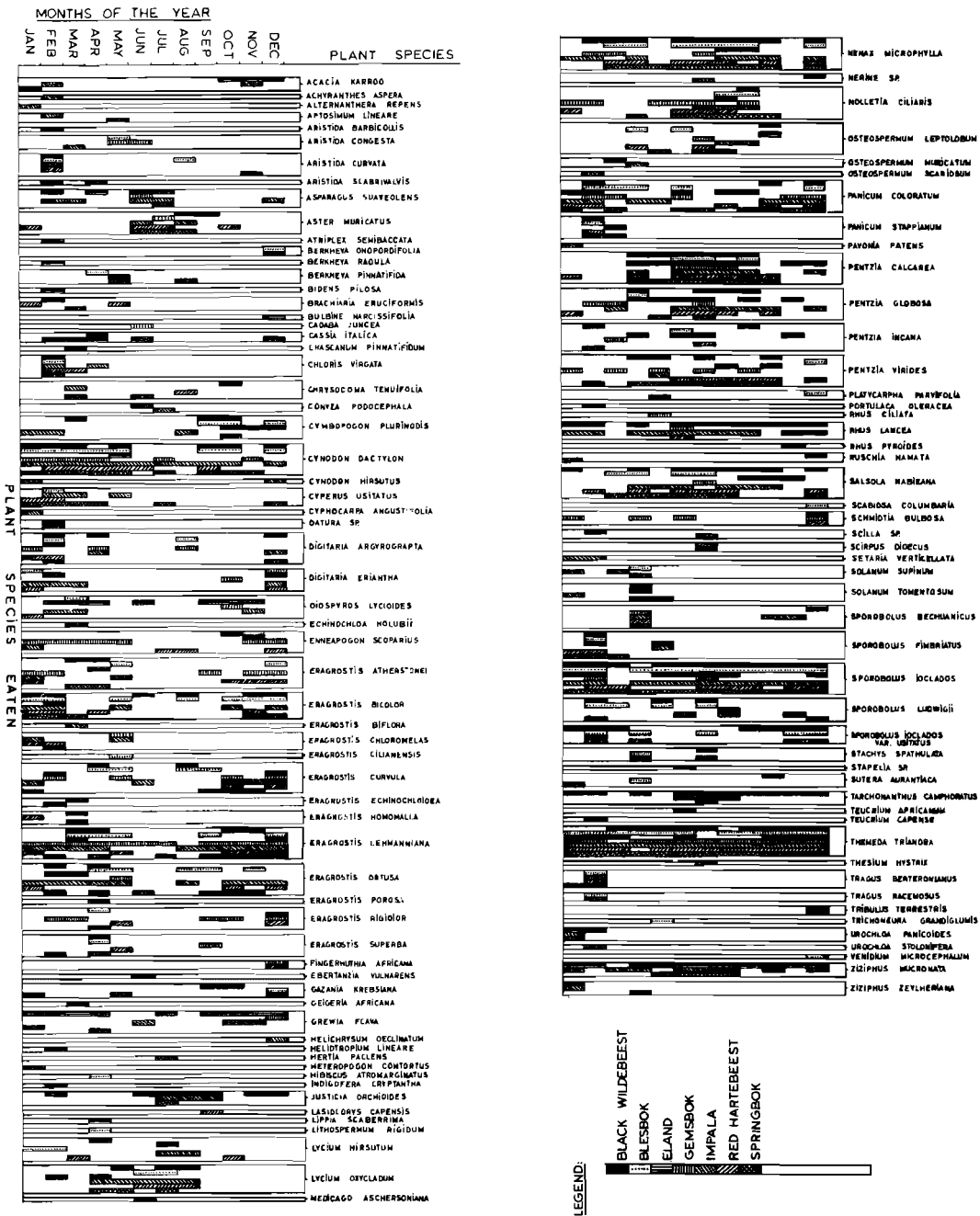


FIGURE 4. Utilization of plant species by antelope in different months of the year. Plants listed alphabetically according to genera.

(summer). This is particularly noticeable in the case of *Eragrostis* species, except *E. superba* which is not well eaten. On the other hand *Sporobolus ioclados* and *Themeda triandra* are eaten by most antelope throughout the year. The latter is by far the most abundant grass on the reserve and always provided (even when dried) good palatable fodder, except where old material forms a dense and partly decomposed cover. It is the only grass used by all the antelope species on the reserve. During winter it produces green shoots when sufficient dried material is available to protect the young leaves against frost. Although young shoots are inconspicuous, the stomach contents of blesbok and springbok contained large amounts of these green leaves during winter and they were observed to pick green shoots from dry tufts of *T. triandra*.

All *Sporobolus* species provide excellent summer grazing while *S. ioclados*, *S. ioclados* var. *usitatus*, *S. ludwigii* and *S. bechuanicus* are also relished by game in winter. In *S. ioclados* the basal parts of the leaves remain green in winter and it is a more useful winter grazing than *T. triandra* because the green material is more accessible to game. It was also noticed in large amounts in the stomach contents of blesbok and springbok during winter. It grows well even on the poorest soil on the reserve. This is also true of *S. ludwigii* which (although much scarcer) is grazed well during winter. It was not recorded for gemsbok because it does not occur in their feeding range. *S. bechuanicus* is restricted to the large pan and provides excellent winter fodder. The height to which it grows varies considerably from year to year, apparently depending upon the amount and distribution of summer rain. During 1957–59 it reached a height of about 2 ft. but since then has not grown higher than a few inches.

Although quite common and represented by eight species, the genus *Aristida* is seldom eaten. New leaves of *Cymbopogon plurinodis* ("Terpentyngras") appear immediately after winter before the first rain. At this stage it is eaten by game. Both forms of *Cynodon* form large patches around the buildings and drinking places and are well eaten by game and domestic stock. *Enneapogon scoparius* which occurs abundantly on isolated patches in the western area is well eaten by gemsbok and cattle. *Panicum* spp. are relished by game but are scarce on the reserve. *Pogonarthria squarrosa*, although frequent on sandy red soil, is not eaten by game. *Schmidtia bulbosa*, although very scarce and restricted to the western area of the reserve, is utilised by game generally in mid-summer and by gemsbok until the middle of the winter (Fig. 2.)

Setaria spp. are scarce on the reserve but grow well in gardens and other cultivated areas. When cultivated *S. verticillata*, which is a very good fodder for domestic stock, grows well even on poor calcareous soil. All *Setaria* spp. seem to be an excellent fodder and are locally known as "soetgras" (sweet grass). *Tragus berteronianus* is well eaten by game only in February. *Urochloa* spp., especially *U. stolonifera*, are very scarce on the reserve and are grazed down completely by game and domestic stock during January and February.

Most grasses have little or no feeding value after the first winter frost appears. It is interesting that certain grasses which form an important part of the diet of antelope on the reserve during one season, are completely ignored at another (Fig. 4). These grasses, which are common to abundant on the reserve, are listed in Table 2, which shows the months in which they were not taken by any antelope.

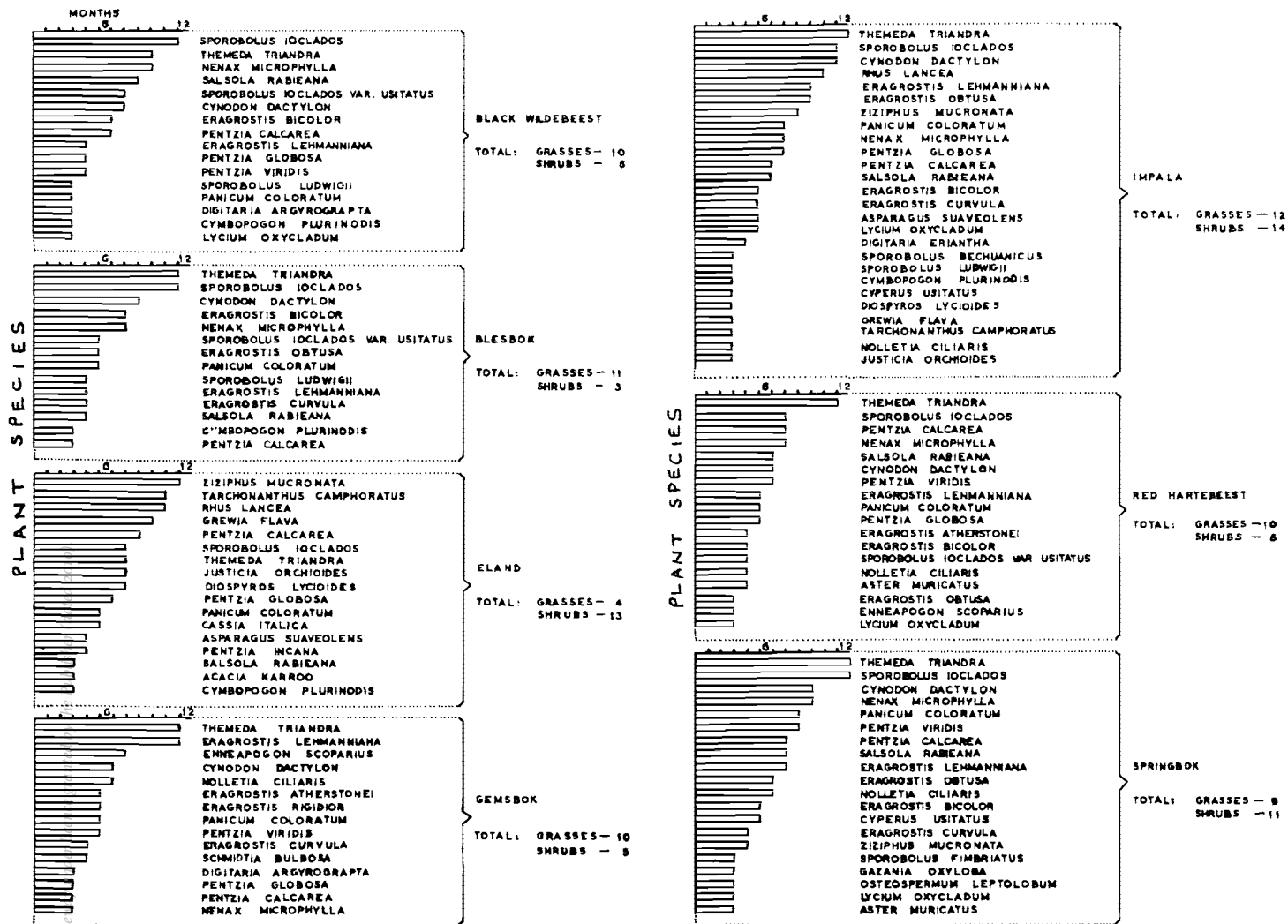


FIGURE 5. Plants eaten by the various antelope for three or more months of the year, arranged in order of importance in the diet.

TABLE 2: GRASSES NOT EATEN DURING CERTAIN MONTHS

| Species | Months not eaten |
|---------------------------------------|-----------------------------------|
| <i>Chloris virgata</i> | May, June |
| <i>Cymbopogon plurinodis</i> | April to July |
| <i>Digitaria argyrograpta</i> | March, May to July, Sept. to Nov. |
| <i>Digitaria eriantha</i> | April to Nov. |
| <i>Enneapogon scoparius</i> | June, Sept. |
| <i>Eragrostis atherstonei</i> | June to Aug. |
| <i>Eragrostis bicolor</i> | July, Sept. |
| <i>Eragrostis curvula</i> | March, July |
| <i>Eragrostis obtusa</i> | July |

Five of the seven antelope considered in this study used between 10 and 11 grass species (although different), considering only plants eaten three months and more during a year. Impala use comparatively less (Fig. 5). Black wildebeest, blesbok and gemsbok used grasses more extensively than non-gramineous plants.

The importance of non-gramineous plants

Figure 5 indicates the number of non-gramineous plants eaten by game for three or more months of the year. It is clear that eland preferred shrubs and trees, while impala, red hartebeest and springbok fed more or less equally on grasses and other plants.

Most of the karroid shrubs are excellent fodder plants. The genera *Aster*, *Justicia*, *Lycium*, *Nenax*, *Nolletia*, *Osteospermum* and *Pentzia* which flower in early winter and stay green until nearly the end of winter are grazed mainly during this season. This is particularly noticeable following rains in April–May. The only type of lye-bush that occurs on the reserve is *Salsola rabieana*, which is relished by all game. Its distribution is, however, limited, and it is found mainly in the eastern area. One of the karroid shrubs, *Nenax microphylla*, commonly known as “Rooiganna” is well eaten by all game. A small herb *Gazania krebsiana* which inhabits the elevations on brackish soil in the eastern area is very well eaten by game but it is rare on the reserve. *Sutera aurantiaca* is eaten by game, while *S. pinnatifidia* was not recorded as browsed in the course of this study.

Larger shrubs and trees like *Asparagus* sp., *Diospyros lycioides*, *Grewia flava*, *Rhus lan cea*, *Tarchonanthus camphoratus* and *Ziziphus mucronata* are well used by some game species. The seeds of *Diospyros*, *Grewia*, *Rhus* and *Ziziphus* form an important part of the diet of eland and impala, while the dried fallen leaves of *Ziziphus* are relished by springbok from May to August.

A *Datura* species (probably *D. stramonium*, locally known as “stinkolieboom”), which is a weed in cultivated lands, is left untouched until the seed stage is reached, but then is completely eaten down by springbok and black wildebeest. It was also observed that ostrich fed on these plants at the same time as the antelope. These plants are never touched by domestic

stock, but on one occasion, at the end of February, all *Datura* plants disappeared from the reserve over a period of three days.

Most of the shrubs listed in Table 3 seem to be palatable right through the year, and it is not clear why they were browsed less in summer. Possibly the abundance of green grasses during the rainy season provides adequate food.

TABLE 3: EDIBLE SHRUBS NOT EATEN DURING CERTAIN MONTHS

| Species | Months not eaten |
|--|-------------------------|
| <i>Aster muricatus</i> | Feb. to May, Nov., Dec. |
| <i>Grewia flava</i> | May, Aug. |
| <i>Lycium oxycladum</i> | Sept. to March |
| <i>Nenax microphylla</i> | Nov. |
| <i>Nolletia ciliaris</i> | March, Nov., Dec. |
| <i>Osteospermum leptolobum</i> | Nov. to March |
| <i>Pentzia calcarea</i> | Jan. to March |
| <i>Pentzia incana</i> | Dec., Jan. |
| <i>Pentzia viridis</i> | Nov. |

Poisonous Plants

Eland fed on *Bulbine narcissifolia*, *Cassia italica*, *Nerine* sp. and *Scilla* sp., while blesbok, wildebeest, eland, impala and springbok took *Solanum* sp. (Fig. 2), *Nerine* sp. and *Scilla* sp. *Geigeria africana* was also eaten by springbok. *B. narcissifolia*, which was on one occasion well eaten by eland is claimed by local farmers to be poisonous to stock, but they probably confuse it with the well-known "slangkop" (*Ornithoglossum* sp.) which occurs in this region. According to Watt *et al.* (1962) farmers state that *B. narcissifolia* is "a good feed for goat and sheep in the Bloemhof district". *Cassia italica* is also eaten by eland. Amongst local farmers this plant is believed to be poisonous to stock and is known as "swartstorm" due to its purgative effect. Davy (1912) has shown that the root is mildly purgative for stock, but Steyn (1929) obtained negative results upon feeding the dry plant to rabbits. *Nerine lucida* has been found poisonous to goats (Steyn 1931) and, according to Watt *et al.* (1962), all *Nerine* spp. contain alkaloids, and *Scilla* spp. contain substances which are poisonous to stock. *Solanum* spp. are claimed to be poisonous by local farmers, but Watt *et al.* (1962) stated that *S. supinum* is poisonous to man, while Steyn (1934) could find no ill effects from the oral administration to a rabbit. A toxicity test with the ripe and unripe fruits of *S. tomentosum* was negative (Watt *et al.* 1962). *Geigeria africana*, which occurs in limestone areas in the reserve, where it is said to be most toxic, is deadly poisonous to sheep and goats and to a lesser extent to cattle (Watt *et al.* 1962). It is eaten by springbok in the flowering stage, when it is probably less dangerous (Steyn 1932). The poisonous plants *Senecio burchellii*, *Moraea polystachya* and *Geigeria burkei* which occur on the reserve were not eaten by any game during the course of this study.

Food habits of the various antelope

Figure 4 shows that a mere 14 to 26 species of plants provide the main food resources for any one species of antelope. This includes plants eaten 25 per cent or more of the year. Out of 263 plant species occurring on the S. A. Lombard Nature Reserve, only 113 are utilised by antelope (Table 4). For further details refer to Figures 4 and 5.

TABLE 4: THE NUMBER OF PLANT SPECIES UTILISED BY ANTELOPE

| Antelope | Number of plant species eaten | Percentage of total number of species on the reserve |
|--------------------------|-------------------------------|--|
| Black wildebeest | 41 | 16·0 |
| Blesbok | 47 | 17·9 |
| Eland | 57 | 21·7 |
| Gemsbok | 33 | 12·5 |
| Impala | 62 | 23·6 |
| Red hartebeest | 45 | 17·1 |
| Springbok | 68 | 25·9 |

Black wildebeest. During the course of this study two herds (each just over 20 in number) lived on the reserve. They feed at night as well as during early morning and late afternoon, lying down during the heat of the day and very seldom visiting drinking places during this time. The animals utilised 16 per cent of the total number of plant species on the reserve, and except for gemsbok needs the smallest variety of plants. According to Figure 5, their main diet (plants eaten three months and more a year) consists of 63 per cent grass and 37 per cent shrubs. Although most game species under discussion make fairly good use of karroid shrubs, e.g. *Nenax microphylla*, *Salsola rabieana*, *Osteospermum leptolobum*, *Nolletia ciliaris* and *Pentzia* spp., black wildebeest exclude most of these species from their diet at times when they are well eaten by other antelope (Fig. 4).

Blesbok. These animals used 17·9 per cent of the total number of plant species (Table 3), and their diet consisted of 78·5 per cent grass and 21·5 per cent shrubs. They are thus primarily grazers and feed day and night at intervals. During the course of this study blesbok did not exceed 140 in number and herds of up to 60 were observed.

Eland. As shown in Table 4, eland feed on 21·7 per cent of the plants on the reserve and, unlike blesbok, are good browsers, making use of 76·5 per cent shrubs against 23·5 per cent grass. They never exceeded 30 in number and usually formed a single herd, which was kraaled and fed during part of the winter, but let out for observing food habits.

Gemsbok. The four animals kept to a relatively small area in the western part of the

reserve. Their food consisted of 12·5 per cent of the total number of plants in the reserve of which 66·6 per cent was grass.

Impala. The 160 impala in the reserve ran in two main herds with smaller herds of excess rams. One group kept to the bushveld area adjoining the big pan, ranging westwards into the area of scattered bush, while the other herd had its range in the old diamond diggings to the north of the laboratory and also further into the western area. The herd in the bushveld had access to abundant "vaalbos" *Tarchonanthus camphoratus* which is absent from the rest of the farm.

The impala fed on the greatest variety of important food plants (Fig. 5). Their main diet (Fig. 3) consisted of 46·2 per cent grass and 53·8 per cent shrubs, amounting to 23·6 per cent of the total number of plant species in the reserve. Although the existing plants produce millions of seeds each year and seedlings are abundant on other parts of the farm, young Karree *Rhus lancea* was completely absent from the normal range of the impala; and it is believed that they destroy all seedlings by grazing.

Red hartebeest. The number of hartebeest during the course of this work was about 30 in a single herd. They used 17·1 per cent of the total plant species in the reserve, of which 55·6 per cent were grasses and 44·4 per cent shrubs.

Springbok. This antelope outnumbered all others, about 800 head using the whole reserve as their feeding range, except for the small bushveld area south of the laboratory. They fed on 25·9 per cent of the total number of plant species (Table 3), and their main food plants consisted of 45 per cent grass and 55 per cent shrubs (Fig. 5). Although the springbok, which was a natural inhabitant of this region, makes use of the largest variety of plants, it was found that 36 of the 68 species were eaten only for one month a year (Fig. 4), and its main food resources consisted of only 20 plant species, against 26 in impala (Fig. 5).

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SUMMARY

A total of 263 plant species, occurring on the S.A. Lombard Nature Reserve, situated in dry *Cymbopogon-Themeda* veld at an altitude of 4,000 ft. near Bloemhof in Western Transvaal,

are listed with an indication of their abundance on the reserve. The main vegetation types on the reserve are discussed.

The utilisation of the various plants by seven species of antelope was studied by monthly observation of feeding animals and identification of the plants eaten by them over a period of three years. The results are presented in histograms and tables.

Black wildebeest, blesbok, eland, gemsbok, impala, red hartebeest and springbok fed on 113 plant species to a greater or lesser extent. The number of plants eaten for more than 25 per cent of the time by any one species varied from 14 to 26. Feeding behaviour is also dealt with.

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